Howard W. Sams

PF PHOTOFACT

INDEX

AND TECHNICAL DIGEST

MARCH • 1951
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INDEX No.
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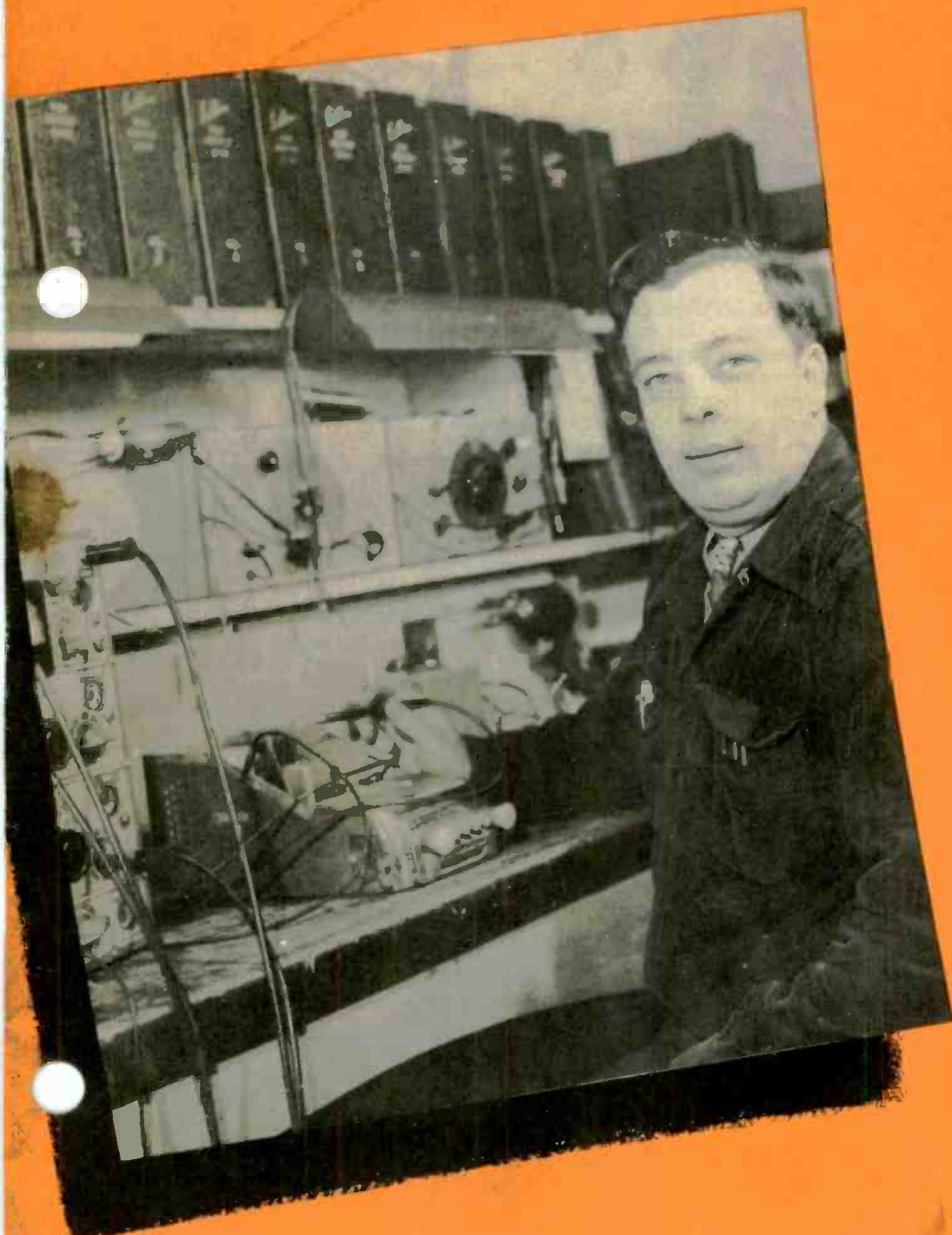
COVERING PHOTOFACT FOLDER SETS 1 THRU 127



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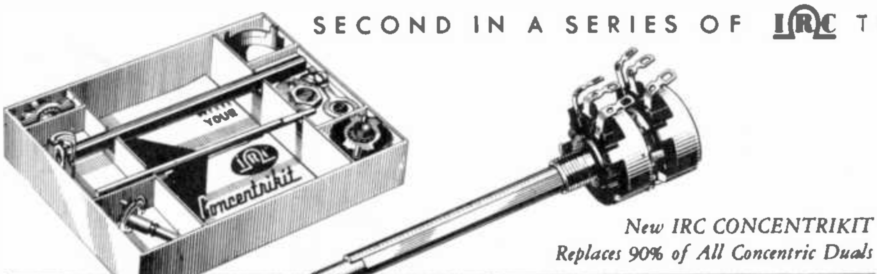


New IRC CONCENTRIKIT
Replaces 90% of All Concentric Duals

HOW TO ASSEMBLE MOST CONCENTRIC DUAL CONTROLS FOR TV OR RADIO WITH ONLY A FEW BASIC PARTS

Actually, you can duplicate almost any concentric dual carbon control shown in Photofacts Index—with IRC's new CONCENTRIKIT. And you can do it in just a few minutes! This kit of specially designed parts—plus a wide selection of shaft ends and base assemblies—gives you a full range of concentric duals for auto radios, home receivers, TV sets.

No More Searching and Waiting for Exact Duplicates

IRC's CONCENTRIKIT is the sure-fire answer to your concentric dual inventory problems. Now, instead of stocking a shelf-full of slow-moving controls you *may* need someday—or shopping and waiting for exact duplicates—you can quickly and easily assemble the exact special control replacement you want. That's going to save you time and inventory investment, and speed up your service. And *that's* going to put more profit in your pocket.

From Pre-war Concentrics to the Latest TV Specials

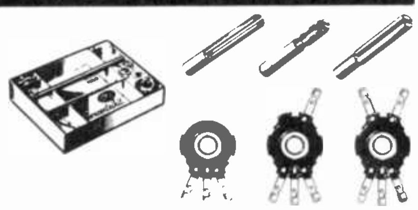
LOW-COST, UNIVERSAL INVENTORY — NO OBSOLESCENCE

With TV sets constantly being improved, and using more and more concentrics, the problem of obsolescence is almost as bad as that of finding exact duplicates. CONCENTRIKIT is your insurance against being "stuck" with specials that are out of date. Yet, at the same time, CONCENTRIKIT lets you service outmoded sets without looking all over the landscape for suitable concentric duals.

Only 11 Universal Parts—plus Shaft Ends and Base Elements

SAVE BY BUYING ONLY WHAT YOU NEED

Each CONCENTRIKIT contains 11 IRC *universal* parts—common to all IRC Type Q Concentric Duals. It does *not* include inner shaft ends, control Base-Element assemblies, switches or sleeve



bushings. These are purchased separately—as you need them. But because they all are *standard* with IRC, there's no difficulty in getting what you want when you want it. And because they are so adaptable, you save by buying only what you need.

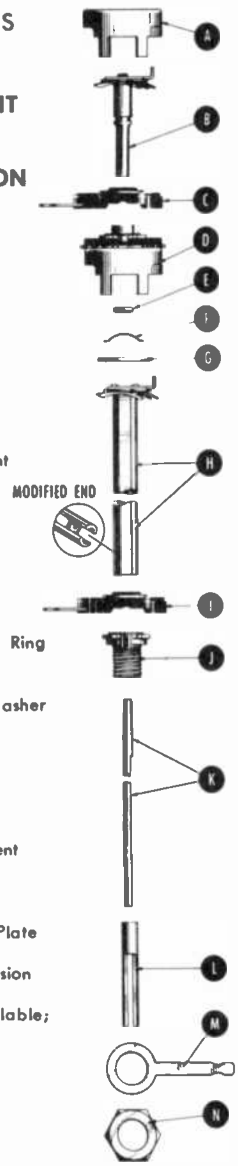
The parts of CONCENTRIKIT have been made as universal as possible. The control coupler permits positioning of terminals in 16 different positions to duplicate the terminal location of original controls. The outer shaft is channeled to the right depth for most flats so you can apply them with a minimum of filing. Width of channel has been selected to give you proper guide for slotting. Inner shaft employs the well-known IRC Tap-in Shaft attachment to provide easier assembly for universal use.

A Wide Variety of Shaft Ends and Base Elements

The majority of inner knobs on concentric duals require a special fitting known as a shaft end. IRC makes three available to cover a wide range of needs. Also, two base elements are required for each concentric dual. These are available in a wide assortment of resistance values, tapers and tapped units. Select the proper shaft end and base-elements when you purchase CONCENTRIKIT.

For many concentric duals, you'll need a switch—and for some (such as auto replacements) you'll need sleeve bushings. IRC provides both single and double-pole switches (Type 76-1 and 76-2) to give you substantial coverage of all your switch requirements. Sleeve bushings come in three adaptable types.

CONCENTRIKIT ASSEMBLY IDENTIFICATION OF PARTS



- A Control Cover
- B Inner Shaft (and Contactor)
- C Rear Base-Element (not included in CONCENTRIKIT)
- D Coupler
- E Resilient Retainer Ring (Stock No. R-2)
- F Spring Thrust Washer
- G Disc Washer
- H Outer Shaft (and Contactor)
- I Panel Base-Element (not included in CONCENTRIKIT)
- J Bushing-Ground Plate
- K Inner Shaft Extension
- L Shaft End (3 available; not included in CONCENTRIKIT)
- M Grounding Lug
- N Mounting Nut

NEW TV CONTROL MANUAL

IRC's new up-to-date TV Control Manual is scheduled for release in April. Includes comprehensive listing of replacements for vast majority of TV sets. Also lists complete replacement detail on concentric dual controls—including not only TV but also home radio and auto sets as far back as they have been used. Features complete section on use of Concentrikit, providing many tips and short cuts on its use. Order this valuable IRC TV Control Manual (Form SO86A) from your IRC Distributor.

Pick of the Trade

Don't Buy Geiger Counters Buy Battery Portables

THE WORD around McGraw-Hill, source of much information—most of it well-informed, is: DON'T buy a geiger counter. You probably couldn't understand what it was telling you and, even if you could, it wouldn't do you much good. DO buy a battery radio. That will give you official and operational information and instructions when it's all over and, presumably, the power is too.

Will give it to you, that is, if there is anyone left to hand it out and a station able to push it out AND if you're there to hear it.

Have fun, chums, and keep your eye on that wild blue yonder.

—*Electronics Markets*—January, 1951

* * *

Auto Radio Servicing

WITH listening-in while you ride now firmly accepted as a four-season habit, and over 18-million involved in dial spinning, auto radio servicing has become quite a round-the-year affair, offering bright income-building possibilities throughout the year.

LEWIS WINNER, *Editor Service Magazine,*
See January, 1951 Issue

* * *

PAUL GALVIN of Motorola says, "set manufacturers at the end of 1950 have the capacity to produce 55,000,000 radio sets as compared with 12,000,000 radio sets in 1940." That gives a pretty good idea of what we've got right now in plant capacity.

* * *

DEFAULTING service contractors give the service industry a black eye. This can be prevented by letting associations insure the contracts of their members.

MAURICE DE ANGELI, Editor
Radio and Television Maintenance
See January, 1951 Issue

* * *

NATIONAL EMERGENCY pulls the teeth of the FCC's color-television decision: producing black-and-white sets will be difficult enough. By the time the question comes up again technical advances will have altered the picture and, from what we have seen and heard recently in Washington, compatibility will be part and parcel of it.
The industry has, in a sense, been saved by the bell.

W. W. MACDONALD, *Managing Editor*
Electronics
See February, 1951 Issue

* * *

SERVICE TECHNICIANS, in the year ahead, have their greatest opportunity. Millions of television sets are not giving proper performance in the home, and authorities have estimated that approximately 70% of all television sets now in use are in need of proper realignment and other adjustments in their circuitry. Speaking of shortages, no one will challenge the statement that we still are in need of many thousands of trained television technicians, not only to take care of the 10,000,000 sets now in use, but as replacements for industry technicians called into service. Never before, and perhaps never again, will there be such an opportunity. Yes, 1951 should be a boom year for the technician.

OLIVER READ, *Editor*
Radio & Television News
See January, 1951 Issue

PF PHOTOFACT INDEX

AND TECHNICAL DIGEST

VOL. 1 • NO. 2 — MARCH, 1951

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HOWARD W. SAMS, *Publisher*

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ABOUT THE COVER: The photograph is of Martin G. Moody, owner, Martin's Radio Shop, 5517 N. Clark Street, Chicago 40, Illinois. Mr. Moody writes: "Just a few words to express my thanks for the help you are giving the radio and television serviceman with your PHOTOFACT Folders. I believe that a complete set of PHOTOFACT Folders is as necessary to the radio and television service shop as adequate and accurate test equipment. With today's varied and complex receivers we must have correct and easy to use information at hand. PHOTOFACT Folders are certainly complete, and all data is very well presented. I have gotten into the habit of using the appropriate folder on each repair job, not only the tough ones, and I feel that each job has been done a little better and certainly a lot faster. You can be sure that my collection of folders will be kept up to date."

MILTON S. KIVER
President, Television Communications Institute

Shop Talk

WHAT DO WE DO NOW? To the seasoned TV serviceman, what to do when he is given a TV set to repair is second nature. But there are unquestionably more novices than experienced veterans in the field and to them "What Do You Do Now?" is a frightening question. While it is not possible to set down a strict step-by-step procedure in this limited space, a general approach can be outlined.

When a TV set is first taken to the bench for repair, read the customer's complaints carefully. (If you are inspecting the set in the home, determine all you can concerning set behavior before even touching the set. This not only helps you, but gives the customer a chance to tell what he knows. And it makes for wonderful customer relations.)

The next step is to turn the set on and permit it to warm up. (If the set fuse is blown or does blow when the power is turned on, a short circuit is indicated and this should be located before the power is once more applied to the set.) With an antenna connected to the set, observe what indications are obtained. Examine the screen, listen to the sound, and then check the operation of the various front panel controls. Do this carefully because it will tell you much concerning set operation. Does the picture remain in sync over the normal rotation range of the horizontal and vertical hold controls? If both controls are critical, then the trouble normally exists in some circuit leading to the vertical and horizontal sweep systems and not in the sweep systems themselves. If only one system appears to be affected, then the trouble can be assumed to be situated here.

How effective is the contrast control? Is there sufficient leeway in the fine-tuning control to permit a station to be properly tuned in? Does the sound and the picture come in at the same setting of this control? Does the set display the same defect on all stations?

This line of self-questioning, while done conciously at first, becomes, with repetition, second nature. Learn to observe and you've taken a long stride toward becoming an experienced serviceman.

From the symptoms demonstrated by the set through its sound and picture, plus what you have learned from rotating the various controls, you should have some inkling of the approximate location of the trouble. (This information is given in standard television texts.) Let us say that it is the horizontal sweep system. Locate the tubes in this section of the receiver and substitute in their place tubes known to be good. Substitute one tube at a time. (A set of special testing tubes kept specifically for this purpose is a great time saver.) Checking each suspected tube individually in a tube tester is time-consuming and may not always reveal the defective tube.

It is only after it has been determined that the tubes are okay that the circuits themselves are checked. In the amplifier stages following the video second detector, in the sync separator stages, and in the deflection systems, the writer likes to check waveform first. In all other stages, voltage checks are made at the start. This procedure is admittedly a matter of preference, but it seems to work out quite well.

Determine from the service manual, or from an experienced serviceman, whether the wave patterns or the voltage values obtained are normal. 10 to 15 per cent variations in voltage (and resistance) readings can be accepted; discrepancies greater than this should be checked carefully. Test condensers by bridging across them other units of equal (or closely similar) value. Look for the obvious and don't take too much for granted.

Here, then, in outline form is a time-tested and proven method of approach. It is simple, direct, and works with the percentages. After you have gained experience and service poise you will undoubtedly modify it to suit yourself. But it will get you started in the beginning.

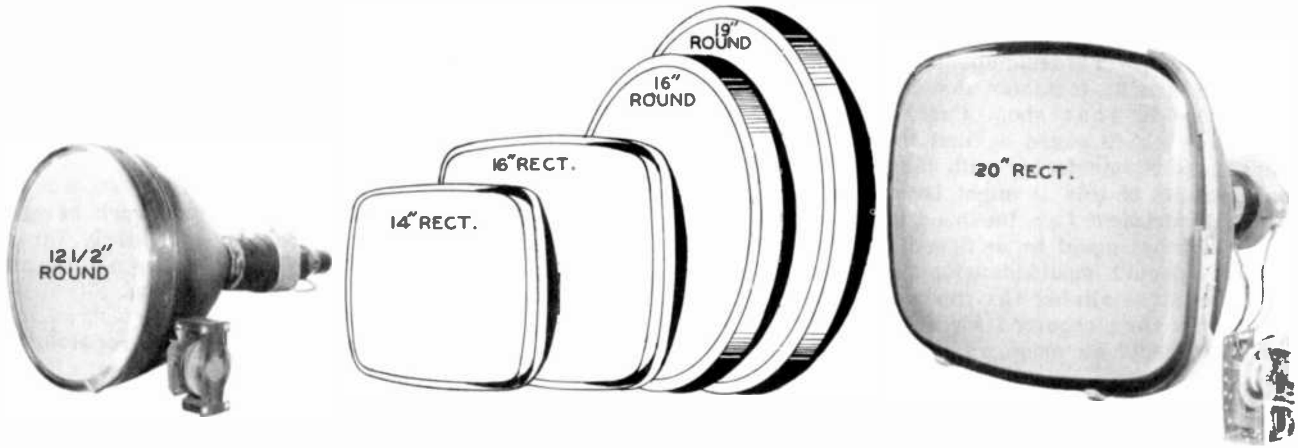
For any TV receiver servicing in the home, a small pocket-size tube manual and a booklet showing tube layouts for various TV sets will prove of immense value. The tube layout book (such as Sams' "Television Tube Location Guide") will help you trace the signal path through the receiver while the tube manual will, if nothing else, identify the various pins of the socket and give you a rough idea of the voltages that should be present. Surprisingly enough, it is generally the so-called "old timer" who forgets (either purposely or unconsciously) these two booklets and then finds himself stumped by a new set or a new tube.

In this rapidly changing field of television, new tubes and new chassis are appearing constantly and the service technician cannot afford to adopt the "I know it" attitude. There is just too much to keep abreast of.

A NOTE ON SERVICE STUMPERS. Every television receiver is a well-ordered, carefully-designed mechanism that operates according to a certain set of rules. From a knowledge of these rules, we can, with a fair degree of accuracy, generally trace a defect to a certain section of the receiver from a study of the symptoms. This is the familiar pattern of approach for all TV servicemen.

There are times, however, when the serviceman encounters troubles which appear to bear little or no relationship to the symptoms they produce. Thus, for example, in the Capehart CX-33 receiver, failure of a video amplifier tube causes the high voltage on the C. R. T. to disappear. Your first impulse, upon receiving such a set, is to note the absence of high-voltage and thereafter to confine your attention to the

♦ ♦ Please turn to page 44 ♦ ♦



High, Wide and Handsome

by MERLE E. CHANEY

The conversion of television receivers using 10" or 12" picture tubes to those employing 14", 16", or larger, represents a new field in which the television technician can supplement his income. The trend toward larger picture tube sizes does not antiquate the 10" or 12" set by any means, but there is a desire on the part of the television viewer to own a set with a larger screen. A television set represents a good-sized investment and most people cannot afford to sacrifice their initial investment by purchasing a new receiver. The answer to this is the conversion of the older set so that a larger picture tube can be used. This places the service technician in a position to perform additional services for the customer, creating good will and, at the same time, broadening his sources of income.

Obviously, all conversion work must be profitable and several items should be taken into consideration before entering into this field. First, it must be remembered that a conversion job takes much more time than a regular service job. In almost every case several parts must be removed from the chassis and new parts must be installed. This may require some metal work to fabricate mounting brackets for the new parts, which is a time consuming job. Considerable work will be required on the cabinet to accommodate the new tube. Even under the best conditions it is estimated that a satisfactory conversion will take a service technician a day to complete the job, and in some cases a little longer. In other words, in a one-man service shop, the regular service work would be stopped for at least a day, or perhaps longer, which in most cases could not be tolerated. Remember, the repair and maintenance of radio and television sets is the real backbone of your business and to insure its future, this work should not be slighted in any way.

When a customer's set fails he brings it to your shop for repair and, when you accept the job, he expects you to complete it as soon as possible. This necessitates the repair of the sets in proper sequence. It would be economically unsound to refuse any repair jobs which can be done by your shop. Also it would be unsound to accept conversion jobs if they were to interfere with your regular repair work. This does not mean, however, that there is no place in the one-man shop for conversion work. Past experience has shown that there may be certain periods when there will be fewer sets brought into the shop for repair. It is during these periods that it would be possible to complete a conversion job.

The time when a conversion job is to be done, in most cases, can be controlled. Since the customer's set is operating he is more willing to wait a few days, if necessary, for the conversion job, than he would be if his set had failed and required service. Thus the set could be scheduled to be picked up at a time when the work would fit into the schedule of the service shop. In every case it is recommended that the set not be picked up until you are ready to start the conversion work. This means that the set will be in your shop for a minimum of time, with greater satisfaction to the customer.

Service shops employing two or more technicians should be in a better position to handle conversion work than in the case of the smaller shop. The

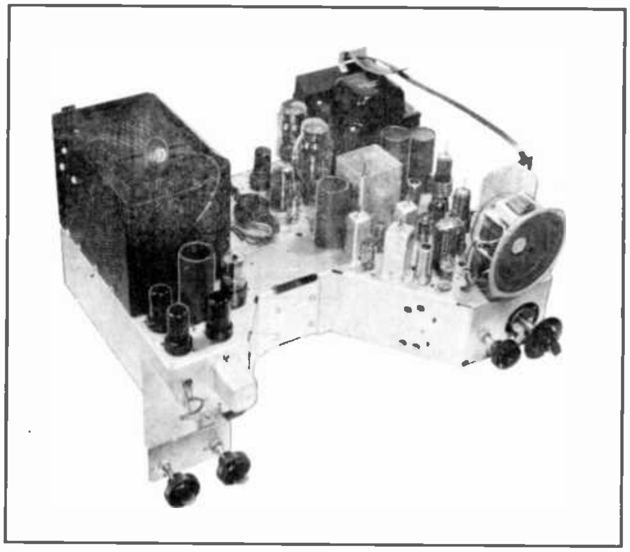


Fig. 1. 630-Type TV Chassis with Deflection Yoke and Focus Coil Removed.

very fact that several technicians are required to do the service work, indicates that considerable work is being done by that shop. Caution must be exercised here too, to guard against the acceptance of conversion jobs interfering with the regular service work. Because of this it might be wise to set up a separate department for the handling of conversion work. Personnel could be assigned to do this work and after a period should develop methods and techniques for streamlining the operation. By cutting down on the time required for doing the job, more conversions could be made, resulting in more profit for the shop.

So far our discussion has dealt with the time element of doing this type of work. It is of great importance and is the first obstacle that must be hurdled. If you feel that you are getting maximum output from your shop now, and that the acceptance of additional work would place a burden on your organization, no conversion work should be accepted. If you decide to enter into the field, on a limited basis, keep it on a limited basis. It is awfully hard to turn down jobs, but if you do not have the time to complete them, accepting them would be the same as selling merchandise which you do not have. It is much easier to explain to the would-be customer that you simply do not have the time to do the job at the moment, than to have him on your neck for not turning out the job on schedule. Your frankness may make him a potential customer for future repair work or you might even find that he will be willing to wait for the conversion job until such a time as you can handle it.

Assuming that you have decided to do conversion work, either on a large or small scale, the next step is to decide what receivers are going to be accepted. From the cabinet standpoint, there are three distinct groups. The first would be the case where the customer is going to mount his receiver in a custom installation or in a new cainbet, with this work being done by someone other than yourself. Obviously, this is the most desirable course since it does not place the responsibility of the cabinet work on you.

The second group would be those receivers that are to be mounted in the original cabinet. The cabinet in this case is the limiting factor as to how large a tube can be used. Be sure that sufficient data is available or that past experience has shown that the tube which the customer wants will fit into the cabinet before you contract to do the job. It is suggested, when doing a conversion job for the first time on any model, that no alterations be made on the cabinet until the chassis is converted and that it is definitely established that the new tube will fit into the cabinet. Also, notes should be listed to be used as a guide for any future work on that same model. After the work on the cabinet is completed, a template should be made to make the next job easier.

The third group can be classified as those sets which are to be mounted in custom installations or in new cabinets with the responsibility of the installation given to you. This obviously requires more work than in either of the preceding groups. Since the average service shop is not set up to do cabinet work of this caliber, it might be possible in some cases

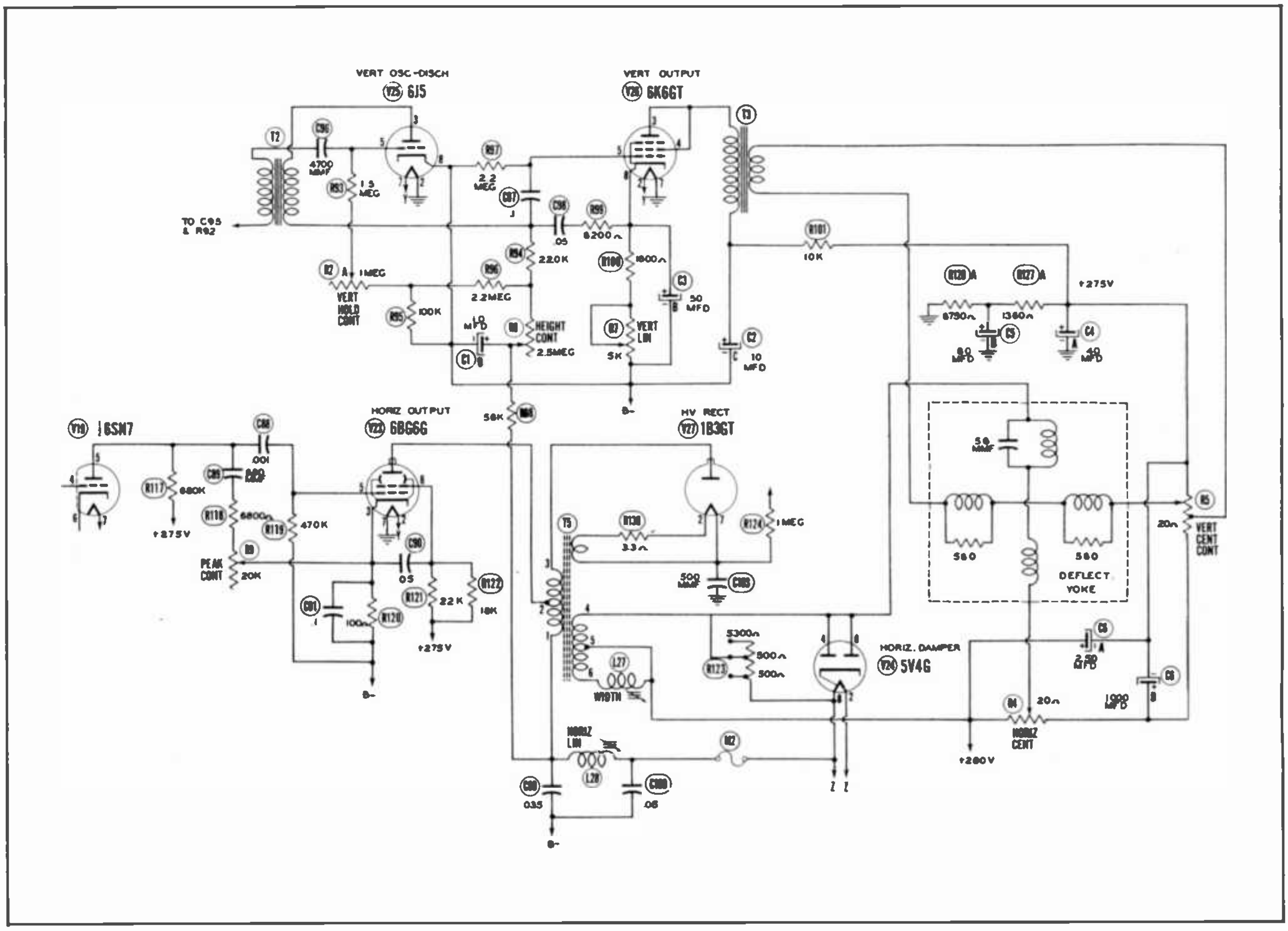


Fig. 2. Schematic of Horizontal and Vertical Sweep Circuits before Conversion.

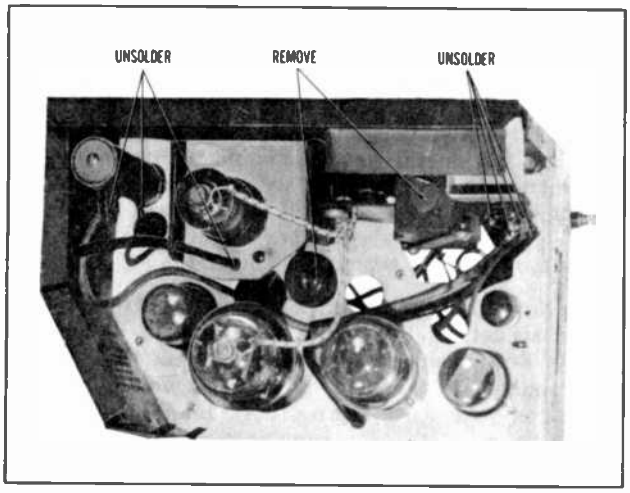


Fig. 3. Original Wiring in HV Compartment.

to contact a local cabinet maker and engage him to do this work for you. This would also apply to group two listed above. Any arrangement of this type should be entered into cautiously, however, making sure that both parties will benefit.

The three groups listed should serve as a guide to help you select what receivers you are going to accept as far as the cabinet work is concerned.

The next thing to consider is which chassis can be converted from an electrical standpoint. First of all, the series filament type sets can present several problems in making a conversion and therefore it might be wise to not accept them for conversion. This does not mean that they cannot be converted, but unless specific data is available outlining the correct procedure, several problems might arise during the conversion which could result in a loss instead of a profit.

Usually a little more power will be required to sweep the larger tube. Consequently those sets having power supplies that are already working at maximum capacity may cause trouble after the conversion is made. This information can be obtained from service data which gives the current drain on the power transformer. The next actor is the general layout of the chassis. If the affected parts are crowded, making the work difficult, the set should not be accepted for conversion. Again this does not mean that a set of this type cannot be converted, but it might be economically sound not to attempt it. It is hard to draw the line where sets will or will not be accepted, but usually a careful study of the circuit and photographs of the chassis layout, will aid in making a decision. If, after a job is accepted, it is found that the conversion is more difficult than anticipated, with resulting higher costs, any future requests for conversion of the model should not be accepted.

The maintenance of an adequate supply of parts for carrying on this work is very important. By having the parts on hand before the job is started, much time will be saved and you will have the assurance that the job can be completed. This is especially true since the supply of parts is rather uncertain at this time. The maintenance of a parts supply includes not only the electrical components but also the mechanical parts such as stock for making brackets, tube escutcheons and bezels. If any one of the required items are not on hand when the job is started, it may hold up its completion for some time - much to the dissatisfaction of the customer.

Whenever possible it is an aid in selling conversion jobs to establish a set price for the conversion of any specific model. This price can then be quoted to the customer and he knows exactly what it is going to cost him. The established price also gives the customers added confidence, helping in selling the job. If, after quoting a price on a certain model, it is found that the price is too low or too high, it may be revised before accepting another job on the same model.

There are times when it would be logical to suggest a conversion job to the customer from a financial standpoint. If a set with a small-size picture tube is in the shop for repair, and it is found that the picture tube or a major component in the deflection circuit is defective, the customer might be interested in having the set converted. Since one of the costlier components, such as picture tube, horizontal output transformer, or deflection yoke, needs replacement, the net cost to the customer for the conversion job would be less.

It is suggested that an explanation be made to the customer as to the extent of the guarantee of the receiver after the conversion has been made. This may avoid misunderstanding in the future in the event of failure of components not associated with the deflection circuits.

Following is an account of the work done on one of the models converted in our laboratory. It should provide an idea of the extent of work required to do the job. Keep in mind too, that this particular model is very well suited for conversion and that there are many sets in the field which would require additional work.

CONVERTING THE 630-TYPE TV CHASSIS

In this conversion a 630-type TV chassis, illustrated in Figure 1, was used. This chassis is used in many models which have cabinets too small to accommodate a larger tube, and if it is not desired to use a new cabinet, a conversion cannot be made.

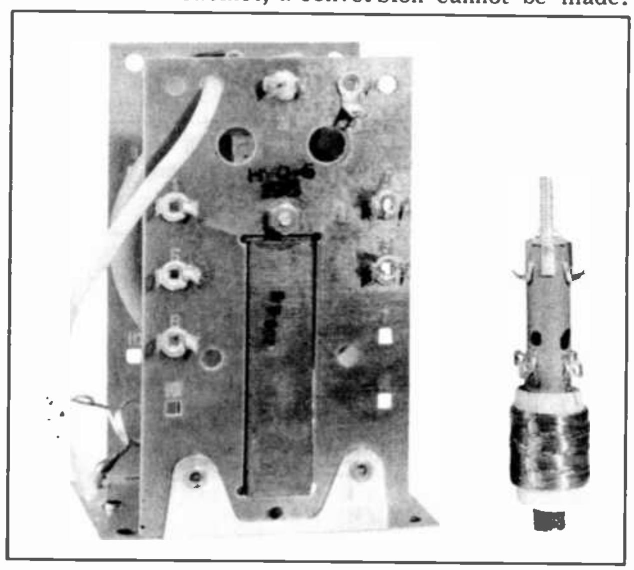


Fig. 4. New HV Transformer and Width Coil.

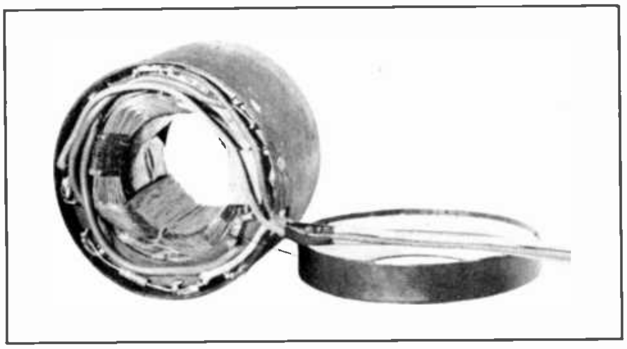


Fig. 5. New Deflection Yoke.

If, however, the chassis is to be mounted in a new cabinet or in a custom installation, a conversion to a larger tube is practical.

Conversion to 14'', 16'', or 17'' Picture Tube

A partial schematic, showing the horizontal and vertical deflection circuits as they are wired in the original circuit, is given in Figure 2. This may be referred to when removing the old parts.

The first step was the removal of the deflection yoke and focus coil. The leads to the deflection yoke and focus coil were unsoldered, at the chassis end, and these units and their brackets removed. An octal socket was then installed on the chassis and leads from the horizontal and vertical circuits were connected to the socket. These leads were connected to the same terminals on the chassis from which the deflection coil leads were removed. They may be terminated at the octal socket at any of the terminals but it is suggested that a sketch be made of the connections so that it can serve as a guide for connecting the leads from the deflection yoke to the plug, which will be made later. In this particular conversion the deflection yoke socket was positioned near the back of the chassis as shown in Figure 7. With this socket on the top of the chassis it is easily accessible even though the chassis may be mounted in close quarters. All four leads, two from the vertical circuit and two from the horizontal circuit, should be dressed close to the chassis to prevent pulses from being fed to the synchronizing circuits, which might result in erratic sync. By carefully dressing the leads near the chassis, no trouble was experienced.

Next, the two focus coil leads were terminated at the socket, again making a notation of which terminals were used. We then had all six leads which are required to feed the signals and voltages to the deflection yoke and focus coil, terminated at the socket.

The use of this socket is optional. In those cases where the picture tube is to be mounted directly on the chassis it would not be required. When the tube is to be mounted separately from the chassis the socket should be employed.

The next step was the removal of the old components from the high voltage compartment. After taking off the removable section of the HV compartment, terminals 1, 4, 5, and 6, as shown in Figure 3, were unsoldered. The screws mounting the horizontal transformer to the side of the HV compartment were removed, as well as all the screws holding the HV compartment to the chassis. The HV compartment was then removed, which gave access to the HV rectifier filament leads which were then unsoldered. By disconnecting the leads from the top caps of the 1B3 and 6BG6G tubes, the horizontal transformer could then be removed.

Since the original HV filter capacitor is only a 10 KV unit, it was removed so that a unit with a

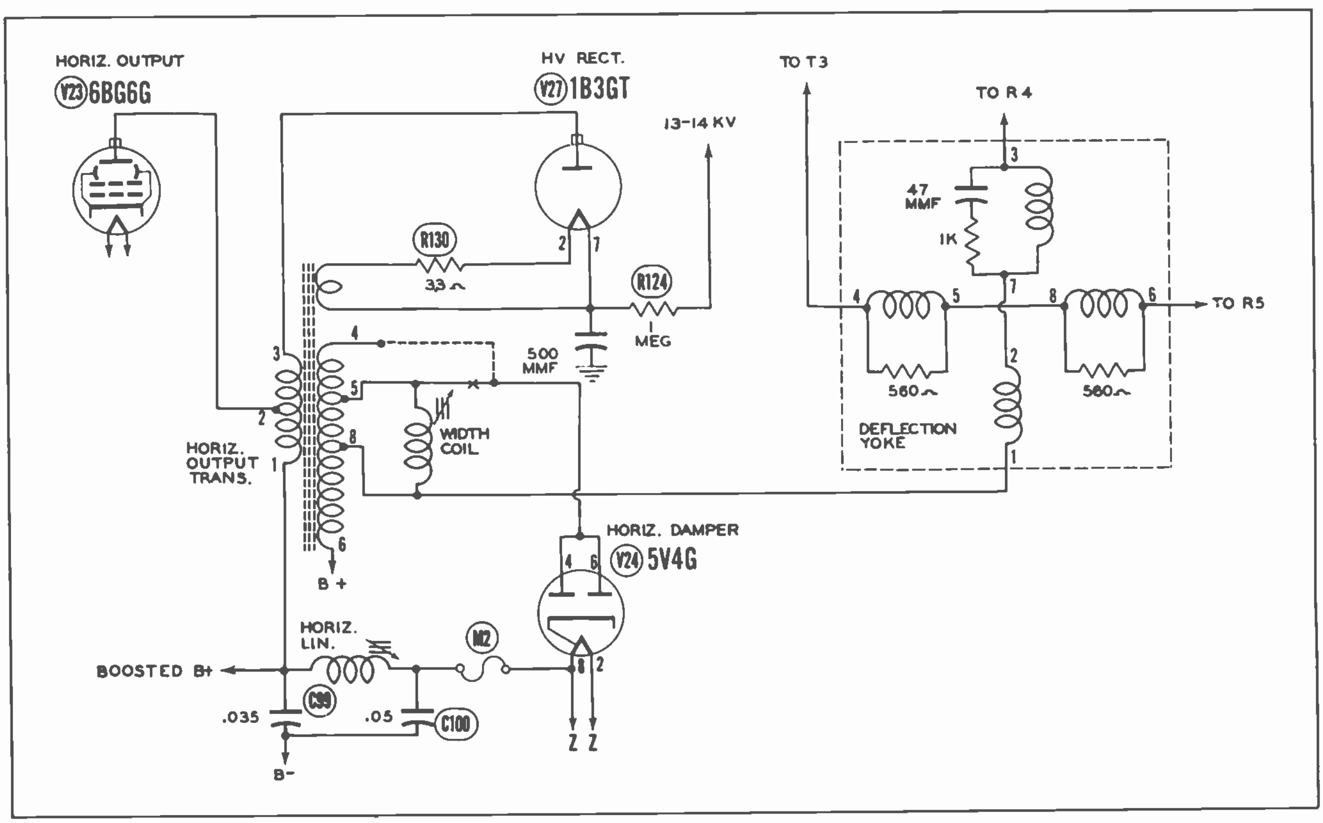


Fig. 6. Schematic of Horizontal Sweep Circuit after Conversion.

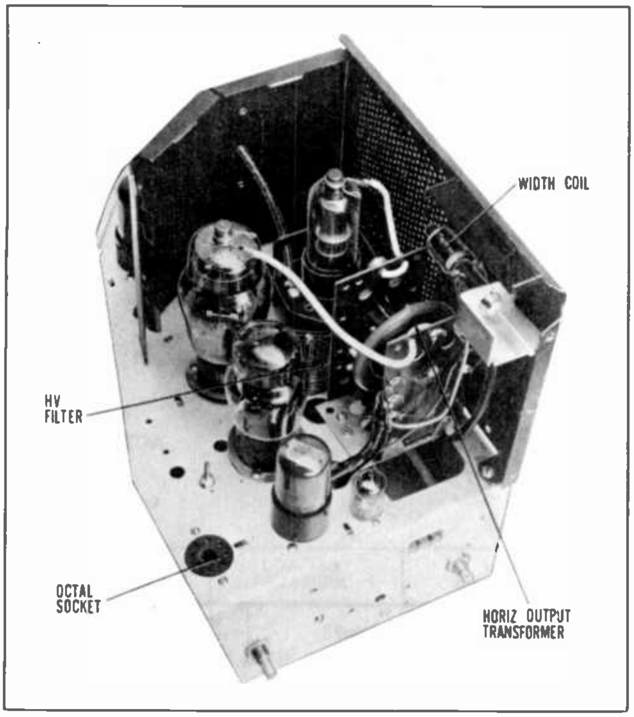


Fig. 7. HV Compartment Showing New Components.

higher rating could be employed. The leads to the damping resistor (See Figure 3) were then unsoldered, as this unit is not required in the new deflection circuit. The high voltage lead was also unsoldered and removed. The old width coil was then removed from its bracket which completed the removal of the parts which were not to be used in the new circuit. The chassis was then ready for the mounting of the new components. A complete parts list of all components required for this conversion is provided, following the step by step procedure given later.

First, the new 15 or 20KV filter capacitor was mounted in the same hole as was the original. It may be necessary to enlarge the hole slightly to accommodate the new unit. If the terminal on the new unit is not threaded, the hole should be enlarged only enough to permit a tight fit of the terminal in the hole. After seating the capacitor in the hole, it may be soldered to the chassis on the underneath side.

The next step was the mounting of the new horizontal output transformer and width coil, which are shown in Figure 4. The Merit type HVO-6 horizontal transformer was mounted on the chassis by first drilling three new mounting holes. The transformer was positioned close to the HV rectifier tube mounting bracket as shown in Figure 7. This is very important since mounting of the transformer too far from the bracket will make it impossible to connect the HV rectifier filament leads to the proper terminals. After the transformer is mounted, the filament leads were connected to the same terminals of the rectifier socket as were the original, again taking care that no sharp points are left after the solder operation.

The next operation was the mounting of the new width coil. The original width coil has an inductance of approximately .035 to .12 MH which cannot be used with the HVO-6 transformer. Any attempt to use the original width coil will result in the effective shorting of one-fourth of the secondary of the HVO-6 transformer which will prevent operation. The Merit type MWC-1, which has an inductance of 3 to 27 MH, was used. It was mounted on the same bracket as the original width coil, but due to its larger diameter, the hole required a little reaming. Do not attempt to mount this coil any other place than in the HV compartment, as the strong field radiated by it may affect the operation of the set. After the width coil was mounted, the side and front section of the HV compartment was put back in place. The width coil was then connected to the proper terminals as shown in the schematic of the new circuit given in Figure 6.

The Merit type HVO-6 horizontal transformer is a universal type. It will provide sufficient sweep for the large picture tubes and can be used with standard type horizontal output tubes. In this particular circuit it was found that the original 6BG6G provided adequate sweep for a 14'', 16'', or 17'' picture tube. The primary of the HVO-6 was connected the same as the original transformer. Terminal 1 was connected to B+ boost; terminal 2 to the top cap of the 6BG6G and terminal 3 to the top cap of the 1B3. These connections are shown in the schematic of Figure 6. With the exception of the new HV filter capacitor, the HV circuit remains the same as the original circuit. The leads which were disconnected from the secondary terminals of the old horizontal transformer were then connected to the proper terminals of the new transformer per the schematic of Figure 6. The damper tube plates should be connected to terminal 5 of the transformer. Normally this will provide proper damping and sufficient boost voltage. If, after putting the set in operation, however, it is found that insufficient sweep is obtained, the damper plates may be connected to terminal 4 of the horizontal transformer.

This completed all the connections on the chassis and the rest of the HV compartment was put in place. The next step was the connection of the deflection yoke and focus coil to the plug. A Merit type MD70-F, which is a 70 degree unit, was used. Three resistors and one capacitor must be added to the yoke. The values and the connections of these components are given in the schematic of Figure 6 and instructions for mounting them are given in an instruction sheet packed with the new yoke. Figure 5 illustrates this yoke after the components and leads are wired in. Connect whatever length leads are required to extend from the deflection yoke to the socket on the chassis. Allow plenty of length for the leads. If they are tight when the installation is made, the yoke may be held in a cocked position. Terminate these leads in an octal plug at the proper terminals which can be determined from the sketch made earlier when the deflection socket was wired. The focus coil leads were then extended and terminated at the proper terminals in the plug. In many cases the original focus coil may be used on the 14'', 16'',

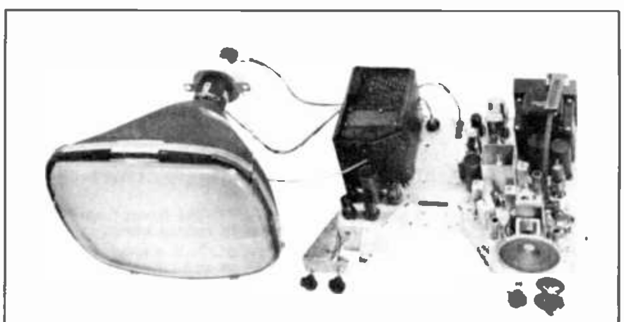
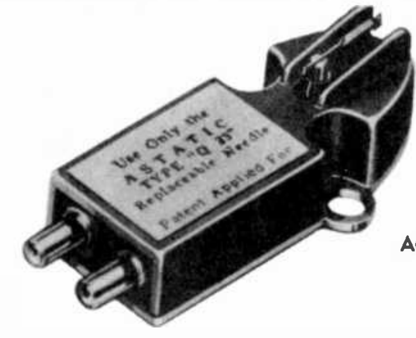


Fig. 8. Complete Unit after Conversion.

♦ ♦ Please turn to page 25 ♦ ♦

Astatic PRODUCTS DATA

"CAC" SERIES CRYSTAL CARTRIDGES

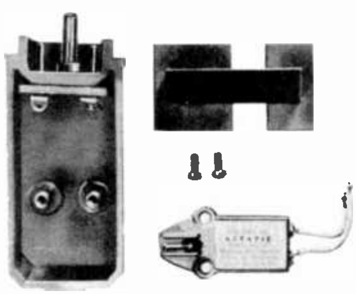


TWICE ACTUAL SIZE

The Model CAC-J is the cartridge which Astatic developed in conjunction with the Engineering Research and Development Department of CBS to match precisely the recording characteristics of LP records. It is internally equalized to follow Columbia Records, Inc., ideal frequency response for the recording characteristics of LP records. Aluminum housing with standard ½" mounting holes. Will fit most tone arms. Includes adapter plate to mount in RCA and similar 45 RPM record changers. Performance quality . . . with equal fidelity on either 33⅓ or 45 RPM records . . . truly sets today's standard of perfection, and has been so acclaimed by an increasing number of impartial experts. Other models available (see table) with All-Groove or three-mil styli tips to modernize a broad variety of phonographs, to meet the demands of the quality market of perfectionists and serious music lovers, where the CAC Series found its first ready acceptance. All models except the CAC-AG-J are available with diamond styli (those which have the letter "X" in the model designations).

CAC-J REPLACES ★	CAC-AG-J REPLACES	CAC-78-J REPLACES
SHURE P73, P73A, P73AR, P73R, P93MG, P95MG, W21A, W21AR, W53MG	SHURE P71, P71A, P71B, P71C, P71CA, P81, P81A, P81AD, P81C, P81CA, P81D, P81E, W26A, W26B	SHURE P70, P70A, P85, W23A, W23B
ELECTRO-VOICE 14, 14S, 34, 34S	ELECTRO-VOICE 33, 33S	ELECTRO-VOICE 32, 32S
WEBSTER A2, A2M, F12, F13M	WEBSTER A91, A9M1	WEBSTER A3, A3M
RCA 74067, 74625, 75476		

★ FITS RCA 45 RPM CHANGERS AND IS STANDARD FOR COLUMBIA 102 AND 103 PLAYERS



MODELS FOR PLUG-IN HEADS

Shown beside a typical plug-in type tone arm head are the special terminals and fittings which adapt the models CAC-W-J and CAC-78W-J for speedy replacement in such equipment.

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

Model	List Price	Minimum Needle Pressure	Output Voltage 1000 c.p.s. 0.5 Meg. Load	Frequency Range c.p.s.	Needle Type*	For Record	Approx. Net Wt. in Grams	Code
CAC-J	$ 7.50	6 gr.	1.0†	30-11,000	Q-33 (J) (1-mil tip)	33⅓ and 45 RPM	5	ASWZZ
CAC-X	31.00	6 gr.	1.0†	30-11,000	Q-33 (X) (1-mil tip)	33⅓ and 45 RPM	5	ASXDN
CAC-W-J	7.50	(Same as CAC-J except equipped with special terminals and fittings for easy installation in record changer tone arms with plug-in heads.)					5	ASWYB
CAC-W-X	31.00	(Same as CAC-X except equipped with special terminals and fittings for easy installation in record changer tone arms with plug-in heads.)					5	ASXDM
CAC-78-J	7.50	15 gr.	1.35††	30-11,000	Q (J) (3-mil tip)	78 RPM	5	ASWZY
CAC-78-X	31.00	15 gr.	1.35††	30-11,000	Q (X) (3-mil tip)	78 RPM	5	ASXDL
CAC-78W-J	7.50	(Same as CAC-78-J except equipped with special terminals and fittings for easy installation in record changer tone arms with plug-in heads.)					5	ASWYA
CAC-78W-X	31.00	(Same as CAC-78-X except equipped with special terminals and fittings for easy installation in record changer tone arms with plug-in heads.)					5	ASXDK
CAC-AG-J	7.50	10 gr.	1.35††	30-11,000	Q-AG (J)**	33⅓, 45 and 78 RPM	5	ASWZX

†RCA 12-5-31-V Test Record or equivalent.
††Audio-tone 78-1 Test Record.

*"J" stands for Sapphire Tip, "X" for Diamond Tip.
**All-Groove Needle Tip of special design and size to play 33⅓, 45 and 78 RPM Records.

JOHN MARKUS

Editor-in-Chief, McGraw-Hill Radio Servicing Library

Dollar and Sense Servicing

TRENDS IN TV SERVICING. Shorter service contracts are coming, particularly for renewals, because of the unknown future costs of labor and parts. Many eastern contractors are favoring the 90-day contract for this reason.

Downward drop in percentage of contracts bought by purchasers of sets may be stopped, even turned upward by fear of parts shortages. Set-owners hope that a contract will give them priority on scarce, allocated tubes and parts. If you can handle a few more contracts, this is a legitimate and effective argument. An individual desperately in need of one scarce part is going to find it pretty tough going without a contract.

Stretching of strategic cobalt, nickel, copper, aluminum and steel is the order of the day among manufacturers, to make as many sets as possible with what they've got. This means taking off metal gadgets, decorations and nonfunctioning parts or changing to plastics.

Boosters of FM radio are going to find the going still tougher in the months ahead, because the FM tuner is one thing that can be left off on TV sets and consoles with little or no complaints from purchasers. Making FM optional is the first step in this direction by some manufacturers.

Circuit design trends to be looked for: Fewer tubes per set, with reduced sensitivity and hence reduced usefulness in fringe areas; selenium rectifiers in voltage-doubler circuits replacing power transformers, to save copper and silicon steel; smaller Alnico magnets in speakers; no more built-in antennas, since they're rarely used anyway; electrostatoc picture tubes (not for many months, though), to save deflecting-coil copper.

GRAY MARKET PARADOX. In the New York metropolitan area, large service organizations are being besieged with phone calls offering needed 300-ohm twin-lead, tubes and other scarce parts in quantities at prices actually lower than from regular distributors. It's high quality merchandise, too - - not distress junk. One possible explanation is that the boys who borrow cash to buy and hoard for a rise in the market can't hang on and pay their interest for long, hence have to dump when servicemen refuse to pay their inflated prices.

Some of the scarcest replacement receiving and picture tubes are being peddled at fantastically high prices by speculators. Generally these tubes are in bulk packages normally used only for set manufacturers. This indicates either that tubes are getting side-tracked out of normal channels or that smaller set-makers are quietly going out of business and releasing their stocks of parts through the usual radio-row channels of New York City.

Though older almost-obsolete picture tubes are scarce here and there, the most-needed large modern tubes are generally plentiful and even coming down in price. Two years ago, a tube engineer predicted that picture tubes would someday cost little more than a sealed-beam auto headlight bulb; maybe he wasn't pipe-dreaming, after all. Such is this business we're in - - now, yesterday and forever screwy.

SMALL TV SETS. During the first three postwar years (1946-48) some 1,200,000 TV sets with 12-inch and smaller screens were sold. DuMont sales chief Walter Stickel estimates that almost a million of these will be replaced in 1951 because their screens are now considered to be too small for good viewing. These sets will have to be reconditioned for resale, rental or conversion to bigger picture tubes. Since the work can be done during slack periods, it's one way of keeping down the idle-time overhead expense. At resale, the table model 10-inchers are bringing from $50 to $100 in the New York area. At rental, one service organization is getting $12 a month including use of an indoor antenna. As-is sets available at around $25 may well be worth picking up to rob for tubes and parts, as many servicemen are already doing.

COLOR. Looks now as if it's black and white for the duration. Even the public has forgotten.

CATS AND DOGS. In this true story, an 80-pound German short-haired pointer stepped on an empty box on the stairs while chasing the cat downstairs at full speed. The mutt slid down the rest of the way on his nose, hit the polished living room floor, and crashed into the leg of the card table that was temporarily supporting a newly acquired DuMont metal-cabinet TV set. The table leg broke, the card table fell on the dog, and the TV set crashed end-over to the floor. The cat got away. The dog limped away. There was no implosion. Our heart finally got back into sync. The set? It worked perfectly after being turned right-side-up, and has only a few hairline scratches to show for the incident. But there's a quarter-inch-deep gouge in the oak floor, there's a chunk of plaster out of the wall, there's a card table waiting for fixing that never gets done, and we're in the doghouse because it was our idea to get that cute little puppy!

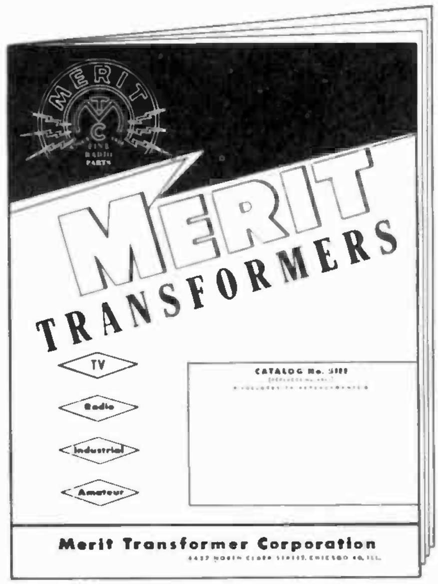
◆ ◆ Please turn to page 53 ◆ ◆

Watch MERIT *For* TV *In* '51

KEEP POSTED ON TV COMPONENT PARTS WITH MERIT CURRENT LITERATURE, *FREE!*

See your Jobber!

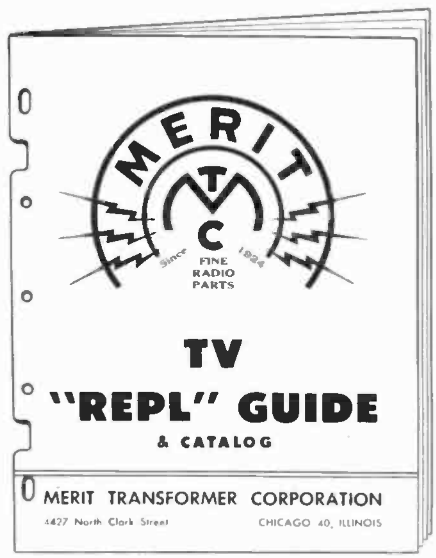
The new 1951 MERIT CATALOG #5111 shows complete up-to-date specifications on the entire Merit line of TV, Radio, Amateur and Industrial Transformers. The Merit TV line is as complete as current and advance information will permit.



You'll need the DEC. 1950 MERIT TV REPL GUIDE & CATALOG for saving time in selecting the correct replacements for all popular television receivers. This handy, easy-to-use popular guide lists model and part numbers of 70 manufacturers, covering 800 models and chassis. First two pages list all TV Transformers and Specs.

DEALER PRICE SHEET-FORM No. 2, dated DEC. 30, 1950 shows the part No., Net price and List price of over 280 parts.

AUTO VIBRATOR TRANSFORMER SHEET-FORM No. 3, dated DEC. 30, 1950, shows model No., Net, List prices and Specs. of VIBRATOR TRANSFORMERS for FORD-GM-MOTOROLA and MOPAR car radios. Also simple easy-to-read replacement guide covering 30 manufacturers.



MERIT OUTPUT TRANSFORMER CHART-FORM No. 4, single sheet shows proper Merit output transformer for use with all popular output tubes. Both MERIT specific and universal types are shown. Mounting style is included for further convenience.

MERIT TV COMPONENTS-FORM No. 5, dated JULY 1950 —illustrated descriptive sheet on MERIT "FLYBACKS" "DEFLECTION YOKES," "FOCUS COILS" and WIDTH LINEARITY COIL WITH AGC.

MERIT comparative part number sheet for TV & RADIO FORM No. 10—shows numerical listing of MERIT part Nos. to competitive Nos. on TV—on Radio, competitive Nos. to MERIT, for easy conversion.

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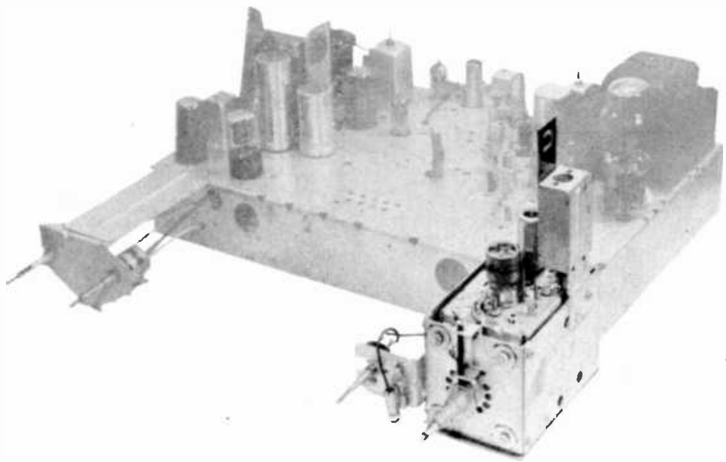
Television Tuning Units



by W. William Hensler

Research material contributed by: Wayne R. Ayers • Eugene L. Bowden • Merle E. Chaney • Garland Mowry • William D. Renner

A description of Circuits, Characteristics, Servicing Methods, and Alignment Procedures for commercially employed television tuners.

PART II

THE GENERAL INSTRUMENT TUNER MODEL 44

The General Instrument Model 44 TV Tuner is a capacitively tuned unit providing continuous tuning over two ranges. One range covers the low band TV channels, 2 through 6, and the other range covers the high band channels, 7 through 13. Switching between bands is achieved through the use of a slide switch which extends the full length of the tuner. The use of the long switch permits the mounting of the tuned circuit coils directly on the slide switch near the proper tube sockets and associated components. With this arrangement the lead lengths can be kept at a minimum and components are accessible for checking or replacement.

Figure 1-11A illustrates the General Instrument Model 44 TV Tuner.

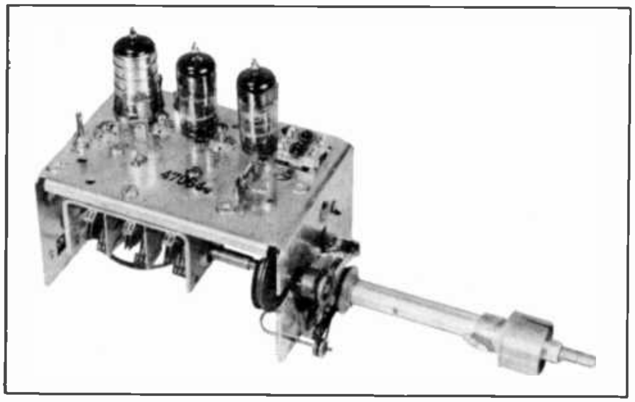


Fig. 1-11A. General Instrument Model 44 TV Tuner.

The slide switch is actuated by a cam mounted at the end of a shaft concentric to the tuning shaft. A 5 to 1 reduction is provided from the tuning shaft to the tuning capacitor. A second concentric shaft, for mounting the channel indicator, is linked to the tuning capacitor shaft by a dial string which is cemented to the pulleys on both shafts to prevent slippage. A spring loaded pulley takes up the slack to minimize backlash.

The tuner is so designed that the slide switch is near the center of the unit with the tubes and most of the components on one side of the switch and the tuning capacitor on the other. A terminal strip is located at the rear of the unit for making connections to the rest of the receiver. A shield is provided for the oscillator tube and an external shield slides over the bottom of the unit, shielding the bottom and two sides. The top and ends are shielded by the frame of the tuner, thus providing complete shielding of the tuner.

Two RF stages are employed. Type 6AG5 or 6BC5 tubes are used in these stages and a 6J6 serves as the mixer and oscillator. All replacements of the RF amplifier tubes should be made with type 6BC5 rather than the 6AG5 tubes. Higher transconductance is provided in the 6BC5, which is interchangeable with the 6AG5, and no wiring change is required.

Proper bandpass is achieved in the General Instrument Model 44 by stagger tuning the two RF stages. In both high and low channel ranges the plate circuit of the first RF amplifier is tuned to the low side of the band, while the plate circuit of the second RF amplifier is tuned to the high side of the band.

The input circuit consists of two double tuned bandpass circuits. The low range circuit has sufficient bandpass to cover channels 2 through 6 while the high range circuit covers channels 7 through 13. The proper circuit is selected by the range switch. The primaries of L1 and L2 (see Figure 1-11K) are center-tapped to ground and designed to match a 300 ohm balanced input. The primaries are trimmed by capacitors mounted on top of the tuner. The secondaries are tuned by the distributed capacity of the circuit and the input capacity of the RF tube. C1 couples the signal to the RF amplifier grid and R1 serves as the grid load, which is returned to the AGC line to control the gain of the stage.

The tuned plate circuit of the 1st RF amplifier, in the high range, consists of L4, A3, the output cap-

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acity of V1, and one section of the variable capacitor in series with C8. In the low range position L4 and C8 are shorted out by the range switch and L5 is placed in the circuit. R3 is connected across L5 to reduce the "Q" of the circuit to broaden the bandpass on the low channels. R4 and C5 make up a decoupling network for the first RF stage. In order to reduce the loading effect of the input resistance of the second RF amplifier upon the 1st RF tuned plate circuit, during high channel operation, the coupling capacitor, C6, is connected to a tap on L4. On some units C6 was connected to the junction of L4 and L5, and C7 was connected as shown dotted on the schematic. When connected in this manner C6 and C7 form a capacitive voltage divider which accomplished the same purpose as the tapped coil. R5 is the grid load for the second RF amplifier and R6 is the cathode resistor which permits self biasing of the second RF amplifier. C9 bypasses the cathode resistor to prevent degeneration in the stage.

The tuned plate circuit of the second RF amplifier is identical to that of the first RF amplifier except for the value of the low band coil shunt, R7, which is 1500 ohms. The coupling capacitor, C12, is always connected to a tap on L6 instead of to a capacitive divider network as used in some units in the first RF amplifier circuit.

C13 and R8 form a decoupling network for the second RF stage. Note that an additional capacitor, C11, parallels C13. Physically C13 is connected to the switch terminal to which L7 is mounted and C11 is connected directly to terminal 6 of the second RF amplifier tube socket. There is a possibility that the inductance in the lead connecting these two points may cause degeneration if only one bypass capacitor were used. The leads on both C11 and C13 are very short, further decreasing the lead inductance. Two capacitors are also used on the first RF stage for the same reason.

C12 couples the RF signal to the triode mixer, one section of a 6J6 dual triode. R9 and R10 make up the grid load for the mixer. The junction of resistors R9 and R10 is terminated at the top of the tuner, point ♦A, for scope connection during alignment. R9 isolates the mixer grid from the scope input.

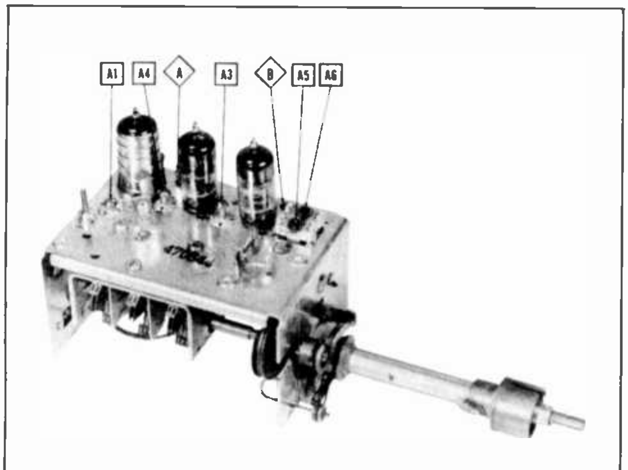


Fig. 1-11B. General Instrument Model 44 Tuner Alignment Points.

The schematic shows a series-tuned mixer plate circuit. L10 is trimmed by the output capacity of the mixer, C19, and the input capacity of the first IF stage. This circuit will vary according to the requirements of the receiver in which it is used. The mixer plate coil may be left off the tuner entirely. When a double tuned IF system is employed, two coils may be mounted on the tuner, usually one on top and one inside the unit. A sound trap, located on top of the tuner, may be added on non-intercarrier receivers. The mixer plate circuit is actually the first IF coil and for its adjustment the IF alignment instructions of the receiver should be consulted.

The second half of the 6J6 is connected in a modified Colpitts oscillator circuit. The third section of the tuning capacitor connects to the plate circuit for tuning. The slide switch is shown in the high range position on the schematic and the tracing out of the oscillator circuit in this position, shows that L8, the high range oscillator coil, has one end connected to the plate of the oscillator tube and the other end returned to the grid. C16, the tuning capacitor, and C18 are in series; and placed across L8. The circuit is trimmed by A1. C18 and the rotor of the tuning capacitor are returned to ground. This ground point governs the amount of feedback voltage applied to the oscillator. Note that in this circuit the value of capacity added from plate to ground, and from grid to ground is large as compared to the interelectrode capacity of the oscillator tube. This minimizes oscillator drift during warmup and also allows replacement tubes to have a greater tolerance in interelectrode capacities without necessitating oscillator realignment. L11 isolates the tuned circuit from the B+ line. C15 and R19 make up the grid leak network and C20 couples the oscillator signal to the mixer grid.

In the low range position C16 and L8 are shorted out and L9 is placed in the circuit. Also the parallel combination of C17 and A2 is connected in parallel with C18 to provide a variable padder on the low range. In some units a 13 mmf. capacitor is used instead of C17 and A2. The operation of the low range oscillator is exactly the same as in the high range position. The tuning capacitor, trimmed by A1, and the parallel network of C18, C17 and A2 are in

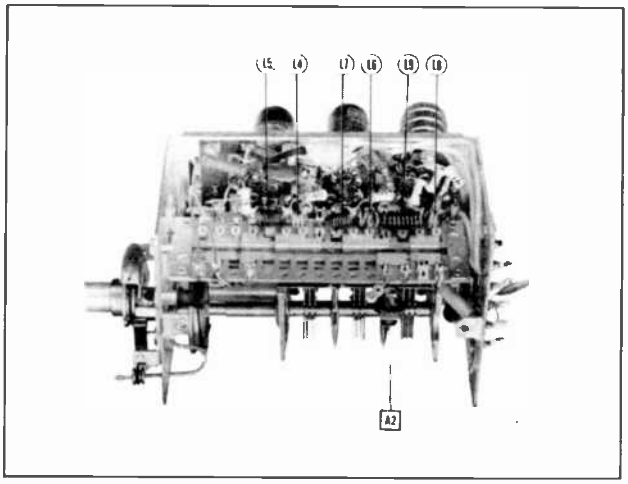
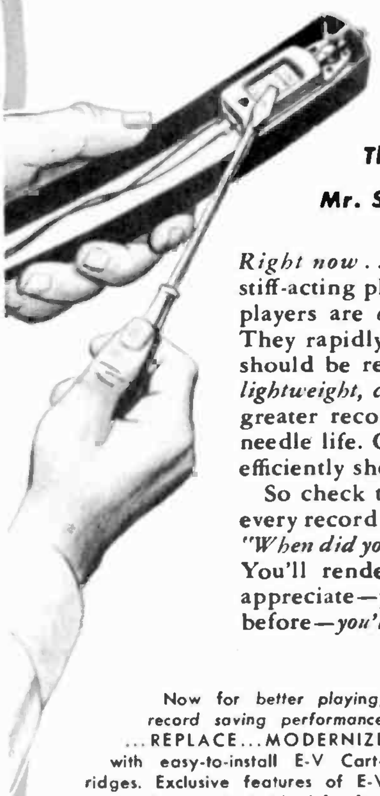


Fig. 1-11C. General Instrument Model 44 Tuned Circuit Coils.

"When did you last change your Phono-Cartridge?"



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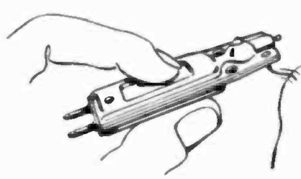
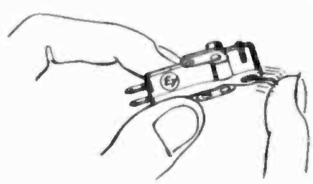


Old style, stiff-acting needle system



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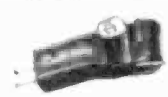
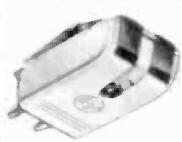
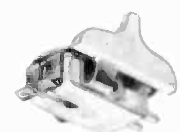


Model 32 for 78 rpm
Model 33 for 78, 45 and 33⅓ rpm

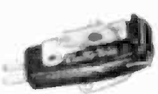


Model 12 for 78 rpm
Model 14 for 45 and 33⅓ rpm

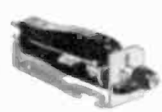
Model 34 for 45 and 33⅓ rpm



Model 16-TT for 78, 45 and 33⅓ rpm



Model 42 for 78 rpm
Model 44 for 45 and 33⅓ rpm
Model 43 for 78, 45 and 33⅓ rpm



Model 96-T for 78, 45 and 33⅓ rpm

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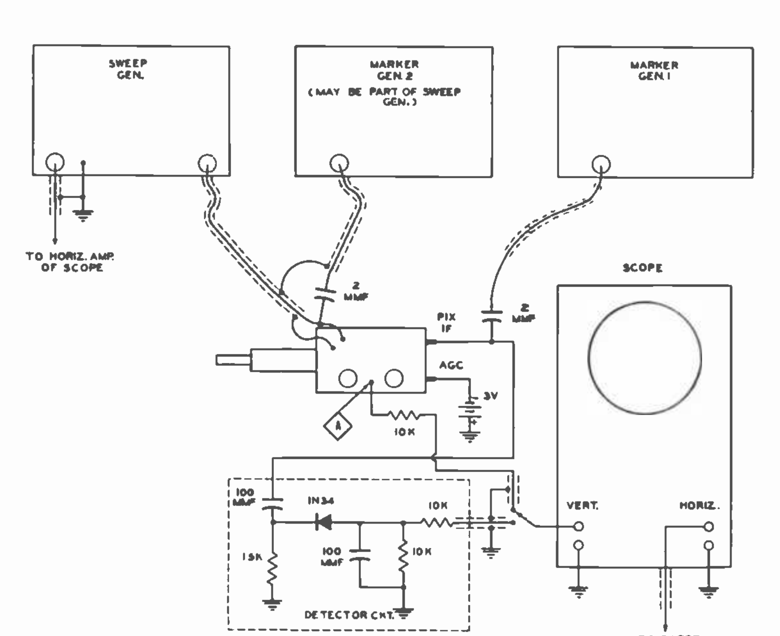


FIG. 1-11D

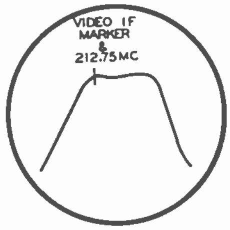


FIG. 1-11E

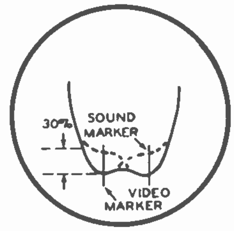


FIG. 1-11F

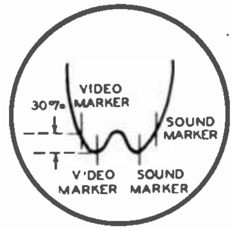


FIG. 1-11G

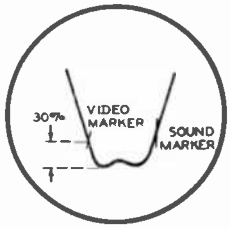


FIG. 1-11H

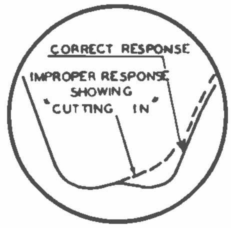


FIG. 1-11I

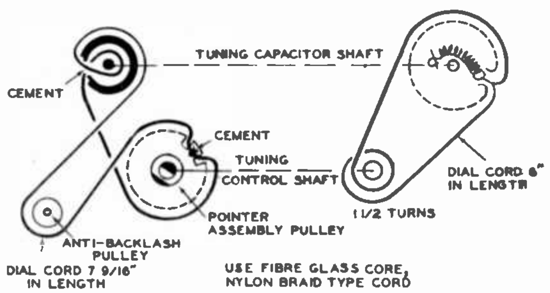


Fig. 1-11J. Dial Drive Stringing.

series and are placed across L9, the low range oscillator coil. The high and low ranges of the oscillator circuits, as well as the RF stages, have a certain amount of overtravel to assure coverage of all channels. The amount of overtravel is given in the alignment instructions for this tuner.

In addition to the alignment point ♦A, another test point (the junction of R1 and R2) is brought out to the top of the tuner. It may be used to check the AGC voltage applied to the tuner. This point is designated as Point B on the schematic and on the tuner photograph (Figure 1-11B).

The recommended supply voltage for the tuner is 135 to 150 volts. AGC or some form of bias is applied to the AGC terminal at the rear of the unit. With 1.5 volts on the AGC line normal current drain for the tuner is 35 to 40 ma.

If the sensitivity of the receiver is low, the oscillator injection voltage should be checked at point ♦A. Normal reading is a minimum of -2 volts, measured with a VTVM having a 10K ohm isolating resistor in series with the DC probe. If the reading is less than -2 volts, replace the 6J6 and recheck the voltage. In the event of oscillator tube replacement, a slight adjustment of the oscillator trimmer, A1, may be required to compensate for a variation of interelectrode capacity in the replacement tube. The procedure for adjusting the oscillator is given in the accompanying alignment instructions.

Erratic operation is usually caused by faulty switch contacts or tube sockets. The tube pins should be checked for dirt or corrosion, or bent pins which might prevent proper contact to the socket terminals. A slight pressure on the switch contacts may disclose a faulty connection due to a dirty or bent contact. If noise is experienced when the tuning capacitor is rotated, check for dirt or foreign material on the plates, or on the clips which ground the tuning capacitor shaft. They should exert considerable tension on the shaft and should be clean. Five clips are used and the end of each of them is soldered to the frame of the capacitor as well as to a grounding strap which

♦ ♦ Please turn to page 20 ♦ ♦

for Greatest TV Picture Quality

AMPHENOL -INLINE-*

*Reissue Patent No. 23,273

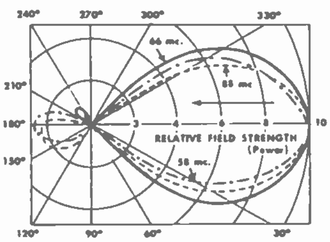
TV ANTENNAS

OUTSTANDING MECHANICAL SPECIFICATIONS

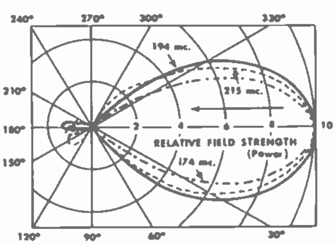
Part	Material	Yield Strength	Size	
		psi	o.d.	Wall
Mast (galv.)	¾" Thinwall Steel Conduit	32,000	0.922"	.049"
Large Folded Dipole	3S ½ H Al.	19,000	.500"	.049"
Small Folded Dipole	3S ½ H Al.	19,000	.375"	.049"
Reflector	3S ½ H Al.	19,000	.500"	.049"
Crossarm	3S H Al.	26,000	.875"	.065"
Center Support & T Casting	Al. Alloy 45,000 psi tensile strength			

EXCELLENT RADIATION PATTERNS

These are the radiation patterns of the AMPHENOL Inline antenna at 58 mc., 66 mc., and 88 mc., in the low band, and 174 mc., 194 mc., and 215 mc. in the high band. Notice the uniformity of these lobes at all frequencies. The lack of lobes off the sides and negligible ones off the back maintains high front-to-back and front-to-side ratios necessary for the rejection of various interferences. The presence of a single forward lobe is usually a very desirable feature, especially when it is wide enough to provide adequate interception area for some differences in transmitter location, changes in the wave front's direction of travel, or physical movement of the antenna in high winds. Furthermore, it is not too critical of orientation. It is necessary only to aim it and forget it.



Horizontal radiation pattern of Amphenol TV Antenna Model No. 114-005.



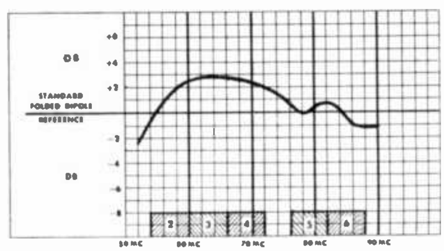
Horizontal radiation pattern of Amphenol TV Antenna Model No 114-005

HIGHER GAIN

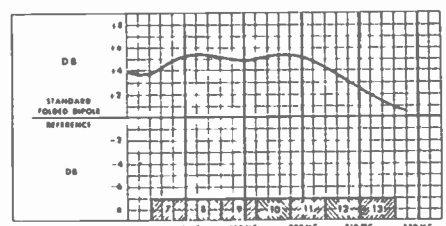
These gain curves of the AMPHENOL Inline antenna represent the intercepted voltage of the AMPHENOL Inline Antenna as plotted against the intercepted voltage of a reference folded dipole cut to the frequency being compared. There is no channel in either the low band or high band where there is more than a three decible change within the channel that can cause picture modulation or "fuzziness." Gain of the AMPHENOL Inline antenna is quite flat over all channels.

You will find more gain designed into the high band because of greater need for it, due to higher losses at these frequencies. Also, notice the drop-off on channel six. This is at the edge of the FM band and is subject to FM interference, so the Inline's gain is purposely held down at that frequency.

The excellent broadband characteristics, impedance match, single forward lobe radiation patterns on all channels, maximum gain, lightning protection, and superior mechanical features of the AMPHENOL Inline Antenna make it the antenna for greatest TV picture quality!



Gain of Amphenol Model No 114-005 Antenna over a reference folded dipole, 54 to 88 mc



Gain of Amphenol Model No 114-005 Antenna over a reference folded dipole, 174 to 216 mc

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WALTER R. JONES

Associate Professor of Electrical Engineering, Cornell University

As I See It

AC-DC RECTIFIER PROBLEMS

It is common practice to find that the rectifier tube in an AC-DC receiver is the tube which most frequently needs replacing. The defect usually indicated is that of an open heater. If the tube types involved are 35Z5GT or 35W4, the open heater generally occurs at the tap. When this represents the total trouble, the substitution of a new tube remedies the situation and the receiver is back in service.

There are situations which can and do arise in a receiver of this type where an analysis of the rectifier tube will indicate that an open heater exists, but actually there are also other defects present. In such cases, the substitution of a new rectifier tube will result in the complete destruction of the tube within the first few minutes of operation. In these days of tube shortages this might become a very serious situation. Let us examine these possibilities in greater detail.

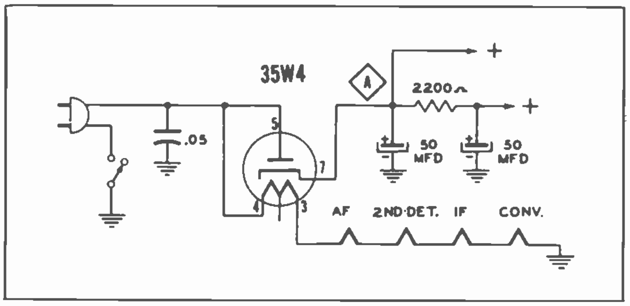

Figure 1

Examination of Figure 1, shows a circuit diagram of the rectifier circuit of an AC-DC receiver shown in Photofact Set No. 117, Folder No. 5. The rectifier tube used is type 35W4. The most serious problem facing a rectifier tube involves a shorted filter capacitor. Let us assume that in some manner a short circuit develops between point ♦A and ground. The plate of the rectifier is tied directly to the power line and thus the tube has the entire line voltage impressed across it. An enormous current will flow through the tube since the only limitation will be the spacing of the tube itself. All data sheets for this type of rectifier indicate that the minimum value of effective plate supply impedance should be 15 ohms. This schematic indicates that this requirement has not been met, with the result that the short circuit current will be high enough to cause serious damage to the rectifier tube itself and probably to the electrolytic capacitor as well. The capacitor may then appear as a short circuit to the next rectifier tube which is used as a replacement, and consequently the tube will fail as soon as the cathode has been heated sufficiently to pass current.

An analysis of a rectifier tube which has failed because of a short circuit may lead to erroneous conclusions unless it is checked for shorts as well as for an open heater. The effects of the short circuit will usually lead to a short between the heater and cathode, an open heater, and possibly a short between plate and cathode. When the circuit is similar to that in Figure 1, the following steps should be taken before inserting a new rectifier tube in the receiver:

1. Check point ♦A for a short circuit.

2. Check electrolytic capacitor at ♦A.

3. Insert resistor of at least 15 ohms between point ♦A and the cathode terminal of the rectifier socket to limit current in case of another short in the filter circuit. The physical location of the resistor in the receiver must be carefully selected, because it will operate at a fairly high temperature. The wattage rating may be one-half watt.

Figure 2 shows a circuit diagram of the rectifier circuit of an AC-DC receiver shown in Photofact Set No. 117, Folder No. 9. This receiver employs the same type of rectifier, the 35W4, but the circuit shown is already provided with a 27 ohm resistor located between the filter circuit and the cathode of the rectifier, where it was suggested that a 15 ohm resistor be added in Figure 1. The effect of the additional resistance over the minimum value recommended by the tube manufacturer will serve to limit the current to a slightly lower value, thus reducing the probability of the electrolytic capacitor or other components in the receiver being damaged. When replacing a rectifier tube in a receiver having a circuit wired as indicated in Figure 2, it will be wise to check the tube for an open heater, and for

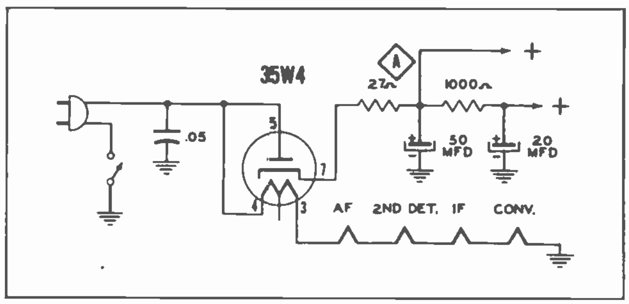

Figure 2

short circuits between heater and cathode and also between plate and cathode. If a short circuit appears at either point then the "surge limiter" as the 27 ohm resistor is called, should be checked to see if there is any indication of an overload having occurred. If the slightest doubt exists the resistor should be replaced. Should any indication of overloading appear, point ♦A should then be checked for a short.

There is another method which is often employed to provide the safety factor afforded by the "surge limiter," and that is the use of a circuit

♦ ♦ Please turn to page 51 ♦ ♦

♦ ♦ Continued from page 17 ♦ ♦

is returned to the chassis. Since the tuner is well shielded, very little dirt or dust will get into the unit under normal operating conditions. If the receiver is located in a spot where considerable dust or dirt is in the air, however, erratic operation may result after a long period of time. The obvious remedy in such a case would be the cleaning of the affected parts.

In the event either dial string comes unwound, it should be restrung according to the instructions which follow in Figure 1-11J. Improper stringing will result in excessive wear, slippage and excessive torque. If the pointer cord has broken, make up a new one of the fibre glass core, nylon braid variety, to the length specified. Set the tuning capacitor fully meshed, and with the tuning shaft at the position indicated, loop the cable around the pointer sleeve pulley. Lift the knot forward over the rim of the pulley, dropping the cord in the cord locking slots. Bring the cord on the right side of the pulley up to the tuning capacitor shaft pulley. Feed the cord through the slot and loop it around the shaft and back through the slot. Continue in a clockwise direction around the pulley, then pull the slack cord down over the anti-backlash pulley. The cord should then be cemented at the points indicated.

The drive cord is strung in a conventional manner, having the cord wound around the drive pulley 1-1/2 turns with the knot in the cord hooked in a spring inside the pulley to take up the slack. Refer to Figure 1-11J which shows the stringing in detail.

If, after replacing the pointer cord the pointer is improperly positioned, it will be necessary to unsolder the pointer ferrule from the shaft and rotate it to its proper position. It should then be tack-soldered to the pointer shaft. The pointer is correct when it is pointing to the number 13 when the receiver is tuned to that channel (air check or by signal generator).

The alignment instructions, schematic diagram and dial stringing information for the General Instrument Model 44 TV Tuner appear in Figures 1-11B through 1-11J and the tabular alignment charts.

* * *

We wish to acknowledge the cooperation of the General Instrument Corporation in supplying us with technical data and samples which were used in this presentation.

ALIGNMENT INSTRUCTIONS

GENERAL INSTRUMENT MODEL 44 TV TUNER

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Two marker generators are required to align the circuits of this tuner. Marker No. 1 is coupled through a 2 or 3 MMFD capacitor to the grid of the first video IF amplifier. The frequency to which marker No. 1 is tuned will be indicated in the table by an asterisk (*).
Marker generator No. 2 is connected across the sweep generator at the antenna terminals. If the sweep generator has a built in marker, it may be used for marker No. 2. The frequency to which marker No. 2 is tuned will be indicated in the table by a dagger (†).
During alignment it is necessary to switch the scope between alignment point A and the detector circuit connected to the tuner output. It is recommended that a single pole, double throw switch be used for switching the oscilloscope input, connected as shown in figure 1-11D. All connecting leads should be shielded and kept as short as possible.
The sound and video IF frequencies are used as reference points to align the oscillator and for tracking adjustments, therefore it is necessary to determine these frequencies used in the receiver employing this tuner.
Connect the negative lead of a 3 volt battery to the AGC terminal on the tuner, connect the positive lead to chassis or common negative in transformer-less receivers.
Remove the second video IF amplifier tube from its socket to prevent feedback from the video IF amplifier.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

HIGH BAND OSCILLATOR ALIGNMENT

Turn the band switch to "high band" (counter-clockwise).
Leave bottom cover in place while performing step 1.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to either antenna terminal. Low side to chassis.	215MC (10MC SWP)	*Video IF Frequency † 212.75MC	Tuning gang fully open.	Vert. amp. thru detector to 1st video IF grid. Low side to chassis.	A1	Adjust A1 to make the two markers coincide as shown in figure 1-11E.
2.	"	"	175MC (10MC SWP)	* Video IF Frequency † 172.75MC	Tuning gang fully closed.	"	L8	Use a non-metallic tool to adjust L8. Turn spacing so that markers coincide. Replace bottom cover. If markers separate, make slight readjustment of L8 so that marker will coincide with cover in place. Repeat steps 1 and 2 until High Band oscillator covers the proper range.

LOW BAND OSCILLATOR ALIGNMENT

Turn the band switch to "low band" (clockwise).
Remove the bottom cover of the tuner.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.	Direct	High side to either antenna terminal. Low side to chassis.	87MC (10MC SWP)	* Video IF Frequency † 84.75MC	Tuning gang fully open	Vert. amp. thru detector to 1st video IF grid. Low side to chassis.	L9	Use a non-metallic tool to adjust L9. Turn spacing until markers coincide.
4.	"	"	56MC (10MC SWP)	*Video IF Frequency † 54.25MC	Tuning gang fully closed	"	A2	Adjust A2 so that markers coincide. Repeat steps 3 and 4 until no further improvement can be made.

HIGH BAND RF ALIGNMENT

Before attempting the RF Alignment the oscillator should first be aligned as outlined in steps 1 thru 4.
Replace tuner shield and turn the band switch to "high band" (counter-clockwise).
Feed the channel 13 video carrier frequency (211.25MC) into the antenna terminals, and the video IF frequency into the first video IF amp. grid.
With the oscilloscope connected through the detector circuit to the video IF amp. grid, adjust the tuning gang until the markers coincide (see figure 1-11D equipment set up).
Leave at this setting throughout step 5.
For step 6 adjust the tuning gang in a similar manner, except that frequencies used are the channel 7 video carrier (83.25MC) and the video IF frequency. Leave at this setting throughout step 6.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Direct	High side to either antenna terminal. Low side to chassis.	213MC (10MC SWP)	†211.25MC †215.75MC	13 (See notes above)	Vert. amp. thru 10KΩ to point A . Low side to chassis.	A3, A4	Adjust A3 for maximum amplitude at the 211.25MC marker. Adjust A4 for maximum amplitude at the 215.75MC marker. Repeat adjustments until satisfactory band pass is achieved. Figures 1-11F, G, and H give acceptable response waveforms.
6.	"	"	177MC (10MC SWP)	†175.25MC †179.75MC	7 (See notes above)	"	L4, L6	Using non-metallic tool, adjust spacing of turn of L4 for maximum amplitude at the 175.25MC marker. Adjust L6 for maximum amplitude at the 179.75MC marker. Repeat adjustments until satisfactory band pass is achieved. See figures 1-11F, G or H. Repeat steps 5 and 6 until no further improvement can be made.

LOW BAND RF ALIGNMENT

Turn the band switch to "low band" (clockwise). Remove tuner shield.
Set the tuning gang to channel 6 in the manner outlined under high band RF alignment, using channel 6 video carrier frequency (83.25MC) and the video IF frequency of the receiver.
Leave at this setting for step 7.
For step 8 set the tuning control to channel 2 using the channel 2 video carrier frequency (55.25MC) and the video IF frequency. Leave at this setting for step 8.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	High side to either antenna terminal. Low side to chassis.	85MC (10MC SWP)	†83.25MC †87.75MC	6 (See notes above)	Vert. amp. thru 10KΩ to point A . Low side to chassis.	L5, L7	Adjust spacing of turns of L5 of maximum amplitude at the 83.25MC marker. Adjust L7 for maximum amplitude at the 87.75MC. Repeat these adjustments until proper band pass is obtained.
8.	"	"	57MC (10MC SWP)	†55.25MC †59.75MC	2 (See notes above)	"	L5, L7	Adjust spacing turns of L5 for maximum amplitude at the 55.25MC marker. Adjust L7 for maximum amplitude at the 59.75MC marker. Repeat steps 7 and 8. A compromise adjustment of L5 and L7 may be necessary to satisfy both steps 7 and 8.

ANTENNA PASS BAND ALIGNMENT

The antenna primary trimmers are adjusted at the factory with a wide range sweep oscillator and a delay line. The coupling is also carefully adjusted and should not be disturbed. Only in cases where these adjustments have been accidently or otherwise changed alignment be attempted.

HIGH BAND ANTENNA PRIMARY ALIGNMENT

Replace tuner shield and turn band switch to High Band (counter-clockwise).
Set tuning capacitor to channel 13 position as outlined in notes under High Band RF Alignment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Direct	High side to either antenna terminal. Low side to chassis.	213MC (10MC SWP)	Not used	13	Vert. amp. thru 10KΩ to point A . Low side to chassis.	A5	Turn A5 counter-clockwise to a reduced capacity setting. Then turn A5 clockwise observing the wave form. The amplitude will increase to a certain point and then the wave shape will start to change shown in figure 1-11I. Back off A5 to a maximum amplitude and minimum "cutting in" point.

LOW BAND ANTENNA PRIMARY ALIGNMENT

Turn band switch to Low Band (clockwise).
Set tuning capacitor to channel 6 position as outlined in notes under Low Band RF Alignment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Direct	High side to either antenna terminal. Low side to chassis.	85MC (10MC SWP)	Not used	6	Vert. amp. thru 10KΩ to point A . Low side to chassis.	A6	Turn A6 counter-clockwise to a reduced capacity setting. Then turn A6 clockwise observing the wave form. The amplitude will increase to a certain point and then the wave shape will start to change as shown in figure 1-11 I. Back off A6 to a maximum amplitude and minimum "cutting in" point.

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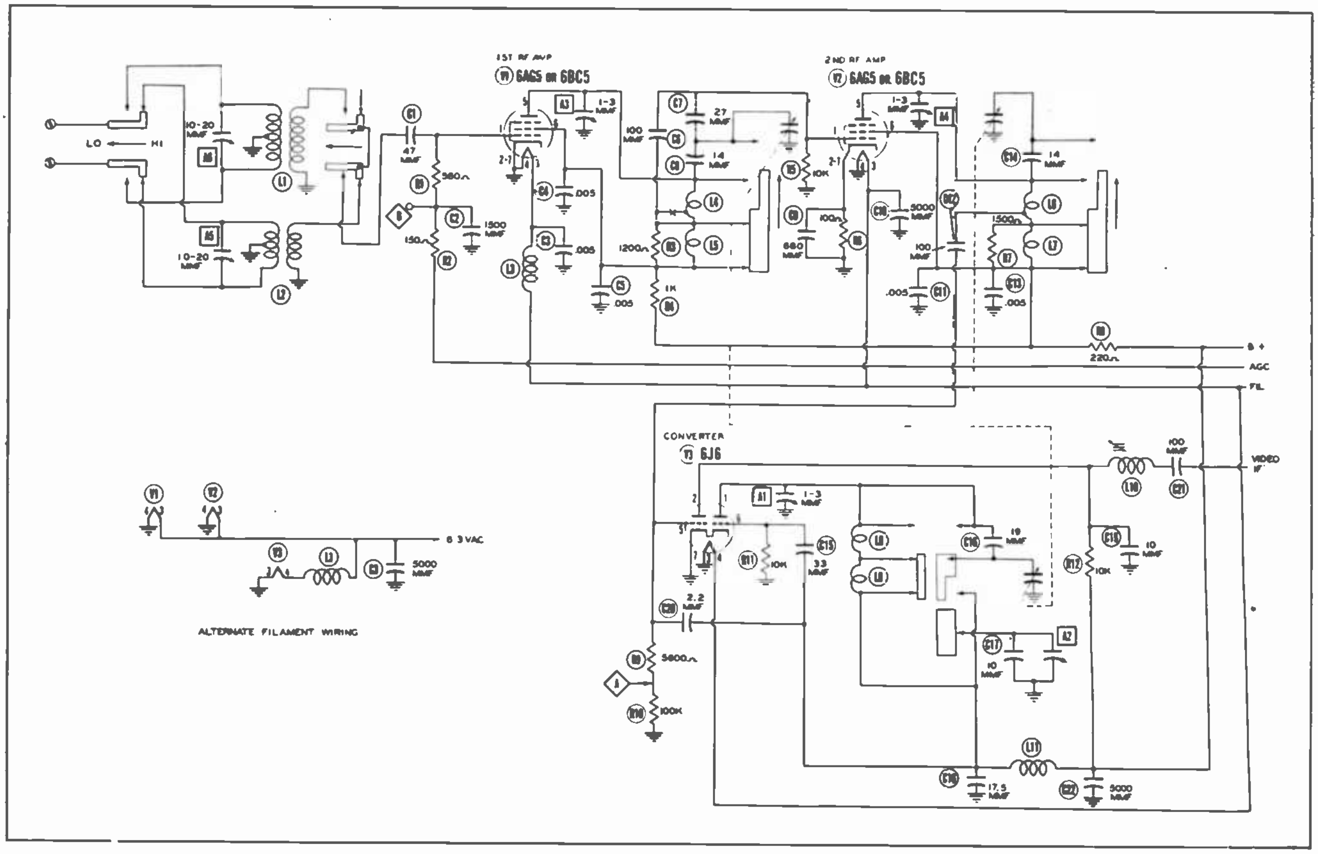

Fig. 1-11K. Schematic of General Instrument Model 44 TV Tuner.

THE HALLICRAFTERS PRINTED CIRCUIT TUNER

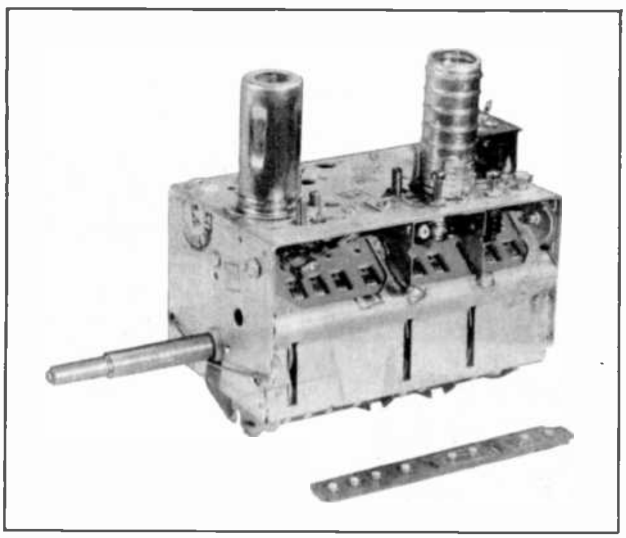

Fig. 1-12A. Hallicrafters Printed Circuit Tuner.

The Hallicrafters printed circuit tuner is a two-tube, turret-type unit employing printed circuit coils. These coils are contained on insulated segment strips which are mounted on the turret. Each of the twelve segments used has an RF mixer and oscillator coil. Switching between channels is accomplished by turning the channel selector switch to connect the desired coils. This tuner is illustrated in Figure 1-12A.

The segments are clip-mounted in slots in each end of the turret, and a spider-type spring at one end maintains tension to hold them in place. The printed circuit coils are situated on the outside surface of the segments and are connected to rivet-type contacts. As the turret is turned to select the desired channel, the contacts on the rotor connect to the spring-type stationary contacts. An additional stationary contact in the tuner connects the adjacent mixer coil to ground to increase shielding and minimize any tendency for parasitic oscillation being set up in the adjacent mixer coil.

The turret is held in place in the tuner by two lengths of spring wire, one at each end, which press against grooves in bearings on the turret shaft. The turret is easily taken out by removing the two spring wires. Since the printed circuit coils are on the outside surface of the segments, it isn't necessary to remove the turret to inspect them. If closer inspection is desired, the segments may be removed individually by releasing the tension of the spider spring with the thumb nail, moving the segment slightly toward the spring, and lifting out. These segments may be rearranged on the turret so that local channels are covered with less turning of the channel selector switch. The segments are numbered 2 through 13 for identification.

◆ ◆ Please turn to page 47 ◆ ◆

♦ ♦ Continued from page 9 ♦ ♦

if proper focus cannot be obtained, a new 470 ohm, thin type unit will be required.

The leads to the picture tube socket were then extended to the proper length. These leads should be long enough so that no strain is placed on the neck of the tube when the installation is made. If these leads are quite long, they may be taped at regular intervals to form a sort of cable. If the leads are taped, however, the grid lead should be left free, as taping it close to the rest of the leads will increase the distributed capacity and may degrade the picture.

When the deflection yoke and focus coil are mounted in a bracket which is not connected to the chassis, a ground lead should be connected between the chassis and the bracket. This is especially true when a glass tube with an outside aquadag coating is used.

This completed the conversion and the new tube was installed. A new single type ion trap was used instead of the old double type. The set was then turned on and was carefully watched for any symptoms of shorts or over-heated parts, which might have been caused by improper wiring. After warm up, the service controls were adjusted for proper width, height and linearity. In the event that proper height and vertical linearity cannot be obtained, the method for correcting height and vertical linearity for 19'' and 20'' tubes, which follows, should be tried.

Conversion to a 19'' or 20'' Picture Tube

The 630-type chassis may be converted to use 19'' or 20'' tubes by following the same procedure as given for 14'', 16'', or 17'' tubes, with some additional changes to get adequate sweep and improve vertical linearity.

To gain additional sweep, the plates of the damper tube were connected to terminal 4 of the horizontal output transformer, which provides additional B+ boost voltage.

To improve vertical linearity R98, 56K ohms (see Figure 2), was disconnected from the B+ boost voltage and connected to the junction of C4A and the vertical centering control. R179 was changed to 2.2K ohms. The 6K6GT vertical output tube was changed to a type 6V6GT tube. The focus coil was changed from the original, which measured 250 ohms, to a thin type, which is especially designed for use on short-neck tubes. The new unit has a DC resistance of 470 ohms. This gives additional flux density for proper focusing within the range of the original focus control.

STEP-BY-STEP INSTRUCTIONS FOR MAKING PICTURE TUBE CONVERSION

1. Unsolder deflection yoke and focus coil leads.

2. Remove yoke, focus coil, and mounting brackets.

3. Install octal socket and solder connecting leads to deflection output and focus circuits (see text).

4. Remove side and rear of HV compartment shield. Unsolder leads 1, 4, 5, and 6 on horizontal output transformer. Remove screws holding horizontal output transformer to HV compartment shield. Remove this portion of HV shield.

5. Unsolder filament leads from HV rectifier and remove horizontal output transformer.

6. Remove HV filter capacitor and install new unit (see text).

7. Mount new horizontal output transformer as shown in Figure 7 (see text).

8. Solder HV rectifier leads, and connect new HV filter capacitor.

9. Replace side and front portion of HV shield.

10. Ream out width coil mounting hole and mount new coil.

11. Connect new HV lead (see text).

12. Make necessary connections to horizontal output transformer, per text and Figure 6, and replace side and back HV shield.

13. Install necessary components in deflection yoke, as recommended by the manufacturer, and connect leads of required length to yoke and focus coil. Solder these leads to a plug, if an octal socket is used, or directly to the appropriate circuits.

14. Change vertical deflection circuit as given for 19" or 20" tubes, if vertical linearity cannot be obtained.

15. Turn set on and adjust size and linearity control for the best picture.

PARTS LIST

1 - Horiz. Output Trans.	Merit HVO-6
1 - Width Coil	Merit MWC-1
1 - Deflection Yoke	(Merit MD70 or MD70-F (Stancor DY-7
1 - 15KV or 20KV Filter Capacitor	(Aerovox HV20C (CRL TV2-502
2 - 560 ohm @ 1/2 w Resistors	IRC BTS-560
1 - 1000 ohm @ 1/2 w Resistor	IRC BTS-1000
1 - 47 mmf. Capacitor	Aerovox 1469 - HV-00005
1 - Octal Socket & Plug and HV Lead	

ADDITIONAL PARTS REQUIRED IN SOME APPLICATIONS

1 - 6VGT Tube	Sylvania or Equivalent
1 - 2.2K ohm @ 1 w Resistor	IRC BTA-2200
1 - Focus Coil for Short Neck Tubes	Merit MF-2
1 - Single Magnet Ion Trap	

Any methods or techniques that are offered here should be considered as suggestions rather than recommendations, since they may not necessarily be the easiest way to effect the conversion. However, our experiments on various models of receivers have enabled us to present data which should be helpful.

Keyed AGC Operation

by ROBERT B. DUNHAM and W. WILLIAM HENSLER

One of the most significant features which has been employed in TV receivers is a keyed automatic gain control circuit. Not only is the performance of the set improved with this circuit, but the operation is greatly simplified. In a large percentage of the first post-war receivers, the contrast control varied the gain of the video IF amplifier. This was accomplished by varying the bias applied to the IF stage, or by increasing or decreasing the resistance in the cathode circuit of the video IF amplifiers. The setting of the control was quite critical and its misadjustment might result in overload of the video IF or the video amplifiers. This not only caused poor picture reproduction, but in many instances resulted in clipping of the sync pulses and loss of synchronization. In weak signal areas this type of contrast circuit is especially objectionable since the signal level may vary constantly, requiring frequent adjustment of the contrast control. If some circuit could be added to provide bias to the video IF strip which is proportional to the signal strength, automatic control of the gain would be accomplished.

The first attempts at accomplishing this were patterned after the automatic volume control (AVC) circuits used for many years in radio applications. Several advantages were afforded by this system over that of the manual operation, but it still presented several problems peculiar to TV reception. In sampling the DC voltage across the detector diode load, as is done in radio, the time constant of the AGC filter must be long enough to filter out the lowest frequency present. The nature of the video signal is such that considerable 60 cycle signal is present, due to the blanking signal during vertical retrace time. An efficient filter at this frequency must necessarily have a long time constant, which results in a slow acting AGC system. A fast fading signal, such as that experienced from airplane reflections, causes the receiver to "breathe," sometimes so rapidly that it approaches a flutter. In order to overcome this fading, a fast AGC system is required.

Another disadvantage of the conventional type AGC is the fact that all signals, including noise, that are rectified by the video detector, are filtered and fed to the AGC line. This is objectionable since these noise pulses will decrease the sensitivity of the receiver. Figure 1 illustrates an AGC circuit of this type. The rectified video signal is filtered by R4 and C2, and then applied to the proper circuits. The time constant of this filter is 112,500 micro-seconds, or approximately one-ninth of a second. This is too long a time constant to properly react to airplane "flutter." The obvious thing to do to make the filtering of the AGC signal easier would be to increase the sampling rate. Also, if some means were employed to sample the signal level for only a short period of time, the effect of noise bursts on the AGC level would be lessened.

Through the use of a keyed AGC system, the above requirements are fulfilled. The horizontal scanning frequency is used as the sampling rate which makes possible the use of a much shorter time constant in the AGC filter. Also by sampling the signal level during the horizontal sync pulse only, much greater noise immunity is achieved. The keying tube can conduct only during the sync pulse, which represents slightly less than one-twelfth of the horizontal line time. Thus it can be said that this type system should be twelve times more immune to noise bursts or pulses than the conventional AGC system.

The most universally used keyed AGC system is the type which employs a 6AU6 tube having a positive going video signal applied to the grid and pulses from the horizontal output being fed to the plate. Such a circuit is given in Figure 2. The only plate voltage which is available for the AGC tube is that which is derived from the horizontal output circuit during retrace time. Thus the tube could conduct only at this time. In addition, the positive going video signal, which is direct coupled to the grid of the tube, holds the tube near cutoff except during horizontal retrace time.

Various methods have been employed to obtain the pulse voltage to be applied to the plate circuit of the keyed AGC tube. One is by capacitively coupling the pulse voltage present on the plate of the horizontal output tube to the AGC tube. Since the peak amplitude of these pulses is quite high, the capacitor used in this application must have a rather high voltage rating. Also there is a possibility that un-

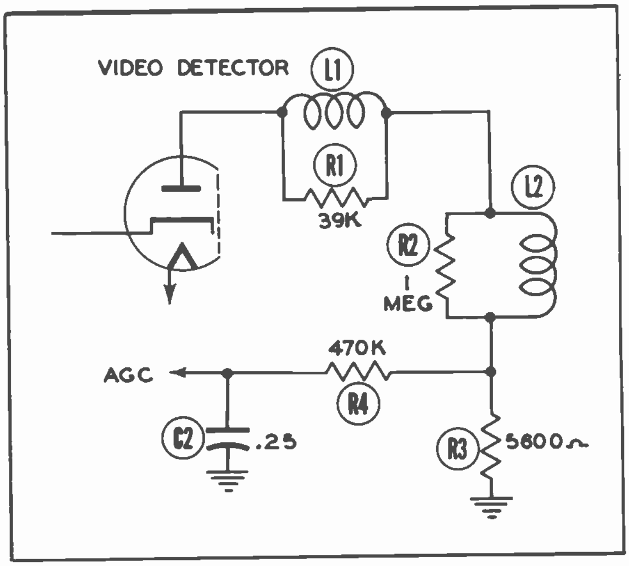

Figure 1. Conventional AGC Circuit.

desirable radiation may be experienced, especially if the AGC tube is located at a distance from the horizontal output tube. Consequently the most often used method is that of inductively coupling the pulse voltage by adding an additional winding on the width coil. A shielded cable is used to couple the pulses to the AGC tube, as shown in Figure 2. Note that the cable shield is bypassed to chassis by C10A, thus preventing radiation which might cause erratic operation.

Another means of obtaining the pulse voltage is through the use of an additional winding on the horizontal transformer. This requires the use of a special transformer, therefore the use of the AGC winding on the width coil is more frequently employed.

For the AGC tube to conduct, the horizontal sweep circuit must be synchronized with the received signal. By referring to Figure 2 it can be seen that the AGC tube is directly coupled to the resistive load of the video IF amplifier tube. R135 is placed in the circuit to prevent loading of the AGC tube on the video signal. The plate current of the video amplifier tube, flowing down through R50, holds the AGC tube cutoff, except during sync pulse time. The amplitude of the sync pulse, therefore, controls the conduction of the AGC tube. The greater the signal amplitude, the greater the conduction of the AGC tube, and vice versa. The AGC voltage is developed across R139 and R140, with C104 serving as the filter capacitor. All of this voltage may be applied as AGC voltage or only a portion of it, depending upon the requirements of the receiver. Note that the discharge path of C104 is through R139 and R140. This circuit has a time constant of 50,000 micro-seconds, which is considerably less than that of the circuit of Figure 1. The time constant of the charge path of C104 is even less, since the only resistance in series with it is the plate resistance of the tube. With this circuit arrangement the potential on the AGC line can vary at a rapid rate, reducing fading or flutter, which is characteristic of the older type contrast circuit.

Several methods are employed for controlling the contrast of the receiver when an AGC circuit is used. The contrast control, as connected in the circuit of Figure 2, varies the screen potential of the video amplifier to control the contrast. In some receivers the contrast control may be placed in the cathode circuit of the video amplifier which also varies the gain of the video amplifier.

When operating a receiver employing a keyed AGC system, it is seldom necessary to adjust the contrast control when changing from one station to another. Nor is it necessary to readjust the controls even though the signal strength may be continuously varying, providing, of course, the signal does not drop below the useable level.

The keyed AGC circuit shown in Figure 2 is directly adaptable to the 630-type chassis and instructions for incorporating it in this chassis will be included in a subsequent issue of the Technical Digest.

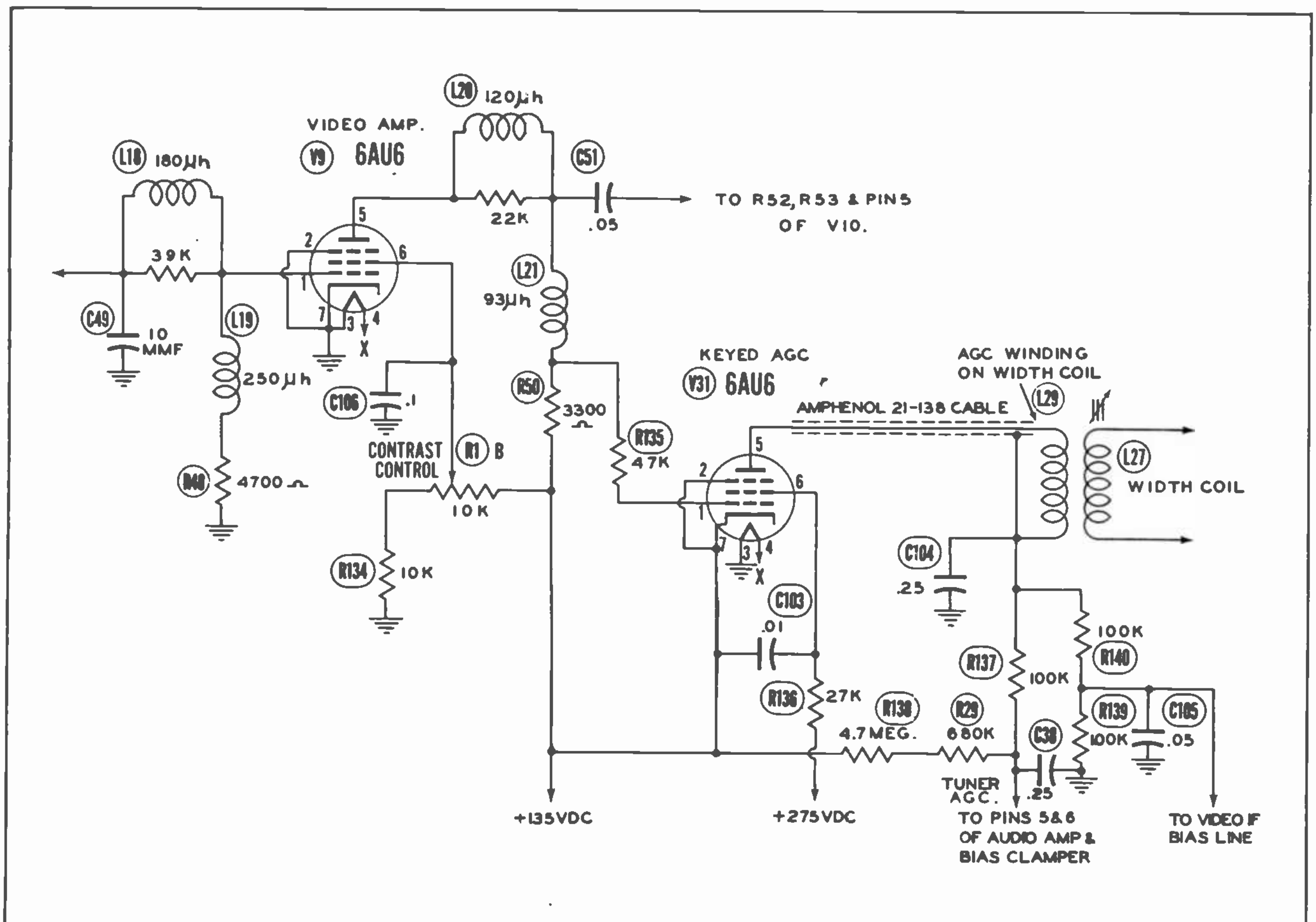

Figure 2. Keyed AGC Circuit.

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"SHOP TALK" (Continued from page 4)

high-voltage circuits and the horizontal deflection system. This is indeed the most logical method of approach to the problem. But in this instance it will seemingly not lead you anywhere.

Whenever you come up against a really tough servicing job, it has been the writer's habit to put the set aside, concentrate on the set schematic, and try to determine whether any apparently unrelated section of the set is affiliated somehow with the section to which the symptoms point. In the Capehart set mentioned, such perusal will reveal that the cathode of the 6BG6 horizontal output amplifier and the cathode of the 6AH6 video amplifier both connect to the same -90 volt point in the B+ power supply. What happens is simply this: The cathode of the 6AH6 is biased 90 volts negative. The filament of this miniature tube has one side grounded. If the 6AH6 has a slight defect in construction, a difference of potential this large between filament and cathode will be powerful enough to break down the insulation between these elements and effectively ground out the 90 volts. With the proper biasing voltages removed from the 6BG6, it ceases to operate normally and no high voltage is produced. Replacement of the 6AH6 video amplifier tube corrects the situation.

"Hidden Ball" service defects have many parallels in radio receivers. Thus, it frequently happens that cases of severe hum arise because of leakage between filter capacitors which, while located in the same container, actually serve different sections of the receiver. Hence, what we encounter in television is not something radically new, but a familiar friend disguised in new clothes.

Another lesson to learn from the foregoing is that whenever there exists a large difference of potential between filament and cathode of a tube, there also exists the very definite possibility of a voltage breakdown. This is especially true of miniature tubes.

FIELD STRENGTH METERS. A very useful instrument, for any man who is going to do any amount of outside service or installation work, is a field strength or a field intensity meter. The uses for such an instrument are numerous, not only for yourself, but for customer relations as well. With such a meter, it is possible to locate the best position and the optimum height for an antenna, to compare the attenuation of one lead-in against another, to determine conclusively which antenna is best suited for your particular purpose, and to know precisely how much signal is actually reaching the set.

A major factor in determining just how good a picture you get is the amount of signal that you feed the set. If the sensitivity of the set is high, you may be able to overcome some loss in signal, but generally the limits in this respect are quite narrow because you have the noise that the set itself generates to contend with. In 9 receivers out of 10, operating a set within 75 per cent of its maximum sensitivity will give you a picture which is too spotty to watch unless you live so far from a station that you have no other choice. Thus, the only solution is to get as much signal to your set as possible and only with a field intensity meter can you be sure.

The common practice of stationing one man at the receiver screen is generally good for spotting ghosts and checking gross differences in signal strength. But after 5 minutes of concentrating on the screen, this man is usually unable to differentiate between signals as far apart as 500 microvolts in strength. The same two man installation crew can do a better job in less time with a field intensity meter.

Finally, there is the very useful job in public relations that such a meter can perform. Any sign of poor performance on the part of a set is often erroneously blamed on a poor installation, i. e., the wrong antenna was used, or the antenna was not properly positioned, or the lead-in has too high an attenuation, etc. With a reliable field intensity meter indicating the strength of the signal reaching the set, there is very little room for argument.

And, as every serviceman is only too well aware, a customer must be given as much attention (if not more) as the set. To get a customer on your side is sometimes worth many times the cost of the meter.

A servicing job recently came up that could have been solved with a field intensity meter. A serviceman found that a set was overloading on channels 4 and 5, but apparently operating satisfactorily on channels 7 and 9. The first guess, of course, was the tuner, but after everything that could be done to this unit had been done, the symptoms remained. Valuable time went by while every conceivable test was made on the chassis. Finally it was noted that the A. G. C. voltage was not negative enough, permitting the controlled tubes to operate at almost full gain. As a result, normal signals were amplified to such an extent that sync clipping occurred, producing all the symptoms of overloading. For weak signals, which in this case turned out to be true of channels 7 and 9, the excessive amplification was not quite as noticeable and therefore escaped attention.

Some clue to the source of this trouble (i. e., defective A. G. C. action) could have been obtained by using a field strength meter to measure the intensity of the incoming signals. A properly functioning A. G. C. system should not permit the set to overload with any but excessively strong signals.

REVIEW: The article selected for review this month concerns insurance protection for servicemen. After reading the article, "Servicemen Need Protection," you will agree that indeed they do.

SERVICEMEN NEED PROTECTION
by Herbert S. Brier
RADIO and TELEVISION MAINTENANCE
(August 1950)

Subscription Price $2.00 per year
in U. S. A. and Possessions,
$3.00 per year in Canada

Above and beyond the technical knowledge that a man must possess in order to successfully operate a radio and television service shop, he must also have a fair grasp of business. He must know how to operate efficiently, he must know how to build up his business, and, above all, he must know how to protect what he does have. And the only satisfactory method of protection lies in insurance.

For the radio or television service shop owner, insurance may be divided into two broad general classifications. First, there is insurance against actual property loss, as from fire, windstorm, boiler explosion, automobile collision, and theft, as well as health, accident, and life insurance. Secondly, there is liability insurance, or the protection you get when some one sues you for damage you have supposedly caused them.

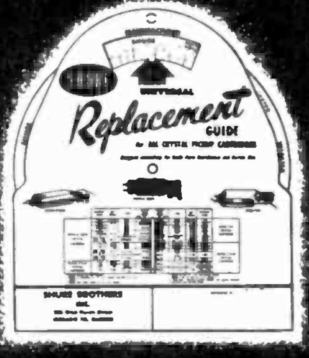
Now, let us consider only insurance against actual property loss. Your prime objective, with any type of insurance, is to obtain as extensive a coverage as possible. In the case of fire insurance, for example, you want protection not only from the actual ravages of the fire itself, but from such accompanying destructive effects as loss caused by water and other agents used in fighting fires. And generally, for a slight addition to your premium, you can obtain protection against losses caused by windstorms, cyclones, hail, vehicles, aircraft, riot, etc. Maybe you are a little skeptical about some of the items listed. Remember, however, that the additional cost is usually very small and it takes only one cyclone, or one riot, or one windstorm to put you out of business.

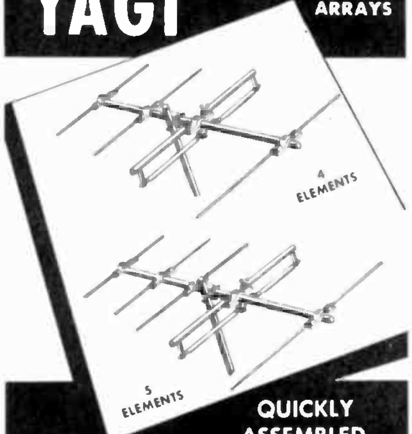
On a par with not having the right type of insurance coverage is not having enough. Don't look for bargains in insurance. The rates of all reputable companies are very much alike and if some agent comes along with a fast deal involving (supposedly) greater coverage at considerably less cost, BEWARE! Fine print and fast deals have put more men out of business than you can count in a month of Sundays. If you are the least bit doubtful about an insurance company, its financial rating can be obtained by writing to the state insurance board at your state capitol.

Another form of insurance against property loss that may become more and more important as parts and equipment become scarcer is theft or dishonesty insurance. Outside losses are covered by various forms of robbery, burglary, theft, and open stock insurance; employee dishonesty is coverable by fidelity bonds.

Fidelity bonds are usually available in two forms. In one, each employee is bonded, and in the other, one bond covers all employees. With individual position bonds, losses caused by the collusion of several employees are covered up to the sum of their individual bonds. But with a blanket bond, protection extends only to the amount of the bond, no matter how large the loss or how many are involved; but in that case it is not necessary to prove that a bonded employee is guilty. An indirect advantage of bonding employees is that insurance companies investigate those whom they bond and may save you from hiring a dishonest one.

Liability Insurance: Liability insurance is the second general classification previously mentioned





"SHOP TALK" (Continued)

and in many respects, the most important form of insurance. While property losses are limited to the value of the property, it is difficult to set a definite value on a human injury.

Suppose a customer trips over a loose floor board in your shop and wrenches her back; suppose one of your trucks runs over a small boy playing in the street; suppose a customer's son picks up the wrong end of your hot soldering iron: How much injury has been done in each instance? In the case of a suit, a jury would decide - and juries are as variable in their verdicts as a loose antenna mast flapping in the wind. The only way to remove this potential sleep-killing load from your shoulders is by the proper type of liability insurance. You can purchase medical liability insurance, property damage liability, and many other forms of liability insurance in separate policies. However, many of these liability policies may be combined in a general or comprehensive liability policy. The main difference between a specific and a comprehensive liability policy is that the specific policy covers only those liabilities actually mentioned in the policy, and no others. On the other hand, a comprehensive policy covers every liability not specifically mentioned. Usually the comprehensive policy is preferable.

To keep the cost of insurance premiums low, while still enjoying as much coverage as you feel is necessary, it is suggested that insurance policies be bought for a period of from three to five years. Another way to lower premium costs is by eliminating a fire hazard, or installing a few fire extinguishers. Again, there are such cost-saving measures as burglar alarms, better locks, or removing valuable papers and money from your shop to a bank safety deposit box. And accepting a higher deduction clause in automobile collision and similar policies written with a "deductible" clause will also reduce premiums, but will require you to absorb small losses while losses which could prove fatal to your business.

For greater detail on insurance problems study the original text and similar article appearing in the August 1950 Radio and Television News Magazine. Both are well worth while.

♦ ♦ Continued from page 23 ♦ ♦

Under each of the printed circuit oscillator coils is a small plate of non-magnetic material, mounted on a screw, which varies the frequency of the local oscillator. The screw adjustment is accessible from the front end of the tuner.

Some components of the tuner are available for observation through an opening in the right side of the assembly. The turret must be removed to inspect the remaining components.

The arrangement of components has made it possible to hold lead lengths to a minimum. It is extremely important, when replacing a defective part, that the location and lead length exactly duplicate the original. At the same time, avoid moving other components any more than necessary.

A shaft concentric with the channel selector switch shaft operates the fine tuning trimmer. Fine tuning is accomplished by moving a cam-shaped piece of material between two fixed plates, thus changing capacity by varying the dielectric.

To minimize the presence of stray RF fields, shielding in this tuner is provided by several means. Both tubes have shields, with an additional lead shield around the 6J6 to reduce microphonics. Inside the tuner a metal shield separates grid and plate circuits of the RF tube. Another shield is placed between the plate circuit components of the RF tube and the grid circuit components of the mixer tube. An additional stationary contact connects the mixer coils on the adjacent channel strip to ground, providing further shielding.

The turret is so constructed that shields are placed between the printed circuit coils, and ears extending from the shields aid in locking the channel segments securely in position.

In order that the turret is correctly replaced in the tuner, the following procedure should be used. The spiral spring is placed on the turret shaft and the concentric fine tuning shaft is put in position. The turret shaft and the fine tuning shaft each have a grooved bearing which fits into slots in opposite ends of the tuner. At the same time that the turret is placed in the tuner the cam shaped dielectric is fitted between the fixed plates of the fine tuning trimmer. Care should be taken that the dielectric is not damaged, which might result if placed outside the fixed plates. The two lengths of spring wire are then put in place so that they press on the edge of the bearings rather than the turret or fine tuning shafts. Undue wear and stiffness in operation may result if the spring wires are allowed to rest on the shafts instead of on the bearings.

A 6CB6 tube is used in the single RF stage. This tube provides high gain, low noise, and has low interelectrode capacity. The second tube is a 6J6; one triode section is used as the mixer, the other serves as the local oscillator.

A low-pass pi network is used in the grid circuit of the RF amplifier, while a double-tuned bandpass network is employed in the plate circuit. The oscillator is of the Colpitts type.

Referring to the schematic diagram, Figure 1-12G, antenna coil L1 is designed to match a 300-ohm input line and has its primary center-tapped to ground. The low side of the secondary is grounded and the high side connected in series with L2, C1, and C2. The junction of C1 and C2 is connected in series with the printed circuit RF coil, L3, and A1 to ground. The junction of L3 and A1 is connected to the grid of V1. The tuned grid circuit of V1 consists of C2, the printed circuit RF coil, L3, A1, the distributed capacity of the circuit elements, and the interelectrode capacity of the tube.

The correct bandpass on the low channels, as observed on a scope, is obtained by adjusting A1 for maximum amplitude between sound and video markers. A2 is adjusted for maximum amplitude on the high channels. R1 is the grid return to the AGC line,

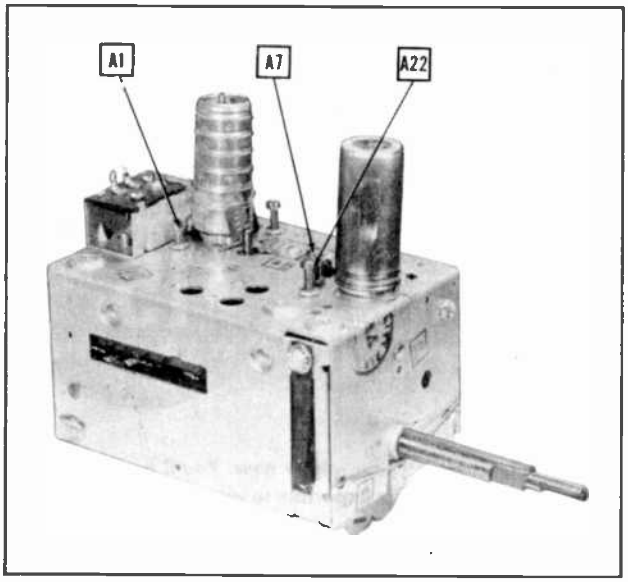


Fig. 1-12B. Hallicrafters Printed Circuit Tuner Alignment Points.

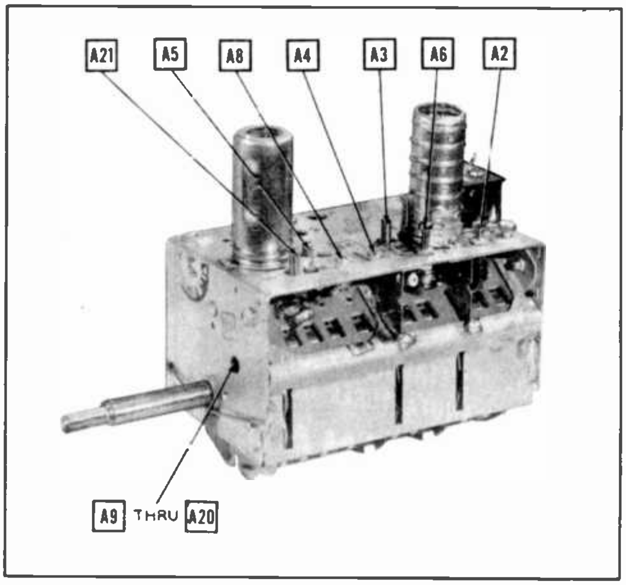


Fig. 1-12C. Hallicrafters Printed Circuit Tuner Alignment Points.

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Walco TRADE NAME OF ELECTROVOX CO., INC. EAST ORANGE, NEW JERSEY and C4 is an AGC filter. C2 bypasses the filament of V1 to ground.

The coupling between V1 and V2 is an M-derived bandpass filter. The tuned circuit portion consists of L5, A6, the printed circuit mixer coils, A4, C7, A8, C8, A7, and L6, and the interelectrode capacity of V1 and V2. A3, A4, and A5 are adjusted for the correct bandpass on channel 13. A6 and A7 are adjusted for correct bandpass on channel 7. Low channel bandpass is obtained by adjusting A8.

Three printed circuit coils are used in the coupling network of V1 and V2. Coil Z, C7 and A4, or A8 and C8, function as a common impedance coupling between the plate circuit of the RF amplifier and the mixer grid network. Coils X and Y are shielded from each other. The signal developed across coil Z, A4, and C7 is common to the plate circuit section of the RF amplifier and the grid circuit of the mixer. Changing the capacity of A4 or A8 varies the impedance of the common impedance coupling network and thus controls the bandpass. A4 is adjusted for correct bandpass on high channels, and A8 controls bandpass on low channels.

In the screen circuit of the RF amplifier, a small amount of inductance, L4, is placed in series with the screen bypass, C5, to increase input resistance of the tube and, thereby, reduce loading of the grid circuit, particularly on the high channels.

The mixer is one triode section of a 6J6 tube. The series network of R5 and R6 makes up the mixer grid load. The junction of these resistors is brought out to the top of the tuner for alignment purposes. The local oscillator signal is coupled to the grid circuit of the mixer through C2, a 2.2 mmf. capacitor.

The other triode section of the 6J6 tube is used in a modified Colpitts oscillator circuit. The printed circuit oscillator coil of each channel is placed in series with L9 as the turret is rotated. The tuned portion consists of the printed circuit oscillator coil, L9, C14, A22, C16, and the fine tuning trimmer. A22 and C16 provide the necessary feedback. The value of these capacitors is large compared to the interelectrode capacity of the oscillator tube; therefore, realignment should not be necessary when the 6J6 tube is replaced. This also decreases oscillator drift during warmup.

C15 serves as a DC blocking capacitor, and R9 is the grid return. The plate load for the oscillator is R10 and the parallel combination of L8 and R11. R12 and C17 decouple the oscillator from B+, while C12 and R8 decouple the mixer plate circuit.

Troubles which might be encountered in servicing the tuner may involve dirty contacts. If erratic operation is encountered on some of the channels when the turret is rotated, the fault may lie in dirty contacts or insufficient tension from one of the stationary contacts. If the trouble is still present after cleaning the contacts, an instrument, such as an insulated alignment tool, can be gently pressed against each of the stationary spring contacts to determine which one is at fault. If one is found which makes poor contact, remove one of the channel segments and rotate the turret until the blank space is beneath the spring contacts. The faulty contact is then bent slightly, with the alignment tool, to obtain the proper tension.

Complete alignment instructions for this tuner are given in this section, including Figures 1-12B through 1-12F.

We wish to acknowledge the cooperation of the Hallicrafters Co. in supplying us with technical data and samples which were used in this presentation.

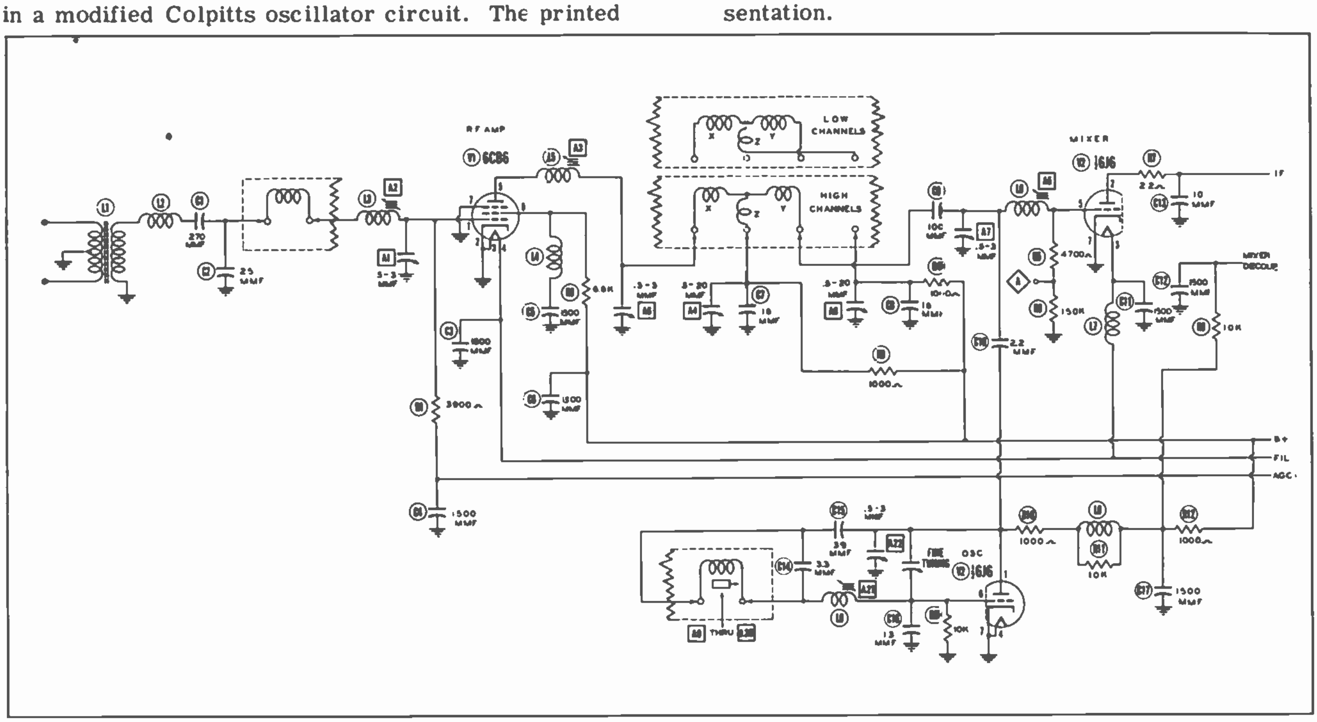


Fig. 1-12G. Schematic of Hallicrafters Printed Circuit Tuner.

ALIGNMENT INSTRUCTIONS

HALLICRAFTER TV TUNER

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the AGC terminal on the tuner, connect the positive lead to B-.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

ANTENNA ALIGNMENT

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	85MC (12MCSWP)	83.25MC 87.75MC	6	Vert. amp. thru detector (fig. 1-12D) to pin 5 (plate) of 6CB6 RF amp.	A1	Adjust for maximum amplitude between the channel 6 sound and video markers.
2.	"	"	177MC (10MC SWP)	175.25MC 179.75MC	7	"	A2	Adjust for maximum amplitude between the channel 7 sound and video markers.
3.	"	"	79MC (12MC SWP)	77.25MC 81.75MC	5	"		Check all low band channels for response curve similar to figure 1-12E. If necessary retouch A1 for best compromise across the low band channels.
			69MC (12MC SWP)	67.25MC 71.75MC	4			
			63MC (12MC SWP)	61.25MC 65.75MC	3			
			57MC (12MC SWP)	55.25MC 59.75MC	2			
4.	"	"	183MC (12MC SWP)	181.25MC 185.75MC	8	"		Check all high band channels for response similar to figure 1-12E. If necessary retouch A2 for best compromise across the high band channels.
			189MC (12MC SWP)	187.25MC 191.75MC	9			
			195MC (12MC SWP)	193.25MC 197.75MC	10			
			201MC (12MC SWP)	199.25MC 203.75MC	11			
			207MC (12MC SWP)	205.25MC 209.75MC	12			
			213MC (10MC SWP)	211.25MC 215.75MC	13			

RF ALIGNMENT

Leave the bias battery connected.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	213MC (12MC SWP)	211.25MC 215.75MC	13	Vert. amp. to Point A. Low side to chassis.	A3, A4, A5	Adjust for response curve similar to fig. 1-12F.
6.	"	"	177MC (12MC SWP)	175.25MC 179.75MC	7	"	A6, A7	"
7.	"	"	85MC (12MC SWP)	83.25MC 87.75MC	6	"	A8	"
8.	"	"	79MC (12MC SWP)	77.25MC 81.75MC	5	"		Check all low band channels for response similar to figure 1-12F. If necessary retouch A6, A7 and A8 for best compromise over the low band channels.
			69MC (12MC SWP)	67.25MC 71.75MC	4			
			63MC (12MC SWP)	61.25MC 65.75MC	3			
			57MC (12MC SWP)	55.25MC 59.75MC	2			
9.	"	"	207MC (12MC SWP)	205.25MC 204.75MC	12	"		Check all high band channels for response similar to figure 1-12F. If necessary retouch A3, A4 and A5 for best compromise over the high band channels.
			201MC (12MC SWP)	199.25MC 203.75MC	11			
			195MC (12MC SWP)	193.25MC 197.75MC	10			
			189MC (12MC SWP)	187.25MC 191.75MC	9			
			183MC (10MC SWP)	181.25MC 185.75MC	8			

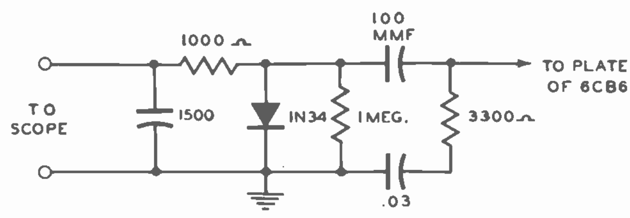


FIG. 1-12D

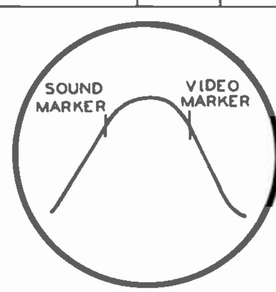


FIG. 1-12E

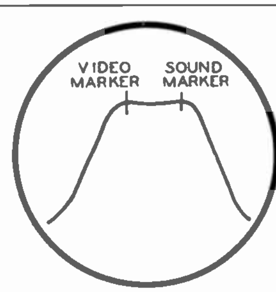


FIG. 1-12F

OSCILLATOR ALIGNMENT

The overall oscillator adjustments (A21 and A22), have been pre-set at the factory and should not normally require adjustment in the field. However, if it is known that the adjustments have been tampered with, or if any of the channel strip adjustments shows insufficient range, they may be adjusted as follows.

A21 should be adjusted on channel 13 with the channel strip adjustment near the center of its range.

A22 should be adjusted on channel 2 with the channel strip near the center of its range.

A21 affects primarily the high channels and A22 affects primarily the low channels, however they are interacting and if either is changed, all channels should be rechecked to see if they have been seriously affected.

SEPARATE SOUND IF RECEIVER OSCILLATOR ALIGNMENT

In the receivers which employ a separate sound channel the oscillator can most conveniently be aligned by feeding the channel sound carrier frequency into the antenna and adjusting for zero voltage reading on the VTVM connected to the sound detector output.

The signal generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	59.75MC (Unmod.)	2	Across sound detector output.	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
			65.75MC	3		A10	
			71.75MC	4		A11	
			81.75MC	5		A12	
			87.75MC	6		A13	
			179.75MC	7		A14	
			185.75MC	8		A15	
			191.75MC	9		A16	
			197.75MC	10		A17	
			203.75MC	11		A18	
			209.75MC	12		A19	
			215.75MC	13		A20	

INTERCARRIER RECEIVER OSCILLATOR ALIGNMENT

The most convenient method of oscillator alignment to use with this receiver is the beat frequency method. To employ this method it becomes necessary to determine exactly one of the IF frequencies used in the receiver. The video IF frequency is usually given in the alignment instructions and is therefore used in the following example, although the sound IF frequency could be used in a similar manner. After the video IF frequency is determined it is necessary to add the video IF frequency to the channel video carrier frequency to determine at what frequency the oscillator operates on each channel.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	55.25MC plus video IF frequency	2	Vert. amp. to tuner output. (1st video IF amp. grid)	A9	Adjust for zero beat indication on scope. This will be indicated by a narrow trace between two wide traces.
11.	"	"	See paragraph above	3 thru 13	"	A10 thru A20	"

"AS I SEE IT" (Continued from page 19)

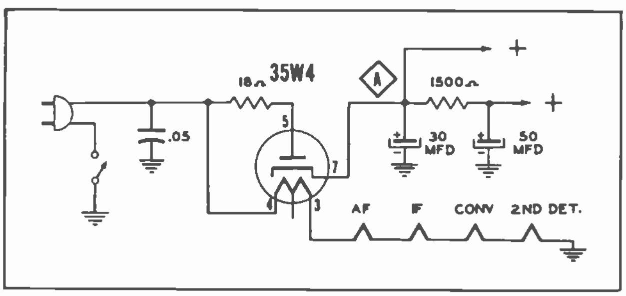


Figure 3

shown in Figure 3, where an 18 ohm resistor is connected in series with the plate of the rectifier to limit the current in case of a short circuit. The resistor connected in this position is called a "rectifier ballast." The circuit diagram shown in Figure 3 is taken from Photofact Set No. 118, Folder No. 6, and is as effective for most purposes as though the resistor were connected as shown in Figure 2. The same examinations of both the defective rectifier tube and the resistor suggested for the circuit illustrated in Figure 2 should be made for receivers wired as indicated in Figure 3.

Occasionally receivers are built which incorporate both "surge limiters" and "rectifier ballasts" and such a receiver schematic is shown in Figure 4, which is taken from Photofact Set No. 118, Folder No. 3. The same precautions should be taken when replacing the rectifier tube, which in this particular case is a 35Z5GT, as have been suggested for the other circuits.

When the rectifier tube in an AC-DC receiver must be replaced, it is advisable to analyze the tube for open heater as well as possible short circuits, realizing that if the heater wire breaks, then there is always the possibility that one end might touch the cathode and indicate a short. If this has happened, however, there will be no evidence of a short circuit at A, or of a defective electrolytic capacitor, if the defective tube has been removed.

If the circuit is similar to that shown in Figure 1, it is wise to add the resistor provided room can be found where it can be safely mounted. Even though the receiver may be of the latest type it will pay to check the circuit diagram since the four circuits shown are used in current receivers. Parts are both scarce and expensive, so that an analysis of the type and condition of rectifier circuit employed may pay worthwhile dividends in AC-DC service work.

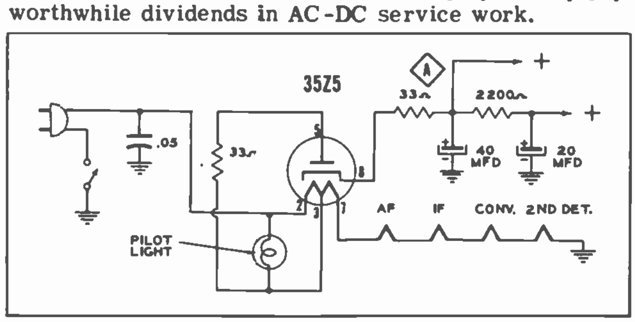


Figure 4

"DOLLAR and SENSE" (Cont'd from page 11)

IMPLOSIONS. What happens when the expressman drops a television set? The accompanying photo tells the story - - the picture tube implodes and makes pretty patterns on the safety-glass window. Not too clearly shown, though, is the inward bellying of the safety glass toward where the picture tube was. The inrush of air to fill the vacuum of the tube volume sucked the glass inward, proving that these big tubes implode instead of explode.

RANGE OF TV STATIONS. FCC engineers used to specify the range of a TV station as 0.5 millivolt per meter, but now they simply say "As far as the station can be received." Programs are going way farther than they're technically supposed to. Recognizing this, stations are revising their sets-in-use figures for program-selling purposes to include all sets within their 0.1 mv/m contour. Roughly this extends the coverage out to 60 miles from the station, whereas 40 miles was considered the limit for good reception heretofore. Some stations even claim good viewing out to the 0.025 mc/m contour, even though this is usable only by sets having the corresponding sensitivity of 25 microvolts (which a few do). New coverage figures are backed by engineering tests and by mail from TV set owners, so you're safe in quoting 60 miles to your customers for average locations. The technical explanation for all this is that people in fringe areas are going to a great deal of trouble and expense to get a picture, and generally are willing to accept considerably less than optimum quality when nothing better is possible.

LIGHT-BULB INTERFERENCE. If the complaint is a horizontal black band blotting out part of the picture, it may be oscillation from one of the old unfrosted electric lamps with the pointed tips, in use in the same house or nearby. Look for them in cellars and out-of-the-way places where the bulbs get so little use that they haven't gotten around to burning out yet. Favorite carrier frequencies of these bulbs fall right in the low-band TV channels.

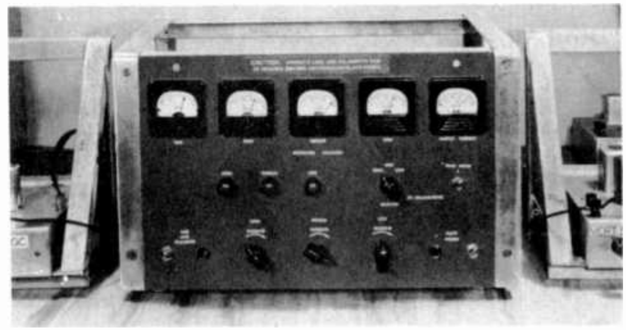
HIGHER IF VALUES. So far in the current TV models, only Arvin, GE and Westinghouse have gone to 45.75-mv intermediate-frequency values. Teletone uses 37.3 mc on some of their sets, while all the rest of the makes are still down around 25 mc.

THREE-SPEED DOLLARS. Despite the loud original predictions of pandemonium, three speeds have been good for the record business. Now the serviceman is coming in for his benefits. All the publicity, plus some 1.5 million brand-new three-speed changers going into 1950 phono combinations, has made many realize that their prewar hard-to-fix 78-rpm changers are as obsolete as a model T Ford. As a result, more changers were made in 1950 than in any previous year in history. Simplification and improvement in design and manufacture have made the modern changer stand up under terrific punishment in the hands of the kiddies, and the few that do go bad are no longer causing ulcers among servicemen. Don't be scared of a 3-speed job; just dig up the Photofact Folder with the correct exploded view of the works, and in no time at all you'll find the right lever to bend or the right screw to turn.

SALTED TV LINES. Right on the seashore, twin-lead can become useless for television in just a few days because of the high moisture and salt content of the air. The salt deposits on the line, then the night fog wets it to form a practically perfect conducting sheath that changes both impedance and attenuation characteristics drastically. Even ten blocks inland, lines go bad within a few months, with the effect most noticed beyond about 20 miles from the TV station. Suggested partial remedies include putting the twin-lead inside large plastic tubing, using open-air 300-ohm line and coating the spacers with silicone grease to shed water, and using air or nitro-pressurized flexible copper coaxial line in really bad locations. Ordinary coax is of course the answer where its own increased attenuation is acceptable. Runs of 100 feet of coax in a fringe location can be just as bad for the picture as salted standard line. For more details on choice and installation of lines along the coast, read "TV by the Sea" in February 1951 Radio-Electronics.

IN LIGHTER VEIN. In an esteemed high-brow society journal, a scientist proposes as a definition for communication, "the discriminatory response of an organism to a stimulus." Now look at the communications cartoon below for your sign-off chuckle. It must be Love!

The above cartoon appeared in the December 1950 issue of TELEVISION MIS-INFORMATION, published by Sheldon Electric Company, Irvington, New Jersey.



More About the "Thing"

While we have the opportunity, perhaps a brief description of the makeup of the "Thing" and its application to articles current or projected, appearing in the "Technical Digest" would be in order.

As previously outlined, the "Thing" consists of a rugged rack system with suitable electrical connection features to distribute power to any number or assembly of individual chassis. In the TV field, for example, we have more than twenty such chassis 2'' x 5'' x 7'', each of which is representative of a typical function or popular circuit design. These chassis range from TV tuning units, sound or video IF's and video amplifiers through sync separators, blocking oscillators, vertical and horizontal output, etc. Selection of proper chassis enables operation of a particular TV system design, with ready observation or measurement on any component stage or assembly. You can readily appreciate the value of noting the results of simulated failures or maladjustments, or the ability to substitute chassis functions of the "Thing" for similar portions of existing receivers.

One of the first problems we faced in our original plans for the project was the necessity for providing a filament and plate power source capable of handling requirements extending from those of 2 or 3 tube sub-assemblies, to complete 30-or-more tube receiver systems.

In addition to the heavy duty requirement, means had to be provided for flexible application. Voltage outputs must range from 100 to 450 volts and remain substantially constant regardless of load. Frequently one design needs multiple voltage values without the necessity of dividing resistors within the individual chassis.

Our final answer to the problem is pictured at the top of this column. The power supply shown provides filament voltage of 12.6 volts center-tapped at currents up to 10 amperes. The plate or B supply has three regulated and metered outputs, each of which can supply up to 250 ma. current in the following ranges: High - 300 to 450 volts; Medium - 200 to 300 volts; Low - 100 to 175 volts. Additionally, a regulated negative supply of 150 volts is available for bias or similar applications.

The power unit employs 2 - 5R4GY HV rectifiers, a 5Y3GT bias rectifier, 4 - 6AS7G pass tubes, 1 - OD3/VR150 and 1 - OB3/VR90 voltage regulators, and 3 - 6AU6 control tubes. The circuit arrangement is a little special. We'll try and include it later when space permits.

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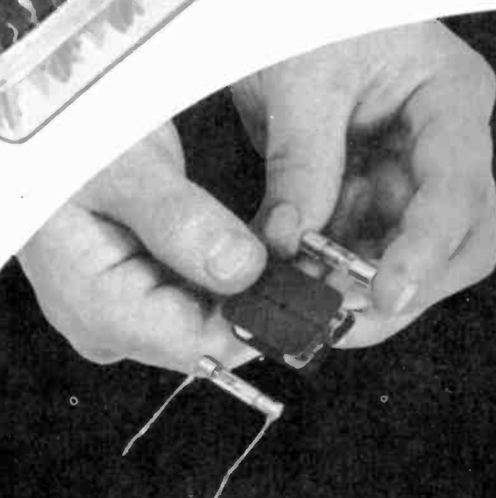

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