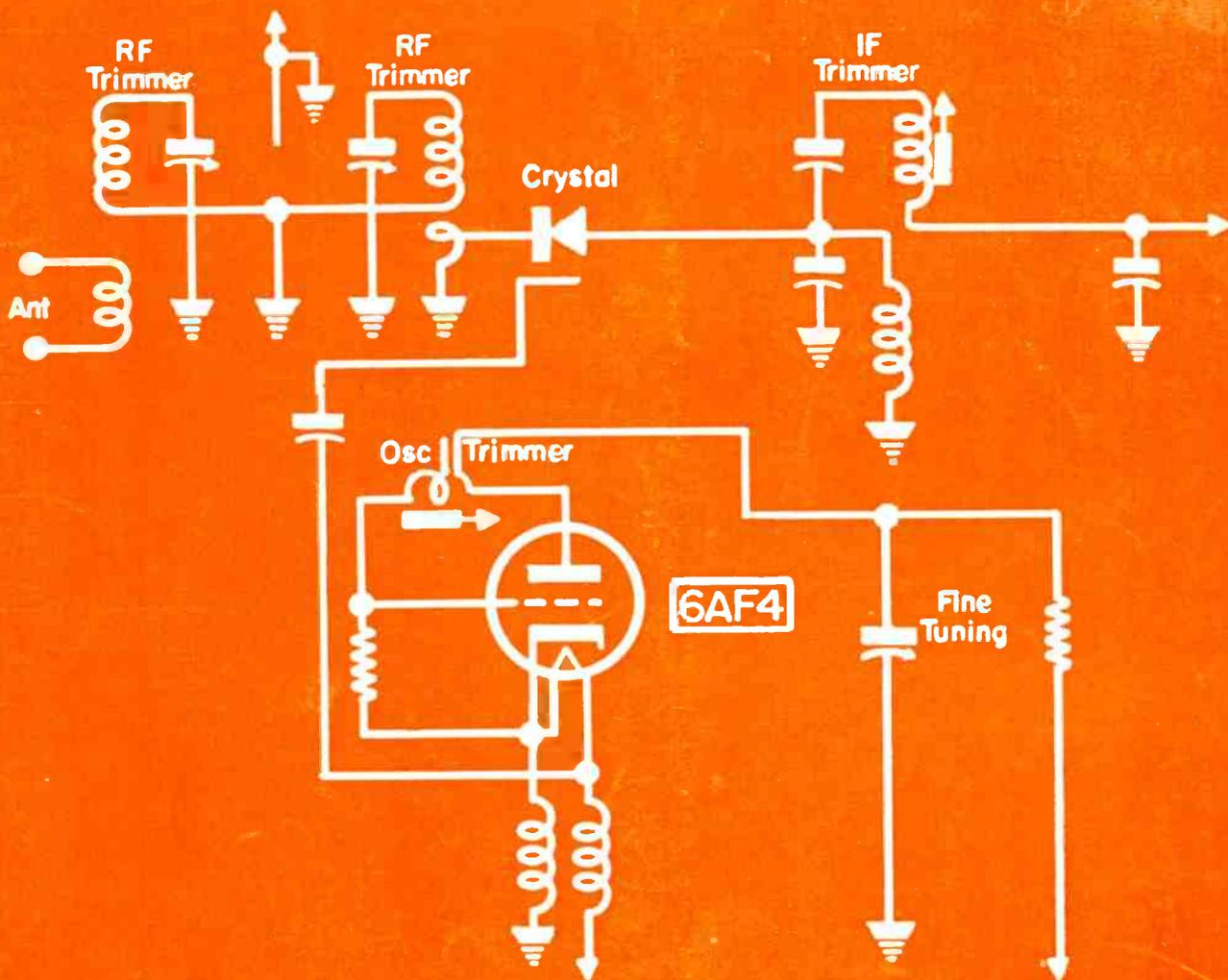


SERVICE

SEPTEMBER
1952



UHF receiver designed to cover the 470-710 and 670-890-mc bands.

[See page 3]

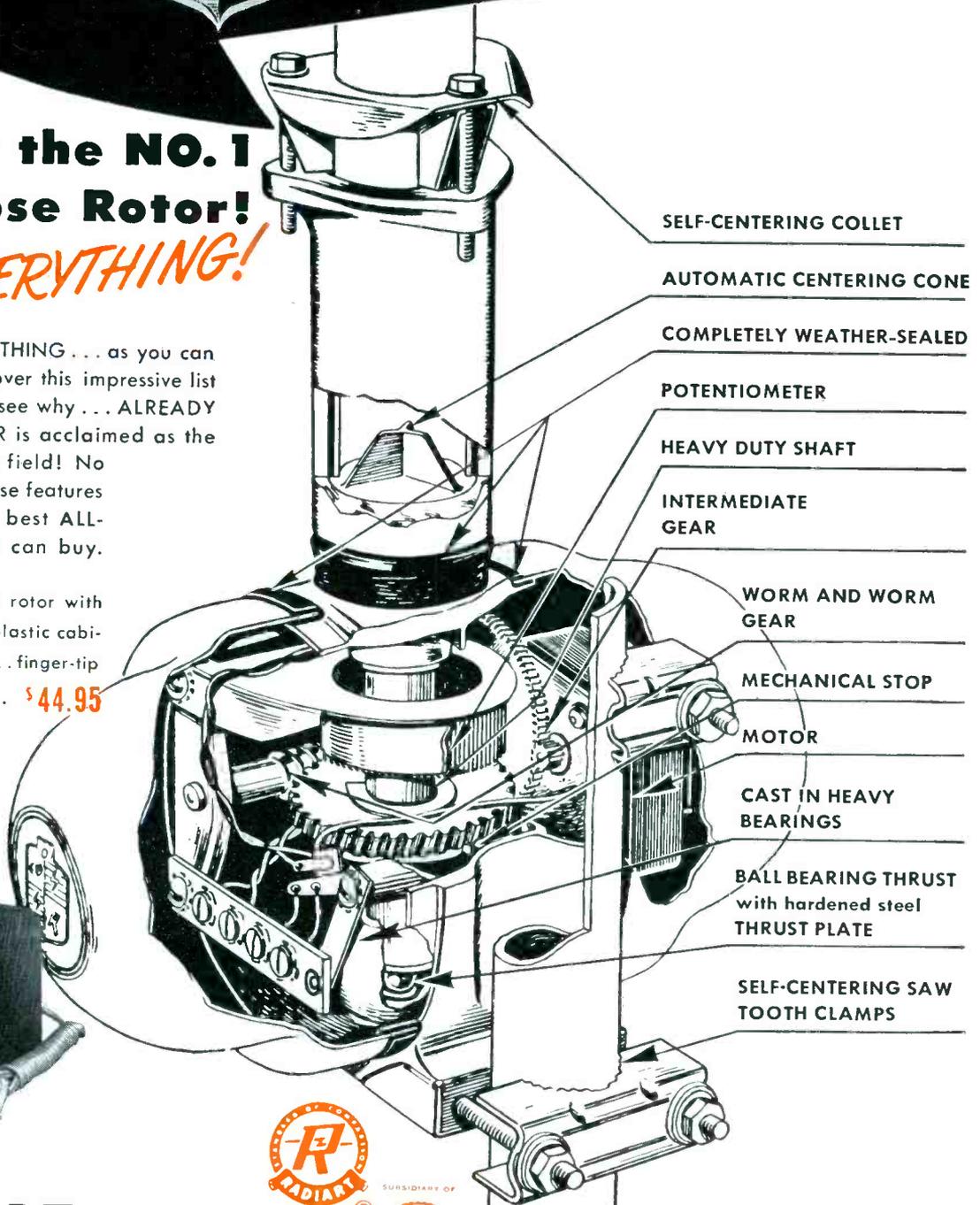
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**...Is the NO. 1
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- HEAVY DUTY SHAFT
- INTERMEDIATE GEAR
- WORM AND WORM GEAR
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- MOTOR
- CAST IN HEAVY BEARINGS
- BALL BEARING THRUST with hardened steel THRUST PLATE
- SELF-CENTERING SAW TOOTH CLAMPS

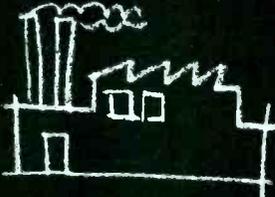
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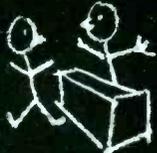


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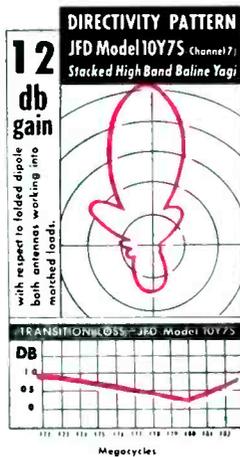
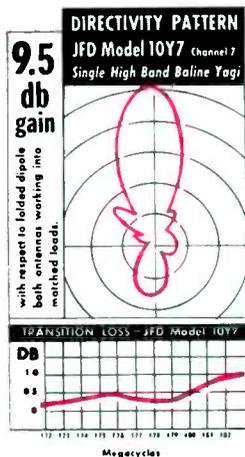
the greatest Yagi of them all
JFD 10-ELEMENT "Baline" YAGI

***12 db** (gain of stacked JFD BALINE over a tuned folded dipole)

***9½ db** (gain of single JFD BALINE over a tuned folded dipole)

*These figures have been verified by the Hazeltine Corporation, world famous research laboratory. All JFD gain figures are based on a reference tuned folded dipole. Beware of exorbitant gain figures which are not based on any reference level.

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Single JFD High Band BALINE Yagis

Channels	Models	List Price
7-13	10Y7-10Y13	\$13.85

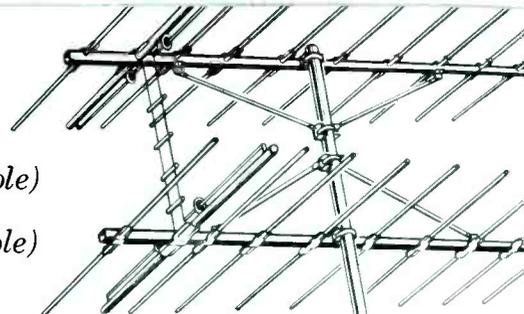
Stacked JFD BALINE Yagis

Channels	Models	List Price
2	10Y2S	\$63.70
3	10Y3S	63.70
4	10Y4S	\$6.90
4-5	10Y45S	67.80
5	10Y5S	56.90
6	10Y6S	51.40
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Include JFD Baline matching transformers at no extra charge

Single JFD Low Band BALINE Yagis

Channels	Models	List Price
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3	10Y3	31.85
4	10Y4	28.45
4-5	10Y45	33.90
5	10Y5	28.45
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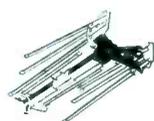


illustrated: JFD No. 10Y2S-10Y6S
 Low Band Stacked Baline Yagi

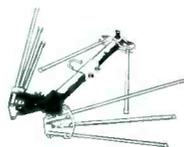


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JETENNA... the conical with jet-action assembly
...no other fan conical assembles so fast, performs so well!



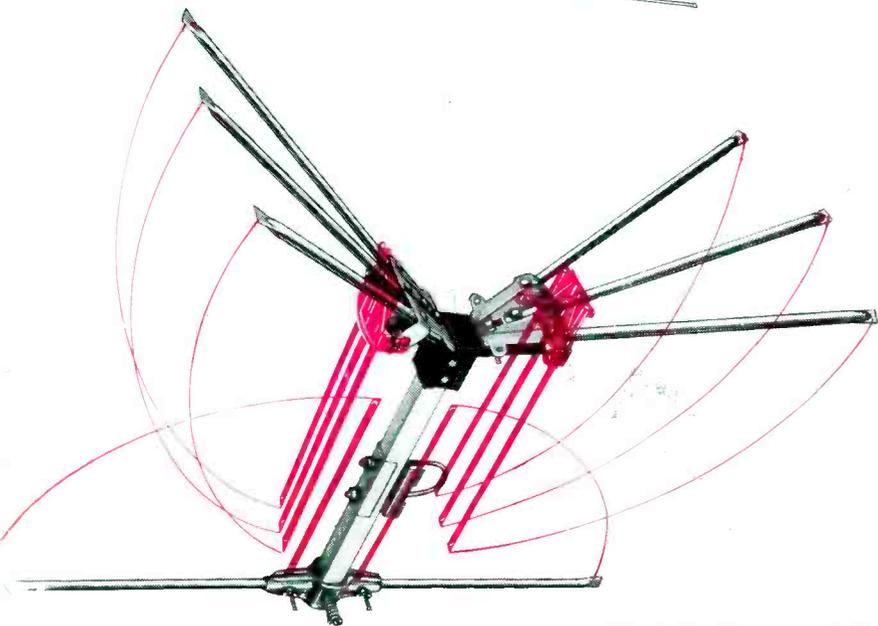
1. Pre-assembled JFD JeTenna as packaged. Note its compactness of construction and craftsmanship of design.



2. As the JeTenna swings open, dipole elements fan instantly into exact position by riding along unique fulcrum indices.



3. JeTenna elements lock into position effecting 35° forward inception angle and 40° dipole angulation for greater signal pickup. Reflectors snap into place for quick tightening by wing nuts.



Series with 1" seamless aluminum square crossarm and seamless aluminum elements reinforced with Fibreglas dawels.

No. JET160	Single Bay	Up to 8.8 db*	\$12.50 list
No. JET161	2 Bay	Up to 12.5 db*	\$26.40 list
No. JET164	4 Bay	Up to 15.5 db*	\$56.80 list

Series with 1" seamless square aluminum crossarm and wood-doweled butt-seam aluminum elements.

No. JET660	Single Bay	Up to 8.8 db*	\$ 9.75 list
No. JET661	2 Bay	Up to 12.5 db*	\$20.70 list
No. JET664	4 Bay	Up to 15.5 db*	\$45.40 list

*Performance tested and figures verified by the Hazeltine Corporation, Little Neck, N.Y. World Famous Research Laboratory.

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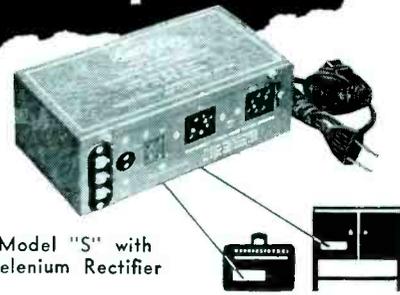
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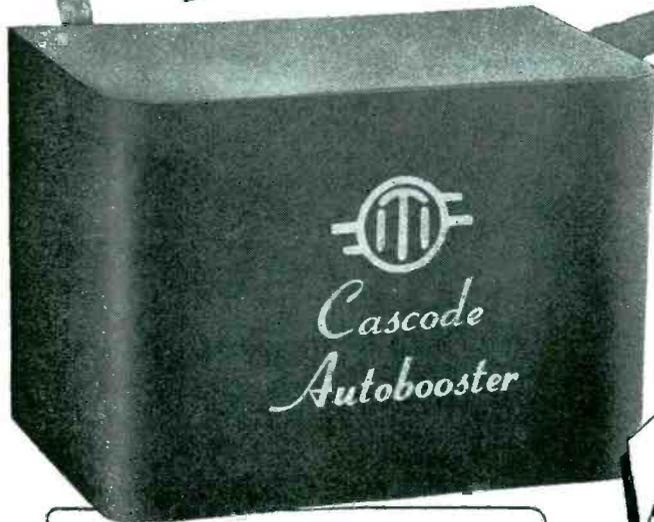
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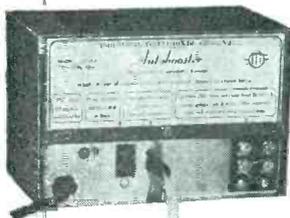
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All-Channel
AUTOBOOSTER
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Single Channel
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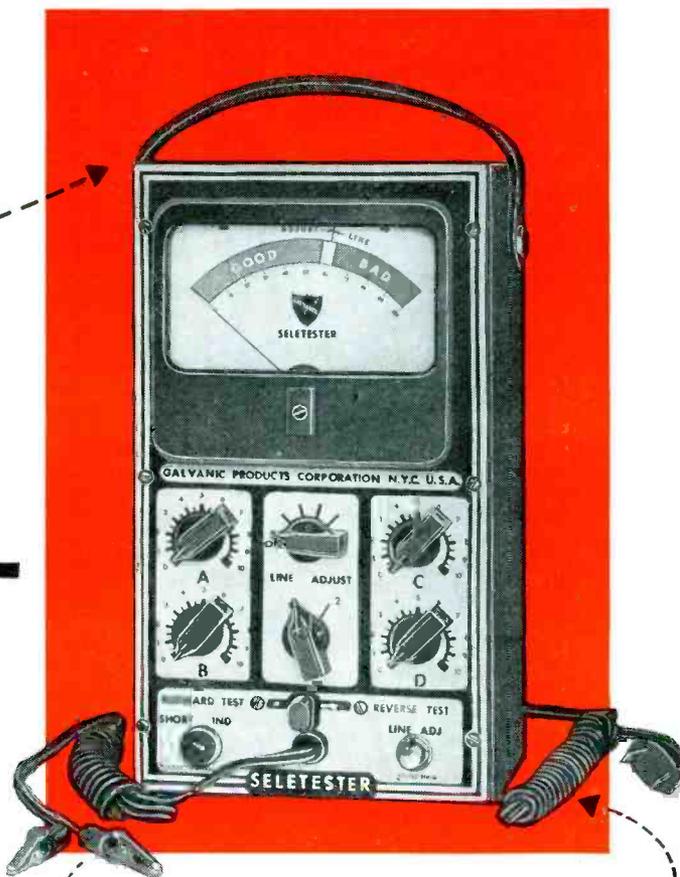
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ACTUAL SIZE

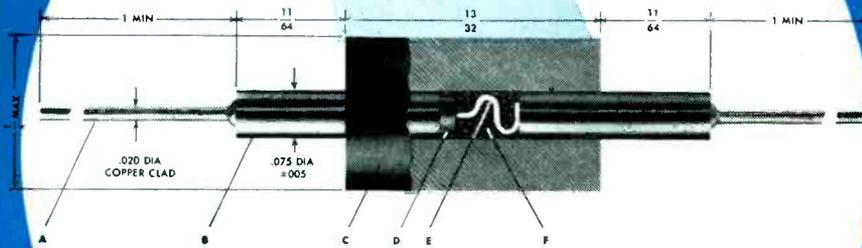
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1N52
1N63
1N64
1N65
1N69*
1N70*
1N75
1N81*

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- C. Glass-filled plastic case
- D. Germanium crystal soldered directly to base
- E. .005" tungsten cat whisker
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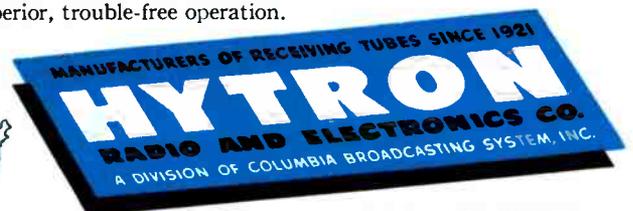
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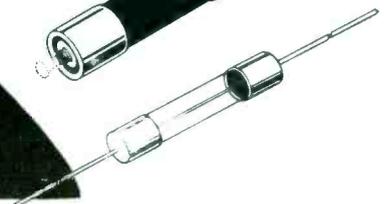
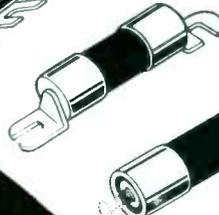
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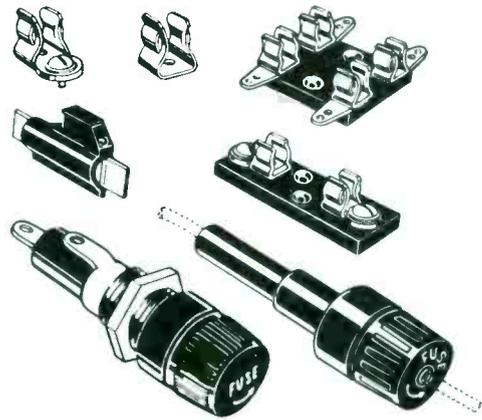
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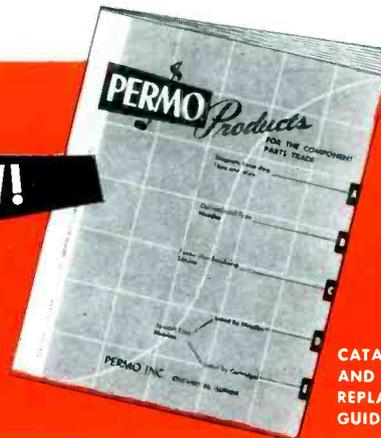
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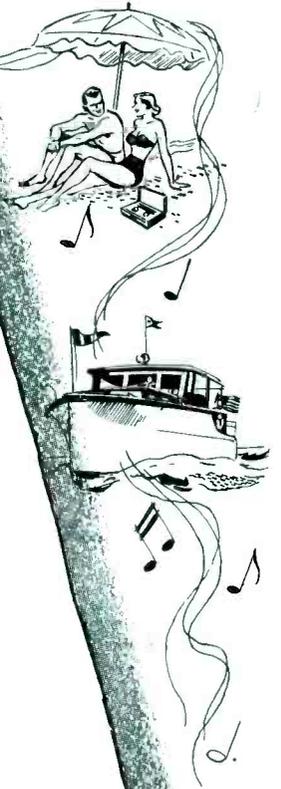
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**RADIO BATTERY
COMPLEMENT**



**No. 964
"A" BATTERY**

Lowest priced "A" battery of its size on the market, "Eveready" No. 964 provides many more listening hours than "A" batteries previously available for personal-size sets.

LIST PRICE ONLY 25¢ EACH!

No. 477—"B" BATTERY

Lowest priced "B" battery of its size on the market, new "Eveready" No. 477 "Mini-Max" battery... gives high *sustained* voltage for peak-volume listening throughout its long life.

LIST PRICE ONLY \$2.35 EACH!

THE COMPLEMENT

Two No. 964 "A" Batteries
One No. 477 "B" Battery

ONLY
\$2.85
COMPLETE!

**LOWEST INITIAL COST AND LOWEST COST-PER-HOUR OF ANY
RADIO BATTERY COMPLEMENT ITS SIZE ON THE MARKET!**

**BATTERY ENGINEERED BY
BATTERY MANUFACTURERS FOR
BEST BATTERY PERFORMANCE**

The terms "Eveready", "Mini-Max", "Nine Lives" and Cat Symbol are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

IN CANADA: National Carbon Limited, Montreal, Toronto, Winnipeg

G.E. TELLS YOUR CUSTOMERS!

National advertising sponsored by General Electric gives public the facts about the important service rendered by a skilled, highly-trained industry.

This ad, now running in LIFE and COLLIER'S, will help 35,000,000 readers to understand and respect the television serviceman and his work.

As a manufacturer of high-quality tubes and parts, General Electric has an important stake in your business, and is anxious to see a greater appreciation of your experience and abilities.

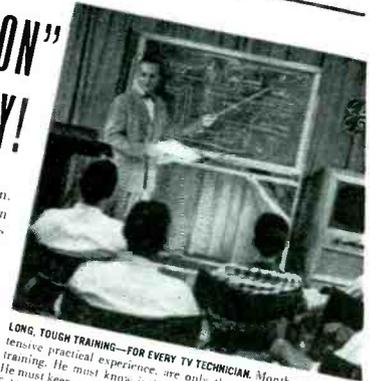
For extra copies of this LIFE-COLLIER'S ad write General Electric Company, Tube Department, Schenectady 5, New York.

AMERICA'S NEWEST "PROFESSION" KEEPS 18 MILLION TV SETS HEALTHY!

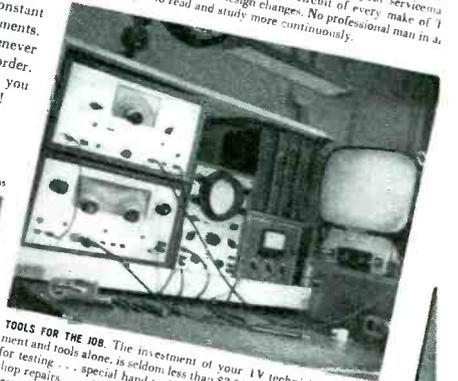
EIGHTEEN MILLION new "patients" is a tremendous responsibility for the television service industry—an industry that had only 2,000 sets to take care of just five short years ago. The phenomenal growth of TV has challenged every resource of service shop and individual technician. Television itself embodies new electronic principles which had to be learned by over 51,000 servicemen, most of whom were radio specialists. Manufacturers did everything they could to make it easy for these to become the highly-qualified TV experts they are today. Schools and courses were established . . . new test equipment was developed . . . replacement tubes and parts were distributed to every TV area. But the real responsibility for acquiring

TV know-how rests with the serviceman. As a group, these technicians have done an unprecedented job of meeting the service needs of the "TV epidemic". They have built for themselves an important new industry based on one ideal: to safeguard a billion-dollar owner investment in TV. Your TV serviceman deserves your full respect and confidence. He has invested over \$3,000 in special test and other equipment in servicing sets. He is technically trained . . . experienced . . . familiar, by constant study, with latest television improvements. Call your favorite TV serviceman whenever you want your set put in top working order. He will always do his best to serve you promptly and at a fair, reasonable cost!

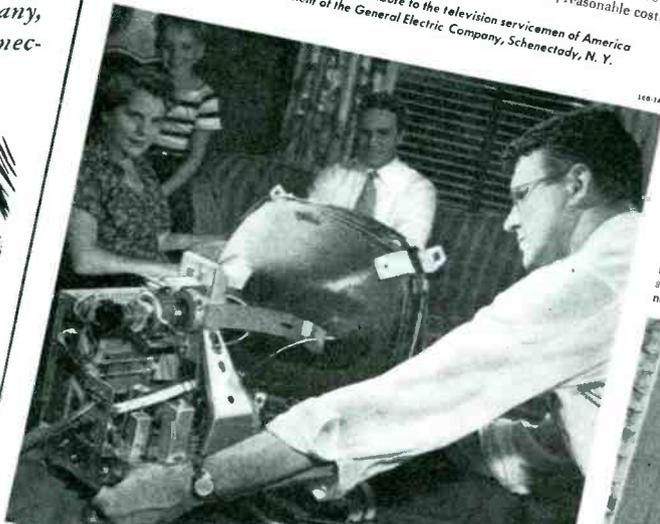
This advertisement is published as a tribute to the television servicemen of America by the Tube Department of the General Electric Company, Schenectady, N. Y.



LONG, TOUGH TRAINING—FOR EVERY TV TECHNICIAN. Months of study, and intensive practical experience, are only the start of your serviceman's training. He must know intimately the circuit of every make of TV. He must keep posted on all design changes. No professional man in a field is obliged to read and study more continuously.



TOOLS FOR THE JOB. The investment of your TV technician in equipment and tools alone, is seldom less than \$3,000. Precision instruments for testing . . . special hand-tools . . . bench equipment for major TV shop repairs . . . these are plusses he must add to the customary house-nessman's investment in shop and trucking facilities.



OPERATION TELEVISION—RIGHT IN THE HOME. When your TV serviceman removes your TV chassis from its cabinet, ask him to show you the myriad tubes, coils, and other parts, inter-connected by an "orderly maze" of wiring! Only highly-skilled hands can safely probe for faults, make repairs—usually on the spot—that restore the picture and sound to normal. His tools and equipment are as complete for their purpose as the contents of a doctor's kit. Aided by his specialized training, your serviceman diagnoses TV troubles and restores your set to "health", in the least time and at the least cost to you.



ON CALL RIGHT THROUGH THE DAY. Morning, afternoon, or evening, a phone call finds your TV serviceman ready to respond. Serving a community that relies on him, he makes every possible effort to live up to this responsibility. His charges—which reflect the actual time he spends serving you plus any necessary tubes and replacement parts—are your best investment in television satisfaction.

★ THIS ADVERTISEMENT IS PUBLISHED AS A TRIBUTE TO THE TELEVISION SERVICEMEN OF AMERICA BY THE TUBE DEPARTMENT OF THE GENERAL ELECTRIC COMPANY

Dealers Sell

BAKER TOWERS

Because they're...

- SOLD QUICKER
- INSTALLED FASTER
- BUILT BETTER

OUTSTANDING ADVANTAGES

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

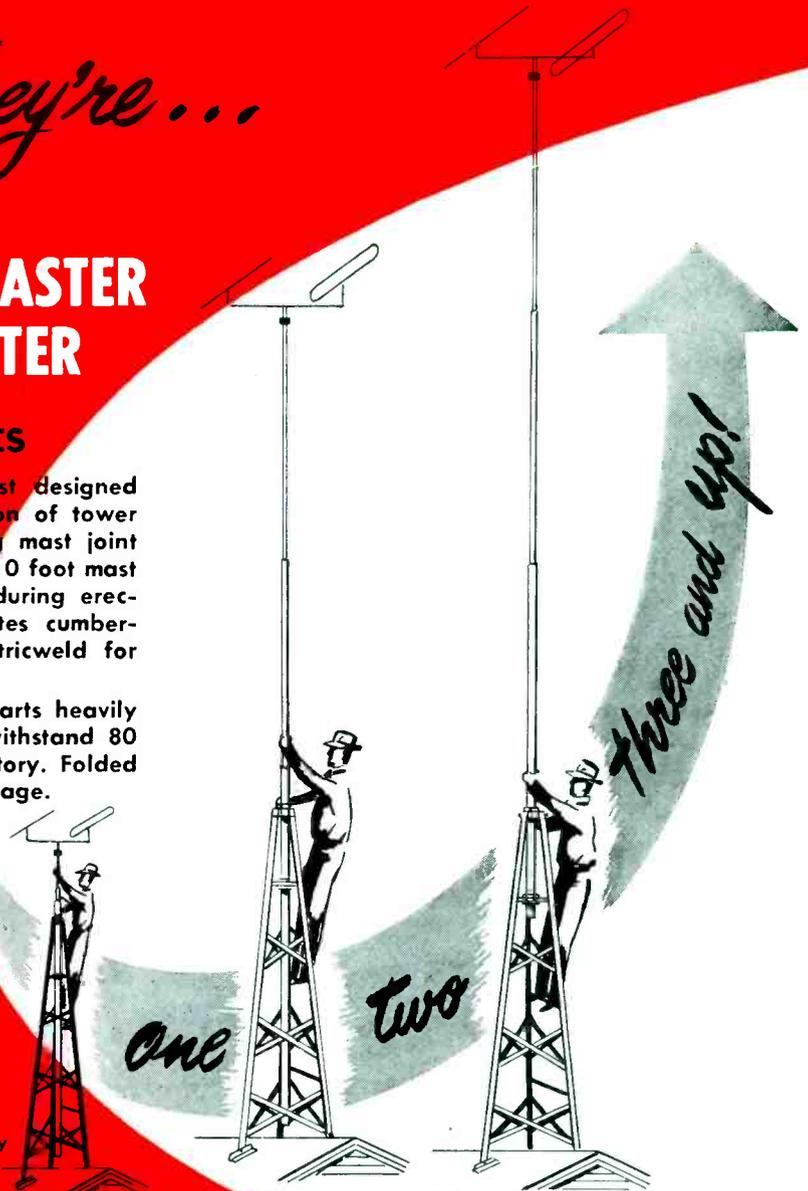
Tower fits any pitch roof. All steel parts heavily galvanized for long life. Designed to withstand 80 mile wind. Major assembly done at factory. Folded compact flat for easy shipment and storage.

EASY TO INSTALL

As easy as one, two, three

- 1) Simply belt the base level on roof and clamp readied mast in tower.
- 2) Extend top 10' mast section until it stops automatically and is held temporarily by safety catch. Then lock in position. Extend middle section in the same manner.
- 3) This done, just raise the complete mast, clamp in position, and the tower is up!

No tip up, no trip up. No other tower is so easy to install.



RETAIL LIST PRICE

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

• BAKER OFFERS THE DEALER

- * 10' fitted end masts.
- * 20' telescoping masts.
- * 30' telescoping masts.
- * Roof mounts to fit any pitch roof.

BAKER MFG. COMPANY

EVANSVILLE, WISCONSIN

BAKER MFG. COMPANY
DEPT. A
EVANSVILLE, WISCONSIN

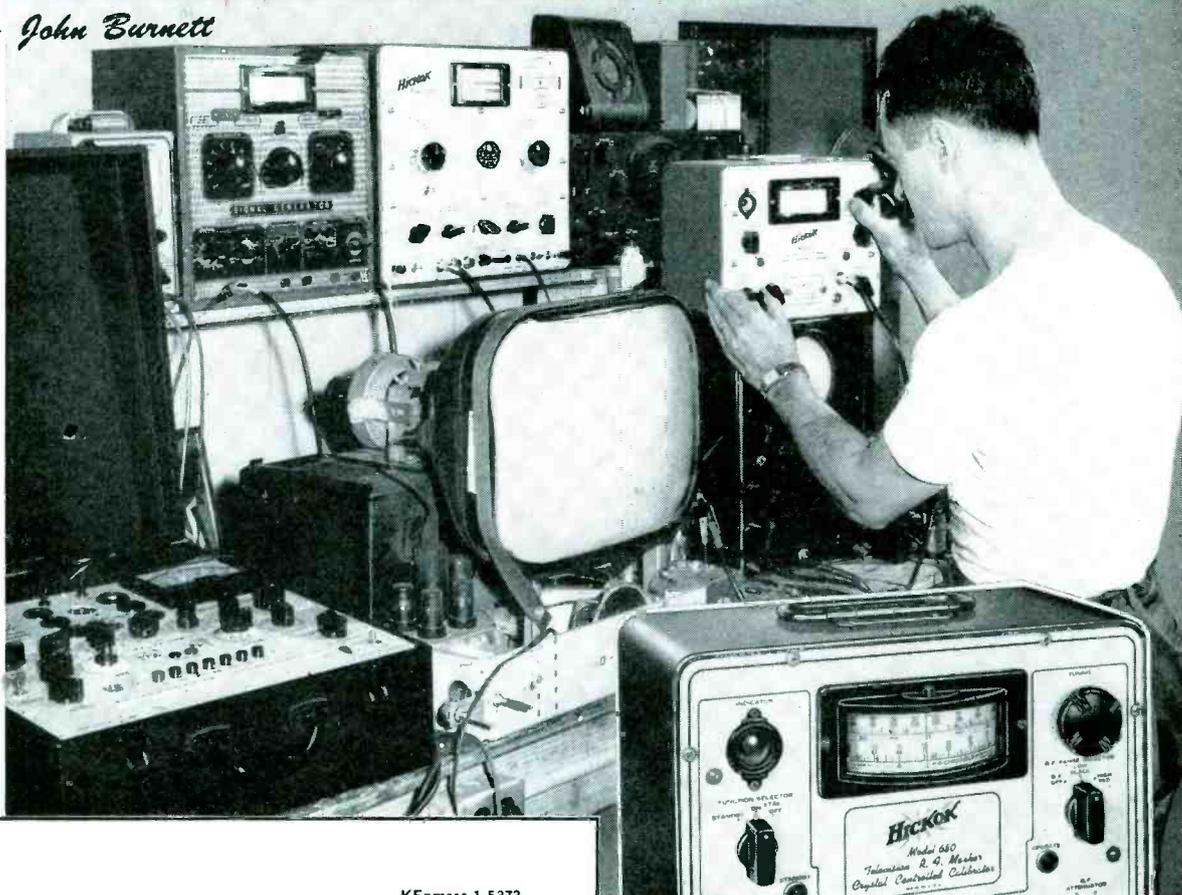
Please send me information on the Baker 40 TK Tower and other Baker tower products

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

Name _____ Company _____
Address _____
City _____ Zone _____ State _____

"MY HICKOK 680 CALIBRATOR HAS PAID FOR ITSELF BY ELIMINATING CALL-BACKS"

Writes John Burnett



BURNETT

RADIO AND TV SERVICE

455 East 152nd Street, Cleveland 10, Ohio

The Hickok Electrical Instrument Co.
10566 Dupont Avenue
Cleveland 8, Ohio

Gentlemen:

I have one of your Model 680 Calibrators and I am very pleased with it. In my 17 years of technical experience I have always believed that the best equipment is the most profitable to own. The accuracy and simplicity of use of the 680 backs me up.

In addition to TV tuner work, I use it to calibrate other signal generators to crystal accuracy. In overall TV alignment, I use it with my new Hickok 610A for a really sharp RF marker.

To tell the truth, I don't know how I got along without the 680 before, especially in servicing the large screen TV jobs.

I'll make no bones about it, my 680 Calibrator has paid for itself in a very short time by eliminating call-backs which were taking most of my profit and wasting my time. It's a great little instrument.

Sincerely yours
John P. Burnett

KEmore 1-5373
IVanhoe 1-4357



**Model
680**

HICKOK

\$129.50

The exclusive Hickok Magic Eye circuit provides a fast and easy method of setting frequencies to an accuracy of 1-20th of 1%. A choice of three crystals is available from front panel, (2.5 mc crystal is supplied). It is calibrated for UHF, too. Write a post card right now. We will gladly send you complete technical details.

THE HICKOK ELECTRICAL INSTRUMENT COMPANY

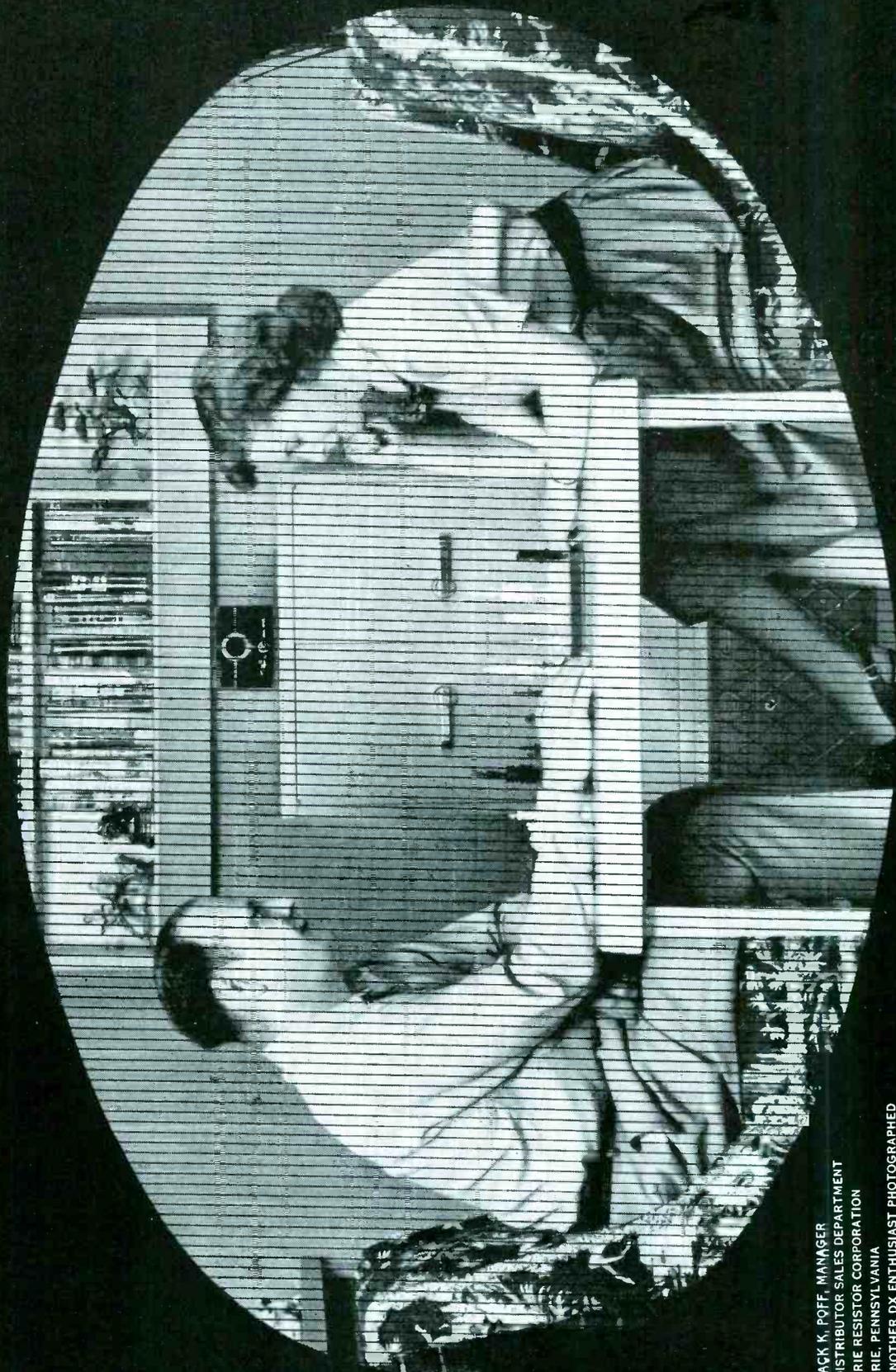
10521 Dupont Avenue

• Cleveland 8, Ohio

Regency

HIS CHOICE IS

LARGEST SELLING VHF BOOSTER . . . AT ANY PRICE!



JACK K. POFF, MANAGER
DISTRIBUTOR SALES DEPARTMENT
ERIE RESISTOR CORPORATION
ERIE, PENNSYLVANIA
ANOTHER DX ENTHUSIAST PHOTOGRAPHED
AT HOME WITH MRS. POFF

BURTON BROWNE ADVERTISING

ALSO MAKERS OF THE

Regency

UHF CONVERTER



TUBE AND TOOL CARRYING CASE
Holds 137 tubes — plus all regular tools.

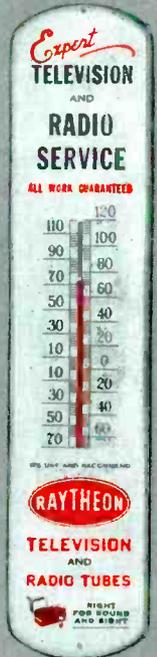
FLASHING SERVICE DISPLAY
A 6-color display featuring your ability to
"Clear Up The Picture."



PLEXIGLO ILLUMINATED SIGN
A bright and colorful service selling sign.



SHOP JACKETS and COATS
Expertly designed; sturdy, long wearing, comfortable garments. Full length or jacket style.



OUTDOOR THERMOMETER
A heavy gauge, jumbo size (8" x 39") outdoor unit.



SCOTCH TAPE AND DISPENSER
3/4" Scotch Acetate Tape bearing your name. Handy Dispenser.

To help you increase your profits...
To help you work more efficiently...

has made these useful
NEW SALES AND SHOP AIDS
AVAILABLE TO YOU!



POLITICAL WINDOW STREAMER
You can use this effectively from now 'til November.



ILLUMINATED TEST PATTERN CLOCK
A Telechron motored beauty.

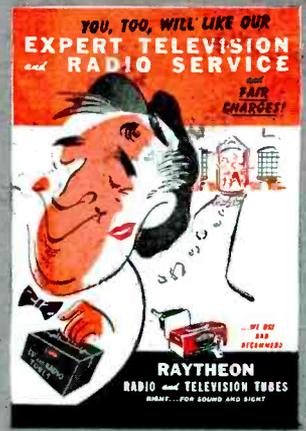


Write for FREE BOOKLET!

It's chock full of these and many other useful shop aids and sales promotion items that are musts for every service dealer — imprinted stationery, job tags and record cards, ad mats, post cards, shipping labels, decals, etc. Some are free, others available at less than cost. Ask your Raytheon Tube Distributor for them or write for booklet to Department D



DISPLAYS
Colorful displays that sell your service.



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

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

Excellence in Electronics

RADIO · TELEVISION · ELECTRONIC
SERVICE

The PC Chassis Era

SEVEN YEARS AGO there appeared a sensational announcement disclosing that scientists in Washington and Silver Spring had developed a radio-controlled missile which had been responsible for the destruction of countless enemy aircraft. Described as a proximity fuse, the development was cited as one of the most important contributions to the ordnance and electronic world. For through the ingenious use of a miniature fool-proof transmitter-receiver in the cap of a shell, an explosion could be produced when an object, such as a plane, came within range. The tiny wonder set owed its remarkable performance to a unique chassis design, featuring an indestructible printed circuit, with wiring and some components printed or etched on a ceramic base.

Industry envisioned the *pc* idea as the ultimate medium in production, providing a means of mechanizing chassis wiring, and perhaps the printing of some parts, too.

Soon some began producing *pc* assemblies for special applications. Others began experimenting with complete *pc* chassis production, and soon several practical procedures were evolved. About a year ago, a few set manufacturers began concentrating on the *pc* idea, and found that they could produce completely-wired chassis using *pc* techniques. It was felt that the approach might be used in the production of table-model sets, with complete *pc* chassis.

Last month* one of these chassis was briefly described. A few weeks ago another manufacturer announced that he also was going to market a *pc* chassis using a photo-engraving or etching process. In their technique, a sheet of bakelite and a sheet of copper are laminated under high pressure and heated into a perfect bond. Then, it was said, the copper side of the bonded sheet is covered with an emulsion, on top of which a negative of a circuit is laid and developed, like a picture. The sheet is then dipped into an acid which washes away the unwanted copper, leaving only the lines of the circuit, permanently adhered to

the bakelite base. Thus, all wiring is firmly fixed onto the chassis, with breakage impossible.

As reported earlier, aside from the use of special miniature sockets, which are expected to become available shortly, the *pc* sets use components of standard design, although usually small enough to permit direct contact to the *pc* leads.

The uniformity of wiring and fool-proof contacts has attracted the producers of TV chassis in these plants and elsewhere, and it is felt that perhaps in several years portions, or in some instances, complete chassis might be fabricated with *pc* wiring.

The evolution of this form of wiring introduces quite a new phase in servicing which will undoubtedly prompt the use of new concepts of procedure and, in some instances, new test gear. Even the presentation of circuit diagrams may be altered, with wiring following the exact pattern of the processed chassis.

To familiarize Service Men with some of the new servicing techniques that might obtain, SERVICE will publish, next month, a comprehensive analysis of one of the *pc* table-model receivers, complete with illustrations of the exact wiring used on the chassis, and the typical parts that have been installed and will probably be used in other types of receivers. Subsequently, there will appear supplementary data on other *pc*-type chassis.

These reports should be of significant interest to every Service Man, for they will describe a new mode of wiring and layouts which will undoubtedly inaugurate a new era in troubleshooting.

A Billion-Dollar Market Forecast

TV may soon become the core of a billion-dollar income for Service Men, according to the manager of a service department contract section of a mid-west manufacturer. During an address, he reported that if the present rate of receiver production is maintained for the next ten years, and 50-million sets are in use, industry might require over 200-million service calls per year. Based on eight calls per day, or 2,000 per year per man, and at an

average charge of \$6 per call, the service income would reach a staggering sum of over a billion dollars. If, this expert declared, we should have 70-million sets in operation, it is entirely possible that the income could be doubled.

Should industry produce the 50-million sets or more, and the yearly average of 5-plus service calls are required per chassis over 125,000 Service Men might eventually participate in this multi-billion dollar service business!

UHF Results

WITH THE ULTRAHIGHS scheduled to become a reality very soon now, many Service Men are being asked to comment on the typical receiving problems that may prevail.

There are six basic factors which it will be necessary to consider. Some of these exist now in very high operation, but will be even more apparent on the higher frequencies. The problems are: shadows, ghosts, seasons, set noise and interference, and drift and tuning. Man-made noise will not be a problem because it will rarely be present at the higher frequencies. Shadows, and set noise and interference, will constitute the most direct difficulties. It is, of course, assumed that the proper antenna and transmission lines will be used, and that the antenna will be oriented accurately for pinpoint pickup. In the November issue of SERVICE, the first of a series of papers describing these conditions and related system circuitry and components, will be published.

These articles will be prepared by one of the country's outstanding *uhf* specialists, and will be designed to serve as a practical guide in the installation and servicing of ultrahigh gear.

Our Biggest Issue

WE'RE PROUD to announce that this is the largest issue in our history. To our ever-growing family of friendly readers, buyers of the variety of products advertised in the columns of SERVICE, and to our many loyal advertisers, our sincerest thanks for the grand support that has made this issue possible.—L. W.

* National Scene. SERVICE; AUGUST, 1952.

Everybody's talking about the new Pyramid Imp!



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

here's why—



IMPS ARE REALLY RUGGED!

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



IMPS WON'T FREEZE OR MELT!

They'll operate faithfully in temperatures ranging from -40°C . to $+100^{\circ}\text{C}$. (212°F .)—and that's the boiling point of water!



IMP LEADS CAN BEND AND BEND!

Tinned leads that are really securely anchored—you'll be amazed at how much punishment they'll take without breaking!

IMPS ARE MOISTURE-PROOF!

No moisture can get through the varnished plastic case, or even through the lead anchor-points.



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

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



PYRAMID ELECTRIC COMPANY

1445 Hudson Boulevard
North Bergen, New Jersey

Name.....

Company.....

Address.....

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

SERVICE... *The National Scene*

TV PROSPECTS SPARKLE AS STATION GRANTS CONTINUE; 41 NOW APPROVED--In a series of swift, surprising moves, the FCC has authorized 19 more stations on both bands, bringing the total issued to 41. Originally, it had been said that the most authorizations the Commission would be able to okeh this year would be perhaps 25, with fewer the greater probability. . . . The deep south, far west, east, and even the far Pacific, were welcomed into the new station fold by Washington. The south, thus far, has received headline attention. In Mobile, Alabama, the Pursley Broadcasting Service received channel 48, and will operate with an erp of 22.5-kw visual and 12-kw aural, using an antenna which will be 250' high. . . . El Paso and Austin, Texas, were also among those receiving new stations, the Tri-State Broadcasting Co. (El Paso) winning channel 9 (erp 64-kw visual and 32-kw aural), and Tom Potter receiving a permit for channel 24 (erp 280-kw visual, 145-kw aural) for Austin, where a 640' antenna will be used. . . . Polan Industries in Ashland, Kentucky, received approval for channel 59 (250-kw visual, 130-kw aural), while the Modern Broadcasting Co., Baton Rouge, Louisiana, was given the go-ahead for channel 28 (225-kw visual, 115-kw aural). The Kentucky station will use a 470' antenna, and in Baton Rouge the antenna height will be 490'. . . . Chattanooga, Tennessee, won two grants for channels 49 and 43, the former being operated by Chattanooga TV, Inc., and the latter by Tom Potter. Powers of 20-kw visual and 10-kw aural will apply for the channel-49 station, and 275-kw visual and 140-kw aural for channel 43. The latter station will use a 1270' antenna site. . . . Bridgeport, Connecticut, will have another uhf station, channel 49, which will have a power output of 99-kw visual and 60-kw aural by way of a 660' antenna system. . . . In Scranton, Pa., the Appalachian Co. received channel 73 to operate on 11-kw visual and 5.9-kw aural. Scranton Broadcasters, Inc., were also awarded a channel in Scranton, 22, with a power output of 290-kw visual and 150-kw aural. Here, an extremely high antenna site will also be used, 1170'. . . . The South Bend Tribune (Indiana) and the West Central Broadcasting Co. (Peoria, Ill.) received permits for channels 34 and 43, respectively, with the former operating on 170-kw visual and 88-kw aural, and the latter on a power output of 175-kw visual and 88-kw aural. . . . In this area, the Midwest TV Co. (Massillon, Ohio) and Summit Radio Corp. (Akron) also received uhf channels. Midwest will use channel 23 with an output of 99-kw visual and 50-kw aural, while Summit Radio will use channel 49 with a power of 145-kw visual and 73-kw aural. . . . Two stations were approved for Reading, Pa.; Eastern Radio Corp. receiving channel 61 (260-kw visual and 135-kw aural), and Hawley Broadcasting Co., winning channel 23 (225-kw visual and 120-kw aural). . . . In the Pacific, the operators of KGMB received channel 9 with a power of 35-kw visual and 17.5-kw aural. . . . Portland, Oregon, will probably have the honor of being the first to be on the air with a uhf transmitter. They'll use the equipment originally installed at the experimental site in Bridgeport, and are expected to be on the air around Thanksgiving time. . . . The operators of channel 61 in Reading (WHUM) also announced that they hoped to be on the air soon, probably before Christmas. . . . Transmitter manufacturers are expected to begin delivering their gear to the others who have received uhf channels, on a substantially regular basis, during the early spring. It is believed that in the spring of '53 at least 12 more uhf stations will begin telecasting. More news on the new-station allocations and the roaring prospects on the verhighs, and ultrahighs, too, next month.

ARTSNY EVENING INSTRUCTION CLASSES TO REOPEN--According to a note from A.P. Henry of the Manhattan Trades Center in downtown New New York City, approval has been given for the reopening of the evening class sessions for the members of the Associated Radio-Television Technicians of New York. Advance registration has been excellent, and according to ARTSNY's prexy, attendance will be better than ever.

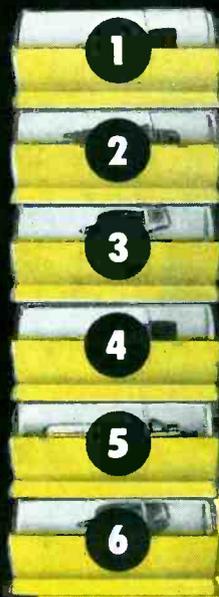
SERVICE... *The National Scene*

COMMERCIAL COLOR TV STILL YEARS AWAY--Notwithstanding the bubbling enthusiastic predictions which have appeared in the daily press, full scale compatible color TV is still not around the corner. According to the nation's leading specialists in the art, including the vice chairman of NTSC, who is also executive vp in charge of research at Hazeltine, at least two years more will pass before some color TV sets are in operation, and five years from now color might become a factor in TV. . . . The system, as evolved by NTSC, has merit and will undoubtedly be the accredited color technique for the nation. But, at the present, there is still a need for refinement, and, as noted by one of the chairmen of an NTSC panel . . . "the maturing of standards . . . and the exploration of the practicability of simplifying standards to reduce receiver complexity." . . . In preparation for the presentation of the industry-approved system to the Commission, perhaps in '53, one committee of NTSC has formally released a set of definitions* which it is believed may become official in the electronic dictionary. Among the new items defined is chrominance, described as the colormetric difference between any color and reference color of equal luminance, the reference color having a specified chromaticity. Another new term defined is color burst, which is noted as that portion of a composite color signal comprising the few sine-wave cycles of color subcarrier frequency (and a color-burst pedestal, if present) which is added to the horizontal pedestal to sync the color-carrier reference. The definitions also revealed that the term color-phase alternation, described as the periodic changing of the color phase of one or more components of the color subcarrier between two sets of assigned values, is expected to be used in place of the terms oscillating color sequence and flip flop, frequently referred to in the past. . . . In an early issue, all of the color TV definitions released by this NTSC will be published. Watch for them.

ACTUAL PICTURE-TUBE SIZE REAPPEARS AS TOPIC OF LIVELY DEBATE--A recent announcement of a 21-inch spherical tube, claiming 220-square inches of viewing surface, by a leading midwest setmaker, has zoomed into the limelight the old, much-argued question of exact sizes that can be advertised. It seems as if the new tube, which measures 20 $\frac{3}{8}$ " on the diagonal, against 20 $\frac{1}{4}$ " applied to a 20" spherical tube, has prompted many to declare that the new tube is only a 20" model. The manufacturer has noted that the old 16" tubes measured 16 $\frac{3}{8}$ " on the diagonal, while 16 $\frac{5}{8}$ " tubes were classified as 17" models. . . . One tube manufacturer has indicated that the new tube is actually a 20" spherical model with glass extensions welded on to provide the increase in diagonal measurement. . . . Another tube manufacturer indicated that 21" glass cylindrical tubes now being produced provide a minimum of 234 square inches of picture area. He added that 21" cylindricals provide 41 square inches more picture surface than a 20" glass sphericals. According to present plans, the new tube will only be used in the models produced by the setmaker.

SERVICE RECEIVES A FEW MORE BOUQUETS--Commenting on the recent TVI article in SERVICE, RTMA's service coordinator told ye editor that we did . . . "an excellent job of presenting Rand's talk." . . . In another note to ye editorial desk, a sales manager of a leading instrument maker noted that . . . "it is a pleasure to be able to tell you that, of all the magazines going to the service field . . . yours has been chosen as the only one to include . . . our products . . . for any planned promotion. This is based on results we have received over the past several years, and we feel that your magazine truly reaches the people to whom we want our messages to go." We're deeply grateful to you gentlemen for these approving remarks.--L. W.

\$4⁰⁰ opens up
A NEW BUSINESS
FOR YOU...



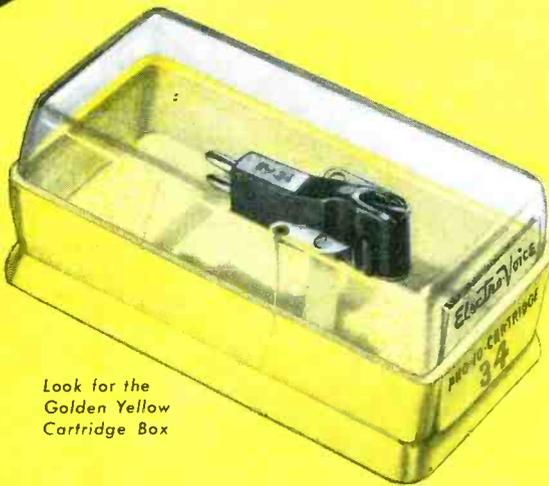
**GOLDEN OPPORTUNITY FOR ALERT SERVICEMEN
 TO TURN \$4.00 INTO HUNDREDS**

The market is wide-open...a ready market...an actual \$70,000,000 Phono-Cartridge Replacement market. Facts and figures prove it! What an opportunity for you and every serviceman to get new business, profitable business you're not getting now!

ELECTRO-VOICE SHOWS YOU HOW... AND PAVES THE WAY E-V helps you with everything you need to build a money-making Professional Phono Service business—New Sales Aid Kit, Manufacturer's Set Model Replacement Guide, Dramatic Direct Mail Campaign including Post Cards and Stuffers, Handbook on Cartridge Sales and Service, Professional Phono Service Sign, Window and Wall Streamers, Service Tags, etc. With these sales tools you can easily turn that \$4.00 into HUNDREDS.

The E-V Basic 6 Preferred Type Cartridges enable you to make over 92% of all cartridge replacements and give immediate replacement service. Not only that... every E-V Cartridge now comes like a jewel in a new golden yellow, self-stacking plastic box.

It's the most powerful, most effective merchandising plan ever conceived in the phono service field!



Look for the Golden Yellow Cartridge Box

FREE

Send Now for Bulletin CP-1.
 Gives You the E-V Plan—Tells you How to Make \$4.00 Open New Business for You.

ELECTRO-VOICE, INC.
411 CARROLL STREET
BUCHANAN, MICHIGAN

Please Rush FREE Bulletin CP-1

Electro-Voice

411 CARROLL STREET • BUCHANAN, MICHIGAN
 Export: 13 East 40th St., New York 16, U.S.A. Cables: Arlab
 PHONO CARTRIDGES • MICROPHONES • HI-FI SPEAKERS • TV PRODUCTS

NAME _____
 ADDRESS _____
 CITY _____ ZONE _____ STATE _____
 MY DISTRIBUTOR'S NAME _____

TV TROUBLESHOOTING

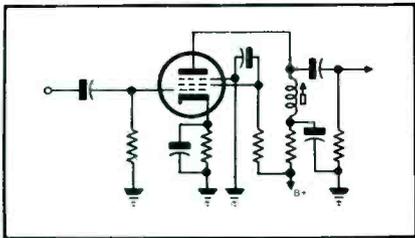


Fig. 1. A typical if-amplifier stage using a pentode.

Fig. 2. Amplifier stage, with $B-$ at -150 v and plate supply at ground potential.

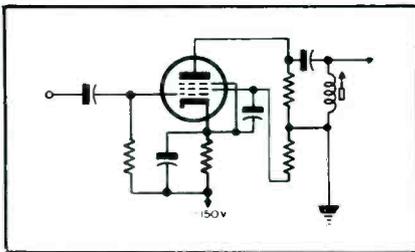


Fig. 3. Steps to follow in checking output of low-voltage power supply: *A*, disconnect all leads to stages feeding from this point; *B*, connect dummy load resistor (5000-ohms, 20-watt) from point indicated to ground; *C*, check can be repeated from negative voltage output point . . . pin 8 on ballast tube.

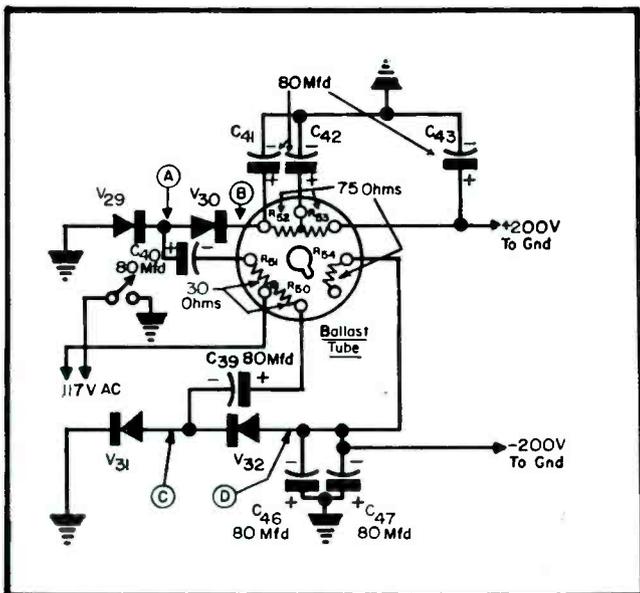
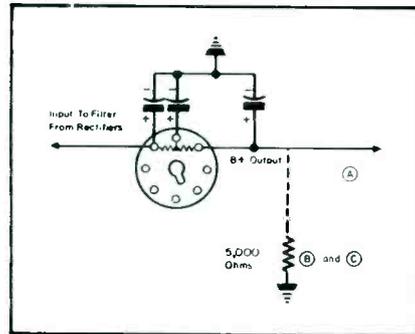


Fig. 4. A low-voltage power supply; Emerson chassis 120087B. *A*, *B*, *C* and *D* represent voltage test points.

VOLTAGE MEASUREMENTS are one of the Service Man's most valuable tools in radio and TV troubleshooting. Generally, voltage checks are used to help locate the defective component after the defective stage has been found by other troubleshooting methods.

Most Service Men have learned how to interpret voltage readings by working on sets where $B-$ is connected to the chassis; or to a common bus with the same *dc* potential as the chassis, and where the plate voltage is obtained by being connected through plate loads to either the most positive voltage in the power supply or a less positive voltage obtained by a voltage-divider network across the power supply.

While this method of voltage distribution is used in most TV models, a substantial number of models use one or more of the following variations:

- (1) $B-$ may be quite negative compared to the chassis, by as much as -150 v.
- (2) The plate supply voltage for some stages may be connected to ground or even to a negative voltage point on the voltage divider, giving plate and screen voltages which are negative compared to the chassis.
- (3) Several stages may be connected in series or series-parallel. One result may be cathodes and control grids which are considerably positive with respect to ground; in some cases by as much as $+100$ or $+150$ v. Another result may be a complex voltage distribution where a defect in one stage

may affect the voltage readings in several other stages.

Usual Methods of Interpreting Voltage Readings

In Fig. 1 we have a simple pentode if amplifier stage. Let us analyze a set of voltage readings around this stage, such as might be produced by a specific trouble. In the following table are a comparison of the measured readings with the manufacturer's data for a normally operating stage:

(To Ground)	E_k	E_g	E_{g2}	E_p	$B+$
Manufacturer's data	2	0	120	150	152
Measured	0	0	86	144	150

It is assumed that a new tube has been tried and the trouble is not due to a bad tube. Analyzing these readings we find that: (a) No voltage on the cathode indicates either no current through the tube or that the cathode is shorted to ground. (b) If there is no current through the tube, there would be no voltage drop through the plate load and the screen-dropping resistor. Thus we would have plate and screen voltages that are *higher* (more positive) than normal, or just about $B+$. (c) Since the measured plate and screen voltages are *lower* than normal, while $B+$ is normal, then the trouble cannot be due to no current flow through the tube. (d) The other possibility, indicated by zero voltage on the cathode, is a shorted cathode bypass capacitor. This would result in shorting out the cathode-bias resistor. Without bias on this stage, the grid is no longer negative compared to the cathode; that is, the cathode is no longer positive compared with the grid, thus there would be consequently more current through the tube, a larger voltage drop through the plate load and the screen-dropping resistor, and so plate and screen voltages would be lower. (e) According to the measured voltages, all of the conditions listed in (d) are true; cathode voltage to ground is zero, plate and screen voltages are lower than normal. Therefore, the indications point to a shorted cathode bypass.

Voltage-Reading Interpretation Rules

The general rules for interpreting voltage readings in standard circuits are:

- (1) With $B+$ normal, any defect that causes *more* current through the tube will cause lower-than-normal plate and screen voltages. (Some possible troubles are shorted cathode ca-

With Voltage-Readings

by **CYRUS GLICKSTEIN**

How Voltage-Reading Skills Can be Applied to Interpret Troubles in Complex TV-Chassis Circuitry

capacitor; reduction in the value of cathode resistor and gassy tube.

(2) With $B+$ normal, any defect that causes less current through the tube will cause higher-than-normal plate and screen voltages. Some possible troubles are increase in value of cathode resistor, open filament and low cathode emission.

(3) An increase in (more positive) cathode voltage indicates either more current through the tube or a change upward in value of cathode resistance.

(4) A positive voltage on the grid (measured to ground when the normal voltage should be zero) indicates either a leaky coupling capacitor from the preceding stage or a gassy tube.

There are, of course, several other possible voltage changes if troubles originate in either the plate or screen circuits. These same general rules, with some slight modifications, can be applied to circuits with negative voltage readings. Let us assume, for example, that the following readings are measured in a faulty circuit, shown in Fig. 2, and compared to the manufacturer's data:

(To Ground)	E_k	E_g	E_{sg}	E_F	Plate Supply
Manufacturer's data ..	-148	-150	-30	-20	Ground
Measured ..	-147	-148	-55	-31	Ground

In interpreting negative voltages, it is simply necessary to:

(a) Note whether the measured voltage is more or less negative than the manufacturer's data.

(b) Remember that more negative is the same as less positive and less negative the same as more positive.

(c) Compare this mentally to the conventional circuit.

The readings measured around the circuit of Fig. 2 disclose that the resulting information does not match the manufacturer's data. Plate and screen voltages are more negative (the plate is $-31 v$ instead of $-20 v$; the screen is $-55 v$ instead of $-30 v$), while cathode and control-grid voltages are less negative (the cathode is $-147 v$ instead of $-148 v$; the control grid is $-148 v$ instead of $-150 v$). In other words,

the plate and screen voltages are less positive (less positive = more negative) and the cathode and control grid voltages are more positive (more positive = less negative).

As noted before, when cathode voltage is more positive than normal, we usually have either more than normal current through the tube or an increase in the value of cathode resistance. When, in addition, the plate and screen voltages are lower (that is, less positive) than normal, there is only one possibility. There is too much (more than normal) current through the tube. When in addition, the grid is more positive than usual, the possible reasons for the increased current through the tube are either a leaky coupling capacitor or a gassy tube.

By following the foregoing rules outlined under (a), (b) and (c), then, it is simple for Service Men accustomed to conventional circuits to interpret easily troubles in circuits with negative voltage readings.

Troubleshooting LV Supplies

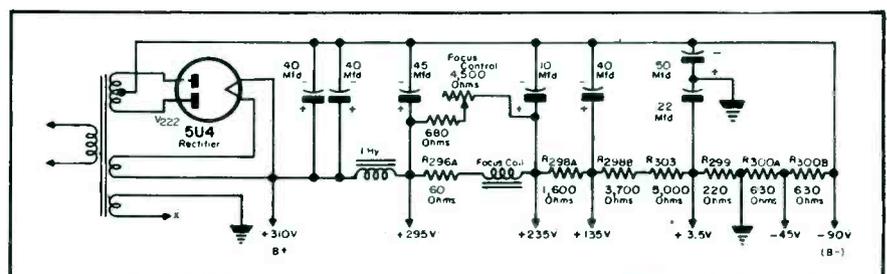
Another type of TV receiver, where voltage readings may acquire a little more than the usual skill to track down trouble quickly, is illustrated in Fig. 4; Emerson chassis 120087B. Here, the low-voltage supply consists of two voltage-doubler circuits, with the outputs in series. One doubler output is positive with respect to chassis ground, the other negative. Some tubes have negative voltages, other stages have positive voltages, and several have a

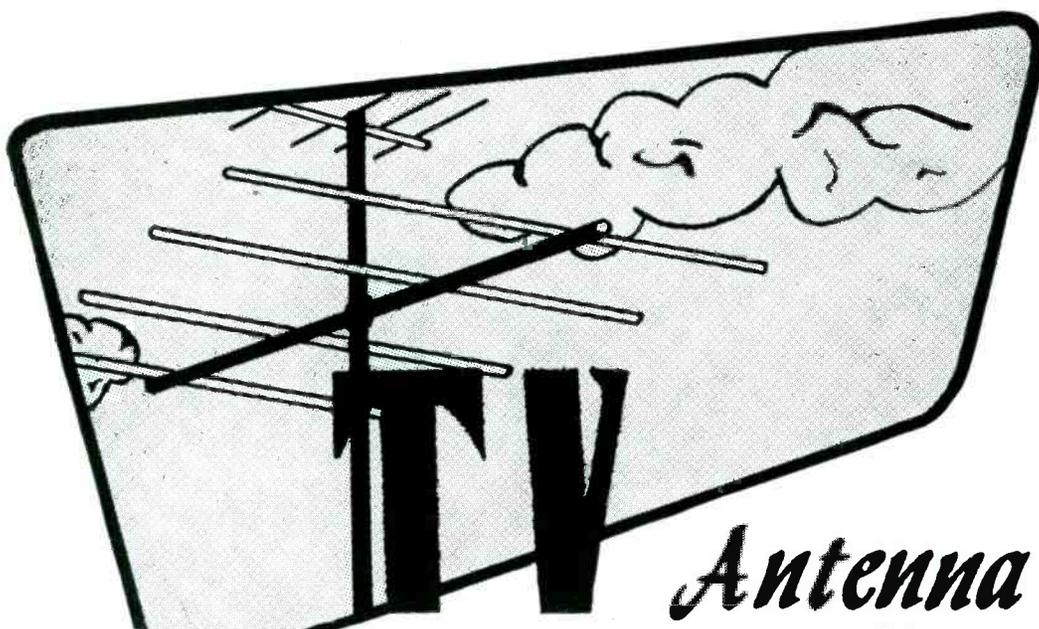
combination. One of the common troubles in this model is the breakdown of selenium rectifiers, filters or the voltage doubling capacitors, C_{40} (+doubler) and C_{30} (-doubler). A quick check on the positive voltage situation can be made at points A and B . On this doubler, point A measured to chassis should read $+100 v$ and point B $+200 v$. A check made at points C and D on the other doubler should reveal that point C measures $-100 v$ and point D $-200 v$ to the chassis. If the readings are not normal, we then face the old question: Is the defect in the power supply or in one of the other stages which is loading down the power supply? The usual procedure for isolating the trouble is: (a) Check the resistance reading from the hot side of the supply to the chassis; if the reading is not normal, the defect can usually be traced by further resistance checks. (b) Detach the load (all the other stages) from the power supply, when the resistance reading is normal, and then remeasure the voltage output from the supply. To obtain an accurate result, it is advisable to wire in an equivalent load resistor; a 5,000-ohm/20 w resistor is satisfactory for this purpose. Now, if the voltage output from the power supply is normal, the defect must be outside the power supply, in one of the other stages. If the voltage output is still low, the defect is in the power supply.

Selenium rectifiers that have normal resistance readings are not necessarily good; those with abnormal resistance readings are bad. The resistance read-

(Continued on page 100)

Fig. 5. Low-voltage power supply used in Capehart CX-33, showing resistive voltage divider employed to obtain different voltage outputs.





Antenna Digest

design.. application.. installation.. service

by RALPH G. PETERS

A Monthly Survey of New Antenna Developments: Broad-Band Yagis . . . Motorless All-Direction Systems . . . Towers . . . Multi-Element Yagis . . . Rotator Motors . . . Conical-V-Beams

WHEN, SEVERAL MONTHS ago, the FCC released its long-awaited *vlf/uhf* allocation schedule, all industry hailed the announcement. To the Service Man, the issuance of the time table was a monumental moment, for it ushered in a new era; an era which has been aptly described as one gilded with opportunities*, and not only in the ultra highs, but the veryhighs, too.

With the lifting of the freeze order, there are now three major *vlf* markets which present Service Men with the greatest concentrated money-making opportunity he has ever known.

(1) Areas in which *vlf* stations will have to change channels, on the same band.

(2) Areas in which a new *vlf* station is being added to the present one, on the same band.

(3) Areas served at present by two or more stations.

In the first case, when a channel-shift takes place, those using single-channel yagis may face quite a dilemma. If a set owner changes his antenna before the channel shift, he will be without reception until the shift occurs. If he waits until the channel is changed, the consumer will

again be without reception until a new antenna is installed. Naturally, these set owners will want to change their set antennas on the same day that the station changes channels. Obviously, this will be impossible. To solve this problem, there have been developed multiple-channel or *broad-band* yagis which will cover a variety of channel combinations. One manufacturer‡ has announced five types of yagis for such broad-band pickup: 2-3-4; 4-5-6; 2-3-4-5; 3-4-5-6, 7 to 13.

In those areas where a new very high station is being added to the

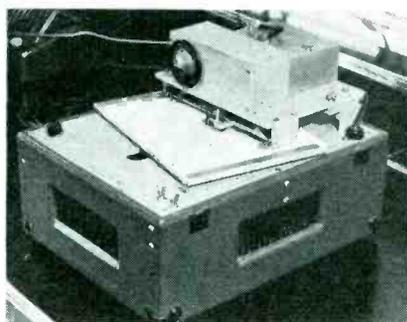
present one, on the same band, an additional yagi will have to be installed and tied into the present installation with a separate lead, through a manual switching system. Or, the new broad-band yagi can be installed to do the job of *both* single-channel yagis.

In the areas which now have two or more channels on the air, the Service Man usually must choose between separate yagis for each channel or the standard type of broad-band antennas. The separate yagi approach will offer good signal results, but the installation may become a bit complex, involving multiple leads, and switching systems. The conventional broad-band antenna does pose a solution, too, but in some instances, this may be at the expense of adequate gain. The broad-band yagis have been cited as offering the advantages of both types of antennas with high gain on the required channels.

In an analysis‡ of *broad-band yagi* design, many typical problems were reviewed. Considered, for instance, was the problem of developing a resonant dipole system which could hold up across the band from channel 2 to 5 to take advantage of the reflective and directive systems. The use of conventional single dipoles was

‡Channel Master.

Recorder used to plot directivity of broad-band yagis. (Courtesy Channel Master)



*Views and News, SERVICE; August, 1952.

THE WORLD'S FIRST BROAD BAND YAGI!

CHANNEL MASTER'S *new* futuramic

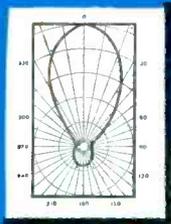


The first antenna ever built that combines . . .

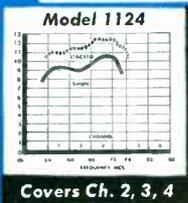
-  Broad band coverage *with the*
-  High gain and directivity of the Yagi

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

Horizontal Polar Pattern



BOOM BRACED



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

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

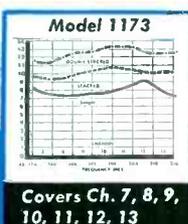
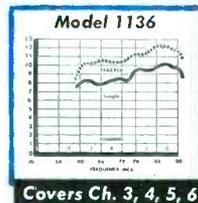
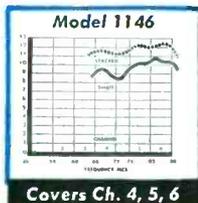
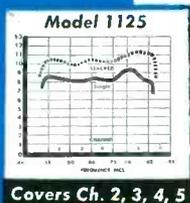
- Areas in which a new VHF station is being added to the present one.

The great number of single-channel Yagis

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

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

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



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

SHATTERS all performance records!

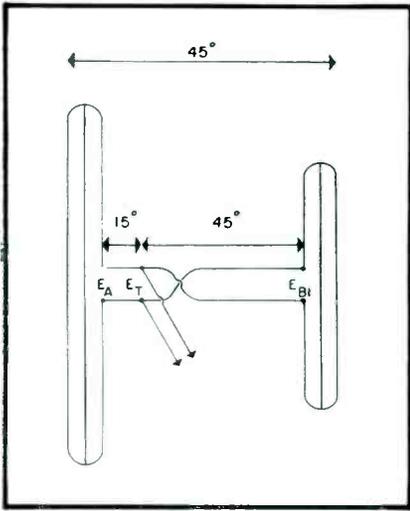
- Channel for channel, the Broad Band Futuramic will outperform any conventional SINGLE-CHANNEL Yagi.
- On each of its specified channels, one single Low Band Futuramic will outperform any 4-bay conical or fan array.
- A single High Band Futuramic will outperform any 2-bay conical or fan array on every channel from 7 to 13.
- A high-low Futuramic combination is the most sensitive array ever devised for all-channel VHF reception.
- And the Futuramic uses Channel Master's famous Z-Match system for maximum stacking gain.

Write for complete technical literature.

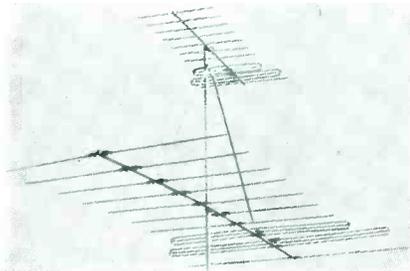
CHANNEL MASTER CORP.

ELLENVILLE, N. Y.

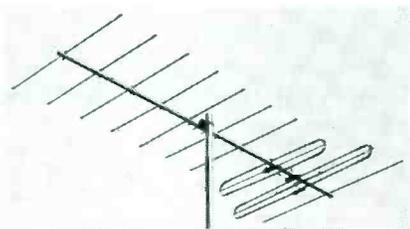




How spacing of the dipoles is accomplished in the Channel Master broad-band yagi. Dipoles are 45° apart in free space. Feed points are 15° in front of the lower frequency dipole. Higher frequency fold is fed through a length of twin lead 45° long which is transposed so that its effective length is 135°.



High-low broad-band yagi combination. (Futuramic; Channel Master)



Single high-band broad-band yagi. (Futuramic; Channel Master)



Steel tube and rod construction tower, electrically welded with dip-zinc galvanized 10' sections. Has heavy cross-braces along one side of the tower to serve as ladder steps. Construction permits orientation of the antenna after the tower is installed and guy-wires secured. Has all-round surfaces and the low surface area. Hinge-action base mounts at roof peak, on side slope, or vertical wall, or flat roof. Will accommodate motor rotator; however, an optional fitting, known as the *Rota-Dapter*, is provided where unusually heavy antenna arrays are to be installed with motor rotator. (Model 600; Easy-Up Tower Co., Racine, Wis.)

found impossible because they could not hold up over such a wide band of frequencies. Two dipoles had to be used for either end of the band, phasing them in such a way so that they would each contribute their two peaks, still maintaining resonance in-between, and, therefore, holding a fairly constant impedance across the entire band under consideration.

Then, there was probed, the case where the signal being received was on a higher frequency; the one to which the small fold was resonant. In this case, the current in the smaller fold was in phase with its voltage. The larger fold, cut to the lower frequency, was found to act as an inductive reactance. In this case, the current lagged the voltage. Since vectors rotate in a continuous manner as the frequency changes, it was found possible to maintain a basic relationship (135°, in this instance) for all frequencies between the low and the high to which the two dipoles were tuned, thus providing a twin tuned dipole system for the broad-band yagi.

The report[†] also noted that since the addition of more than one reflector does not contribute materially to gain, it was decided to design the twin tuned dipole system to give its maximum gain at the low frequency, so that this maximum gain, combined with the single reflector, produced both substantial gain and directivity on the low end of the channels under consideration. It was found that the parasitic directive system employed did not suffer the limitation in number of elements that a parasitic reflective system does. Therefore, it was possible to add seven directors which provided strong gain at the higher frequencies. The result of the somewhat stronger directive system was that the antenna tended to have a slightly sloping gain characteristic increasing with frequency. This was noted as being desirable since it tends to keep the actual voltage fed to the receiver at a constant level.

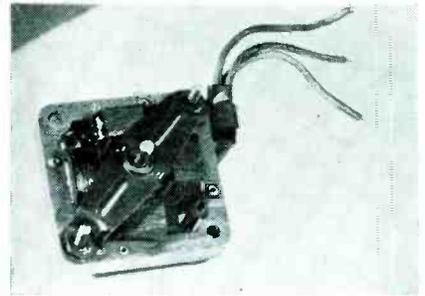
Motorless All-Direction Antenna

In another effort to achieve multiple-channel DX reception, an entirely different principle has been employed.

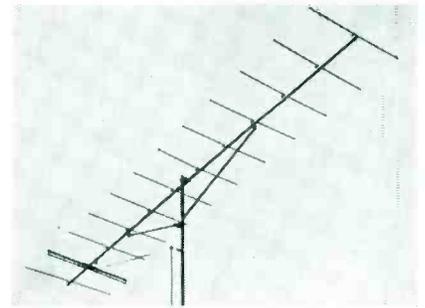
According to a patent¹, covering the new system, a pair of dipoles are crossed perpendicularly or at other angles so that four dipole rods are provided. Any two of these dipole rods or pairs can be selected in achieving a desired orientation of the antenna;

(Continued on page 98)

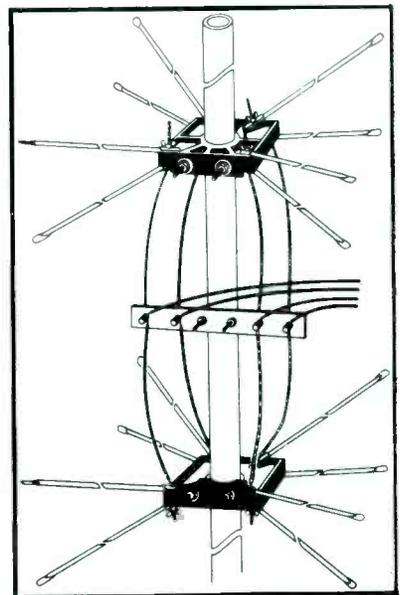
¹No. 2,585,670, issued to M. P. Middlemark, president of All-Channel Antenna Corp.



Reversible 2-pole, four-coil motor for both remote control TV tuner and rotating antenna applications. Can be furnished either as split-phase capacitor type or split-phase resistance type, depending upon application requirements. Designed for 24, 12 or 6 volts, ac. and may be used either horizontally or vertically without affecting performance characteristics. Model illustrated, with 3 leads, designed for use with single-pole, double-throw switch. Adaptation, with 4 leads for use with double-pole, double-throw switch, is available where increased output is desired. (Model O; General Industries Co., Elyria, Ohio.)



Twelve-element single channel yagi. Available in high- and low-channel models. Features construction with V-shaped boom braces and reinforced element stampings. Other features include pre-assembled construction, 6-mc bandwidth, and high front-to-back ratio. Both models may be stacked by using the regular Long John phasing harness. (Long Long John; Vee-D-X).



Stacked array of fringe and outer-fringe area motorless all-channel all-direction antenna. (All-Channel Antenna Corp., 70-07 Queens Boulevard, Woodside, N. Y.)

NO! the most expensive sets don't
always work better in the fringe areas,

BUT...

ANY television receiver equipped with a

TARZIAN TUNER

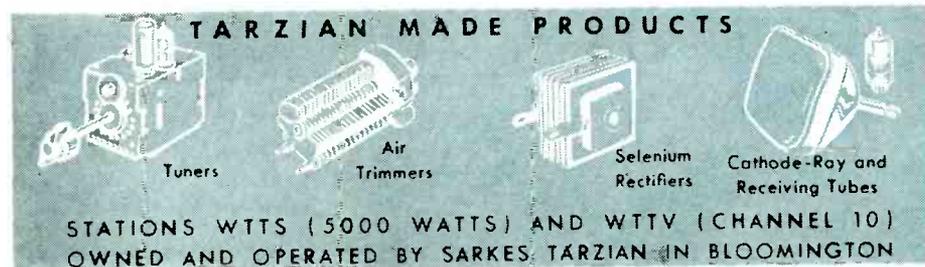
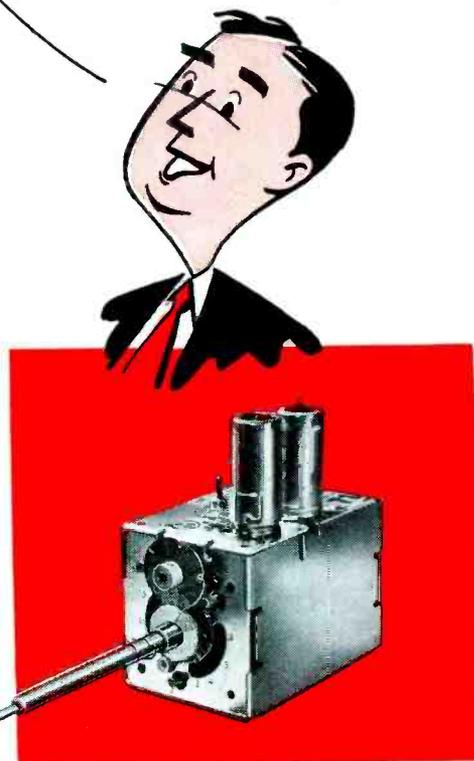
will do the best job of pulling in distant stations

It's no wonder that manufacturers of many of the better known TV sets on the market today depend upon the trouble-free TARZIAN TUNER for the excellent performance of their sets.

No other commercial tuning unit possesses so many of the desirable features found only in the TARZIAN TUNER. For unexcelled selectivity . . . stability . . . and reception—especially in fringe areas—there is no better tuner than the **TARZIAN TUNER**

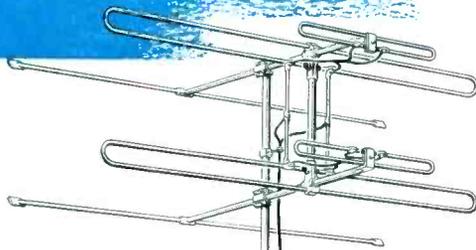
The sensible Tarzian approach to UHF—a full band, all station tuner—is a typical engineering example of keeping up with—or rather—one step ahead of—developments in the ever changing industry.

SARKES TARZIAN, Inc., Tuner Division, Bloomington, Indiana



Tarzian Tuners and Tarzian Picture Tubes are available for the growing replacement market. Write for complete information.

whatever
your
viewpoint...



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dealer,
installer or
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The Amphenol Inline is the antenna for you! Stocking problems are minimized because the one antenna gives superb performance on *all* channels. Saves duplicate inventory of accessories too, because the Amphenol Inline is packaged for a quick, easy installation including twin-lead, mounting clamps, mast and stand-off insulators.

The aerodynamically clean design of the Inline preserves the neat appearance of the home and most important of all, regardless of viewpoint, is the fact that no broadband antenna now in existence can match the quality of the picture made possible by the Amphenol Inline Antenna.

See your Authorized Amphenol Distributor for your free copy of this 20-page booklet containing all the factors which determine Better TV Picture Quality.



AMERICAN PHENOLIC CORPORATION
1830 South 54th Avenue • Chicago 50, Illinois

AMPHENOL

Ultrahigh 2-Channel Receptors

by WYN MARTIN

[See Front Cover]

WITH THE ULTRAHIGHS truly around the corner, telecasters having forecast that some stations should be on the air before '52 bows out, several receiver manufacturers have begun preparing for the event by including all-channel tuners* in their chassis, and providing for the internal use of special *uhf* converters.

An intriguing contribution to the latter type of tuning has been made by Westinghouse who has developed a pair of *uhf* receptors: one for the 470 to 710-mc band and the other for the 670 to 890-mc band. Receivers have been so designed that both receptors can be used, with each one tuned to a specific channel.

The basic circuit employed in the receptor appears on the cover.

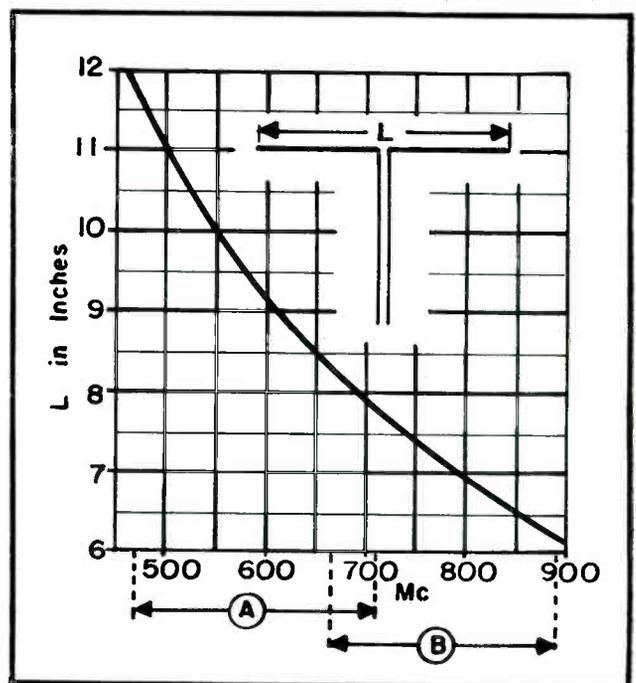
Each receptor contains a local oscillator with a 6AF4, which operates 45.75 mc higher than the video carrier frequency of the received *uhf* signal. The oscillator frequency is initially adjusted by an oscillator slug, and fine tuning is provided by the fine tuning control on the TV receiver. Suitable band pass circuits tuned to the frequency of the received signal by *rf* trimmers serve as the antenna input

*SERVICE; July, 1952.

(Continued on page 95)

Fig. 1. Chart illustrating lengths of dipole elements of a simple *uhf* resonant dipole which might be used in medium-strength areas.

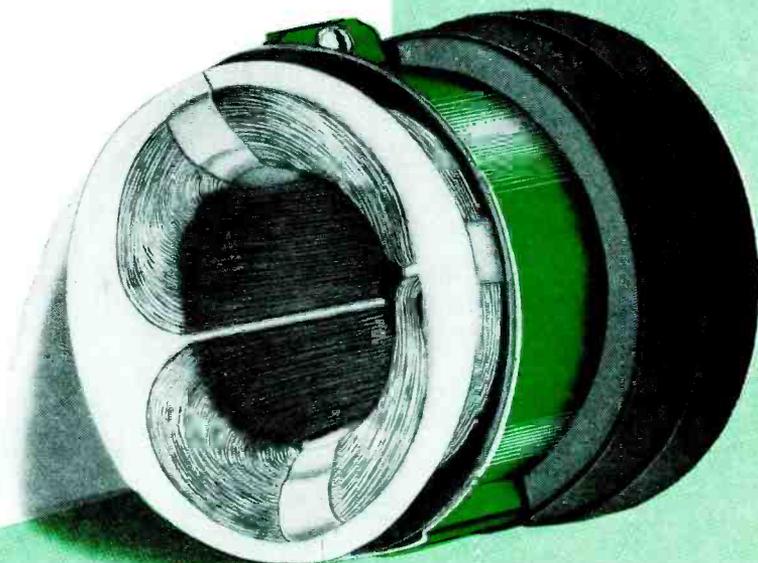
(Courtesy Westinghouse)



TODD put the OK in the YOKE!

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Todd GREEN BAND COSINE DEFLECTION YOKES



A *Todd* GREEN BAND ANTI-CORONA FLYBACK TRANSFORMER

... is the logical mate to a yoke installation. For best performance, use both ... Green Band Yokes and Green Band Flybacks.

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See Your Distributor or Write for Literature and Replacement Guide.

You can generally depend upon engineering for good design. The point is to maintain the standard in production. TODD does exactly that ... and every TODD Green Band TV Component is decidedly better and more reliable, because of the extra painstaking care and attention devoted to the all important stages of production.

Whether you build or replace, you can look to these TODD quality standards as your complete assurance of long, trouble-free, and effective performance:

- High deflection sensitivity.
- High order of inter-coil insulation.
- Good line and corner Focus.
- 1000 to 1 Cross-Talk Ratio for Minimum Interlace Distortion.
- Compensated cosine design for Minimum Pincushion Distortion.
- Minimum Leakage Flux to Deflect Beam.
- Coil Balance held Within One Turn.
- High Permeability Cores and High Q Geometry for good retrace time and foldover elimination.

TODD Green Band Yokes employ rigid Nylon segments for inter-coil isolation ... resulting in greater dielectric efficiency, and reduced danger of flashover. There is a TODD Green Band Yoke for every requirement and every application.

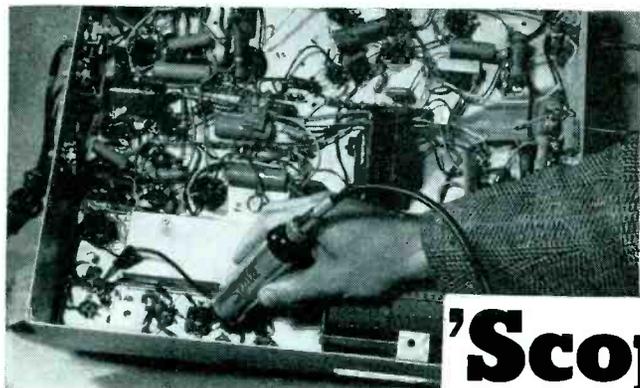


TODD Was First To Have Commercial Acceptance of a 90° Deflection System for 27 and 30 inch Picture Tubes.

T O D D - T R A N C O R P .

M O U N T V E R N O N 1, N. Y.

TV Chassis Checking and



Aligning with

'Scope and Probe

by BRUNO ZUCCONI

Scala Radio Company

Methods Available to Hunt Trouble With 'Scope and Crystal Diode Probe

IN TROUBLESHOOTING and alignment the *vtm* and 'scope are key tools, each playing a related role.

A *vtm* can measure *dc* resistance, *dc* voltage, and occasionally *ac* voltage. It can also measure the peak-to-peak voltage of a wave, as illustrated in Fig. 1, indicating voltage of the taller excursion; however, it reveals nothing of the smaller excursion. A 'scope goes a step further and shows the voltage of both components of the waveform, as the photo reveals.

In Fig. 2 we have another interesting type of waveform with both high and low-frequency components. The low-frequency component has the greater voltage, and thus this is the voltage indicated on the *vtm*. Usually this information is inadequate and a 'scope must be used to obtain complete information.

A *vtm* can be used to locate a shorted capacitor, but a 'scope has to be used to determine if it is open.

Manufacturers of TV receivers normally publish the correct 'scope waveforms and peak-to-peak voltages of these waveforms as an aid to future troubleshooting. To illustrate the value of these 'scope traces, let us analyze Fig. 3, where the screen bypass capacitor is open, causing screen degeneration to take place. Insofar as a *dc* voltage and resistance check is concerned, the stage will get a clean bill of health. But a 'scope test will show proper waveform and p-p voltage at the grid, *subnormal* p-p voltage at the plate, and *output waveform* at the

screen-grid terminal, analytical clues which aid the Service Man in pinpointing the trouble—the screen bypass capacitor.

Extending Frequency Range of 'Scope

Most service 'scopes will not respond to frequencies above 1 or 2, or at the most, 4 mc. Signal-tracing procedures required to locate dead or weak high-frequency stages, for example, require use of the 'scope at 20, 30, or 40 mc. Such frequency-range extension is commonly accomplished by use of a crystal probe.

A crystal probe used with a 'scope must possess several special features; unlike a probe for use primarily with a *vtm*, it must rectify the *rf* component of the signal, but it must pass the modulation envelope of the signal into the vertical amplifier of the 'scope. Accordingly, a 'scope probe must have certain filter characteristics determined by the service applications which it is designed to meet. For example, for application in video-amplifier adjustment, the probe must rectify completely and filter video frequencies from 100 kc to 4.5 mc, but it must pass undistorted a 60-cycle square wave. For application in *if* signal tracing, the probe must have a relatively high-

input impedance at 25 mc. up to 45 mc. For application in testing the output of a conventional sweep generator, the probe must be flat up to 225 mc. Since there are strong 60-cycle and 15.75-kc fields about a TV chassis, the probe must be properly shielded to avoid stray field pickup, even when connected to a high-gain 'scope amplifier. Because the probe must be used in cramped spaces, it must be well insulated to avoid shorts. Such a probe can be used to display *ac* waveforms in the presence of relatively high *dc* voltages, and hence suitable high-frequency blocking capacitors must be used in its construction. The crystal diodes used in such probes must not only have a high front-to-back ratio, but must also accommodate reasonably high *ac*-signal voltages without loss of sensitivity or burnout.

Locating a Dead IF Stage

In locating a dead *if* stage, a modulated *rf* signal is introduced into the antenna posts of the receiver. If a fairly strong TV signal is available from the antenna it can be used for this purpose; otherwise, the modulated output from a signal generator should be used to obtain sufficient input voltage. The output from the generator should have the same frequency as the channel to which the TV receiver is tuned. The probe should be touched successively to the grid terminals of the first, second, third and fourth *if* tubes, watching the pattern on the

Above: Crystal probe in use to trace an *hf* signal through an *if* amplifier. Antenna terminals are being swept by a sweep generator.

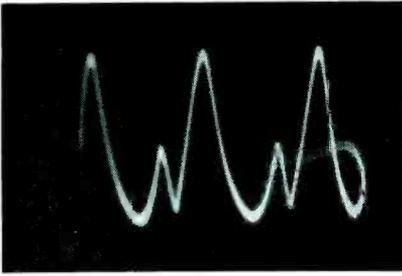


Fig. 1. Waveform with two components. A *vtvm* can indicate the voltage of the larger component, but does not reveal the presence of the smaller component.

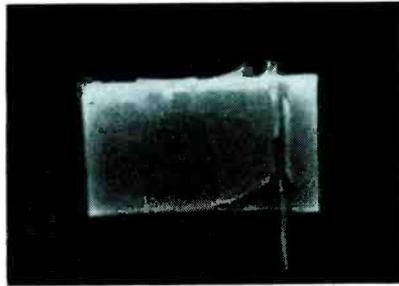


Fig. 2. A TV waveform with both horizontal and vertical frequency components. A 'scope is required to measure the individual peak-to-peak voltages of these components.

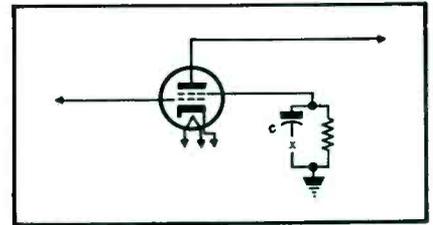


Fig. 3. Screen circuit of a beam-power tube, in which the bypass capacitor is open at X; a fault which can only be disclosed by a 'scope.

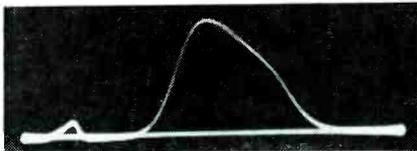


Fig. 5. Pattern obtained on screen of 'scope during the signal-tracing procedure. The relative height of the pattern from stage to stage shows the stage gain.

'scope screen. (The probe can be touched to the plate terminals of the tubes, if desired.) If the pattern disappears at any point, the stage can be assumed to be dead and troubleshooting is in order. The ratio of the pattern height observed from grid to plate of a stage is an indication of the gain of that stage at the frequency of test.

Viewing Response of Single IF Stage

The probe can be used to view the response curve of a single stage in a

Fig. 6. Closeup of crystal diode probe.



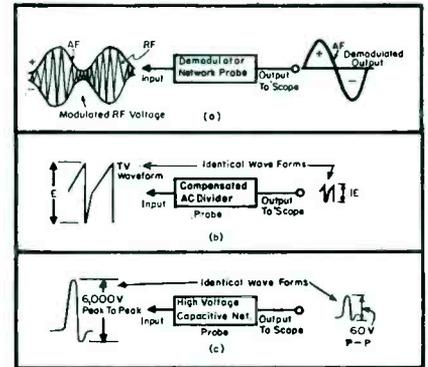
Fig. 7. To view the response of a single *if* stage the output from the sweep generator is applied to the grid of the tube preceding the tuned circuit to be tested, and the crystal probe is preferably applied at the plate of the tube following the tuned circuit to be tested; it is necessary to shunt a 200-ohm swamping resistor across the plate-load impedance of the tube to which the probe is applied, or the response curve obtained will not represent truly the single-stage response which is sought. The tuned-grid circuit, which is connected to the grid of the first tube, does not affect the response because the low impedance of the sweep output cable acts as a swamping resistor. The crystal probe is a necessary part of the test setup because the 'scope will not respond directly to the *hf* output of the sweep generator.

TV receiver, or it can be used to view the combined response of two or more stages. In this application, the circuit diagram for the receiver is first inspected to determine the particular coils which are to be tested. If a single coil is to be tested, the output from the sweep generator is applied to the grid of the tube preceding the coil; the sweep signal is applied through a .1-mfd blocking capacitor to avoid disturbing the grid bias of the tube. The crystal probe is then touched to the grid terminal of the tube following the coil, and the single-stage response curve will appear on the 'scope screen. The central purpose of this transformation is to obtain an impedance stepup at the input of the probe so that the field of application of the 'scope can be extended to TV circuits having impedances 10 times as high as could be normally tested without waveform distortion. Both the capacity and resistance can be varied to give correct ratio, regardless of 'scope variables.

How to Avoid Detuning

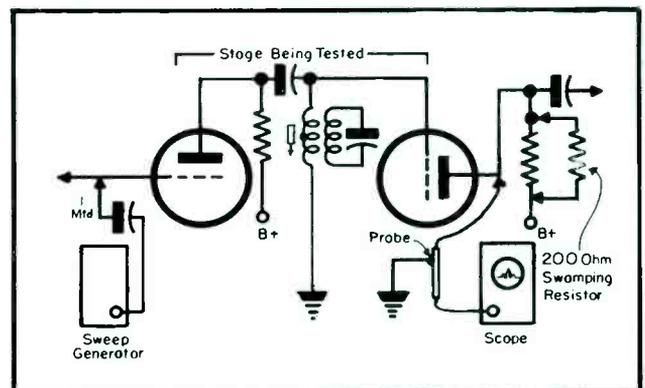
The operator should note that since the crystal probe has a small input capacitance, this test tends to detune the coil. To avoid this detuning, the probe can be applied to the *plate* terminal of the tube following the coil, provided a 200-ohm resistor is shunted across the plate-load impedance during this test. The 200-ohm resistor *swamps out* the resonant response of the plate load, so that the 'scope shows the true response curve of the grid circuit; at the same time, the tube follow-

(Continued on page 32)



(Fig. 4.)

A: Operational features of a signal-tracing (demodulator) probe. Like a *picture detector* in a TV receiver, the signal-tracing probe accepts a modulated *rf* signal, and partially rectifies and filters the waveform; the *rf* carrier component is rectified and filtered to *dc* voltage, but the modulation envelope is delivered as an *ac* voltage to the vertical amplifier of the 'scope. The *dc* component of the demodulator output is blocked by the series capacitor of the 'scope input circuit. **B:** Operational features of high-impedance video (low-capacitance) probe. Like the *compensated ac attenuator* in the 'scope itself, the low-capacitance probe accepts all video frequencies and attenuates them by a given amount (in this case 1-to-10), without introducing frequency discrimination or unequal time delay. Accordingly, the waveform is a replica of the input waveform. The central purpose of this transformation is to obtain an impedance stepup at the input of the probe so that the field of application of the 'scope can be extended to TV circuits having impedances 10 times as high as could be normally tested without waveform distortion. Both the capacity and resistance can be varied to give correct ratio, regardless of 'scope variables. **C:** Operational features of high-voltage (capacitive divider) probe. When a small high-voltage high-reactance capacitor is connected in series with a low-reactance capacitor and the arrangement is suitably calibrated, high-voltage waveforms above a certain limiting frequency can be safely applied to the input circuit of a 'scope for waveform inspection and peak-to-peak voltage measurement. In this manner the field of application of a 'scope can be extended into high-voltage circuits which would otherwise burn out the instrument. Suitable choice of reactance ratios provides a high-impedance input. Capacity network can be varied to give correct ratio regardless of 'scope variables.



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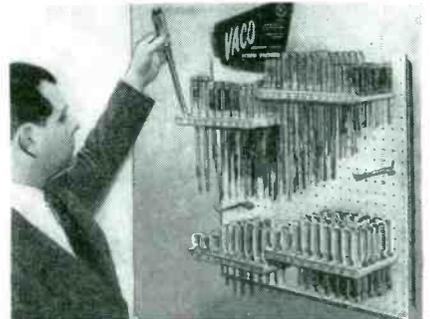
'Scope-Probe Checking

(Continued from page 31)

ing the coil isolates the probe input capacitance from the coil under test so that no detuning occurs.

The probe illustrated is provided with a short ground lead which must be used at all times. Some other and longer ground lead should not be used, as absurd indications will frequently result. When testing an *if* amplifier, the ground return should be made to the same point in the set as the grid return. The results obtained with the probe at frequencies above 100 mc will depend more upon the nature of the connections than upon any other single factor.

Tool-Part Displays



Merchandising display for screwdrivers. *Vario-Board*, announced by the Vaco Products Co., 317 E. Ontario St., Chicago, Ill. Board, constructed of multiple punched-out masonite, measures 24"x34" with four movable, self-anchoring wooden shelves 1" thick, 6" deep and 11" wide with individual holes for each driver.

Below: Rack displaying *ferris-loopsticks*, *vari-loopsticks*, and *TV-IF* signal boosters, announced by Grayburne Corp., 103 Lafayette St., New York 13, N. Y. Stand is built in a 3-level arrangement, and occupies 6" of front display space. It is being offered free to parts distributors as a package deal with the purchase of a combination of any 3 cartons of the above-mentioned Grayburne products.



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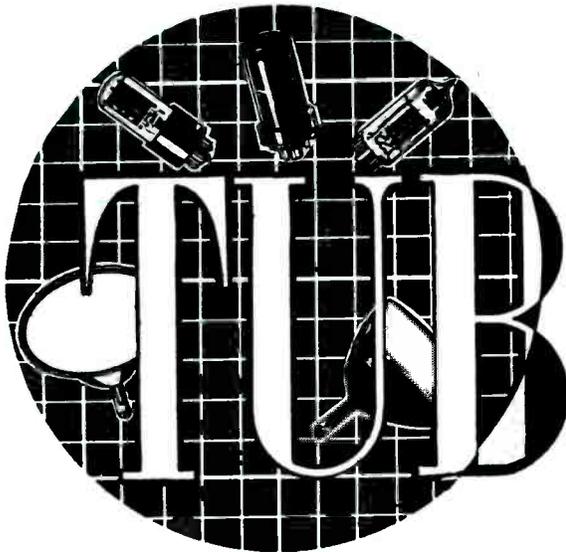
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TUBE

News

by L. M. ALLEN

High-Reliability Tube Characteristics . . . Features of Subminiatures and UHF/VHF TV Miniatures . . . Picture-Tube Design Notes

HIGH RELIABILITY TUBES, developed after World War II for the airlines and designed to function under extreme electrical and physical conditions not normally encountered in standard radio or TV sets, are now finding increasing applications in military and communications equipment. The demand has prompted the production of many types for a variety of purposes. According to E. F. Petersen of G. E. *hr* tubes will soon be available to fill 50 to 75 percent of the nation's receiving tube sockets in new military, communications, and industrial electronic equipment.

Lab and field tests have disclosed that *hr* tubes can reduce failures by as much as 10 to 1 in certain applications. The longer life possibilities and increased continuing efficiency afforded by the tubes, have attracted some TV and radio set makers who have indicated that the use of such tubes might

Quilted flannel-lined picture-tube cover designed to fit any size tube. (RTL-40; Rytel Electronics Manufacturing Co., 9820 Irwin Ave., Inglewood, Calif.)



prove to be a boon to sales. It was noted though that the current higher price of the tubes could restrict general use.

Available now from one manufacturer* are sixteen *hr* tubes:

HR Type	Description	Standard Prototype
GL-5654	Sharp cutoff <i>rf</i> pentode	6AK5
GL-5670	High - frequency twin triode	2C51
GL-5686	Beam-power amplifier	none
GL-5725	Dual-control sharp cutoff <i>rf</i> pentode	6AS5
GL-5726	Twin diode	6AL5

*G.E. *Five-Star*.

Picture-tube tester which determines tube defects and also checks filament voltage, first anode voltage, bias voltage and the video signal. With the unit, the TV picture tube can be checked without removing it or the chassis from the cabinet. (Kine-Test; Vidair Electronics Manufacturing Co., Lynbrook, N. Y.)



HR Type	Description	Standard Prototype
GL-5727	Thyratron	2D21
GL-5749	Remote cutoff <i>rf</i> pentode	6BA6
GL-5750	Pentagrid converter	6BE6
GL-5751	High-mu twin triode	12AX7
GL-5814	Medium-mu twin triode	12AU7
GL-6005	Beam-power amplifier	6AQ5W
GL-6072	Twin triode	12AY7
GL-6135	Medium-mu triode	6C4W
GL-6136	Sharp cutoff pentode	6AU6
GL-6137	Remote cutoff pentode	6SK7
GL-6201	Twin triode	12AT7

The GL-6072 is a low-noise, low microphonic twin triode intended primarily for use in the low level stages of high-gain audio frequency amplifiers. It is a direct replacement for the 12AY7, except for a heater cur-

(Continued on page 74)

TV picture tube test adapter for tube testers which is claimed to give a quantitative measurement of cathode emission, and tests for filament continuity and inter-element shorts. It comes with standard 12-pin TV tube socket, octal plug-in connector and features an extra long 4-foot cable that enables the picture tube to remain in the set while testing. (Type CRA; Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, New York.)



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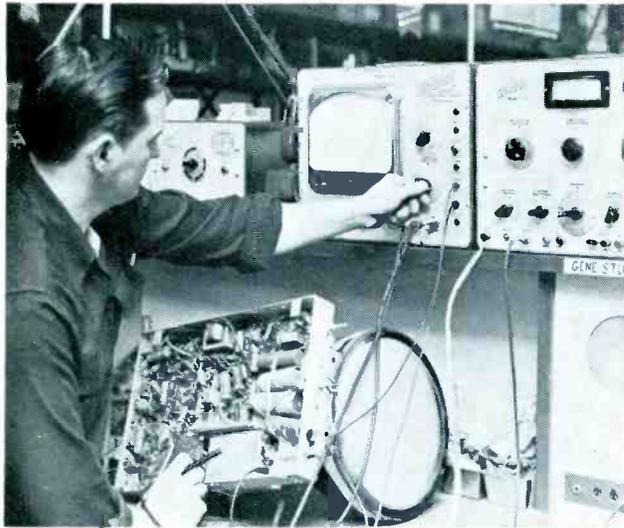


Using the VTVM in TV Servicing

TV Servicing

by JOHN B. LEDBETTER

Engineer, WKRC-TV



Left: A *vtvm* setup on a TV servicing bench. (Photo courtesy Mirus TV Service, Cincinnati, Ohio).

Application Procedures Which Can be Followed in Checking AFC and Discriminator Circuits, Bias, Germanium Diodes, Insulation Resistance and Receiver Adjustments

IN THE TV chassis, there are many portions of the circuit which can be checked quite effectively with a *vtvm*. To illustrate, the voltage developed in FM discriminator or *afc* circuits can be measured directly at the discriminator and at the grid of the oscillator control tube with a *vtvm*. With one model[‡], the zero center-scale *dc* voltmeter is very useful in adjusting the frequency response of discriminator circuits for zero voltage output. When the circuit is being tuned, the pointer will swing to either right or left, indicating the polarity and approximate amplitude of the *dc* voltage being developed. As the correct adjustment is approached, the meter sensitivity can be increased by shifting the selector switch to a lower voltage range. On other types of *vtvm*'s, the polarity and

approximate amplitude of each half of the discriminator voltage wave can be measured by switching the voltmeter selector from *B+* to *B-*.

The *agc* voltage developed by the incoming signal can be measured at the grids of the *rf* or *video if* tubes being controlled, at various distribution points along the *agc* bus, or at the output of the *agc detector* or *rectifier*. Measuring the voltage at each point (while the *agc* threshold control is varied) will indicate whether a particular tube is being overloaded or whether the correct amount of *agc* voltage is being developed.

Oscillator Strength

Measurement of oscillator strength may be rather difficult in a TV receiver. However, since the negative *dc* voltage developed at the oscillator grid is always proportional to the strength of the oscillations, this check is sometimes helpful in determining the approximate efficiency of the oscillator. (This can usually be determined by substituting a new oscillator or low-voltage rectifier tube.) The relative

oscillator strength on different channels can be determined by taking comparative readings for each band while the fine-tuning control is adjusted from minimum to maximum. (Similar measurements can be made on AM, FM, or short-wave receivers, the comparison readings being taken for each band, while the tuning capacitor is rotated from its minimum to maximum range.)

Receiver Adjustments

The voltage developed in the video channel of a TV receiver can be accurately measured with the *vtvm* across the video detector load resistor. This measurement is helpful in locating, orienting, or matching the antenna; tuning out transmission-line reactances; checking booster amplifier efficiency; or using the receiver as an

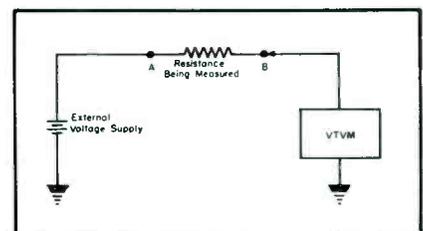
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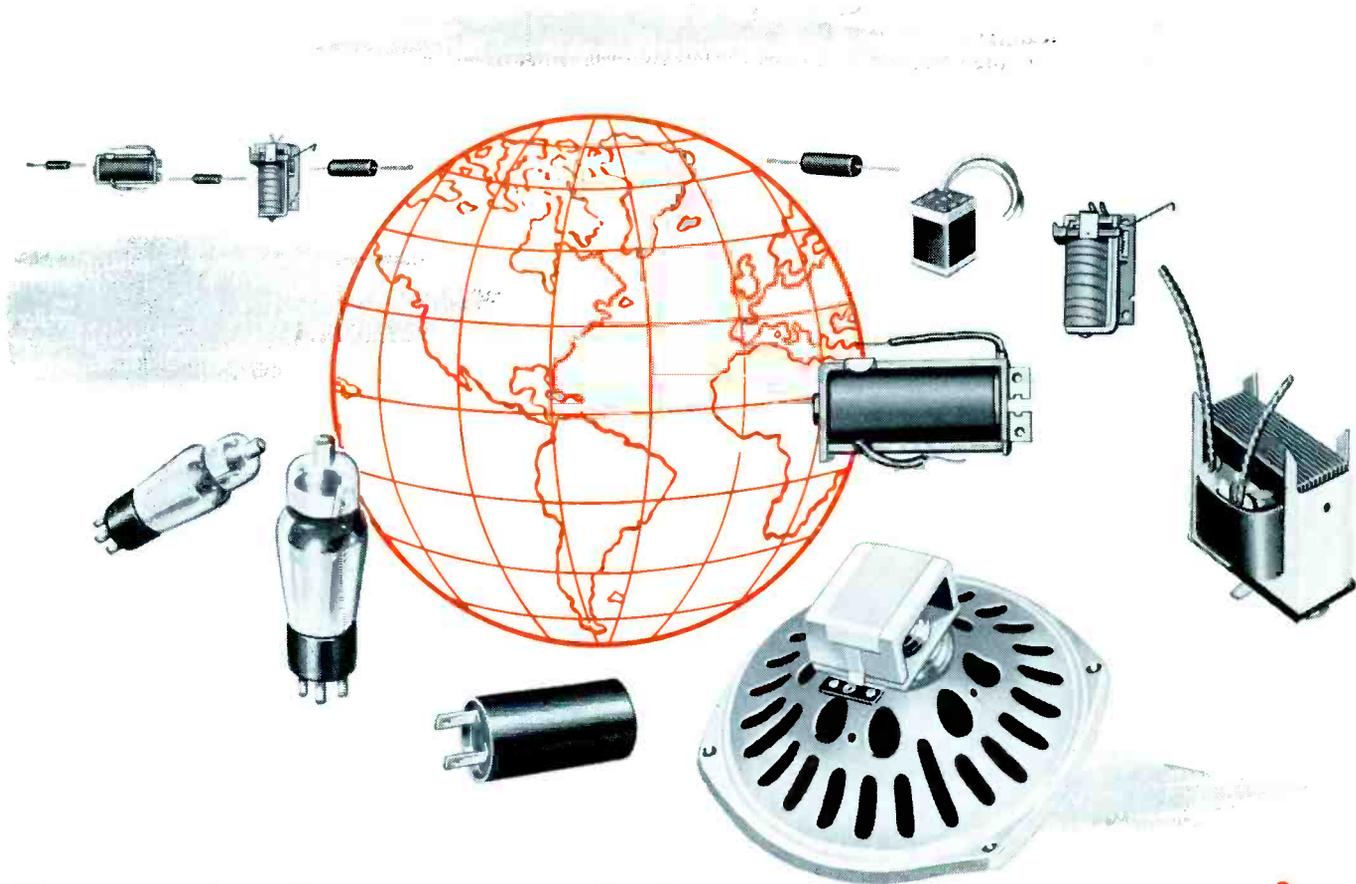


(Left)
A *vtvm*** with a probe***.

[‡]RCA VoltOhmyst.
^{*}RCA WV-75A. ^{**}RCA Advanced Volt-Ohmyst. ^{***}Insuline 316.

Fig. 1. Circuit for measuring resistances above 1000 megohms with a *vtvm**.





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TRIO ANNOUNCES SENSATIONAL NEW ZIG-ZAG ANTENNA

Patent Pending

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Plus

★ **All-Channel VHF Performance!**

Here's the greatest advance in TV antennas since TRIO'S introduction of the dual channel yagi! The sensational new TRIO ZIG-ZAG antenna is basically a multiple element yagi type antenna on each channel, yet one 2-bay antenna — and in some models a single bay antenna — covers all VHF channels!

This sensational antenna has sharper directivity and higher front-to-back ratio. It provides snow-free pictures and fade-free sound even in the most remote fringe areas.

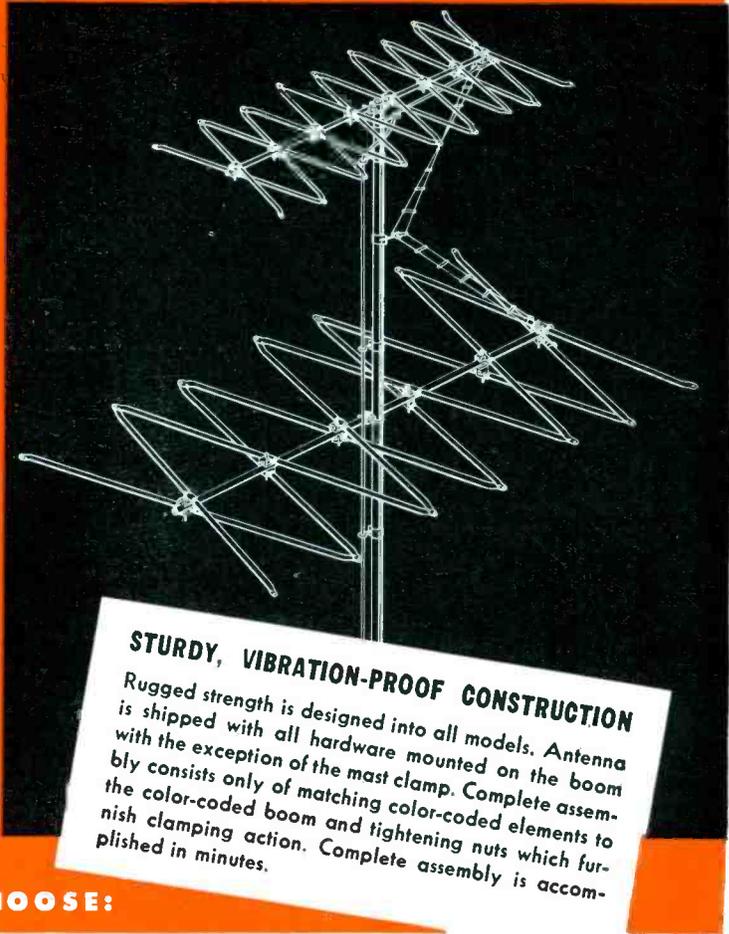
Tremendous forward gain is accomplished without long bulky, arrays that operate on only one channel. With the new fringe area model ZIG-ZAG antenna, one bay provides tremendous gain on all low channels, 2 thru 6, and the other bay provides similar high gain on channels 7 thru 13.

HOW THIS AMAZING ANTENNA WORKS

Trio ZIG-ZAG antennas utilize a new principle whereby an array is composed of a series of elements, one or more of which is resonant on any one channel while the remaining elements, which are non-resonant on that channel, provide parasitic voltages having the proper phase relative to the direct voltage. These act as very efficient directors and reflectors. All elements are directly connected to the feed-line.

The various models, listed below, are designed to provide a simple installation for all areas, from metropolitan to extreme fringe. Two bay models, like the single bay models, are operated with a single 300 ohm lead-in to the set, with less than a 3:1 standing wave ratio.

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ZZ12L

ZZ16H

FOR EXTREME FRINGE RECEPTION — ZZ16H provides over 14 DB voltage gain as compared with a resonant reference dipole on Channels 7 thru 13; and ZZ12L provides gain of 12 to 14 DB on Channels 2 thru 6. Gain of the ZZ12L is 12 DB on Channels 2 and 3 and is 14 on Channels 4, 5 and 6. These models have narrowest forward lobe and highest front-to-back ratio and should be used in areas where co-channel interference is a problem.



ZZ8L

ZZ8H

FOR NORMAL FRINGE RECEPTION — Where maximum gain is not necessary, these models are ideal. The ZZ8H for Channels 7 thru 13 and the ZZ8L for Channels 2 thru 6. Voltage gain is 9 DB on Channels 2 and 3 and 11 DB on Channels 4 thru 13. These models have patterns comparable to a well designed multi-element single channel yagi.

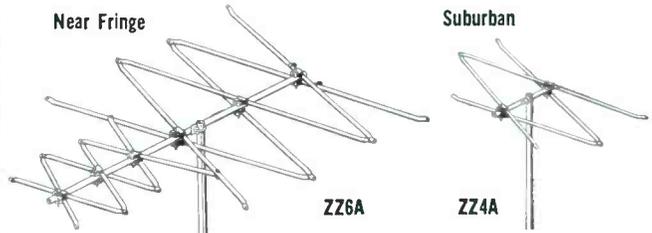


WRITE FOR CATALOG

ZZ6L

ZZ6H

FOR NEAR FRINGE RECEPTION — These models provide a voltage gain of 8 to 9 DB on Channels 2 thru 13. These models have pattern and gain comparable to a cut-to-channel yagi. ZZ6L covers Channels 2 thru 6. ZZ6H covers Channels 7 thru 13.



Near Fringe

Suburban

ZZ6A

ZZ4A

SINGLE BAY ALL-CHANNEL RECEPTION — Model ZZ4A is a single bay antenna providing adequate gain and directivity on all channels, 2 thru 13, in suburban areas. Model ZZ6A is also an all-channel single bay antenna providing greater gain for near fringe use.



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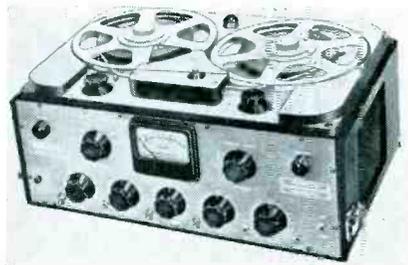




Transcription players for operation at 78, 45 and 33 1/2 rpm. Equipped with a built-in lighted stroboscope speed control. Amplifier employs a 10 watt hi-fi push-pull circuit, with separate inputs for microphone, phono and radio tuner; the gain controls for these units can be mixed and faded. Tone control system is said to provide 15 db or bass boost at any setting of the volume control and 23 db of treble attenuation. Equipped with either crystal pickup or magnetic pickup. (TP17, TP17X; David Bogen Co., Inc., 29 Ninth Ave., New York 14, N. Y.)



Radio and 3-speed-phono combination, which features a 5-tube ac/dc superhet, separate tone and volume controls, and instant change-over phono-radio switch. The phono consists of constant 3-speed motor, dual needle arm, and 3-tube audio amplifier. (Model 550B; Clinton Radio and Phono Corp.)



Three-speed tape recorder which plays 10 1/2-inch NARTB reels and 5 and 7-inch reels. Has a push-pull 9-tube 12-watt amplifier. Mixing channels for mike, radio and phono input. (Tapesonic model 70; Premier Electronic Labs., 382 Lafayette St., N. Y. 3.)



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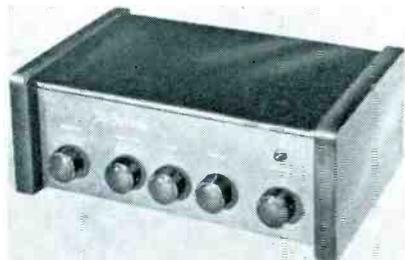
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Equalizer preamp with five input channels: TV audio, FM-AM tuner, low-level microphone, high-level magnetic cartridge, and low-level magnetic cartridge. There are separate, continuously variable bass and treble controls, providing 20 db bass attenuation and 20 db accentuate, independent of treble control; 15 db treble accentuate and 20 db attenuation, independent of bass control. Distortion is said to be less than 0.3% over the audio range, 20 cps to 20 kc, at 4 volts. Unit may be placed up to 30 feet from the power amplifier. (Models C-104 and C-104A; McIntosh Labs., Binghamton, N. Y.)

Remote-control audio system developed by Newcomb Audio.



AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

Design and Application Features of Hi-Fi Amp with Remote-Control System . . . New Audio Products: Three-Way Corner Reproducers . . . Equalizer Preamps . . . Duplex Speakers . . . Transcription Players

THE PRONOUNCED TREND to hi-fi has stimulated the development and production of an unusual assortment of audio components which individually and collectively could insure truly wide-range reproduction. To illustrate, recently, one manufacturer* designed a system composed of a preamp, 25-watt power amplifier¹ with a highly-damped output, and a complete remote control for the unit which can be placed up to 100' from the amplifier.

The remote control requires only one cable and as many as five 2X twenty-foot prefab cables can be used as extensions. The main operating controls are on the remote, and six inputs are on a shock mounted preamp installed on the main power amplifier. On the remote, a five-position selector provides for a choice of low-frequency crossover points for domestic records, foreign records and the new AES response curve. It also automatically increases the overall gain when switched to a microgroove side. Another five-position switch provides four stages of record-condition compensation. A third switch selects the program material.

A compensated volume control maintains proper listing balance at reduced volume levels. Separate bass and treble tone controls provide for individual control of bass and treble response.

The main amplifier employs two 12AX7s, a 12AU7, two 6L6Gs and a 5U4G. The remote control unit uses two 12AX7s and a 12AV6.

Installation

The cable from the remote control to the main amplifiers can be run in

any convenient way along the floor molding or under the floor by drilling 1½" holes for the cable connectors. The cable should not be run alongside a power line such as a lamp ac cord, as it may cause hum pickup; nor should it be sharply kinked, or stapled tightly.

Since the various inputs are on the main amplifier, it must be placed near the record player, radio, etc. Using the shielded leads normally supplied with phono pickups, about five feet is the suggested maximum distance. However, by using good quality low-capacity shielded cable, as much as ten feet may be allowed between the amplifier and phono. The power transformer

end of the amplifier must be kept at least three feet from a magnetic or variable reluctance cartridge as these cartridges are very sensitive to hum pickup. The main amplifier must be located in a well ventilated place as the power and rectifier tubes generate considerable heat.

Audi-Balance Output

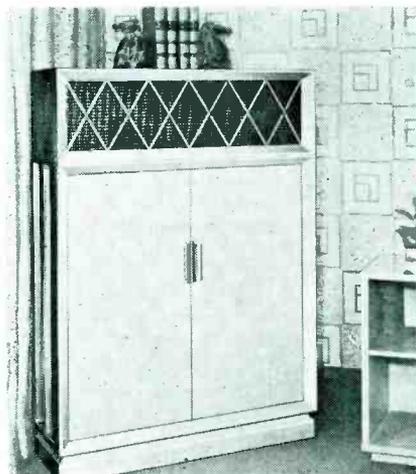
A unique feature of the amplifier is an *audi-balance* output designed to balance dynamically the output tubes and provide lowest distortion. To achieve *audi-balance*, an output balance switch, located between the output tubes and power transformer, is pushed to a special position and held there. Then an *output tube-balance control* is turned so that minimum hum prevails. This adjustment provides the dynamic balance.

Either low or hi-magnetic pickups or crystal cartridges can be used. Inputs are provided for magnetic cartridges rated at from 10 to 30 millivolts, and from 35 to 100 millivolts. Any wide-range crystal pickup that has a rated output voltage of .5 volt or more can be used. The amplifier is equalized for both crystal and magnetic pickups. However, some crystal pickups overemphasize the bass. In this case, a .1-megohm resistor should be installed across the cartridge pins.

A limiter control is provided in the amplifier to adjust the gain of the magnetic and crystal sections of the preamp.

The amplifier can be used with a phono, radio, TV or tape equipment. For the latter, there is a tape recorder

Three-way corner reproducer featuring a folded exponential horn for bass range, 250-cycle crossover and twin-cone driver for mid-range and high frequencies, horn-loaded. Bass range is reproduced by a 15-inch speaker driving a folded exponential horn. The walls and floor comprising the room corner form an extension of this horn. The middle register and high frequencies are reproduced by a twin-cone driver unit with a magnet producing a flux of 20,000 gauss. The twin-cone unit drives a horn which includes a reflector-diffuser element. The dividing network utilizes air-core coils of heavy copper wire, and paper dielectric, oil-impregnated capacitors. (Model 250; Brociner Electronics Laboratory, 1546 Second Avenue, New York 28.)



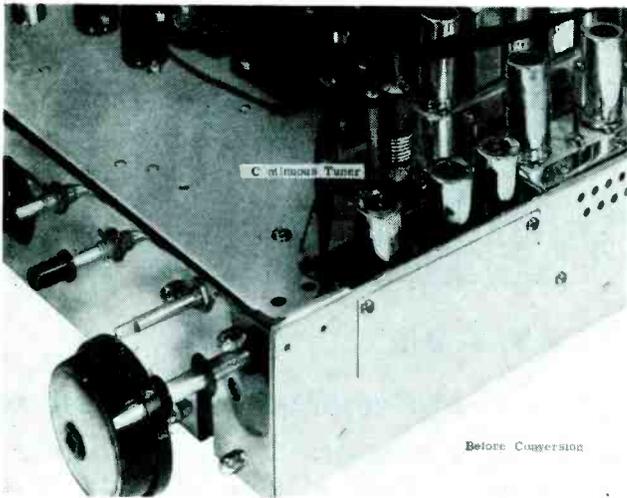
¹The frequency response of the preamp, remote control and power amplifier is claimed to be ±1 db from 10 to beyond 30,000 cps.

(Continued on page 103)

*Newcomb Audio Products; Classic 25 Home Phono Amplifier.

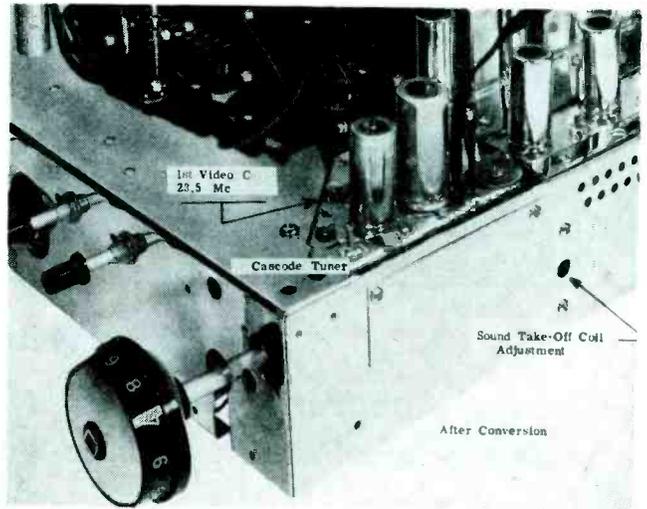
(Below)

Chassis before conversion.



(Below)

Chassis after conversion.



CASCADE Tuner Conversion

by **BERNARD A. MENARIK**

*Application Engineer
Radio Craftsmen, Inc.*

CASCADE TUNERS,* whose high-gain features have been widely applauded, are now becoming available for wiring into TV chassis.

Recently such a tuner† (turret type) was developed for the Radio Craftsmen models RC101, RC200, C101, C200 and C201.

Cascade Tuner Efficiency

The tuner is said to provide almost twice the sensitivity. (It is impractical, both from a mechanical and electrical viewpoint to try and replace the tuner in the earlier models RC100 and RC100A. There is no apparent advantage for the cascode conversion in large signal areas, since the sensitivity of the previous tuners is sufficient for normal picture operation.)

Tuner Installation

In preparing for the cascode tuner installation the leads of the old tuner

are unsoldered. The standard tuner can then be taken out by removing the mounting screws and sliding the tuner out towards the rear of the chassis. The next step involves the removal of the booster switch lever arm assembly, leaving the booster switch wired into the circuit with its slide switch pushed to the rear of the chassis. This switch position will produce the normal *if* response curve.

In Fig. 1 appears the proper color-coded wire connections; the tuner should be mounted first before proceeding with the insertion of the sound take-off coil assembly.

Sound Take-Off Installation

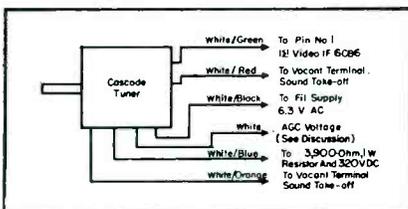
The sound take-off coil† can conveniently be mounted directly behind the cascode turret type tuner on the inside of the chassis proper. Chassis of the 101, 200, 201 type contain an

elongated hole on the front right side of chassis. This elongated hole now becomes a guide for the proper spacing of the holes which must be drilled for mounting. Using the elongated hole illustrated in Fig. 2 as a guide, a $\frac{5}{16}$ " diameter hole is drilled through the center lines. This hole serves as an entrance to the tuning slug when adjustment of sound take-off coil is made later. Again using the center lines, two $\frac{5}{32}$ " *D* holes are drilled, spaced $\frac{1}{8}$ " apart from the cross line of the drilled $\frac{5}{16}$ " *D* hole. Now the sound take-off coil assembly is mounted through the newly drilled holes, so that the shielded black wire appears closest to pin 1 of the first sound *if* tube, a 6AU6; Fig. 3.

Delayed-Graded AGC Used

To obtain optimum performance with the cascode tuner a delayed and graded *agc* must be wired into the circuit. This action correctly propor-

Fig. 1. Proper color code wire connections for cascode tuner in Radio Craftsmen TV chassis.



*Radio Craftsmen 5S019A.
†See page 68, this issue.
‡Radio Craftsmen 25B050.

Fig. 2. Mount holes for sound take-off coil.

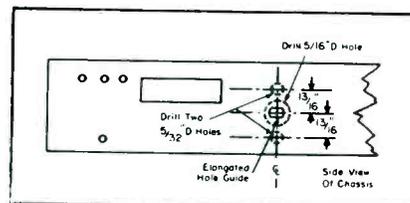
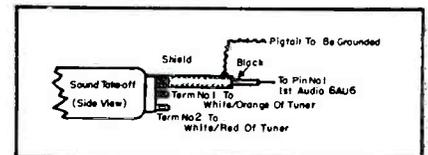
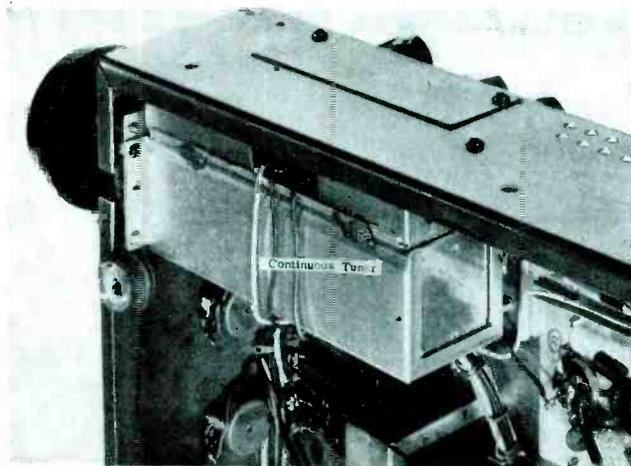


Fig. 3. Sound take-off assembly. A +130 lead should be added to terminal 2.



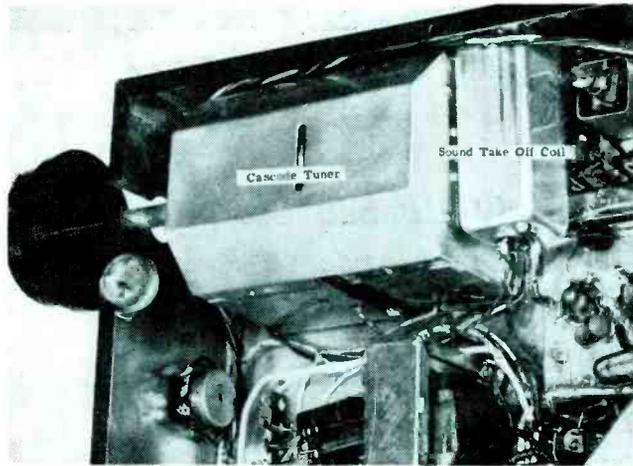
(Below)

Closeup of receiver showing continuous tuner in place.



(Below)

Closeup of chassis showing cascode tuner installed.



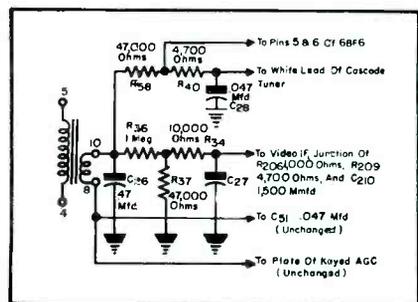
Tuner Substitution Steps Evolved to Permit Use of High-Gain Turret-Type Tuner Using 6BQ7

tions the gain of the *rf* and *if* amplifier stages for minimum snow in a fringe area picture, and prevents overload effects from strong signals. The key in determining what approach to use in *agc* circuit changes is to observe whether your Craftsmen model possesses a 16-kv high voltage transformer or a 13-kv transformer. In later Craftsmen models employing a 16-kv transformer,² a separate *agc* winding will be found on the transformer. Fig. 4 illustrates the circuit changes which should be made.

In earlier Craftsmen models employing a 13-kv high voltage transformer,³ no separate *agc* winding was on the transformer. When this type of transformer obtains the changes shown in Fig. 5 should be made.

R_{44} , a 10,000-ohm resistor, which is located in the 6AU6 keyed *agc* tube circuit, may be changed to 6800 ohms or may be completely shorted out.

Fig. 4. In chassis using 16-kv transformer with separate *agc* winding, circuit changes shown must be made to accommodate cascode tuner. The C_{27} capacitor should be a .47-mfd unit.



R_{41} (33,000 ohms) may be removed also. These two resistors should be altered as suggested to suit experimentally the general performance of the chassis in question because of varying inherent sync levels.

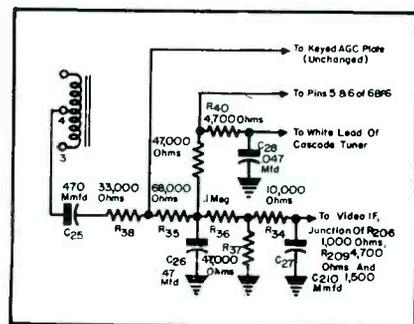
Generally, only a few of the original *agc* components change in value. However, the take-off connections are important and it would be advantageous to completely familiarize one's self with the original schematic and wiring layout and compare it to the proposed *agc* change.

Sync Amplifier

Some Craftsmen models⁴ contained a 6C4 sync amplifier which now must be changed to a 6BF6 to provide diodes for *agc* delay. The components of the 6C4 circuit remain unchanged. However, pin connections must be re-

²Part No. 19S016. ³Part No. 19S012 and No. 19S012A.

Fig. 5. Where the kv transformer (13 kv) does not employ a separate *agc* winding, the circuit alterations shown here must be made. C_{27} should be a .47-mfd unit.



wired and R_{57} wired to pins 5 and 6 as shown in Fig. 6.

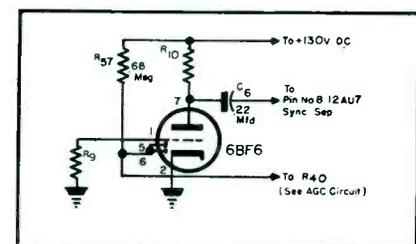
Sound Take-Off Alignment

After completing the installation and wiring, the receiver should be completely realigned. However, if no test equipment is available the sound take-off coil can be adjusted by completely unscrewing the screw adjustment of the sound-take of coil and then returning the slug approximately 17 complete turns inside the coil. Minimum volume control setting should produce no audio in the video pattern when the sound trap is adjusted correctly. This, of course, assumes that the local oscillator slug of the cascode tuner has been set to approximately the correct position of the received television signal. The slanting first video coil, as found on the top of the

(Continued on page 99)

⁴RC101, RC200, C101, C200 and C201.

Fig. 6. Pin connection changes required for 6BF6, which replaces 6C4, to provide diodes for *agc* delay. R_{10} is a 22,000-ohm resistor. R_0 is a 6800-ohm resistor. A 22,000-ohm resistor should be added from pin 7 to ground for best results.



FRINGE-AREA Servicing

by DONALD PHILLIPS

Carefully-Planned Broadcast and TV Chassis Repair Methods Found by Experience to Provide Best Results in Weak-Signal Zones.*

THE INSTALLATION and servicing of TV chassis or standard sets in areas beyond the normal receiving range represents quite a challenge to the Service Man's professional ability. Unlike the local-area installations, with plenty of signal to play with, the fringe zones normally demand the utmost in receiver efficiency for viewing or listening. Thus the Service Man is not only confronted with the problem of seeing to it that the set is installed properly, but that the absolute maximum in proficiency obtains on a continuing basis. It is the latter requirement that can be troublesome, if thorough know-how is not at hand. Receivers that lose their pickup ability in fringe areas often must be probed meticulously, stage by stage, to locate some wee part that is not up to standard.

Tubes represent a major problem in *weak-response* chassis. Often a tube that will respond in the *good* sector on a tube tester might fail to deliver satisfactory performance in a set. Such results are not the fault of the tester. There are certain types of tubes that simply cannot be tested fully in the average tube-checker. Rectifiers, for instance, cannot be placed under full operating loads. Thus it is necessary to check plate voltages of the set. If they are suspiciously low, the rectifier should be replaced. If there is an increase of over 10%, the tube can be left in the set. Power output tubes also cannot be loaded to full output in

a tester. In this instance an audio signal should be applied to the chassis, noting the reading on an output meter across the voice coil. Then the tube should be replaced and the reading noted. For instance, with a 4-ohm voice coil, a 50L6 (rated at 2 watts output) would give a reading of about .7 volt for full output. Similar values may be calculated for any output tube, using the plate and screen ratings supplied in tube annuals.

The second detector tube stage can be another source of trouble; its efficiency can dip quite low without affecting the output noticeably; yet quite a bit of distortion is generated when this triode gets weak. The plate load resistors of tubes (12SQ7, 12AT6, 12AV6) commonly found in this stage, will run around .5 megohm, with grid resistors as high as 10 megohms. Plate load resistors which have increased in value can cause loss of gain. They should be checked and if they have increased more than 20% above rating, they should be replaced. A trace of gas in the tube, and coupling capacitor leakage will cause distortion. Leakage in the last coupling capacitor can also cause weakness. Open cathode bypass capacitors, when on the last audio tube, have also been found to cause a loss of gain. Second detector and audio driver stages may be tested by the same methods; a signal can be applied and the output voltage measured.

Often *if* amplifier tubes are left in chassis when they are actually weak

enough to be replaced. Replacing a weak *if* tube may not make too great an apparent difference in the audio output of the set, but there will be improvement in the selectivity and sensitivity. Oscillator-mixer and *rf* amplifiers are subject to the same troubles. A loss of conversion transconductance can cause fading, oscillator drift, and low sensitivity.

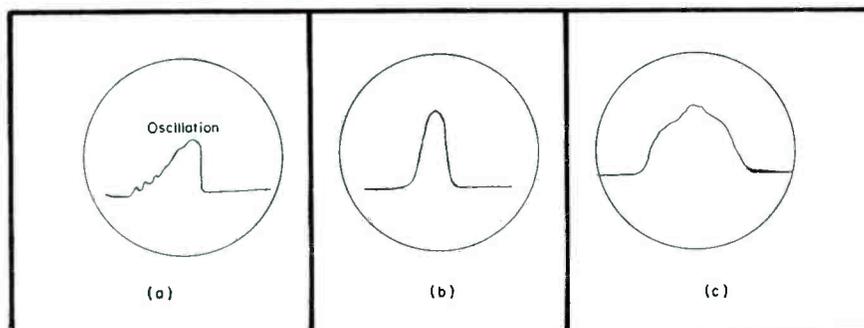
Customer resistance represents an acute problem in tube replacement, for often they cannot see a valid reason for putting in a new tube, when the old one seems to play just as good. Your 'scope and FM signal generator can come in quite handy at this point both for the customer and yourself. The use of these instruments can readily reveal when replacements are necessary. If replacements are really necessary, the 'scope pattern will almost double in height, showing graphically the need for a new tube. The same procedure may be adopted in testing *rf*, mixer or oscillator tubes. If a new tube is really needed in that particular stage, the increase in pattern height will tell you. You can also realign the stage in question while the 'scope is connected. If, as often happens, the *if* amplifier is oscillating or trying to howl, the effect will show up very plainly on the 'scope. Often, perfectly good tubes will have a tendency to howl and oscillate in an *if* amplifier. Replacement with another tube, sometimes of a different make, will cure the trouble. Excessive *swishing* or squealing when crossing stations has been traced to incipient regeneration in *if* stages. This may be corrected, most of the time, by a slight retuning. The curve shape should be altered until it agrees with that of Fig. 1b. The swishing will disappear.

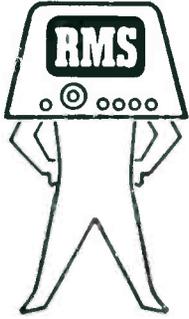
High-power-factor in filter capacitors can also cause oscillation troubles in the *if* and *rf* amplifiers. due to *common coupling* in the power supply. This can be checked while the 'scope is connected, by bridging the suspected capacitors with perfect units, and noting the change in the curve shapes.

[To Be Continued]

*Based on notes prepared by Jack Darr.

Fig. 1. Typical 'scope results. View in (a) illustrates trace produced when *if* amp oscillates. 'Scope display in (b) appears when *if* stage has been returned to eliminate swishing. In (c) we have the trace which will appear when the *if* is broadly tuned and lacks selectivity.

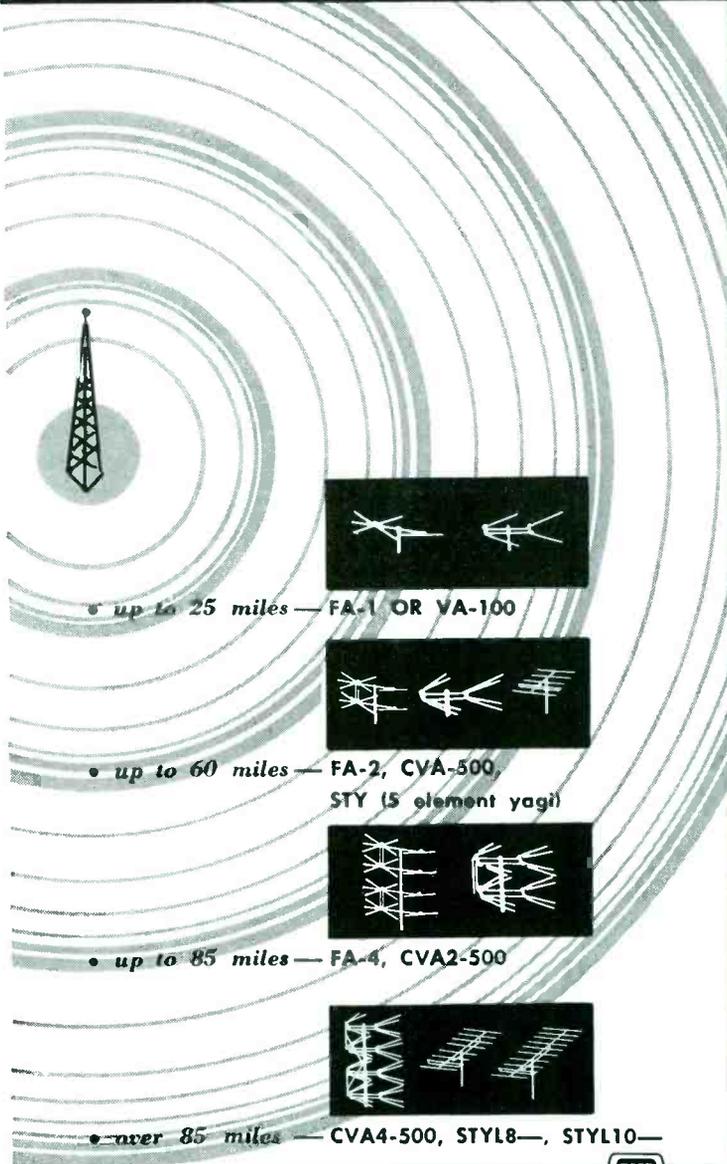




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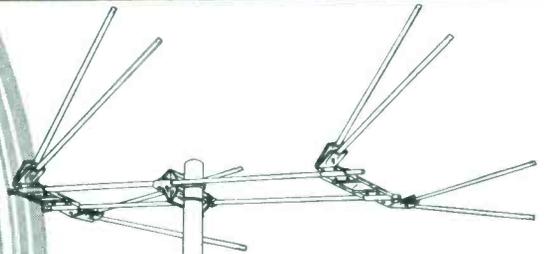
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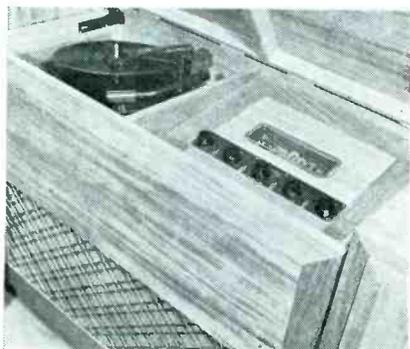
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Physical Mounting-Layout



Practical Installation Hints Which Have Been Found to Insure Best Results: Avoiding Undesirable Interaction Between Parts . . . Provision for Adequate Ventilation . . . Use of Proper Acoustic Design of Loudspeaker Mounts . . . Arrangements Which Afford Simple and Convenient Operation, and Facilitate Servicing

AUDIO COMPONENTS are occasionally mounted more or less haphazardly among various shelves and bookcases, with unlabelled control knobs distributed between the floor and the ceiling, and with some of the units installed in such a way that removal for servicing requires a minor carpentry job. Such an assembly *may* work well and may be fine for the hobbyist who is mainly concerned with musical results. For the Service Man, however, the assembly of custom audio components involves much more than a sequence of proper electrical connections. The professionally-built unit is expected to be attractive and convenient to use.

A mechanical layout of a radio-phono system, whether it is installed in a cabinet, in a wall, or on bookshelves, must be designed to meet the following requirements:

- (1) Avoidance of undesirable interaction between components.
- (2) Simple and convenient operation.
- (3) Adequate ventilation.
- (4) Easy servicing.
- (5) Proper acoustic design of the loudspeaker mounting device.

Interaction Between Components

There are two types of undesirable

interaction between components; hum pickup and acoustical feedback.

The danger points of hum pickup on the receiving end are low level tubes or parts (especially those parts of an inductive nature) with high amplification ahead of them. The most common sources of electromagnetic hum fields are inductive power components such as transformers and chokes. Thus the greatest care in physical layout will concern the location of magnetic pickups, or their associated preamps, in relation to power supplies or motors. When a separate preamp is used the assembly must be tested before the preamp chassis is mounted permanently, because a significant amount of hum may sometimes be induced over distances as great as half a foot or more.

Hum-Trap Layout

Fig. 1 illustrates a mounting arrangement which is a hum trap. The magnetic pickup is within several inches of the tuner power transformer when the changer base is pushed back into the cabinet and when outside-record grooves are being played. This layout problem appeared some years ago during an audio servicing assignment. Since it was not convenient to turn the position of the record changer or to move the tuner the problem had

to be solved electrically. A two-circuit radio-phono switch was substituted for the one that came with the tuner, the extra gang being used to disable automatically the tuner power supply when the selector switch was on *phono* position.

An acoustical feedback loop may be set up between the loudspeaker and susceptible low-level components such as microphonic tubes or tuning capacitors. The phenomenon is the same as that which occurs when a telephone receiver is held to its own mouthpiece. In the case of the radio with improper layout the back wave of the speaker is reintroduced into the signal channel through the vibration of microphonic parts, and the signal is built up, through repeated return to the input, into a self-sustaining howl. The danger of this effect appears when the reproduced sound has reached a certain intensity level, after which the sounds emerging from the speaker may be high enough to terrify any normal consumer.

The problem of acoustical feedback is only present in those installations where the speaker and low level stages are housed in the same cabinet. The conditions for feedback are especially favorable in cabinets of the totally enclosed type, where internal sound pres-

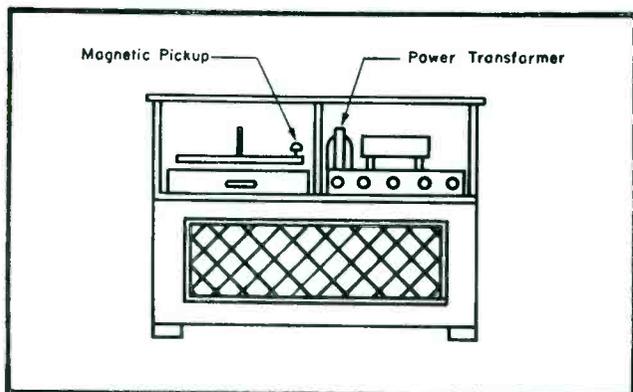
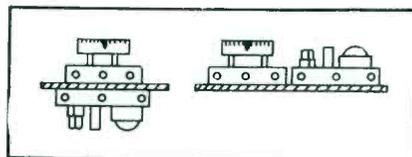


Fig. 1. Layout of components which involves danger of hum pickup: Power transformer and magnetic cartridge are too close to each other.

(Above, left)
Fig. 3. Sloping control panel.

(Photo by David Hebb)

Fig. 2. Two possible mounting layouts for tuner and amplifier.



of AUDIO COMPONENTS

by **MARK VINO**

asures build up to high values. Corrective measures include:

(1) Careful placement of low-level components relative to the back radiation of the loudspeaker.

(2) Replacing tubes which may be electrically perfect but microphonic; perhaps exchanging positions between two tubes of the same type.

(3) Hanging sound-absorbent material between the speaker and the microphonic component to act as acoustical shielding.

(4) Rubber shock-mounting of the chassis containing the microphonic part, or of critical tube sockets, to isolate them from cabinet vibration.

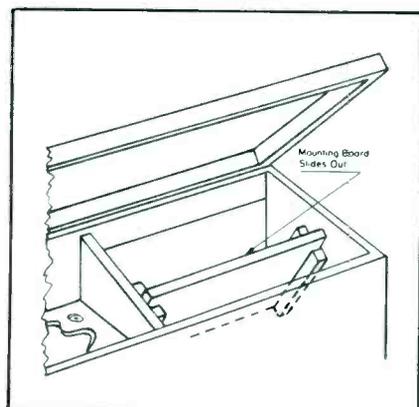
(5) Use of a separate speaker cabinet or mounting device.

Operating Convenience

One of the most important factors in this category is the location of all control knobs in a central, easily-accessible position. Tuners which include volume and tone controls solve the problem automatically, but such tuners are the exception rather than the rule, and audio controls are usually found on the amplifier proper or on a remote control unit connected to the amplifier. Thus the amplifier or control unit must be mounted adjacent to, over, or under the tuner; or long flexible control shafts must be used between the control panel and the amplifier. One disadvantage of such shafts lies in the danger of annoying backlash in the cable, although this feature is not unavoidable when good cable is used.

Two common arrangements for mounting the tuner and amplifier together are shown in Fig. 2. Installing an amplifier control unit upside down requires no special precautions, but mounting the entire amplifier in such

Fig. 4. Method of mounting equipment in a lift-top cabinet.



a position should not be attempted unless ventilation is very good, as heat from the tubes rises into the chassis. If the amplifier is to be mounted in other than a horizontal position it is necessary that a tube manual be consulted for mounting data on the rectifier and output tubes. For example, specifications on the 5Y3, a very common rectifier used in commercial amplifiers, indicate that a vertical position for the tube is preferred, but that horizontal operation is permissible if pins 2 and 8 are in a horizontal plane. A chart with mounting information for popular rectifiers and output tubes appears in Fig. 5. When the precautions listed in this chart are not heeded, premature tube failure caused by sagging elements may result.

The main control panel should be accessible to the operator with a minimum of stooping or peering. If bookshelf or wall mounting is used, the radio dial should be at about eye level; when this is possible the tuner should not be mounted on a lower shelf, merely because conventional radio dials are normally a few feet from the floor.

Lift top cabinets, although they are less popular due to the sacrifice of a useful table surface, provide an opportunity for mounting the equipment in

Tube	Function	Mounting Data
2A3	Power amplifier	Vertical mounting preferred, but horizontal mounting permissible if pins 1 and 4 are in horizontal plane.
5U4G	Rectifier	Vertical mounting preferred, but horizontal mounting permissible if pins 1 and 4 are in horizontal plane.
5V4G	Rectifier	Any position.
5Y3GT	Rectifier	Vertical mounting preferred, but horizontal mounting permissible if pins 2 and 8 are in horizontal plane.
6A57G	Twin power amplifier	Any position.
6B4G	Power amplifier	Any position.
5L6	Power amplifier	Any position.
6L6G		
6V6		
6V6GT	Power amplifier	Any position.
6X5	Rectifier	Vertical mounting preferred, but horizontal mounting permissible if pins 3 and 5 are in horizontal plane.
6X5GT	Rectifier	Any position.

Fig. 5. Tube mounting data. (From 1947 RCA Tube Manual)

such a way as to provide unusual ease of control coupled with pleasing appearance. Fig. 3 shows a cabinet with a sloped control panel like that of a broadcast studio control console. The sliding board on which the equipment rests makes installation and removal for servicing simple and fast, and the construction is such that any piece of furniture with a lift top can be readily converted to this design.

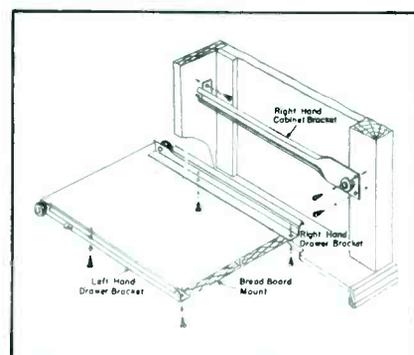
Unless there is some reason for keeping all components in their original condition, controls which are duplicated by a tuner and amplifier should not both appear on the control panel. Duplicate knobs tend to create confusion and can be responsible for improper operation of the set. The shafts of unwanted controls can be cut short and the corresponding panel holes omitted.

Most quality audio systems have at least five controls. It should be standard procedure to furnish labels for the function of each knob with decals, metal plates, or labels on the knobs themselves. All that is needed for the application of decals are scissors, a pair of ordinary tweezers, and a container of water. Instructions for use are provided when a book of decals is purchased.

If the record changer is located at the back of a cabinet or shelf where records cannot be loaded easily the changer base may be mounted on metal slides, which are inexpensive and are not difficult to install. When the slides come in different lengths, it is a good idea to buy the largest size that the cabinet will accommodate, so that the record changer will pull out as far as possible. Fig. 6 illustrates one method

(Continued on page 99)

Fig. 6. Changer base mounted on slide-rail slides. Other types of slides are made for installation underneath the base. (From installation instructions for the SC-30 slide drawer hardware kit, published by Webster-Chicago).



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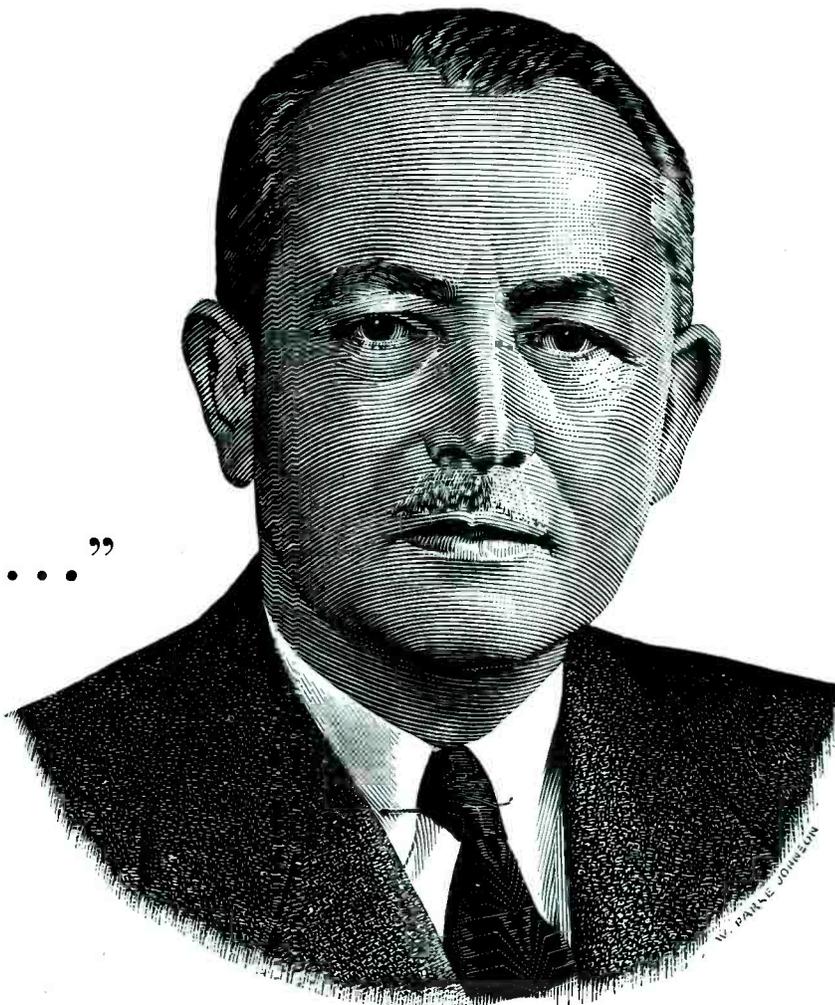
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SERVICE



UHF TV CONVERTER

by HENRY R. HESSE

Senior Engineer, TV Receiver Division
Allen B. DuMont Labs

AT THE ULTRAHIGHS, it is particularly important to minimize loss. Accordingly, in the DuMont *uhf* converter,* an *rf* choke serves as part of a low-pass filter to pass the *if* output of the mixer, to prevent loss of *rf* signal, and to reduce oscillator radiation. The other side of the crystal is connected to an oscillator injection network and a *pickup* tab. The oscillator injection network is inside the oscillator compartment to reduce oscillator radiation.

A uniform crystal current is important to maintain a constant crystal impedance at *rf* and *if*, and also to obtain a low noise figure. The injection network was designed to obtain a relatively uniform crystal current characteristic over the band. Because the pickup is capacitive, the injection will increase with frequency. The capacitor and inductance in this circuit are resonant near the minimum oscillator frequency and help to increase the injection at the low frequencies. A 68-ohm resistor limits the maximum impedance to 68 ohms at 400 mc. The impedance of the injection network is only 20 ohms at 800 mc due to the capacitor and 8 ohms at *if* due to the inductance. The injection circuit losses must be kept low since the network is in both the *rf* and *if* circuits.

Local Oscillator

The local oscillator circuit is a Colpitts type using a 6AF4 and is tuned by a tuner section between 395 and 810 mc. A .5 to .3-mmfd grid capacitor is used as a high-frequency oscillator tracking adjustment while a fixed 4-mmfd (N 750) grid capacitor is used for temperature compensation.

A special oscillator tube socket had to be designed because excessive capacitance and inductance encountered in conventional tube sockets prevented the oscillator from reaching the maximum frequency required. The socket contacts the tube pins very close to the glass envelope reducing the inductance to a minimum. Air dielectric between the grid the plate contacts

Part II . . . Characteristics of the Local Oscillator . . . Features of the Low-Noise 6BQ7 Dual-Triode Neutralized Cascode Circuit . . . Tracking and Alignment Procedures . . . Reception Report

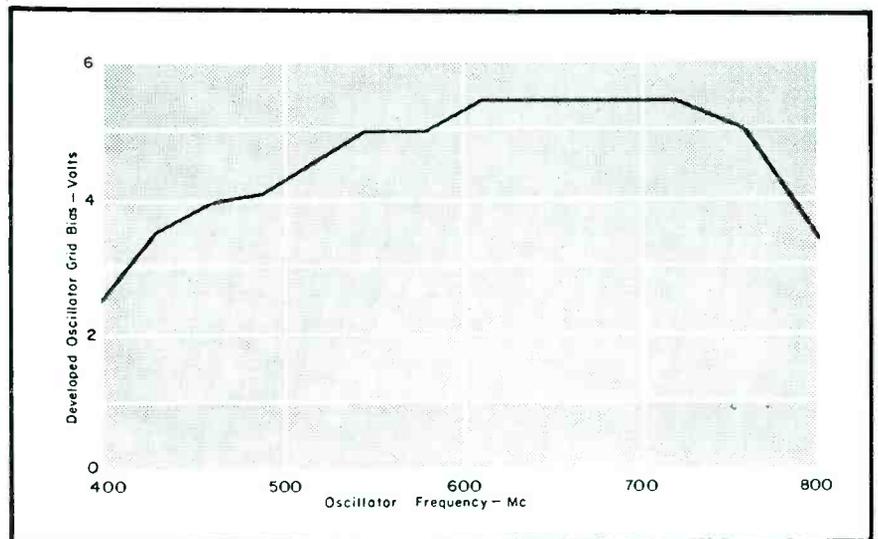


Fig. 1. Oscillator developed grid bias characteristic in *uhf* converter.

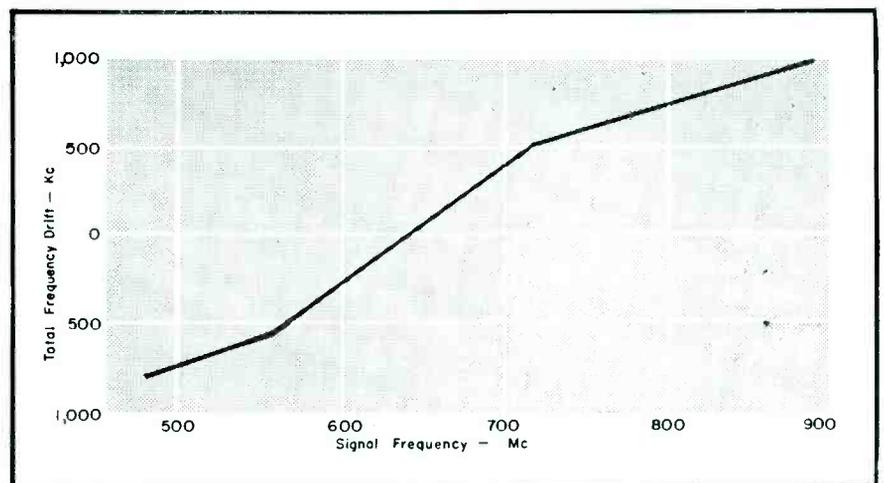
reduces the socket capacitance to a minimum. It has been found that some *rf* chokes develop parasitic resonances at *uhf*. Fortunately, a .5-uh choke has been found that has caused very little trouble. Eight of these chokes

are used in the local oscillator and preselector circuits. The oscillator performance as measured by its developed grid bias is relatively uniform.

Oscillator radiation is an important consideration in the design of a tuner

(Continued on page 77)

Fig. 2. Plot illustrating total frequency drift after two hours in cabinet with a temperature rise of 27° C.



*SERVICE, front cover diagram; August, 1952.

Servicing Helps

by M. A. MARWELL

Eliminating Electrostatic Charge in Metal Picture-Tube TV Chassis . . . Overcoming Vertical Drift . . . Increasing Picture-Tube Life . . . Correcting Small Horizontal Size . . . Avoiding Excess 25BQ6 Failures . . . Stopping Yoke Ringing . . . FM Oscillator Drift Cures . . . Installing Slow-Blow Fuses

DUE TO THE USE of the metal 21-inch picture tubes, several instances have been encountered in Stewart Warner 9209 chassis where an electrostatic charge has been developed on ungrounded metal receiver components such as the nameplate, speaker frame and the built-in antenna. In the case of the nameplate, a slight shock can be transmitted to the receiver operator. The voltage developed on the other two components becomes apparent as a typical snapping sound as the voltage discharges to a point of lower potential.

The coloring pigment on the black picture-tube mask can also provide a high-voltage leak path, and can create a condition where it is possible to draw a slight charge through the safety glass or cabinet front. This condition exists only on receivers using a black mask and can be eliminated by grounding the mask at one of the mounting screws. In all cases, grounding of these items will provide a remedy. First, the speaker frame should be grounded by soldering a wire from one of the connectors to the frame itself. A stranded wire should then be connected from one of the speaker mounting nuts to the lower mask mounting nut and then to the nameplate hinge mounting screw.

When the built-in antenna is connected for TV reception, it does not exhibit an arcing characteristic since

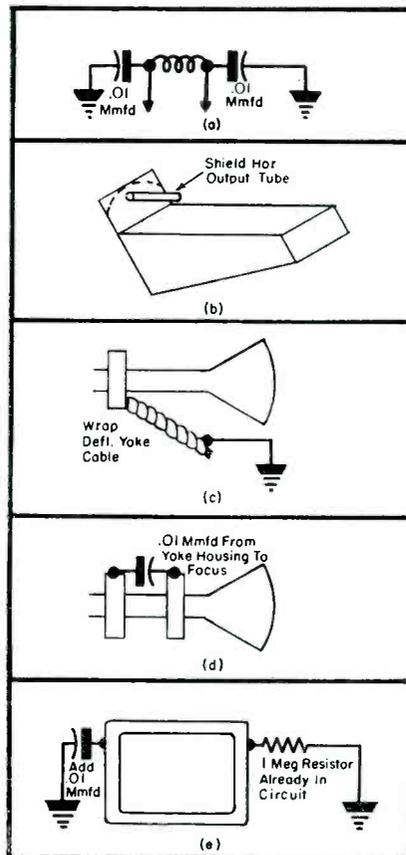
there is leakage path to discharge the voltage. However, when the built-in antenna is disconnected, one side of it should be connected to chassis ground. This can be accomplished by securing the built-in antenna lug under the speaker grounding nut. After these components have been grounded, all dust should be removed from the picture tube face and also from the high voltage insulating sleeve.

Vertical Drift

Some Stewart Warner 19-tube TV receivers have been found to suffer from a drift condition. This should not be confused with vertical instability due to electrical interference or weak signal. The drift becomes apparent after the receiver has been placed in operation for some time. The picture may start to roll vertically and this can generally be corrected by resetting the vertical hold control. Within a few minutes, it may be necessary to again reset this control and in general this amount of adjustment would suffice for that period of receiver operation. However, after the receiver has been shut off for any length of time, similar readjustment would again be required after it was turned on.

This unstable condition has been found to be a characteristic of certain 6BL7GT tubes and the only cure is

*Sylvania.



How to eliminate horizontal oscillator harmonic radiation, which affects AM reception: A pair of .01-mfd capacitors should be connected from each side of the ac input to ground, if there is no filtering in chassis. The horizontal output tube should be completely shielded. Extreme caution should be observed in shielding, so that sufficient circulation is allowed inside the shield to prevent overheating of the tube. Wire mesh or perforated metal can be used. The deflection yoke cable should be wrapped with aluminum foil or aluminum back tape. The foil or tape should be grounded well to the chassis. A .01-mfd capacitor should be placed from the deflection yoke housing to the focus assembly or other positive ground. On receivers using canvas helting picture-tube mounting straps, a .01-mfd. capacitor should be placed from the front metal picture tube mounting band to ground; in parallel with a 1-megohm resistor which may be in circuit. (Courtesy Philco)

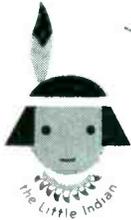
to undertake tube replacement. An improved version of this tube* has been found to provide the answer to this problem; it is identified by a star adjacent to the code date on the base.

Increasing Picture-Tube Life†

There are some picture tube defects which can be overcome by Service Men with the aid of special equipment. Such deficiencies normally involve low cathode emission resulting in poor brightness, and electrical leakage such as cathode-grid leakage resulting in poor brightness control, internal arcing, etc. Low emission can be corrected by reactivation and tube brightening processing.

Reactivation duplicates a process used in almost all picture tube factories. It

†Based on notes supplied by H. Suesholts of Transvision.



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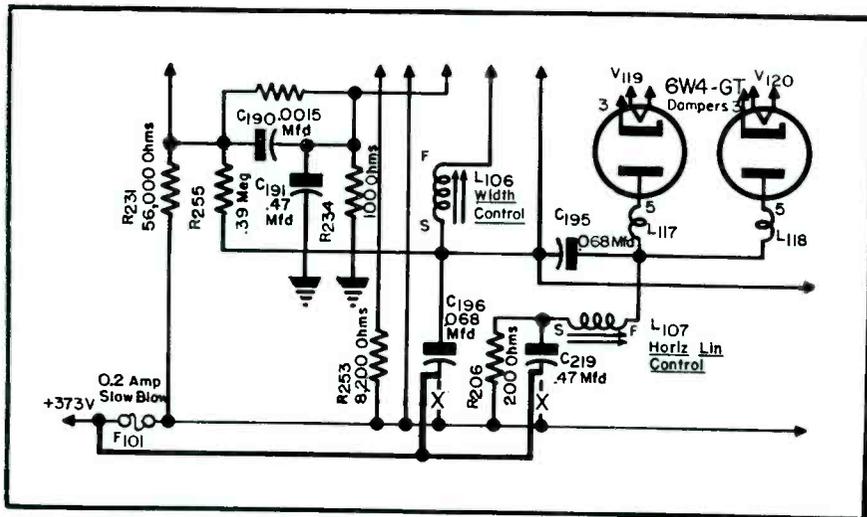
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Partial schematic of RCA 21-inch TV chassis, illustrating circuit changes required for slow-blow fuse installation.

consists of raising the cathode temperature considerably above normal temperature while at the same time drawing a heavy grid current. This grid current is many times the normal emitting current of the cathode.

It is important that this current be limited to a value which is not heavy enough to lift the cathode coating from the cathode.

In the plant this process is called *aging*, and is based on the following theory of operation:

Low emission is due to the disappearance of the pure barium from the cathode surface. All materials emit electrons, but certain materials are better emitters. Pure barium is one of the best of all.

To get sufficient emission, pure barium must always be present on the cathode surface. In the manufacturing process, the function of the aging process is to cause the deposition of pure barium on the cathode surface.

During the life of the tube, barium is continuously being replaced on the cathode surface, as the old surface is evaporated or poisoned by the barium combining with the gas in the tube.

If this surface is not replaced as quickly as it is used up, then the tube becomes dimmer and dimmer until it can no longer be used.

Reactivation tends to reverse this process so that the rate of formation of a pure barium surface is increased. Once emission increases because of this, the rate of ionization of residual gases in the tube increases. Since ionized gases are picked up by the getter in the tube more easily than gases which are not ionized, the poisoning of the barium surface is reduced. Thus, a reactivated tube has good prospects of staying good for a long time.

Another means of increasing emission is the insertion of devices in the

filament circuit of the tube. Increasing the cathode temperature usually increases the emission because emission increases with an increase in cathode temperature on a bad tube; (on a good tube, emission does not increase because it is stabilized by the space charge effect).

In cases where such devices are used, it is best practice to utilize as low a filament voltage as possible because increasing the filament voltage can cause serious side effects.

The increased temperature causes a marked increase in electrical leakage in the tube. This is not noted when the set is turned on but usually becomes serious after the tube has reached maximum heat ($\frac{1}{2}$ to 1 hour later).

This leakage effect acts as a high resistance short between the tube elements, resulting in poor brightness control, internal arcing, and a number of other defects.

In general, it may be stated that reactivating devices and tube brightening devices are valuable tools for the Service Man. Neither work in all cases although both give a high percentage of good results.

Tests have shown that a tube which cannot be reactivated cannot be satisfactorily improved by a brightening device, but many tubes which do not improve with a brightener, might be successfully reactivated.

Electrical leakage develops on almost 10 per cent of all tubes during the life of the tubes. Ordinarily, tubes defective because of this must be discarded. However, a low cost sparking device¹ is now available which reduces this leakage, allowing the tube to operate normally.

RCA Service Tips**

A new fuse, replacing F101, has been incorporated in both the 17 and

¹Transvision.

21-inch television receivers. It is a slow blow type and is intended to reduce fuse blowing due to surges. The new fuse is rated at 0.2 ampere and is carried under stock number 76801. It can be identified by a small spring enclosed at one end.

Most early production 17-inch receivers have a 2-watt wire wound resistor (R_{234}) in the cathode circuit of the 6BQ6GT. Such receivers will need no modification if the slow blow fuse is installed in the field. A few 17 inch receivers have composition type resistors in the cathode circuit. If a slow blow fuse is installed in such a receiver, the composition resistor should be replaced with a 180-ohm, 2-watt, wire-wound type (stock number 766-39).

All early production 21-inch receivers employed a composition type resistor (R_{234}) in the 6CD6G cathode circuit. If a slow blow fuse is installed in one of these receivers, the composition resistor should be replaced by a 100-ohm, 2-watt, wire-wound resistor (stock number 74015). Late production receivers employ the wire-wound resistor.

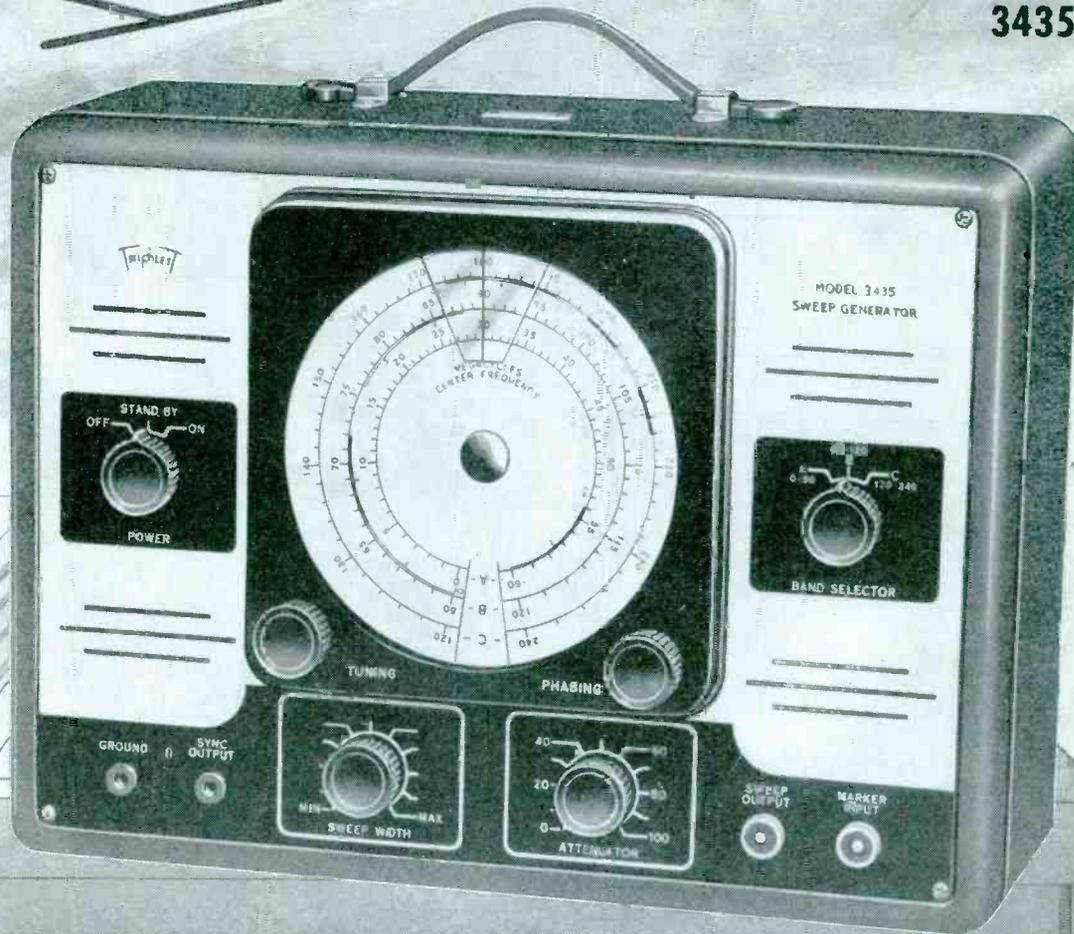
In a few 21-inch receivers, the slow blow fuse has been known to fail due to *ac* from the sweep circuit flowing through F101. To eliminate this difficulty the factory has made a wiring change: C_{190} (.068 mfd) and C_{219} (.047 mfd) were changed from their original connection and reconnected to the +373 volt bus side of the fuse as shown in the partial schematic diagram above, at left.

As a field service convenience if a slow blow type fuse fails in an unmodified 21-inch receiver, it should be replaced by a quick blow type (stock number 73600). However, if an unmodified receiver is brought into the shop for service, C_{190} and C_{219} should be reconnected and a slow blow fuse installed.

Socket Connections to 1B3GT Rectifier . . . RCA Models 17T150-1-3-4-5, 17T160-2-3, 17T172-K-3-K-4-K: In some KCS66 series RCA chassis, the 1B3GT socket terminal 5 has been used as a tie point. It has been found that some brands of tubes have an internal jumper in the tube base between pins 5 and 7. Such tubes will not operate in the KCS66 series chassis wired in this manner. To avoid this difficulty, a tube which does not employ a jumper between pins 5 and 7 should be used; the 1B3GT tube socket should

**Notes on 17T150, 17T151, 17T153, 17T154, 17T155, 17T160, 17T162, 17T163, 17T172, 17T172K, 17T173, 17T173K, 17T174, 17T174K, 21T159, 21T165, 21T176, 21T177, 21T178 and 21T179 TV models.

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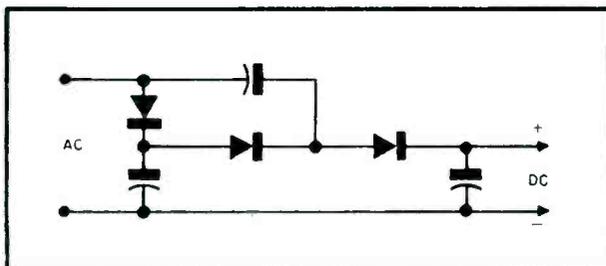
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Below: A voltage-tripler circuit using selenium cells. In this arrangement, the no-load dc output voltage is equal to 4.24 times the ac rms input voltage. In the case of a 117-volt ac supply, this circuit provides a transformerless arrangement delivering a no-load dc output voltage of 496. The voltage regulation is about 40% when using 40-mfd capacitors and about 28% when using 100-mfd capacitors, together with 200-ma miniature rectifiers for the screen and plate voltages in the low-level stages of TV sets. (Courtesy International Rectifier Corp.)



be rewired so that terminal 4 is employed as the tie point instead of terminal 5; if the tube has a jumper between pins 5 and 7, pin 5 should be clipped off the tube base.

Gin-Pole Installation

The gin-pole described in the article covering ropes and ties in antenna installations, which appeared in the April issue of SERVICE, can be made much easier to handle by substituting large harness snaps for the permanent rings on the guy ropes, at the top of the pole. In this fashion, the ropes can be removed and coiled up separately, making the outfit much easier to carry and put up. The pulley and hoisting ropes can also be connected by snaps. These can be obtained at a hardware store.

Stromberg-Carlson Service Suggestions

Non-use of 6SN7GTA tubes in Horizontal Oscillator Position (300 and 400 series): It has been found that 6SN7GTA tubes do not oscillate as rapidly as 6SN7GT tubes in the horizontal oscillator position, particularly when rapidly switching from radio or phono position to TV position or rapidly turning the set on after turning it off. When the oscillator does not immediately oscillate, there is no drive to the horizontal amplifier thus causing the high voltage fuse to blow repeatedly.

Correcting Small Horizontal Size (421 chassis): At normal line voltages, some of these receivers will produce second anode voltages in excess of 18 kv, often resulting in insufficient picture width. This second anode voltage can be reduced and sufficient width obtained by connecting a 60-mmf, 3-kv mica capacitor in series with

a 560-ohm resistor between terminals 3 and 7 of the horizontal output transformer. The resistor must connect to terminal 3 and the capacitor to 7 to avoid corona.

The R_{203} screen-dropping resistor for the 6AV5 horizontal output tube, has also been decreased in value from 15,000 to a 12,000-ohm value.

Motorola Service Notes

Excessive 25BQ6 Failure . . . TS-325 and TS-326 series: Due to heater-to-cathode flashovers in some 12AX4 tubes, some chassis require frequent replacement of the 25BQ6 horizontal output tube due to open heater. This trouble has been traced to a heater-to-cathode arc caused by the high-voltage pulse on the 12AX4 cathode flashing over to the heater, and may be remedied by installing a disc-type 5000-mmf ceramic capacitor from pin 7 of the 12AX4 damping diode (V_{216}) to ground. The chassis ground kickout immediately adjacent to pin 7 should be used. The capacitor serves to bypass the pulse and prevents the breakdown. For a more balanced heater-current distribution, in case of heater failure in one or the other of the parallel-heater strings, the 25BQ6 and 25L6 heaters should be interchanged in the heater circuit. This serves to protect filter capacitor C_{250A} in the case of the 25L6 heater failure.

Failure of Yoke Damping Resistors . . . TS-325, TS-326 and TS-351 chassis: There have been a few failures of the damping resistor across the horizontal-deflection coil in replacement yokes. A one-watt resistor should be employed in this position in place of the 1/2-watt resistor originally used, which it appears will not withstand the high-voltage pulse.

Yoke Ringing . . . TS-325, TS-326 and TS-351: The value of the shunt

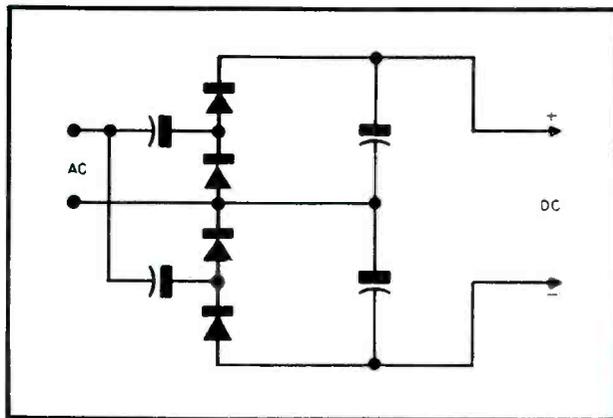
capacitor, C_{255} , is rather critical in the deflection yoke, and ringing can result if it varies too much from optimum. A 27-mmf capacitor used in earlier yokes has been found to be too low for distributed capacity yokes used in present models. Although 47 mmf is about right for the present yokes, 50-mmf and 56-mmf capacitors have been used. If ringing is encountered, the capacitor should be replaced with one of correct value through experimentation; the capacitor must have a 2,000-volt rating.

No AGC due to Faulty 6CB6 Tubes . . . TS-325, TS-326 and TS-351 series: Some 6CB6 tubes have developed a high-resistance leakage between grid and filament in these chassis, which will adversely affect the agc so that either an overload condition or loss of sensitivity results. It has been found that, in many cases, the defective tubes will show a high-resistance leakage between grid and filament when measured cold with a v_{rvm} .

Audio Beat on Channel 7 . . . TS-325, TS-326 and TS-351 chassis: An audio beat on channel 7 can be corrected by replacing the shielded contrast lead with an unshielded lead. The shielded volume-control lead originally was routed between the 9-terminal strip and the audio if strip. This lead should be rerouted to the other side of the terminal strip to minimize the 4.5-mc pickup in the lead. The ground lead from the center pin of the ratio-detector socket (V_{208} , 6AL5), originally dressed over the 10-mmf electrolytic (C_{244}) to a chassis ground kickout, should be moved from this kickout to the kickout near the tube socket on the video if side.

Oscillator Drift in FM Receivers. . . Excessive frequency drift in Motorola FM sets manufactured between '49

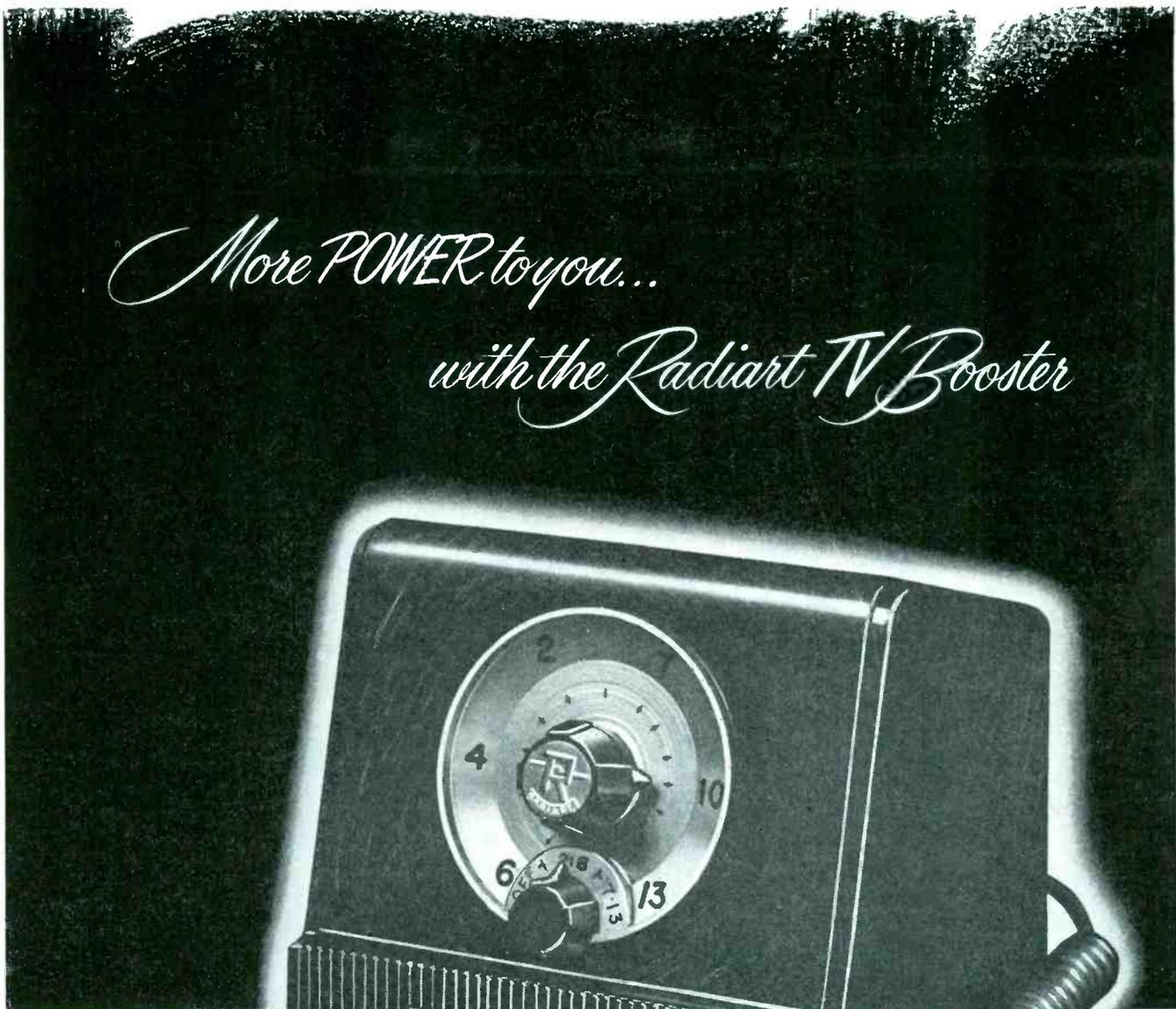
(Continued on page 78)



Above: A voltage-quadrupler circuit, with two half-wave voltage doublers and their ac inputs connected in parallel, and the dc outputs connected in series. The no-load dc output voltage delivered equals 5.65 times the ac rms input voltage. Thus, with an ac input voltage of 117, the dc output at no-load will be 661 volts. Voltage regulation when using 40-mfd capacitors is about 88% and about 36% when using 200-mfd capacitors. (Courtesy International Rectifier Corp.)

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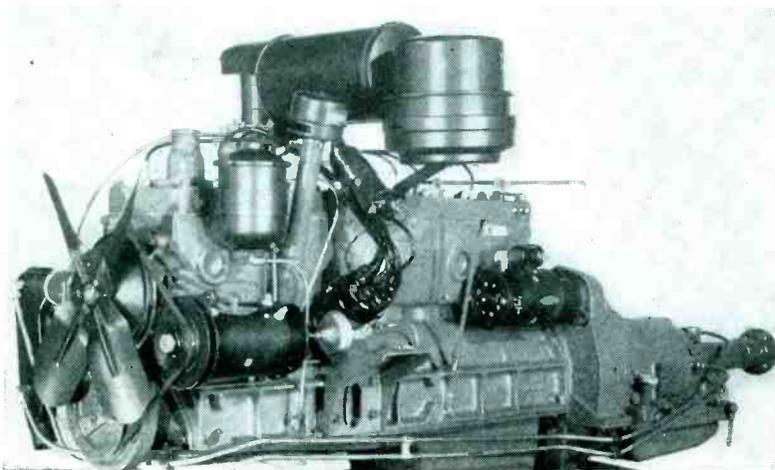
SERVICE, SEPTEMBER, 1952 • 57

Auto Radio

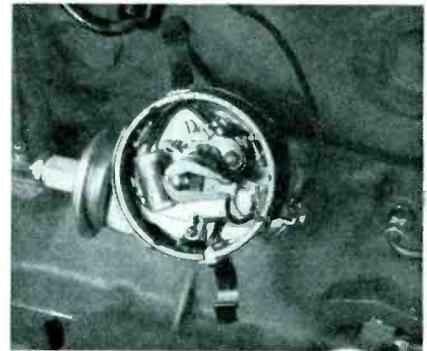
Interference Problems

by SOLOMON HELLER*

Part II † . . . Sources of Troubles in Ignition System, Generator and Wheels (Static) and Cures... Application of Signal Tracer for Interference Hunting.



Left: View of generator, fan belt and engine in a modern car.



Above: Closeup of distributor points.

THERE ARE THREE types of interference-suppressing devices frequently incorporated into cars, either by the auto manufacturer, or by the Service Man who installs the car chassis:

(1) *Distributor suppressor*, a specially-designed resistor that is inserted between the ignition coil and the distributor as close to the distributor as possible. Its resistance is in the vicinity of 10,000-20,000 ohms. The distributor suppressor does not materially reduce the high voltage passed on to the distributor; it does, however, reduce the *rf* energy present, by using it up in the form of heat losses in the resistor.

(2) *Sparkplug suppressors*, which are also resistors of a specially-constructed type, resembling distrib-

utor resistors. The resistance of a spark-plug suppressor may be greater than that of a distributor suppressor. Sparkplug suppressors were often used in series with the sparkplugs (one for each sparkplug) in cars built years ago. Modern cars seldom use them, since they tend to reduce the intensity of the spark formed at the spark plug, and may thus affect motor performance. In some auto-radio installations, the presence of an acute interference problem may have necessitated their insertion.

(3) *Bonding units*. Bonding is the technical term used to describe the establishment of a good electrical connection between various metal units in the car, and the car chassis. Bonds are short pieces of flexible metal

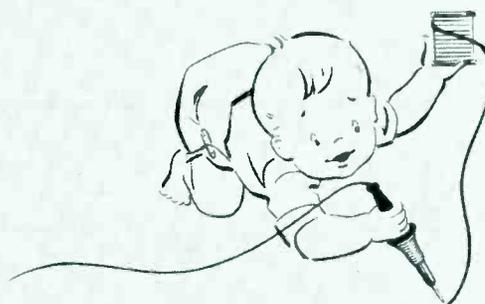
(usually copper), especially constructed to permit the making of good electrical ground connections. Very little bonding will probably be found in new cars.

The theory behind bonding is: When a difference in potential exists between two metals (a certain amount of insulation, or poor contact, must be present for such a potential difference to arise), an arc-over or discharge will take place between them. This discharge will occur at an irregular rate, at frequencies covering the entire radio spectrum. If units like the steering column, oil pipes, flexible cables passing through the dash, etc., do not make a good electrical connection to the dash (the dash is the metal partition between the motor compartment

*Co-author of *Television Servicing*.

(All photos and illustrations courtesy Packard Motor Car Co.)

†Part I appeared in the June, 1952, issue of SERVICE.



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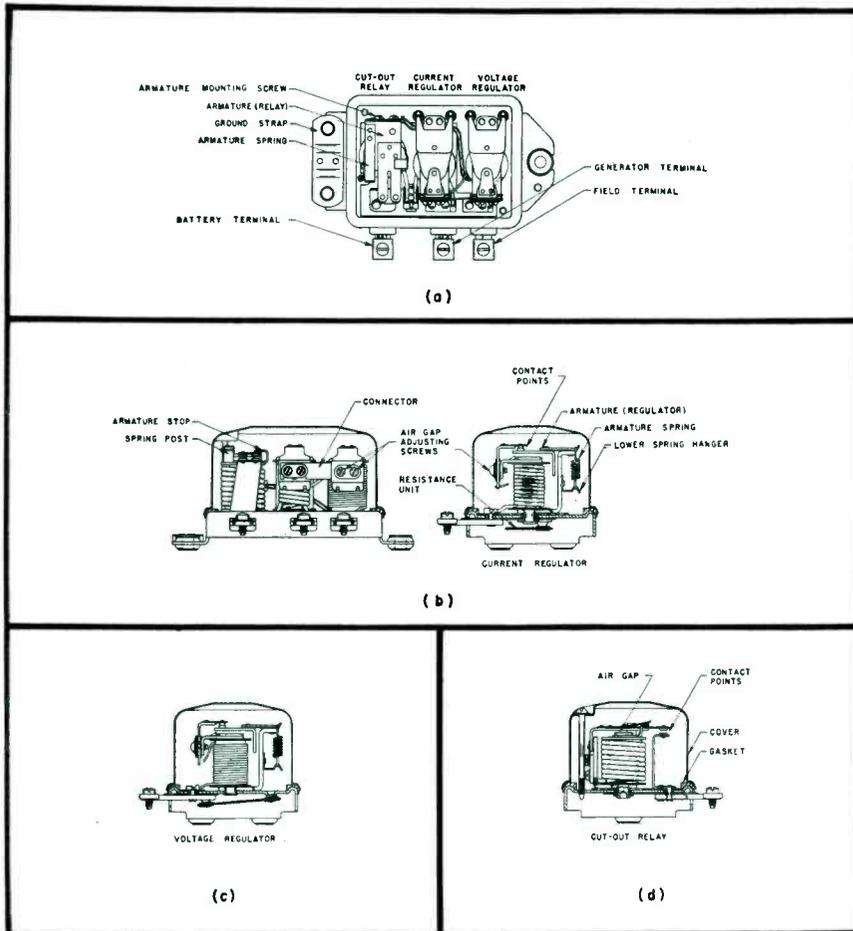
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Views of current and voltage regulators (a), current regulator (b), voltage regulator (c) and cut-out relay (d).

and the front seat), ignition signals can build up a potential along these units, making them *hot* with respect to the car chassis, and causing them to act as transmitting antennas.

Preventing Interference Thru Bonding

When the Service Man performing an auto-radio installation, is confronted by interference arising in this way, he may bond various units coming out of the dash to the latter, to prevent it. If these bonds should loosen or break—an unlikely eventuality, but possible—ignition interference may be heard. This is mentioned so that the Service Man, checking for ignition noise sources in a car previously free of this trouble, may know where to look.

When removal of the antenna decreases the noise considerably, the antenna should be grounded to the car frame. There are special antenna plug-in units available that facilitate the making of such a test. If the interference stops completely, any bond present on the motor hood should be checked (if a cowl or roof-type antenna is present) since a poor bond may be permitting ignition noise to get from the motor compartment to

the antenna. A poorly-fitting hood on which no bond is present can also be the source of the trouble.

Dome Light Noise

The ineffective bypassing of the dome light may be the cause of ignition noise pickup, if a roof antenna is present. If putting on the dome light reduces the interference noise, the dome light wiring is probably the cause of the interference. The dome light wiring acts as a source of interference because it functions as a transmitting antenna, radiating ignition signals to the car antenna.

The filter units on the dome light wiring have most likely become ineffective in such a case, and should be checked. A bypass capacitor, or a capacitor and an *rf* choke, at the point where the dome light wiring starts going up the corner post of the car, should be looked for in such a case, and visually checked for poor connections. It is unlikely that internal faults will be present in these units, because the voltages to which they are subjected are so low.

In the case of antenna or lead-in pickup, there are six possible sources

of trouble other than those described. These are:

(1) Imperfect ground contact on a shielded lead-in. Rust may have accumulated at the ground point, or points, to which the shield is connected, producing high-resistance contacts.

(2) Leaky high-tension cables in the ignition system; this trouble will probably affect the operation of the ignition system, as well as the radio.

(3) Loose connections in the ignition system.

(4) Improper motor operation. A motor that does not hit properly, or has other defects, can be a source of ignition-type interference.

(5) Distributor trouble; excessive spacing between the rotor and the points of the distributor.

(6) Defective distributor or spark-plug suppressors, located by visual inspection, or resistance checks. Defects in these sturdy units are rare. Also, defective spark plugs.

The electrical system of the car must be in perfect working order before interference-free performance can be demanded of the car's radio. An auto mechanic should, of course, check for those defects affecting the radio that the radio Service Man does not feel qualified to hunt for himself.

When removal of the antenna does *not* decrease ignition interference, direct chassis pickup is most likely occurring. A poor electrical connection of the radio receiver's metal case to car ground is a possible source of the trouble, and should be checked.

Another possible source of trouble is the hot battery lead connecting to the receiver. Interference may be invading the receiver through this lead. Any bypass capacitor present between the hot lead and ground should be visually checked for defects; it may also be bridged with an identical new unit, and results noted.

The ground connection of any unit in the ignition system or its vicinity should be checked, when the origin of chassis pickup is being sought. This connection may be a natural one, or it may have been improved by a bond. Units that may be found bonded include the engine, oil pipes, and flexible cables or rods passing through the dash.

The check referred to can be made by means of a twelve-inch file with an insulated handle. If the grounding of any unit (via the file) to the dash, or some other good car body ground point, noticeably reduces the intensity of the interference, an imperfect bond or ground at that point is indicated, and should be improved.

Another important source of interference in the car (beside the ignition

Introducing - an outstanding new cartridge
in smart new "jewel-case" packing

WEBSTER ELECTRIC
-the Featheride[®] MODEL BX

for RCA and COLUMBIA Replacement Use



The Model BX is packed (suspended, and with needle guarded) in a beautiful Tenite "jewel case" with hinged cover . . . a case for which you and your customers will find countless uses.

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in Columbia
record players.

for installation
in RCA series
RP 168 and RP 190
automatic record
changers.

for installation
in RCA series
RP 193-1 automatic
record changers.

SPECIFICATIONS AND DATA

- Application: 33 1/3 and 45 RPM records.
- Output (1000 CPS): .05—.75 volts.
- Tracking Pressure: 7 grams
- Cut-off Frequency: 7000 CPS.
- Weight: 10 grams.
- Size: See installation drawings.
- Construction: Moulded plastic half-shells.
- Mounting: Universal for RCA record changers and Columbia record players.
- Terminals: Pin type.
- Needle: Osmium tipped, replaceable.

The new Featheride Replacement Crystal Cartridge Model BX meets the rapidly growing demand for a superior replacement cartridge for RCA automatic record changers and Columbia record players. It offers unusually high fidelity. Compact and light in weight, it tracks perfectly at only 7 grams pressure.

Like all Webster Electric replacement cartridges, the Model BX is protected against moisture and humidity by the famous Dri-seal crystal construction. Each cartridge is furnished with a 1-mil osmium needle, bracket and spring for installing in RCA's 168 and 190 series arms, also spacer nuts for installing in RP 193-1 series arms. With bracket and spring removed, it may be installed in Columbia or other 1/2" mounting arms. Send for Catalog Sheet No. RC 189.

Webster Electric Co., Racine, Wis. . . . Established 1909

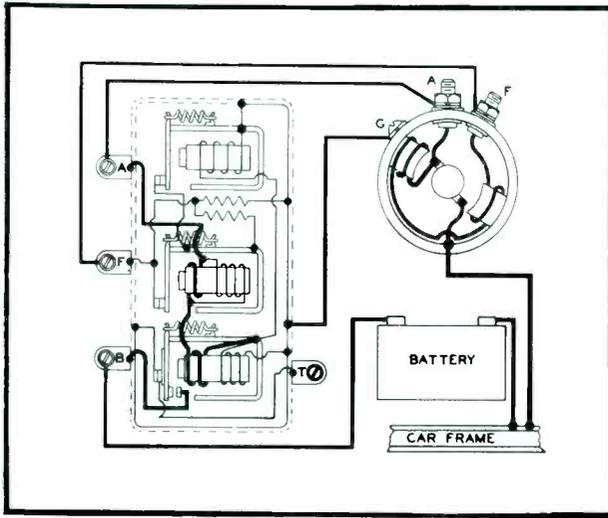
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Racine, Wisconsin

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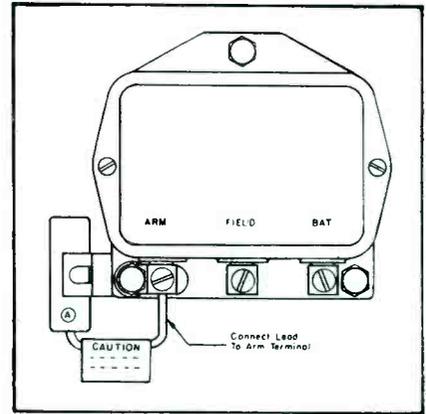
"Where Quality is a Responsibility and Fair Dealing an Obligation"



Left: Voltage regulator used in auto radio system.

Below: Voltage regulator capacitor installation.

(Courtesy Motorola)



system) is the generator. Let's briefly consider its function and operation, before we deal with the trouble it can cause on occasion.

In the course of supplying power to the ignition system and other electrical units in the car, the storage battery tends to run down. It can be brought back to full output by circulating a current from an outside source through it. The generator supplies this current.

The generator is similar to an electric motor. It is usually mounted at the side of the engine block and driven by the engine fan belt. (Sometimes a chain or gear is used in place of a belt.) The mechanical energy of the generator's rotation is transferred into electrical energy that is delivered to the battery.

The generator supplies current to the storage battery through a cut-out relay. The relay closes when the terminal voltage of the battery drops below that of the generator. The relay opens when the generator voltage falls below that of the battery (a condition that is present when the engine is idling), preventing a reverse current flow from the battery to the generator.

Current flow to the battery from the generator is regulated in modern cars by a voltage and current regulator. This unit keeps the current delivered to the battery within the required limits, and prevents the battery from being overcharged.

The generator is capable of causing considerable interference to the auto radio, since it contains a commutator and brushes, and sparking at the brushes produces *rf* noise signals. The regulator may add to this noise, due to sparking at *its* contacts.

A portion of the undesired *rf* noise is radiated; another part of it may be transferred to the radio through the battery lead.

To reduce this type of interference,

a bypass capacitor is connected from the generator armature terminal to a good ground point on the frame of the generator.

The characteristic noise produced by generator-type interference is a howling, whirring or whining sound. The noise is particularly noticeable when the motor is speeded up and the ammeter reads charge.

To determine whether the generator is causing the noise, the engine should be accelerated and the switch cut off. If the whine decreases in amplitude as the engine slows down and stops, the generator is the source of the interference. If no noise is noted the instant the switch is turned off, the generator is most likely to be the cause of the trouble.

The amount of interference produced by the generator depends on the condition of the brushes and the commutator. Steps to reduce or eliminate generator interference include the replacement of its bypass capacitor or the cleaning of the commutator. Sometimes voltage regulator contacts, or other trouble in the regulator, may require servicing.

Wheel Static

A third major source of interference is tire or wheel static. Wheel static is a relatively infrequent source of annoyance in modern cars. It is produced by friction between the road and the rubber tires of the car. Static electricity is generated by this friction, just as it is when a comb is run through dry hair. Electric charges accumulate on insulated substances on the tires, or on the metal wheels (when the latter are electrically isolated from the car body).

The charges leak off to the car body, or the road itself, at a rate determined by the quantity of charge present, and the nature and length of the

insulation between the *hot* or charged areas and adjacent ground points.

Static charges are built up in appreciable amounts primarily on hard-surfaced roads like asphalt or concrete. Dry sunny weather favors the development of wheel static. The build-up of electric charges occurs on all four tires, but the resultant interference is most often due to discharges from the front two only. The rear wheels, being grounded to the frame of the car through the axle, usually provide a very low-resistance path for the discharge currents; negligible potentials are, in most cases, built up at these wheels by the discharges occurring there.

The front wheels do not have such a good ground path. They may, it is true, be grounded to the body of the car through their axle, and the front wheel bearings. The bearings are, however, packed in grease, and the path to ground they provide is, for this reason, generally a high-resistance one. Large *rf* noise voltages may consequently be developed across this resistance.

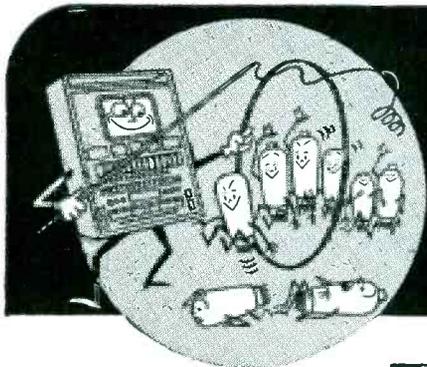
The *rf* noise created by wheel-static discharges is radiated to the car antenna. Pickup of this noise may be especially good (or bad) when an undercar antenna is present.

The build-up of wheel static has been reduced to some extent by the insertion of certain materials into car tires which make the tires slightly conductive, minimizing the development of a potential difference between the car wheels and the road.

The first problem the Service Man will face with respect to wheel static is, how to recognize its presence.

Wheel static may, in some cases, be heard as an almost continuous roar, resembling to some extent heavy static in home receivers. In other cases it may be less continuous in nature, and

(Continued on page 79)

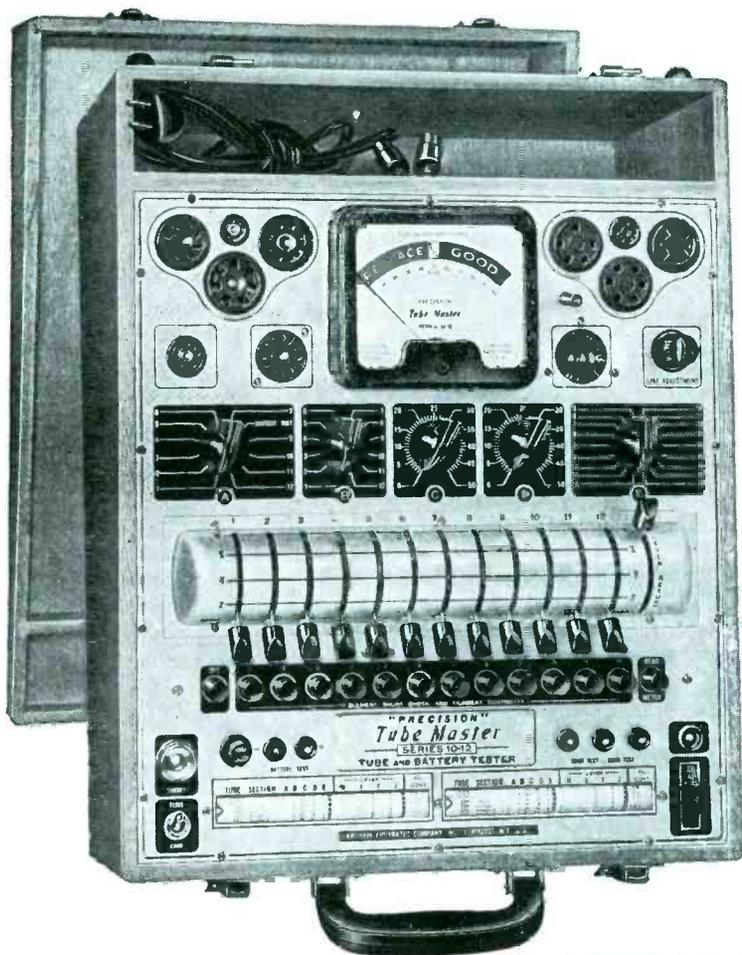


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Model 10-12-P (illustrated): in sloping portable hardwood case with tool compartment and hinged removable cover. Sizes 13 3/4" x 17 1/4" x 6 3/4" \$104.50
Model 10-12-C (Counter Type) \$109.25
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It has been conclusively proven that even though a tube may work well in one circuit, it might fail to work in another—simply because different circuits demand different relative performance characteristics, such as amplification factor, plate resistance, power output, emissive capability, etc.

In the PRECISION "ELECTRONAMIC" Circuit, the tube under test is made to *perform* under appropriately phased and selected individual element potentials, encompassing a wide range of plate family characteristic curves. This **COMPLETE PATH OF OPERATION** is electronically integrated by the indicating meter circuit in the positive performance terms of *Replace-Weak-Good*.

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ASSOCIATIONS



ARTSNY and the New York City License Bills

IN THE FALL OF 1947, prompted by the threat of an unfavorable licensing measure in New York City, the *Associated Radio-Television Servicemen of New York, Inc.*, was formed.

A code of ethics was promulgated, an education program and publicity program initiated, and the race was on to place the problem of the honest and competent Service Man before the public. An emblem was adopted and presented as a symbol identifying those that could be relied upon for honest and competent service.

In addition, a grievance committee was set up to handle customer Service Man relationship problems. Their conscientious work was instrumental in several court actions against dishonest and incompetent Service Men. The public and press applauded these bold moves and excellent results achieved, and the sponsors of the licensing legislation decided to shelve their bill.

Shortly after the abandonment of the ordinance, a series of disturbing incidents began to appear and licensing seemed to be imminent again.

The advent of TV found qualified Service Men at a premium. Many manufacturers had failed to supply the qualified Service Man with data which would facilitate servicing. Some set makers deemed it necessary to enter the service field themselves, offering contract type of service.

The possibilities of service contracts attracted many operators who were unfamiliar with television, radio or electronics. Contract rates were established by independent contract service organizations to compete with the manufacturers' rates and the money started rolling in. Success looked assured. It was simple to get any one, and a driver on a truck and put up antennas. That was the first step. Then came the request for repairs. And complaints, some were justified, others were not; but the problems mounted because the antenna installers were not equipped to handle the problems of service. Calls were unnecessarily repeated, costs of operations increased, and service dipped far below acceptable standards. Sets were detained for abnormal lengths of time. Some chassis disappeared under unaccountable circumstances, and before long, the operators found themselves in quite a predicament—truly at the end of the line. Bankruptcy was the only outlet. Customers ran to the courts, district attorneys and public officials. Legislation was again in the wind.

Newspapers reported on the incompetent and dishonest services rendered by some. Magazines roared out with editorials decrying the honesty and competency of *all* TV Service Men. Civic authorities again set about preparing legislation.

The independent honest and competent Service Man once more found himself a

By **MAX LIEBOWITZ**
President, ARTSNY and NETSDA

[On several occasions members of industry have expressed their views on licensing in SERVICE. This month, a report on the subject by an association spokesman is offered.]

victim of circumstances, and attacked from all quarters.

The big operators were in there punching for a licensing bill. Here was an opportunity, they felt, to really get on the gravy train. Here was a chance for the contractor to recoup some of his fallen prestige. As a matter of fact, here was an opportunity to eliminate the independent Service Man by legislation. How? Well, they would foster legislation featuring prohibitive provisions for the majority of independent Service Men. Their plan was quite apparent when the first TV license bill was introduced. For provisions included: \$25.00 fee for issuance of certificate of qualification; \$25.00 file fee for certificate of financial status; \$10.00 file fee for interim certificate of financial status; \$500.00 fee upon issuance of the license; \$50.00 fee for renewal of the license, and \$5,000/10,000 contractors liability insurance. In addition, it would be necessary to employ at least three persons; a supervisor, helper, and office worker. And a minimum of 500 square feet of work space plus 30 square feet of bench area would be required. Equipment deemed necessary included a signal generator, sweep generator, 5-inch scope (minimum), vacuum-tube voltmeter, audio-frequency oscillator, alignment *set up* capable of aligning receivers to manufacturer's specifications. Space for storage was also stipulated and shops were

to be open 8 hours per day minimum, Monday through Friday.

All test equipment was to be tested for accuracy at least once per year at a testing laboratory accredited by the Commissioner of Licenses. (A supervisor was classified as one having at least five years of actual full time experience in the care, servicing and maintenance of electronic equipment, of which at least two years had been devoted to the field of television, or at least two years attendance at a school, either public or private, in training for the care, installation and maintenance of television receivers, or practical experience equivalent to such schooling.)

The association vigorously attacked the bill. Members were vehement in their protest, declaring that bill had been designed to drive the small independent Service Man out of business, to the advantage of the big service contractors.

Many trade papers and newspapers supported the association in the fight to protect the rights of the *little fellow*.

Thanks to the continued attacks by the dailies and some professional journals, and untiring argument efforts of association members the proposed unfavorable legislation was doomed and the independent TV Service Man saved from extinction. The big boys had failed in their maneuver, and it was not long before one contractor with 15,000 contracts and another with about 20,000 contracts took a swan dive via bankruptcy. This again raised a clamor for legislation, and paved the way for the introduction of a watered-down version of the previous bill, permitting a commissioner to set up rules and regulations for the regulation of the television Service Man. The discretionary powers were too broad.

Again the association reared its head and fought the bill. It was pointed out that it was unpractical to agree to live under legislation promulgated by an appointed official, without any apparent ceiling on his authority. The association was instrumental in convincing the members of the City Council that the bill required extensive modification, and the Council agreed.

It was becoming apparent that something was going to be done about licensing, and the Service Man could cooperate in formulating good legislation, which would protect the customer public, rid the field of the incompetent bad apple, recognize the competent Service Man on the basis of ability, make contractors retain funds in escrow to guarantee against failure and loss to the public, permit newcomers access to the field upon proving ability after a training period, and prevent politics from turning the legislation into a football.

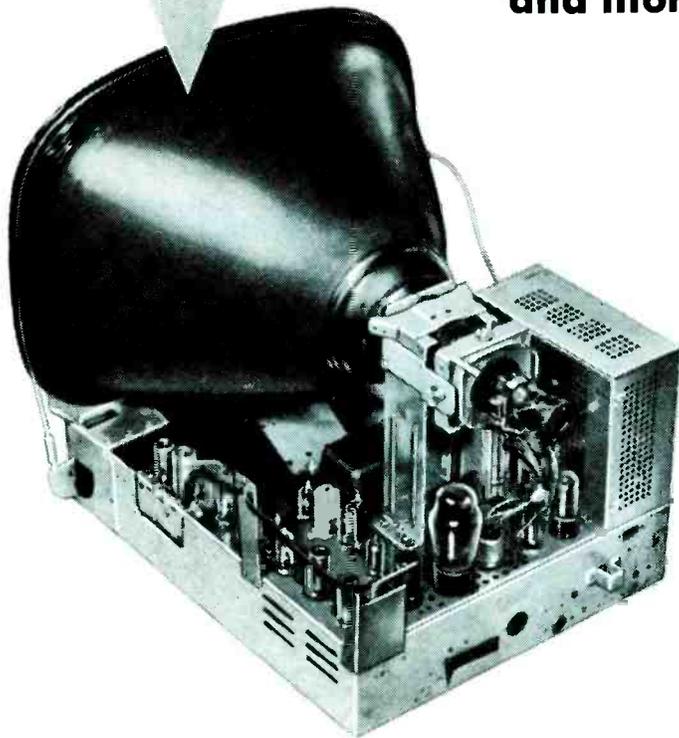
A rough draft of a bill which was believed to meet the many requirements of
(Continued on page 81)



Max Liebowitz and Carl Quirk of DuMont during a meeting of ARTSNY.

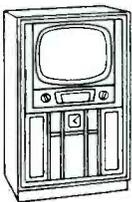
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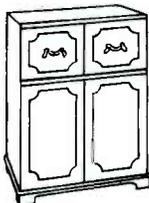
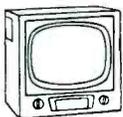


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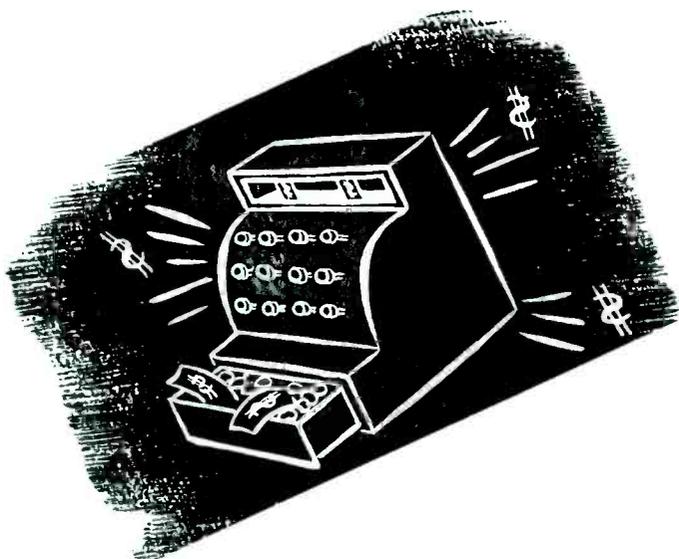


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Prices slightly higher in South and West.

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- Rocket TV Tuner—Cascode type—guarantees sharp, clear pictures in distant fringe areas.
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- Safety glass removable from front on most models.
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**Olympic gives you all these features
that assure quality performance . . .
long life . . . easy servicing**



Business Aids . . .

Audio Servicing Opportunities in Small Towns

Dear Don Kay:

Last month you briefly described some of the *servicing* opportunities which prevail in the small community. I'd appreciate additional suggestions on this all-important subject.—M. E.

Dear M. E.:

Indoor and *Drive-In* theatres are excellent audio prospects for the Service Man. The indoor theatres use amplifiers of up to 35 watt size, usually with twin inputs from the two photocells in the sound heads. Normally, a small dual-channel preamp is mounted on the booth wall between the two projectors, and cabled to the main amplifier at the side or back of the booth. A monitor speaker is mounted in the booth, with the main horns behind the screen. Troubles that occur here are identical to those that will be found in ordinary sound equipment. You might make arrangements with management to check this equipment for a week at regular intervals, replacing any weak parts or tubes.

Drive-In theaters use hi-power amplifiers ranging up to 250 watts; each am-



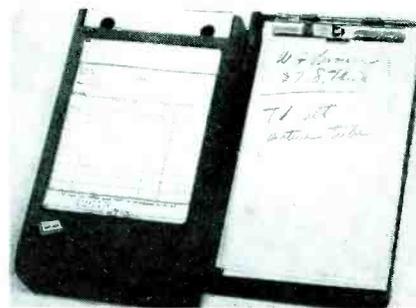
TV service truck, *International L-120*, with an *Aristocrat Service-Utility* body, for one-trip TV installations, introduced by the International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Open truck body is said to enable easy hauling of TV receivers, assembled antennas, ladders, parts and tools. Also featured are tool and parts bins in the horizontal and vertical compartments of the body. Body may be covered with a form-fitting canvas canopy in inclement weather. View above shows service truck in use by Air Vision, Inc., operating in Waukegan and Wilmette, Ill.

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

plifier must furnish about .75 watt to each of possibly 200 speakers out on the ramps. Sound equipment will be found in duplicate; two main amplifiers, two preamps, etc., arranged so that a spare may be quickly switched in if the amplifier in use should fail. In a typical tube lineup for one of these amplifiers will be found 6SJ7 (input), 6J5 (driver), two 6B4s driving a pair of 805s in the finals.

Operating voltages are furnished by 866s which run up 1500 volts for the 805s. The preamps use 1273s, a non-microphonic pentode, similar to 7C7s, and 6J5s with 5Y3 rectifiers. Monitor speakers are used in the projection room. These systems may be serviced on a contract basis, or on a fee system. Theater managers are usually glad to use the services of a local man who can be depended upon and be available; usually the nearest theater equipment technician is many miles away, and valuable time can be lost if the gear cannot be repaired promptly.

In your local hospital or well-equipped doctor's office are several pieces of electronic equipment that Service Men can repair. There is, for instance, the diathermy machine, which is nothing but a high-powered, unmodulated and antennaless radio transmitter. One must be very careful in servicing this equipment because of the high voltages. Sometimes, these machines will be found using raw *ac* on the plates of tubes such as 211s, 805s, etc. Average output is around 200 to 250 watts *rf*. Newer models use 866s as rectifiers, and are much less likely to cause radio interference. It is important to search for accumulations of dust and dirt on switches, sockets and coils. Insulation on these machines, usually ceramic, can be washed with carbon-tet,



Pocket register, with a folding memo holder, that holds up to 100 duplicate sets and contains a file compartment, introduced by Moore Business Forms, Inc., 900 Buffalo Ave., Niagara Falls, N. Y. Device consists of a lightweight register with a hinged metal plate or clipboard attached to the right side of the register. Plate has a chrome-plated spring clip on the top for holding a group of separate memos. When not in use, metal memo holder folds over the top of the register to form a protective cover, allowing the unit to be slipped into the pocket. With the memo holder as part of the register, a Service Man may have a list of each of the daily calls to be made. Service calls, recorded on individual sheets can be inserted under the metal clip according to geographic locations, and as each call is completed, the sales slip can be written and the call slip either discarded or clipped under the bottom of the pack.

which will prevent trouble with arcs and flashover.

Even some of the components employed in X-ray machines can be repaired by Service Men: Tap-switches, meters, cables and wiring, etc. Electroencephalographs, electrocardiographs, and the like can be easily repaired, if you don't let the names frighten you! The apparatus is actually quite simple basically. Most of the troubles will be found in broken wiring, dead batteries, and the small motors.

There are still more servicing possibilities that exist in every town; these will be reviewed next month.

Sincerely,

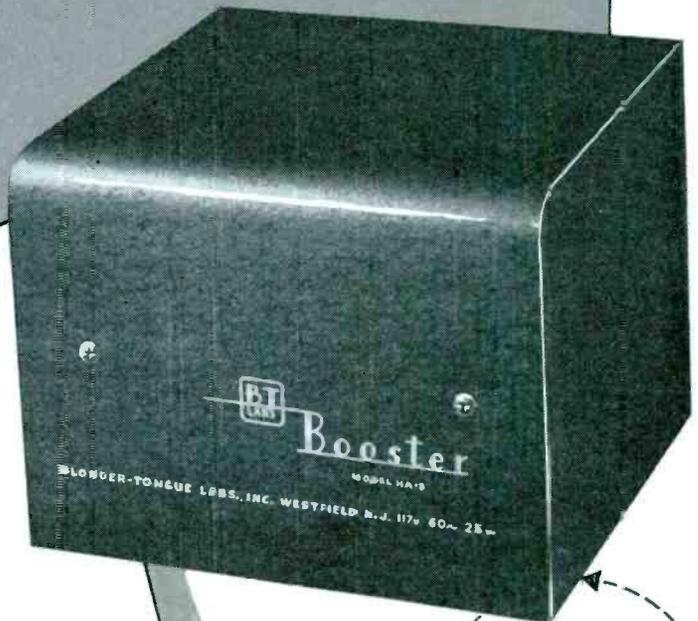
DON KAY

*Based on experiences of Jack Darr.

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A BROAD-BAND, 3-TUBE, 3-STAGE,
FULLY AUTOMATIC BOOSTER WITH
ALL-CHANNEL GAIN IN EXCESS OF 16 db.

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THE NEW **B-T**
BOOSTER
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Designed and Manufactured by
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Better Television

NO Knobs to Set
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COMPARE THESE SUPERIOR FEATURES:

- ★ Fully Automatic Broad Band Performance . . . NO Tuning.
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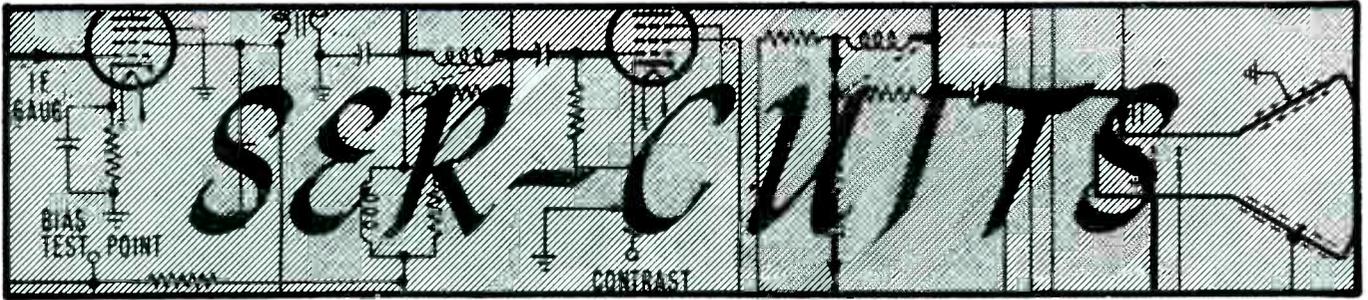
Standard RTMA Warranties Apply

Specify **B-T** Amplifiers and Accessories
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Write for complete Data.



BLONDER-TONGUE LABORATORIES, INC.
WESTFIELD, NEW JERSEY



by M. W. PERCY

Analysis of TV Chassis Which Employs a Cascode RF Tuner, 41.25 IF-Stage Trap, and Electrostatic Focus Picture Tube

TO INCREASE SENSITIVITY and improve signal-to-noise ratios, receiver designers have begun to include a new type of circuit, known as the *cascode*.

In one model, the Capehart CX-36, the *cascode* design is employed in a two-stage *rf* tuning unit, with a 6BQ7 used as a driven-grounded grid (*cascode*) *rf* amplifier. The two-stage amplifier combines the equivalent gain of a pentode with the low-noise factor of a triode.

IF Stages

Four stages (6CB6s) of common *if* amplification are employed in this

chassis, with the *if* of the stages in the 40-mc region. Both picture and sound information are amplified simultaneously (intercarrier) throughout the *if* stages, and are then separated after heterodyning in the video detector.

Using the intercarrier sound principle, the sound *if* carrier must be kept at a low level with reference to the picture carrier level. To maintain the proper difference in amplitude between the two carriers, a 41.25-mc trap is included in the coupling transformer between the first and second *if* stages.

Coupling between the mixer and the first *if* is by means of a low-impedance

overcoupled circuit. The coil in the grid circuit of the first stage and the mixer plate transformer form a tuned overcoupled circuit centered at 43.5 mc. The second, third and fourth stages and the video detector are coupled by means of bifilar *if* coils. The *staggered-pairs* system of tuning is used, wherein the second and fourth coils are tuned to the low-frequency side of the *if* bandpass (42.65 mc) and the third and fifth coils are tuned to the high side (45.3 mc) while the first coil in the grid of the first stage is tuned near the center of the pass band.

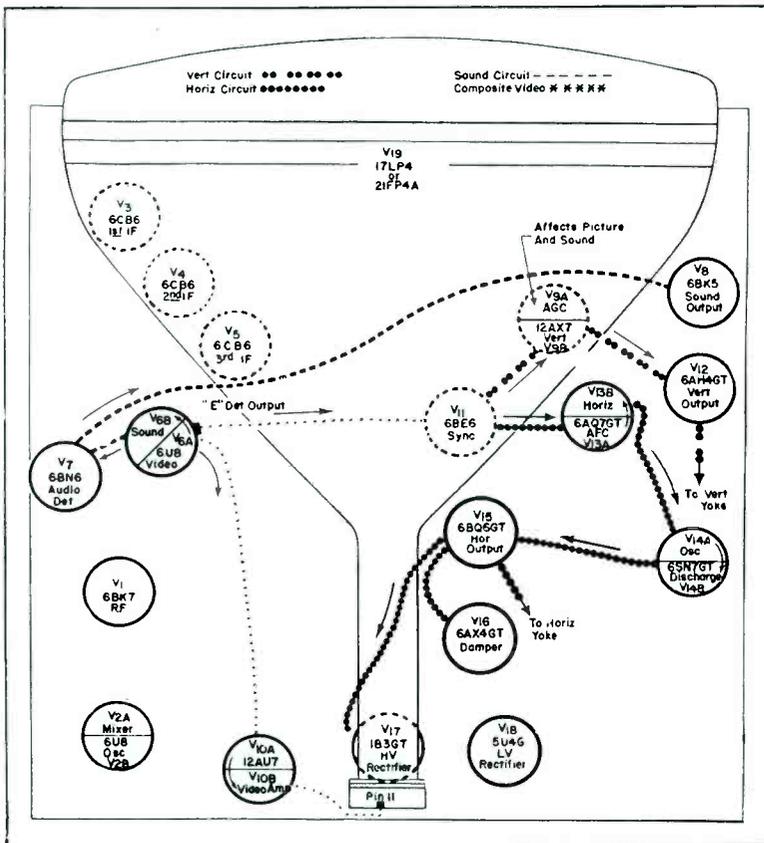
The use of bifilar-wound transformers allows a coefficient of coupling to be achieved which approaches unity. The coupling capacitor, such as used with impedance coupling, is not necessary with this type of transformer. The bifilar coils provide noise immunity due to the low resistance presented in the grid circuits by the secondary winding. Noise pulses of sufficient amplitude would develop a charge on a coupling capacitor, if used, which in turn would cause a momentary increase in bias and subsequent reduction in stage gain. The noise pulse itself, which modulates the carrier toward the black level, is not objectionable; however, each pulse is followed by a white tail (or streak) which has an undesirable effect both on picture and sync.

Each bifilar coil is tuned by a threaded powdered-iron core which is adjustable from the underside of the chassis. The first trap is tuned to the co-channel sound *if* and the second and third traps are both tuned to the adjacent channel sound *if*. *Agc* voltage is applied to the first and second stages; self-bias is used on the third and fourth stages.

Video Detector

The video detector is a germanium crystal diode, 1N64, and is mounted

Fig. 1. Signal path chart for Zenith 19K chassis, which can be used to isolate particular section of receiver for troubleshooting. A complete report on the circuitry used in this chassis will appear next month.



The finest all-channel antenna ever made!

the SKYLINE

- ★ 28 fewer element connections
- ★ 8 integral elements VS. 40
- ★ Pre-assembled
- ★ Quick rigtime
- ★ Extra heavy—all aluminum
- ★ Amazing reception up to 150 miles

Patented

The Skyline foldable colinear antenna possesses higher gain with respect to signal strength because the elements are integral!

No loss of signal strength through a multiplicity of mechanical connections.

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of the second amplifier. The output of this tube is coupled through a series peaking coil and a coupling capacitor into the grid of the picture tube. Total gain in the two stages of video amplification is 70 times, providing a video drive of 120 volts peak-to-peak or more at the picture tube grid.

A slug-tuned 4.5-mc trap is included in the plate circuit of the second video amplifier to prevent the beat signal, developed in the detector, from reaching the picture tube grid.

The electrostatic-focus picture tube used in this chassis is of the low-voltage type which requires a voltage of approximately 300 v at the focus anode.

Keyed AGC

A 6AU6 is employed as a keyed *agc* amplifier. The grid of this tube is *dc* coupled through a 3,300-ohm isolating resistor to the plate of the sync amplifier tube. The signal appearing at this point is a sync-positive composite video signal. (The white portions of the signal may be crushed, but this does not affect the *agc* action because of direct coupling from the second detector to the *agc* amplifier.)

The cathode of the *agc* amplifier is connected to a variable voltage source composed of a 3,300-ohm resistor, a 10,000-ohm *agc* pot, and a 10,000-ohm resistor, connected between the +150-volt bus and ground. The cathode of the 6AU6 is bypassed to ground by a 10-mfd electrolytic capacitor. The cathode of the *agc* amplifier is at such a potential with respect to its grid that only the sync pulses cause current to flow in the 6AU6.

The plate of the *agc* amplifier is pulsed with a 700-volt positive pulse, derived from a secondary winding on the horizontal width coil. The duration of this pulse is only for the retrace time of the horizontal deflection system. This coincides with the received sync pulse applied to the grid of the *agc* amplifier, provided the horizontal oscillator is in sync, and properly phased. Thus the *agc* amplifier operates as a keyed rectifier tube, and produces a negative voltage at the plate which is filtered, and after proper voltage division, is applied to the control grids of the first two *if* stages and the *rf* stage as bias.

As the strength of the received signal increases, the peak sync voltage developed at the plate of the sync amplifier increases and thus increases the current output of the *agc* amplifier. This results in a more negative *agc* voltage being developed, which reduces the gain of the controlled stages.

To amplify and shape the sync pulses before their application to the vertical

effects is said to be achieved between the sync, sound and video circuits.

Video Amplifier

Two stages of video amplification are employed in this chassis; the triode section of a 6X8 and a pentode 6AQ5. The rectified output of the video detector developed across the video detector load resistor is coupled directly into the grid of the first video amplifier. The amplified output of this tube is then capacitively coupled into the grid of a 6AQ5 second amplifier.

Variation of contrast is provided by a potentiometer in the cathode circuit

Ser-Cuits

(Continued from page 68)

on the top terminals of the last *if* transformer; harmonic radiation from the crystal is prevented by enclosing the diode within a shield; the detector circuit is filtered to eliminate harmonic feedback, also.

Take-off of both sound and sync signals is accomplished in the output of the video detector, and in this manner, complete freedom from inter-

and horizontal sweep circuits the following tubes are used: 6BA6 sync amplifier, 6BE6 sync separator and noise clipper, and half of a 12AT7 as a sync clipper.

The composite signal is *dc* coupled through a 10,000-ohm resistor, from the video detector output to the control grid of the 6BA6. The signal at this point is sync-negative (positive picture phase). After amplification by the 6BA6, the signal (sync-positive) is applied to the second grid of the 6BE6 sync separator. The second grid of this tube is biased so that only signals above the blanking level will cause a variation in tube current.

The first grid of the 6BE6 is coupled to the control grid of the 6BA6 through a 330,000-ohm resistor, and, therefore, receives the composite signal in opposite phase to that applied to the second grid. The *dc* potential at the first grid of the 6BE6 is such that the sync-negative signal that is applied to it will have no effect. Only noise signals of greater amplitude than the tips of sync will be sufficient to gate the tube. The bias at the first grid of the 6BE6 is automatically varied in accordance with the strength of the incoming signal, so that the point of tube current cutoff is always just beyond the tips of sync.

From the output of the 6BE6 the sync pulses are capacitively coupled to a conventional triode sync clipper. Here, the tops of the sync pulses are leveled off and then fed to their respective sweep circuits. The horizontal pulses are coupled through a small capacitor to the horizontal *afc* circuit from the plate of the sync clipper. The vertical pulses are taken off a voltage divider in the plate circuit of the sync clipper and fed into a printed circuit vertical integrator.

Vertical Multivibrator and Output

The vertical scanning pulses are developed in a conventional two-tube multivibrator and discharge circuit using a 6V6 and a 6C4. This circuit provides the sharp pulse which is required to develop a sawtooth of current in the vertical winding of the deflection yoke.

Vertical sync pulses are coupled into the vertical *mv* circuit from the output of the sync clipper through the vertical integrator network and injected at the grid of the 6C4.

Horizontal AFC Circuit

The horizontal sync pulses are applied to the center tap of the primary winding of the horizontal oscillator transformer. The pulses appear, in

(Continued on page 72)

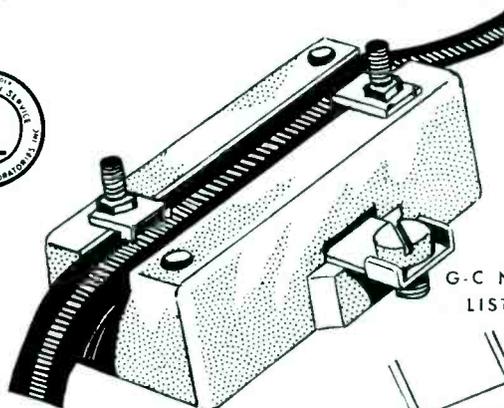
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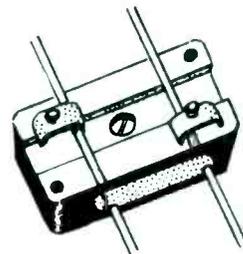
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Ser-Cuits

(Continued from page 71)

phase, at both plates of the 6AL5 sync discriminator (*afc* detector). Also appearing on the diode plates is a sine-wave voltage developed in the primary of the transformer through inductive coupling from the tank circuit of the horizontal oscillator. The sinewave voltage appearing on either diode plate will be 180° out-of-phase with that on the other.

If the horizontal oscillator is in exact synchronism with the received

sync pulses, the pulses will appear on the sinewave of one diode plate as the sinewave voltage is going through zero in a negative direction, and on the other plate as it goes through zero in a positive direction. Since the sync pulses appear when both diode plates are at zero potential, there is no control voltage developed and hence the operation of the circuit is not changed.

If the frequency of the oscillator should drift, the received sync pulses will not appear on the sinewave voltages at the zero point, but at some point either before or after it goes through the zero point. Since the

sinewave on one plate is of opposite polarity to the other and since the sync pulses are of the same polarity on either plate, the sync pulse will add to the sinewave that is positive at that time and subtract from the sinewave that is negative. This will produce a condition of voltage unbalance in the cathode circuit of the *afc* detector, thus developing a control voltage. The control voltage will be either positive or negative depending on whether the oscillator frequency is higher or lower than the sync pulse rate. This control voltage is *dc* with a 15,750-cycle ripple which is filtered and applied as bias control to the grid of the reactance tube.

The horizontal oscillator is a variation of the Hartley-type circuit using $\frac{1}{2}$ 12AU7, with a reactance tube ($\frac{1}{2}$ 12AT7) connected across its tank circuit. The free-running frequency of the oscillator, with the *afc* detector tube (6AL5) removed, is made as near the horizontal sync rate as possible by adjustment of the iron core of the secondary of the oscillator transformer. With the *afc* detector tube removed, there is no additional bias applied to the reactance tube, and the reactance presented across the oscillator tank is a fixed average value.

Horizontal Output and High Voltage

In the plate circuit of the horizontal sinewave oscillator is a choke which is part of a peaking circuit consisting of a 22,000-ohm and 5,600-ohm resistor, and a .047-mfd capacitor. This network forms a sharp pulse which oscillates for a few cycles at a frequency much higher than the horizontal sync rate. This oscillation is rapidly damped out before the cycle of the horizontal oscillator is completed. This sharp, positive pulse is *rc* coupled to the horizontal discharge tube input circuit, driving this tube out of cutoff, causing it to conduct. An 820-mmfd discharge capacitor produces a sharp sawtooth voltage in the horizontal discharge tube plate circuit. This capacitor charges through a 120,000- and 250,000-ohm (horizontal drive pot) resistor, respectively, while the discharge tube is cutoff. The discharge capacitor is returned to the cathode of the horizontal output tube through a 6,800-ohm peaking resistor, providing the sharp negative pulse necessary to drive the horizontal output tube to cutoff during the horizontal retrace time.

The horizontal output stage employs a 6BQ6GT beam power amplifier that produces the horizontal deflection current, and is also the source of the *hv* supply for the picture-tube second anode. When the plate current in the

6BQ6 is suddenly cut off by the sharp negative pulse applied to its control grid, the magnetic field which is created in the primary of the horizontal output transformer collapses, developing a very high-voltage pulse. This voltage tends to oscillate in the 6BQ6 plate circuit, but is rapidly damped out by the 6W4GT damper tube. The B+ boost is a combination of the +300-volt supply voltage plus the charge that is developed across a .22-mfd capacitor during the retrace time; duration of the *hv* pulse developed in the 6BQ6 plate circuit. This boost voltage is used as plate supply for the horizontal discharge tube and also for the picture tube first anode voltage.

6BQ6 Coupling

A ferrite-core transformer is used to couple the output of the 6BQ6 to the horizontal winding of the deflection yoke and also to step up the *hv* pulse for rectification by the 1B3GT *hv* rectifier. The deflection yoke is coupled off across two intermediate points on the horizontal output transformer secondary. This method of coupling is said to provide optimum impedance match and tends to reduce the effect of high-frequency ringing which would show up in the raster as light and dark vertical bars.

Phono Needle Contest

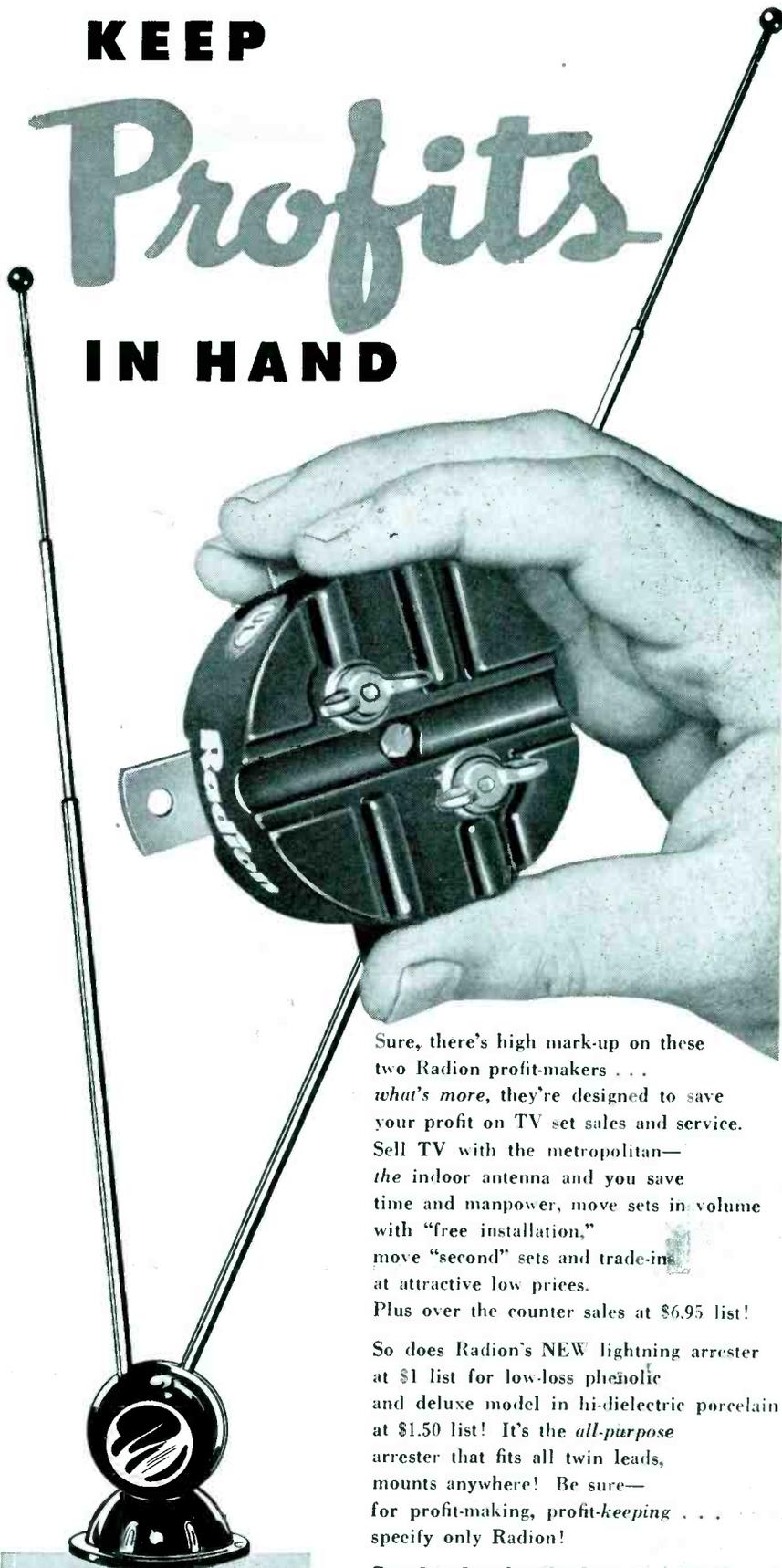


Karl W. Jensen, vice president, Jensen Industries, Inc., and Paul J. Steffen, Paul J. Steffen Advertising Agency, discussing the recently announced *Win a Grand* contest, offering \$5000 in cash prizes to the nation's radio-TV Service Men selling the most Jensen phono needles during a four-month promotion: September 1 to December 31. To be eligible for one of the prizes (187 will be awarded), Service Men will be required to send in an official entry blank, available from parts distributors, together with all the empty Jensen needle packages collected during period of contest. Contestants will also have to state in 15 words or less why they sell Jensen needles. (Symphonette and coin-machine needles will not be accepted in contest.)

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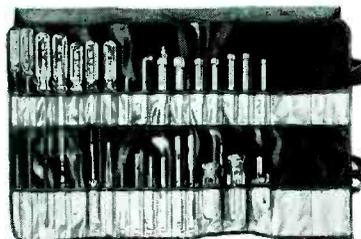
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amplifier with 250 volts on the plate it has these typical characteristics and operating ratings: grid voltage, -8.5 volts; amplification factor, 17; approximate plate resistance, 7,700 ohms; plate current, 10.5 milliamperes

A direct replacement for the 6AU6, the GL-6136 is a miniature sharp-cutoff pentode, intended for use as a high-gain *rf* or *if* amplifier.

As a class *A1* amplifier with 250 volts on the plate, typical operating conditions and characteristics include: screen voltage, 150 volts; cathode bias resistor, 68 ohms; approximate plate resistance, 1 megohm; transconductance, 5,200 micromhos; plate current, 10.6 milliamperes; screen current, 4.3 milliamperes. It has a maximum plate dissipation rating of 3 watts.

The GL-6137 is a remote cutoff pentode which may be used as a direct replacement for the 6SK7 as a high-gain *rf* or *if* amplifier.

As a class *A1* amplifier with 250 volts on the plate, the GL-6137 requires a screen voltage of 100; grid number 1 voltage, -3 ; approximate plate resistance, .8 megohm; transconductance, 2,000 micromhos; plate current, 9.2 milliamperes; and screen current, 2.6 milliamperes.

The GL-6201 is a miniature twin triode designed for use as a grounded-grid amplifier or as a frequency converter in *vhf* applications. It is a direct replacement for the 12AT7.

As a class *A1* amplifier with 250 volts on the plate, it has a transconductance rating for each section of 5,500 micromhos. Other typical ratings include: cathode bias resistor, 200 ohms;

Tube News

(Continued from page 34)

rent of 350 instead of 300 milliamperes.

It has a maximum plate dissipation rating of 1.5 watts. Typical characteristics and operating ratings for each section as a class *A1* amplifier with 250 volts on the plate include: grid voltage, -4 volts; amplification factor, 44; approximate plate resistance, 25,000 ohms; transconductance, 1,750

micromhos; plate current, 3 milliamperes.

The GL-6135 is a miniature medium- μ triode designed for use as a local oscillator in *vhf* receivers, and can also be used as an audio amplifier and in general purpose applications. It features a relatively high value of plate-to-grid insulation resistance throughout life.

The triode is a direct replacement for the 6C4W, except for an increase in heater current to 175 milliamperes. It has a maximum plate dissipation rating of 3.5 watts. As a class *A1*

amplification factor, 60; approximate plate resistance, 10,900 ohms; plate current, 10 milliamperes.

Subminiatures

Subminiature double triodes, types 6111 and 6112,¹ designed for use at relatively high ambient temperatures where long-life and stable performance are required under severe shock and vibration conditions in compact, light-weight equipment are now available. Both of these tubes are suitable for use at frequencies ranging up into the *uhf* region.

Type 6111 is a medium-*mu* double triode in a T-3 envelope, with characteristics similar to those of type 6SN7GT and may be used for similar applications.

Type 6112 is a high-*mu* double triode in a T-3 envelope with characteristics similar to those of type 6SL7GT and may be used for similar applications.

UHF/VHF TV Tubes

A 6AN4,¹ designed for *uhf-vhf* television tuner service has also been developed.

The 6AN4 is a T-5½ miniature triode designed for use as a grounded grid *rf* amplifier or mixer. The tube is claimed to feature high *gm* and *mu*, internal shielding between plate and cathode leads, and double plate and grid connections for reduced lead inductance. A gain of 10 db, 10-mc bandwidth, and a noise figure of 15 db, can be obtained at 900 mc.

In combined services, the 6AN4 is said to eliminate the necessity of a low-noise, pre-*if* amplifier.

A high-perveance double triode, type 6BX7GT,¹ designed for vertical deflection and oscillator service in television receivers has also been announced.

The tube is said to be particularly well suited for reduction of vertical distortion in television receivers, due to low plate supply voltage. The tube is mounted in a T-9 bulb and is supplied with a short intermediate shell octal base with 8BD base connections. It may be mounted in any position.

Picture Tubes

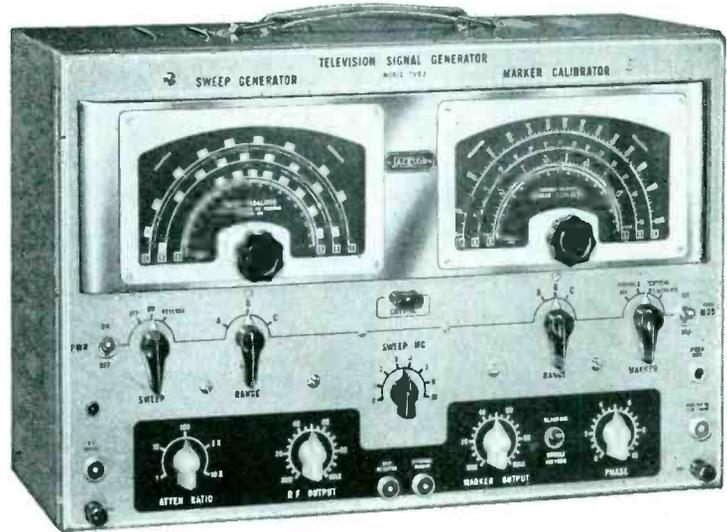
Development of a 27-inch metal shell television picture tube, which is already being sampled to the television industry set manufacturers, was recently disclosed by RCA.

The tube incorporates a scalloped glass-to-metal seal which is said to

¹Sylvania.

(Continued on page 76)

This instrument provides complete sweep and marker frequencies

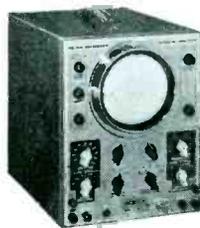


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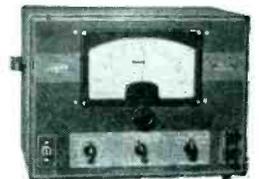
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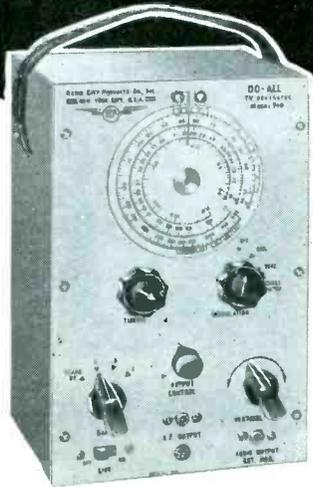
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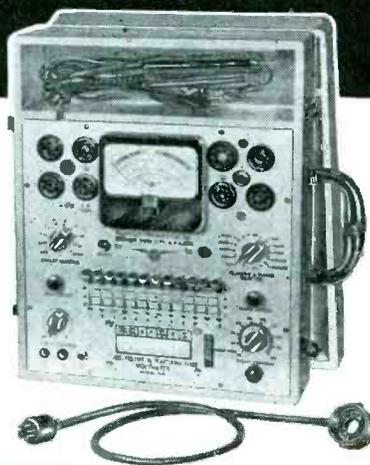
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Tube News

(Continued from page 75)

make possible a spherical faceplate. The tube is slightly shorter than the 21-inch metal shell type. It has a frosted filterglass faceplate with aluminumized backing.

Sylvania has also announced a 27-inch picture tube, with, however, a rectangular all-glass envelope.

The tube has neutral density gray-filter face-plate to provide for glare

reduction. It is a magnetically focussed and deflected tube for use with an ion trap, and is supplied without an external conductive coating.

By using a deflection angle of 90°, the overall length of the new tube is 22 1/2", which is less than the length of 21" tubes. The picture is approximately 18" high by 24" wide, providing about 400 square inches of picture area.

The recommended operating conditions include: anode—20,000 volts,

grid 2—300 volts, and ion trap field strength—45 gauss.

TV Miniatures

A power pentode of the 9-pin miniature type, designated as the 6CL6 and designed especially for use in the final video-amplifier stage of television receivers, has been announced by RCA.

Designed in miniature as the equivalent of the metal type 6AG7, the 6CL6 is said to have a high transconductance, low interelectrode capacitances, and high output-current capability. These features are claimed to make possible the design of wide-band video circuits having a voltage gain of 40 to 45.

Separate base-pin connections for grid 3 and cathode permit the use of an unbypassed cathode resistor to provide degeneration without encountering parasitic oscillations which would otherwise occur if grid 3 were connected to the cathode within the tube.

A medium *mu*, nine-pin miniature twin triode, 6BZ7, designed for use in low-noise *uhf*-amplifier applications and particularly for cascode operation, has been developed by Hytron. It is said to feature improved cascode tuner gain and higher mutual conductance than the 6BQ7 to which it is otherwise similar.

A miniature 9-pin medium-*mu* triode and sharp cutoff pentode contained in one envelope, the 6X8, is now in production at Sylvania.

The tube is designed as a combined mixer and oscillator for television receivers using an intermediate frequency of approximately 40 mc. Characteristics of the pentode section of the 6X8 are similar to the 6AG5, and the triode section is comparable to one section of the 6J6. Except for a common cathode, application of the 6X8 is similar to the 6U8.

The pentode mixer section of the 6X8 provides low grid No. 1 to plate capacitance as compared with a triode mixer. This low grade No. 1 to plate capacitance is said to reduce feedback problems often encountered in mixers when using an *ij* in the vicinity of 40 mc. The low output capacitance enables the tube to work into a high impedance plate circuit resulting in higher mixer gain.

The 6X8 is also suited for use as a mixer in AM-FM receivers. The pentode may be used as a pentode or triode-connected mixer depending on the desired signal-to-noise ratio.

UHF Converter

(Continued from page 51)

or converter. To reduce oscillator radiation in this model thorough shielding of the tuner and additional shielding of the oscillator has been used. The oscillator supply leads (heater and B+) pass through a two section filter. The mixer output is also filtered.

Tracking and Alignment

Tracking the *rf* preselector circuits has not been found difficult, but tracking of the *rf* circuits with the oscillator was quite difficult. Conventional methods cannot be used at *uhf* because of residual inductance and capacitance effects within the oscillator tube envelope. This makes the shape of the oscillator tuning curve different than the *rf* tuning curve, which cannot be even approximately correlated at two or three points as conventional low frequency circuits are tracked. In a method finally adopted the characteristic impedance of the tuner elements was altered by tapering the width of the outer strip to obtain the correct frequency difference between the local oscillator and *rf* preselector circuits at all frequencies. To align properly the double tuned preselector circuit, it will be necessary to have a high-output *uhf* sweep generator and 'scope. The alignment procedure uses the mixer crystal as a rectifier. The rectified output of the crystal shows the response curve on a 'scope.

Low Noise Amplifier

The low-noise amplifier employs a 6BQ7 dual triode in a neutralized cascode circuit (grounded cathode triode feeding a grounded grid triode), with the first stage neutralized. A double tuned output transformer secondary circuit has provision for 72-ohm unbalanced or 300-ohm balanced output impedances.

The *vhf-uhf* switch performs the following functions:

- (1) In the *vhf* position the converter is turned off and the *vhf* antenna connects to the *vhf* receiver antenna terminals.
- (2) In the *uhf* position the converter is turned on, the *uhf* converter output is connected to the TV receiver antenna terminals and the *vhf* antenna is shorted to ground.

The power supply is a conventional transformer type using a 6X4 rectifier and a two section *rc* filter. The low noise amplifier is operated at 150

(Continued on page 78)

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Such a thing is easier to understand because most of us are more familiar with automobiles than with today's highly complicated TV and radio sets. But such unconnected troubles occur in TV and radio nevertheless—and because they are so

hard to explain in non-technical terms, it is always embarrassing to your service technician when they do.

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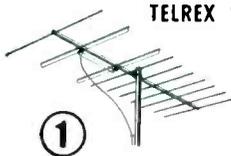


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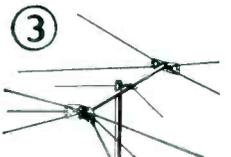


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"BAT WING" the finest top-of-set antenna made REQUIRES NO TUNING, PRUNING OR ADJUSTMENTS! Outperforms any other indoor type and features modern, rich styling to harmonize with finest furnishings.



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FOR ALL VHF CHANNELS—New six element TV series. Extremely high forward gain and front to back ratio exceeds most 8 element beams—compares favorably with many 10 element antennas. Supplied to distributors custom cut.

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ASBURY PARK 4, N. J.

SEE US AT THE NEDA SHOW—BOOTH 117

UHF Converter

(Continued from page 77)

volts and the *uhf* local oscillator is operated at 75 volts.

Overall Performance

The most important criterion of any input circuit is its noise figure. In this model, the noise figure is about 16 db over the band, only slightly higher than the noise figure of most *vhf* tuners on channel 13 developed a few years ago. The 6AJ4 grounded grid *uhf* rf amplifier tube, just announced, should make it possible to reduce the

noise figure. The average gain has been found to be 6 db over the entire band; the input *vswr* better than 1.5 over the band, and the *if* rejection much greater than 60 db.

Reception Tests

These converters have been tested at Bridgeport and New Haven on 530 and 850 mc from NBC experimental Bridgeport transmitters. At our plant in East Paterson, 15 miles from New York, signals from the new DuMont 713-mc *uhf* transmitter have been monitored. The pictures have been satisfactory, with only a slight back-

ground noise twinkle with a signal strength of 140 *uw* at the converter input.

This converter has been found to fulfill the requirements set forth in all respects except for a slight frequency drift.

Credits

The author is grateful to project leader C. D. Nestlerode, mechanical engineer D. Felt, engineer R. Gardner, and all his co-workers for their share in the project, and to the P. R. Mallory Co. for their development of the Mallory *uhf Inductuner* and collaboration to fit our needs.

Servicing Helps

(Continued from page 56)

and '51 may be caused by a defective or incorrect temperature compensating capacitor in the FM oscillator circuit. This capacitor, located on the FM oscillator inductor assembly, has a value of 85 mmfd and a negative temperature coefficient of either .000750 mmfd/mmfd/°C or .001500 mmfd/mmfd/°C. The table model receivers, which are tightly enclosed, generate more heat and require more compensation than the relatively open and cooler consoles.

If objectionable frequency drift is noticed during the warmup period, the compensating capacitor should be changed. It may not have the proper temperature coefficient. For example, oscillator drift requiring returning to a lower frequency on the dial indicates that the degree of compensation is too great. A replacement should be used. On tubular capacitors, the temperature coefficient coding appears as the end dot on the capacitor, and it should be either purple for 750 parts per million or orange for 1,500 parts per million. Disc-type capacitors are marked directly in parts per million.

Florida Distributor Opening



At opening of new quarters of Herman Radio Supply Co., 1365 N.W. 23rd St., Miami, Florida; Lou Cohen, general manager of Herman Radio, second from left; Harry R. Ashley, prexy of Electronic Instrument Co., Inc., third from left; Harvey Herman, owner of the jobber company, fourth from left; Bill Jaudon, EICO sales rep, extreme right.

Auto Radio

(Continued from page 62)

somewhat different in sound. It may manifest itself in rasping or clicking sounds, whose frequency or repetition rate varies with the speed of the car. To some ears, wheel static may appear as a grating or swishing sound. With the car traveling at a constant speed, the noise may be audible as a steady hiss.

When the noise first appears, it may sound like a slight rustling. As the car is speeded up, the amplitude of the noise will increase until, in some cases, all reception is drowned out.

The loudness of the noise produced will vary with the nature of the road, being greatest on an asphalt or concrete highway, and much less, or absent, on a gravel or dirt road. The speed of the car, and the sensitivity of the receiver, will also affect the amplitude of wheel static. Extremely sensitive sets in autos traveling at high speeds may be very noisy, if wheel static suppressors are not present or functioning.

The sounds produced by wheel static may, in some instances, be difficult to differentiate from those due to ignition interference, or an oncoming electrical storm. Several methods of pinning the guilt on the wheels may be employed.

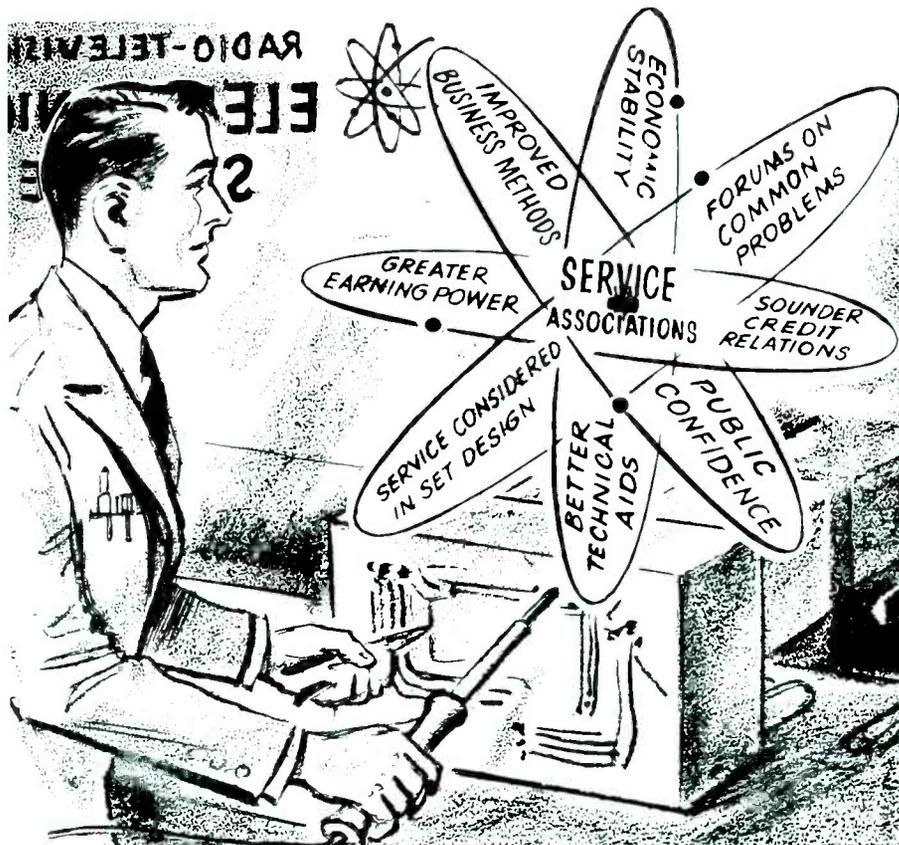
In one method, the foot brakes can be applied. The symptoms will disappear if wheel static is to blame. With the motor running, but the car standing still, no noise will be heard in such a case. On the other hand, if ignition or atmospheric noise is present, the symptoms will persist.

Driving off a paved or hard road onto a dirt one will reduce or eliminate wheel static symptoms; another way to identify the source of trouble.

In a third method of determining if wheel static is producing excessive interference, the auto radio can be tuned to some point between stations, and the volume control advanced to its maximum clockwise position, bringing the receiver to its greatest sensitivity. The car should be accelerated to a fair rate of speed—say 30 or 40 miles per hour—the clutch should be disengaged, and the engine turned off. An almost continuous roar will be heard in the speaker, if the wheels are the source of the interference. Final verification is obtained by pressing on the brake pedal. If the noise is eliminated, wheel static is definitely the source of trouble.

In some instances, the rear wheels, rather than the front ones, may be

(Continued on page 80)



THE MODERN ELECTRONIC TECHNICIAN HAS A NEW VIEWPOINT!

A changing attitude on the part of the radio and television service technician is the thing that is pulling the electronic service profession out of the doldrums. He is learning that he cannot call himself a success, as an individual, until he can look around and see other technicians who have assets he can admire or compare with his own. As long as there are too many in his profession operating without scruples, and trying to get along under a "hand to mouth" economic operation without adequate testing instruments and other technical aids, there is not much to measure one's success by.

His interest and attendance at the local service association meeting shows that the modern Electronic Technician is beginning to look beyond the "tip of his soldering iron." Through these associations, he is rapidly gaining recognition, not only in his own community, but also in the vast electronic industry, as being an essential link between the manufacturer and consumer.

In addition to getting valuable technical "know-how" from non-commercial sponsored lectures and demonstrations, he is finding out how to make his business bring a fair return on his rather large investment in

training, experience, and testing instruments. He is also learning how to be fair to both his customers and himself by keeping his "know-how" and test equipment up-to-date and not resorting to price cutting for his service in diagnosing trouble.

As technicians gain that feeling of mutual respect and esteem among themselves by regarding each other as business associates instead of raw competition, their most valuable asset—technical "know-how"—will no longer be obscured. The technician's interest in matters which affect his economic welfare will lead him and the entire service industry to greater economic stability.

The time and money you devote to your service organization is not an expense—it is an investment in your future that will be paid back many, many times.

Our 25th Year

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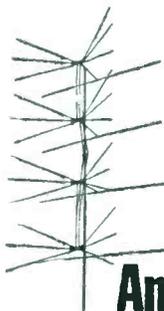
USE Mandl's Television Servicing

Here are detailed, illustrated instructions for locating and correcting EVERY flaw or failure that may occur in each stage of today's TV receivers. You'll learn simple signal tracing procedures; trade tricks in diagnosing troubles in minimum time; the essentials of successful VHF and UHF servicing; how to trouble-shoot A.G.C. circuits, synchroguide circuits, and all other circuits, including the latest improvements. A complete master trouble index enables you to QUICKLY find the cause of and procedures for correcting any trouble, including those hard-to-find troubles. Hundreds of diagrams, original photographs of flaws as they appear on the TV screen, oscilloscope patterns and other illustrations further aid you in locating trouble, testing, and making adjustments.



Noll's Television for Radiomen

Very clear, thorough, non-mathematical explanations of the function and operating principles of every element and circuit in TV reception; how the receiver is constructed; basic principles of transmission; and the techniques of installing, adjusting, and aligning today's receivers, with full instruction on test equipment and its use. Here, in the simplest, clearest terms, is the basic knowledge that is a MUST for good TV work.



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Are fringe area reception, ghost reception, interference your problems? This book shows you how to overcome them—how to improve gain; minimize noise on the transmission line; get the MOST out of the antenna system at any location. It tells how to determine the right type of antenna for the site and the best position for it; gives full data on all types of antennas including those for the new UHF and VHF locations, yagi antennas, stacking, boosters, and other fringe area aids.

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Address

(This offer good only within continental limits of U.S.A.)

Auto Radio

(Continued from page 79)

causing the symptoms. If the noise is decreased when the emergency brake is partly applied, but is increased when the clutch is disengaged, rear wheel static is present.

Eliminating Static

Front wheel static can be eliminated, generally during chassis installation, by providing a good low-resistance connection between the front wheels and the axle. Grounding springs or static collectors are inserted into the hub caps on the wheels. The spring, by providing a good electrical connection from wheel to axle and car frame, prevents a build-up of static charges on the wheel.

To prevent rear wheel static, static collectors are inserted in the rear hub caps.

The Service Man who encounters wheel static should check for the presence of static collectors at the wheels of the car. If they are present, he should make sure they are making good contact, and are clean. If grease or dirt is present at the wheel spindle section to which the static collector connects at one end, it should be removed. The center hole in each wheel spindle should be clean and smooth. The static collector should be pressed down tight into its position, and be holding firmly.

In some rare cases, where cars have no static collectors, and have been previously untroubled by wheel static interference, pencil marks on tires may be the cause of excessive static discharges to ground. Scrubbing the tires with grease-removing soap, and then cleaning them with gasoline, may eliminate symptoms, when particles like these on the tires are the source of trouble.

[To Be Continued]

Compare! PROVE EMC SUPERIORITY!

MODEL 205 tube tester

- Tests all tubes including Noval and sub-miniatures
- Completely flexible lever type switching arrangement
- Tests all tubes from .75 volts to 117 filament volts by standard emission test
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Tests all tubes including Noval and sub-miniature • Tests all batteries under rated load • Emission testing method gives easy, direct readings • Tests resistance to 4 megohms • Tests condensers from .01 to 1 mfd • Uses four-position lever type switches • Checks condenser leakage.

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- Checks tubes for gas content
- Detects both shorted and open elements
- Tests all tubes from .75v to 117 filament volts
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Associations

(Continued from page 64)

good legislation was formulated. Many hours were devoted at various meetings considering all aspects of the bill, and finally a measure was presented. It passed through the New York City Council by a vote of 19 in favor, 4 against.

The preamble to the bill set declared that: "The selling and servicing of television receiving apparatus had become the subject of great abuse with the result that the public had been victimized by irresponsible sales methods, unethical and financially unstable service organizations and inferior installation, maintenance and repairs, and as a result there is a need for legislative intervention."

A deadline was set after which a service contractor or service dealer was required to obtain a license; service was to be rendered only by an accredited technician or an accredited apprentice under the direct supervision of an accredited technician. The apprentice could however make repairs except to the chassis, without the supervision of an accredited technician.

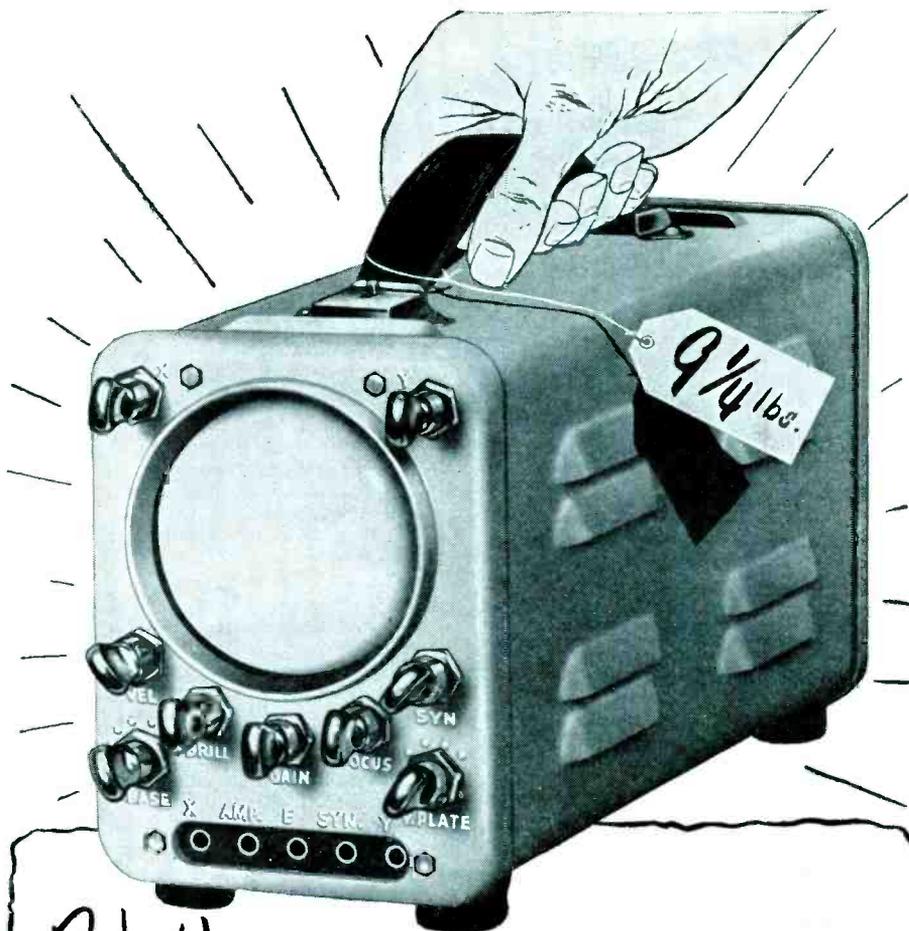
All licenses were to be issued by the commissioner, and the fees for the licenses were set at modest levels.

As the permit referred to was good for a limited time to permit preparation for the license, the date for termination was set ahead about eighteen months after which period, only the license would be issued, and only after passage of a qualifying examination. This, however, was only applicable to the technician class, the apprentice not being required to take a qualifying examination. The apprenticeship would, however, in the course of events lead to the technician license, provided an examination was passed.

The supervisory committee was to be appointed by the Mayor of the City and was to comprise a member of the law department designated by the corporation counsel; a member of the board of education designated by the superintendent of schools, and said member to be a radio-mechanic teacher; a member of the IRE having been engaged in the industry for a period of five years; a person engaged in the industry servicing electronic apparatus for at least ten years of which no less than three years was devoted to servicing receiving apparatus; a person engaged as a service dealer for a period of at least five years; and the service manager of a set distributor with at least five years experience as such. None of the members except the mem-

*The terms, as used in the bill, were generally defined as: *Service* referred to installation, maintenance, repair, replacement, testing, inspection and modification of receiving apparatus. *Service Contractor* . . . a person receiving money in advance before such service is rendered. *Service Dealer* . . . a person who employs an accredited technician or an accredited apprentice. *Accredited Technician* . . . a person who is the holder of a license or permit pursuant to the provisions of the license bill. *Accredited Apprentice* . . . a person who is the holder of an apprentice permit pursuant to the provisions of the license bill. *Board of Technical Examiners* . . . the board appointed pursuant to the license bill to determine the fitness of applicants for a technician's license. *Supervisory Committee* . . . committee set up pursuant to the license bill with the power to set rules, regulations and aid in technical examinations. *Dealer* . . . a person who is a retail vendor of receiving apparatus. *Distributor* . . . a person selling receiving apparatus at wholesale.

(Continued on page 82)



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Light • Fast
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5½" x 4½" x 11½"
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Eliminate call backs with this really portable precision-made Cossor Oscilloscope. Take it with you on every call. The 1039 is easily carried, weighs only 9¼ pounds! Built for years of tough service. Metal control knobs. C.R. Tube mechanically protected. Recessed sockets giving access to X and Y plates, amplifier, synch and ground connections. High frequency amplifier in 2 ranges 25 C.P.S. to 3.5 MCS. Variable gain control. Separate switching provides DC to Y, AC to Y, signal to amplifier at maximum gain (60) or intermediate gain (10) . . . Repetitive time base 10 C.P.S. to 50 KCS. plus with negative synch. Finish—sage gray enamel. See your jobber or write for complete information.

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"Making Money in TV Servicing"

Tells how to start and operate a profitable TV service shop. Covers: overall planning, initial investment, selecting location, finances, budget control, work control, overhead, service charges, purchasing, operating and personnel problems, service contracts, customer relations, collections, advertising, etc. Written by a successful authority in the TV service field—sound, practical advice. 136 pages, 5 1/2 x 8 1/2".

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"Television Antennas" New 2nd Edition

A complete treatment of TV receiving antennas, based on actual field experience. Shows how to select proper antennas for given locations; explains how to install and solve troubles. Chapters on: antenna principles; construction; analysis of all commercial types; full installation data and short-cut hints; TV antenna problems and trouble-shooting. Fully illustrated. 224 pages, 5 1/2 x 8 1/2".

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"Television Tube Location Guides"

VOL. 3. Shows tube positions and functions in hundreds of important TV sets. Helps save servicing time. Often, looking at the picture or listening to the sound, provides the clue to the trouble. Frequently, a tube failure is the cause. This guide, with its clear, accurate tube placement and function diagrams, makes trouble diagnosis and tube replacement quick and easy, without removing chassis. 192 pages. All

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A full, easy-to-understand explanation of TV principles, operation and practice. Covers Cathode Beam Formations and Control, Beam Deflection Systems, Beam Mod. and Synch.; analyzes CR tubes, camera tubes, voltage supplies, saw-tooth generators, antenna circuits, control functions, antenna circuits, RF input tuning, IF systems, AGC, DC restoration, etc.; with full bibliography and glossary. 208 pages, 8 1/2 x 11".

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- TC-1 MM-1 TAG-1
 TGL-3 TGL-2 TGL-1 TV-1

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Associations

(Continued from page 81)

ber of the corporation counsel's staff and the member of the board of education were to receive any compensation.

Two types of service contractor licenses were provided; class A or B, the former being available to one who maintains an escrow fund and the latter for one who did not maintain an escrow fund.

The activities in New York soon spread to other areas, with the result that unfavorable legislation, designated to drive the independent out, aroused the little fellows and they sprang into action. In Pennsylvania, the inequitable license bill which appeared caused a commotion of sufficient amplitude to lead to the revision and formulation of House Bills 1464 and 1465.

In some areas, groups began opposing the licensing trend. This negative reaction has puzzled many, particularly those in our group. One wonders if the large employers of Service Men fear licensing as the means for raising the standing of the Service Man. Is it possible that the licensing of qualified technicians would increase a Service Man's ability to defend his reputation against grossly exaggerated and misleading advertisements?

It seems that after a thorough digestion of all comments, there is but one move the competent Service Man should make: *Get on the Bandwagon for Licensing* which will benefit not only you but the public at the same time. It is important though to make certain the legislation is not designated to favor the big fish over the small fish, but gives all a semblance of equal opportunity.

In closing I would like to make one observation. Although the Board of Estimate yielded to pressure from a remote source in referring the bill back to the Council for further study, many Service Men in the City of New York are known to favor the bill, and are expending energy in an effort to promote good legislation for the benefit of the public and the honest and competent Service Man, whether it be on the local city level, the intermediate state level or the paramount federal level.

It takes unity for strength, and it is of the utmost importance that you join your local Service Man group in its fight to improve your standing and relationship to the public, your potential customer.

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

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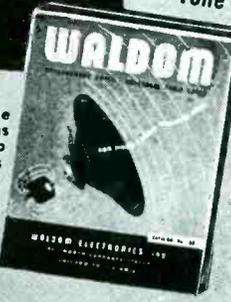
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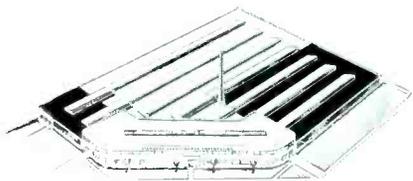
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TEN YEARS AGO

WARTIME SERVICING of pickup, motor and record changers was discussed by Alfred A. Ghirardi, who described how aural symptoms could be used to trace troubles directly and indirectly to faulty crystal pickups, such as, rumbles or growls. . . . Circuits in FM squelch systems, home recorders, and shortwave receivers were reviewed. One chassis analyzed, a Silvertone FM/AM model, was noted as using fifteen tubes, with a 6SJ7 limiter, and a 6J5 squelch tube. Cathodes of the 6J5 and 6SQ7 audio tube were said to be tied together and returned to ground through a common 5000-ohm resistor in the squelch circuit. . . . The front cover featured a power shifter for operating 1.5-volt battery sets of 4 to 6 tubes from a 6-volt storage battery. Two separate supplies were used for A and B, completely isolated so as not to short out the bias resistor of some sets. . . . Commutator maintenance was another Sept. '42 article. . . . Sylvania engineers reported that, in addition to the sharp impulse noises resulting from transients applied directly to a tube element when it makes intermittent contact with another conductor, intermittent contact between two conductors in a tube can result in a signal being picked up by a preceding high-frequency stage. Lint was cited as one of the major sources of noisy tubes. . . . Jack Grand, after 18 years with Sun Radio, resigned to join Burlingame Associates. . . . Army-Navy E production awards were won by Philco, Hallcrafters, Western Electric, Henry L. Crowley and Co., American Lava Corp., Galvin Manufacturing Co., and IRC. . . . Hart Lehman enlisted as a private in the infantry. . . . Fred R. Tuerk became prexy of Utah Radio. . . . Jerry Kahn was elected chairman of the Sales Managers Club, Western Group.

Plant Expansions

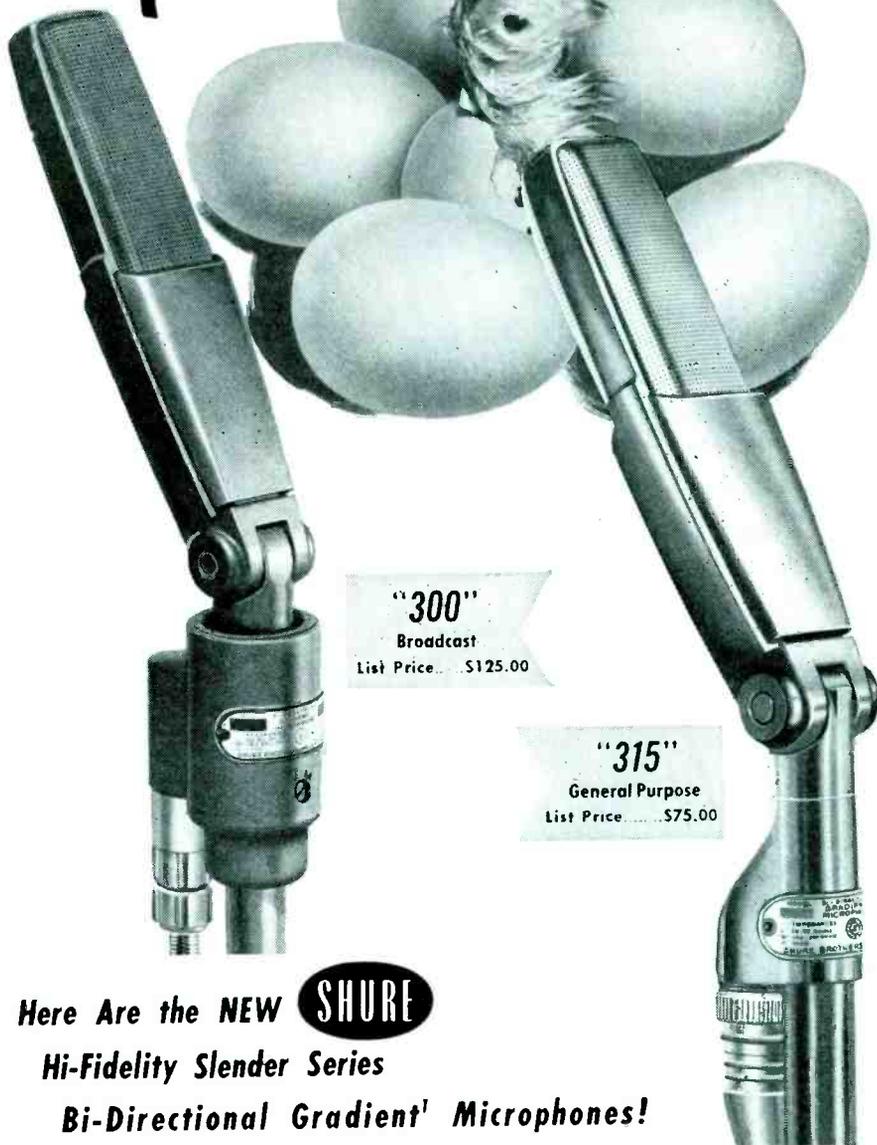


Work is nearing completion on two new wings of the Standard Transformer's factory, shown above, at Addison, Elston and Kedzie Ave., Chicago, which will add approximately 35,000 square feet of production space to the transformer plant. Wings will add fifty per cent to the production capacity and provide needed warehousing, stock and storage space.

Below: A 115,000 square-foot plant, located at 4330 W. 47th St., Chicago, built by the National Video Corp. Railroad sidings run directly into the plant, and trucking docks span the outside of the shipping and receiving entrances.



Speaking of Brand New!



"300"
Broadcast
List Price... \$125.00

"315"
General Purpose
List Price.....\$75.00

Here Are the NEW **SHURE**
Hi-Fidelity Slender Series
Bi-Directional Gradient' Microphones!

● These microphones outperform all other "slender" microphones—because of their advanced acoustical, electrical and mechanical features. Both models permit greater performer freedom (performers can stand at a 73% greater distance from the microphone!) The "300" and "315" will pick up voice and music from front and back—yet discriminate against unwanted noises from the sides. They reduce reverberation and the pickup of distracting random noises by 66%!

● Model "300" Broadcast is specially designed to meet the exacting requirements of TV, radio broadcasting, and recording. It has a special "Grayje" subdued, non-reflecting finish that blends into the background, gives the spotlight to the performer. Has a "Voice-Music" switch for perfect reproduction of the soloist working at close range, or for the distant instruments of the orchestra. Special vibration-isolation unit eliminates "handling" noises and the pickup of floor vibrations. Model "315" General Purpose is similar in size, design and technical features to the Model "300." It is finished in rich, soft chrome—ideal for those public address applications where its streamlined design and beauty lend prestige to any setting in which it is used.

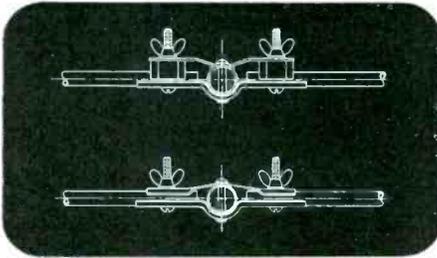
IMPEDANCE TABLE	OUTPUT LEVEL
L—35-50 ohms	58.7 db below 1 Milliwatt per 10 microbar signal
M—150-250 ohms	59.5 db below 1 Milliwatt per 10 microbar signal
H—High	57.0 db below 1 volt per microbar

Shure Patents Pending

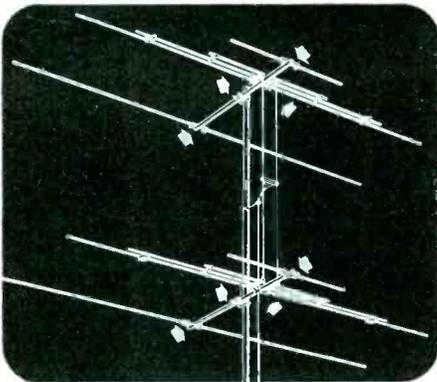
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For positive element support under the most severe conditions, the Q-Tee is now supplied, at no extra cost, with special reinforcing brackets, making the Q-Tee the strongest antenna for its weight ever made. (See below)



plus every desirable feature in an all-channel antenna

First antenna to employ printed circuit filters. Provides higher average gain than other broad band antennas over all channels. Better front-to-back ratio with perfect 300 ohm match and lower standing wave ratio. Easily installed and serviced. Better rooftop appearance. Available in three series—Q-Tee Single Bay for primary areas; Q-Tee Double for near-fringe areas; Q-Tee Quad for fringe areas. The Single Bay . . . lists for only **\$7.75**

VEE-D-X

THE LAPOINTE-PLASCOMOLD CORP.
 ROCKVILLE, CONNECTICUT 0-9

Send me complete information on the Q-Tee.

NAME

ADDRESS

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

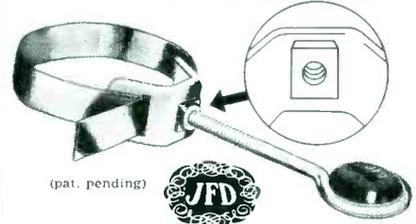
Rep Talk

BURT C. PORTER Co., Seattle, Wash., has been appointed rep for Jensen Manufacturing Co., in Washington, Oregon, Alaska, western Idaho and western Montana. . . . *George Pettitt Co.*, 549 W. Washington Blvd., Chicago 6, Ill., has been named rep for Electronic Instrument Co., in Illinois, Wisconsin and Minnesota. . . . *Saul Goldberg*, formerly a hi-fi rep with Hudson Radio distributors, has joined Transvision, Inc., as a rep in the Queens and Long Island area of metropolitan New York. . . . *Earl T. Champion* 6454 N. Sheridan Rd., Chicago 26, Ill. (Illinois, Wisconsin); *H. E. Walton Co.*, 128 Kercheval Ave. (Grosse Point), Detroit 30, Mich. (Michigan); *A. T. R. Armstrong Co.*, 50 St. Clair Ave. W., Toronto, Canada (Canada except British Columbia); and *Frank Wedel Co.*, 3215 Western Ave., Seattle, Wash. (British Columbia, Washington and Oregon), have been named reps for South River Metal Products Co., Inc. . . . *J. M. Harms*, 443 Broad St., Newark, N. J., has been appointed rep for Products Research Co. . . . *Merrill B. Lamont*, formerly with Bendix, has been named a sales engineer, and *Frank Van Gilder*, district manager for the eastern Pennsylvania area, of the Morris F. Taylor Co., 8416 Georgia Ave., Silver Spring, Md. . . . *The Newhope Corp.*, 6 E. 39th St., New York City (metropolitan New York and northern New Jersey); *Edward Braddock*, Browning Lane, Haddonfield, N. J. (Washington, Baltimore, Philadelphia, Trenton and Camden); *Roger M. Minthorne*, Weatherly Building, Portland 4, Ore. (Oregon, Washington, Idaho, Montana and British Columbia); *Leroy J. Smith Co.*, 3270 Stoner Ave., Los Angeles 34, Calif. (southern California and Arizona); *Stanley K. Wallace*, P.O. Box 744, Lutz, Fla. (Alabama, Florida, Georgia, Tennessee, Mississippi N. and St. Carolina); *Harold A. Chamberlain*, 31 Milk St., Boston 9, Mass. (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and northern New York); *Land-C-Air Sales* (Kine-Lite only), 1819 Broadway, New York 23, N. Y.; *G. L. Koenig, Koenig Sales*, 6359 Antioch Ave., Merriam, Kan. (Missouri, Iowa, Kansas and Nebraska); and *Edwin F. Liddle*, 18925 Grand Ave., Detroit 23, Mich. (Toledo, O., and Michigan), have been appointed reps for Vid-aire Electronics Manufacturing Co. . . . *Ellinger Sales Co.* has moved to larger quarters at 6540 Northwest Highway, Chicago, Ill. *James Fitzsimmons*, formerly with Walker-Jimieson, has joined the firm. . . . *David Sonkin*, formerly of 1775 Broadway, has moved to 10 Fiske



Earl T. Champion

it's the Nut that counts!



Nut universal STAND-OFF INSULATOR

greatest improvement in screw-eyes since TV began!

6 full, machined threads provide "bulldog" grip, anchor the screw-eye for good! No stripping of any screw-eye, no slipping of strap! Reinforced "arch-bridge" construction prevents bending or buckling of clamp no matter how much the stand-off is tightened. Ultra-low loss polyethylene insert and sturdy electro-galvanized steel strap for universal mounting on any mast up to 2 1/2" od. Available for both single and dual lead-ins in 3 1/2", 5 1/2", 7 1/2" and 12" sizes.

Write for Form No. 149 and Free Nut Stand-off Sample . . . today!



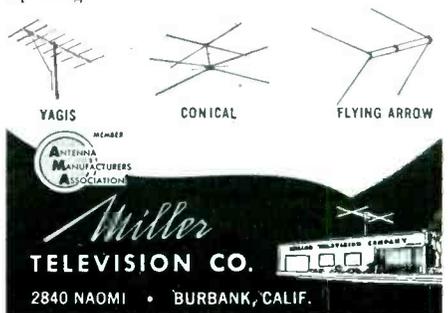
JFD Mfg. Co.
 Brooklyn 4,
 Bensonhurst 6-9200

world's largest manufacturer of TV antennas & accessories



Q. Who produced the first commercially manufactured West Coast Antenna?
 A. John Miller—five years ago. Quality built . . . realistically priced, an antenna bearing the name Miller enjoys an unmarred reputation with jobbers, mfg. reps. and retailers.

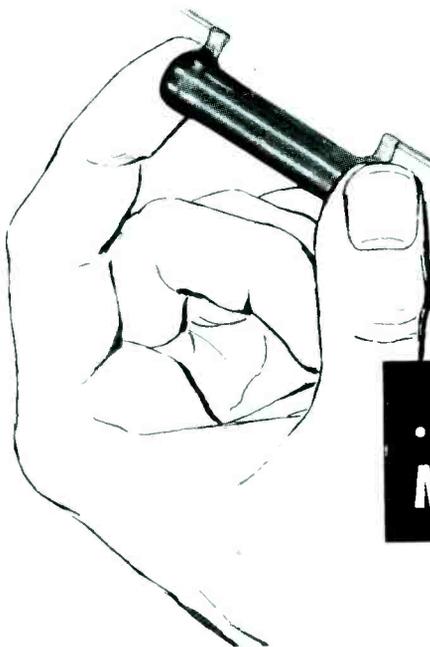
Solve your antenna problems by asking John Miller . . . the West's Pioneer producer of over 1/2 million quality antennas in California alone. A Miller customized antenna is designed to provide good TV reception in all areas, under all conditions. Prepaid to all points in the U. S. Jobbers and mfg. reps. write for new Miller Catalog S-9 for answers to your technical questions . . . also for choice territories now opening.



Place, Mt. Vernon, N. Y. . . . *Wilfrid Graham* has joined *Albert D. Leban* to form Leban and Graham, factory sales reps, headquartering at 218 Lloyd Lane, Philadelphia, Pa., and will cover eastern Pennsylvania, southern New Jersey, Delaware, Maryland and the District of Columbia. . . . *Robert Mosher*, Needham, Mass. (Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont and Maine); and *J. Alan Biggs*, Boyles-town, Pa. (Mid-Atlantic states, upstate New York and eastern Pennsylvania) have been named reps for Permo, Inc. . . . *Weller-Rahe* (jobber sales Ohio); *Orville Smith* (jobber sales Michigan); and *Henry G. Wall* (jobber and industrial sales northwestern New York), have been named reps for Thordarson-Meissner. . . . *Stanley W. Cluphf*, formerly associated with Walker-Jimmieson, Inc., has opened his own rep office at 555 N. 12th St., Laramie, Wyo., and will cover Colorado, Montana, New Mexico, Utah and Wyoming. . . . *Earl T. Champion* has been named rep for Merit Coil and Transformer Corp. in Wisconsin and Illinois. . . . *Tom Marchiano* has joined The Newhope Corp. as an associate. *A. L. Santora* has also joined the selling staff as a junior salesman. . . . *Art Mayer*, 617 Cornelia Ave., Chicago, Ill., has been appointed rep for Snyder Manufacturing Co. for the midwest territory. . . . *JKM, Inc.*, 510 N. Dearborn St., Chicago, Ill., has been named rep for Utah Radio Products Co., Inc., in the Chicago area. JKM has also been appointed rep for Crest Laboratories for industrial and jobber sales.

News Briefs

BELMONT RADIO will hereafter be known as the *Raytheon TV and Radio Corp.* . . . *Charles A. Rice* has been elected president of United Electronics Co., Newark, N. J., succeeding Rudolph H. Amberg, who died recently. *John R. Beers* has become vice president in charge of operations. . . . *Frank R. McMillan* has been named assistant radio division sales manager of IRC. . . . *Canadian Aviation Electronics Ltd.*, Montreal, Canada, has been granted an exclusive license to manufacture DuMont TV receivers in Canada. *K. R. Patrick* is CAE prexy. . . . *William J. Doyle*, vice president in charge of sales of Astatic Corp., addressed a recent meeting of the board of directors and membership of the Phonograph Manufacturers Association, Inc. . . . The Container Corp. of America has designed a new package for the newly designed *Regency TV* signal booster. . . . *George J. Zipf* is now district manager, in charge of sales and service, for the Chicago district of Raytheon. . . . The battery committee of NEDA has issued a battery index, that lists leading brands, which have been cross referenced as to comparative and interchangeable numbers. Copies of the index are available in moderate quantities without charge from NEDA, 221 N. LaSalle St., Chicago 1, Ill. . . . *UHF* tubes necessary in the manufacture of TV tuners are now available in substantial quantities, according to an announcement from the G.E. tube department. Tubes include 6AF4, 6AJ4 and 6AM4.



OHMITE

resistors

... for that EXTRA MARGIN OF SAFETY!

Customers judge your service by the results they get. If a radio or TV repair job fails to stand up, they blame *you*, not the parts you used.

Don't jeopardize your business reputation with "just-as-good" replacement parts. OHMITE resistors provide an extra margin of safety. You can depend on these quality resistors—wire-wound or composition—to give years of trouble-free service.



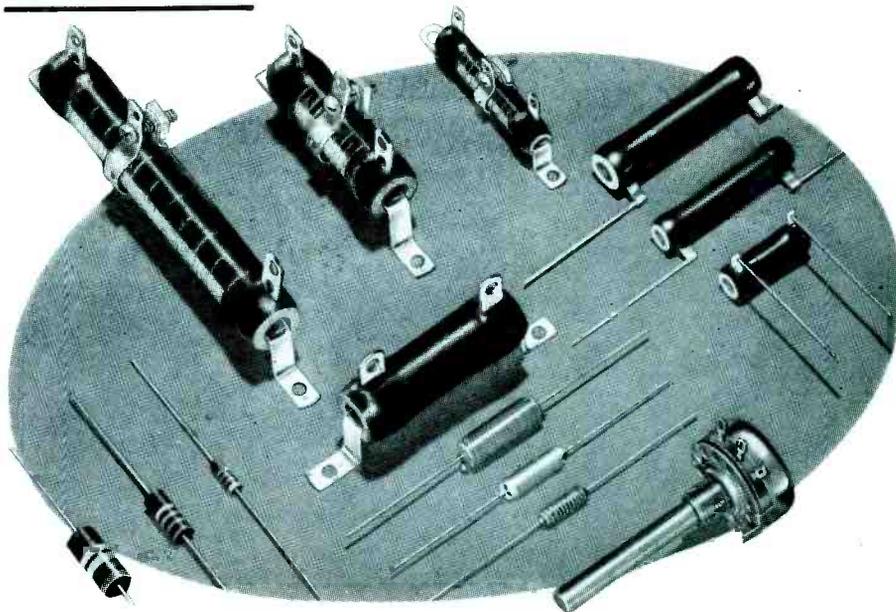
OHMITE MANUFACTURING COMPANY
4877 Flournoy Street, Chicago 44, Illinois

Send for stock catalog

Be Right with . . .

OHMITE®

DEPENDABLE RESISTANCE UNITS



WHEN
EVERYTHING
ELSE FAILS . . .
TRY

DURANTTES!



Proven best by any test! Plastic tubulars in permanent "rock-hard" casings. Drop 'em; bang 'em; scratch 'em; burn 'em — NO DAMAGE. Leads firmly anchored — won't pull out.

And just as rugged electrically. Aerolene impregnant eliminates the stocking of both oil and wax types. No shelf deterioration. Excellent high-temperature characteristics. Satisfactory operation from sub-zero to over 212° F.

Ask your distributor for Aerovox Duranites — the toughest capacitors ever offered.



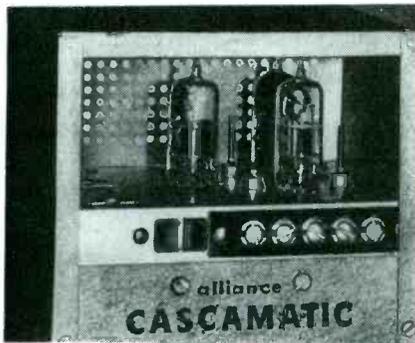
FOR RADIO-ELECTRONIC & INDUSTRIAL APPLICATIONS
AEROVOX CORPORATION
NEW BEDFORD, MASS., U. S. A.

In Canada: AEROVOX CANADA LTD., Hamilton, Ont.
Export: 41 E. 42nd St., New York 17, N. Y.

TV Parts . . . Accessories

ALLIANCE AUTOMATIC TV BOOSTER

An automatic TV booster, *Cascamatic*, that features the *California* circuit, has been announced by the Alliance Manufacturing Co., Alliance, Ohio. Designed for mounting on back of set, booster turns on and off with the set, is pre-tuned to all channels and contains three tubes.



* * *

SIMPSON CROSSHATCH GENERATOR

A crosshatch pattern generator, 485, that may be used to check horizontal and vertical linearity, hold, height, width and drive adjustments when transmitter test patterns are not available, has been introduced by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

Model provides a synchronized signal, modulated on the carrier frequencies of channels 2 through 6, which can be tuned and sent through the receiver under test. When the receiver has been properly adjusted, the signal will show equally spaced lines in vertical, horizontal or crosshatch patterns on the picture tube. All patterns are locked in place with synchronizing pulses exactly the same as the sync pulses in transmitted waveforms. Output cable includes a variable termination network which can be adapted to provide 75 or 300-ohm terminations.



* * *

VEE-D-X UHF LIGHTNING ARRESTER

Lightning arresters, *RK-204* and *RK-300*, for *uhf* applications, have been announced by the La Pointe-Plascomold Corp., Rockville, Conn.

Get RID of
BARKHAUSEN
OSCILLATION



with the
**PERFECTION
B. O. ELIMINATOR**



(Actual Size)

To eliminate the vertical black bars which appear in TV pictures as a result of Barkhausen Oscillation in the horizontal sweep output tube (such as the 25BQ6, 6BQ6, 6EV5, 25EV5, 6AU5 or 25AU5, etc.)—use the Perfection B. O. Eliminator.



Easy to Install

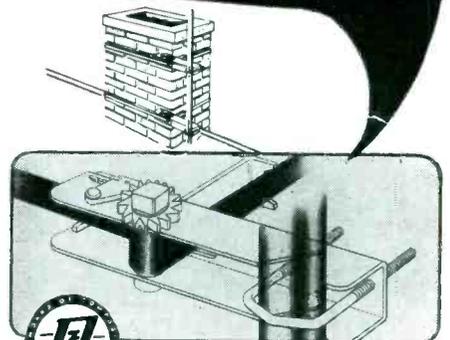
Because it brings a concentrated magnetic field near the screen grid it usually eliminates the oscillation. Just slip the B. O. Eliminator over the tube, move down, or up, or turn until the dark vertical bars disappear.

Order today from your supplier!

PERFECTION ELECTRIC CO.

2635 South Wabash Avenue, Chicago 16, Illinois
Makers of Perfection Speakers, Ion Traps and BeamMaster TV Picture Centering Controls

**FASTER
STURDIER**
Lower Installed Cost



SPEE-DEE CHIMNEY MOUNT

Model AK85 The fastest-installed chimney mount ever devised for TV antennas! Rugged in design—simple to install. Simply thread strapping through ratchet, around chimney and back through ratchet—wind up ratchet tight—and the job's done! Heavy gauge, zinc-plated steel with large "U" bolt for up to 1 3/4" O.D. mast and full length galvanized steel strapping.

THE RADIART CORPORATION
CLEVELAND 13, OHIO

REGENCY VOLTAGE BOOSTER

A voltage booster, *Regency VB-1*, which is said to maintain a 117-volt power supply regardless of line voltage variations from 90 to 130 volts, has been introduced by I.D.E.A., Inc., Regency Division, 790 Pendleton Pike, Indianapolis 26, Ind. Can be used with any electrical device drawing 350 watts or less.

An automatic transformer with tapped primary, is featured, permitting use in high-voltage areas to decrease line voltage.



* * *

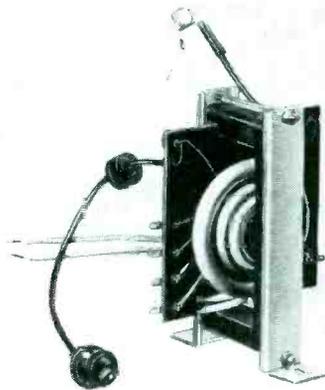
RAM FERRITE-CORE HORIZONTAL OUTPUT TRANSFORMERS

Two ferrite-core horizontal output transformers, *X070* and *X073*, have been announced by Ram Electronics Sales Co., Irvington-on-Hudson, N. Y.

Model *X070* may be used with 12 to 21-inch picture tubes and model *X073* with 7 to 12½-inch picture tubes.

At no load *X070* delivers 13 kv, while *X073* provides 11 kv. Both may be used with 6BG6, 6BQ6 and 6AU5 drivers.

In Zenith replacements, *X070* may be used for S16566, S17435, S17140 and S18125, and *X073* for S15709, S15911, S15710, S16191, S17130 and S17265.



* * *

J.W.M. TOWER

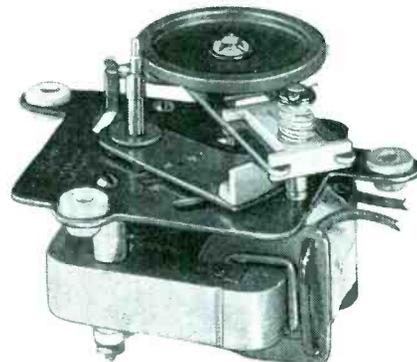
A steel tower, made of 1" steel tubing, that is electric welded into 10' sections which may be bolted together, has been announced by Jeromesville Machine and Welding, Jeromesville, Ohio.

Top section is so constructed that a rotator can be mounted within the tower, driving the antenna through a bushing in the top.

Another First...

3-Speed Record-Changer Phonomotor

new design
new simplicity
new low cost



• First with the belt-type 3-speed motor . . . first with the turret-type 3-speed motor . . . General Industries again leads the field with this novel 3-speed motor.

Developed for one of General Industries' good customers, and field proven over a period of time, this 3-speed motor as illustrated has a stepped shaft and shifting idler wheel arrangement. Model illustrated currently being supplied to well-known record-changer manufacturer, with special construction for customer's own application.



THE GENERAL INDUSTRIES CO.

Department MF • Elyria, Ohio

MOSLEY TV ACCESSORIES

A two-set TV coupler, *Dual-Match*, has been announced by Mosley Electronics, 2125 Lackland Road, Overland, Mo.

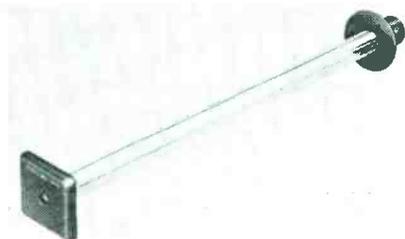
Coupler may be mounted on baseboard or on the back of most TV sets, and is designed for use with standard 300-ohm flat transmission line.

A weatherproof TV or FM lead-in wall entrance, *Wall-Thru*, that can be installed in any wall up to 13" thick has also been announced by Mosley.

Consists of molded polystyrene inside and outside wall plates combined with a sturdy 14" extruded polystyrene tube, ¾" od. Both wall plates are designed to accommodate either standard flat 300-ohm transmission line or RG-59/U coax cable and are adapted for use with tubular type 300-ohm line.



Above: Mosley Dual-Match.
Below: Mosley Wall-Thru.



Free Sample

is yours!

TRY
before you
BUY!

3 oz.
for
the price
of
2 oz.
\$1.00
retail

immediate
full refund if
dissatisfied!



"SILENCER" ... the amazing new Volume Control and Contact Restorer!

- One drop of "Silencer" instantly eliminates all noise indefinitely.
- Cleans, restores volume controls, band switches, push button assemblies, tuners, etc.
- Far superior to temporary carbon tetrachloride.
- Not an oil that changes capacities and gums controls.
- Tested, approved and used extensively by thousands of servicemen.

Write for your **FREE SAMPLE**
or take this ad to your jobber
and get **FREE SAMPLE!**

Send \$1.00 for full sized 3 oz. bottle if
your jobber is out of stock and send
your jobber's name for his credit.

"SILENCER" IS SOLD
THROUGH RECOGNIZED
JOBBERS!

Illinois

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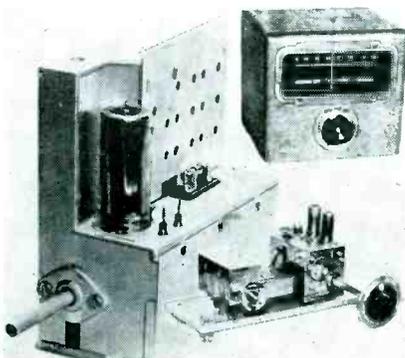
22 W. Madison St., Chicago 2, Ill.
Financial 6-0456 Suite 900

G-I UHF TUNER AND CONVERTER

A *uhf* tuner, 60, that it is said can be fitted and mounted in any position around a *vhf* tuner, has been announced by General Instrument Corp., 829 Newark Ave., Elizabeth 3, N. J.

Tuner is claimed to offer low noise factor, no sliding contacts, straight line frequency dial calibration, and full *uhf* channel coverage.

Converter, 61, contains a model 60 tuner, and is designed to operate with any TV set. Includes its own power supply and built-in antenna.



* * *

TRIO 2-MOTOR TV ANTENNA ROTATOR AND YAGI

A 2-motor TV antenna rotator, that is said to function under severe weather extremes, has been announced by the Trio Manufacturing Co., Griggsville, Ill.

According to the manufacturer, the rotator and control unit were tested in an environmental test chamber (mountain-top conditions) where temperature was dropped to $-50^{\circ} F$ and a partial vacuum applied to equal atmospheric pressure at 15,000-foot altitude, during which rotator operated perfectly. Other tests included: supporting a 50-pound vertical load in 100-mph gales during continuous operation; operating with 600 inch pounds bending moment applied; operating while surrounded by water in temperatures of zero and below, and a vibration test, etc.

A dual-channel yagi, 445MU and 479MU, featuring a speedy assembly, has also been announced.

Each element section of the antenna is color coded and slips into an insert correspondingly coded. Inserts are swaged into the boom. The ends are threaded and split and are said to provide a strong grip when aluminum locking nuts are tightened. Available as a dual-channel yagi, 445MU, for channels four and five, and 479MU for channels seven and nine.

* * *

RADIO CRAFTSMEN HI-FI TV RECEIVER

A hi-fi TV receiver, C-202, for custom installation with 17 to 24-inch picture tubes, has been developed by The Radio Craftsmen Inc., 4401 N. Ravenswood Ave., Chicago, Ill.

Chassis incorporates cascode turret tuner, delayed and graded keyed *agc* and a 5-watt push-pull audio amplifier that is claimed to have less than 2% distortion and a response of 20 to 20,000 cps. Also featured are a double-shadow tuning eye, electrostatic focusing, vertical-line erase circuit, dual channel *if* circuit, 16-kv anode voltage, and 15-microvolt sensitivity.

NEW *Mueller* CLIPS

The Only Complete Line
A Clip for Every Purpose

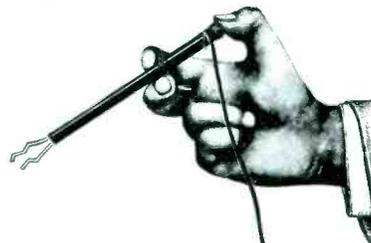


Non-Ferrous
Crocodile Clip
with Insulator

Copper
Alligator
Clips



WEE-PEE-WEE
Phosphor-Bronze
Clip



THE SNAPPER—For "Deep-Sea" Tests

Mueller clips are offered in a great variety of types and sizes—insulated and uninsulated.

SEND FOR SAMPLES & CATALOG 610
CLIP SPECIALISTS SINCE 1906

Mueller Electric Co.

1565 E. 31st St., Cleveland 14, Ohio

XCELITE Hand Tools
PREFERRED BY THE EXPERTS

You're time and money ahead
with a full kit!



You'll finish the job in a hurry and save valuable man-hours with a complete set of XCELITE Nut-drivers. Your choice of blade length from the 3 1/4" Stubby to the long 6-incher, which comes in 9 nut sizes: 3/16" to 1/2". The Stubby is available in 1/4, 5/16 and 3/8" nut sizes. Hollow shaft models have 8 nut sizes—insulated if desired. See your supplier for the complete line!

XCELITE INCORPORATED

Formerly Park Metalware Co., Inc.

Dept. V
Orchard Park, N. Y.

For Originality
LOOK TO **XCELITE**

CATALOGS, BULLETINS ETC.



Sprague Products Co., 61 Marshall St., North Adams, Mass., has released a 12-page capacitor catalog, C-382, that may be tied to the counter for use by customers. Detailed are net and list prices of twist-lok electrolytics, molded tubulars and ceramic models.

* * *

Littlefuse, Inc., 1865 Miner St., Des Plaines, Ill., has published a TV fuse and automotive fuse guide. TV guide lists brand name and model numbers of chassis, and corresponding fuse requirements. Automotive fuse guide includes car radio fuses for all makes of cars beginning with '40, and including '52 models.

* * *

Berlant Associates, 4917 W. Jefferson Blvd., Los Angeles 16, Calif., has issued a 6-page folder describing the advantages of creating a hi-fi library on tape.

* * *

Astron Corp., 255 Grant Ave., E. Newark, N. J., has announced the publication of catalog sheets, complete with engineering performance and test specifications, on type AQ subminiature paper capacitors.

* * *

General Cement Manufacturing Co., 919 Taylor Ave., Rockford Ill., has issued a 16-page brochure, *The Story of G-C*, that details the manufacturing facilities of the company.

* * *

Cornell-Dubilier Electric Corp., South Plainfield, N. J., has published a 40-page edition, *TVR-7A*, of its capacitor replacement guide. Guide lists 1149 TV set models of 73 manufacturers alphabetically; shown are serial and chassis numbers, original capacitor ratings and C-D replacement with rotational stock number. One guide section also lists the capacitors and TV set models for which they can be used; a third section lists rated capacity and voltage of each twist-prong electrolytic. A fourth section is devoted to a cross index of former twist-prong electrolytics and their present equivalent part numbers.

* * *

TapeMaster, Inc., 13 W. Hubbard St., Chicago 10, Ill., has issued a bulletin, 102, describing portable model PT-125 dual speed tape recorder, models TH-25 and PA-1 dual speed transport mechanism and bias-erase oscillator for custom installation, and model SA-13 portable power amplifier and speaker.

* * *

Haydon Products Corp., 1801 Eighth Ave., Brooklyn 15, N. Y., has prepared a catalog describing TV installation accessories. Literature details a combination universal swivel mount that is said to fit peak, pitched or flat roofs, and which also can be used as a corner or a side-wall bracket.



EXTRA! EXTRA!

PROFIT FOR YOU! V-M tri-o-matic® 956-GE RECORD CHANGER



More servicemen prefer the V-M 956-GE than any other record changer! It's fast and easy to install, saves valuable time — it's fool-proof and reliable in operation, saves call-back and service time — it's top quality in clear, faithful Hi-Fi sound reproduction — makes valuable, satisfied customers!

The V-M tri-o-matic 956-GE Record Changer features a constant-speed, hum-free four-pole motor, automatic muting switch for silent change cycle, GE Variable Reluctance "Turnabout" Cartridge for Hi-Fi reproduction across the entire tonal range. Has automatic shut-off, plays all size, all speed records automatically. Complete with 6' AC cord and 4' sound cord. Available without base, Model 951-GE, for use in combinations. Pre-cut mounting board, available at \$2.25 list, speeds installation. Get details from your V-M distributor!

V-M CORPORATION

BENTON HARBOR, MICHIGAN



Don McGohan, Inc., 3700 W. Roosevelt Rd., Chicago 24, Ill., has released a bulletin, 200, featuring amplifiers and sound systems. Described are eight models ranging in power from 7-60 watts, a 60-watt amplifier booster, mobile unit with regular or phono top, portable sound systems, carrying cases, speaker baffles, sound projector, microphones and a 3-speed record player and changer.

* * *

Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y., has issued an 8-page brochure describing facilities for production of electronic parts and equipment.

Thordarson Electric Manufacturing division, McGuire Industries, 500 W. Huron, Chicago, Ill., has released a catalog, 400-K, that describes 42 new transformers designed for TV receiver replacements.

* * *

Sprague Products Co., 61 Marshall Street, North Adams, Mass., has prepared a distributor pocket capacitor catalog, N-489, which can be used for special mailings or included with monthly statements or letters to service customers. Listed are Sprague's line of TVL twist-lok electrolytics used in television and radio servicing.

for dependable sound,
INDUSTRY relies on
ATLAS



DR Double-Reentrant Projectors



Paging & Talk-Back Speakers



ALNICO-V-PLUS Driver Units



Dual Speakers



FULL - GRIP, VELVET-ACTION Mike Stands



ATLAS SOUND CORP.

1442-39th Street, Brooklyn 18, N. Y.
In Canada: Atlas Radio Corp., Ltd., Toronto, Ont.

Tools . . .
Instruments
Parts . . .

MALLORY 2-WATT FRONT CONTROLS

A 2-watt wire-wound front control section, *W1* series, available in 10 resistance values ranging from 750 to 7000 ohms in tapped and untapped types, has been introduced by P. R. Mallory and Co., 3029 E. Washington St., Indianapolis, Ind. May be employed in conjunction with *UR* carbon rear-control sections to fabricate a dual concentric volume control of exact replacement characteristics.

Assembly fittings consisting of an inner shaft, phenolic spacer, special coupling cup and a shaft end are supplied with each control section. It is said that over 90% of all TV and automobile radio set dual volume control requirements can be met by combinations of these controls.

* * *

G-C PLASTIC LONG-NOSE PLIERS

An insulated pair of long-nose plastic pliers, 8387, has been introduced by General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill.

Measuring 6 3/4" in length, the pliers are claimed to be shock-proof. Tool is made of high-impact bakelite material and is said to be extremely handy for picking up nuts and bolts and other parts when a TV set is hot.



GALVANIC SELENIUM RECTIFIER TESTER

An instrument for testing selenium rectifiers, *Seletester* 100A, has been announced by the Rectifier Division, Galvanic Products Corp., 110 E. Hawthorne Ave., Valley Stream, N. Y. Meter provides means for making four required and prescribed tests for forward resistance, reverse leakage current, opens and shorts.

Tester may be used for stacks rated at 10 to 1000 ma. In some cases, tests can be conducted without disconnecting rectifier leads.

Instrument also features an electro-forming circuit for badly shell-aged rectifiers. Forming progress is visible on the meter. Equipped with 4' test leads, alligator clips and 6' line cord.



* * *

INSULINE LONG ALIGNMENT TOOL

A long alignment screwdriver, 6159, measuring 12" has been developed by the Insuline Corp. of America, 36-02 35th Ave., Long Island City 1, N. Y.

Made of flexible bone fiber, with screwdriver blades at both ends.

* * *

PLASTOID HEAVY TV TWIN-LEAD

A *Synkote* 300-ohm twin-lead, in reels of 1,000', has been produced by Plastoid Corp., 42-61 24th St., Long Island City, N. Y.

Each lead contains No. 18 stranded wire, imbedded in a 185-mil web of white or brown polyethylene. Leadin is claimed to have a very high tensile strength, resistance to salt air, heat and sunlight.

* * *

AMERICAN BEAUTY ANGLE-TYPE SOLDERING IRON

An angle-type electric soldering iron, *American Beauty* 3128-A, requiring an input of 60 watts and using a 1/4" plug-type tip, has been introduced by the American Electrical Heater Co., Detroit 2, Mich.

Available in standard voltages and for 32 volts, ac/dc.



USED ON EVERY RADIO-TV SERVICE CALL!

Sprayway PLASTIC SPRAY
PREVENTS and PROTECTS
Chassis • Antenna • Circuit Parts
and Wiring from Rust • Corrosion
Corona • Leakage

Sprayway Acrylic Plastic Spray belongs in every service kit. A touch of the button on top of the can sprays an insulating, protective coating on chassis and wiring. Moisture-proof, grease-proof. Air-tight. High dielectric. An easy economical way to reduce service complaints and call-backs, insure top performance. Order through your jobber or write direct.

\$1.39 12 oz. Clear . . . Aluminum . . . Black . . . White

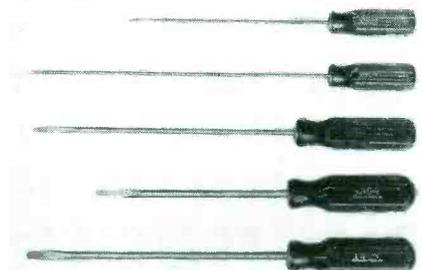


TRU-PINE COMPANY 7638 VINCENNES AVE CHICAGO 20 ILL
Telephone. ABERDEEN 4 6400

XCELITE NON-SPARKING SCREWDRIVERS

Beryllium-copper screwdrivers, that are said to have non-sparking, non-magnetic and fatigue-resistant properties, have been introduced by Xcelite, Inc., Orchard Park, N. Y.

Screwdrivers feature non-magnetic blades that are claimed not to affect the image when used in adjusting focalizers on TV sets, and if bent under stress, may be returned to original shape. Available in $\frac{1}{8}$ ", $\frac{3}{16}$ " and $\frac{1}{4}$ " diameters in varying lengths. Handles are blue plastic.



* * *

SINGER PRODUCTS CEMENT

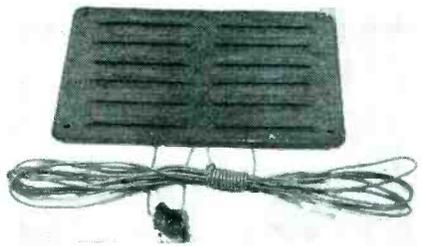
An all-purpose clear-liquid cement, *Weldit*, is now available from Singer Home Products, 121-03 Sutphin Blvd., Jamaica 4, N. Y. Liquid is said to cement anything to anything else permanently, stop all leaks, and be unaffected by water, alcohol, naphtha, oil, gas, etc. Electrical connections can be insulated and water-proofed by pouring a few drops onto the connection and allowing to dry.

* * *

RYTEL REAR-SEAT SPEAKER GRILLE

A rear-seat speaker grille, *RSG 60-K*, constructed of aluminum material that it is said will conform to any contour, has been developed by Rytel Electronics Manufacturing Co., 9820 Irwin Ave., Inglewood, Calif.

Speaker covers mounting bolts of 6" x 9", 7" oval or smaller speakers, and is finished in gray crackle.



* * *

SPRAGUE MOBILE RADIO CAPACITORS

Two *Hypass* feed-through capacitors, *48P18* and *80P3*, designed to eliminate automotive radio noise and filter power-line, filament, and control circuits, have been announced by the Sprague Products Co., 61 Marshall St., North Adams, Mass.

Capacitor *48P18* is rated at .5 mfd 50 *vacw*, and 40 amperes through current. It is said to provide effective filtering of voltage regulator noise in mobile radio installations when installed in series with the battery and generator armature leads to the voltage regulator. Capacitor *80P3* is designed to filter and bypass harmonics and spurious *rf* currents in transmitters, radio, and TV receivers. A bulkhead mounting bracket permits through-chassis mounting for circuit shielding and isolation. Rated at .1 mfd, 600 *vacw*, 20 amperes through current, and may be used at potentials up to 250 volts, 60 cycles *ac*.

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SERVICING
WITH
"STANCOR
TRIOS"**



(Groups-of-three most frequently used Stancor TV Replacement Components listed below)

Don't Waste valuable time waiting for a replacement—carry it in stock!

STANCOR CHOKES	C-2325 C-2326 C-2327	COVER 70% of your TV REPLACEMENTS*
STANCOR DEFLECTION YOKES	DY-1 DY-8 DY-9	COVER 70% of your TV REPLACEMENTS*
HORIZONTAL DEFLECTION OUTPUTS	A-8127 A-8128 A-8130	COVER 45% of your TV REPLACEMENTS*
VERTICAL DEFLECTION OUTPUTS	A-8112 A-8115 A-8123	COVER 70% of your TV REPLACEMENTS*
VERTICAL BLOCKING OSCILLATORS	A-8111 A-8121 A-8122	COVER 65% of your TV REPLACEMENTS*

* Based on a statistical analysis of all replacement recommendations in the Stancor TV Replacement Guide.

Stancor Transformers are listed in HOWARD W. SAM'S Photofact Folders and JOHN RIDER'S Tek-Files.

FREE!

Stancor's new 24-page catalog listing over 475 transformers and related components for all types of electronic applications. Includes over 100 TV units. Get your free copy from your Stancor distributor or write Stancor direct!



STANDARD TRANSFORMER CORPORATION

3588 ELSTON AVENUE, CHICAGO 18, ILLINOIS

COSSOR 'SCOPE

A portable "scope, *Cossor 1039*, is now available from Beam Instruments Corp., 350 Fifth Avenue, New York 1, N. Y. Features include: high frequency amplifier in two ranges, 25 cps to 3 and 3.5 mc. Variable gain control. Separate switching which provides *dc* to *Y*, *ac* to *Y*, signal to amplifier at maximum gain (60) or intermediate gain (10). Repetitive time base. 10 cps to +50 *kc*, with negative sync. Metal control knobs and mechanical protection for *crt*. Recessed sockets give access to *X* and *Y* plates, amplifier sync, and ground connections.

DUMONT 'SCOPE ADAPTER

A terminal adapter, *2592*, which is said to permit easier use of coax cables for carrying signals to the banana-jack type terminals of 'scopes and other test equipment and also provide correct impedance-matching termination for the coax, has been announced by the Instrument Division, Allen B. Du Mont Laboratories, Inc., 1500 Main Ave., Clifton, N. J.

Can be used on any instrument having banana-jack type terminals spaced $\frac{3}{4}$ " on centers. Input signal to the terminal adapter is fed through a standard coax connector which fits Amphenol plugs 82-ISP, 83-ISP, 83-776, UG18B/U, UG21B/U, UG94A/U, UG88/U and UG260/U.

MAKE MORE MONEY!



with the famous CREST
PICTURE TUBE REJUVENATOR

renew brightness, sharpness, and detail of weak, dim CR tubes! results are amazing!

EVERYWHERE SERVICEMEN are brightening profits with this PROVEN MONEY MAKER.

CREST LABORATORIES—A leading source of transformers pioneered in the design and development of CRT rejuvenators. Service men look to Crest Laboratories for quality, performance and assured satisfaction.

HOW IT WORKS: Easy-to-install Picture Tube Rejuvenator increases cathode emission of weak CRT's by raising cathode filament temperature.

BRIGHTEN PROFIT PICTURE: Actually assures prolonged life of weak tubes. SAVE the difference between a CRT and \$2.79 for the Rejuvenator. SAVE on service contracts, parts warantees. Quick profit on service calls.

- ✓ Simple Plug-in Unit — installed in less than 1 minute
- ✓ Permanent Hook-Up
- ✓ Attractive, colorful packaging complete with easy instructions.
- ✓ No Exposed Wires
- ✓ Fits all Size Tubes
- ✓ Automatically Operated — turns on and off with set
- ✓ Standard RTMA Guarantee

Heavy Duty Model "B" for standard as well as for electrostatic focus tubes. \$3.40 Dealer Net.

Model "C" for standard tubes \$2.79 Dealer Net.

Available at Local Jobbers, or inquire

CREST

LABORATORIES, INC.

Whitehall Building, Far Rockaway, N.Y.

B AND W DIP METER

A pocket-size dip meter, model 600, for measuring resonant circuit characteristics, has been announced by Barker and Williamson, Inc., 237 Fairfield Ave., Upper Darby, Pa.

Meter may be used as a grid dip oscillator, absorption wave meter, auxiliary signal generator, and *rf* signal monitor. Its many uses include determining the resonant frequency of tuned circuits, antennas, feed line systems, and parasitic circuits; neutralizing and tuning transmitters before power is applied; aligning filters, traps, receivers, converters, *if* amplifiers; and peaking coils.

Model has a calibrated frequency range of 1.75 to 260 mc in 5 overlapping bands. Color-coded plugin coils are supplied with each instrument. A 0-500 ma meter is equipped with an adjustable sensitivity control.



DRILSAW HAND TOOLS

A tool, *Drilsaw*, that drills its own holes and saws in any direction, has been announced by Drilsaw Co., 1561 Virginia Ave., Glendale 2, Calif.

Hand tool, with a gimlet point and a blade which is toothed spirally, is available in four diameters: 3/16", 1/4", 5/16" and 3/8".

* * *

CLAROSTAT FIELD-ATTACHED SHAFT WIRE-WOUND CONTROLS

Wire-wound controls, with field-attached shafts, have been announced by Clarostat Manufacturing Co., Inc., Dover, N. H. Controls may be used with any one of the 11 different *Pick-A-Shafts*. Shaft is inserted in the shaft fitting of the control, and a tap seats the shaft under a locking C-washer.

Wire-wound controls come in three series: series *A13*, a wire-wound control rated at 2 watts; series *A58*, rated at 3 watts; series *A10*, rated at 4 watts, with a wide range of resistance values available in each series. Choice of any one of the 11 *Pick-A-Shafts* is made with the purchase of control.

* * *

HOLUB VOLTAGE TESTER

A voltage tester, *Hi-Test*, having only one test lead, and indicating *ac* or *dc* voltages from 115-600 *v*, has been introduced by Holub Industries, Inc., 413 DeKalb Ave., Sycamore, Ill.

Second test prod is permanently mounted in one end of the tester. Overall length is 8 1/2"; test lead with 4-inch plastic handle, 48"; and weight 10 ounces.

* * *

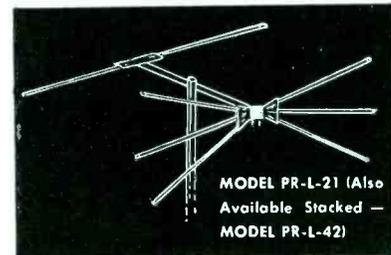
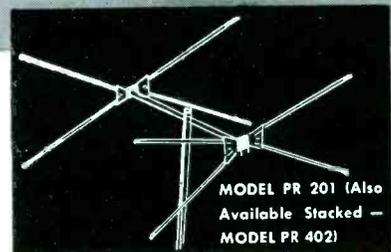
a "TESCO" exclusive

the **ROCKETENNA**

IT'S THE CATS WHISKERS AND JUST AS SENSITIVE! TRADE MARK

by T-V PRODUCTS CO.

- ✓ Amazingly Powerful Reception
- ✓ Rugged All-Aluminum Construction
- ✓ Lifetime Factory Warranty



Complete factory Preassembly features sensational "Quick-as-a-Wink" construction. No Nuts or Bolts to Tighten... rugged rivet assembly prevents damage by wind and storm vibration.

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PRODUCTS CO.

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Write for Catalog S

CROSLY APPOINTS FRANK FEILEN FIELD SERVICE MANAGER

Frank Feilen has been appointed field service manager of the Crosley Division, Avco.

Feilen, recently regional service manager in the Crosley Atlanta region, will headquarter in the service department on Spring Grove Ave., Cincinnati, O.



Frank Feilen



Oden F. Jester

O. F. JESTER NOW STANDARD COIL DIST. S-M

Oden F. Jester has been named sales manager of the distributor division of Standard Coil Products Co., Inc. Jester is a former vice president of the Meissner-Thordarson-Radiart division of Maguire Industries, and for a number of years was general sales manager of Utah Radio Products and radio sales manager of Stewart-Warner.

* * *

SPICO TV ANTENNA RECEIVES PATENT

A U.S. patent, 260587, for an indoor TV antenna, *Super Phantom* (model TV-503) has been awarded to Spirling Products Co., Inc., New York City. Model features *adjust-a-knob* control and impedance matching stub. It is also said to be tip-proof.

* * *

CAPPUCCI BECOMES RMS GENERAL MANAGER

Edward M. Cappucci has been made general manager for Radio Merchandise Sales, 2016 Bronxdale Ave., New York 60, N. Y.

Cappucci joined RMS as plan superintendent of the antenna division, several years ago and was shifted to purchasing prior to this most recent move. Cappucci, in addition to his new duties, will continue as executive in charge of purchasing.

RMS has also announced that *John Laura* has been appointed western branch manager, and will operate from the RMS West Coast branch at 140 E. Washington Blvd., Los Angeles 15, Calif.



E. M. Cappucci



John Laura

KNOWS HIS BUSINESS



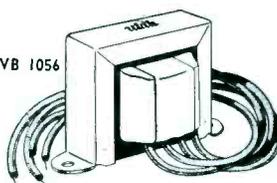


Yes, this Service Man knows his business—knows that he must be sure replacement transformers will perform superbly and reflect favorably his reputation as a highly skilled service technician.

He doesn't gamble with mediocre transformers, he installs the choice of leading set manufacturers—Utah. Don't hazard your reputation with unproven parts, specify "Utah" Transformers and be sure of a job well done.

**POWER TRANSFORMERS • VERTICAL OUTPUT TRANSFORMERS • FILTER CHOKES
VERTICAL BLOCKING OSCILLATORS • AUDIO OUTPUTS**

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VB 1056



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P-1052

Speakers . . . Transformers

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RADIO PRODUCTS CO., INC.

HUNTINGTON, INDIANA

A WHOLLY OWNED SUBSIDIARY OF NEWPORT STEEL CORPORATION

B. V. K. FRENCH JOINS SICKLES

B. V. K. French has become a member of the field engineering staff of the F. W. Sickles division of the General Instrument Corp., P. O. Box 330, Chicopee, Mass.

* * *

RADIO ESSENTIALS IDEA CONTEST

A contest, with a first prize award of \$50.00 describing the most needed item for radio and TV that is not now available, has been announced by Radio Essentials Inc., 152 MacQuesten Parkway South, Mt. Vernon, N. Y.

Service Men should sketch a suggestion, and send it in before Oct. 1. Other prizes include \$25-\$15-\$10 and ten \$5 cash awards.

JENSEN SPEAKERS LISTED IN RIDER TEK-FILE AND MANUALS

Listing of Jensen and Viking loudspeakers in the replacement guide of Rider Tek-File and Manuals, has been announced by the Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 38.

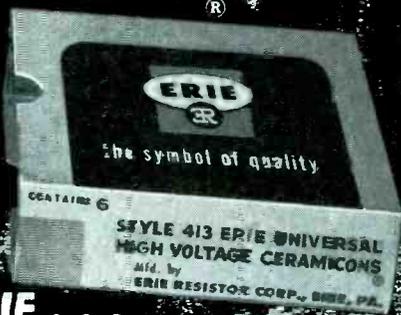
* * *

MOSLEY APPOINTS G. E. MOBUS AD MANAGER

Organization of a department of advertising and sales promotion, headed by *George E. Mobus*, has been announced by Mosley Electronics, Overland, Mo.

Mobus, formerly with the Bartz Advertising Agency, Peoria, Illinois, has served for the past three years as account executive.

The ORIGINAL Universal High Voltage TV Filter Ceramicons



By ERIE . . .

the solution for *all* your high voltage TV filter replacement problems

This package contains six (6) Style 413 ERIE Universal High Voltage TV Filter Ceramicons and an assortment of 14 adapter terminals.

Carry one of these handy package assortments with you on all your TV service calls. You are assured of having, at all times, the CORRECT RE-

PLACEMENT UNIT for any receiver rated at 20 KV or lower.

If your requirements are for all of one combination of terminals, the Style 413 may also be obtained in handy plastic kits of ten HV Ceramicon bodies. Adapter terminals are supplied in packets of five each of a type.

Order through your jobber.



ERIE RESISTOR CORPORATION . . . ELECTRONICS DIVISION

Main Offices: ERIE, PA.

Sale Offices: Cliffside, N. J. • Philadelphia, Pa. • Buffalo, N. Y. • Chicago, Ill. • Detroit, Mich. • Cincinnati, Ohio • Los Angeles, Calif.

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Have You Entered THE BIG

Jensen \$5,000.00

Cash Prize Contest?

SEE YOUR *Jensen* NEEDLE DISTRIBUTOR
TODAY FOR DETAILS AND ENTRY BLANKS.

LEARY NOW C-D JOBBER S-M

Raymond T. Leary has been appointed sales manager of the jobber division of the Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Leary formerly served as industrial sales head of the C-D Chicago sales office, covering the Illinois and Missouri territories.

* * *

DR. YUEN T. LO JOINS CHANNEL MASTER AS PROJECT ENGINEER

Dr. Yuen T. Lo has been appointed project engineer at the antenna development laboratory of the Channel Master Corp., Ellenville, N. Y.

A graduate of the National Southwest Associate University of China, Dr. Lo taught at the Radio Research Institute of Tsing Hua University where he also was engaged in ionosphere research.



Dr. Y. T. Lo

* * *

MIDDLETON'S TV TROUBLESHOOTING BOOK PUBLISHED BY RIDER

A 204-page book, *TV Troubleshooting and Repair Guide Book*, by R. G. Middleton, has been announced by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

Book discusses problems that arise in servicing TV receivers and presents these troubles along with their respective cures. Through the use of patterns taken from TV receiver picture tubes and waveforms from scopes, book discloses how trouble symptoms can be recognized and remedied.

Ten chapters cover: receiver differences and waveforms; hints in visual alignment procedures; troubleshooting sync circuits; locating sweep troubles, etc. Priced at \$3.90.

* * *

BENDIX TV AND RADIO OPENS REGIONAL OFFICES

Opening of regional offices in New York, Chicago and San Francisco, as the first step in a nationwide expansion program, has been announced by the Bendix TV and Radio Division, Bendix Aviation Corp., Baltimore 4. Offices are planned to give guidance to dealers and distributors within the region on sales, advertising, and service problems.

Regional manager of the New York office, 500 Fifth Ave., Room 3000, is *Ralph Morel*. Region encompasses all of the eastern seaboard states, including Tennessee, Pennsylvania, West Virginia and Alabama. Chicago office, Room 545D, Furniture Mart, will service the mid-western markets and the Plain states from the Dakotas to the Texas border. *L. G. Miner* has been named regional manager in Chicago. Nine Pacific Coast and far western states will receive their sales and service assistance from offices in San Francisco. *Donald Ross* will supervise these activities from Merchandise Mart, 1155 Market Street, Room 429.

UHF Receptors

(Continued from page 28)

circuit in each receptor. The incoming *uhf* signal mixes with the local oscillator signal in crystal mixer circuits, and the resultant *if* output (center frequency is 44 mc), is fed to a 6AK5 *rf* amplifier in the TV set. When the channel selector on the TV receiver is set to either of the *uhf* positions, the 6AK5 *rf* amplifier and 6X8 mixer-oscillator circuits serve as *if* amplifiers at 44 mc, and the *vhf* oscillator section of the 6X8 is disabled. Thus, the 44-mc output of the *uhf* receptor is amplified in these circuits and fed into the *if* strip in the receiver.

To install a *uhf* receptor, it is necessary to remove the rear cover of the TV receiver. The receptor is then plugged into either of two *uhf* sockets located on the rear of the *vhf* tuner mounting bracket. If the receptor is plugged into the socket nearer to the side of the chassis, the *uhf* position nearer channel 13 on the channel selector is activated. If the receptor is plugged into the socket nearer the center of the chassis, the *uhf* position next to channel 2 on the channel selector is activated. Ribbon-type antenna leads from the receptor should be connected to the *uhf* antenna terminals on the back cover of the receiver. To prevent impaired reception which may result if the antenna lead runs close to the receiver chassis, the lead should be passed through the same clip that supports a built-in *vhf* antenna lead.

A piece of wire, which protrudes from pin 1 of the plug, serves to adjust internal coupling between *rf* coils. Care must be exercised to avoid altering original factory placement of this wire.

The *rf* trimmers will detach from the unit if they are rotated too far counterclockwise. If this occurs, the following procedure should be used to avoid damaging the ceramic part of the trimmer when replacing the screw: With the screw removed from the unit and the metal locking device placed on the screw, the locking device should be rotated until it is near the head of the screw. The screw should then be inserted in place and rotated clockwise several full turns. While keeping the screw from turning, the locking device should be rotated clockwise until it is moderately tight against the outside of the receptor.

Antenna requirements for satisfactory *uhf* TV reception are determined by the signal conditions in the particular locality.

A simple resonant dipole antenna as shown in Fig. 1 (p. 28), may provide

*SERVICE, July, 1952.



The SMART, NEW way to buy your C-D RED SEAL Vibrators in the RE-USABLE Plastic Vibrator Kit

You get the re-usable plastic box FREE with the nine vibrators

★

You get the best vibrators money can buy

★

You get in one purchase the 5 types that serve over 60% of the popular replacement requirements

Save time... with the convenient C-D VIBRATOR KIT that gives you 9 vibrators in 5 types PLUS a sturdy transparent plastic box with a hinged cover and dividers that has dozens of uses around the shop and at home. The assortment includes two 5300; two 5301; two 5326; two 5342 and one 5335 — all with 5 big POINTS of superior construction: (1) all-riveted assembly, (2) beveled counterweight, (3) shock absorber lead design, (4) air-gap insulated mounting screws, (5) improved sponge rubber cushioning — 5 PROMISES of superior performance in service.



CONSISTENTLY DEPENDABLE

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SOUTH PLAINFIELD, NEW JERSEY



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• ROTORS • VIBRATORS • CONVERTERS

satisfactory reception in medium-signal areas. Where signals are weak or reflections troublesome, a high-gain directive antenna system should be used. Typical of this type of antenna are the corner reflector, the rhombic, and the yagi,* and special combination types, recently announced.

VTVM TV Servicing

(Continued from page 36)

exploring device or signal-strength indicator.

In many circuits, reduced grid bias will indicate a gassy tube, even

though the effect on overall performance is slight or not apparent. This drop in grid bias can be measured accurately with the *vtvm*. A drop in negative bias or positive bias on one or more *if* tubes may also indicate a leaky coupling capacitor between the plate and grid of a video amplifier stage. If the defective capacitor is in the grid circuit of a stage supplied from the contrast control, the range of this control will be nullified or reduced.

In audio circuits where the volume control is connected directly to the control grid, a gassy condition may in-

(Continued on page 96)

33 1/3% More Storage Space in Same Area
With Equipto SHELVING

Especially designed for
 the Electronic Industry

- Economical • Light Weight, High Capacity • Shelves Instantly Adjustable.

Don't waste valuable space with useless oversized shelving. The new 8" deep Equipto shelving specifically designed for electronics trade can be used as a regular instantly adjustable shelf or inverted to use the turned up shelf edge for extra protection to keep valuable items from falling to floor. The 8" depth is made expressly for the narrow lineup of merchandise necessary in this field. Holds 150 lbs. without reinforcements. Can be reinforced to hold up to 1200 lbs. on each shelf.

TYPICAL ASSEMBLY
 Use end to end as shown or back to back for maximum storage in small space. Shelves may be adjusted on any one unit on 1/2" centers without adjusting shelves on any other unit.



No. 565-A
 Closed Type Shelving 8" x 3' x 7' high. Single or starting unit; equipped with backs and sides. Ideal for dope storage.



No. 893-8
 Open Type Shelving 8" x 3' x 7'



Even if items tip over—the risk of falling to floor is greatly reduced when shelves are used with flange turned up. The turned up flange is used as a stop. Also saves 1" of space at shelf flanges.



View of typical 8" deep shelf showing flange down.
 The fast, labor saving shelf clip used to make all shelves instantly adjustable on 1/2" center.

View of typical 8" deep shelf inverted showing flange up.
 Sway Braces available as needed, included in price.

OTHER STYLES AND SIZES AVAILABLE

Equipto Division of Aurora Equipment Co.
 790 Prairie • Aurora, Illinois
 Phone: Aurora 9231

Write for **FREE** Catalog **40** YEAR

(Continued from page 95)

crease the grid current to such an extent that the volume control will eventually become noisy, even though the grid current is not high enough to produce noticeable distortion. Measurement of grid bias (or correction of a direct-coupled control by adding a .01-mfd unit or similar capacitance in series with the volume control arm) can prevent early failure or noisy operation of the control.

Germanium Diodes

Diodes used in *dc* restorer, clipper, *agc*, or sync separator circuits can be given a rough check with a *vom* by disconnecting one lead of the diode and making a resistance check in both directions across the diode. The resistance in one direction should be several hundred ohms; several thousand ohms in the other. If the resistance is approximately equal in both directions, a new diode should be substituted.

The foregoing check will only show whether or not the diode is rectifying. To check actual operating characteristics,* —50 volts should be applied to the diode (+ to cathode and — to anode) and the current measured on the 0-1 ma scale of a good milliammeter. This is the reverse current and can be compared with the manufacturer's specifications for that particular type of diode. (Reverse resistance = voltage divided by current). Then 1 volt can be applied to the diode (with — to cathode and + to anode) to check forward resistance. This value should be checked with manufacturer's specs. A 1N65, for example, should have approximately 0.25 ma reverse current and 2.5 ma forward current.

Bias cell voltages can also be accurately measured with the *vom* without danger of excessive current drain and resultant damage to the cells.

Insulation Resistance

Leakage up to 1000 megohms can be measured with a *vom*.¹ This is helpful in measuring leakage through the insulation of capacitors, transformers, cables, coils, etc.; small paper and mica capacitors usually have leakage resistance well above 1000 megohms.

To extend resistance-measuring ranges, an external voltage of 20 to 500 volts can be connected in series with resistance being measured and

*G. E. Techni-Talk; June-July, 1950.

Build YOUR OWN Heathkit TEST EQUIPMENT

Heathkits are completely engineered instruments supplied unassembled. Every kit goes together smoothly and easily. All drilling, punching, and painting has already been done for you.

It's easy and fun to build a Heathkit. All parts are furnished and are of highest quality for years of trouble-free, dependable operation.

Save money by constructing your own. All expensive wiring and assembly costs are completely eliminated.

Detailed construction manual shows clearly where each wire and part goes and tells exactly how to build the kit. Write for free catalog.

- Heathkit AUDIO GEN. KIT \$34.50
- Heathkit TUBE CHECKER KIT \$29.50
- Heathkit TELEVISION GENERATOR KIT \$39.50
- Heathkit SIGNAL TRACER KIT \$19.50
- Heathkit CONDENSER CHECKER KIT \$19.50
- Heathkit IMPEDANCE BRIDGE KIT \$69.50
- Heathkit HANDITESTER KIT \$13.50
- Heathkit BATTERY ELIMINATOR KIT \$24.50
- Heathkit R.F. SIGNAL GEN. KIT \$19.50
- Heathkit PUSH-BULL. OSCILLOSCOPE KIT \$43.50
- Heathkit ELECTRONIC SWITCH KIT \$19.50
- Heathkit VACUUM TUBE VOLTMETER KIT \$24.50

HEATH COMPANY
 BENTON HARBOR, MICHIGAN

EXPORT AGENT
 ROCKE INTERNATIONAL CORP.
 13 E. 30th St.
 NEW YORK CITY (14)

v_{tm}. This voltage need be only high enough to produce a reliable deflection on the meter, preferably at about half-scale.

To measure in this range, the selector switch should be set to +volts and a *dc* voltage reading made at a point nearest the *v_{tm}*. Then the probe can be shifted to the point nearest the voltage source for the second reading.

The resistance under measurement will be found from: $X = \frac{11 \times A - B}{2}$

(as indicated in Fig. 1, p. 36) where *X* is the resistance being measured, and *A* and *B* are the voltages measured at those two points. Example: Let us suppose that the external voltage being used is 350 volts, and the voltage reading at *B* is 2 volts. Since the voltage at *A* is 350 volts, the resistance will be:

$$\frac{11 \times 350 - 2}{2}, \text{ or } 1,914 \text{ megohms.}$$

Meter Protection

When measuring circuits which contain both *ac* and *dc*, one should be sure that the *dc* component does not exceed 600 volts. If it does, a 1-mfd (or larger) capacitor of adequate voltage rating should be connected in series with the probe input to protect components in the diode circuit.

Before checking resistance, all voltage should be removed from the circuits. In all equipment, the *ac* plug should be pulled instead of relying on the *on-off* switch. A defective switch or unusual circuit arrangement may place voltage on one or more circuits. In high-voltage circuits, no voltage should remain in the filters. Any possible charge should be bled off by shorting temporarily to ground.

The meter selector switch should be on the proper range and function before making a reading. When measuring unknown voltages, you should start with the range switch in the highest position and decrease in steps until the suitable range is obtained.

In measuring peak-to-peak voltages, the voltage range of the meter should not be exceeded. Any measurements in deflection or *hv* circuits must be made with high-voltage probe or voltage multiplier.

When making *hv* measurements, the voltage should be removed from the circuit while the ground clip and probe are being connected. If turning off power during checks is undesirable or impossible, you should make sure that the ground clip is firmly connected, and fingers should be kept well

¹Such as the RCA WV75A.

22 Db GAIN

OVER A TUNED DIPOLE

MOST POWERFUL TV ANTENNA EVER DEVELOPED FOR HOME USE

- ★ 10 Times More Powerful than Stacked 10 Element Yagis.
- ★ Extends Fringe Area Reception An Additional 40 Miles.
- ★ Motorless All Direction uhf and vhf Reception.
- ★ Broadband All Channel uhf and vhf Reception.
- ★ Quick Rig Flip Out Assembly.
- ★ Half Cost of Single Channel Stacked Yagis.
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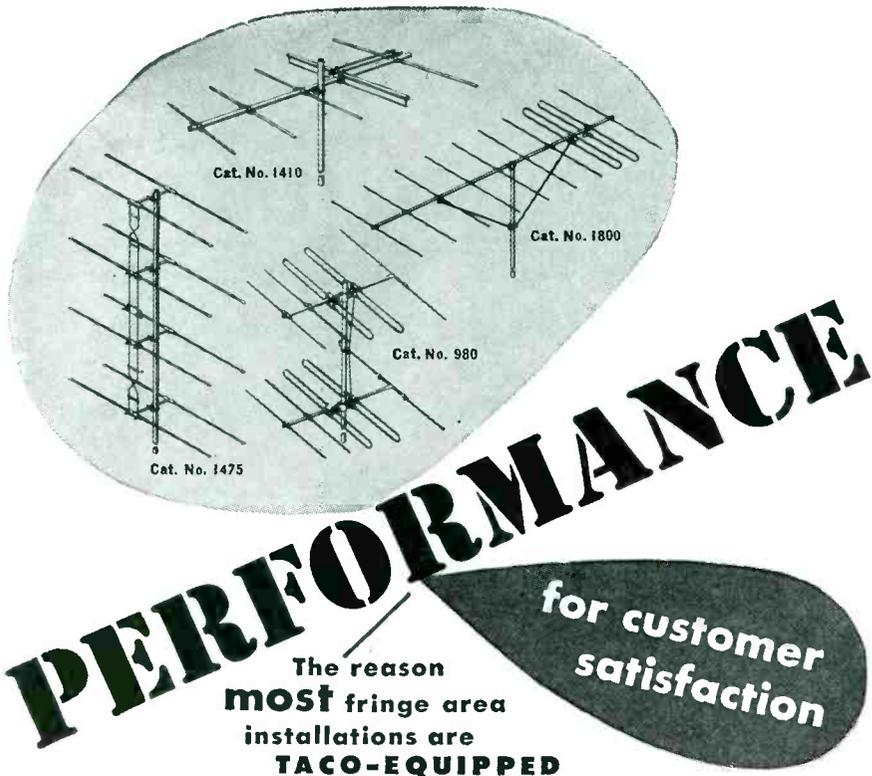
away from the probe tip. The meter should never be left connected to a *hv* circuit after the measurement has been completed.

You should not depend on immediate removal of *hv* when the main power switch is thrown off. Filters may retain sufficient charge to cause serious injury. If the *hv* is supplied by a motor-generator set, you should wait until the generator stops. Turning the main switch may turn off the line power, but does not provide safety grounding of the high-voltage circuits in these cases.

The *v_{tm}* ground lead should not be connected to a high-voltage point. Such procedure may produce severe shock, since the *v_{tm}* ground lead also connects to the instrument case. It is also good practice to keep the *v_{tm}* at ground potential to avoid incorrect readings caused by potential differences between the instrument case and the chassis of the equipment under test.

Credits

The author is grateful to RCA and G.E. for their notes on *v_{tm}*'s and on germanium diodes.



The reason most fringe area installations are TACO-EQUIPPED

Ask your distributor for your Taco Cat. No. 38 — the Antenna Handbook.



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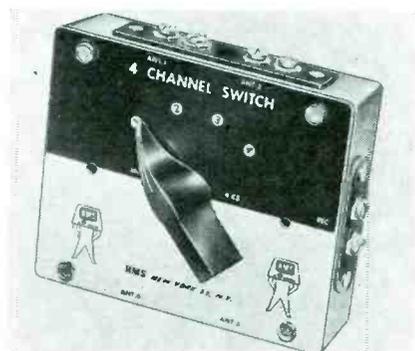
In Canada: Stromberg-Carlson Co., Ltd., Toronto 4, Ont.

TV Antennas

(Continued from page 26)

the remaining two are generally shorted or connected together. The selected combinations may comprise either straight or conical dipoles and may include reflector elements. The entire arrangement is accomplished by a switch.

The system is said to provide for the selection of 16 directions. The desired directivity is accomplished by the operation of the selector switch which has nine different positions; 360° of selected directivity are provided.



Four-channel switch for switching four television antennas into one receiver or for operating any one of four receivers from a single antenna. (Model 4CS; RAIS)

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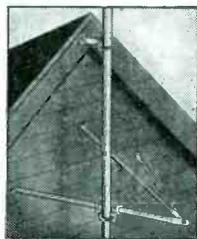
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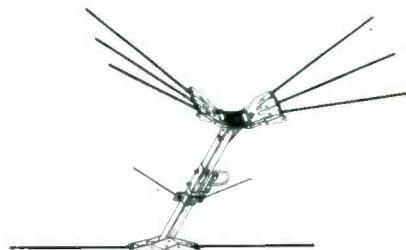
Permits mounting by use of brackets fastened to eave and wall. All aluminum construction provides guarantee against corrosion and staining. Special "U" bolts provide mast accommodation up to 1 1/2" O.D. and prevent mast from turning in high winds. Complete with hardware.

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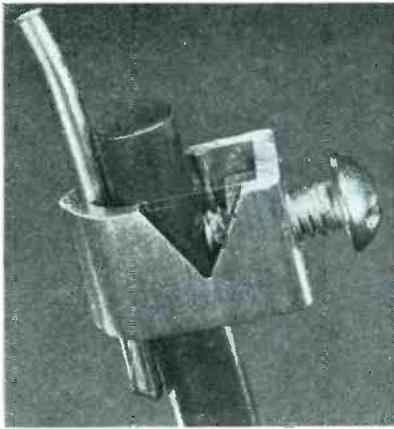
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Conical-V-Beam antenna which features all-aluminum outrigger pivot plate and mating pressure plate which is said to reduce set-up time. Tightening of a wing nut grips solid dural element rods in the jaws of a 3" all-aluminum element clamp. Insulation is of laminated micarta. Has a Hi-Y reflector, integrally embodied. (Meteor E-Z-Rig available in the basic single unit ME-2X-TV, two bay array ME-4X-TV, and a four bay unit ME-8X-TV; Telrex, Inc., Asbury Park, N. J.)



Above: A triple-driven (broad-band) yagi antenna, which consists of a straight dipole, and a reflector, and has been designed to cover channels 3, 4, 5 and 6. (Musketeer; Ward Products Corp., 1523 East 45th St., Cleveland 3, Ohio.)

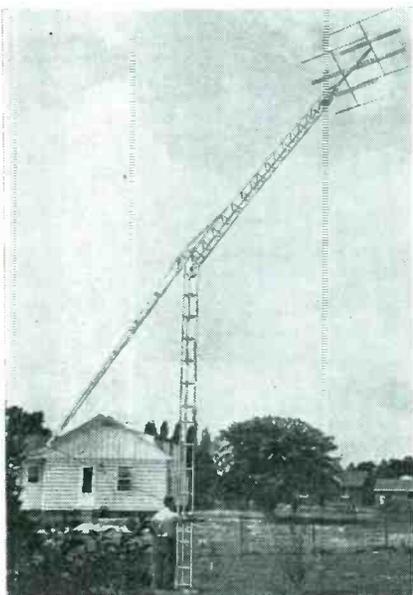


Cutaway view of ground rod with an extruded aluminum wire clamp, which will accommodate all ground lead wire from No. 3 to No. 20. Screw and nut fastening provision is said to permit wire to nest in grooved slot in the clamp. (South River Metal Products Co., Inc., 377-37th Turnpike, South River, N. J.)



Above: Dual-channel yagi designed primarily for fringe areas where two channels are operating and are received from the same direction. Through the use of a rotator it is possible to use this antenna on two channels in different directions. Antenna is a 5-element design with three directors, antenna element, and one reflector. A folded-dipole tuning element is connected across the terminals of the antenna element. Factory-tuned to the desired two channels. Channel combinations now available are 3-6, 4-5. (Dual-Channel Bazooka (1410); Taco.)

Fold-over tower, which makes use of tower sections and a fold-over kit. The kit consists of a short base section, hinge section, boom and reel and cable mechanism. Tower hinges near the midsection and can be raised and lowered by turning a crank on the reel. (Rohn Mfg. Co., 2108 Main St., Peoria, Ill.)



Cascade Tuner Conversion

(Continued from page 43)

tuner, may now be adjusted in conjunction with local oscillator slug to obtain the best visual results of a transmitted test pattern.

Should a more scientific approach be desired, the alignment procedure technique outlined in the chassis service instructions should be followed.

After making certain that the audio *if* alignment operations 1 to 4 (per service instructions) have been checked, the video *if* alignment operation step 1 will furnish specifications for tuning the sound take-off coil for a null indication at 21.6 mc.

Video *if* alignment operation step 7 will furnish specifications for tuning the inductance located on top of tuner (screw adjustment at an angle). This frequency is 23.5 mc.

RF and Mixer Alignment

(1) The station selector is set to channel 12.

(2) A 'scope is connected through 10,000 ohms to test point *T*; wire loop on top of tuner.

(3) For negative bias -3 volts *dc* is connected to the *agc* lead (white covered wire) from tuner.

(4) Sweep generator is now fed into antenna terminals, sweeping channel 12.

(5) C_2 , C_3 and C_4 (upright screws on top of tuner) are now adjusted for flat-top response curve and maximum gain. Markers should be checked on all channels. They should fall in automatically on all channels.

Oscillator Alignment

(1) Set should be turned on and channel to be viewed selected.

(2) Fine tuning control should be centered.

(3) A non-inductive screwdriver should now be placed through the opening, and oscillator coil adjusted for best picture and sound.

(4) This adjustment should be repeated for each channel that can be viewed in the area.

Audio Components

(Continued from page 47)

for mounting a changer base on slides.

Ventilation precautions are particularly important in the case of rectifier and power amplifier stages. One large hole, drilled for the purpose of allow-

(Continued on page 100)

THE ORIGINAL



IT COUNTS
and CARRIES
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**CARRIES EASIER
LOOKS NEATER
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The Customer only knows what she sees. She probably wouldn't know a rectifier from a resistor, and couldn't read a meter. But she can read the writing on a wall—and on her floor when you set your tools down.

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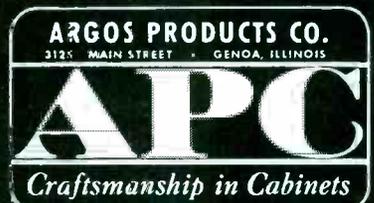
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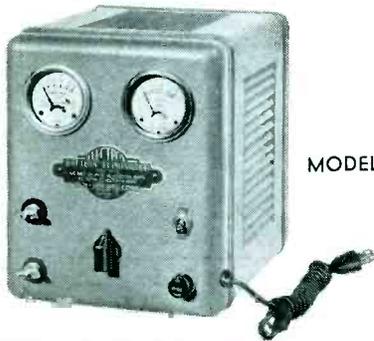
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MODEL AR-4

Same size, constructed to same high standards as Model AR-5 above, except output voltage is not adjustable. Delivers 6 volts D.C. at approx. 15 amperes.

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Audio Components

(Continued from page 99)

ing air currents to circulate, is not as effective as two smaller ones which provide a two-way channel; openings at both top and bottom of the housing are especially effective for draining off the heated air and supplying a cool replacement. Cross-ventilation is as beneficial in radio cabinets, as in hot apartments.

When the amplifier has a dust cover the cover may be removed for the sake of ventilation of the parts. The heat problem is simplified in those assemblies which have a separate fixed gain amplifier or a special chassis for the rectifier and power amplifier stages, as the separate unit can be mounted away from the rest of the equipment.

Ease of Servicing

Nine times out of ten the Service Man who assembles a custom installation will be the one to service it. Quick and inexpensive repair jobs, made possible by an intelligent original layout, will go far in building a reputation in the custom audio field.

The equipment should be easy to get at and tubes can be changed without removing any of the chassis. Many a repair headache can be averted in this way, especially during the guarantee period.

Each chassis should be individually removable for service. All chassis are normally screwed down to the cabinet or shelves firmly, but removal should not require contortionist procedures and special tools such as right-angle screwdrivers, Bristol wrenches, and the like. Someone else may service the set some day, and will come unprepared to get at the chassis.

If cables are stapled permanently to cabinet walls there should be plugs or screw connectors at each end. Holes through which cables pass must be large enough to accommodate the plug,



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Teleron Co.

COLLEGE POINT
NEW YORK

too; the wire should not be passed through a small hole and then attached to the plug. Confusion between different plugs and sockets may be avoided by using a different type of connector for each function. There are several types of shielded connectors available; phono tips, microphone plugs, etc. But if the chassis sockets make duplication necessary the various couplings should be clearly color coded or marked in some way. It is also a very useful procedure to use, whenever possible, the same type of plug for the same function in all installations, so that the individual unit may be tested at the shop with a standard harness.

Loudspeaker Mounting

Good acoustic baffling is the most important and the most critical of all mounting requirements, and will be discussed in a special article which will appear soon in SERVICE.

VR TV Troubleshooting

(Continued from page 23)

ing with the prods of the ohmmeter positioned one way should be considerably larger than the readings with the prods

(Continued on page 103)

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For TV, FM and Amateur Transmission Line



- Fits Any Wall Up to 13" Thick!
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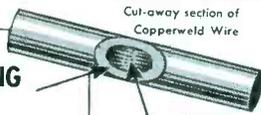
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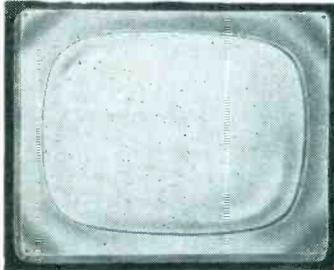
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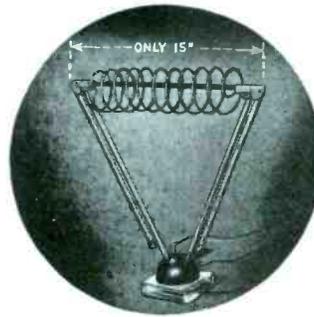
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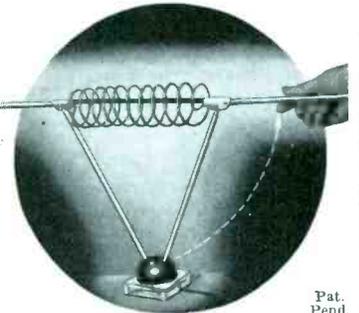
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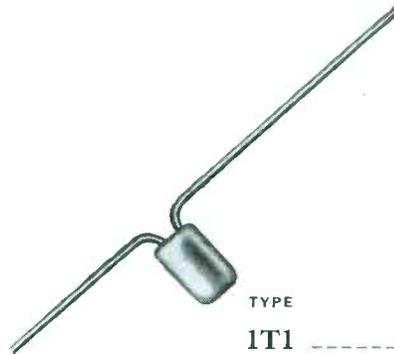


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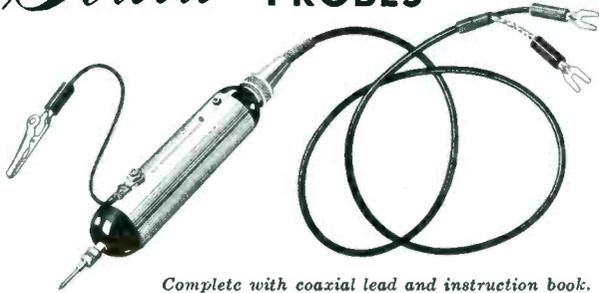
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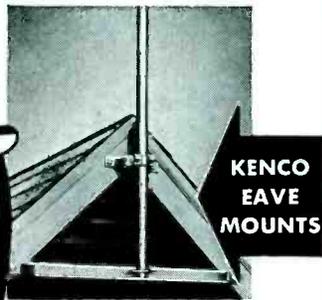
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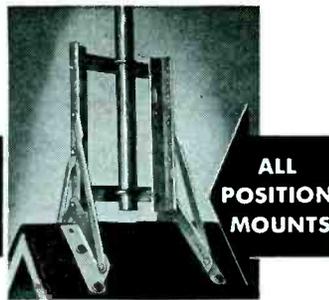


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- Model #106... For walls up to 1 3/4" thick.

VR TV Troubleshooting

(Continued from page 100)

reversed. If they are not, the selenium rectifier can be called defective. Of course, measurements should be made with parallel circuits disconnected, so as not to throw off the readings. A normal resistance reading is not a conclusive indication that the rectifier is okeh, because under load it may not function normally. The quickest method to check a suspected rectifier is to substitute another with the same current rating. The low value resistors (R_{60} and R_{61} , 30 ohms, in Fig. 4) in the ballast tube are placed in series with the rectifiers and filters to cut down the surge currents on the peak of the ac input cycle, and also to act as fuses. Where there are defective rectifiers or filters, or other overloads on the power supply, the excess current may cause these current limiting resistors to open. When replacing a selenium rectifier or a filter capacitor, it is advisable to check the surge resistor in series with the defective unit. When a replacement must be made in this model, it is not necessary to replace the entire ballast tube. A resistor with the specified resistance and wattage can be wired across the correct ballast-tube terminals.

Some complex changes in voltage can occur when trouble develops in TV receivers using voltage divider circuits across the low-voltage power supplies.

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PRECISE MEASUREMENTS CO.
942 KING'S HIGHWAY, BROOKLYN 23, N. Y.

Audio

(Continued from page 41)

output socket available. Mounted on the main chassis, it provides a connection to the high level high-impedance available on some tape recorders to allow recording of programs. At normal listening levels about .5 volt will be available to the recorder. The recorder's input impedance must be at least .5 megohm.

Also available is a *compensated volume control*: Compensation built into the volume control automatically maintains an aural balance as the volume is lowered, by accentuating both highs and lows approximating the curves established by Fletcher and Munson. A limiter control on the preamp section of the main amplifier is used to establish the correct volume control threshold.

A *phono crossover selector* is also provided to correct bass turnover points for foreign and domestic records and the AES response curve.

A *record condition compensator* provides maximum attenuation of record surface noise and distortion with a minimum of effect on wanted frequencies. Output impedances of 8 and 16 ohms are provided for loudspeakers.

Record Changer Troubleshooting†

Groove Skipping: Anything that may cause a drag on the tone arm will contribute to groove skipping. For example, a worn needle will tend to skip grooves. Another possibility is that the lubricant between the gear engagement pawl and the trip motion arm may have become excessively tacky after the changer has been in use for some time. The lubricant is applied between these two parts strictly as a safety measure to insure a friction load if the friction washer should lose ten-

sion. If the trip friction washer has the correct tension, the changer will function properly with the lubricant removed. Therefore, it is suggested that all of the lubricant be removed from these two parts and left dry. It may be necessary to bend the washer to get proper friction, but don't add too much tension. The lubricant should not be removed from any other place in the changer.

†From *Admiral Service Notes* for chassis RC550, RC550GA and RC550A.

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JOTS AND FLASHES

TV SERVICING has become such a vital factor in the technological world that engineering colleges have decided to include comprehensive courses on the subject. *Pratt Institute*, famous the world over for its practical science and technical instruction programs, has announced a 36-week course on TV technology and servicing to begin this fall. More than 50 per cent of the training time will be spent in a lab, and the courses will be conducted by graduate communication engineers. . . . A new correspondence course for TV Service Men has also been announced by *International Correspondence Schools* of Scranton, Pa. Both transmitting and broadcasting problems will be covered in a series of 45 lessons. Among those who have prepared the ICS lessons are: *John J. Karakash*, Lehigh Univer-

sity engineering department *M. C. Jones*, director of engineering, *Allen D. Cardwell Manufacturing Co.*; and *F. Malcolm Gager*, research engineer, *U.S.N.* . . . To familiarize Service Men with the characteristics of its new TV chassis, *G.E.* will soon inaugurate a nationwide educational program which will take the form of engineer-Service Man meetings throughout the country. . . . *Edgar M. Villchur*, whose lucid articles on audio have been appearing in *SERVICE*, will conduct a series of courses on the reproduction of sound at *New York University* this fall. . . . *Max Cohn*, prexy of *South River Metal Products Co., Inc.*, recently became the father of a daughter, his second child. . . . *Howard S. Moncton* is now administrative engineer of the radio and TV division of *Sylvania Electric.* . . . *Harvey Radio Co., Inc.*, 103 W. 43rd St., New York 18, N. Y., has released a hi-fi audio catalog.

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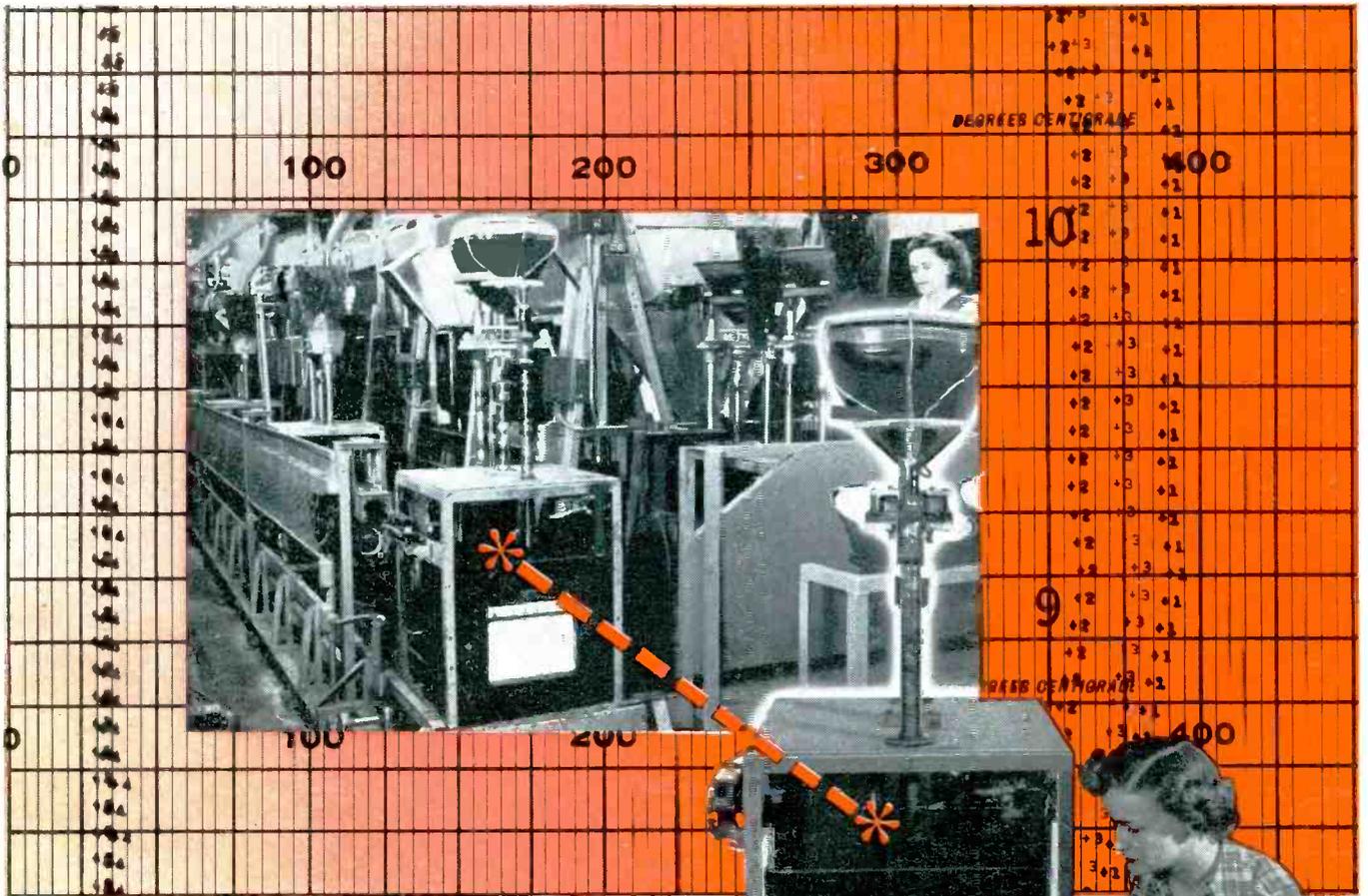
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