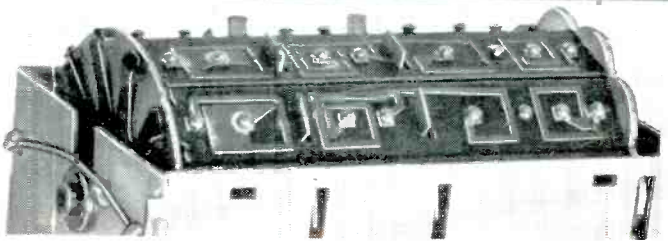
RADIO and TELEVISION maintenance



● An RCA engineer explains the design and use of the new printed-circuit TV tuner See Page 6

JUNE 1950

NEW PUBLISHERS

THE International Publishing Corporation has purchased **Radio & Television Maintenance.** IPC has taken over complete ownership, control and direction of the publication commencing with this issue.

As the final transaction for the magazine was not completed until the end of May, this issue does not reflect the changes and improvements planned by the new owners whose holdings include the Fair Catalog, Convention and Trade Shows Magazine and Convention & Trade Show Directory.

A large complete staff has been assigned to the publication. The newly created Circulation Department is checking the record of every subscriber to insure that all past subscription commitments are fully adhered to. While **Radio & Television Maintenance** has a high-level circulation in the maintenance field, all subscription records should be completely processed by the new department shortly after the publication of this issue.

In announcing the purchase of **Radio & Television Maintenance** from Boland & Boyce, Inc., Paul Roberts, president of IPC, declared:

"We feel that the service field of the industry is about to enjoy the greatest and most rapid expansion ever witnessed in any industry. We are prepared to invest substantial sums to give this skyrocketing field a trade publication that will keep up with the needs of the budding giant."

The new editorial staff is being assembled to provide the latest information available in an interesting and factual manner. Special columns and features will be gradually added until **Radio & Television Maintenance** will offer the most comprehensive trade journal available.

To be added, starting with the July issue, is a complete news section covering the field. Also planned is greater coverage of new products.

The number of pages of **Radio & Television Maintenance** will be increased in the near future and you may look forward to a bigger and better publication both in volume and content.

Sales offices for the magazine are in the Warwick Hotel in New York City under the direction of Philip Harrison, vice-president and treasurer of IPC, and at 82 W. Washington Street, Chicago.

In releasing the news to the press of the purchase of the magazine Mr. Roberts stated, "Our investigations have satisfied us that the potential for Radio & Television Maintenance is so great, we may safely put all our resources behind this new endeavor to make it the success that it should be.

"While we maintain offices abroad for other publication interests," he continued, "we do not intend any immediate expansion into the international field. Our present plans are to create a factual, accurate and up-to-the-minute trade journal that servicemen and dealers can look to for the latest information in the field."

RADIO INDUSTRY NEWSLETTER

WASHINGTON COLOR HEARINGS IN FINAL PHASE

The Federal Communications Commission is expected to hand down its decision on the question of colorvideo by August of this year. This is the prediction made by Edwin C. Johnson, Senator from Colorado, and chairman of the Senate Interstate and Foreign Commerce Committee, following a conference with Wayne Coy, chairman of the FCC. Having heard direct testimony on and witnessed various demonstrations of the different color television systems, the Commission has now wound up its hearings by ordering RCA, CBS, and CTI to file individual proposals based on the evidence presented at the hearings. Each of these three firms had advocated its own system of color television. The summary proposals which they will make are expected to form the basis for a final ruling by the FCC. In the meantime, the National Television System Committee, organized earlier this year at the suggestion of the Radio Manufacturers Association (RMA) is continuing its own independent investigation of the problem.

TV TAX PROPOSAL KILLED

The House Ways and Means Committee has rejected the proposed 10 percent manufacturers' excise tax on telesets, which had been expected to yield over $40 million annually in new revenue. In proposing the new tax, Secretary of the Treasury John W. Snyder had argued that the ten percent tax now imposed on radio should be applied to TV receivers as well "in the interest of tax equity". The House Committee, however, decided, that imposition of such a tax would be harmful to the infant industry, which is only now starting to earn a return on its initial investments, and which still has to make up for its early losses. The decision of the House Committee has been hailed by all segments of the industry as clearing the way for continued expansion.

SPEED EXPERIMENTAL PHONEVISION TESTS

The first transmitter ever made especially for phonevision experimental broadcasts has been completed and is undergoing final tests at General Electric. It will soon be shipped to Zenith which developed the system of phonevision. The transmitter, which has a power of one kilowatt, will be installed by Zenith in Chicago for experimental phonevision broadcast. Zenith recently received authorization from the FCC to conduct a ninety-day limited commercial test of phonevision. It is believed that the experiment will draw nationwide attention.

DUMONT ANNOUNCES 3-COLOR DIRECT VIEW TUBE

A patent for a three-color direct-view television tube has been issued to Allen B. Du Mont Laboratories. In its construction, the new tube is similar to the familiar black-and-white picture tube, except for a new form of fluorescent screen. Instead of having a coating of fluorescent material which produces black and white pictures when struck by an electron beam, this new tube has a fluorescent screen composed of tiny fluorescent dots which emit red, blue, and green colors respectively when struck by the electron beam. The new tube can be used in any of the three color television systems now before the FCC, it was said. Two months ago, RCA announced completion of production models of a single-gun, three-color, direct-view television tube, and demonstrated it at an FCC hearing.

BUSINESS BOOMING, OUTLOOK GOOD

Television business is reaching new highs in production and profit, and the long range outlook appears more favorable than ever before. This is the censensus among leading TV manufacturers. A quick glance at figures recently released by various companies lends support to this view. Philco reported first quarter sales up 50% over '49, Sylvania showed an increase of over $2 million, RCA announced that its business had jumped 300 percent during the last ten years, and DuMont revealed that its 1950 sales were running 36% ahead of 1949 volume. Reflecting the increase in demand, numerous concerns have announced expansion of their production facilities. Despite recent heavy price cutting, it is now generally anticipated that the next five years will be boom years in the television industry, with the service trade getting a large share of the bonanza.

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RADIO and TELEVISION maintenance

JUNE, 1950

FEATURES

DEPARTMENTS

DEVOTED TO SERVICE OF RADIO-AUDIO-VIDEO

IF IT'S NEW...

KEN-RAD DEALERS HAVE IT!

THE way to get ahead, stay ahead, in radio-TV servicing, is *stock and install Ken-Rad tubes!* New types—because Ken-Rad designing sets the pace—come to you ahead of time. As 1950 home receivers appear in your neighborhood, G-E and Ken-Rad tube research enables you to service new sets with the ultra-modern types they require, whether TV-picture, metal, glass, or miniature. Ken-Rad tubes you receive today, fill tomorrow's needs!... 6AV5-GT is one of many advanced types you will find in modern TV circuits. Your Ken-Rad distributor has this new tube, and others, that will give you rail position in the race for more service business. Phone or write him at once!

6AV5-GT BEAM POWER TUBE

With its companion type the 25AV5-GT (heater requirement 25 v as against 6 v), this new tube serves as a horizontal-deflection amplifier in TV. Operating direct from a 125-v power supply, accessories such as a transformer and high-voltage filter capacitors can be done away with, which adds to circuit simplicity and economy. Design of the tube gives it the ability to withstand high surge plate voltages.... By stocking the Ken-Rad brand, you will have the 6AV5-GT and 25AV5-GT—and other important new types—*now*, when required to service late-model receivers!

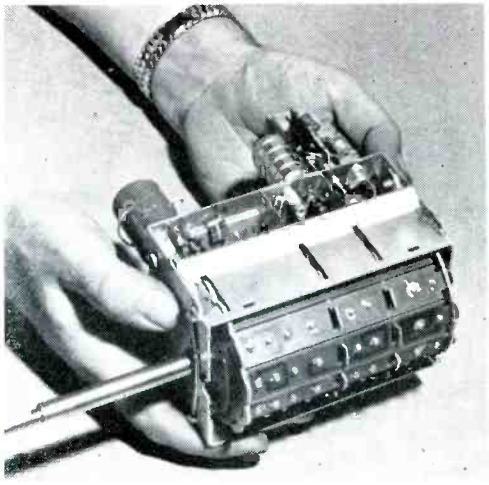
KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

182-JA4

New Developments



Just announced: the first

Printed-Circuit TV TUNER

Wound coils eliminated by photo-etching process; tuner promises better receiver operation, improved fringe area reception

A MAJOR advance in home television receiver design has been made with RCA's introduction of the industry's first "printed-circuit" television tuner. The result of intensive research begun shortly after the war, the new tuner promises to contribute greatly to television receiver design progress. It is of particular interest to the technician because he will soon encounter it in his work, and because it constitutes an important replacement item for him.

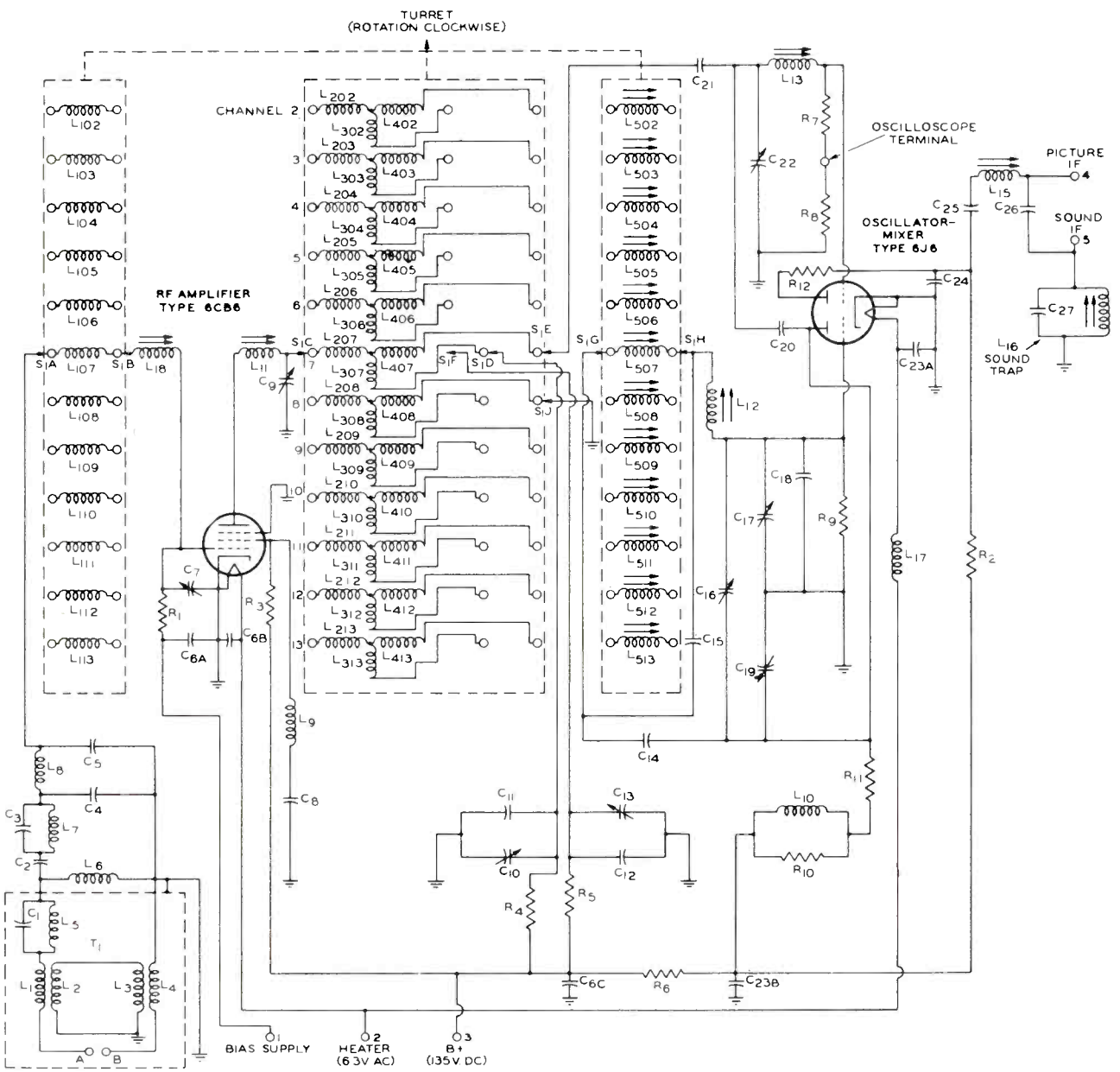
The printed circuit tuner represents a radical departure from conventional designs. While these use wound coils, the new unit reproduces the critical circuits by utilizing a photo-etching process. This process not only eliminates the mechanical winding of separate coils, but at the same time produces precision circuits giving top performance.

The photo-etch process developed for the printed tuner begins with the photographing of a circuit drawing. A contact print is then made from the negative in a copper-clad sheet of phenolic plastic which is coated with a light-sensitive material. The print of plastic sheet is next developed and placed in an etching solution. The solution etches away that part of the copper not covered by the pattern of the circuit, leaving the required copper circuit on the plastic sheet. The sheet is then placed on a die and cut into separate sections and pierced. The tuner, of the turret type, employs individual coil strips or segments, each containing the printed circuit for a separate television channel. These segments are easily removed for service or replacement. All tuned circuits are printed with the exception of the oscillator coils for channels two to six.

Circuit design

A circuit diagram of the 206E3 television tuner appears in Fig. 1. The input circuit contains a pair of elevator transformers to match the tuner to a balanced 300-ohm transmission line and to attenuate noise which may be induced in the transmission line. This circuit also contains a high-pass filter with cutoff at approximately 47 Mc, and with maximum attenuation at approximately 23.5 Mc for rejection of intermediate frequencies at the grid of the r-f amplifier. A tuned low-pass pi-network with a coil for each channel, provides gain and selectivity at the grid of the r-f amplifier and reduces oscillator voltages at the antenna terminals. The constants and configurations of the pi-network have been chosen to provide a varying impedance transfer to the grid of the r-f. amplifier so that optimum noise factor is achieved for all channels. This characteristic favors operation of these tuners with indoor types of antenna.

Controlled negative resistance has been introduced at the grid of the r-f amplifier to maintain high gain at high signal frequencies, and to minimize the effects of cathode inductance. The r-f amplifier is a type 6CB6 tube (the RCA tuner is the first to use this tube as an r-f amplifier). The output of the r-f amplifier contains a double-tuned band-pass filter with maximum attenuation at approximately the image frequency of each channel. This filter, with coils for each channel, provides high image rejection and also attenuates voltages of oscillator frequencies at the plate of the r-f amplifier. The oscillator, with adjustable coil inductances for each channel, contains a single-ended temperature-compen-



C1: Capacitor, 12 μμf ± 10%
C2: Capacitor, 270 μμf ± 20%
C3: Capacitor, 12 μμf ± 10%
C4: Capacitor, 9 μμf ± 5%
C5: Capacitor, 27 μμf ± 5%
C6A: Capacitor, 1500 μμf, Min.
C6B: Capacitor, 1500 μμf, Min.
C6C: Capacitor, 1500 μμf, Min.
C7: Capacitor, Variable, 0.5-3 μμf
C8: Capacitor, 1500 μμf, Min.
C9: Capacitor, Variable, 0.5-3 μμf
C10: Capacitor, Trimmer, 0.5-20 μμf
C11: Capacitor, 18 μμf ± 5%
C12: Capacitor, 16 μμf ± 5%
C13: Capacitor, Trimmer, 0.5-20 μμf
C14: Capacitor, 39 μμf ± 10%
C15: Capacitor, 3.3 μμf ± 10%
C16: Capacitor, Fine Tuning
C17: Capacitor, Variable, 0.5-3 μμf
C18: Capacitor, 13 μμf ± 1 μμf
C19: Capacitor, Variable, 0.5-3 μμf
C20: Capacitor, 2.2 μμf ± 10%
C21: Capacitor, 100 μμf ± 10%
C22: Capacitor, Variable, 0.5-3 μμf
C23A: Capacitor, 1500 μμf, Min.
C23B: Capacitor, 1500 μμf, Min.
C24: Capacitor, 10 μμf ± 5%
C25: Capacitor, 270 μμf ± 20%
C26: Capacitor, 4.7 μμf ± 10%
C27: Capacitor, 62 μμf ± 5%
L1: Antenna Coil Assembly
L2: Antenna Coil Assembly
L3: Antenna Coil Assembly
L4: Antenna Coil Assembly
L5: Wave Trap
L6: Shunt Coil
L7: Wave Trap
L8: Antenna Coil
L9: Capacitor Assembly, (Screen Coil)
L10: Coil and Resistor Assembly
L11: Plate Coil
L12: Oscillator Coil
L13: Grid Coil
L14 Designation Not Used
L15: Plate Filter Coil
L16: Trap Coil Assembly
L17: Choke Coil, (Filament)
L18: Antenna Coil
R1: Resistor, 1/2 watt, 3900 ohms ± 10%
R2: Resistor, 1/2 watt, 10000 ohms ± 10%
R3: Resistor, 1/2 watt, 6800 ohms ± 10%
R4: Resistor, 1/2 watt, 1000 ohms ± 20%
R5: Resistor, 1/2 watt, 1000 ohms ± 20%
R6: Resistor, 1/2 watt, 1000 ohms ± 20%
R7: Resistor, 1/2 watt, 4700 ohms ± 20%
R8: Resistor, 1/2 watt, 150000 ohms ± 20%
R9: Resistor, 1/2 watt, 10000 ohms ± 10%
R10: Resistor, 1/2 watt, 10000 ohms ± 20%
R11: Resistor, 1/2 watt 1000 ohms ± 10%
R12: Resistor, 1/2 watt, 22 ohms ± 10%
T1: Elevator Transformer

NOTE: In some tuners C17 may be omitted and the value of C19 changed to 1.0 - 6.0 μμf.

FIG. 1

sated Colpitts circuit to provide oscillator stability.

A fine tuning control, located concentrically on the channel selector shaft, permits fine adjustment of the oscillator frequency. The mixer plate circuit contains a tuned low-pass filter section for the picture i-f output and high-Q trap for the sound i-f output. This trap is tuned to 21.25 Mc and attenuates sound i-f frequencies at the picture i-f input. The low pass filter section minimizes oscillator frequencies at both sound i-f and picture i-f grids. The picture i-f output frequency is normally 22 Mc, but may be adjusted for operation between approximately 21.8 and 23.0 Mc, so that it may be used with various stagger-tuned i-f combinations.

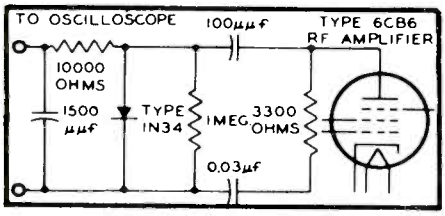


Fig. 2 Crystal-diode circuit used for coupling the oscilloscope to the r-f amplifier.

Individual oscillator adjustments are easily accessible from the front of the chassis, making adjustments possible with the receiver in its cabinet. All other adjustments are readily accessible at the top of the tuner chassis. A connection for circuit alignment and checking has been provided by an oscilloscope terminal on top of the chassis. Both the individual coil strips and the complete turret assembly are easily removable for servicing purposes.

Alignment procedure

The equipment required for alignment of the unit consists of the following instruments: sweep generator, 'scope, television calibrator, vtvm, and 21.25 sound i-f amplifier, TV receiver, or equivalent.

Antenna Circuits: Set the tuner bias to —1.5 v. Connect the sweep generator at the antenna terminals, using a 300-ohm matching pad if necessary. Connect the oscilloscope to the plate (pin No. 5) of the r-f amplifier (6CB6) through a crystal diode circuit as illustrated in Fig. 20. Adjust C7 for maximum response on the oscilloscope between the picture and sound carriers of channel 6. Adjust L18 for maximum response on the oscilloscope between the picture and sound carriers of channel 7. Now observe the response of all channels on the scope. Readjust C7 for channels 2 through 6, and L18 for channels 7 through 13, so that the best compromise is obtained in making the response of each channel look like that shown in Fig. 3.

R-F Alignment. After connecting the scope to the terminal on top of the tuner chassis, adjust L11, C10 and L13 for proper curve shape of channel 13, as shown in Fig. 4.
C9 and C22 for channel 7, C13 for channel 6. Observe response of channels 2 to 6 on scope, and adjust C9, C13, and C22 for best compromise (see Fig. 4). Now do the same for channels 7 to 13, readjusting C10, L11, and L13.

Oscillator Alignment. Connect vtvm to the output of receiver discriminator circuit and connect the television calibrator to the tuner antenna terminals. Tune calibrator to 59.75 and set tuner to channel 2, with fine-tuning control at midrange. Adjust C19 for zero voltage at output of discriminator circuit. Now set calibrator to 215.75 Mc and tuner to channel 13, and adjust L12 for zero voltage at output of discriminator circuit. Tune calibrator to the sound carrier of channels three to twelve, and adjust oscillator adjustment for zero voltage at output of discriminator circuit (Oscillator adjustments for channels 2 and 13 have been set at the factory, and they can be used as reference points). Recheck r-f alignment.

Picture I-F. Connect television calibrator to grid (pin 5) of the mixer oscillator (6J6) and tune it to 22.0 Mc. Connect vtvm across the load resistor of the picture i-f second detector of the television receiver and set the tuner to one of the high frequency channels in which no harmonics from the television calibrator are present. Adjust L15 for maxi-

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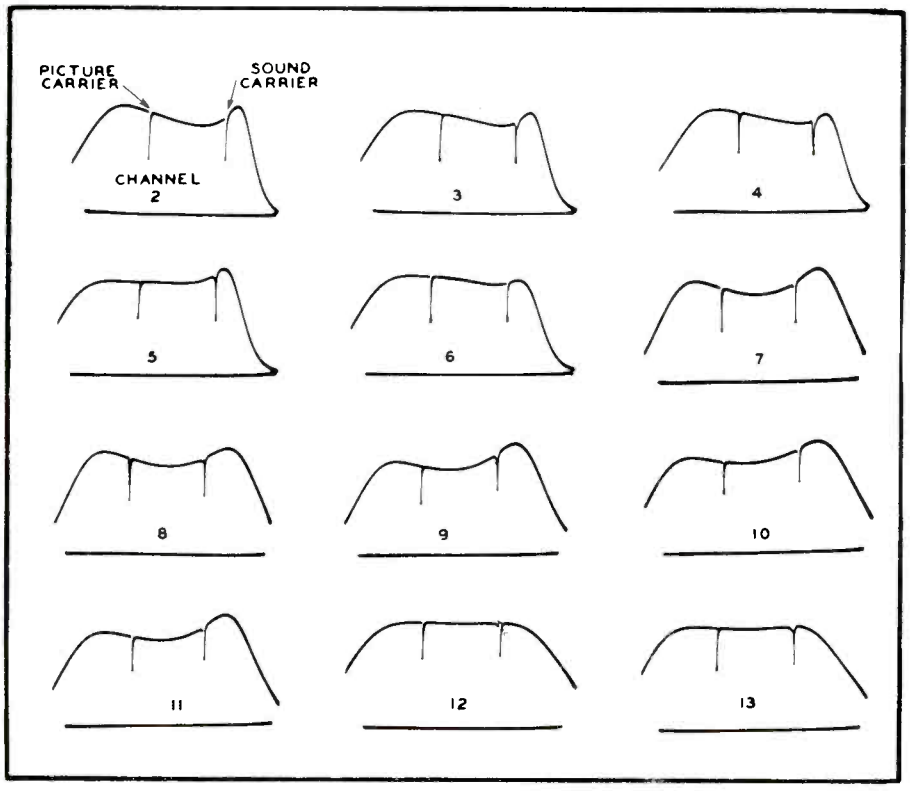

Fig. 3 Typical r-f response curves measured at the oscilloscope terminal.

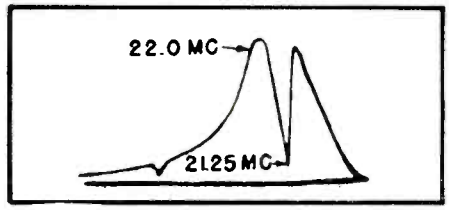

Fig. 4 Typical tuner response curve of overall tuner measured at grid of first i-f tube.

Simple Adaptation of An Old B. C. Receiver Produces a Gadget With Many Uses for Servicemen

VERSATILE BROAD-BAND R. F. AMPLIFIER

By John T. Frye

A top view of the unit. Note the .5 mfd., oil-filled condenser mounted inside the case near the filter condenser bank. The co-ax leads going from the panel outlets to the amplifier can be seen. The amplifier cover has been removed.

HAVE YOU ever wished that you had an amplifier that would handle radio frequency voltages as easily and with as little fuss as your general utility audio amplifier handles the frequency in the audio spectrum? Time and again the writer has dreamed wistfully about such an amplifier: one that would be absolutely stable, that would amplify any frequency encountered in the IF or broadcast band range of an AM receiver, and that would require no adjustment whatever when changing from one frequency to another in this range.

Just Three Hours' Work

I was sure that such a piece of equipment would be invaluable around the service shop as a signal tracer or in conjunction with the 'scope or VTVM for making measurements, but I was always discouraged by the thought of the amount of work and experimentation that I was certain would be required in the construction of such an amplifier. You can imagine, then, the mixture of pleasure and chagrin with which I recently discovered that I could have such an amplifier for the expenditure of three or four hours' work, and that everything I needed for its construction was lying right beneath my nose for the past twenty years!

The complete band-pass amplifier is ready-to-hand in any of the old Sparks-Withington "Equasonne" receivers, such as the Model 9-30 pictured. (Diagram in Fig. 1.) As can be seen, this receiver consists of three distinct parts, excluding the dynamic speaker that is not shown.

Along the rear of the board that serves as the "main chassis," is the combination power supply and audio power amplifier—everything shown in the top portion of the diagram of Fig. 1. At the left front is the selector unit consisting of a four-gang tuning condenser and the associated coils. All of the actual frequency selection is done in this unit.

The output of the selector unit was fed directly into the amplifier unit, which is shown at the right front of the board.

Flat Response on B.C. Band

The amplifier was intended to give nearly uniform amplification to any signal presented to it by the selector unit within the range of 550-1,400 kcs. This was accomplished by means of five cascaded RF stages coupled by means of aperiodic transformers. Additional frequency compensation was added in the plate circuit of the first RF tube and in the grid circuit of the power detector that followed the fifth RF stage. The entire RF amplifier and detector stage was housed in a shielding metal case only 3½" x 6½" x 8½". All necessary leads were brought into this unit through a single eight-wire cable. The volume was controlled by a variable resistor in the cathode return lead of the RF stages. A phonograph jack was included for use with a magnetic pickup. When the plug from the pickup was inserted in the jack, the 20,000 ohm cathode resistor of the power detector stage was replaced automatically with a 1,000 ohm resistor that changed the detector into an audio amplifier.

A little investigation revealed that the response of this amplifier shows practically no attenuation down to 100 kcs., although the story was different at the other end of the band; there the output drops off very abruptly beyond 1,500 kcs. There are some hills and valleys in the output, but they are not pronounced, and the gain of the five RF stages alone is more than 500 times.

Discarded Power Amplifier

I cut the unit down so that it could be mounted in the service-panel along with other instruments. To this end, the power amplifier was entirely discarded. Earphones are better than a speaker when the instrument is employed as a signal-tracer, for then full advantage can be taken of the extremely low noise level of the unit. Furthermore, if it *was* desired to use a speaker, a coupling transformer could always be used to run the output of the detector into a general-purpose audio amplifier.

→ to following page

The power transformer was not moved, and the metal sub-chassis upon which it was mounted was cut off 11½" from the transformer end. Then the rectifier socket, the choke and resistor-panel, the filter condenser bank, and the terminal strip were all remounted on this sub-chassis so as to be about evenly spaced. Three small bolts were used to fasten this sub-chassis securely to the rear of the amplifier shield, the bolts passing through the flange of the sub-chassis and through the case of the amplifier.

The original mounting bolts were pried out of the bottom of the amplifier case, and an 8" x 14" aluminum panel was fastened to the front of this case by means of bolts and 1" brass spacers. It was necessary to set the panel ahead of the case so as not to interfere with the ventilation of the amplifier. A jewel for the pilot lamp was put in the upper left-hand portion of the panel, and the power switch was put in the lower left-hand part. The original phonograph input jack was mounted on the right-hand side opposite the pilot-jewel and was connected in the plate circuit of the detector. The original volume control was mounted on the right-hand side opposite the line switch. A "ground" binding post was installed in the lower center portion of the panel.

Use of Test Prods

Two Amphenol 83-1R fittings, together with 83-1H hoods, were mounted respectively on the right and left sides of the panel midway between the parts already mounted, and short lengths of RG8/U were run from these fittings through the ends of the amplifier case, as shown in the photograph.

The inner conductor of the co-ax that enters through the left-hand end of the amplifier was connected directly to the grid lead of the first RF amplifier, and a ¼ watt, one megohm resistor was connected between this grid and ground. The shields of both pieces of co-ax were soldered to the amplifier case at the points of entry.

The center wire of the co-ax cable entering the case at the right-hand end was connected through a .5 mfd., 600 volt, oilfilled condenser directly to the plate of the fifth, or last, RF amplifier. This connection permits the amplified RF voltage to be led out of the amplifier before detection.

The only other changes necessary were the substitution of a 2,500 ohm, 20-watt resistor for the speaker field, reconnecting the proper wires to the terminal strip, connecting the 20,000 ohm resistor permanently in the cathode circuit of the power detector, and the building of two simple probes for the RF input and output circuits. These probes are made by connecting an Amphenol 83-1SP fitting to one end of a five-foot length of RG8/U

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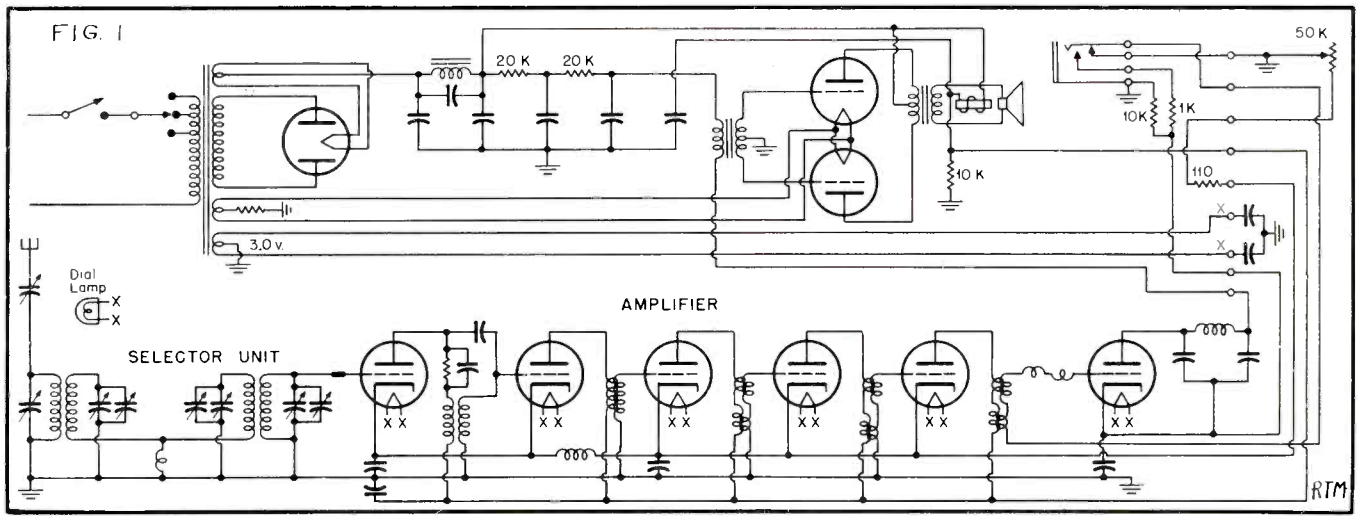


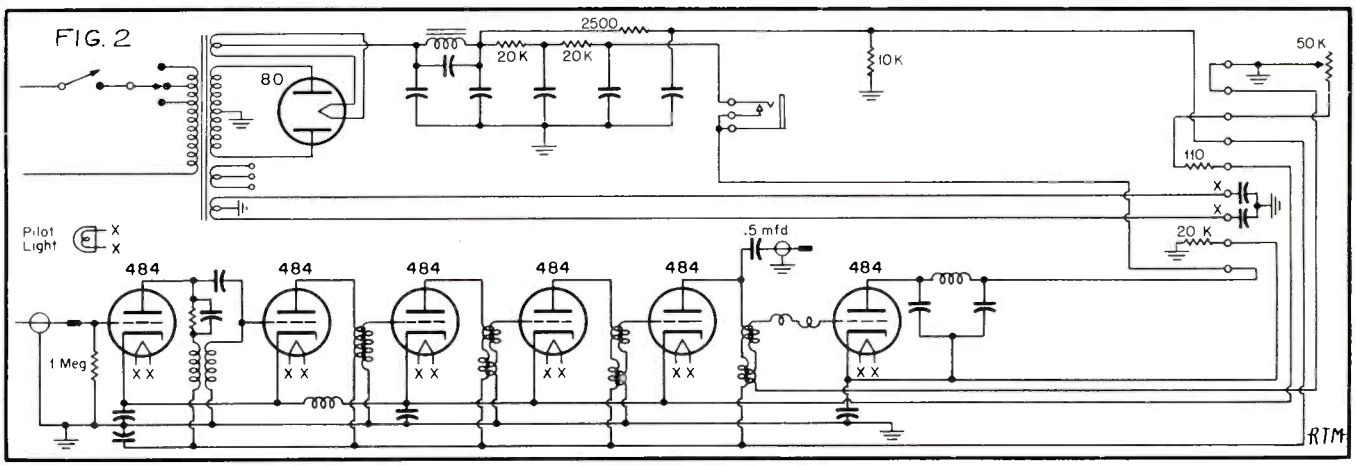


Fig. 1. Circuit diagram of the original Sparton Model 9-30 receiver used by the author for raw material in building his broad-band R.F. Amplifier. Fig. 2. Diagram of circuit as altered. Note absence of original tuning section, audio output section, and loudspeaker, and use of six amplification tubes for R.F. Signal being traced is fed into the grid of the first 484 through input probe.

All About Antennas

A pre-publication glimpse of a comprehensive book on antennas.

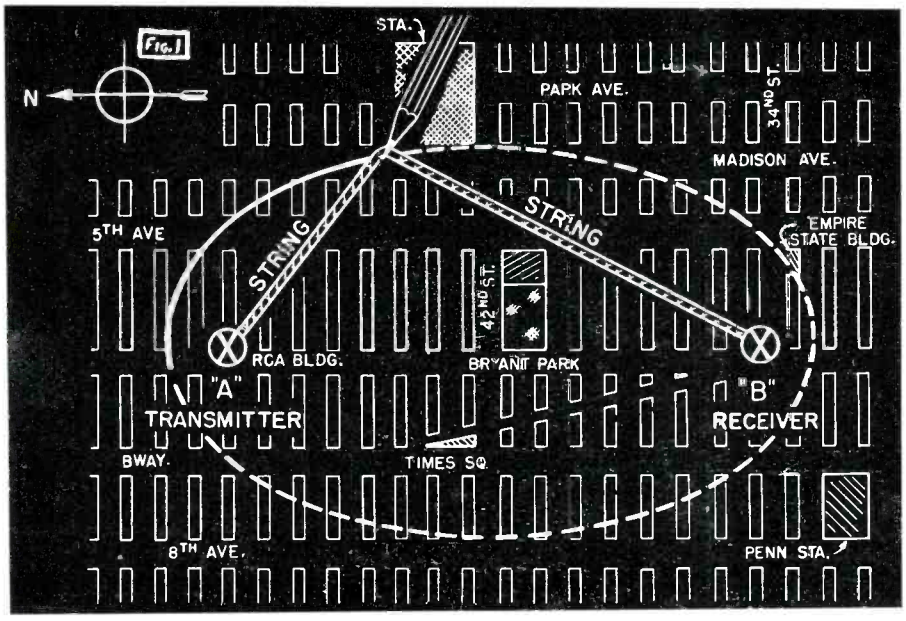


Fig. 1. Determining location of reflection causing ghosts. The transmitting and receiving antennas may be imagined to be surrounded by a huge ellipsoid in space. If reflections are caused by objects somewhere on this ellipsoid, the total radio path length from transmitter to reflection surface and from there to the receiving antenna remains constant. To determine where the reflection takes place, we must measure on the screen the distance between the ghost and the original picture. Knowing this value, we can calculate the delay time in microseconds and also the distance traveled in that time. This distance plus the distance between transmitter and receiver will give us the total radio path length. As shown in the illustration, we can then place two pins on a map of the area, one representing the transmitting, the other the receiving antenna. Taking a fine thread representing the total radio path distance (using the appropriate scaling factor of the map) and attaching the ends to the pin, we can then draw the ellipse, on which the possible reflecting objects will be located.

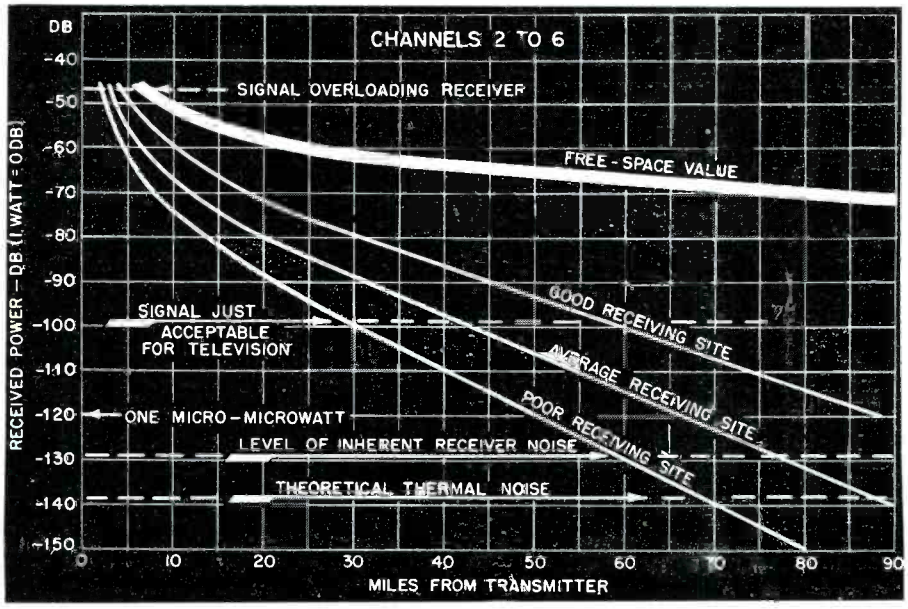


Fig. 2 (left). Relation between signal power received on half-wave dipole and distance from transmitter to receiver site, for channels 2 to 6. The theoretical maximum signal is indicated by the curve marked "Free-Space Value". As distance from the transmitter increases, divergence of expected signal levels for different receiving sites and this theoretical signal increases. These curves are based on large number of actual measurements.

WHEN we heard via the grapevine that Rider's new book on antennas was going to be the most complete thing on the subject ever presented to the service technician, we thought it worth our while to take a look at the manuscript and see what the book would be like when it is published.

To satisfy our curiosity, we paid a visit to Rider's place and had a very informative talk with Arnold Bailey, who is the author of the book, and with Mr. John F. Rider, who is publishing it. We also had an opportunity to examine all the various sections of the forthcoming volume, review the illustrations, and thus get a pretty good picture of what had been done.

Let's mention first that the author, Arnold Bailey, is among the top ranking antenna experts of this country. There're few people who can rival his theoretical background and practical experience. Not only is he completely familiar with all antenna developments which have taken

→ to page 23

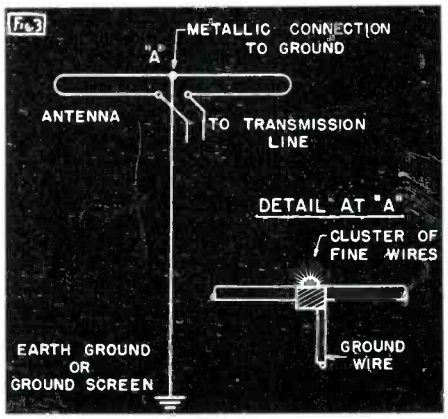


Fig. 3. Method of draining off static charges on metallic antenna structures, originally suggested by A. C. Kadow. Electric charges from the atmosphere may produce audible hiss in the receiver unless an easy conducting ground is provided for d-c energy. In the illustration, the rate of discharge is considerably increased by the cluster of fine wires at point "A".

Service Technique

Correct installation of lightning arresters and lead-in lines really cuts interference

TRANSMISSION LINE TECHNIQUES

DO you know how to connect up a television antenna? Don't laugh; I am serious. The other day, a licensed, practicing, electrical engineer, a graduate of Purdue University, called me up on the telephone. His first words were, "Herb, am I crazy or what?"

The story behind the question is this: He had purchased a new television receiver, specifying that the antenna installation include a lightning arrestor. Instead, the technician who installed the antenna wrapped one of the guy wires around the metal standpipe on the roof, telling my friend that this was much better than a lightning arrestor.

The engineer, knowing the National Electrical Code, protested to the dealer, and demanded that he fulfill his agreement by sending over a man to install a lightning arrestor where the feed line entered the window. The same technician returned, fuming that he had installed over 2,000 television antennas, and this was the first time that he had ever run into such a crank. But he did install a lightning arrestor—up on the roof, grounded it to the same point where he had previously wraped the guy wire!

According to the National Electrical Code:

"Lightning arrestors shall be located outside the building, or inside the building, between the point of entrance of the lead-in and the radio set . . . and as near as practicable to the entrance of the conductors to the building. The lightning arrestor shall not be located near combustible material nor in a hazardous location . . ."

Obviously, no matter how carefully installed, a lightning arrestor on the roof cannot meet these requirements, unless the feedline goes directly through the roof. My engineer friend simply gave up the struggle, installed the arrestor himself where it belonged, and dropped the matter. The incident prompted me to do a little investigating of the way lightning arrestors are installed in the area. I learned the following:

Seldom meet requirements

Most television antennas have either no lightning protection, or the dubious protection of a guy wire fastened to a pipe or rain gutter. Of those with lightning arrestors, many have it up on the roof, and of those mounted where the feed line enters the window, it was not always a part of the original installation. The set owner often either installed it himself or paid someone else to do it.

The importance of this to the television antenna installer is that when he erects an antenna, he automatically contracts that his work will be in reasonable accordance with generally-accepted safety practices; therefore, if lightning should hit an improperly-protected antenna, he could be held legally responsible for the resulting damage.

Use of coax lines

Shielded feed lines for television antennas have the reputation in the text books as being ideal for interference-ridden locations, but many television technicians, after trying them, claim that their losses are so high that nothing is gained by using them. Not all the losses are in the shielded line. Part of them are caused by the way the line is used, and careful attention to detail will allow one to obtain the advantages of a shielded line, while minimizing its disadvantages.

Although it is generally known that most television antennas and receivers are designed for balanced 300-ohm lines, it is surprising how often attempts are made to substitute unbalanced coax for the 300-ohm ribbon with no attempt to compensate for the differences in the two lines. The results are usually disastrous. Much better results are often obtained by inserting impedance-matching transformers between the antenna and the coax, and between the coax and the receiver antenna terminals.

Seventy-five ohm to 300-ohm matching transformers are rather expensive and add their losses to that in the cable; so if they can be efficiently eliminated, so much the better. Some receivers are designed for either 300-ohm ribbon or 75-ohm coaxial input, and do not require the matching transformer at the receiver. And others designed for balanced input may perform better with the inner conductor of the coaxial cable connected to one input terminal and the outer shield grounded to the receiver chassis than when an impedance-matching transformer is used. (This does not apply to receivers using a push-pull input stage.)

Eliminating transformers

Where only 300-ohm connections are provided, a method of eliminating the matching transformers is to use a pair of RG-59-U or RG-11-U 75-ohm coaxial lines with the shields connected together and to the antenna mast at the top, and with the shields grounded at the chassis on the other end. Center conductors are attached to the antenna elements and to the receiver at antenna terminals. This set-up offers the advantages of having a balanced line, reducing losses in transmission, and eliminating the losses of a matching transformer.

Objections that might be advanced against this system are the cost of the additional length of cable required, and the fact that the resulting impedance of the two cables in series is only 150 ohms, as compared to the 300-ohm impedance of the antenna and of the receiver input. Both objections have little ground in actual experience, the amount saved on the line-matching transformers will probably more than pay for the additional cable. When evaluating the effect of the apparent two-to-one impedance mismatch, two factors must be con-

→ to page 23

Shop Equipment

When you need an

Emergency ISOLATION TRANSFORMER

You can construct this temporary unit which will perform satisfactorily until you acquire a regular one

A TRANSFORMER to isolate ac-dc equipment from the power line is something the technician requires but often has not at hand. While a commercial unit will have to be acquired sooner or later, there are acceptable substitutes for emergency needs.

Two ordinary receiver type power transformers, hooked up back to back as illustrated in Fig. 1A, make a satisfactory one-to-one ratio substitute; and using the filament windings of one or both transformers (Fig. 1B and 1C) permits varying the output voltage above and below the line voltage.

Assuming the line voltage to be 115 volts, the circuit of Fig. 1B will give output voltages between 104 and 126 volts, while that of Fig. 1C will supply between 93 and 137 volts in five or six volt steps, depending upon the number of filament windings used, and on whether they are connected in series-aiding or series-opposing with the output winding.

From Surplus

As practically all ac-dc receivers consume less than thirty five watts of power, a pair of transformers designed to furnish about one hundred milliamperes at approximately three hundred volts is adequate for continuous-service duty. Smaller transformers are satisfactory for intermittent service.

Fig. 2 shows another practical substitute for a regular isolation transformer. Transformer T is a 115/230-volt transformer of the type using two identical primaries which, in regular operation, are connected in parallel for 115 volts and in series for 230 volts. As an isolation transformer, one of these windings is connected to the 115-volt line and the

→ to page 26

The latest of the commercial units available in RCA's TV Isotap, which combines in one compact instrument an autotransformer and an isolation transformer, and is a companion piece to RCA's Isotap WP-24A used in am-fm radio service. The autotransformer connection provides 500 volt-amperes for the servicing of the larger a-c television sets which are equipped with power transformers. This is a very useful instrument.

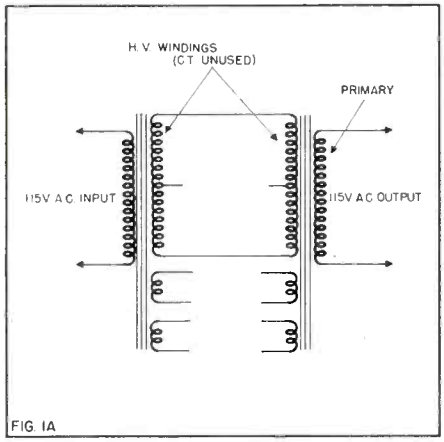


FIG. 1A

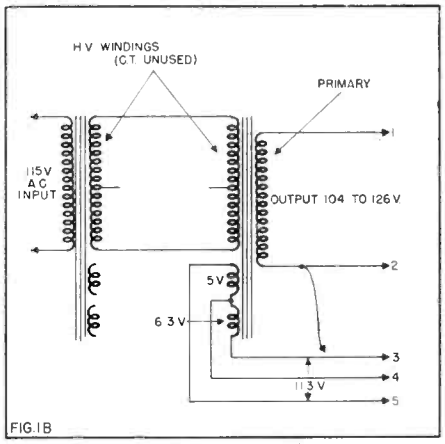


FIG. 1B

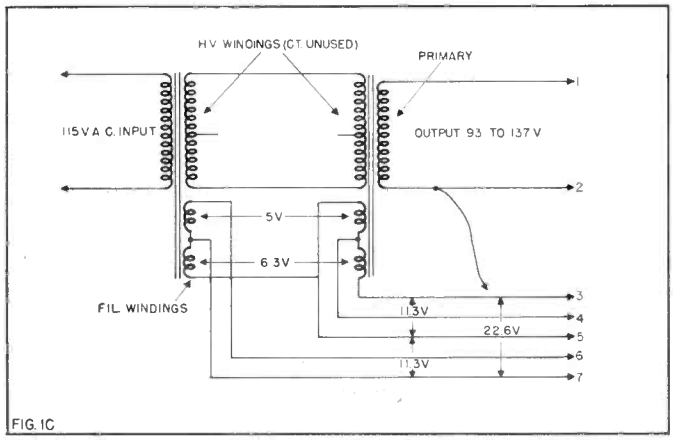


FIG. 1C

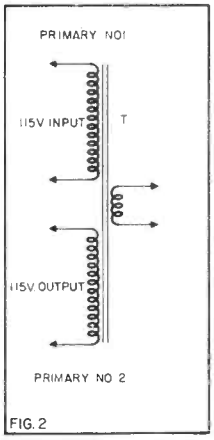


FIG. 2

Fig. 1A, 1B, 1C, methods for using a pair of receiver type power transformers as emergency "isolation" transformers. 1A gives a one-to-one ratio, while 1B and 1C show how filament windings may be utilized to vary the output voltage. Using terminal #1 as the common output terminal and connecting terminal #2 to terminals #3, 4, etc., output voltages between the limits indicated on the diagrams will be obtained between terminal #1 and the other numbered terminals.

Fig. 2 Using a 115/230-volt transformer with twin primaries as 115-volt isolation transformer. The secondary winding(s) are ignored or may be connected in series with the output windings to vary the output voltage as shown in Fig. 1B.

Experiences of a Tucson technician show how to develop

FRINGE AREA BUSINESS

by James R. Rose

ON December fourth of last year, station KPHO-TV in Phoenix, Arizona, gave its first scheduled broadcast. In Tucson, over 100 miles to the south, Roh's Radio Shop had spent the greater part of the year in preparation for this event. An aerial survey of the terrain had been made and the shop equipped for TV sales, installation, and service. After the first broadcast, methods were evolved to overcome fringe area problems.

Tucson is surrounded by mountains. Before the aerial survey had been made, one TV engineer told shop owner Ed Roh, "I wouldn't even call Tucson a fringe area; all you'll get here will be skip reception."

Roh hired a plane and flew the station-to-Tucson route using a compass heading with compensation being made for the plane's drift. The altitude above terrain was checked along the entire course. The value of this procedure coupled with the use of existing maps should not be underestimated. In this case it proved that a six-mile pass over a slight rise to the north of the city would give Tucson a clear channel.

After consulting several TV engineers, Roh began to equip his shop for TV. By the time Phoenix started broadcasting, the former radio shop had been completely modified to handle TV. Supplemental equipment consisted of an RCA sweep generator, and RCA television calibrator, a five-inch DuMont scope, a Hickok vacuum tube voltmeter, and a Walsco alignment kit.

With the start of broadcasts, the fringe area problem had to be faced squarely. It was solved by set modification and very specialized antenna intallation.

Modifying sets

A considerable gain in picture definition was realized by narrowing the i-f band width on all sets to three megacycles. The increase on peak was estimated at 50%. The inter-carrier type of circuit has proven superior to others tested.

Every set received is in need of alignment. One reason given is climatic. Tucson is an arid desert city and the sets are shipped from humid areas. The work done in the shop solves only a small portion of the fringe area problem. The Phoenix station is 100 to 125 miles away from the different installations in the Tucson area. Its rated output is 17,400 watts. Roh decided that before an installation could be made it would be necessary to take field strength readings in different parts of the city.

A truck was equipped with a 40 foot collapsible mast—single stack Yagi—, field strength meter, and small receiver. It was discovered that elevated locations did not always give the reception expected. In many cases, the opposite was experienced: lower areas would give the strongest readings.

By the use of the TV-equipped truck, Roh has been able to determine whether any specific location is practicable for TV, and what antenna costs will be. He does not encourage the purchase of a set where the microvolt reading is less than 100. The average antenna height of present installations is 45 ft.

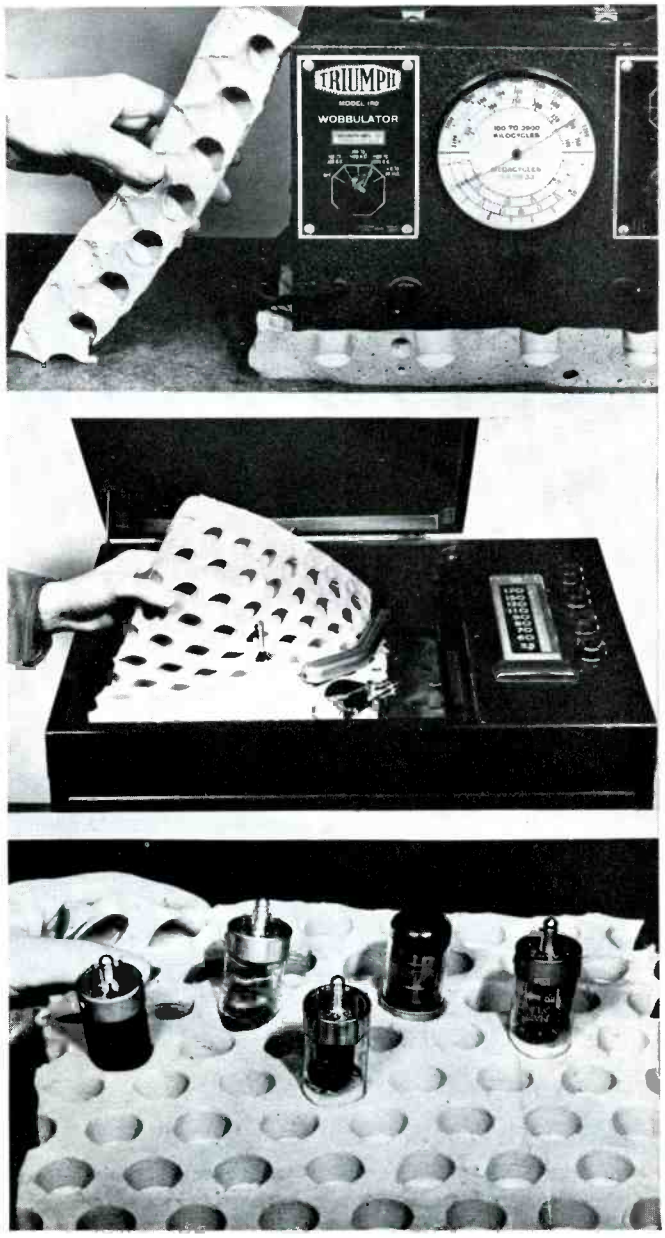
The choice of antenna was based on testing several types. They were tested separately and together in several locations throughout the Tucson area. The best average signal strength was measured on a twin stack Yagi (Taco 985-5) with a reading of 400 microvolts. A gain of 10 to 12 db resulted from the use of this type of antenna.

In addition to the equipment al-

→ to page 27

FOAM RUBBER found useful in Service Shop

Several applications described. Some are illustrated at right. May be used to cushion test equipment against jarring (top), to protect tone arm against skidding when moving phonograph (center), as tube holder for some tubes (bottom.) Others uses described below.



by Harry F. Leeper

THE introduction of foam rubber has given rise to many applications in the most unexpected quarters. It started in the furniture field, where it was first used in chairs, sofas, as mattresses, and as pillows.

Now it has found uses in the radio service industry as well.

If you have never thought of using foam rubber in your daily work, you may be missing a chance to put an easily available and relatively cheap material to work for you. Let it be understood that foam rubber will do nothing startling or revolutionary in your shop, but it will often come in very handy in many little ways to make your work easier.

Foam rubber is a material which you can get in a number of different stores. Most of them will be listed in the classified section of your telephone directory under the heading "Rubber—Sponge." It is also carried by many surplus stores.

Foam rubber comes in various thicknesses and sizes; and it can easily be cut into almost any shape you may desire. The pieces pictured in the accompanying photographs have a maximum thickness of about 1½ inches, without being compressed.

What does it cost?

The price of foam rubber varies according to the kind you buy, its thickness, etc. On the average, it is approximately eighty cents a pound. Just to show you how heavy a material foam rubber is, a piece 1½" thick, 10 inches long and 11 inches wide weighs a little less than half a pound, and would cost approximately forty cents.

How can it be used?

One of the purposes for which you can use foam rubber is to cushion test instruments on the service bench. When mounted in this rubber, the instruments are protected from jarring or light pounding. There will be no wobbling, since the weight of the equipment will make it stand up solidly.

Another use you can make of foam rubber is when you are moving an automatic phonograph or radio-phono combination for service purposes. A piece of foam rubber placed over the spindle and under the pickup arm will prevent the arm from skidding and will protect the needle. Tying the arm to its rest is fine, but how often has the string or rubber band come loose during moving? Foam rubber is almost foolproof.

Pieces of this rubber placed under certain sections of the chassis can serve as cushions for tubes and other parts while testing or making repairs.

When testing a-c/d-c radios on a metal bench top, a good sized piece of this rubber will afford positive insulation between chassis and bench top.

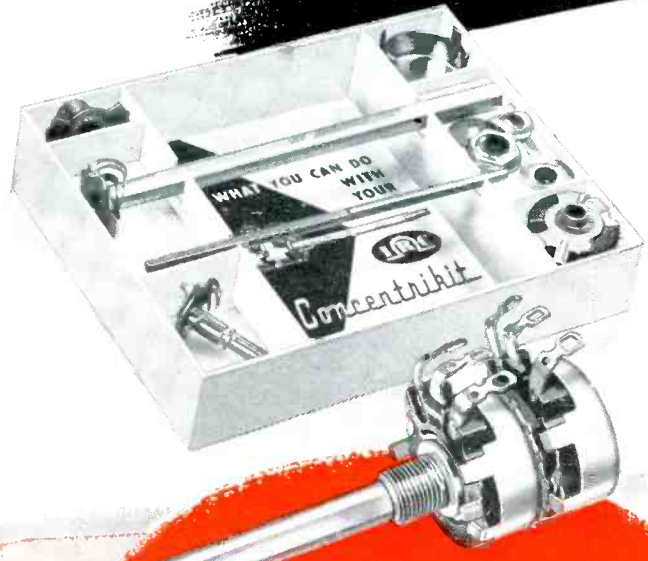
Another particularly good use to which foam rubber can be put is as a receptacle for loctal or miniature tubes. You can put such tubes into the circular openings which this type rubber contains, and thereby prevents them from rolling against each other or from the bench. By enlarging the openings, you can use the rubber to receive regular tubes as well.

These are only a few of the many uses to which you can put foam rubber in your daily work. There are probably many more which will suggest themselves to you once you start using this material. ✔ ✔ ✔

SERVICE TECHNICIANS ACCLAIM SENSATIONAL

IRC control development

Concentrikit



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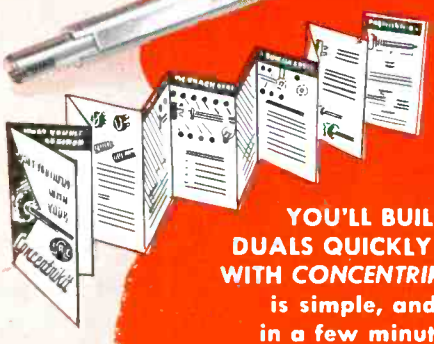

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B11-119	1
B11-120	1
B11-121	1
B11-123	2
B11-128	2
B11-130	1
B13-130	2
B13-130X	1
B18-130X	1
B18-132X	1
B11-133	2
B13-133	2
B13-133X	1
B18-133X	1
B19-133X	1
B11-137	3
B13-137	2
B13-137X	1
B18-137XX	1
B19-137X	1
B11-139	2
B13-139	1
B13-139X	1
Inner Shaft Ends	
E-187	3
E-190	1
E-202	2
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Service Technique

Before Calling for a replacement

Make SURE it's the TUBE

by R. L. Spalding
CRT Engineering Dept.
CAPEHART-FARNSWORTH CORP.

Here's a simple test setup to check if picture tubes are defective. Will save you trouble and expense.

THE following is the proposed set-up for actual service testing of a cathode ray tube. The required equipment is as listed.

1. D-C kilovoltmeter 0-15,000 VDC.
2. 0-1 d-c ma meter, mounted as in Fig. 2.
3. RCA VoltOhmyst, or equivalent.
4. TV chassis known to be in proper working condition.
5. Special jumper cable as shown in Fig. 1.

About midpoint in the jumper wires, about ½ inch of the insulation should be removed in a staggered manner so that bare areas do not accidentally short against each other. This bare wire should be tinned to prevent fraying.

The 0-1 ma d-c meter should be mounted as shown in Fig. 2. It has been found advisable that a .1-mf 500-v mica condenser be shunted across this meter to prevent surge current damage. Thirty-(30) kilovolt test leads should be mounted directly on the meter terminals and these leads should be terminated with insulated alligator clips.

The test procedure can then be conducted as follows:

1. Mount tube in receiver known to be operating properly. Apply ion trap or beam bender and instead of connecting regular socket to tube base, insert special jumper plug.

2. Connect (+) lead from 0-1 ma meter to H.V. lead of set. Connect (—) lead from 0-1 ma meter to CRT anode button.

3. Connect VoltOhmyst (—) lead to pin #11 or cathode lead of jumper plug (at bare section). Connect (+) d-c lead of VoltOhmyst to pin #10 or G_2 lead of jumper plug. Connect (—) lead of kilovoltmeter to TV chassis.

5. Turn brilliance and contrast controls clear counter clockwise and then turn on set. At this point, the meters should read:

E_{anode}: 8,000 v or better for 10 inch set
10,000 v or better for 12 inch set
11,000 v or better for 16 inch set

I_{anode}: 0 ma

E_{G2}: 225 v or better for all sets.

Note: If I_{anode} meter reads very high and cannot be turned down with brilliance control, check E_G, bias range as in 10. below. Also check for good socket connections. If this does not show up the fault, the tube is probably gassy and should be replaced.

6. Assuming the above conditions are met, the brilliance control should be slowly increased. The ion trap can be set as soon as the 0-1 ma meter reaches .1 ma or 100 ua.

7. The brilliance is still further increased, and the following conditions should be met:

I_{anode}: At least .2 ma or 200 μa by the time control is completely clockwise.

CAUTION: If I_{anode} snaps off-scale as soon as brilliance is started up check socket connections and if they are correct, it indicates a gassy cathode ray tube.

E_{anode}: At 200 μa I_{anode}, this voltage should be:
7000 v or better for 10" sets
8500 v or better for 12" sets
9000 v or better for 16" sets

E_{G2}: Should remain at some value above 220 volts during above test.

When to return it

8. Assuming we can reach 200 μa for I_{anode} and still maintain E_{anode} and E_{G2} properly, increase brilliance control still further to check maximum emission of tube and condition of TV supply. In some picture tubes the I_{anode} will go as high as 1.25 ma or 1250 μa, which indicates an excellent cathode. Each and every "good" tube should reach 200 μa if E_{anode} and E_{G2} are held to proper values. If all potentials are correct and tube will

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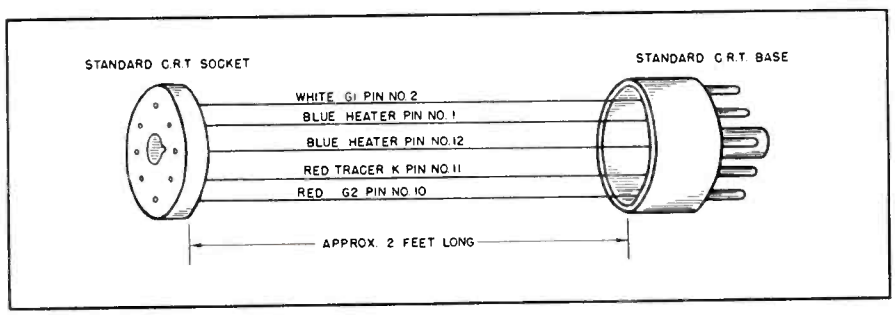


Fig. 1 How the jumper cable is constructed

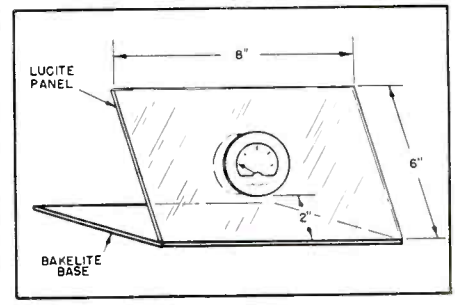
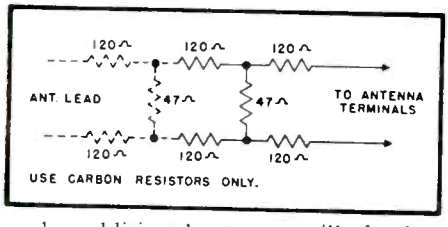


Fig. 2 Mounting ma d-c meter

SHOP TIPS

WESTINGHOUSE: Model H-226: Sensitivity Check

It will often be desirable to check the operation of the receiver on a weak signal. The weak signal condition can be simulated by connecting an attenuator pad, constructed as shown in the illustration, between the antenna lead and the receiver. The degree of signal attenuation will depend on the number of stages in the



pad; additional stages will further weaken the signal.

When sufficient attenuator stages have been inserted to provide weak signal conditions, a comparative check can be made by connecting the antenna plug to a receiver known to be in good condition, and comparing the picture obtained with that of the receiver under test.

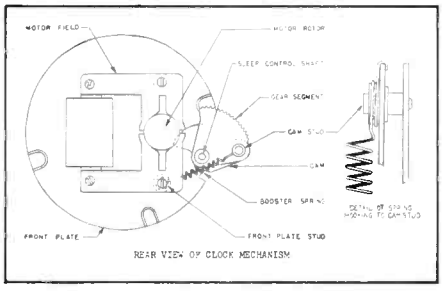
Westinghouse
Service Notes

GENERAL ELECTRIC: Models 64 and 65 Sleep Control: Addition of Booster Spring.

Late production receivers incorporate a helical spring in the clock mechanism which provides a more positive trip action to the switch contact assembly when operating the sleep control.

Failure of switch contacts to open may be due to the incomplete travel of the sleep control gear segment and cam assembly, after its release by the segment gear's drive pinion. Normally, the spring action of the switch contacts through the sleep control switch lever should be sufficient to allow sleep control cam and gear segment to spring outward completely after it becomes disengaged from its pinion drive gear. However, if binding or position of control parts results in failure of segment gear and cam to swing completely outward properly releasing switch control lever and contacts, the addition of the Booster Spring (G-E part RMS-203) will provide the additional tension to correct segment gear and cam operation.

Installation of the booster spring is not difficult, it being necessary only to move the radio chassis sufficiently within the cabinet to gain access to the clock back cover mounting case. Remove the case. The clock mechanism may then be drawn forward



REAR VIEW OF CLOCK MECHANISM

from the front of the radio cabinet, just far enough to permit installation of the booster spring. The accompanying illustration shows the position of the booster spring as viewed from the rear of the clock mechanism. One end of the spring is fastened to the cam stud, the other end to the brass front plate stud.

General Electric
Radio Service Bulletin

SENTINEL: Models 400, 401, 402, 405, 406, 411 (using 12AT7 oscillator tube): Tearing and Picture Breakup when Set is Jarred.

This condition is caused by a loose padder trimmer slug screw in C11. The reason for it is a loose fit between padder trimmer screw and threaded sleeve, preventing a firm grounding contact, resulting in a breaking up of the picture, noise streaks, and possible detaining of the received picture. The remedy is the installation of a locknut bushing, Sentinel part No. PST 500, on padder trimmer screw, which will hold trimmer screw firmly and provide a proper ground. To correct the condition, slide the locknut bushing on a thin bladed screwdriver with the nut end toward the handle and insert the screwdriver into the trimmer screw's slot, as shown in the accompanying illustrations. While holding the padder trimmer screw so that it will not turn, slide the locknut bushing on the padder trimmer and turn it down by hand until it is tight against the front of the r-f tuner unit chassis. *Caution:* Do not turn the locknut down too tight; this may result in stripping the screw or damage to trimmer. Solder nut to tuner frame. Check each local channel oscillator trimmer for correct adjustment.

Sentinel
Service Bulletin

CAPEHART: CX-31 Chassis: Improper High Voltage Supply Operation

It has been reported by Capehart field engineer Ed Zank, that the 3.3 ohm resistor, which is connected in series with the filament of the 1B3/8016 high voltage rectifier tube, has contributed to improper operation of the high voltage supply in a number of these instruments. If this resistor is appreciably higher in resistance than 3.3 ohm, it may reduce the filament current of the 1B3 and thus cause the high voltage to be materi-

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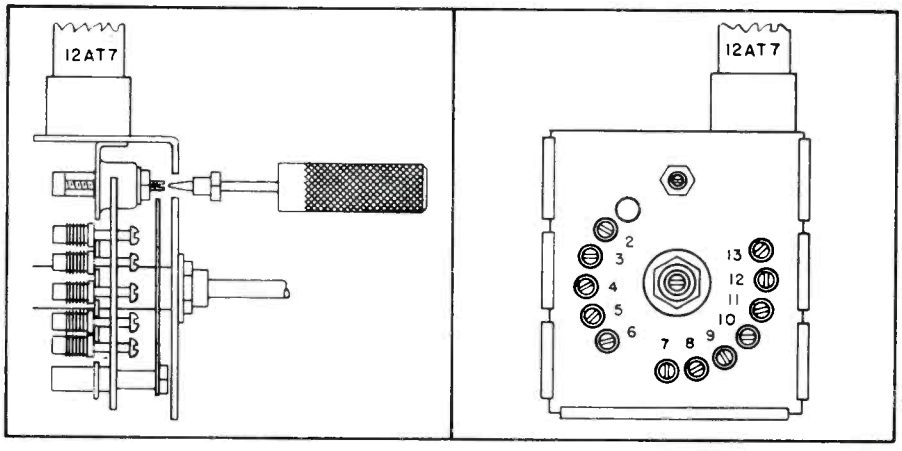


PRODUCTS FOR THE TRADE

VTVM-MULTIMETER

A very versatile test instrument has been introduced by Precision. It's a complete vtvm-megohmmeter, affording 48 ranges to 1200 volts, 2000

meg, 12 amp, plus 64 db, and d-c vtvm ranges to 12,000 and 30,000 volts. Features all zero-center vtvm and shielded connectors. The ohmmeter uses two 1.5 volt flashlight cells, easily replaceable from the rear of the cabinet. For additional info write to **Precision Apparatus Co., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.**

SELF-SUPPORTING TOWER

This Tower, Model TV, available to a height of 88 feet, is of the self supporting variety. The balance is achieved by the use of graduated corner angles, which makes the tower heaviest at the bottom where the load is greatest. To give extra strength, steel girts and braces have been positioned at various points. The tower features a permanently mounted ladder which permits easy access to the working platform and antenna. It is also furnished with mast castings, mounted 20 inches apart, to provide two point support for the antenna. Illustrated erection instructions are furnished with each shipment. **Baker Mfg. Co., Evansville, Wisc.**

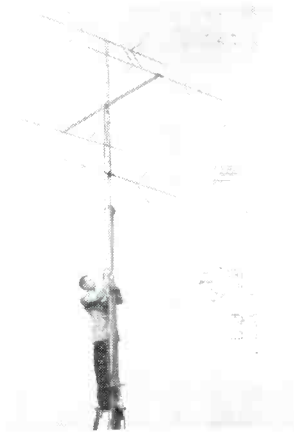
INTERFERENCE LOCATOR

Interested in the location and reduction of man-made radio noise? Sprague has just come out with a new radio interference locator for the 550 kc to 30 Mc range, Model 302. The instrument utilizes an 8-tube superhet circuit, and operates either from self-contained batteries or 115 volt mains. Each locator is supplied with both a loop and a collapsible rod antenna for normal use. An r-f search probe, insulated for 35,000 volts a.c. is also available for field use. Other features include: an audio probe, built-in output meter, battery test meter, calibrated r-f and audio gain controls, beat frequency oscillator, etc. Get

bulletin M-446 for complete description of the unit. Write for it to **Sprague Products, 91 Marshall St., North Adams, Mass.**

REVERSIBLE BEAM

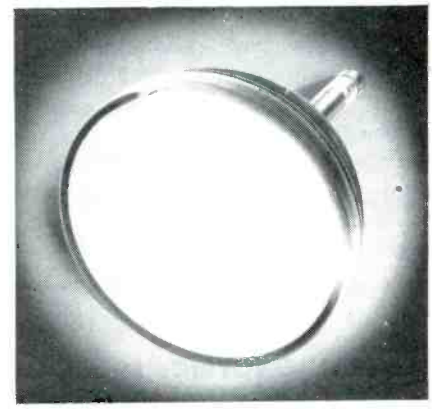
RCA is now offering a new television antenna array for use in fringe areas lying between stations occupying the same or adjacent channels, when the signals are received from opposite directions. The antenna has a high front to back ratio, providing maximum gain in one direction while



rejecting signals arriving in the opposite direction. With the antenna, a "diplexer" is supplied, which permits instantaneous reversal of the directivity of the antenna. This is accomplished by flicking a switch, which may be located near the television receiver. Another outstanding feature of the new array is the use of "V" attachments which provide uni-directional reception on all channels. The "V" attachments eliminate the need for compromise antenna orientation. The array consists of four dipoles arranged in the form of a square and interconnected through the diplexer network to the television receiver. The diplexer is a phasing network consisting of four one-quarter wavelength lines, an absorving resistor, and a switch to permit choice of dipole combination. Available from RCA parts distributors. **RCA, Camden, N. J.**

NEW TYPE 12LP4A

For the first time, the 12LP4A type picture tube will be available with the DuMont bent-gun ion trap design and the gray filter plate. The bent gun de-



sign has been modified so that it is possible to use either a single or double magnet beam bender, allowing direct interchangeability with all type 12LP4 tubes. **Allen B. DuMont Labs., Clifton, N. J.**

INDOOR ANTENNA

Here's an antenna which is unconditionally guaranteed for satisfactory life-time use. It's JFD's "Panorama". Its base is so designed that the antenna will not tip or rock in spite of the most extreme dipole positions. Three-section, triple-chrome plated brass telescopic dipoles can be adjusted for best reception on any channel. Will improve reception when used in parallel with roof installation, but designed primarily for locations where permanent installations are not permitted. Write for Bulletin 16 to **JFD Manufacturing Corp., 6101 16th Ave., Brooklyn 14, N. Y.**

→ to page 25

Versatile Broad-Band R.F. Amplifier

→ from page 10

and cutting away the shielding and insulation from about ¾" of the center conductor of the other end.

All of the changes made in the wiring can be easily seen by comparing the diagrams of Fig. 1, that of the original receiver, with Fig. 2, that of the finished product.

Can Use Other Models

I used the RF amplifier from a Sparks-Withington Model 9-30, but there are several other models put out by this manufacturer in which the RF amplifier is almost identical with that of the 9-30. Some such models are: Sparton Model 89A, 931, AC-89, 109, 110, and the Sparks Ensemble. Thousands of these sets were sold, and many of them are still in use, which bears witness to their sturdy construction and good components. Almost every radio serviceman will know where he can get one of these amplifiers. If the 484 tubes that were originally used are not readily available, 27's may be substituted, in which case the tap on the power transformer primary should be set at the 120-130 volt point to compensate for the normal three-volt output of the 484 filament winding.

Operation of Unit

First, set an AC-DC midget on your bench, but do not plug it in. Turn on your amplifier, plug in a pair of ordinary phones—a crystal earphone *cannot* be used without a coupling transformer—and turn the gain all the way on. Attach a probe to the input Amphenol fitting and run a lead from the ground post of the amplifier to the frame of the receiver's tuning condenser. Now, when you touch the stator of the tuning condenser that is connected directly across the loop antenna, you will find that you can tune in all of the stations that are ordinarily received in your locality with good volume. If there are any shorting plates or poor wiper connections in the tuning condenser, you will note it immediately.

Next, turn the set on and move your probe around below the chassis. You will find that the sensitivity is amazing. You can pick up the signal quite easily with the probe held four or five inches away from the plate lead of the IF amplifier tube! When the bared end of the probe is held against the insulation of this lead, the volume of the signal can be heard from the 'phones all over the room. Detuning is no problem, for you only have to *get close* to a lead carrying any appreciable amount of RF to get a good signal in the earphones. If you want a tighter coupling, wrap two or three turns of insulated wire around the bared end of the probe and the tiny capacity this represents will be sufficient to pick up all but the weakest signals. In fact, the outfit is so sensitive that a few feet of wire attached to the end of the probe will enable you to pick up all of the good-reception stations at once.

This sensitivity holds true all the way from 100 kcs. to 1,500 kcs. No change is necessary when going from the RF portion of the receiver to the IF.

Low Noise Level

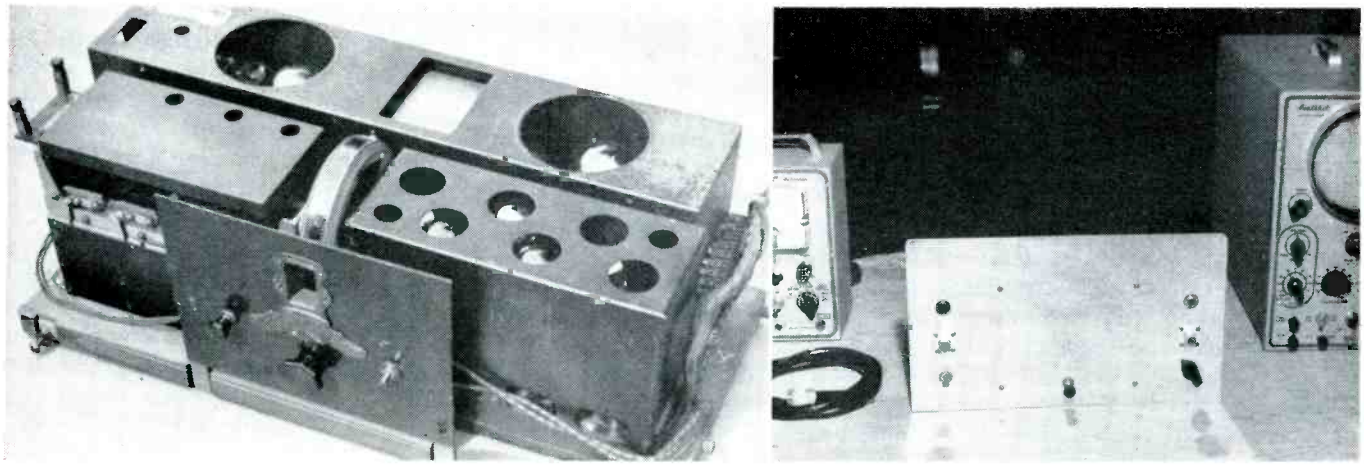
One of the best features of the instrument is its extremely low noise level. Careful shielding and excellent filtering results in a unit which is so quiet, even with the volume all the way on, that it is hard to tell by listening in the 'phones whether the switch is on or off. This enables the operator to spot any noise arising in the RF portion of the receiver with ridiculous ease. As the probe is shifted down along the line from the antenna input, the origin of a noise is instantly detected. Noisy tubes, RF and IF coils that are going out, defective resistors—these and many other such faults are as easy to spot as an open coupling condenser in the AF system with an ordinary signal tracer.

Every day I learn new uses for the amplifier such as running down the cause of RF oscillation and bringing a badly-out-of-alignment IF system into alignment in a matter of seconds by simply using the probe to pick up the signal from each winding as it is brought into tune with the service oscillator. It is enough to say that when a set that is dead is placed upon my bench, the first thing I reach for is the probe of this broad-band amplifier.

Other Applications

But it has other uses than signal tracing. One of the most important of these is as an outboard amplifier for use with an oscilloscope in the investigation of frequencies up to 1.5 megacycles. The ordinary general-purpose 'scope does not have an

→ to page 26



The original Model 9-30 Sparton radio, left, from which the R.F. section and power supply were taken, and a front view of the completed job, right, together with VTVM and oscilloscope. The new device greatly increases the usefulness of these instruments.

SPEAKING AMONG OURSELVES

Some More DXing. We had a very interesting letter from Bob Witscher, Chief Engineer of station KFAM-FM in Saint Cloud, Minn., telling us about his experiences with long-distance television. Writes Bob: ". . . within a period of two days last summer, conditions for distance were temporarily good. First, Houston, Texas was identified. Then Fort Worth, New Orleans came in on channel 6. The next day on channel 2, what was expected to be a repeat of Houston, turned out to be Baltimore. Then Boston was heard on f.m.—94.5 Mc. To add to the unpredictable, Boston TV was also coming in. At the same time 50 Mc amateurs were picked up on channel 1. My antenna is a 32-element 2 meter beam which is not too good on TV or 100 Mc f.m. The TV receiver is an Admiral and f.m. is picked up with a Pilot tuner." Thanks, Bob, for telling us about your adventures; and if any of you fellows have something to match them, write us and we'll pass it on to our readers.

That's Telling Them. For the first time in our memory, a New York radio station has come out plugging for the local Technicians' Association. At various times during the day WOR tells its listeners to have their receivers serviced by the shop displaying the blue symbol of the Associated Radio Servicemen's Associations of New York; that they're qualified to do a good job; and that their reliability is unquestioned. Coupled with the recent series of spots on TV, presenting the technician as one of the strongest links in the television chain, the service trade has been getting a pretty good break from the stations. All this is very promising and we hope the habit spreads all over the country.

Watch for the New Ones. A new channel can be quite a headache; witness the plight of a service friend of ours who was suddenly flooded with an avalanche of service calls, following the opening of channel 9 in New York. Seems most of his installations were not oriented to bring in a good signal from the new transmitter. The reason we mention this here is that his troubles hold a lesson for all of us. Don't wait for the customer to complain and distrust your competence. Just before a new station goes on the air, write him and explain the situation. You'll not only have made a steady customer, but there'll be plenty of recommendations from him too.

You Ain't Seen Nothing Yet. If you think tubes are large now, wait till next year. G-E is going to come out with a 24-inch direct view tube late this fall, and at DuMont a 3′ x 4′ direct view CRT is in the mills. The 24-incher will produce a picture almost as large as your daily newspaper page, and the 3′ x 4′ affair will not be very short of life-size reproduction. Direct view, mind you.

It's True. Here is a little item which should interest our receiver manufacturers. The Milwaukee Journal made a survey of television ownership and came up, among other things, with this interesting fact. 363 of the people whom they polled didn't know the make of their sets. Surprising as this seems, it shows one thing clearly. These people did not shop brands. They relied on someone else's recommendation; and although we have no fact to back it up, we suspect the people who made the recommendation and the sale were none other than the local technicians.

TV Or Not TV. While we're wrestling with the problems of color, u-h-f, phonovision, etc, etc, our friends in Canada are still discussing their first TV transmitter. Discussing it, not building one; which is just a little sample of the vigor of our economy. Well, good luck there old chaps. Let's see you on the air soon.

Shop TIPS

→ from page 19

ally reduced.

It is suggested that this resistor be checked in instances of low second anode voltage, or it may be removed completely to improve the voltage regulation.

Capehart-Farnsworth
Service Bulletin

—RTM—

RCA Model 65BR9: Intermittents

The RCA storage-battery portable, Model 65BR9 has a 1200 mmf, 5-volt condenser across the filaments of a 1T4 and the 1S5 tubes. This condenser develops an intermittent partially-shorting condition that results in erratic and puzzling changes in volume because of its effect on the filament voltages of these two tubes. Cutting the condenser out of the circuit will restore the volume but will also introduce a noticeable hum, especially on a-c operation. The defective unit should be replaced.

John T. Frye
Logansport, Ind.

—RTM—

PHILCO: Record Changer Models M-9X and M-12C: Inoperative

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

Philco
Service Bulletin

→ to page 29

All About Antennas

→ from page 11

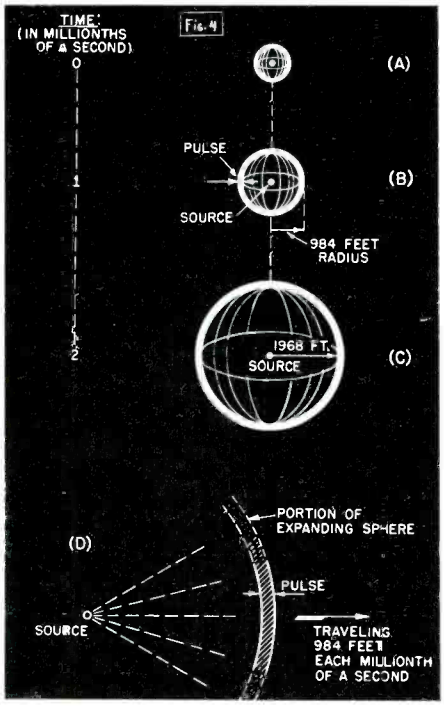


Fig. 4 Expanding sphere of radio energy. Pulse sent out by radio transmitter produces ever-expanding sphere of energy. At (A), pulse of energy leaves source and travels in all directions at the rate of 984 feet per microsecond. Expanded sphere one millionth of a second after leaving transmitter is shown in (B), its radius being 984 feet. Two microseconds after pulse has left source, it appears as in (C), with a radius of 1968 feet. (D) shows a portion of spherical wavefront traveling at 984 feet per microsecond.

place during the past 25 years, but he also has done very important work on antenna design, holding patents on a great number of them. In short, for an author to tell you all about antennas, Mr. Rider could hardly have picked a better man. As he explained to us, his purpose in writing the book has been to bring together all the theory and all the practice which the technician requires for the most successful operation of his business.

From A to Z

After having gone over the manuscript, we can report to you that this will indeed be the first book to give the technician a complete picture on TV and other high-band antennas (and provide the ham with information he's been missing for a long time).

The book not only tells how the different antennas work, but also why. It gives the information you need to make best use of the various designs, indicates what type antennas are best suited for different type installations. It covers every conceivable antenna type, both for TV and ham operation. It provides a practical guide to successful antenna installation. In fact, if you want to evaluate the book, it'll prove more important to the technician than any test instrument he may own. It'll pay for itself many times over in the improved work you'll perform because of it.

The accompanying illustrations show some of the practical aspects to which the book can be put. They're typical of many diagrams you'll find there; and you'll have a hard time finding this material elsewhere.

We recommend that you watch for the book when it appears; and we'd like to add that we're mighty pleased to note the new highs which Rider has set for electronics books with the publication of his volumes on oscillographs and antennas. HG.

—RTM—

RADIO INDUSTRY'S TRADE NAMES

The "Aisle of Trade Names" at the recent 1950 Parts Distributors Show in Chicago, representing many of the 800 companies participating in the annual exposition. On two billboards are seen the brand names of nearly all the biggest radio and electronics parts manufacturers in the country. The accent was on sales at the huge industrial fair, sponsored cooperatively by five radio manufacturers' associations.

—RTM—

Transmission Line Techniques

→ from page 12

sidered. One is that the figure of 300 ohms assigned as the center impedance of television antennas is merely a nominal, average value, which may vary as much as ten to one over the television channels. (At least one television antenna, the "Circle-X" has a nominal impedance of 150 ohms.) The second factor is that careful measurements of losses in antenna feed lines have shown that a two-to-one mismatch is very nearly as good as a perfect match.

Where economically feasible and where the additional weight can be supported, substituting transmitting type RG-11-U, 75-ohm coaxial cable for the receiver type RG-59-U will cut feeder losses in half. A balanced coaxial line of two RG-11-U cables probably has lower losses than 300-ohm ribbon, especially on the high-frequency channels.

Coaxial fittings best . .

The method of terminating the coax at the receiver can also greatly affect its efficiency in decreasing interference. Simply connecting the in-

→ to page 26

trade LITERATURE

New Books

Questions and Answers in Television Engineering, *by* C. V. RABINOFF *and* M. E. WOLBRECHT *(McGraw-Hill, pp 300, $4.50)*

●

Electronic Engineering Master Index, vol. IV *(Electronics Research Publishing Co., $17.50)*

●

Essentials of Electricity for Radio and Television, *by* M. SLURZBERT *and* W. OSTERHELD *(McGraw-Hill, pp. 533, $5.00)*

Reviews

Servicing TV Receivers *(Sylvania, pp. 119, $2.00)*

This very useful book covers the television receiver from section to section and analyzes troubles in each. The material presented is given in easy to use form. For each fault, the book provides a characteristic test pattern. In addition, it describes the usual effect on receiver operation, the cause of the defect, and its remedy. It also contains a number of more generalized service notes. A worthwhile book to have. Sylvania has offered it free with the purchase of 100 receiving or three picture tubes.

●

Television Components Handbook, *by* A. C. MATTHEWS (Philco Corp. pp. 160, $2.50)

As the title indicates, this volume deals with the various components that go into a television receiver. For each component it lists the several operating characteristics, and does it quite exhaustively. Although the book is most valuable if you are doing any sort of television design work, it also contains a wealth of information for the non-designing service technician. Much of the information concerns basic television circuits and is thus of general interest. If you do any electronic construction work, you will want this book.

Most Often Needed 1950 Television Servicing Information, *compiled by* M. N. BEITMAN *(Supreme, pp 141, $3.00)*

The fourth volume in Supreme's series on TV servicing is markedly improved over earlier editions and is, generally speaking, much easier to use. For the receivers which have been selected for inclusion in the book the material is well presented and will aid you in your work. We should mention, however, that the number of manufacturers thus selected is only 19, and that you will find no information on such receivers as Air-King, Capehart, Fada, Olympic, Pilot, Sentinel, Stromberg-Carlson, to name only a few.

●

Vade-Mecum, *by* P. H. BRANS *(Editors and Engineers, pp 600+, $3.00)*

Contained in this book is complete technical information on probably all vacuum tubes of any consequence manufactured in the world. No more complete guide to available tubes is in existence, and the work that must have gone into the compilation of this volume is staggering. Vade Mecum is Latin for "Go With Me." The implication is that if you have this book with you you will never be at a loss about tube information. We're inclined to go along with that.

Catalogs & Pamphlets

Miniature Tubes, Hytron's 4th edition of the Reference Guide for Miniature Electron Tubes lists all miniature tubes to date, regardless of make (132 miniatures, 41 of them new. 70 basing diagrams), and lists similar larger prototypes. It's free for the asking. Write to Hytron Radio & Electronics, Salem, Mass.

Dictionary of Electronic Terms. A 64-page book which defines concisely the words used in radio, TV, and electronics, from A minus to Zone of Silence. More than 2500 terms are defined, many of them illustrated. Included is a section on useful radio data. Allied Radio Corp., 833 West Jackson Blvd., Chicago, Ill. Costs 25 cents, worth it.

Microphone catalog. If you are interested in microphones, you may want to get Turner's latest catalog. This eight-page flier presents the complete line of microphones produced by the firm and furnishes technical information on all models. The Turner Co., Cedar Rapids, Iowa.

TV Equivalent Parts Catalog. Crest Transformer has just published a new catalog of television equivalent parts. It contains complete listings of equivalent parts for over 200 television sets made by over 50 manufacturers. Free if you request it on your company letterhead. Crest Transformer, 1834 West North Ave., Chicago 22, Ill. Ask for catalog #50.

Test Equipment Catalog. Electronic Measurements Corp. is offering the 1950 edition of its test equipment catalog. Gives complete specifications on all EMC products. Get it free by writing to Electronic Measurements Corporation, 423 Broome St., New York 13, N. Y.

Audio Equipment. You may be interested in this pocket manual entitled "1950 Audio Equipment," which deals with high fidelity work, a-m and f-m tuners, phono pickups, records, amplifiers, speakers, and their installation in cabinets and built-in home features. It also contains a condensed listing of a variety of such equipment. A copy may be had by writing to Sun Radio, 122-124 Duane St., New York 7, N. Y.

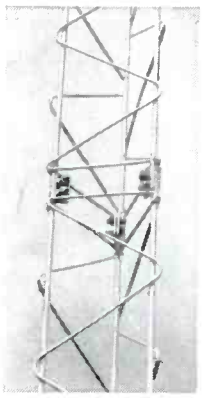
Color. The Television Research Institute has published a special report on the color situation. It contains the first published comparative study of the three systems now before the FCC, pointing out advantages and defects of each. Also included is an analysis of relationship of other business to color TV, forecasts of developments, and reports on government attitudes. $2.00, direct from Television Research Institute, 207 East 43rd St., New York 17, N. Y.

Mail Order Catalog. Radio Shack's Catalog #50 celebrates the 27th year of the firm, and is fuller of listings than ever before. 144 pages describe everything from Aerials to Wrenches. 167 Washington St., Boston, Mass.

Products for the Trade

→ from page 20

TV ANTENNA MAST



We have another television antenna tower this month. This Trylon tower, triangular in shape, comes in 10-foot sections which can be joined for installations up to 60 feet in height. Accessories are available to enable mounting on either flat or peaked roof. The tower is 6½" wide on each of its three sides. bracing between the vertical steel rods is accomplished by somewhat lighter rods in a serpentine lattice work arrangement. These lattice rods also serve as rungs for climbing. The tower mounts any type antenna; and the manufacturer tells us that a 40-foot mast complete with antenna can be installed by two men in three hours or less. **Wind Turbine Co., West Chester, Pa.**

NEW TEST UNIT

Here is an instrument which eliminates the need for separate multimeters, r-f generators and field strength meters for in-the-field testing of radio communication equipment. It's G-E's EX-1-C, designed for use with equipment in the 25-50, 72-76, and 148-174 Mc bands. One of its

primary uses is to align sensitive land-mobile communication receivers which require a very weak signal. The attenuator is adjustable down to substantially zero. A crystal diode pickup head permits comparative measurements of antenna power output. Current and voltage scales are included. Full info can be obtained from **Commercial Equipment Div., General Electric, Syracuse, N. Y.**

→ to page 28

Transmission Line Techniques

→ from page 23

ner conductor to one of the tuner antenna terminals, and connecting the shield to the other terminal, is not good, because any interference or noise picked up by the outer shield is fed directly into the input of the receiver. It is better to connect the center conductor to one of the terminals, and to connect both the coax shield and the second input terminal to the chassis of the set. Special coaxial fittings, of course, provide the best interference protection and the most businesslike job.

Also important in installing a coax transmission line is to tape the antenna end carefully to keep out moisture. It can be seen that using shielded feed lines with TV antennas requires more care and more work to obtain good results than when 300-ohm ribbon is used. The extra trouble, however, is well worth while when noise or interference conditions are really severe.

—RTM—

Versatile Broad-Band R. F. Amplifier

→ from page 21

amplifier intended for the amplification of high frequencies. In fact, most of these amplifiers start falling off quite rapidly beyond 50,000 cycles, and beyond 100,000 cycles they represent a loss rather than a gain.

The 'scope itself, though, is capable of picturing frequencies much higher than this; so if the RF output of the broad-band amplifier is fed directly into the vertical plates of the cathode-ray tube by means of the co-ax probe attached to the output fitting on the panel of the amplifier, very low RF voltages will be faithfully amplified and can be investigated in the same way that audio frequencies are when using the ordinary internal amplifier of the 'scope. For example, the RF output of your signal generator can be viewed in the form of sine waves —or whatever kind of wave your oscillator puts out. The only limit to this kind of examination will then become that of the sweep generator. With the 'scope shown I was able to examine quite easily the output of my service oscillator at a frequency of 200 kilocycles, and the output of the signal generator is considerably less than 50,000 microvolts.

Also Amplifier IF

Another use for the unit is to amplify an IF signal for application directly to the deflection plates of a 'scope for checking the modulation and other characteristics of a received signal. A short piece of insulated wire can be pushed into the last IF transformer can and the probe attached to this. The greatly amplified signal can be taken from the RF output connection directly to the deflection plates, and the "doughnut pattern" of checking modulation, hum, etc., can be used without detuning the receiver. The amplification will provide a fine large pattern for observation.

Still another use lies in providing the signal generator with a signal booster that enables the operator to have available a variable-frequency RF signal of really husky proportions that he can use in conjunction with the RF probe of his VTVM for making accurate measurements of coil gain, wave-trap effectiveness, etc. For example, the signal generator can be attached to the input; the output can be placed across the primary of an antenna coil; and the output of the amplifier can be adjusted so that a substantial value of half a volt appears across the primary. Then the voltage can be read across the secondary and the transformation gain of the coil easily figured. By the same token, the losses introduced by a shorted turn are easily discovered. The ordinary signal generator, alone, seldom has sufficient output to give an accurate reading on the average VTVM. By determining by experiment and measurement the wide-open gain of the amplifier and then by using the VTVM across the output of the amplifier, extremely small RF voltages in the order of a few microvolts may be estimated with fair accuracy.

—RTM—

Emergency Isolation Transformer

→ from page 13

other to the load. The regular secondary windings(s) may be ignored or used as in Fig. 1B to vary the output voltage.

Using only one of the dual windings as the primary, limits the load that may be drawn through the transformer to fifty percent of its former value. The one I have used as an isolation transformer was picked up as "surplus", and is very conservatively rated to deliver 6.3 volts at ten amperes from the secondary. It will therefore handle thirty watts continuously and much more for short periods.

—RTM—

Make Sure Its the Tube

→ from page 18

not reach 200 ua, the tube should be returned to the manufacturer for adjustment.

9. It should be noted that the I_{anode} reading is *not* dependent upon the ion trap setting. If this meter reads 200 ua or better, and there is no raster, check:

a) E_{anode}
b) E_{G2}
c) Ion trap setting
d) Filament voltage
e) E_{G1}

10. The E_{G1} voltage can easily be checked by moving (+) lead of VoltOhymst to pin #2 or G_1 of jumper. This voltage should vary from 0 to —100 volts (reverse polarity on VoltOhmyst) with brilliance control setting. If this bias voltage does not approach 0 volts at the maximum brilliance setting, the tube is partially cut-off. The set should then be serviced to correct this condition.

11. Correct filament voltage is 6.3 volts a-c, and can be checked across pin #1 and pin #12 of jumper lead.

12. Before returning a tube for such things as

a) low brilliance
b) no cut-off
c) open filament
d) no raster, etc.

make certain that all voltages applied

to the tube are correct. There is a great, if not greater, possibility that improper tube operation is caused by circuit defects in the chassis than in the tube itself. Therefore, we urge you to be sure before condemning a tube.

—RTM—

Printed-Circuit Tuner

→ from page 8

mum response at the second detector, as shown on the vtvm.

For sound i-f, tune the calibrator to 21.25 and adjust L16 for minimum response at the second detector, as shown on the vtvm, readjusting L15 and L16 if required.

Where used

Initial designs of the new tuner are intended for use with a stagger-tuned picture system having a carrier of 25.75 Mc, and a sound system having a carrier of 21.35 Mc, as used in the 630TS type of receiver. This type of receiver, which now uses the RCA 201E1 or similar turrent tuner, may be changed over with only two minor electrical changes and few mechanical modifications.

Special features have been incopo-rated in the tuner to make for long life and trouble-free service. These include stator contact springs of solid hardspring silver, and turret contact rivets of solid coin silver. The unit is capable of withstanding well over 40,000 complete revolutions of the turret.

Under typical operating conditions, the tuner provides substantially uniform gain of between 28 and 35 db on all channels.

—RTM—

Fringe Area Business

→ from page 14

ready mentioned, Roh's uses a two-inch pocket scope for outside work and a grid dip meter to resonate antennas. Although set modification and careful antenna installation solved most of the fringe problems, a booster was needed for certain areas.

Field Testing

The biggest factor in the success of Roh's installations has been the testing done in the field. There is no guesswork. All locations are checked

→ to following page

Fringe Area Business

→ from preceding page

before a set is installed. Appearances have been proved deceiving, and many of the most unlikely-looking spots are getting the best reception.

One installation in a valley to the east of Tucson would not have been employed. To the eye, the location was impossible: on the station side, the land rose sharply, eight miles away, and in the same direction there was a mountain range. In addition, the distance from the station was greater than that of any previously installed sets. However, when a signal strength reading was taken it showed over 100 microvolts. A 65 ft antenna was installed which provided good, consistent reception.

A standard fringe area does not exist. It is possible, however, to summarize a typical installation in this area by using averaged figures.

The TV truck is sent out to the potential location. A signal strength reading shows 350 microvolts and a purchase is recommended. A set with an inter-carrier type of circuit is aligned, and the i-f band width is narrowed to three Mc. The set is then installed with a twin stack Yagi, which is erected to a height of 45 ft over the terrain. The receiver is turned on and a final check is made. The result is a picture with good definition from a station which is 104 miles away.

Roh is optimistic about Tucson's TV future. The investment in his store proves it. ✓ ✓ ✓

—RTM—

Products for the Trade

→ from page 25

REGULATED VOLTAGE SOURCE

If you have always wanted a precision source of regulated voltage, you will be interested in the new Sola adjustable, regulated a-c voltage supply. This new voltage supply is called the "Solavolt" type "CVL". It is designed for use with equipment which requires an adjustable source of constant a-c voltage (from 0 - 130 volts) of undistorted wave-shape. Except for the rotor of the autotransformer, there are no moving parts or tubes. Each unit is provided with attached input cord and plug; line on-off switch, one standard receptacle for a fixed regulated 115 volts, one standard receptacle for a variable regulated output of 0-130 volts, and a pair of jacks with regulated variable output of 0-130 volts for connecting instruments with plugs or wire type loads. Write for technical bulletin CVL 140. It's free and gives full specs. **Sola Electric Co., 4633 West 16th St., Chicago 30, Ill.**

—RTM—

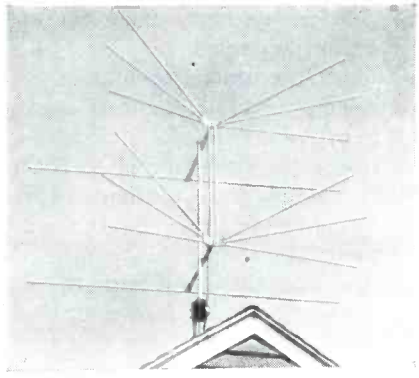
WINDOW ANTENNA

Something new in window antennas. It's Telrex's closed loop conical aerial, known as Superex (very low priced). The antenna is also well suited for concealed indoor use. Each antenna comes with novel mounting bracket which makes installation easier and permits orientation. **Telrex Inc., Asbury Park, N. J.**

—RTM—

HIGH BAND ANTENNA

For those areas where the Taco Lazy X antenna does not provide sufficient gain for the upper end of the high band, a new antenna has been developed, called the Tri-X. The forward angle of the antenna elements has been increased and a third element added in between the others to provide a conical effect. This antenna will emphasize reception on channels eleven, twelve, and thirteen. Noise-snubbers to eliminate wind-whistle effects, and Jiffy-Rig type construction are additional features. **Technical Appliance Corp., Sherburne, N. Y.**



—RTM—

MICRO-MINIATURE CAPACITORS

Here are the smallest tubulars yet, type P83Z, which are 3/16" wide and 7/16" long. These are particularly applicable to radio-electronic usages calling for extra-tiny, low-capacitance paper condensers. They substitute well for usual mica and ceramic capacitors. **Aerovox Corp., New Bedford, Mass.**

Shop Tips

→ from page 22

Distortion in Record Changer Reproduction

Some Field Reports have been received of record changers which have developed distortion in the field, using the two needle crystal. Investigation of the complaints reveals that the distortion is of two types:

1. Distortion due to crystal deterioration. This is ordinarily accompanied by reduction in output from the crystal as well as distortion and is properly solved by replacing the crystal.

2. Distortion due to motor vibration. Some motors develop enough vibration to cause distortion by modulating the crystal output at the frequency of motor vibration. This is coupled through the turntable to the needle, causing the vibration to appear in the output of the player. This type of distortion will usually be more noticeable as the needle approaches the center of the record, especially on 33 rpm records. The solution to this type of distortion is to either tighten the motor mounting which alters the amount of vibration transmitted to the crystal, or to change the motor.

Do not increase needle pressure by reducing the weight of the counter weight. Increasing the needle pressure will result in short record and needle life.

Admiral Radio & Television
Service Bulletin

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Could be this book'll be worth its weight in dollar bills. For it explains in clear, plain language and illustrations how to identify TV set trouble . . . and what to do about it.

Contains more than 100 pages . . . filled with diagrams and photos to help you more quickly locate trouble . . . solve problems . . . improve your TV set repair business.

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So call your distributor today . . . while his supply lasts. Ask him for the book that will improve your television service, and the tubes to improve your profits . . . SYLVANIA.

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- Gives simple, concise instructions for making repairs, proper adjustments.
- Contains complete circuit diagrams of typical television receiver.
- Explains latest television developments.
- Tells about television test equipment and what each instrument will do.
- Provides a practical dictionary of television set trouble.

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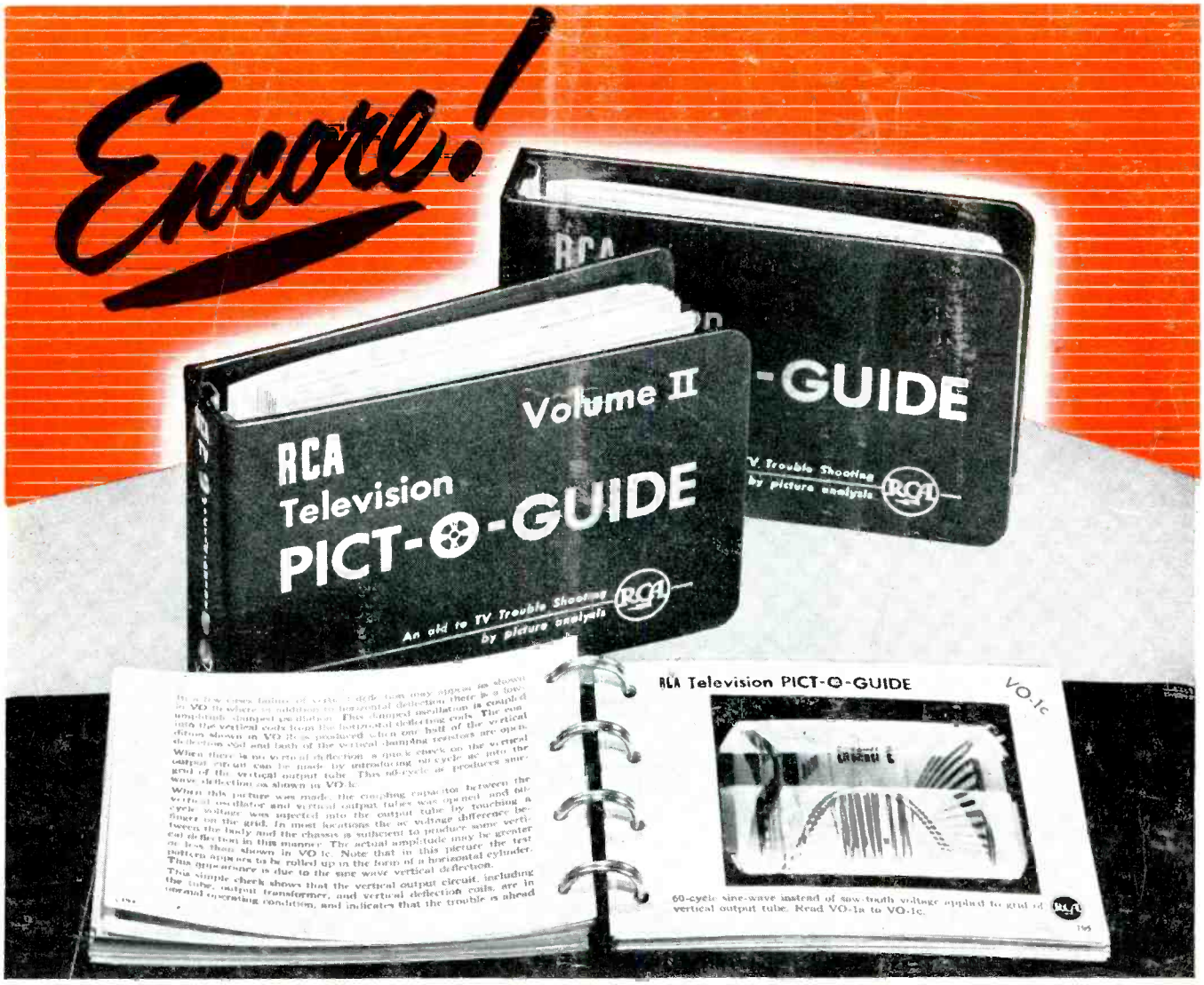

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