JUNE, 1950

Radio SERVICE DEALER

The Professional Radio-TVman's Magazine

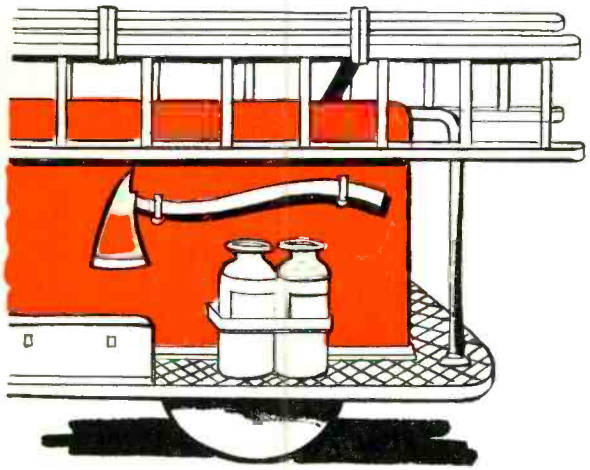
IN THIS ISSUE:

AM-FM-TV-SOUND

Paid Circulation Of This Issue: Over: 23,500

Total Distribution Of This Issue: Over: 25,000

Because
They're Dependable Starters . . .



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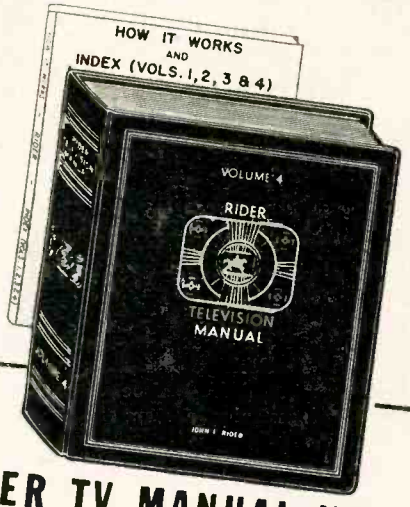

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RIDER MANUALS *mean* SUCCESSFUL SERVICING

EDITORIAL

by S. R. COWAN

Ten years ago we editorially opined that the Radio Industry should emulate Baseball by appointing a "czar" who could and would establish and then enforce the maintenance of certain standards and policies that would benefit all branches of this complex industry. Said "czar", we proposed, would protect the "high" and "low" groups and the parts maker particularly, for because he supplies both set maker and the replacement trade his position is often that of the guy squeezed between two extremes.

Our original editorial caused a furore which died of inertia because then, as now, only the "big boys" had any say in industry developments. But now such chaos is rampant in the radio-television field that the "big-boys", meaning RMA members, are on the verge of assigning a man of world-wide reputation to become, in effect, the industry "czar", although actually he would have a more proper title, such as Industry Co-ordinator.

We reiterate our opinion of ten years ago: This industry needs a "czar" or "co-ordinator", and it needs one immediately. The industry needs Standards and a force to police them once they are established. For example, we need standards of pricing and discount methods. Why are some set manufacturers permitted to offer under their private labels volume controls and other components at lower list prices than the list prices established by the original parts manufacturers for the identical items packaged at their own factories? Why are some glorified servicemen recognized as jobbers, and given jobber discounts, by some parts makers who can't get legitimate jobbers in that section to stock their lines? Why do some "legitimate" jobbers sell items at trade discounts over-the-counter to any Tom, Dick and Harry who walks into their stores when business ethics require that wholesalers should only give established trade discounts to servicemen and dealers who have legitimately established themselves as such? Why do some Jobbers (sic) operate their own retail radio service departments in direct and unethical competition with their own service organization customers?

The industry needs a man who can also co-ordinate and control unethical trade practices on the part of manufacturers, too. Many of them, for example, are advertising ridiculous, false and improper claims for TV sets with built-in antennas. The ex-general of the U. S. Armed Forces currently being considered for the job under discussion, Industry Co-ordinator, deserves the support and best wishes of us all, but the servicing fraternity in particular had better get itself organized quickly so that its properly elected delegates can be appointed at the right time to present our case and win justified recognition from the man who may become radio-TV's "Mr. Big".

Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
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NEW YORK 17, N. Y.

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MAKES ORDINARY TELEVISION GOOD-
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Available in the following models:

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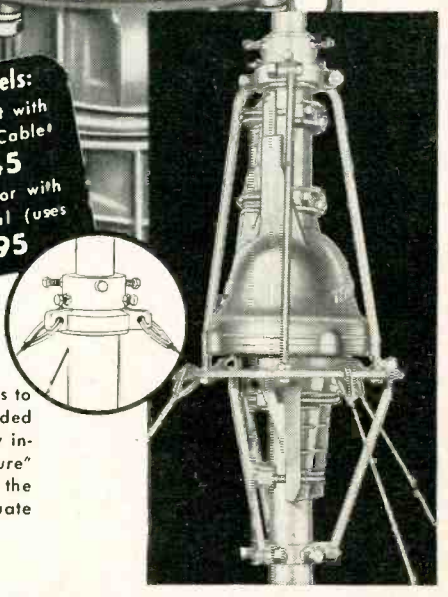

WATCH RADIART FOR TWO SENSATIONAL NEW TV ANTENNAS

Here are two NEW accessories to the TELE-FOTOR to give it added versatility for extraordinary installations. The "*Super-Structure*" will "support a ton"... and the "Floating Guy Collar" is adequate for most guyed installations.

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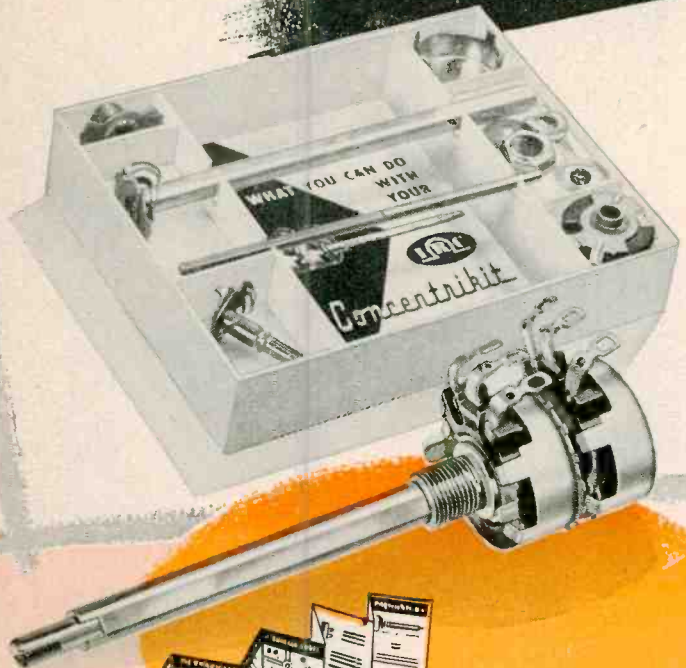
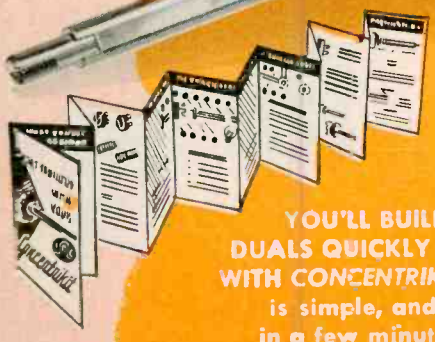


Amazing new IRC Concentrikit is the practical answer to your concentric dual replacement problems. With this set of specially designed parts you can assemble over 90% of all concentric dual types . . . no more long searches and waits for exact duplicates. You save time, worry *and* inventory investment.



YOU'LL BUILD CONCENTRIC DUALS QUICKLY AND EASILY WITH CONCENTRIKIT. Assembly is simple, and can be completed in a few minutes. Step-by-step instructions are furnished with every kit.

REPLACEMENT MANUAL AVAILABLE
Full replacement data on concentrics for all applications, from the earliest home and auto radios to television, are contained in a new IRC CONCENTRIC DUAL REPLACEMENT MANUAL. Be sure to get a copy from your IRC Distributor.

STOCK ASSORTMENT

Television has greatly increased your concentric dual requirements . . . be ready with this CONCENTRIKIT Stock Assortment on your bench. Handsome metal cabinet contains all you need to assemble quickly any of 144 different concentric duals. It covers over 500 models . . . RCA, Admiral, Air King, Belmont, Emerson, General Electric, Motorola, Philco, Westinghouse, Zenith and many others. Order from your IRC Distributor now, or send coupon for more information. International Resistance Company, 413 N. Broad St., Philadelphia 8, Pa.

HERE'S WHAT YOU GET

In Concentrikit Stock Assortment #13

	Quantity
Complete Concentrikits	4
Base Elements	
B11-108	1
B11-114	1
B11-115	1
B11-116	1
B17-116	1
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
Sleeve Bushings	
S-4	1
S-5	1
Resilient Retainer Rings	10
Switches	
76-1	3

Concentrikit Stock Assortment comes in a sturdy all-metal cabinet. Four drawers and individual compartments assure efficient stocking . . . and cabinets may be stacked with IRC Resist-O-Cabinets to make a convenient and good-looking shop arrangement. METAL CABINET IS SUPPLIED AT NO EXTRA CHARGE, you pay only the regular price of the parts.

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ORDER YOURS TODAY!

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☐ I'm interested. Send Catalogs DC1A and DC2S with details on CONCENTRIKIT and Dealer Stock Assortment.

☐ Enclosed find 25c in stamps or coin for my copy of IRC Concentric Dual Replacement Manual.

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IRC

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Field Findings

A resume of Industry happenings here, there and everywhere

by S. R. Cowan

TV Service Advertising

Newspapers and TV stations have been getting more and more advertising from service organizations who feature the advantages of buying a "policy" from them. Some of this advertising is first class, but most of it is very bad indeed. The good advertising simply states that for certain stipulated sums the TV set owner gets certain services for a period of time. The bad advertising contains either willful misrepresentation or, much worse, by deliberate omission deceives the prospective buyer into believing he is going to get much more than actually is the case. We are not going to publish examples of "bad" advertising for that would serve no useful purpose. However, here are illustrations of what can be considered good sales promotional effort.

Summertime TV Slack

All TV set makers have come to believe that the sales potential drops off sharply during the summer months, July and August. They are justified in that conclusion. But, such is not true of TV service potentials, for TV sets are more apt to require repairs during hot and humid summer weather than during more temperate periods. So, during the two Summer months ahead, while the volume of initial TV installation work drops off, it would be advisable for Service Dealers to spend any spare time rechecking the installations they have already made. Without doubt they will find that guy wires have gotten too much play, or have broken off. Or they'll find installations which were made improperly in the first place, and which should be corrected now. Even though the set owner may not have called for service, TV service contractors can render themselves a great money-making service by checking their jobs rather than by merely resting during the slack period ahead.

While on the subject of busy and slack periods, certainly April and May were bad months for TVmen because the plague of windstorms in all parts of the country required countless thousands of call-backs to reset antennas that had blown down or out of orientation.

More TV Statistics

According to RMA reports during the first quarter of 1950 over 1½ million cathode-ray picture tubes were made and of that total 98% were 12" or larger, 37% being 14" or larger. At the same time, it is interesting to note that the production and sale of conventional radio receiving type

Examples of good sales effort

tubes during the first quarter of this year also broke all previous records. For example, in the first quarter of this year over 80 million radio tubes were made as compared to 40 million for the same period of 1949. In March 1950 over 40½ million radio tubes were produced, of which more than 6 million were for replacement use. Therein lies the reason why radio service dealers are doing so well. The more sets in use the greater potential for servicing and replacement sales. Actually, though, as the average TV set is equivalent to 7 conventional AM models, the service volume is still overwhelmingly concentrated in sections of the country having TV.

TV Wire Links

A. T. & T. has gotten its cable through from St. Louis to Memphis and plans to complete the link from Chicago to Omaha by this Fall. The extension from Omaha to San Francisco, routed via Denver and Salt Lake City, may be completed by the end of 1951. Let's hope so. Television, while still in its infancy, with only 108 stations in operation and less than 6 million TV sets in use, has already become one of this nation's 3 largest industries, having passed the $2 billion mark already. Imagine what it will be like in 10 years if no untoward event, like a war, stymies its progress.

Phonograph Drive Planned

A committee of RMA, appointed for the purpose, has approved a plan to promote a national campaign designed to increase the sale of TVsets and conventional radios having built-in phonograph record players, and a joint campaign stressing the modernization of sets in use either by urging the set owner to add phono-players to those that are not so equipped, or by the conversion to 3-speed models if their sets are of the now obsolete single or double-speed player type. We are 100% behind such a campaign, particularly the phase that bears upon modernization of in-use equipment, for this is a purely service-technician type of business.

Only a small fraction of the millions of radios and TV sets now in use are phono-radio combinations. Likewise, in proportion to the total, there are hardly any 3-speed record-player combinations in use as yet. It's up to Service Dealers to try to change this picture for several reasons. To begin with, it is a known fact that the public wants to play records and have record-players. The fact that there are 3 types of records (referring to speeds) available and each having merit justifying its preference, thus simply means that we, as technician-installers, must do the sales promoting job which will result in the prospective customer saying "Okay, go ahead and install one of the new 3-speed units". Once again we must urge radio-TV technicians to overcome their inherent reluctance to be sales-minded. You've got to sell to survive—and in this instance you are basically selling your service as well as a product. No other

FREE NOW!...

with your order for 100 Sylvania Receiving Tubes or 3 Sylvania Picture Tubes

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.

FREE only until August 31st

Remember, you can't buy this book. It's yours *free* from your regular Sylvania distributor during June, July, and August, with the purchase of 100 Sylvania Receiving Tubes or 3 Sylvania Picture Tubes.

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.

HERE'S WHY YOU NEED THIS BOOK

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

SYLVANIA ELECTRIC

25 YEARS OF SERVICE 25th Anniversary SYLVANIA ELECTRIC 1925-1950 RADIO TUBE DIVISION

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

class of radiomen, other than servicemen, enjoys such close personal contact with and entré to homes where there is potential business such as phonograph modernization work. So, let's get going! There's a bright, money-making promotional campaign being worked out now, and as soon as details are available from RMA's committee we'll give you the facts. Then it will be up to you to get your share of business, and it should be a cinch.

Higher Income Brackets

Twenty years ago a national survey was made to ascertain what the average radio serviceman's income was. Having ascertained that the average serviceman then earned approximately $21 per week, a deplorably low figure, every effort was made to suppress the information. Ten years later it was learned that servicemen had improved their status to the point where they were averaging $25 in gross weekly earnings. Remember, however, that in those days a man in the low income brackets kept for himself almost every cent he earned for the income tax rates did not affect him. Now-a-days we have a different situation.

Latest reports from reliable sources indicate that the average radio-TV technician is earning upwards of $66.66 per week gross. He is a married man with 2 children. His average federal and S.S. tax deductions approximate $3.09 weekly giving him a take-home pay check of $62.97. Of course in most states he has to pay state, hidden and other sales taxes not known 10 years ago, and experts compute that these amount to almost $2.05 more, weekly. So, in effect, today the average radio-TV technician is in the 10% tax brackets, but has a net income of $60.95 as compared to $25 a decade ago.

Other factors to consider are these: ten years ago the average radio technician worked 60 hours weekly while today the average is closer to 50 hours. So, summarized, the earnings status of radio-TV servicemen has improved to an impressive degree. Now-a-days we're not ashamed to call attention to our profession, for the status of "profession" is rapidly accruing to us.

Licensing Again Looms

Because various cities have had so many "serviceman complaint" problems recently, although the majority stem from complaints about dealers rather than technicians, the various civic fathers are again holding council hearings on the subject of licensing legislation. The hearings being held in New York City are typical. We

[*Continued on page 27*]

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

Scenectady 5, New York

182-JA4

NOW COMPLETE!

The Ken-Rad TV-service course is ready from A to Z—eight helpful lessons packed with down-to-earth instruction in how to service TV receivers successfully ... and profitably. See your Ken-Rad distributor for your income-building copy!

TRADE FLASHES

A "press-time" digest of production, distribution & merchandising activities

	TV Sets	Home Sets	Auto Sets	All Sets
January	335,588	470,715	189,480	995,783
February	367,065	529,254	221,139	1,117,458
March (five weeks)	525,277	724,691	255,673	1,505,641
TOTAL	1,227,930	1,724,660	666,292	3,618,882

Receiver production figures first three months, 1950

TV Production

Television receiver production during the first quarter of 1950 was 21 percent higher than in the previous peak period, the last quarter of 1949, and was more than three times the output of TV sets in the first quarter of 1949, the Radio Manufacturers Association said today.

Following is a month-by-month breakdown of radio and television set production reported to RMA for the first three months of 1950:

RCA Service Clinic

Spurred by the response to its first television Service Clinic, which attracted more than 5,000 RCA Victor and independent television servicemen to more than 50 inaugural meetings conducted nationwide last month, RCA Victor announced that the second in the series of six scheduled lectures got under way during the week of May 1.

An essential part of the lecture will be the display and demonstration of television test equipment, provided by the RCA Service Company, which includes a sweep generator, oscilloscope, and a marker oscillator. In addition to film slides and printed lecture texts, the meetings will also feature a dynamic demonstrator which will be used to illustrate how servicemen can localize service troubles by analyzing the kinescope picture. Each serviceman attending the lecture will receive a booklet, complete with illustrations and diagrams, covering the information discussed. In effect, the complete set of six manuals, one for each of the six different lectures scheduled, will serve as an invaluable reference guide for the servicing of RCA Victor television receivers.

New Du Mont Color System

A patent for a three color direct view television tube has just been issued to Allen B. DuMont Laboratories, Inc.

In its construction, the new tube is similar in most ways 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 color tube has a fluorescent screen composed of tiny fluorescent dots which give forth red, blue, and green colors respectively when struck by the electron beam. The tiny dots are arranged so that each dot of one color is adjacent to adjoining dots of another color.

In operation, as the electron beam of this new color television tube passes over the tiny color spots successively, it is turned on and off rapidly in accordance with both the brightness and color of the picture to be reproduced.

The new color television tube can be used in any one of the three color systems now proposed before the F.C.C.; namely, field sequential, dot sequential, or line sequential.

Tele-Clues Proving Popular

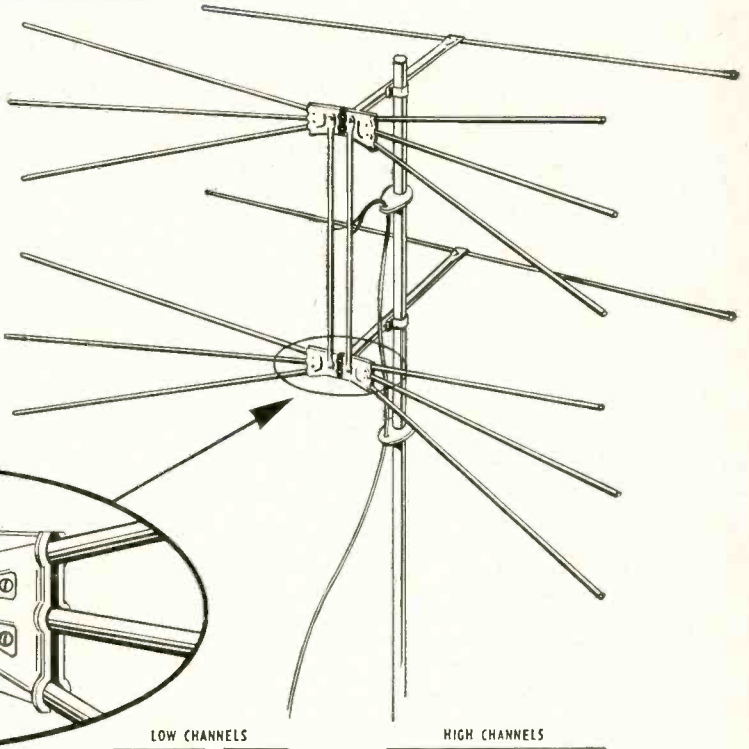
A series of pictorial "Tele-Clues" to aid servicemen in localizing circuit defects within television sets, are proving to be popular as evidenced by the large number of requests received by the editor. The "Tele-Clues", which are available *free* of charge through General Electric and Ken-Rad distributors, are inserted in the bi-monthly publication, "Techni-talk" which is published by the Tube Divisions of General Electric.

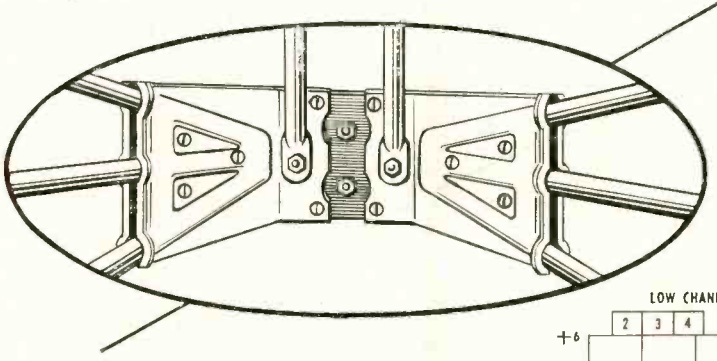
[*Continued on page 28*]

ANOTHER TACO REQUIREMENT-DESIGNED TYPE ALL-CHANNEL TACO TRI-X

● For 16 years Taco has been providing the serviceman with the antenna best suited to his particular needs. For each TV area with its own specific conditions as to channels operating, directivity and signal strength, Taco has provided the best design.

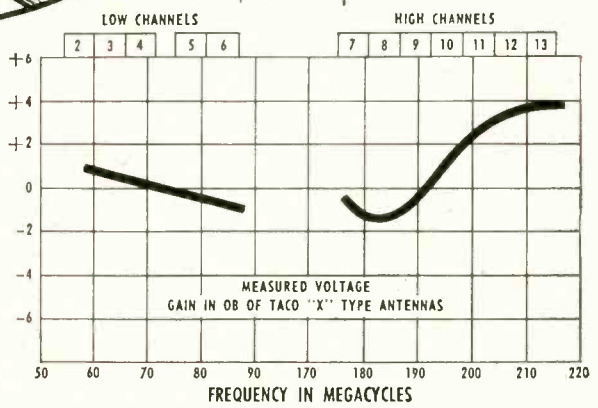
For areas where additional gain is desired on channels 11, 12, and 13, the new Taco Tri-X is now offered. Designed as an alternate for the Lazy X, this new Taco antenna incorporates all the latest developments of the unparalleled Taco Engineering and Research facilities.





The new apex design used in the Taco Tri-X eliminates the inherent weak point of X type antennas. Heavy aluminum fans, ribbed for extra strength, are bell-mouthed on ends of grooves thus leaving no sharp edges in contact with element rods. Special Taco noise-snubber eliminates bothersome wind-whistle effect. Jiffy-Rig construction provides the fastest, most practical assembly.

SEE YOUR JOBBER FOR PRICE AND DETAIL



Graphic illustration showing gain of Tri-X compared to Lazy X. Through low-band difference is negligible. In high-band operation the Tri-X shows considerable gain over the Lazy X on channels 11, 12, and 13.

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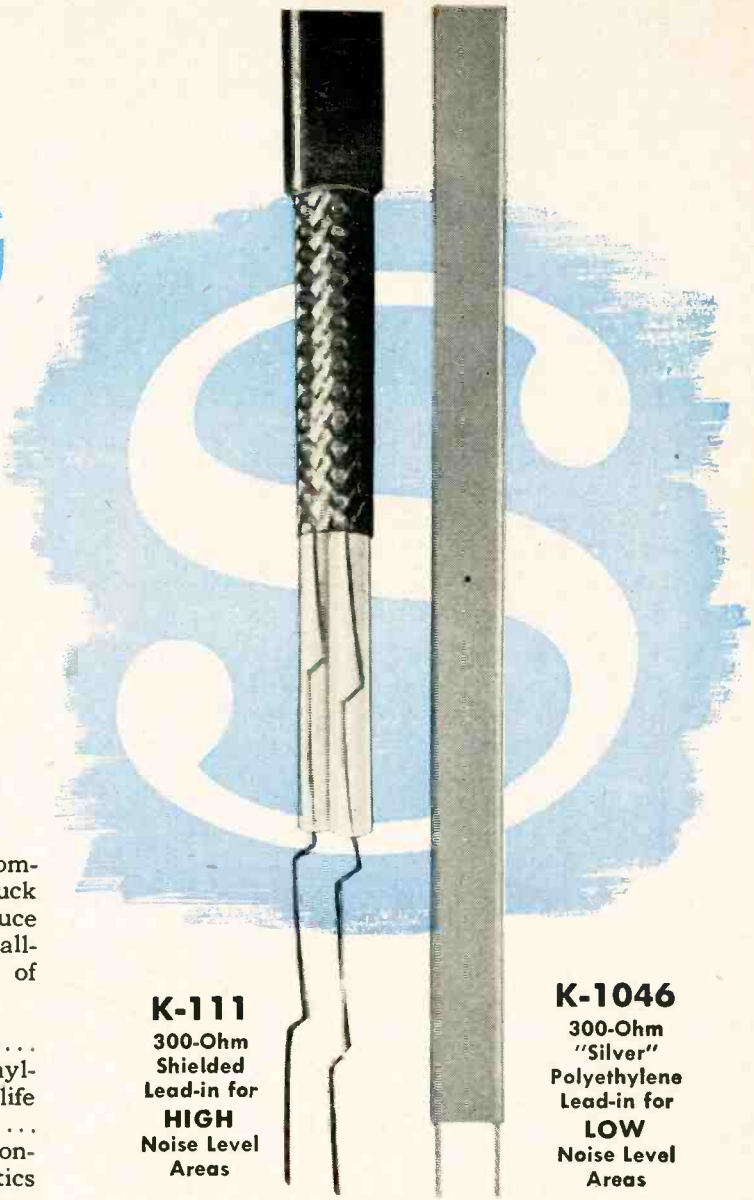

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Short-Cuts in AUDIO SERVICING

by Matthew Mandl

Common audio troubles and how to find them is the subject of this elementary article. Much of the information contained is the result of long and pratical experience in the field, and should provide interesting reading to all.

SERVICE technicians with long practical experience in the field invariably have a number of clever short cuts which they use in order to localize troubles quickly and easily. Many of these procedures are somewhat off the beaten path of ordinary service routine, but they bring results because they are based on a sound and instinctive insight into trouble diagnosis. While actual methods among different technicians vary, each one succeeds in getting a good idea of what the general trouble is long before he needs to resort to elaborate voltage, current and resistance measurements. Thus, an analysis and study of these servicing tricks will not only be worthwhile to the newcomer in the field, but will also serve as an exchange of ideas for the more experienced repairmen.

In AM or FM receivers, the sounds which come from the loudspeaker (or the lack of them) give important indications of the type troubles which exist, and for this reason many technicians use this section of the receiver as a basis for their initial diagnosing. The clues given by the type sounds coming from the speaker, when combined with a few simple checks, will give most if not all the answers needed to find the trouble. As a basis for this discussion, therefore, we will use *Fig. 1* as an illustration of some of the methods utilized for getting to the heart of any trouble which might exist in the audio sections of FM, AM or PA systems as well as the audio sections of television sets.

This drawing shows a typical push-pull audio section in which *V1* is the input from the detector or phono pick-up, while *V2* is a phrase inverter; both tubes contained in one envelope and having a common cathode. *V2* derives its signal voltage from an added resistor attached to the grid leak of *V3*, the value of *R6* being chosen so that it feeds the same amount of audio voltage to the grid of *V2* as exists on the grid of *V1*. In this manner the proper out-of-phase relationships are established for push-pull operation. *V3* and *V4* are the push-pull tubes working into a standard output transformer which feeds the loudspeaker voice coil.

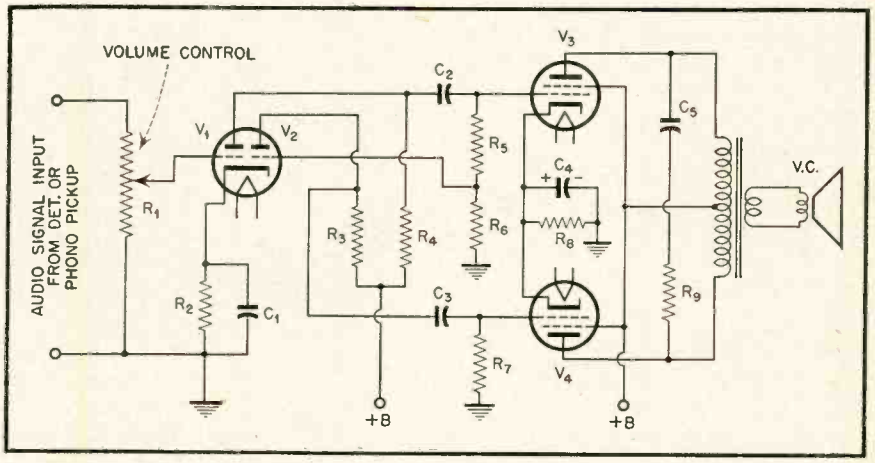


Fig. 1. Typical push-pull audio amplifier, using phase inversion.

The "Dead" Set

If a set is inoperative when tuned on, a quick, visual inspection of the tubes will often eliminate the immediate need for checking each one with a tube checker. If the filaments are lit and it is not an a-c/d-c type of receiver each tube can be lifted from its socket and put back in. This should be done from the last audio stage, working back toward the detector. The "make and break" of the tube socket potentials under this procedure usually gives the experienced man an inkling of whether or not the set is really "dead"—or is "alive" but does not pass the signal to the speaker. The total absence of sound is due either to lack of B voltages or because of an open output transformer or defective speaker. Even if a tube were inoperative, virtually all sets have a slight residual hum coming from the loudspeaker and this clue, combined with the clicking noise which results from the tube lifting process, indicates that B voltages are present. If no hum or clicking sound is heard at any time, then the set is considered to be "dead" in the sense that no response, minute though it might be, is secured from the speaker.

The tube lifting procedure will not work with the a-c/d-c receivers, however, because of the series filament arrangement. Again, however, if all tubes are lit and with the chassis removed from the cabinet, each grid terminal of the tube socket can be touched with the end of a screwdriver. Inasmuch as the grids are the most sensitive, this method will again produce clicks if B voltages are present and the signal finds continuity from the disturbed grid to the loudspeaker. This procedure is, in reality, a rudimentary form of signal tracing and forms an excellent basis upon which to build the trouble shooting procedures.

If the set acts alive for all tubes but one, the stage in which the trouble exists will have been localized. From then on it will be a matter of checking the suspected tube with a tube checker or locating the defective resistor or condenser which is giving trouble in that particular stage.

If the set acts totally dead and it has a dynamic type of speaker, several quick means can be employed for finding out whether or not the field coil is open. One of these methods consists of bringing a screw-driver near the center bar of the speaker pot in order to see if the magnetic field is absent due to lack of B current flowing through the field coil. With most modern receivers, however, the front is sealed off by a felt disk to prevent metal filing or dust from entering the voice coil aperature. A better method is to get a pocket compass and have it handy on the work-

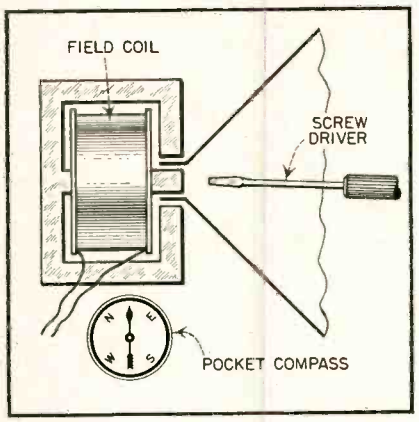


Fig. 2. Quick means for checking magnet field in speaker.

bench. Bringing the compass near the field coil will give a quick indication of B current flow through the field coil, and the presence of the magnetic field is a sure indication that the field coil is not open. (See *Fig. 2*)

Another cause for the set acting totally dead is a defective output transformer. If the primary opens, the output tube (or tubes) will not receive B voltage and no sound will reach the voice coil. The latter, too, could be defective, as well as the secondary winding of the output transformer. An ohmmeter check of these sections will, of course, show up the trouble, as would B voltage check at the plates of the tubes. A handy device, however, which will give an immediate audible indication of the trouble, as well as show up any distortion or volume decrease which might arise by faulty output components, is indicated in *Fig. 3.* This consists of a small PM speaker mounted in an old receiver housing or attached to the most convenient place on the work bench.

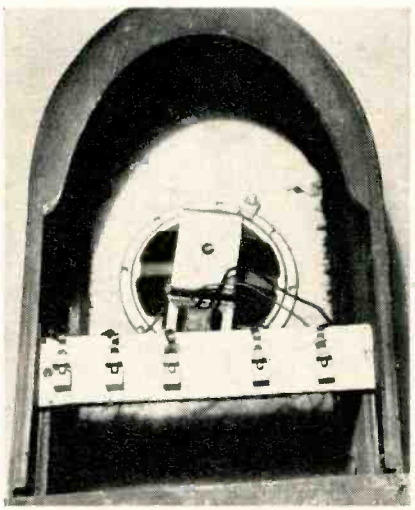


Fig. 3A. Physical appearance of test speaker illustrated schematically in Figure 3B.

This test speaker is wired in such a manner that it will check voice coils, secondaries and primaries with a minimum of bother, and some of the older shops have several set up along the bench. As shown in *Fig. 3,* a terminal strip is provided so that test prods can be attached as required. If the primary of a transformer is suspected, terminals *4* and *5* can be placed from the output tube plate to +B, placing a jumper across *1* and *2* to close the circuit. If this speaker produces the sounds from a station, the trouble will, of course, be in the transformer or speaker of the receiver. If the test speaker gives no sound, the earlier stages should be checked for open circuits or defective components. If the output transformer of the receiver is shorted, the test speaker will not function—but the usual trouble in transformers will be open circuits, and it is rare that a short is encountered.

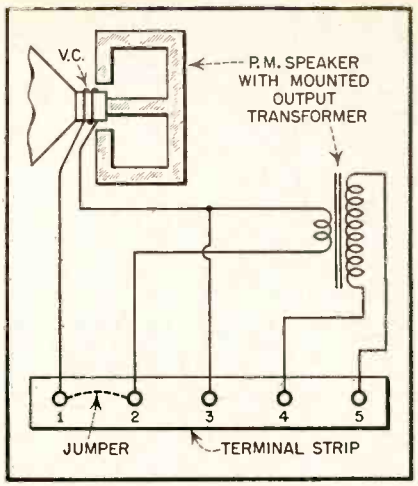


Fig. 3B. Wiring diagram of service bench test loud speaker.

If one of the tubes of a push-pull stage is defective, the test speaker will also indicate this, by placing terminal *4* at the plus B center of the transformer and alternately touching the terminal *5* test prod to the plate of one output and then the other. The lack of response for a particular test will indicate, of course, which push-pull tube is defective.

If the test speaker plays at the primary side of the output transformer, but the receiver is still dead, the trouble must lie in either the secondary winding or in the voice coil of the speaker itself. In this case a quick check can be made by removing the jumper from terminals *1* and *2* of the test speaker, and running test prods from terminals *1* and *3* to the secondary of the receiver's output transformer. This places the voice coil of the test speaker across the output and if no sound is forthcoming it indicates a defective secondary or shorted voice coil. If the test speaker does play, then the secondary winding is all right, but the voice coil of the receiver's speaker is at fault. Many other uses will be found by the servicing technician for this simple and inexpensive time-saver.

Checking Distortion

Distortion in audio amplifiers is usually due to faulty coupling capacitors, incorrect bias or defective tubes. In push-pull a decided unbalance between the tubes will also be a contributing factor, even though both tubes may check all right in a tube checker. A rapid method for ascertaining unbalance is to place a d-c voltmeter directly across the two plates of the output tubes as shown in *Fig. 4.* If both tubes are substantially matched and drawing equal currents, little voltage will appear across them. If they are decidedly mis-

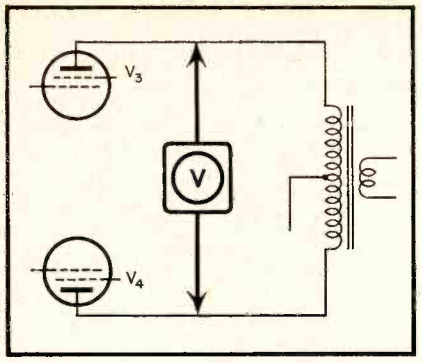


Fig. 4. Quick check for unbalance in push-pull stage.

matched, potentials of 5 volts or more will be encountered. If the meter reads backwards, change the meter leads. Zero voltage should not be expected across the plates, because there will always be slight differences between the d-c resistance of the two primary windings as well as small differences in tube emission. Voltages up to approximately five volts are normal, though voltages of 8, 10, or 15 volts indicates tube replacements are necessary.

For efficient push-pull operation, two tubes should be chosen which have similar emission characteristics. If, for instance, four tubes are checked on a tube tester and the readings are as indicated in *Fig. 5*, tubes *1* and *2* would work better in a push-pull arrangement than tubes *1* and *4* or *1* and *3*. Tubes *3* and *4*, however, will also be satisfactory, since these two have similar characteristics. Thus, even though all four tubes are good, certain combinations will not work out best for push-pull operation.

Another common cause of distortion are leaky coupling capacitors, because their lowered resistance will alter the grid voltage due to leakage from the +B side of the capacitor. The quickest way of checking this is to read grid voltage from grid to cathode, to make sure a minus bias still exists. A plus grid potential means either a bad coupling capacitor or a gassy tube, and both should be checked further. Bridging a coupling capacitor with another is no check for a leaky condition, since putting another across a leaky one does not remove the partial short. Bridging a along the bench. As shown in *Fig. 3*, capacitor (or resistor) is only a means for checking a suspected open circuit, not a leaky or shorted condition. If the coupling capacitors of a push-pull stage are suspected, both should be replaced for either one alone can introduce distortion.

In *Fig. 1*, a shorted *C1* or *C4* would also cause distortion because it would remove the bias which is developed across these cathode resistors and cause excessive tube currents. A d-c voltage check across these resistors will indicate a shorted capacitor by the absence of a reading. If either of these capacitors open, there will be a decrease in volume due to degeneration, but distortion will not be produced. In case of a suspected open capacitor, another one can be temporarily placed across it as a rapid check. A pronounced increase in volume indicates an open cathode bypass.

Other causes of distortion may be loose speaker cones, improperly centered voice coils or insufficient magnetic fields in the speaker core. A substitution check with the test speaker as previously detailed will indicate whether the distortion exists in the speaker or originates within the circuit itself.

Checking Other Troubles

As will be noticed in *Fig. 1*, the screen grids of *V3* and *V4* are returned to plus B, a common practice

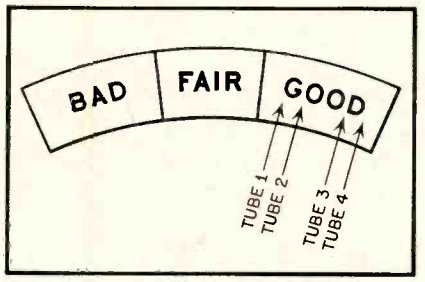


Fig. 5. Tubes which read closest to each other should be paired.

in both single and push-pull outputs. With pentodes and beam power amplifiers the slightly greater screen potential has no appreciable affect on performance, and this design eliminates the need for a screen dropping resistor and a by-pass condenser. In this position the second filter condenser of the power supply effectively acts as a by-pass for the screens and prevents signal variations and motorboating. If severe motorboating exists, therefore, a quick check can be made by placing an 8 or 16 μf electrolytic from one of the screen grids to ground. If this stops the motorboating, the second filter capacitor should be replaced. This check works in almost all instances, because the motorboating is usually due to an open second filter, or one in which the capacity has decreased to an appreciable degree. When the test establishes a defective filter, the old one should be removed, because a decrease in capacity is usually accompanied by a decrease in resistance, and the capacitor may be passing a considerable amount of current, thus loading the power supply and dropping B voltages. Any filter condenser which runs hot should be replaced, because it indicates excessive current drain.

Distortion in push-pull will also result if one of the push-pull tubes becomes defective, or if one side of the primary opens. If the defective tube does not short, the amplifier will still function, though with decreased efficiency. This does not always show up as distortion unless the volume is turned up, because the remaining tube is still capable of handling approximately half of the normal power output of the push-pull stage. Thus, if distortion is high when the volume is turned up, but virtually non-existant with low volume, it may mean one push-pull section is not functioning.

If glass tubes are used in the final stage they will provide for virtually an instant indication of an open transformer section. With the one side of the primary open, the tube plate will receive no voltage. The excessive current flowing through the screen grid circuit will cause the screen grid wires to glow brightly from the excessive current dissipation, and this indication is readily visible in the glass tube. With the metal tubes, lifting one tube out, replacing it and lifting the other of the push-pull tubes, will show which side is the dead side, because the receiver will not play when the good tube is pulled out and the defective one remains. This test will also be effective for indicating an open transformer section in the primary.

While the foregoing short cuts will not solve all the problems of trouble shooting audio amplifiers, particularly those of the intermittent type, they will in most cases enable the technician to save considerable time in localizing the stage or even the exact part which is defective.

Similar procedures can be applied to other stages of FM, AM or TV receivers with the same time-saving results. When these short cut methods have been applied several times, they will become an automatic routine which will greatly facilitate and expedite trouble shooting.

Fig. 1. Complete unit in operation.

Conversion of 630 TS Chassis TO 3 ft. x 4 ft. PROJECTION

by V. R. PARKER

Chief Engineer, Hi-Par Products Co.

Converting 630 chassis for Projection TV can prove highly profitable if the proper sales approach is made

CONVERSION of an RCA 630 TS type chassis to 3 ft. x 4 ft. Projection may readily be done by means of a kit manufactured by the Hi-Par Products Co. The projection unit used is the Norelco Protelgram Television Projection System (North American Philips Co., Inc.). The kit consists of a wired Picture Tube Protection and Power Supply for the H.V. Driver Unit chassis, plus a number of interconnecting cables and components, the purposes of which will be explained shortly.

Used in conjunction with the Protelgram System, which consists of a 3NP4 projection tube, a 3NP4 tube socket with cable, a tailpiece, an optical box, and a high voltage power supply; and housed in a suitable cabinet as shown in *Fig. 1*, excellent results will be obtained on a suitable screen. *Figure 2* illustrates all the parts and units necessary for the conversion. The circuit schematic of the Picture Tube Protection and Power Supply for the H.V. Driver Unit is shown in *Fig. 3*.

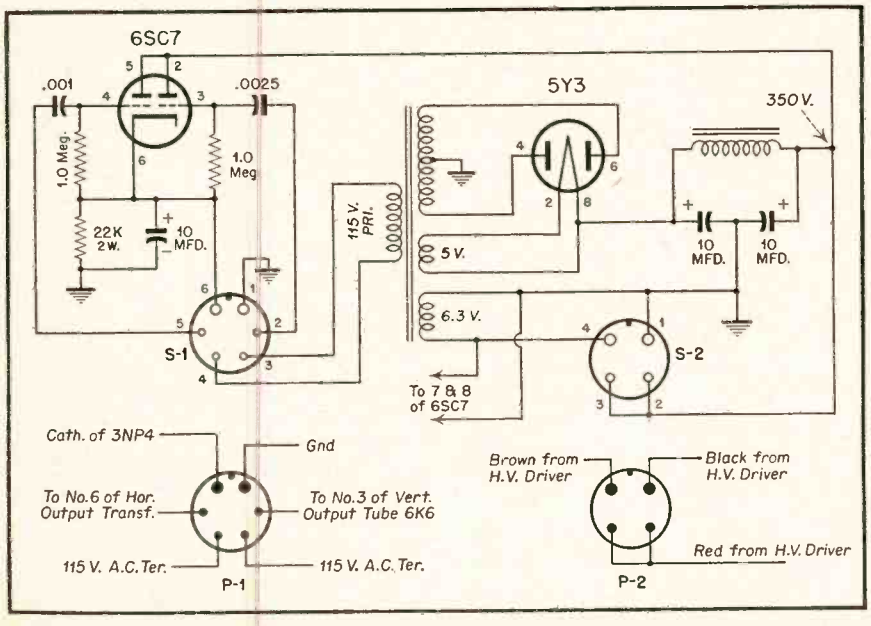


Fig. 3. Picture Tube Protection and Power Supply for H. V. Unit.

Circuit Changes

By referring to *Figs. 4* and *5* which are the original and modified circuit diagrams it will be seen that the principal changes to be made on an existing chassis are in the 2nd video amplifier stage. This is necessary because the 3NP4 projection triode requires considerable more grid drive than conventional 10" or 12" direct view type tubes. A peak to peak voltage of 90 to 100 volts is quite satisfactory. A 6V6 beam type tube is used in place of the 6K6 pentode. A lower value plate resistor (2200 ohms) is used to increase the band width and a B+ supply of 275 volts is used in place of the 135 volt connection. Other changes are in the grid circuit and cathode bias resistors.

The procedure in making the conversion is as follows:

1. Before attempting the conversion it is absolutely necessary that the TV chassis be in perfect normal operating condition with a direct view tube. A copy of the service notes on the 630TS receiver as published by RCA Victor should be available for reference purposes.
2. Remove the following parts:
   Deflection coils and focus coil.
   C. R. tube socket.
   Focus control.
   1B3 tube and connection to top cap.
   H.V. lead to C.R. tube.
3. Detach Brightness control and Hor. and Vertical hold control from their bracket.

4. Remove bracket controls are mounted on.

5. Install new bracket for controls. One end is mounted under nut that holds the volume and contrast control to chassis. The other end is mounted to chassis using the same 3 self tapping screws previously used.

6. The controls are now mounted to the new bracket with the Brightness Control on the *inside* and the Horizontal and Vertical hold control on the *outside*.

7. The focus control is mounted in the center of the bracket. An extension shaft is provided to increase the shaft length to match the other controls.

8. Install one of the bakelite terminal strips with #6 screw and nut in the small hole next to the ⅜" hole that previously held the focus control.

9. Remove the 1800 ohm resistor *R-183* in the focus coil circuit. One end of the 270 ohm 2 watt resistor *R-182* is attached to one terminal of this strip and the connection that previously went to the arm of the focus control is attached to the remaining terminal. From these two terminal points connect the twisted black wire to the focus control, routing the wire through the wide slot in the front center of the chassis.

10. The remaining bakelite terminal strip is mounted close to the 6K6 2nd video amp. tube socket in one of the holes that previously held the focus coil bracket to the chassis. The original self tapping screw is used.

11. From terminal #4 of the 6K6 2nd video amplifier V-116 socket remove the 135 V. B+ connection and the short wire that is connected to

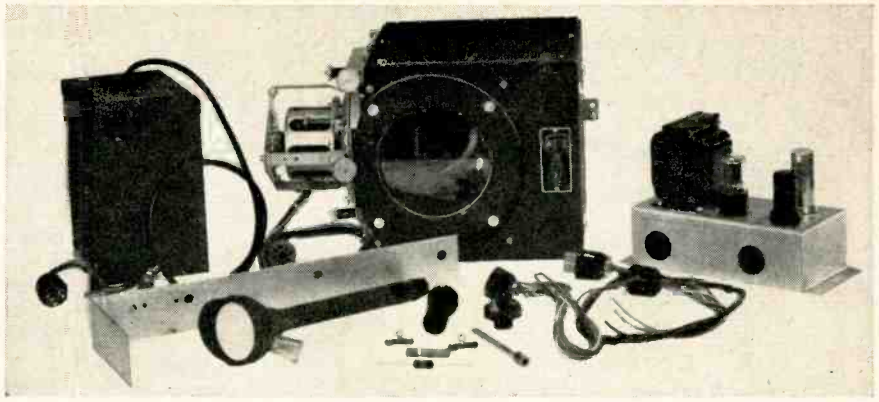


Fig. 2. Parts necessary for conversion.

terminal 6 of the 6AU6 1st video amp. V-115. These are now soldered to one terminal of the bakelite terminal strip. This is very important as this preserves the continuity of the 135 V. B+ through the entire chassis.

12. Next remove the 3300 ohm resistor *R-147* and in its place install the new 2200 ohm 2-watt resistor. A connection is now made from *terminal 4* of tube V-116 and the 2200 ohm resistor to a 275+ point. The end of the 6800 ohm resistor *R-141* is a convenient point to make this connection.

13. Remove the video peaking link jumper bar on rear of chassis. Remove the 330 ohm resistor *R-144* from cathode circuit and replace with the new 220 ohm resistor provided.

14. In the grid circuit of V-116 the 1.2 meg. resistor is removed. The grounded end of the 820 K ohm resistor *R-142* is removed and attached to the remaining terminal on the bakelite terminal strip. A connection from this point to −2V. is made by running a wire to one side of the 470 K ohm resistor *R-138* in the grid circuit of the 6AU6 1st video amplifier tube V-115.

15. Replace the 6K6 2nd video amplifier tube with the 6V6GT.

Final Assembly

This completes the actual circuit modifications and it is now only necessary to connect the 7-wire cable from the optical unit, the 6-wire cable from the picture tube protection and H.V. driver power supply chassis, and the 5-wire cable to the picture tube.

The 7-wire (octal) cable from the Norelco Optical Unit fits into a male octal socket supplied with the kit. The other end of this cable is connected to points on the receiver as explained shortly. The 6-wire cable plugs into the Picture Tube Protection Unit, and is also connected to various points in the receiver. The 5-wire cable is the picture tube cable supplied with the Norelco Unit, and connects to certain points in the receiver as explained shortly. Finally, the 4-prong cable, which is part of the Norelco

[*Continued on page 35*]

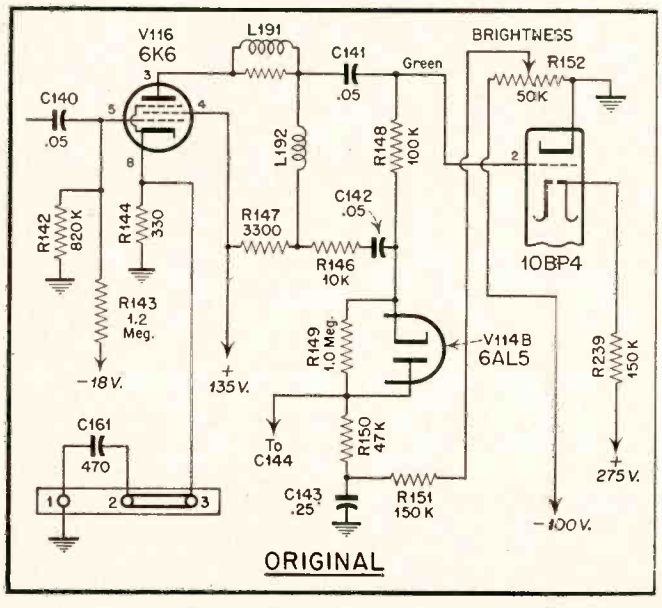


Fig. 4. Original 630 TS partial schematic.

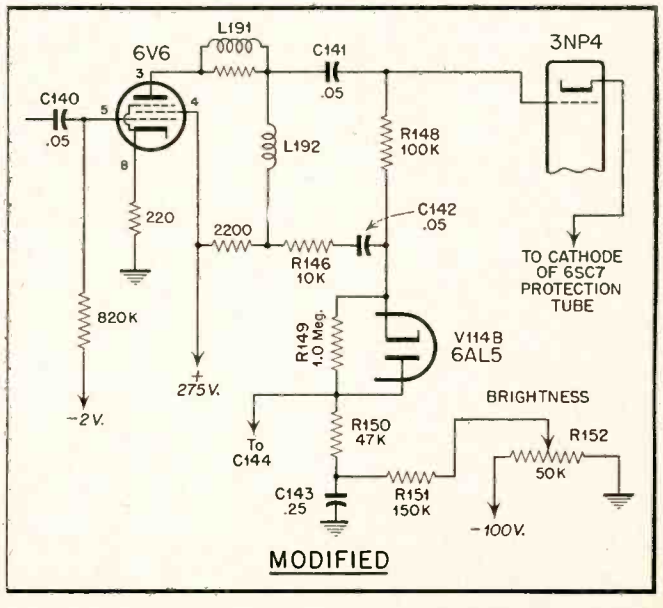


Fig. 5. Modified 630 TS partial schematic.

Combination Inductance Bridge

by **Rufus P. Turner**

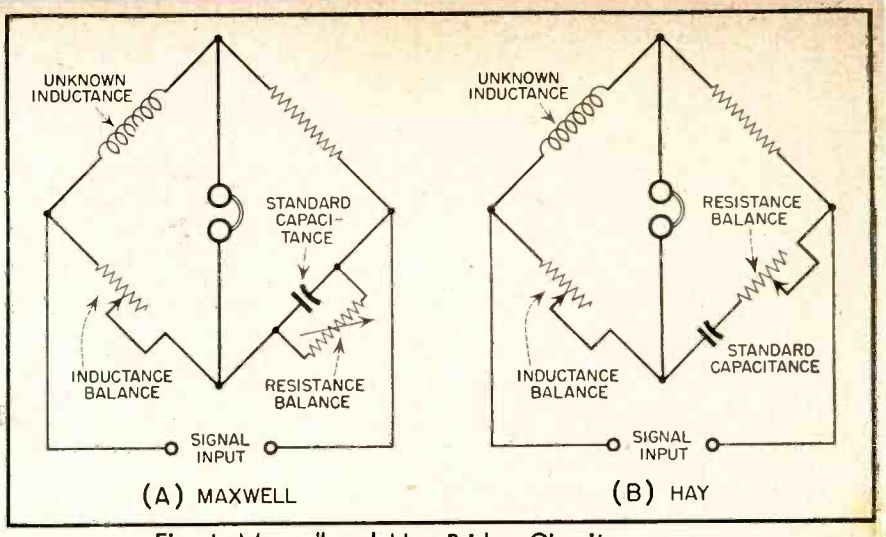
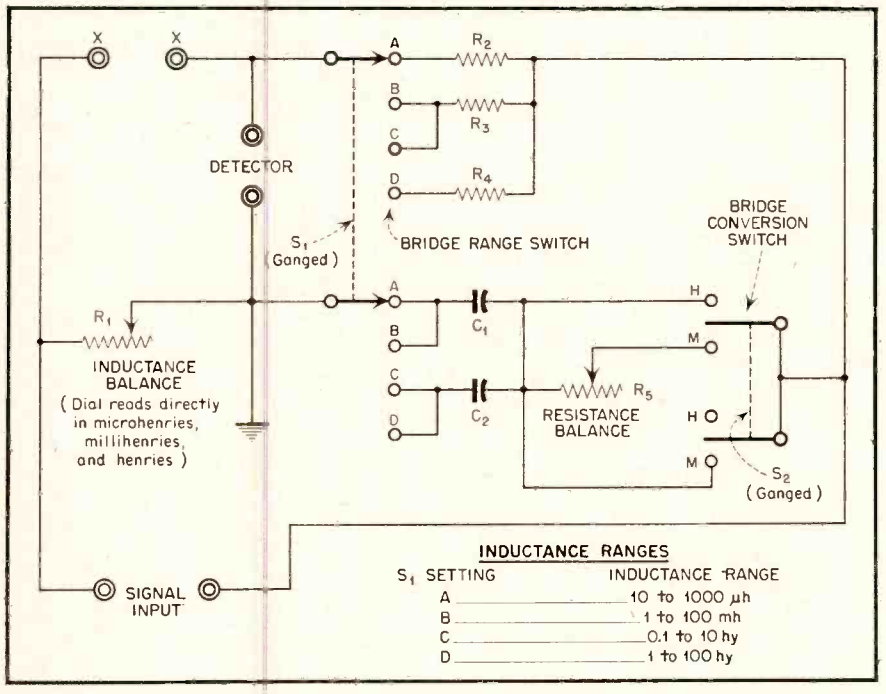


Fig. 1. Maxwell and Hay Bridge Circuits

Inexpensive arrangement which may be switched to either Maxwell or Hay circuit for close adjustments with all coils.

THE Maxwell bridge is very handy for coil checking because its circuit is simple and it requires no inductance standard. This bridge measures an unknown inductance in terms of a known capacitance, a desirable method since accurately-determined capacitors are more readily obtained by servicemen than inductance standards. A very useful bridge may be assembled from ordinary radio parts and calibrated with an ohmmeter.

Many technicians who have built Maxwell bridges have had difficulty in securing a good resistance balance, especially when checking large iron-core choke coils. This is because the resistance balance rheostat is in parallel with the standard capacitor, as shown in *Fig. 1(A)*. The Hay bridge (See *Fig. 1(B)*, on the other hand, is more satisfactory for checking such coils. In the latter circuit, the resistance balance rheostat is in *series* with the standard capacitor. It would appear that some scheme for changing the Maxwell bridge to a Hay bridge, and vice versa, would permit checking of all kinds of coils with little difficulty.



C1—0.01 ufd. mica
C2—1.0 ufd. oil-impregnated, oil-filled
R1—10,000-ohm linear-taper wirewound potentiometer
R2—10 ohms 1 watt
R3—1000 ohms 1 watt
R4—10,000 ohms 1 watt
R5—250,000-ohm potentiometer (See Text)
S1—2-pole, 4-position, non-shorting rotary selector switch
S2—2-pole, 2-position, non-shorting rotary selector switch
S2—2-pole, 2-position, non-shorting wafer-type switch

Fig. 2. Circuit of Combination Bridge

Figure 2 shows how the addition of a double-pole, double-throw switch (S_2) will permit the resistance balance rheostat to be connected at will either in series or in parallel with the standard capacitor. In position M of switch S_2, the rheostat is in parallel with the capacitor and a Maxwell bridge circuit is obtained. In position H, the rheostat is in series with the capacitor, and we have a Hay bridge. Thus; if a satisfactory null setting is not obtained at one position of the changeover switch, simply throw the switch to the other position and repeat adjustments of the inductance balance rheostat (R_1) and resistance balance rheostat (R).

The circuit constants given in *Fig. 2* permit measurement of the inductance of all air-core, iron-core, and powered-iron-core coils between 10 microhenries and 100 henries. Four ranges are provided. Rheostat R_1 is a linear-taper wirewound unit and may be of the volume control type. Its dial is graduated in as many steps as possible from 1 to 10. (1 corresponds to the 100-ohm setting of R_1, and 10 to the 10,000-ohm setting). The calibration may be carried out with a resistance bridge or a good ohmmeter. The dial readings are in-

[*Continued on page 35*]

FRONT ENDS

by Samuel L. Marshall

(From a forthcoming book, "Television Service Techniques")

Part 1

The purpose of the Front End, and its position in the overall receiver was discussed in the previous installment. We are now ready to analyze the circuits and components of various types of Front Ends used in television receivers. In this first installment we cover the ant. and r-f input sections.

BREAKING down the Front End into its basic circuits as indicated in the block diagram of *Fig. 3-1*, we find that the signal progresses through this section* in the following manner: First, coming from the antenna the signal enters the receiver through a suitably matched Antenna Input circuit. The output of this circuit is then fed into an r-f tube, from which it proceeds to an r-f transformer. After amplification and selection in these circuits the signal enters the mixer tube. There it combines with the signal from the local oscillator, and, by the familiar action of heterodyning, produces *sum* and *difference* frequencies in the output of the mixer. All signals except the *difference* frequencies are short circuited by the i-f transformer which is connected in the plate circuit of the mixer.

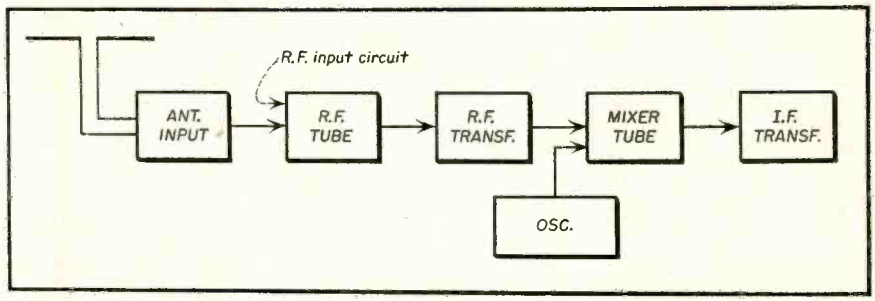


Fig. 3-1: Block diagram of typical Front End.

Front End Requirements

A properly operating Front End should provide the following:

1. Proper impedance match between downlead and receiver.
2. Proper electrical and mechanical selection of the desired Channels.
3. Proper conversion of the incoming r-f signal to the required sound and video intermediate frequencies.
4. Good signal to noise ratio.
5. Proper bandwidth characteristics.
6. Rejection of unwanted frequencies.
7. Amplitude and Frequency stability.
8. Ease of servicing.

The effectiveness of a Front End in meeting the above requirements is usually dependent on the care and ingenuity put into the electrical and mechanical design, the quality of its components, and the extent to which it has been put through actual tests in the field. In the early days of TV many manufacturers and servicemen engaged in contract work suffered great financial loses as a result of Front End trouble; Front Ends which behaved well at first but which broke down in the Field. This could have been prevented by a little more time and effort spent by manufacturers in testing the durability of their products. The lesson learned by many servicemen as a result of this experience has been not to accept claims by any manufacturer regarding his products unless backed up by adequate field tests or authoritative testing agencies.

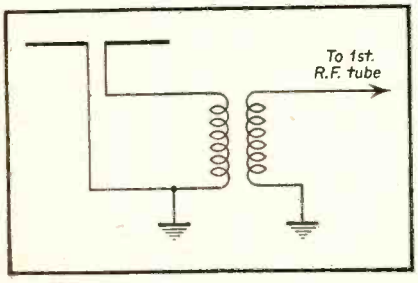


Fig. 3-2: Unbalanced input.

Effects of Line Mismatch

For optimum transfer of signal energy from the antenna to the receiver, and for minimum reflections in the antenna circuit, the characteristic impedance of the downlead should be equal to that of the input circuit of the receiver. Impedance mismatch between these two circuits may weaken the signal at the antenna terminals of the receiver. The reason for this is that line mismatch produces reflections and standing waves which in turn increases the *reactive*

* *RSD, May 1950, Elements of Signal Distribution, Part 1, Fig. 2-3*

line current, thereby producing greater line losses. A line which is reactive is one in which an equivalent amount of inductance of capacitance exists.

For the same reason, a mismatched line may produce phase conditions or standing waves along the line. Thus, the signal strength may actually have maximum and minimum values all along the line, and if by chance the line is connected to the receiver antenna terminals at a point of zero potential, very poor reception will be had. Where such conditions exist, better results may be obtained, especially on weak stations, by trying different locations on the line as the points of connection to the receiver.

Another condition arising from an unmatched line is picture blurring caused by reflections set up in the line.

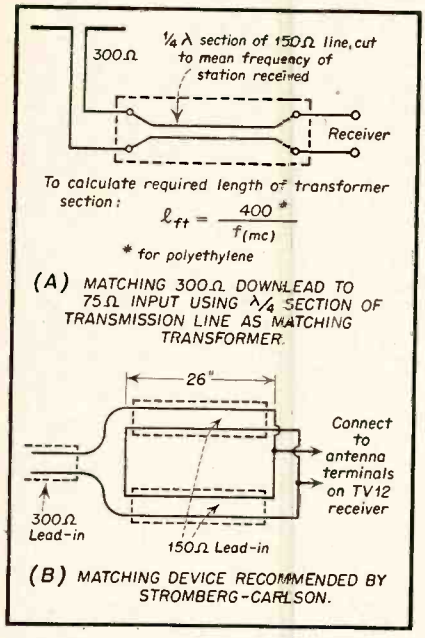


Fig. 3-3: Two methods of matching downleads to receivers.

These reflections produce multiple images on the picture tube screen which, though not as widely separated from each other as the familiar "ghosts" produced by building reflections, are separated just enough to produce a blurred picture.

Antenna Input Circuits

Antenna input circuits are broadly divided into two categories, balanced, and unbalanced. Referring to *Fig. 3-2* we show a typical unbalanced circuit. Unbalanced circuits are generally designed for use with 75 ohm unbalanced coaxial cable. In some locations, particularly in Fringe Areas, it might be necessary to use 300 ohm line with a 75 ohm input receiver because of the lower loss characteristics of 300 ohm line. In such cases a proper matching transformer, or system such as shown in either *Fig. 3-3A* or *B*, may be used. These systems make use of the properties of transmission lines whereby they behave as transformers when cut to one-quarter of their operating wavelength, and connected in the line at their open ends. It might be pointed out that there are many excellent grades of coaxial cable, single and balanced, which approach the low-loss characteristics of polyethylene twinlead, and which have the added advantage of being matched to the receiver without the use of impedance matching devices.

* *For complete treatment see "Television Installation Techniques", by Samuel L. Marshall; John F. Rider, Publishers.*

TYPE	CHARACTERISTIC IMPEDANCE (OHMS)	CAPACITANCE μμf/ft.	ATTENUATION db/100 ft. 200 mc.	VELOCITY OF PROPAGATION	
COAXIAL CABLE (LOW CAP.)	71	13.5	4.4	65.9	Coax.
300Ω	300	5.8	3.6	82.0	Unshielded Polyethylene twinlead
150Ω	150	10.0	4.7	77	
75Ω	75	19.0	8.3	69	
FEDERAL K111	300	4.2	4.6	82	Shielded twin-conductor cable
FEDERAL K117	185	6.8	6.0	84	
FEDERAL K200	200	7.8	.66*	—	
ANACONDA ATV225	225	6.4	4.7	84	

Fig. 3-4: Characteristics of coaxial cable, twinlead, and shielded twin conductor cable. Federal K200 is a very large diameter cable.

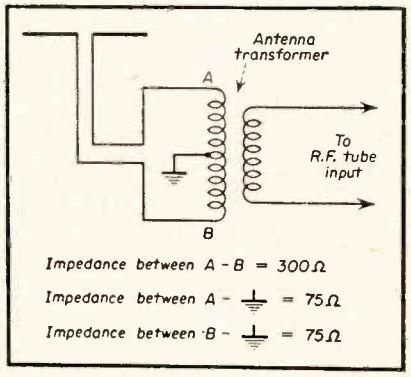


Fig. 3-5: Balanced input.

The following is an example illustrating the application of these principles to a typical problem.

Example 3-1:

Find the length and impedance of a section of quarter-wave line designed to match a 300 ohm downlead to a 75 ohm antenna input. The station being received is Channel 4 (66-72 mc).

Solution:

1. Mean frequency equals $\sqrt{66} \times \sqrt{72} = 70$ mc.
2. Length $(\ell_{ft}) = \frac{70}{400} = 5.71$ ft.
3. Impedance $= \sqrt{300} \times \sqrt{75} = 150\ \Omega$

For best results the transmission line should not be rolled up. Note also that the length of line was calculated for Channel 4, and does not hold for other frequencies.*

Comparative loss, propagation, and capacitance per foot characteristics of twinlead, coaxial cable, and low-loss shielded twin conductor cable are given in *Fig. 3-4*.

Most modern receivers use balanced 300 ohm input circuits with a 75 ohm center tap as shown in *Fig. 3-5*. Since the inductance, and hence the impedance, of a transformer varies roughly as the square of the number of turns, half a coil will have one-quarter the impedance of an entire coil. This explains why the center tap of a 300 ohm coil has an impedence of 75 ohms. It must be remembered that the d-c resistance has not been considered in this discussion since it is negligible.

The advantages of a balanced input over an unbalanced one is that any electrical noise or other signals picked up in the downlead will be cancelled in the primary of the transformer. In fact any signal striking the downlead causes two identical signals to pro-

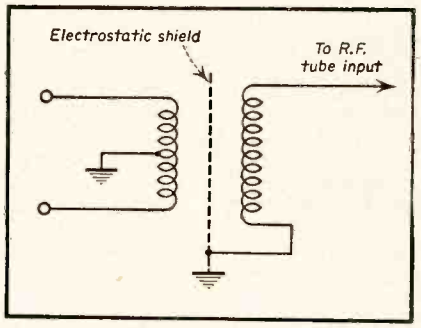


Fig. 3-6: Balanced input circuit with electrostatic shield; used in G.E. Model 820 receiver.

[*Continued on pege 32*]

U. H. F. TUNING ELEMENTS

by ALLAN LYTEL

Read this analysis of the behavior of condensers and resonant circuits at ultra high frequencies, and learn why certain components and circuits now employed in TV, and about to make their appearance on the market, behave as they do.

THE fundamental action of high frequency currents are quite different from those generally considered in low frequency broadcast band operation. These differences form an important basis for ultra high frequency techniques since ordinarily a coil or an inductance is composed of many turns of wire, in which the inductive reactance varies directly with frequency. A capacitance is defined as any two conductors separated by a dielectric and this no longer remains a pure capacitance for u.h.f. The paper capacitor with its rolled up construction actually has a small amount of inductance inherent in its design and construction which is ordinarily ignored for low frequency radio work. However, as the frequency is increased, the inductive effect of the capacitor construction becomes increasingly important.

The capacitor leads themselves have a small amount of inductance and taken together, the inductive effects of an ordinary capacitor become increasingly important as the frequency is increased until the capacitor becomes a self-resonant circuit. At this point, it can no longer effectively act as a capacitance. The coil has capacitance between adjacent turns and this capacitive reactance causes the coil to act as a self-resonant circuit. Even in the present day television band, some tuned circuits use the distributed capitance of the coil to resonate with the inductance of the coil.

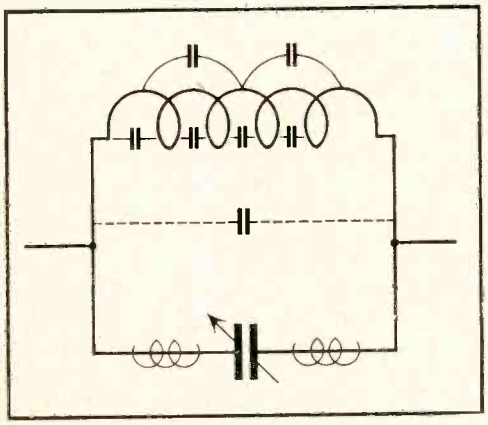


Fig. 1. Effect of distributed capacitance across a coil.

As the frequency is increased, alternating current flow tends to travel on the surface of conducting materials, and this is known as the skin effect. The effective resistance of a wire is increased as the frequency is increased since the current flow is now entirely on the surface of the wire and the wire effectively has a smaller diameter per current flow. Eddy currents also contribute an undesirable additional loss at high frequencies. An eddy current is that current flow between any two points of potential difference on a given conductor caused by induction. There is no work done by these eddy currents hence they represent energy losses. An example of eddy current loss is the current flow induced in a nearby conductor in which this induced current flow represents a circuit loss. The eddy currents plus the skin effect are responsible for the increased losses of an ordinary circuit at the higher frequencies.

Taken together the effects of a capacitor and an inductor as the frequency is increased make the ordinary parallel resonant circuit unreliable for use as a tuning element. The distributed capacity (See *Fig. 1*) reduces the efficiency of a coil and the skin effect and eddy currents further reduce the effectiveness of a coil. Inductance present in the capacitor leads, reduces the capacitance hence the ordinary parallel resonant circuit with a fixed capacitor and inductor no longer can be used for tuning.

Another difficulty is involved with the size of the elements. Less and less wire, that is fewer and fewer turns are needed for the coil to resonate at a high frequency. The capacitance necessarily, also must be very small, hence a high frequency tuning circuit would consist of perhaps half a turn of wire with a distributed capacitance existing in this half turn. Other methods than the ordinary variable capacitor are obviously needed to tune this circuit.

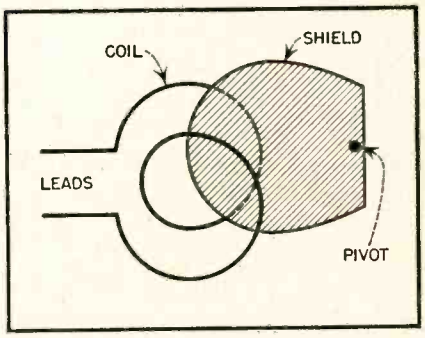


Fig. 2. Unique tuning system used at the ultra high frequencies.

New Types of Tuned Circuits

A coil having a very few number of turns can be used as a self-resonant circuit as pointed out above by utilizing the distributed capacity of the coil. A unique tuning system shown in *Fig. 2.* uses a metallic conducting shield which effectively reduces both the inductance and capacitance of this coil and thus becomes the tuning element. The shield is rotated about the pivot point as shown and the maximum shielding effect which is minimum inductance is obtained when the shield is inserted the maximum distance in the coil. Minimum shielding and hence the greatest inductive effect

[*Continued on page 31*]

SHOP NOTES

Write up any "tricks-of-the-trade" in radio servicing that you have discovered. We pay from $1 to $5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor".

Crosley Models—10-412, 10-418, 10-404MU, 10-404M1U Increase Vertical Size

If trouble is experienced with the above models in being unable to obtain sufficient vertical height, the following changes can be made.

1. Change *R171* from a 5,600 ohm resistor to a 4,700 ohm, 10%, one watt resistor, Part No. (39374-121).

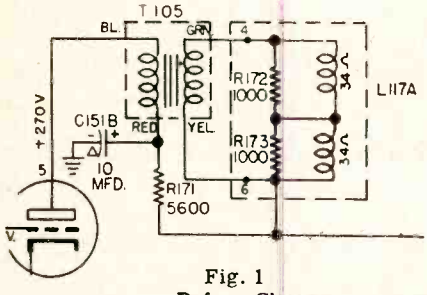


Fig. 1
Before Change

If this change does not provide enough height, the vertical height may be further increased as follows:

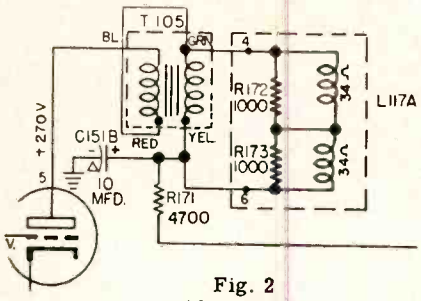


Fig. 2
After Change

2. Change *T105* to an Auto-transformer by connecting the secondary winding in series with primary, as is shown in *Fig. 2.*
   a. Remove the red lead of the primary winding of *T105* at the terminal board where it is soldered beneath the chassis. There is another lead to this lug which is red with white tracer.
   b. Move it to the adjacent lug to which two green leads (one from the transformer secondary and one from the deflection coil) are connected.
   c. Remove the yellow lead of the *T105* secondary winding and the yellow lead of the deflection yoke from the lug of the terminal board nearby where they are both soldered.
   d. Move these two leads to the lug where the red lead of *T105* was formerly connected.

Crosley Service Dept.

Philco-Models 49-1040 Etc. Changes In Rating Of B+ Protective Fuse

The value of the protective fuse in the first productions of the above models was ¼ ampere. It was found that under normal operating conditions the current surge encountered during the warm-up period may cause the fuse to melt. Therefore, its value was changed to ½ ampere. The chassis using the ½-ampere fuse has "½" stamped on the rear.

After extensive tests, it was found that a ⅜-ampere fuse withstands the normal current surge and also provides greater protection than the ½-ampere fuse. The ⅜-ampere fuse is used in all later productions of these models.

Whenever fuse replacements are made in the field, a ⅜-ampere fuse should be used regardless of the value originally in the receiver. Orders should be placed with the Accessory Division under Philco Part No. 45-2656-10.

Philco Service Dept.

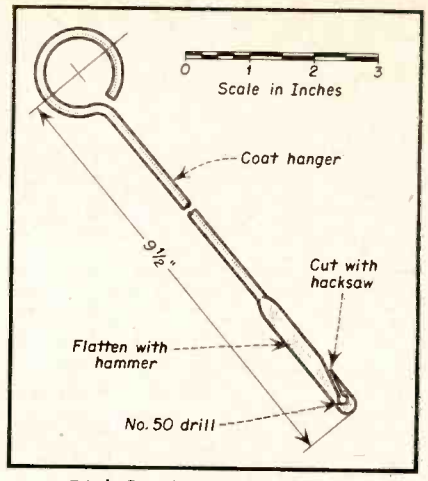
Checking Flyback Transformer

Without a scope it is difficult to determine whether the high voltage flyback transformer is delivering the proper voltage to the 6BG6 and the 1B3GT. I overcame this by wiring a 1.5 volt flashlight bulb into a tube base to pins 2 and 7. Remove the 1B3GT and replace it with the flash-light bulb. The brilliance of the bulb will give a good indication as to the performance of the transformer.

Submitted by:
H. Ackerman
Brooklyn 4, N. Y.

Dial Cord Stringing Hook

This hook is very simple and inexpensive to make and requires only a few minutes of your time. You will find it very handy and will save many headaches. It is made as follows: Take a piece of a coat hanger, about 10 inches long and make a loop at one end. The other end is flattened with an ordinary hammer and a hole drilled with No. 50 drill. This hook can be put to many other or special use by varying the shape and the length of it. Cut a slot with a hacksaw from the edge to the center of the hole.

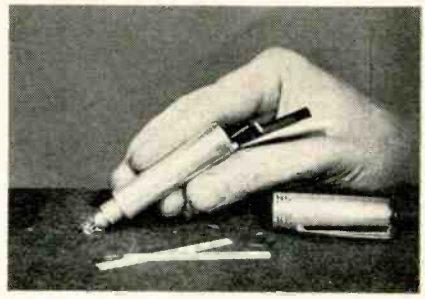


Dial Cord Stringing Hook

Submitted by:
Donat A. Duquet
Waterville, Maine

Discarded Pen Light Carries Speaker Shims

A convenient method of carrying speaker centering shims is to place the shims in the battery section of a discarded pen light which has a clip for the pocket.



While the shims are mixed in the container, they are easily selected by their color.

Submitted by:
H. Leeper
Canton, Ohio

Difficult Bolt & Nut Replacement

To replace a nut on a bolt in a congested place is easy if you use a length of wire or small solder. Place the wire or solder on top of the bolt and allow the nut to slide down over the wire into place. Using a small screwdriver to start the nut will finish the job.

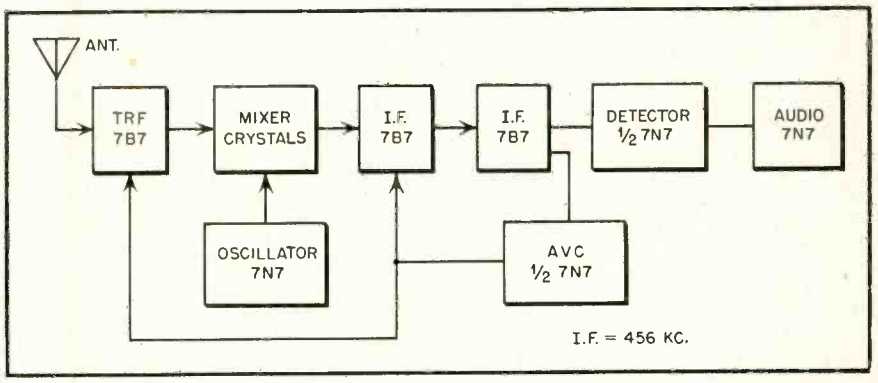
Submitted by:
Wayne E. Lemons
Buffalo, Mo.

CIRCUIT COURT

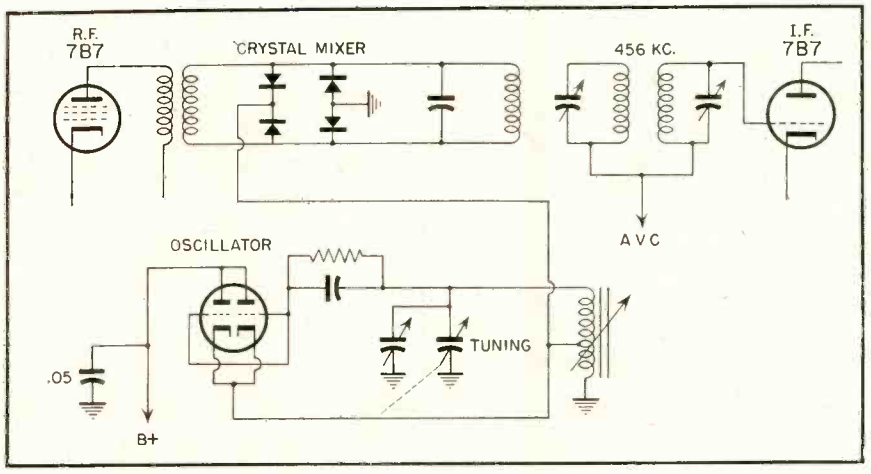
Kappler Model 102T

Almost everything about this rack-mounting, a-c operated broadcast band receiver is different from the conventional instrument. A total of six tubes, exclusive of the rectifier, are employed and it is interesting to note that only two types are employed. The layout is so interesting that a block diagram is shown. It will be noted that the mixer stage uses four crystal rectifier elements in a full wave circuit in place of a tube.

Type 7B7 pentodes are used as r-f and i-f amplifiers, all the other stages employing 7N7 dual triodes. A partial schematic shows the mixer circuit and coupling to the first of the two i-f stages. It is interesting to note that the i-f signal is coupled to the two tuned circuits by a low impedance link from the rectifiers. A large capacitor, .001 μf, keeps any signal or oscillator voltage out of this circuit, permitting the 466 kc i-f to pass.



Block diagram of Kappler Model 102T.



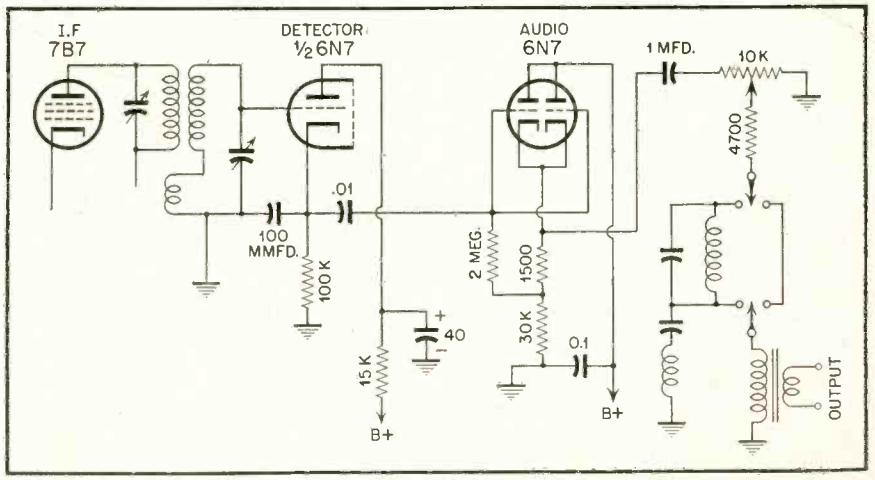
Partial schematic showing mixer circuit and coupling to first i-f stage.

The oscillator circuit, using the two sets of triode elements in the 7N7 tube in parallel, uses a Hartley circuit with the plate at ground potential for r-f. Voltage is fed to the mixer stage from the cathode tap. A feature of the coupling to the mixer is that the point is balanced to ground and thus will not tend to pass oscillator voltage to the stage ahead or following. A frequent source of birdies is thus eliminated.

The i-f stages are overcoupled to provide exceptional bandpass with good gain and reasonable selectivity. The second detector is of the so-called infinite impedance variety. Rectification takes place between the grid and cathode and the output appears on the cathode. Amplification takes place as audio frequency in another 7N7 with parallel sections, and as shown is connected as a cathode follower. Note the similarity of the detector and amplifier stages. These circuits are shown to the left and below in the partial schematics.

The output of this instrument is at transformer is parallel fed and has two paths, selected by a switch. One path feeds the transformer directly. The other connects a 10 kc filter in the primary circuit to eliminate cross-talk and heterodyne. The filter has both series and parallel sections.

The output of this instrument is at a low level and is designed to feed a low impedence amplifier for subsequent gain and power.



Partial schematic of detector and output circuits.

NEW PRODUCTS

NEW DU MONT TYPE 12LP4A

Allen B. Du Mont Laboratories, Inc., Tube Division, announces a new Teletron, the Type 12LP4A, in production at its Allwood, New

Jersey, plant. This new picture tube will provide leading manufacturers of initial equipment, for the first time, with a Type 12LP4 tube employing the Du Mont bent-gun ion-trap design, and featuring the new gray filter face plate.

The elimination of ion blemishes by use of the Du Mont bent-gun results in sharper spot resolution. Modification of the bent-gun design in the Type 12LP4A, permitting the use of either a single or double magnet beam-bender insures direct interchangeability with all Type 12LP4 tubes.

LOW NOISE PENTODE

Tube Department, Radio Corporation of America, Harrison, N. J. announces the new tube 5879 is a sharp-cutoff pentode of the 9-pin miniature type intended for use as an audio amplifier in applications requiring reduced audio noise.

Utilizing a single-ended structure which is relatively short and rigidly mounted to minimize microphonics, a controlled getter deposit to minimize internal leakage, and a double-helical-coil heater to minimize hum—all features contributing to reduced audio noise—the 5879 is especially recommended for service in the input stages of medium-gain public-address systems, home sound recorders, and general-purpose audio amplifiers.

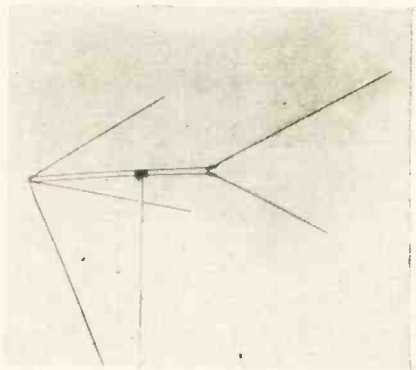
NEW HYTRON TUBES

The Hytron 1X2A is a miniature filamentary-type rectifier (having higher ratings than the 1X2) designed for use in television sets as high-voltage rectifier supplying power to the anode of the cathode-ray tube. It is designed and rated primarily for use in fly-back type of power supplies. In new equipment applications the 1X2A when used within its maximum ratings, is a replacement for type 1B3CT/8016 at d-c output potentials as high as 14 to 15 kilovolts.

Also announced is the new Hytron type 12BH7 a double triode, having semi-high perveance units. It is intended for use in television receivers and other applications where the use of two similar triode sections in a single envelope is desirable from the viewpoint of space saving and lower cost.

ALL-CHANNEL ANTENNA

The Workshop Associates, Inc. announces a new all-channel television antenna—the DUBL-VEE. Utilizing a principle new to television,



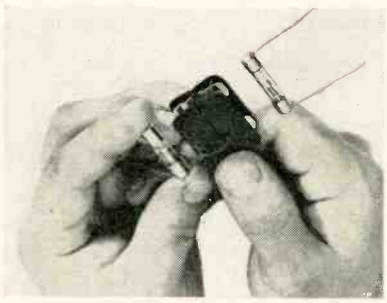
the DUBL-VEE features extremely high gain with a streamlined, rugged, easy-to-assemble construction.

Workshop has acquired a new factory to manufacture DUBL-VEE antennas where production is already in progress. First shipments were made to distributors in mid April and have continued rgeularly to date..

Free literature may be obtained by writing directly to Sales Department, the Workshop Associates, Inc., 135 Crescent Road, Needham Heights 94, Massachusetts.

NEW FUSE HOLDER

Littelfuse Corporation of Chicago has perfected a new fuse holder which snaps onto inates the time wasting and costly servicing the blown pigtail within the set. This elimproblem which is the usual difficulty when replacing soldered-in pigtail fuses.



Called the "Snap-On TV Fuse Holder", this fibre attachment takes only 15 seconds for installation. The fuse holder and the pigtail become permanent attachments within the set. Each time a new fues is needed, it can be slipped into the holder. With this revolutionary improvement for servicing—soldering, cutting and the blowing of fuses with a hot iron become trials of the past.

CONCENTRIC CONTROL ASSORTMENT

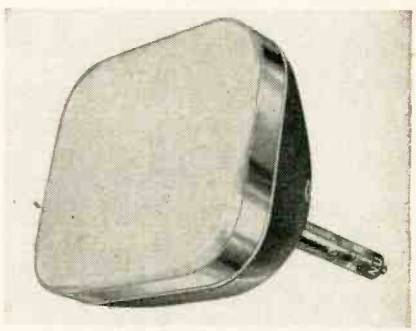
To meet Service Technicians' increasing need for replacement concentric dual controls, IRC has announced a new Concentrikit Stock Assortment. This assortment, an extension of IRC's revolutionary Concentrikit, contains 94 parts. With it the majority of concentric dual controls can be speedily assembled.

This stock assortment of standard IRC parts is supplied in a handsome all-metal cabinet. Cabinet has four drawers and individual compartments marked for efficient stocking. For an attractive and convenient shop arrangement, cabinets may be stacked with IRC Resist-O-Cabinets. Concentrikit Stock Assortments are available at all IRC Distributors, or write for Catalog DC2S: International Resistance, 401 N. Broad St., Phila. 8, Pa.

RECTANGULAR TUBES

Two new 16" and 14" rectangular tubes have been announced by National Union Radio Corporation of Orange, New Jersey.

The N. U. 16KP4 is a 65° direct-viewing picture tube providing a 10⅛" x 13½" rectangular picture having the standard 3 x 4 aspect ratio. It features a face plate having an integral neutral gray filter which increases the contrast ratio when viewing under ambient light conditions. The N. U. 16KP4 utilizes the



new tilted-beam type gun to obtain improved picture detail. It requires only a single-field ion trap. The N. U. 16KP4 is identical to the now-popular N. U. 16TP4 except for an increase in neck length to 7½" which permits adaptability to a greater range of focus coil and deflection yoke designs.

The N. U. 16KP4, in addition, makes a suitable replacement for type 16PR4 in most applications.

The N. U. 14CP4 is a 65° direct-viewing picture tube providing an 8⅝" x 11½" rectangular picture. In other respects it is similar

to the 16KP4 described above, having the 7½" neck length for greater flexibility with respect to focus coil and deflection yoke designs.

NEW BLUE-CONE SPEAKER

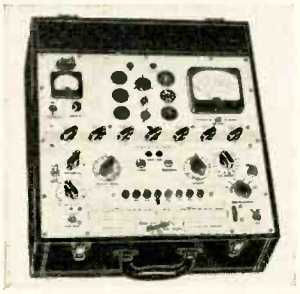
A brand-new, dark-blue cone for which ideal response is claimed, now identifies the Permoflux 8T8-1 "ROYAL EIGHT" 8" speaker. Manufacturer says that when this speaker is properly baffled, it compares with any 12"

speaker on the market. Literature is available showing how to baffle the "ROYAL EIGHT" in a cabinet occupying ½ the space and costing about ½ as much as equally effective baffling for a 12" speaker. Write the manufacturer: Permoflux Corporation, 4900 W. Grand Ave., Chicago 39, Ill.

TUBE TESTER

A new laboratory type instrument built to test all the latest sub-miniature tubes, including television, with professional accuracy.

Known as the Model 539, this tube tester is designed for maximum accuracy throughout. Scale reads directly in microhms. Has a separate meter to permit accurate adjustment of line voltage while tube is under test. Pro-



vision is made for inserting plate milliammeter to read plate current of the tube under test.

Built into strong, portable carrying case with leatherette covering. 17" x 18" x 18½"; 31 lbs.; 110-130 VAC.

Available at Hickok jobbers, or for additional information, write today to H. D. Johnson, The Hickok Electrical Instrument Company, 10533 Dupont Avenue, Cleveland 8, Ohio.

SLAVE PROJECTION UNIT

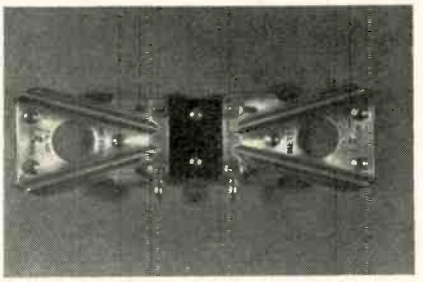
Joe Snaider, President of Snaider Television Corp. announced that his firm is now ready to deliver a new projection slave receiver that is entirely new in the Industry.

This new product, the result of many months of development, is remarkable in that it may be attached to any type of TV receiver on the market, regardless of the size of the CR tube and it will deliver a bright, clear projected picture up to 6 feet by 8 feet. It uses only the video signal and sound of the master set having its own, self-contained power supply.

This new unit is now being demonstrated at the factory at 540 Bushwick Avenue, Brooklyn, and is in production to fill the many advance orders on hand.

CONICAL ANTENNAS

Telrex, Inc., Asbury Park, N. J., manufacturers of the "Conical-V-Beam" has just in-

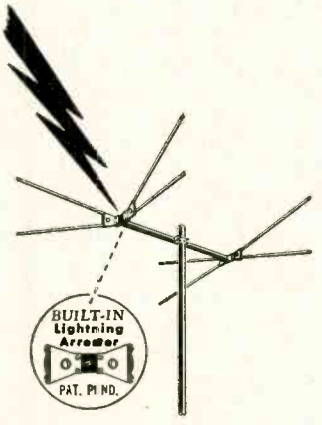


troduced its new "Metro" series, an economy line of "Conical-V-Beams" which supercedes the former "Special" series.

Designed to incorporate many of the exclusive features of their DeLuxe line, the "Metro" includes full 3-inch element clamping channels, reverse flanging of the "butterfly clamp" for greater rigidity and freedom from vibration, and other important electrical and mechanical impovements. The "Metro" features solid dural elements.

UNIQUE ARRESTER IDEA

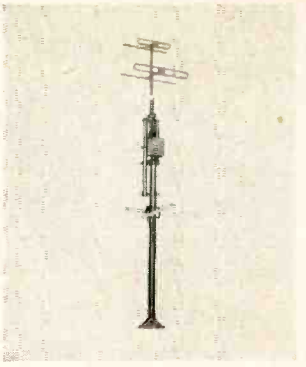
JFD Mfg. Co., B'klyn, N. Y. announced that its television antenna engineers have perfected a Lightning Arrester that is molded directly



in the dipole bakelite insulator of the "D-Xer" Conical antennas Nos. TA160, TA161 and TA162. Further information and literature is available from the manufacturer, its representatives and distributors.

JACK-UP TOWER & ROTATOR

Shown below is the Crown Antenna Rotator mounted on a "Camburn Jack-Up T.V. tower". The Camburn Sales and Manufacturing Company of Battle Creek, Michigan and Crown Controls Company, New Bremen, Ohio, work together in developing a mounting arrangement so that the Crown Antenna Rotator and the Jack-Up tower can be used together.



The Jack-Up tower has a variable height of 20' 8" to 47' and in this way the rotator is easily accessible. Further information on either product can be obtained from Crown Controls Company, New Bremen, Ohio.

ORE DETECTOR KIT

Allied Radio Corporation 833 W. Jackson Blvd. Chicago 7, Ill., announces the KNIGHT "Scout"—a new, low-priced, portable, radioactive ore detector in easy-to-build kit form. A great deal of interest in such units has been aroused by the big rewards offered by the Government for the finding of radioactive mineral deposits. An 8-page instruction manual contains step-by-step pictorial diagrams keyed to the instructions, plus a schematic diagram.

Compact and lightweight (only 2¼ pounds), the "Scout" is very easy to use. Operator merely carries it at his side; when a radio-

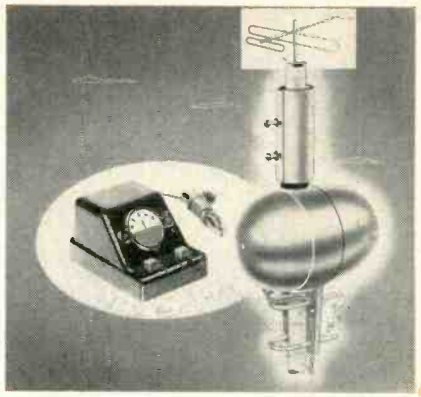
active source such as uranium is approached, the clicking sound in the headphones increases in frequency.

ANTENNA ROTATOR

The U. S. Devices Corp., of Oak Tree, South Plainfield, New Jersey, announces its entry into the antenna rotator field with the introduction of its new Antenna Rotator.

The new U. S. Devices Antenna Rotator has been fully tested by the largest independent testing laboratory in the world. From their very severe tests, it was definitely established that the new rotator is capable of rotating any antenna or stacked array of antennas manufactured. It is also sufficiently strong to rotate all "ham" equipment.

Full information may be obtained by writing direct to the manufacturer, U. S. Devices



Corp., Antenna Rotator Division, Hillside Ave., Oak Tree, South Plainfield, New Jersey.

7-INCH SCOPE

A new high-gain, wide-band cathode ray oscilloscope designed particularly for television circuit, has been announced by the Radio Tube Division of Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y., according to C. W. Shaw, general sales manager.

The new type 400 oscilloscope, which is supplied with 7-inch Type 7JP1 green screen cathode ray tube, provides a vertical sensitivity of ten millivolts per inch and a vertical response which is useful up to four megacycles.

NEW CRYSTAL-CONTROLLED TV GENERATOR

The Dual Mega-Marker Sr., manufactured by Kay Electric Co., Pine Brook, N. J., is a crystal controlled generator of sound and picture RF carriers for use as markers in TV tuner and receiver work. Tone modulation on the sound carrier may be switched on or off. The sound carrier may also be switched on or off. A 4.5 mc crystal controlled signal is available at a separate output connector. At-

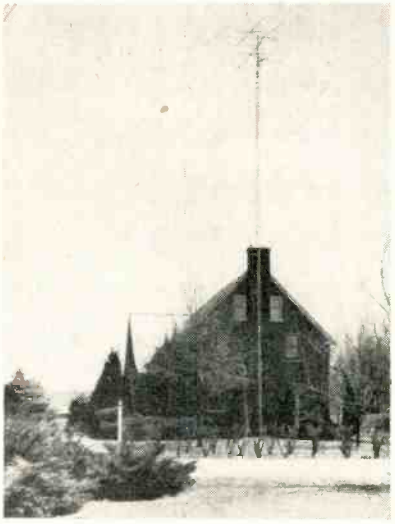
tenuators are provided for all out-put signals. This instrument may be used for marking picture carrier positions on TV RF curves,

for providing signal at 4.5 mc for intercarrier work, and for aligning the local oscillator of TV receivers.

TV TOWER

A new All-Aluminum home antenna tower is now in production by Thompson & Ruby, Inc., of Brownstown, Indiana.

Numerous desirable features are incorporated in this new product. Riveted tower sections are shipped completely cartoned, ready for the installer to easily join together.



Full information is available from the Company in Brownstown, Indiana.

MAGNETIC TAPE RECORDER

Allied Radio Corporation of Chicago announces the release of a new low-priced Magnetic Tape Recorder. Extremely light and compact, the new Knight Tape Recorder incorporates the latest engineering features for ease of operation—simplified tape threading which eliminates fumbling, and only one control for tape transport mechanism (with three positions: Record-Play, Off, Rewind). This unit records for a full hour on a 1200-ft. reel of tape with 30 minutes for each half of tape width. Recording speed is 7½" per second, rewind speed is 20 times as fast—another outstanding feature of this unit. Other features include a special speaker switch that permits muting speaker when recording from microphone and a constant speed capstan drive. Proper recording level at all times is assured by the neon bulb level indicator.

FIELD FINDINGS

[*from page 8*]

will report full details in our next issue provided such information qualifies for publication.

Philadelphia's 2nd

The Philadelphia Radio Service Men's Assn. will hold its second annual radio-TV service convention at the Broadwood Hotel Sept. 25-27, 1950. The technical lectures on the program last year were so fine that attendance passed the 4,000 mark; and even greater results are anticipated for the coming clinic. Outstanding au-

FIELD FINDINGS

[from page 27]

thorities on many phases of radio and television servicing problems are scheduled to deliver lectures, none of which will exceed one hour. The moderator this year, as last, will be yours truly. More about this really worthwhile technical convention will be published in a forthcoming issue, especially when a complete listing of lecture titles and speakers is available. Other service associations would do well to have delegates attend the Philadelphia shindig to learn how to plan and carry on such conventions of their own, for it is our considered opinion that no technican situated within reasonable travel limits from such a technical clinic can afford to miss a single lecture on the program.

[Continued on page 36]

TRADE FLASHES

[from page 10]

By referring to the pictorial "Tele-Clues", the serviceman can identify the circuit and in many cases the component which is defective. For instance, one photograph may show the type of picture produced on the TV screen which results from a short in the deflection yoke, or another picture, which shows white trailing reflections, indicates phase shift and poor low-frequency response due to a particular resistor having changed value.

Thus the serviceman can "pin down" the source of his trouble and make the necessary repairs without testing or experimenting with each circuit.

Centralab Introduces New Line

Centralab unveiled for Distributors at the Chicago May Parts Show a new and greatly increased line, including new "Blue Shaft" Volume Controls, a new plan for handling TV control replacements with "exact duplicate" controls, an expanded line of ceramic capacitors, printed Electronic Circuits introduced to the Distributor trade, and various control, switch and capacitor kits offered as merchandising features.

A new television and radio service catalog, No. 27, had its first distribution at the Show.

Hytron Announces New Reference Guide

The new 4th Edition Hytron Reference Guide for Miniature Electron Tubes is just off the Press. Original—unique—lists all miniature tubes to date, regardless of make. 132 minia-

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tures—41 new tubes. 70 Basing diagrams. Lists similar larger prototypes. This new 4th Edition may be had from the Hytron jobber; or write Hytron Radio & Electronics Corp., Salem, Mass. They are free for the asking.

Mrs. Jacob Mucher Passes On

The wife of Jacob Mucher, one of the founders and original owners of Clarostat Mfg. Co., Inc., passed away on May 17th at their Brooklyn, N. Y. home. She had been in poor health for some time past.

Mrs. Mucher was the mother of Vic, George and Bill Mucher of the Clarostat organization. Also the mother of Mrs. Fran Chamberlain, wife of Clarostat's jobber sales manager, and of another daughter.

Ulrich Joins National Union

Appointment of Vinton K. Ulrich as Manager of the Renewal Tubes Sales Division has been announced by Kenneth C. Meinken, President, National Union Radio Corporation of Orange, New Jersey.

Vin Ulrich is one of the few radio sales managers who is a qualified applications engineer. Plans for National Union's active promotion of renewal tubes to be announced shortly, include both radio and television receiving tubes as well as "Videotron" television picture tubes.

New Catalog

Walker-Jimieson, Inc. Chicago distributors, has announced release of its new 1950 television, radio, and electronics parts catalog, specially planned and designed for quick and easy use by Service Dealers.

Catalog will be sent free to those entitled to buy at wholesale prices. Write for Catalog No. 170, Walker-Jimieson, Inc., 311 S. Western Ave., Chicago 12, Ill.

New 1949 Electronic Index

John F. Rider, president of the Electronics Research Publishing Co., Inc., 480 Canal Street, New York 13, N. Y., announces that the Electronic Engineering Master Index for 1949 will be available in June.

U. H. V. TUNING

[*from page 21*]

and lowest frequency, is obtained when the shield is rotated so that it is not inserted in the turns of the coil. The shield effectively reduces the inductance of the coil since it prevents the magnetic field from one turn from inter-acting with a magnetic field in another turn. The shield may be thought of as a metal chassis dividing the coil into two parts and such a coil would obviously have less inductance than if both parts of the coil were mounted on the same form so that they had a mutual inductance. Tuning by means of a shield is actually used in u.h.f. tuned circuits and it serves as an introduction to other types of tuned circuits.

The Butterfly Tuner

An extension of the idea that a shield reduces the magnetic effect in a coil and can be used for tuning evolves into the tuned circuit known

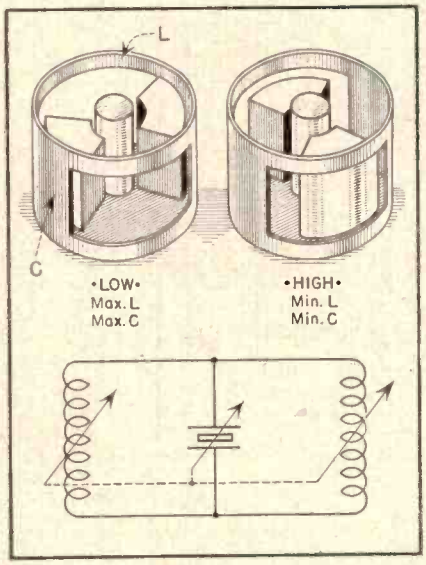


Fig. 3. Butterfly Tuner and its equivalent circuit.

as the "butterfly". This circuit actually contains inductance and capacitance which are integral parts of the mechanical arrangement which comprises the circuit. As shown in *Figure 3*, a butterfly consists of an outer cylinder and an inner rotor. This outer cylinder has two large rectangular holes cut from its surface. Because of this, the cylinder effectively acts as both an inductance and a capacitance as may be seen from the figure. Capacitance is obtained between the plates of the outer cylinder and the inner rotor. Inductance is obtained from the strips of metal which connect the capacitor plates. An equivalent circuit for the butterfly is shown in the figure

as a parallel resonant circuit. Both the inductances and the capacitance are made variable by turning the rotor.

In the position of highest resonant frequency, the rotor is turned for the position of minimum capacity and minimum inductance. A small value of capacity is obtained since there is the greatest possible separation between the rotor and the stator. At the same time, this position represents minimum inductance because the rotor is effectively shielding the inductance. As we have seen, a shield placed in or near a coil reduces its inductance hence the rotor in this position acts as a shield.

The lowest resonant frequency is obtained when the rotor is in the opposite position. Here there is a maximum capacity since the rotor and stator are in the completely meshed position. There is also maximum inductance at the same time there is maximum capacity which results in the lower resonant frequency. Maximum inductance is obtained since there is a minimum shielding effect on the inductor by the rotor in this position.

Some types of butterfly circuits consist of several layers, that is, the rotor has a number of plates and the stator has a number of plates and this type of butterfly circuit which is stacked rather resembles a variable capacitor in which the stator plates are connected to a one-turn coil. Tuning is accomplished in the same manner by changing both the inductance and capacitance simultaneously. Various shapes of rotors and stators may be used to obtain different types of angular rotation. For a particular frequency band, a special type of rotor or stator shape is chosen to cover the band with a reasonably good degree of tracking.

FRONT ENDS

[*from page 20*]

ceed down both conductors almost instantaneously. Since both signals entering each end of the antenna transformer primary are in phase they cancel each other in the coil. This does not happen to the antenna signal because the signals in both conductors of the downlead are 180° out of phase with each other.

Noise pickup in a balanced transformer may enter the secondary by virtue of the capacitive coupling between primary and secondary before the signal is cancelled in the primary. This condition may be minimized by employing an electrostatic shield between both windings as shown in *Fig. 3-6*.

Another type of antenna transformer, called an "Elevator Transformer", is illustrated in the partial schematic shown in *Fig. 3-7* where a pair of transformers are shown as used in the RCA 206E3 printed-circuits tuner. These transformers are primarily designed to match the tuner to a balanced 300 ohm transmission line, and

to attenuate any noise which may be induced in the line.

The network of coils and condensers following this antenna transformer combination is designed to pass frequencies above 47 mc only, and as such is called a "high pass filter". It

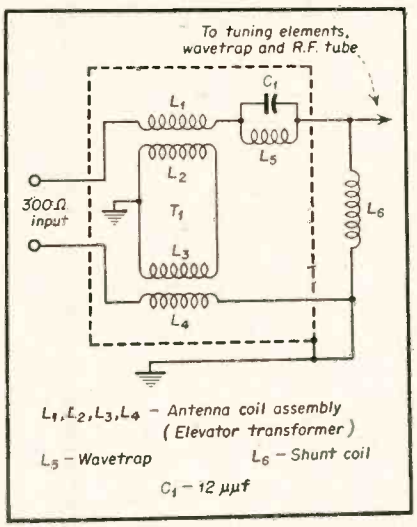


Fig. 3-7: Application of Elevator Transformer as an antenna input transformer. (RCA)

is also designed to provide maximum attenuation at 23.5 mc for rejection of i-f interference at the r-f grid.

Tube Input Circuits

Two basic types of tube input circuits are used in TV. The first is the conventional grid input circuit shown

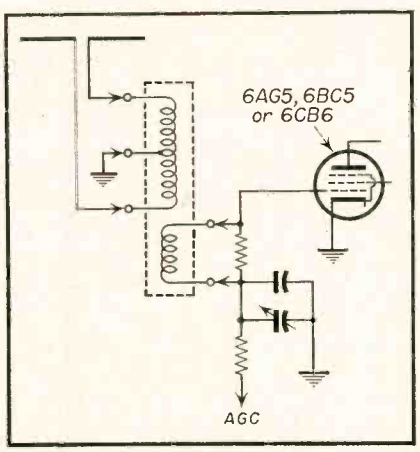


Fig. 3-8: Conventional grid input circuit as used in Standard Tuner.

in *Fig. 3-8*. The second is a grounded grid amplifier as shown in *Fig. 3-9*.

The use of grounded grid amplifiers arose from the use of triodes in the Front Ends of TV receivers because of their lower noise (internal tube noise) characteristics. As the number of elements in a tube is increased the internal noise effects also increase, especially at high frequencies. There-

fore, triodes are favored at tube types in TV Front Ends.

However, triodes cannot be used in very high frequency circuits without some form of neutralization, on account of feedback between plate and grid. The use of a grounded grid circuit permits the use of a triode without neutralization, since the grid now acts as a shield between plate and grid. Because the potential between grid and cathode still varies with the input signal, as far as the output voltage is concerned the tube acts asa conventional amplifier.

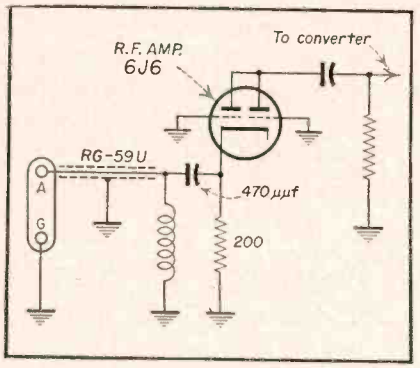


Fig. 3-9: Grounded grid amplifier used in Stromberg-Carlson Model TV-12LM receiver.

No discussion on antenna input circuits would be complete without mention of the push-pull input arrangement used in the RCA 630 TC chassis. Reference to *Fig. 3-10* will reveal a simplified version of this section.

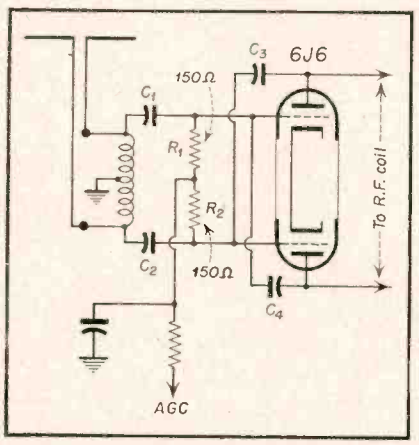


Fig. 3-10: Input circuit used in RCA 630 TS chassis.

The balanced input coil effectively short circuits the low-frequency signals which are picked up by the antenna. Condensers, C_1 and C_2 are antenna isolating capacitors. The re- of the twin triode 6J6 tube, and effect sistors R_1 and R_2 are the grid returns a 300 ohm circuit for the antenna input. Condensers, C_3 and C_4 are neutralizing capacitors.

INDUCTANCE BRIDGE

[*from page 18*]

terpreted directly in inductance units (microhenries, millihenries, or henries) according to the range table given in *Fig. 2*. The signal source may be an audio oscillator (400 or 1000 cycles) or a 60-cycle voltage obtained from the secondary of a filament transformer. The detector may be headphones, an a-c vacuum tube voltmeter, or magic eye tube. Provision should be made to plug in volume-control-type rheostats of different values at R_5, since no single unit will reach all of the high- and low-resistance values required over the full range of the bridge.

The bridge is operated in the following manner: (1) Connect the coil of unknown inductance to terminals *X-X*. (2) Connect the detector and signal generator to the bridge. (3) Set switch S_2 to position *M*. (4) Rotate the dial of rheostat R_1 to obtain a null. (5) Adjust rheostat R_5 to sharpen the null, and readjust R_1 if necessary. (6) If the null is indistinct, or if no null is obtained at any setting of switch S_1, throw switch S_2 to position *H* and readjust R_1 and R_5.

The busy radio serviceman can build a handy inductance bridge of this type for five dollars or less, using all new components. It is very likely that he will be able to salvage most required parts from his spare parts box.

PROJECTION CONVERSION

[*from page 17*]

Unit, plugs into the Picture Tube Protection Unit directly.

Since the plug and socket ends of these cables are factory made and tested, it is only necessary that the remaining ends be properly connected to the chassis point indicated.

On the top side of the 630TS chassis, almost directly over the Vertical Linearity control are 3, ½" holes. The seven wire cable with octal plug is run through the rear hole. The 5-wire tube socket cable is run through the front hole. The 6-wire cable is run through the hole in the rear of the chassis where the focus control was originally mounted.

The following color coding is used to indentify each wire:

7-wire cable with octal plug.

1. Black — Ground
2. Orange with White Tracer — Arm of Horizontal Centering control.
3. Orange with Black Tracer — #4 and #6 of 5V4G tube V-128.
4. Blue with white tracer — Arm of Vertical Centering control.
5. Blue with Black tracer — Green Lead of Vertical Output transformer.
6. Red — To one side of terminal strip that focus control leads are connected to.
7. Yellow — To remaining terminal of above same strip.
8. No connection.

6-wire cable with plug.

1. Black — Ground
2. Orange — #3 of Vertical Output tube 6K6, V-122.
3. Rubber zip — (115 V. A.C. Connect to the two outside terminals of the 3-terminal strip located on the end of chassis directly behind the Horizontal Centering.

4. Rubber zip — (control and just below the power transformer.
5. White — #6 of Horizontal Output transformer.
6. Green — Cathode of 3NP4 tube. Connect to green lead of 5-wire cable from tube socket.

5-wire cable with 3NP4 tube socket.

1. Red — Video, to junction of .05 mfd. condenser *C141* and 100K ohm resistor *R148*.
2. Yellow — #7 of 6K6GT Horizontal oscillator tube, V125.
3. Blue — Ground.
4. Black — Ground.
5. Green — To Green lead of 6-wire cable and plug.

Separate instructions are enclosed for the North American Philips projection unit and reference is made to them for installing the projection tube and adjusting the optical unit.

It is advisable to set up the complete assembly "on the bench" and adjust the chassis and optical unit before installing it in the cabinet.

Before applying power to the chassis make sure all plugs are inserted in their proper sockets and that all tubes are firmly seated.

FIELD FINDINGS

[*from page 28*]

Pacific Electronic Exhibit

Plans continue for the 6th annual Pacific Electronic Exhibit that opens in the Long Beach, Cal., municipal auditorium Sept. 13 for a three-day run. This year, besides the exhibit booth displays, the event will also be a conference for electronic business leaders and engineers.

Golenpaul 20 yrs with Aerovox

Comes spring, 1950, and Charley Golenpaul rounds out twenty years with Aerovox Corporation, one of the world's largest manufacturers of capacitors for radio, electronic and industrial applications, located in New Bedford, Mass.

It was back in 1930 when Aerovox was still in Brooklyn, N. Y., that Charley joined the company.

Twenty years later finds Charley Golenpaul still at Aerovox, wearing the title of Sales Manager, Distributor Division.

Shure Bros. 25th Anniversary

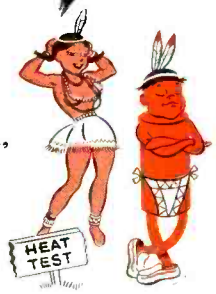
Shure Brothers, Inc., Chicago, Ill., one of the largest independent makers of microphones and acoustic devices, celebrated its 25th anniversary on April 25 with a luncheon and afternoon party for all employes.

AD INDEX

HIAWATHA WAS A PIKER!

"Go out into the world," said Pops*
"and don't come back 'till you're proved tops!"

The water test he passed with ease,
Earning a feather was just a breeze...



Heat was applied to test his worth
In "hot spots" he then won a berth...

The life test took a long, long time
Though others quit—he kept his prime...

His leads proved strong—his casing tough
It did no harm to treat him rough!

His Pops was pleased when he came through
We know you'll like the Redskin, too!

Sangamo's New Molded Paper Tubular Capacitor gives LONG LIFE under severe conditions!

The REDSKIN is easy to work with—on production line or on the bench—because the especially designed flexible leads resist breakage and can't pull out! It offers greater mechanical strength because of its plastic construction. It is molded under *low* pressure, assuring elements undamaged in fabrication, longer life and greater dependability. It is an 85° C tubular which offers assurance of long life under television and other severe operating conditions.

A trial of these *better* molded tubulars will convince you. See your jobber—if he can't supply you, write us.

*Big Chief Sangamo

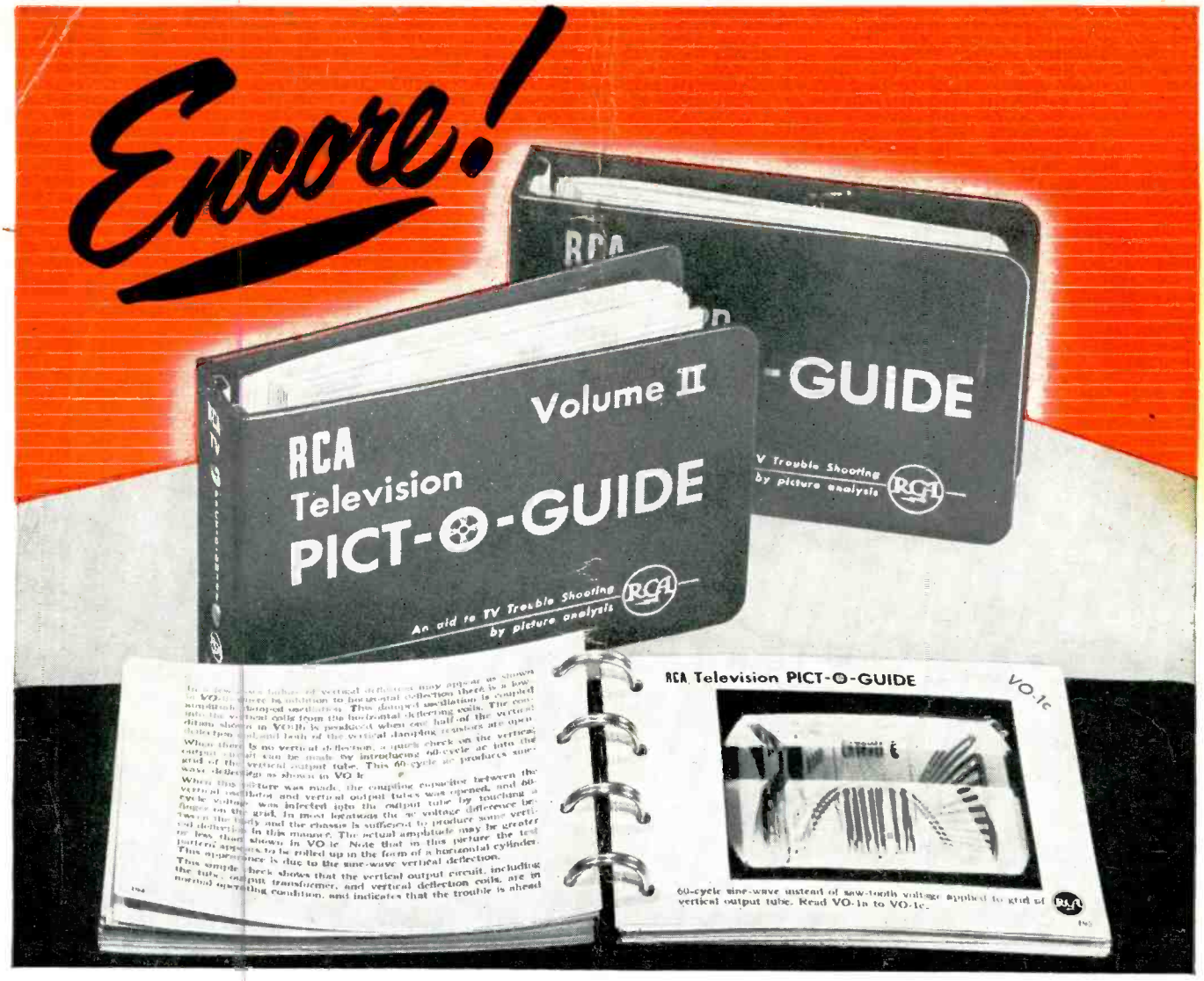
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

In Canada: Sangamo Electric Company Limited, Leaside, Ont.

SANGAMO

SC50-6



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Acclaimed as one of the greatest practical and instructive aids to TV receiver trouble shooting in the field, the *original* RCA Pict-O-Guide provides eyewitness identification of many faults common to all TV receivers and gives basic, authoritative remedies—the kind of practical information that pays off on the job.

There's no substitute for the quality of service information in the RCA Television Pict-O-Guide . . . just as there's no substitute for the quality of RCA tubes. *Both* are yours at no additional cost!

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