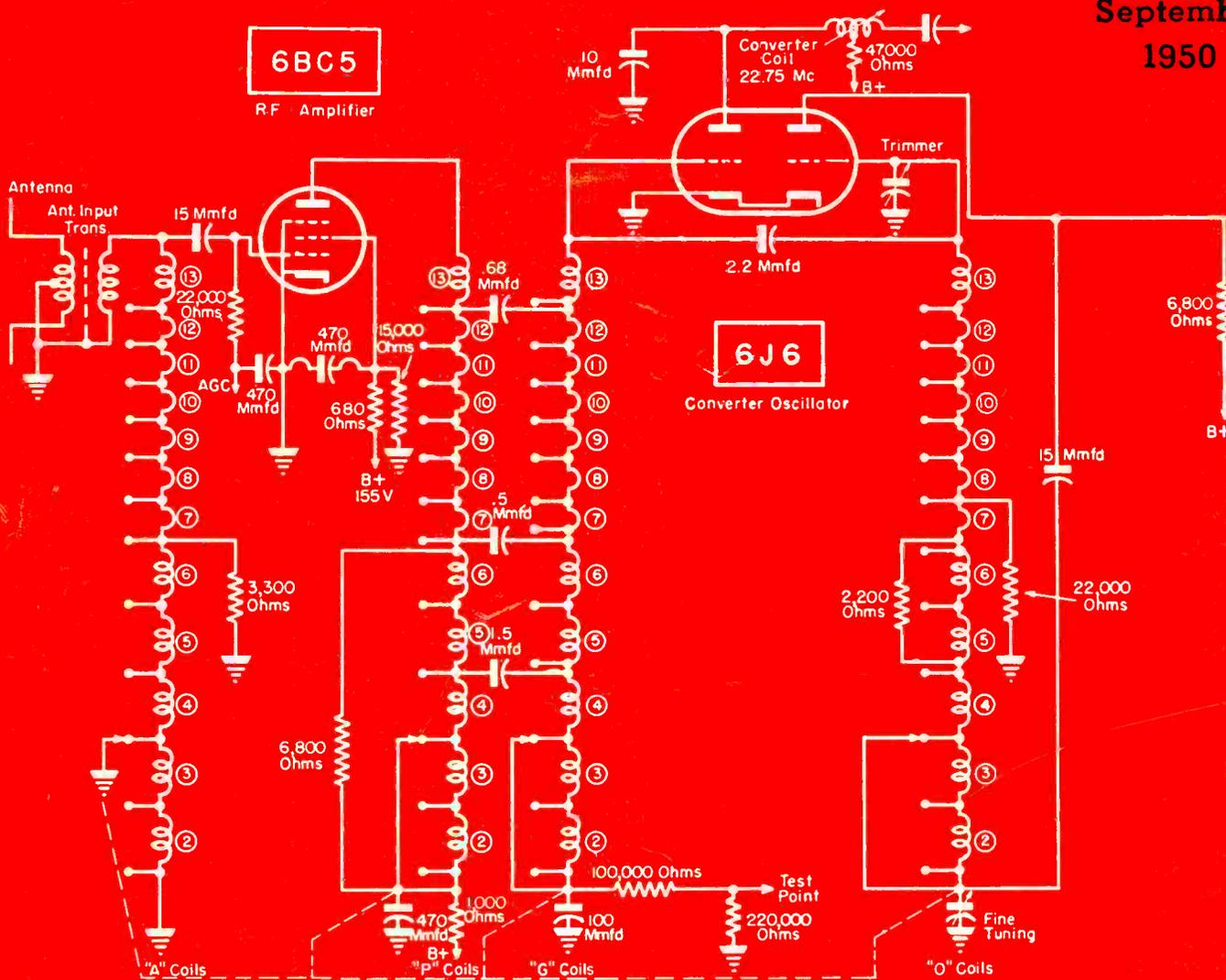


SERVICE

September
1950



Two-tube TV tuner featuring use of a double triode as a converter-oscillator.

[See page 2]

THE GREATEST

DEVELOPMENT IN TUBULAR

CAPACITORS IN 25 YEARS



WELDED LEADS

another

C-D first!

now available in "BLUE CUB"*

paper tubular capacitors

Only C-D moulded tubulars have welded leads!

- Sturdy welded joints between wire leads and foil of capacitor section results in permanent connections; no intermittents; no open-circuit defects!
- Permanent bond between lead wire and foil electrodes will withstand soldering temperatures, shock, vibration and rough handling.

That's why "Blue Cubs"* have become the fastest selling moulded tubular on the market today. In addition to "Leadweld"* terminals you get all these plus features:

STYRICAST MOULDED—

The only tubular cast in plastic after Vikane* impregnation. No heat or pressure to pinch, distort or injure unit.

FIXEDRESIN CASE—

Will withstand temperatures up to 300° F. without softening.

VIKANE* IMPREGNATION—

Only C-D tubular capacitors are Vikane* impregnated. This superior impregnant provides high stability of all electrical characteristics during long service life with exceptionally high insulation resistance, low power factor, and great durability under voltage stress.

For fewer servicing headaches, more satisfied customers and greater profits—insist on C-D "Blue Cubs"! Best by Field Test!

CORNELL-DUBILIER ELECTRIC CORPORATION, South Plainfield, New Jersey. Other plants in New Bedford, Brookline and Worcester, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, Ohio.

For nearest C-D jobber see your local Classified Telephone Directory.



CONSISTENTLY DEPENDABLE

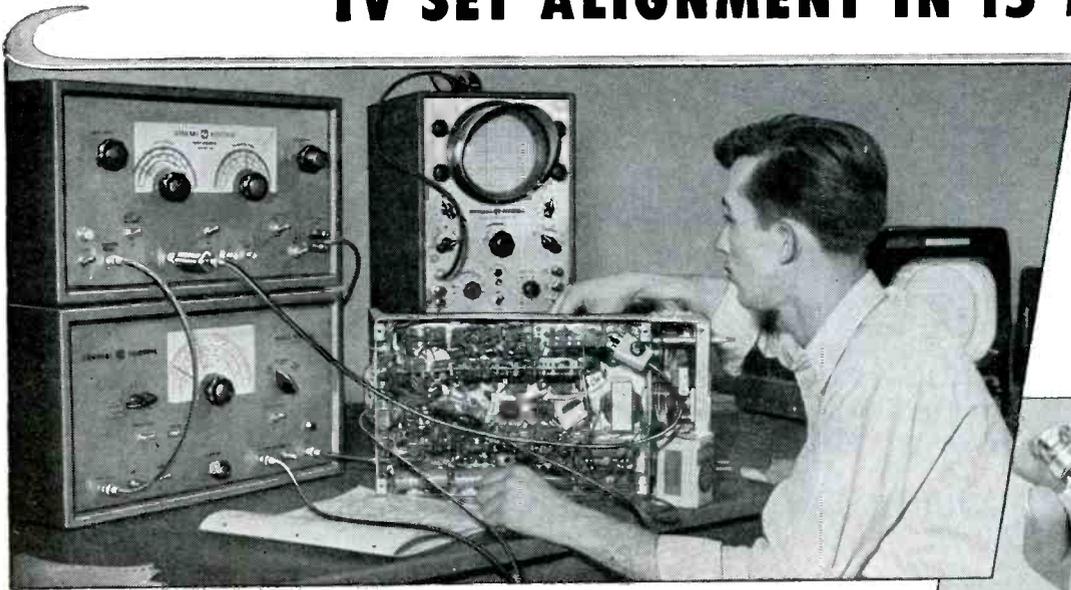
CORNELL-DUBILIER

CAPACITORS • VIBRATORS • ANTENNAS • CONVERTERS



"Complete, Accurate

TV SET ALIGNMENT IN 15 MINUTES!"



Says **JIM OTTMAN**
TV Service Supervisor
General Electric Supply Corp.
Buffalo, New York



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.

"**C**OMPLETE 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.*

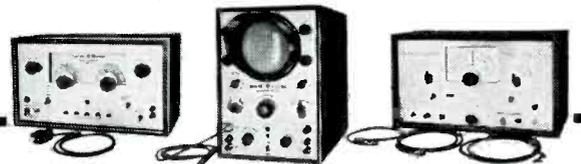
"We now repair most head ends right in the service shop because the G-E Variable Permeability Sweep has enough output to do the job alone. This G-E Package is the only equipment

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!"

That's the opinion of TV Service Manager Jim Ottman, of Buffalo. What this G-E equipment has done for his operation, it will do for yours. It's easy to buy—simple to use—and what a difference in results!

**ASK ABOUT THE G-E EASY BUDGET PLAN!
LET THE EQUIPMENT PAY FOR ITSELF!**



General Electric Company—Section 390
Electronics Park
Syracuse, New York

Send me complete information on the G-E Television Test Package and new Balanced Adaptor—plus **TERMS OF THE EASY BUDGET PLAN.**

NAME _____

ADDRESS _____

CITY _____ STATE _____

You can put your confidence in—

GENERAL  ELECTRIC



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Including *Radio Merchandising and Television Merchandising.*
Registered U. S. Patent Office

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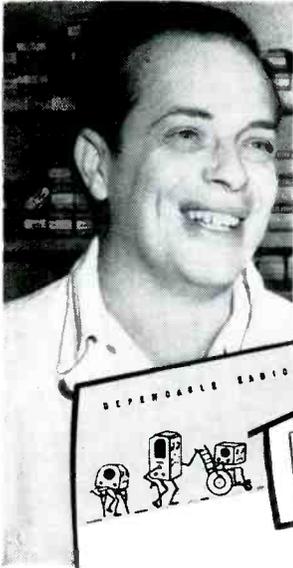
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**"We doubled our
store space...
increased our staff"**

DEPENDABLE RADIO SERVICE BY CAREFULLY TRAINED EXPERTS

BETTER RADIO INC.
136 W. Park Avenue
ELMHURST, ILLINOIS
Elmhurst 3228

April 28, 1950

Sylvania Electric Products Inc.
Advertising Department
Emporium, Pa.

Gentlemen:

During January, February and March, I sent 12,000 postal cards to each occupant of three suburban towns, Elmhurst, Villa Park, Lombard and countryside. I had a local letter service handle addressing and mailing at a cost of only 1/3¢ per card.

Business began to pour in soon after the first mailing. In January, it was up 33%, February 35% and March up 45% compared to service business in similar months in 1949. Yes, service business increased an average of 38% the first three months of this year, over last.

Due to the increased business we've had as a result of your campaign mailings, we have doubled our store space, increased our service staff from two to six bench positions, and added an outside staff for antenna installations.

Just thought you would like to know! Thanks for your help in the rapid growth of "Better Radio".

Cordially,
Howard J. Hitzeman
Howard J. Hitzeman
President
BETTER RADIO INC.

Read this remarkable record!

**Now let this SYLVANIA DEALER
CAMPAIGN boost your business!**

The above letter is actual proof of how Sylvania's Service Dealer Campaigns step up sales.

Now the new fall campaign is ready for you. It's tied in with the advertising your customers will be seeing in the Saturday Evening Post, Life, Look, Collier's and Radio and Television Best. It's sure-fire, powerful and complete . . . from colorful window and counter displays to bright, business-pulling postal cards . . . even radio spot announcements and ad mats.

All yours ALL FREE . . . you pay only the postage (1¢ for each card). So don't delay, mail the coupon TODAY!

"Ran out of new..."

"I was watching an international beauty contest when suddenly..."

Call Us for expert radio and TV service at reasonable prices...

Let us use and recommend SYLVANIA RADIO AND TELEVISION TUBES

DISPLAYS

We repair

You'll like our expert radio service and fair prices!

WE USE AND RECOMMEND SYLVANIA RADIO AND TELEVISION TUBES

WINDOW STREAMERS

POSTAL CARDS

HOW DOES YOUR RADIO SOUND?

DEALER'S IMPRINT

RADIO SPOTS

Spot Radio Announcements

FOR SYLVANIA RADIO SERVICE DEALERS

AD MATS

Put us and your radio or television set in top shape for Christmas

For the BEST in Radio and Television Service

Call us... DEALER'S IMPRINT

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT LAMPS, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

**SYLVANIA
ELECTRIC**

Sylvania Electric Products, Inc.
Dept. R-1709, Emporium, Pa.

Send full details about Sylvania's Fall Advertising Campaign for Radio-TV Service Dealers.

Name _____
Company _____
Street _____
City _____ Zone _____ State _____

Dealers Hail New High Gain Antenna Without Reflectors

Brach Slashes Prices As Costs Go Up

The unique design of the Bow Tie V has enabled Brach to reduce the price of this new antenna far below any other comparable TV antenna assembly in the quality Brach line. The Bow Tie V construction measures up to the same high mechanical standards which typify all of Brach products. In spite of its extremely low price, the Brach Bow Tie V will be ruggedly constructed of the finest virgin-aluminum seamless tubing and non-hygroscopic insulators.

Antenna Authority Praises Performance

"The new Brach Bow Tie V gives gain where its needed most," says Ira Kamen, noted TV antenna authority and now a Director of the Brach organization. "By gaining more signal strength on the high channels" according to Kamen, "you compensate for the greater transmission losses inherent at the upper frequencies".

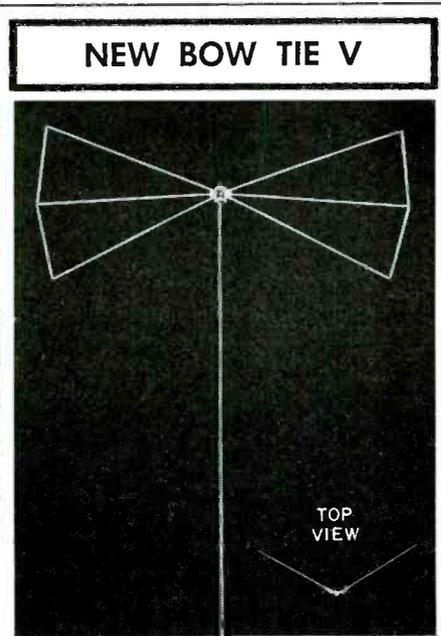
Mr. Kamen is well known as author of "TV-FM Antenna Installations" and "TV Master Antenna Distribution Systems".

Newly Developed Insulator Insures Superior Reception



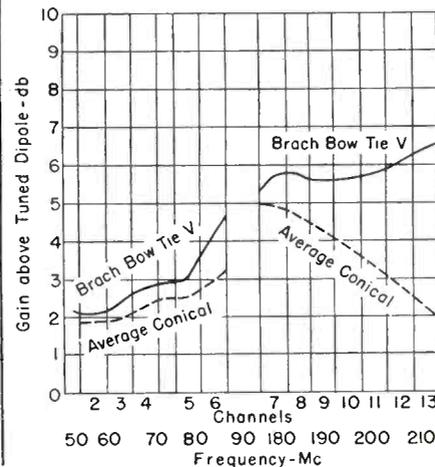
The Brach Bow Tie V insulator is a specially designed 6 element clamp, made of sturdy high impact Bakelite and heavy gauge tempered aluminum. It has real VHF insulation to minimize signal loss. Its tight grip provides a hold on the elements that wind, sleet, snow won't budge.

Unique Design of "BRACH Bow Tie V" Antenna Raises Gain and Cuts "Singing"



Combining a completely revolutionary design with precision engineering and stark simplicity, the Brach Bow Tie V antenna has outperformed others in a series of tests. Only 42 seconds is needed for assembly.

LABORATORY TESTS PROVE BOW TIE V PERFORMS BETTER THAN CONICALS



After exhaustive tests Brach Manufacturing Corp. of Newark, N. J. has introduced a revolutionary new design in their new Bow Tie V Antenna. Aside from its complete simplicity and the absence of reflectors and directors, the Bow Tie V has been proven superior in actual field tests. The new "closed end" feature increases gain, minimizes side lobe pick-up and eliminates vibration of elements. The Brach Bow Tie V can be stacked and gives top performance on high and low channels in both high signal and fringe areas.

Commenting on the new Brach Bow Tie V, Mr. Jack Winer, (right) Pres. of Dynamic Stores in N. Y., Wash. and Conn. said, "For



rugged simplicity and super performance you can't beat the new Brach Bow Tie V." Mr. George Hawley, (left) Pres.

of Television Associates, Newark, N. J. had this to say. "Our servicemen should average more than four hours each, a week saved on antenna installation. Furthermore, call-backs will definitely be minimized by its rugged construction."



"Red" Goldenberg of Sherwood Distributors, Hillside, N. J. points out the salient features of the Brach Bow Tie V to Les Palmer of Palmer Service Co., Inc., West Orange, N. J. "Private demonstrations of the Brach Bow Tie V have indicated tremendous dealer interest", Goldenberg said.

BRACH

MFG. CORP. • Div. of General Bronze Corp. • 200 Central Ave., • Newark 4, N. J.

MORE **HYTRON** **RECTANGULARS** FOR YOU!



NEW SIZES
Smaller 14-inch, larger
17-inch and 20-inch tubes
join Hytron's original
16RP4 rectangular

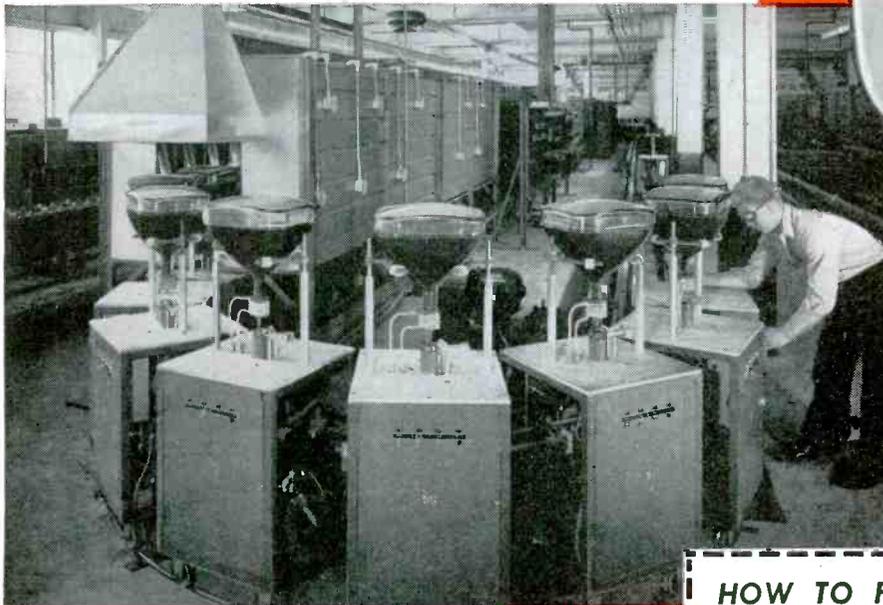


THE ORIGINAL HYTRON 16RP4 STARTED SOMETHING

Its rectangular design really clicked. Because it is logical . . . compact . . . economical. Everyone seems to want Hytron rectangular TV picture tubes. We just haven't been able to make enough.

But now we can serve you better. With a new, ultra-modern plant devoted to rectangulars. The original Hytron 16RP4. Also the new Hytron 14-, 17-, and 20-inch tubes.

It's smart to pick Hytron rectangulars. Nine out of ten leading TV set makers do. Take advantage yourself of Hytron's leadership . . . its wide line . . . its stepped-up production. Ask for the original and best in rectangulars. Demand Hytron.



NEW PLANT

Hytron's big new TV tube plant at Newburyport, Mass., uses latest of fast, automatic, precisely-controlled equipment to give you more tubes . . . better tubes.



New HYTRON TUBE PULLER

Makes pulling 7-pin miniatures a cinch. New, seventh Hytron shop tool now available at Hytron jobbers. Order yours today! Only 75¢ net.



MAIN OFFICE: SALEM, MASS.

HOW TO FIND YOUR HYTRON JOBBER

Want to learn where to buy original Hytron tubes? And the famous Hytron service-shop tools? It's easy. Fill in and mail this coupon today.

HYTRON RADIO & ELECTRONICS CORP.,
Salem, Massachusetts

Please rush a list of Hytron jobbers near me! (PLEASE PRINT)

NAME

STREET

CITY

STATE

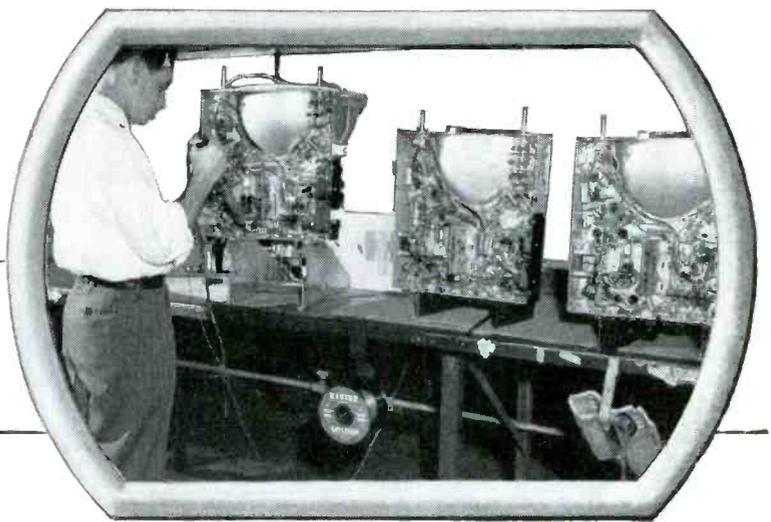
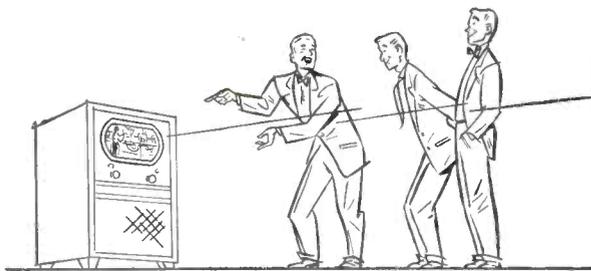
R.E.

**KESTER
SOLDER**

Give top quality TV service with Kester "Resin-Five" Core Solder

TV—the nation's fastest growing business demands the nation's number 1 solder. Kester "Resin-Five" Core Solder, formulated especially for TV, will out perform any solder of the rosin-core type. It easily solders such metals as brass, zinc, nickel-plate, copper, and ferrous alloys.

**MADE ONLY FROM NEWLY MINED
GRADE A TIN AND VIRGIN LEAD**



'Resin-Five' Core Solder

non-corrosive . . . non-conductive

Kester... Standard for the TV and Radio Fields

"Resin-Five" flux is more active and stable than any other rosin-type flux. Yet it is absolutely non-corrosive and non-conductive.

FREE SOLDERING BOOKLET—Send for Your
Copy of — *Soldering Simplified*

Kester Solder Company
4248 Wrightwood Avenue • Chicago 39, Illinois
Newark, New Jersey • Brantford, Canada



Make the most out of every man-hour . . . with Radion!

Taste!

RADION SAVES YOUR TIME—TIME'S MONEY TODAY!

Over 1,000,000 sold!

The METROPOLITAN—TA-49

The industry standard, Model TA-49 indoor TV Antenna, Mahogany bakelite. 300 ohm lead-in line. 3-section telescoping tubular steel dipoles. Fully assembled. Individually packaged. Shipped six to a master carton. Shipping weight, 11 pounds. LIST PRICE, \$6.95.

Cinches "borderline" sales!

The SUBURBAN—TA-51

Model TA-51 Conical Outdoor Antenna. For wall, window or attic mounting. Weatherized ebony bakelite head. 300 ohm lead-in line. Four telescoping tubular steel dipoles, triple chrome plated, 4-foot telescoping mast. Steel base mount, black copper-oxide, rustproof. All channel coverage without adjustment. Fully assembled. Individually packaged. Packed 6 to a master carton. Shipping weight, 30 pounds. LIST PRICE, \$9.95.

Aristocrat of indoor antennae!

The COSMOPOLITAN—TA-55

Uniquely beautifully FOTO-TENNA specifically designed to blend with the finest interior decorating scheme. Beautiful brown leatherette, 11" x 14" closed, opens to opp. 22½" x 14". Complete with lead-in wire. Individually packaged. Packed 12 to a master carton. Shipping weight, 22 lbs. LIST PRICE, \$7.50.



Yes, sir, the more quickly you can get a set installed and be on your way, today, the better your bank balance looks. That's why so many dealers have their service men take along a Radion on every set-delivery. Radion often saves time-consuming outdoor installations, usually brings 'em in on all channels when built-in antennae can't satisfy the customer. Your man is on his way to the next job in a hurry, leaving a happy set-owner behind him. His speed will make you a happy boss, too. And more prosperous! Mail the coupon—learn *more* about Radion!

Radion

THE RADION CORPORATION

1137 Milwaukee Ave., Chicago 22, Illinois

SPEED PAYS! GET PROFIT-PACKED FACTS!

MAIL THIS NOW!

THE RADION CORPORATION

1137 Milwaukee Ave., Chicago 22, Illinois

For Money-Making Data on Radion Products check here:

- Metropolitan No. TA-49 Cosmopolitan No. TA-55
 Suburban No. TA-51

Name.....

Company.....

Address.....

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

NOW! A FULLY AUTOMATIC ANTENNA ROTATOR BY ALLIANCE

The New **HIR**

with The Most Accurate Indicator On the Market!



JUST SET THE POINTER AND FORGET IT!

● **AUTOMATIC** — the new deluxe model HIR Alliance Tenna-Rotor is fully automatic! The antenna turns to any setting on the dial and stops.

● **FASTER INSTALLATION** — the only rotator where no orientation of antenna is required. Has special "Zip" feature—4-conductor cable.

● **NEVER OUT-OF-DATE** — station selector dial is eraseable. May be marked for present or new channels at any time by viewer.

● **MOVING MYSTIC LIGHT** — light moves along dial—shows position while antenna rotates. Pointer indicates antenna direction *at all times!*

And remember!

Only ALLIANCE delivers a national TV campaign to five million viewers around 60 stations.

- Has more than 250,000 users
- Comes with special "Zip" feature 4-conductor cable.

The famous Model DIR also available with handy — North — South — East — West indicator. Approved by Underwriters' Laboratories — guaranteed for one year!

Alliance Manufacturing Co.
Alliance, Ohio

Export Department: 401 Broadway, New York, N. Y., U. S. A.

alliance
TENNA • ROTOR

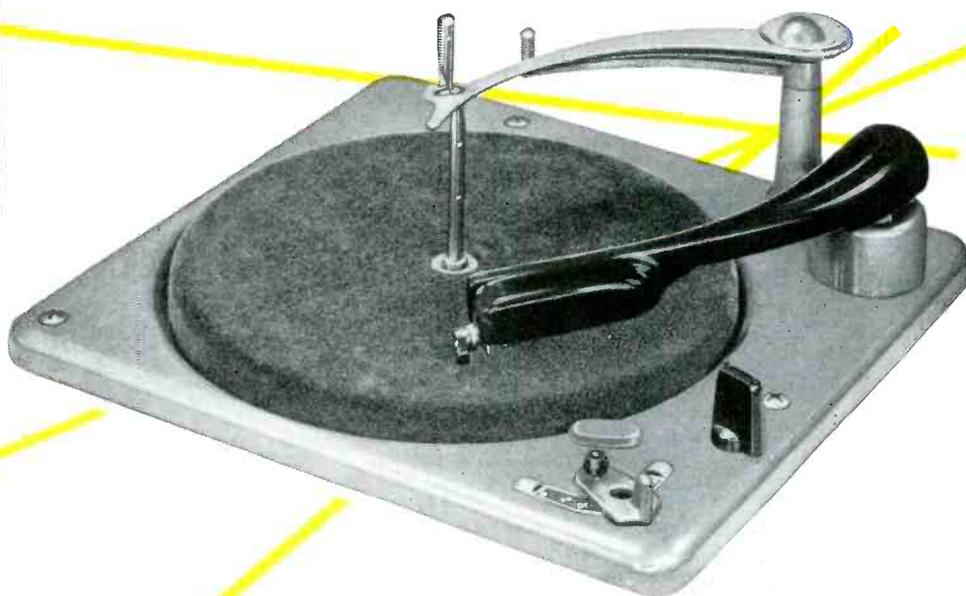
(TV ANTENNA ROTATOR)

It's **NEW** ... exclusive "triple-action"

It's **UNIQUE** ... plays all speeds, all sizes

It's the **FINEST** ... naturally, because

It's a **WEBSTER-CHICAGO**



Here's the new Webster-Chicago completely automatic record changer that plays all three sizes at all three speeds—with *only one control lever*.

It's the ideal replacement unit for consoles now equipped with single and dual speed record changers.

Check these Model 100 features—you will not find them on any other unit. Each of these outstanding "triple-action" features means more sales for you.

- Automatically plays 12-inch, 10-inch or 7-inch records at 33 $\frac{1}{3}$, 45 or 78 rpm without any special adjustments.
- Pick-up arm comes to rest position after last record is played.
- Idler wheel retracts when control speed is off: eliminates flat spot which causes "wow."
- Fewer working parts for longer life of carefree operation.
- New automatic manual position plays home recordings or "inside-out" records without special adjustment.
- Operates on 105-120 volts, 60 cycle
- AC 50-cycle adaptor available.
- Dimensions: Base 13 x 13 $\frac{1}{2}$ in., 5 $\frac{1}{8}$ in. above mainplate, 3 $\frac{1}{8}$ below mainplate. Shipping weight: 14 lbs.

Another  Product

WEBSTER-CHICAGO
Chicago 39, Illinois

**You Get
OVERALL
Test
Performance
With...**

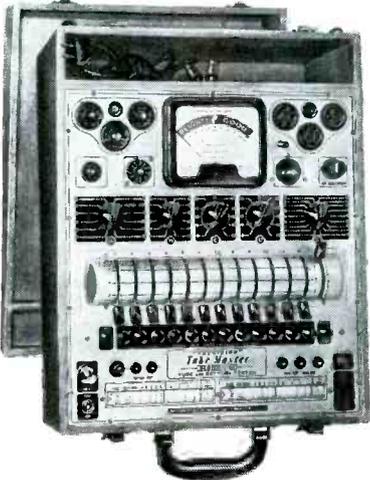


-PRECISION- SERIES 10-12 *Electronamic** TUBE PERFORMANCE TESTER

*Reg. U.S. Patent Office

with 12 ELEMENT free-point Master Lever Selector System

★ To test modern tubes for only one characteristic will not necessarily reveal overall performance capabilities. Tube circuits look for more than just Mutual Conductance or other single factor.



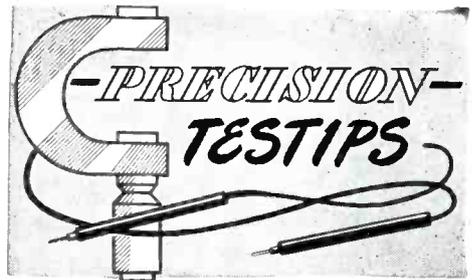
MODEL 10-12-P (illustrated): in sloping, portable hardwood case with tool compartment and hinged removable cover. Size 13 3/4" x 17 1/4" x 6 3/4".....\$95.10
MODEL 10-12-C (Counter Type).....\$99.40
MODEL 10-12-PM (Panel Mount).....\$99.40

★ In the Precision Electronamic Circuit, the tube PERFORMS under appropriately phased and selected individual element potentials, encompassing a wide range of plate family characteristic curves. This complete Path of Operation is integrated by the indicating meter in the positive PERFORMANCE terms of Replace-Weak-Good.

- ★ Facilities to 12 element prongs.
- ★ Filament voltages from 3/4 to 117 volts.
- ★ Tests Noval 9 pins; 5 and 7 pin acorns; double-capped H.F. amplifiers; low power transmitting tubes; etc. **REGARDLESS OF FILAMENT OR ANY OTHER ELEMENT PIN POSITIONS.**
- ★ **ISOLATES EACH TUBE ELEMENT REGARDLESS OF MULTIPLE PIN POSITIONS.**
- ★ **DUAL** short check sensitivity for special purpose tube selection.
- ★ Battery Tests under dynamic load conditions.
- ★ 4 1/2" Full Vision Meter.
- ★ Built-in Dual-Window, brass-gear roller chart.
- ★ **FREE** Replacement Roll Charts and supplementary tube test data service.

See

the "Precision" Master Electronamic Tube Testers at leading radio equipment distributors. Write for catalog describing Precision Test Equipment for all phases of modern A.M., F.M., and TV.



TUBE TESTING

Many years experience and development have indicated to Precision Field and Factory engineers that: "General purpose Tube-tester design should not be based upon just one selected characteristic, such as mutual conductance alone."

It has been conclusively proven that a tube may work well in one circuit, but fail to work in another circuit — simply because different circuits demand different relative performance characteristics. Among these characteristics are: electron emission, amplification factor, plate resistance, mutual conductance, power output, etc.

Tube manufacturers and research laboratories maintain elaborate tube testers which actually measure each characteristic individually. These testers, aside from great size and complexity, are much too expensive for service technicians. Their demand is for a tube tester which is compact, reasonable in cost, simple in operation, and which gives a reliable indication of the general over-all tube merit, or performance capability.

Extensive research has proven to our satisfaction that such a practical tube tester should be based upon the common factor that **Tube Output** (voltage or power) is the result of a plate current caused by an applied control-grid voltage — which current must be adequate even at full peak operating conditions.

This important principle is illustrated in Fig. 1 and is the heart of the famous, time-proven, Precision Electronamic® tube-tester circuit.

Because of the appropriately phased A.C. character of the test potentials, we refer to it as a sweep-signal or "Electronamic" test. It determines tube performance over a complete path of operation, from zero to peak output. This point-by-point performance-ability is then integrated by and indicated on a meter in direct terms of Replace-Weak-Good.

*Reg. U.S. Pat. Off.

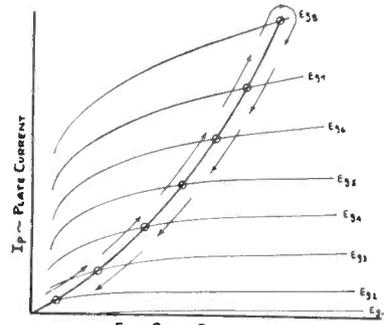


Fig. 1 — The "Electronamic" Method Tests the Tube Over a Complete Path of Operation.

The efficiency of this sweep-signal or "Electronamic" test results from encompassing several fundamental tube characteristics, NOT JUST ONE. Accordingly, when a tube passes this demanding performance test, it can be relied upon, to a very high degree, to work satisfactorily in most circuits.

It is for this reason that we find the "Electronamic" tester best to meet the realistic requirements of the technician — affording high practical correlation between test results and "in-application" performance.

By comparison, a single-characteristic test, such as the emission tester, has usefulness insofar as the tubes to be tested are used in circuits which depend primarily upon cathode-emission capability (assuming little alteration of vital electrode positions or continuity).

Even other single-characteristic testers have their definite limitations. More practically, the progressive technician will find the sweep-signal or "Electronamic" test to efficiently indicate the general over-all tube performance merit.

R.G. Bob Middleton

Engineering Division

← SERIES ES-500 — 20 MV. High Sensitivity, Wide Range 5 inch C.R. OSCILLOGRAPH.

V. Amp. Response to 1 MC! Low C, High R input Step Attenuator! Z axis modulation terminals! 9 tubes incl. V.R. and 2 rectifiers! Complete with light shield and mask. Heavy steel case 8 1/4 x 14 1/2 x 18"......Net Price: \$149.50

→ SERIES E-400

Wide Range H.F. SWEEP SIGNAL GENERATOR
Direct Reading
from 2 to 480 MC.

Narrow and Wide Band

Sweep for F.M. and TV

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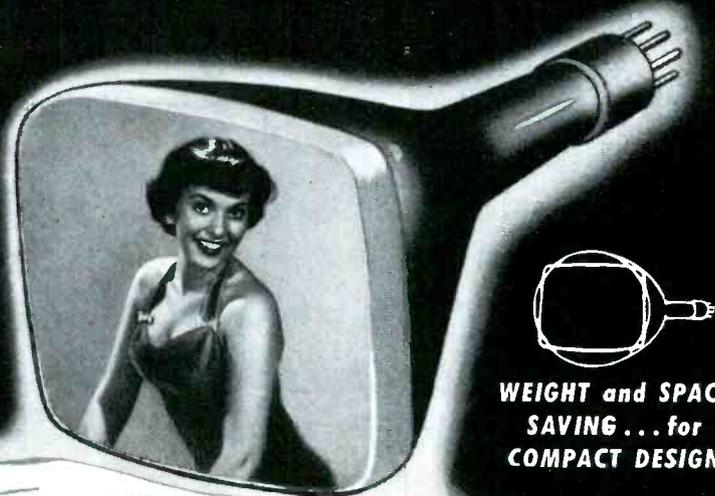
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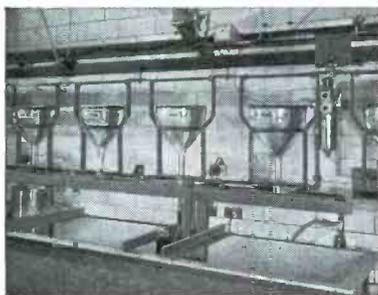
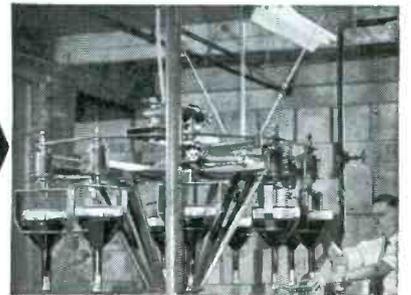
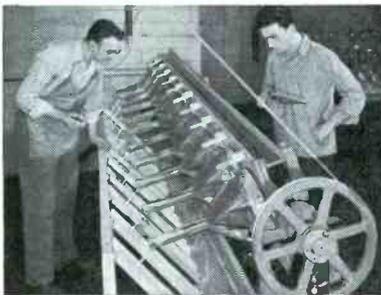
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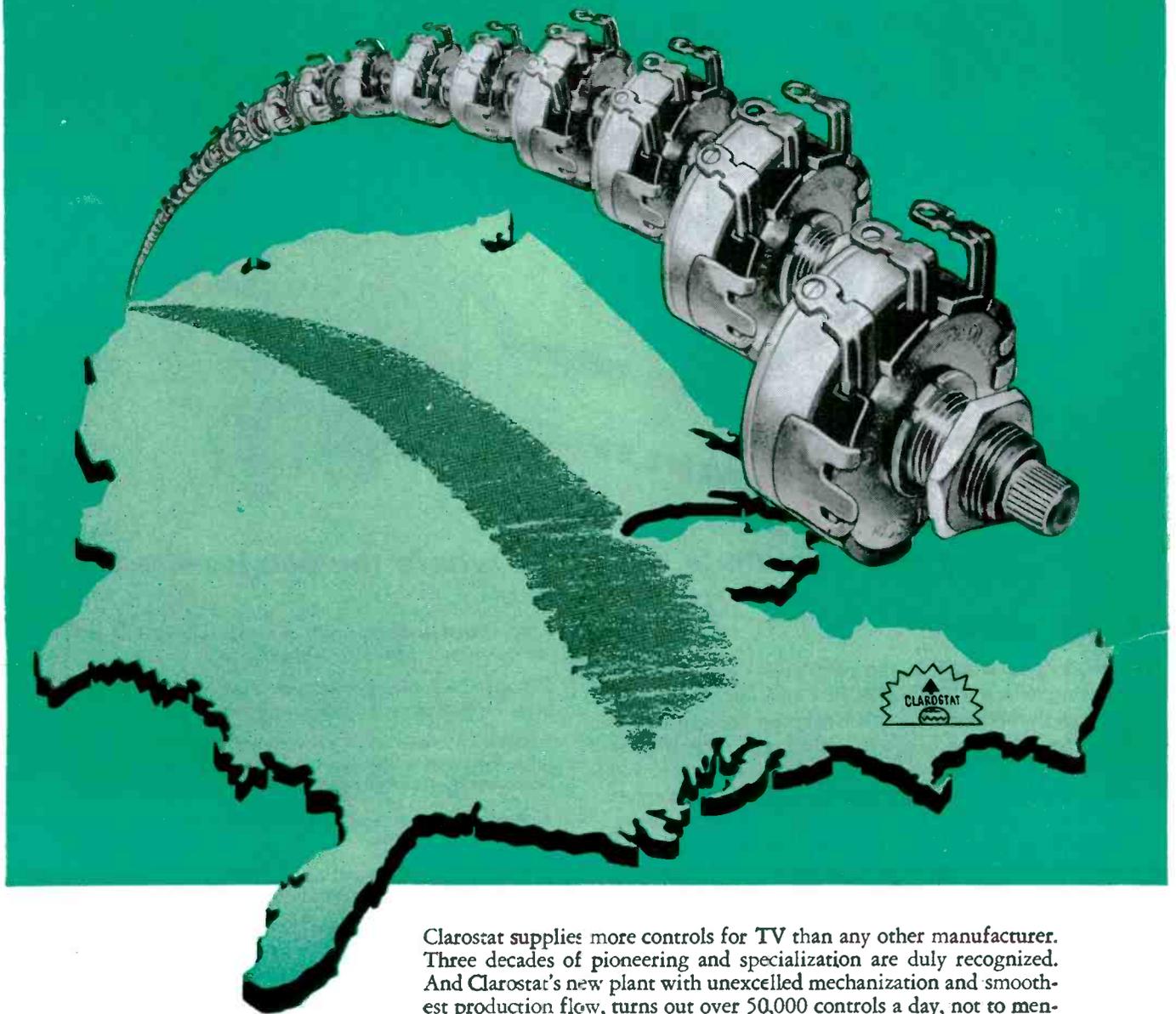
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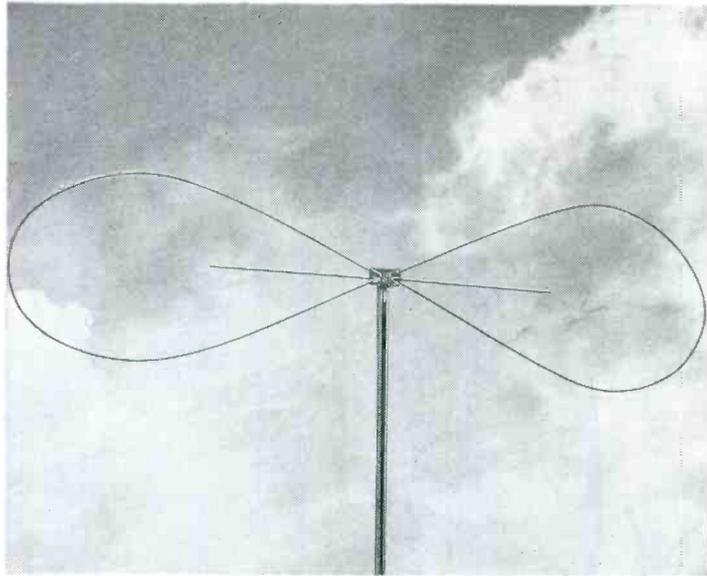
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OR YOUR
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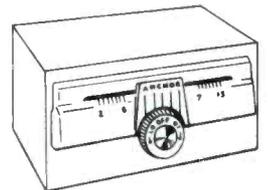
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Conversions and Honesty

WITH PICTURE TUBES of the 14, 16 and 19-inch variety now as prosaic an item as the 7s and 10s were only a short while ago, large-screen viewing has become the topic of the day everywhere.

Owners of the early-era 27 and 53-inch models, fascinated by the new giant pictures available, have scanned the crystal ball searching for an answer to their plight. Of course, purchase of a new chassis has provided a rapid solution for many. But there are those who have been reluctant to part with their set, not only because it probably performs very well, but because of the substantial investment in the package. Those sets of '48 and '49 were priced on the high side. The answer to the dilemma of many has been. . . *conversion*. Through a revision of the circuitry, particularly the high-voltage system, and alteration of the cabinetry, especially the front panel, it has been found possible to produce a big-picture set with outstanding merit.

Quite a few groups of Service Men have become very active in this new effort and found themselves involved in really a big business. In Chicago, the interest has been so keen, that some Service Shops have had to set up production-line methods to deliver the chassis on time. In some instances as many as twenty to twenty-five men have been employed to make the various changes in the sets and cabinets. The majority of the conversions have been in the 10 to 14-inch class, particularly the rectangular types, this being the largest tube most of the 10-inch cabinets will accommodate. There have been conversions of 12-inch to 16-inch, and on occasions 10-inch models have been converted for use with 16 and 19-inch tubes. However, the 10 to 14 and 12 to 16 have become considered as standards and prices set up for these operations, with \$75 applied to the 14-inch change and around \$100 for the 16-inch affair. In one shop, nearly a thousand chassis have been converted since the Spring, and plans are afoot to dig into perhaps another thousand before the year is out.

Set owners have been found to be

the best customers for the conversions, although in some communities dealers have been quite a source of activity. Many interesting sales techniques have been employed to drum up business; direct solicitation, direct-mail advertising, announcements over TV during news telecasts, and advertisements in program magazines.

In Philadelphia, conversion has become a hectic project, too, with some of the boys averaging up to 75 chassis a week.

The sensational growth of the converter operation has been due, in the main, to a strict adherence of a rigid code of ethics involving the fulfilling of every promise and the maintenance of continuous friendly relationship with the consumer. Unfortunately, some have chosen to violate these golden rules and there has been trouble. Not content with normal profits, these boys have adopted tactics, which they felt would skyrocket their profits, even though it might be at the expense of the consumer. Tried in a large metropolitan center, the plan backfired with a vengeance. In a *Get-Rich-Quick Wallingford* type deal, a batch of 7-inch chassis were bought and converted for 12 and 14-inch tube use, with full knowledge that the results could never be satisfactory. The sets were sold to a dealer, who announced a sale of large picture-tube sets at ridiculously low prices. The sale was a success, a smashing one, but the aftermath was truly chaotic. The returns and complaints from the Better Business Bureaus almost ruined everyone. The dealer had to make refunds and the Service organization had to make readjustments. Everyone lost in this foolish campaign to do business the wrong way. This disastrous deal had its repercussions on many fronts, too, with general accusations being blasted against the Service Man. We know that this was an unusual and rare incident. But its effects were extremely damaging, the cause of gnawing gossip which could be ruinous.

There are plenty of golden chips in this Servicing business and everyone has an opportunity to earn them, plenty of them, without resorting to shady schemes. The Servicing industry

has earned the respect of everyone for its excellent record, a record which has featured particularly, honesty!

Well Done

ANYONE WHO has any doubts about the capabilities of the TV Service Man should listen to Howard Sams, who cited recently why he felt the boys are doing a grand job. Said Sams . . . "When we consider that television has grown from a precocious infant to a giant industry within the span of a few years, we must admire, rather than find fault with the work of the technician who is being called upon to service this relatively unfamiliar instrument."

Surveying the overall problem, which has faced the Service Man since the early days of the art, Sams said: "With the rapid growth and almost constant change in conventional radios, the Service Man has had no easy task to keep abreast of this medium alone during the past few years. And when we superimpose television on that job almost overnight, the remarkable thing is not that there is some criticism of his service work, but that he has been able to grasp the intricacies of television as rapidly and as thoroughly as he has, and has kept the nations sets in good working order. True, there may have been some inferior servicing, but where the technician has *honestly availed himself of the technical data and manuals* which give him a thorough working understanding of the sets he is called upon to repair, in the overwhelming majority of cases, no reasonable set owner has had reason to complain of his work."

Discussing the recent moves by some municipalities to hoist licensing on Service Men, Sams declared: "All the regulations and licensing ordinances in the world won't improve a job of television servicing, if the technician is not in possession of the know-how with which to do a good repair job. It is the industry's responsibility to see to it that these technical data are available and that the Service Man becomes a full partner in the manufacture-distribution-servicing team to give the public its money's worth in television."

Sound comment!—L. W.

Improving the Audio System

by MELVIN C. SPRINKLE

THE PAST YEAR has witnessed a significant spiralling interest in better sound. The demand for custom audio components, including amplifiers, speakers, FM tuners, and record players, has mounted and created an entirely new industry. The recent avalanche of long-playing records has given fresh impetus to an already booming business. A music lover can now purchase a recording of fidelity considered impossible five or more years ago. He also has available phono pickups which are better than broadcast equipment of 1945. A large percentage of these high quality records are sold to those with reproducing equipment that will not reproduce one-tenth of the music that is on their own records. However, the high-fidelity idea is rapidly spreading; more and more music lovers are buying audio amplifiers just to play their records. All this and television too.

There are literally thousands of receivers that were bought because the

little woman liked the style of the cabinet. Over the years the cabinet has become a part of the family and persons are reluctant to junk the radio in favor of a new one. These old receivers, with a little work on the audio end, can be made to perform like \$1000 models. There is pleasure to the owner and profit to the Service Man in these old models.

To many Service Men mention of *high quality* or *high fidelity* conjure up immediate thoughts of woofers and tweeters, with the first emphasis on wide frequency response. Those of us who are directly involved in high quality audio work have learned a long time ago that wide-frequency range is the *last* factor to be considered. It has been found that public acceptance and demand for real high quality consists of three steps:

(1)—Reduction of distortion to the lowest possible value. This can be accomplished by substitution of the output transformer with a better trans-

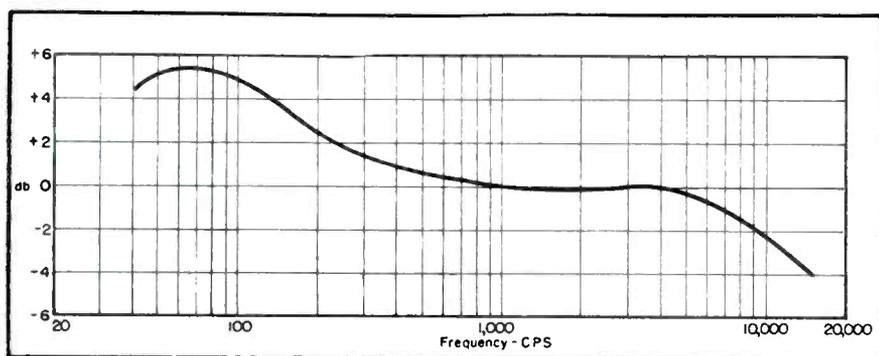
former, not a replacement type transformer. The *dc* voltages must be checked to make sure that the tubes, especially the output tubes are operating properly. It is important to see that clean signals of adequate levels are delivered to the output tubes and that in push-pull amplifiers the signals are accurately balanced. Power output of amplifier must be checked at frequencies from 30 to 15,000 cps.

(2)—Reduction of hum and extraneous noises to inaudible levels with audio gain at loud levels. This involves ordinary techniques with which any Service Man is very familiar.

(3)—Once the distortion and noise levels are low, then the frequency range of loudspeakers and phono pickups can be increased with the assurance that the customer is not only going to be pleased himself, but will broadcast the news to others.

During the past winter, it was suggested to a Service Man that an attempt be made to modernize some old sets just to see what could be done and how much of this work was around. The results were so striking and profitable that modernization has become the key operation in this Service Man's business. During his winter campaign several unusually interesting revisions were made.

In one instance, a small *pa* amplifier used by a local church was involved. Used were 6L6Gs in push-pull. Before beginning modernization, the amplifier was restored to its original condition by replacing one of the coupling capacitors and then response and power output curves were made, as shown at left. The original response looked pretty good and a cursory examination of this amplifier might indicate that it was in satisfactory condition. However, during frequency-response measurements with a 'scope connected across the output load resistor, it became evident that there was excessive distortion below 100 cycles. This was borne out by a power curve which revealed that the mid-range (1000 cycles) power was 12.5 watts, but at 75 cycles the power dropped 10 *db* or to 1.25 watts, the drop-off being precipitous. This emphasized another of the *facts-of-life* on

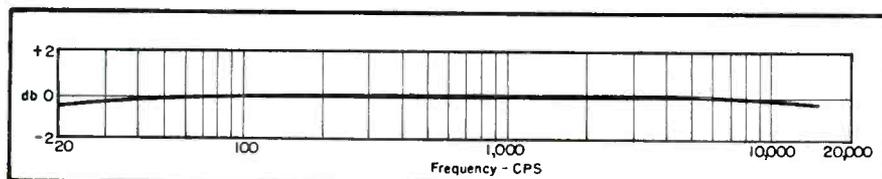


(Above)

Frequency response of an amplifier, with the treble control set for maximum response; Lafayette model 718.

(Below)

Frequency response of amplifier, after its output circuit has been modernized through the installation of a new output transformer (0 db = 1.73 volts across 8 ohms).



A Revealing Report on Modernization Techniques Which Have Been Found Effective in Stepping Up Efficiency of Amplifiers and AF Systems, Through the Replacement of, in the Main, Output Transformers.

high quality; power output is often more important than frequency response. There is no relationship between frequency response and power output at frequency extremes; the latter is a function of the design of the output transformer and is something over which the user has no control. Inadequate power output at frequency extremes is one of the prime causes of intermodulation distortion, which to the consumer appears as *radio sound*.

This amplifier was modernized by the installation of a new output transformer¹ and the rerouting of one lead to reduce the hum level. The frequency response and power measurements were repeated, and the results shown at left, below, were secured. The frequency response was found to be flat within 1 db from 20 to 15,000 cycles. The power curve was very interesting. With *no* changes, but the output transformer, the midrange power was increased 20 per cent (0.8 db) to 15 watts. The power drops were only 3 db (to half its midrange value) at 25 and 15,000 cycles as compared to 115 and 10,000 cycles previously.

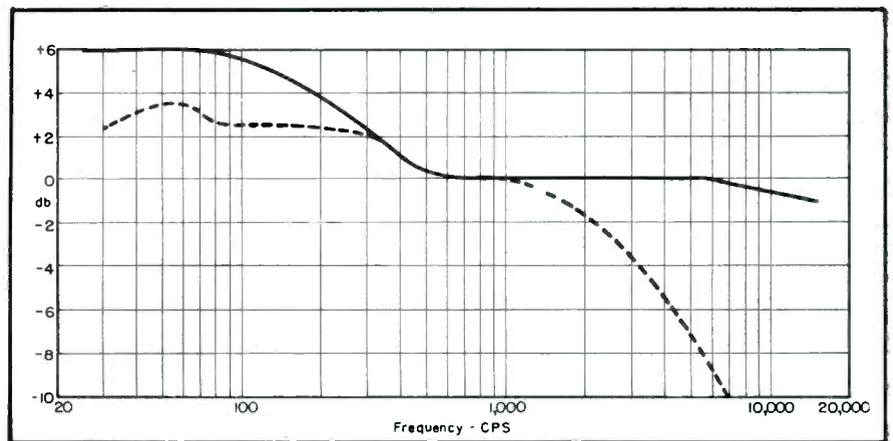
The second case concerned a home-type amplifier promulgated by a consumer's organization. Long ago this research group had become convinced that commercial receivers were not good buys and decided to recommend that consumers buy audio units. The general complaint on this amplifier was that it didn't sound much better than a console radio. In checking, no frequency response measurements were made, because the amplifier had bass and treble controls that could control boost. A power measurement showed that although this amplifier was rated at 10 watts and used triodes in a circuit that would normally give 10 watts, the maximum useful power at 1000 cycles was 7.5 watts. The output transformer was replaced² and an increase in power to 10.4 watts was noted. There were much greater power increases at the bass and treble ends and a corresponding reduction in distortion.

The question of power output at frequency extremes is of such impor-

tance that it warrants some special comment. Frequency response is a gain measurement; it is a statement or curve disclosing how the gain of the amplifier changes (or remains constant) as a function of frequency. Power output, on the other hand, is a measure of how many watts, and at what distortion level, are delivered at various frequencies. If we confine ourselves to the audio spectrum where cathode lead inductance and transit time effects do not bother us, a tube or a pair of tubes used as a power amplifier will deliver its nominal power to a resistive load coupled directly to the plate at any frequency, including *dc* (zero frequency). It will be noted that tube manuals in their ratings for audio service do not impose any frequency restrictions on power output. However, in practical

amplifiers it is necessary to use an output transformer to couple the load (speaker) to a power amplifier. Thus, it is the *output transformer* that determines how many watts the load receives at various frequencies. In particular, it is distortion that puts a limit on the useful power at treble and bass frequencies; a meter that is used to measure frequency response measures distorted signals as readily as undistorted. It is the power output that determines whether an amplifier *sounds good*.

In the third case, a prewar \$250.00 type of receiver had to be revamped. The complaint was that the set *just doesn't sound good*. Measurements revealed that the audio performance was far from being representative of high quality. The power output was about 4 watts in the midrange before excessive distortion set in and fell off rapidly at both the bass and treble ends. The power performance was so poor that no attempt was made to plot a power curve. Then the frequency response was measured with the treble and bass control set for maximum response. It was found that the response fell off rapidly above 1000 cps and that the maximum bass boost was about 2.5 db; curves below. A bump at 50 cps was caused by resonance effect in one of the transformers. The dy-

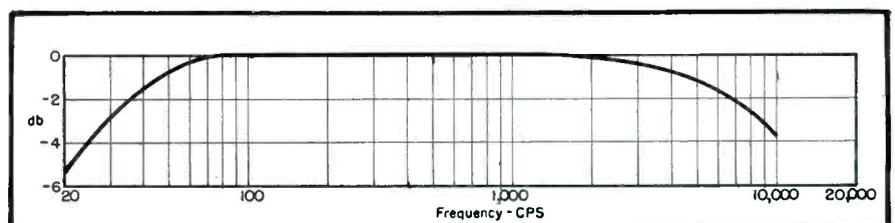


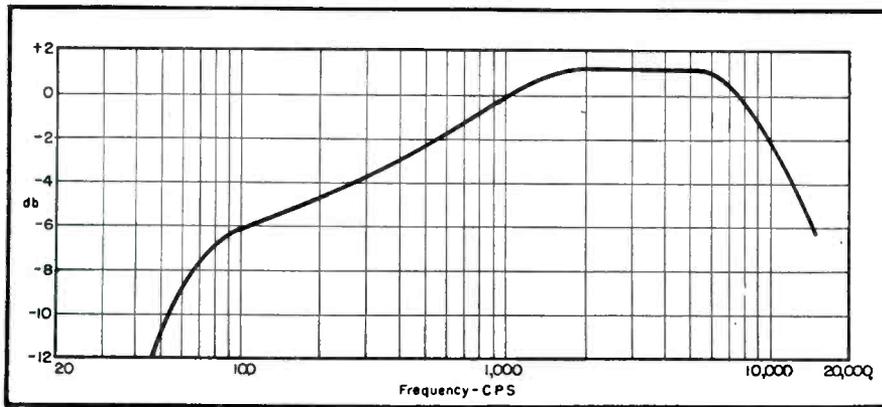
(Above)

Frequency response of the audio system of a prewar chassis, with the bass and treble controls set at maximum, before (dashed line) and after (solid line) a new output transformer was installed; *Magnavox CR-156*.

(Below)

Plot of the undistorted power output of the audio system, after the transformer was inserted (0 db = 6.5 watts).



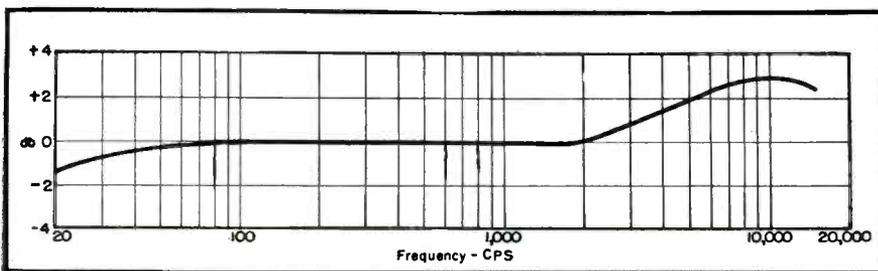


(Above)

Frequency response of another prewar chassis, *af*, with the bass and treble controls at midposition; *Scott model 800B*.

(Below)

Response of the audio system after the output circuit was revamped (0 db = 1.73 volts across 10 ohms).



(Below)

Plot of the undistorted power output before (dashed line) and after (solid line) the output transformer was installed (0 db = 16 watts).

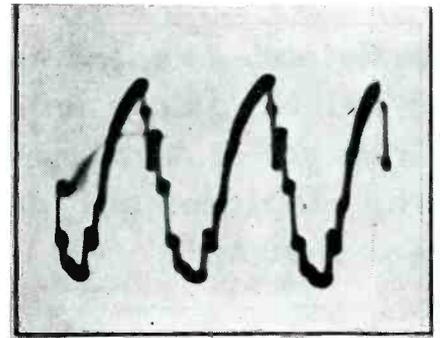
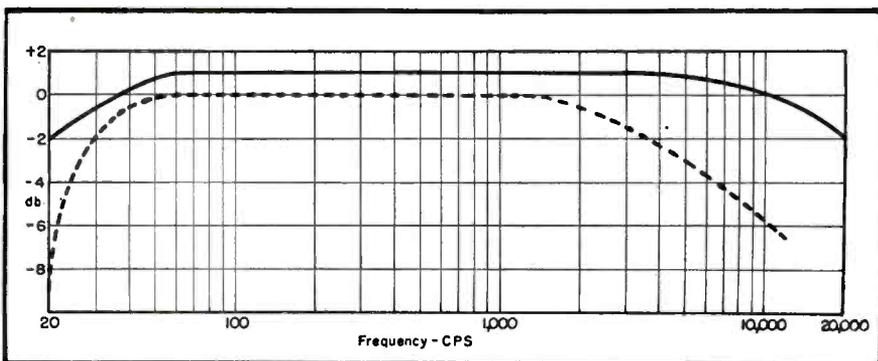


Fig. 1. Square-wave response at 3000 cycles with flat response settings.

Fig. 2. A 400-cycle square-wave response with controls set for flat.

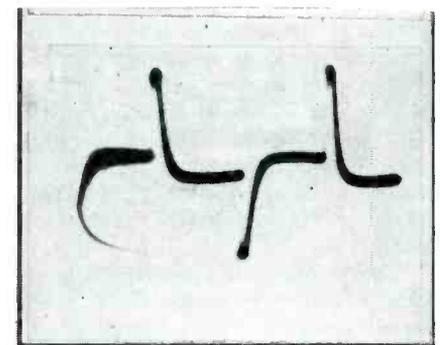
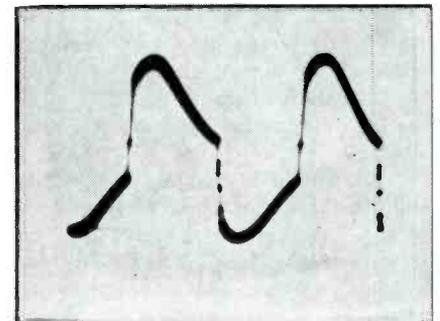
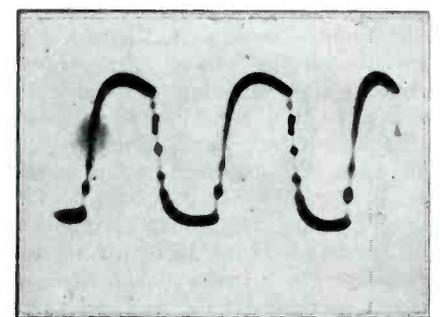


Fig. 3. Square-wave response at 70 cycles with controls set for flat response.

Fig. 4. Square-wave response at 1000 cycles with flat response settings.



Figs. 1, 2, 3 and 4 illustrate response before corrections were made in circuit.

dynamic performance of the audio section was checked using a simple square wave clipper. Square waves have been found to provide a simple test of audio performance, showing at a glance the frequency response, phase characteristic and transient distortion. Unretouched photographs of the square wave response of this receiver in its original condition appear in Figs. 1 to 4. Fig. 3 shows the square-wave response at 70 cycles with controls set for *flat response*. This looks like a differentiator circuit and is graphic evidence of the lack of good clean bass in the sound. The high pass filter action revealed by the plot was found to be caused by a poor primary inductance in the output transformer. A 400-cycle square-wave response with controls set for flat ap-

pears in Fig. 2. The poor bass response, evidenced by the tilt, and on the trailing edge, indicated the beginning of some very peculiar distortion. Fig. 4 shows a 1,000 cycle square wave plot, with a poor high-frequency response shown by the rounding of the top and leading edge, while the trailing edge shows more of the distortion. Fig. 1 illustrates a 3000-cycle square wave. Here, it will be noticed, the high frequencies have almost gone, while the trailing edge is filled with distortion.

Again the problem was attacked by replacing the output transformer³. The original output transformer was mounted on the loudspeaker and was of open frame construction. The

(Continued on page 57)

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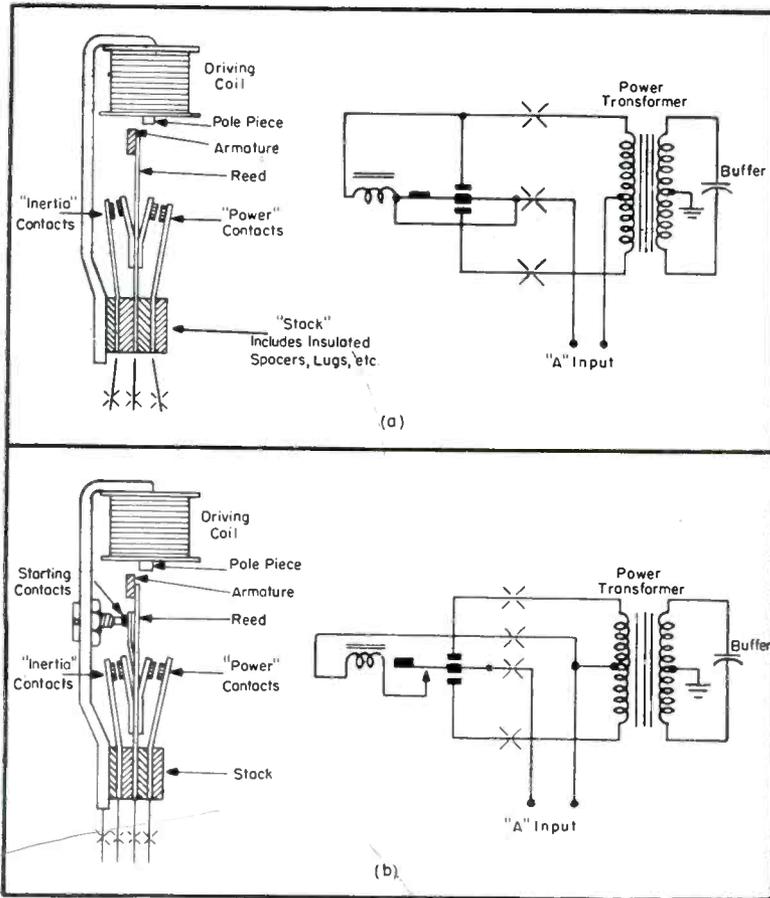
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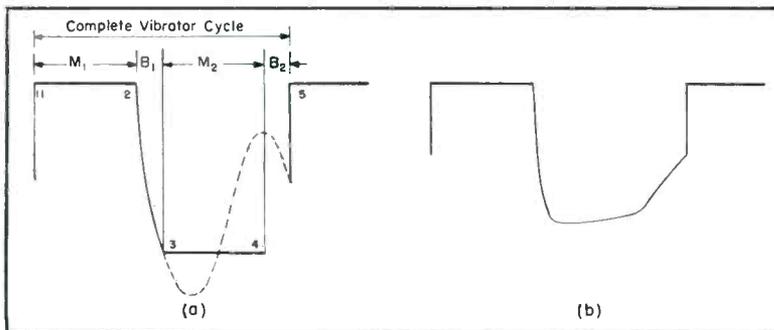
Testing VIBRATOR

by RALPH BRAY

Engineer, Auto Radio
Philco Corporation



Figs. 1a and b. Two types of full-wave four-contact vibrators, and their power-transformer connections. Circuit in a represents a shunt-drive system, and arrangement in b is that of a separate driver or series-drive setup.



*From a talk presented at the Philco Service Convention.

(Left, center)

Fig. 2a and b. Typical waveforms. In a we have a developed voltage waveform action, with no B+ load or with rectifier tube removed. Plot in b covers a loaded condition.

(Left)

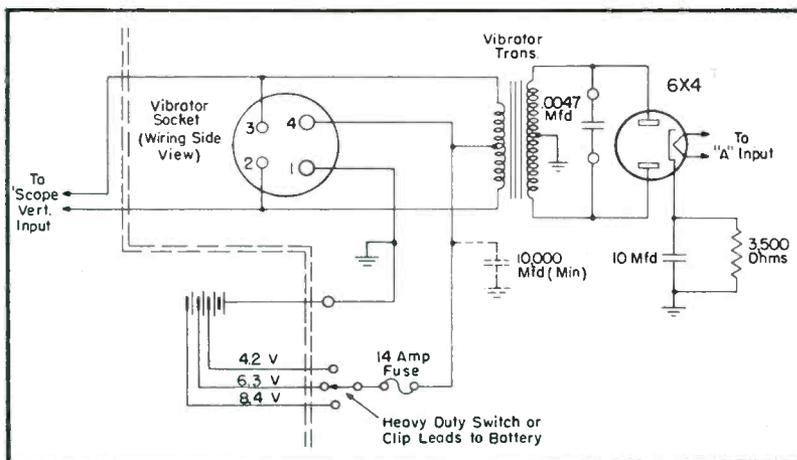


Fig. 3. A test-jig setup for a 'scope. The .0047-mfd capacitor, a 1600-v type with an electrical centerline, is used for the Philco 83-0025 and 83-0035 vibrators, while a .0068-mfd, 1600-v value, serving as a buffer, replaces the .0047 for the 83-0026 and 45-6307 vibrators.

Power Supply Systems

Troubleshooting Series and Shunt-Drive Type Vibrator Systems With The Aid of 'Scope Waveforms. How To Check Supplies With Alternate Methods.

driving coil after starting is approximately 12 volts when using a 6-volt *A* power source. This is due to auto transformer action in the tapped primary winding.

Another vibrator commonly known as a *separate driver* or *series drive* type² is shown in Fig. 1b. This differs from the *shunt drive* type mainly in that it has an extra pair of contacts which are normally closed when the vibrator is at rest. These contacts form a ground return connection to one end of the drive coil, while the other end of the coil is connected directly to the *A* voltage source. It will be noted that one of the vibrator socket prongs must be connected to *A* voltage with this vibrator, but this prong has no connection in the *shunt drive* type. When *A* voltage is applied, the reed armature is pulled toward the *pull* or *power* side contacts, which at the same time breaks the driver coil contacts. The reed then moves to close the opposite contacts, due to inertia, as described for the *shunt drive* type.

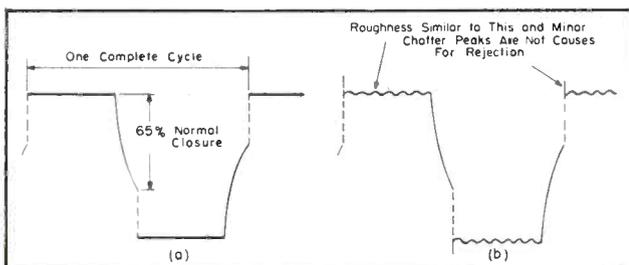
Trouble Shooting Hints

The *series drive* type will vibrate mechanically even though the power-transformer primary center tap and end leads are open. This is not true

¹Philco car-radio vibrators 83-0025, 83-0035 and 45-6307 are examples of the *shunt drive* type.

²Philco car-radio vibrator 83-0026 is an example of the *series drive* type.

Fig. 4a and b. In *a* appears a waveform of normal or center design, where the oscillation frequency determined by the buffer causes a gradual voltage reversal during contact break. Pattern shown in *b* reveals irregular but unbroken contact-make periods.



of the *shunt drive* type since current, to energize the starting coil, must flow through one-half of the transformer primary and the complete primary circuit must be satisfactory to establish full driving coil voltage.

Circuit Operation and Test Jig

To interpret correctly vibrator power-supply wave shapes the function and purpose of the timing or *buffer* capacitor must be understood. This capacitor appears in Figs. 1a and b connected across the power transformer secondary. In conjunction with the secondary inductance and reflected or leakage inductance of the primary, it forms a resonant circuit. This is illustrated by Fig. 2a where the developed voltage waveform is shown through the power-contact make (*M1*), contact breaks (*B1*) and inertia-contact make (*M2*). At the instant of contact break (point 2) an extremely rapid voltage reversal would take place with resultant high arcing and contact deterioration if it were not for the oscillation developed by the resonant circuit. This oscillation causes the voltage to reverse more or less gradually until the other set of contacts make at point 3. If the contacts (*M2*) did not make, however, due to faulty construction or excessive wear, the oscillation would continue, as shown by the dotted line, until the first set of contacts make again at point 5. Illustrated is action with no *B+*

load or with the rectifier tube removed. With a *B+* load the oscillation becomes damped before reaching point 3. The resultant waveform under loaded conditions is shown by Fig. 2b. This condition, where only one set of contacts *make* is known as *single footing*. The *A* input starting current is excessively high, while the *B+* output is little more than one-half its normal level.

The 'scope is an extremely handy instrument for vibrator testing, revealing many trouble areas quite accurately. In Fig. 3 appears a schematic of a test jig for a 'scope, the jig being used in conjunction with a 'scope³ having a variable frequency horizontal sweep. Voltage for waveform presentation is taken across the total primary winding and applied to the 'scope vertical input terminals. Since one of these terminals is usually grounded to the 'scope housing, the test jig and 'scope cannot have a common ground connection.

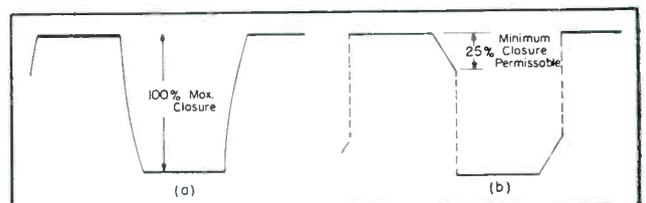
It is *extremely important* that the test jig power transformer and *buffer* capacitor have centerline electrical characteristics. These parts comprise the tuned circuit and thereby affect the electrical closure between break of one set of contacts and make of the other. Since a part of the purpose of this jig is to determine whether the vibrator is adjusted within its tolerance limits, the associated components must have no deviation from specified center values.

It will be noted that a .0068 mfd *buffer* is required when testing some vibrators and a .0047 *buffer* is used when testing others. This variation is due to a difference in contact time efficiency, which is a percentage of the total time required for the two contact *make* periods to the total time required

(Continued on page 29)

³Philoscope model 7019.

Fig. 5a and b. Pattern representing 100% closure condition appears in *a*, and in *b*, we have a 25% closure pattern. These are the maximum and minimum extremes allowable for contact-closure variation.



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Vibrators

(Continued from page 27)

for a complete cycle. This is approximately 70% for one set of vibrators⁴ and 78% for another set of vibrators⁵. In many cases these vibrators are used interchangeably in production sets without changing *buffer* value since the operating differences are not usually great enough to materially affect vibrator life.

It will also be noted that a 10,000-mfd minimum, 25-volt electrolytic capacitor is used in the test jig *A* input circuit. This capacitor is a necessity if a battery eliminator is used for *A* power, or if leads to a battery are long enough to offer appreciable resistance (the capacitor somewhat approximates the storage battery capacity). All wiring in the primary circuit, such as fuse holder, switches, wire, etc., must present as low a *dc* resistance as possible. Wire should be 14 gauge or heavier. The vibrator socket should be mounted with screws so that it can easily be replaced since continued insertion of vibrators will eventually spread the contacts. The fuse holder should be mounted so that the fuse is visible, and a 14-ampere fuse should be used.

Provision must be made for switching *A* input voltages to the test jig. These voltages from a fully charged battery should be approximately 4.2, 6.3, and 8.4. 'Scope waveforms are to be observed with an input of 6.3 volts.

Vibrator Tests

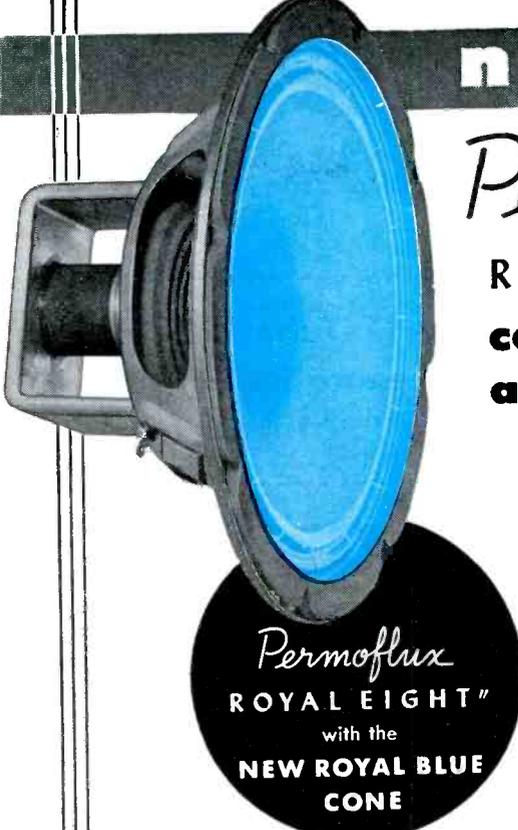
After a vibrator and the proper *buffer* capacitor are plugged into the test jig, an *A* input voltage of 4.2 should be switched in. If the vibrator blows a fuse at this voltage or subsequent higher voltages, it should be rejected even though jarring the vibrator may clear the short temporarily.

If the vibrator does not start at 4.2 volts the next higher voltages should be switched in successively and if it then starts, input voltage should be removed and the 4.2 volts then reapplied. An oxide coating may have developed on the contacts during shelf life which will be removed by a short period of operation at higher voltage (the *shunt* drive vibrator is more susceptible to this type of *no-start* condition). If the vibrator still fails to start at 4.2 volts it should be rejected.

After it has been determined that the vibrator starts properly it should be subjected to 8.4 input volts to insure that no fuse blowing or *sticking* occurs. The vibrator should be jarred or

(Continued on page 62)

⁴Philco 83-0026 and 45-6307.
⁵Philco 83-0025 and 83-0035.

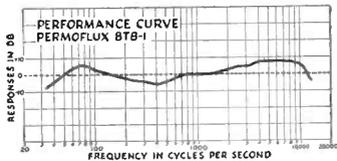


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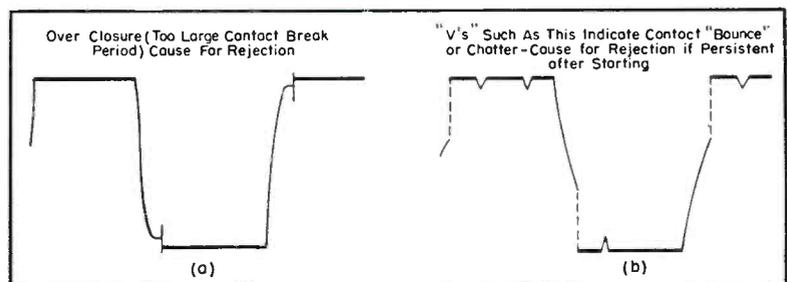
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Fig. 6a and b. In *a* is represented a 'scope plot of overclosure, where contact break periods have too great a duration. In the *b* pattern, the breaks in the waveform during contact-make periods are caused by contact bounce.



SER-CUITS

Detailed Study of Bendix 17-Tube TV Chassis, With Data on the RF, IF, AGC, Video, Sound, Sync Separation, Vertical Deflection, Horizontal Sweep and Power-Supply Circuitry . . . Highlights of AM/FM Portion of Chassis.

IN FOLLOWING THE TREND to compact chassis with less tubes, but with large picture tubes, manufacturers have introduced models with nearly 100% fewer tubes than were employed in the chassis of '48 and '49, with picture tubes up to 16" in size.

An interesting example of this new streamlined design is illustrated in Fig. 1, where we have the chassis of the Bendix models 2051, 3051, 6001, 6003 and 6100, all 17-tube sets using the 14 and 16-inch rectangular tubes.

RF System

A rotary switch type tuner is used in this series. It is made up of a series of coils in cascade, bridging the contacts of a three-section switch. All coils are preadjusted, and final overall tuning adjustments are made at the plant with the use of a sweep generator. (Adjustment of the tuner in the field is impossible unless a sweep generator is used.)

The circuit is designed to accommodate a 300-ohm balanced input. The signal is fed to a transformer and inductively coupled to the grid of the *rf* amplifier. In the antenna transformer for the high channels, T_{400} , the primary is grounded at the center by a switch. On the low channels, this switch is open and T_{401} is placed in the circuit. The secondary circuit resonant frequency can be changed by compressing or expanding the L_{414} section on high channels and the $L_{407-408}$ sections on low channels. A 2200-ohm resistor, R_{406} is used as an *rf* load resistor for all channels. The *agc* voltage is developed in the second detector circuit and applied back to the grid of the *rf* amplifier. The *agc* decoupling network is composed of a 680-mmfd capacitor (C_{413}) and a 680-ohm resistor (R_{407}).

A 6AG5 or 6CB6 pentode *rf* amplifier is used. The plate of this amplifier is coupled to the grid of one-

half of a 6J6A mixer by a .25-mmfd, .5-mmfd or 1.5-mmfd capacitor (C_{408} , C_{409} , C_{406}). Alignment of the inter-stage tuned circuits is accomplished by adjustment of the inductances. When properly aligned the overall response of the *rf* system should be flat over a bandwidth of not more than 15 *mc* at a 6-db point. Grid leak bias (2.5-5 v) for the mixer is provided through a 220,000-ohm resistor, R_{402} . The time constant for the grid circuit is made up of the 220,000-ohm unit and a 470-mmfd capacitor (C_{407}). High side of this capacitor provides a convenient test point for checking the *dc* voltage developed by the oscillator injection voltage, and for connecting a 'scope to examine the response characteristic of the *rf* system, with a sweep generator connected to the antenna terminals.

The other half of the 6J6A mixer is used as a Colpitts type oscillator. Frequency is controlled by the amount of feedback through the tuned circuit from the plate to the grid. There are two oscillator coil slug adjustments accessible from the front of the set. The fine tuning capacitor has been provided with enough range so that it is not necessary to provide individual adjustments for each channel. Capacitive coupling (C_{408}) is used to inject oscillator voltage into the mixer circuit. The *dc* voltage developed by the injected oscillator signal, measured at the test point in the mixer grid circuit, should equal not less than 2.5 volts on channel 12. The fine tuning provides a frequency coverage ranging from 1.6 *mc*, on channel 2, to 2.6 *mc* on channel 13. A 10-mmfd capacitor, C_{411} , bypasses any higher harmonics or spurious oscillations produced in the oscillator.

The output voltage of the mixer is developed across a 15,000-ohm load resistor, R_{405} , and fed to the first *if* amplifier through a series-tuned circuit consisting of L_{462} and a 100-mmfd

capacitor, C_{412} . This circuit is tuned to 25 *mc* and is an inherent part of the triple stagger-tuned *if* system.

IF System

A triple-stagger tuned, two-stage amplifier with crystal detector output comprises the *if* system. Triple stagger tuning is used to achieve the maximum possible gain for the desired bandwidth of 2.6 *mc* within 6 db.

A unique feature of the *if* is the design of the *if* transformers. The coils are bifilar wound (two windings interwound) with triple Formex insulated wire. This type of winding approximates unity coupling and gives the effect of a single tuned coil. A number of advantages are derived from such an arrangement. Improved filtering of all plate and grid returns can be achieved as the bypass capacitors can be returned to the same ground as the associated cathode. With the bifilar winding it is possible to keep the time constant in the grid circuit of each amplifier down to a low value. As a result there is no charging of the grid circuit by heavy noise pulses, and picture information is transmitted continuously through the *if* system.

One 6CB6 and one 6AU6 are employed. An unbypassed 56-ohm cathode resistor (R_2) is used in the first stage to minimize the variation of input capacity with *agc* voltage changes. With the values used at 4-volts bias, there is only a 0.5 db variation from peak response in the picture carrier location.

A 1N60 crystal is used as the video detector. This is a crystal similar to the 1N34, but one which has been tested dynamically.

This receiver is like all other high-frequency receivers in that its performance can be greatly impaired by

(Continued on page 32)

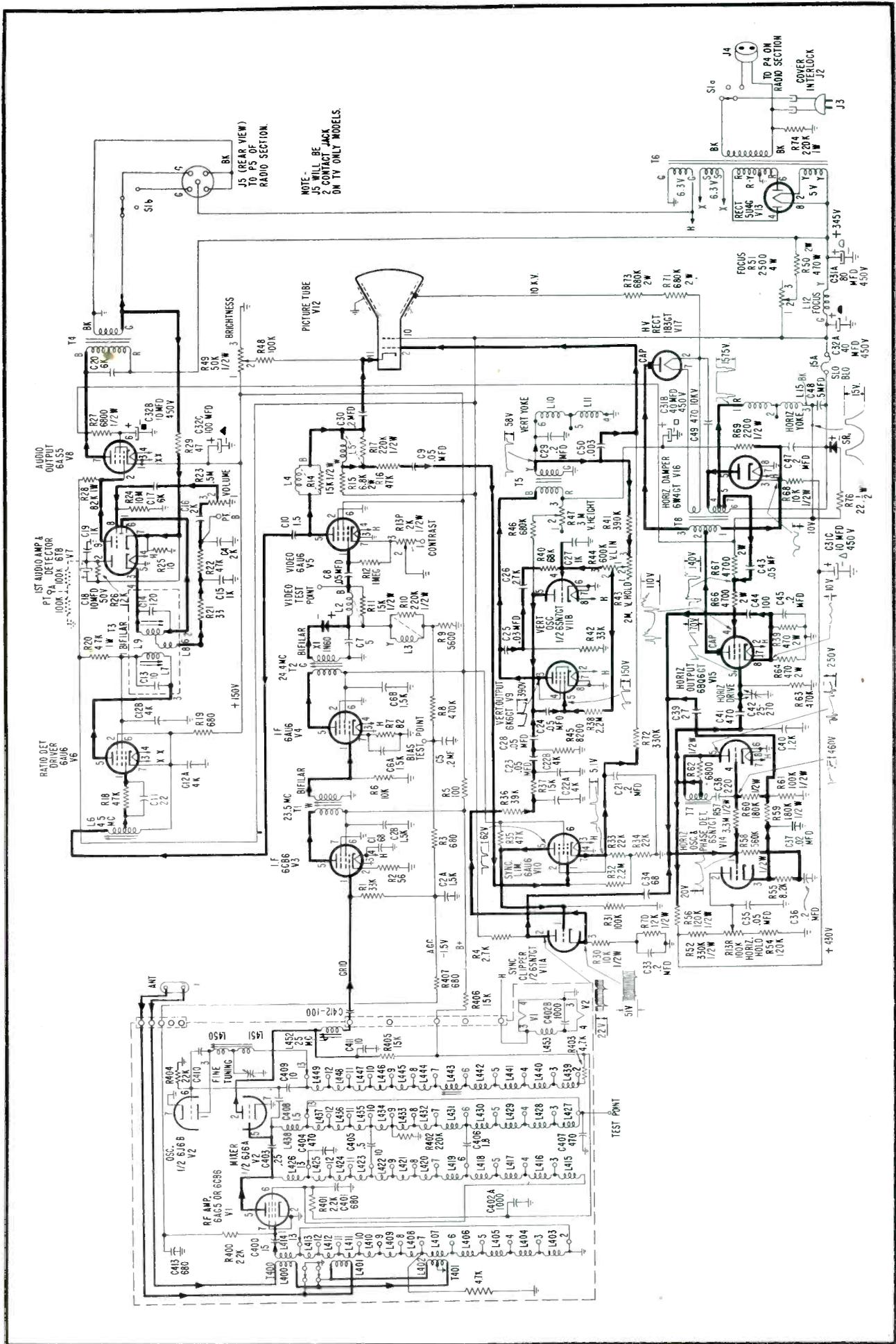
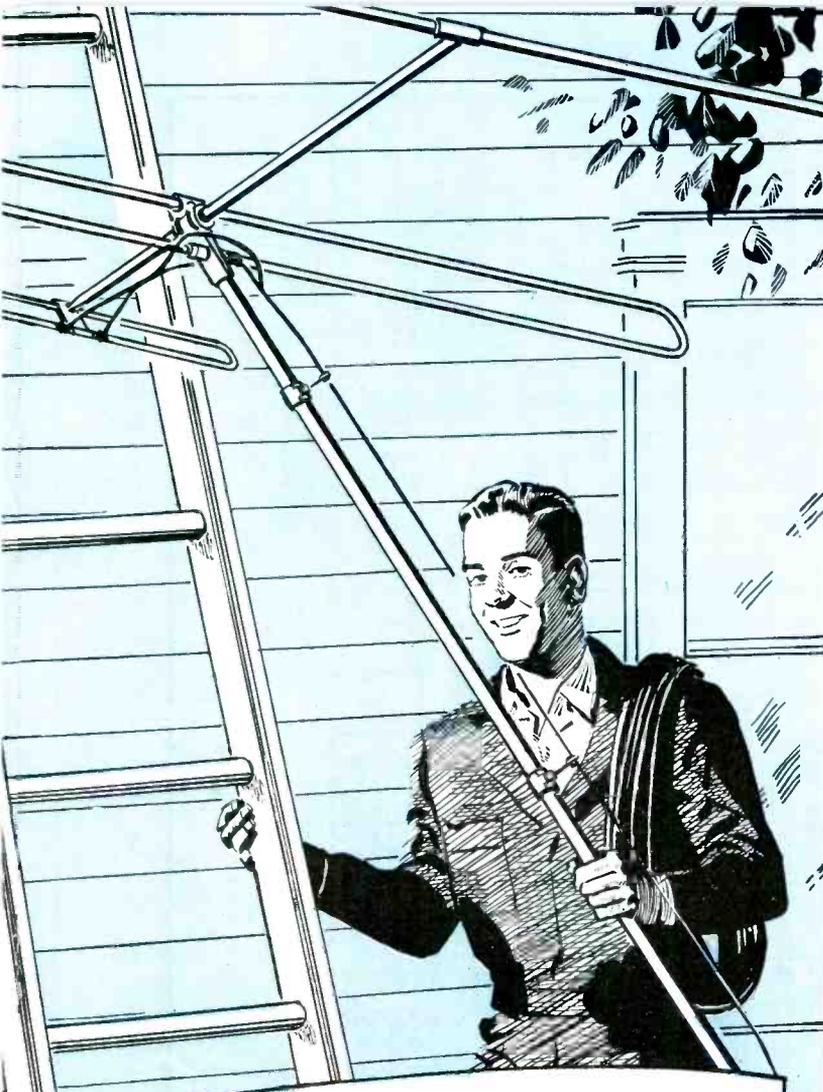


Fig. 1. Schematic of the Bendix TV chassis, models 2051, 3051, 6001, 6003 and 6100.



Ser-Cuits

(Continued from page 30)

altering the lead dress or the location of the grounding points of the component. Therefore, the receiver should not be changed an appreciable amount from its original design in making service replacements.

Two test points are provided for *if* checks. One is on the *agc* string after the 470,000-ohm filter resistor (R_6). This point is used for checking developed *agc* voltage and for applying bias potentials when making sweep tests on the *rf* and *if* channels or aligning the *if* system. The other test point, at the video detector output, can be used for several tests: (1) a high impedance *dc* meter can be used here for checking the voltage developed by the detector; (2) a 'scope can be tied to this point for checking the response characteristics of the overall *rf* and *if* systems with a sweep generator; (3) a 4.5-*mc* signal can be applied for aligning the intercarrier sound channel.

AGC System

The *agc* action is designed to hold the signal at the video amplifier grid to a maximum of about 3.5 volts peak-to-peak, when signals up to 1 volt are applied to the antenna terminals. For signal strengths of greater than 1 volt at the antenna, it will be necessary to remove the antenna coil section on that channel from the tuner to prevent overloading. Satisfactory reception then can be obtained with as much as 10 volts antenna input signal.

Video System

The video system consists of a 6AU6 amplifier with associated wide-band lowpass filters. The output of the detector is applied to a filter (L_2 wound on a 15,000-ohm resistor, R_{11}) with sufficient bandwidth to pass 4.5-*mc*. As a result, a 5600-ohm load resistor (R_8) must be small to minimize attenuation of the higher video frequencies.

Contrast is controlled by varying the amount of degeneration in the video amplifier stage. This is done by varying the resistance of a 2000-ohm pot (R_{13}) in the cathode circuit. A control that has a multiple finger wiper on the resistor element is used to avoid producing a picture with noise streaks when the contrast is adjusted.

All of the coils in the video system are shunted with damping resistors. The series coils are loaded rather heavily to damp out transients which tend to accentuate picture sharpness, but affect contrast adversely. The design of the video system with the rest of the receiver provides a response characteristic which is fairly flat to 1 *mc*, is down 3 db at about 2 *mc*, and is down 6 db at 3.2 *mc*.

Both the intercarrier sound *if* (4.5 *mc*) and synchronizing information are taken off the plate circuit of the video amplifier. The video signal is applied to the cathode of the picture tube through a .2-mfd capacitor (C_{30}) of black positive polarity. The cathode is returned to a 50,000-ohm brightness control (R_{40}) through a 100,000-ohm resistor (R_{19}). The *dc* restoration, for holding black level, is accomplished in a rather unusual manner. Two variables are involved, the voltages on both cathode and grid of the picture tube. When a signal is applied to the cathode, it tends to hold white level constant with respect to ground. Examination of the signal voltage on the cathode, as observed on a *dc*-connected 'scope, will show the white level holding constant and the sync and black level increasing as contrast is

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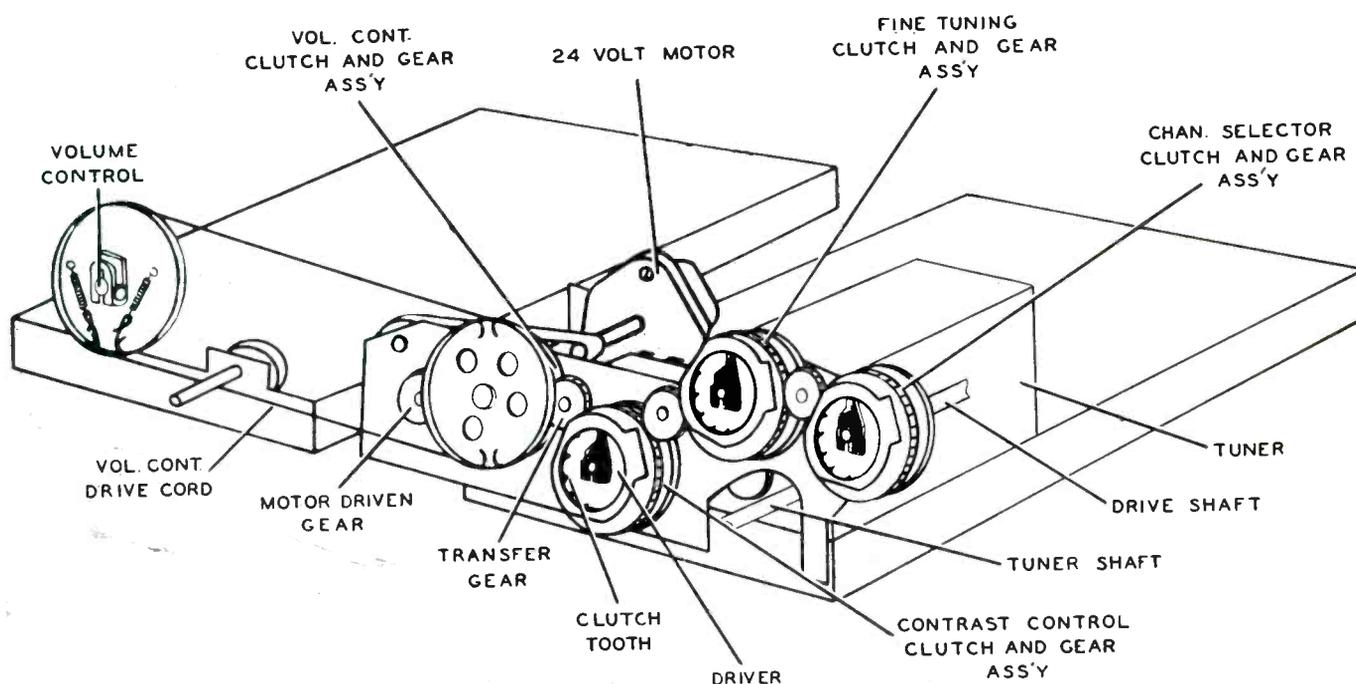


Fig. 1. View of the gear and clutch assembly, looking at the front of the chassis.

THE EVER INCREASING demand for the larger type of picture tube has had considerable influence on the viewing habits of the people. As the size of the picture presentation has increased, the distance between the screen and viewing audience has become larger.

The resultant increased viewing distance has created quite a situation for the television host. Shall he sit in among his guests and enjoy the entertainment, or shall he monitor the performance and selection of channels by jumping up whenever it is necessary.

To solve the problem, remote control systems have been evolved. These systems permit flexible control of the picture and sound. In one arrangement,¹ developed by Philco, the consumer can control the volume, picture contrast, fine tuning, and channel selection of the receiver.

The remote control unit is made up of four major components: a remote control box and connecting 8-wire control cable, a spring loaded reel assembly to keep tension on the control cable and allow freedom of movement, a 24-volt transformer and ac motor, and a collection of four solenoids in a gear and clutch assembly.

To keep remote-control system users from either straining their eyes trying to see the channel number selected, or their mind from trying to remember what program is on which channel, a

clock face positioning of the channel numbers has been provided. The channel selector knob has been arranged so that the channel numbers run clockwise. A pilot light, used in conjunction with a channel selector knob, provides illumination of the channel selected, while the rest of the channels are dark.

In the remote control hookup, the shaft of the motor can be made to move in a clockwise or counter-clockwise direction by applying 24 volts ac to either of two fields electrically 90° apart. The voltages are applied by moving one of the switches in a remote control box in any of two off-center positions. These switches are center-sprung so that when finger pressure is released, the switch returns to center-normal or open position. These switches are all of the double-pole double-throw variety. The only control assembly on the power chassis is the one for the volume control. This control is driven by a drive cord connected to the volume control clutch and gear assembly on the rf-if chassis. An ac power switch for power to the television chassis is connected to the vol-

ume control, but remote control unit power is independent of this switch. This eliminates the necessity of turning on the power manually before remote control can be used.

A drawing of the gear and clutch assembly taken, looking at the front of the chassis, appears in Fig. 1. It will be noted that transfer gears are used to transfer the movement from one gear to the next. One gear of this group is driven through a belt from the shaft of the motor. This gear, therefore, couples the rotary motion to the remainder of the system. The first speed reduction step employs a belt and step-down pulley arrangement in order to achieve quiet operation. Since the receiver controls are all of the dual variety, only the outer portion or sleeve is connected to the driver and clutch. The inner control, for example, the brightness control is operated manually.

Operation of Solenoid

An exploded view of the solenoid and clutch assembly appears in Fig. 2. Four of these are used in the unit. The solenoid assembly for the channel selector is different only in that it has a switch built into it. This switch is used to cut off the power to the motor when manual band switching is used. It is closed when the solenoid is acti-

¹Philco RC-1.

*Based on a talk offered by Dan Lerner, Philco TV field engineer, at the recent Philco Service Convention.

Design and Operational Characteristics of Setups¹ Which Permit Control of Volume, Picture Contrast, Fine Tuning and Channel Selection.

vated and the armature is attracted towards the pole piece. The armature forms the short circuit path to complete the switch circuit. To prevent chattering due to residual magnetism in a steel surface connection, a thin copper washer about .002" thick is placed between the pole pieces and the armature surface.

The clutch and gear assembly and bushing are a one-piece unit and revolve continuously as long as the motor shaft is turning. When the solenoid is activated, the armature moves forward pushing up against the retaining ring. This magnetic force overcomes the pressure of the return spring. The driver is attached to the control shaft by a 10/32 clamp screw, so that when the clutch is brought forward approximately 1/8" the driver engages a clutch tooth. The control shaft will then start to rotate. The armature is returned to normal or resting position by a return spring when the voltage is removed from the solenoid by releasing a control switch.

Cycling Operation

A rear view of the detent and roller assembly is presented in Fig. 3, and in Fig. 4 appears an exploded view of the cycling switch and detent assembly for the channel selector. When the channel selector switch is thrown remotely, the channel selector solenoid and motor

are activated. Thus the channel selector gear is engaged and the selector shaft starts to rotate. Vertical pressure is maintained by the detent spring and lateral pressure by a centering spring in the cycling switch assembly. The cycling switch is activated when the centering lever moves either to the right or left of the center position. The indexing roller moves up on the star wheel and the pressure of the centering spring in the cycling switch is overcome, and the switch is closed. The cycling switch is in series with the switch in the channel selector solenoid. In turn, these switches together parallel the switches in the remote control box, so that during the time the roller is riding on the star wheel and the cycling switch is connected, the drive shaft continues to turn, even though the remote control band switch is released. This cycling action continues until the roller dips into the bottom of the next star wheel depression. This takes the pressure off the centering spring, and the spring returns the centering lever to center of the cycling switch and opens the switch. Thus, all voltage is removed from the solenoid, and the armature then returns to the free position, disengaging the channel selector clutch and gear.

A simplified diagram of the electrical wiring of the remote control
(Continued on page 69)

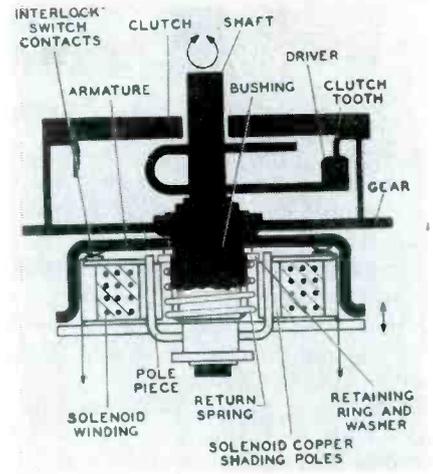


Fig. 2. Exploded view of the solenoid and clutch assembly. Four are used in the unit.

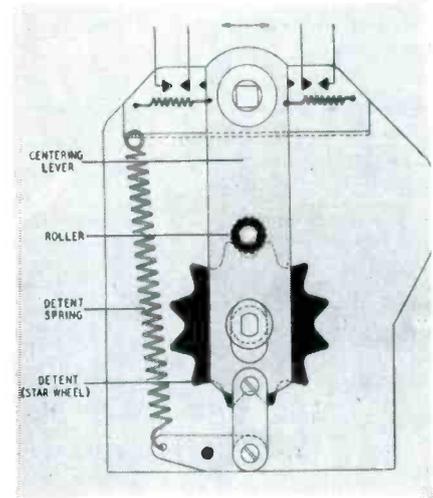


Fig. 3 and 4. In Fig. 3 appears a rear view of the detent and roller assembly. An exploded view of the cycling switch and detent assembly for the channel selector is shown in Fig. 4.

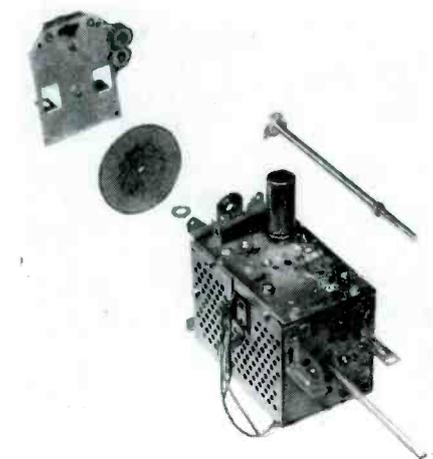
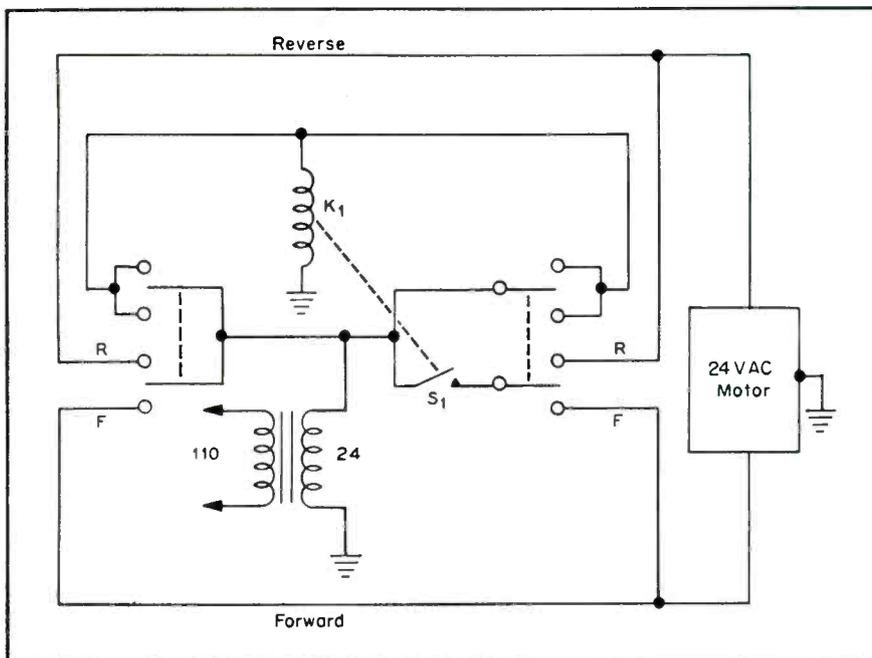


Fig. 5 (left). Simplified diagram of the electrical wiring of the remote-control assembly.

A 2-Tube TV Tuner

by C. S. ROOT

Television Engineering Department
The Magnavox Company

[See Front Cover]

IN THE TV CHASSIS, the front-end tuner plays an extremely important role, contributing to the receiver's sensitivity, signal-to-noise ratios, uniformity of band-pass curves and interference rejection ratios. Recent tuner designs have displayed many of these features which have made it possible to produce extremely efficient models. In a tuner¹, developed specially for the Magnavox sets, these improved performance results, have been obtained by such innovations as a series connection of all *rf* coils with switching always in the low side to avoid adding switch capacity at the hot end of the coils. The inductance of every *rf* coil has been made adjustable so that all four coils in any one channel may be peaked up for maximum gain and optimum band-pass curve.

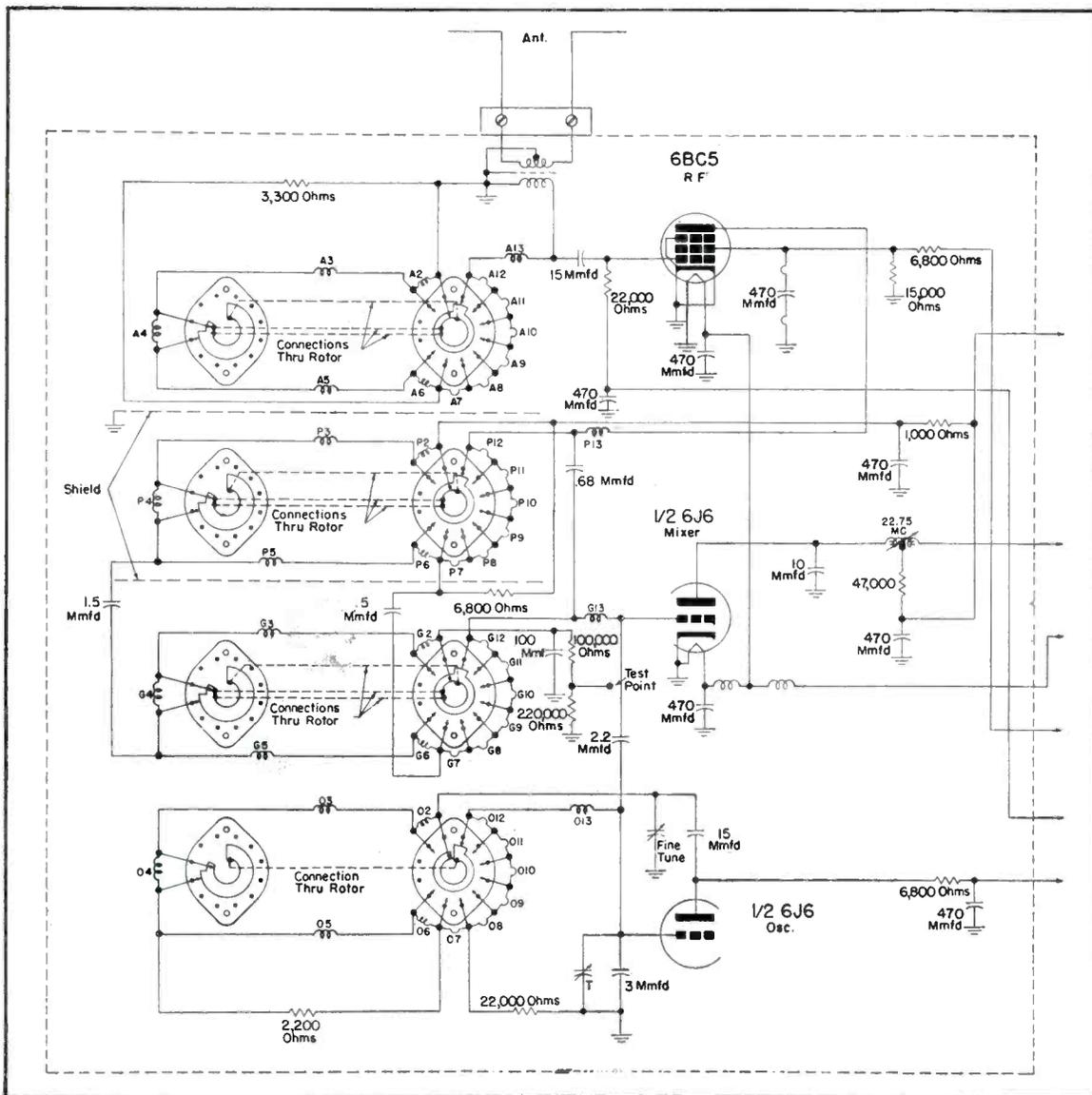
In order to achieve substantially the same sensitivity and signal-to-noise ratios on the high band channels as on the low band, the tendency toward greater tube loading on the high channels must be overcome. In this tuner the *rf* grid loading on high band has been overcome by screen neutralization introduced by the use of longer than usual leads on the *rf* screen bypass capacitor. Converter grid loading was overcome by using

relatively high oscillator injection, which means that the converter gain is derived more from the strong oscillator signal and less from the amplification of the tube. (Less tube amplification means less grid loading.) The use of lower tube gain was also found to reduce all of the various *rf* and *if* feedback effects that normally cause trouble with a triode converter, the type of tube used in this model.

The triode converter was selected because of its lower noise and its function as a double triode permitting service as a converter and oscillator affording a reduction in the number of tubes required; two have been used in this tuner. In addition to loading and feedback effects there are other triode converter problems which it was

¹Magnavox M-1.

(Continued on page 61)



Detailed schematic of the 2-tube TV tuner illustrated on the cover this month.

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NEW RCA High-Voltage Probes—WG-289, WG-290

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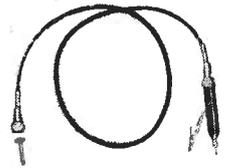
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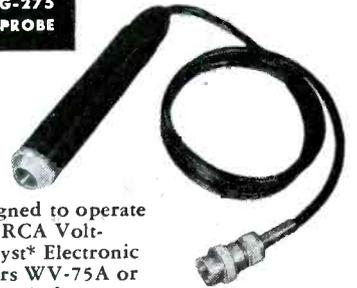
RCA WG-263 CRYSTAL PROBE



Converts VoltOhmyst* Meters 163, 165, 165-A, 195, 195-A, WV-65A, WV-75A, and WV-95A into VHF voltmeters for use up to 100 Mc; also used with Chagalyst* Analyzers Types 162, 162-A, 162-B, 162-C and 170-A. Can be used for relative readings to 175 Mc. Price: \$8.95.

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

RCA WG-275 DIODE PROBE



Designed to operate with RCA Volt-Ohmyst* Electronic Meters WV-75A or WV-95A, for reading rms or peak-to-peak voltages at frequencies from 30 cycles to 250 Mc. The probe fits coaxial "T" connectors, and permits direct measurement of voltages in coaxial lines. Price: \$30.00.

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

RCA WG-265 MINIATURE TESTPOINT ADAPTER



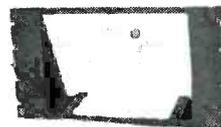
Makes your troubleshooting faster, easier, safer by making tube-base connections accessible on the tube side of the chassis. Pins on one end of the adapter fit a 7-pin miniature socket, and socket facilities on the opposite end accommodate all types of 7-pin miniature tubes. Tabs project for easy probe contact. Price \$1.50.

RCA ISOTAP WP-24A FOR RADIO SERVICING



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CITY AND STATE

ASSOCIATIONS



ARTA

THE AKRON RADIO TECHNICIANS ASSOCIATION, Akron, Ohio, has been incorporated, according to a note from W. O. Parson, association secretary.

Parson also reports that an all-out drive to better relationships between Service Shops and the general public has been inaugurated by the association through a publicity program involving the publishing of the names of members who can give qualified service and are dependable.

Licensing Study

A committee has been appointed to study licensing possibilities. The group has also met with the City Council to probe city codes on television antenna installations.

A *Radio-TV Service Industry Day* program has been planned for October. Feature of the day will be a meeting with talks by Al Sauders and Ed Noll.

Union Approved

In an effort to stabilize charges, ARTA has sanctioned the joining of all hourly rated radio and television and installation men with a local union, TRW affiliated with the CIO.

FRSAP

A LARGE GROUP attended the fourth annual clambake and meeting of the Federation of Radio Servicemen's Associations of Pennsylvania at Lily Lake, Penna.

Among those present were delegates from Scranton, Wilkes-Barre, Philadelphia, Reading, Harrisburg and Altoona.

This affair is held annually with the Radio Servicemen's Association of Luzerne County as host.

PR SMA

THE PHILADELPHIA RADIO SERVICE MEN'S Association will inaugurate a membership campaign in conjunction with PRSMA's second annual convention and electronics exhibition at the Broadwood Hotel, Philadelphia, Pa., Sept. 25-27.

Among those who are scheduled to appear at the convention are Charles Hirsch and W. F. Bailey of Hazeltine. Mr. Hirsch, who is chief engineer of the Hazeltine research division, will deliver an extensive talk on color TV, covering the characteristics of all the systems available to date. A color slide demonstration will also be offered.

At the convention-exhibition, over 50 manufacturers and distributors will exhibit.

PRSMA now has about 500 television and radio technicians on its membership rolls.

TEN YEARS AGO

From the Association News Page of **SERVICE, September-October, 1940**

GEORGE C. CONNOR, Hygrade Sylvania commercial engineer, delivered an address before the Jersey City Radio Servicemen's Association in Arion Hall covering new tube applications, what to look for in new circuits and how to correct possible trouble. Martin Seel, president of the Jersey City chapter, conducted the meeting which was sponsored by Dale Radio Co., of New York. Representing Dale at the meeting was Jack Unger, Norman Leeb, Rene Jacobs, Bob Ternane and Deal Ellman. . . . Emil Maginot was reelected president of the Boston chapter of the Radio Technician's Guild. Bill Staples was named vice president. S. DiRusso succeeded Bill Staples as librarian and Frank Kennes and Joseph Cabral were renamed treasurer and secretary, respectively. . . . Dan Fairbanks, sales manager of the resale merchandising division of IRC, delivered a talk at Dallas, Texas, before the local service organization. . . . Four key men of RCA appeared at a PRSMA on-the-air meeting over WFIL: Thomas F. Joyce, vice president and advertising director; Dr. G. A. Morton of the electronic research laboratory; G. L. Beers, television research engineer and Dr. A. F. Olson, acoustic research engineer.

At the recent FRSAP meeting at Lily Lake, Penna.: Dave Krantz, association prexy, seated fourth from left; John G. Rader, secretary-treasurer, fifth from left; Leon Helk, corresponding secretary, rear row, second from left.





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Build your business future by establishing a reputation for careful, skilled TV service work. Satisfy your customers by replacing with components that are standard in the best receivers the industry makes, backed by a name you can depend on...General Electric.

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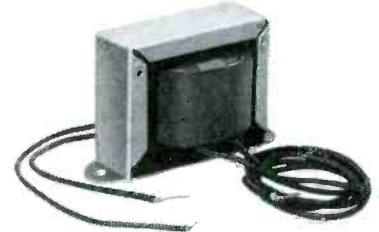
WIDTH & LINEARITY CONTROLS—

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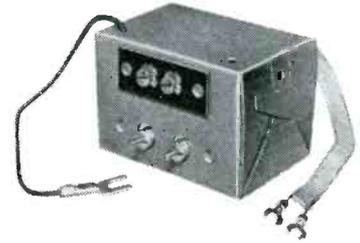


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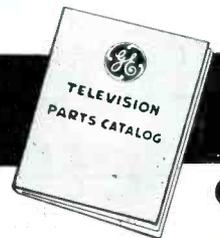


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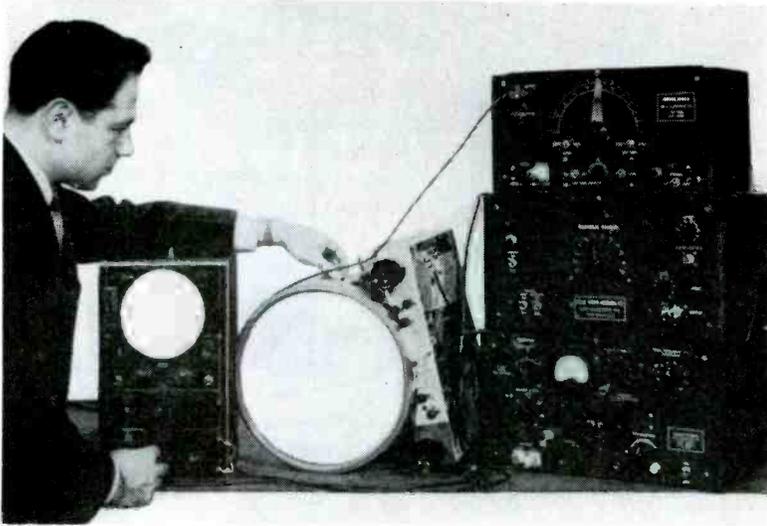


Fig. 1. Aligning the Zenith 23G22 TV receiver with a 'scope, sweep and *if* and *rf* marker generators.

IN ALIGNING TV receivers, it has been found that the application of visual techniques¹ are extremely effective, assuring accurate control of the many steps required in the adjustment process. Although there are many points of approach, which are common to most chassis, circuit variations do exist and make it necessary to employ special alignment methods at various sections of the models.

In the Zenith 23G22², for instance, there are quite a few innovations and accordingly the alignment required is far from standard. In the power supply, as an example, the filaments (with the exception of the 1B3GT/8016 high voltage rectifier and the 5U4G low-voltage rectifier) are connected in series and parallel banks to the line. An auto-transformer supplies low-voltage rectifier filament and plate voltages, and a 5U4G and 25Z6 are used to supply all circuits with their respective B

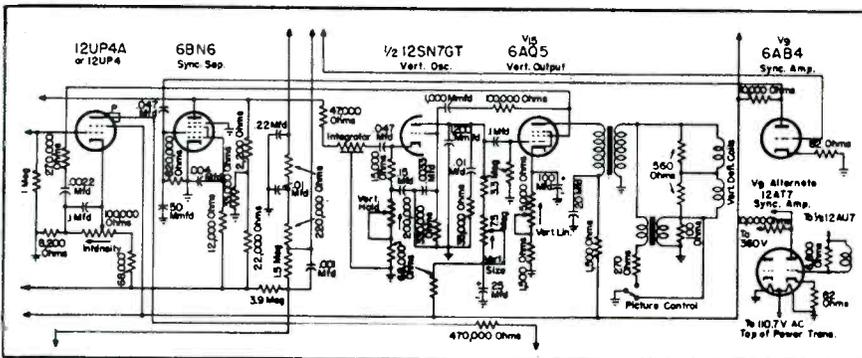
voltages: +360 and +150 with respect to ground (chassis).

In view of this arrangement, no tube should be removed before first disconnecting the receiver from the power line, as damage to other tubes may result. All electrical returns and one side of the *ac* line are connected to the top chassis, which, therefore, could be *hot* with respect to external grounds such as water pipes, radiators, gutters, vent pipes, etc., regardless of how the *ac* plug is inserted in its power socket. No shielded lines, coaxial cable shields or any grounds can be connected directly to the chassis, *unless* the auxiliary equipment contains transformer-type power supplies. To

¹Libby, Lester L., *SERVICE*; October and November, 1948, and January, March and April, 1949. Robinson, Victor I., *SERVICE*, July and August, 1949. Silberg, Irving, *SERVICE*, October, 1949.

²*Ser-Cuits*, Zenith 24G22/23/24/25 series, *SERVICE*, February, 1950.

Fig. 2a. Picture-tube circuitry of the Zenith 23G22/23 chassis.



avoid a *hot* chassis, either of two precautionary measures may be applied; a 200 mmfd, 900 *v ac* capacitor can be installed between the test transmission line shields and the top chassis, or a 300 to 500-watt isolation transformer may be used. It must always be remembered that only the top plate is common to the receiver electrical circuits, and that test equipment common leads must therefore be connected to the top chassis plate and not to the wrap-around type base, characteristic of this chassis.

When servicing the high-voltage power supply, extreme care must be exercised to avoid contact with the second anode high potential. A well insulated vacuum-tube voltmeter, which has a 10,000-volt range, or higher, should be used to measure the high potential. Failure in any section of the 15.75-kc horizontal sweep circuit may cause the supply to be inoperative. If the difficulty is not obvious, circuit tracing must begin at the 6SN7GT horizontal oscillator, through the 12SN7GT horizontal discharge tube, and the 19BG6G horizontal amplifier. The 19BG6G plate voltage must be measured at terminal *4* of the horizontal output transformer. Voltage *should not* be measured at the plate of the tube, because the voltage at this point is extremely high due to the inductive build-up through the horizontal output transformer. The 25W4 damping tube adds an additional 125 volts to the plate voltage of the 19BG6G, and failure of the 25W4 will also cause its high voltage to be inoperative.

Adjustments and Alignment

During alignment and when making *agc* adjustments, peak output voltage at the detector must be measured. Any 'scope can be calibrated with commercially available calibrators or with a 3-volt battery. To do this, the 3-volt battery should be connected across the vertical input of the 'scope and the instantaneous deflection, and base line marked on the screen. Before repeating this procedure, the 'scope input terminals should be shorted out to eliminate any inaccuracies caused by a charged input capacitor.

AGC Adjustments

The calibrated 'scope is connected to test point *C* (on top of the chassis near the 12AU7 video amplifier), or pin 2. With an antenna connected to

Alignment Techniques

AGC and AFC Adjustments, and Alignment of the IF, Intercarrier Sound, Master Oscillator, Turret Tuner and RF Shelf in the Zenith 23G22 Chassis.

by **MARTIN MEYERSON**

Engineering Department
Kay Electric Company

the TV set, the strongest TV signal is selected and the detector output observed on the 'scope. The 4000-ohm *agc* delay control should then be adjusted for a 3.5-volt peak output. In weak signal areas it will be impossible to obtain a 3.5 volt indication on any signal, and the *agc* delay control will have to be adjusted for the best signal with least noise.

AFC Adjustment

Because the range of the horizontal hold has been increased, the receiver may not stay in horizontal sync when switching from channel to channel unless the 100,000-ohm horizontal hold control is near its electrical center. In adjusting the *afc*, it is necessary to use a zero center meter, a *vtrm* with its pointer set to midscale, or a *vtrm* with a polarity switch to indicate the ± 3 to 4 volts. The common lead of the *vtrm* should be connected to the *afc* terminal *I* and the *hot* lead to terminal *H*, making certain that the meter case is not grounded to the TV chassis. The horizontal hold control should then be rotated from one extremity to the other, while the horizontal frequency adjustment is adjusted for an equal voltage swing around zero on the *vtrm*. The horizontal hold control should then be permanently set near this zero midpoint for best results. For this reason, the horizontal hold control

should never be used for centering the picture.

Focus and Center Adjustments

The focus and centering system in this receiver incorporates a permanent magnet with mechanical adjustments which regulate the density and position of the magnetic field. The centering control lever positions the magnetic field and is used to center the picture both vertically and horizontally.

Focusing is accomplished by turning the brass focus adjustment shunt ring located on the neck of the picture tube. The position of this ring regulates the density of the magnetic field which is parallel to the electron beam in the picture tube. As long as this parallel condition exists, the magnetic field is not cut by the electrons. When the electrons diverge from the parallel path, the magnetic field is cut and it forces the electron stream back into the proper axis. An improperly ad-

justed focus and centering assembly causes the electron beam to hit the neck rather than the screen of the picture tube, causing the outer extremities of the tube to be shadowed.

IF Alignment

In aligning the *if*, the negative lead of a 3-volt battery is clipped to test point *A* (in the 6BN6 sync separator circuit of the 23G22/23 chassis) and the positive lead to the top chassis, to establish the *agc* bias. The pip output from the *if* marker and the TV set video detector output are connected to the vertical input of the 'scope. A time base is established by externally sweeping the *X* axis of the 'scope from the sweeping oscillator. During the alignment, the output from the sweep generator should be kept at a level which develops approximately 3 volts peak output at the detector. After the bias and 'scope connections are made, the following steps are followed:

(1) The output of the sweep generator is fed to test point *D* (pin 5 of the 6AU6 third video *if*) and the output transformer adjusted until the 44.25-mc peak appears symmetrically

Fig. 2b. Alternate 6V6GT vertical output for circuit, diagrammed in Fig. 2a, at left.

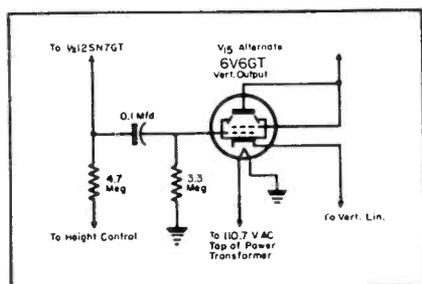
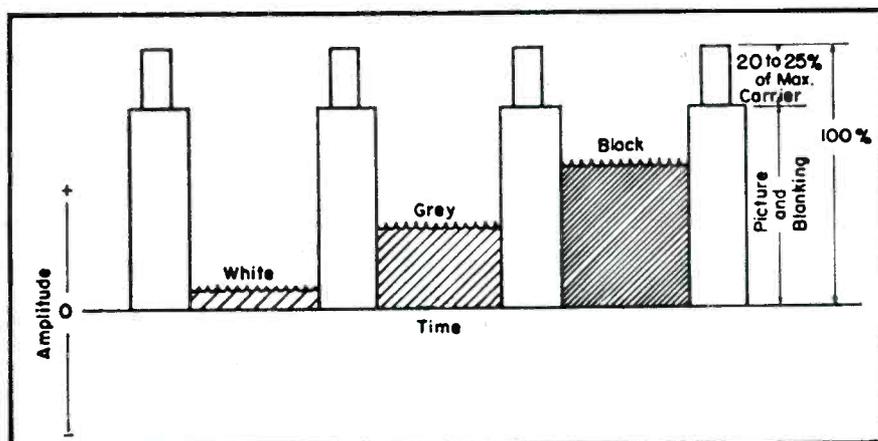
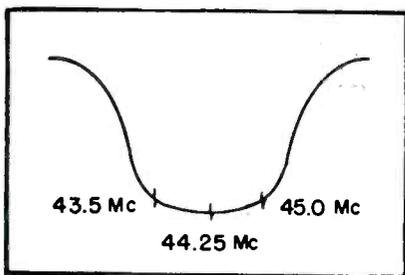


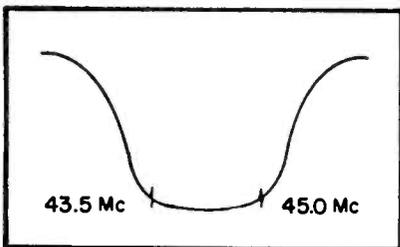
Fig. 3. Plot of the composite video signal.



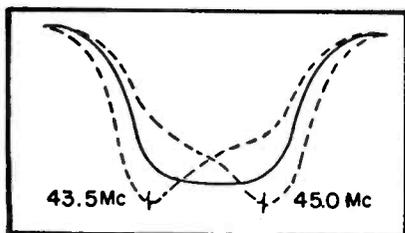


(Above)

Fig. 4. The fourth video if response.

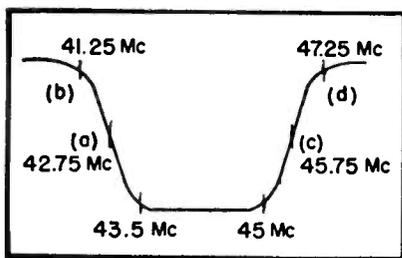


Figs. 5 and 6. Second, third and fourth video if response.



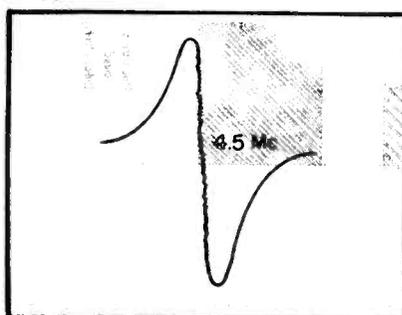
(Below)

Fig. 7. Overall video if response: (a), channels 7 to 13, video, 2 times down, 42.75 mc; (b), channels 2 to 6, sound, 20 times down, 41.25 mc; (c), channels 2 to 6, video, two times down, 45.75 mc; (d) channels 7 to 13, sound, 20 times down, 47.25 mc.



(Below)

Fig. 8. Intercarrier sound response.



between the 43.5 and 45-mc markers; Fig. 4.

(2) The sweep generator is then connected to test point *E* (pin 1 of the 6AU6 second *if*) and the third *ift* adjusted at 45 mc and the second *ift* at 43.5 mc until a symmetrical curve, as shown in Fig. 5, is obtained. If these transformers are properly adjusted, rocking the adjustment of the fourth *ift* from one side to the other should increase the amplitude of the 43.5 and 45-mc peaks, as shown in Fig. 6, with these markers located slightly inside the peaks. It may be necessary to readjust the second and third *ift*, or both, if the peaks do not increase similarly when the fourth *ift* is rocked. After the peaks are checked, the fourth *ift* should be adjusted for symmetry, as shown in Fig. 5.

(3) Now the sweep generator is fed to test point *F* (pin 1 of the 6AG5 converter, which is brought up through the chassis near the base of the tube), and the first *ift* adjusted at 45 mc and the first *if* tube input coil and the converter plate coil adjusted at 43.5 mc until a symmetrical overall response curve, as shown in Fig. 7, is obtained. A slight readjustment of one or more of the *if* transformers may be necessary if the overall response curve is not similar to that shown in Fig. 7. For an additional check, a 47.25-mc *cw* marker may be injected into the set (*cw* switch on *if* marker) and the trap in the 6C4 oscillator input adjusted for minimum indication on the 'scope (or a *vtvm* connected to the video detector).

Intercarrier Sound Alignment

In this operation, a tone-modulated TV test pattern is tuned in and the quadrature coil in the 6BN6 grid circuits, adjusted for best sound. A step attenuator is inserted between the antenna and receiver and the received signal reduced to a level where hiss is heard with the sound. The sound take-off coil, input coil and 500-ohm buzz control is then adjusted for cleanest sound and least buzz. The input signal must be kept at such a level that the hiss never disappears during these adjustments (no limiting by the *gated beam tube**). In some cases, it may be difficult to attenuate the signal below the limiting point of the *gated beam tube*, so that aural adjustments are incorrect, and the following visual method may be used:

(1) A 'scope should be connected to test point *B* (ungrounded side of the audio volume control) and a 4.5-mc frequency modulated signal fed through a 500-mmfd isolation capacitor to test

point *C* (pin 2 of 12AU7 video amplifier). The receiver volume control must then be turned on fully counter-clockwise and the sweep generator adjusted for an *S* curve, similar to a discriminator response, on the 'scope screen.

(2) Then the sweep output should be increased for maximum indication on the 'scope and the signal attenuated until a drop in the amplitude of the response curve is noted. When this drop in amplitude occurs, we have an indication that the *gated beam detector* is not limiting.

(3) The sound take-off coil is now adjusted for maximum response, as shown on the 'scope. The input coil and buzz control are then adjusted simultaneously for maximum curve amplitude and best linearity, being careful that an increase in amplitude does not cause the 6BN6 *gated beam* to reenter its limiting range.

(It will be noted from Fig. 8 that the negative leg of the *S* curve is approximately twice as long as the positive leg and that the adjustment of the input coil causes the positive leg to broaden. Proper adjustment is evidenced when the *S* curve is of maximum amplitude and the top portion of the curve is at its narrowest point.)

(4) In the final step a 4.5-mc marker is injected into the sweep (crystal switch on *if* marker) and the quadrature coil adjusted until the marker falls at the base reference line. This line may be found by reducing the horizontal 'scope gain until a single vertical line is seen, and the break in the line is the reference point.

After visually aligning the sound section, a check should be made on a TV station, and slight readjustments of the buzz control and quadrature coil may be necessary.

Master Oscillator Alignment

The 6C4 master oscillator operates above the incoming frequency on the low channels (2-6) and below on the high channels (7-13). A master oscillator coil is used to preset the master oscillator on channel 7, because this channel does not have a strip oscillator adjustment.

The master oscillator adjustment is to be made only if resonance cannot be obtained with the strip oscillator adjustment wrench, when the fine tuning control is in its center position (open end of pulley on *rf* shelf facing away from chassis), and after it has been

(Continued on page 65)

*Allen, L. M., *Tube News*, SERVICE, January, 1950; *Serv-cuits*, SERVICE, February, 1950.

PHONO installation and service

Phono Compensation Systems . . . Turntable News . . . Preamps and Amplifiers . . . Microphone Systems With Miniature Mikes . . . Pickups for Three-Speed Play.

by **KENNETH STEWART**

PHONO COMPENSATION is a particularly important feature in combination chassis, affording an ideal means of improving the audio response. In the networks employed for compensation, the values of the resistors and capacitors are in part controlled by the receiver's characteristic. In a chassis (1407) made by Stromberg-Carlson (model 16RPM), for instance, the compensation net was revised and appears as illustrated in Fig. 1.

To further improve the audio response, later models of this series included an additional revise, with the 1-megohm resistor, R_{31} removed from the circuit.

Turntable News

A continuously variable-speed turntable¹ featuring a *vari-con self-seating rim drive*, which is said to operate without *wow* at speeds from 20 to 100 rpm is now available. It is also claimed that the table can be immediately regulated to any speed to com-

pensate for any fluctuations in line voltage or frequency.

Speeds are regulated by movement of a lever from left to right or vice versa. The unit has a 12" cast aluminum turntable, with hardened and ground shaft and a constant-speed, 4-pole motor, with cone pulley. Noise level is said to be -30 db maximum below average recording level. Dimensions are: 16" long, 12" wide, and 1½" above chassis, 4½" below chassis.

A new line of phonodrives² featuring a *cat's-paw* tangent-contact drive, has been developed. Three models have been produced: a three speed unit, to operate at 78, 45 or 33½ rpm;

and two units for the 78 rpm only.

The manufacturer reports that the phonodrives achieve a minimum of background noise.

The three speed unit is a rim-drive, 2-pole dynamically balanced motor with a positive turret drive mechanism and a shift-lever control throwing the drive wheel into instant positive contact with the motor shaft for the desired speed. This model is also provided with either 7¾" or 9" diameter turntable. An adapter disk for 45 records and a speed indicator plate are also included. Motor dimensions below mounting plate: Length, 2½"; width, 2⅜"; depth, 2⅞".

A record changer³ which automatically plays one or both sides of records at 33½, 45 and 78 rpm, all sizes 7", 8", 10" and 12" intermixed in any sequence of the same speed, has been

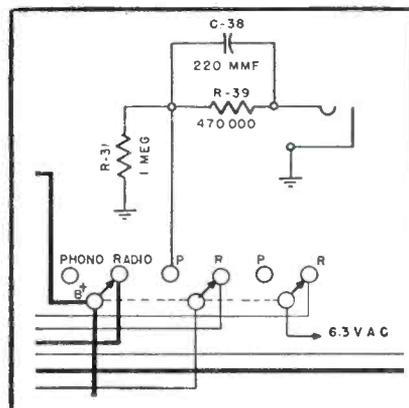
(Continued on page 66)

¹Model CVS-12; Rek-O-Kut Company, Inc., 38-01 Queens Blvd., Long Island City, N. Y.

²Models DTP, DSP and PSP; Russell Electric Co., 4501 S. Western Blvd., Chicago 9, Illinois. (Bulletin 5000 mailed on request.)

³Lincoln Engineering Co., Record Changer Division, 5701 Natural Bridge Ave., St. Louis 20, Mo.

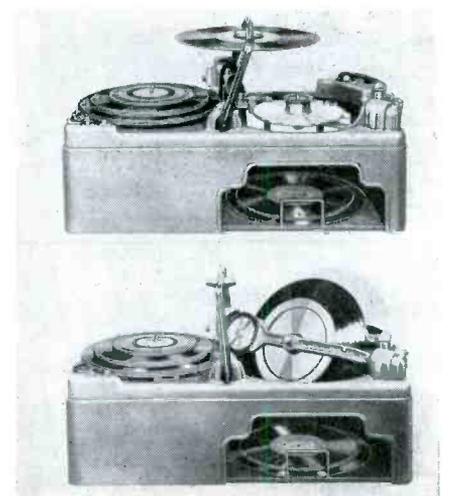
Fig. 1. Phono compensation circuit of Stromberg-Carlson model 16 RPM.



Rek-O-Kut *vari-con* turntable.



Lincoln automatic 3-speed changer. Top view illustrates record being shifted for play. Bottom views shows record being turned.



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FEATURES	TELE-ROTOR		Rotator A		Rotator B	Rotator C	Rotator D	Rotator E	Rotator F
	TR-1	TR-2	Type 1 2						
TORQUE FT. LBS.	34	36	5½		4.5	6.75	2.25	4.5	6.00
TORQUE PER POUND OF ROTATOR	1.13	1.13	0.91		0.55	1.08	0.35	0.58	0.86
SIDE THRUST OVERLOAD (FT. LBS.) TO STOP ROTATION	325	325	94		50	83	88	110	160
WEATHER PROOFING	One piece "Water Shed" Dome Housing		Rubber Gasket	Metal Ring	Felt Washers	Rubber Gasket	Rubber Gasket	Rubber Gasket	Rubber Gasket
ELECTRICAL TO MECHANICAL EFFICIENCY TORQUE PER WATTS CONSUMED	72%	58%	16.4%	16.3%	13%	11%	4%	11%	11%
TYPE OF LOAD BEARING	Two 6½ in. dia. Ball Races		Double Sleeve	Sleeve & Ball 2 in. dia. Ball Race	Sleeve	Sleeve	Double Ball Race 1 in. dia. Ball Race	Double Sleeve.	
MAST CAPACITY	2"	2"	1¾"		1¾"	2"	1¾"	2"	1½"
ALIGNMENT OF ROTATOR SUPPORT MAST AND ANTENNA MAST	in Line	in Line	Off Set		Off Set	Off Set	In Line	Off Set	In Line
MOUNTING VERSATILITY	Mast or Platform		Mast Only	Mast Only	Mast Only	Mast Only	Mast Only	Mast Only	Mast or Side Plate
TYPE OF DIRECTIONAL INDICATION	End of Rotation Light	Dial lights 8 Positions and end	End of Rotation Light	Meter	Meter	Meter	End of Rotation Light	Meter	Meter

Servicing Helps

by M. A. MARWELL

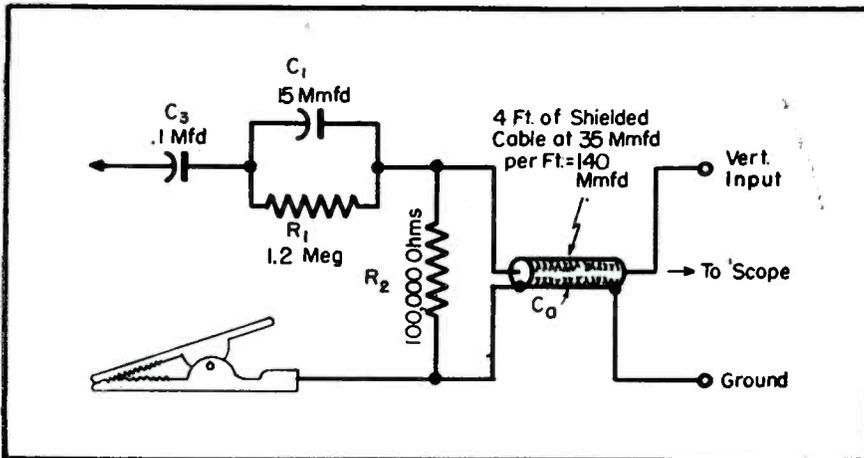


Fig. 1. Circuit of low-capacity probe designed by Emerson.

TO REPRODUCE faithfully high-frequency waveshapes (15 kc and higher) and to prevent loading of the circuit under observation, a low-capacity probe must be used. Such a probe* can be constructed in the shop.

As illustrated in Fig. 1, five components are required: 1-mfd and 15-mmfd capacitors, 1.2-megohm and 100,000-ohm resistors and four feet of shielded cable. All parts should be mounted on a small sheet of bakelite, preferably inside a paper or mica tube. A shielded cable must be used because it prevents stray pickup. The length of this cable is very important since its capacity is used in the design of the probe. The high capacity of this cable (140 mmfd) and R_2 (100,000

ohms) minimizes the effect of different input impedances in various oscilloscopes.

The cable has a 35-mmfd per foot capacity. The 15-mmfd unit should have a tolerance of $\pm 10\%$. With 10% tolerance in the cable and in C_1 , the peak-to-peak-voltages at 15 kc can be measured with 10% accuracy, provided the 'scope is calibrated on a 60-cycle sine wave.

Due to the construction of the probe, the signal at the 'scope terminals is approximately 1/12 of its actual value. This means that a 'scope with at least .05 rms volts-per-inch vertical sensitivity is required. The average 'scope will meet these requirements. Since the 'scope is calibrated on a 60-cycle sine

wave through the probe, the attenuation of the probe will not effect the accuracy of the peak-to-peak voltage readings.

In trouble-shooting, it is of great value to know the peak-to-peak voltages of the various wave shapes. The 'scope can be easily calibrated to read these voltages.

Philco 50-T1400 Series, Runs 1 and 2

Reduction of vertical jitter: Vertical jitter in the picture due to line voltage fluctuations in these models may be greatly reduced or eliminated by adding an extra filter network to the B supply feeding the vertical oscillator and discharge tube. This network consists of a 10,000-ohm resistor and a 10-mfd capacitor, as illustrated in Fig. 2.

Preventing horizontal-sync tear at minimum contrast control setting: Horizontal tear at the top of the picture may be caused by a horizontal damper lead radiating energy into the sync separator circuit. The effect of this radiation may be reduced by redressing these leads as follows:

Redress the blue lead on B_{3-3} to the mounting jack of the high-voltage capacitor under C_{16} , and under T_6 to the capacitor mounting jack. This wire connects C_{61} to C_{76} , and radiates some horizontal output signal to the lead connected from B_{3-2} to B_{3-3} , which is in the sync separator grid circuit. This wire should also be redressed (from B_{3-2} to B_{3-3}) on the 6SN7GT side of B_3 , under R_{76} to B_{3-3} .

Admiral 24 Series, 20Z1, and 21B1, 21C1 TV Chassis

Removing adjacent-channel interference: In some locations when a TV set is tuned to one channel it will pick up some signal from an adjacent channel. This type of interference is usually noticeable when the wanted station is weaker than the interfering

Emerson Low-Capacity Probe . . . Reduction of Vertical Jitter and Preventing Horizontal-Sync Tear at Minimum Contrast Control Settings in Philco Chassis . . . Removing Adjacent Channel Interference in Admiral Models . . . TV IF Transformer Alignment.

*Based on data supplied by Emerson Radio.

station. Current production sets have suitable traps to eliminate adjacent channel interference, and where this is a problem, the traps may be easily added to earlier production sets.

Types of Adjacent Interference

Adjacent channel interference may take two forms:

(1)—The picture has an interference pattern produced by the adjacent higher channel picture carrier. Sometimes the interference will take the form of a superimposed picture (stationary or moving slowly) similar to that on the adjacent higher channel; at other times it may appear as a number of diagonal lines or as a vertical moving bar.

Since other forms of interference also produce diagonal lines, the presence of a station on the adjacent higher channel must be definitely determined.

(2)—The picture has a herringbone interference pattern produced by the adjacent lower channel sound carrier. Close examination will often reveal the fine lines of the herringbone pattern varying in accordance with the speech or music on the adjacent lower channel.

Since FM interference from other sources also produces a herringbone pattern, the presence of a station on the adjacent lower channel must be definitely determined.

Both of the above types of interference may be eliminated from the 24 series chassis by installing a dual trap.**

The trap should be installed as shown in Fig. 3. The left hand side of the mounting bracket should be mounted by means of a No. 8 self-tapping screw, in a vacant hole already punched in the chassis. The right hand side of the mounting bracket may be soldered to the chassis to save drilling a new hole.

The coil L_{301} should be disconnected from the tuner and connected to the trap as shown. The lead from the trap is then connected to the tuner.

The trap marked 19.75 will remove

(Right)

Fig. 3. Dual-trap installation in Admiral chassis to remove adjacent channel interference.

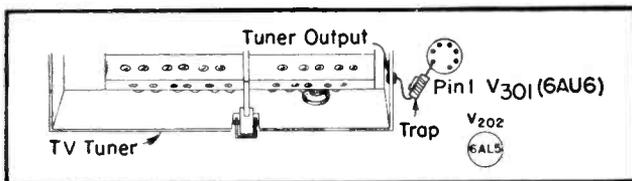


Fig. 4. Single-trap installation in Admiral sets, which removes herringbone interference pattern produced by the adjacent lower-channel sound carrier.

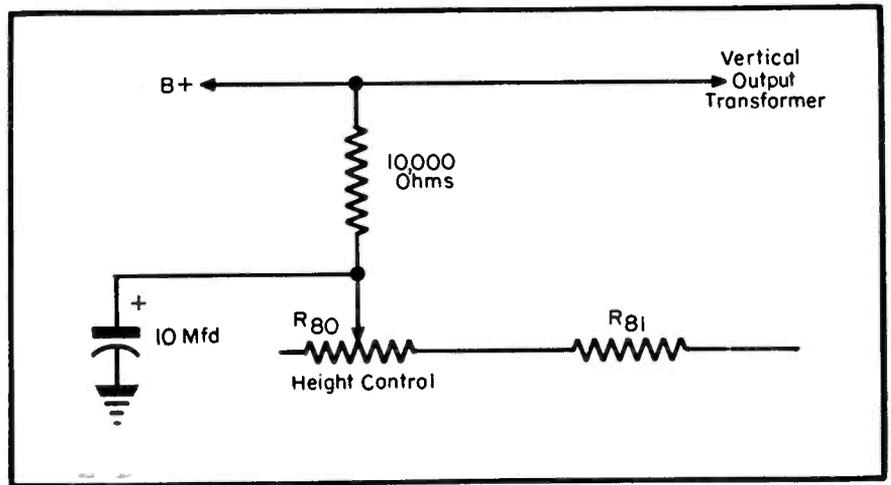


Fig. 2. Filter network system installed in Philco model 50-T1400 series to reduce vertical jitter.

type 1 interference, and the trap marked 27.25 will remove type 2 interference.

The two tuned circuits are pre-adjusted at the factory and should not normally require adjustment in the field. However, if adjustment is made to eliminate interference in the picture without using test equipment, the slugs should not be turned more than approximately one turn in either direction.

If the dual traps are installed when alignment equipment is available, a signal generator should be connected to the oscillator-mixer tube V_{102} (6J6) through a dummy shield, a *vtvm* connected to test point X and trap slugs tuned for minimum at 19.75 and 27.25 mc.

The insertion of the dual trap will cause the 25.75-mc video *if* marker to move slightly off the 50% position of the *if* curve. This will not make any

noticeable difference in the picture, but adjustment of A7 will move the marker to the 50% position on the curve.

Fixed Tuned Trap

A trap * * * is also available for removing type 2 interference on 20Z1 chassis. This trap is fixed tuned and consists of a coil and a fixed capacitor resonant at 27.25 mc.

The trap is connected by removing the lead between the *rf* tuner and the grid (pin 1) of the first video amplifier V_{301} (6AU6) and connecting the trap in place of the lead; Fig. 4.

This trap may be installed in the field without realignment. (The 20Z1 chassis code ON, run 7 or higher, has the trap incorporated.)

Although all current production of the 21B1 and 21C1 chassis have the trap installed, the first few hundred receivers produced did not have them.

Chassis 21B1 with the traps installed can be identified by code OM, run 1. Chassis 21C1 with the trap can be identified by code OM, run 4.

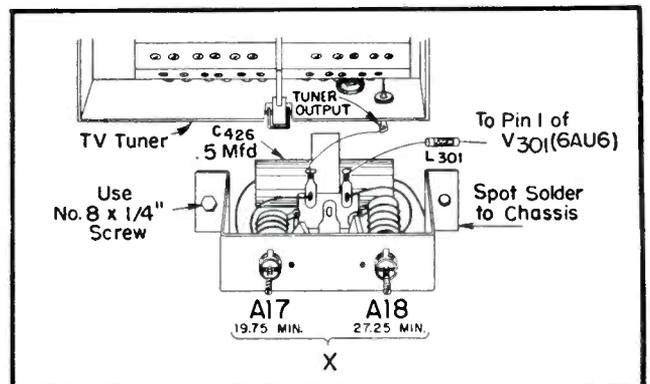
The trap (for removing type 2 interference) can be installed by removing the lead between the tuner and pin

(Continued on page 60)

**Admiral part No. A3320.

‡Production 24F1 chassis code OM, run 10 or higher, and 24D1 chassis code on run 9 or higher, have traps. 24F1 chassis code OL, run 10 or higher and 24G1 code OL, run 11 or higher, have traps. Chassis 24H1 code OL, run 6 or higher also have traps.

***Admiral part No. 72A 102.



V Receiver Production Changes

Westinghouse Revised AGC Circuitry . . . G. E. Receiver Filament-Circuit Changes . . . Philco Sync-Circuit Modifications . . . New AGC Circuits in Philco TV Chassis . . . Westinghouse Sound System Circuitry

by **DONALD PHILLIPS**

SUBSTITUTION OF TUBES, with corresponding differences in operational characteristics, have prompted the inclusion of many revisions in circuits. In the Westinghouse V-2150-106 chassis, for instance, it was decided to use the 6AK5 as an *rf* amplifier instead of the 6AG5, used in the 101 chassis. Due to the difference in tube's cut-off characteristics the *agc* circuit in the —106 chassis had to be altered; Fig. 1. Only one-half of the *agc* voltage developed is applied to the video *if* amplifier tubes in the revised chassis, and full *agc* is applied to the tuner. A 22.6-mc peaking coil used in the 101 chassis is not used. Instead, the 22.6-mc peaking adjustment is in the tuner

assembly, and is accessible from the top of the tuner.

Filament Circuit Change

Late production G.E. receivers (12T3, 12T4, 12C107, 12C108 and 12C109) now use a single 0.6 ampere Globar resistor in the filament circuit to give the same current regulation in this circuit during the warm-up period as was previously accomplished by two 0.3 ampere Globar resistors, R₁₅₃ and R₁₅₆; Fig. 2.

Sync Change

Philco models 50-T1600, 50-T1632 and 50-T1633 now employ a new sync

circuit, with a section of a 12AU7 connected as a diode and used as a series noise limiter, or noise gate; Fig. 3. By making the diode conduct in step with the strength of the received signal, as reflected in the video-*if* B+ voltage with *agc* changes, the effects of noise on synchronization have been reduced over a great range of signal strength.

Revised AGC Circuitry*

The code 122 Philco receivers (models 50-T1600, 50-T1632, 50-T1633) have had several circuit changes included:

(1)—A dual sync separator is no longer used. Instead, a single separator and series noise gate is used.

(2)—The 6AL5 video detector and *agc* rectifier has been changed to a 12AU7, which is now used as a video detector, *agc* rectifier and first sound *if* (intercarrier) amplifier.

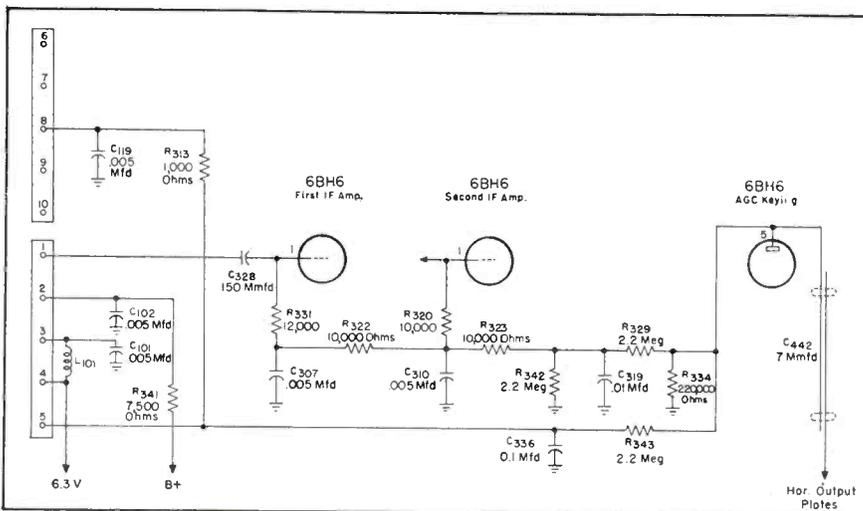
(3)—The 4.5-mc trap has been moved from the plate of the video-output tube to the output of the video detector.

(4)—The *agc* clamper has been removed and the *agc* system changed to variable-delay *agc* with sound *agc* boost.

(5)—The intercarrier sound takeoff point has been moved from the plate of the first video amplifier to the output of the video detector.

The variable delay *agc* is obtained by applying a positive voltage to the cathode of the video detector, *agc* rectifier section of the 12AU7. This voltage is obtained from a voltage

Fig. 1. Revised *agc* circuit for Westinghouse V-2150-106 chassis, the change having been made because of the use of a 6AK5 as an *rf* amplifier, instead of a 6AG5.



divider in which the contrast control is one leg. In operation, on reception of a weak signal, the contrast control must be turned clockwise to maintain contrast. This increases the positive (delay) voltage applied to the *agc* rectifier, thus preventing *agc* action when receiving weak signals, where all the possible gain is needed. This delay voltage does not affect the video-detector action, because the voltage is applied to the cathode, and the video detector plate (control grid acts as plate) is returned to the same *dc* potential; the *agc* plate is returned to ground. Since the cathode is positive with respect to the *agc* plate, there is no *agc* action unless the incoming signal is strong enough to overcome the delay voltage. When a moderately strong signal is received, the contrast control must be turned in the counter-clockwise direction, thus reducing the positive delay voltage. With stronger signals, the negative *dc* voltage developed across the FM detector filter capacitor completely cancels the remaining positive delay voltage, resulting in full *agc* action. On still stronger signals, this negative voltage from the FM detector not only cancels the delay voltage, but boosts the *agc* voltage as well. Thus, the system provides flat *agc* action over a large range of received signal strengths.

In the dual sync separator circuit (horizontal and vertical), which has been changed to a single sync separator with a variable diode noise gate, a positive voltage, obtained from a voltage divider, is applied to the diode plate, while the sync signal, of positive polarity, is applied to the cathode. The diode will pass the sync signal as long as the cathode remains negative with respect to the plate. The value of plate voltage is such so that this is the condition for all normal sync signals. However, when a noise signal greater than the sync signal is received, the cathode of the diode is driven positive with respect to the plate, and the diode is cut off, thus preventing the noise from passing on to the second sync separator.

The positive voltage applied to the plate of the diode is made proportional to the strength of the signal being received by obtaining it from the load side of a dropping resistor in the B+ line that supplies plate and screen voltages to the *if* stages. The current through the resistor, therefore, depends upon the amount of current drawn by the *if* stages. When a stronger signal is received, the *agc* voltage increases; this decreases the current drawn by the *if* stages, and

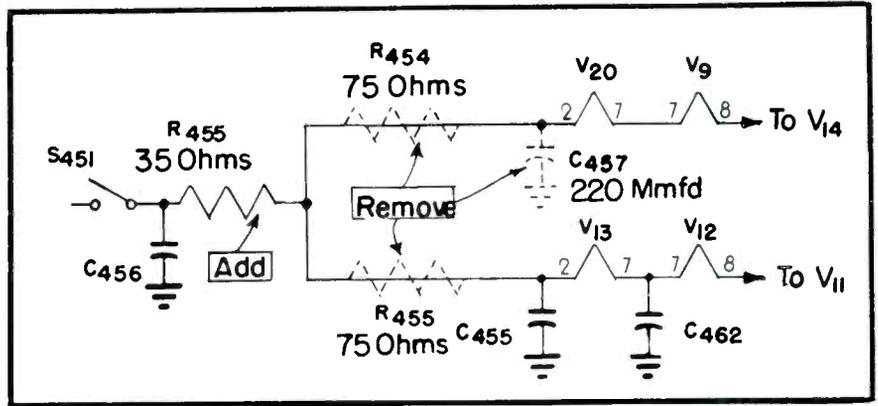


Fig. 2. Filament circuit change in G.E. chassis, incorporated to correct voltage regulation.

decreases the voltage drop. Since this results in an increase in the voltage applied to the plate of the noise-gate diode, it raises the level at which the diode will gate out the noise. When a weaker signal is received, the opposite effect is obtained.

The other section of the 12AU7 is used as the first *sif* (intercarrier) amplifier. The 4.5-mc signal is picked off the diode detector shunt-peaking coil and fed through one-half of the 12AU7 to the 6AU6 second *sif* (intercarrier) amplifier.

Westinghouse TV Sound Systems

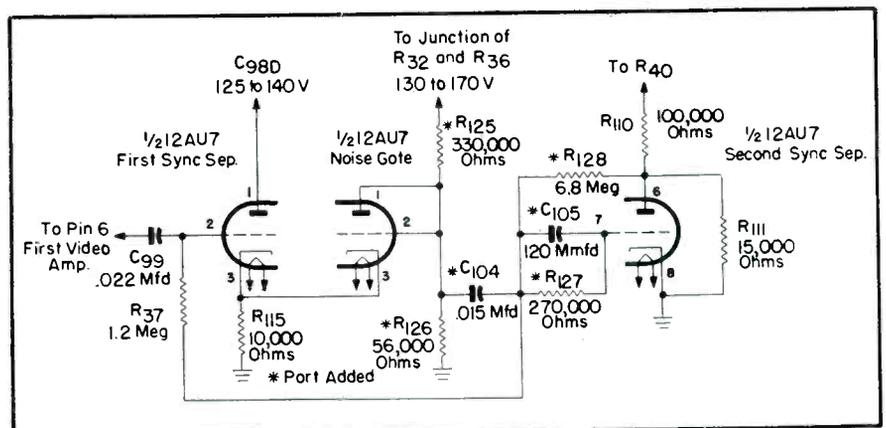
In the V-2152-01 Westinghouse chassis,** when the selector switch is in the phono position, the output of the record-player pickup cartridge is applied through the volume control to the grid of the 6AV6 first audio amplifier, where it is amplified and passed on to the audio output connector.

A voltage is developed across a 100,000-ohm resistor, R_{201} , when grid current flows in the 6BH6 second sound *if* and FM *avc* tube. This voltage is utilized as *avc* voltage by applying it to the FM *rf* amplifier tube. Since a keyed *agc* system is employed for TV and a diode *avc* system is used

for AM, the *avc* voltage developed across R_{201} serves only for FM radio operation.

The 455-kc output of the AM converter is applied through T_{201} to the grid of a 6BJ6 first sound *if* amplifier. Negligible impedance is offered to the 455-kc signal by the relatively slight inductance of the secondary winding of T_{201} , so the effect of T_{201} can be neglected. This is also true of the primary winding of T_{201} which is connected in series with the primary of T_{206} . The 455-kc signal is amplified in the 6BJ6 first sound *if* stage and applied through T_{205} to one of the diode plates in the 6AV6 tube. This diode serves as the AM detector and develops the *avc* voltage. The detector output is developed across a 470,000-ohm resistor, R_{202} , and is applied through a .01-mfd unit, C_{214} , and the selector switch to the volume control. From here, it is applied to the grid of the 6AV6 first audio amplifier, where it is amplified and passed on to the audio output connector. The signal developed across R_{202} is filtered by a 1,000-ohm resistor, R_{203} , and a .022-mfd capacitor, C_{210} , and is applied as AM *avc* to the grid of the 6BJ6 first sound *if* amplifier.

Fig. 3. New sync separator circuit included in run 4 of the Philco models 50-T1600, 50-T1632 and 50-T1633, new parts added being indicated by the asterisks.



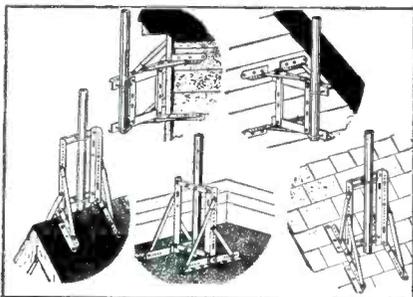
* Based on copyrighted notes prepared by Philco.
** SERVICE, July, 1950.

New TV Parts . . . Accessories

INSULINE ANTENNA MOUNT

A multi-position TV antenna mounting that is said to adjust to practically any position on a roof, parapet, side wall or corner of a building has been announced by the Insuline Corporation of America, 3602-35th Ave., Long Island City, N. Y. Constructed of cadmium-plated, heavy-gauge steel, the mount is fastened in place with common lag bolts. Pivoted design enables the TV installer to insert the assembled antenna in a lowered position and then to raise and secure it.

One mount, No. 6136, takes antenna poles up to 1½" outside diameter; another, No. 6139, takes 2" poles.



* * *

ROTO-RAK TV SERVICE RACK

A *Roto-Rak* TV service rack, designed to handle any size or make of chassis, has been announced by Arbor Mfg. Co., Depew, N. Y. In application, the Service-Man fastens two chassis bars to the bottom of the chassis, sets up the frame by spreading it apart and mounts chassis bars on crossarms.

All parts are reached by turning the entire assembly, which can be locked in any position. Service Man can sit in a comfortable position while making adjustments.

Equipped with easy-rolling casters for moving while set is mounted. Can also be adapted for use in automatic record changer repair.

Roto-Rak is 45" high and measures 34" wide when open (10" wide when closed), and 30" deep. Weight, 75 pounds. All-steel construction.

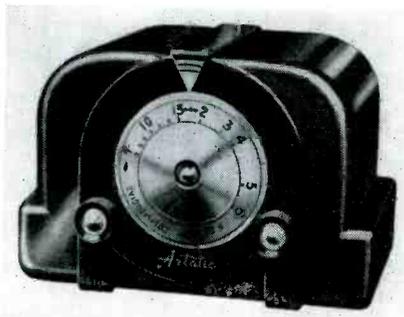


ASTATIC BOOSTERS

Two boosters, the BT-1 and BT-2, featuring use of the Mallory Inductuner for continuous variable tuning, through both TV and FM bands, have been announced by Astatic Corp., Conneaut, Ohio. Other features are a selenium rectifier, single 6AK5, provision for either 72 or 300-ohm impedance input and output, off-on switch for cutting in and out of the circuit.

BT-1 is encased in a metal cabinet with a mahogany woodgrain finish and gold dial facing and numerals.

Model BT-2 is housed in a dark brown plastic cabinet. The entire dial face revolves below a fixed pointer in tuning. Dial and numerals are harmonizing gold and green. Has a recessed pilot light to show whether booster is on or off.



* * *

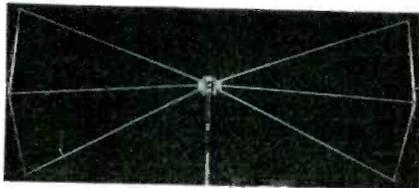
BRACH TV ANTENNAS

Two TV antennas have been developed by the Brach Manufacturing Corp., 200 Central Ave., Newark, N. J.

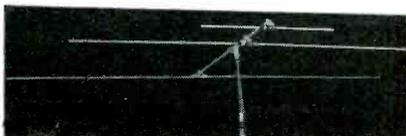
One, the *Bow-Tie V*, No. 452, is a closed circuit V type in which three antenna rods, of the same electrical length, emanate from each side of a non-hygroscopic insulator and are joined at the ends by means of shorting bars. The shorting bars are said to provide more surface area and raise the gain of the antenna proportionately higher than would the adaption of directors or reflectors, particularly on the upper channels.

Uses seamless tubing and a high impact insulator. Available in stacked form, too.

T-Bar antennas, the second type developed by Brach, are recommended for use with those sets which have 75-ohm front ends and for installations in noisy areas where coax line is required. Available in single (No. 423) and stacked (No. 435) form.



Above: Brach Bow-Tie V
Below: Brach T-Bar

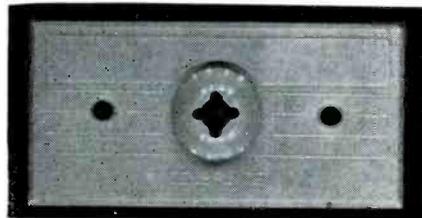


TELEPLATES

Plastic cover plates for use with twin-lead or coax, Teleplates, have been announced by the Teleplate Sales Co., 510 Cuyahoga Savings Building, Cleveland 15, Ohio. Standard 300-ohm twin-lead can enter the back of the plate from any of the four edges, by breaking out a lip on the desired wall. Plates can be used on the floor, wall, baseboard, window sill, etc. Can also be used to cover the hole when the lead is brought through the wall.

Plates are 1⅞" x 3⅝", and have two mounting holes. They are available in ivory and brown, and come individually packed complete with mounting screws, 20 to a display, 5 displays to a standard carton.

For bulk users, name, address, phone or advertising can be inserted in the top space of the plate.



* * *

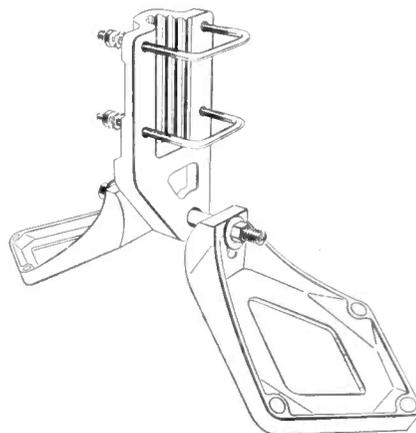
CHANNEL MASTER ROOF MOUNTS

All-angle peak mounts have been announced by Channel Master Corp., Ellenville, N. Y.

Said to fasten on perfectly flat roofs (level or sloping), and peaked roofs of any angle or pitch.

Gripped by a rigid-U-bolt clamp in a serrated nest.

Mount, model 9015, is a heavy-duty unit, consisting of 3 castings of hard-temper aluminum, alloy 319. Accommodates from 1" od to 2" od.



DON GOOD FILTERS AND TRAPS

Five products, a *Telepass** (a TV high-pass filter), two variable *Teletraps** and two variable *TVI Traps** (one high and one low band), have been announced by Don Good, Inc., 1014 Fair Oaks Ave., South Pasadena, California.

Telepass is said to eliminate or greatly reduce interference which may be picked up by the *if* amplifier or the TV receiver. Manufacturer states that the filter effectively eliminates interference which may arise from strong, local low-frequency fields radiated from diathermy or X-ray equipment, industrial induction heaters, household appliances, neon signs, etc.

The principles used in the filter are said to eliminate the use of critical capacitors and undesirable resonate frequencies through the use of a simulated ceramic core and cup assembly, cast as an integral unit enclosing the interference component. Pretuned at the factory. Has a small low-loss polystyrene case: 2 3/8" x 1 1/4" x 4 1/8". Built in two standard types: No. 72 for 72 ohm line and No. 300 for 300 ohm line.

Teletraps are available in a R-301 FM type for installation at the TV receiver antenna terminals to eliminate interference from FM stations. Model is rated for 88 to 110 mc and is housed in a low-loss polystyrene case of 3 5/8" diameter. Second type, R-302 DA, is also designed to be installed at the TV antenna terminals to eliminate interference from diathermy and amateur signals within its tuning range. Rated for 26 to 32 mc. It is of the same size as the R-301 FM. *Traps* feature the use of a *high Q* variable quarter-wave stub.

Variable TVI traps are supplied as model No. T-301 LB, a low band type for channels 2 to 6 and model T-302 HB, for channels 7 to 13.

*Patent Applied For *Trade Mark Applied For



* * *

TACO TV DISTRIBUTION SYSTEM

A master antenna distribution system has been announced by Technical Appliance Corp., Sherburne, N. Y.

System has been designed primarily for TV store demonstration needs. Uses separate, plug-amplification strips. Signal is fed through a power amplifier into a mixer chassis and then on to isolation boxes feeding one or two receivers each. According to manufacturer, the total number of receivers fed through a single system can exceed 100.

Up to 8 receivers may be connected up directly from amplifier without the need of separate isolation boxes. It is claimed that the isolation boxes do not load down the common transmission line.





REVOLUTIONARY GIVES YOU

maximum replacement

WITH A **minimum of cartridges!**

THIS MEANS MONEY TO YOU!



ORTHOGONAL SERIES 32, 33 and 34

This TORQUE DRIVE* vertical-type crystal cartridge is being used more and more in original equipment and for replacement. The 32 series greatly improves 78 rpm reproduction—saves record wear. The 34 series for 33 1/3 and 45 rpm beautifully plays the new wide-range, high fidelity recordings—tracks perfectly at 5 grams pressure. The 33 series handles all three speeds, with remarkable efficiency. All specially moisture protected for extra long life. Has 1/2" and 5/8" hole spacing. Color coded. Simple to install. Replaceable osmium-tip or sapphire-tip needles.

*E-V Pat. Pend. Licensed under Brush patents.



SERIES 12 and 14

The Series 12 TORQUE DRIVE crystal cartridge replaces over 150 types in general use for 78 rpm. Saves time and work—speeds servicing. Gives better reproduction and longer record life. Series 14 for 33 1/3 and 45 rpm is performing brilliantly in thousands of record changers. Tracks perfectly at 5 grams pressure. Color coded. Replaceable osmium-tip or sapphire-tip needle.



SERIES 16 TWILT FOR ALL 3 SPEEDS

Superbly plays 33 1/3, 45 and 78 rpm records with a single twin-tip replaceable needle without weight change, with tracking pressure of only 6 grams, and does it with TORQUE DRIVE efficiency. You merely tilt the Twilt and select the 1-mil or 3-mil needle tip for fast or slow speed records. Setdown is accurate. Mounts easily in most any standard pickup arm, with nothing more required than reducing needle pressure. Also available without tilting mechanism.



SERIES 60 REPLACES OVER 20

New Econo-Cartridge for economical replacement of over 20 conventional Bimorph crystal types. Frequency response to 6000 cps. Output is 3.5 volts with compliant needle, and 4.5-5 volts with straight shank needle. Has exclusive E-V needle stop which prevents chuck from rotating excessively and damaging crystal.



INCORPORATED

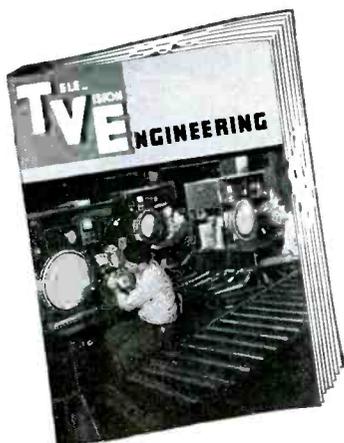
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SNYDER TV ANTENNA SYSTEM

A *Select-A-Beam* TV antenna, TX-50, system has been announced by the Snyder Manufacturing Co., Philadelphia, Penna.

Describing the antenna, Snyder sales-manager Dick Morris said that beam selections are electronically controlled. Three combinations of elements are possible, with each combination orienting electronically to the desired station by means of a selector switch.



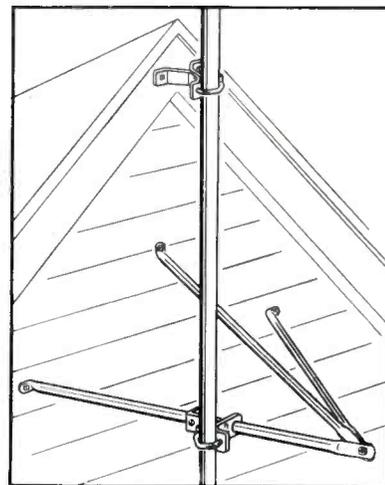
Dick Morris

* * *

SOUTH RIVER ADJUSTABLE WALL BRACKETS

Two adjustable wall brackets, WBA-18 and WB3-18A, for TV antennas, have been announced by South River Metal Products Co., Inc., South River, N. J.

Brackets are constructed of aluminum alloy tubing, and furnished with square-head slotted wood screws with a hot dipped galvanized finish. Screws permit either the use of a wrench, screw driver or pliers for mounting.



* * *

OAK RIDGE TV ANTENNA

A *Beam-Master V* antenna has been announced by Oak Ridge Products, 239 E. 127 St., New York 35, N. Y. Uses structural aluminum angle construction. Elements are reinforced with a dowel on one end and the other end of the elements are pressure sealed.

Designed for single or double stacking.

* * *

WARD ATTIC ANTENNAS

An attic model antenna, model TVH-52, has been announced by the Ward Products Corp., 1523 E. 45 St., Cleveland 3, Ohio.

The antenna, a dipole type, is suspended upside down in the attic.

REGENCY TV BOOSTERS

Regency TV boosters, model DB 400, made by I. D. E. A., Inc., Indianapolis, are now available in ivory plastic and in deep-tone mahogany cases.

Both boosters measure 4½" in height, 5½" in width and 3¾" in depth.



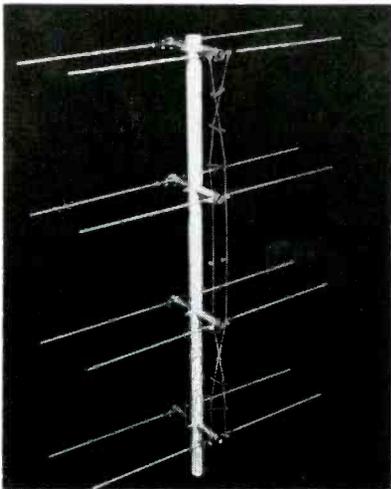
Dick Mitchell, I. D. E. A. sales manager with Regency boosters

* * *

VEE-D-X UHF ANTENNA

An experimental model, X-UHF, antenna has been developed by LaPointe Plascomold Corp., (Vee-D-X), Unionville, Conn.

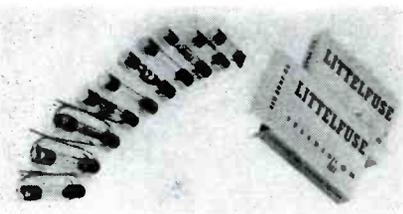
Antenna, a miniature version of the Vee-D-X RD-13A Super, is a four-bay stacked array. Tests have been made on reception from the experimental NBC station KC2NAK (Stratford, Conn.) which operates on 529-535 mc. Antennas are available on special order for experimental work.



* * *

LITTELFUSE TV FUSE KIT

A kit of 10 TV fuses, in a 2¼" x 1½" container, has been produced by Littelfuse. Included are eight basic types needed most frequently, two of the eight being duplicated, providing more adequate coverage on the more popular types.



Go after the Fringe Business

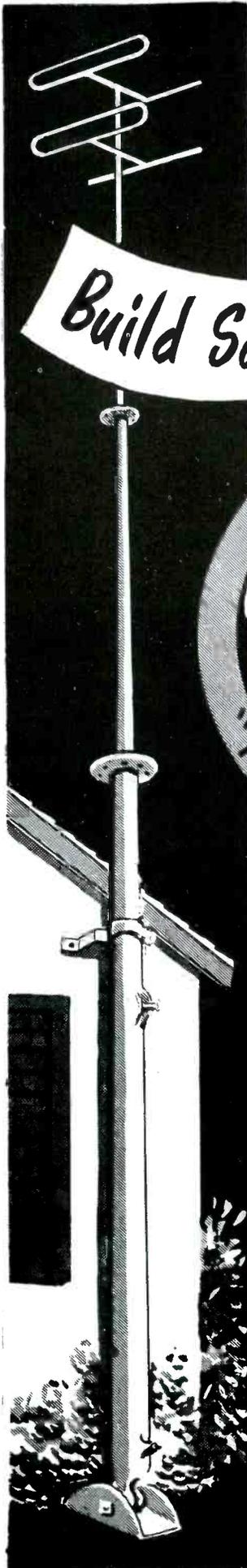
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Build Sales Up with

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PNEUMATIC TELEVISION TOWER

"TOWERS ABOVE THE REST"



EASY TO INSTALL: Air-Up can be installed by one man in 30 minutes or less. A heavy steel base is furnished with a 14-inch ground stake. May also be mounted on a flat or slanted roof.

AIR-UP does not fill with snow and ice and become too heavy for roof. Spring trigger locks tower in extended position automatically. To lower, merely pull cord on trigger. Withstands winds up to 80 miles per hour if properly installed, and guyed.

CONVENIENT: Air-Up can be lowered for maintenance or storms and pumped up again in less than a minute with standard auto pump.

AIR-UP is constructed of heavy gauge 2½" diam. steel tubing and is finished with cadmium plating on both inside and outside. Neoprene weather seals are used. Air-Up is fully guaranteed against mechanical and material defects.

ELEVEN DIFFERENT MODELS, \$26.95 AND UP. Full Jobber and Dealer discounts plus substantial freight allowances.

AIR-UP TOWER CORPORATION.

CABLE-UP TOWERS are similar in appearance to the Air-Up towers shown at left. Cable-Up towers, however, utilize built-in pulley and cable assemblies to raise and lower the tower.

Our C-54 is a 54-ft. Cable-Up Tower, which lists for only \$58.95.

AIR-UP TOWER CORPORATION
350 East Broadway, Muskegon Heights, Michigan

Please send Price List and additional information on AIR-UP PNEUMATIC and CABLE-UP Television Towers.

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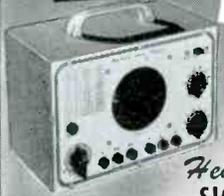
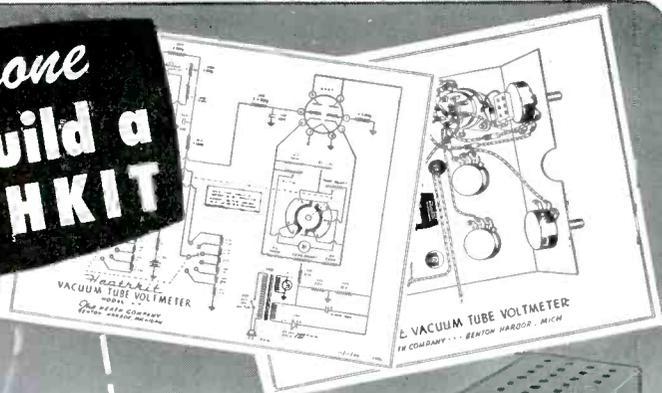
Rep Talk

I. D. E. A., Indianapolis, has appointed *Arthur E. Akeroyd* to serve as rep for the Regency booster in the six New England states of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut. . . . The Browning Laboratories, Inc., has appointed the *Dan J. Connor Co.*, 1036 Broad St., Philadelphia, Penna., as its rep in the Philadelphia-Washington-Virginia territory. . . . *William Richter*, 295 Lake Avenue, Rochester, N. Y., has been named Insuline rep for New York State north of Westchester and Rockland Counties. *Gerber Sales Co.*, 739 Boylston St., Boston, Mass., have been assigned the New England territory by Insuline. . . . *J. K. Rose*, 6240 North Francisco Ave., Chicago 45, Ill., has been appointed by Permoflux to represent them in Ill., Mich., Ind., Western Ky., Wisc., and Minn. . . . The Los Angeles chapter of *The Repts*, will soon issue the seventh edition of its directory of electronic manufacturers and representatives. *E. V. Roberts*, 5014 Venice Blvd., Los Angeles 35, is chairman of the directory committee. Others on the committee are *Gerald B. Miller*, chairman of chapter's board of governors; *Harold A. Kittleson*, president; *John B. Tubergen*, secretary-treasurer and *Ralph K. Reid*. . . . *George Davis* will represent Universal Microphone Co., in Arizona and Southern Calif. . . . *Frank Lebell* has joined the staff of E. V. Roberts and Associates, Los Angeles electronic sales reps, to cover the distributor and jobber trade in Southern Calif. and Arizona. . . . *Jack Poff*, Erie Resistor distributor sales manager, met with Erie's sixteen distributor sales reps from various sections of the country recently, at the plant in Erie, Penna. . . . *Jules J. Bressler* is now located at 1780 Broadway, N. Y. 19; phone Plaza 7-2689-2690. . . . *G. S. Marshall Co.* have moved to 365 So. Fair Oaks Ave., Pasadena 1. *Jack Hachten* has joined the sales engineering staff to cover Southern Calif. and N. M. . . . *J. T. Hill Sales Co.*, Los Angeles, are now representing *Morse Mfg. Co.*, Fitchburg, Mass., in Southern Calif. and Arizona for its 45 rpm record inserts. . . . *Young and Myers Co.*, 4550 Main st., Kansas City 2, Mo., have been appointed Kansas, Missouri and Nebraska factory reps for *James B. Lansing Sound, Inc.*, Los Angeles. . . . *John F. Rider Laboratories, Inc.*, have appointed ten Rep members to introduce *Quik-Shot* soldering irons to the distributor trade this fall: *Neal Bear*, *Charles Dolfuss* and *Les Morrow*, all reps of the Buckeye Chapter; *Irvin Aaron* and *J. K. Rose*, Chicagoland Chapter; *Bruce MacPherson*, Hoosier Chapter; *Al Rissi*, Los Angeles; *Paul Scholz*, Missouri Valley; *A. J. Nelson*, Rocky Mountain; and *Robert M. Campion, Sr.*, Southwestern. . . . *Robert M. Hardie* and *Richard E. Osborne*, members of the Los Angeles Chapter, are now covering the Calif. territory for Radiart.

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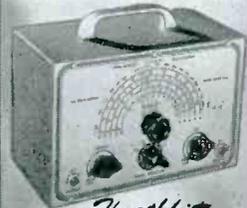
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Improving Audio

(Continued from page 24)

new unit was of upright construction and of larger dimensions and could not be mounted on the speaker. The back edge of the chassis permitted installation, with the drilling of a hole for leads and four holes for mounting. With the output transformer installed, there was an increase in power output to 6.5 watts. The bass response also improved. Then attention was directed to eliminating the distortion in the high frequency square waves. The culprit seemed to be the auto-transformer used for phase inversion. It was removed and a phase inverter tube, a 6SL7, was installed. The familiar split load type was selected, the tube being inserted into the second audio socket formerly occupied by a 6J5. The other section of the 6SL7 was used as the second audio stage, replacing the 6J5 whose socket was used.

With these changes the treble response was greatly improved, but the sound did not yet have the *bite* of the *high highs*. A 10-kc whistle filter was then removed. Many tests on AM have disclosed that even with flat (1 db down) response to 15,000 cycles little trouble was experienced with 10-kc interstation whistle. The *rf* and *if* sections had enough selectivity to cause the whistle to be low enough in level to be unobjectionable. Square wave tests showed that the distortion was gone when the filter was removed. To top off the rear end, about 10 db of inverse feedback was used from the output transformer secondary to the cathode of the first section of the 6SL7. This provided satisfactory speaker damping and at no extra cost, the distortion had been lowered to even smaller values.

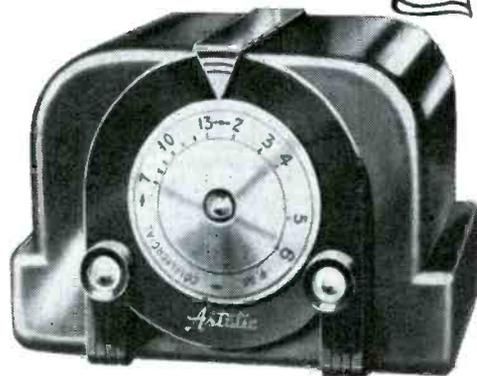
With inverse feedback in the circuit, came a corresponding gain reduction, which meant that more signal had to be provided to the second audio stage. The 6J5 first audio stage was removed and rewired for a 6SN7, the second section providing enough gain to more than make up for that lost in the feedback and in the bass boost.

The bass boost RC circuit was located after the first section of the 6SN7, while the treble roll-off RC circuit was moved from between the plates of the output stages to the grid circuit of the first 6SL7 section. The values in the bass boost circuit gave plenty of boost (6 db) with no changes, while the capacitor in the

(Continued on page 58)

Presenting the NEW Astatic TV and FM Boosters Models BT-1 and BT-2

Astatic raised tremendously the level of improved TV reception through pre-amplification of signal, when it developed its famous deluxe model AT-1 Booster with exclusive variable gain control and dual tuning. Now Astatic brings another great advancement to the progress of TV enjoyment—with two low-cost boosters that equal, to all practical purposes, the primary function of the highest priced units. Never before has so much quality been incorporated in a booster to sell at so low a price. Why not get the complete details? Write today.

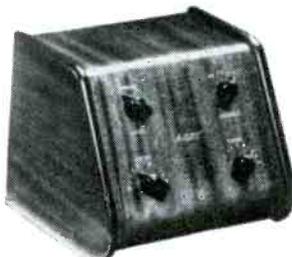


Booster Model BT-2
List Price \$32.50



Booster Model BT-1
List Price \$29.95

Only ASTATIC offers
as complete a choice of
BOOSTER MODELS



Booster
Model AT-1
List Price
\$49.50

Increasing numbers of TV set owners will still want the finest Booster that money can buy—and that means Astatic's deluxe Models AT-1 and AT-1B, with rich furniture finish mahogany or blond wood cabinet, exclusive and variable gain control, dual tuning and powerful four-tube operation.

LOOK AT THE AMAZING QUALITY FEATURES IN THESE LOW-PRICED BOOSTERS

- 1 Employ Mallory Inductuner for continuous variable tuning.
- 2 High gain, very uniform on both high and low channels.
- 3 Simplified controls—single tuning knob with continuous tuning through both TV and FM bands.
- 4 Band width adequate over entire range.
- 5 Low noise design and construction.
- 6 No shock hazard to user.
- 7 Off-on switch for easily cutting in and out of circuit.
- 8 Selenium rectifier.
- 9 Use single 6AK5 Tube.
- 10 Provide for either 72 ohm or 300 ohm impedance input and output.
- 11 Model BT-2 has handsome, dark brown plastic cabinet.
- 12 Model BT-1 has metal cabinet in rich mahogany woodgrain finish.
- 13 Large dial face is easy to see in tuning.
- 14 Model BT-2 has recessed pilot light to show when booster is on.

THE
Astatic
CORPORATION
CONNEAUT, OHIO
IN CANADA: CANADIAN ASTATIC LTD. TORONTO, ONTARIO

RCP *Complete Service Equipment for* TELEVISION AND RADIO

Model TV-80 SWEEP GENERATOR and MARKER

A high quality Sweep Generator combined with a TV marker. Sharp, clean-cut patterns with stability and sharp legible marking.

Comprehensive range—continuously variable 5—240 megacycles.

Sweep width—variable 400 KC to 10 MC.
Linearity—as required for band pass checking with an oscilloscope.

High "O" absorption marker 17 to 48 M.C.
Future IF's of higher frequencies provided by direct calibration of marker dial.

Marker calibration—accurate to within 1 per cent.
Planetary Drive.

Provision for use of external marker.
Special design permits retrace to be blanked out independently, regardless of type of oscilloscope used.

Controls for regulating sweep width—sweep amplitude—phasing—marker tuning—Pilot Light—Power Switch.

TEE VEE 90 OSCILLOSCOPE

Combines two essential instruments needed in TV testing—alignment—service. A complete oscilloscope and a complete sweep generator that can be used independently. Oscilloscope also has its own variable linear sweep. Sinusoidal sweep with phasing control for use with internal RF sweep generator when testing band pass characteristics. Synchronization provision for either internal positive, external or line frequency.

External jack provided for trace blanking. Requires 10 volts of negative pulse to blank a normal intensity level trace.

Independent sweep generator has a center frequency range of 1.5 to 45 megacycles giving a choice of any IF frequency desired. The band width can be varied continuously from 0.5 KC to 7 MC.

Traveling detector probe is included for observing signal at any point of the RF circuit under test.

Supplied with tubes, probe, coaxial output cable.

NEW MODEL 654 V.T. VOLTMETER

Electronic balanced bridge type push pull circuit V.T. voltmeter for A.C. measurements, as well as D.C.

A discriminator alignment scale with zero center permits operation in both directions.

Ohmmeter measurements—0.2 ohm to 1000 megohms in 5 range.

DC Volts: 0.5-25-100-250-1000.

AC Volts: 0.5-25-100-250-1000.

DB: -20 to 16, -6 to 30, 6 to 42, 14 to 50, 26 to 62.

Complete with isolation probe and leads.

Net Price \$47.95

NEW DYNOPTIMUM FREE POINT TUBE TESTER

MODEL 323 P.C.

The only tube tester that protects against obsolescence by having 2 extra circuit and tube element switches that are spares and are not used with 2 extra socket caps for possible new tube bases—more pins and elements.

Besides it is a free point tube tester designed to test the very latest tubes such as the new 8-prong sub-miniatures, etc. Unusually speedy to operate, simple and accurate. New design roll chart gives approximately 1,000 tube listings. All short-leakage and quality tests included.



\$84.50
Net Price



\$127.50
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Buy from your Jobber. Insist on R.C.P. instruments. Write for Catalog 105.

RADIO CITY PRODUCTS CO., INC.

152 West 25th St. New York 1, N. Y.

(Continued from page 57)

treble rolloff was reduced considerable until the rolloff was 3 db at 2500 cycles. The low rolloff frequency may seem low, but the values decided on were proved by listening tests. Photographs of the final square wave response are shown in Figs. 5, 6, 7 and 8. These were taken at the same frequency and control settings as the square-wave photos before modification.

Not only was the frequency response improved, but the power output was improved. A midrange power of 6.5 watts was obtained because a field coil speaker was used. Had the plate voltage on the output stage been increased to 325 volts, the power output would have been 12 watts. This was confirmed by temporarily removing the field coil and substituting a choke.

In case four, the receiver used a tone-control system which featured degeneration in a 6J5 to give either bass or treble boost or cut. The controls for this circuit were set at mid-range, the nominally flat position, and a frequency response curve was made. As was suspected, the response drooped, being 6 db down at 100 cycles. With the bass control at maximum, the boost was only 2.5 db! On a power-output test the results were fair. See curves on page 24.

The first step in improving the audio was to remove the resistor and capacitor connected between 6L6 plates. Then the output transformer was removed and another installed in the same location as the original transformer, but mounted on 3/8" sleeves so as to have the stud connections clear the chassis. Wires to the transformer were fed through holes already in the chassis. The original circuit had feedback from one of the 6L6 plates to one of the 6SL7 driver and phase inverter plates, the feedback being a 1-megohm resistor. It was desired to include both 6L6 tubes, and all the audio circuits on the amplifier chassis in the feedback loop. The jumper between the two 6SL7

Fig. 5. Square-wave response at 70 cycles, with controls set at flat response.

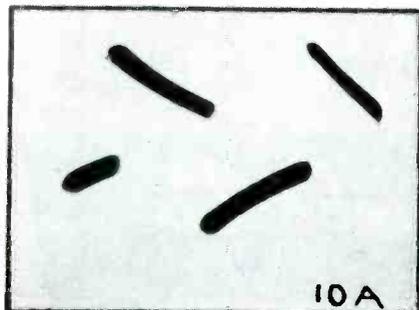


Fig. 6. Square-wave response at 400 cycles, with controls set at flat response.

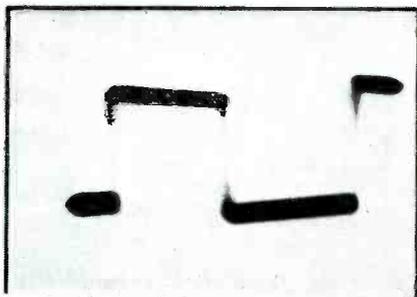
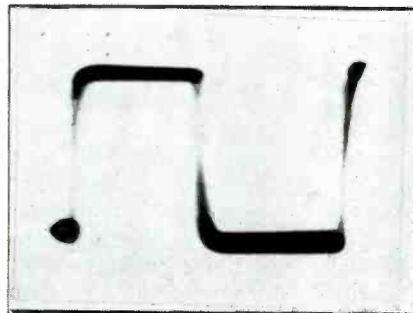


Fig. 7. Square-wave response at 1000 cycles, with controls set at flat response.



cathodes was removed and a separate self bias resistor (of twice the resistance) installed on the phase inverter cathode.

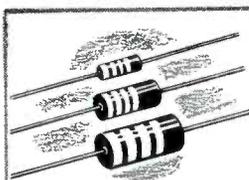
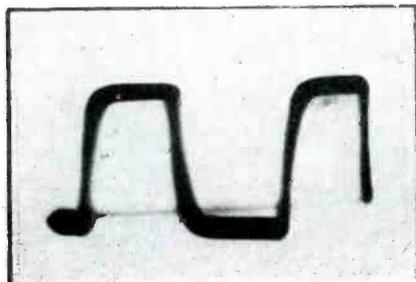
A 50-mfd electrolytic capacitor was used to bypass the resistor. The input section cathode resistor was also increased to twice resistance and was not bypassed. Feedback was taken from the output transformer secondary 16-ohm tap to the unbypassed 6SL7 cathode. No instability was encountered on enough feedback to reduce the source impedance of the amplifier to about 6 ohms on the 16-ohm tap. The only other change made involved removal of the mica capacitor from grid to ground of the input section of the 6SL7 tube.

Having cleaned up the amplifier section, attention was turned to the audio components installed on the main chassis. This was necessary because a quick square wave test showed that the original circuit was not doing justice to the new output transformer that had been installed. A 5600-ohm resistor, installed in series with the bass boost choke, was removed. All coupling capacitors in the top chassis were increased to .1 mfd. The electrolytic capacitors in the cathode circuits of two 6J5s were checked and found to have high power factor; these were replaced. In the original design, a paralleled resistor and capacitor were used in series with the input grid of the 6SL7. These components were located in the amplifier chassis, but it was found that they picked up considerable electrostatic grid hum. They were removed to the receiver chassis where a convenient location was found near the audio cable that connects the two chassis. No hum pickup was encountered here. The value of the shunt capacitor was found to be too great, and it was reduced until 2000-cycle square waves

(Continued on page 60)

Fig. 5, 6, 7 and 8 illustrate response after circuit revisions were made.

Fig. 8. Square-wave response at 3000 cycles, with controls set at flat response.



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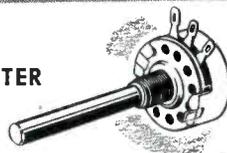
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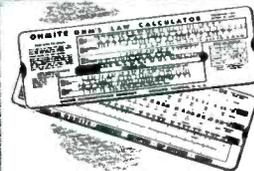
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Improving Audio

(Continued from page 59)

were square. (The purpose of the RC network is to compensate for the capacity in the audio cable between the chassis.)

Having completed the work, frequency response curves were again run, using the same tone control settings. On the mid-position, the response was only 1 db down at 20 cycles. Previously, it had been down 12 db at 45 cycles. The treble tip up, with maximum at 10,000 cycles, was caused by the treble control not being flat at mid position. If flat high-frequency response were desired, a slight counterclockwise rotation of the treble control could produce it. The bass and treble controls now *took hold*, the bass boost being 11 db at 60 cycles and the treble boost being 8 db at 7000 cycles. Corresponding roll-offs were present. The power output in the midrange was increased 1 db because of the lower insertion loss of the transformer, while much more undistorted power was available at both the treble and bass ends.

These case histories point up the statement that modernization work is easy and profitable. Any AM or F/M superhet that has a reasonable amount of room on the chassis is a prospect. Even the *ac/dc* receiver is not exempt, since a number of them were made in console form for use in New York and other metropolitan areas where *dc* power is still in use. The only two types of receivers which should be avoided are the 3-way battery portable and midget *ac/dc*. In some cases where there is room, it has been found possible to secure some amazing results in *ac/dc* midgets with a good output transformer and some feedback. Of course, all FM receivers should have good audio. Many FM receivers have very poor audio and their owners are unaware of what FM can do. These persons should be at the top of the priority list for modernization work.

An audio cleanup job is the prelude to the sale of additional profit makers such as 3-speed record changers, better loudspeakers, magnetic pickups and preamplifiers, etc. Take a tip from the gasoline service station who shows you how your car can be improved by new type tires or spark plugs, and who carries such accessories as rear view mirrors and body polish. He knows how many oldsters can be made like new with some minor changes!

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Servicing Helps

(Continued from page 49)

1 of V₃₀₁ (6AU6) and connecting the trap in place of the lead; Fig. 5.

This change may be made in the field without realigning the receiver.

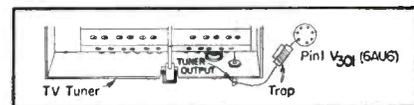
Alignment Tool

The new line of Westinghouse television receivers (models H-626T16, H-628K16 and H-630T14), uses *if* transformers with mechanically improved cores. This improvement consists of a thicker wall around the adjusting slot to reduce core breakage. To permit this thicker wall, the size of the slot for the aligning tool has been reduced.

An aligning tool, electrically and mechanically suitable for the improved cores, has been designed†. Use of an improperly designed tool will chip or break the *if transformer cores* and it is therefore recommended that the proper tool be obtained and used.

†Westinghouse Part No. V-8345.

Fig. 5. How single trap can be installed in the Admiral models to remove lower channel sound-carrier type interference.



2-Tube TV Tuner

(Continued from page 36)

found necessary to overcome for optimum results. The large oscillator voltage fed through the triode to the converter plate must be prevented from appearing on the first *if* grid where it would be rectified and result in a large negative bias on the *if* tube thus reducing *if* gain very substantially. This was eliminated by connecting the converter *if* coil in series, between the converter plate and the first *if* grid, so that it is tuned by the converter plate capacity and the first *if* grid capacity in series. At the oscillator frequencies the converter coil then appears merely as a choke to prevent oscillator voltage on the converter plate from getting to the first *if* grid.

The triode converter also has a relatively low plate resistance compared to a pentode, so that it furnishes all the damping needed for proper bandwidth in the converter *if* circuit. To avoid adding unwanted additional damping with the B+ feed resistor, that resistor was connected to a tap near the center of the converter coil at a point on the coil which is at ground potential, as far as signal is concerned.

Shielded Transformer

Another feature included in the tuner has been an input transformer with an electrostatic shield which acts to prevent most man-made interference voltages on the antenna from appearing on the *rf* grid. These voltages are usually picked up equally on both sides of the antenna and thus create no voltage across the primary as a whole. Because of the shield they cannot be fed directly from the ends of the primary to the grid end of the secondary by capacity between those points.

A fine tuner having a relatively large range has been included to eliminate the usual complaints caused by the channel tuning point drifting too near to the end of the fine tuning range or past it. Any resulting tendency toward more critical tuning has been avoided by using a 300° fine-tuner rotation and a 2½-inch diameter fine tuning knob, located concentrically outside the channel selector dial.

The tuner is only 2½" wide, 2⅞" high and 4¾" long.

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IMPEDANCE Every RACON Paging Speaker is available in 8, 15 or 45 ohms—at the same price.

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MOUNTING RACON mounting brackets are designed for life. Instead of zinc or thin sheet metal brackets which give way under vibration, only husky rib-reinforced aluminum castings are employed.

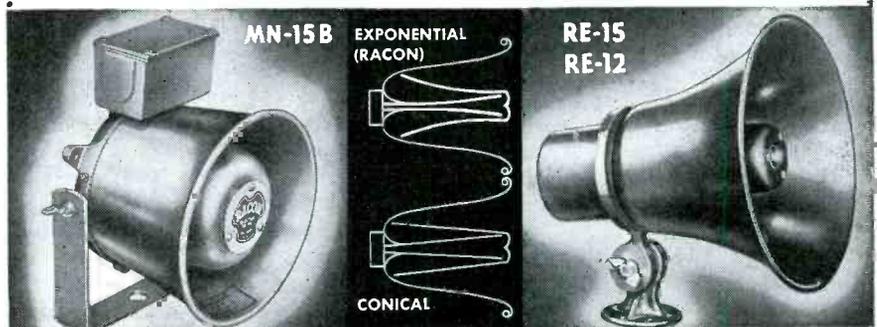
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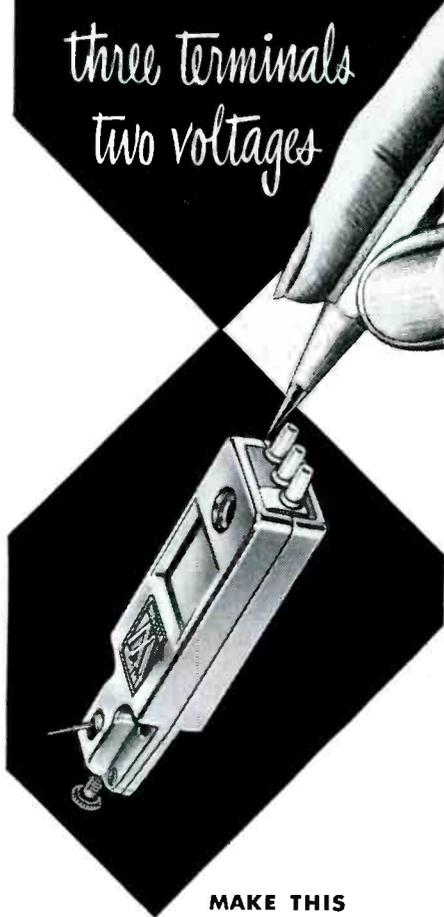
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Vibrator Tests

(Continued from page 29)

tapped to make sure that possible wire ends or loose particles will not cause shorts.

Input voltage should then be switched to 6.3 volts and the waveform observed on the 'scope. The 'scope horizontal sweep frequency and vertical amplitude should be adjusted to give approximately the same proportionate waveform shown.

Center-Design Waveforms

Fig. 4a illustrates a normal or center design waveform where the oscillation frequency determined by the *buffer* causes a gradual voltage reversal during contact break. The smooth voltage reversal in this instance occurs for approximately 65% of the total voltage change and is called the per cent of closure.

Fig. 4b shows the same percentage of closure and also shows irregular but unbroken contact *make* periods. The irregularity is not cause for rejection since it represents minor variations in contact resistance during the *make* which will minimize or disappear after a short running period. Minor contact chatter at the start of contact *make* also is not cause for rejection.

Max-Min Extremes

Fig. 5a represents a 100% closure condition and 5b a 25% closure. These are the maximum and minimum extremes allowable for contact closure variations. A condition where one contact break period has 100% closure and the other contact break period has 25% closure is also acceptable.

Fig. 6a represents a condition known as *overclosure* where the contact *break* periods have too great a duration. This allows the oscillation frequency wave to reach a peak and start to reverse before the next contacts *make* and is cause of rejection.

Fig. 6b illustrates breaks in the waveform during contact *make* periods which are caused by contact bounce. If these breaks do not disappear after a short period of operation, the vibrator should be rejected.

The waveform of any given vibrator in the test jig will be observed under centerline or normal conditions. With a production chassis, the same vibrator waveform may vary due to necessary

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production tolerances of other components.

Although the 'scope check can determine good and bad vibrator action, it will not always show up all mechanical defects which can give trouble. Some of these latter troubles show up as short period mechanical breakdowns sometimes occurring only when the vibrator reaches a certain temperature during operation. Excessive *A* voltage resulting from improper voltage regulator operation in the car will almost certainly result in short time vibrator failure. With 6-volt car battery systems, car radios are generally designed to operate with a *maximum* of 8 volts at the *A* input terminal, but even at this voltage the life of tubes and the vibrator is materially shortened. Regulator action should maintain a maximum car generator voltage somewhere between 7.0 and 7.5 volts. The voltage at the radio input will then be a few tenths less than this due to the *IR* drop in the car cables and accessory switch.

Ser-Cuits

(Continued from page 33)

range of signals. This can be observed by placing a *dc*-connected 'scope between grid and cathode.

To insure sufficient blanking, so that retrace lines will be eliminated, a pulse is taken off the secondary of the vertical output transformer and applied to the grid of the picture tube.

Sound System

As stated previously, intercarrier sound reproduction is used in this chassis. By this method the 4.5-*mc* beat note between the picture and sound carriers is utilized. The sound carrier has been attenuated sufficiently from the peak video level.

The sound system consists of a 6AU6 driver amplifier, a 6T8 ratio detector and first audio amplifier, and a 6AS5 audio output amplifier. The 4.5-*mc* signal is applied to the driver tube from the tap on an adjustable coil, which is in series with a 1.5 mmfd capacitor (C_{10}) connected to the plate of the video amplifier. The series-tuned circuit serves as a trap for attenuating 4.5-*mc* in the video channel. The small coupling capacitor (C_{10}) minimizes the addition of capacity across the video filter. The grid of the driver tube is fed from a tap on a coil (L_0) to keep the impedance in the grid circuit low enough to eliminate instability due to plate-grid feedback. In addition, loading of the video circuit is also avoided when the driver tube draws grid current upon application of the 4.5-*mc* signal. Limiting action is obtained in the grid as well as the plate, which with the screen, operates at a low *dc* potential.

The driver-amplifier tube is connected between +365 volts and +150 volts as part of a voltage-regulation system. A *RC* filter network (R_{10}) consisting of a 680-ohm resistor and .004-mfd ceramic dual (R_{10} and C_{12A}) between the cathode of the 6AU6 and +150 volts, prevents any 4.5-*mc* signal from getting on the +150-volt string.

A conventional ratio detector circuit is used. A 33-ohm resistor (R_{21}) in series with the coupling link of the detector transformer (T_3) stabilizes the impedance presented by the diodes of a 6T8. If this resistor were deleted, the variation in impedance between individual tubes would cause the AM rejection to vary between receivers.

Because of the use of the 6AS5 output amplifier tube as part of the vol-

(Continued on page 64)



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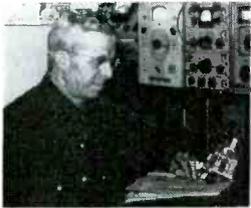
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Ser-Cuits

(Continued from page 63)

tage-regulation system it is possible to *dc* couple the first audio amplifier to the grid of the output amplifier. About 12 db of negative feedback is provided by the network connected between the speaker voice coil and the cathode of the first audio amplifier to reduce output distortion.

Sync Separation

Video signals are applied to the grid of the sync limiter tube from the plate of the video-amplifier tube through an isolating resistor of 47,000 ohms (R_{16}) and a .05-mfd capacitor (C_9). Isolation between the video-amplifier plate circuit and the grid of the sync limiter is required to avoid adding excessive capacity to the video plate circuit which would reduce video bandwidth.

Clipping and limiting is accomplished in both the grid and plate of the 6AU6. The grid develops its own bias and the plate is operated at very low *dc* potential. The output of the sync limiter tube is fed to a sync clipper and phase inverter and this pulse is fed through an integrating network and two .05-mfd coupling capacitors (C_{23} and C_{28}) to the vertical oscillator and output tube. The full signal amplitude is applied to the horizontal deflection system through a differentiation circuit consisting of a 68-mmfd capacitor and a 560,000-ohm resistor, C_{34} and R_{68} .

Vertical Deflection System

The vertical deflection system consists of a free-running multivibrator (V_{11B} and V_9) which is locked into synchronism by vertical triggering pulses. The output of the multivibrator is fed into a pair of vertical deflection coils (L_{10} and L_{11}) without the use of further amplification. The multivibrator employs one half of the 6SN7 and a 6K6 (V_9).

Horizontal Sweep System

The horizontal sweep system consists of a blocking oscillator (V_{14B}) which is coupled to a horizontal output tube (V_{16}) that drives a pair of horizontal deflection coils (L_{14} and L_{15}), and a phase-detector tube (V_{14A}) which is used to synchronize the blocking-oscillator tube.

The horizontal oscillator employs $\frac{1}{2}$ of a 6SN7GT as a blocking oscillator, whose frequency is controlled by the *L*, *R*, and *C* in the circuit. The amount of charge placed on the 220-mmfd capacitor, C_{38} , will also determine the blocking frequency.

The synchronizing system used to lock the oscillator in step with the

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NEWCOMB SOUND IS BETTER

Manufacturers of public address, mobile, phonograph, musical instrument and wired music amplifiers • Portable systems • Portable phonographs and radios • Transcription players • Rack and panel equipment.

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DEPT. E, 6824 LEXINGTON AVE.
HOLLYWOOD 38, CALIFORNIA

synchronization pulses employs $\frac{1}{2}$ of a 6SN7GT as a phase detector.

Adjustment of Width Control

The width control on models with a 12 $\frac{1}{2}$ -inch picture tube, consists of an aluminum sleeve which slides over the neck of the picture tube. One end of the sleeve is placed through the focus coil and into the yoke. The horizontal sweep is reduced by adjusting the sleeve further into the yoke.

Power Supply

A straight *ac* transformer power supply is used. The rectifier is a 5U4G, which does not heat up faster than the rest of the tubes in the receiver. Consequently there is no high surge voltage during the warm-up period and standard rating 450 v electrolytics are used.

The 6AU6 and 6AS5, in series with the *rf* and *if* amplifier, serve as voltage regulators to maintain a relatively constant voltage supply for the *rf* and *if* stages, when the current in those stages varies as a function of signal level. When the current through the *rf* and *if* amplifiers changes, the cathode voltage on the 6AU6 and 6AS5 varies accordingly. This causes the impedance of these tubes to change, and the drop across them is maintained approximately at a constant level.

Visual Alignment

(Continued from page 44)

determined that the channel strip itself is not at fault.

Although it is possible to set the master oscillator by tuning in a TV station and adjusting the master oscillator coil and strip coils until a proper pattern is observed, the use of a 12-channel crystal-controlled front-end marker and sweeping oscillator has been found to speed up the job. This visual alignment should be performed as follows:

(1) A 3-volt battery is connected to test point *A*.

(2) Then the front-end marker and sweep generator are interconnected and their combined output fed through a 50 to 300-ohm matching transformer or resistance pad, to the antenna terminals of the receiver.

(3) The 'scope is then connected to test point *C* and the sweep generator hooked up in the same manner as for *if* alignment.

(4) The channel selector is then set to channel 7 and the fine tuning control turned until the open end of the pulley on the *rf* shelf faces away from the chassis.

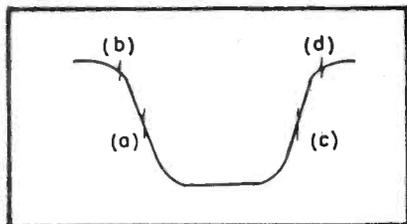
(5) The sweep generator is finally adjusted for an *rf* response curve. Fig. 9, and the front end marker set to channel 7. The picture and sound carriers on the response curve should then be observed and the master oscillator coil adjusted until the channel-7 picture marker falls at approximately 50% down on the response curve, and the sound carrier at the knee of the curve.

The channel selector should then be rotated and the strip oscillators aligned so that their respective picture and sound markers fall on the response curve, as shown in Fig. 9.

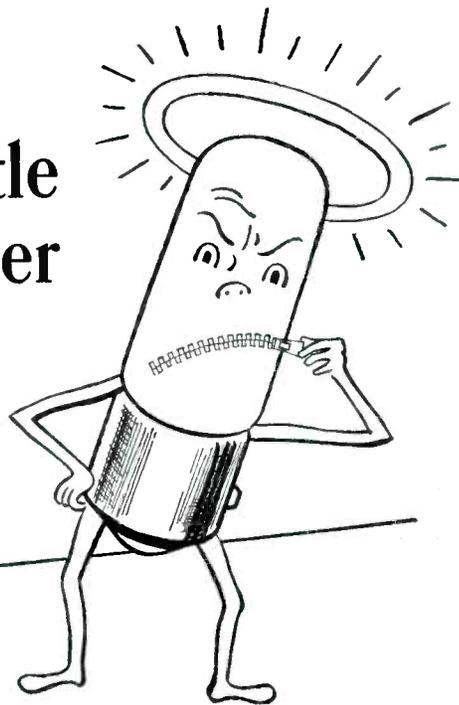
Turret Tuner and RF Shelf Alignment

The adjustment of the *rf* amplifier and mixer tuned circuits is normally a factory procedure. The circuit elements themselves are sufficiently stable so as not to change critically during the life of the set unless tampered with

Fig. 9. The *rf* response: (a), channels 2 to 6, video carriers, two times down; (b), channels 7 to 13, sound carriers, twenty times down; (c), channels 7 to 13, video carriers, two times down; (d), channels 2 to 6, sound carriers, twenty times down.



The tough little lamp that never talks back



CALL it static if you will, but some radio interference is just plain "back talk" from old style panel lamps. Vibration caused by high notes loosens the joints between filament and lead-in wires. Tiny arcs result which are picked up by the speaker as static.

Not so with G-E panel lamps. Filament supports are longer and pressed firmly into the softer metal of the lead-

in wires—a vibration-proof joint. They take the shrillest soprano in stride without "talking back", last longer, assure customer satisfaction.

For full information on prices and types of G-E miniature lamps, call your G-E Lamp supplier. Or write Lamp Department, Division 166-S9, General Electric Company, Nela Park, Cleveland 12, Ohio.

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



GENERAL ELECTRIC

or accidentally damaged. Because the bandwidth of these stages is quite large, even replacement of the *rf* amplifier or mixer tubes will not adversely affect the overall response or impair the performance of the receiver. Hence, readjustment of these coils will not generally be required in the field, and should not normally be attempted. If misalignment is encountered and is known to be the result of normal differences in replacement tube and circuit capacities, the following procedure may be employed to touch up the key adjustments and restore the *rf* pass

band to its normal condition:

(1) The 3-volt battery supply and 'scope are connected to the TV receiver.

(2) The sweep generator is connected through a matching transformer or pad to the antenna terminals of the receiver.

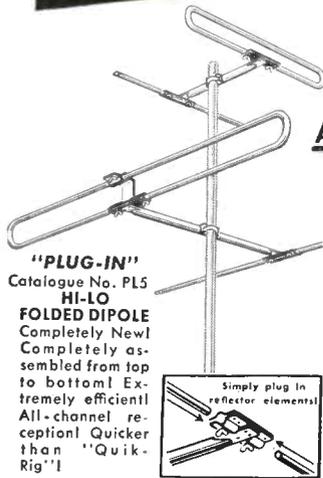
(3) The sweep generator is adjusted to provide the *rf* response curve for each channel (after it has been ascertained that the *if* is correctly aligned and flat-topped), and the pattern observed to see if the response curve for

(Continued on page 66)

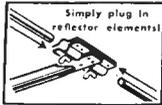
E-A-S-Y YET SO

FAST AND SO

GOOD!



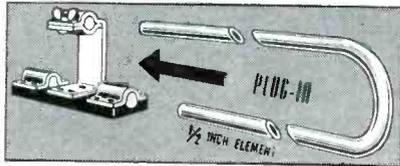
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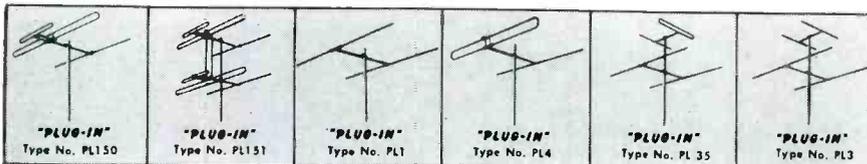
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Write for FREE descriptive literature on this new line of JFD "PLUG-IN" antennas. For the most complete line of television antennas and accessories, ask for the latest catalog No. 58.

"The 'Exclusiveness' of JFD is the Quality of its Product"



MANUFACTURING CO., Inc.
6109 16th Ave., B'klyn 4, N. Y.

Visual Alignment

(Continued from page 65)

each channel tilts approximately the same amount. The channel selector switch is then set to channel 4 and the rf grid capacitor, rf plate capacitor, and converter grid capacitor adjusted for curve symmetry and amplitude, without sacrificing bandwidth; see Fig. 9.

(4) If the receiver sensitivity is satisfactory on the low channels, but is down on the high channels, the rf shelf cover must be removed and the high-channel peaking trimmer should be adjusted for maximum sensitivity with band pass. Removal of this cover detunes the converter plate coil and thus the converter must be adjusted with the cover off and readjusted after the cover is replaced.

Phono

(Continued from page 45)

produced. Speed selection is made by moving an indicator lever to speed desired. Full loading of 22 lp records provides up to 21 hours of uninterrupted music. Changer stops automatically when last record is played.

Soft rubber-suction cup on transfer arm picks up record by the label from the loading table and places it on the turntable where it is held by another suction cup. No metal touches the record except the needle. Only one record at a time is on the turntable. Unit is said to be engineered to be jam-proof.

The tone arm, equipped with a crystal cartridge, or provision for variable reluctance cartridge, is independent of the changer mechanism and may be moved freely on or off record. Only one record at a time is on the turntable eliminating wear on records from slippage.

Additional selections of the same speed can be added or removed at any

Frank McIntosh, left, president of McIntosh Engineering Laboratory, Inc., congratulating Roy Neusch, director of the Harvey Radio Company's sound department in N. Y. C., on the opening of their Audio-Torium.



DRAKE PeeWee

the mighty mite with
a PROFITABLE future



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TOOL KIT!**

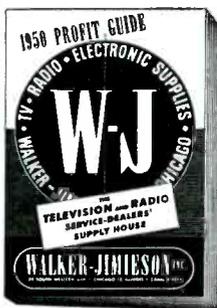
ACTUAL SIZE
7/16 IN.

Yes sir! PeeWee in your kit means saved time—extra profits. A full 35 watts, with 3/16" tip, the Drake PeeWee is chrome plated—has baffle plates to keep handle cool. Order from your distributor now.

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time, even with the machine in operation. Special selections can be put on record table for immediate playing without removing other records or waiting until all previous records have been played. Any record may be rejected by pushing a reject button.

Changers are available in two models; *standard* for custom installation, and a *Capchart* replacement model.

Preamps and Amplifiers

A small-size preamp⁴ to equalize low frequencies and provide necessary gain for magnetic pickups has been announced.

It is self-powered and can be operated with any high quality, high input impedance amplifier. Installs by plugging in.

A *pa* amplifier⁵ rated at 32 watts at 5% or less harmonic distortion (measured at 100, 400 and 5000 cycles) and providing 48 watts peak output is now available. The model features: 3 microphone inputs (each convertible for use with a low-impedance mike by means of a plug-in transformer); 2 phono inputs with dual fader; electronic mixing and fading on all 5 inputs; and separate bass and treble tone controls. Frequency response is said to be ± 1 db, 40 to 20,000 cps. Output impedances are 4, 8, 16, 166 (70 volts), 250, 500 ohms. Gain characteristics are: Mike, 128 db (2 meg); 115 db (100,000 ohms); 115 db (150 ohms). Phono, 82 db ($\frac{1}{2}$ meg). Tubes used: 3-6SQ7, 3-6SC7, 2-6L6; 1-5U4G, 1-6X5GT.

Microphone Systems

Three microphone systems⁶ for swivel, stand and lapel applications, each system employing a small size non-directional microphone with a condenser type diaphragm have been evolved. The mike is used in a circuit

⁴Model 230H; Pickering and Co., Oceanside, Long Island.

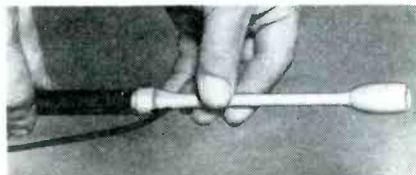
⁵Model 1932 *Green Gem*; Rauland-Borg Corp., 3523 Addison St., Chicago 18, Ill.

⁶*Tru-Sonic Microphone Systems*; Stephens Manufacturing Corporation, 8538 Warner Drive, Culver City, Calif.

Pickering preamp.



Stevens microphone.



Rauland-Borg 32-watt amplifier



Use STANCOR EXACT DUPLICATE TRANSFORMERS

Every call-back you make means lost time and profits. Why take a chance with transformers that "almost fit?" You're sure of a good job and a satisfied customer when you use Stancor *Exact Duplicate* transformers for TV servicing. These units meet the exact specifications, electrically and physically, of the original components. Representative types are listed below.

Vertical Blocking - Oscillator Transformer. Stancor Part Number A-8121. Exact duplicate of RCA type 208T2. For generation of 60 cps required to drive grids of vertical discharge tubes.

Plate and Filament Transformer. Stancor Part Number P-8156. Exact duplicate of RCA type 201T6 used in model 630TS receiver.

Deflection Yoke. Stancor Part Number DY-1. Exact duplicate of RCA type 201D1. For use with direct viewing kinescopes such as 7DP4 and 10BP4.

Focus Coil. Stancor Part Number FC-10. Exact Duplicate of RCA type 202D1. For use with magnetically focused kinescopes such as RCA type 10BP4.

Horizontal Deflection Output and HV Transformer. Stancor Part Number A-8117. Exact duplicate of RCA type 211T1. For use with direct viewing kinescopes, such as types 7DP4 and 10BP4.

For complete specifications and prices of these and other Stancor TV replacement components, see your Stancor distributor or write for Television Catalog 337.

JUST PUBLISHED—Ask your Stancor Distributor or write for your free copy of the **New STANCOR TV CATALOG and REPLACEMENT GUIDE**. Also available is the **New STANCOR CATALOG OF TRANSFORMERS** for radio, sound and other electronic applications.



STANDARD TRANSFORMER CORPORATION

3592 ELSTON AVENUE • CHICAGO 18, ILLINOIS

which does not require tubes mounted adjacent to the head. It is claimed that all auxiliary equipment can be used up to 400 feet away from the head, connected only by a $\frac{5}{32}$ " diameter standard single conductor microphone cable carrying no high currents and voltages to feed critical

low level circuits.

Operates with a one-tube amplifier circuit incorporated in an oscillator de-
(Continued on page 68)



MAY 1950 ISSUE
63 MANUFACTURERS.
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Get this easy-to-use, time-saving guide to exact replacements for all popular television receivers. Simplifies servicing, cuts repair-bench time. Write us today for your free copy.



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4435 NORTH CLARK ST., CHICAGO 40, ILL.

Phono

(Continued from page 67)

modulator unit to achieve an output of -15 dbm when operated in the usual sound field of 10 dynes/cm².

Mike Operation

No polarizing voltages are employed and thus the manufacturer states, diaphragm spacing can be many times closer than that used in conventional condenser type transducers. This is said to allow maximum capacitive change with the very minimum of diaphragm movement. Pressure variations on the diaphragm produce minute changes in head tuning. These changes result in amplitude modulation of oscillator energy fed to an infinite impedance demodulator. This demodulator converts these signal changes to audio frequency voltages.

The microphone head contains a tiny coil which is tuned by the diaphragm capacity to the approximate frequency of a crystal-controlled oscillator located in the oscillator/demodulator unit.

Pickups

A single magnetic unit has been designed for playing all lateral 33 $\frac{1}{3}$, 45, 78 rpm records.⁷ Available with special connector for plugging into a Webster changer arm. Point pressure is said to be 8 grams for all discs. Output about 20 mv. Sapphire stylus (or diamond) replaceable individually. Available in high (or low) impedance.

Phono Needle Wall Chart

A replacement needle wall chart⁸, which contains all pertinent information on 89 needles, with actual size silhouette illustrations, and includes every needle on the market today is now available.

Copies of the chart, suitable for hanging on the shop wall, may be obtained without cost from jobbers or by writing direct to manufacturer.

⁷Audax L-6; Audax Company, 500 5th Ave., N. Y. 18.

⁸No. J-24; Jensen Industries, Inc., 329 South Wood St., Chicago 12, Ill.

Audax polyphase reproducer for Webster changer



... as dependable replacements for molded mica and paper tubular capacitors



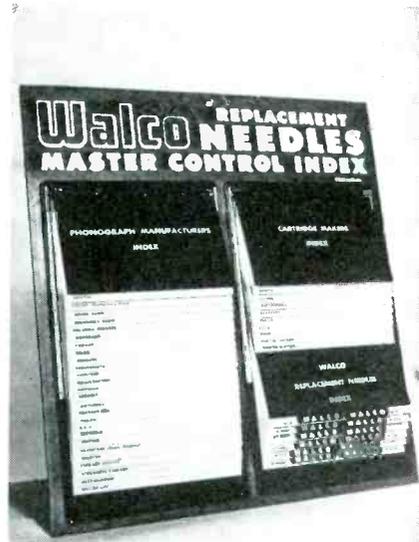
When you replace defective micas or papers with ERIE CERAMICONS you are guaranteeing customer satisfaction. Ceramics are the best dielectrics... ERIE CERAMICONS are the best ceramic condensers. Use ERIE CERAMICONS... they are made by the original ceramic condenser manufacturer in this country.

If your distributor cannot supply you, write us for information. New catalog on request.

Electronics Division
ERIE RESISTOR CORP., ERIE, PA.
LONDON, ENGLAND • TORONTO, CANADA.

(Below)

A master-control needle index, recently developed by Walco. Index contains three files of set information to furnish dealers with accurate, specific, cross-referenced data on all phonographs by year and model number, as well as by cartridge and needle. One file is a detailed listing of all phonograph manufacturers by year, model number, cartridge and needle used; the second lists cartridge manufacturers and contains photographs, model numbers, prices, and installation notes on all needles and pickup cartridges in use today; the third file contains a special selection of thirteen Walco replacement needles which it is said can be used to replace the needles of better than 90% of all phonographs now in use.



ALBANO NAMED TEL-O-TUBE CORP. SECRETARY

Anthony J. Albano, chief engineer of the Tel-O-Tube Corporation of America, East Paterson, N. J., has been elected secretary of the corporation. He succeeds Irving Kagan, who resigned.

Prior to coming to Tel-O-Tube more than 2 years ago, Albano served with DuMont as a production engineer for over four years.



A. J. Albano

* * *

NORM COOPER BECOMES NATIONAL SERVICE MANAGER FOR HALLICRAFTERS

Norman J. Cooper has been appointed national service manager of the Hallicrafters Co.

Cooper was, for fourteen years, with Stewart-Warner Corp., and since 1945 served as head of the service department.

Seven regional service engineers were also named by Hallicrafters: William Bidinger, Atlanta; Walter Douthett, Toledo; Robert Cain, Dallas; William Shaw, Los Angeles; Harry Englert, Pittsburgh; William Foot, New York; and Henry Samuelson, Chicago.

Edward Croxen, former Hallicrafters' service manager, has been transferred to the firm's Chicago factory branch, where he will set up a service department of a model distributor organization.

* * *

SYDNEY MASS APPOINTED JERROLD ELECTRONICS AD DIRECTOR

Sydney J. Mass has been named advertising and sales promotion director of the Jerrold Electronics Corp., 121 North Broad St., Philadelphia 7, Pa.



S. J. Mass

* * *

TACO EXPANDS

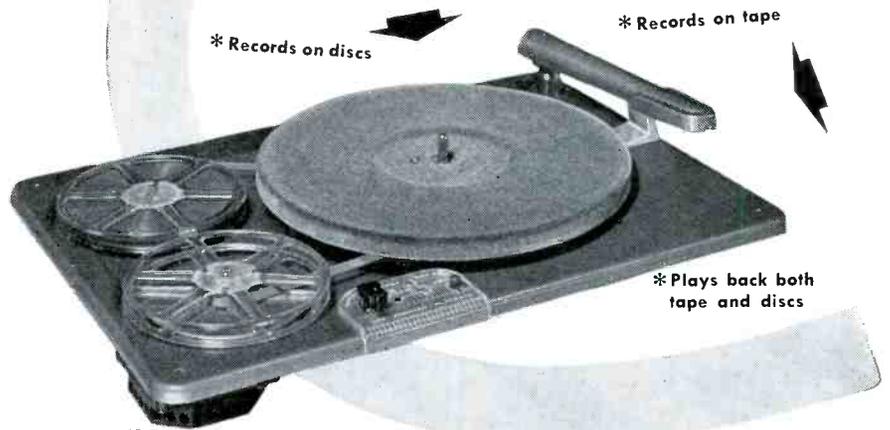
A separate building, with 20,000 square feet of space is being built by Taco at Sherburne, N. Y., for the purpose of housing plating operations required in the production of antennas and accessories.

* * *

AUDAK CATALOG

A catalog describing *Polyphase tuned ribbon* and heavy duty pickups, and cutting heads, has been published by the Audak Co., 500 Fifth Ave., New York 18, N. Y.

SENSATIONAL...



* Records on discs

* Records on tape

* Plays back both tape and discs

* Plays any 78 R.P.M. Record

GENERAL INDUSTRIES MODEL 250

TAPE-DISC RECORDER

Sensational, indeed... at a cost which enables it to be incorporated in moderately-priced radio and TV combinations... the first *complete* home recording and play-back assembly for both tape and disc use.

The Model 250 Tape-Disc Recording Assembly is General Industries' newest development in the sound reproduction field. Already thoroughly tried and tested in actual use, it contains many new design innovations, including fool-proof operating features that anyone can understand.

A new catalog sheet, describing all of the recording and play-back features of the GI Model 250, will be sent upon request. Write, wire or phone for your copy *today*.

* when connected with the proper amplifier.

A very complete service manual is included with each unit. It also contains a suggested amplifier circuit as well as a complete amplifier parts list.



The GENERAL INDUSTRIES Co.

DEPARTMENT D • ELYRIA, OHIO

Remote Control

(Continued from page 35)

assembly appears in Fig. 5. It will be noted that only one of the switches in the remote control unit is represented.

Operation During Rotation

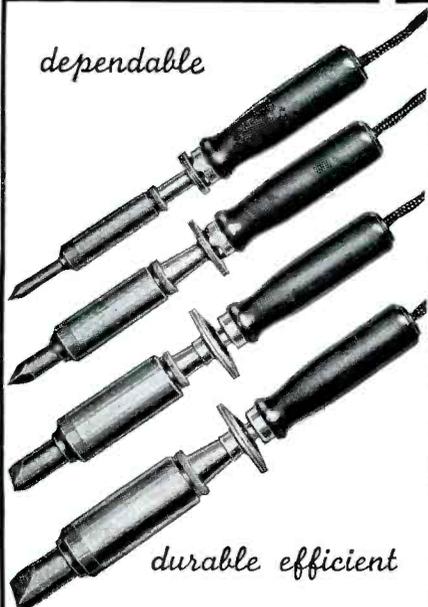
As the tuner shaft starts to rotate, the centering lever is thrown off center, closing the cycling switch. Even though finger pressure is released from the remote channel selector switch, power is still supplied to the solenoid through the cycling switch

in series with the channel selector inter-lock switch. Power is applied until the cycle is completed, the roller falls into a depression in the star wheel, returning the centering lever to center, which opens up the cycling switch. This cuts off power to the solenoid, which in turn causes the armature to spring back and disengage the clutch from the driver on the control shaft.

For manual operation the channel selector interlock switch will remain open, for the channel selector solenoid is not activated. Thus, no power can be applied to the motor.

American Beauty

dependable



durable efficient

ELECTRIC SOLDERING IRONS

are sturdily built for the hard usage of industrial service. Have plug type tips and are constructed on the unit system with each vital part, such as heating element, easily removable and replaceable. In 5 sizes, from 50 watts to 550 watts.

TEMPERATURE REGULATING STAND

This is a thermostatically controlled device for the regulation of the temperature of an electric soldering iron. When placed on and connected to this stand, iron may be maintained at working temperature or through adjustment on bottom of stand at low or warm temperatures.



For descriptive literature write

111-1

AMERICAN ELECTRICAL HEATER COMPANY
DETROIT 2, MICH., U. S. A.

N. U. DECAL-BANNER AND SIGN

A three-piece sales promotion package, which includes one weatherproof banner, 23" x 48"; one metal flange sign, 24" x 8 3/4"; and one 7 1/2" x 8" door decal, complete with shop's street number, has been announced by National Union Radio Corp., Orange, N. J.

Three units are available from N. U. distributors.

* * *

NEW C-D PACKAGE DESIGN

A new package design for its complete line of capacitors and vibrators has been adopted by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

The basis of the design is multiple packaging, which provides for convenient storage of these items ordinarily purchased in quantities. For example, small moulded tubular capacitors will be packaged in quantities of 10, which in turn will be packed 10 boxes to a master package, 100 capacitors in all.

Net prices in code also appear on the master boxes. All packages also are marked with the quantity and identity of the contents. Concealed inventory tabs easily detached permit the Service Man to keep a running record of the items used.

* * *

TELREX NEWS MONTHLY

The first issue of a monthly magazine, *Telrex Service News*, has been released by Telrex, Inc., Asbury Park, N. J. The house organ is edited by John B. Patterson, advertising manager, in collaboration with a technical staff headed by Irvin Guttman, chief electronics project engineer.

Featured is a column *Tek-Talk*, containing excerpts from a book written by M. D. Ercolino, originator of the *Conical-V-Beam* and president of Telrex, Inc.

Issue contains an antenna range map for major TV areas, antenna performance graphs, a cartoon, miscellaneous product news, *tricks of the trade*, and a question-answer column.

* * *

IRC CONCENTRIKIT STOCK ASSORTMENT CATALOG

A catalog, DC2S, with details on IRC's *Concentrik Kit Stock Assortment* has been announced by International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Assortment covered contains all necessary parts for assembly of any of 144 different concentric dual controls.

* * *

INSULINE CATALOG

A 36-page catalog, G-551, describing a line of radio-television components, has been prepared by the Insuline Corporation of America, 3602 35th Ave., Long Island City, N. Y.

* * *

STANCOR TV GUIDE

The seventh edition of a *Television Catalog and Replacement Guide*, form 338, has been published by the Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill. A twenty-six page booklet, it lists specifications and lists prices of all Stancor transformers and related components for TV replacement or conversion, indexed for use in 618 TV chassis and receiver models made by 64 manufacturers.

BLACK or BLUE TV FILTERS

the **HOT** TV LINE

TeleFILTER: Top quality black or blue screen.

TeleCLEAR: Economy filter, black or blue screen.

Blue screen filter recommended to improve "black tube" picture — Write for full details, including big-profit discounts!



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SYNDER DISTRIBUTOR SALES POLICY TO BE RETAINED

In view of the successful results obtained through its present distributor setup, the Snyder Manufacturing Co. has announced that it will retain the same distributor methods for the coming 12-month period.

The decision was reached at a sales meeting presided over by Ben Snyder, company president.

Snyder also revealed fall plans which call for the introduction of new products to the trade by Snyder field reps: Len Pill of the West Coast, Sam Wiley covering the Midwest and Charles Schlager in the East.



Ben Snyder

* * *

ADMIRAL RUMBLE JOINS ERIE RESISTOR

Rear Admiral C. A. Rumble, USN (Ret.) since 1945, head of the Electronics Branch in the Office of The Chief of Naval Operations, has joined Erie Resistor Corporation, Erie, Pa., as manager of the Washington division.

SHELDON TV MIS-INFORMATION BOOKLETS

The third issue of *Television Mis-Information* will soon be published by Sheldon Electric Co., 68-98 Coit St., Irvington, N. J.

As in the past, the issue will contain predictions of future occurrences in the trade.

Service Men can obtain copies by writing to the editor of *Television Mis-Information*, mentioning that the reader learned about this publication through SERVICE.

* * *

RCA RECEIVING TUBE BOOKLET

A revised edition of the booklet, *RCA Receiving Tubes for AM, FM, and Television Broadcast*, has been announced by the tube department of RCA.

The booklet, a 24-page affair, covers more than 450 receiving tubes and picture tubes including more than 50 new types. It provides reference to the characteristics and socket connections for each tube type, as well as a classification chart which groups the tubes according to their family class, their functions, and their filament or heater voltages. Types having similar characteristics and the same filament or heater voltage are bracketed in the chart.

Booklet (form 1275-E) can be obtained from RCA Tube Distributors, or by sending 10 cents to Commercial Engineering, RCA Tube Department, Harrison, N. J.

* * *

RADIO-MATIC ACQUIRES CABINET MANUFACTURING FACILITIES

Radio-Matic of America, Inc., has announced the acquisition of facilities for the production of radio and TV cabinets at 760 Ramsey Avenue, Hillside, N. J.

J. A. Silva is vice president and general manager of Radio-Matic.

* * *

M. LITTLE NOW QUAM-NICHOLS PREXY

Matthias Little has been elected president of the Quam-Nichols Company, Chicago. James P. Quam has become chairman of the board.

Little, who joined Quam-Nichols in 1930, has ben vice president since 1946.

* * *

ELECTROVOX TO USE SAM'S SERVICE

The Electrovox Company, East Orange, New Jersey, has become a participant in the engineering services of Howard W. Sams & Co., Inc.

* * *

MASCO CATALOG

A catalog, No. E-351, describing individual amplifiers and complete sound systems from 8 watts to 52 watts for fixed, portable and mobile installations, has been announced by the Mark Simpson Mfg. Co., Inc., 32-28 49th Street, Long Island City 3, N. Y.



"It's Extra Dollars For Me..."

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Jensen NEEDLES

Increase your income 50% annually by selling a needle on every service call. It's easy to suggest a new needle when servicing a TV or radio set... the easiest dollars you ever made!

FREE!

Jensen's New 1951 Needle Wall Chart Tells You What To Use



JENSEN REPLACEMENT NEEDLE KIT

Contains the most popular sellers. Enables you to take care of 90% of all replacements. Get your kit and free wall chart from your jobber today.



Jensen INDUSTRIES, INC.

331 So. Wood St., Chicago 12, Ill.

* * *

TELREX RECEIVES CONICAL - V - BEAM PATENT

Telrex, Inc., Asbury Park, N. J., has received a patent covering their *Conical-V-Beam* antenna.

* * *

MEISSNER DISC-RECORDER BULLETIN

A four-page bulletin, describing a home disc recorder, type 4DR, which can be used to record and play back on three speeds, has been announced by the Meissner Manufacturing Division of Maguire Industries, Inc., Mt. Carmel, Ill.

Also announced by Meissner has been a bulletin covering 3/4-inch permeability tuned if coils for 455, 262 kc and 10.7 mc applications.

CENTRALAB TV CONTROL GUIDE

A forty-page guide, describing replacement controls and printed-circuit replacements, has been published by Centralab, 400 East Keefe Ave., Milwaukee 1, Wis.

Included are data on single controls, controls without shafts, wirewound types with fingertip knurl shafts, linear tape wirewounds, and a complete guide listing controls required for TV chassis, with application data on each control.

The printed-circuit replacement chart details characteristics of the various types used, such as the balanced diode load filter, triode couplers, etc., and the various TV chassis in which they are now employed.

Guide is priced at 25 cents.

8 WAYS BETTER THAN FRICTION TAPE*

Polyken[®] No. 163 ELECTRICAL TAPE



*Check These 8 Extras:

- Higher dielectric strength
- Better moisture barrier
- Less bulk—equal strength
- Higher tack (quick stick)
- Cleaner (doesn't collect dirt)
- Unwinds easily
- Doesn't fray
- Sticks firmly

Now for the first time in over 70 years comes a basic, revolutionary improvement over sticky, old-fashioned friction tape. It's POLYKEN No. 163 Electrical Tape . . . available now through your electrical distributor in three convenient packs. And dependable POLYKEN No. 163 costs no more than most ASTM friction tapes. See your distributor or write today for *free* folder "Test It Yourself." Address POLYKEN, Dept. S-1, 222 W. Adams St., Chicago 6.

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DEPARTMENT OF

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DIVISION OF THE KENDALL COMPANY

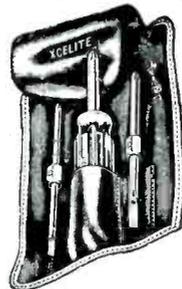
222 W. ADAMS ST., CHICAGO 6

FOR ORIGINALITY

LOOK TO **XCELITE**

Why this CK-3 Set is a BEST SELLER WITH RADIO AND TV MEN

- 6 tools in one handy roll plastic kit!
- Quick-change blades (Nos. 1, 2 and 3 Phillips and 3/16", 1/4" and 5/16" regular screwdrivers) fit big XCELITE handle!
- Roll kit has two *extra* pockets for XCELITE detachable reamers, nut drivers, other screwdriver blades you can get to fit the XCELITE handle at a saving over getting separate tools!



THIS 6-TOOL KIT, YOURS **4.35**
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ASK YOUR SUPPLIER OR WRITE:

PARK METALWARE CO., INC.

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DEPENDABLE ELECTROLYTICS for TV and RADIO REPLACEMENT

Illinois Condenser electrolytics are truly reliable. Made in a modern plant staffed by highly skilled condenser craftsmen, engineers and designers. Illinois Condensers possess superb electrical characteristics. Capacities are always plus and their low loss factor and low leakage make them ideal for use in all electronic circuits. Every Illinois Condenser is Unconditionally Guaranteed For One Full Year From Date of Purchase!



Type UMP

Twist prong mounting. Ideal TV and radio replacement. A wide range of voltage and capacity types. Available in single, double, triple or quadruple units, 5 to 500 volts working D.C.



Write today for expanded catalog. There is a Guaranteed Illinois Condenser for practically every application.



ILLINOIS CONDENSER CO.

1616 NORTH THROOP STREET CHICAGO 22, ILL.

MEL BYRON NOW CHIEF ENGINEER OF EICO

Mel Byron has been appointed chief engineer of the Electronic Instrument Co., Inc., 276 Newport Street, Brooklyn 12, N. Y. Byron was formerly an independent research consultant for several manufacturers and technical consultant for D. Van Nostrand Co.



Mel Byron

* * *

STEWART NAMED CHIEF ENGINEER OF CLIPPARD INSTRUMENT LAB.

Arthur W. Stewart has been named chief engineer of the Clippard Instrument Laboratory, Inc., Cincinnati, Ohio.

Stewart was formerly associated with International Detrola Corp., as assistant chief engineer; Crosley Corporation as auto radio engineer; and Colonial Radio, in the engineering division.

* * *

DESIGN PATENT AWARDED TO JFD FOR LIGHTNING ARRESTER

A design patent, No. D-4664, has been awarded to JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn, New York, for its AT102 twin-lead lightning arrester.

* * *

INSTRU-RENTAL BULLETIN

A bulletin describing a new service, which provides for the rental of instruments, has been published by the Instru-Rental Co., 411 Albee Building, Washington 5, D. C.

VOLTOHMYST TO SCIENCE AWARD WINNER



J. B. Coleman (right), assistant director of engineering, RCA Victor, presenting a Senior Voltohmyst to David Kusner, second prize winner in the recent National Science Fair, the instrument having been chosen by Kusner on his *wish list* as the prize most desired should he win. The winning exhibit submitted by Kusner in the competition sponsored by the Science Clubs of America was an automatic *rf* heating unit.

New Parts . . . Instruments . . .

TV DEVELOPMENT SELENIUM RECTIFIERS

Plastisel selenium rectifiers, with selenium plates stacked and sealed in a plastic tube, have been announced by T. V. Development Corp., 2505 Surf ave., Brooklyn 24, N. Y. Units resemble an electrolytic in shape and size, and can be mounted by means of the conventional type pigtail leads.

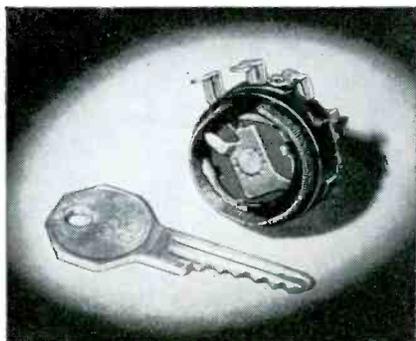
Said to be guaranteed for at least 1,000 hours life, and be moisture-proof, short-proof, shock-proof and leak-proof.

Delivery is now being made on the 40, 65, and 100-ma sizes, according to J. H. Kerner, sales manager.

* * *

CLAROSTAT L-PADS

L-pads, type No. CM8727, have been announced by Clarostat Mfg. Co., Inc., Dover, New Hampshire. Pads of 8 ohm type are single units with two separate wire windings for maintaining constant impedance. They were designed primarily for use in outdoor drive-in theatres and other *pa* uses. They are 1 1/8" diameter by 9/16" deep. Available upon special order within impedance ranges from 6 to 300 ohms. Rotation of the control is 120°.



* * *

DUMONT REPLACEMENT INPUTUNERS

Inputuners employing the Mallory-Ware three-section spiral Inductuner plus antenna tuning, series T3A, have been announced by the Electronic Parts Division, Allen B. Du Mont Laboratories, Inc., East Paterson, N. J. Inputuner is designed to work into the *if* system of TV receivers using a separate sound *if*. It is available with variations in the mixer plate network, making it adaptable without alteration to various types of separate sound *if* receivers.

Input impedance is 300 ohms. The inclusion of the sound trap with the tuner is optional, as well as the choice of either 21.25 or 21.75 mc sound center *if*. Tuner comes complete with 6BC5 *rf* and 6J6 mixer-oscillator tubes, TV-FM dial scales and mixer plate network.

SNAP-ON TV FUSE HOLDER!

DEAL NUMBER 1
Catalog No. 094024

Snap-on fuse holder for quick, easy replacement of TV pigtail fuses. Snap regular replacement fuses in other side—the job is done. No more cutting out the pigtail. No more messy soldering. No more fuses blown by hot irons. Save time, save work, save the customer's money, and still make big TV profits.



2 TV PROFIT DEALS!

TV FUSE KIT

DEAL NUMBER 2
Catalog No. 094023

TV fuse kit—10 assorted fuses that service all TV receivers—Admiral, Philco, RCA, Zenith, Emerson, Hallicrafters, etc., etc., etc. The serviceman needs the right fuse in his box—it is in this kit when he needs it. Saves time, saves profit.

LITELFUSE, CHICAGO 40, ILLINOIS • Longbeach 1-4970

BLONDER-TONGUE LAB BOOSTER

A television booster which is said to operate automatically without tuning has been announced by Blonder-Tongue Laboratories, 20 Gunther Ave., Yonkers, N. Y.

The booster, called the B-T *antensifier*, utilizes a wide-band amplifier principle which is said to allow simultaneous amplification of the high and low television bands, as well as sound, without adjustment. An automatic power switch is controlled by the TV receiver's on-off knob.

Unit is said to offer an average gain of 20 db over the entire TV range. Four *vlf* duo-triodes are used.

Blonder-Tongue Booster



DURABLE DURANITE

• Durable! That's why Duranite tubulars are so popular. This radically different molded capacitor features Aerolene, the new impregnant; new processing methods; new Duranite molded casing.

Drop, bang, scratch—no damage to that durable Duranite casing. Unaffected by high temperatures. Immune to high humidity. Stock them well in advance if you wish—no shelf deterioration. Pigtailed won't



pull out. Definitely, the durable Duranite.

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Insist on Duranites for durable tubulars. Ask your local distributor for latest Aerovox catalog featuring many new capacitor types and extended listings.



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SPECIAL PURPOSE TUBES

NATIONAL UNION RADIO CORP.

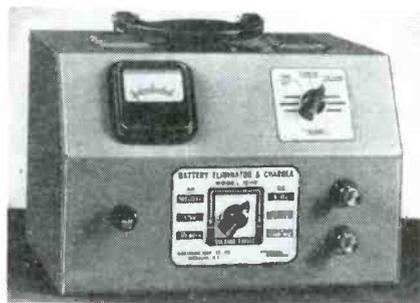
Main Office: ORANGE, N. J.—Plants: NEWARK, N. J.; HATBORO, PA.

EICO BATTERY ELIMINATOR KIT

A battery eliminator, booster and charger kit, model 1040-K, has been announced by Electronic Instrument Co., Inc., 276 Newport St., Brooklyn 12, N. Y.

Kit features a full-wave bridge circuit, comprising 4 extra-heavy-duty manganese copper-oxide rectifiers and a transformer which is variable from zero to 15 volts output.

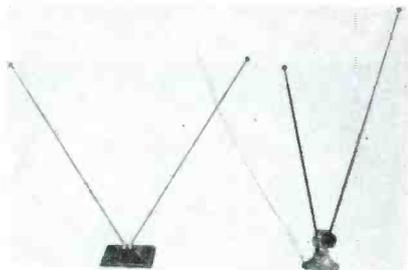
Has a meter which measures both current and voltage output. Has a continuous rating of 10 amperes at 5-8 volts, and an intermittent rating of 20 amperes.



* * *

PEERLESS INDOOR TV ANTENNAS

Indoor television dipoles, of polished Admiralty brass, are now being made by Peerless Products Industries, Inc., 812 North Pulaski Road, Chicago, Ill. Models said to feature automatic friction allowing adjustment of dipoles at any angle, and phosphor bronze contacts. One model, G84TV, is said to have a tarnish-free and rustproof round base, with a plastic knob for dipole adjustment. Another model, 50TV, has a weighted base of molded polystyrene in mahogany-walnut finish.

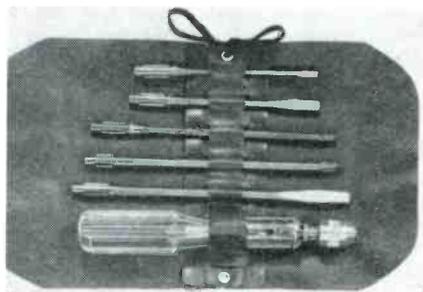


* * *

OX WALL SCREW DRIVER KIT

A 6-piece screw driver kit which includes blades to meet practically all the requirements of the Service Man has been announced by the Ox Wall Tool Co., Ltd., 928 Broadway, New York 10, N. Y.

Included in kit is a non-inflammable, amber-colored, plastic handle, two cabinet blades, 1 mechanic's blade and 2 blades for recessed head screws. Handle is a 3-way ratchet type.



INSULINE HIGH-VOLTAGE PROBE

A heavy-duty probe, the *100X Kilo-volter*, that multiplies existing ranges of any standard 10- or 11-megohm *vtvm* by a factor of 100, is now available from the Insuline Corporation of America, 3602 35th Avenue, Long Island City 1, N. Y.

Measures $8\frac{1}{2}$ " long and fitted with a clear lucite nose piece and red barrier insulator. Furnished with a five-foot coaxial cord and a separate grounding lead. The cord terminates in a standard single-contact microphone connection. A special adapter plug is available to permit this same connector to be used with *vt* meters having phone jacks instead of microphone fittings.



* * *

OHMITE 2-WATT MOLDED COMPOSITION POT

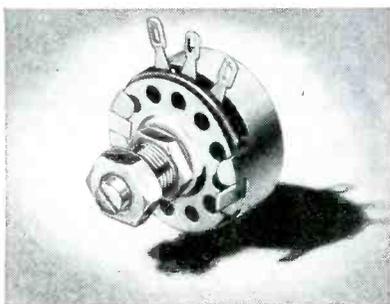
Two-watt molded composition potentiometers with linear taper are now available with a short screw driver shaft and locking nut from Ohmite Manufacturing Co., 4974 West Flournoy St., Chicago 44, Ill.

Known as the type AB *locking shaft* potentiometer, the new unit is said to be useful where resistance adjustments are infrequent, and where tampering with the adjustment is discouraged.

Has a solid-molded resistance element, heat-treated under pressure, which is said to be unaffected by heat, cold, moisture, or length of service. The terminals are imbedded in the resistance element, and all parts are corrosion resistant. Unit is said to have a low noise level, smooth taper and high load-carrying capacity.

Potentiometer is available in sixteen stock resistance values from 50 ohms to 5 megohms. The unit is $\frac{1}{16}$ " in diameter, and extends $\frac{9}{16}$ " behind the panel. A spst switch, to be attached to the back of the control, can be supplied extra.

For complete information, write for bulletin 131A.



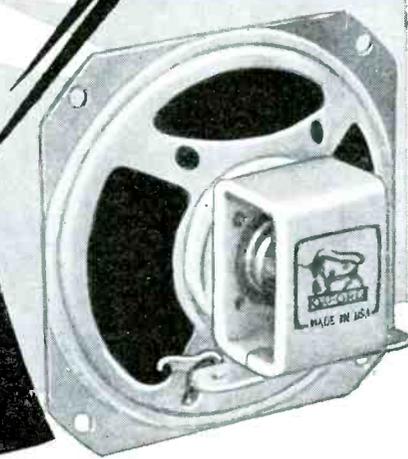
VERSATILITY

VERSATILITY

VERSATILITY



OXFORD Speakers



ver-sa-til-i-ty . . . ability to change easily from one action, style or subject to another; power to do many things well. (*Webster's Dictionary*)

The Oxford Speaker line is extremely versatile in that there is a unit to meet every replacement need. Inventory is kept at a minimum because all Oxford Speakers have a constant demand. Eliminate overstocking by using this speaker line which has no obsolete models.

Regardless of the sound application, Oxford Speakers will solve each requirement . . . have the "power to do many things well".

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OXFORD ELECTRIC CORPORATION

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CHICAGO INSTRUMENT VTVM

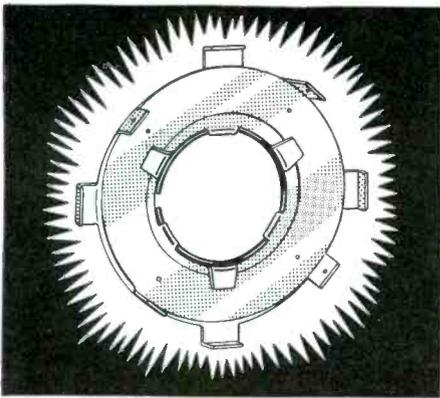
A vacuum-tube voltmeter has been announced by the Chicago Industrial Instrument Co., 536 W. Elm Street, Chicago 10, Ill. Included are 7 ranges of ac and dc volts to 5,000; 0 to a billion ohms in 6 ranges; a capacitance scale from 50 mmfd to 5,000 mfd; and 0 to 500 milliamperes in 4 ranges.

Tester case design features a front panel which slants upward. Instrument may be used either in an upright position or flat position by removing and rotating the panel in the case. Has a $5\frac{1}{2}$ " meter.

Right:

Chicago Instrument vtvm





Center TV Pictures in 3 Seconds with the NEW BeamaJuster



1. Snap BeamaJuster on back cover of tube yoke. (Fits any standard yoke and ANY SIZE TUBE.)
2. Rotate BeamaJuster as shown here for approximate centering of picture.
3. Make final adjustment by sliding outer plate of BeamaJuster vertically or horizontally.

Now service men can center TV pictures in 3 seconds instead of 20 to 30 minutes. The new Perfection BeamaJuster eliminates costly and complicated centering controls of the resistor type. It also replaces mechanical centering controls which tilt the focus coil to center the picture and require numerous springs, wing nuts and special brackets.

The BeamaJuster not only saves time and money but assures lasting results. No drifting of the picture once it is set by the BeamaJuster. This control does not affect spot size, focus or picture definition. Over 3,000,000 TV sets need this simpler centering control. Also perfect for conversions from 10 and 12 inch tubes to larger size tubes. Order today from your supplier.

PERFECTION ELECTRIC COMPANY
829 SOUTH STATE ST., CHICAGO 5, ILL.

Makers of Perfection
Alnico 5 Speakers
and Ion Traps



Trade Mark



UNIVERSAL ROOF MOUNT Just What TV Installers Have Been Looking For

- 1—All-aluminum castings with plated steel bolts.
 - 2—Tested to withstand any normal load up to 1500 lbs.
 - 3—Will take tubing O.D. 3/4" to 2".
- Ask your jobber—or send for circular and prices.

SMITH ELECTRIC MFG. CO.
ASHLAND, OHIO

STANCOR OUTPUT TRANSFORMERS

Two outdoor type, line-to-voice coil, output transformers have been added to the Stancor transformer line, manufactured by Standard Transformer Corp., 3580 N. Elston Avenue, Chicago 18, Ill. Units have primary impedances of 3,000/2,000/1,500/1,000/500 ohms and secondary impedances of 16/8/4 ohms. Part No. A-333 is rated at 14 watts, and part No. A-3334 at 25 watts. An adapter hardware kit is also available for use where lack of usual mounting space requires that the transformer be clamped to the bracket of a trumpet projector.

* * *

SIMPSON CAPACITY BRIDGE

A bakelite-encased capacity bridge, model 381, has been announced by the Simpson Electric Co., Chicago.

Allows for three capacity ranges: 20 to 500 mmfd, .005 to 2 mfd and 1 to 500 mfd.

Measures 3 5/8" x 5 1/2" x 2 3/8". Weight, 1 3/4 pounds.



* * *

ABNER-HULL TV TABLE

An adjustable TV table has been announced by the Abner-Hull Manufacturing Company, 143 Newbury Street, Boston, Mass.

Table is said to be made from kiln dried selected northern hard woods.

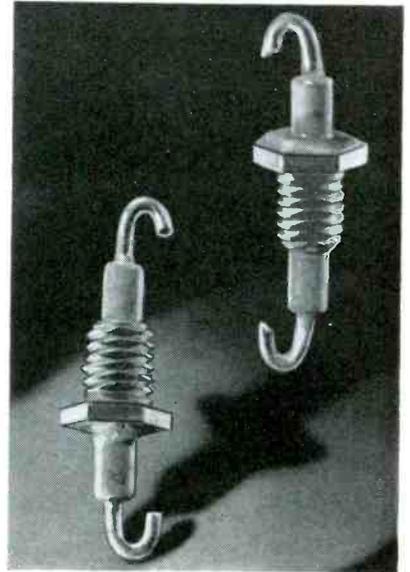
TV tables are adjustable from 16 3/4" x 16 3/4" to 26 1/2" x 26 1/2" in each direction, converting table models into consolettes. Adjustment feature is concealed. The table is 27" in height.



CRL CERAMIC FEED-THRU CAPACITORS

Tiny ceramic feed-through capacitors, designed for single hole mounting where a capacity ground to either chassis or shield is desired, have been announced by Centralab. These feed-through capacitors are now used extensively in TV set production. Lead inductance is said to be virtually eliminated.

Available in 500, 1,000 and 1,500 mmfd. Voltage rating, 600 volts dc working, 1,000 v dc flash test. Both ends of the terminals are hooked to facilitate soldering.



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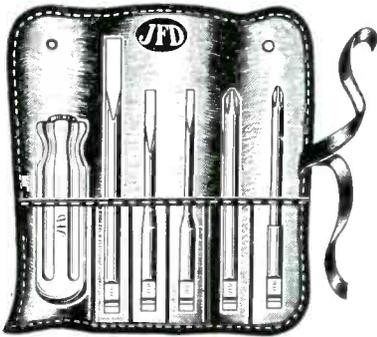
City..... State.....

JFD SERVICING TOOL KITS

Two tool kits, designed for TV and radio servicing, have been announced by the JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

One kit, No. BR98, a screw-driver combination, consists of five tools whose shanks fit one universal handle. The five screw-driver blades are made in various sizes and tip thicknesses to cover most requirements. The steel blades are bright cadmium-plated with tempered, fully polished ground tips. Universal handle is made of unbreakable, non-inflammable, shock-proof amber plastic. All five tools and handle are packed in a six-section leatherette case.

The second kit, No. BR99, consists of five hex socket wrenches: $\frac{1}{4}$ " x 3", $\frac{5}{16}$ " x 3", $\frac{11}{32}$ " x 3", $\frac{7}{16}$ " x 3", $\frac{3}{8}$ " x 3". The sockets are electrically heat-treated for durability and hardness. The handle, employing a positive spring action clutch, is said to resist most acid and alkalis. The five tools plus handle are packed in a six-section leatherette case.



Top: JFD BR98 kit.

Below: JFD. BR99 kit.



* * *

JACKSON 'SCOPE

A 'scope, model CRO-2, featuring a five-inch 5UP1 tube, has been announced by the Jackson Electrical Instrument Co., 18 South Paterson Boulevard, Dayton 1, Ohio. Wide-band vertical amplifier response said to be uniform from 20 cycles to 4.5 mc. Sensitivity said to be .018 rms volts-per-inch with response uniform to 100 kc.

Vertical input impedance 1.5 megohms, shunted by 20 mmfd. Direct-to-plate balanced 6 megohms, shunted by 11 mmfd. Horizontal input impedance, 1.1 megohms.

Voltage calibration said to permit peak-to-peak voltage measurement of all

waveforms. Switching arrangement provides vertical pattern reversal.

Sweep oscillator provides saw-tooth wave, 20 cycles to 50 kc. in 5 steps. Sine wave sweep of 60 cycles also available.

Direct connection, through capacitors to *cr* tube deflection plates. Intensity modulation, either external or internal 60 cycles. Removable calibration screen. Demodulation probe also available for use in signal tracing.

Right:
Jackson 5" 'scope

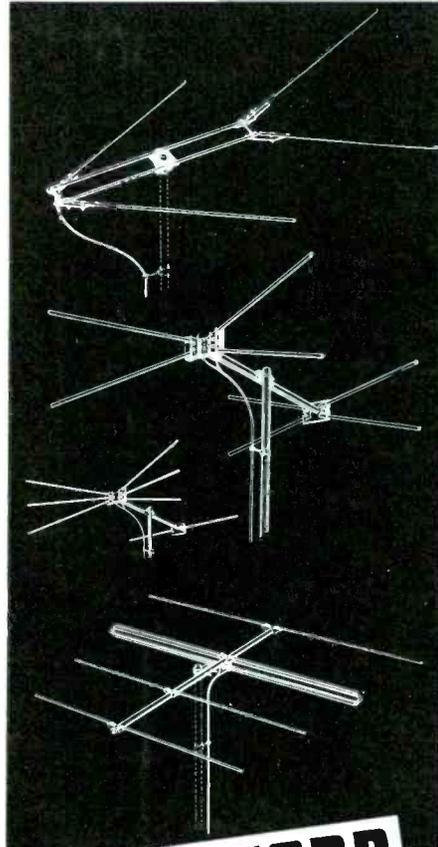
WARD

PUTS THE ACCENT ON

Star Performance



The true measure of antenna performance is in the reception it provides. Ward leadership in engineering and design is your assurance of good TV reception.



NEW WARD FLYING ARROW:

An all-band antenna that hits the bulls eye with exceptionally high gain throughout the entire high band. Sharp directivity, maximum energy transfer, fast assembly. Completely preassembled. Stacking kits available for assembling 2 bay arrays. **\$7.95** LIST

NEW WARD CONICAL:

High in quality—low in cost. Unique element spacing and angular adjustments eliminated pattern breakup with no falling off of high band response. New molded universal insulator permits any desired element arrangement to suit local conditions and preferences. Stacking kits for 2 single bays and 4 bay arrays.

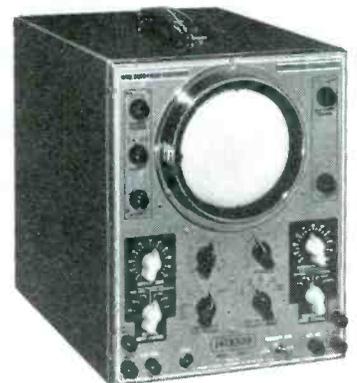
NEW WARD YAGI:

Outstanding in performance for fringe and super-fringe areas. Built-in impedance transformer steps up impedance. Pin point directivity. Very high front to back ratio. No co-channel interference. Minimum standing wave ratio guarantees maximum energy transfer. Plus Ward rugged construction and complete factory preassembly. A model for each channel 2 to 13. Stacking kits for high and low bands.

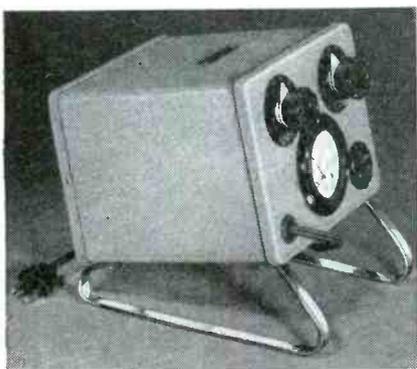
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THE WARD PRODUCTS CORP.

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It's **NEW**
...and it's **NEWS!**



VARIVOLT MASTER Model N-202 Voltage Adjusting Isolation Transformer

A new, larger capacity transformer that provides positive control of your voltage fluctuations—better than ever, and safer because it isolates you from your work. Raises voltage or lowers it—in 1½ volt steps—high for locating weak points, low for testing under minimum conditions. Handles the smallest or largest servicing job, even up to 20" TV Combinations!

Rated capacity at 117 volt output is 500 watts. A marvel of efficiency, Varivolt Master weighs 21 lbs. yet requires less than a square foot of bench space. Steel runners permit easy movement, and slant the instrument for accurate reading. See your Jobber Today!

Write for Catalogue
Today

It's free. The Halldorson line of Vacuum Sealed Transformers is tops for quality—one of the completest in the industry. You're up-to-date with a Halldorson Catalogue. The Halldorson Company, 4500 N. Ravenswood, Chicago 40, Illinois.



Keyed AGC and Sync Systems

IN A REVIEW¹ of the keyed *agc* system in the Westinghouse chassis (H-600T16 (with V-2150-61A and V-2150-61B chassis), H-603C12, H-605T12, H-606K12, H-607K12, H-608C12 and H-609T10), it was pointed out that the 6BH6 served as the keying tube.

The signal applied to the 6BH6 control grid meets three requirements: the sync pulses extend in a positive direction, its amplitude varies proportionately with the strength of the received signal, and the absolute peak level of the sync pulses is independent of variations in the *dc* component of the composite signal. The latter requirement is met by using only direct coupling in the input and output circuits of the stage between the video detector and the 6BH6 grid. Direct coupling preserves the *dc* reference level of the original signal.

In view of the foregoing considerations, it is apparent that the 6BH6 will conduct only during the time that each horizontal output pulse appears at the plate of the tube. When the tube conducts, current flows down through a 220,000-ohm resistor, R_{344} , and a voltage is developed across this resistor. This voltage is filtered by a 2200-ohm resistor, R_{326} , and a .01-mfd capacitor, C_{335} , and is applied as *agc* voltage to the tubes under control. Since the pulse voltage applied to the plate of the 6BH6 is essentially constant in amplitude, the magnitude of the plate current flow and the resultant voltage across the 220,000-ohm unit, R_{344} , is a function of the signal applied to the control grid. It should be noted that the sync pulses are the most positive portions of the signal applied to the grid and that these pulses are constant in amplitude depending on the strength of the received signal. Moreover, they

are synchronized so that they appear at the grid at the same time as the horizontal pulses appear at the plate. Therefore, the amplitude of the sync pulses determines the value of the *agc* voltage that is developed.

One advantage of a keyed *agc* system is its superior performance in noisy areas. The pulse applied to the 6BH6 plate is very sharp and of short duration (about 10 per cent of the time required to scan one horizontal line). Since the 6BH6 conducts only during the pulse, any noise pulses on the received signal during the cutoff interval have no effect on the *agc* voltage. For this reason, normal sensitivity is maintained in extremely noisy areas.

Another advantage of keyed *agc* is the faster correction that is provided for variations in signal strength. To obtain the *dc* voltage that is required for proper operation of an *agc* circuit, a filter circuit is used to eliminate voltage variations at the lowest frequencies applied to the system. In the diode-type system where the *agc* voltage is developed by rectification of the *if* output, frequencies as low as 60 cycles must be filtered. This necessitates a filter that has a long time constant. The use of such a filter causes the *agc* system to react relatively slowly. With a keyed *agc* system, however, only the 15,750-cps pulses need be filtered. This can be accomplished with a much shorter time constant filter. In fact, the time constant can be decreased to one-tenth of that of the diode *agc* filter, and adequate filter action will still be obtained. The fast-acting *agc* voltage obtained thus is of decided value in the elimination of airplane flutter, the flutter effect that may be observed when an airplane flies by. Of course, the flutter effect cannot be eliminated in extreme conditions when the signal strength fades to zero at the receiver.

Sync Systems

The new-chassis sync systems, around which major video operations are centered, are replete with circuit features. In the circuit used in the Westinghouse, H-600T16 (with V-2150-61 chassis), H-601K12, H-602-K12, H-604T10, and H-604T10A, the composite video output of the video detector which appears across a 4700-ohm resistor, R_{317} is ap-

¹SERVICE; July, 1950.

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plied to the grid of the first sync amplifier through another 4700-ohm unit, R_{318} . At this point in the circuit, the sync pulses extend in a negative direction. So far as the sync pulses are concerned, the first sync amplifier functions as a resistance-coupled amplifier, and the input signal is amplified and inverted in the stage. The higher video frequencies are bypassed at the plate of the first sync amplifier by a 47-mmfd capacitor, C_{420} .

One diode plate of a 6AL5 is coupled to the plate of the first sync amplifier through a .25-mfd capacitor, C_{423} . This diode section functions as a noise clipper. The sync pulses, which extend in a positive direction at the plate of the first sync amplifier, drive the noise-clipper plate positive with respect to ground. When this occurs, the diode conducts and the .25-mfd capacitor is charged toward the peak amplitude of the sync pulse. After the sync pulse passes, this capacitor discharges slowly through a 2200-ohm resistor (R_{441}) to ground, thus applying a negative potential to the plate of the diode. Since the discharge time constant of the .25-mfd capacitor and 2200-ohm resistor is very long as compared to the intervals between sync pulses, the capacitor discharges only slightly during the intervals, and a negative potential is maintained at the plate of the diode. As a result, the diode is normally cut off during the interval between sync pulses. If a noise pulse which has an amplitude greater than the sync pulses occurs during the interval between sync pulses, the negative diode plate potential is overcome and the diode conducts, clipping the noise pulse to the level of the sync pulses. This greatly reduces the effect of the noise pulse.

The output of the first sync amplifier, which is subjected to the clipping action, is applied to the grid of the sync separator, through a 270-mmfd capacitor, C_{428} . A relatively low voltage (70) is applied to the plate of this tube through a 150,000 and 47,000-ohm voltage divider, R_{440} and R_{430} . With this low voltage, the bias that is developed by grid leak action in the grid circuit of the tube is sufficient to cause the pedestal and video portions of the signal to fall below the plate current cutoff point, thus eliminating them from the output. The tube conducts during the time of the sync pulses, and the output consists essentially of negative-going sync pulses.

TVI Article Next Month

The concluding installment of the Ira Kamen paper on TVI will be presented in the October issue of SERVICE.



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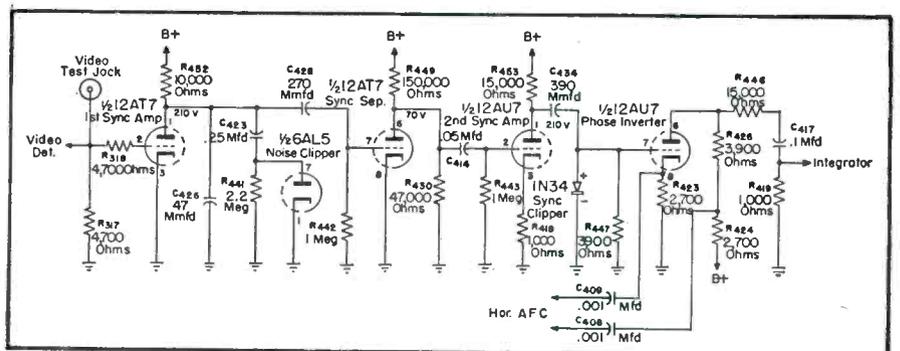
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Fig. 1. The sync system employed in the Westinghouse V-2150-61 chassis.



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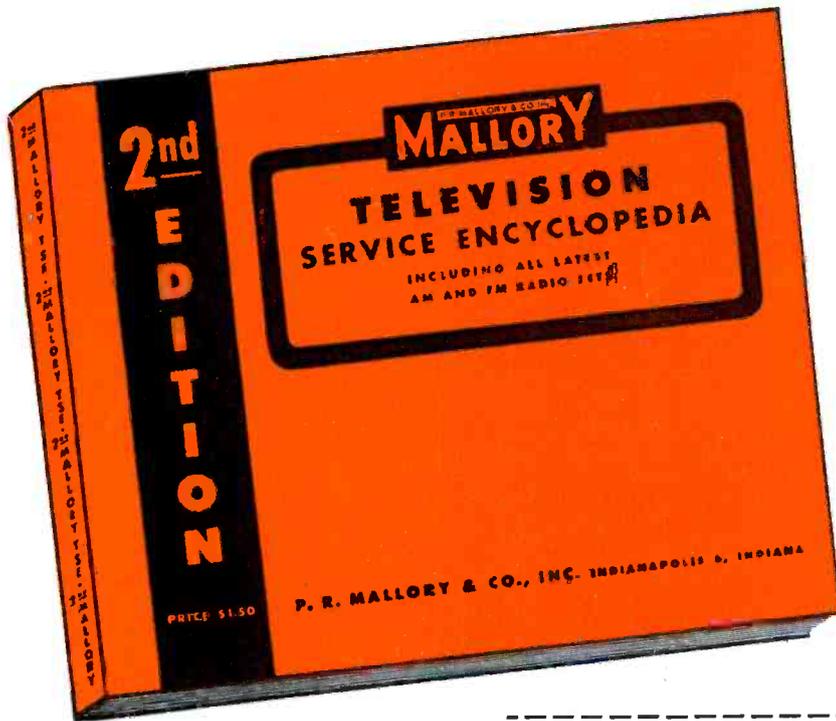
REPLACEMENT PARTS will continue to be available for most normal requirements, contrary to recent indications that an immediate shortage threat exists, according to RTMA prexy Robert C. Sprague. In a spot check of distributors in New York City, Sprague found that most distributors are generally well-stocked with replacement parts, although it has been found necessary to allocate certain components, because of unusual demands from dealers since the Korean outbreak. These allocations, which involved tubes, resistors, antennas and capacitors, were brought on by a small minority of dealers and Service Men, trying to hoard. Reviewing the situation, Sprague declared: "I am confident that most dealers and Service Men are going along with distributors trying to treat the public favorably and avoid hoarding. However, a few unscrupulous persons, if permitted to do so, could create shortages." There'll be a billion-dollar renewal market in '55, revealed H. F. Bersche, renewal sales manager of RCA's Tube Department, in an address before the NEDA convention in Cleveland recently. Specifically, Bersche disclosed that the home and auto radio renewal market would be represented by over 800-million tube sockets in '55, up from 600-million sockets in '50. In his opinion, 38-million TV receivers will be made by '55, representing 700-million receiving tube sockets and the replacement market for some 350-thou-

sand picture tubes. A prediction that there will be a need for nearly 130-thousand Service Men in '55 was also made by Bersche. . . . Douglas Carpenter, sales manager of Vee-D-X has been named chairman of an RTMA subcommittee which will formulate a program of advertising standards for TV antennas. Associated with Carpenter on the committee are Larry Kline of Ward Products and Carl V. Wisner of Amphenol. . . . Ray Rice, former director of public relations for Raytheon, died recently. Rice was a Colonel on staff of General Bradley during World War II. He was buried at Arlington National Cemetery with full military honors. . . . Federated Purchaser, Inc., has opened another store, this time in Easton, Pa., at 701 Northampton St. . . . Emil Maginot, formerly with National Union, is now sales manager of the distributor sales division of American Television and Radio Co., St. Paul, Minn. . . . Arthur C. Stallman, prexy of Stallman of Ithica, New York, has been named NEDA president. Other new officers elected are: W. D. Jenkins, Radio Supply Co., Richmond, Va., chairman of the board; Dahl W. Mack, Scranton Radio and Television Supply, Scranton, Pa., first vice president; A. W. Greeson, Jr., Johannesen Electric, Greensborough, N. C., second vice president; Max Epstein, Federated Purchaser, N.Y.C., treasurer and Hoyt C. Crabtree, Crabtree Wholesale Radio, Dallas, Tex., secretary.

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