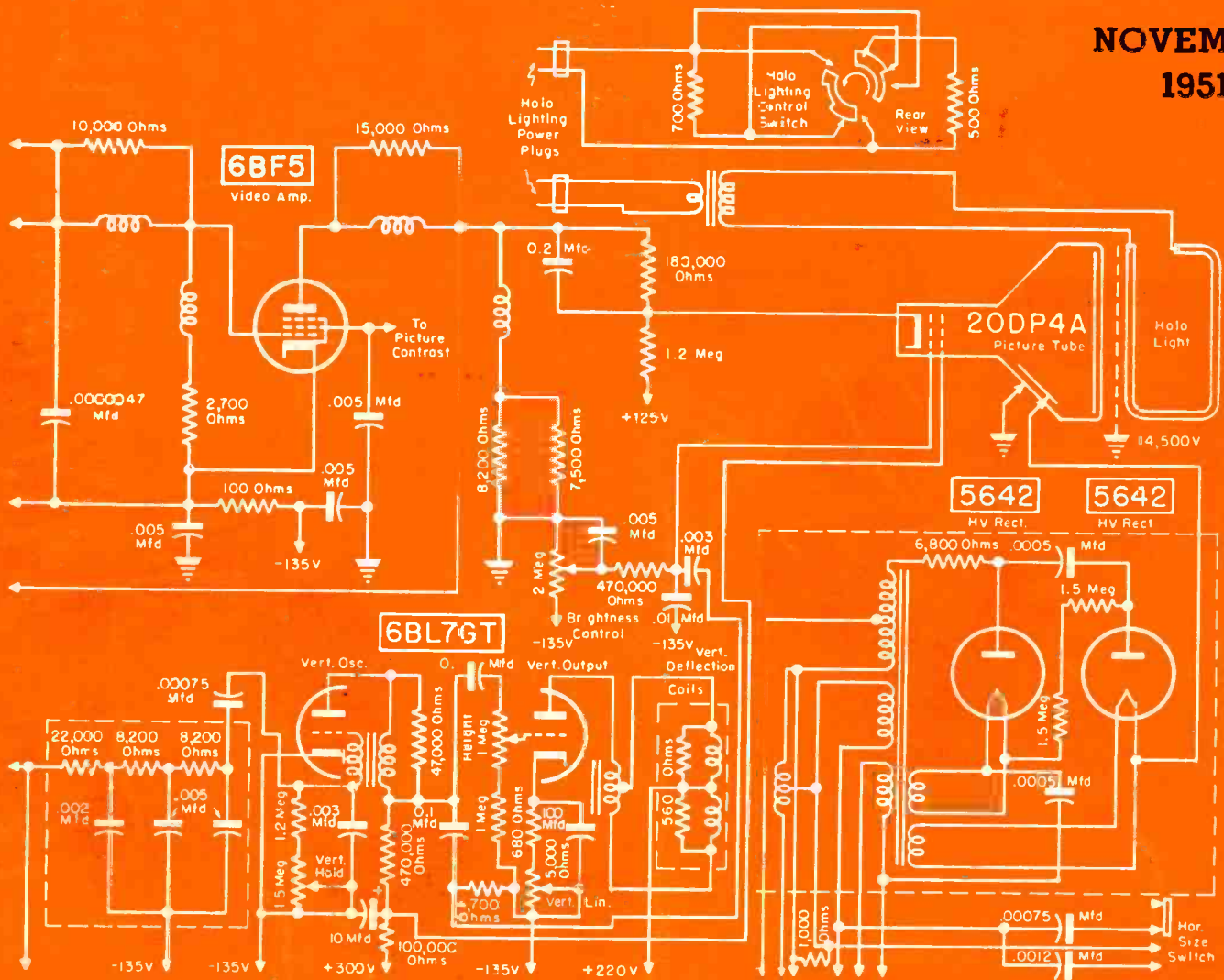


SERVICE

NOVEMBER
1951



Video output circuit of 20-inch chassis featuring surround lighting for rectangular picture tube.

[See page 2]



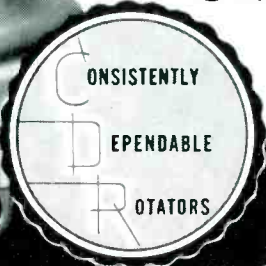
the MOST

POWERFUL

TV ROTATOR

on the market

TELE-ROTOR
PATS. PEND.



TELE-ROTOR



YAGI ANTENNAS



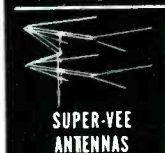
HI-LO ANTENNAS



INDOOR ANTENNAS



FM ANTENNAS



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LAZY-X CONICALS



STRATE-LINE ANTENNAS

Power When And Where You Need It... To Turn Any TV Antenna Array Under All Weather Conditions

When your customers want an antenna-turning device, it is YOUR RESPONSIBILITY to sell them one that will do the job best day in and day out... night in and night out! This covers considerable ground... but the TELE-ROTOR fills the bill! STURDY enough to hold any array... POWERFUL enough to rotate it under all weather conditions... DEPENDABLE because it offers long-lasting, uninterrupted service! Give them the best... they'll thank you for your recommendation!

MODEL TR-2... complete rotator with "COMPASS CONTROL" cabinet having illuminated "perfect pattern" dial... (uses 8 wire cable) ... \$49.95

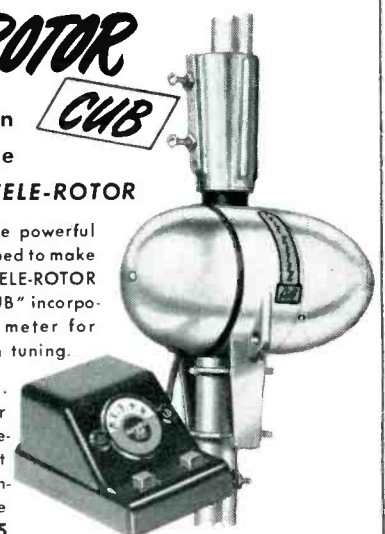
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CUB

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Featuring the same powerful motor that has helped to make the 'heavy duty' TELE-ROTOR so famous, the "CUB" incorporates a sensitive meter for utmost accuracy in tuning.

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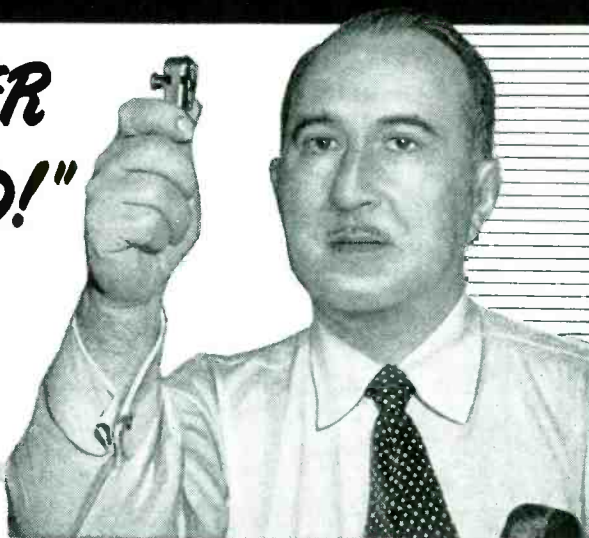
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VARIABLE RELUCTANCE CARTRIDGE

**"OUTSELLS ALL OTHER
MAKES COMBINED!"**

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"MORE customers ask us for G-E than for all other cartridge brands combined. In our business that's an important tip-off because people who come to us usually know exactly what they want in audio performance. They demand that we stock the best. We handle every commercial cartridge—and G-E Variable Reluctance units outsell them all by at least 4 to 1!"

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Every stylus in every G-E cartridge is double-damped to absorb virtually all mechanical noise. Diamond or synthetic sapphire tips are available for standard or microgroove records.

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**PREMIUM
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AT NO
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Sprague Black Beauty Telecap Tubulars are different from and superior to every other molded paper capacitor because they are made by the same dry assembly process as large metal-encased oil capacitors. They cannot be contaminated by dust or moisture during manufacture.

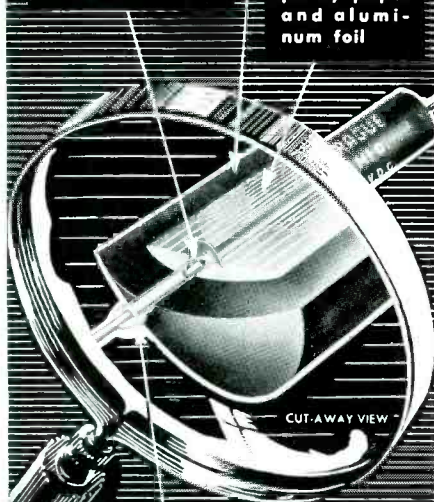
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SPRAGUE

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Now this precision-matched miniature Pliers Kit yours **FREE**



IT'S SYLVANIA'S
GREATEST
PREMIUM YET!



... with every 100 Sylvania
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purchased between Nov. 15th and Dec. 15th

Here's exactly the tool kit every radio and TV serviceman has always needed. A complete miniature pliers kit. It contains:

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MAN, WHAT A
TIME AND WORK
SAVER!



All have precision-matched jaws with finely-milled teeth, forged from the finest steel by a leading manufacturer of surgical instruments. Regular \$4.50 value!

This kit, packed in sturdy plastic case, is yours absolutely free when you buy just 100 Sylvania Receiving Tubes or 3 Sylvania TV Picture Tubes from your Sylvania Distributor. But, please hurry! Offer closes Dec. 15th. Your regular Sylvania Distributor has these kits now. Call him TODAY!

WHY YOU'LL WANT THESE PLIERS

1. Especially designed for radio and television service work.
2. A craftsman's tool... forged from highest quality steel, not cold-rolled or stamped.
3. Precision-matched jaws... sure grip, finely-milled teeth.
4. Needle-nosed and parrot-nosed pliers wonderful for inaccessible wiring.
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THE MAGIC OF MODEL M

"The Magic of Model M" . . . a new trend for TV antennas! And Walsco introduces the *first* antenna with chromate-coated Magnesium cross-arms. Structural strength is almost equal to steel, and yet is 1/3 lighter than aluminum. Once you install, *that's all!* No costly call-backs that eliminate your profit. Chromate-coating assures positive corrosion resistance. Elements are made of high-conductivity, super-strength aluminum alloy, reinforced with Swiss "Permalum." Guaranteed sturdier, more dependable under severest weather conditions. Equipped with famous Walsco "signal director" and unbreakable insulator. Same high standards of Walsco crystal-clear TV reception.

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M*

M

Structural strength
almost equal to steel

M

One-third
lighter than aluminum

M

Chromate-coating for
positive corrosion resistance.

AVAILABLE AT PARTS JOBBERS EVERYWHERE

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Model 4092 M—Dual Array —List \$19.85

Model 4094 M—4 Bay Stack —List \$44.50

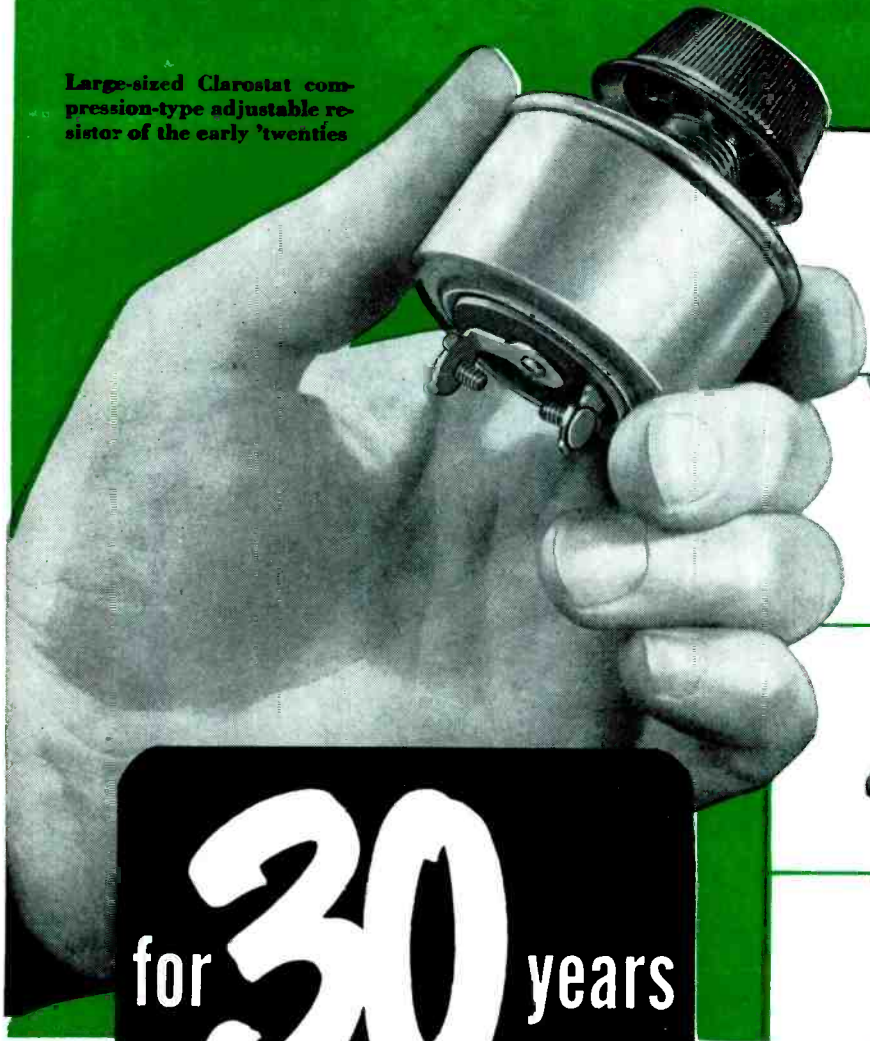
All prices without mast.

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WALSCO

1921 ~~~~~ 1951

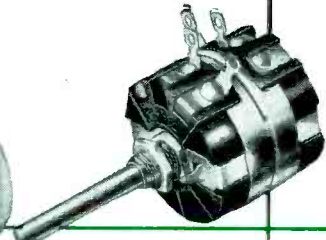
Large-sized Clarostat compression-type adjustable resistor of the early 'twenties



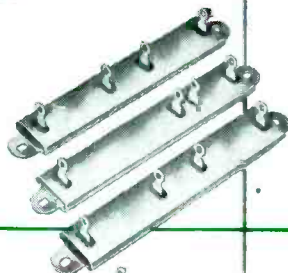
for **30** years

"the house of Resistors!"

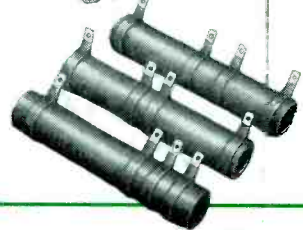
It was in the early 'twenties. Socket-power radios needed voltage control to be practical. And Clarostat came up with the RIGHT answer—the original Clarostat compression-type adjustable resistor. Since then, over three decades, Clarostat has come up time and again with the RIGHT resistor, control and resistance device. That's specialization—and it's yours when you ask your jobber for Clarostat resistors, controls and resistance devices. • Latest catalog on request. • Be sure you use Clarostat service data!



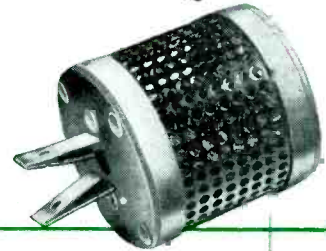
Wire-wound potentiometers and rheostats.



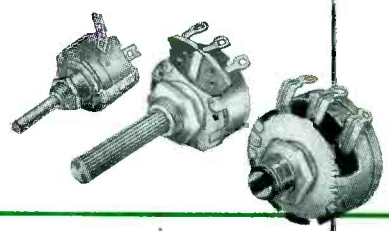
Metal-clad wire-wound molded resistors.



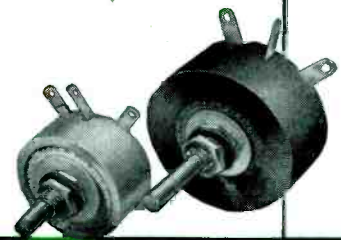
Greenohms — inorganic-cement-coated power resistors.



Voltage-dropping and voltage-regulating ballasts.



Choice of controls — no bigger than a dime! — 1/16" — 1 1/8" dia.



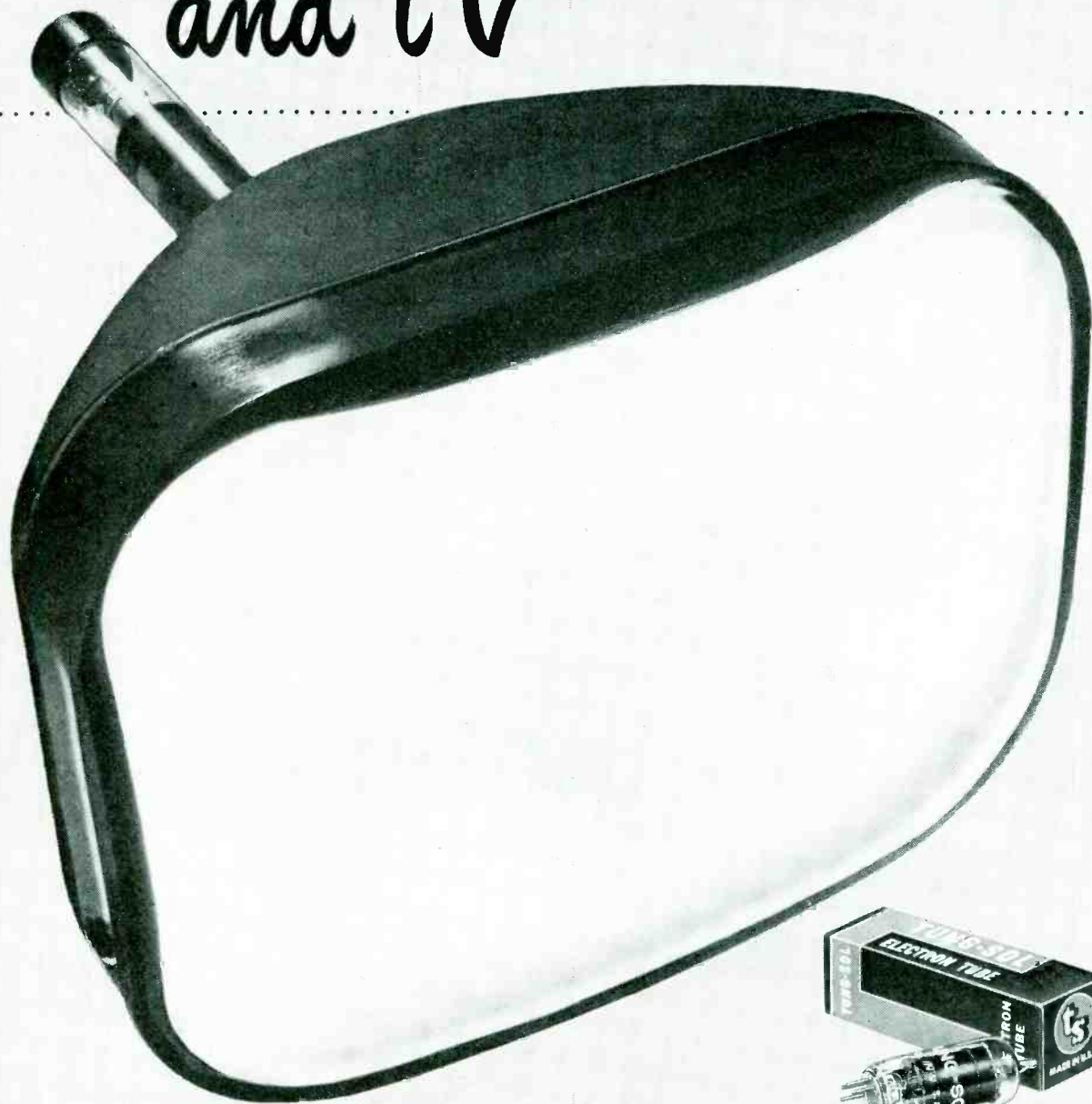
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Radion

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1130 Wisconsin Ave.
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● Send me free "How to Profit with Radion"

Name _____
Firm _____
Address _____

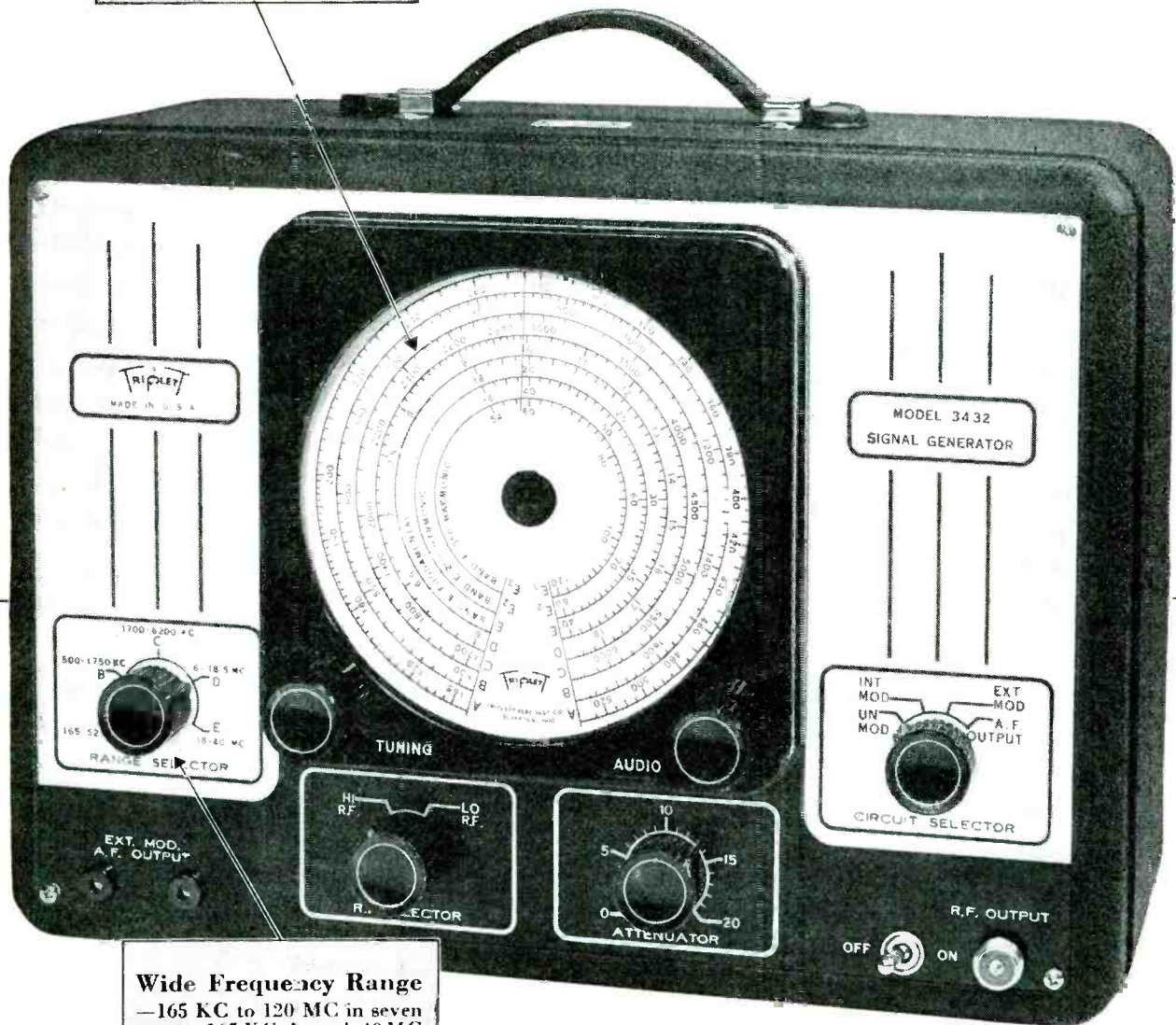
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is the word for Model 3432

Take it at face value, and you can't be wrong! The big, BIG no-glare illuminated dial, the fine control Output Attenuator, the wide frequency range, improved shielding to control radiation, and other performance features—all proved for action and accuracy. Give it the bench test—you'll find more competence packed in its handsome metal case than any test oscillator you ever used. It's double-copper shielded and individually calibrated against precise crystal standards. It is competent every step of the way.

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Seven long 330° scales for easy reading at any spot on the dial. All illuminated!—no glare. Top scale is 16" long. Dial has 10 to 1 ratio vernier tuning.



Wide Frequency Range

—165 KC to 120 MC in seven ranges. 165 KC through 40 MC fundamentals; through 120 MC by strong harmonics.

ONLY \$79.50 at your Distributor
(Price subject to change)

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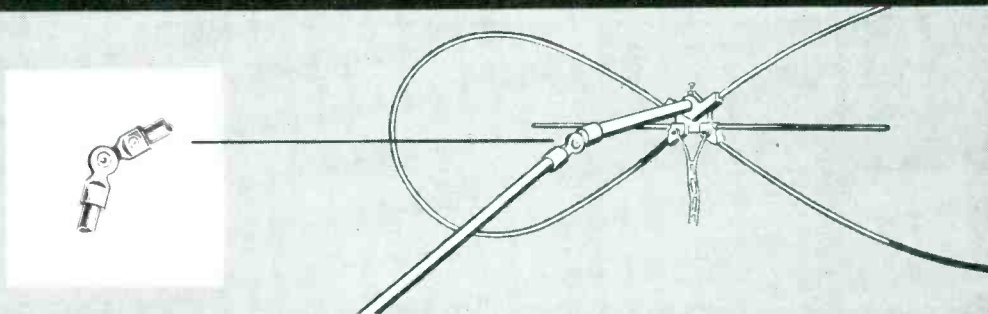
Triplet

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

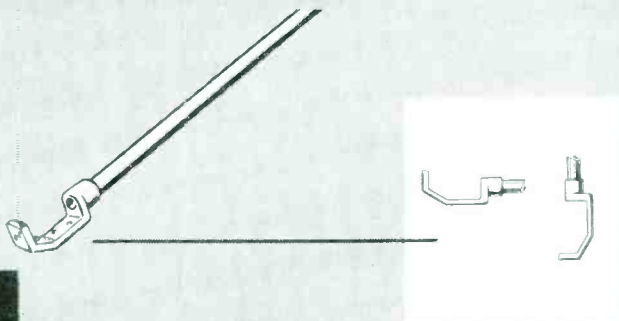
NEW

PROFITS FOR YOU NOW PROTECTION FOR PROFITS IN THE FUTURE

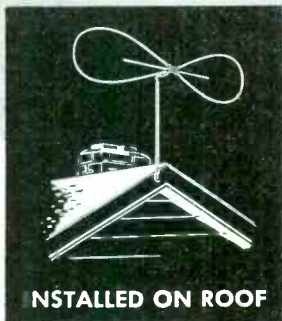
Easy-acting, quickly locked swivel permits simple adjustment for best reception.



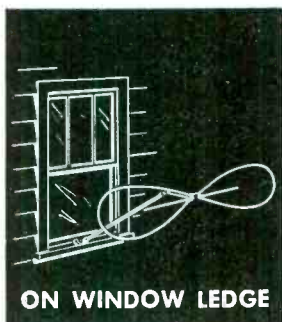
LOW-COST, HIGH-GAIN PRIMARY AREA ANTENNA



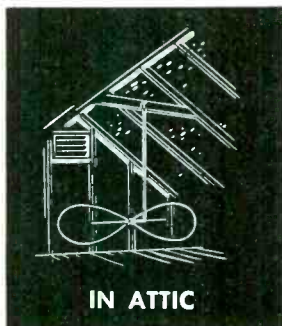
A three-way bracket provides for quick and easy installation on window ledge, the roof, practically any place. Bracket punched for installation upright or in either of two positions shown. Used with either a 300 ohm or co-axial lead in.



INSTALLED ON ROOF



ON WINDOW LEDGE



IN ATTIC

Introducing the self-mounted all-channel BUTTERFLY swivel-positioned TV ANTENNA

Here is a more flexible, simpler, low-cost, high-gain television antenna for primary area reception . . . another new development by Tel-a-Ray, the company that has expanded the area of clear, interference-free TV reception with its Reception Master long-distance antenna and unique Pre-Amplifier.

The new Tel-a-Ray Butterfly Swivel-Positioned Antenna can be quickly installed and adjusted for maximum signal gain right on the window ledge, in the attic, on the roof. Like all Tel-a-Ray antennas, it is ruggedly constructed of tough extruded aluminum and guaranteed against wind and weather damage.

You can solve service problems in a jiffy with the Butterfly . . . give your customers the most brilliant reception . . . reduce call-backs and other after-sale service that steal away your profits. It is the ideal antenna to push in capturing the huge replacement market. The Butterfly comes complete with three-position bracket, or mounted in one-, two-, or four-bay arrays for improved reception in outer service areas and near-station dead spots.

Get full information now from your distributor, or write to us direct.

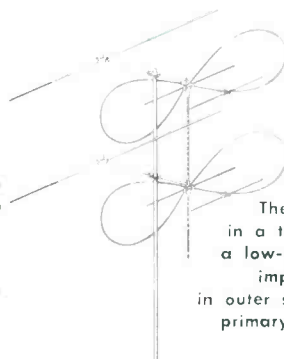
LOW PRICED FOR VOLUME

The Butterfly with the three-way bracket mounting is listed at just \$4.95. For the single bay array, the suggested retail price is \$12.95.

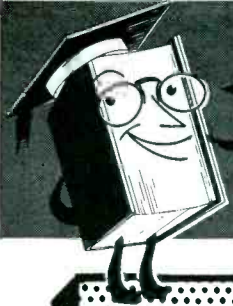
Tel-a-Ray



ENTERPRISES, INC.
BOX 332S • HENDERSON, KY.



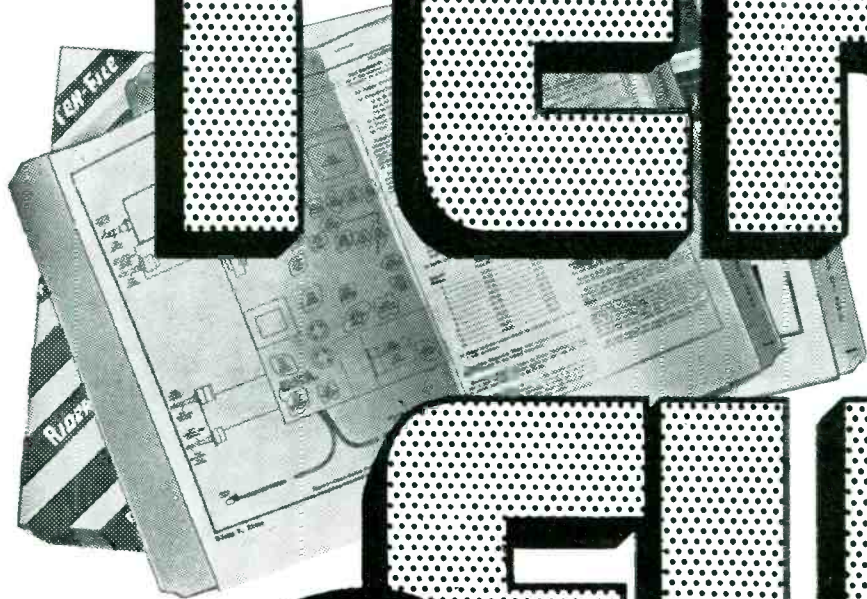
The Butterfly mounted in a two-bay array . . . a low-cost way of getting improved TV reception in outer service areas, or in primary area dead spots.



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Announcing a new service that only RIDER could bring you!

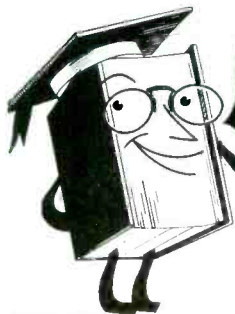
TEK-FILE



IT'S COMPACT!



IT'S FACTORY AUTHORIZED!



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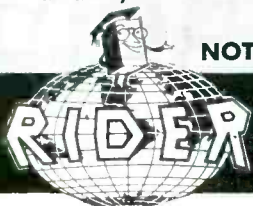
Now—the new Rider TV8 Manual available two ways. First as the standard single volume—or the sensational, new Tek-File way!

For the first time you can have the complete Rider TV data you need . . . bound separately by individual manufacturers. You order only what you need—when you need it . . . at a low, low price that will amaze you!

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See your jobber today. Learn how Tek-File can make your servicing job—faster—easier—more profitable!

NOTE: Starting in November all RIDER TV data will be available the new TEK-FILE way!



JOHN F. RIDER Publisher, Inc.
480 Canal Street, New York 13, N. Y.

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...Are they
paying off for you?

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2 Did you know that Rauland provides a full 120-day price protection on distributor inventory of replacement picture tubes? That Rauland distributors can carry a stock adequate for their territories without risk of loss through price adjustment?

3 Did you know that Rauland offers valuable premium points for the prompt return of warranty registration cards? Each card returned promptly entitles dealer and distributor to premium points redeemable in valuable merchandise prizes.

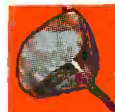
If you have not received full details on all of the above, write, phone or wire your distributing contact on Rauland tubes. If you have not received your prize merchandise catalog, use the coupon below today.

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Americans save . . .”*



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“I want to see Americans save for their own personal security, and I want to see them, as stockholders in our government, urge economy in all phases of our national life in order to provide national security against aggression.”

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As Chairman of the Ohio Payroll Savings Advisory Committee, Mr. Collyer knows what is being accomplished by leaders of industry, top management and labor in their joint effort to step up the Payroll Savings Plan. A few recent figures should be interesting to those not so familiar with the national picture:

- In the steel industry campaign, Carnegie-Illinois Steel Corporation (now U. S. Steel Company), recently raised its payroll participation from 18% of 100,000 employees to 77% . . . Columbia Steel Company of California went from 7.9% to 85.2% . . . American Bridge Company signed 92.8% of the workers in the large Ambridge plant . . . 87%

of Allegheny-Ludlum Steel Corporation's 14,000 employees are now on the Payroll Savings Plan . . . Crucible Steel Company of America, reinstating its plan, signed up 65% of its 14,500 employees.

- In the aviation industry, Hughes Aircraft Company went from 36% to 76%; Boeing Aircraft enrolled 10,000 new names before Christmas.

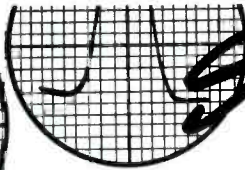
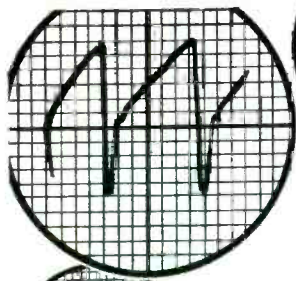
Some dollars and cents figures? In the last quarter of 1950, sales of \$25 E Bonds—the denomination so popular with payroll savers—increased 2.5% by 245,000 bonds more—over the last quarter of 1949.

If you do not have The Plan That Protects the personal security of your employees, the national economy and our country's defense, phone, write or wire to U. S. Treasury Department, Savings Bonds Division, Washington Building, Washington, D. C. Your State Director is ready to help you install a Payroll Savings Plan or step-up your employee participation.

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WITH THE

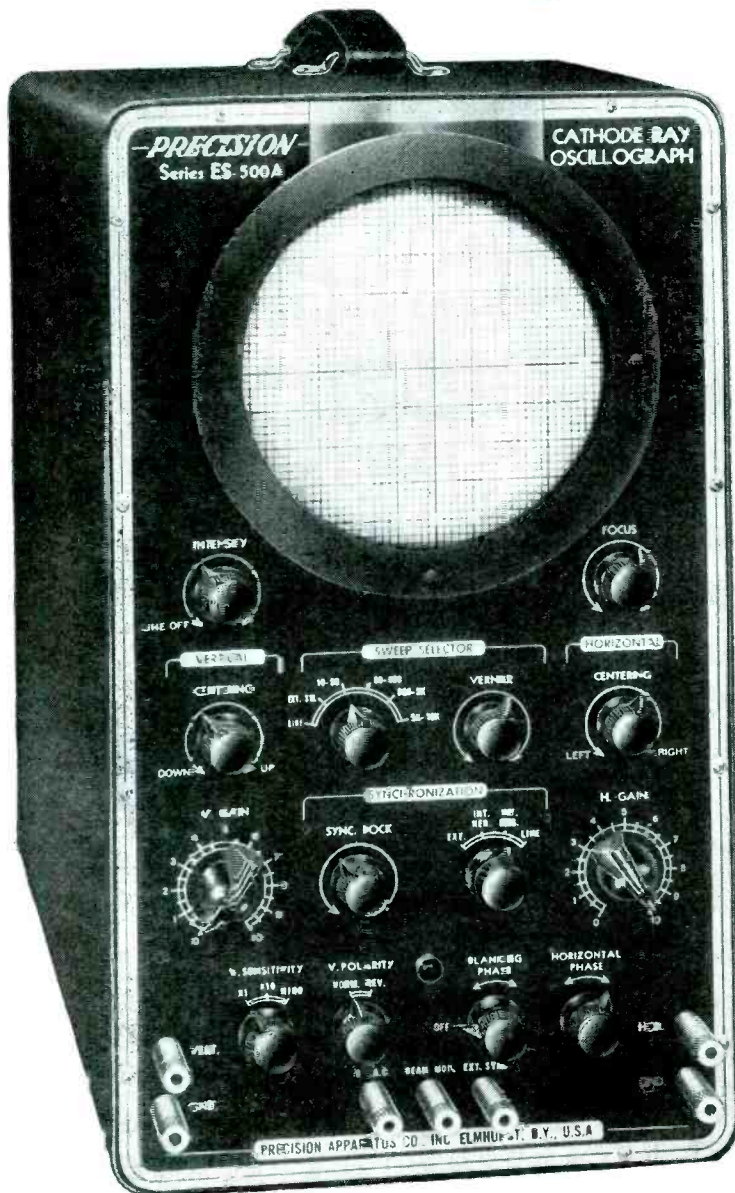
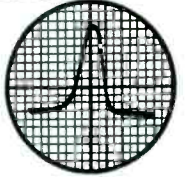
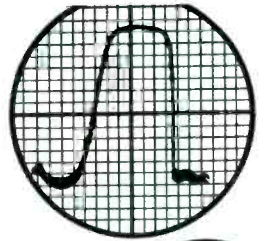
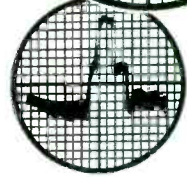
PRECISION ES-500A

HIGH SENSITIVITY—WIDE RANGE

5" OSCILLOSCOPE

PUSH-PULL VERTICAL AND HORIZONTAL AMPLIFIERS

20 MV PER INCH "V" SENSITIVITY—150 MV PER INCH "H" SENSITIVITY



SERIES ES500A affords the ultimate in performance, visibility and operational flexibility at moderate cost. "Precision" engineers have incorporated every necessary basic feature which they have found to be required to meet the needs of the rapidly advancing art of electronics, A.M., F.M., and TV.

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SUMMARY OF IMPORTANT FEATURES

- * **High Sensitivity, Extended Range, Voltage Regulated Push-Pull Vertical Amplifier**—20 MV (.02 V) per inch deflection sensitivity. 10 cycles to 1 MC response. 2 megohms input resistance. Approx. 22 mmfd. input capacity.
 - * **Frequency Compensated Vertical Input Step Attenuator**—X1, X10, X100 plus continuous variable gain control in cathode follower input stage.
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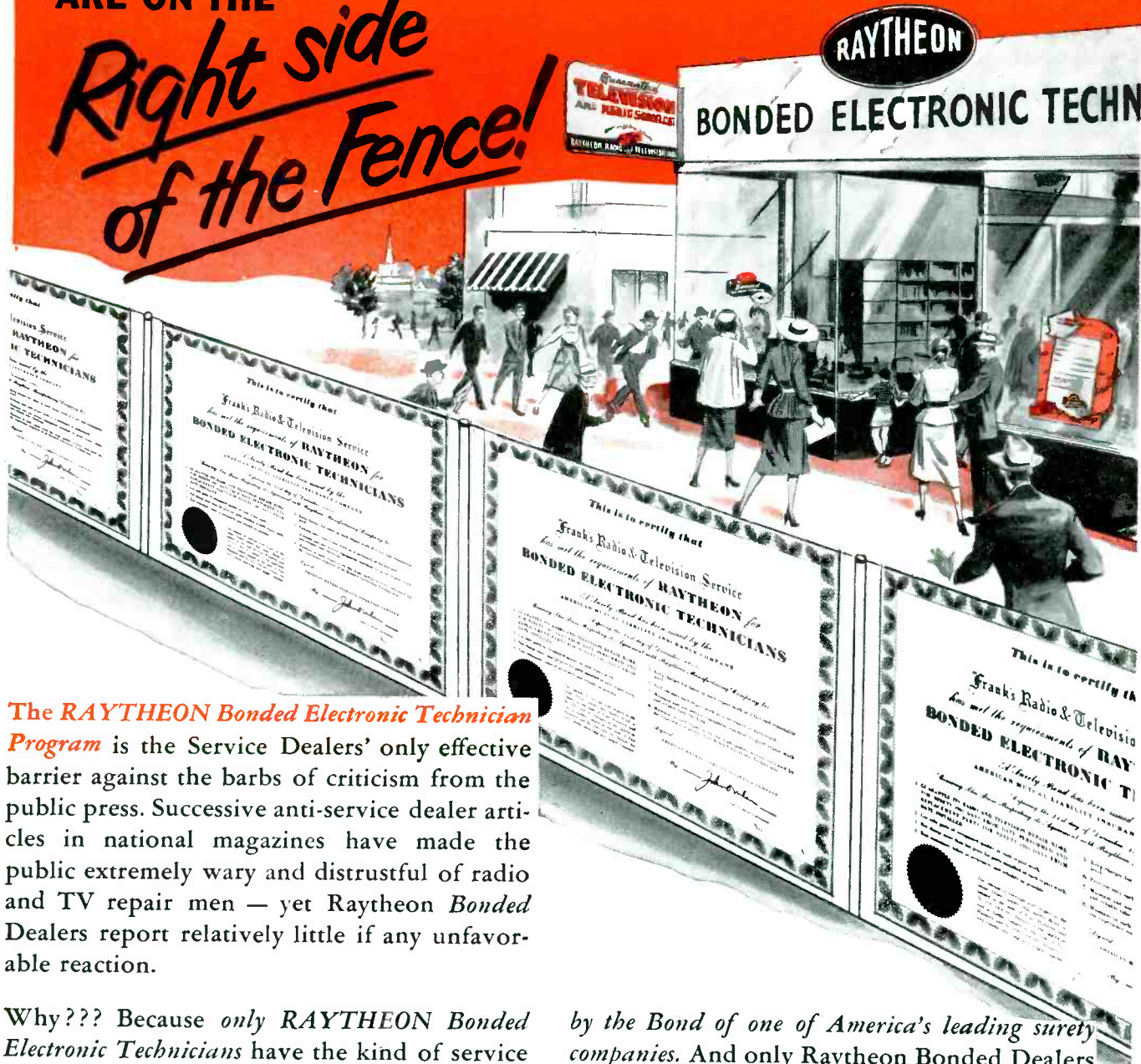
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*Right side
of the Fence!*



The **RAYTHEON Bonded Electronic Technician Program** is the Service Dealers' only effective barrier against the barbs of criticism from the public press. Successive anti-service dealer articles in national magazines have made the public extremely wary and distrustful of radio and TV repair men — yet Raytheon Bonded Dealers report relatively little if any unfavorable reaction.

Why??? Because *only RAYTHEON Bonded Electronic Technicians* have the kind of service in which the customer can have complete confidence — *cash-protected, guaranteed service backed*

by the Bond of one of America's leading surety companies. And only Raytheon Bonded Dealers operate to a "Raytheon Code of Ethics" which completely satisfies their customers and protects themselves.



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RAYTHEON MANUFACTURING COMPANY

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Excellence in Electronics

RADIO AND TELEVISION RECEIVING TUBES, CATHODE RAY TUBES, SPECIAL PURPOSE TUBES, SUBMINIATURE TUBES, MICROWAVE TUBES



The \$887-Million Service Market

THE BUSINESS OF SERVICING, which in the one-tube super and neotrodyne days was quite a tepid member of industry, has certainly romped along since then and gathered huge links of strength and substance, rivaling some of the giants in the industrial world in its dollar-volume earning capabilities. Thirty years ago the income possibilities were a bit meager. Today, however, the return-potentialities have become enormous. According to a survey recently completed by Tung-Sol, servicing, today, represents a \$887-million market.

In an analysis of this tremendous market, it was found that the millions of standard receivers, auto sets and television sets in use, and still to be sold, are responsible for this dynamic growth. Specifically, home radios were described as accounting for \$385-million worth of service work, spread over 77-million home receivers, with a \$5.00 annual billing cited as the charge allowed for each set. In the car-radio category, with over 17-million sets in use, and about \$6.00 spent annually for repair of each of the sets, the income possibilities lead to the staggering figure of \$102-million. Television receivers were also classified as a substantial factor, not only insofar as servicing is concerned, but installation as well, with \$150-million noted as the repair-income bill that might be expected, and \$250-million declared as the amount to be spent for installations. A distribution of 10-million TV sets, with a \$15.00 annual service charge, was used as the basis of calculating the service income, while a market of 5-million sets was included in the installation picture, with a \$50 per-set charge indicated for each installation.

There are many who are well aware of this roaring business, and are capitalizing on the potentialities every day through resourceful business activities. There are unfortunately, many, too, who are perfectly willing

to discount these possibilities and blandly dismiss these vast opportunities. This servicing business does exist and it's available to everyone, but to get a full share of it, one must go after it. Promotion, advertising and publicity can play a major role in rounding up this profitable market. To build up radio and TV service business, manufacturers have been very cooperative in preparing a variety of business aids. In the Tung-Sol report, for instance, it was disclosed that there are now available all types of specially prepared advertisements, describing the facilities of service shops, with the ads carrying such inviting copy as "We're the doctor you need when your radio and television set has the heaves or the hiccups." Other ads announce the fact that "We don't work miracles, just do good service work that gives ailing radio and TV sets good-as-new performance that seems miraculous."

Checkup campaigns also play a vibrant role in the servicing business, and can contribute many, many dollars to the income of every service shop. To capitalize on this market, Philco has prepared a complete program consisting of a mailing piece, newspaper ad and follow-up letter.

A 10-point checkup plan is featured in the promotional material. Specifically, it is said that the Service Man will 1) Inspect transmission line, antenna and all connections for mechanical and electrical efficiency 2) Inspect all chassis components for security of mechanics and signs of electrical breakdown 3) Adjust back controls to assure maximum picture linearity 4) Check range of all front controls to assure best tuning control by set owner 5) Adjust picture-tube focusing, centering beam bender for maximum brilliance 6) Clean and polish safety-glass panel and picture-tube face 7) Check test pattern to assure maximum height and width with good linearity

8) Check oscillator and fine-tuning range for maximum sound and picture clarity 9) Adjust horizontal-hold system for maximum horizontal steadiness 10) Furnish accurate written technical report of inspection and general operative condition of set.

Noting that the psychology of TV servicing is much different than that of radio, the program points out that many radio-set owners may have *tin ears*, but there are no *tin eyes* in television. Viewers all want the best reception, and are quite willing to pay for ethical service to get that type reception.

Servicing during checkup calls can not only contribute to the plus side of the ledger, but also serve as a profitable reference for other calls, since a satisfied customer is always anxious to advertise that fact and tell the neighbors that you're the man to call for that TV set repair or checkup.

Component Sales

During a recent meeting in Washington, an industry rep was asked to detail the items that might be classified as being of a replacement nature. The following listing was offered as an official view: tubes; fixed and variable capacitors; audio and power transformers; chokes and yokes; volume controls and switches (all kinds, including adapters, shafts, couplers, etc.); resistors (fixed and variable—all types composition and metallized, wire-wound, not including volume controls); loudspeakers; tube sockets; coils, antennas and accessories (lightning arresters, ground rods, rotators, boosters); wire and cable; chemicals; phono motors, arms, pickups, cart-ridges, needles; microphones; batteries; vibrators; recording mediums; relays and indicating devices.

Certainly an extensive assortment of replacement parts for the Service Man to merchandise another example of the expanding market which prevails in the business of servicing today.—L. W.



FROM COAST-TO-COAST

More Demonstrations Mean More Sales!

SOLD ON SIGHT!

Millions of eye-compelling TV demonstrations on both Alliance Tenna-Rotor and Tenna-Scope, the Alliance Booster, pay off!

Advertising that penetrates to the fringe in every TV area—Television plus Newspapers—assures your success with ALLIANCE!

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Tenna-Scope is a Television Booster

SOLD THE MOST
because they're
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30 MILLION VIEWERS IN 10 MILLION HOMES AROUND 70 TV STATIONS SEE ALLIANCE TV DEMONSTRATIONS!

SERVICE... *The National Scene*

TV LICENSING BILL PASSED BY COUNCIL IN NEW YORK CITY--That blistering issue, involving the licensing of TV Service Men in New York City, reached a sizzling stage a few weeks ago, when the first step towards full official sanction of the move was made by the city council, who by a vote of 19-4 approved the measure. Should the ordinance receive the nod from the board of estimate and the mayor, on and after February 1, '52, Service Men and contractors will be required to secure licenses, ranging in cost from \$5 to \$25.* The council passage was heralded by many. According to councilman Charles E. Keegan, who along with councilmen Stanly Isaacs and Abraham Sussman, introduced the legislation, the bill will . . . "go a long way toward curbing the abuse to which the public has been subjected." However, he said, if at some time in the future industry proves that it can "clean its own house," he would . . . "heartily support a bill to repeal this licensing bill." NETDSA prexy, Max Liebowitz, viewed the bill as a striking contribution. In his opinion, the bill is not only designed for the protection of the public, but for the best interests of the service industry itself. He felt that all, including those who were opposed to the measure, should now support it, since honest Service Men and contractors . . . "have nothing to fear from this bill, and much to gain from it." "As a result of the passage of this bill," he added, "I look for similar legislation throughout the country." In other camps, the measure was harshly denounced as an impractical approach. According to a spokesman for a leading contractor, licensing will not cure all of the industry's evils. It is impossible, he said, to license honesty or competency. In his opinion, the bill does not provide for a guarantee that every service job will be done efficiently.

LEGISLATION SOUGHT IN PASADENA, CALIF.--The trend to licensing, initiated on the Pacific coast several months ago, has spread to many communities. In Pasadena, the city council now has under consideration a measure which would provide for . . . an examination of journeymen and apprentices to determine if they are qualified to install and repair, and a financial guarantee, probably through bonding, that service sold in advance would be available for the period promised. Those who are approved will receive a license stipulating that the owner has been found responsible and capable.

SERVICE MEN APPLAUDED BY INDUSTRY ASSOCIATION HEAD--In a message before the International Association of Electrical Leagues, RTMA prexy, Glen McDaniel, declared that . . . "The vast majority of TV Service Men are honest, and there are no more unscrupulous or dishonest operators in the TV servicing field than in any other similar operation." He felt that the only way to control larceny in any form is to enforce existing laws which prohibit it. "You don't make a thief honest by passing a new law compelling him to take out a license," he added. Discussing the complaints heaved at Service Men by the public, the association head declared that . . . "Much of the criticism that has been directed against the servicing segment of our industry is unfair, in that the entire industry is damned for the offenses of a very few."

PARTS WARRANTY PLAN OFFERED TO ELIMINATE INEQUITIES--In a program designed to stabilize the parts warranty situation, the prexy of the servicing association in Chicago indicated several possible cures. In his opinion, Service Men should be allowed to collect a fee for the handling of warranty parts. In such an arrangement, it was stated, perhaps a flat fee should be allowed at the time of replacement, by the distributor or manufacturer, either as a credit or a cash payment at the end of each month. This could be done, he said, either as payment for each replacement, or as a flat-fee percentage of the warranty fee.

*See June, '51, issue of SERVICE for complete report of types of licenses that will be available.

SERVICE...The National Scene

SERVICE MEN BLUE-BOOKED--Regardless of whom he directly represents, the Service Man is an emissary to the public from all the companies engaged in the manufacturing and marketing of receivers. So stated Bendix Radio sales head, Bob Fordyce, recently in a special letter which accompanied a unique booklet, revealing how the Service Man can serve effectively Mr. and Mrs. Consumer, as well as those who make and sell the product, which must be kept in continuing operation. Sprinkled with lively cartoons, the booklet offers wise counsel on behavior in the home and in the field. To wit: A TV Service Man is a professional man and should always make an appearance as such. . . . The purpose of your visit is to service a TV receiver--not to chatter. . . . Don't tackle a job beyond your capabilities to complete. . . . Don't make delivery promises your schedule can't meet. . . . Leave your working area clean. . . . Don't talk down anyone's product, and never speak disparagingly of the last servicing job performed on the set you have been summoned to repair. . . . Always try to make your service calls on schedule. . . . Your service truck is your business home, keep it neat and clean at all times.

TV SERVICE EDUCATION PROGRAM LAUNCHED BY RTMA--An educational and information program, created to provide more trained Service Men and improve service practices, has been announced by RTMA. Sponsored by the association's service committee, and directed by E. W. Merriam, recently appointed service manager of the association, the program will involve recommendation of servicing courses in approximately 2500 vocational schools, and in as many adult educational schools throughout the country. To further the program, there is now being prepared a 3-year vocational high school syllabus on radio and TV, and a 10-12 month course for adult educational institutions. The 3-year course, it was said, is expected to provide high-school students with an opportunity to learn TV-radio servicing, while the shorter course will serve to aid qualified Service Men who are not familiar with TV.

TECHNICAL EDUCATION ADVISORY PANEL PROPOSED--The establishment of a 15-member panel of service managers of contractors, dealers and distributors, in Philadelphia, has been proposed by the president of NEDA's Keystone chapter, Morris Green. The purpose of the panel, it was said, would be to determine fully what educational projects are required by TV Service Men in Philadelphia, and then to assist in obtaining the widest dissemination of the educational material required to solve the proposed problems.

TV MASTER-ANTENNA SYSTEMS WINNING WIDESPREAD FAVOR--The use of couplers and amplified types of master-antenna links, cited as a solution to crowded rooftops, has not only received the enthusiastic attention of apartment-house operators, department stores, hospitals and other similar establishments, but the large metropolitan hotels. A few weeks ago, the famous Waldorf-Astoria in New York City announced that all of its 2500 rooms were now provided with outlets for television, as well as radio, with reception from all of the 7 stations in the area available in every room. Not only does the system permit individual-room viewing, but distribution of signals to up to 200 chassis in one room. In addition, the system permits closed-circuit operation for transmission of special programs within the hotel proper. All rooms have been equipped with 17-inch console type of receivers.

DISTRIBUTORS CITED AS MISUSING SERVICE MEN SALES-PROMOTION ALLOWANCES--In an effort to aid Service Men in their promotional activities, many manufacturers provide a special fund which appears as an additional allowance to distributors, over and above regular discounts. Unfortunately, many distributors have failed to follow through on this plan, employing the allowance kitty for their own purposes, which on many occasions has covered purchases of gifts for holidays, etc. This practice has been noted as defeating the intent of the sales-promotional allowance, depriving the Service Man of the funds which can be used to promote his business.--L. W.

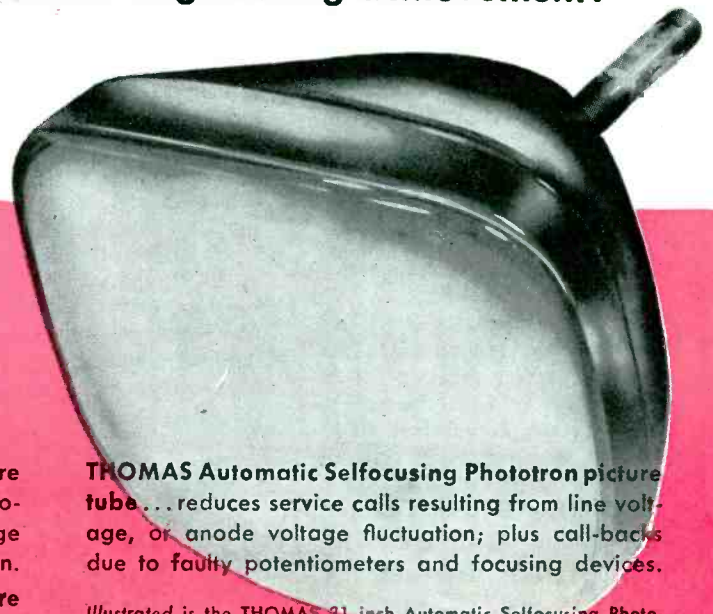
This is it!



the **NEW** *Thomas*

Automatic Selffocusing Phototron picture tube . . .

available with sensational glare-reducing cylindrical surface face plate...the latest THOMAS engineering achievement!



THOMAS Automatic Selffocusing Phototron picture tube . . . replaces either electromagnetic—or electrostatic—focusing tubes. Gives sharp focus edge-to-edge for the entire tube life . . . without focus deterioration.

THOMAS Automatic Selffocusing Phototron picture tube . . . requires no focusing circuits or components. And is directly replaceable without circuit changes.

THOMAS Automatic Selffocusing Phototron picture tube . . . reduces service calls resulting from line voltage, or anode voltage fluctuation; plus call-backs due to faulty potentiometers and focusing devices.

Illustrated is the THOMAS 21 inch Automatic Selffocusing Phototron picture tube with glare-reducing cylindrical surface face plate. The selffocusing feature is available in other sizes and types.

Contact your jobber or distributor for the complete THOMAS Phototron line . . . or write THOMAS direct.



Thomas Phototrons are *Exact* original equipment with these 20 TV set makers and many others . . .
 ADMIRAL • HOFFMAN • OLYMPIC • MECK • PILOT • STEWART-WARNER • KAY-HALBERT • MAGNAVOX • IMPERIAL • STARRETT
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ELECTRONICS Inc.

PASSAIC, NEW JERSEY



CON-1, ADVERTISING AGENCY

Inventory Requirements for Service Shops Found to be Simplified Through Use of Parts Which Have Multiple Application Features, Like Dual Volume Controls Which Employ Selective Type of Construction; with Front and Rear End Sections Being Supplied as Separate Integral Units in Variety of Resistances, Tapers and Taps.

Trend to **STANDARDIZED**

THE IMPACT TELEVISION has had on the service industry has been most evident in the financial readjustment the average Service Man has been compelled to make, while coping with the greatly expanded inventories necessary to service TV chassis. Today, the average service shop is faced with the problem of stocking some 700 different dual volume controls, more than 250 different values of *twist-prong* electrolytics, several hundred vacuum tubes, and an untold number of transformers, coils, and chokes. In addition, the shop must carry ceramic capacitors, special hardware, tools, and reams of technical assistance sheets, schematic diagrams, and publications.

Answer to Problem

This problem in economics has one obvious answer. If the average Service Man is to operate efficiently, and at a profit, he must employ every possible short-cut to reduce his dollar investment in replacement parts inventory to conform with the amount of business potential contained in his market area. At the same time, he must maintain his service effectiveness at a satisfactory level to meet competition and retain customer loyalty.

Fortunately, this trying situation

has been recognized by a few radio-television replacement parts manufacturers, who have made definite progress toward its solution. Evidence of this attitude may be found in the general trend toward standardized replacement lines. One example is the selective-assembly, dual-volume control program¹ recently announced, featuring a series of dual-volume control replacements² for radio, auto radio, television, and other electronic equipment.

The selective-assembly volume control was conceived and designed to reduce the number of dollars invested in idle dual-control inventory, without sacrificing overall flexibility and effectiveness of operation. This was accomplished by offering a selective-assembly style of construction, the front and rear end sections of which are supplied as separate integral units in a variety of resistances, tapers, and taps. In application, it is only necessary to select the required front and rear sections and then spend a few minutes coupling them together with hacksaw, mallet, file, and vise. With this type of system in force, a small

inventory of 30 front sections and 30 rear sections affords duplication of the electrical characteristics of any one of 900 different dual controls.

The extremely complicated and varied nature of dual controls found in radio, television, and other electronic devices, presented many problems in the development of this universal replacement control. It was discovered that fewer parts and less hand labor were preferred by Service Men. The final design was simplified by pre-assembling all control sections, and by reducing the number of accessory parts required. Without this preassembling, complete factory testing, prior to delivery of various control sections, would not have been possible.

The simplification of design was found to make it possible to reduce the amount of hardware and assembly fittings required for coupling a front and rear section together.

Coupling Method Adopted

The method chosen for coupling the shaft-end to the concentric shaft, and the concentric shaft to the rear control section, was found to contribute to the simplicity and flexibility of the control. It was decided to use a $\frac{1}{8}$ " dia-

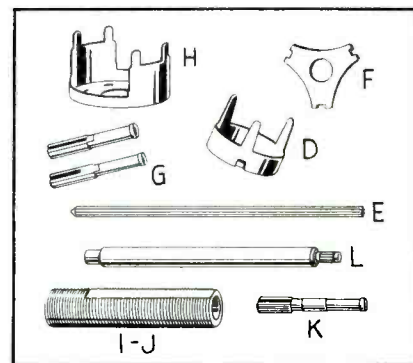
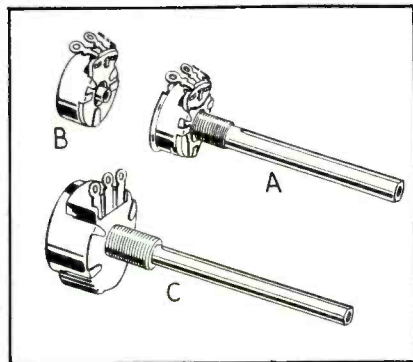
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¹Mallory. ²Mallory Midgetrol; Reg. U. S. Pat. Off.

Fig. 1. (Left), in A, B and C, are the front and rear carbon-control sections and a 2-watt wire-wound front section, respectively, illustrating the features afforded by selective assembly.

(Right)

Fig. 2. Coupling cup (D), concentric shaft (E), phenolic spacer (F), and commonly used .187 and .202 shaft-ends (G) supplied with carbon, front-control sections. Also illustrated is the modified coupling cup (H) which, in addition to shaft (E), phenolic spacer (F), and shaft-ends (G), is supplied with each 2-watt wire-wound front section. Special, and some infrequently needed dual-volume controls, such as auto radio controls with $\frac{7}{16}$ " and $\frac{1}{2}$ " bushings, and single shaft duals, require accessory hardware which is not supplied with front-section units. Accessory hardware available separately includes: $\frac{7}{16}$ " and $\frac{1}{2}$ " diameter brass bushings (I and J), a special shaft-end (K) for some models of Zenith television, and a coupling shaft (L) for use when coupling two carbon controls together as a single-shaft dual. Attachable ac switches in *spst*, *spdt*, and *dpst* circuit combinations are also available.



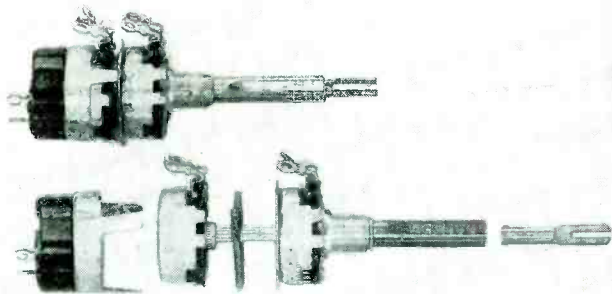


Fig. 3. At top: Parts assembled to duplicate the physical as well as the electrical characteristics of the *contrast-volume*, dual concentric control found in the 630 chassis. Below is an exploded view of the same control, showing the relative position of its component parts. The original control was equipped with an *ac* switch; thus, the new assembly was found to require an *spsst* switch, 10,000-ohm carbon, front-control section, and a 1-megohm tapped, rear-control section. Left to right, components are shaft-end, concentric shaft, front control section, penolic spacer, rear control section, and *spsst ac* switch. Coupling cup (D), shown in Fig. 2, ordinarily employed when joining two carbon sections together, was discarded because the *spsst ac* switch serves the same purpose. In preparing for the installation and assembly, the shaft-end is selected first. Then the outer and concentric shafts are cut to length. The *ac* switch is disregarded momentarily and parts aligned. Aligned parts are then placed in upright position on a vise anvil. Shaft-end is then tapped firmly with mallet (concentric shaft will be driven into rear control section, almost simultaneously with mating to the shaft-end). The *ac* switch is then slid into place and retaining tabs bent over. Installation of control in TV set is the final step.

REPLACEMENT PARTS

by CLINT R. BOWMAN

Engineer, Wholesale Division
P. R. Mallory and Co., Inc.

meter steel rod as the concentric shaft, splined along its entire length. When assembling the control, the concentric shaft is tapped into undersized holes in the shaft-end and also in the axle of the rear control section. The splines prevent axial movement between parts, thus forming permanent joints. The stub shaft of the rear control section extends completely through the control and abuts against the rear of the housing. This was found to absorb any shock which might otherwise be transmitted to the relatively fragile resistance element and contactor during the concentric shaft assembly operation. To reduce eccentricity and binding to a minimum the shaft-ends have been shaped to include the only bearing surface or contact between the two shafts along their entire length. This method of construction was found to permit considerable accidental mis-alignment between front and rear control sections, without affecting the

operation of the completed dual control.

Dual-concentric controls with carbon elements and $\frac{3}{8}$ " panel bushings are encountered more frequently in general service work than any other type. As a result, they have become the standard where dual controls are concerned. Occasionally, however, it is necessary to replace dual controls which differ in some respects to the so-called standard type. At this point, the Service Man finds himself in a spot for lack of a satisfactory replacement. Dual concentric-controls with wire-wound front and carbon rear sections, dual controls with single shafts, and dual controls with $\frac{7}{16}$ " and $\frac{1}{2}$ " panel bushings, are naturally difficult to obtain and match.

Emerson Chassis Requirements

For example, Emerson television models 631, 632, and 633 require a

dual concentric control with a 2500-ohm, wire-wound, front section and a 1-megohm, tapped, carbon, rear section for replacement. Duplication of this control is relatively simple with the selective-assembly components. Fig. 4 illustrates the built-up replacement and exploded views, respectively.

TV Model Needs

Industrial maintenance personnel and test-equipment service engineers will be more likely to encounter dual controls with single shafts than will the radio-television Service Man. However, a few television sets do use such a control, and when encountered, replacement becomes a headache. Sears television model 8130 uses a single shaft, dual carbon control in its video amplifier as gain adjustment. The special coupling shaft illustrated

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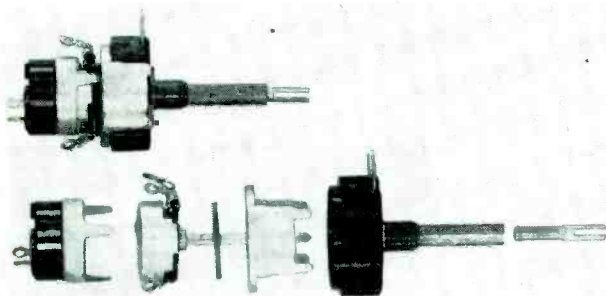
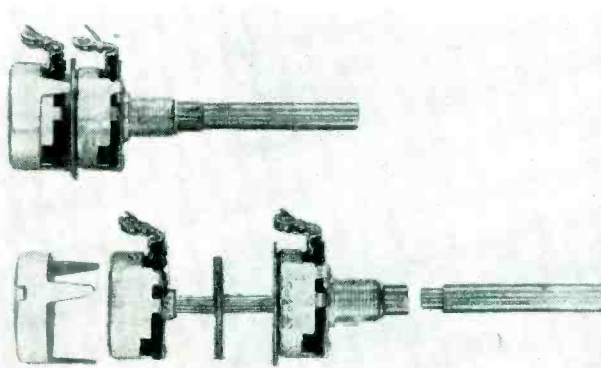


Fig. 4. Views of replacement dual-concentric control, which can be used in Emerson 631, 632 and 633 chassis, built-up unit being shown above, and exploded view below.

Fig. 5. Dual control with single shaft used in Sears 8130 TV chassis.



AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

THE PHONO PICKUP, that grand old-timer of the reproducer world, whose popularity has continued to grow since its introduction over three decades ago, certainly has passed through quite a series of unusual designs since those early days. Then, magnetic pickups were the vogue, the units developing an electrical current from the modulation groove of a record by causing a coil to be moved in a magnetic field (between the poles of a magnet), thus generating a varying current which followed the modulation changes in the record grooves, so that an amplifier might transpose it into sound.

A drawback of the early pickups, whether mechanical or electrical, was needle pressure. With a needle pressure of 10 ounces or more, the modulation grooves in the records were soon worn out and the reproduction became noisy.

The crystal pickup followed the magnetic cartridge. This took advantage of the characteristics of Rochelle Salt crystals, which when distorted mechanically caused a current to be developed. With a stylus assembly attached to the crystal element, it was found that variations in modulations on the records could be transferred to the needle, which in turn through the

Cecil B. DeMille, famous producer-director, and tape recorder (Ekotape) used for dictation of speeches, recording ideas and notes for future reference, etc. (Courtesy Webster Electric.)



Evolution of the Phono Pickup* . . . Phono Pre-amps and Noise Controls...Hi-Fi Amplifiers and Remote Controls with Preamp . . . Binaural Amplifiers for Tape Systems . . . Matching Transformers . . . Intercom Design . . . Tape Transport Mechanisms.

stylus would twist the crystal, developing voltage in rhythm with the recording.

Advantages of Crystal

The immediate advantage of a crystal over the early magnetic model was frequency range. Of possible equal importance, but not so evident to a customer, was the fact that a crystal cartridge offered a high impedance and was therefore more versatile in its use in connection with an amplifier. Filtering circuits could be used to cut down record noise and regulate frequency response.

To the consumer, the increased range of the crystal was found to be most desirable. In addition, the response was more uniform, magnetic pickups having a tendency to peak at

certain frequencies due to natural mechanical resonance.

Drawbacks to Early Crystals

A serious drawback to the early crystals was their short life and hygroscopic tendencies necessitating frequent replacements particularly in humid climates. Early crystals also had heavy needle pressure with the resultant record wear.

Beam-of-Light Pickups

In one effort to overcome these problems, a beam-of-light pickup** was developed. Modulation was transferred to the amplifier over a beam of light; thus, there was claimed to be no mechanical transfer of needle chatter, etc.

To minimize record wear, the pickup was adjusted, when installed, to not exceed 1¼ ounces pressure.

Electrodynamic Pickup

Shortly after this development, an electrodynamic type** of pickup was introduced. This was developed to

Binaural amplifier developed for use with a binaural tape recorder. Binaural recording is accomplished by recording the original sound, either voice or music, through two separate microphones. Each of these microphones records on a separate side or channel of standard ¼-inch sound recording tape. The two channels are recorded at the same time and reproduced simultaneously through two separate speakers or two separate headphones. (Model PJ6-BJ; Magnecord, Inc.)



*Based on notes supplied by Philco.

offset certain recording problems. Since the standard commercial record was found to be neither a constant amplitude or constant velocity recording, but a combination or both, a peculiar response condition prevailed. Generally records are now found to be cut at a constant amplitude up to a certain frequency, called the turnover frequency, and from this frequency to the upper limit they are generally constant velocity. Various record manufacturers vary this turnover frequency, but most records are cut with a turnover of 300 cycles.

Tracing and Tracking Error

This practice was adopted since it was desirable to record the maximum volume that is practical on a record, so that it is high in comparison to any interfering noises: high-frequency amplitude was thus limited because of distortion. Tests showed that when the wavelength becomes comparable to the amplitude (as at the end of a record) the distortion becomes very bad. This was identified as the tracing and tracking error, and was found to be due to the inability of the needle, because of its diameter, to resolve a wavelength comparable to its own dimension. This limitation was not found to exist at low frequency, and in fact, the error decreasing proportionally to the frequency. Therefore, it was noted, high amplitudes could be recorded at low frequencies. On the other hand, since the amplitude in-

**Philco.

Phono pickup cartridge, employing a condenser harness which slips on or off the terminals to change output from a high of 4 volts to a low of 1.2 volts at 1,000 cps, which it is said will serve as a replacement for more than 125 different standard 78 rpm cartridges now in use. Cartridge also features a needle chuck limiting principle which restricts motion of the chuck both radially and lengthwise. Purpose is to prevent dislocation of the chuck and to protect against crystal breakage from rough handling and when changing needle, it is said. Cartridge is furnished with the condenser harness in position on the terminals. Installed in that manner, output is low. Slipping off the condenser raises output. Range of the new cartridge is said to be up to 5,000 cycles. Minimum needle pressure is one ounce; weight of the cartridge 19 grams. The housing is stamped steel. (Model L-12-U; Astatic Corp.)

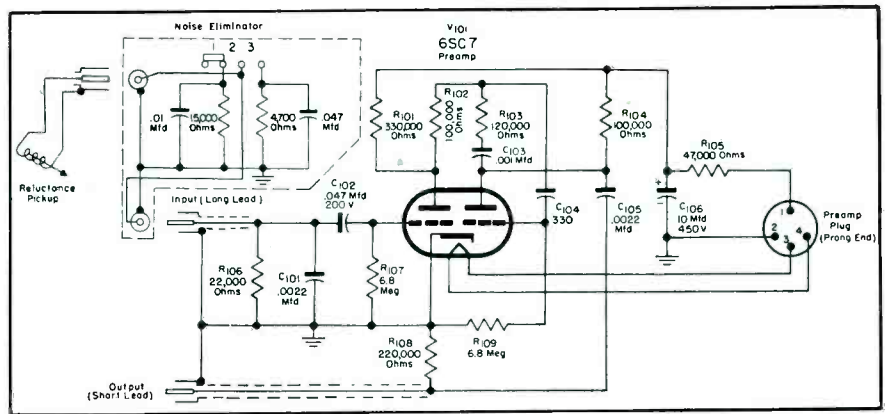
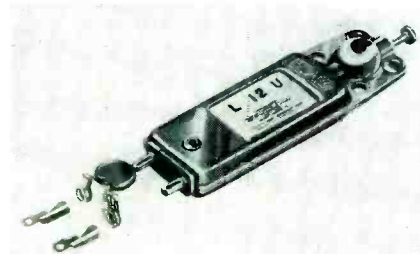


Fig. 1

Capheart phono preamp (C-295) and noise eliminator, featured in the C-282 and C-305 chassis, wired for use with model 333A-VR record changer employing the variable reluctance type pickup. In all of these models, the on-off switch on the radio chassis controls the power source for all functions of the receiver. Volume and tone controls on the radio chassis also function for phono and TV as well as radio operation. With the operation selector (band switch) in the phono position, the record changer automatically shuts off the power source to the entire instrument when it has played the last record. When the operation selector is then switched to either TV or radio, the power source will again, automatically, be turned on.

creases with decreasing frequency, the amplitude actually doubling each time we half the frequency, down at the lowest frequencies of interest the amplitude on a 100-line record was found to be so high that the modulation of one groove appeared to run into the next. It is necessary at this point therefore to record at constant amplitude.

Two and Three-Speed Changers

The advent of two and three-speed changers demanded an entirely new approach to record reproduction from the pickup viewpoint.

Previous type pickups could not be used for the *lp* and 45-rpm, since the

grooves are of smaller size and closer spacing. The available lateral amplitude, which determines the driving force, had been reduced to less than one half of that obtainable on standard play records.

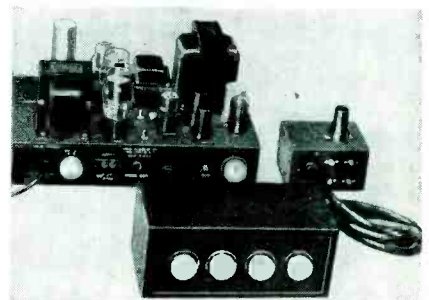
On standard records the spacing is about 100 lines per inch, whereas on the microgroove types, spacing is as high as 300 lines per inch. The spacing between grooves on the *lp* and 45 records is only .0018, and it is in this spacing that the modulation must take place. Each groove must only use half of this space if overcutting or breaking through the grooves is to be avoided; therefore, the displacement from rest

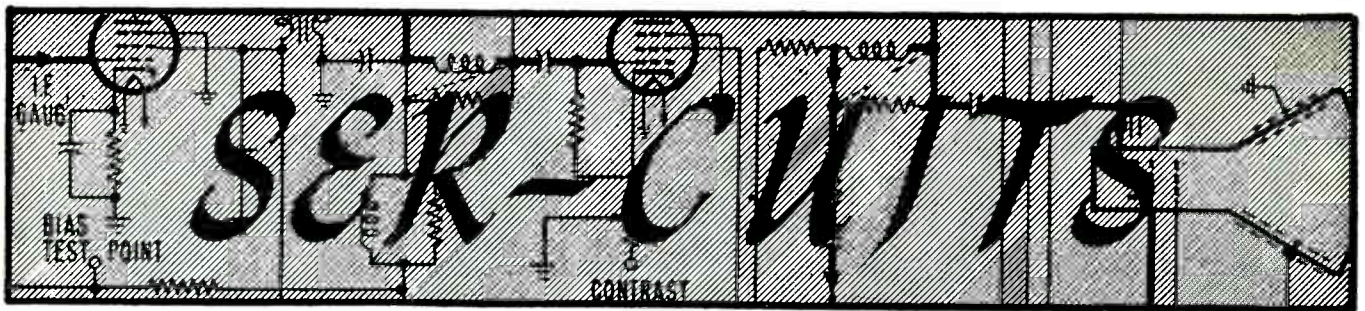
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intercom designed for systems requiring operation of more than one master station along with sub-stations. Incoming calls may be answered by master stations or sub-stations without manual operation, from a considerable distance from the unit. Units are said to provide a flexible combination from which incoming calls may be answered from a distance of up to forty feet from any master station or sub-station, in which master stations may talk with each other, sub-stations may be called selectively, or exclusively to any master station, and any master may be used privately or non-privately at its own option. Model CL-5, combination system for five station use, and CL-10 is a combination system for ten stations. (Talk-A-Phone Co., 1512 S. Pulaski Rd., Chicago.)



Triode amplifier and remote controller and preamp. Amplifier, rated at 10 watts output is said to deliver full rated output with less than 1.3% distortion over the range from 20 to 20,000 cps. Unit is said to deliver 25 watts, 2½ times its rated output, at less than 5% distortion. Remote controller and preamp is said to provide full control of *function selection, volume, tone, and record equalization* at distances up to 25' from the amplifier. A 7-position selector switch on remote unit features 4 phono positions marked in *turnover* frequencies, which is said to permit finger-tip selection of bass compensation to match the standard *turnover* frequencies used in making records. The remaining 3 positions on the selector switch are for AM, FM, and TV tuners. The preamp section is shock mounted and equipped with inputs for all popular phono cartridges, as well as for the 3 tuners. (Model HO10 amplifier, RXPX remote control-preamp; David Bogen Company, Inc., 663 Broadway, New York 12, N. Y.)





by M. W. PERCY

Highlights of IF/FM TV-Trap Circuitry Designed to Provide High Attenuation to Signals of all Frequencies Below 47 MC . . . Features of Variable-Delay AGC With Sound AGC Boost and Sync Systems.

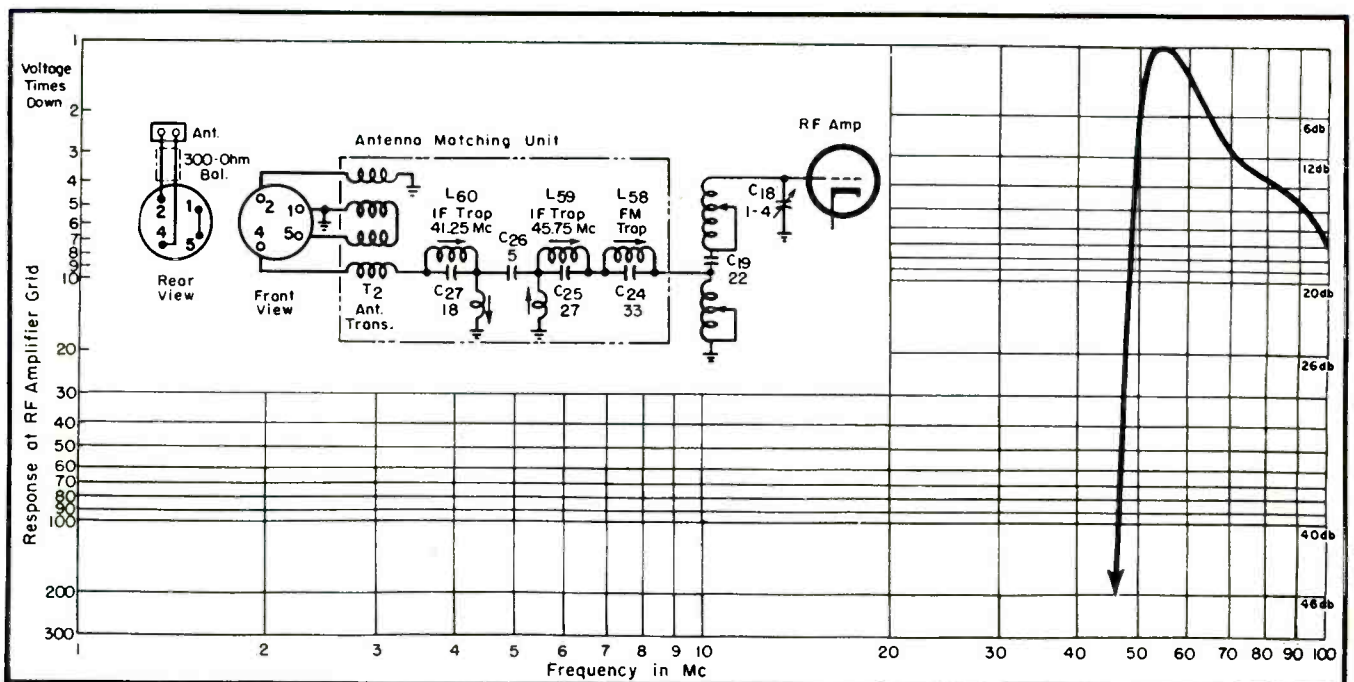


Fig. 1. Partial schematic of input for rf system of RCA 17T153 and 21T176 chassis, which features a filter in the antenna matching circuit designed to provide high attenuation to signals of all frequencies below 47 mc. Chart, shown with circuit, illustrates input response as measured from 300-ohm input to rf grid with receiver tuned to channel 2.

WITH TV RECEIVERS being used more and more in fringe areas, every effort is being made not only to provide increased gain, but improved hold or lock circuits, as well as inputs with interference-elimination properties.

An interesting example of the latter feature, appears in Fig. 1; an rf unit with a new type of input filter in the antenna matching unit designed to provide extremely high attenuation to signals of all frequencies below 47 mc. This permits the receiver to operate satisfactorily on weak TV signals in

areas of strong signals from police and other transmitters, provided of course, that they are free of harmonic or parasitic radiations which would fall within the TV channels.

Filter Characteristics

The filter circuit, used in RCA 17T153 and 21T176 chassis, consists of a highpass M-derived filter with a pi intermediate section and terminating half sections. In addition, an FM trap

is provided to reject signals from stations in the 88-108-mc range. The filter is aligned at the factory to provide the proper cutoff response. Adjustment of the trap coils must not be changed unless the proper test equipment is available. Because of the extreme attenuation in this filter, a high output signal generator and a high sensitivity 'scope is required. Even a slight misalignment may cause serious

(Continued on page 26)

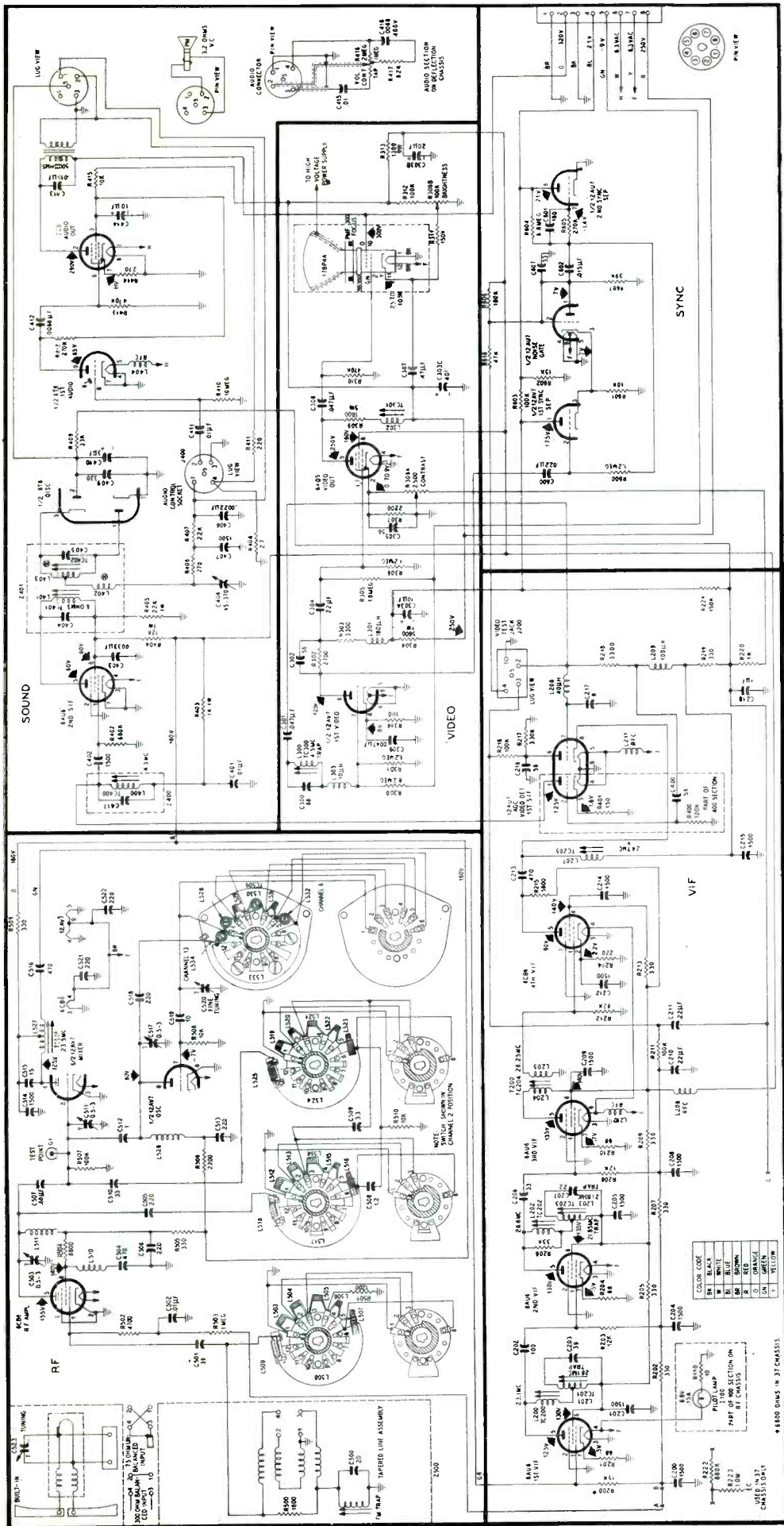


Fig. 2. Circuitry of Philco 33 and 38 chassis used in 122 and 123 models. Illustrated are the vif, video, sound, rf and sync sections.

[See pages 26 and 27 for circuit details.]

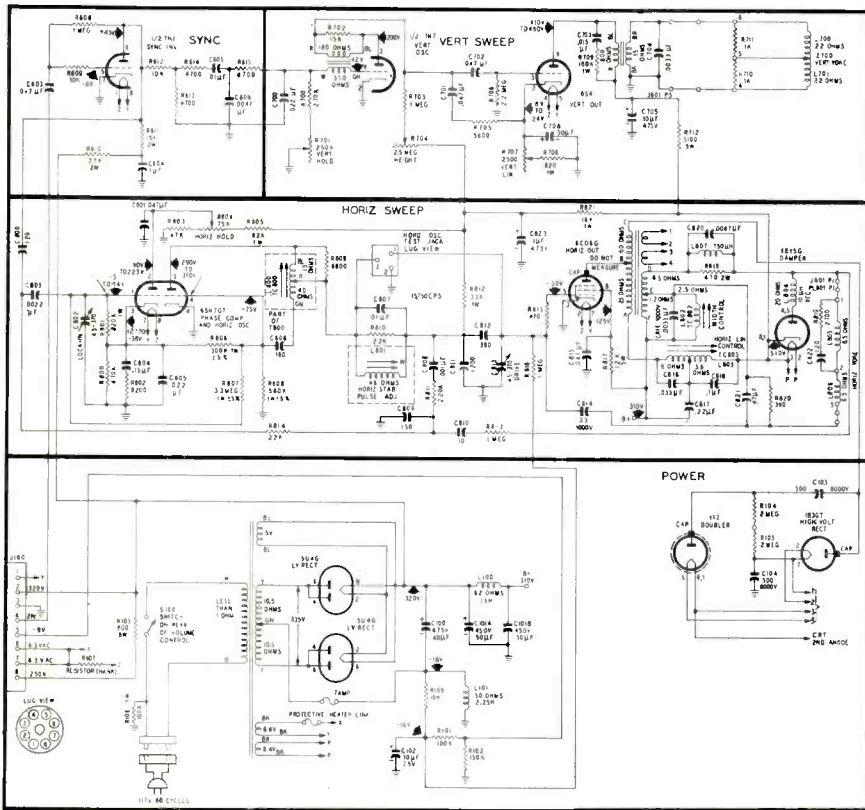
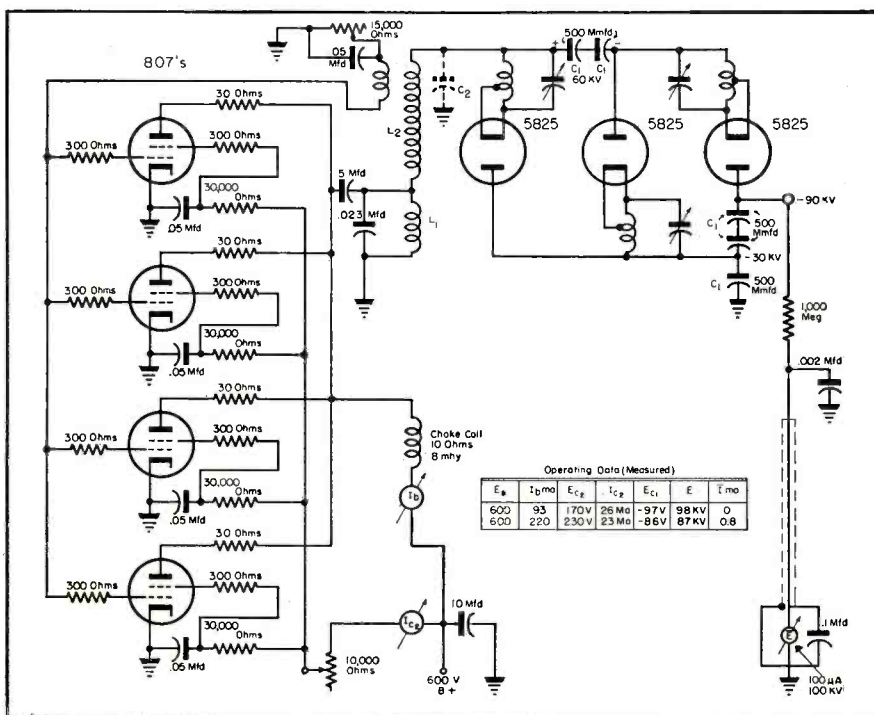


Fig. 3. The sync, power, vertical and horizontal sweep circuitry of Philco 33 and 38 chassis.

(Below)

Fig. 4. A 90-kv rf TV circuit designed for the 5825 tubes and employed in projection-TV systems. This circuit is also often used with the 25- and 35-kv coils, with the coils having a secondary current of about 5 milliamperes. Frequency of the coils is normally about 70 kc. The 25-kv units usually have a secondary with about 8-pi windings on a 2 1/4" diameter tubing, while the 35-kv secondary is a 10-pi winding affair wound on a 3" diameter tubing. (Courtesy Spellman Television)



attenuation of the signal (especially on channel 2) or permit *if* interference. The FM trap may be adjusted without test equipment.

Response Plot

As shown in the plot, the response at the rf amplifier grid is at least 200 times down in voltage (46 db) at all frequencies below 47 mc. Two regions of extreme rejection are provided (41.25 and 45.75 mc) to prevent feed-through of signals which might fall in the *if* band. Additional rejection of undesired signals is provided by the rf amplifier plate and mixer-grid tuned circuits, and by the trap between stages of the rf amp.

Philco Chassis

In Figs. 2 (p. 25) and 3 appear the circuit of a receiver with circuitry developed to provide improved DX-area reception; Philco '52 TV models, codes 122 and 123.

AGC System Features

Some of these circuit revisions, in this instance, appear in the *agc* system, which consists of variable-delay with sound *agc* boost. The variable-delay *agc* is obtained by applying a positive voltage to the cathode of the video detector *agc* rectifier section of the 12AU7; this voltage is obtained from a voltage divider in which the contrast control is one leg. When a weak signal is being received, it is necessary to turn the contrast control clockwise to maintain contrast. This increases the positive (delay) voltage applied to the *agc* rectifier, thus reducing or preventing *agc* action when receiving weak signals, where all possible gain is needed. This delay voltage does not affect the video-detector action, because the voltage is applied to the cathode, and the video-detector plate (control grid acts as plate) is returned to the same *dc* potential. There is no *agc* action unless the incoming signal is strong enough to overcome the delay voltage. When a moderately strong signal is received, it is necessary to turn the contrast control in the counterclockwise direction, thus reducing the positive-delay voltage. With stronger signals, the negative *dc* voltage developed across the FM detector filter capacitor completely cancels the remaining positive-delay voltage, resulting in full *agc* action. On still

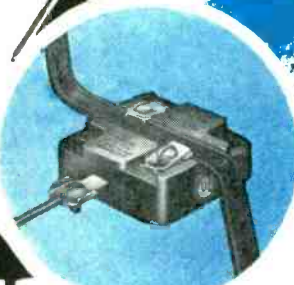
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Ser-Cuits

(Continued from page 26)

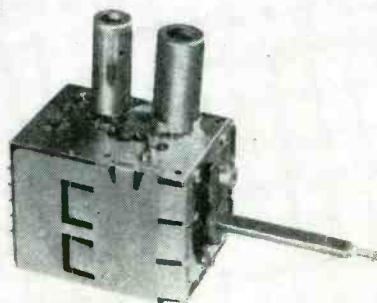
stronger signals, this negative voltage from the FM detector not only cancels the delay voltage, but boosts the *agc* voltage as well. Thus, the system provides flat *agc* action over a large range of received signal strength.

Sync Gain-Control Circuitry

The sync also contains interesting gain-control circuitry. It consists of a first sync separator, a variable diode noise gate, a second sync separator, and a sync inverter. The composite video signal is fed to the first sync separator, one half of a 12AV7. The output of the first sync separator is taken from the cathode, and applied to the cathode of the noise gate, one half of a 12AU7. A positive voltage, obtained from a voltage divider, is applied to the diode plate, while the sync signal, of positive polarity, is applied to the cathode. The diode will pass the sync signal as long as the cathode remains negative with respect to the plate. The value of plate voltage is so chosen that this is the condition for all normal sync signals. However, when a noise signal greater than the sync signal is received, the cathode of the diode is driven positive with respect to the plate, and the diode is cut off, thus preventing the noise from passing on to the second sync separator.

Weak and Strong Signal Effects

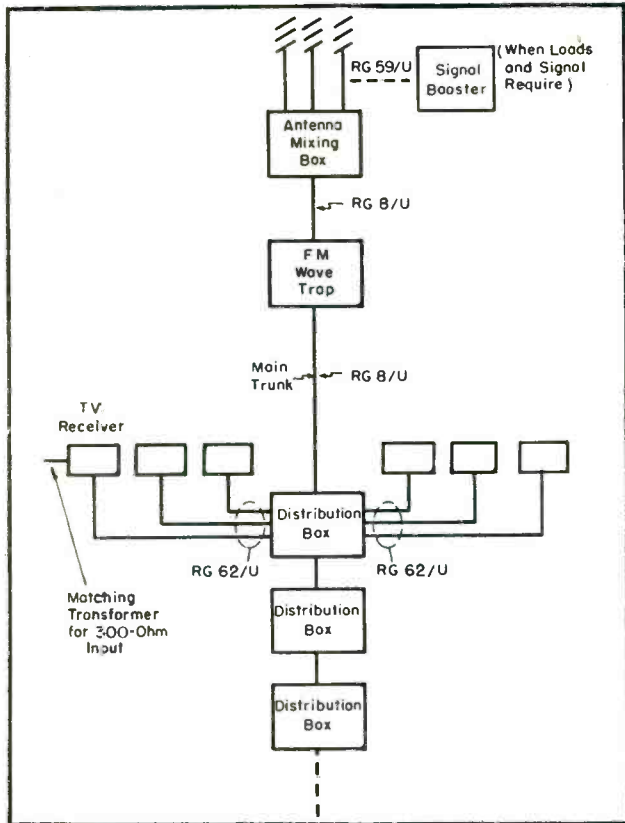
The positive voltage applied to the plate of the diode is made proportional to the strength of the signal being received, by obtaining it from the load side of a dropping resistor, R_{313} , in the B+ line that supplies plate and screen voltages to the *if* stages. The current through this resistor, therefore, depends upon the amount of current drawn by the *if* stages. When a stronger signal is received, the *agc* voltage increases; this decreases the current drawn by the *if* stages, and decreases the voltage drop across R_{313} . Since this results in an increase in the voltage applied to the plate of the noise-gate diode, it raises the level at which the diode will gate out the noise. When a weaker signal is



(Left)

Tuner for *vhf* TT-16, developed by Sarkes Tarzian, which provides for 12-channel coverage, plus an *uhf* position, in which tuner is changed to an amplifier for the ultrahigh *if*. Tuner features use of 6X8.

Fig. 5. Layout of a master-antenna system installed in the Chancellor Hall, Philadelphia, by Witte Radio and Television.



received, the opposite effect is obtained. The second sync separator, one half of a 12AU7, removes all remaining video information from the composite signal. The output of the second sync separator is fed to the deflection chassis through a power-connecting cable. A sync inverter, one half of a 7N7, reverses the polarity of the sync pulses and amplifies them for proper triggering of the sweep oscillators.

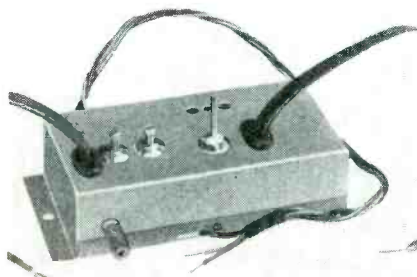
The vertical sweep circuit uses one half of a 7N7 as a conventional blocking oscillator. The vertical output stage uses a 6S4.

Blocking Oscillator

The horizontal sweep voltage is generated by a blocking oscillator, the frequency of which is determined, within the locking range, by the phase relationship between the horizontal sync pulses and the horizontal sawtooth at a phase-comparer grid. The blocking oscillator and the phase-comparer each use one half of a 6SN7. A 6CD6G is used as the horizontal sweep amplifier, and a 6BY5G is the horizontal damper.

(Right)

Pre-tunable single-station *uhf* tuner, also announced by Sarkes Tarzian, which can be connected to input of *vhf* tuner, which supplies voltages for unit. The ultrahigh attachment can be mounted on the TV chassis with brackets.



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The LICENSING THREAT



by CHARLES GOLENPAUL

Sales Manager, Distributor Division
Aerovox Corporation

LICENSING, proposed on many occasions and shelved every time, appears to have returned to haunt the servicing industry. As in the past, the misdeeds of a few have revived the ghost.

All statistics prove that the majority of Service Men and service organizations have been and will continue to be fair and square. If anything, it's the public that should be soundly spanked for not willingly paying what is fair and square for honest service jobs. The time has come when the public should be educated in service costs, for I'm convinced that it's mainly *ignorance*, rather than downright *cussedness*, which accounts for those complaints over service charges.

Actually, the service profession has done a splendid job of servicing the 14,000,000-odd TV sets now in use. In many instances, the sets have reflected early engineering that had to be corrected out in the field, so that Service Men have had to be design engineers as well as repair men.

I have always insisted that the Service Man receive his just fee. The time has come when Service Men have to band together to get a fair living out of their highly skilled efforts.

Unfortunately, there have been a relatively few Service Men and service organizations that have taken the pub-

lic *for a ride*, and created a trying situation that could affect everyone, through licensing honest Service Men and service organizations.

How would you like to pay an annual license fee, make out still more returns and reports to bureaucrats, and feel that you were being watched at every return and occasionally brought up on charges even when you were innocent?

That threat is just around the corner, if some Service Men continue to cheat their customers through misrepresentation or excessive charges or failure to carry out service contracts.

Maybe you think I'm an alarmist. Hardly. Let me call your attention to one instance.

The City Council of New York City, in committee on September 27th, declared: "The business of selling service contracts and serving television receiving apparatus has become the subject of great abuse, with the result that the public has been and is being victimized by irresponsible sales methods, unethical and financially unstable service organizations, and inferior installations, maintenance and repair."

That speaks for itself. The city government is considering an unsalaried supervisory board of seven named by the Mayor, including experts from industry, to be set up to

encourage *self regulation*. The bill provides for annual license fees of \$15 for technicians, \$5 for apprentices, \$25 for service contractors, and \$25 for service dealers. Violators would be guilty of misdemeanor and punishable by fine not to exceed \$500 or six months imprisonment, or both.

Then there is a companion measure, much along the same lines of the bill defeated in the State Legislature some time ago, proposing to protect the TV set purchaser from losses through bankruptcies of service contractors by having the latter place the full service fees in escrow in a bank, drawing against same each month but always having sufficient deposits to insure carrying out the contracts even if the contractor fails.

That is just New York City and New York State. The idea may be contagious. Other large cities and other states may fall in line, if New York City and New York State put through such measures. Soon the Service Man or service contractor may find himself subject to examinations, license fees, escrow accounts, audits, checkups, and even answerable to various charges made by unreasonable customers and there are many such.

Let us hope, therefore, that this bureaucratic threat can still be

(Continued on page 60)

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Direct-coupled amplifiers are used to provide low-frequency response flat down to dc. Excellent low-frequency square-wave reproduction, essential for correct sweep alignment, is thus assured. Good square-wave response up to 100 Kc enables the WO-57B to reproduce blanking and sync pulses for dependable television servicing in the shop or in the field.

You will find the RCA WO-57B equipped right down to the last detail . . . including a nickel-iron-alloy shield surrounding the C-R tube to minimize hum pickup.

The RCA WO-56A has design features which make it a versatile instrument for use in servicing and development work on circuits for television, radio, audio, and industrial electronic applications.

Its two identical dc push-pull amplifiers have equal phase-shift characteristics and ample output and gain to provide three-times horizontal-trace expansion. Wide-range centering allows any portion of the expanded trace to be observed for detail.

The 'scope includes practical refinements such as a magnetic shield for the C-R tube, retractable light shield, line-frequency sweep with phasing control, voltmeter-type range switch for making peak-to-peak measurements, and dual concentric controls for coarse and fine adjustments of gain, sweep, and sync functions.

Ask your RCA Test Equipment Distributor for complete technical data folders, or write RCA, Commercial Engineering, Section 56KX, Harrison, New Jersey.



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HARRISON, N. J.

DAMPING-TUBE REPLACEMENT CIRCUITRY

by J. T. CATALDO

Selenium Rectifiers Found Suitable Substitute for 6X5 Damping Tube in Flyback Circuit of Transvision 12-Inch TV Chassis

OFTEN IT BECOMES necessary to improvise, during servicing calls, and resort to substitution techniques. This is particularly true with tubes. Recently, it was found that it would be impossible to secure a 6X5 damping tube in time to deliver a chassis¹, the delivery date being late Saturday night. The first attempt at improv-

ing revolved about a suitable substitute rectifier tube, but with no avail. The tube was either too large physically or it meant excessive wiring changes in an already crowded chassis.

The next thoughts turned to selenium rectifiers as a replacement. However, the only rectifiers available were the conventional radio stacks exten-

sively used in both radio and television receivers. Although the manufacturer's technical data on these units specified a maximum input voltage of 130, it has been found that they may be used in circuits whose input voltage is approximately 260, providing the load is resistive or inductive. This condition holds because the radio stack is rated for 130 volts input when operated into a capacitive load, as shown in Fig. 1a. The capacitor C charges up to approximately the line voltage during the conducting half-cycle; Fig. 1b. On the non-conducting half-cycle (Fig. 1c), the polarity of the charged capacitor is in series with the line voltage. Therefore, the rectifier withstands or blocks the sum of these two voltages, which is approximately 260 volts or twice the line voltage.

Two Cells Required

Since the alternating voltage on the plate of the 6X5 (Fig. 2a) is in the order of 500 volts, it is necessary to use two selenium rectifiers* connected in series to replace the 6X5. The cells were connected as shown in Fig. 2b. Physically, the rectifiers were

(Continued on page 63)

¹Change was made on a 12-inch Transvision set. The same change was made in a 17-inch model, which was a conversion of a 12-inch receiver.

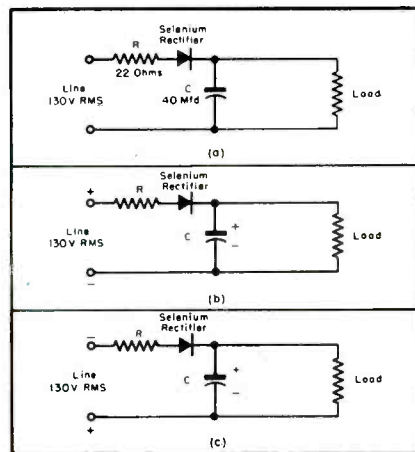


Fig. 1. Circuits illustrating how selenium rectifiers withstand sum of two voltages. In a appears a conventional half-wave circuit, with a capacitive load. Capacitive charge during conducting half cycle is noted in b. In c we have a non-conducting half cycle, where the polarity of the charged capacitor is in series with the line voltage. R represents a current limiting resistor of 22 ohms; C, a 40 mfd capacitor and RS, the selenium cell.*

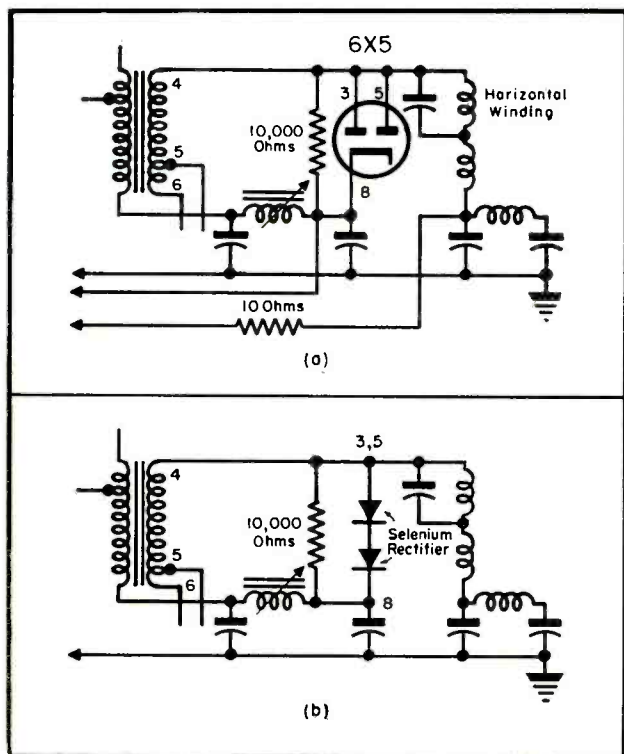


Fig. 2. The 6X5 damping circuit (a) and selenium-cell revision (b).

*Two International Rectifier model RS-75 selenium rectifiers were used.

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The **Simpson** volt-ohm-milliammeter that outsells all others combined.

20" TV Chassis with SURROUND LIGHTING for PICTURE TUBE

by WYN MARTIN

ROOM LIGHTING and TV, which has been quite a debated subject, has prompted many to seek design techniques that might be used to permit the use of substantial lighting while viewing. Several interesting solutions to the problem have appeared. In one instance, the picture-tube face plate has been so oriented, that glare and reflection from room lighting is minimized. The use of black-face-type face plates and aluminized tubes have also contributed to the cause.

Believing that built-in lighting might be a major assist, one manufacturer decided to experiment with cold-cathode tubes. It was found that a tube of light could surround the picture tube with interesting results, providing not only effective lighting for a room, but unusual picture-tube viewing effects. As a result, the idea was included in a series of models, one of which is diagramed on the cover this month; Sylvania 25M. The tube of light, known as *HaloLight*, has been tied in with the chassis system, its intensity being controllable by a knob on the front panel, which operates a five-position switch.

Tube Complement

The chassis employs a 6CB6 *rf* amplifier; 6J6 oscillator-mixer; 6AU6 first video *if* amp; 6BA6 second and third video *if* amp; 6BC5 fourth video *if* amp; 6AL5 video detector-*agc* line clamper; 6BF5 video amplifier; 6AU6 sound *if* amp and 6AU6 sound *if* limiter; 6T8 ratio detector-first audio amp; 6V6GT audio output; 6SN7GT *agc* amp-sync amp and clipper; 12AX7

[See Front Cover]

agc rectifier-sync separator; 6BL7GT vertical oscillator and output; 6AL5 horizontal discriminator; 6AU6 horizontal control; 6SN7GT horizontal oscillator and discharge; 6BQ6GT horizontal output; 6W4GT damper; 5642 (2) high-voltage rectifiers; 5U4G (2) low-voltage rectifiers; and a 20DP4A picture tube.

Horizontal AFC

A sine-wave horizontal *afc* is employed, which it is claimed provides picture stability, even in the presence of noise and weak signals.

Horizontal sync information from the sync clipper is supplied to the horizontal discriminator. A voltage from the horizontal oscillator is also supplied to the horizontal discriminator. The output of the horizontal discriminator is then applied to the horizontal control tube which functions to hold the horizontal oscillator in synchronism with the incoming horizontal sync pulses.

Horizontal-Oscillator Operation

The horizontal oscillator actuates the horizontal discharge tube through a horizontal ringing coil producing a peaked sawtooth wave. Approximately one-half of the sawtooth component of this wave causes current to flow in the plate circuit of the horizontal output tube. This current energizes the horizontal deflection coils through a horizontal scanning transformer to provide the right half of the horizontal scan. During the right half of the scan, a small amount of current is also flowing

through the damper tube. At the end of the sawtooth, the inverse pulse component acts on the grid of the horizontal output tube to cutoff plate current flow. When this occurs, the energy in the horizontal deflection circuit transfers rapidly from the inductive branch of the circuit to the capacitive branch, resulting in a voltage peak of approximately 2000 across the horizontal-deflection coils. This voltage is stepped up to approximately 7250 by the turns ratio of the horizontal scanning transformer and fed to a voltage doubling rectifier circuit to provide approximately 14,500 volts, the necessary potential for the picture-tube high-voltage anode.

HV Pulse-Period

The damper tube does not conduct during the high-voltage pulse period because of the polarity of the pulse. During this pulse period, when the energy transfers from the inductive branch of the horizontal deflection circuit to the capacitive branch and back again to the inductive branch, the electron beam in the picture tube is moved rapidly from the right to the left edge of the raster to accomplish retrace.

Completion of Retrace

At the completion of retrace, energy again flows out of the inductive branch of the circuit. The horizontal output tube is still cutoff during this time and a strong current flows through the damper tube. This current decreases to zero linearly to provide the left half of the scan. As the current approaches zero, the horizontal output tube again begins to conduct and the entire cycle is repeated.

IT'S STARTED!



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PICTURE TUBE
REPLACEMENTS
COMING!**

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Over 4,000,000 TV sets are now over two years old. Just as electric-light bulbs dim with age, the picture tubes in these sets are failing.

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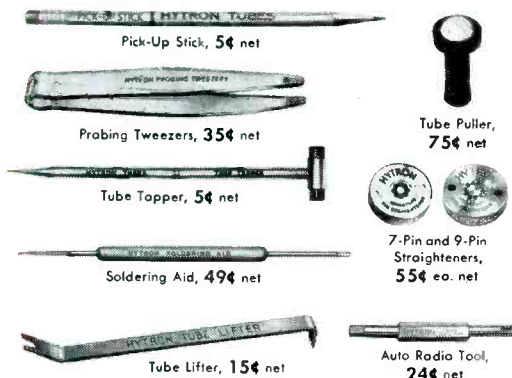
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MAIN OFFICE: SALEM, MASSACHUSETTS

MUSIC as a



Left: Music reduces absenteeism . . . makes going to work fun.

Effectiveness of Music on Different Types of Work . . .

Planned Music Benefits . . . Selection of the Proper

Compositions

Music's virtues as a stimulant to production can be destroyed if the wrong type of programming is employed. This is particularly true where the work involved requires considerable concentration and the music can be considered disturbing.

This fact was well illustrated during a test* among workers performing operations which required a high degree of manual dexterity and a sense of timing. In this study, the average weekly output per 100 man-hours during three weeks without and three weeks with music increased only 4.1%. In still another 9-week test, there was one week where the output dropped slightly.

It was also found in a school experiment** that typing proficiency was noticeably reduced by jazz and dirge music. As a general rule, the average factory worker accepts music overwhelmingly, while the office worker tends to shun exposure on the grounds that it interferes with his thinking. Inevitably, the same individual, when subjected to a reasonable period of well planned background music reproduced at low level, will reverse his attitude and state that the music relieves the tension of office and executive work, that it relaxes and improves intra-office relationship.

Planned Music Merit

As noted earlier, proper programming is imperative if maximum benefits are to be achieved. Reporting on the results of one experiment to determine relative effectiveness of a planned pro-

gram, a recreation‡ association disclosed that the average per cent of maximum efficiency was found to be: Before music, 72.0% and after music, 80.0%, providing an increase of 8%; after planned music the result was 86.8%, providing a total increase of 14.8%.

Not only had introduction of music increased efficiency, but planned programming had resulted in almost doubling the benefits of the use of music.

Factors to be Considered in Program Planning

There are numerous factors to be considered in developing a healthy program diet. Unfortunately, not always is worker preference the criterion. For instance, it does not require much imagination to realize what would happen to quantity or the rejection rate, if baseball games were soundcast during work periods. The effect of slow, profound classics on a high speed assembly line is also not difficult to perceive. Still, expressed preferences are quite important, since they form the most important communicative link between the electrical mechanism which reproduces what we call music, and the human mechanism which either accepts or rejects accordingly. If the nature of the work, product, worker intelligence and temperament, and environment are fully

considered, composition of a really productive program is not too difficult.

Selection of Music

In selecting program material, familiarity, tempo, orchestration, appeal, and mood must be considered. The selection available or obtainable should be classified and matched to known conditions as determined by the factors mentioned previously for a specific audience.

For example, several surveys have indicated that well-known even-tempoed dance music is most popular, generally speaking. Yet, there are some surveys which favor other types of music, depending upon the average intellect of the listeners. In one study¹ involving 19 factory glee-club members, 30 stenographers, 104 office workers and 40 lamp-factory workers, *hit parade* type music was liked by all groups and particularly favored by the stenographers and factory workers. Though acceptable to all groups, Hawaiian music was most favorable to the factory workers. The office workers and stenographers disliked fast dance music, while the glee club and factory groups were indifferent. Though all groups liked semi-classical music, the glee club preferred it the most, the factory the least. Waltzes were liked by all groups, while polkas and square dances were disliked by the glee club and office workers. Spirituals were not very popular; marches rated fairly well, but least preferred by the factory as was classical music. Novelty and humor-

*Burriss Meyer analysis. **Reported in *Journal of Educational Psychology* by M. B. Jensen.

‡Industrial Recreation Association.

Production Tool

by LAWRENCE J. EPSTEIN

University Loudspeakers, Inc.



Right: Boredom is the greatest enemy of quantity and quality production.

ous type music didn't fare too well, nor did hillbilly and western music, which seemed to meet varied reaction according to the group; moderate acceptance by the factory workers, mild disfavor by the office workers. Sex makeup of the audience has not been found to be an important factor, although some tests have indicated that males prefer all-instrumental selections, while females like a healthy smattering of males vocalists rendering currently popular tunes.

Tempo

Of particular importance is the tempo of the music played. Jitterbug and boogie-woogie are generally too stimulating, causing disruption of the individual worker's procedural cycle, or else too distracting for the employee who must apply a fair amount of concentration to do accurate work. A singularly good example of a tempo type to avoid is *Deep in the Heart of Texas*, where the temptation to drop work and clap one's hands in accompaniment is almost overwhelming.

There is a difference of opinion regarding the possibility of stepping up production by judicious selection

of music tempo. In one recorded experiment, greatest quantity was obtained with *peppy* music, though best quality was achieved with sweet music. Greatest net yield, however, resulted from a variety program of music. In another test, output was lowest during days when waltzes and Hawaiian music was played; it was better with marches, polkas, and *hit-parade* selections. Nevertheless, it is difficult to subscribe to the generalization that fast music will be more productive than slow music. There are too many variables involved, and one is quite apt to find that what is good for one plant or even a part of that plant, is not suitable for another. It is best to accept the premise that while fast or extreme tempos should be avoided, music with a moderate, clearly-defined, and fairly consistent rhythm can be expected to produce the most beneficial results generally. Such music will also keep interest and morale at a high pitch. It has been found wise to avoid thickly orchestrated music which seem to lose continuity of theme; they are almost as bad as music which is too slow tempoed. This type of music can create subconscious confusion which interferes with speed of the work cycle. Vocals are satisfactory, if the tempo is not too dreamy, but they should not be used too fre-

quently. Vocals have been found to give an occasional lift to the programming, but they command attention and can therefore become distracting.

Basic Types of Music

According to one industrial record library, there are four basic types of music:

Opening Music: Marches, patriotic airs, polkas, and other bright and cheerful tunes, suggested for 15-minute schedules at the start of each new work day (mornings) or new shift. Closing music should be of the same type, each category obviously designed to invigorate the worker either upon his arrival or departure from work.

Fatigue Music: Refreshing music such as that offered by name bands, popular lively tempo dance music, musical comedy favorites, etc., played for some discrete period sometime before and after lunch when production curves usually show a consistent let-down in production.

Luncheon Music: This should consist, first, of classics and semi-classics, including great vocal and instrumental artists, salon music and ballads, etc. The latter part of the luncheon program can be devoted to moderate

(Continued on page 63)

¹Kerr, W. A.; Journal of Psychology.



Left and right: Examples of directional and radial-type reflex trumpets used in factories to cover relatively wide areas. Speaker at left features a trumpet and driver*, bell diameters varying from 16 1/4" to 30 3/4" and horn lengths from 12" to 27 1/8". At right is a radial reflex unit**.

*University model PH trumpet and PA 30 driver.

**University RPH, which should be used with PH/PA 30.



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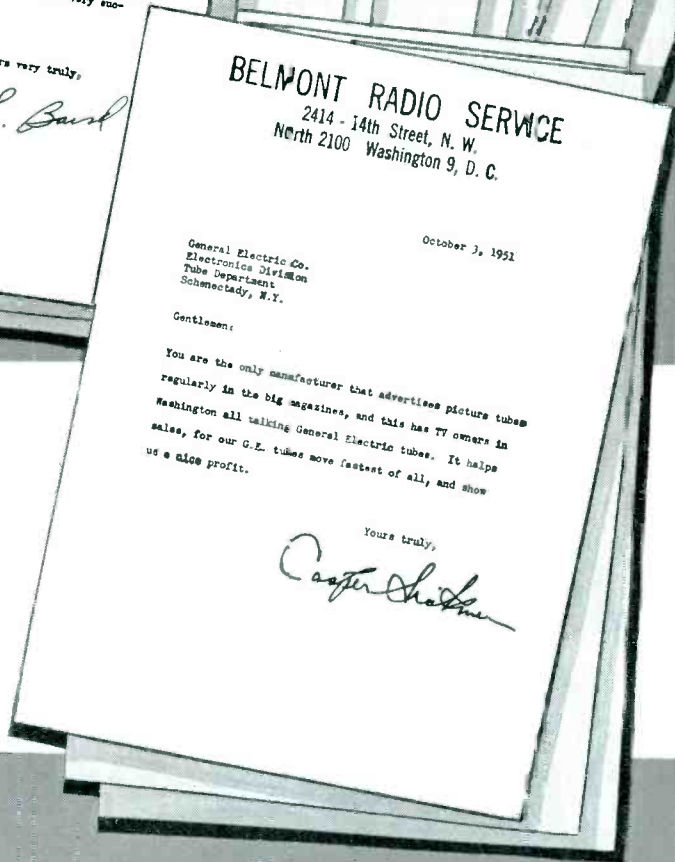
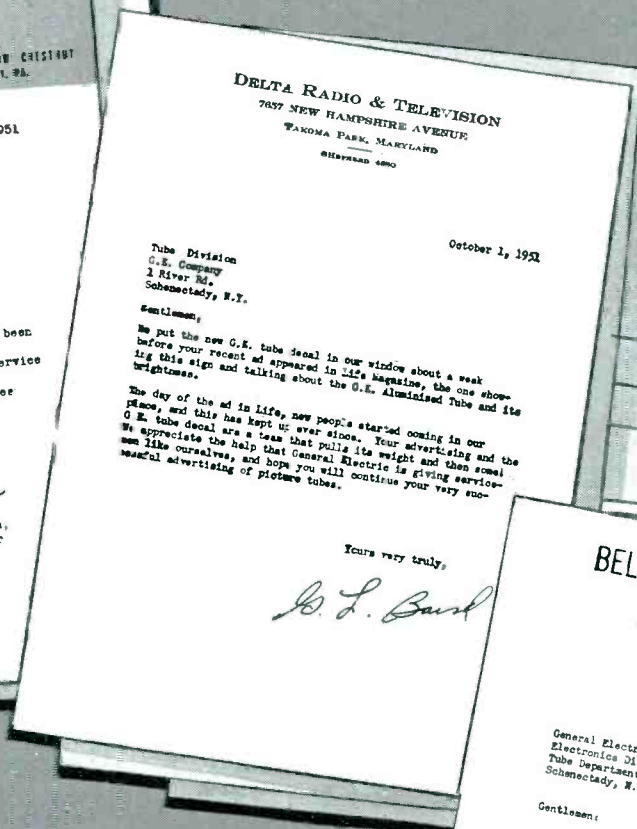
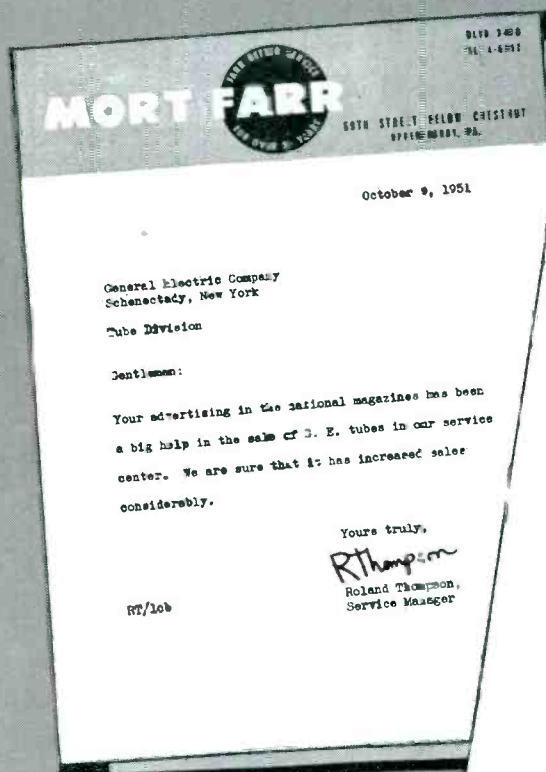
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Only G-E Tube Dealers

can write letters like these, proving how powerfully
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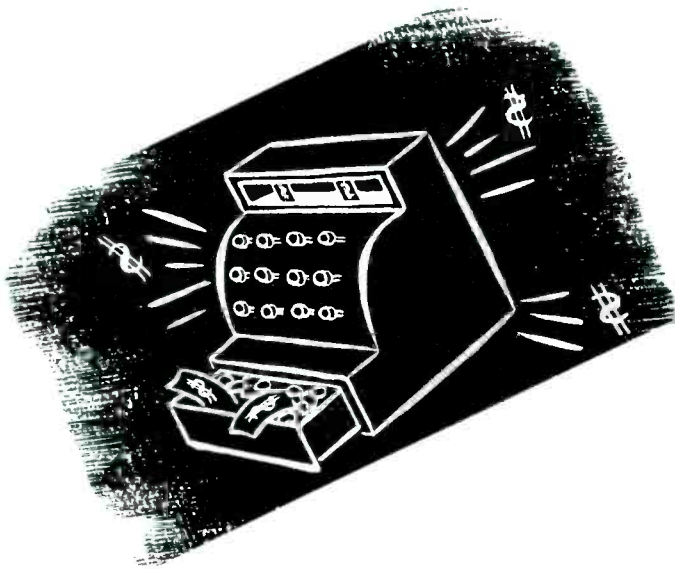
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181-K410



Business Aids . . .

Practical Solutions to Typical Service-Shop Problems

[In response to many requests, arrangements have been made to feature every month in SERVICE a column devoted to a discussion of Business Aids for the Service Shop, based on queries submitted by readers of SERVICE. Topics to be reviewed will include advertising, bookkeeping, customer relationship, filing systems, displays, direct mail, etc. These columns, the first of which appears below, will be conducted by a veteran Service Man with over a quarter of a century experience in the field, who is currently operator of a large Service Shop, and is also extremely active in association affairs. 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.]

Dear Editor :

I recently opened a shop around the corner from my home. It is located on a fairly well-travelled street coming off the main business artery in this town. Since this is my first store venture, having previously been employed as a technician and in my spare time operated out of my home, I am puzzled about the proper use of my display window. I'd like to see it used to the best advantage. I don't want

(Continued on page 62)



ANTENNA REPORT

A ----- Television Service Member

Date _____ 124 Reliable Ave. Dealer _____ Yourtown, U.S.A.

Name _____ Make _____

Address _____ Model _____

City _____ Serial _____

Apt. _____ Tel. _____ Date Installed _____

Installation Rework

Installation Description Customer's Complaint _____

Roof Chimney

Wall Mount Centralized

Standard Special

Other _____

Type Building and Roof

Pvt. House Flat

Apt. House Sloping

Hotel _____

Other _____

Reception Report

Ch	Good	Fair	Poor	Refl.	Int.	Other
3						
6						
10						

Material Used

Antenna Used _____

Est. Len. Line _____

Single Twinex Coaxial

Double Twinex Switch

NOTE -- Indicate all data relative to installation description and reception difficulties on back of this report.

Installation Chief _____

Installation Helper _____

Date _____

As found before rework

Ch	Good	Fair	Poor	Refl.	Int.	Other
3						
6						
10						

Customer's Confirmation of Reception as shown above

Customer's Signature _____

After Rework

Ch	Good	Fair	Poor	Refl.	Int.	Other
3						
6						
10						

Customer's Certification

I certify that the reception at my location is as noted hereon after the antenna work was completed.

Customer's Signature _____

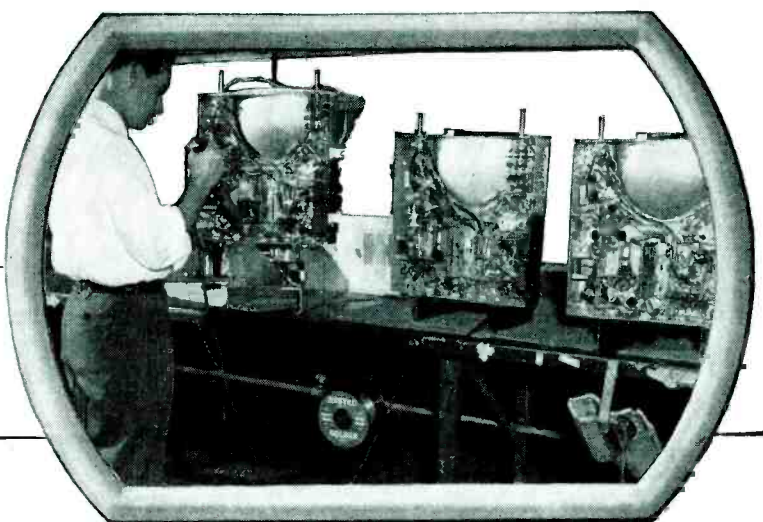
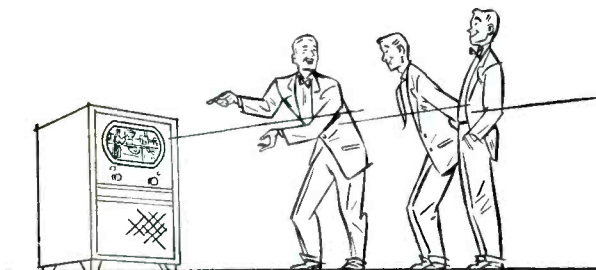
Left: Typical tube promotional material available to Service Men for their shop windows or interiors. (Courtesy RCA)

Above: TV antenna report form which has been found to expedite service calls, and accelerate installation and repairs, reducing call backs and assuring a net gain on every job. (Courtesy Philco)

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

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Sync-Circuit Troubleshooting with Wide-Band 'Scopes' . . . Eliminating Picture-Tube Shadow . . . Minimizing Sound and Video Detector Radiation* . . . Curing Vertical Roll and Picture Wash-Out in Extreme Fringe Areas.

Servicing Helps

by M. A. MARWELL

OFTEN SERVICE MEN experience difficulty in tracing sync trouble because they are unable to see what is happening in the sync or sweep circuits. With the aid of a wide-response 'scope, it has been found possible to provide an accurate picture of the defect, and the performance of the horizontal and vertical pulses. Poor high-frequency response gives the effect of amplitude discrimination as far as the horizontal pulses are concerned. Thus, the vertical pulses can appear as much as 30 per cent higher than the horizontal pulses.

Narrow-band 'scopes can be modified to provide an extended frequency range. To illustrate, the Philco 7019 model can be altered so that its frequency response is down about 3db at 1.5 mc.

Two Approaches to Problem

There are two approaches to the solution. In one there is used a constant impedance looking into the grid of the amplifier, changing the gain by varying the cathode bias. A higher-input coupling capacitor and screen bypass capacitors are said to result in improved low-frequency response, while the use of a constant impedance and unbypassed cathode resistor is claimed to provide better high-frequency response. A wafer-type step switch is used in the cathode circuit, the switch being calibrated in steps of .6, 2, 5, 20 and 40

*Based on copyrighted notes prepared by Philco.

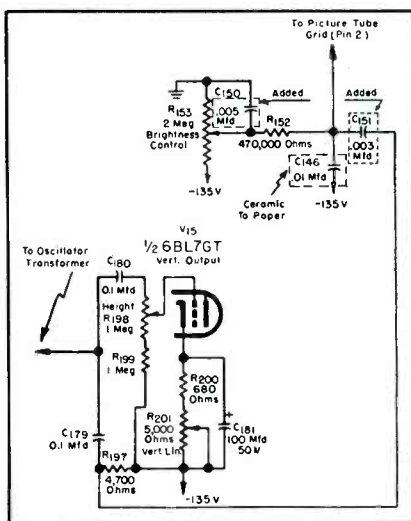
and also 80 v p/p direct to the plates of the 'scope for 1-inch deflection. For convenience, a low-pass input filter can be incorporated to help filter out noise when a sine-wave signal of a low frequency is being viewed.

Second HF Response Method

The second method for obtaining a high-frequency response involves the use of a fixed input load consisting of a 1-megohm resistor. The input capacitor must be changed to .25 mfd. A

Below

Altered Sylvania circuit (chassis 1-366; code C10 and chassis 1-441; code C04), which provides for suppression of vertical retrace lines by the addition of .005-mfd and .003 mfd capacitors and returning C146 to -135 v, the latter being changed from a .01-mfd ceramic capacitor to a .01-mfd paper capacitor.

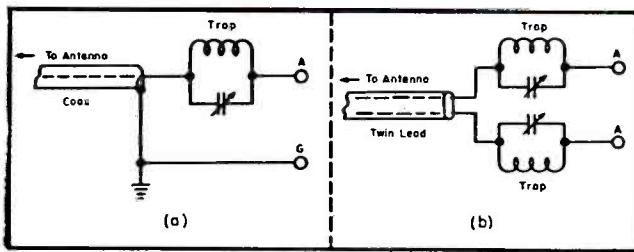


Feeding Deflection Plate

To feed the vertical deflection plate directly, the switch should be so wired that the connection to the plate of the 6AU6 is opened in the maximum counterclockwise position of the 25,000-ohm potentiometer. The ground connection should be removed from the ground jack for *horizontal sync input*; this jack is connected to the vertical deflection plate. Thus, for feeding signals directly on the vertical deflection plate, the test lead must be removed from the *vertical input* jack and plugged into the reconverted *horizontal sync ground* jack.

Elimination of Shadow

Proper adjustment of the beam bender can serve to eliminate picture-tube shadow. Since many types of beam benders are in use, the adjustment procedures will vary. There is, for instance, one type, which has two ring magnets and is placed on the neck of the picture tube with the smallest ring magnet toward the face of the tube. The arrow appearing on the frame of the assembly should point to the anode connector. Another type



Above

Parallel-tuned FM trap which may be used to eliminate FM interference, with a parallel resonant circuit connected in series with the transmission line. It may be used with 72-ohm coax (A) or 300-ohm twinlead (B). When used with twinlead two traps are necessary, one for each side of the line. Each of the resonant circuits is made up of an air core coil, consisting of 10 turns of No. 14 enameled copper wire, close wound, with an inside diameter of one-half inch and a 1 to 1.5 mmfd variable capacitor. After a trap has been installed it should be tuned to minimize the interference. (Courtesy DuMont)

uses two bar magnets, placed on the neck of the picture tube with the bracket colored blue toward the face of the tube. The magnets will locate either adjacent to or opposite to the anode connector, depending on which is found to give maximum brilliance. A single-bar magnet is used in a third type, the magnet being placed on the neck of the picture tube with the part number towards the tube base and the magnet on side of the tube opposite the anode connector. A fourth type has a single-bar magnet, which is placed on the neck of the picture tube with the arrow located on the frame of the assembly pointed to the anode connector. In still another single-bar magnet type, the magnet is placed on the neck of the picture tube adjacent to the anode connector. The arrow appearing on the magnet support bracket must point to the anode connector. There is also a beam bender which has a bar and a ring magnet, placed on the neck of the picture tube with the ring magnet toward the face of the tube. The bar magnet must appear on the side of the tube opposite the anode connector.

On picture tubes using metal shells and having no anode connector, the location between pins 3 and 4 on the tube base may be used as the equivalent reference point.

Deflection Yoke Examination

Shadow might also be eliminated by examining the deflection yoke to make sure it is concentric with the neck of the tube and pushed as close to the bell of the picture tube as possible. Cardboard wedges should be inserted between the back of the deflection yoke and centering bar to prevent any tendency for the yoke to spring back away from the bell. It may be necessary to remove the rubber bumpers to

allow the yoke to move closer to the bell of the picture tube.

Center of Deflection Change

There is still another deflection-yoke position change that might be made. The center of deflection might be moved to decrease the possibility of the beam striking the sides of the tube neck. This modification can be made by replacing the 1¼-inch length core around the windings with a 1⅝-inch core, placing a spacer between the back of the core and fiber collar.

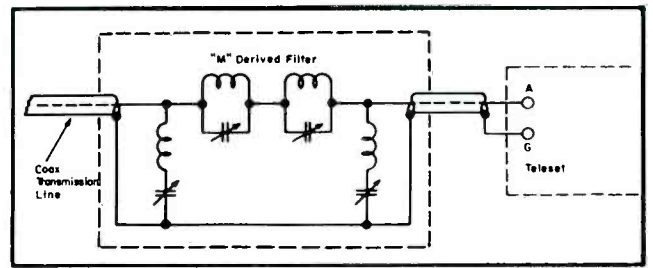
Focuser Assembly Test

The focuser assembly should be examined to see that it is concentric, and then should be adjusted to 90° with the axis of the tube neck.

If shadow appears in pair of upper or lower corners, it may be possible to correct this condition by introducing a small amount of current in the vertical deflection coil; a slight negative voltage can be applied across a 3300-ohm resistor, which is in series with the secondary winding of the vertical transformer in Philco chassis.

Cure for Shadow on Left

If shadow appears on the left-hand side of picture, the raster can be shifted to the left by removing the bottom end of the 6CD6 screen resistor from B+ and connecting it to the bottom end of the horizontal deflection coil, pin 3. (In later Philco models, this change has been incorporated.) Therefore, if the raster needs shifting to the right, the bottom end of the screen resistor should be removed from



Above

An M-derived band elimination filter which when properly adjusted will give adequate attenuation of the entire FM broadcast band, with minimum attenuation of the desired television signals. A band-elimination filter of this type, which is preferable to traps in weak-signal areas, is available from Du Mont distributors. The filter comes enclosed in a case for mounting on the back panel of the receiver.

pin 3 of the horizontal deflection yoke and tied directly to B+.

Sound-Video Detector Radiation Interference

In TV receivers, the detectors may cause internal interference, since they are non-linear devices, producing harmonics of the signal. This condition can exist in the video and sound detectors. Certain harmonics of the video and sound *if* fall in the *rf* bandpass of a particular channel. These harmonics radiate from the detectors and are picked up by the *rf* input circuit, amplified, and mixed with the incoming signal causing an interfering beat.

Field Expedient

Although every effort has been made to reduce the effect of this beat, the trouble still may occur. The best field expedient is to move the *if* of the receiver so that the harmonics of the *if* radiated from the detector fall outside the *rf* bandpass of the channel.

It is recommended that in non-intercarrier receivers both the sound and video *if* be shifted, using regular alignment equipment. However, if a moderately strong signal is available, only the sound *if* may be shifted, resulting in a new position for the video carrier. The amount the video carrier may be shifted depends mainly upon the signal strength.

Low-Signal Area Cure

In low signal areas, it is permissible to move the sound *if* as much as 500 kc-lower in frequency without changing the video *if* alignment. Moving the sound *if* higher in frequency requires realignment of the video *if*. In

Channel of Possible Interference		Harmonic	New SIF	New VIF
4	66- 72 mc (3X)	66.3 mc	21.9 mc	26.4 mc
7	174-180 mc (8X)	176.8 mc	21.7 mc	26.2 mc
11	198-204 mc (9X)	198.9 mc	22.0 mc	26.5 mc
5	76- 82 mc (3X)	79.8 mc	20. 8 mc	25. 3 mc
9	186-192 mc (7X)	186.2 mc	22.07 mc	26.57 mc
13	210-216 mc (8X)	212.8 mc	21.75 mc	26.25 mc

Table illustrating sound (upper portion of tabulation; channels 4, 7 and 11) and video *if* beats (lower portion of tabulation; channels 5, 9 and 13), the sound *if* beat being caused by a harmonic of 22.1 mc and the video *if* beat caused by a harmonic of 26.6 mc.

good signal areas, the video *if* should be realigned if the sound *if* is changed more than 15 kc.

The receiver's sound *if* may be shifted in the home using only the station signal and a voltmeter by connecting a 20,000 ohm-per-volt voltmeter to the FM test jack so the FM crossover may be observed. The station on which the beat occurs should be tuned in, the fine tuning adjusted for best sound, and then tuned until the beat disappears. The FM detector secondary should then be readjusted for zero voltage indication on the meter, and the FM detector primary and other FM transformer adjustments tuned for maximum output. The position of the fine tuning control should then be checked on each channel and recentered by adjusting the oscillator slugs, if necessary.

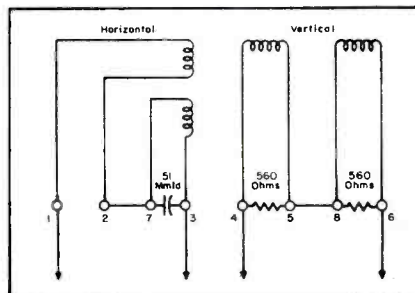
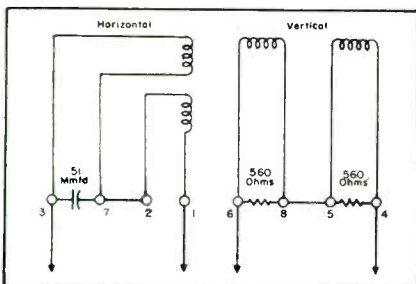
Vertical Roll

In extreme fringe areas some Admiral 21 series gated *agc* receivers have been found to suffer from vertical roll and picture wash-out with the contrast (picture) control turned to the full-on position.

Five Possible Causes of Trouble

There are five basic causes that may result in this condition in receivers using either the cascode or conventional tuners: Noise pulses in low signal areas; *if* regeneration; weak tubes; weak or defective IN64 germanium diodes; and low line voltage.

Below, left, and right: Circuitry of DuMont Y2A distributed winding deflection yokes. Below appears the schematic of yoke designed for use in transformer type circuits, while unit at right is for autotransformer systems.



Production Changes

To eliminate the first two causes, a production change has been made in all chassis stamped run 15 or higher. (Receivers containing these chassis are packed in cartons marked XXXF.)

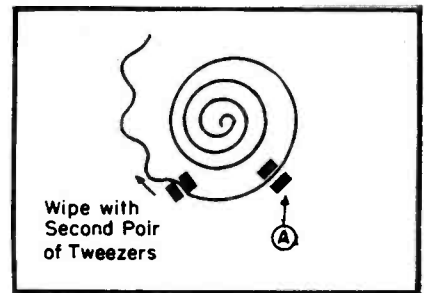
Vertical Roll Circuit Changes

To correct vertical roll and picture wash-out, the following circuit changes should be made: (a) Disconnect and remove R_{422} (15,000 ohms). (b) Connect a wire jumper across C_{419} (47 mfd) to remove it and R_{425} (12,000 ohms) from the circuit. (c) Disconnect the two leads from pin 6 of V_{305} (6AC7), solder the two leads together and insulate with tape. (d) Connect a 15,000-ohm, $\frac{1}{2}$ -watt resistor from pin 2 of V_{301} to pin 6 of V_{305} . (e) Connect a .005-mfd capacitor between pins 6 and 1 of the 6AC7. (f) Connect a 20-mfd, 450-volt, electrolytic between pin 6 of the 6AC7 and ground. (g) Locate junction of resistors R_{418} , R_{419} and R_{420} . Disconnect R_{419} (2,200 ohms) at this junction and connect it to pin 6 of the 6AC7. (h) Replace R_{418} (47,000 ohms) with a 33,000-ohm, 1-watt resistor. If chassis is used in a radio-phon-combination, a 33,000-ohm, 2 watt-resistor must be used. (i) Replace resistor R_{417} (18,000 ohms, $\frac{1}{2}$ watt) with a 1 watt, 18,000-ohm unit. (j) Connect a .005-mfd capacitor between pin 3 of V_{302} and ground. (k) Connect a $3\frac{1}{4}$ " length of $\frac{1}{4}$ " shield braid insulated with 2" length of $\frac{1}{4}$ " sleeving between front and rear of underside of *if* strip. (l) On top side of chassis, spot solder *if* strip to chassis.

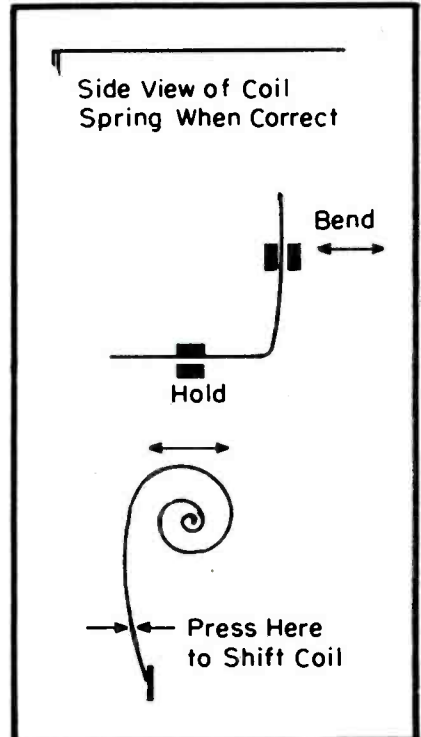
Tube Check Procedure

The following tubes should be carefully checked in Admiral chassis by replacement if sync troubles are

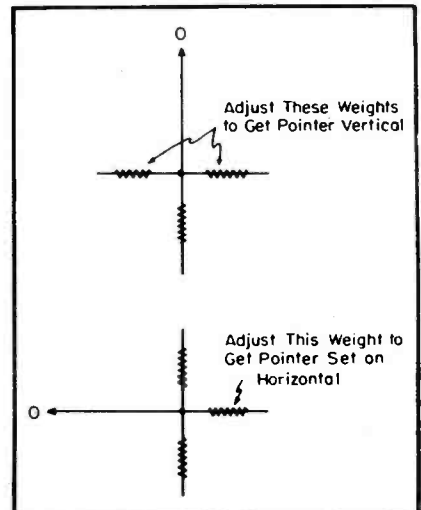
(Continued on page 62)



Above and below: Methods which can be used to straighten hair springs in moving-coil D'Arsonval type *dc* meter. Coil should be held tight with one pair of tweezers and wiped with second. Coils of hair spring should be a smooth helix on a flat plane; each portion of coil should be on level with its fellow and the spiral should develop smoothly. (Max Alth)



Below: There are a variety of counter balances in use in meters. Some are but drops of solder, some tiny nut and bolt affairs, and some springs that can be moved when they are compressed. If springs are used the two side weights must be adjusted so that the needle is vertical. On the single counter weight models the single weight can be moved from side to side for correction. If you have balanced it properly, the meter should hold its zero position. Slight deviations are permissible. The percentage depends upon the original quality of the meter. (Max Alth)



New 1952 HEATHKITS

Heathkit
TELEVISION
GEN. KIT \$39.50

Heathkit
ELECTRONIC
SWITCH KIT \$19.50

Heathkit
AUDIO GEN.
KIT \$34.50

Heathkit
CONDENSER
CHECKER KIT \$19.50

Heathkit
R. F. SIGNAL
GEN. KIT \$19.50

Heathkit
A.C. VOLTMETER
KIT \$29.50

Heathkit
SQUARE WAVE
GEN. KIT \$29.50

Heathkit
INTERMODULATION
ANALYZER \$39.50

Heathkit
AUDIO FREQ.
METER KIT \$34.50

Heathkit 5" OSCILLOSCOPE KIT

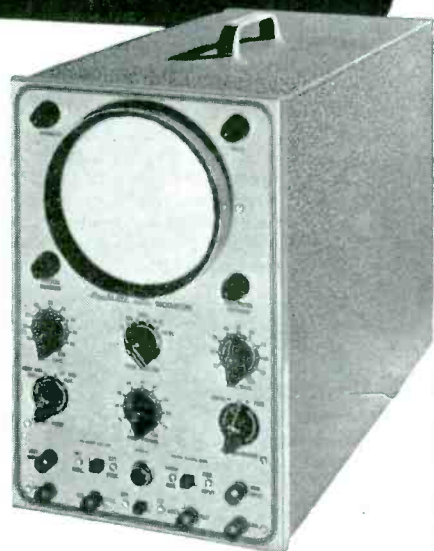
- New "spot shape" control for spot adjustment — to give really sharp focusing.
- A total of ten tubes including CR tube and five miniatures.
- Cascaded vertical amplifiers followed by phase splitter and balanced push-pull deflection amplifiers.
- Greatly reduced retrace time.
- Step attenuated — frequency compensated — cathode follower vertical input.
- Low impedance vertical gain control for minimum distortion.
- New mounting of phase splitter and deflection amplifier tubes near CR tube base.
- Greatly simplified wiring layout.
- Increased frequency response — useful to 5 MC.
- Tremendous sensitivity .03 RMS per inch Vertical .6V RMS per inch Hor.
- Dual control in vernier sweep frequency circuit — smoother acting.
- Positive or negative peck internal synchronization.
- Multivibrator type Wide Range Sweep Generator.

A brand new 1952 Heathkit Oscilloscope Kit with a multitude of outstanding features and really excellent performance. A scope you'll truly like and certainly want to own.

The kit is complete with all parts including all tubes, power transformer, punched and formed chassis, etc. Detailed instruction manual makes assembly simple and clear — contains step-by-step instructions, pictorials, diagrams, schematic, circuit description and uses of scope. A truly outstanding value.

MODEL 0-7
SHIPPING WT. 24 LBS.

\$43.50



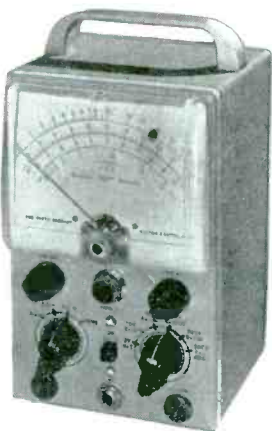
Heathkit VACUUM TUBE VOLTMETER KIT

- New styling — formd case for beauty.
- New truly compact size — Cabinet 4 1/8" deep x 4-1/16" wide x 7 3/8" high.
- Quality Simpson 200 microamp meter.
- New ohms battery holding clamp and spring clip — assurance of good electrical contact.
- Highest quality precision resistors in multiplier circuit.
- Calibrates on both AC and DC for maximum accuracy.
- Terrific coverage — Reads from 1/2V to 1000V AC, 1/2V to 1000V DC, and .1 to over 1 billion ohms resistance.
- Large, clearly marked meter scales indicate ohms, AC Volts, DC Volts, and DB — has zero set mark for FM alignment.
- New styling presents attractive and professional appearance.

The 1952 Model Heathkit Vacuum Tube Voltmeter! Newly designed cabinet combines style and beauty with compactness. Greatly reduced size to occupy a minimum of space on your work-bench. Covers a tremendous range of measurements and is easy to use. Uses only quality components including 1% precision resistors in multiplier circuit for greatest accuracy. Simpson 200 microamp meter with easy to read scales for fast and sure readings.

All parts come right with kit, and complete instruction manual makes assembly a cinch.

MODEL V-5
SHIPPING WT. 5 LBS.



\$24.50

YOU SAVE BY ORDERING DIRECT FROM MANUFACTURER

EXPORT AGENT
ROCKE INTERNATIONAL CORP.
13 E. 40th ST.
NEW YORK CITY (10)

The **HEATH COMPANY**

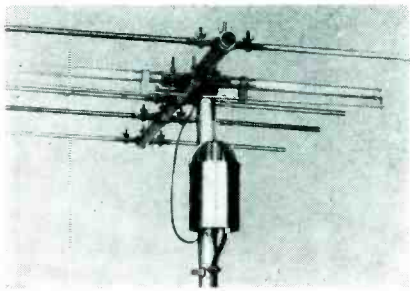
... BENTON HARBOR 11, MICHIGAN

New TV Parts...Accessories

VEE-D-X MAST MOUNTED BOOSTER

A mast-mounted, single-channel booster, *Vee-D-X Rocket, model RB*, has been developed by The LaPointe-Plascomold Corp., Windsor Locks, Conn. Featured are heat dissipation; compensating adjustments for voltage loss in transmission line regardless of line length; and amplification of signal before line noise pickup.

Power is supplied from a separate power pack on the back of the set which is automatically turned on and off by the TV receiver. Included in the *rf* assembly is a 6J6 push-pull cross neutralized amplifier that is said to provide 18 db gain with a 5-mc bandwidth.



* * *

PLAX POLYSTYRENE RODS

Plax polystyrene rods and tubings, in 12" lengths are now available from Julius Blum and Co., 532-540 West 22nd St., New York, N. Y. Each size is packed in its individual carton. A complete stock of 17 sizes of rod and tubing occupies a shelf space of 6" high by 18" long by 12" deep.

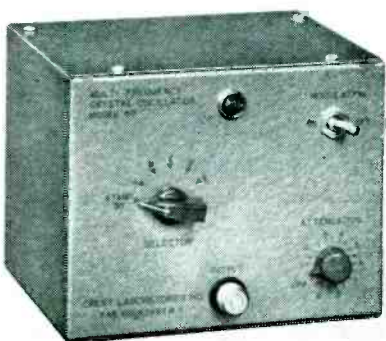
Diameter of the polystyrene rod ranges from 1/8" to 1" while diameter of the tubing ranges from 1/4" (outside) and 1/8" (inside) to 1" (outside) and 7/8" (inside).

* * *

CREST MULTI-FREQUENCY CRYSTAL OSCILLATOR

An oscillator, *model 50*, that is a multi-frequency high-output signal generator, has been announced by Crest Laboratories, Whitehall Building, Far Rockaway, L. I., N. Y.

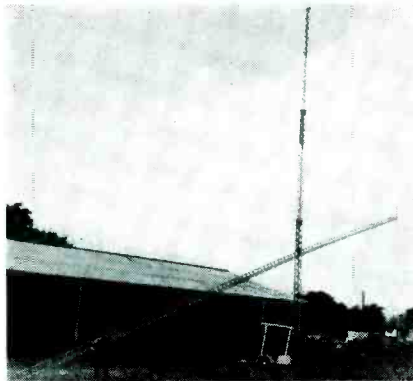
Unit is said to provide multiple outputs for spot frequency alignment of television receivers. Available in a range of 4.5 to 50 mc.



ALPRODCO TELESCOPING ALUMINUM TV TOWER RIG

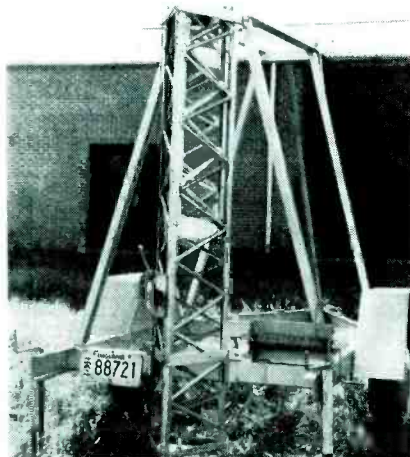
A telescoping aluminum TV tower, mounted on a two wheel trailer, that is said can be raised to 72' in 15 seconds, has been announced by Alprodcoc, Inc., Kempton, Indiana, and Mineral Wells, Texas. Unit consists of three 24' lengths of aluminum towers that telescope together, all mounted on a framework that is fastened to a two wheel trailer. Trailer is equipped with jacks which are used to level and steady it while it is being used.

Tower rig can be used for demonstrating TV receivers right in a prospect's home. Equipped with a 12' mast, it can be used for testing signal strength when antenna is raised up to 78'. It is claimed that two men can erect a tower of any size up to 120'.



Above: Raising a 100' Alprodcoc permanent aluminum TV tower into position.

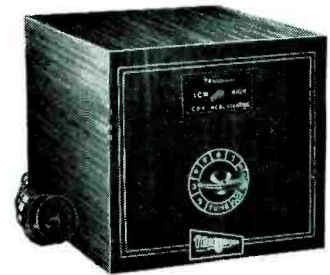
Below: Closeup of rig with the tower in an upright position. The trailer has three jacks used to level and steady the rig. The windlass on the left side of the tower is used to raise or lower the telescoping towers. The windlass fastened to the right side of the trailer frame is used to raise the permanent tower into position. All cables furnished are airplane cables.



TRANSVISION PICTURE-TUBE REACTIVATOR

A picture-tube reactivator, which it is said can be used without removing the picture tube from the TV set, has been produced by Transvision, Inc., Dept. DG, New Rochelle, N. Y. Reactivator is claimed to give a full reactivation with a short-aging cycle.

Describing the operation of the unit, Transvision noted that in tube degeneration gases are released by tube elements and casing walls after prolonged heated operation. These gases combine with the pure barium on the surface of the cathode, poisoning the cathode so that electrons are no longer emitted from the surface. Normally, this surface is replaced by a new coating of barium being formed. The speed at which this new coating is formed is dependent upon the temperature at which the cathode surface operates and the amount of cathode current being drawn. Increasing the temperature and the cathode current speeds up the process.

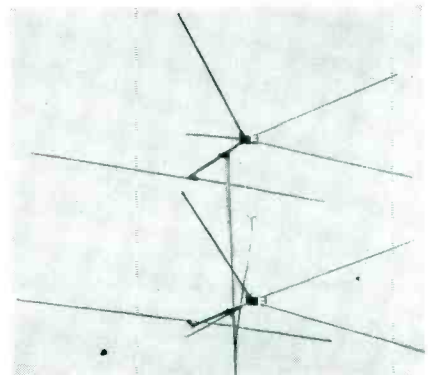


* * *

BRACH ANTENNAS

An antenna, *model TA-462 Air Special*, and a stacked model, *TA-466*, have been introduced by the Brach Manufacturing Corp., 200 Central Ave., Newark, N. J.

Unit is 4-bar antenna with a single reflector. Has length and forward tilt of the antenna elements designed to provide maximum forward gain with a single bar reflector. Reflector element is adjustable for peaking on channels 2 to 6.



[Additional TV product news on page 78 and 84.]

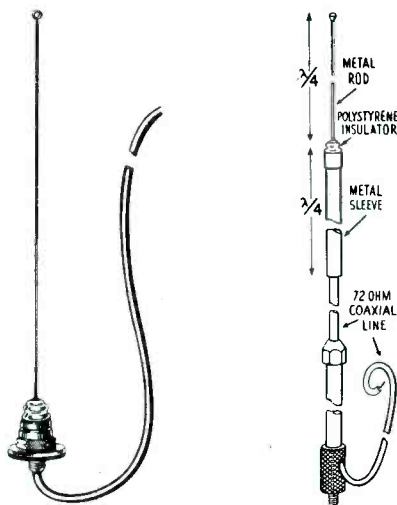
Parts . . . Instruments . . . Tools

MASTER MOBILE AUTO ANTENNAS

A rooftop, 113, and a coax *vhf* antenna, 114, have been announced by Master Mobile Mounts, Inc., P. O. Box 1817, Los Angeles, 36, Calif.

Rooftop antenna is a quarter-wave design operating in the *vhf* range from 140-165 mc. Requires a single 7/16" hole cut in the car roof for mounting. Antenna is of stainless steel wire, has a threaded fitting and is supplied with a 10' length of coax cable.

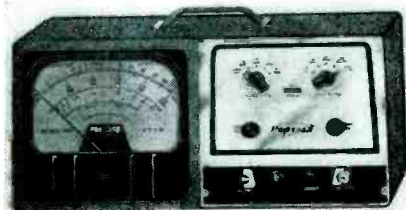
Coax *vhf* antenna is a sleeve type for open vehicles, using 140-165 mc range. Unit is supplied with an 18' adjustable section, and is said to provide an impedance match for a 72-ohm coax transmission line. Furnished with 10' of coax.



PRECISE VTVM

A vacuum-tube-voltmeter, 907, with a 7½-inch meter, which can be built horizontally or vertically, in kit or factory-wired form, has been announced by Precise Development Corp., Oceanside, N. Y.

Unit has a + *dc*, - *dc* and *ac* ranges of 0.5-25-250-500-1000; ohms range of R x 1, R x 10, R x 1000, R x 10,000 and R x 1,000,000 (from .01 to 1 ohm to 1 billion ohms); db from -20 to +55; and a frequency range of over 250 mc, with top voltage of over 30,000 volts. *DC* accuracy is said to be 2 per cent or better.

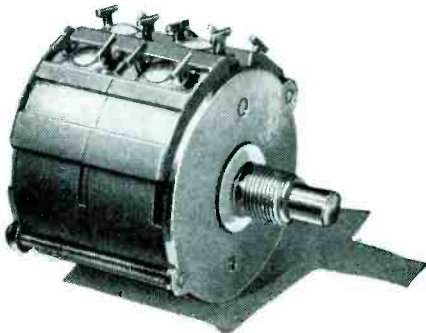


CLAROSTAT MULTIPLE CONTROLS

A potentiometer, 424, that is said to provide simultaneous control of from 2 to 20 circuits or functions in tandem assemblies, has been introduced by Clarostat Manufacturing Co., Inc., Dover, N. H.

Potentiometer is encased in a mineral-filled bakelite housing designed to lock together with similar units to form a single tandem assembly that is held together by metal end-plates and threaded tie rods. Contact arm of each unit can be adjusted on the common shaft that slips through all the tandem sections, to synchronize with reference to the common shaft or with the contact arms of other units. Mechanical rotation may be continuous or limited. Electrical rotation is 345° and it is claimed that it can be adjusted to within ±1°.

Resistance range of each potentiometer is 100 to 100,000 ohms for linear windings. Tapered windings are also available. Linear controls are rated at 3 watts, while tapered controls depend on the nature of their taper. Standard overall resistance tolerance is said to be ±5%. Ratio of voltage at any point on the potentiometer to total impressed voltage can be within 0.5% of the theoretically correct value.



ELECTRONIC DEVICES MOLDED-IN SELENIUM RECTIFIERS

A line (*Plastisel*) of miniature electronic selenium rectifiers, molded-in similar to small tubular capacitors, with ratings up to 200 *ma dc* output has been announced by Electronic Devices, Inc., Precision Rectifier Division, 429 12th St., Brooklyn, N. Y. The outer case is spiral-wound phenolic tubing filled with wax which is said to be rock hard at 100°C. Rectifiers are manufactured with bare or insulated tin-copper leads.

In ratings from 250 to 500 *ma dc* the standard open plate construction is used.

MASTER MOBILE HAM BAND ANTENNA

An all-band mobile antenna that is center loaded has been introduced by Master Mobile Mounts, Inc.

Coils are interchangeable to any band, 80 through 10 meters. Antenna may be operated on ten meters by shorting out the coil in use.

Overall length is 8' 10", and will fit mounts with 3/8" SAE threading.

LAMKIN FM MODULATION METER

An FM modulation meter, 205, that measures the maximum deviation, due to modulation, of fixed and mobile FM transmitters, has been developed by Lampkin Laboratories, Inc., Bradenton, Florida. Unit is tunable to transmitter frequencies of from 30 to 200 mc.

Instrument includes a mixer, limiter, discriminator and peak-reading *vtvm*. Mixer incorporates a ratio-coupled oscillator, a variable-frequency oscillator with a crystal; the input is untuned and the *if* is 2.5 mc. Discriminator is linear within 1 per cent over a band 150-kc wide.

Zero drift and change in sensitivity of the *vtvm* are said to be less than 2 per cent, for line-voltage changes of 115 ± 15 *v*; the *af* response flat within 2 db from 50 to 10,000 cps.



G-C TUBE-PIN STRAIGHTENER

A tube-pin straightener, 8655, for both the miniature and jumbo miniature of the 7- and 9-pin types, has been introduced by the General Cement Manufacturing Co., Rockford, Ill. Tubes are inserted into proper receptable, a steel die aligning and straightening the pins.

LITTELFUSE TV FUSE RELACEMENT KIT

A plastic box, *One Call TV Kit*, containing nine TV fuses and six TV *snap-on fuse holders* for replacing pigtailed, has been announced by Littelfuse Inc., 4757 N. Ravenswood, Chicago, Ill.

Kit provides 45 fuses, packed in metal dispensers of 5 each that have sliding tops which release one fuse at a time. A fuse size chart appears on the back of each box. Plastic kit is 2½" x 4½"



Know "WHY" Ceramic Capacitors . . .

Here are the facts about Ceramic Capacitors — why they are the most permanent capacitors . . . why they do a better job . . . give a better performance . . .

Up until a few years ago, capacitor design was based on one idea — "the bigger the better." Paper and mica, etc., were cheap, readily available materials, and their use was the only known art for making commercial capacitors (or "condensers" as they used to be called).

Now don't misunderstand us . . . those old condensers were really OK as far as they went. *But today there's something more to talk about . . . CERAMIC CAPACITORS.*

Actually, the idea of ceramic capacitors isn't new. They've been used as electronic components for more than 20 years. We call them new because it's only in the last few years that service-engineers have paid any attention to them . . . and because some of these modern ceramic capacitors really are new . . . with *new* higher voltages, *new* and better physical characteristics. So if ceramic capacitors were overlooked by service-engineers during the last few years . . . we feel it's because you didn't know about just how *good* they really are—or because what you needed wasn't available.

Let's take a look at modern ceramic capacitors and the story behind them. It was in the early 1900's when German scientists discovered the dielectric properties of ceramic materials. In the U.S.A., we had an abundant supply of mica and other materials, so U.S. research men never bothered with ceramics. Then came World War I, and ceramics became mighty important in European radio manufacture. Ceramics were a long way from perfected but they did the job . . . and continual improvement made them increasingly important in the electronic field. Meanwhile, at Centralab, we had started to investigate these new materials. It was soon found that U.S.A. had a bigger source of raw ceramic materials and that our stocks were of vastly superior physical and electrical characteristics.

Then one of our foreign representatives supplied us with a complete set of foreign-made ceramic components. Result — Centralab developed a ceramic research program. The program was big and thorough . . . and it's still going on.

In a few years, Centralab put on the market its first ceramic capacitors. With World War II, came tremendous developments in electronics. Radio, radar and other electronic equipment demanded the finest in component parts . . . and ceramic capacitors came into their own. *In fact, independent research has shown that during World War II, in some classes of military equipment, there was not a single known instance of a failure of a ceramic capacitor!*

Thus, through the lessons learned over a period of 20 years of intensive research — Centralab Ceramic Capacitors have today become the best capacitor buy for safe guaranteed servicing. For when you use CRL ceramic capacitors, you're using the benefits of hundreds of thousands of man-hours of research—experiments with over 20,000 different ceramic compounds!

That's why any ceramic isn't the best ceramic for the job. Each of those 20,000 ceramic mixes had definite physical and electrical characteristics . . . and when we say that Centralab today uses only 250 of those 20,000 tested compounds, you can be sure that those discarded did not perform to the exacting requirements of sensitive electronic circuits.

Yes, and if you compare the old-style paper and mica capacitors with modern ceramic capacitors . . . point for point, based on your own technical experience, you'll see why ceramics are vastly better . . . the safe, dependable way to assure a good service job.

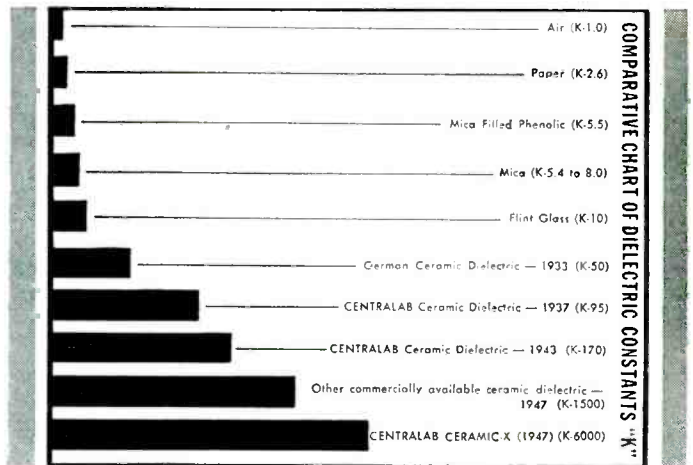
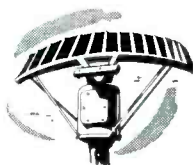
For example, every serviceman is aware of the moisture absorbing quality of paper condensers . . . and how moisture can seep in along the leads on mica units. Compare these old designs with modern ceramic tubular and disc types . . . Centralab's Ceramic-X capacitor bodies are nonhygroscopic . . . moisture absorption being only .007% or less! That fact alone means Centralab Capacitors give you and your service customer the ultimate in reliability—even under severe tropically humid conditions.

Old-timers in the service field . . . yes, and young ones, too, will recall the bulky size . . . the difficulty of handling old-fashioned large size capacitors . . . when size seemed to be an important factor in design. Now, look at modern ceramic capacitors. They're less than 1/2 the size . . . you can fit them anywhere!

When you look at this chart of the development of capacitors using various materials . . . the tremendous improvement of the dielectric con-

stant "K" with the entry of ceramics into the field is dramatically evident.

One of the most serious problems with old-time capacitors was that they broke down under high temperatures. Here again, ceramics have more than proven their superiority. 85° C. will not harm the modern ceramic capacitor. In fact, the ceramic body itself can easily withstand any temperature encountered in electrical apparatus. High capacity is



well maintained under wide temperature variation. What's more, the copper-silver electrodes are electro-bonded to the ceramic with a tensile strength of 30,000 lbs. per square inch — thus preventing any possible change of the relative position of the electrodes.

A typical example of the high degree of perfection and performance offered by ceramic capacitors is contained in CRL Hi-Vo-Kaps. These units are rated at 10 — 20 and 30 KV and are intended exclusively for TV. You'll find that practically the entire TV industry has standardized on these CRL units as original equipment for this most exacting application.

When it comes to low power factors—check ceramics against all others. With ceramics, initially it's .1% to .6%. After 100 hours at 95% humidity, it's .5% to .3% and they'll return to normal! That's ceramic high efficiency! If it's accuracy you want, ceramic capacitors can give you unusually close tolerances in wide range of values.

In r.f. circuits, where drift is critical, one of the likely causes is temperature change. Stabilization can be effected by capacitors which compensate for temperature variations. Centralab pioneered ceramic capacitors for this purpose. This important research resulted in Centralab's famous TC-Hi-Kaps Zero Temperature and Negative Temperature Compensating units. These are a Centralab exclusive "First". For service-engineers they are the industry's last word in accurate stabilizing capacitors.

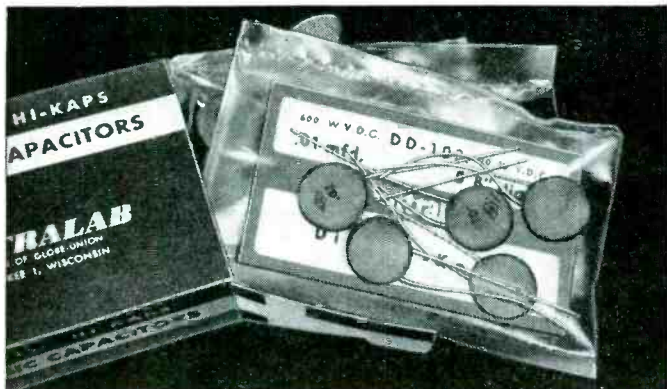
Service-engineers today are called upon for more exacting work — more downright customer satisfaction. Every job that comes into your shop is a challenge to your reputation. Regardless of the care in workmanship, no service job is better than the components you put into it. To stay in business tomorrow — you can't take chances today.

Field research shows that smart service-engineers everywhere are replacing all old-fashioned or dangerously old capacitors with ceramic capacitors, within the capacity ranges available. Particularly if there is any indication of possible failure within a reasonably short period. For by-pass and coupling applications . . . they're using Centralab BC Hi-Kaps. For tuning applications, they're using temperature compensating TC Hi-Kaps. It's their own assurance of a good job well done . . . and their customer's insurance of complete satisfaction. What's more, to the serviceman and customer alike . . . *there's little or no premium in price.*

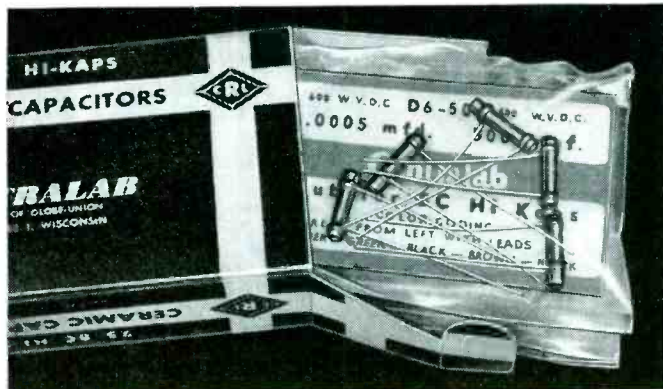
You'll find Centralab ceramic capacitors are available in a wide variety of capacities from any recognized better radio parts distributor. Ask him. And remember, Centralab is the pioneer in the field of electronic ceramics. That fact alone is your best assurance of engineering know-how, production know-how, and performance know-how that permits no compromise with quality.

and you'll Buy Ceramic Capacitors

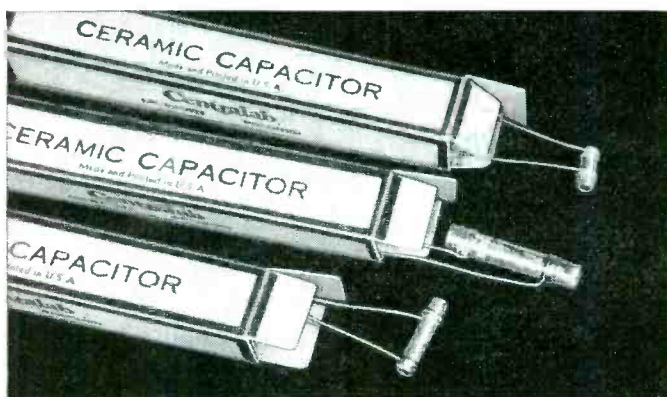
Choose the exact capacitors you need from the world's widest line of ceramic capacitors — for jobs that demand the best in guaranteed TV-AM-FM servicing . . .



CERAMIC DISC HI-KAP CAPACITORS — provide very high capacity in extremely small size, with minimum thickness. For by-pass, coupling and general applications. Superior power factor and low inductance.



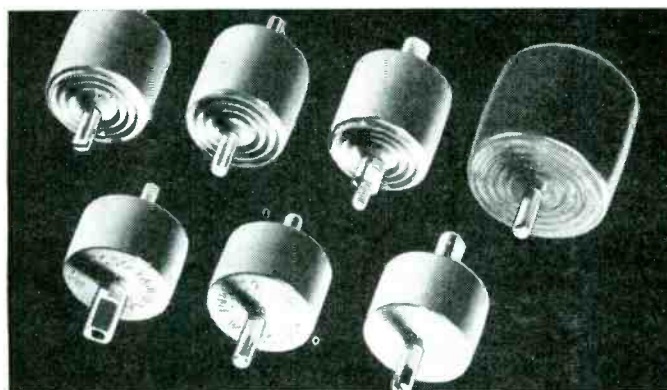
CERAMIC BC TUBULAR HI-KAP CAPACITORS — for by-pass or coupling applications and most general circuit work. Smallest size on the market. Remarkable stability under high temperatures or humidity.



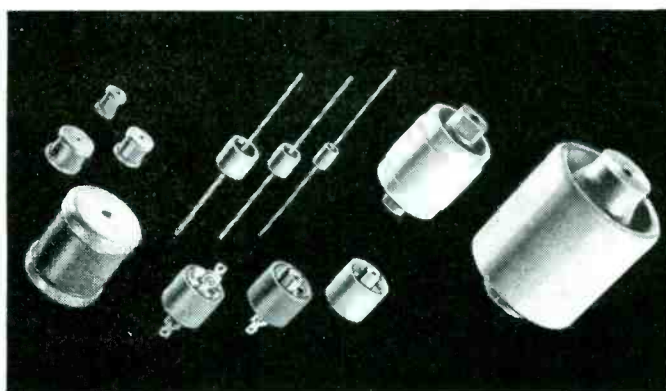
TC TEMPERATURE COMPENSATING CERAMIC CAPACITORS — stable units that do not change in capacity under wide temperature variations—or may be selected to correct for frequency drift in resonant circuits caused by temperature changes. Also superior replacement for close tolerance micas.



CAPACITOR KITS — several are available. Illustrated is assortment of 200 units of most generally used values, supplied in a four-drawer metal cabinet. Often assures required values will be on hand when needed in labs or for service. No charge for cabinet.



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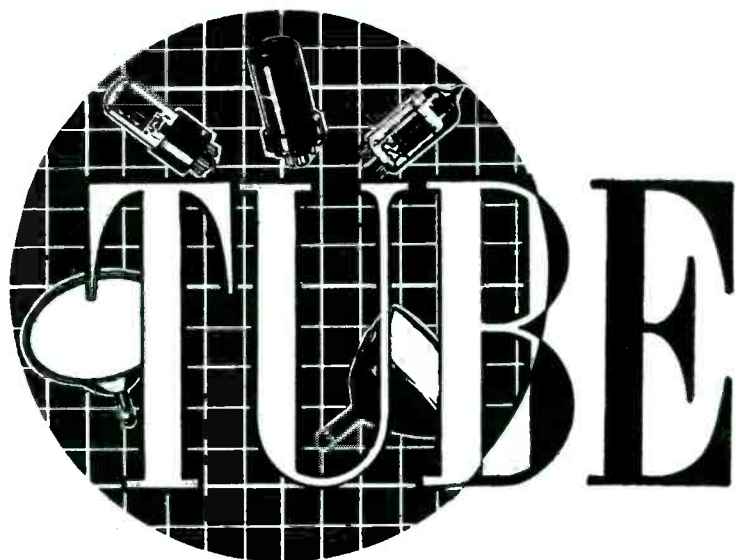
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SERVICE, NOVEMBER, 1951 • 49



News

by L. M. ALLEN

Design and Application Features of Damper Diodes for Transformerless Receivers and for Direct-Drive Deflection Circuits . . . Miniature Triode-Pentodes . . . 17-Inch Metal-Shell Picture Tubes with Low-Voltage Electrostatic Focus

TV RECEIVERS, which in the early days featured up to 30 tubes and more, and currently seldom have more than 23, have not suffered from the reduced lineup as many have believed, but instead have offered improved results. The development of tubes with unique

characteristics has contributed substantially to this striking evolution.

Damper Diode

Available now, for instance, for horizontal-frequency damper service is an indirectly-heated damper-diode* which has a ceramic sleeve of aluminum oxide, fired to extreme hardness, completely isolating the cathode

from the heater wire, affording maximum heat transfer with full insulation protection. This design has been found to eliminate the need for an external damper tube transformer. Specifically, the heater-to-cathode insulation rating has been boosted from 2000 to 4000 (pulse rating) and 450 to 900 volts (*dc* rating).

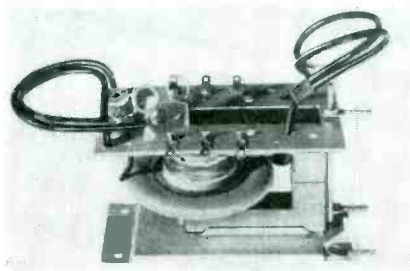
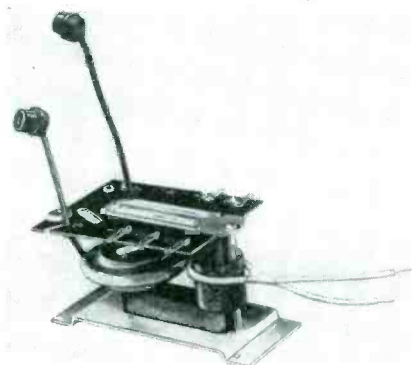
Also designed for the new type chassis are miniature triode-pentodes**

Replacement and conversion TV autotransformer, X054, for picture-tubes up to 21-inch rectangular, introduced by Ram Electronics Sales Co., 7 South Buckhout St., Irvington-on-Hudson, N. Y. In sets using selenium-rectifier voltage-doubler circuits with 250-volts B+ supply, the autotransformer is said to produce 13.5 kv with a boost voltage of 430 volts; and with standard power supplies, 15 kv with a boost voltage of 500. Unit has been designed for use with Y70F30, a 30 millihenry ferrite cosine yoke.

*Tung-Sol 6AX4GT. **Tung-Sol 6U8.

A 77J-1 type of flyback (HVO-7) that, it is said, can be mounted above and below the chassis horizontally or vertically or on the side wall of the hi-voltage cage within the TV set, developed by the Merit Coil and Transformer Corp., 4427 North Clark St., Chicago, Ill. Unit is identical to the Merit HVO-6.

A conversion TV kit, 1000, which contains a 77J-1 type of flyback (HVO-7); a width-linearity coil (MWC-1) with *agc* winding which matches the HVO-7, and one cosine wound deflection yoke (MDF-70) for edge-to-edge picture focus, introduced by the Merit Transformer Corp., 4427 North Clark St., Chicago, Ill. Included with the kit are a technical data sheet on the components, and a conversion procedure bulletin.



which can be used as a local oscillator mixer.

Circuit Flexibility Provision

The tube has two electrically independent sections, a triode and a pentode; each section is shielded, and both are said to be capable of good performance at the higher frequencies.

Because the two sections are independent, flexibility of circuit design is available, especially in TV tuner oscillator use. At low voltages, the triode portion of the tube is said to have sufficient reserve emission to operate under widely varying supply voltage conditions.

Pentode Gain

The pentode provides effective gain with low local-oscillator voltage injection, resulting in low oscillator radiation from TV receivers. Use of the pentode section as the mixer permits a high (40 mc) *if*, now being used in many chassis in an effort to reduce interference and increase stability.

The construction and characteristics of the 6U8 have provided designers with a desirable flexibility for combining circuit functions. For instance, the pentode section of the tube can be used as an *if* amplifier, video amplifier, sound limiter or synchronizing separator. The triode performs satisfactorily as a horizontal or vertical oscillator, or sync clipper.

17-Inch Low-Focus-Voltage Picture Tube

Picture-tubes with advanced features have also played quite a role in improving set performance. To illustrate, there has been developed a 17-inch, metal-shell picture tube² utilizing low-voltage electrostatic focus, a feature which not only eliminates the need for a focusing coil or magnet, but makes it possible to obtain the focusing-electrode voltage from a low-voltage *dc* supply of the receiver.

Focusing Electrode

The focusing electrode in the tube has its own base-pin terminal to permit choice of focusing voltage for best results. The focusing-voltage range within which a picture tube gives optimum focus will change with different combinations of *ultor* and grid-No. 2 voltages. Adjustment for this change

is made possible by the separate focusing-electrode terminal.

Focusing Voltage

Because the focusing electrode operates at low voltages, the focusing voltage can conveniently be obtained from a fixed or adjustable tap on the low-voltage *dc* supply of the receiver. With either method, focus can be maintained automatically with variation in line voltage and with adjustment of picture brightness.

Fixed Focus

When fixed focus is used, the focusing voltage can be set at a value which will give good results for the particular operating voltages. If somewhat better performance is desired, adjustment of the focusing voltage will be required.

Grid 2 Connection

Using a design in which the cathode is not connected to any other electrode, the tube is said to retain the advantage of low input capacitance when employed in a cathode-drive circuit. Also, since the focusing electrode is not connected internally to grid No. 2, the tube permits a reduction in focusing voltage as grid-No. 2 voltage is raised, a necessary relationship for optimum focus.

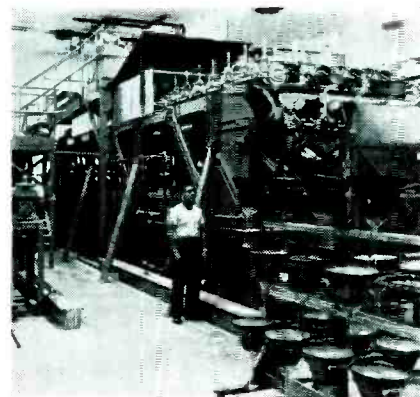
The Ultor Function Grid

In this tube, grid No. 5 which has the *ultor* function, grid No. 3, and collector are connected together within the tube and are conveniently referred to collectively as *ultor*. The *ultor* represents the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest *dc* voltage for accelerating the electrons in the beam prior to its deflection.

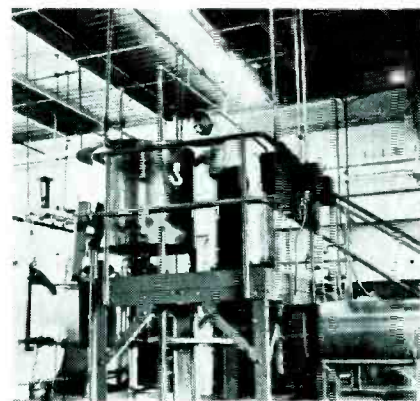
Correct Ultor Voltage

Brilliance and definition decrease with decreasing *ultor* voltage. In general, the *ultor* voltage must not be less than 12000 volts.

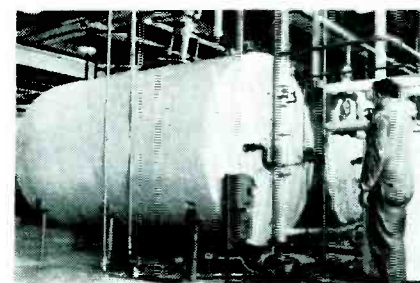
Right: Research and development picture tube laboratory at G.E.'s Electronics Park, Syracuse.



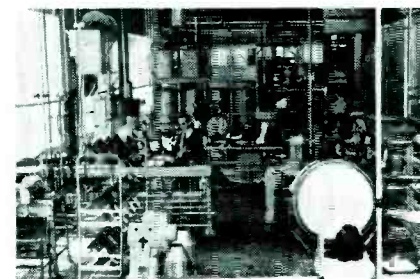
TV picture-tube production at G.E. This view illustrates screening-solution processing. After the screening solution is mixed, it is poured into the neck of the picture tubes on the platform, shown in the background. The screening solution then settles and the excess water is poured off as the TV bulbs go over the drum at the end of the screening conveyor, shown in foreground.



Examining one of the stainless steel tanks used to mix ingredients for the screening solution. From here the ingredients are piped down to the screening room where they are mixed with phosphor powder and de-ionized water to form the screening solution.



From the filter, the water is piped to the insulated stainless-steel storage tanks, shown above, and subsequently used in the screening process.



ASSOCIATIONS



NETSDA

REPRESENTATIVES from all association chapter members of the National Electronic Technicians and Service Dealers Associations met at Toots Shor's Restaurant in New York City recently to review industry problems. In addition to the chapter members, there were large delegations from West Chester, Rochester, and Buffalo, New York, and from Fall River, and Boston, Mass.

The RTMA Service Committee's report was presented during the meeting. It was noted that the promises made in the report would not solve the present problems.

A committee was appointed to publicize and supply information to all other servicing associations and persons interested in obtaining information on the New York City and Pennsylvania licensing bills.

The body approved a resolution declaring that . . . "NETSDA representatives will not attend any future meetings called by the industry unless duly authorized representatives only of national or state groups are in attendance."

RTSA, Pittsburgh

AT A RECENT MEETING of the Radio and Television Servicemen's Association of Pittsburgh, Inc., George Sharpe, president, who attended as a delegate to the state federation meeting, reported on the 50-point program presented to the Joint Electronic Radio Committee on Service and on the revised State licensing bill. The 50-point plan was approved as an association goal and the revised licensing bill received an almost unanimous vote of approval, too.

PR SMA

THE MEMBERSHIP COMMITTEE of the Philadelphia Radio Service Men's Association, is now headed by Leonard Carr and assisted by Hugh McCormack, who have sparked a membership drive.

TEN YEARS AGO

From the Association News Page of SERVICE, Nov.-Dec., 1941

TWO MEMBERS of the Chicago chapter of the Radio Servicemen of America, demonstrated the use of the Chanalyst, using receivers with actual, not manufactured, troubles. Many sets were brought in by members of the chapter for the clinical diagnosis. An improved chapter service form was presented for adoption. Revisions, based on several years of use in the field, were said to make the form even more valuable in the selling and billing of *corrective services*. . . . Earl Drollinger of the Danville chapter of RSA offered a talk on *Servicing Radios with a VTVM*. An interesting demonstration was also offered. . . . Norman N. Neeley, Frank Koessler and Tom Bissett appeared at a meeting of the Radio Technicians' Association in Los Angeles.

FRSAP

THE FEDERATION OF RADIO Servicemen of Penna. has completed its speaker schedule for '51 and has begun to prepare the '52 January to June schedule. In November Raytheon, in a joint meeting, will feature Mr. Gill, chief field service engineer. John Rider will also appear as a guest speaker during the month.

ASRE, Penna.

THE REGULAR RADIO and TV school of the Blair County Association of Radio Service Engineers has been resumed, with Mr. Brubaker as instructor. Through the cooperation of the state group and distributors, several manufacturers' meetings have been conducted in Altoona and were well attended. RCA and TACO conducted the open meetings.

LRST, Penna.

NEW OFFICERS of the Lackawanna Radio Service Technicians Association have been installed. The officers are: president, James Jerome, Olyphant; vice president, Raymond Rogers, Peckville; secretary, Howard Greene, Scranton; treasurer, Henry Goven, Olyphant. Directors: Leon Helk, Carbondale; Merrill Greene, Scranton, and Fay Maynard, Scranton. Merrill Greene, Scranton, is the retiring president. The officers were installed by Helk, also a past president. The following committee chairmen were named: Public relations, Helk; complaint, Merrill Greene; membership, Joseph Kuzmac; ways and means, Maynard, William Slavinskis, Scranton, was named chairman of arrangements for the state meeting at which the local association will be host.

MSRSA, Penna.

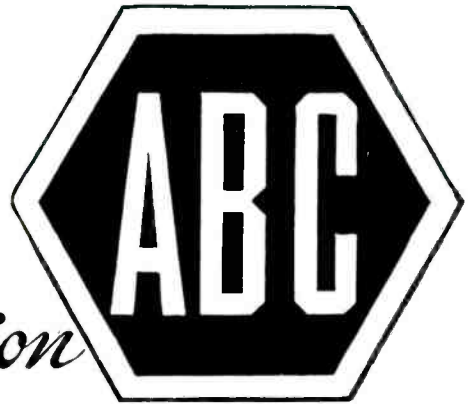
DURING A meeting of the Mid-State Radio Servicemen's Association of Penna., sponsored by local distributor D and H of Harrisburg, A. G. Petrasek, of RCA, spoke on problems in TV servicing. He used a live chassis for all demonstrations with the latest RCA test equipment. Now available, for a small charge to members is a keystone emblem which can be used to stamp receipted bills.

ESFETA

AT A QUARTERLY meeting of the Empire State Federation of Electronic Technicians Associations, during which twenty delegates from nine chapters appeared, discussions covered educational programs, membership drives, and the RTMA report. It was announced that programs to help local chapters build membership would be promoted.

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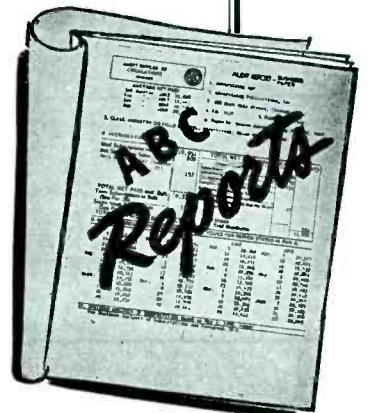
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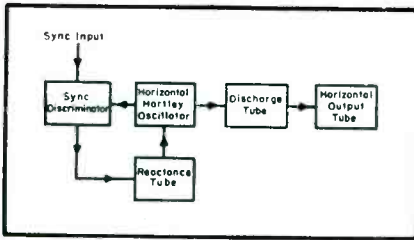


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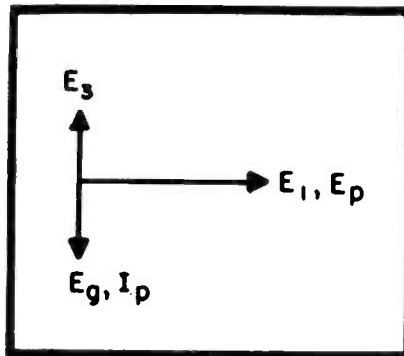
A. B. C. REPORTS — FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE

SERVICE, NOVEMBER, 1951 • 53

Servicing AFC

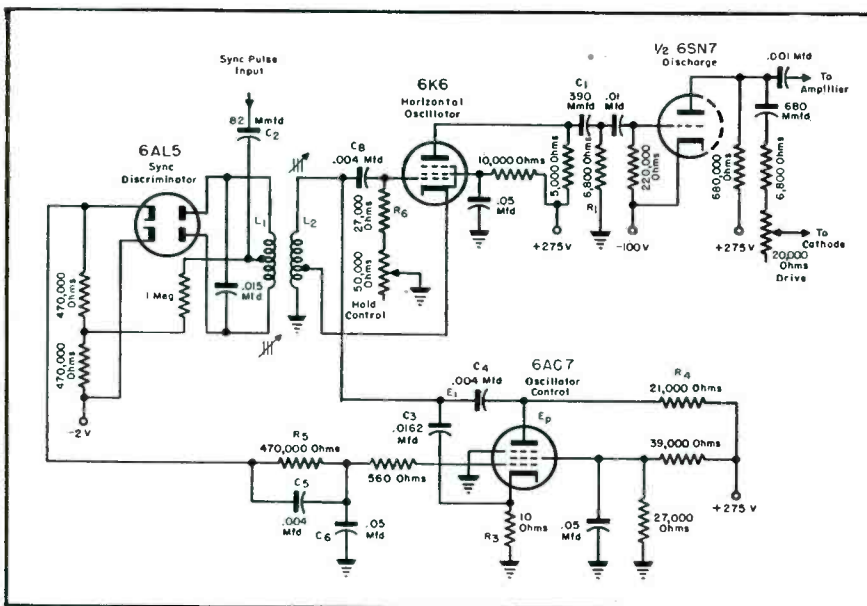


(Above)
Fig. 1. Block diagram of *afc* sync circuit used in RCA 630.

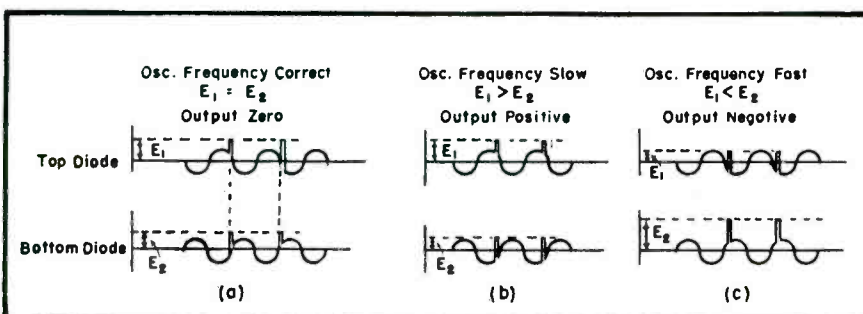


(Right)
Fig. 4. Phase relations of different voltages and plate current in reactance modulator.

(Below)
Fig. 2. Schematic of 630 *afc* sync circuit.



(Below)
Fig. 3. Plots of results of sync pulse and oscillator waveform addition at diode plates of sync discriminator, when oscillator speed with respect to the sync pulse is correct (A); too slow (B); too fast (C).



THE EARLIEST TYPE of *afc* circuit was employed in the famous 630 chassis. Since this model is still being built or assembled by many companies, the *afc* circuit merits an extended discussion.

This circuit is made up of a discriminator, a reactance tube, and a very stable Hartley-type oscillator; Figs. 1 and 2. The 15,750-cycle plate pulses of the oscillator are differentiated by C_1R_1 ; Fig. 2. The resultant sharp pulses are used to trigger a discharge tube, and thus initiate the retrace.

Frequency Control Circuit Operation

The frequency-control circuits operate in the following manner: Two input signals are applied to the discriminator; Fig. 2. One is the horizontal sync pulse, coupled through C_2 . This pulse is applied to both diode plates through transformer winding L_1 . Since the winding is center-tapped, the amplitude of the sync pulse voltage at one plate, will be equal to the sync signal voltage at the other plate. The phase of the sync pulse voltages at each diode plate will also be the same, since the phase shift introduced by one half of L_1 is the same as the shift in phase introduced by the other half.

The second input to the discriminator is the oscillator signal. This is coupled through the transformer, and appears at each diode plate 180° out of phase. The 180° difference in phase is, of course, another way of saying that the top of transformer winding L_1 must be going positive, when the bottom of L_1 is going negative.

Total of Voltages at Plate

Now, the two signals applied to each discriminator diode add. Let us see what the voltages at these plates total under various conditions.

If the phase of the sync pulse is such that it arrives at the instant the sine wave is going through zero, the voltages at both diode plates will be equal; Fig. 3a. Since the voltage output of one diode opposes that of the other in the load circuit, the net voltage output will be zero. This is the condition that prevails when the oscil-

SYNC Circuits

by SOLOMON HELLER* and PETER ORNE

Part II Comprehensive Analysis of Operation of Circuit in the 630 Chassis.

lator is at the correct frequency, and the phase of the sync pulse with respect to the oscillator signal is correct. No *afc* correction is applied under the circumstances.

Off-Frequency Oscillator

If the oscillator goes off frequency (if it runs too fast or too slow with respect to the sync pulse) the sync pulse will not arrive when the oscillator signal is going through zero, as in the preceding case, but at some other moment; Fig. 3b. c. Unequal voltages will, as a result, appear at the discriminator diode plates. One of the diodes will, in consequence, conduct more than the other, and the net output voltage will be either positive or negative. The output voltage will be positive when the oscillator is running too slow (Fig. 3b), and it will be negative when the oscillator is running too fast (Fig. 3c).

Discriminator Output Voltage

The discriminator output voltage is applied to the grid of the 6AC7 reactance tube, and causes the latter to shift the oscillator frequency to the correct operating point. The way it does so warrants some discussion.

The reactance tube is connected in parallel with the tank circuit of the horizontal oscillator and acts as part of the latter's inductance. The *ac* oscillator voltage is coupled to both the plate and cathode of the reactance tube.

Now, the $C_3 R_3$ circuit, through which the oscillator voltage is applied to the cathode, is almost purely capacitive, since the reactance of C_3 is very large compared to the 10-ohm resistance of R_3 . Current through this circuit will therefore lead the ap-

plied voltage by almost 90° (current leads voltage 90° in a purely capacitive circuit). The voltage drop R_3 , which might be called E_3 , is in phase with the current in R_3 (voltage and current are in phase in a resistance). Thus, E_3 will lead the applied voltage by 90° ; Fig. 4.

Phase Relationship

Voltage E_1 , or the voltage applied to $C_1 R_1$, is also applied to $C_3 R_3$, and causes a current to flow through these components. The $C_1 R_1$ circuit is not, as $C_3 R_3$ was, predominantly capacitive, but predominantly resistive, because the reactance of C_1 is small compared to R_1 's resistance. C_1 therefore will not change the phase of the oscillator signal voltage appreciably, and E_1 , the applied oscillator signal voltage, will have the same phase as E_p , the oscillator voltage present at the plate of the reactance tube.

Comparing E_p and E_3 we see that they are 90° out of phase, with E_3 leading E_p by that amount. Now, we know that the signal voltage at the grid (E_g) is 180° out of phase with the cathode signal voltage; grid voltage changes are opposed or bucked by cathode voltage changes, when the cathode is unbypassed. Therefore, E_p , E_3 and E_g will have the phase relations indicated in Fig. 4.

Grid-Cathode Voltage

The grid voltage E_g , or more precisely, the grid-to-cathode voltage, will change in accordance with the oscillator-signal voltage developed across the cathode. If the cathode voltage

goes more positive, it will make E_g more negative, and vice versa. E_g will give rise to a plate current, I_p , that is in phase with it; an increase in grid voltage produces an increase in plate current and vice versa. The phase relations of E_p , E_3 , E_g and I_p are indicated in Fig. 4.

As is evident from the vector diagram, the plate current lags the plate voltage by practically 90° . Current lags voltage 90° in an inductance. Thus, since the current lags the voltage 90° in this circuit, the reactance modulator actually is behaving just like an inductance, or more accurately, an inductive reactance.

Summarization

Summarizing, we find that the voltages applied to the reactance modulator cause its plate current to lag its plate voltage by 90° , and thus make the tube behave in a manner characteristic of an inductance, or an inductive reactance. The inductive reactance presented by the tube is varied by a correction voltage applied to its input, and thus causes the oscillator frequency to change.

Examining the foregoing in detail, we find that when the bias of the reactance modulator is changed, the plate current of the tube will change, but the plate voltage will not alter appreciably. (This is true because the plate voltage in a pentode depends very largely on the screen voltage, and is practically independent of the plate current if the load resistance is small, as it is in the foregoing case.) If the bias is increased, making the grid more negative, the plate current will decrease. Since the apparent reactance the modulator presents to the oscillator tank circuit, X_L , is equal to E_p/I_p (just like $R = E/I$ in resistive circuits), a decrease in I_p will cause

*Instructor at American Radio Institute; co-author of "Television Servicing."

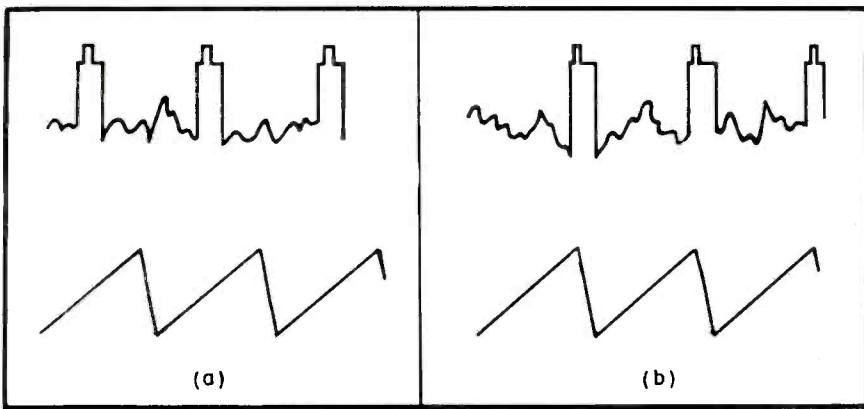


Fig. 5. The sync pulse must arrive when the receiver's retrace is starting, otherwise the trace cycle in the transmitter will not be in phase with the one in the receiver, as indicated above in *A*. Incorrect phasing results in blanking bar in center of picture. In correct phasing, *B*, the blanking area covers the retrace.

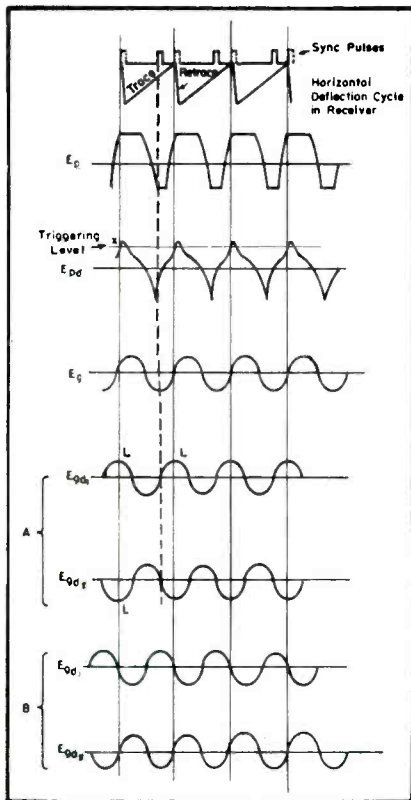
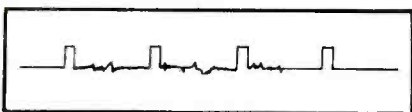


Fig. 6. Phase relations of E_p , E_{pd} , E_g , E_{gd1} and E_{gd2} . When the sync discriminator is *not* detuned, the phase of E_{gd1} and E_{gd2} will be as shown in *A*. When the sync discriminator is properly detuned, the phase of E_{gd1} and E_{gd2} will appear as in *B*. (The solid-line pulses are present when E_{gd1} and E_{gd2} are as shown in *A*. The dotted-line pulses are present when E_{gd1} and E_{gd2} are as shown in *B*.) In case *A* the operation of the *afc* circuit would bring the sync pulse in at the zero point of E_{gd1} and E_{gd2} . The sync pulse would, however, arrive during the trace, not during retrace, and the blanking bar would therefore be seen in the picture.

Fig. 7. Noise pulses are random in nature. In a group of them, as shown here, there are approximately as many positive as negative ones.



effective tank circuit inductance to become lower. The frequency of the oscillator is consequently increased, and the oscillator is brought back to its normal operating frequency.

One final part of the circuit operation remains to be explained: The adjustment of the *afc* circuit in such a way that the retrace is started when the sine-wave oscillator signal is going through zero. Let us consider why this must be the case.

Retrace in the transmitter's horizontal oscillator is initiated by the horizontal sync pulse. The sync pulse initiates the retrace in the receiver as well, when the latter employs a trigger-synchronized circuit, and thus locks the transmitter and receiver oscillators into step. When the receiver uses an *afc* system, on the other hand, the sync pulse, although it still initiates the retrace in the transmitter, no longer does so in the receiver. Nevertheless, the sync pulse must arrive when the receiver retrace is about to begin, if the deflection cycle in transmitter and receiver are to coincide; Fig. 5. The *afc* circuit must therefore be designed so that receiver retrace takes place, or rather starts to take place, at the exact time the sync pulse arrives.

Let us consider what the circuit operation would be, if no special adjustment was made to produce the desired action.

Signal E_p at the plate of the oscillator (Fig. 6) is created by a pulse of current that flows during a portion of the cycle, since the oscillator is operated class *C*, and is cut off for part of its cycle. Therefore, E_p is not a sine-wave signal.

As indicated earlier, E_p is sharpened by a differentiator network C_1R_1 , (Fig. 2), and becomes E_{pd} . At point *x* of the E_{pd} waveform, the discharge tube is triggered, and receiver retrace begins.

E_g is the signal waveform at the grid of the oscillator. It will be noted that this waveform is a sine wave. The flywheel effect of the tuned circuit in the grid shapes the distorted waveshape, E_p , that is fed back from plate to grid, so that it becomes sinusoidal. Thus, E_p is 180° out of phase with E_g , due to the inverting action of the tube.

The 90° Phase Shift

E_g is transferred to the plates of the diode, and would appear as E_{gd} , and E_{gd2} on these plates, if the primary and secondary were both tuned to the same frequency. In such a case, E_{gd} , and E_{gd2} would be shifted 90° , since a phase shift of 90° always takes place

X_L to rise. When the reactance in shunt with the oscillator tank circuit increases, the total inductive reactance in the tank circuit will increase, causing the resonant frequency of the circuit to go down; the resonant frequency goes down as the inductive reactance goes up, and vice versa. Similarly, a decrease in the modulator's bias will increase its plate current and reduce the inductive reactance it presents to the oscillator tank circuit, causing the resonant frequency to the latter to go up.

Let us see now how this information helps us understand the correction provided by the action of the reactance modulator.

It was previously pointed out that when the oscillator frequency increases, the diode output voltage is negative; Fig. 3c. This negative voltage is applied as a bias to the reactance modulator (Fig. 2), causing its reactance to increase in proportion, and thus increasing the reactance of the oscillator tuned circuit. The frequency of the oscillator is, in consequence, brought down, by an amount equal to the amount it went up. In short, the tendency of the oscillator to drift higher in frequency is instantly compensated for by the action of the *afc* circuit.

A similar compensation occurs when the oscillator tends to drift lower in frequency. The sync pulse in this instance arrives too soon (Fig. 3b), since it is faster-running than the oscillator. The voltage at the top diode becomes greater than that of the bottom diode, causing the top diode to conduct more. As a result, the voltage output becomes positive. This positive voltage is applied to the grid of the reactance modulator and, by decreasing its bias, increases the modulator's plate current. The inductive reactance presented by the reactance modulator becomes lower, causing the

AFC Sync Circuits

(Continued from page 56)

when a signal is passed from primary to secondary of a loosely-coupled tuned circuit.

Now, the sync pulse must come in when E_{kd1} and E_{gd2} are going through their zero point; to prevent a correction voltage from being applied to the deflection oscillator when the phase of the latter with respect to the sync pulse is correct. The sync pulse must also come in when E_{pd} is at point x . These conditions cannot both be satisfied as the circuit now stands, because point x of E_{pd} occurs, not when E_{kd1} and E_{gd2} are going through zero, but when the latter are at point l . The horizontal blanking bar would be seen in the picture, if this condition remained uncorrected; Fig. 5.

Waveform Shift

Something must be done to shift the phase of E_{kd1} and E_{gd2} with respect to E_{pd} . This something is the detuning of the secondary winding of the sync transformer. When this detuning is correct, the phase of the E_{kd1} and E_{gd2} waveforms is shifted (to the phase indicated in *B*, Fig. 6) so that their zero point now coincides with the x point of E_{pd} .

The sync pulse can arrive when the E_{kd1} and E_{gd2} waveforms are going through zero, and E_{pd} is initiating the retrace at point x , and thus the circuit action will be normal. That is, the sync pulse, by arriving when the receiver's retrace is starting, will cause the receiver and transmitter horizontal oscillators to lock in step. Secondly, the sync pulse, by arriving at the zero point of the sine-wave signal at the diode plates of the sync discriminator, will prevent a correction voltage from being applied to the reactance modulator, when the oscillator's frequency and phase with respect to the sync pulse are correct.

Triggering Control

It should be noted that only when the detuning of the secondary winding is correct, will the two conditions cited be perfectly satisfied.

Network C_1R_1 (Fig. 2) sharpens E_p not only to permit triggering occur at a very definite point of the oscillator signal, but also to assure that triggering can be made to occur at the exact

(Continued on page 58)

RCA LIGHTNING ARRESTERS

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TYPE 214X1
For Indoor Installation
\$110 Suggested List Price

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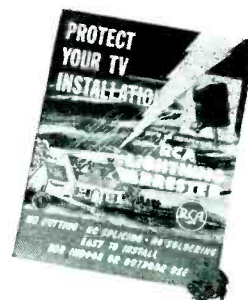
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Choice of the Experts for 40 years

(Continued from page 57)

time the oscillator signal is going through zero at the sync discriminator plates.

Filter Net Action

Filter network $R_0C_0C_n$ removes interference and noise pulses from the circuit. The time constant of this network is long, compared to the duration of one sync pulse. That is, one sync or noise pulse will not charge up C_0 appreciably; C_n will be charged appreciably only by a group of sync pulses.

Bias Variations

The bias of the reactance modulator will change only when the charge on C_n changes. Therefore, the bias will be unaffected by one sync pulse, and will respond only to a group of sync pulses. In short, the bias will vary as the average amplitude of a group of sync pulses varies.

Short RC Network Time

If the bias varied in accordance with the amplitude of one or a few sync pulses (rc network time too short), noise pulses would be able to affect the reactance modulator, and thus upset synchronization.

Long Time Constant Results

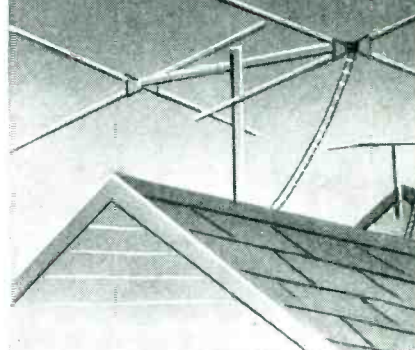
What happens to noise when the network's time constant is relatively long? In a group of noise pulses, there are approximately as many positive-going noise pulses as there are negative-going ones. If the network responds to a group of sync and noise pulses, the sync pulses, all going in one direction, will cause a charge to accumulate on capacitor C_n . The positive and negative noise pulses will, on the other hand, produce no charge, or a negligible charge, on this capacitor, since the pulses are random in nature, and the charges they tend to produce therefore average out; Fig. 7.

Reactance Modulator Unaffected

Since noise pulses do not appreciably charge C_n , and since the bias of the reactance modulator changes only when the charge on C_n changes, the reactance modulator will be unaffected by noise pulses, and horizontal synchronization will be unimpaired.

[To Be Concluded in December]

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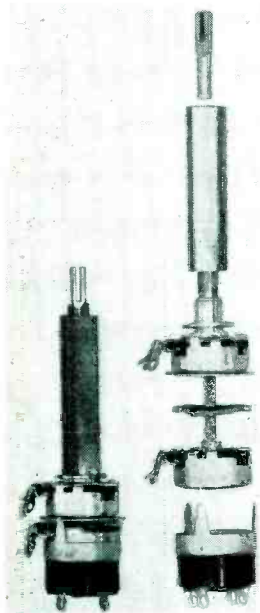
Replacement Lines

(Continued from page 21)

as *M* in Fig. 2, is required for all single shaft and dual replacements. It must be obtained separately, in addition to the other assembly parts which are supplied with each front section control. Fig. 5 (p. 21) illustrates how volume-control parts are used to make this duplication.

Any combination of front and rear carbon sections may be used for dual control replacement in auto radios. Controls having $\frac{3}{8}$ " panel bushings can be duplicated by means of the standard parts and fittings supplied with each front section. However, separate bushings (*I* and *J* in Fig. 2) must be obtained for those sets requiring $\frac{7}{16}$ " or $\frac{1}{2}$ " bushings. Fig. 6 illustrates how parts may be used to duplicate the dual concentric volume-tone control of the '49-'50 Delco Chevrolet auto set. In addition to assembly parts and fittings supplied with the front section control, a $\frac{1}{2}$ " bushing (*J* in Fig. 2) must be obtained. The actual assembly of this control follows the identical procedure employed for standard dual concentric carbon controls described previously, but with the addition of the $\frac{1}{2}$ " panel bushing. Incidentally, both auto set bushings are easily attached to the control by means of internal threads which mate with the original $\frac{3}{8}$ " control bushing. As an added precaution, each bushing is supplied with a strong metal washer which acts as a backing to relieve unnecessary strain on the control when the mounting nut is drawn tight.

Fig. 6. Makeup of concentric volume control used in '49-'50 Delco Chevrolet auto set.



This is NO BULL!



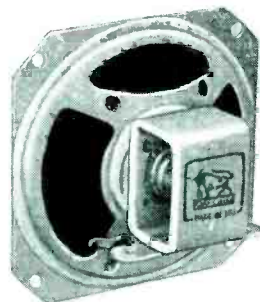
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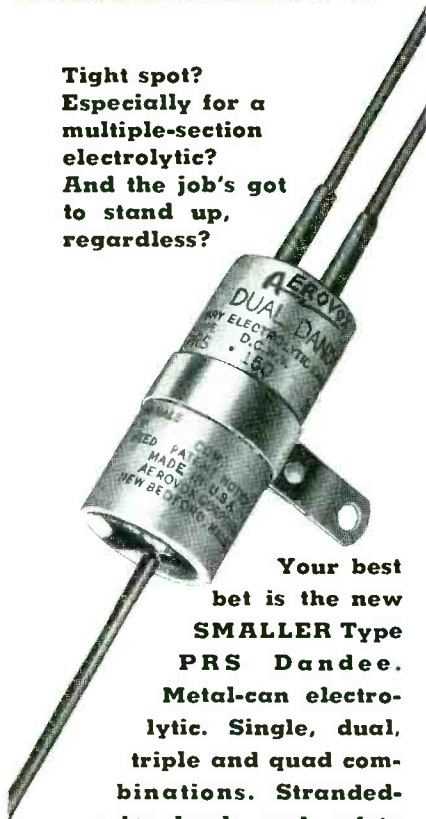


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Licensing

(Continued from page 30)

squelched, but it will have to be done with deeds and not mere words. First and foremost, service abuses must stop. Let's be frank in admitting that many a TV or radio set owner has been taken for a ride by unscrupulous Service Men or at least Service Men anxious to make a fast buck. Several years ago when *The Reader's Digest* came out with that blast against radio Service Men, we in the trade knew that there was some basis for the sizzling attack, although the majority or radio Service Men were really honest. As is usually the case in generalizations, the good were branded with the bad. The reaction was such that it too a couple of years to live down that blast. But since then, especially with the advent of TV servicing on a full scale, Service Men and service contractors here and there have been playing the public for suckers, and once again we are in for lots of criticism.

There's enough money to be made in honest TV and radio servicing. The Service Men and service contractors are entitled to fair pay for time, effort and materials. You are certainly entitled to transportation charges. You are entitled to overhead costs, such as rent, telephone, light, heat, bookkeeping and even something towards bad accounts. You are entitled to charge for parts and materials at list prices, for your trade discounts are yours to keep and not to be given away to the general public. You are entitled to pay off the cost of equipment, particularly costly test instruments. You are entitled to catch up on the cost of your schooling and training and the growing fund of experience, for the diagnosis remains the major part of the service charge.

But let's keep this business honest. When servicing sinks as low as to charge a set owner \$10 merely for inserting the plug in the outlet, or \$15 for replacing a wornout receiving tube, or \$25 for locating and replacing a blown capacitor, it's just another form of robbery. At least Jesse James used a gun and was a bit more gallant about it.

In the matter of TV service contracts, it's so important to be a good custodian of the policy funds entrusted to your care as service contractor. Remember, you haven't earned that service contract policy payment until the entire contract period runs out. The money may be earned by you month by month, of course; you may withdraw say one-twelfth of the amount each month. But far too many Ser-

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vice Men and even the large service contractor organizations have proceeded to use the policy fees immediately upon receipt, so that nothing has remained in the event of costly picture-tube replacements during the contract life. It's been a very childish situation, if not a downright crooked one. And unfortunately so, because with the coming of TV servicing many a Service Man or organization has been raised to the level of a custodian of funds, the moneys from service contracts, with full opportunity to reap a good honest profit. But how the trade has abused this opportunity!

Time and again, during talks before Service Men throughout the country, I have played up the dignity that should be attached to being a Service Man. After all, once a TV or radio set is sold, the Service Man becomes the king pin. The manufacturer is no longer important. From then on the owner depends on you to keep that set going, to safeguard his investment, and to protect the reputation of the set manufacturer. You are the doctor and surgeon. You are trusted. Your verdict is final. And you are entitled to a doctor's or surgeon's fee, based on your legitimate costs and profits. But please, fellows, don't take advantage of the situation! Don't pull this nice business down to the gutter, for if you continue in that direction, you'll surely bring about regulation to the point where your soul no longer will be your own.

Let's keep the service business free, by being worthy of the confidence that's placed in us by a properly-treated public.

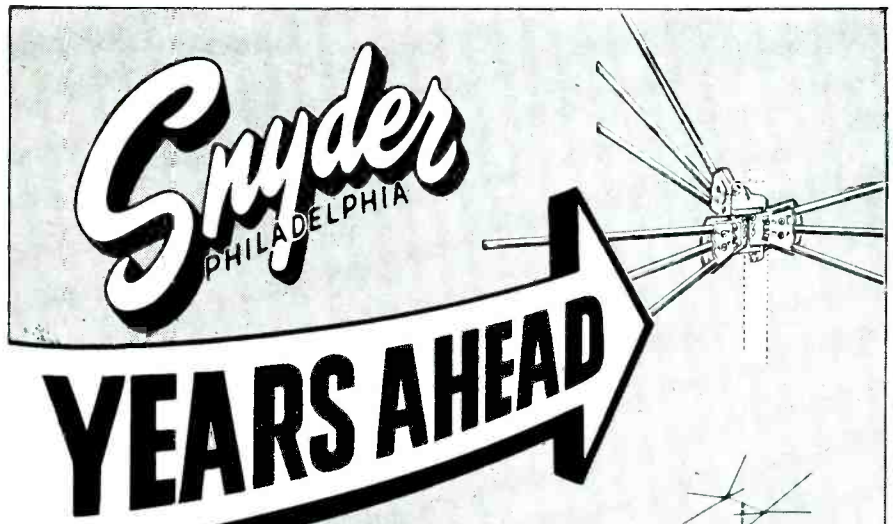
RCA TUBE DEPARTMENT PROMOTES FOUR TO HEAD DISTRICT RENEWAL SALES

W. H. Garrett, central district; Victor Williams, southeastern district; C. A. Brokaw, western district; and W. H. Allen, eastern district, have been promoted to newly created posts as district managers of RCA renewal field sales.

They will be responsible for the supervision of all renewal sales, distribution, sales promotion, and merchandising of tubes, batteries, electronic components, and test equipment.



L. S. Thees (center), general sales manager of the RCA tube department, and the four new RCA renewal sales district managers: W. H. Garrett, W. H. Allen, C. A. Brokaw, and Victor Williams. Standing, from left, are H. F. Bersche, manager, RCA renewal sales section; W. L. Rothenberger, manager, sales operations, and L. J. Battaia, manager of the renewal sales field force.



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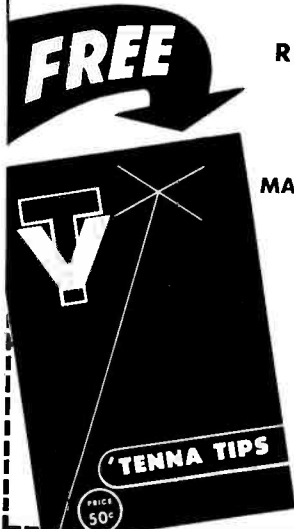
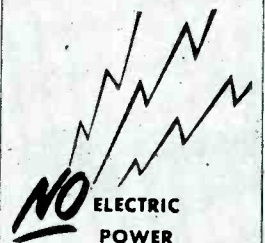
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Business Aids

(Continued from page 40)

it to be just another window cluttered up with old chassis, tubes, and parts. Can you offer any advice?—E. M.

Reply to E. M.

Dear E. M.:

Since your window costs you so much rent per month it must be considered as an investment in your business. It should serve as a silent salesman, therefore, selling your product to the passing public and helping to establish public confidence for you. It is particularly important to see that the window is always kept clean, both inside and outside. It should be well lighted; electricity is the cheapest means of advertising. It is wise, too, to see that the window is illuminated after closing hours; an automatic clock could be used for that purpose. Many component and tube manufacturers have an assortment of effective displays, with and without illumination, which are ideal for windows. Often the displays, usually available at your local parts distributor, are so designed that they can be changed every month.

Background material, if the window is enclosed, could follow the seasonal colors or holiday design trend. This material can either be obtained from advertising display companies at a low cost, or made up in the shop using various colored papers or cloth, and tying in small displays. The use of a servicing motto is recommended; example . . . *It is never too late for good service.* Companies supplying display material for background will be glad in most cases to supply you with their catalogs showing seasonal features and materials and the costs. As an eye-stopper you might install a large picture tube with the gun removed, a sign featuring a shop message being inserted near the face of the tube and a small bulb connected to a flasher placed behind the sign. Not only could the sign message be changed every week or month, but the color scheme, too, within the tube or in front of the tube's face.

Sincerely yours,

Don Kay

Servicing Helps

(Continued from page 44)

present: V_{403} (12AU7) sync separator and clipper; V_{301} (6CB6, 6BC5, 6AG5) rf amplifier in 94C18-4 TV tuner (leakage between elements will cause sync pulse clipping due to incorrect *agc* voltage); V_{305} (6AC7) video amplifier. (Some of these tubes draw excessive current and cause sync pulse clipping.)

Defective Crystal Remedy

If the vertical roll is due to a faulty 1N64 germanium diode, the crystal can be checked by disconnecting one side of the diode from the circuit and checking the front-to-back ratio with the ohmmeter range of a *vtvm*. (Diodes

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can be easily ruined by heat. To eliminate the possibility of damage by heat, the diode should be disconnected from the circuit by lifting the peaking coil (L_{301}) from the tie point which is connected to pin 4 of V_{305} .) The front-to-back ratio should be on the order of 1,000 to 1,500 times; i.e., if a diode measures 300 ohms in one direction, it should read 300,000 to 500,000 ohms in the other direction.

Importance of Lead Dress

Lead dress is very important in this circuit to prevent high peak voltages from the *agc* circuit causing damage to the germanium diode. The germanium diode should be dressed away from the white lead connected to pin 5 (plate) of *agc* tube V_{303} . The white lead should be dressed close to the chassis. The orange lead connected to pin 1 of the *agc* tube should be dressed well away from the video amplifier tube, V_{308} .

Next Month

THE ANNUAL INDEX for 1951 will be featured in the December issue of SERVICE.

Music

(Continued from page 37)

dance music to serve as further recreation to employees, if dancing is feasible.

Special Music: Special occasions, holidays, specific purposes.

That music has helped production in many plants has been revealed in many probes. It has been revealed, for instance, that in mills, where there are very high noise level areas, specially designed loudspeaker mechanisms, proper selection of music with regard to frequency and continuity of volume, have limelighted the value of music. The programs are sought even under the worst noise circumstances.

In the plant of a company manufacturing precision apparatus, music has been found effective in counteracting fatigue, especially in the late afternoon.

In the offices of a chemical company music was found to relieve monotony, fatigue, and boredom in its drafting department. Even a precision instrument company has found that music when played at the proper sound level is supplemental rather than distracting.

Damping-Tube Circuits

(Continued from page 32)

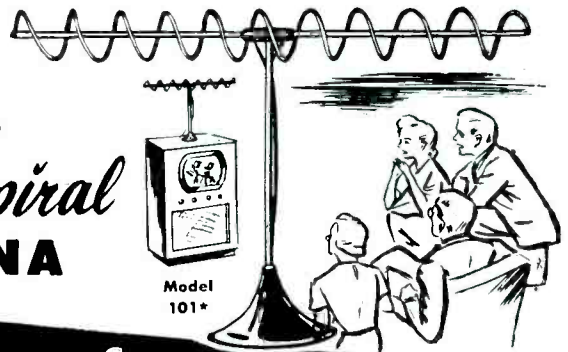
mounted on the inside apron of the chassis and leads were soldered to the corresponding pins on the tube socket. It is believed that an easier way would be to mount the rectifiers on an old tube base so that it may be plugged into the tube socket. However, the results of the change were satisfying and no effects of ringing were indicated in the video received.

It was found that 75 *ma* selenium rectifiers were required in the substitution. In replacing other rectifier tubes, it will be necessary to use stacks having a different voltage and current rating. For example, due to the current and voltage requirements, three 150 *ma* selenium rectifiers, connected in series, should be used to replace a 5V4. Although replacing a tube with selenium rectifiers is more expensive, it is an expeditious way of performing a repair when the necessary tube is not available, a situation that may often occur during the present emergency.



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Each high note, lively tune, clever word, cute step, is received remarkably true with Hi-Lo, the indoor TV spiral antenna which is in a class by itself. Design, appearance, engineering, cost, fidelity ... all add up to the most revolutionary antenna with the best reception imaginable.

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Canadian patents 1951

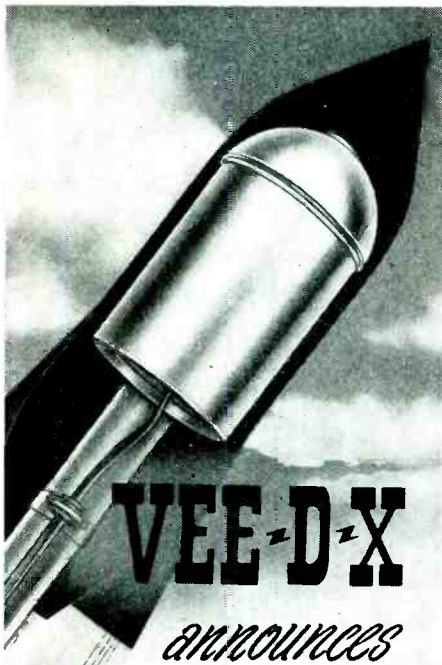
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**H. LAURENCE KUNZ APPOINTED
SANGAMO ELECTRIC CAPACITOR DIV.
GENERAL MANAGER**

H. Laurence Kunz has been appointed general manager of the Sangamo Electric Co. capacitor division, at Marion, Illinois. Kunz has served as sales manager of the division during the past six years, and prior to that as assistant general sales manager. He has been with Sangamo for 25 years, having joined the company after receiving his degree in electrical engineering from the University of Illinois.



H. Laurence Kunz

* * *

**TRICRAFT APPOINTS POTASHNIK
SALES MANAGER**

Lou Potashnik has been named sales manager of the Tricraft Products Company, 1535 North Ashland Ave., Chicago 22, Ill.

* * *

**VIKING SPEAKERS NOW A JENSEN
REPLACEMENT ITEM**

Viking loudspeakers, formerly a Jensen private brand line for low-cost replacement purposes, are now being identified by the phrase *Viking by Jensen*.

Presently included are 12 models from 3½" to 12" sizes, and with 4 x 6, 5 x 7, and 6 x 9 ovals, all *pm*. A bracket set is available which provides flexible facilities for chassis and transformer mounting.

* * *

**MALLORY WINS OSCAR-OF-INDUSTRY
TROPHY**

The bronze *Oscar of Industry* trophy, for the best annual report in the electronics-radio industry, was awarded recently to P. R. Mallory & Co., Inc. Charles C. Fagg, director of the company, received the trophy at an annual awards banquet in the grand ballroom of the Hotel Statler, New York.

A jury which made the selections for the *Financial World Survey of Annual Reports* was headed by Dr. Carman Blough, research director of the American Institute of Accountants, assisted by Dr. Pierre R. Bretey, president of the National Federation of Financial Analysts Societies; Elmer Walzer, financial editor of the United Press; Denny Griswold, publisher of Public Relations News; and Guy Fry, past president of the National Society of Art Directors.

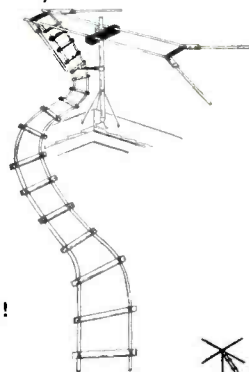
* * *

SHOWER JOINS RADIO RECEPTOR

E. G. Shower, formerly a member of the technical staff of Bell Telephone Labs, has joined the staff of Radio Receptor Co., Inc., Brooklyn, N. Y. as chief engineer of the germanium division.

**1/6 the LOSS
With Permanent
OPEN LINE
by T.V. Wire Products**

Guarantees lowest loss . . . holds the signal stronger on short or long runs (½-mile to mile with minimum loss) . . . resists disastrous atmospheric conditions indefinitely!



**NOW AT
A NEW
LOW PRICE!**

Through Your Distributor — or Write

T. V. WIRE PRODUCTS

THE PERFECT FINAL TOUCH
TO QUALITY INSTALLATIONS



102 Prospect Ave., Burbank, Calif.
ROckwell 9-2562

**MILLER APPOINTS KERMIT SUITS
EASTERN S-M**

Kermit Suits, 48 Stanley St., Dumont, N. J., has been appointed eastern sales manager of the M. A. Miller Manufacturing Co., 1165 East 43rd St., Chicago 15, Ill.



Kermit Suits

* * *

RCA BATTERY PROMOTION MATERIAL

Promotional material on batteries, including an illuminated battery display unit which flashes an identification, are now available from local RCA distributors.

Included are a battery fact finder for location of interchangeability, replacement and price information, dummy carton display material, and an automatic pencil with a revolving midsection of stock numbers and interchangeable types.

* * *

**CLAROSTAT REPACKAGES RESISTORS
AND CONTROLS**

A carton in blue-green and black colors to be used to package resistors and controls, has been announced by the Clarostat Manufacturing Co., Dover, N. H.

A. S. JOHNSON NOW NATIONAL CARBON PREXY

Adger S. Johnson has been appointed president of National Carbon Company, a division of Union Carbide and Carbon Corp. Johnson had been vice president and general manager of National Carbon.



A. S. Johnson

* * *

REIGEL NAMED STANCOR DISTRIBUTOR COORDINATOR

Robert J. Reigel has been named distributor sales coordinator for the Standard Transformer Corp., Chicago, Ill.

Reigel formerly was sales manager of the Thordarsen-Meissner division of Maguire Industries.



R. J. Reigel

* * *

SAMS APPOINTS RENNER SALES-ENGINEERING MANAGER

W. D. Renner has been appointed manager of sales engineering of Howard W. Sams and Co., Indianapolis, Ind.

Renner was formerly chief field engineer and technical advisor on Photofact publications.



W. D. Renner

* * *

WOLLGANG JOINS OXFORD ELECTRIC

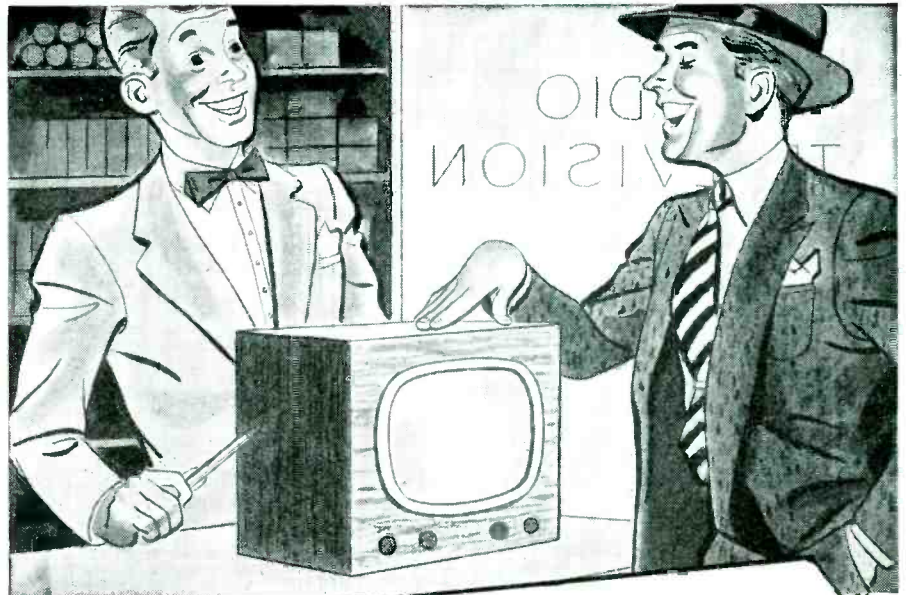
V. E. Wollgang Jr., formerly chief buyer of Webster Electric, has joined the sales department of the Oxford Electric Corp., 3911 S. Michigan Ave., Chicago 15, Ill.

* * *

OXFORD CATALOG

A 4-page catalog listing information on permanent-magnetic speakers, electrodynamic speakers and speakers for TV replacement, auto-radio replacement, public address, intercoms and outdoor weather-proofing applications, has been released by the Oxford Electric Corp.

Detailed are speaker lines ranging from 2" to 15" units.



THIS MAN IS YOUR MOST VALUABLE BUSINESS ASSET!

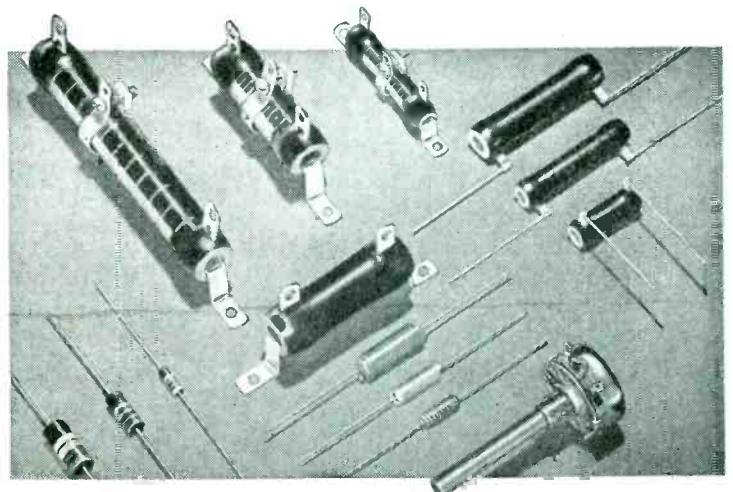
A satisfied customer—the keystone of any successful business! You endanger customer good will when you use “just-as-good” replacement parts on your repair jobs. Use quality OHMITE components—known the world over for dependability among servicemen, amateurs, and design engineers—and you can be sure of customer satisfaction every time. It’s just good business!

OHMITE MANUFACTURING COMPANY
4879 Flournoy St., Chicago 44, Ill.

Be Right with **OHMITE**[®]
RHEOSTATS • RESISTORS • TAP SWITCHES



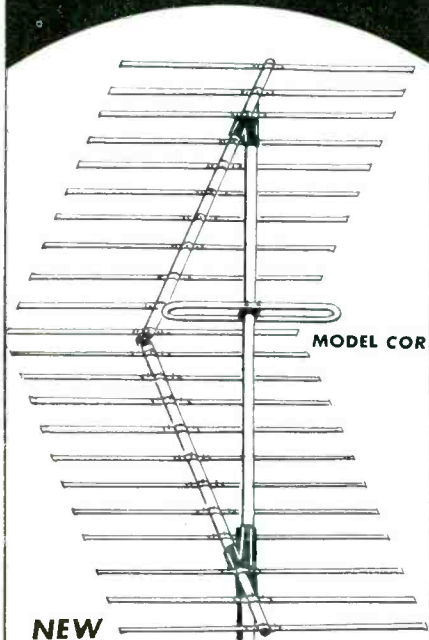
Write
FOR
STOCK
CATALOG



IF YOU SERVICE IN ANY OF THESE AREAS . .

BINGHAMTON, BIRMINGHAM, BLOOMINGTON, BUFFALO, CHARLOTTE, DAVENPORT, ERIE, GRAND RAPIDS, INDIANAPOLIS, JOHNSTOWN, KANSAS CITY, LANCASTER, NEWARK, NEW HAVEN, PROVIDENCE, RICHMOND, ROCHESTER, ROCK ISLAND, ST. LOUIS, SAN DIEGO, SCHENECTADY, SEATTLE, TOLEDO, TULSA, UTICA AND WILMINGTON . . .

or in areas
fringe to these cities . . .



MODEL COR

NEW RMS CORNER ARRAY

WILL GIVE YOU AMAZING TV RECEPTION RESULTS!

fringe and extreme fringe areas of these cities and similar locations throughout the country can now obtain snow-free television pictures with the Corner Array.

doubles television entertainment by producing sharp pictures from signals of a station fringe to these cities.

Example: adds channel 13 (Johnstown) to the TV fare of Pittsburgh set owners.



RADIO MERCHANDISE SALES, INC.
NEW YORK 59, N. Y.

GENERAL CEMENT CATALOG

A 64-page catalog, 155, describing radio chemicals, radio and TV parts and service aids, alignment tools and hardware, has been published by the General Cement Manufacturing Co., Rockford, Ill.

Detailed are over 150 products from adhesives to wrinkle varnish.

* * *

HUBER AND DORFNER NOW N. U. DISTRICT MANAGERS

Edward G. Huber has become National Union Radio Corp. district sales manager for eastern Pennsylvania, south Jersey and Delaware. This is an addition to the New Jersey territory being handled by Huber.

Lyle T. Dorfner has become district manager for the northern midwestern territory comprised of North and South Dakota, Minnesota, Wisconsin, northern Illinois.

Mr. Dorfner's headquarters will be at Route No. 2, Manakoni Point, Osseo, Minnesota.

* * *

ARNETT APPOINTED GENERAL ASSISTANT TO PREXY OF DU MONT

Keeton Arnett has been named general assistant to the president of Allen B. Du Mont Laboratories, Inc., Clifton, New Jersey.

Arnett was formerly senior vice president of the Fred Eldean Organization.

* * *

E-V BOOSTER BOOKLET

A 16-page booklet describing TV boosters and presenting testimonials on the features of the preamps has been published by Electro-Voice, Buchanan, Mich.

* * *

AUDICRAFT PA SPEAKER COMPANY ORGANIZED

A new company, Audicraft, Inc., has been organized to manufacture horn-shape *Fideliflare* speakers and diaphragm assemblies, of the *self-instal* type. Headquarters are at 77 S. 5th St., Brooklyn, N. Y. Alan Abrahams is president and Arnold J. Siegel is in charge of sales.

* * *

SPIRO NOW JFD ASST. AD MANAGER

Frank K. Spiro, formerly with Fawcett Publications and Kenyon and Eckhardt, has been named assistant advertising manager of the JFD Manufacturing Co., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

* * *

SUPPLEMENT TO TUBE SUBSTITUTION BOOK ANNOUNCED BY RIDER

The first supplement to the *Receiving Tube Substitution Guide Book*, by H. A. Middleton, has been scheduled for publication in November by John F. Rider Publisher, Inc., 480 Canal St., New York 13.

Supplement systematically lists approximately 700 new radio-television tube substitutions in their proper numerical sequence. Accompanying wiring instructions and illustrations of original and substitute tube sockets also appear. Has 48 pages and is priced at 99 cents.

END PROFIT LEAKS!

Broken antenna connections and terminals can take huge bites out of your profits through returns and call-backs. End it all by selling the *one* Indoor TV Antenna with connections completely enclosed against breakage.

Look for the satin finish Admiralty brass dipoles; positive jamless action—perfect electrical connections at all telescopic joints—polystyrene insulators—all marks of quality, *exclusive* with **GOLDEN WAND.**

\$6.95
List



Buy them
from your
wholesaler

Two models to
suit all tastes:

Model TG84
(shown)
Model 50TV

PEERLESS PRODUCTS INDUSTRIES



818 N. Pulaski Rd., Chicago 51, Ill.

News Briefs

THE CIRCLE-X ANTENNA Corp. has opened a \$100,000 sales campaign, known as the *Circle-X Round Up*, with incentive merchandise ranging in price from several hundred dollars to a few dollars to all jobber salesmen, to promote the sale of Circle-X antennas. . . . Robert Levitre has become expeditor in the production control department of Clarostat, and Arthur G. Jordan has replaced Joseph F. Cook in the scheduling and follow-up of all wire-wound resistors. . . . Setchell-Carlson's unitized TV line was recently unveiled in the exhibition hall at the Minnesota State Fair. Included were 17- and 20-inch rectangular picture-tube models. . . . Teldisco, Inc., 444 William St., East Orange, N. J., whose prexy is Col. E. N. Bloomer, director of selective service in N. J., has been appointed wholesale distributor for Zenith radio and TV receivers in 13 New Jersey counties. . . . Plans for the expansion of its industrial sales division, have been announced by the Fischer Distributing Co., 118 Duane St., New York 7, N. Y.

**HUDSON RADIO NAMES BAUME
SOUND DEPT. MANAGER**

Max Baume has been appointed manager of the sound department of Hudson Radio and Television Corp., 48 W. 48th St., New York 19, N. Y.

* * *

MUNIZ BECOMES TRAD VP

Ricardo Muniz, formerly general manager of the DuMont TV receiver manufacturing division, has been named vice president in charge of operations of the Trad Television Corp., Asbury Park, N. J.

Muniz will be in complete charge of engineering and production. Trad recently announced an expansion program which includes approximately 2-million dollars worth of government contracts, increased domestic television production and production on a theatre television set.

* * *

**RIDER TV-ELECTRONICS VOCATIONAL
GUIDE PUBLISHED**

A book by Ira Kamen and Richard H. Dorf, *TV and Electronics as a Career*, has been published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

Engineering, broadcasting, manufacturing, servicing, parts and receiver distributing, sales representation, retailing, and electronics in the armed forces are discussed by the authors, and J. R. Poppele, vice president, WOR-TV; R. W. Peterson, assistant manager, Electronics Division, Admiral; and W. H. Bohlke, manager, Custom Service Division, RCA Service Corp.

Also included are appendices on pay scales for broadcast personnel and TV service branch personnel, electrical engineering curriculum, and educational institutes in the U. S. teaching radio, television, and electronics.

Contains 325 pages with 136 illustrations. Priced at \$4.95.

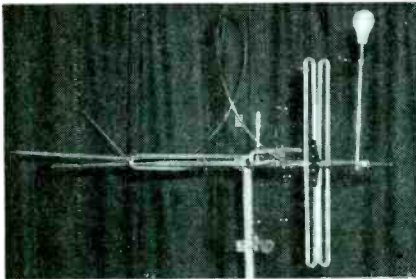
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BRACH POSTCARD PROMOTION

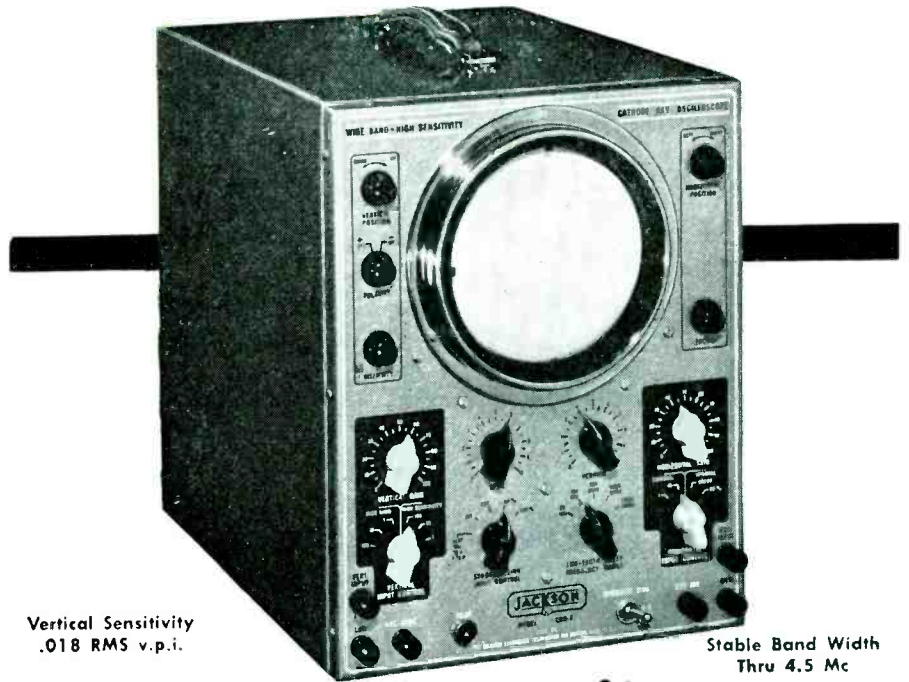
To develop consumer demand for Brach antennas and 2-set couplers, the Brach Manufacturing Corp., 200 Central Ave., Newark, N. J., has announced a consumer postcard mailing campaign. The postcards illustrate, in cartoon form, why the TV consumer should ask for Brach TV products.

The postcards will be distributed by the Brach jobbers.

AT NEDA SHOW



A novel version of a DX TV antenna displayed by Freteo during recent NEDA exhibition in Cleveland, which it was said featured a pair of folded horizontal dipoles and one vertical high and vertical low, and a tail assembly patterned after the P80 shooting star, with a vertical stabilizer to stabilize any signal that happens to come by. The light bulb was said to improve signal gain and keep airplanes from landing on the antenna.



Vertical Sensitivity
.018 RMS v.p.i.

Stable Band Width
Thru 4.5 Mc

**JACKSON Oscilloscope
gives you "dual service"**

This is a high-quality, laboratory-grade 5" Oscilloscope that provides the "dual service" of both high sensitivity and wide band width.

s p e c i f i c a t i o n s

Vertical Amplifier—Video-type frequency compensation provides flat response within 1.5 db from 20 cycles thru 4.5 Mc, dropping smoothly to a still useful value at 6 Mc.

Sensitivity Ranges—With a band width of 20 cycles thru 100 Kc, the sensitivity ranges are .018, .18, 1.8 RMS volts-per-inch. The wide band position 20 cycles thru 4.5 Mc has sensitivity ranges of .25, 2.5, 25 RMS volts-per-inch.

Horizontal Amplifier—Push-pull with sensitivity of 55 RMS volts-per-inch.

Input Impedances—Vertical 1.5 megohms shunted by 20 mmfd. Direct to plates, balanced 6 megohms shunted by 11 mmfd. Horizontal: 1.1 megohms.

Linear Sweep Oscillator—Saw tooth wave, 20 cycles to 50 Kc in 5 steps. 60 cycle sine wave also available, as well as provision for using external sweep.

Input Voltage Calibration—Provides a standard voltage against which to measure

voltages of signal applied to vertical input.

Vertical Polarity Reversal—For reversing polarity of voltage being checked or for choosing either positive or negative sync voltages.

Return Trace Blanking—Electronic blanking provides clear, sharp trace to prevent confusion in waveform analysis.

Synchronizing Input Control—To choose among INTERNAL, EXTERNAL, 60 CYCLE, or 120 CYCLE positions.

Intensity Modulation—60 cycle internal or provision for external voltage for intensity modulation uses.

Additional Features—Removable calibration screen—Accessory Model CR-P Demodulation Probe for Signal Tracing—All-steel, gray Ham-R-Tex cabinet. Total net weight only 26 pounds. Same height as other Jackson TV instruments: 13" H x 10 1/4" W x 15 1/8" D.

Prices: Model CRO-2, Users' Net \$197.50. Model CR-P Probe, Users' Net \$9.95.

TWO OTHER FINE JACKSON INSTRUMENTS

Model 655 Audio Oscillator



Sine-wave 20 cycles to 200,000 cycles. Less than 5% harmonic distortion between 30 cycles and 15,000 cycles. Frequency calibration accurate within 3% or 1 cycle. Hum level down more than 60 db of maximum power output. Output impedances of 10, 250, 500, 5000 ohms or Hi Z resistive output.

Model TVG-2 TV Generator

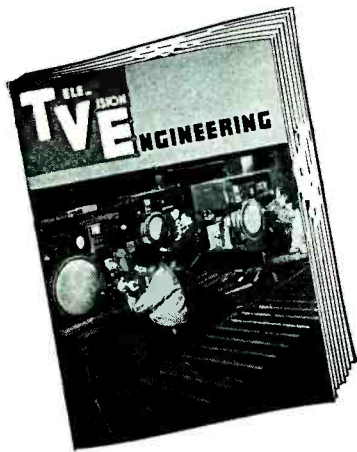


Sweep Oscillator in three ranges from 2 Mc thru 216 Mc, all on fundamentals. Reversible sweep direction. Sweep width variable 1 Mc thru 18 Mc. Marker covers 4 Mc thru 216 Mc. Crystal Oscillator to use as Marker or Calibrator. Video Modulation, from external source for using actual video signal for check, or for use with Audio Oscillator to produce bars for linearity checks.

See your electronics distributor for more information, or write

JACKSON ELECTRICAL INSTRUMENT CO. • DAYTON 2, OHIO
"Service Engineered" Test Equipment
IN CANADA: THE CANADIAN MARCONI CO.

... if you are commercially or professionally interested in TV, you must read



TELEVISION ENGINEERING

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Devoted exclusively to TV Research . . . Design . . . Production . . . Operation . . . Instrumentation

TELEVISION ENGINEERING is the *only* trade publication which directs its *entire* editorial content to executives and engineers who design, manufacture, operate and maintain television receiving and transmitting equipment—both commercial and educational.

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Color TV Systems . . . Ultrahigh Receiver-Transmitter Design Problems . . . Tube Production-Line Techniques . . . TV Broadcast Equipment . . . Camera Tube Research . . . Glass, Plastics and Metal in TV . . . TV Test Equipment in the Plant . . . Film Recording . . . Flying Spot Scanners . . . Tone Amplifiers for TV Films . . . Compact Motors for TV . . . TV Component Design . . . Mechanical Design Factors in Antennas . . . Quality Control Charting . . . Microwave Relays . . . Receiver and Transmitter Servicing . . . Production Aids . . . Instrument Activities . . . TV Sound Systems . . . Studio Lighting.

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Here is my remittance for my subscription to TeleVision Engineering at the
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Occupation Title

Department in which employed

Operation Production Research

Employed by

Nature of Business

(State if TV Manufacturer, TV Broadcast Station, etc.)

CLOVER NOW TRIAD JOBBER SALES HEAD

Ernest Clover is now director of jobber sales at Triad Transformer Manufacturing Co., Los Angeles.

* * *

RCA SERVICE NOTES BINDER

The RCA tube department has announced that distributors are offering Service Men a three-ring leatherette binder at no extra charge when they purchase RCA Victor service data literature costing them \$10 or more.

The binders are intended for the filing of individual RCA Victor service data booklets. However, it was said, the purchase price of such literature when bought in bound volume form will also be counted toward a bonus binder.

RCA Victor service data include bound volumes of technical and servicing information covering all RCA Victor radios, phonos, and TV receivers produced from '23 through '50; plus special data on early '51 TV receivers, etc.

* * *

CLAROSTAT TV CONTROL REPLACEMENT MANUAL SUPPLEMENT

A TV control replacement manual supplement is now being offered to TV Service Men through Clarostat jobbers.

Clarostat issued a manual last spring listing 343 set listings covering nearly 1500 TV models, 105 standard controls with 5,705 applications and 222 RTV or exact-duplicate controls with 3,451 applications.

The supplement provides a continuation of RTV numbers listing the manufacturers part that they are used to replace.

* * *

NEWCOMB SOUND CHART

A wall chart of impedance mismatch and line loss versus line impedance and line length, chart 102, has been announced by Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif. It is available free to sound specialists and audio installation engineers.

* * *

SOUTH BEND LATHE ATTACHMENT CATALOG

More than one hundred and sixty attachments and accessories for South Bend lathes, drill presses and shapers are illustrated in a 35-page catalog, No. 5102, announced by South Bend Lathe Works, 425 East Madison St., South Bend 22, Indiana.

Although the attachments and accessories are designed primarily for use on South Bend machine tools, it is said that many of them can be adapted to other makes.

SPIRAL-INDOOR ANTENNA TV SHOW



On-stage view during a daily Goldblatt *Let's Have Fun* show on WGN-TV, Chicago, featuring a commercial on the Hi-Low spiral indoor antenna.

**DU MONT STORY DRAMATIZED
OVER WABD**

A television dinner in the Passaic Armory, Passaic, N. J., attended by New Jersey Governor Alfred E. Driscoll and other notables, honoring Dr. Allen B. Du Mont and the Du Mont Laboratories, and featuring a dramatic documentary, *The Du Mont Story*, originating in the Ambassador Theatre, New York, was featured recently during a WABD telecast.

The Du Mont Story covered a twenty-one-year period in the life of Dr. Du Mont, action ranging from Dr. Du Mont's work in '30 at W2XCD, the De Forest experimental station, and the beginnings of the Du Mont labs in '31 in the basement of Dr. Du Mont's home, to the present.

BELL SOUND CATALOG

A 24-page catalog describing hi-fi amplifiers, recording equipment, portable record players, mobile amplifiers, booster amplifiers, *pa* systems, intercoms, and accessories has been published by Bell Sound Systems, 555 Marion Road Columbus 7, Ohio.

Among the allied equipment detailed are microphones, low-impedance matching units, portable speaker cases, speaker trumpets, etc.

JAVEX APPOINTS REPS

Javex, Garland, Texas, has named the Herb Erickson Co., 201 N. Maine St., Hendersonville, N. Carolina, and Fred H. Larrabee Co., 6033 Main St., Kansas City, Missouri, as reps. The Erickson group will handle the southeastern states, and Fred Larrabee will operate in Missouri, Kansas, Iowa, and Neb.

NEDA '51-'52 COMMITTEES NAMED

Special and standing committees have been announced by the National Electronic Distributors Association.

W. D. Jenkins, Radio Supply Co., Richmond, Va., is now chairman of the *tube division* assisted by Elliott Wilkinson, Wilkinson Brothers, Dallas, Tex.; Aaron Lippman, Aaron Lippman and Co., Newark, N. J.; Milton Fischer, Fischer Distributing Co., Inc., New York, N. Y. and Charles Ollstein, Sanford Electronics Corporation, New York.

L. W. Hatry, Hatry & Young, Inc., Hartford, Conn., has become chairman of *capacitors, resistors, vibrators, volume controls*, assisted by H. E. Ruble, Srepc, Inc., Dayton, Ohio; Ralph M. Peffer, Radio Distributing Co., Harrisburg, Pa.; Gordon Fulton, Fulton Radio Supply Co., Jackson, Mich. and Henri Jappe, A. W. Mayer Co., Boston, Mass.

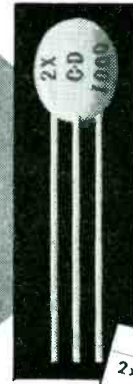
V. N. Zachariah, Zach Radio Supply Co., San Francisco, Calif., is chairman of the *transformer, reactor and coil committee* which includes C. C. Roarke, Associated Radio Distributors, San Francisco, Calif.; Roger Fjelstad, General Radio, Inc., Seattle, Wash., and Paul Hargis, The Hargis Co., Austin, Tex.

The *replacement speaker, microphone, sound equipment accessory committee* consists of Anthony Dybowski, Dymac, Inc., Buffalo, N. Y., chairman; and Louis Richmond, Springfield Radio Co., Inc., Springfield, Mass.; Stan Almos, K-L-A Laboratories, Inc., Detroit, Mich.; Henry F. Morrison, Morrison's Radio Supply, Ashtabula, Ohio, and John H. Brown, J. B. Distributing Co., Omaha, Neb.

Right: Equipment designed for the testing of printed-circuit components. (Courtesy Cenralab)

NOW AVAILABLE!

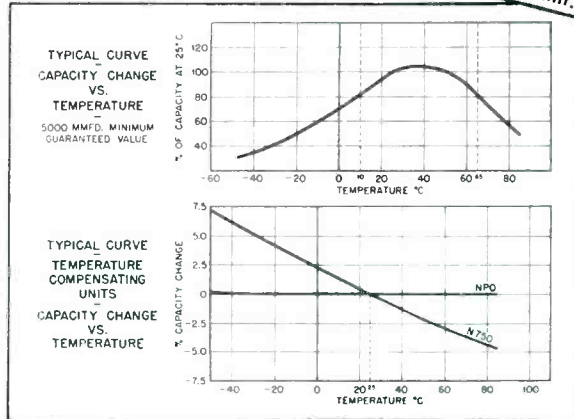
C-D



DUAL CERAMICS

**guaranteed
minimum
capacities:**

CAPACITIES:	PART NUMBER:
2x100 mmf. +50,-20%	6TMSDT1E Tol. +50,-20%
2x1000 mmf.	6TMSDD1B
2x1500 mmf.	6TMSDD15C
2x2000 mmf.	6TMSDD2C
2x2500 mmf.	6TMSDD25C
2x3000 mmf.	8TMSDD3C
2x4000 mmf.	8TMSDD4C
2x10,000 mmf.	8TMSD51C



- Small • Space-saving
- Lightweight • Ideal capacitor construction
- Low inductance • Stable, dependable performance • Fully insulated • Capacity clearly stamped in mmf. for capacities under 1000 mmf., and in mfd. for capacities of 1000 mmf. (.001 mfd.) and over.

Order C-D Dual Ceramics from your Cornell-Dubilier jobber today. Write for catalog. CORNELL-DUBILIER ELECTRIC CORPORATION, South Plainfield, New Jersey.

OTHER PLANTS IN New Bedford, Cambridge and Worcester, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, Ohio.



CORNELL-DUBILIER

CAPACITORS

BEST BY FIELD TEST



SEE YOUR LOCAL CLASSIFIED TELEPHONE DIRECTORY FOR NEAREST C-D JOBBER



RECORDS SHOW THERE'S NO BOOSTER

LIKE... *SEC* BOOSTER

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The extremely high efficiency of SEC's newly designed tuned circuits eliminates the usual loss of gain on high channels, provides the ultimate gain and picture clarity on both high and low channels. SEC's superior design and rigid inspection by qualified engineers assure you the highest performance.

Available at your favorite distributor; however, if you are in one of the few areas not yet represented, send orders direct.



LIST PRICE
\$34.95

(Usual trade discounts apply)

SPECIFICATIONS

Tube complement:
Single 6J6
Coverage:
Channels 2-13 Incl.
In-put: 75-300 ohms
Output: 75-300 ohms
Current:
110-120V 60 cycles
Size: Height, 4 1/4"
Width, 6", Depth, 4"

STANLEY SALES

600 WEST THIRD

NATIONAL DISTRIBUTORS

OWENSBORO, KENTUCKY

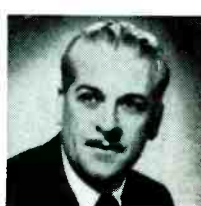
Rep Talk

PAUL ECKSTEIN, formerly sales manager of Hallieraters, has established his own sales rep organization in The Pure Oil Building, 35 E. Wacker Dr., Chicago, Ill. . . . Henry Lavin, Meriden, Conn. (New England states). Murphy and Cota, Atlanta, Ga. (North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi) and Lawrence Elliot Co., Cleveland, Ohio (Kentucky), have been named reps for Ram Electronics Sales Co. . . . Jack F. McKinney Sales Co., 1330 North Industrial Blvd., Dallas, Texas, has been named rep for the picture-tube division of the Allen B. DuMont Labs. Jack F. McKinney and Bob Nesbitt will cover Texas, Oklahoma, Arkansas, Louisiana and Mississippi. . . . Harold A. Chamberlin Co., 31 Milk St., Boston 9, Mass. (New England states) and Gassner and Clark Co., 6349 N. Clark St., Chicago 26, Ill. (northern half of Illinois and southern Wisconsin) have been appointed reps for Javex, Garland, Texas. . . . Haig Tatossian has been appointed manager of industrial sales for Land-C-Air Sales Co. . . . Donald E. Koorck (Albany and Hartford), Jack K. Sauter, (Buffalo, Rochester, Syracuse and Binghamton), Philip E. Cunningham (Nashville, Chattanooga, Knoxville and Birmingham), Robert F. Cage (Detroit, Saginaw, Lansing and Grand Rapids),

Daniel Gentile, Jr. (Kansas City, Des Moines, Sioux Falls and Denver) and Bryce S. Durant, Indianapolis, Milwaukee and Peoria), have been added to the field rep force of the RCA Victor home instrument department. . . . John F. Pero, formerly of the Burgess Battery Co., has joined the sales staff of Blair-Steinberg Co., 395 Broadway, New York 13, N. Y. . . . Intex Co., Inc., 303 W. 42 St., New York 18, N. Y., have been named export reps for Electronic Measurements Corp. . . . Marvin E. Nulsen, 5376 East Washington St., Indianapolis, Ind., has been named rep for the picture tube division of Allen B. DuMont Labs. in Indiana and the cities of Cincinnati, Ohio, and Louisville and Lexington, Kentucky. . . . G. S. Marshall Co., Pasadena 1, Calif. now represents Tensolite Insulated Wire Co., Sterling Engineering Inc., and Electronic Devices, in California, Arizona and New Mexico. . . . Henry W. Burwell has been elected president of the Dixie chapter of the Reps. Others elected were: E. L. Hollingsworth, vice president; and Frank C. Nickerson, secretary-treasurer.

Paul Eckstein

Les A. Morrow



James M. Pickett, 12 E. 78th St., New York City, has been elected president of the New York chapter of the Reps. Harry Finkelstein, 136 Liberty St., New York City, and Wally Shulan, 136 Liberty St., New York City, were elected vice president and secretary-treasurer, respectively. . . . Samuel N. Stroum, 610 19th Ave., North, Seattle 2, has become Washington and Oregon rep for Helipot Corp. . . . Perlmutth-Colman Associates, 1335 Flower St., Los Angeles, California, have been named reps for the Crest Transformer Corp., in California, Arizona and Nevada. . . . Robert B. Anderson, Anderson Sales Co., Boston, Mass.; Earl S. Dietrich, Earl S. Dietrich Co., Cleveland, Ohio; Marshank Sales Co., Los Angeles, Calif., headed by David N. Marshank and KaDell Sales Associates of Chicago operated by Harold KaDell and Steve Grimm, are now representing the General Transformer Company, 18240 Harwood Ave., Homewood, Ill. . . . Les A. Morrow Co., Cleveland, Ohio, has been named sales rep of Thomas Electronics for Ohio, Kentucky, western Pennsylvania and West Virginia. . . . Audicraft Inc., has appointed the Stang Sales Co., 509 Fifth Ave., New York, N. Y., to represent them in New York, New Jersey, Washington, Baltimore and eastern Pennsylvania. . . . G. W. Delzell, 643 Coombs Creek Drive, Dallas, Texas, has been appointed sales rep for the southwest territory of the Insuline Corporation of America, to cover Texas, Louisiana, Oklahoma, Mississippi and Arkansas. . . . J K M Incorporated, 510 N. Dearborn St., Chicago, Ill. is now representing Utah Radio Products Co., in the Illinois and Wisconsin area. Oden Jester and Bob Karet of the rep firm were originally connected with the Utah Radio, the former as vice president and the latter as jobber sales manager. . . . Cinema Engineering Co., Burbank, Cal., has appointed James J. Backer as its Pacific northwest representative, covering Oregon, Washington, Montana and Idaho, as well as British Columbia and Alaska. . . . E. V. Roberts and Associates, Los Angeles, has been appointed California, Arizona and Nevada rep for Audio Development Co., Minneapolis, Minn. . . . Albert M. Solen, 1225 E. 17th Ave., Denver, Colorado, is now Rocky Mountain and El Paso, Texas rep for the JFD Manufacturing Co. . . . Elliott Equipment Co., 712 Sixth Ave., South Minneapolis, Minn., has been named sales rep for the cathode-ray tube division of Allen B. DuMont Laboratories, Inc., and will cover jobbers in Minnesota, and North and South Dakota. Merrill K. Franklin is head of the organization.

Jack F. McKinney (center) and Bob Nesbitt (left), newly appointed sales reps for the DuMont cathode-ray tube division, being greeted by Bill C. Seales, general sales manager of DuMont's tube division, as they dropped in at the Teterboro, New Jersey, airport with the plane they use in making their calls in the southern and southwestern area.



TV ALIGNMENT JIGS[‡]

TV ALIGNMENT, which consists of injecting a signal of a known frequency and type into a certain point and examining how the receiver amplifies the signal at some output point, has confused many Service Men since it appears that a good connection to the output and input spots in a receiver seem difficult to attain.

A good positive connection at the input points should minimize the tendency for instability in a TV receiver during alignment.

Antenna Jig

When a signal generator, which normally has an output impedance of approximately 72 ohms, is connected to the antenna input terminals of a TV receiver, which usually has a 300-ohm impedance, an impedance matching device must be used. If there is a mismatch, standing waves will be produced around the connecting cable; thus this cable is said to be *hot*, and by touching the cable at any point, hand capacity will be introduced which changes the positioning of the standing waves and upsets all alignment results. When using a sweep generator the effects of mismatch can be very easily seen, since it can easily be noticed that the response curve shape changes when the connecting cable is touched.

To simplify this operation, an antenna jig can be used. In one model* there are 150-line elevator coils which step up the 72-ohm generator output impedance to the 300-ohm receiver input impedance. In addition, an attenuator pad, having a loss of approximately 60 db, is incorporated in the circuit to level off any slight mismatch which might occur due to variations in input impedance between individual receivers. This impedance matching network is mounted in a metal case and can be used with receivers that have two-screw terminals of antenna input, or with a short piece of 300-ohm line and 4-prong plug to fit the earlier antenna sockets. A threaded, female, receptacle is provided to connect to the cable assembly.

In an earlier jig model**, the impedance matching was effected by the use of carbon resistors instead of coils. The network was mounted inside of a metal can, and a 4-prong antenna plug was mounted on one side. For more

[‡] From Philco service notes.

* Philco 45-1736.

** Philco 45-1637, 145-1670, 245-1740, 245-1739.

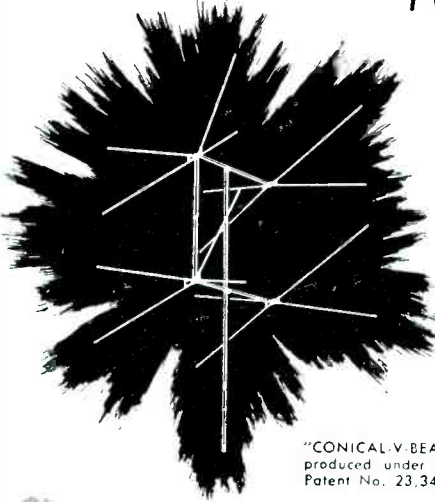
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universal use the jig could be equipped with a short piece of 300-ohm line and 4-pin antenna socket.

IF Jigs

To provide a connection to the mixer grid of tuners, an *if* jig is required. One type¹ can be used for this application by slipping the jig over the mixer-oscillator tube and letting a spring loaded contact come up against the mixer grid connection. If a tuner using a projection-type socket and larger

diameter tube shield is encountered, it is necessary to remove the larger tube shield and insert a smaller tube shield that will fit into the jig. Grounded connection is made by the shield contacting the inner surfaces of the projection socket.

This jig may also be used to contact the connection to the video *if* amp grids which are accessible from the top of Philco chassis (49-1150, 1450 series) through small holes near the *if* tube shields.

A supplement² is also available. This
(Continued on page 72)

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

TV Alignment

(Continued from page 71)

consists of a tube shield to which a prong has been fastened, and when combined with the *if* jig it can be used to inject signals into the mixer grid of all receivers, except the 8-channel tuner type.

Also available is an *if* jig³ which can be used to contact the mixer grids of newer-type tuners. It can be also used to contact the *if* grid test points which are of the button type and protrude above the chassis; some models of the 50-T1600 series.

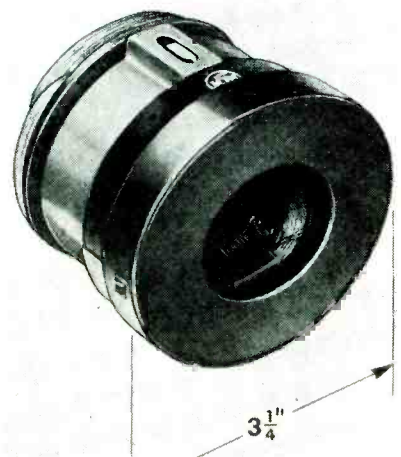
One of the most useful jigs is the *bias-box*, which can be made in the shop. Required is a 6-position switch, 3-prong plug, metal shell for plug, alligator clip, 4 small penlite batteries (1.5 v), and a metal case 6" x 4" x 2". Batteries may be fastened in place by using a thin metal strip that is secured by metal screws on each side.

It is suggested that an insulating material such as thin cardboard be placed around the inside of the case near the batteries in order to minimize the likelihood for shorting out.

The plug part may be connected to the *video test jack* of Philco receivers, using either a 3 or 4-pin test jack. The plug fits both sockets because one of the pins is clipped off leaving 2 whole pins. On 3-pin test jacks the plug should be inserted with the cut-off pin to the front, and on 4-pin test jacks with the cutoff pin to the extreme right. The jig provides a lead from the video detector output, and also provides access to the *agc* bus so that various negative voltages can be applied.

A 6-volt supply is used to simplify troubleshooting of the *agc* circuits.

WIDE-ANGLE YOKE

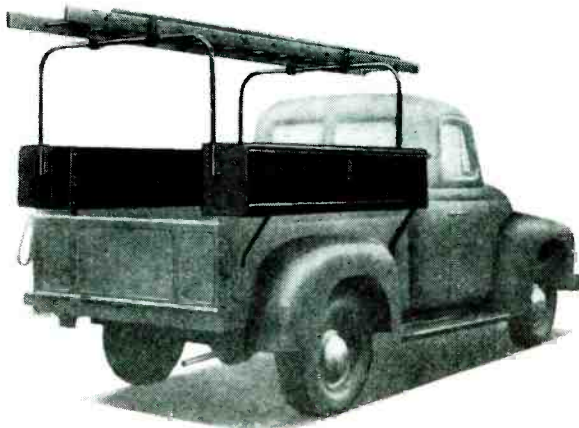


RCA deflecting yoke for use with 20- and 21-inch picture tubes.

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CREDIT MANAGEMENT

by JACK DARR

A WELL-KNOWN LECTURER, addressing a group of Service Men, once said: "You men are just about the world's best technicians, but the worst businessmen!" As a member of that group, we agreed with him, looking back over some of our past experiences. If you'll reminisce, you'll recall several business mistakes that were quite costly. A banker, discussing this problem, declared: "What's the use of doing a job, if you don't get paid for it?" One can't argue with that premise.

If there is no financial gain from a job, there must be something wrong. You're in the business to make a living for yourself and your family. The living is there, make no mistake! We all have an opportunity to make a very good living in servicing and most do!

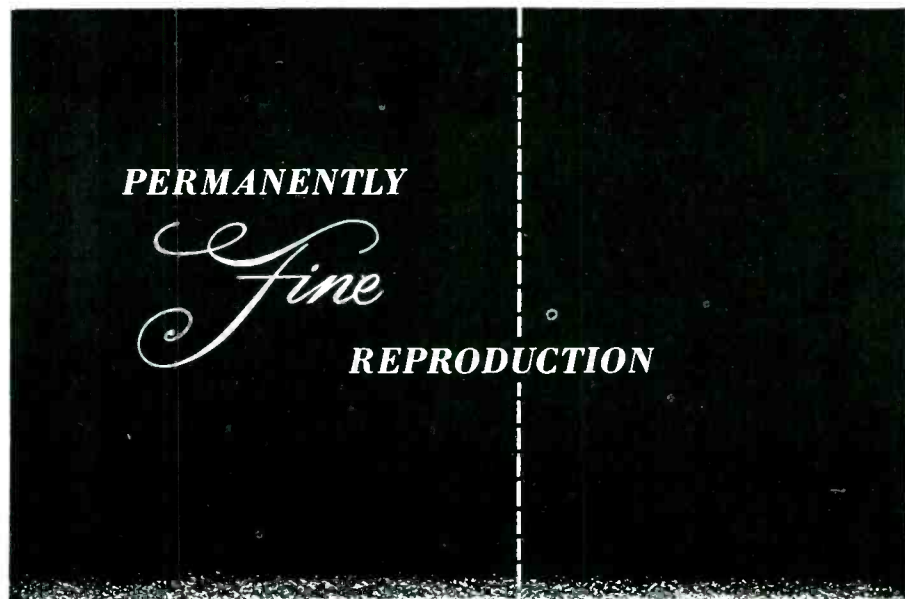
To capture and hold on to that financial gain, some sort of credit-control system is an absolute must, particularly for the one-man shop. It is perhaps more vital in the one-man operation than in a larger outfit. When making a service charge for a job, it is important to remember that this income must cover time spent, pay for parts used, a share of your overhead expenses, and a profit. If you fail to collect all or any part of this, you lose not only the cash invested in parts, but the time spent in doing that job.

This represents not only a lack of profit, but an actual loss, and adds to the overhead. Of course, there's one wee ray of sunshine; you can always deduct it from your income tax!

Some sort of accurate, easy-to-handle bookkeeping system is an essential, if you're to know anything about your financial standing. This is also necessary for the multitudinous price-control reports, sales-tax reports, and all the other Government statistical nightmares that burden the average businessman today.

The system must provide, concisely and accurately, the customer's name and address; make and model of chassis; date; parts used; services performed; and the price charged for each item. This will also provide a technical record of the job, and serve as a basis for making guarantee adjustments, should they become necessary at a later date. This information is best kept on a *job-card*.

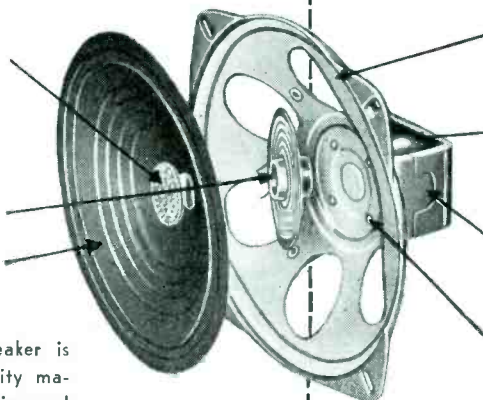
In our shop a three-part tag is used. Printed locally on card stock, it pro-



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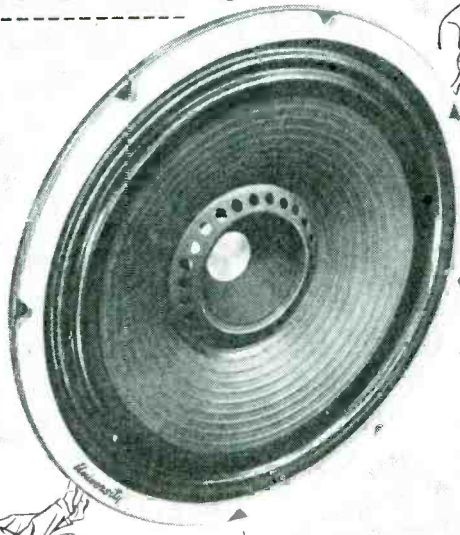
vides (1) a claim-check, with the shop name and a short advertising message; (2) an identification tag and (3) a 3 x 5 job-card. When a set comes in, the claim-check is detached and given to the customer, and the two remaining parts attached to the cabinet with a bit of scotch tape. After the set is completed, the job-card is detached, and all necessary information filled in on a typewriter, leaving the identification tag on the set. The job card is then filed.

A small metal card-file is used, al-

though a cardboard box of suitable size could be used. In the front, are an alphabetical set of index cards and behind are a set of numerical index cards, from 1 to 31, and then a set of cards for each month. As a job card is filled out it is filed in the front section under the customer's name. All cards in this section are unpaid. When the set is called for or delivered, if it is paid for, the card is pulled, marked *pd*, and the figures are entered in the daybook, under the current date. If

(Continued on page 74)

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Credit Management

(Continued from page 73)

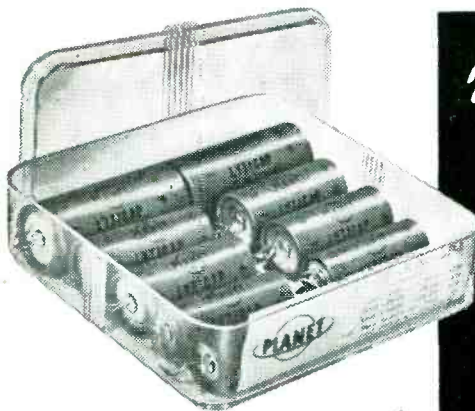
the set is delivered, but not paid for, the card goes back into the file, with a pencil check in the corner.

At the end of the month, all cards in the unpaid file are pulled, stacked in order, and the statements made out from them. The cards are then returned in a group to the very front of the file, under a heading *unpaid*. As the statements are made out, an alphabetical list of names and amounts should be prepared. These can be delivered personally, checking off the amounts paid on the list. This has been found to avoid confusion as to which bills are paid and which are still unpaid. The cards are then pulled from the unpaid group, marked *pd*, and filed in the numerical file, under the current date. All cards in the date-file should be paid.

Cash collected daily, or at the end of the month, is entered in a daybook, which is a simple ruled ledger, with two columns. Separate headings are made for *parts* and *service*. Parts charge appear on one side, name in the center, and service charge on the other. This is a necessity, if you're in a state with a sales tax. In our area the tax is on parts charges only. To find your gross income, at the end of each month, it is only necessary to run up the two columns of figures on the nearest adding machine, and there you are!

Expenses can best be kept track of in a separate book. This doesn't have to be a big book. A separate category must be set up on each page, such as *rent, heat, lights, automobile expenses, radio parts and tubes* or anything else that is necessary. Deductible expenses can also be set up in one section, and the non-deductible in another. This might seem like quite a bit of trouble, but actually, in practice it becomes almost automatic, and when income tax time rolls around, you'll certainly be glad you took the little time needed to get your records in this shape. You'll be surprised at the amount of money that can be saved on your taxes, by having every penny spent for business purposes itemized. With these records available, you can even make out your own income tax returns, in about a half-an-hour, if you want to!

The extension of credit on service work must be watched very carefully. As a rule, about the only absolutely safe credit risks for a Service Man are established radio dealers or other businessmen in your town. Their credit must be pretty good, or they wouldn't



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still be in business! Steadily employed persons or reliable independent mechanics, etc., are usually good risks. Talk to your fellow merchants; especially the older men who have been in business in town for some time. They probably have had most of the bad credit risks and can reveal them to you in a flash. Don't be too easy in granting credit, especially to unknown persons; once you get a reputation as an *easy mark*, you'll find yourself with all the business you can take care of, but very little cash to show for it! Bitter personal experience can attest to that fact!

Financing of New Equipment

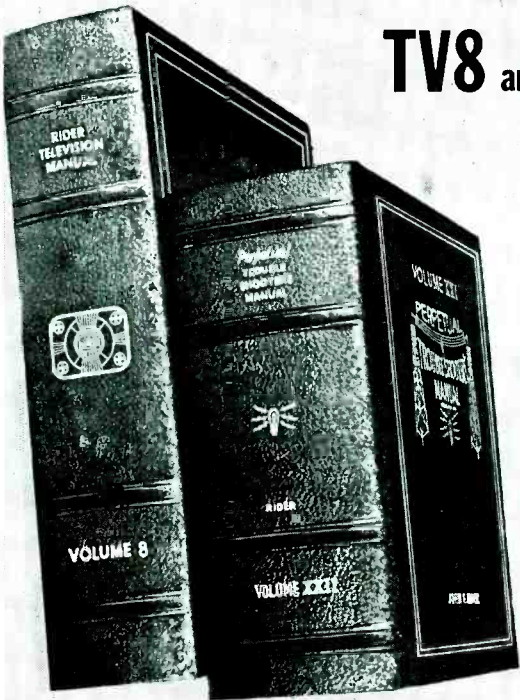
You might run into the problem of financing the sale of new gear, such as small sets or sound equipment, etc., if you sell any, and most of us do. In our opinion, the best place to take care of this is through your local bank. Your banker should be told all about your problems, disclosing the details of your proposed operations. You'll probably find him to be most cooperative. Find out how much interest you'll have to add, when writing out contracts, what the minimum monthly payments and down payments will be, and how much you'll be expected to keep in reserve, as a guarantee against non-payment of accounts.

This is the way the process works: First the contract is made out on an approved form, available at your local printing shop. Required are the serial number, make and model of the chassis, and the customer's name, address and occupation. The latter data are extremely important, since it is one of the first items your banker will ask you when you take him the contract. In filling out the contract form, it is important to be sure to add the interest and sales tax, if any, and explain all this to your customer, before he signs it. In this way, you'll be freed from that complaint: "Where'd that charge come from?" After all this is properly signed, one copy is given to the customer, and the other copy or copies go to the bank. At the bank an assignment form is signed; this is printed on the back of the form. When this is signed, you are guaranteeing payment of the unpaid balance, in case the customer fails to do so. In other words, you're assuming that the customer will pay, just as if you were helping him to borrow the money from the bank. Therefore, it is to your interest to see that the customer repays the note, for if he doesn't, you're responsible. Your interest in the note is secured by the value of the merchandise purchased, and the title to the equipment actually remains with

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you until the note is paid in full. Arrangements should be made with the bank to assure notification if any of the radio *paper* becomes delinquent, so that you can take action to repossess the equipment, if that should be necessary. This is a case where individual judgment of each contract becomes necessary. In one instance, repossession may be the only answer; in another, a short extension of time may result in a paid-up contract. Your familiarity with the circumstances, and the banker's knowledge of the character of the individual customer is the only thing that will guide you in these cases.

It is important to be sure that arrangements are made with the bank

whereby no contract will be released to the customer, if you have had to make one or more payments on it. If a contract like this is released to the customer, marked *paid*, you have no legal recourse. It becomes a matter of the integrity of the individual customer, and on occasion you'll find one without this property, so that you'll be left holding the bag losing enough money to remove all profit from the transaction.

One of the besetting sins of the Service Man in financial matters, is pure inertia. In other words, the boys would much rather poke around an intermittent portable on the bench, than

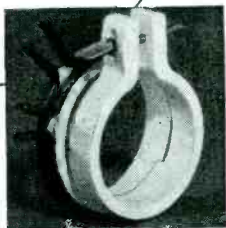
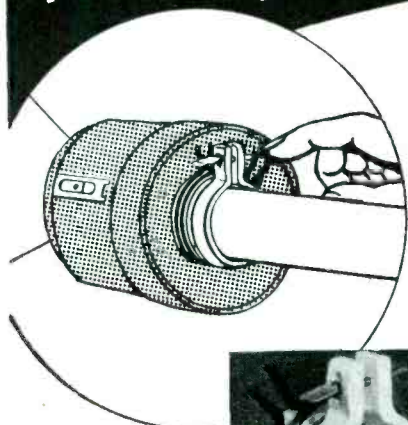
(Continued on page 76)

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Credit Management

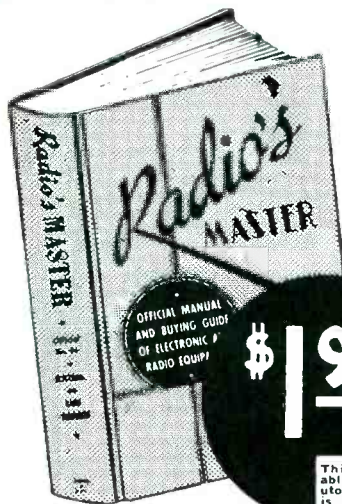
(Continued from page 75)

go running around town with an armful of bills, annoying people. *Don't do it!* Leave that portable sitting there, get that armful of papers, and get out to your collecting. The portable will still be there when you get back, and probably won't have cut out by that time, either! If you're going to be able to pay all *your* bills, you're going to have to get out and collect the money due *you* for your work! Never be bashful about presenting anyone with a bill, either. You haven't done anything of which to be ashamed! You have done an honest job of work, made a fair charge for it, and you're entitled to your money. Simply walk up to the man, hand him the bill, and make some pleasant little remark about it. Of course, if he happens to be one of your best friends, a cheerful insult or two is quite permissible. By the way, don't argue about a bill, especially in public! If the customer wants to give you an argument, ask him to come around to the shop, where the records can be checked, and do your arguing there. We've found this to be a pretty good method. If you encounter a dispute about a bill, say jokingly: "Well, you know, I *might* have made a mistake about it, at that. Come on, let's run over to the shop and look up the job-card. Might have copied it wrong." Then, after you get him there, show him the card, and tell him: "No, sir, I was right. I was sure I'd made a mistake, but there it is! I wrote out this card right after I fixed the set, and there's what we did to it, and there's what we charged for it." Most of them will fold up. You'll also run into the complaint: "It ain't worked since you fixed it! It's worse'n it was!" Strangely enough, this is very seldom heard on paid-up gear. It seems that only sets with unpaid service bills develop this complaint! Therefore, it is suggested that the complaint be taken with several large grains of salt. Ask them to bring the set back to the shop for checking. Maybe a *tube has blown out* or something. Once you get it back in the shop, if circumstances warrant, you can hold the set until the bill has been settled.

In summation, your business methods should be identical with your technical methods. They will only be as efficient as the time and trouble you put into them! Pay attention to your bookkeeping, and to your collections, and you'll find it will be a lot easier to buy that new 'scope when you need it!

You'll find it

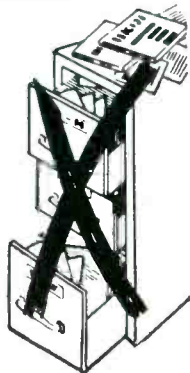
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UHF for TV

by P. SELVAGGI

ON THE ULTRAHIGHs, there are many delicate reception problems. These frequencies require a more direct line-of-sight transmission than do the present TV frequencies. In addition, the signals at these frequencies do not penetrate obstructions as well, and consequently the received signal strength can be reduced in many areas.

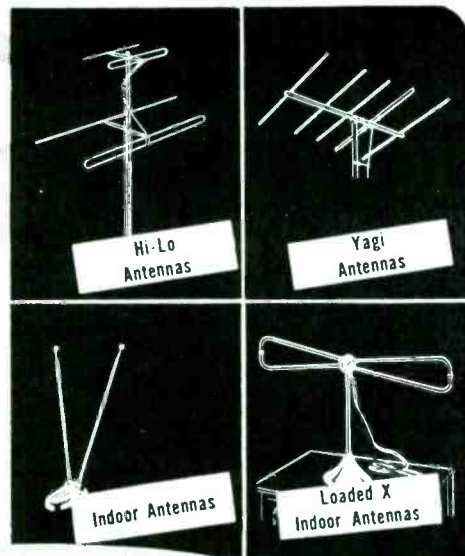
Another problem with the use of such high frequencies is that of reflections. Wavelengths at these high frequencies are so small that any small obstacle may cause a reflection back to the antenna, causing a cancellation or reinforcement of the signal. Thus, if the antenna is moved a quarter wavelength, in such circumstances, the signal strength will vary considerably. A quarter of a wavelength at 500 mc is approximately 6" and at 900 mc a quarter-wavelength is 3 1/8". At these short wavelengths wind sway also becomes an important problem. If an antenna is placed in an advantageous position a movement of only 6" caused by the wind will cause cancellation of the received signal. The installation of antennas at these high frequencies will become something of an art. Great patience and care will have to be exercised in determining a good location. Once its location has been chosen, the antenna will have to be fastened very securely to prevent wind sway.

Use of the higher frequencies has some advantages, however. The shorter wavelengths will make it possible to reduce the physical size of antennas saving space and making it possible to use antenna arrays. Arrays give greater gain and directivity characteristics, which are very important on *uhf*. Greater directivity helps in eliminating ghosts and other random interference. The greater gain is important because the signal strength at *uhf* is likely to be less than the *vhf* signal strength. The size of an antenna array

(Continued on page 87)

a model
to fit any
application

the antenna job hasn't
been found that a C-D SKYHAWK
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TV ANTENNAS



CORNELL-DUBILIER offers you, the discriminating serviceman, a line of antennas unequalled in completeness. Regardless of the application, regardless of the situation, there is a C-D SKYHAWK ANTENNA to fill the bill. Don't risk inferior substitutes when you can be sure of the painstaking construction and outstanding performance of CORNELL-DUBILIER antennas.

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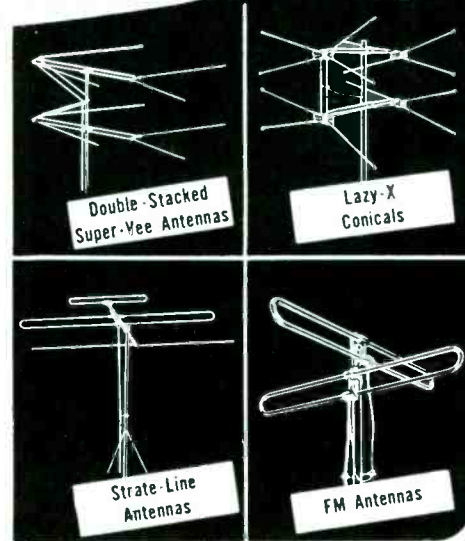


Fig. 1 a and b: Comparison of a *vhf* dipole with an array at *uhf*, a representing halfwave dipole for 70 mc and b, three halfwave dipoles spaced half-wavelength apart for 700 mc.

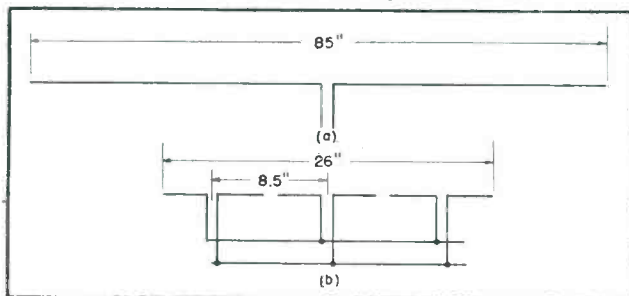
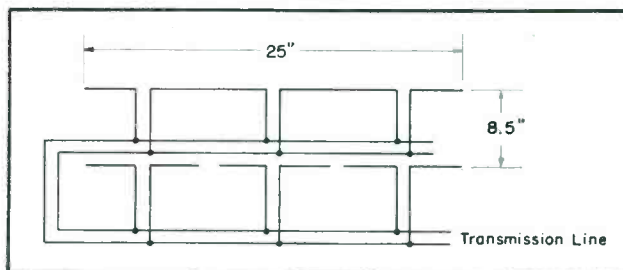


Fig. 2. Vertically and horizontally stacked array of dipoles for 700 mc.



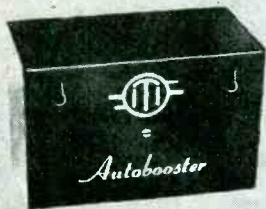
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FULL, 5 MC BANDWIDTH
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IT-75A Fully Automatic, All-Channel AUTOBOOSTER—Up to 19 db (9 times) gain • Separate inputs for high and low band antennas or single high-low antenna • May be peaked in the field for maximum performance on any channel • Installed at rear of receiver.



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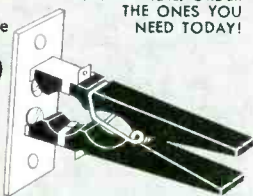
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TV Parts

[Additional new-product news on pages 46 and 84.]

B-T 8-OUTLET DISTRIBUTION UNIT

An 8-outlet distribution unit for all-channel use, model *DA8-1M*, has been announced by Blonder-Tongue Labs, 38 N. Second Ave., Mt. Vernon, N. Y.

Unit has four TV set outlets on the front, and four on the rear. Includes screw-type terminals that will handle both 75 and 300-ohm lines. Matching transformers are built-in.

Unit employs three 6J6s and one 6BC5. Units can be connected together, it is said, to form a system to supply up to 2000 TV chassis.



CLAROSTAT TV BALLAST

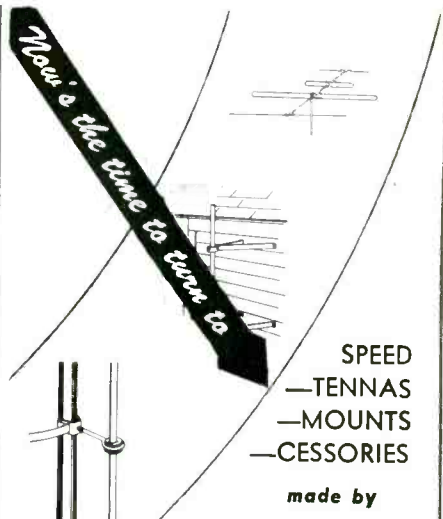
A TV ballast, B917571, has been added to the line of replacement parts of the Clarostat Manufacturing Co., Inc., Dover, N. H.

WALSCO MAGNESIUM CROSSARM ANTENNA

An antenna, model *M*, featuring cross-arms of chromate-coated magnesium, that is said to have a structural strength almost equal to steel and to be one third lighter than aluminum, has been announced by the Walter L. Schott Co., 3225 Exposition Pl., Los Angeles 18, Calif.

Elements of antenna are of aluminum, reinforced with Swiss *permalun*.

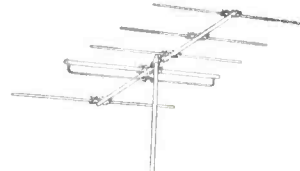
Included is a signal director which is claimed to improve the gain on high-band channels and to eliminate ghosts. Antenna also features an insulator, which is guaranteed unbreakable under all operating conditions.



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—MOUNTS
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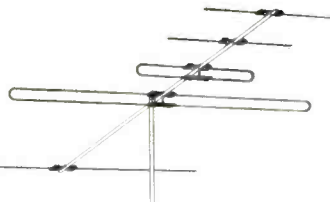


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Quick-rig . . . tremendously high gain . . . maximum performance in fringe areas. Sturdy, trouble-free construction—exclusive mast clamp design prevents turning or canting.

PAR-5 INLINE

High sensitivity . . . excellent reception in toughest fringe areas . . . gain equivalent to stacked antennas of most types.



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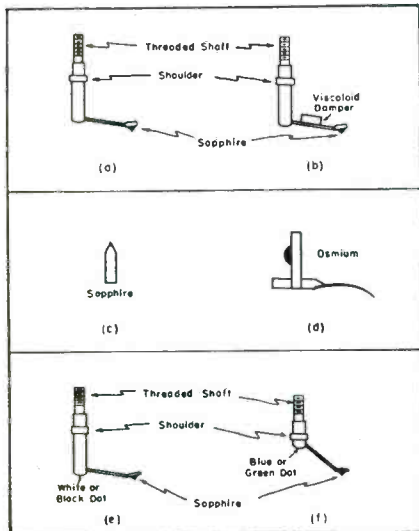
4

**QUICK-SELLING
FEATURES**

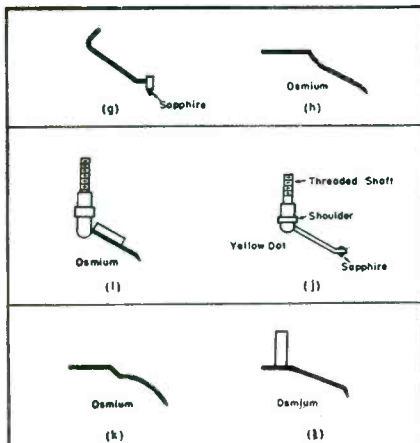
- Vastly improves reception of television sets.
- Rejects and reduces "Ghosts," Noise and "Snow."
- Provides additional pickup.
- Enhances any room with its rich appearance.

Audio

(Continued from page 23)



Above and below: Characteristics of replaceable styli for crystal pickups used in RCA phonos. The needle arrangement shown in *H* and *I* can be used for 33 1/3 or 78. However, they are marked red for 33 1/3 use and plain for 78 use. The types shown in *A* and *B* represent those discontinued at the present.



due to the motion of the needle point as it follows the groove, will be only .0009. This extremely slight motion of the needle must, therefore, generate a voltage sufficient to drive an amplifier.

Thus, to play any type of record a reproducer must now have adequate output; high effective compliance of needle and driving system; minimum needle pressure to reduce needle and record wear; freedom from distortion; and ability to operate under adverse humidity conditions.

To meet these requirements, in one instance, there was developed an all-purpose crystal and included in a series of changers.¹ Featured in this


(Continued on page 80)

¹Philco models M-20 and M-22.

Designed for YOU!

the V-M tri-o-matic[®]

950 record changer



This one compact unit is the "heart" of the V-M tri-o-matic—the complete basic mechanism! Simplest to operate—and service—of any 3-speed changer on the market, the V-M tri-o-matic 950 is the ideal unit to replace obsolete one and two-speed changers.

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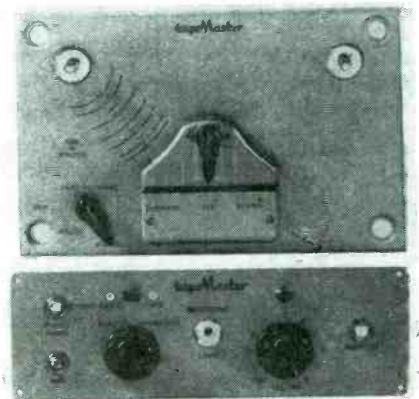
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(Right)

Tape transport mechanism and matching preamp-bias erase oscillator. The mechanism operates at a tape speed of 7 1/2 inches per second and incorporates both fast forward and fast rewind, single switch control, and an oversized motor. The preamp unit incorporates a push pull bias-erase oscillator, inputs for both radio-phonograph and microphone, outlets for amplifier and headphones, master switching and neon recording level indicator. (Models TH21 (transport mechanism) and PA-1 (preamp)); Tape Master, Inc., 13 W. Hubbard St., Chicago 10, Ill.)



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Audio

(Continued from page 79)

crystal were two new developments, clamping of the crystal and driving of the crystal blank.

Generally, a crystal is clamped on only one side. In this system the crystal was rigidly clamped on two adjacent sides. With this clamping the voltage was found to be increased, the waveform improved, and in addition an absence of distortion in the higher frequencies prevailed.

In the driving of the crystal blank, a mechanical-lever system was used, to provide the necessary mechanical

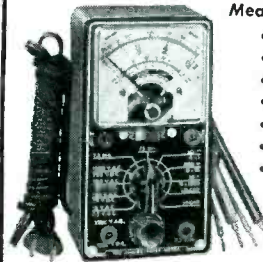
Below

Matching transformers designed to match the dual projector and paging and talk-back type speakers to either constant-voltage (70-volt line) or constant-impedance systems. Transformers are mounted in a heavy steel protective housing that is said to prevent mechanical or atmospheric damage. Double rubber grommets and gaskets protect the cable connections entering the transformer housing. Bracket is claimed to be easily integrated with the speaker mounting bracket. Power-handling capacity of both models is 12 watts. Model T-11 transformer primary is for 500, 1000, 1500 and 2000 ohms; secondary for 4 and 8 ohms. Model T-12 transformer primary for 45 ohms; secondary is for 4 and 8 ohms. (Weather proof-line transformers; Atlas Sound Corp., 1449 - 39th Street, Brooklyn 18, N. Y.)



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The most complete and compact multi-service instrument ever designed!



Measures:

- Voltage
 - Current
 - Resistance
 - Capacity
 - Reactance
 - Inductance
 - Decibels
- Plus Good-Bad scale for checking the quality of electrolytic condensers.

Specifications:

D.C. Volts: 0-7.5/75/150/750/1500 Volts.
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 0-10,000/100,000 ohms. 0-10 Megohms.
 D.C. Current: 0-7.5/75 Ma. 0-7.5 amperes.
 Capacity: .001 Mfd.-.2 Mfd. .1 Mfd.-20 Mfd.
 Electrolytic Leakage: Reads quality of electrolytics at 150 Volt test potential.
 Decibels: -10 Db. to +18 Db. +10 Db. to +38 Db. +38 Db. to +58 Db.
 Reactance: 15 ohms-25 K ohms 15 K ohms-2.5 Megohms.
 Inductance: .5 Henry-50 Henries 30 Henries-10 K Henries.

Handsome round cornered molded bakelite case 3 1/8" x 5 7/8" x 2 1/4" complete \$21.40 with all test leads and instructions.

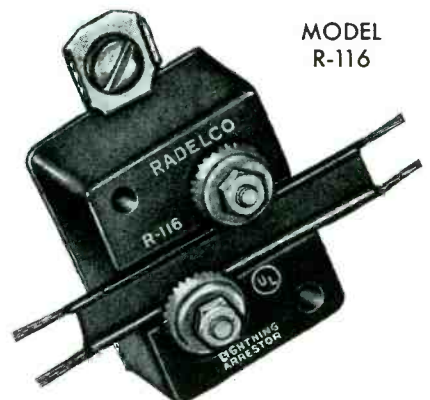
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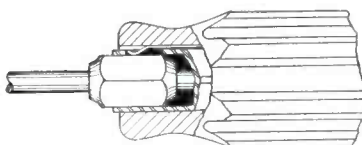
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It holds the blade in the handle by friction—a spring imbedded in the handle with a hex bushing, puts pressure on the hex part of the blade. Simple, positive, foolproof! Handle still fits any XCELITE hex blade—still makes an ideal 7/16" nut driver for mounting TV antennas. Now in all CK-3 sets.



Section thru Hex Bushing showing leaf spring holding blade in place

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advantage required to drive the crystal with the available lateral amplitude of microgroove records.

The folded-lever system was found to make it possible to house the unit in a case of small dimensions, thus helping to keep the mass of the cartridge low. The high compliance coupled with low stylus force was found to provide low needle talk, low scratch and low distortion.

Diamond Styli Replacements

Diamond styli are now available on request for all phono replacement needles listed as sapphire tips from M. A. Miller.

In the case of dual tipped replacement needles, Miller says the long play one-mil tip will carry the brunt of extreme wear. A compromise is therefore offered with three mil standard tip of sapphire and a one mil tip of diamond to effect an economy of original purchase price.

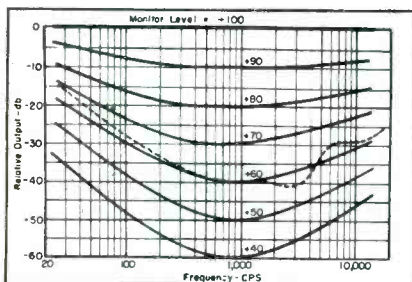
The Language of Acoustics*

As late as the early '30s, the language of acoustics was still in a state of flux, even though the modern science of electro-acoustics started in '17 with the development, by E. C. Wente, of the capacitor microphone, which was of relatively high quality and dependability. This device as a measuring device, and loudspeakers covering the audible range, were developed in the late twenties and thirties.

The lack of standard definitions, in the early days of audio, as cited a few months ago in these columns, not only led to confusion among readers of acoustical literature, but to loose thinking on the part of the scientists developing acoustical techniques. In architecture, for example, the term *absorption* might have referred to the amount of power absorbed when sound strikes a piece of material used in lining an

* From a report presented in the American Standards Association journal *Standardization*.

(Continued on page 82)



HEART **OF A** *good* **RECORD-CHANGER**

It's General Industries' turret-type, 3-speed motor, currently being supplied to record-changer manufacturers.

In this highly efficient design, turntable speeds of 33 $\frac{1}{3}$ —45 and 78 RPM are secured through three separate pulleys mounted on a turret plate. By means of a simple lever, the desired pulley is brought into contact with the idler wheel. The two pulleys not in contact with the idler wheel remain stationary.

In addition to this turret-type motor, General Industries also offers the popular Model TR turret-type, manual 3-speed motor, as well as the Model TS belt-driven 3-speed motor for both manual and record-changer applications. Write today for full information on all models.

General Industries also offers a complete range of single and dual-speed phonomotors to meet every phonograph and record-changer requirement. Complete details on request.

The GENERAL INDUSTRIES Co.
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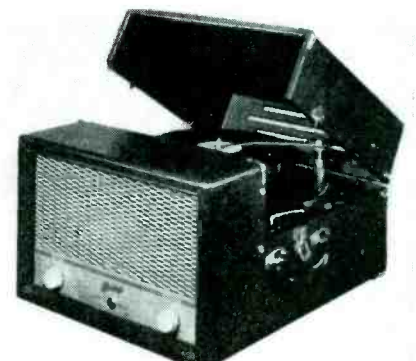
Left

Response curves for a loudness control at various settings. Monitor level figures represent the actual listening level at which compensation most closely follows the Fletcher-Munson curves (hearing standard) one of which is shown dotted for a level of +60 db. The normal listening level in the average living room ranges from +65 to +75 db.

(Courtesy IRC)

Right

Phono with a 5-watt amplifier, Webster changer and a 6" x 9" Alnico V pm speaker. Plays 33 $\frac{1}{3}$, 45 or 78 rpm records. Operating panel includes a tone control, volume control and pilot light. A kickproof metal grill protects the speaker. (Model RC-12; Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, California.)



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Of SERVICE published monthly at New York, N. Y. for October 1, 1951.

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(Signed) LEWIS WINNER, Editor

Sworn to and subscribed before me this 24th day of September, 1951.

(Seal) Catherine C. Pons, Notary Public

enclosure. Or, it might have referred to reduction in the sound pressure as a sound wave is reflected by a piece of material. Or, again, it might have been referred to the change in the length of time a sound would persist in a closed room lined with sound-absorbing material. Nor was it clear whether the term was being used in reference to a plain sound or a diffused sound wave. Because of this lack of definition, the importance of these factors in the measurement of acoustical properties was easily overlooked. Today, *sound absorption* is defined as . . . *the process by which sound energy is diminished in passing through a medium or in striking a surface.* A square foot of perfect absorption has been given the name of one of the early experimenters in architectural acoustics, *Sabin*. And the term *sound absorption coefficient* has been assigned to mean . . . *the fraction of incident sound energy absorbed by the surface or medium.* The time required for a sound to decrease after the source of the sound is stopped is now known as *reverberation time*. A room designed to absorb sound, sometimes called an *anechoic chamber*, has been given the name *dead room*.

Work on acoustical standards start-

Audio

(Continued from page 81)

ed in '32, when a committee was set up by the Acoustical Society of America to work on terminology, scales and methods of measurement. As a first requisite, the committee started with standard definitions of the terms to be used. Organized under the procedure of the American Standards Association, this committee brought together scientists and technical experts from every important group concerned with the science of acoustics. It produced tentative standard definitions in '36, and followed in '42 with a revised and expanded edition.

Early Problems

Both these editions went as far as they could at the time in codifying the terminology and definitions that could be agreed upon. As far as architectural acoustics is concerned, the science was well enough advanced by '36 so that no new changes were found necessary in future editions. In other fields, however, rapid advances appeared. Thus, it was necessary to compile a new set of standards, recently completed, which includes terms on

recording and reproducing, on underwater sound, etc.

The new edition was prepared in cooperation with the technical committee on electroacoustics of the IRE, as mentioned in earlier articles.

The new standard presents lucid definitions of such term as *ultrasonics*, now defined as sound in the frequency range above about 15 kc per second. And *supersonics* has been described as the *phenomena associated with speed higher than the speed of sound*. These terms have frequently been used interchangeably. The use of ultrasonics in testing steel, rubber, and similar materials has made it possible to check on the strength of these materials without testing to destruction. Because of its very recent development, only a small part of the language associated with the science of ultrasonics has been codified.

Definitions of the terms applying to use of ultrasonics in locating objects and measuring distances under water have been complemented by data on standard sea water conditions.

New Concepts

Despite the fact that hearing and speech may be considered the oldest and best established of any field of

acoustics, the section on hearing and speech now includes several important changes in bone concepts. The term *phonetic speech power* which called for a test for 1/100 second, is not in the present edition, since the interval of time is no longer considered important. Instead, the definition of *threshold of audibility* outlines in general terms the method of determining . . . the *minimum effective sound pressure . . . that is capable of evoking an auditory sensation*. The earlier edition expressed this concept in terms of the sound pressure of a sinusoidal wave.

Industrial Use of Acoustics

The industrial use of acoustics has been taken into consideration in the standardization of the term *mel* as a unit of pitch and of *sones* as a unit of loudness. These are subjective units which reflect the listener's reaction to changes in frequency and sound intensity. No longer is it necessary to calculate pitch and loudness on a logarithmic scale. Both the *mel* and *sones* are calculated on an arithmetical basis. Thus, if a sound rises to twice its original pitch, the new pitch can be expressed in double the number of *mels*. If a sound increases three times in loudness, it can be expressed in three times the number of *sones*.

Section on Music

The subjective and objective approaches to acoustics have been combined in a section on music. *Tone* is now defined as both a . . . *sound wave capable of exciting an auditory sensation having pitch* (reflecting the scientist's objective viewpoint), and as a . . . *sound sensation having pitch* (reflecting the musician's and psychologist's subjective interest).

The '51 edition also reveals that the standard pitch of *A* above middle *C* has been maintained at 440 cps. Several years ago this standard seemed to be threatened when an Austrian delegation to UNESCO proposed international adoption of 435 cps. However, 440 cps already had been widely accepted as an international standard on recommendation of a committee of the prewar International Standards Association. In Great Britain, it is broadcast each morning as a guide for British musicians, and here it is broadcast frequently by the Bureau of Standards over WWV. American jazz bands have been credited in some quarters with the responsibility for the 440 standard pitch. Fearful of being considered flat, they tuned up their instruments higher and higher on the sharp side. Standardization of the

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pitch at 440 in the '36 edition arrested the tendency toward higher and higher tuning—a boon to piano manufacturers, particularly.

The standard not only defines acoustical terms used in music, but also provides tables of intervals (just intervals, small intervals and equally tempered intervals), as well as frequencies of the tones of the usual equally tempered scale based on the *A* of 440 cps.

Recognizing the trend toward the use of the meter-kilogram-second sys-

tem of units, the standard provides a conversion table to help in converting *cgs* acoustical units into the *mks* system.

General Definitions

In addition to the terms used in only one field, which are listed in the individual sections, a general section defines terms used in more than one field. *Reverberation*, for example, used to apply only to architecture; now it is also used in connection with underwater sound.

Kenco Mounts

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265 Colfax Avenue
Kenilworth, N. J.

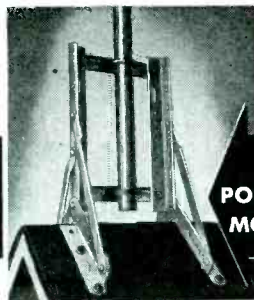


**KENCO
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MOUNTS**

Easily mounted on hanging rafters or trim boards of eave. Eliminates need for drilling into brick or masonry walls. Ideal for buildings with extended roofs. Hot dip galvanized.

Available in 3 sizes:

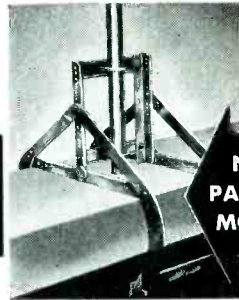
- Model #135 22" Eave Mount
- Model #136 28" Eave Mount
- Model #137 48" Eave Mount



**ALL
POSITION
MOUNTS**

A strong, self supporting mount for peak, slope, side wall, corner or flat mountings. Positive locking braces eliminate need for guy wires in many installations. No blocking or shimming necessary.

- Model #105 ... For masts up to 1 1/2"
- Model #101 ... For masts up to 2"




**NEW
PARAPET
MOUNT**

The KENCO Parapet Mount gives positive anchorage to apartment house walls without damage to building. Powerful clamping action insures safe installations. Shipped assembled. Quickly installed. Hot dip galvanized.

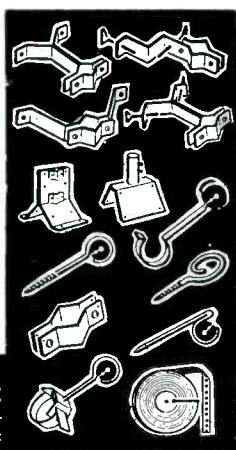
- Model #106 ...
- For walls up to 1 1/2" thick.

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JFD TV-SET COUPLERS

TV couplers, *Tele-Plex*, that are said to deliver full signal strength to two, three or four sets using the same antenna, has been developed by the JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y. Each unit has a built-in lightning arrester.

Available to couple two 300-ohm sets to a 300-ohm antenna, *TC21-300*; to couple four 300-ohm sets to a 300-ohm antenna, *TC4L-300*; and to couple four 72-ohm sets to a 300-ohm antenna, *TC4L-72*.



DUMONT FM/TV TUNER REPLACEMENT

A plan, promoting the installation of FM tuners, with *Inputuners*, and providing a trade-in allowance on present tuners, has been announced by the electronic parts department, Allen B. DuMont Laboratories, Inc., 35 Market St., East Paterson, N. J.

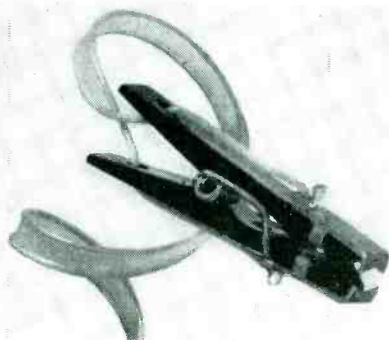
TV Parts

[Additional new-product news on pages 46 and 78.]

ITI TENNA-CLIP

A TV antenna clip, *Tenna-Clip*, that provides positive connection to standard screw-type antenna posts for 300 ohm lines, has been announced by Industrial Television, Inc., 359 Lexington Ave., Clifton, N. J.

Manufacturer claims clip will not short out, provides strain relief, and a permanent connection. A free sample is available upon request on business letterhead.



DU MONT 21" TV PICTURE TUBES

Two all-glass 21" rectangular TV picture tubes, *21EP4A* and *21KP4A*, have been announced by the cathode-ray tube division of the Allen B. Du Mont Laboratories, Inc., Clifton, N. J.

Both types employ the same all-glass bulb which results in a picture area of 242 square inches. The screen face is made of filter-glass for minimizing reflections and improving contrast.

The *21EP4A* employs the Du Mont bent-gun for electromagnetic focusing. A single-magnet ion trap is used. Type *21KP4A* is of the new *selfocus* type requiring no focus controls or circuitry. It may be used as a replacement for either electromagnetic or electrostatic focusing types.

* * *

G-C PICTURE TUBE EXTENSION

A picture-tube extension, *8689*, is now available from General Cement Manufacturing Co., 919 Taylor Ave., Rockford Ill. According to G-C, the chassis can be removed without disturbing the picture tube, and the picture tube mounted away from the chassis allowing flexibility in custom built TV cabinets. Extension is four feet in length and heavily insulated with positive contact receptacles.

Identifying Unmarked Power Transformers

by MELVIN C. SPRINKLE

EVERY SO OFTEN a Service Man runs into the problem of identifying the windings on an unmarked power transformer. The item might have come from the emergency inventory, the manufacturer's sheet might have been lost or perhaps the leads have become discolored, all contributing to slight bewilderment. It has been found that a systematic procedure can be employed to solve the problem and quickly identify the windings, without damaging the transformer.

Steps Involved

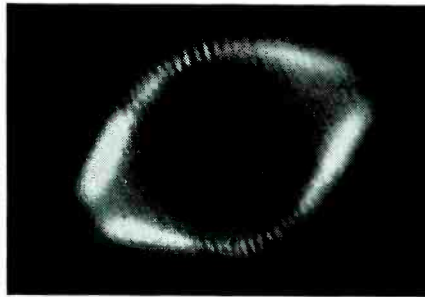
First, it is necessary to check the terminals or leads with an ohmmeter to establish the continuity of the various windings. If there are leads, the insulated parts should be twisted together so as to have each winding in pairs. The ohmmeter check will also establish the leads which are center taps in the case of high voltage windings. It will also be wise to check the *dc* resistance of each winding to case, since some transformers have direct connection between case and center taps.

Then the *dc* resistance of the various windings should be written down. The old memory should not be trusted. It will be found that the high voltage will have the highest resistance, usually 100 ohms or more. The center tap will show approximately the same resistance to each end. If the *dc* resistance of the high voltage winding is more than 250 ohms each side of center tap, then the unit is either a very high voltage winding, or more likely the high voltage winding is corroded and likely to fail.

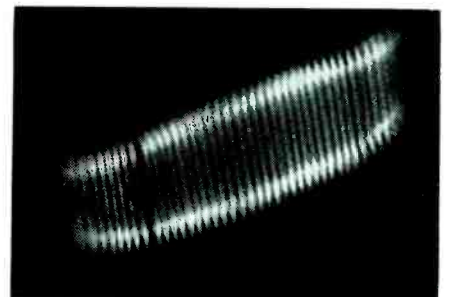
The primary should have no more than 10 ohms and may be less. Heater and rectifier filament windings will have very low resistance.

In the third step, a 50-watt 115-volt lamp connected in series is used and the suspected primary is connected to the 115-volt *ac* line. If the winding is the primary, the lamp will not light, or at best light very dimly. If the winding is not primary, the lamp will light to almost full brilliance. *Caution:* Stay away from the high voltage winding. If the primary is shorted, or has shorted turns, or if any of the secondary windings are shorted either completely or partially, the lamp will glow more brightly or light up to full brilliance.

Why G-E dial lamps are seen

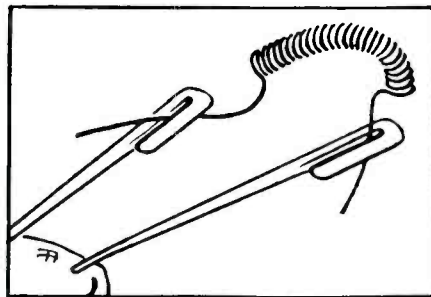


OLD FILAMENT. High notes often cause the filaments and lead-in wires of radio dial lamps to vibrate. In old-style lamps, they vibrate to frequencies different from those of the noise. This produces a whipping action (above) which eventually tears the filament apart.

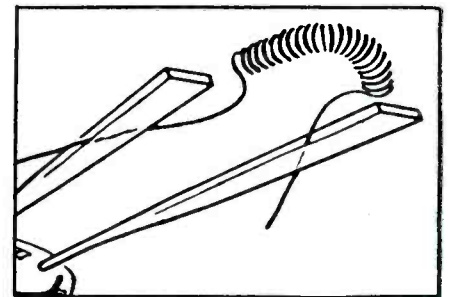


NEW FILAMENT. By redesigning the filament supports of G-E radio dial lamps, General Electric engineers matched the frequencies and greatly reduced the effects of vibration (above). As a result, G-E radio dial lamps give longer, more dependable service.

... but not heard



OLD-TYPE JOINT. Some types of dial lamps actually cause "static". Old-type clamp joints in the bulb (above) often permit changes in resistance or tiny arcs that cause the lamp to radiate bothersome interference.



IMPROVED JOINT. To prevent dial lamps from being "noisy", General Electric developed a better joint—one with tungsten filament legs pressed firmly into the softer metal of the lead-in wire. It's another reason why G-E dial lamps insure customer satisfaction!

GENERAL  ELECTRIC

When the primary has been identified by the winding with a low *dc* resistance and on which the lamp does not glow brightly, the 115-volt *ac* line may be applied directly. Then, using an *ac* voltmeter the voltage of the other windings may be measured and labeled.

Judging Ratings

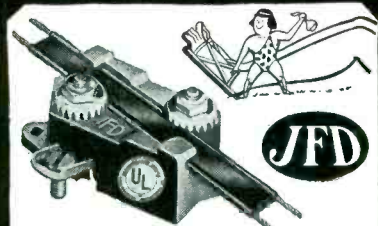
Having identified the winding voltages, the next question arises as to what rating can be applied. Here, one has to use some common sense, guided by a few rules.

If the actual filament windings are fed out through sleeving, the wire diameter can be measured with a micrometer, first removing with sandpaper any enamel insulation that may be used. The current rating can be figured on the basis of 1000 circular mils of copper area per ampere. A wire table will convert the diameter into circular mils per ampere, but the 1000 circular mil figure will give very conservative results.

Some power transformers do not have the actual wires fed out for con-

(Continued on page 86)

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Against Lightning Hazards

No. AT 105

For ribbon-type and oval
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ONLY JFD Lightning Arresters offer you these
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Alphabetically listed, there are 85 picture troubles,
over 58 raster and 17 sound troubles and by this
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WHERE the trouble is; plus step-by-step instruc-
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CHECKS USE THE PICTURE TUBE AS A GUIDE.
H. G. Cisin, the author, is the inventor of the AC/DC
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Power Transformer Tests

(Continued from page 85)

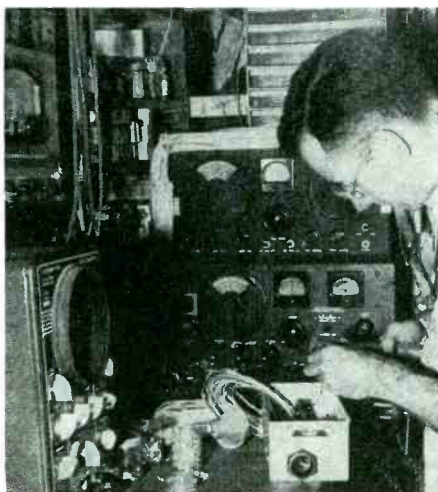
nections, and in this case the size
of the connecting lead can be used
provided some judgment is exercised.

No hard and fast rule can be laid
down on current rating of high volt-
age windings but some general princi-
ples may be helpful.

Connecting Load

The load should be connected to
the heater and rectifier filament wind-
ings only and the transformer allowed
to run for 50 to 10 minutes. The case
temperature should be noted by feel.
It should be body temperature or
slightly more. The desired load should
then be added to the high voltage
through rectifier tube and again the
transformer allowed to run for 10
minutes or so. The temperature should
not rise to more than about 160°F,
which is about the same as the water
temperature in an auto radiator. On a
practical basis the transformer should
get considerably warmer than the
body, but should not burn the hand
or get unduly hot. For critical jobs
even where new transformers are
used and where reliability is impor-
tant, the temperature rise of the power
transformer should be checked. Field
measurements can be made fairly ac-
curately by fastening a thermometer
to the case with putty, taking care to
see that the bulb is next to the case
and that the thermometer is not close
to heat producing tubes. The tempera-
ture should not rise above about 160-
170°F.

AIRCRAFT RADIO SERVICING



Wiring up a junction box in a typical aircraft-
radio Service Shop. Receivers at the end of the
bench are used for testing between transmitter,
installed in a customers plane, and shop.

(Photo by Max Alth)

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BUY CHRISTMAS SEALS
FIGHT TUBERCULOSIS

UHF for TV

(Continued from page 77)

for 700 mc and a half-wave dipole used for 70 mc is illustrated in Fig. 1. The dipole array has a gain of 4.806 over the single halfwave dipole, while its overall length is much smaller than the length of the 70-mc dipole. Fig. 2 shows how an array can be stacked vertically to obtain greater gain and directivity. The addition of another row of antennas gives the array a gain of 7.806 over the ordinary halfwave dipole. In extreme cases, where greater gain and directivity are desired, arrays can be constructed in depth with reflectors and directors. These illustrations are not offered as exact solutions to any specific problem, but as suggestions of what is possible and practical in the way of *uhf* antenna construction. The important problem of impedance matching at the receiver may greatly restrict the antenna design.

Complicated arrays may not be necessary in ordinary cases. The technique of handling high-frequency receiving antennas will become easier as more information is gathered about them. Field studies concerning antenna configurations, sites, and installation problems are being made, providing data that will help to improve reception.

To receive signals in the *uhf* range of 480 to 920 mc, a converter must be incorporated into the receiver. The converter's function is to amplify the *uhf* signals and then to convert these signals to the frequency band of one of the television channels used at the present time. The manner in which this is done is shown in the block diagram of Fig. 3. The *rf* amplifier accepts the *uhf* signals from the antenna and amplifies them before passing them to the mixer. The local oscillator is injected into the mixer to beat with the *uhf* signal producing an *if* frequency. This *if* frequency corresponds to a band pass of one of the channels currently used. If channel 13 is chosen, the *if* amplifier will be tuned to pass frequencies from 210-216 mc. A switch in the converter is then used to disconnect the receiver from its antenna, and connect the converter *if* output to the receiver input terminals. Fig. 4 shows another plan using a crystal mixer as an input instead of an *rf* amplifier. The crystal mixer has a more favorable noise factor than an *rf* amplifier. Crystals are also cheaper than the existing tubes used for *rf* amplification at *uhf*. A power supply is usually incorporated into converter units so that the converters are self contained.

In the design of a *uhf* converter it

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RMA Guaranteed—Standard Brands Only		Every One a Terrific Buy!	
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1A5	.69	6BH6	.89
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6AL5	.79	6SK7	.79
6AQ5	.89	6SN7	1.09
6AT6	.69	6SQ7	.69
6AV6	.69	6V6	1.39
6BA6	.79	7C4	.89
6BC5	.89	7F8	1.59
6BD6	1.09	12AL5	.89
		50L6	.75

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40x40x20—150 V.	.69	6.70	59.95
50x30x20—150 V.	.69	6.70	59.95
50x50—150 V. (200-25 V.)	.79	7.70	69.95
25—25 V.	.19	1.50	13.50
25—50 V.	.19	1.50	13.50
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 - 6" 62 ohm with output 3.75 ea.
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Cap.	Per 10	Per 100
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.005	.79	6.90
.01	.89	7.90
.02	.99	8.90
.05	1.09	9.90
.1	1.25	11.50

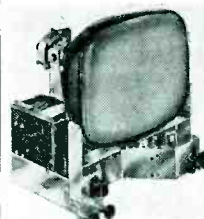
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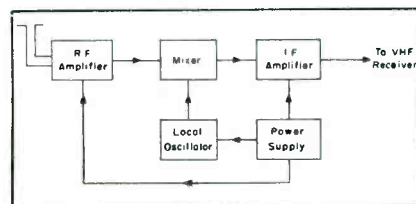
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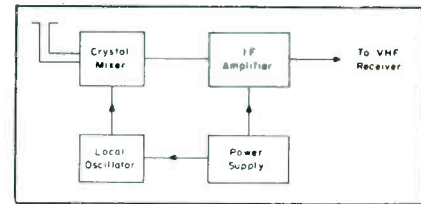
is necessary to consider such problems as noise factor, spurious responses, image rejection and oscillator radiation. Many manufacturers have been experimenting with converters and

Fig. 3. Block diagram of a converter using an *rf* amplifier input.



many of the problems have been solved. In the next and subsequent issues of SERVICE, data on these models will be featured in a series of special articles.

Fig. 4. An *uhf* converter using a crystal-mixer input.



ATR

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NEW LITERATURE

"A" Battery Eliminator, DC-AC Inverters, Auto Radio Vibrators

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AMERICAN TELEVISION & RADIO CO.
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JOTS AND FLASHES

PORTABLE RADIOS, believed by many to have become a has-been, actually is quite a popular item. According to L. S. Thees, general sales manager of the RCA tube department, more than 9 million battery-operated portable sets have been sold since the end of the war, and the sales are still rising. As a result, the sales opportunities for batteries and other portable accessories are extremely bright . . . Nearly 100 per cent of all TV picture tubes now being sold to TV receiver manufacturers are rectangular in form and 16 inches and larger in size, RTMA reported recently. . . . NEDA will hold its '52 convention at the Ambassador Hotel, Sept. 20 to 24. Aaron Lippman has been appointed chairman of the convention. . . . Lincoln, Nebraska, a city of 100,000, has 17 Tacoplex master-antenna systems installed in apartment houses, accord-

ing to Louis Leuck of Leuck Radio Supply, the local Taco jobber. . . . A branch plant, with approximately 45,000 square feet of floor space that will employ upwards of 100 people, and be used for the manufacture of electronic components, has been opened in Kane, Pa., by the Stackpole Carbon Co., St. Marys, Pa. . . . Hatry and Young of Massachusetts Inc., recently announced the opening of a 5-story building at 811 Boylston St., Boston. . . . Due to the rapid growth of membership in the *Radio and TV Technicians Guild of Florida*, it was felt necessary to increase the members in its board of directors. Accordingly, at the monthly business meeting three more members were elected to the board for a period of one year: Samuel Kessler, Thomas M. Middleton and John C. Ryan, making a total of eleven men now serving on the board. Plans are under way for a series of technical lectures for the season.

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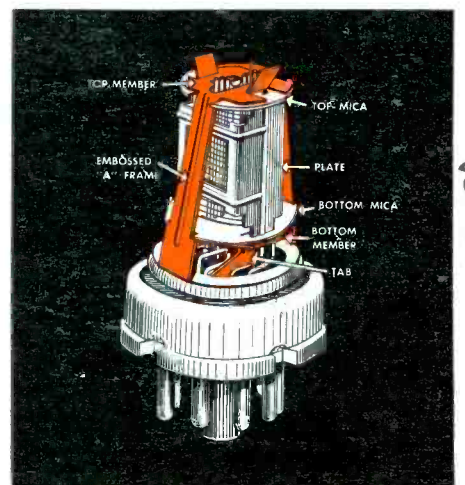
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