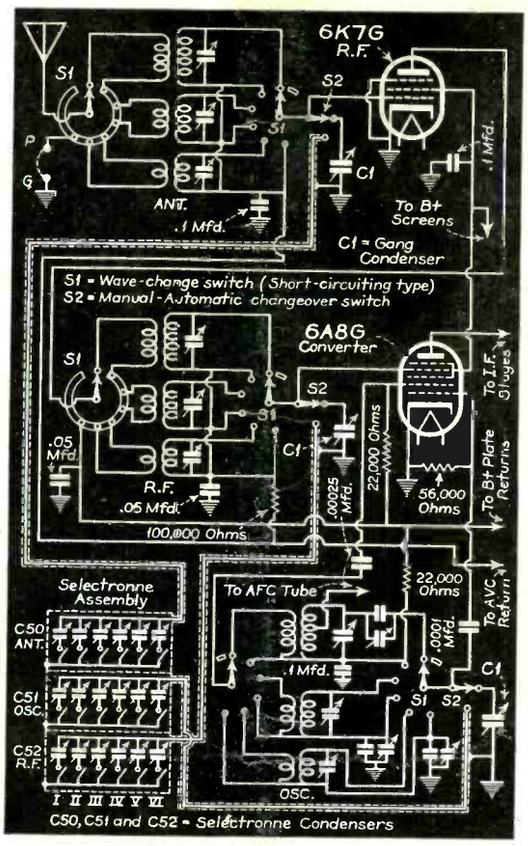
SERVICE

A Monthly Digest of **RADIO** and Allied Maintenance



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(*See page 466*)

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A Monthly Digest of Radio and Allied Maintenance

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EDITOR
Robert G. Herzog

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THE ANTENNA . . .

RADIO PROGRAMS AND RECEIVER SALES

WE ALL LISTEN IN ON the radio, often against our will, and with some of us our distaste for the programs increases with each listening. Radio editors and critics in magazines and newspapers throughout the country have taken pains of late to survey radio programs and point out their shortcomings. At a recent National Association of Broadcaster's Convention in Chicago, program directors were blamed for the ever increasing obnoxiousness of radio programs in general.

It does not concern us here just what is wrong with radio programs in particular or even in general . . . or who is to blame. Let the critics decide whether the fault lies in the content or the delivery technique . . . or of the desirability of studio audiences. (It is our opinion that both contents and delivery need improving and studio audiences spoil most programs.)

What does concern us, however, is the effect these poor programs have on receiver sales. There can be no doubt that good programs are an incentive to sales. In New Zealand the broadcasting company lays a direct claim to increasing sales. After all, the radio receiver's function is radio reception. With sales possibilities for some 46,880,000 sets and 23,900,000 auto radios we can not overlook a single obstacle. Something should be done about it!

• • •

PUSH-BUTTON TUNING

STILL ON THE SUBJECT of poor radio programs . . . the receiver manufacturers, perhaps inadvertently, have provided a partial solution. Since the new push-button tuning devices limit the number of stations which can be so tuned, the listener will no doubt set these up for his favorite stations. More often than not, because of easier tuning, this will mean silencing of all the other stations.

Sponsors now more than ever must look to their laurels or they will be without listeners. It is far too simple to *tune out* an obnoxious program with these push-button devices. In the mad scramble for listeners better programs may yet result.

LISTENERS SURVEYS

AS A HELP TOWARD DETERMINING just what stations are favored in each locality, dealers and distributors can make a type of listeners survey simply by keeping records of the stations set-up on automatic tuning dials, on every set of the type that they sell. Enterprising stations should certainly be anxious to obtain such records. In the interest of better programs, as an incentive toward receiver sales, the dealers should be willing to cooperate with the stations.

• • •

NEW YORK TRADE SHOW

PLANS ARE PROGRESSING RAPIDLY for the Radio Parts Manufacturers Fall Trade Show, to be conducted in Commerce Hall, in the Port of New York Authority Building, Fifteenth Street and Eighth Avenue, New York City, October 1 to 3.

Shows are an important part of your education. At the show you not only see the manufacturer's products but can meet his technical and sales representatives. Face to face they can help you with your problems or listen to your suggestions. Your attendance will mean profits to you.

• • •

SERVICE DATA

SET MANUFACTURERS HAVE ever been anxious to present their service data in a form most useful to the Service Man. As an effort in this direction many have adopted the tabular form, used in the General Data section of this issue, for their alignment notes. This compact presentation of instructions has much in its favor and will probably be used universally.

Although this point of simplification and standardization will help make service notes more useful, a great deal more is required. This was clearly brought out at a recent meeting of the RMA Service Section in Chicago. Manufacturers are only too willing to improve their service notes, if they could be sure of exactly what the Service Man wants.

With this in mind, we would like to hear from our readers as to just what they expect in the way of service data.

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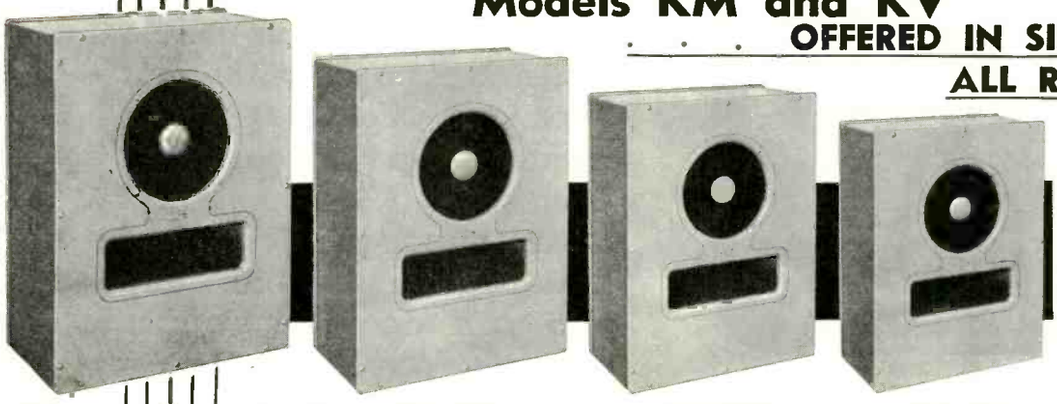

Model KM-15 — *For 15" Speaker* — *Model KM-12 For 12" Speaker* — *Model KM-10 For 10" Speaker* — *Model KM-8 For 8" Speaker*

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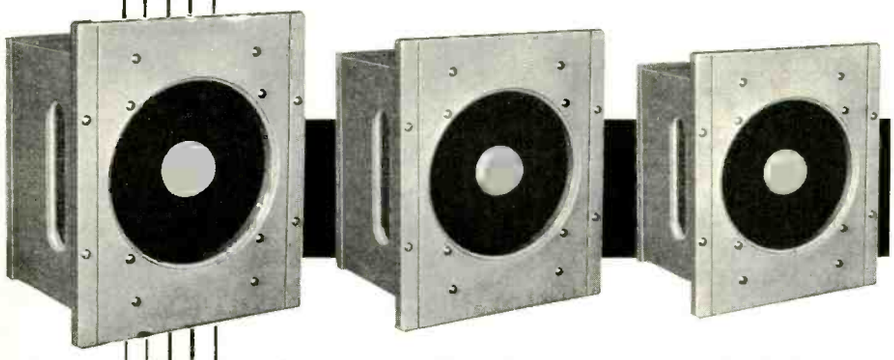

Model KV-12 — *For 12" Speaker* — *Model KV-10 For 10" Speaker* — *Model KV-8 For 8" Speaker*

Model KV

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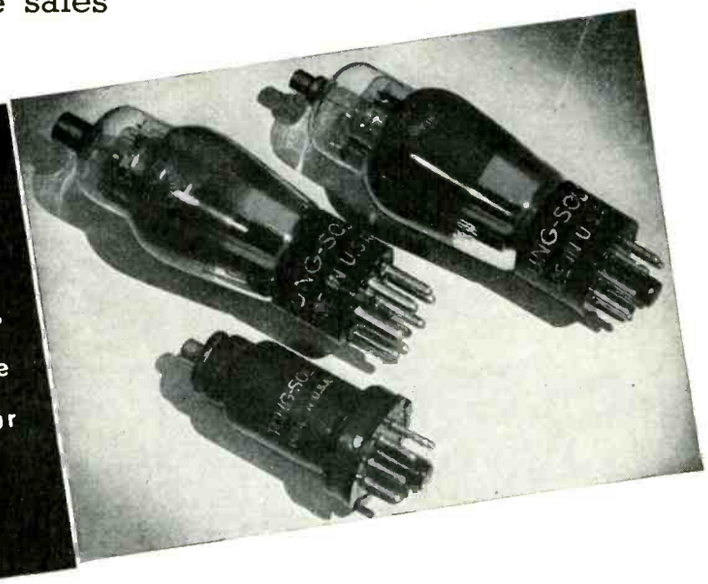

SERVICE

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FOR AUGUST, 1937

BEAT-TYPE SIGNAL GENERATORS

By JACK AVINS

UNTIL A COMPARATIVELY SHORT time ago service signal generators almost invariably consisted of a single oscillator of adjustable frequency, which, in conjunction with an arrangement for modulating and attenuating the output, constituted a satisfactory instrument for the service work encountered at the time. A survey of the newer models of service signal generators, on the other hand, shows that a large percentage are of the beat-frequency type. The reasons for the widespread adoption of this type of design and the extent to which it influences alignment procedure are discussed in this article.

As Fig. 1 shows, the beat-type of signal generator consists of two oscillators, the outputs of which are mixed in a detector tube. One of these oscillators works at a fixed frequency while the frequency of the other oscillator can be adjusted over a wide range. As a result of the mixing of these two frequencies in the detector stage two new frequencies are produced in the output of the detector; these frequencies are equal to the sum and difference of the fixed and adjustable-oscillator frequencies.

For example, in a particular case where the fixed-frequency oscillator operates at 700 kc and the adjustable-frequency oscillator is tuned to say 10,000 kc, the new frequencies produced as a result of rectification in the detector would be equal to 10,700 kc (10,000 kc + 700 kc) and 9,300 kc (10,000 kc — 700 kc). It is interesting to note that the dial reading would not be 10,000 kc but would be equal to 10,700 kc. However, in some cases the instrument might be so designed that the dial reading would be equal to the difference frequency or 9,300 kc. The dial is never calibrated so that the frequency indication is equal to the frequency of the adjustable-frequency oscillator.

CHARACTERISTICS OF BEAT-TYPE

One of the important features of the beat-type signal generator is that the output tends to remain constant over the extremely wide frequency range required of, and covered by, present-day service signal generators. We can compare the action which takes place here with that in the superheterodyne first detector. In the latter circuit, the output at the intermediate frequency is essentially independent of the output voltage of the local oscillator, and depends upon the strength of the input signal. In the same way, the output of the beat-type signal generator is independent of the output of the adjustable-frequency oscillator, and depends only upon the strength of the fixed-frequency oscillator. Since the latter operates at a fixed frequency over the entire frequency range of the instrument, the overall output tends to remain essentially constant.

A more important characteristic of the beat-type signal generator is that the output signal retains the original modulation characteristics of the fixed-frequency oscillator. This simplifies the design of the signal generator to the extent that it is only necessary to design the fixed-frequency oscillator circuit so that the modulation will be linear and free of distortion. Once this design and construction have been carried out, the output of the signal generator will retain the same modulation over the entire frequency range. Again using the superheterodyne analogy, it is evident that the output signal retains the modulation of the fixed-frequency oscillator much in the same way that the intermediate frequency in a superheterodyne retains the modulation originally present in the signal before mixing in the first detector. Considering this analogy it will be clear that the modulated fixed-frequency oscillator in the signal generator corresponds to the modulated signal in the superheterodyne, while the output frequency of the signal generator corresponds to the intermediate frequency of the superheterodyne.

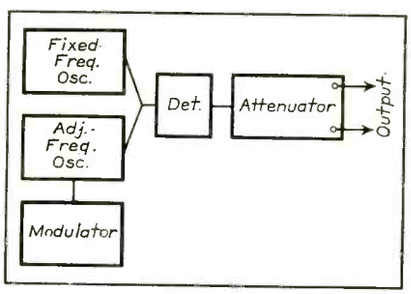

Fig. 1. Block diagram of the beat-frequency type of signal generator.

To the extent that it is fairly difficult to obtain linear modulation and constancy of output over a wide frequency range with the conventional type of signal generator, the beat-type of signal generator constitutes an important development. However, this feature in itself may not be sufficient to warrant the additional complexity and the increased cost of the instrument as compared with the single oscillator type of design. A much more important factor is the fact that the beat-type signal generator is peculiarly adapted to meet the requirements of a signal generator suitable for *visual alignment* methods.

FREQUENCY MODULATION

In the visual alignment method, wherein a trace of the frequency response of the receiver appears on the screen of the cathode-ray oscillograph, the frequency of the signal generator must be varied periodically about the alignment frequency so as to create a picture of the response of the receiver to a band of frequencies in the neigh-

borhood of the alignment frequency. For example, when a receiver is aligned at 600 kc by the visual method, the signal generator must produce not only 600 kc, but must produce a band of frequencies ranging from, say 585 kc, to 615 kc. In this way the trace on the screen of the cathode-ray tube can be made to indicate the frequency response of the receiver.

In the early signal generators of the single oscillator type which were designed to be used in connection with visual alignment, the variation of the oscillator frequency was accomplished by means of a small motor-driven condenser across the tuned circuit of the oscillator. As this small rotating condenser changed from maximum to minimum capacity, the frequency of the oscillator was periodically varied below and above the normal output frequency, and the entire process repeated over and over again at a rate of from about 30 to 120 cycles per second. In this way the response of the receiver to frequencies in the neighborhood of the alignment frequency was shown so as to make possible the adjustment of the various trimmers for the best receiver performance.

This type of frequency modulation possesses a number of drawbacks, foremost among which is the fact that the extent to which the frequency of the oscillator is varied, or the extent of frequency modulation, depends upon the frequency of the oscillator. Thus at the low-frequency end of the band, with the tuning condenser set at maximum capacity, the small motor-driven condenser has relatively little effect upon the frequency of the oscillator, so that the band width of the frequency modulation produced is quite small. On the other hand, at the high-frequency end of the band, the motor-driven condenser constitutes a relatively large part of the tuned-circuit capacity and hence the frequency modulation produced is correspondingly large.

Since in practice it is undesirable to have the band width of the frequency modulation change as the signal frequency is varied, this type of oscillator suffers from the disadvantage that reference must be made to a chart in order to determine the extent of the frequency modulation, so that more or less quantitative conclusions can be made as to the selectivity of the receiver.

We discuss these limitations of the conventional type of frequency-modulated signal generator merely to show how they are overcome in the case of the frequency-modulated beat-type signal generator. Referring again to Fig. 1, let us see how frequency-modulation is accomplished in this case. As the diagram shows, the frequency-modulator unit modulates the fixed-frequency oscillator rather than the adjustable-frequency oscillator. Furthermore, in the same way that the sum and difference frequencies of the detector output retain the audio modulation in the case of ordinary amplitude modulation, so the output of the signal generator retains the identical frequency modulation which is impressed on the fixed-frequency oscillator.

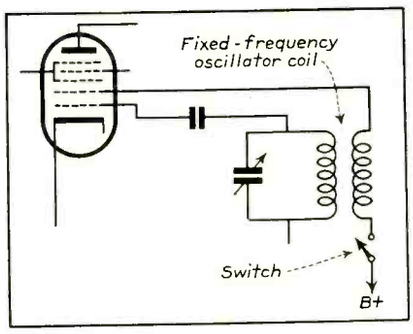

Fig. 2. The location of a switch for disconnecting the fixed-frequency oscillator.

An example will help to clarify these points. Suppose again that the fixed-frequency oscillator operates normally at 700 kc and that when the switch is operated to the frequency-modulation position, the frequency of the oscillator is caused to vary periodically over the range from 685 kc to 715 kc—a total band width of 30 kc. Let us further assume that the dial of the signal generator reads 10,000 kc. Since the 10,000-kc output of the signal generator is the result of beating the 700-kc frequency-modulated signal with a 9,300-kc adjustable-oscillator frequency, it follows that the frequency of the output signal will vary from 9,985 kc to 10,015 kc. It is thus evident that the band width of the frequency modulation remains constant at 30 kc and that it is independent of the actual output frequency which may be, for example, 100 kilocycles or 30 megacycles.

It is clear, then, that the peculiar advantage held by the beat-type of signal generator is that it is possible to secure a constant band width of frequency modulation over the entire range of the oscillator merely by modulating an oscillator which normally operates at just one frequency. Incidentally with this method it is also possible to design the signal generator so that a variable band width of frequency modulation is easily obtainable. Thus a number of the current signal generators are calibrated so that a variable band width from zero to 30 or 40 kc can be obtained.

DIAL CALIBRATION

At the lower frequencies, the dial is as a rule calibrated so that it reads the difference between the fixed and variable-oscillator frequencies. For example, if the frequency of the fixed-frequency oscillator is 700 kc, and the frequency of the adjustable-frequency oscillator is 5,000 kc, then the dial would be calibrated to read the difference between these two frequencies or 4,300 kc; or if the dial reading is 100 kc, then the frequency of the adjustable-frequency oscillator would be 800 kc and the 100 kc output is produced as a result of the difference between these two frequencies. Because the oscillator works at a frequency which is high in comparison with the output frequency (700 kc is considerably higher than 100 kc) the frequency stability of the beat-type oscillator over the lower frequency range of the signal generator tends to be lower than that of the conventional oscillator. While this is not an important disadvantage, the need for an occasional check on the calibration over the low-frequency bands should be kept in mind.

Over the higher frequency ranges of most beat-type generators, the adjustable-frequency oscillator works at a frequency which is lower than the dial reading by an amount equal to the frequency of the fixed-frequency oscillator. For example, if the dial indicates 20 mc, then the adjustable-frequency oscillator would work at 19.3 mc. Of course, the adjustable-frequency oscillator could work at 20.7 mc, but the latter arrangement is seldom used because it is desirable to have the oscillator operate at the lowest possible frequency. In any event the Service Man should know whether his instrument is calibrated so that the adjustable-frequency oscillator works below or above the dial frequency.

OPERATION NEAR THE FIXED-FREQUENCY OSCILLATOR

As we should expect, care must be exercized when working near the frequency of the fixed-frequency oscillator, which for the purpose of explanation has been taken as 700 kc. Let us suppose that the dial is tuned so that it indicates 705 kc. Since the fixed-frequency oscillator on this band works at a frequency 700 kc higher than the dial calibration it follows that the frequency of the adjustable-frequency oscillator is 1405 kc. This 1405-kc voltage beats with the 700-kc voltage and produces the difference frequency, 705 kc. However, in addition to the 705 kc signal, the 700-kc output of the fixed-frequency oscillator is also present in the output of the signal generator and effectively this means that a 700 kc signal in addition to the desired 705 kc signal is fed into the receiver under test. As a result of the presence of these two frequencies in such close proximity to each other, a 5-kc audio beat note will be evident in the output of the receiver. As a general rule, the frequency of the fixed-frequency oscillator is chosen so that the alignment of a receiver is seldom

required at a frequency closer to it than 5 kc. However, when it is desired to align a receiver at a frequency equal to that of the fixed frequency oscillator, it is recommended that the band switch be turned to the highest-frequency band. The output of the signal generator will then contain only the output of the fixed-frequency oscillator.

Alignment at High Frequencies

The alignment of a receiver at the higher frequencies, using the beat-type signal generator, is complicated by the presence of three frequencies in the output of the signal generator. As we have pointed out previously, not only is the actual frequency of the adjustable-frequency oscillator contained in the output, but in addition to this the two sum and difference frequencies are also present.

In explaining how the presence of these frequencies influences the alignment of a receiver at the higher frequencies, we shall take the specific example of a receiver which is being aligned at 22.0 mc. We shall further assume that the intermediate frequency of the receiver being aligned is 465 kc and that the beat-type signal generator being used is so designed that its dial is calibrated to read the sum frequency. The procedure, however, applies to any other case.

With the oscillator set so that the dial reads 22.0 mc it follows that the adjustable-frequency oscillator will be operating at 21.3 mc or 700 kc below 22.0 mc. This frequency will then be present in the output. In addition to 21.3 mc, the difference frequency or 20.6 mc (21.3 mc—700 kc) will also be present in the output. With the signal generator dial tuned to 22.0 mc it follows therefore that three distinct frequencies are being fed into the receiver, namely 22.0 mc, 21.3 mc, and 20.6 mc. Obviously extreme care must be exercised to avoid aligning the receiver to one of the incorrect frequencies, since it is quite possible to adjust the trimmers in the receiver to 21.3 mc or 20.6 mc.

In this connection, turning on the frequency-modulation switch is helpful in distinguishing between these three frequencies, so that the correct one can be identified. When the frequency modulation switch is turned on, the adjustable-frequency oscillator will not be frequency modulated and can be recognized as an unmodulated signal. On the other hand, both the sum and difference frequencies, 20.6 mc and 22.0 mc, will be frequency modulated, because they originate as the result of beating a frequency-modulated signal (the fixed-frequency oscillator) against an unmodulated signal (the adjustable-frequency oscillator). In the case under discussion the correct setting of the oscillator trimmer would be the minimum capacity setting which produced a frequency-modulated tone which can be recognized as a guttural low-frequency note. Larger values of trimmer capacity would bring in first the unmodulated 21.3-mc signal and then the frequency-moulated 20.6-mc signal. In many cases the range of the oscillator trimmer may not be sufficient to bring in the 20.6 mc signal. At any rate the expedient of turning on the modulation switch is of some assistance in determining the correct setting of the oscillator trimmer.

Image Response

Unfortunately the alignment procedure is rendered even more difficult by the presence of the image response which is characteristic of all superheterodyne receivers. As a result, the receiver will in general respond to a given signal for two different settings of the oscillator trimmer. Taking into account the fact that there are three distinct signals present in the output of the signal generator, it becomes apparent that there may be as many as six different settings of the oscillator trimmer for each of which the various r-f trimmers may be adjusted for maximum output. Again whether or not all six possible adjustments will be present depends upon the range over which the variable trimmers can be adjusted.

Bearing in mind that a signal passes through the intermediate frequency amplifier of a superheterodyne whenever the oscillator frequency differs from the signal frequency by an amount equal to the receiver i-f peak, possible receiver oscillator frequencies for which a peak output signal will be noted, can be tabulated as shown in the accompanying table. As in the previous illustration an attempt can be made to distinguish between these frequencies by noting which of the receiver responses is unmodulated and which is frequency modulated (with the switch shifted to the frequency-modulated position). For the conditions assumed, the frequency-modulated signals are indicated by the letters *fm* in the table while the letters *um* after the signal frequency signify that the response is unmodulated.

Frequencies in output of signal generator. Dial at 22.0 mc.

21.3 mc (*um*)	adjustable-frequency oscillator
22.0 mc (*fm*)	21.3 mc + 700 kc
20.6 mc (*fm*)	21.3 mc — 700 kc

Oscillator (in receiver) at which the above signals are received.

20.135 mc (*fm*)	20.6 mc — 465 kc
20.835 mc (*um*)	21.3 mc — 465 kc
21.065 mc (*fm*)	20.6 mc + 465 kc
21.535 mc (*fm*)	22.0 mc — 465 kc
21.765 mc (*um*)	21.3 mc + 465 kc
22.465 mc (*fm*)	22.0 mc + 465 kc

It will easily be seen that a great deal of confusion can be caused by the presence of these multiple frequencies in high-frequency alignment work. There are numerous possibilities of error and where the r-f amplifier of the receiver is initially badly out of line, the probability of misalignment occurring is very great. This is true even where a considerable amount of skill and care are used in making the adjustments.

Eliminating Spurious Resposes

Fortunately, there is a comparatively simple way of eliminating the additional frequencies which are characteristic of beat-type signal generators. By incorporating a switch in the signal generator circuit, the fixed-frequency oscillator can be stopped whenever the signal generator is being used for short wave alignment work. When this is done, the output of the signal generator contains only a single frequency. It follows, therefore, that the possibility of incorrect adjustment will not arise since there are now only two possible adjustments of the receiver oscillator trimmer; one of these is the correct adjustment and the other is the image adjustment. In accordance with conventional practice the image response is almost invariably obtained with the oscillator trimmer capacity increased to the point where the oscillator frequency is lower than the signal frequency by an amount equal to the i-f peak. The correct adjustment can therefore be obtained merely by choosing the lower capacity setting of the trimmer which gives the maximum output indication.

It should be carefully noted that some few receivers are so designed that proper tracking is obtained when the frequency of the receiver oscillator lies below the signal frequency. While these cases are far in the minority among receivers manufactured in this country, this point should be kept in mind where proper tracking is not secured when working on the assumption that the oscillator frequency is above the signal frequency. If it is found that better tracking is secured with the receiver oscillator adjusted so that its frequency lies below the signal frequency, then this should be considered the final optimum adjustment.

With the fixed-frequency oscillator rendered inoperative by means of the switch just mentioned, the frequency of the adjustable-frequency oscillator constitutes the output signal. For this reason, the dial calibration no longer holds true, but the frequency indicated by the dial is now less than the actual output signal by an amount equal to the frequency of the fixed-frequency oscil-

(*Continued on page* 493)

LEARN TO SELL

By S. R. COWAN

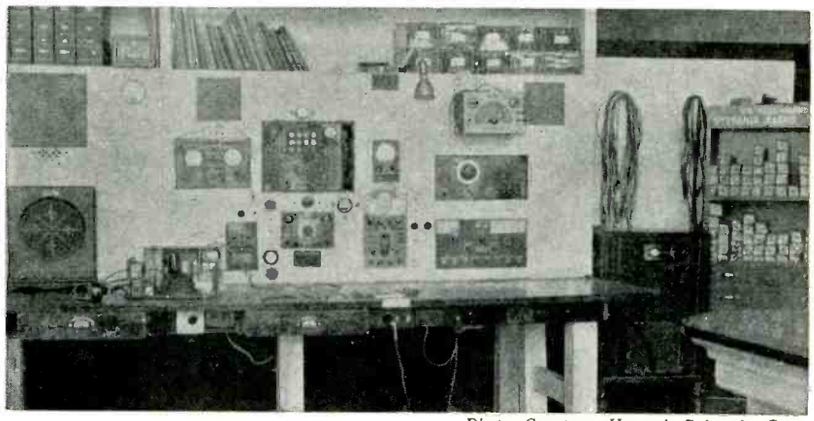

Photo Courtesy Hygrade-Sylvania Corp.

A wideawake Service Man's bench. Nick Kaloris, Steamboat Springs, Colorado, impresses the customers of his "Scientific Radio Clinic" by keeping his bench in this fashion.

ANY MAN ENGAGED IN the radio business can call himself anything that he chooses . . . call yourself a Dealer . . . or call yourself a Jobber . . . or call yourself a Service Man . . . it makes no difference what you call yourself. . . . *I call you a Salesman!*

Did you know that reliable manufacturers and publishers in this industry have recently made a thorough survey of it and have found that there are approximately 29,000 men engaged full time in servicing and repairing radio receivers? But most important . . . over 16,000 of these Service Men operate from a store or shop that they own themselves.

There you have a paradoxical situation! More than half of the really important Service Men in this country are really dealers . . . and any intelligent dealer will readily admit that his prime means of livelihood is derived from his ability to sell. In other words . . . a successful dealer is one who can sell something, whether it be his services repairing defective radio sets . . . or new sets from his pretty display . . . or what have you!

Now, let's look at this situation from another angle. There are 29,000 full time Service Men in this country . . . and every one of them is able to make some kind of a living because he can sell something. In most cases he is able to sell his services . . . his training and experience in making defective sets function properly.

Some Service Men make a fairly good living . . . some just manage to get by. And here is where I tell you something that will make you realize that the picture is far from pretty.

In 1935 the United States Bureau of Internal Revenue decided to learn how much Service Men earned on an average. The statisticians worked for months and finally released these figures:

During 1934 the average Service Man had a gross income of $967.

Think of it! Less than $20 a week.

Last year SERVICE made another survey and found that during 1935 the average Service Man had a gross income of $1113. Not much of an increase, but at least a basis for some hope. Later surveys show that now-a-days the average Service Man enjoys an income of about $1730. But bear in mind this is *gross income,* not net!

I suppose you should feel rather proud of yourselves . . . boosting your annual earning capacity nearly 100% in two years . . . but, don't kid yourself. The Service Man's position is just beginning to be appreciated. I am confident, however, that within a year . . . if you fellows out in the field take some advice . . . you'll really begin to go places and will be able to enjoy an income that will make you proud of being a Service Man, or Dealer, or whatever you call yourself.

But, I want you to analyze the conditions that exist in a very personal manner. Think back; the average Dealer-Service Man only had an income of $1500 during the latter part of last year . . . and about 50% of that income had to be spent in the form of overhead, running expenses and for replenishing inventories of tubes, parts, sets and accessories . . . losses, or what have you! And that left the average dealer with a weekly salary of about $17.

I have personally called upon hundreds of Service Men and servicing organizations throughout the country. I know many of the fellows personally. I also realize that some of these men enjoy a very nice income and pay steep income taxes. Not every Service Man is in the $20 a week class . . . not by a long shot.

But . . . here is the answer . . . every Service Man who enjoys a good income is a good salesman . . . those who just get by are, in nearly every case, poor salesmen. Make up your mind right now . . . either learn to sell . . . learn how and what and why to sell . . . or get out of the game. Your ability to sell will determine your income in the years to come.

And now we'll get down to cases . . . here are a few facts that bear upon merchandising and selling:

A Service Man . . . or a Dealer has but 5 markets, or potential sources of income:

(1) He can sell his own service.

(2) He can sell radio sets, home, auto, farm or phono-combinations.

(3) He can sell parts and accessories and tubes.

(4) He can sell, service or rent public-address equipment.

(5) He can sell radio specialties . . . and these include the entire range . . . from wind or gas driven power supplies, through to home or office types of intercommunication systems.

(1) By selling his own service . . . I mean . . . a Service Man can sell his brains and ability to repair sets. His technical training and experience thus become a part of his stock in trade. In fact . . . he is a man who is able to charge a fee in proportion to what his customer can pay.

(2) By selling sets my meaning is obvious. Over 78% of the 29,000 full-time Service Men in this country sell sets. Those who have stores do . . . 14,000 (almost 50%) carry a stock of sets. Some have franchises for complete lines . . . others carry private brands. Those who don't stock sets, have, in a majority of cases, a working arrangement with their neighborhood dealer-competitor whereby set sales can be consummated on a split commission basis.

(3) By selling parts, tubes and accessories I refer to the sale, not only

(*Continued on page* 494)

GIVE YOUR WINDOW A NEW PLAN†

WITH THE TALK OF BETTER times everywhere and the trend of business lining up for greater sales, every Service Man should bring his window displays to the fore. Give them a definite job to do during the coming season and make every effort to see that your displays accomplish this goal. If your window displays are not now paying their share of the rent they can be made to do so with just a little extra work on your part.

Plan Necessary

And how is the best way to guarantee good results from a window display? First of all, you must have a plan—not only for each window but for the entire series of windows that are installed over a period of time. Just as you have a definite goal to reach in sales, there should be a planned campaign for your window displays. Whether you change your display once a month, or once a week, you should know in advance what your next window will be. You know the seasonal demands of your trade and combined with the national and local holidays it is an easy matter to make up a complete display schedule.

The nature of your plan will, of course, depend upon several circumstances. Are you located in a busy section of a populous town or is yours the only shop in a small, homey village? Are your customers transients who are attracted by cut-rate prices, or are they neighborhood people who demand reliability and quality above all? What emphasis do you desire to place on service as apart from set and parts sales? You may regard these questions as elementary, but it is actually necessary to answer them before you have a basis for planning.

Having decided upon the type of customer that your appeal must be directed to, you must plan the type of campaign which will bring them to you. Holidays are extremely important in this plan because they offer the very best opportunity to make sales. There is definitely a greater demand for merchandise at these times, and through window display and sales force the Service Man can get his share of this increased demand. Holiday window displays are a "natural" for the decorator since every holiday has its own symbolic color—red and green for Christmas, orange and black for Hallowe'en, green for St. Patrick's Day—the use of crepe paper with these colors will be sufficient to create the holiday mood. And, too, people are holiday-minded and will look at holiday window displays; therefore it will be easier to attract their attention.

Spring and Summer, too, are much better than average as far as results from window displays go. The warm sunshine seems to make people more responsive. A cool, cheerful crepe background draws much attention on a hot summer day. A little more care with your summer displays will well repay you.

In every case it is a good thing to remember that many of the large manufacturers furnish display materials which create a much more effective display than the Service Man could very well get up by himself. This material need not always be used exactly as the manufacturer intended. By proper combination of parts of several different displays, with suitable original additions where necessary, an ingenious and highly attractive window display can often result.

The settings for the interiors of the windows need not be elaborate or expensive. If the Service Man has no talent in this direction he may be able to enlist some one who has. The furnishings, background, windows, etc., can all be fashioned from crepe paper.[1]

The Theme

Having planned your window display campaign, you are now ready to set the note which will be struck in all your display efforts. This note might be called your theme song or leit motif and must tie up with your advertising and store slogans. To illustrate, Service Men in new, rather smart neighborhoods have often achieved a very modernistic effect in their store and have carried this idea into their advertising and window displays. It serves to placard them as up-to-the-minute, an impression they strive to uphold. One Service Man in a small mountain village has used a note of intimate humor. He selects the material to be featured and obtains a show card with good humorous appeal; it has been found to be all that was necessary.

In arranging your display your first problem is, of course, to attract attention to your window. With so many objects to distract the eye on every thoroughfare the problem is by no means a simple one. There are various methods of attracting attention. The most obvious, but by no means the easiest to achieve is the spectacular method. Vivid colors, striking backgrounds, gorgeous displays do not readily blend with radio parts, tubes, gadgets and equipment—and even radio sets can only be worked into a background of a home, a theme which can be overworked. Curiosity, human interest, novel arrangements, low prices, are typical attention-attracters which the resourceful Service Man can vary into his window display. His ingenuity will be taxed, of course, but the results will be well worth the effort.

Sketch Helpful

So much for the long-range plan. However, before a window is installed it is well to make a rough sketch. No

(*Continued on page* 494)

†Material for this article was supplied by the Dennison Manufacturing Co.

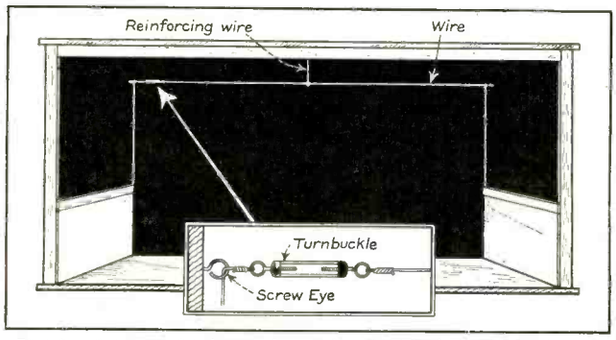

Fig. 1. An open back may be enclosed with the aid of a strong wire extended across the back of the window. Crepe paper does the rest.

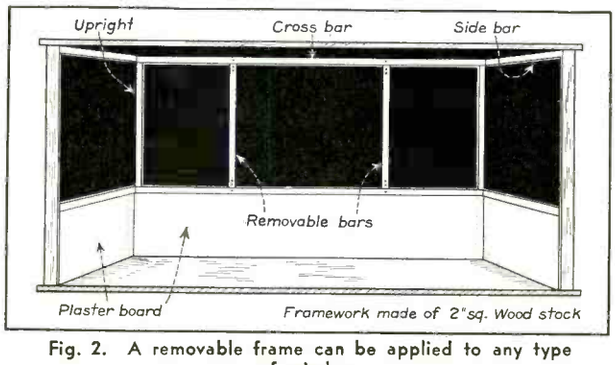

Fig. 2. A removable frame can be applied to any type of window.

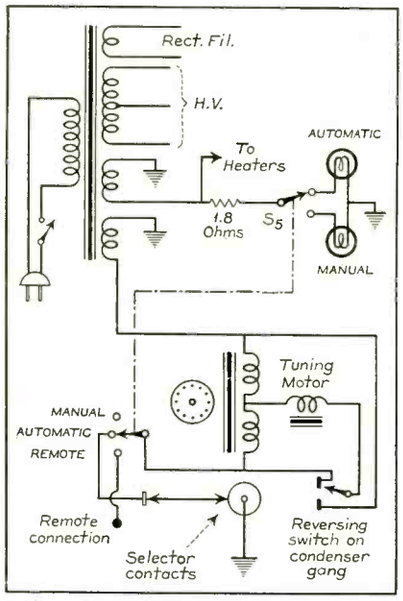

Fig. 3. RCA electric tuning circuit.

in the rubber grommet provided on the top of selector frame.

The Tuning Motor

The tuning motor is mounted on top of the variable condenser for the purpose of facilitating assembly and adjusting in production. The motor was especially developed for this application and is of the shaded pole type, but reversible. The rotor is provided with longitudinal motion for two reasons: First, to operate the afc and amplification suppression switches at the front end of the motor, and second, to provide disengagement of the motor from the driving mechanism to the tuning condenser when the motor is deenergized. It will be noted that the motor engages with the drive mechanism through a pin and arm coupling. The reason for this is to provide a quick coupling and disengagement. This coupling also makes it unnecessary to maintain perfect alignment of the motor shaft and the driven pinion on the condenser end plate which is very desirable should it be necessary to make a replacement in the field.

Wm. E. Newman,
Engineering Dept., RCA Mfg. Co., Inc.

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Zenith 5-S-201, 5-S-218, 5-S-220, 5-S-228, 5-S-237, 5-S-250, 5-S-252 (Chassis 5521)

The Zenith Chassis 5521 is a five-tube a-c receiver using MG type tubes (glass tubes with octal type sockets) in a conventional superheterodyne circuit. The frequency ranges from 540 to 1752 kc and from 5490 to 18,400 kc are covered in two bands. The power consumption is 65 watts and the output 4.5 watts.

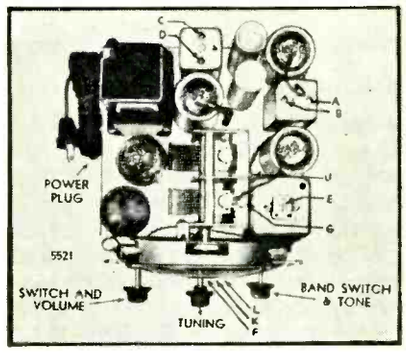
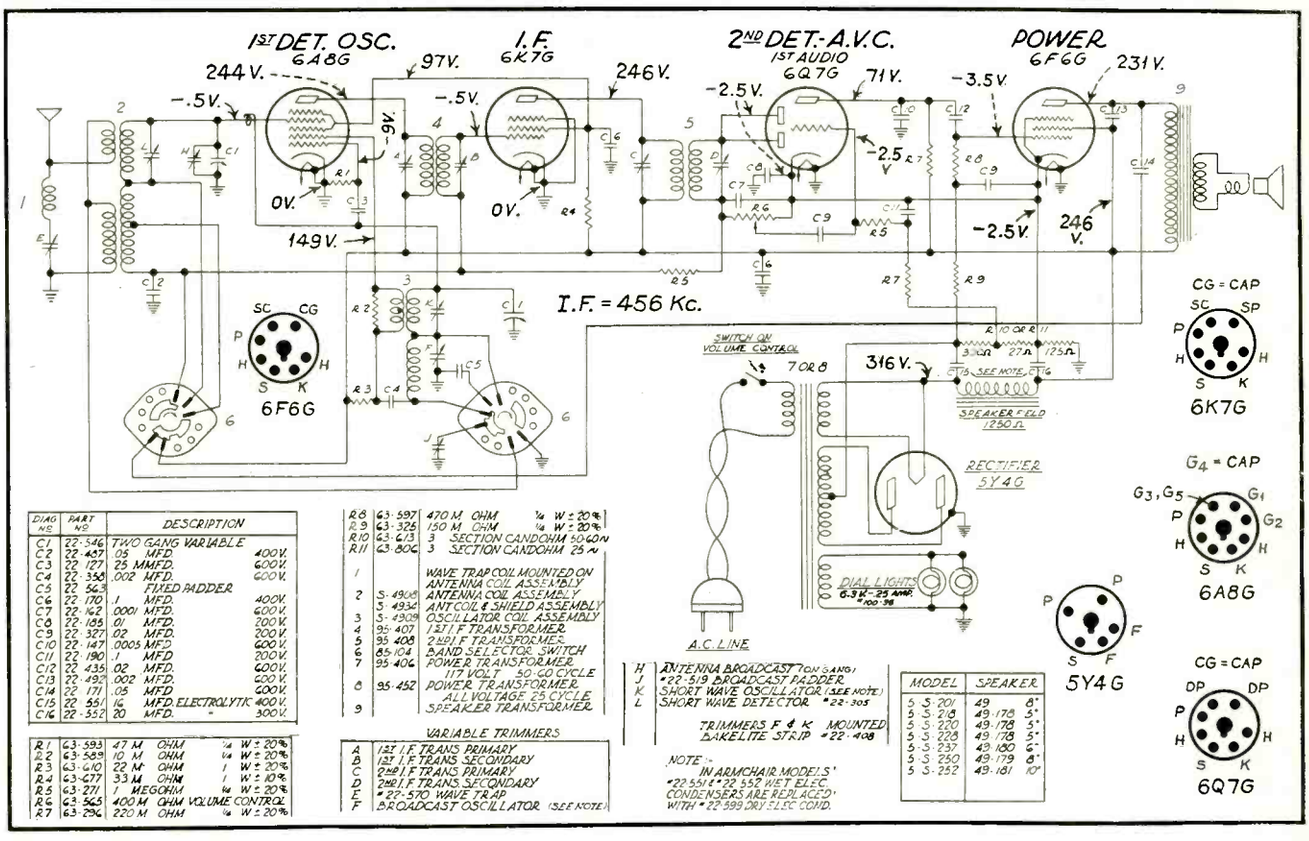


Fig. 2. Zenith 5521 parts layout and trimmer location.

The 5-S-218, 220 and 228 are table models and use 5-in. speakers. The 5-S-237 is an armchair model and uses a 6-in. speaker. The 5-S-250 and 252 are console models and use an 8 in. and 10-in. speaker, respectively.

A circuit diagram of the receiver is shown in Fig. 1 with the tubes used, their functions and the voltages encountered on the socket prongs lettered on the diagram. These voltages were taken with a 1000-ohm-per-volt volt-



DIAG NO	PART NO	DESCRIPTION	
C1	22-546	TWIN GANG VARIABLE	
C2	22-457	.05 MFD.	400 V.
C3	22-127	25 MMFD.	600 V.
C4	22-358	.002 MFD.	600 V.
C5	22-563	FIXED PADDER	
C6	22-170	.1 MFD.	400 V.
C7	22-162	.0001 MFD.	600 V.
C8	22-185	.01 MFD.	200 V.
C9	22-327	.02 MFD.	200 V.
C10	22-147	.0005 MFD.	600 V.
C11	22-190	.1 MFD.	200 V.
C12	22-438	.02 MFD.	600 V.
C13	22-493	.002 MFD.	600 V.
C14	22-171	.05 MFD	600 V.
C15	22-551	16 MFD. ELECTROLYTIC	400 V.
C16	22-552	20 MFD. "	300 V.

R1	63-593	47 M OHM	¼ W ± 20%
R2	63-589	10 M OHM	¼ W ± 20%
R3	63-610	22 M OHM	1 W ± 20%
R4	63-677	33 M OHM	1 W ± 20%
R5	63-271	1 MEGOHM	¼ W ± 20%
R6	63-565	400 M OHM VOLUME CONTROL	
R7	63-296	220 M OHM	¼ W ± 20%
R8	63-597	470 M OHM	¼ W ± 20%
R9	63-326	150 M OHM	¼ W ± 20%
R10	63-613	3 SECTION CANDOHM 50-60 Ω	
R11	63-806	3 SECTION CANDOHM 25 Ω	

1		WAVE TRAP COIL MOUNTED ON ANTENNA COIL ASSEMBLY
2	5-4906	ANTENNA COIL ASSEMBLY
	5-4934	ANT COIL & SHIELD ASSEMBLY
3	5-4909	OSCILLATOR COIL ASSEMBLY
4	95-407	1ST I.F. TRANSFORMER
5	95-408	2ND I.F. TRANSFORMER
6	85-104	BAND SELECTOR SWITCH
7	95-406	POWER TRANSFORMER 117 VOLT 50-60 CYCLE
8	95-452	POWER TRANSFORMER ALL VOLTAGE 25 CYCLE
9		SPEAKER TRANSFORMER

VARIABLE TRIMMERS

A	1ST I.F. TRANS PRIMARY
B	1ST I.F. TRANS SECONDARY
C	2ND I.F. TRANS PRIMARY
D	2ND I.F. TRANS SECONDARY
E	#22-570 WAVE TRAP
F	BROADCAST OSCILLATOR (SEE NOTE)

H	ANTENNA BROADCAST TRIMMER
J	#22-519 BROADCAST PADDER
K	SHORT WAVE OSCILLATOR (SEE NOTE)
L	SHORT WAVE DETECTOR #22-305

TRIMMERS F & K MOUNTED BAKELITE STRIP #22-408

NOTE:— IN ARMCHAIR MODELS #22-551 & #22-552 WET ELEC. CONDENSERS ARE REPLACED WITH #27-599 DRY ELEC COND.

MODEL	SPEAKER	
5-S-201	49	8"
5-S-218	49-178	5"
5-S-220	49-178	5"
5-S-228	49-178	5"
5-S-237	49-180	6"
5-S-250	49-179	8"
5-S-252	49-181	10"

Fig. 1. Zenith 5-S-201, 5-S-218, 5-S-220, 5-S-228, 5-S-237, 5-S-250, 5-S-252 (Chassis 5521) circuit diagram.

Technical Features of 1938 Crosley Radio Receivers....

Model No.	A-157	A-167	A-177	A-267	B557A	B557M	B-637	C647A	517-A	517-B	517-HA	517-KD	517-M	547-A	547-B	547-M	537	567-M	567-N	567-P	637-A	817-A	1117-M
Cabinet *	Auto	Auto	Auto	Auto	T	Ce	Po	Pe	T	Pe	T	T	Ce	T	Pe	Ce	REFRIG. ERATOR CHASS.	ET	ET	ET	Pe	Pe	Ce
Bands	1	1	1	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	2	3	3
Range (Kc.)	540 to 1725				540 to 1725 Kc. 6.0 to 15.0 Mc.		540 to 1710	535 to 1725 Kc. 5.8 to 18.3 Mc.	540 to 1725 Kc. 6.0 to 15.0 Mc.								540 to 1725 Kc.	540 to 1725 Kc. 6.0 to 15.0 Mc.			535 to 1725 Kc. 5.8 to 18.3 Mc.	540 Kc. to 22.0 Mc.	540 Kc. to 22.0 Mc.
Power Supply	6 V.				Battery		2V.	AC/DC	A.C.								A.C.	A.C.			A.C.	A.C.	A.C.
Drain	5.7 Amp.	8 Amp.	10 Amp.	–	–		A=0.36 AMP. B=0.01 A.	–	40 Watts								40 Watts	40 Watts			–	–	–
Speaker	5"	6"	5"	–	–		Ear Phones	–	5"								–	5"			–	–	8"
Power Output (Watts)	4	5	9	–	–		0.2 Watt	–	2								2	2			–	10	10
I.F. Peak	455	262			455		262	455	455								455	455			455	455	455
Volume Control ‡	1 Meg. S	300,000 T	2 Meg. T	–	–		1 Meg. S	–	–								1 Meg. S	–			–	–	–
Tone Control		Cont.	Cont	–	–			–										–			–	–	–
Tuning Eye																							6G5
R.F. Amp.		6K7G			1F5G		34															6U7G	6U7G
Osc. - Mod.	6A8G				1F7G		1A6	6A8G	6A8G								6A8G	6A8G			6A8G	6A8G	6A8G
I.F.	6U7G	PENTODE SECT. 6B8G	6K7G		1D5G		34	6U7G	6U7G								6U7G	6U7G			6U7G	6U7G	6U7G
2nd. Det., AVC	6Q7G	DIODE SECT. 6B8G	6R7G	6Q7G	1C7G		1B5/25S	6Q7G	6Q7G								6Q7G	6Q7G			6Q7G	6Q7G	6C5
1st. Audio		6K7G																					6K5G
2nd. Audio																						6K6G	6K6G
Output	6K6G	6N6G	(2) 6V6G	6K6G	1H4G		950	25A6G	6K6G								6K6G	6K6G			(2) 6K6G	(2) 6K6G	(2) 6K6G
Rectifier	6X5G	6X5G	6W5G	0Z4M				25Z6G	5Y3								5Y3	5Y3			5Y3G	5Y3	5Y3
Ballast								W 44383															
Chassis No.	A-157	A-167	A-177	A-267	–		586	–	517					547			537	517			–	–	–

‡ S after Volume Control means with switch attached.
T = Tapped.

* Ce = Console, Pe = Personal, Po = Portable, T = Table, ET = End Table

Signal Generator Connection	Dummy Antenna	Generator Frequency	Band Switch	Dial	Trimmer
First Detector ..... Grid	0.05 mfd	456 kc	Brdcst	600	ABCD
Receiver Antenna ...	200 mmfd	456 kc	Brdcst	600	E[1]
Receiver Antenna ...	200 mmfd	1500 kc	Brdcst	1500	F[2]
Receiver Antenna ...	200 mmfd	1500 kc	Brdcst	1500	G
Receiver Antenna ...	200 mmfd	600 kc	Brdcst	600	J[3]
Receiver Antenna ...	200 mmfd	1500 kc	Brdcst	1500	FG[4]
Receiver Antenna ...	400 ohms	18.0 mc	S-W	18000	K[5]
Receiver Antenna ...	400 ohms	16.5 mc	S-W	16500	L[6]

[1]This trimmer should be adjusted for minimum indication on the output meter. If the receiver is used in a location subject to code interference adjust the trimmer for minimum interference with the set connected to its antenna and operating on the broadcast band.
[2]Set oscillator to scale.
[3]Rock gang while adjusting for maximum output.
[4]Repeat.
[5]Set oscillator to scale.
[6]Rock gang while adjusting for maximum output.

meter with the antenna and ground disconnected; from the points indicated to the receiver chassis. The volume control was on full during the measurements.

Alignment Procedure

The necessary operations for alignment of these receivers are given in the accompanying table. The condenser or resistor indicated under dummy antenna should be connected in series with the signal generator lead and the position designated under signal generator connection. The adjustments must be made in the order given. For accurate results the alignment should be repeated. An output indicating device should be connected across the speaker transformer or across the voice coil throughout the alignment procedure.

The receiver volume control should be on full and the output meter adjusted for half scale reading by means of the attenuator on the signal generator.

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Stewart-Warner R-147, R-147-X, R-147-P

The Stewart-Warner R-147 chassis is used in the receiver models 1471 to 1479 inclusive. With the exception of the phonograph and power transformer connections the chassis is identical with the models R-147-X and R-147-P.

The Circuit

The chassis is an 8-tube, all-wave superheterodyne using seven metal tubes and a glass tube tuning indicator. It has three tuning ranges: 527 to 1750 kc; 1720 to 5600 kc, and 5.5 to 18.0 mc.

Individual coils and trimmer condensers are provided for each band so that each circuit can be adjusted to give maximum efficiency on every frequency range. To guard against coupling effects between coils, the range switch has a shorting arrangement on the oscillator and detector sections for unused coils.

The antenna coils are designed to give efficient reception with either a standard or a doublet type antenna without the use of any additional coupling transformers. A small connector is provided on the antenna terminal strip to short the "D" and "G" terminals when a standard antenna is used. If a doublet antenna is used, the connector should be turned or removed to open the connection between the "D" and "G" terminals.

A 6K7 tube is used as an r-f amplifier with a 6A8 first detector oscillator. A single i-f stage employs doubly tuned i-f transformers; the second transformer feeds a 6H6 second detector and avc rectifier. The full avc voltage developed across the 760,000-ohm diode load (No. 56) resistor is employed to control the r-f, first-detector, i-f and tuning eye tubes. The cathodes of these tubes are connected to the chassis and minimum bias is obtained by returning the diode load resistor to a negative tap on the voltage divider. This bias is equal to the drop across the 8- and 13-ohm resistors (Nos. 60 and 64) connected in the negative return of the high-voltage winding and is equal to 2 volts as indicated below. A 6F5 metal tube is used as a first-audio amplifier and is resistance coupled to a 6L6 beam-power output stage.

In the circuit diagram (Fig. 1) re-

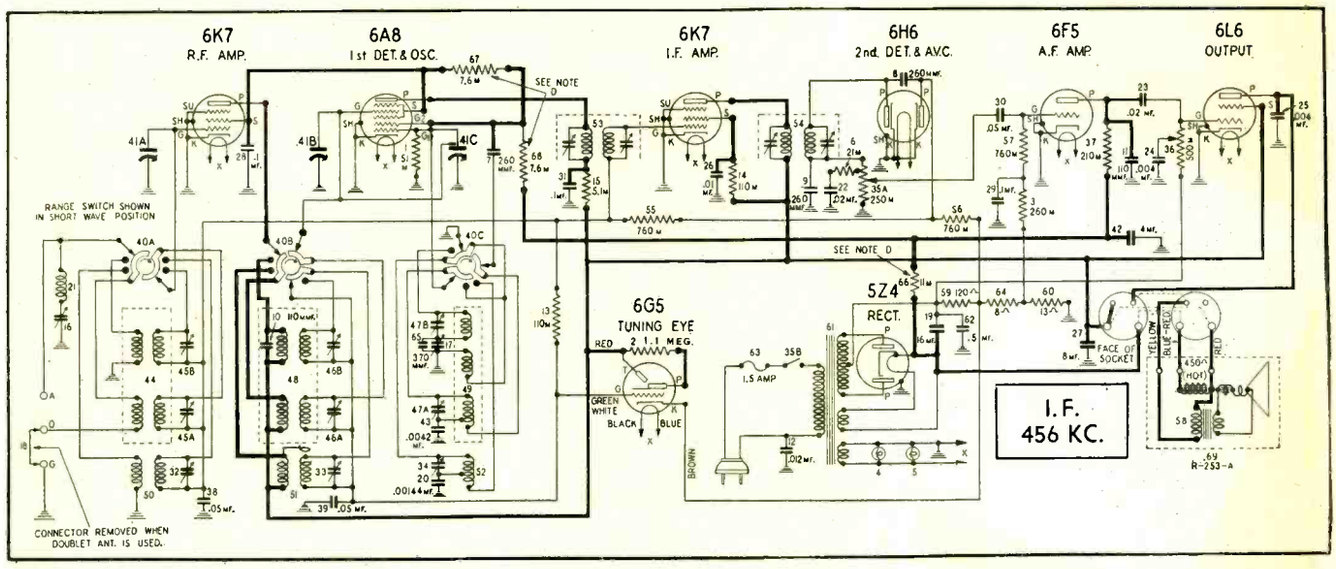


Fig. 1. Stewart-Warner R-147, R-147-X, R-147-P

THE BEST "BUYS" ARE MADE FOR CASH!*

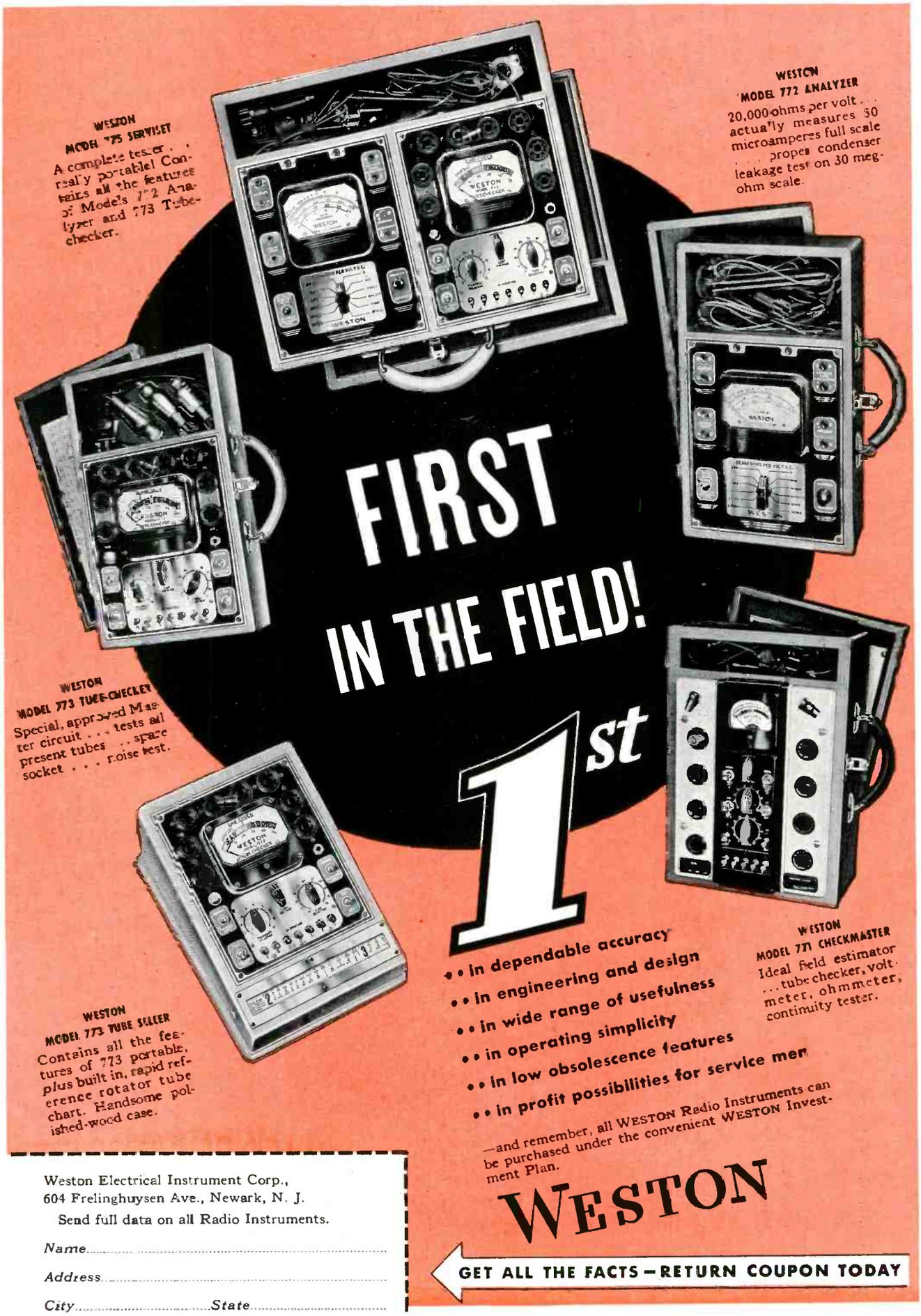
During the years when "sinking or swimming" was an everyday problem, a lot of business men, pressed for cash, got into "no investment" merchandise deals. One by one, most of them have fought their way back to sound business principles. And *only* by buying the *finest quality* merchandise at *lowest possible* cash prices have they been able to prosper.

In the tube field, RAYTHEON offers the highest quality tube made—at cash* prices that save money for dealers every time they buy RAYTHEONS! That is why RAYTHEON business has more than tripled in the last two years . . . why RAYTHEON dealers are prosperous business men! Ask your RAYTHEON jobber.

* By "CASH" we mean your jobber's regular terms.

RAYTHEON

445 Lake Shore Drive, Chicago, Illinois
555 Howard Street, San Francisco, Cal.
420 Lexington Ave., New York, N. Y.
55 Chapel Street, Newton, Mass.
415 Peachtree Street, N. E., Atlanta, Ga.



ference is made to note D in connection with resistors 66, 67 and 68 in the screen circuit of the r-f and detector tubes. In receivers having serial numbers below 351,736, resistor 67 is omitted and the screen grids of the 6K7 and 6A8 tubes receive their current through a 31,000-ohm resistor connected to the screen of the 6L6. In addition the 11,000-ohm resistor, No. 66, is changed to 30,000 ohms, 1 watt and the 7,600-ohm resistor, No. 68, to 16,000 ohms, ¼ watt.

Alignment Procedure

For proper alignment an output meter and an accurately calibrated oscillator with a tuning range from 456 kc to 16 mc are required.

The output meter should be connected across the primary of the speaker transformer or across the voice coil. A convenient point to make the plate connection is to the yellow wire on the speaker socket.

I-F Alignment

Turn the volume control to maximum volume position and keep it in this position throughout the entire alignment procedure. Turn the range switch to the broadcast position (fully clockwise).

Connect the test oscillator output leads to the 6A8 control grid and chassis with a 0.1-mfd condenser in series with the oscillator output. Set the oscillator to exactly 456 kc. Set the receiver dial at any point where it has no tuning effect on the oscillator signal.

Adjust the four i-f trimmers, Nos. 1, 2, 3 and 4, for maximum output meter deflection, then repeat the trimmer adjustment. See Fig. 2 for location of the trimmer condensers.

Wave-Trap Adjustment

The wave-trap adjusting trimmer, No. 5, is located on the back of the chassis. Leave the test oscillator at 456 kc. Connect the oscillator output to the A and G terminals with a 400-ohm resistor in series with the A terminal and oscillator output. Then adjust the wave-trap trimmer No. 5 for minimum output. If some particular station with a frequency near 456 kc causes code interference, it may be desirable to adjust the wave-trap on the actual frequency of the interfering station.

Broadcast Band Alignment

With the gang condenser in full mesh, the dial pointer should be on the white horizontal line below 530 kc on the dial scale. Leave the range switch in the extreme clockwise position, and leave the test oscillator connected to the A and G terminals of the receiver through a 400-ohm resistor.

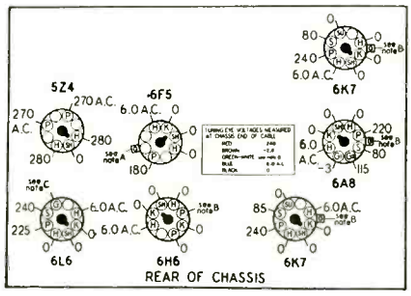


Fig. 3. Socket layout and voltage readings.

Adjust the test oscillator to exactly 1500 kc and turn the receiver dial pointer to 1500 kc on the tuning dial. To calibrate the dial, adjust trimmer No. 6 for maximum output.

Carefully tune the receiver to the signal and adjust trimmers Nos. 7 and 8 for maximum output.

Adjust the test oscillator to 600 kc and tune the receiver to the signal. Adjust trimmer No. 9 for maximum output. Then try to increase the output meter reading by detuning No. 9 slightly and retuning the receiver dial. If the output goes down, detune the trimmer in the opposite direction. Continue detuning the trimmer and retuning the receiver dial until maximum output meter deflection is secured. This operation is commonly known as "rocking" and when performed as described will give maximum selectivity and sensitivity even though the dial may be slightly off calibration at 600 kc.

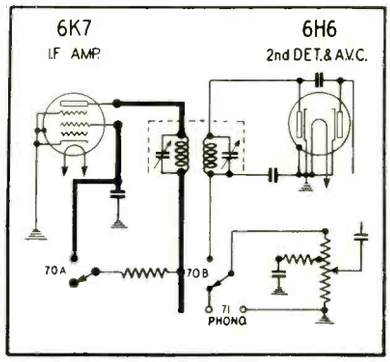


Fig. 4. Stewart-Warner R-147-X phonograph connections.

Band 2 Alignment

Turn the range switch to the center position.

Adjust the test oscillator to exactly 5.0 mc and turn the receiver dial pointer to exactly 5.0 mc on the tuning dial.

To calibrate the dial, adjust trimmer No. 10 for maximum output. If two peaks are found, the proper one is that with the trimmer screw farthest out.

Carefully tune the receiver to the signal and adjust trimmers Nos. 11 and 12 for maximum output. Then try to increase the output by detuning No. 12 slightly and retuning the receiver dial. Continue detuning No. 12 and retuning the dial until the output meter deflection is a maximum. Then readjust No. 11 for maximum output.

Band 3 Alignment

Turn the range switch to the extreme counter-clockwise position. Be sure the D and G terminals on the antenna terminal strip are connected together.

Set the test oscillator to 16 mc and turn the receiver dial pointer to exactly 16 mc on the tuning dial.

To calibrate the dial, adjust trimmer No. 13 for maximum output. Check to see that it has been adjusted to the proper peak by tuning the receiver to approximately 15.1 mc. A repeat signal should be heard at this point. If none is present, even with greatly increased oscillator output, retune the receiver to 16 mc and adjust trimmer No. 13 to the proper peak with the trimmer screw farther out.

Carefully tune the receiver to the signal and adjust trimmers Nos. 14 and

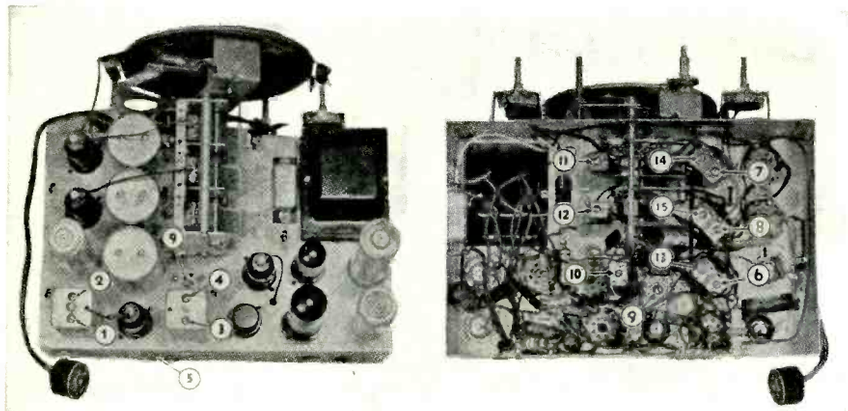


Fig. . Chassis assembly showing trimmer positions.

15 to a peak. Then try to increase the output by detuning No. 15 slightly and retuning the dial until a maximum output meter deflection is secured. Then readjust No. 14 for maximum output.

Check the adjustment by tuning the receiver to the image at about 15.1 mc. The image should be much weaker than the 16-mc signal. If the signal at 15.1 mc dial setting is equal to or stronger than the 16-mc signal, trimmer No. 15 is not set to the proper peak. Turn the trimmer in a turn or so, then readjust as above.

Voltages

The voltage chart (Fig. 3) shows normal voltages between the tube socket terminals and chassis for a 115 volt, 60-cycle line supply. Voltages should be measured with the receiver tuned to 527 kc, the range switch in broadcast position, the volume control full on and the antenna grounded.

Reference is made in the chart to notes A, B and C. These refer to the grid biases used in the receiver. The bias for the 6F5 is —1.3 volts and is measured across the 13-ohm resistor (No. 60) in the negative return of the high-voltage winding. Similarly the grid bias for the 6K7 r-f tube and the 6A8 is the —2.0 volts measured across the 8- and 13-ohm resistors (Nos. 60 and 64) in the same circuit. The bias for the 6L6 output tube is —13.0 volts, measured from the high-voltage center tap to the chassis. This is equal to the combined drop in the three resistors in this circuit (Nos. 59, 64 and 60).

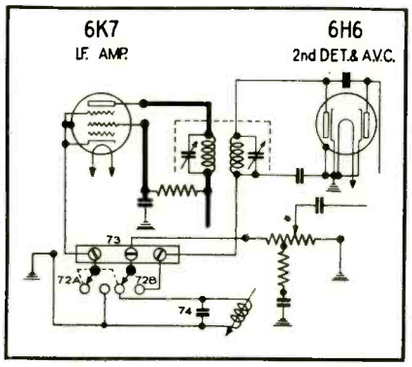


Fig. 5. Stewart-Warner R-147-P phonograph connections.

Phonograph Connections

The diagrams given in Figs. 4 and 5 show the phonograph connections for the model R-147-X and the model R-147-P chassis. These chassis have, in addition, a universal power transformer for operation on a range of line voltages from 100 to 240 volts. Otherwise the R-147-X and R-147-P are identical to the R-147 chassis.

DeWald 700, 700B, 700C, 700LW

These models are 6-tube, a-c, d-c receivers using glass tubes in a conventional superheterodyne circuit. The Model 700B is a table model and the 700C is a console. Both cover a frequency range from 550 to 4800 kc and from 5.7 to 16.0 mc in three bands. The Model 700LW has a long-wave range from 150 to 330 kc instead of the 1700 to 4800 kc police band. A complete circuit diagram of the Model 700 chassis is shown in Fig. 1.

Alignment Procedure

The alignment operations for the receiver are given in the accompanying table. The resistor or condenser listed under dummy antenna should be connected in series with the signal generator output lead and the position on the receiver chassis indicated under signal generator connection.

An output meter should be connected across the primary of the speaker transformer or across the voice coil. Maximum deflection of the meter indicates resonance. Use only enough signal from the generator to obtain a readable deflection on the meter. The receiver volume control should be on full throughout the aligning adjustments.

No aligning adjustments should be

(*Continued on page 492*)

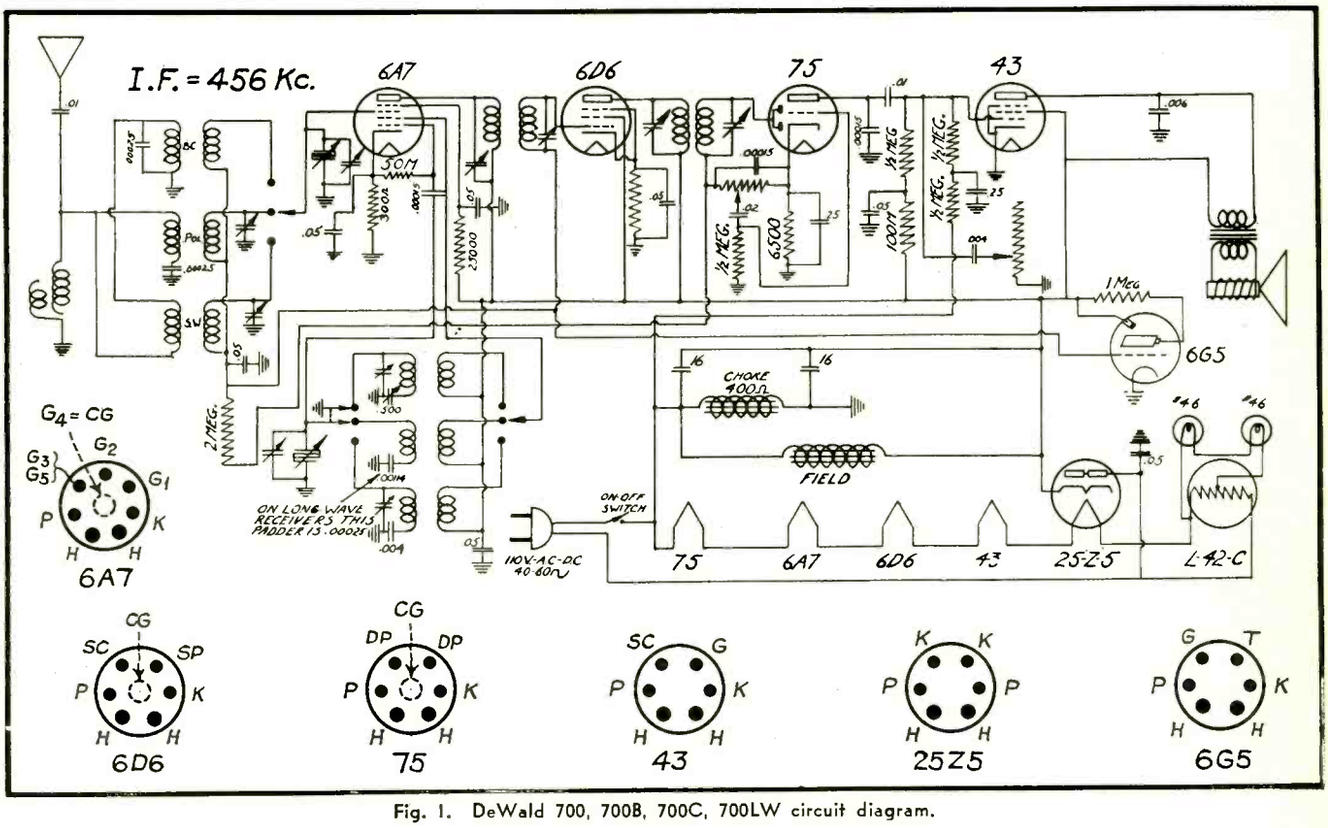


Fig. 1. DeWald 700, 700B, 700C, 700LW circuit diagram.

ON THE JOB . . .

Power Supply for 110 Volts D-C

A useful piece of equipment on the Service Man's bench is a direct current power supply capable of furnishing 110 to 220 volts with enough power to operate a d-c receiver or amplifier.

Voltage Doubler Circuit

The rectifier shown in Fig. 1 uses four type 83 mercury vapor rectifiers connected in a voltage doubling circuit. Examination of Fig. 1 will show that the upper half-wave rectifier has two tubes in parallel as does the lower half of the circuit. Thus 500 milliamperes are available; each tube supplies its full rated load of 250 ma.

A rheostat is provided to adjust the voltage output for proper operation of the receiver or amplifier to which it may be connected. This rheostat should always be set for maximum resistance (minimum voltage) before connecting the load. The resistance may then be decreased until the voltmeter indicates the proper operating potential for the device under test.

The choke-condenser filter circuit is conventional but the choke must have a very low resistance and must be capable of handling at least 500 ma without overheating or saturating. A heavy duty choke from a discarded 6-volt A eliminator is satisfactory. In selecting a multiple filter condenser it is essential that a unit having separate negative returns from the two sections is obtained. Two separate condensers may be used instead.

Low-Power Device

In Fig. 2 the circuit of a simple power supply is also given. This device is capable of delivering about 300 ma or more at 120 volts d-c. For average receiver requirements two 25Z5s will suffice. If only 110 to 120 volts are required at 500 ma the same circuit (Fig. 2) may be used but four 25Z5s should be employed with a total input capacity of 200 mfd. The second filter condenser should also be increased to about 80 mfd. A 50-ohm ballast resistor is required for four 25Z5s in series with a 6.3-volt, 0.25-ampere pilot light across the 120 volt a-c line. (See Fig. 2.)

E. M. Prentke

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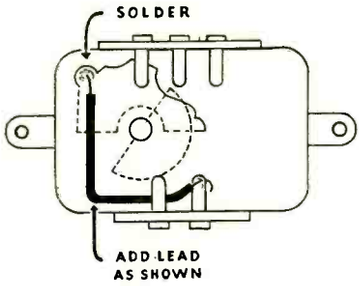
Wave-Trap Adjustment

Additional reduction of code interference may be obtained, in areas where that interference is within the band



RCA Universal wave trap.

between 10 kc above and below the i-f peak, by adjusting the wave trap to the frequency of the interference instead of to the i-f of the receiver. Each receiver installed in affected areas should be accordingly adjusted by the Service Man during installation, after having determined the exact operating frequency of the disturbing station. Effect of wave trap adjustment on battery receivers is increased by use of a short direct (low impedance) ground lead to earth.

The frequency of the RCA Universal wave trap (No. 13467) can easily be extended to cope with the interference frequently encountered from police and amateur transmitters in the 2500 and 2000-kc bands by the addition of the jumper shown in the accompanying illustration. The normal frequency range of the wave trap is from 430 to 1700 kc. The change shown shifts the range to 1200 to 2500 kc.

A further increase of range to include the frequencies up to approximately 6000 kc may be effected by removing the fixed moulded capacitor from the circuit after the addition of the jumper lead. This permits adjustment for the aircraft bands and the 4000-kc (80 meter) amateur band.

RCA Service News

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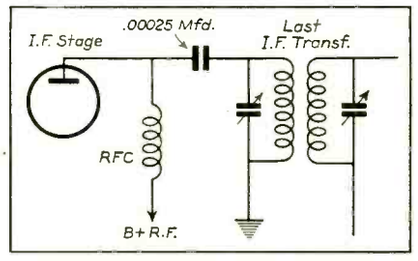
Reducing Hiss Level

In extreme cases, hiss in an i-f stage may be reduced by using the method shown in the accompanying diagram. The stage generating the hiss should first be discovered through the use of the cathode-ray oscilloscope or some other convenient means.

The plate circuit of the tube used in this stage should be disconnected from its tuned circuit and a 0.00025-mfd condenser connected in series as shown. The plate return lead of the tuned circuit is connected to the ground instead of to the plate supply. Plate current for the operation of the i-f tube is fed through a small r-f choke of about 25 to 30 millihenrys.

It may also be necessary to increase the bias on this stage or (in the case of the first i-f stage) on the following stage.

As mentioned above this method



Reducing hiss in i-f stage.

should be used only in extreme cases after all ordinary causes of the hiss have shown negative.

Samuel W. McCochrane, II

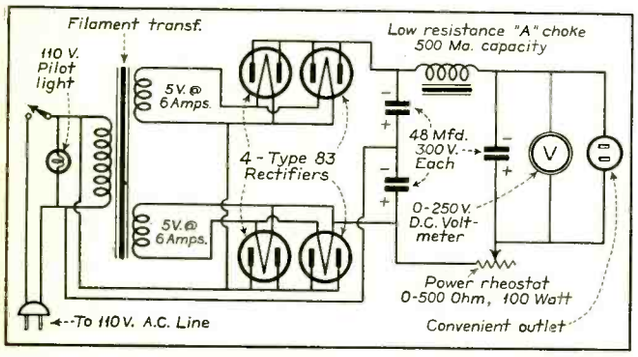


Fig. 1. Power supply for 110-220 volts at 500 ma.

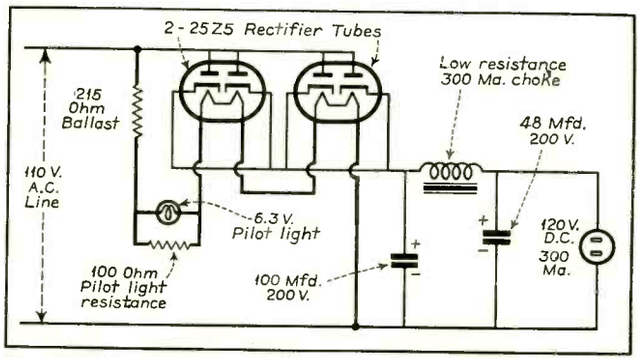


Fig. 2. Power supply for 110 volts at 300 ma.

Servicing Philco Automatic Dials

The automatic dial mechanisms used in the 1937 Philco sets such as the 37-675, 37-116, 37-10, etc., and in some of the 1938 models, are sometimes subject to several ills, notably binding and backlash. Because the planetary drive must turn a large mechanism, any small increase in friction is sufficient to cause backlash, slipping of the vernier and sometimes jamming of the entire dial.

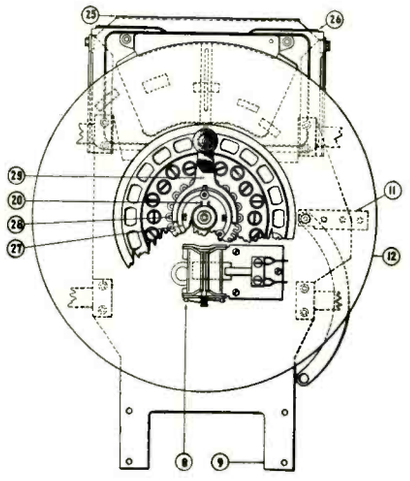
Before servicing these dials, there is one rule to observe: do not squirt oil on the dial assembly! When lubrication is needed, use a medium light graphite grease.

To remove binding, proceed as follows. Remove the chassis from the cabinet and place squarely on the workbench. Check the station indicator and dial scale-band indicator mask guide assembly. Be sure that in transportation or servicing it has not been bent out of position so as to allow either the dial scale or band indicator mask to jump out of their proper guide ways. The guide mask assembly must rest freely between the dial scale and the band mask and be raised sufficiently so as not to touch either on their top edges. If inspection clears the mask guide, loosen the set screws on the flexible coupling and check the condenser gang. Cleaning the rotor wipers, a drop of good oil on the thrust bearings or slight loosening of the rear bearing will repair anything but a bent condenser frame.

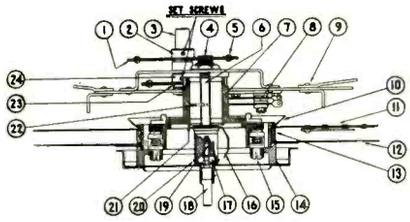
If the dial still binds, remove the mask guide and disassemble the dial. Remove all rings, washers, scales, etc., until only the planetary drive and the plunger assembly remain. If there is any binding or backlash between the drive and the plunger assembly, remove the "C" washer and withdraw the plunger unit. At this point most of these dials turn smoothly and freely. Any trouble remaining at this stage such as play at the bearing of the inside gear or defective planetary, is best cured by replacement.

With all in order before replacing any of the parts, remove all grease, oil and dirt. Carbon tetrachloride is a good cleaner for all parts but the dial scale. The scale is best cleaned with an art gum eraser for most cleaning fluids and water cause the lettering to fade and rub off. Clean the hub which houses the planetary and be sure the audio silencing switch lead is well seated in its slot and won't rub on the plunger assembly when it is replaced. Check the fiber insulating washer, replacing if necessary and tighten all set screws.

Now put on just enough graphite grease to let the plunger assembly slide easily when in place. Take two screwdrivers and tighten up on the anti-backlash part of the inner gear. Back it up from one and a half to two teeth. Hold this gear with a screwdriver from the top and slide on the plunger assembly



Front and end views of Philco automatic dial. The various parts are as follows: (1) and (2) large split gear assembly; (3) shaft; (4) pinion gear and shaft; (5) spring; (6) audio shorting switch assembly; (7) control screw housing; (8) magnetic tuning switch; (9) plate; (10) reflector ring; (11) mask assembly; (12) dial; (13) spacing ring; (14) station tab escutcheon assembly; (15) control screw; (16) audio shorting switch movable contact; (17) large ball bearing; (18) vernier shaft; (19) compression spring; (20) retaining spring for handle hub; (21) control screw housing retaining spring; (22) vernier drive assembly retaining pin; (23) and (24) small split gear assembly; (25) pilot lamp and mask guide assembly; (26) dial screen holder assembly; (27) handle hub; (28) handle screw; (29) handle.



until its teeth mesh with the gear. Replace the large "C" washer and check for free movement. The two sets of teeth on the inner gear should not spread at all when the unit is revolved quite rapidly. If they spread, take up another tooth on the inner gear. If the dial drive grates, back off a tooth.

Slip on the dial light reflector, band indicator mask and the wide, metal spacing ring. Press the ring back tight and see that the band indicator mask moves freely. Early models of the 37-675 and 37-116 have a fine hair spring fitted into the slot in the back face of the spacing ring. It is often wise to remove the spring as it tends to bind the stationary mask to the moving dial and to collect grit. Later runs left out the spring and put spring action in the light reflector. It is not necessary, however. Next, slip on the dial scale. If there is any play from a large key slot on the inner edge of the dial, a spot of household cement or small piece of scotch tape will hold it tight. The thin paper washers which go on next are there to prevent the dial scale from slipping, however they sometimes shrink or are damaged. Put on the station locator ring. Tightening the five screws should cause this ring to lie flat on the plunger assembly, yet holding the dial scale firmly.

Do not put oil or grease on any of the slipping rings or masks, as it will collect dirt or dry out and turn gummy causing binding in a short time.

Station tabs often become loose. A ring of scotch tape on the inside of the station locator ring will hold them firmly in place and still allow easy replacement. Don't use cements or glues to hold the tabs in place. They are very permanent and there is extra money in replacing worn out or cracked tabs which damage easily in their exposed position.

Occasionally you will find that a plunger will not stop the dial when it is revolved in the automatic position. If the screws holding the station locator ring are tight and the ring in place, yet the plungers do not lock in the gate, put three small washers under the gate to stand it off from the main mounting bracket.

The afc shorting switch which is part of the gate assembly, often becomes permanently closed. If the afc is dead in any of these sets, check this switch after checking the afc tubes. The two contact springs can be adjusted by twisting a screwdriver between the springs at their base.

Charles Seeger.

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Testing Socket Voltages

In making measurements from the underchassis of a receiver it has been found, on occasion, that voltages were present at the soldering lug on the socket but were absent at the tube prong; that is, the socket connection was open between the soldering lug and the tube prong—under the wafer.

Because of this possibility it is advisable to make all measurements from the tube prong directly.

Harold C. Dow

Auto-Radio . . .

Fada 267

The Fada Model 267 is a 6-tube automobile radio using glass tubes in a superheterodyne circuit. It covers the frequency range from 535 to 1620 kc. A power output of 3 watts is available at the 6½-inch electrodynamic speaker. The total current drain, at 6.3 volts, is 5.8 amperes. A complete circuit diagram is given in Fig. 1, with the tubes used, their functions and the voltages encountered on the socket prongs lettered on the diagram. These voltages were measured with an input battery voltage of 6.0 volts on a 1000-ohm-per-volt voltmeter. The volume control was on full and the antenna was shorted to the chassis during the measurements. Since the voltmeter introduces a considerable load on the circuits, these voltage readings are not indicative of effective values.

Alignment Procedure

Connect an output meter across the primary of the speaker transformer or across the voice coil. Connect the generator ground lead to the receiver chassis. The chassis should be in its case and connected to a good external ground. Set the receiver dial to some quiet position near 1000 kc. Turn the volume control on full. Turn on the receiver and signal generator and allow both at least 15 minutes to warm up.

I-F Alignment

Remove the control grid lead from the 6A7 converter tube and connect a 50,000-ohm carbon resistor in series with it and the tube's grid cap. Connect the signal generator output lead through a 0.001-mfd condenser to the 6A7 tube's grid cap.

Set the signal generator for a signal of 175 kc. Attenuate the signal from the generator to prevent the leveling-off action of the receiver's avc.

Adjust the three i-f trimmers, T-1, T-2 and T-3, in that order for maximum output. The location of these trimmers is indicated in Fig. 2.

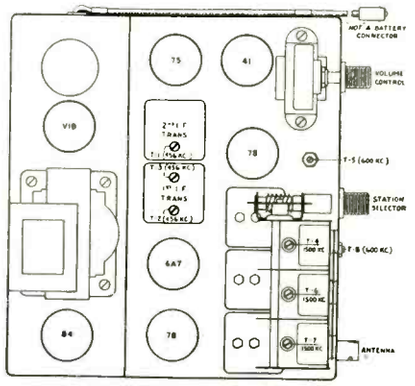


Fig. 2. Parts layout and trimmer locations.

Repeat the i-f adjustments for greater accuracy.

R-F Alignment

Remove the antenna lead, the 0.001-mfd condenser and the 50,000-ohm resistor from the 6A7 grid circuit. Replace the grid lead on the tube's grid cap. Connect the generator output lead through a 200-mmfd condenser to the antenna lead socket.

Tune the receiver and signal gen-

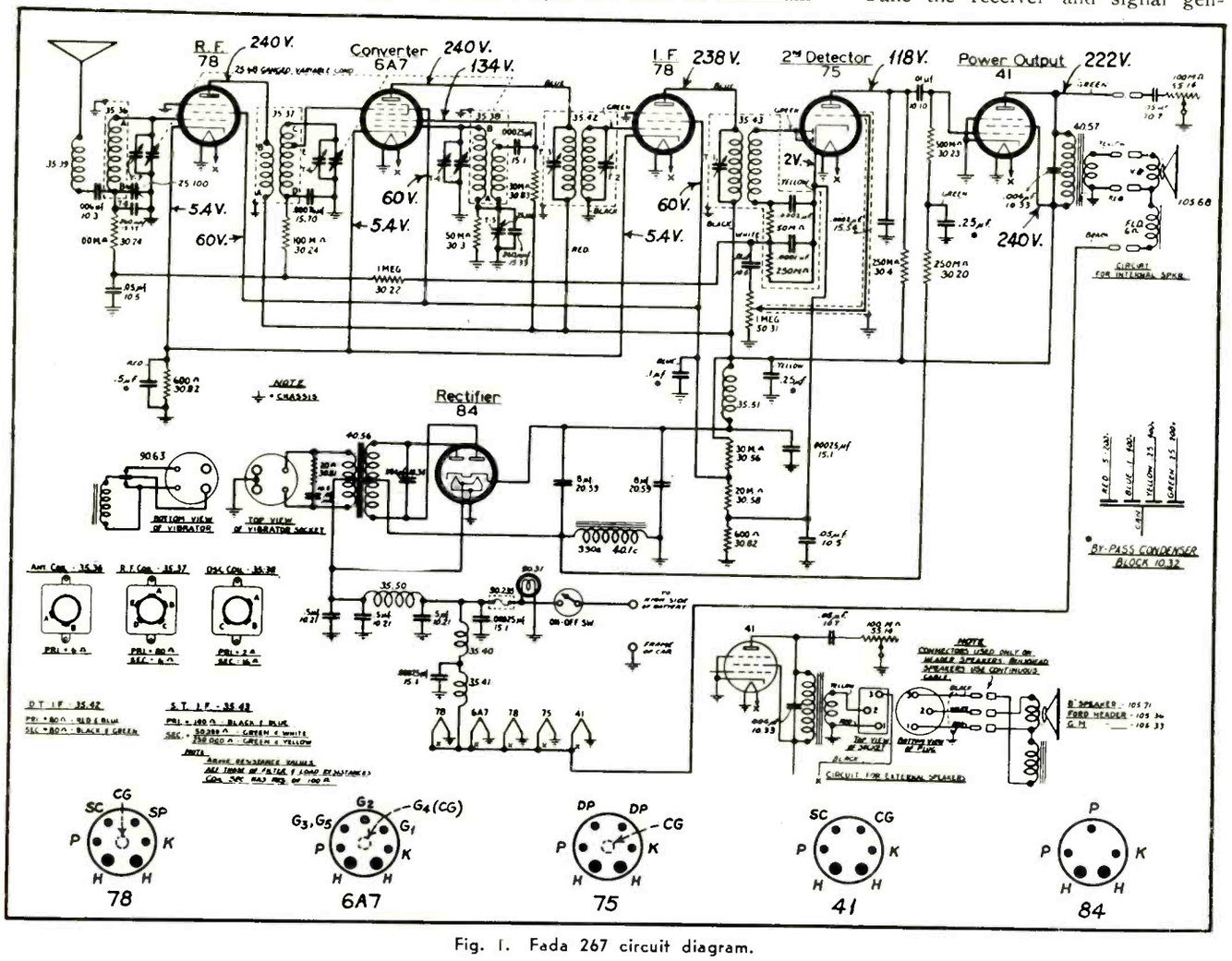


Fig. 1. Fada 267 circuit diagram.

recommended that the low-capacity position (red dots adjacent) be used.

In some installations, where there is not much room to work, it is advisable to adjust the antenna coupling trimmer before bolting the receiver in place.

The wiring of the antenna plugs is such that, in the low capacity position, C-27 is in series with the antenna to the high tap on the antenna coil. In the high capacity position, C-27 is in series with the antenna to the low tap on the antenna coil. These connections may be traced on the schematic diagram.

Audio degeneration is provided by returning a portion of the voice coil voltage of the proper phase to a section of the volume control. This is accomplished by grounding one side of the voice coil and connecting the high side of the voice coil through the capacitor (C-34) and resistor (R-23) to the resistor (R-24) which is in series with the volume control to ground.

The use of degeneration improves the frequency response and reduces nonlinear distortion introduced by the audio amplifier.

Alignment Procedure

All trimmers for aligning the receiver can be reached by removing the speaker cover. When the speaker cover is removed from the case, the field return should be made by a jumper lead between the speaker cover and case. The alignment adjustments should be made with the test oscillator output at the lowest level which will give a readable output indication.

I-F Alignment

Connect an output meter across the voice coil of the loud speaker. Place a modulated 175-kc signal on the grid of the converter (6A8) tube through a 0.05-mfd condenser. Set the volume control at maximum and adjust second i-f trimmer and the first i-f secondary and primary trimmers in the order mentioned for maximum output. Readjust all the trimmers to insure accurate alignment.

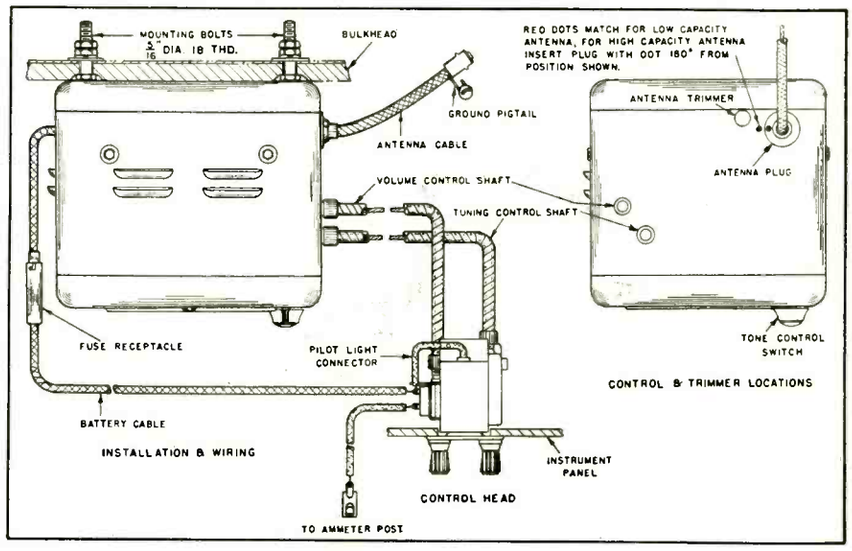


Fig. 4. Installation and wiring.

R-F Alignment

Attach the flexible cables to the control head and to the proper bushings on the receiver. Make sure that the control head is rigidly fastened and that its relative position in respect to the receiver will not change.

Adjust the scale calibration by rotating the station selector knob in a counterclockwise direction until the low frequency end of the dial has reached its stop and until the gang plates are completely meshed.

Item	*Condenser*	*Item*	*Condenser*	*Item*	*Resistor*	*Item*	*Resistor*
C1	0.05 mfd	C16	0.02 mfd	R1	270 ohms	R13	47,000 ohms
C2	0.1 mfd	C17	0.5 mfd	R2	100,000 ohms	R14	430 ohms
C3	0.1 mfd	C18	0.5 mfd	R3	47,000 ohms	R15	470,000 ohms
C4	0.05 mfd	C19	0.5 mfd	R4	1 meg	R16	3,900 ohms
C5	100 mmfd	C20	0.002 mfd	R5	22,000 ohms	R17	390 ohms
C6	0.1 mfd	C21	0.05 mfd	R6	27,000 ohms	R18	270 ohms
C7	100 mmfd	C22	0.02 mfd	R7	220,000 ohms	R19	47 ohms
C8	100 mmfd	C23	0.25 mfd	R8	3,300 ohms	R20	270 ohms
C9	0.01 mfd	C24	0.1 mfd	R9	1 meg	R21	
C10	250 mmfd	C34	0.05 mfd	R10	390 ohms	R22	27,000 ohms
C11	0.02 mfd	C35	5 mfd	R11	150,000 ohms	R23	22,000 ohms
C12	0.1 mfd	C36	8 mfd	R12	470,000 ohms	R24	2,700 ohms
C14	0.002 mfd	C37	10 mfd				
C15	0.008 mfd						

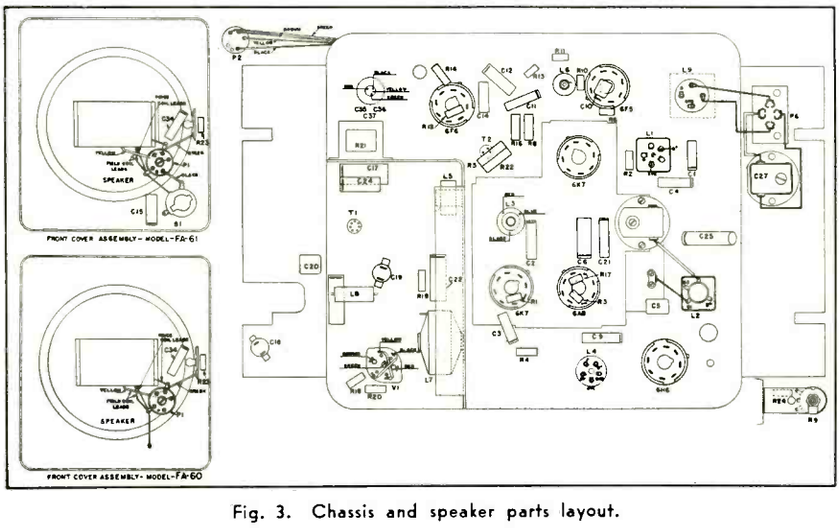


Fig. 3. Chassis and speaker parts layout.

Set the test oscillator to 1,500 kc with the modulation "on." Connect its output through a 250-mmfd condenser to the prong nearest the red dot on the receiver antenna receptacle. Set the receiver dial to 150 and peak the oscillator (C-30), r-f (C-29) and antenna (C-28) trimmers respectively (see trimmer location drawing) to give maximum deflection on the output meter.

Set the test oscillator to 580 kc and tune the receiver to this signal. Peak the 580-kc capacitor (C-26) while rocking the tuning condenser back and forth through resonance. Leave the

(*Continued on page* 495)

Public Address . . .

Bogen 2W Wireless "Commuo-Phone"

THE BOGEN WIRELESS "Commuo-Phone" Model 2W is an intercommunicating telephone system using the usual power lines both for power and to carry voice currents. Two or more may be operated, but since the model is not selective all stations will hear all conversations.

The unit will operate on 105 to 125 volts, either a-c or d-c and consumes about 32 watts.

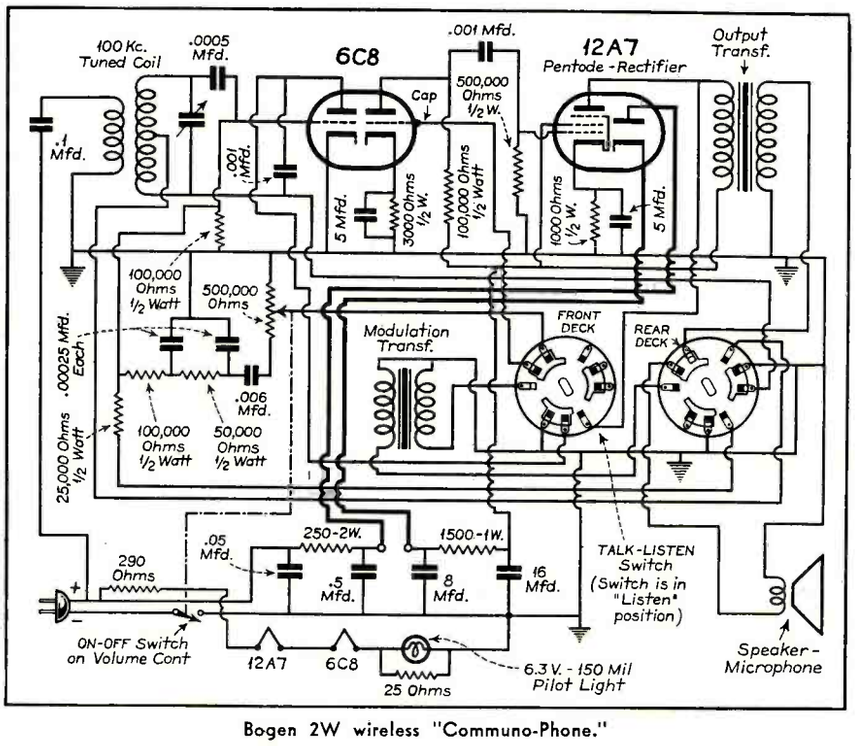
THE CIRCUIT

Two tubes are used in the Model 2W, a 6C8 twin triode and a 12A7 combination power output pentode and half-wave rectifier.

With the talk-listen switch in the talk position, the signal generated in the speaker-microphone voice coil is fed (through the talk-listen switch) into the primary of the modulation transformer. The secondary of this transformer is coupled (by means of the talk-listen switch) to the grid of one section of the 6C8 twin-triode tube. This section is used as a resistance coupled a-f amplifier and amplifies the a-f signal feeding it through a 0.001 mfd coupling condenser to the grid of the pentode section of the 12A7 tube. The signal is further amplified in this stage and passed on to modulate an r-f carrier of approximately 100 kc generated in the other section of the 6C8 tube. The modulated carrier is fed through an 0.1 mfd condenser into the power lines. The 0.05 mfd condenser and 250 ohm resistor block it from entering in the rectifier circuits.

The filaments of the tubes are operated in series with a suitable dropping resistor across the a-c, d-c lines. Direct current for the plate, screen, and grid circuits is also obtained from the a-c, d-c lines, but is rectified by the rectifier section of the 12A7 tube. A brute-force filter consisting of an 8 mfd input condenser, a 1500 ohm, 1-watt resistor and a 16 mfd output condenser is used to smooth out the ripples.

With the talk-listen switch in the listen position the signal passing along the power line is fed through the 0.1 mfd condenser to the primary of the tuning coil. The signal developed across the tuned secondary circuit is fed to one section of the 6C8 tube. The talk-listen switch functions to convert this stage from a tuned oscillator to a tuned diode detector stage which rectifies the signal and passes the a-f modulation on to the other section of the 6C8 tube. This stage, still acting as a resistance coupled a-f amplifier, passes the amplified signal on to the pentode section of the 12A7 tube for further amplification. From there it is fed through the output transformer (through the talk-listen switch) to the speaker-microphone.



Bogen 2W wireless "Commuo-Phone."

CONNECTIONS

For intercommunication between two or more points the required number of units are (each) plugged into the nearest electric outlet of the proper voltage. There are no other connections to make unless the outlets used are wired on opposite sides of a common ground. In this case the two circuits should be bridged at the fuse box or meter with a paper condenser about 1 mfd, 400 volt rating. The condenser will permit the voice currents to cross between the legs without consuming power.

If the device is used on d-c, it may be necessary to reverse the power plug to obtain correct polarity.

The maximum distance between stations is governed by local conditions such as wiring, power load, location of electric meter, etc. Some electric devices such as motors, flashing signs, oil burners, etc., radiate man-made static which in some locations causes considerable annoyance to radio listeners and may cause similar disturbance in the "Communo-Phone." If the source of the noise can be determined it can be reduced or entirely eliminated by the use of condensers or noise filters in the usual manner.

Caution: A ground should never be connected to the chassis of the "Communo-Phone."

OPERATION

The knob in the center of the front panel operates the talk-listen switch which controls the direction of conversation. It normally holds itself in the listen position. To communicate with other stations it is necessary to depress the switch to the talk position. The switch must be similarly operated, at the remote station, to return the conversation. The volume of sound received can be controlled at each station by means of the control provided. All stations partaking in a conversation must be kept on throughout such conversation.

Although the units are designed to operate at 100 kc, and are adjusted to that frequency in manufacture, they may be operated at any other frequency within the adjustable range of the trimmer condenser. It is essential, however, that all stations on one intercommunicating circuit be adjusted to the same frequency as closely as possible to assure best results.

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MICROAMPERE MEASUREMENTS

By O. J. MORELOCK*

MOST SERVICE MEN HAVE now had enough experience with receiver circuits of the high-impedance type to become familiar with applications requiring high-sensitivity voltage measurement

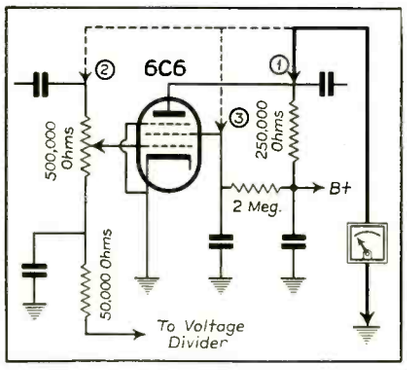

Fig. 1. Measuring plate, screen and grid potentials in a typical resistance-coupled circuit.

where actual circuit conditions would be distorted by heavy meter drain.

In measuring plate, grid, and screen potentials (Fig. 1), or determining cathode potentials in power detector, avc and volume expander circuits (Fig. 2), or in measuring cathode-ray tube plate potentials in experimental and television receivers (Fig. 3), the 1000- or even 2000-ohm-per-volt voltmeter would hardly be adequate. In a great many cases, however, the impression still exists that these applications of a high-sensitivity meter are limited to a few voltage measurements in high-resistance circuits. Yet there are practically as many applications where current measurements must be made in the range from 1 to 20 microamperes. Obviously if the measurements are to be at all accurate a meter providing a reasonably large deflection in this range is required.

*Engineering Dept., Weston Electrical Instrument Corp.

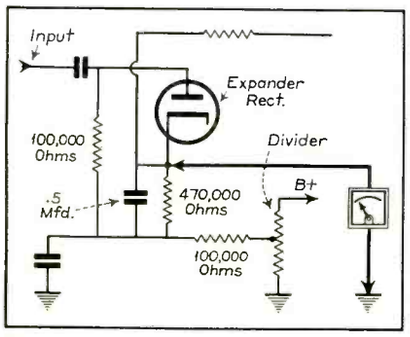

Fig. 2. Measuring cathode voltage in an expander circuit with a high-sensitivity instrument.

Oscillator Grid Currents

Measurement of grid current in oscillator tube circuits will often indicate degree of oscillation or dead spots in cases of erratic operation. These currents are, in general, of the order of 10 to 100 microamperes in superheterodyne oscillators; occasionally such currents may reach 200 microamperes. A zero-current condition would indicate a dead spot.

AVC Diode Current

The diode current in an avc circuit varies from ½ to 15 microamperes depending upon the strength of the signal passing through the receiver. In Fig. 4 a typical diode detector circuit is shown connected across an i-f transformer.

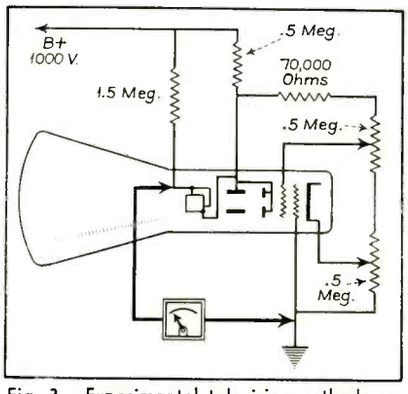

Fig. 3. Experimental television cathode-ray tube circuit. The plate potentials are supplied from a 1000-volt source through high resistances.

As a signal appears across the tuned circuit, current will flow in the diode circuit and a voltage caused by the current through the 500,000-ohm diode load resistor is fed back to the grid circuits to control the incoming signals. The source of all avc action is this small diode current—measured in microamperes and proportional to the signal strength. This d-c is actually rectified r-f signal and must be generated before control action can start. If the avc circuits are suspected of causing trouble in a particular receiver measurement of the diode current would be a proper check; connections for this are shown in Fig. 4.

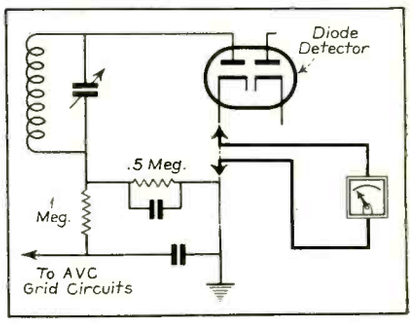

Fig. 4. Typical diode detector and avc circuit. Small currents in this circuit are an indication of the functioning of the circuit.

A similar measurement in the diode detector (if that is a separate circuit) can be made to determine if the tube is rectifying. A zero-current indication in this circuit will indicate that no signals are being fed to the audio amplifier and, of course, no signals will be present in the speaker.

Output Tube Grid Currents

Some types of power output pentodes will distort when gassy or if the circuits in which they are used are so designed that grid current may flow. Fig. 5 shows how a high-sensitivity microammeter can be inserted in the ground side of the grid coupling resistor and a grid reading taken. If the reading is over 1 or 2 microamperes, even on strong signals, it should be taken as a sign of distortion. The tube should be checked for gas and if necessary the circuit corrected by increasing the bias on the tube.

Balanced AFC Circuits

The discriminator tube in an afc circuit shifts the bias on the control tube in proportion to the frequency off resonance of the i-f signal. The type 6H6 tube is usually used for this purpose, as its independent cathodes make it possible to effectively operate the two rectifiers in series. The circuit, Fig. 6, shows a discriminator tube of the type mentioned wherein the two diode circuits must give balanced current or balanced drop when the intermediate frequency amplifier is in exact resonance with the difference frequency

(*Continued on page 498*)

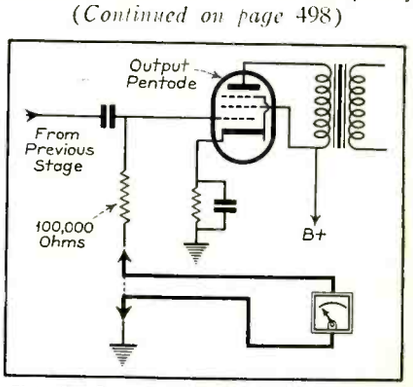

Fig. 5. Power output tube circuit. Excessive grid current indicates distortion.

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RECEIVER CASE HISTORIES

G.E. K-64

Inoperative: Motorboats on certain settings of the volume control. This is usually caused by an open in the 8-mfd condenser (C-38) in the three-section electrolytic block.
Hum on the regular broadcast band: This is often due to an open 4-mfd section (C-20) in the same block.
Hum on the short-wave band: May be caused by the third condenser in this block (C-22), also 4 mfd.

These condensers are located in a cardboard container on the top side of the chassis. If trouble develops in any of the three sections, a return call may be avoided by replacing the entire block.

Howard J. Surbey

•

RCA 6K1

Service notes: This receiver is similar to Model 6K except for minor changes which include: (1) A 5W4 rectifier used in place of the 5Z4. (2) The 0.063-ohm heater resistor (R15) is omitted. (3) A three-point tone control (S3) used in place of the variable tone control (R14). (4) Different power transformers.

The tone control (S3) is connected as follows: Viewing tone control from rear and starting from counter-clockwise lug, lug 1 connects to a 0.017-mfd capacitor (C30), the other side of this capacitor (C30) connects to chassis. Lug 2 connects to the junction of capacitor (C20) and resistor (R9). Lug 3 is not used. Lug 4 connects directly to the plate contact of socket No. 5.

The d-c resistance of the power transformers are: No. 12644, Pri. 8.6 ohms, Sec. 745 ohms. No. 12645, Pri. 12.9 ohms, Sec. 1120 ohms. No. 12646, Pri. 24.5 ohms, Sec. 760 ohms. The voltages for the 5W4 rectifier are: Plate to plate, 692 volts. Either plate to chassis-ground, 346 volts. All other voltages remain the same.

All service data for Model 6K are directly applicable to these receivers except the changes stated above.

•

RCA 6K10, 6T10

Service notes: These instruments are similar to models 6T2 and 6K2 except for cabinet design. Service data for models 6T2 and 6K2 are directly applicable to these instruments.

•

RCA 7X1

Service notes: This receiver is identical to the Model 7X except for cabinet design. All service data for the Model 7X are directly applicable.

•

RCA 8K1

Service notes: This receiver is identical to the Model 8K except for cabinet design. All service data for the Model 8K are directly applicable.

•

RCA 9K10

Service notes: The chassis and speaker for this instrument are identical to the model 9K2. All service data for the 9K2 are directly applicable to these instruments.

•

RCA 121, 122

Inoperative: (See G. E. K-64.)
Hum on regular broadcast band: (See G. E. K-64.)
Hum on short-wave bands (See G. E. K-64.)

•

Wells-Gardner 7L, OEL, 2DL

Types of dials: Four distinct types of dials are used in these receiver models. Each type is supplied in two sizes. When ordering dial parts specify the type of dial; size of dial; name on dial or escutcheon and model or series number of radio.

Under the general heading of pointer dials, there are the Nos. 2 and 4.

The No. 2 dial is of the external pointer type. Each frequency calibration on the dial scale has a different color. A circular micrometer scale, numbered to 10 is also employed.

The No. 4 dial is also of the external pointer type, but employs gold etched dial scales. The micrometer scale is ten sided and is numbered to 100.

A rear view of the pointer dial is shown in the accompanying illustration.

Under the heading of phantom light dials there are the Nos. 3 and 7.

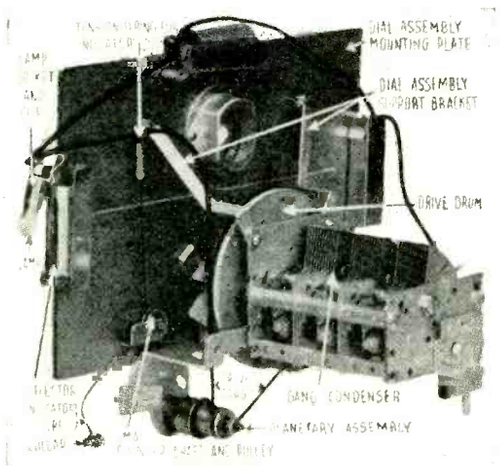
The No. 3 dial is of the moving beam of light indicator type with a celluloid translucent background. The No. 7 dial is similar but has a mirror background. The rear view of the phantom light dial is shown in the accompanying illustration.

In each of the above types of dial there are two sizes known as the 7-in and the 9-in size. The size of the dial is not determined by the length of the glass, but by the horizontal distance across the opening of the escutcheon. The 7-in dials have the upper corners cut off and are approximately 8-in in length. The 9-inch dials are rectangular in shape and are approximately 10 inches in length.

•

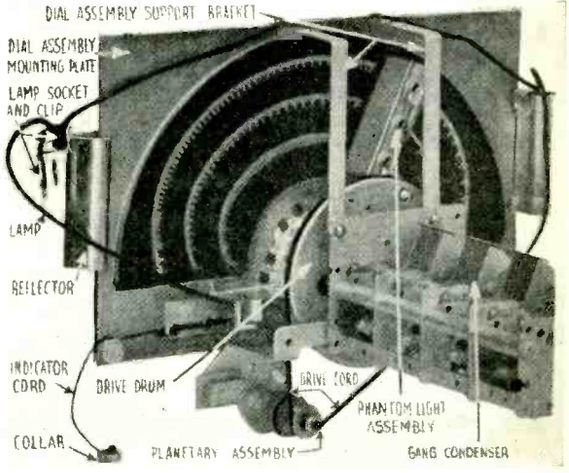
Westinghouse WR-37

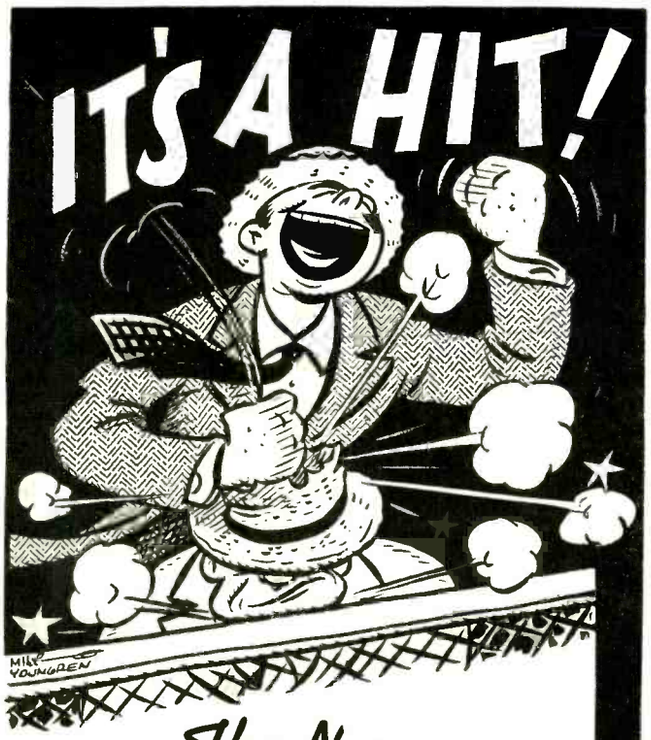
Inoperative: (See G. E. K-64.)
Hum on regular broadcast band: (See G. E. K-64.)
Hum on short-wave band: (See G. E. K-64.)



Left:
Back view of Wells-Gardner pointer dial mechanism.

Right:
Back view of Wells-Gardner phantom light dial mechanism.





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Zenith Stratosphere (Chassis 2501)

Weak and distorted: Check driver transformer (1) for open or short. The audio signal will be weak and a hum evident if the transformer is shorted.

Too many high-frequency notes, low notes lacking: An open center-tap on the driver transformer (1) may cause a loss of low notes. An open 5-mfd condenser (C-14) in the cathode circuit of the 85 tube may also cause similar difficulty, as may a grounded 50,000-ohm resistor (R-4) on tone control or a shorted section on the low-boost transformer.

Motorboats on all bands: This may be caused by an open 0.5-mfd condenser to the 85 socket.

Weak and distorted on all bands: This may be caused by an open 1500-ohm resistor (R-28) in the cathode circuit of the first audio stage.

Fluttering as tone control is rotated: This may be caused by an open or shorted 0.1-mfd condenser (C-4) in the tone control circuit.

•

Zenith 10-S-30, 10-S-155, 10-S-156, 10-S-160, 10-S-147, 10-S-153, 10-S-157 (Chassis 1004)

Off at low-frequency end of dial: If regular alignment procedure fails to correct a large discrepancy between the actual station frequency and the dial reading at the low-frequency end of the broadcast band, check the 600-kc padder for a broken lug or loose wire, etc. Also check the 0.0012-mfd condenser (C-6) in the oscillator plate circuit.

Insensitive on broadcast band: Lack of sensitivity on the broadcast band in these receivers is often caused by an open r-f plate choke.

Noisy in spots on C band: Check the dial pulley; move it away from the dial pan. Poor contacts on any of the band, tone or sensitivity switches may cause noise. A defective volume control will also cause noise as will a defective 16-mfd condenser (C-21) in the screen circuits.

Weak: Lack of volume on these receivers is often caused by an open second-detector cathode resistor or cand-ohm. This will also affect the tone quality. The 0.00025-mfd condenser in the tone circuit will also cause a loss in volume if shorted. This is noticeable on the high-fidelity position of the switch and will also cause distortion. If the volume is low with the tone switch in the normal position, check the switch for a short to the foreign lug.

•

Zenith 12-U-158, 12-U-159 (Chassis 1203)

Off scale: If gain is low in these models and alignment appears difficult check the 20-ohm resistor (R-16) in the screen of the first detector for an open. Also check the 50-mmfd condenser (C-4) in the oscillator circuit. Replace where necessary.

Noisy: Where noise is definitely traceable to the chassis—after the tubes, antenna and ground systems have been checked—check the contacts on the band switch, the volume control, coil wires, sensitivity switch, air trimmers and the 16-mfd screen condenser (C-21) as possible noise sources.

Noisy on D band: Clear the gang condenser bonds away from the chassis holes. Check the wiring of the D-band tuned circuit for shorts. Check coils for loose soldering on lugs.

If the receiver is off scale on this band as well as noisy replace the 50-mmfd condenser in the oscillator circuit.

Stations ride-in: Check the alignment. Check the 0.0012-mfd condenser in the oscillator plate circuit; replace if necessary.

Lack of sensitivity on ultra-short-wave band: Extreme pickup cannot be expected on this band, however, the following will affect operation on this band: open oscillator coil, open or shorted 0.0012-mfd condenser in the oscillator plate circuit, shorted 50-mmfd condenser across the h-f coil, grounded trimmer on the first detector section of the gang condenser.

The length of wires and position of the coils, etc., on this band will affect operation on the entire short-wave band. An open 5-ohm resistor at the h-f coil will give spotty sensitivity. The first detector tube, in particular, has a great effect on ultra-short-wave reception.

Distortion: This may be caused by an open 16-mfd condenser (C-21) in the screen circuit, or a shorted 10-mfd electrolytic (C-20) in the cathode circuit of the output tubes. Open cathode circuits or defective by-pass condensers may cause similar troubles. A shorted 0.005-mfd condenser (C-22) in the plate circuit of one of the output tubes will also cause distortion and loss of output. Distortion only when the tone switch is on normal can be caused by a short between the lugs on the switch.

Carrier or modulation hum: This may be caused by an open electrostatic shield on the power transformer. Reversing the a-c plug often cures the trouble. A 0.001-mfd condenser (400-volt rating), connected from one side of the power line to the receiver chassis will often help.

A shorted 0.005-mfd condenser (C-22) will often cause a similar hum, as will poor tubes or a grounded tap on the volume control.

Poor on high-frequency notes: An open 0.00025-mfd condenser (C-15) in the tone control circuit may cause this failing. An open tone tap on the volume control will cause a loss of highs, but under such circumstances the tone control will have no effect.

Inoperative: Audio stages O.K. but r-f dead. Check the 5-meter coil for open circuit (broken loose from the condenser gang terminal). Check gang and trimmer condensers for short circuits. Check coils and by-pass condensers.

Broadcast band off scale: Check pointer. The dial pointer should line up across the dial scale parallel to the line with the gang condenser plates fully meshed.

The air trimmer for the B band as shown in earlier receivers and listed on service sheets is not used on later models. The Broadcast- and D-band trimmers are in the same positions as shown on these sheets.

•

Zenith 91, 92

Inoperative: Occasionally, when these models are inoperative, reception can be obtained by removing the 24A tube used as an avc tube from its socket. This is usually caused by an open circuit in the avc voltage divider between the tubes cathode and screen. Replace if necessary; value 15,000 ohm.

RCA Service Tip File

•

Zenith 705

Hum and distortion: Bad hum and distortion in these models is often caused by a defective volume control. In many cases the control will not be suspected because it will still function. Replace where necessary; value 1 megohm.

RCA Service Tip File

•

Zenith 807

Distortion: Distortion in this model may be caused by an occasional short in the 0.005-mfd condenser which connects the band switch to ground by one of the many terminals on the switch. Replace if necessary.

RCA Service Tip File

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25,000 OHMS PER VOLT METER. This Super-Sensitive meter is available on Models 551, 541 and 502 at $5.00 extra cost.

BRONZE PANELS—OAK CASES. Each SUPREME instrument is housed in the distinctive Oak "lifetime" case with genuine bronze panel.

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"ISO—GRAD" METER CIRCUIT. Supreme uses a patented circuit which makes possible evenly divided A.C. voltage readings.

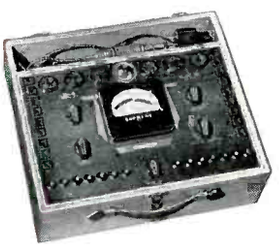
FREE REFERENCE POINT SYSTEM. Makes possible circuit readings from top of the chassis.

MODEL 546

Combines laboratory efficiency with the greatest value ever offered in full-size oscilloscopes! Complete with built-in horizontal and vertical amplifiers. Utilizes the full-size 3" screen cathode ray tube. Used for measurements of A.C. Wave forms, frequency, phase, tube characteristics, hysteresis, hum distortion, A.C. peak volts, overload of A.F. or I.F. amplifiers, vibrators, transmitters, etc. Use with R.F. Signal Generator for visual alignment work.

Dealer's Net Cash Wholesale Price..... $59.95

Or, $6.50 cash and 10 monthly payments of $5.95



MODEL 502 Tube and Radio Tester

When we say that this model is a serviceman's dream come true, we mean just that. Imagine having five tests for every tube PLUS nineteen additional ranges and function of .2 to 1400 A.C. volts in four ranges; .1 ohms to 20 megohms in five ranges; .2 to 1400 A.C. volts in four ranges; .2 to 1400 A.C. volts in four output ranges PLUS an Electrostatic capacity leakage test on a neon bulb and PLUS an Electrolytic filter capacity leakage test on a "Good-Bad" English reading scale. A complete, quality tube tester and set tester in a space 10½ in. x 5 in., weighing only 16 lbs. at this new low price!

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MODEL 551 Analyzer

This extraordinary new model is not only a 'set tester' but provides a method of making voltage, current and resistance readings directly from the tube socket without removing the chassis from the cabinet! Analyzes all voltages from 0.2 to 1400 volts A.C. in 4 ranges and 0.2 to 1400 D.C. volts in 4 ranges at 1000 ohms per volt. Three D.C. current ranges of 0.2 to 1400 volts A.C. Self-contained ohmmeter circuit measures 0.1 to 20 megohms in 5 ranges. 20 functions and ranges in all!

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A corner of Mr. Tressler's service shop, located in Elmira Heights, a suberb of Elmira, N. Y. The largest service shop in Elmira—employs three service men. Mr. Tressler has a service background of thirteen years.

says Mr. Owen O. Tressler

"I have used Centralab volume controls for the past three years, and FIND THEY CANNOT BE EQUALLED. Not only are they quiet in operation, but they FIT the sets they are built for."

Mr. Tressler is but one of the many service men throughout the land who prefer CENTRALAB controls for satisfactory replacements. Manufacturers, experimenters and set builders have in growing numbers changed to CENTRALAB for better performance.

Specify "CENTRALAB."

Centralab

ASSOCIATION NEWS . . .

NEW YORK TRADE SHOW

"I have been in conference with Ken Hathaway, our managing director," said A. A. Berard, sales manager for the Ward Leonard Co., chairman of the Sales Managers Club, Eastern Group, and vice president of the Radio Parts Manufacturers National Trade Show "and we feel highly elated over the prospects for an outstanding parts show here in New York this fall. The fact that within two weeks after the announcement of the show went to the trade, and in spite of the vacation period, the number of booths contracted for was as great as for the same period before the Chicago Show, is an indication of the manufacturers' acceptance.

"This fall showing of our products is one of the greatest assets to the entire parts industry," continued Mr. Berard. "It comes right at the opening of the fall and winter season, and enables manufacturers to show the trade what they have to offer, and provides a central point for the trade, including the jobber, engineer, Service Man, and amateur to get an inside view of the latest devices offered for their use."

Everything is in readiness for the Radio Parts Trade Show at Commerce Hall in New York City, October 1 to 3.

Early reports indicate that parts jobbers and sales representatives, as well as engineers, Service Men, and amateurs from all along the eastern coast and beyond are planning to be in attendance. The demand for exhibition space on the part of the manufacturers has already exceeded the anticipations of the management of the show; and numerous advance reservations for rooms at the Victoria Hotel, the Show Headquarters, have already been made.

Especial attention is called to the fact that while the 1937 New York Radio Parts Trade Show is to be held in Commerce Hall, the Victoria Hotel is the Show Headquarters.

Commerce Hall is located in the Port of New York Authority Building at 15 Street and Eighth Avenue; and the Victoria Hotel is at 51 Street and Seventh Avenue. Commerce Hall and the Victoria Hotel are connected by the Eighth Avenue Independent Subway, less than 10 minutes apart.

Commerce Hall, where the 1937 New York Radio Parts Trade Show will be held October 1 to 3, is one of the largest exhibition halls in the world. It occupies the entire second floor of the Port of New York Authority Building at 15 Street and Eighth Avenue in New York City, and is more than 200 feet wide and 750 feet long.

The Radio Parts Trade Show will occupy whatever part of the mammoth area is required, about 25,000 square feet, which portion will be self-contained.

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PRSMA NEWS

Was the Auction a success? Ask the man who bought some. And the man who sold some was as high pressure as ever. Thanks, boy, you helped a lot.

Boys, be sure to come out to the next meeting and get the low-down about our annual picnic. Non-members are also invited. In fact, we want every Service Man in Philadelphia and other places to come out and frolic at our outing. It's a swell chance to get acquainted as well as have a good time.

The SOS we sent out to lost or strayed members met with quite a success. They showed up at the last meeting. We now wish to broadcast for the following missing persons: Benson, Deitz, Metzger, Van-Horn, Wallace, Oldach, Brosky, Zeismer, etc.

One from the fields: A lady told Thorn the other day that she thought the KC on the dial was an abbreviation for Knights of Columbus.

We ran up to see Gene Kohler after he returned from his honeymoon a few weeks ago . . . and they tell us he's off again for a week's vacation!

The "picnic and-or party and-or dance" contest is getting hotter. What do you want to do with our money? Let the entertainment committee know so you are sure to be satisfied. If you don't—no squawks!

These hot nights are hard on board meeting attendance. Maybe they should be held on the roof, too.

Pharmacists say "precise control over every ingredient." You say "precise control over every part." Your experience should be the constant control for the highest grade of material to meet your necessary guarantee. There is no second best when you pay for it. There should be none when you are being paid for it.

We haven't had as lively a business meeting as we had on these days last year. Remember the birth of the constitution and the defense of our advertising plans? Maybe the progress is easier now.

Larry Oebbecke is still turning 'em away. My, my how the manufacturers clamour for our outlet. And we don't even buy their stuff. But we're the boys who keep it sold to those who do.

The board membership is settled again and it reads like the front row of interest at all meetings.

P. R. Smeigh, Jr.

•

RADIO SERVICE ASSN. OF CALIFORNIA

Our "If" meeting turned out to be quite a thing. Doggoned if we didn't have a better than usual turnout and a really enjoyable session, a symposium on vacations, as it were. Several of the fellows told of interesting experiences and then we got Wil loosened up on his Yellowstone trip and got as nice a travel talk as you could ask for.

The picnic plans are under way! Save Sunday, Sept. 12 for the Annual RSAC Picnic at Russelmann Park. We're going to try to make this a bigger and better blowout than last year's and that'll be going some! Tickets will be on sale at this next meeting and we think there's a plan whereby it will be to our advantage to buy them early.

Do you remember our forgotten man of last year's picnic! We still have a vivid picture of that poor, disheveled, defenseless character standing there in that hail of rolling pins. He's taken a rest cure, but, alas and alack, little does he dream that his days are so few. The Wives have had a whole year's practice since his last misfortune. He'll probably show up with quite a jaunty air but we predict that he'll be very horizontal when he leaves.

H. R. Anderson, S'ecy.

•

ART OF BRITISH COLUMBIA

Our fifth annual picnic was held on Sunday July 11 at Newcastle Island. In every way this was the most successful picnic held by the Association. We had a larger attendance, and, in contrast to previous years, when we finished up with a deficit, a nice profit was realized. About 150 were in the party from Vancouver. About 50 members and their friends came from Victoria.

Many comments were heard about the good time which everyone had and the thanks of the Association are hereby tendered to the following who worked so hard on the Committee to make this picnic a success: G. Cresswell, R. Winstone, W. Munton, A. Birnie, G. Moore, G. Blake-Knox, T. Brown, J. Birks, D. McKim (Victoria), E. McMillan, chairman.

The International Radio Service Convention is scheduled for August 25 and 26 at the Stanley Park Pavilion. Reservations pouring in from Seattle, Spokane, Bellingham and points throughout the Province, coupled with the calibre of speakers we have been able to secure from Toronto, Montreal and the United States, assures the success of the convention beyond our fondest dreams.

Special entertainers for the stag are being brought from Seattle. Our only fear for this event and for the Dinner Dance is that we will not be able to accommodate half those wishing to attend.

However, I wish personally to ask Technicians in Vancouver to attend the technical sessions as we shall judge the merit of staging future conventions largely on the local attendance; for while we welcome our guests from distant points the convention is primarily for you.

Among our speakers: R. A. Hackbush, Fellow of IRE, chief engineer, Stromberg Carlson, chairman, Engineering Division, RMA of Canada; N. R. Olding, regional engineer, C. B. C. Ottawa; R. M. Foster, chairman, Service Division, RMA of Canada, chief engineer, Canadian Radio Corp.

Engineers of Canadian Marconi Co. will present a display of beam radio equipment controlling model Douglas transport plane.

Lectures on: Oscilloscope—electric organ—radio set design—automatic frequency control—modern radio transmitter—etc., etc.

From ART Bulletin.

•

RAYTHEON CONTEST PRIZE WINNER

George F. Chastain of Monett, Mo., was the grand prize winner of the recent Raytheon Service Man's contest.

Mr. Chastain's entry was considered the best of thousands submitted, according to the judges, and he was a very surprised and delighted young man. Recently married, he will probably have plenty of places to put this windfall.

GENERAL DATA—continued

Signal Generator Connection	Dummy	Signal Generator Frequency	Band Switch Position	Dial	Peak Trimmer
		I-F ALIGNMENT			
Short circuit stator and rotor of front gang condenser section.					
6A7 Grid	0.25 mfd	456 kc	Brdcst	600 kc	Second i-f
6A7 Grid	0.25 mfd	456 kc	Brdcst	600 kc	First i-f
Repeat i-f alignment.					
		R-F ALIGNMENT			
Remove short circuit from gang condenser.					
Ant connection	200 mmfd	1500 kc	Brdcst	1500 kc	BC osc[1]
Ant connection	200 mmfd	1500 kc	Brdcst	1500 kc	BC ant[2]
Ant connection	200 mmfd	600 kc	Brdcst	600 kc	BC pad[3]
Repeat 1500 kc adjustments.					
Ant connection	400 ohms	4000 kc	Police	400 kc	PB osc and ant[4]
Or on Model 700LW:					
Ant connection	400 ohms	300 kc	LW	300 kc	LW osc and ant[4]
Ant connection	400 ohms	15.0 mc	SW	15.0 mc	SW osc and ant[5]
Repeat r-f alignment for greater accuracy.					

[1]On rear section of gang condenser.
[2]On front section of gang condenser.
[3]In front of chassis. Rock gang condenser during this adjustment.
[4]Near front of chassis.
[5]Near center of chassis.

attempted without first thoroughly checking over all other possible sources of trouble. Both the receiver and signal generator should be allowed at least 15 minutes to warm up before starting the adjustments.

•

Philco 37-116, 37-675

Inoperative on police band: Dead police band on these models is almost invariably caused by an open primary lead on the first-detector coil, connected from the coil to a lug on the band switch directly beneath it. It can be repaired with a bent soldering iron tip and a piece of bare wire.

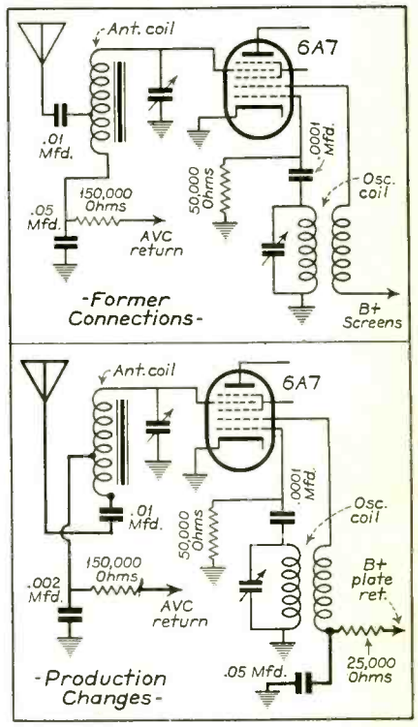
The r-f coil leads in early 1937 Philcos seem to break easily under rough handling of the set in transport or repair. Extreme caution is recommended during trouble shooting.

Charles Seeger

•

DeWald 527

Production changes: More recent production of the model 527 auto-radio receivers have incorporated several changes in the antenna circuit as indicated on the accompanying diagrams. The upper shows the original circuit while the lower diagram includes the changes. As can be seen the antenna lead is fed (through the 0.01-mfd condenser) to the bottom end of the antenna coil instead of to the tap. A 0.002-mfd condenser is used to by-pass the avc return instead of the 0.05-mfd unit previously used.



BEAT-TYPE SIGNAL GENERATORS

(*Continued from page* 463)

lator. It follows that it is necessary to add 700 kc (or whatever the frequency of the fixed-frequency oscillator may be) to the dial reading in order to arrive at the value of the output frequency. To continue with the example which we have chosen, it follows that the dial of the signal generator would be adjusted to read 22.7 mc in order to obtain a 22.0-mc signal.

Switch Added

As far as the actual circuit changes which are required in order to render the fixed-frequency oscillator inoperative, a single pole toggle switch connected in the plate return lead of the fixed-frequency oscillator is entirely satisfactory (see Fig. 2). Note that the action is secured by removing the screen voltage of the oscillator tube. In the case of a separate triode oscillator the connection would be identical, with the exception that the switch would be installed in the plate rather than in the screen circuit.

It should be carefully noted that the generator output is unmodulated with the fixed-frequency oscillator out of the circuit since most beat-type signal generators derive their audio as well as frequency modulation from the fixed-frequency oscillator. This, however, is not a serious handicap since the alignment adjustments can be satisfactorily made by using an output meter which depends for its action upon the avc voltage. If the receiver is equipped with a tuning indicator or with a beat-note oscillator for c-w reception, then either of these devices can be used to carry out the alignment adjustments, thus eliminating the need for special connections.

Cathode Resonance Indication

Where the receiver is not equipped with a tuning indicator or with a beat-note oscillator, the most satisfactory and convenient output meter is a d-c voltmeter connected across the cathode bias resistor of one of the controlled tubes. Unlike the usual type of output meter adjustment, the trimmers should be adjusted for minimum deflection of the pointer, since this condition represents maximum output. In many of the newer receivers, where the cathodes of all the controlled tubes are grounded, it will not be possible to use the connection described above; however, these receivers are almost invariably equipped with a tuning indicator so that the latter can be used as an output meter. A vacuum-tube voltmeter or tuning eye across the avc bus can of course be used in all cases.

LEARN TO SELL

(*Continued from page* 464)

of replacement parts that enter repaired sets . . . and the over-the-counter sale of tubes as well as the home sale of tubes when these are found defective . . . but also to the sale of component parts and tubes to amateur radio fans . . . ham radio operators and experimenters. Here, by the sale of accessories I refer also to the sale of incidental accessories such as auto-radio car antennas . . . extra loudspeakers that are to be tandemed into remote outlets. I also refer to the sale of storage batteries or to noise eliminating filters and other such acessories that might be termed package merchandise accessories. I do not refer to basic radio accessories such as windchargers and power supplies, as these items now-a-days are entitled to a place in the picture all by themselves.

(4) By selling, servicing and renting public-address equipment no further explanation need be given, as the subject is in reality a brand of business that stands out all by itself.

(5) By selling radio specialties I refer directly to the sale of specialty accessories. The group of radio accessories that fall into this classification include wind and gas driven power supply units . . . both for radio receiver operation and for the electrification of a house in the rural area. I also include intercommunication systems in this last group, because this type of apparatus is like a windcharger. Darn few people will walk into a store and buy either a windcharger or a complex speech carrier system. This type of radio accessory must be sold . . . and it takes a smart salesman to sell it properly.

•

YOUR WINDOW PLAN

(*Continued from page* 465)

builder would think of erecting a house without first drawing plans of what he intended to make, because by drawing a plan first he is practically assured of pleasing results; the same follows with window displays.

With plans complete, the next thing to do is to see that the right tools are available. A hammer, tacks, shears and paste will be needed. A small magnetized hammer is easiest to use, and makes tacking a simple matter, while a fairly heavy grade of hand shears will be found best suited for cutting crepe paper. A No. 2 tin tack will serve to hold the paper, although occasionally a longer tack is necessary, especially when tacking a large number of folds of crepe paper at one time.

[1]Full instructions on crepe paper treatments and their application to window displays is given in a booklet, "How to Put the Win in Windows"; obtainable from Dennison Manufacturing Co., Framingham, Mass.

PUSH-BUTTON TUNING

(*Continued from page* 466)

to that obtained with the band switch knob pulled out.

Repeat the procedure for each of the six stations.

When all trimmers have been properly adjusted, replace "Viso-Glo" tube and socket in clamp, replace type 6H6G discriminator tube and attach "Selectronne" escutcheon plate to the front of cabinet.

Any of the six stations to which the "Selectronne" has been adjusted may now be instantly received by pushing the button for the desired stations with the band switch knob pushed in; that is, in the automatic position.

In case all six of the buttons should become depressed through improper manipulation of the "Selectronne," reach into the "Selectronne" box (from the back of the cabinet) through the side next to the "Viso-Glo," and apply a slight pressure of the fingers under the latching bar which runs across the frame work in front of the trimmer box (see illustration). This will immediately release all buttons.

AUTO-RADIO—continued

padder at the setting which gives the greatest deflection.

Realign the oscillator trimmer (C-30) at 1,500 kc.

Battery Polarity

If the receiver is being used in a car with the positive battery terminal grounded, the vibrator should be inserted so that the arrow on the label points to (+) on the vibrator top. For use with cars having the negative terminal grounded the arrow must point to (—). The receiver will not operate if the vibrator is inserted in the wrong position.

Attaching Volume Control Cable

Rotate the volume control fully clockwise with a screwdriver.

Turn the volume control knob to its extreme counterclockwise position, then insert the flexible cable into the receiver bushing.

Rotate the knob fully clockwise against the slipclutch built in the volume control. If the cable tip does not engage the slot in the volume control during the first half of its rotation, reset the volume control with a screwdriver so that this will occur.

Tape both the volume and tuning control cables securely in place to prevent them from changing position.

The gang condenser drive is equipped with a friction clutch. After the flexible drive cables have been connected and taped securely in position, rotate the

AUTO-RADIO—continued

tuning knob in a counter-clockwise direction until the dial reaches its stop at the low frequency end. Continue to rotate the knob for several turns against the friction clutch and the dial will be set correctly.

Suppression of Ignition Noise

See that the distributor contacts and spark plug points do not have too wide a gap. They should be set as recommended by the car manufacturer.

If a built-in roof antenna is used, shield the lead-in from the set up to the antenna and place an a-f filter, consisting of a choke and condenser, in the lead to the dome light as close as possible to the point where the lead enters the corner post.

When grounding the antenna cable shield, or making any other grounds, select a point which is most effective in reducing the noise pick-up. In some cases quieter operation may be obtained by omitting the antenna-shield ground connection entirely.

Ground the motor block to the frame by means of ½-inch copper braid. Also ground the steering post, speedometer cable, oil gauge line, etc., to the bulkhead. It is possible that interference may be carried from the motor compartment to the receiver by these cables.

In cars with composite wood and steel bodies, it may be necessary to bond various parts together such as the instrument panel and the corner posts.

If the ignition coil is mounted on the inside of the bulkhead, it may be helpful to move it to the motor side.

Wheel static interference may be overcome by installing static collector springs under the hub caps.

•

Packard-Philco P-1417, P-1430

Installation: These models are preferably suppressorless installations. A quiet installation can be achieved by using a distributor choke in place of the suppressor supplied with the receiver. A good dome light filter should be installed high in the right corner post, with care taken so that there is no mechanical interference with the closing of the right door. The concealed top hinge congests the available space. *Eugene Triman*

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RCA 8T10

Service notes: The chassis and speaker for this instrument are identical to the model 8T. All service data for the 8T is directly applicable to these instruments.

Changing Pickup Angle of Mikes

THE MICROPHONE shown in Fig. 1 is equivalent electrically to a typical velocity microphone and contains the same movement. However, it is housed in a die-cast casing of unique design.

The directional characteristics of a velocity microphone is identical for the front and rear of the unit as indicated by the dotted lines in Fig. 2. By the addition of directional fins (Fig. 3), the Bruno Laboratories, Inc., have found that the pickup angle may be increased at the front and reduced at the rear of the unit. This latter condition is indicated by the solid lines in Fig. 2. The output level and frequency response is said to remain unchanged by the additions of the fins.

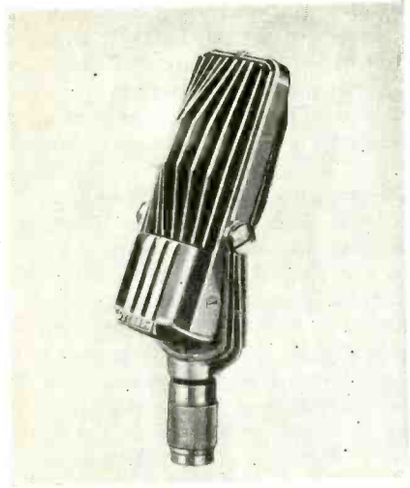

Fig. 1. Velocity mike with directional deflectors.

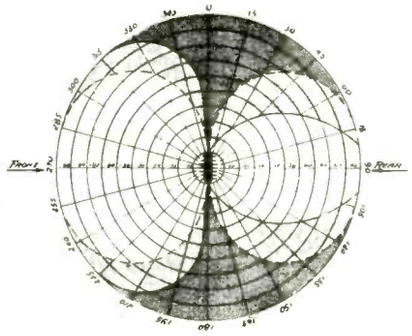

Fig. 2. Directional characteristic of velocity mike, showing changes caused by the addition of the deflectors.

The broadly directional characteristic for the region in front of the microphone means that there will be no discrimination in this area, while the attenuation at the sides and rear reduces the effective reverberation encountered in auditoriums and similar locations. The result is a reduction of feedback and other undesirable interference that tend to handicap sound reinforcement installations.

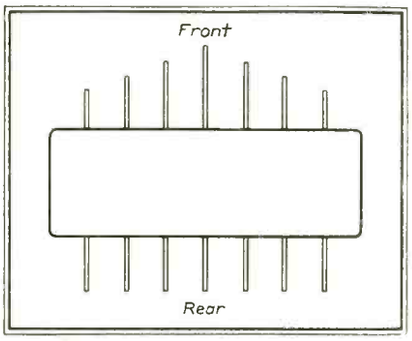

Fig. 3. End view of mike with deflectors.

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RCA 5M, 6M, 6M2

No control of tuning: The tuning cable, sometimes, will not reach the coupling inside the set case. This is caused by excessive curves in the cable. If it is necessary to bend the cable so much that the sheath will not allow the flexible shaft to reach the condenser gang coupling, file the bushing off approximately ⅛ in at the control head. Also file the end of the control cable fitting that enters the control head, where it is connected to the cable, about ⅛ in.

This will push the cable enough farther out from its sheath when it is assembled to the head to allow it to enter the coupling at the set.

Eugene Triman

TEST EQUIPMENT—continued

between the oscillator and incoming r-f signal. The adjustment of this circuit can be undertaken using the supersensitive analyzer on its microampere ranges in series with each of the separate diodes. After adjusting the intermediate frequency amplifier to exact resonance without the control tube operating, these diode circuits can be balanced by connecting the instrument in first one and then the other and adjusting the tube to like readings by means of the tuning condenser shown in the circuit diagram.

Photocell Currents

Photocells of the vacuum-tube type operated in sound equipment of moving picture theatres, or in other devices of this nature operate on currents from ½ to 5 microamperes. If the cell has developed leakage or a gassy condition the distortion in the sound track will be extremely high or erratic operation with resultant noise will occur at all times. The best test that can be made with these cells in position in the equipment is the measurement (in microamperes) of the current to the cell under the illuminating conditions in the equipment. As these current readings are extremely low a sensitive instrument is required. A 1 ma meter would not in any case, indicate on a reading of three or four millionths of an ampere which is the average for such tubes. The servicing of theatre equipment is often in the Service man's line of work and he should be equipped to measure the current sensitivity of these cells as well as that of other vacuum tubes. In addition the meter can be used directly with the Weston Photronic Cell for light measurement as its sensitivity is such that reasonably low light intensities can be measured proportionately while connecting the cell directly to the instrument.

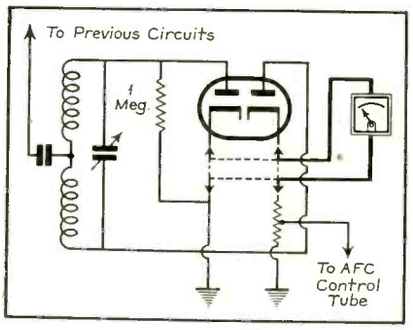

Fig. 6. An afc discriminator circuit. Current balance in the diode circuits, with the i-f tuned to resonance, indicates proper adjustment of the afc trimmers.

Other Current Measurements

The plate current in a high-mu triode is often a critical adjustment. This current ranges between 100 and 200 microamperes, depending on the type of tube used. Through the use of a microammeter in the plate circuit the bias may be adjusted under operating conditions to the value indicated by the tube manufacturer.

The tube manufacturers recommend a rather close adherence to screen current specifications for best results. Some of these are extremely small and can only be checked with a sensitive microammeter. A high screen current reading will readily show-up drifting resistance values in an a-f or r-f circuit.

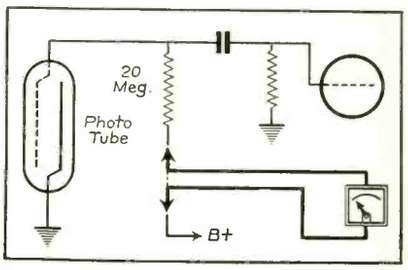

Fig. 7. Photocell circuit. Trouble indications and tube condition are best determined by microampere measurement.

The circuits shown have all been taken from the regular wiring diagram of commercial equipment. They are merely a few of those found in daily service procedure. Current measurements in these circuits should prove extremely helpful in showing up their troubles.

•

Motor Noise

Motor noise will often remain at a disappointing level even after extensive steps for elimination have been taken. To save time and useless experimenting always run the A lead on the opposite side of the receiver case to that from which the antenna lead is connected. In all cases keep the A lead as far as possible from all other cables.

In a well designed set the A lead is part of a resonant circuit tuned to the noise frequency and is therefore highly capable of radiating the noise at an increased level. *Eugene Triman*

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Determining Oscillator Frequency

When in a quandary as to whether the oscillator should be above or below the received signal on the 6-mc to 18-mc band of all-wave supers, close the tuning condenser completely and check for the image there. The high-frequency trimmers have negligible effect when the tuning condenser is fully meshed on all but the band spread type of short-wave super. With the plates fully meshed the image should be in its proper position regardless of the trimmer capacity.

Charles Seeger

TRIAD

The Radio Tube That Gives

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●

Triple-Checked for Quality

Used by Leading Set Manufacturers and Preferred by Expert Servicemen

A Profitable Line to Handle

●

TRIAD MANUFACTURING CO., INC.
PAWTUCKET **RHODE ISLAND**

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NEW MICROPHONE DOES EVERYTHING

3 in 1

1. Uni-Directional
2. Bi-Directional
3. Non-Directional

SHURE "TRI-POLAR" CRYSTAL MICROPHONE

Here, for the first time, is *one* microphone that does everything! Solves almost every conceivable pickup problem encountered in the field—offsets adverse acoustic conditions. Truly a real *all-purpose* microphone—gives you *all three* basically-different directional characteristics—(1) Uni-Directional, (2) Bi-Directional, (3) Non-Directional—in one microphone, each instantly available by means of a 3-point selector switch.

The "TRI-POLAR" is the most advanced microphone available today *anywhere at any price.* Smooth wide-range response from 40 to 10,000 cycles. Rugged, light, compact—no delicate moving parts.

Model 720A "Tri-Polar" (Patent applied for). List Price, complete with 25 feet of cable.... **$39.50**

For complete details, see your Jobber or write for Bulletin 145SA today!

Shure patents pending. Licensed under patents of the Brush Development Company.

SHURE MICROPHONES & ACOUSTIC DEVICES

• SHURE BROTHERS •
225 W. HURON ST., CHICAGO, U.S.A.
CABLE ADDRESS · SHUREMICRO

IMPROVED UP-TO-THE-MINUTE 1937-38 TUBE TESTER

MODEL 430

Positively Checks All Type Radio Tubes According to Data Contained in Latest Recommendation of Tube Engineers

- Has Line Voltage Adjustment
- Has Leakage and Short Test
- Uses Triplett Direct Reading Instrument (GOOD-BAD Scale)

Only $19.80 for this TUBE TESTER

Five flush type sockets provide for all tubes. The tester operation is very simple and indicates condition of the tube for dealer and customer on Direct Reading (GOOD-BAD) colored scale of Triplett instrument. Will also test for inter-element shorts and leakages. Complete in attractive, sturdy, quartered-oak case. Sloping panel of silver and black. Suitable for portable or counter use.

Dealer Price $19.80

Model 431 same as 430 except has Readrite (GOOD-BAD) Meter.

Dealer Price $15.90

SEE YOUR JOBBER WRITE FOR CATALOGUE

READRITE METER WORKS
817 College Drive, Bluffton, Ohio

Without obligation please send me more complete information on ..... Model 430; ..... Model 431; ..... I am also interested in .....

Name .....
Address .....
City ..... State .....

THE MANUFACTURERS . . .

CENTRALAB MIDGET CONTROLS

Centralab, 900 E. Keefe Ave., Milwaukee, Wis., announce a line of replacement midget controls for the service trade.

The control is supplied with a long shaft milled for push-on knobs that require the type of mill ordinarily used for the set-screw knob. Attachable switches are also available.

The control is available in popular resistance values and tapers from 5,000 ohms to 2 megohms. Most of the higher resistance values are available with tone compensating taps on the resistance strips.

Additional information may be obtained from the manufacturer.

TRIPLETT SET TESTER

The Triplett Electrical Instrument Co., Bluffton, Ohio, have announced a DeLuxe

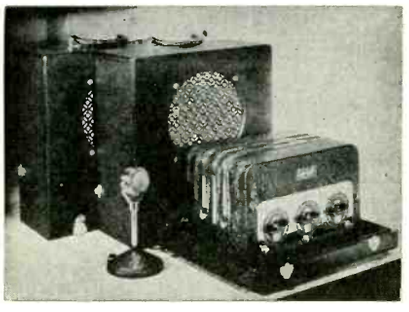
Set Tester (25,000-ohms-per-volt) which has facilities for a-c, d-c and resistance analysis, in addition to incorporating a condenser tester, free-point tester and decibel meter. It has an illuminated front indicating instrument with a large dial. A shadow-graph meter is used for line voltage control.

Additional information may be obtained from the manufacturer.

BELL P-A SYSTEMS

Bell Sound Systems, Inc., Columbus, Ohio, have introduced two 12-watt p-a systems, the Model P-A 412 and the P-X 412. The two systems are similar except that the P-A 412 is for portable use whereas the P-X 412 is for permanent installations. The P-A 412 is illustrated.

Both systems are complete with 12 watt amplifier chassis, two 10-in. permanent

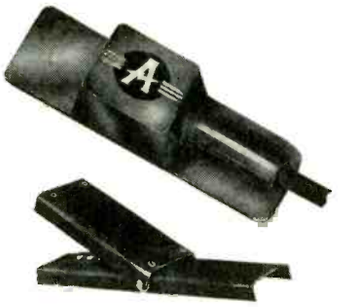


magnet dynamics, a Model 56 crystal microphone, etc.

A descriptive bulletin may be obtained upon request.

AMPERITE "KONTAK" MIKE

The Amperite "Kontak" mike is designed for use with vibration instruments such as the violin, guitar, double bass, etc. The



instrument is said to have a flat response from 40 to 9000 cycles. Its output is approximately —40 db.

The unit is equipped with a foot-operated volume control.

Additional information may be obtained from Amperite Corp., 561 Broadway, New York City.

MUTER BALLAST TUBES

The Muter Co., 1255 S. Michigan Ave., Chicago, announce a line of replacement

ballast tubes for the service trade. These replacement tubes are listed in a special catalog obtainable upon request.

ATR INVERTERS

American Television & Radio Co., St. Paul, Minn., announce a new line of a-c, d-c inverters consisting of more than 32

different types for operation on d-c input voltages from 6 to 220 volts and having a-c output of 110 to 220 volts at various capacities. The ATR line of inverters utilizes eight ¼-in. diameter tungsten contacts mounted on a dual arm arrangement.

More complete information may be obtained directly from the manufacturer.

"GLASSMIKE"

Condenser Products Co., 1369 N. Branch St., Chicago, are introducing their latest product, "Glassmike" to the Service Trade.

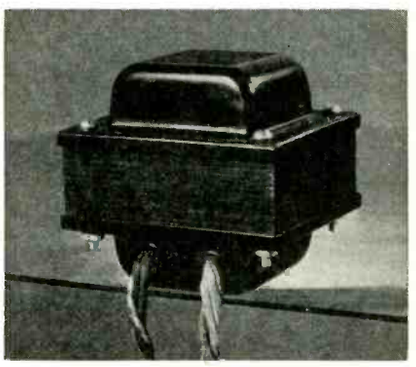
"Glassmike" is a condenser cartridge contained in a glass tube. The condenser plates are tinfoil, not aluminum, and are contacted by flat helical pigtails.

The cartridge is sealed into the glass tube with a compound developed by Condenser Products Co. and called "Hillite." This compound adheres to the walls of the tube and prevents moisture seepage between it and the glass. "Hillite" is not affected by the ordinary operating temperatures encountered in the radio receiver.

Additional information may be obtained from the manufacturer.

THORDARSON UNIVERSAL DUPLICATES

Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, has designed a line of replacement transformers, called the "Uni-

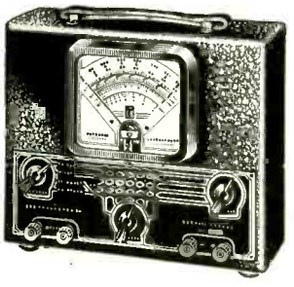


versal Duplicate" line. Eighteen types are said to satisfy the physical requirements of fifty-four transformers because of their mounting features. This universal feature is said to help the jobber because fewer transformers will have to be stocked, and it helps the Service Man because one transformer can be mounted in three different positions.

CLOUGH-BRENGLE ANALYZER

The Clough-Brengle Model 120 Analyzer is a 20,000-ohms-per-volt instrument developed by the Clough-Brengle Co., 2815 W. 19 St., Chicago, for measuring avc, grid bias, diode, audio, screen, and other voltages in tube circuits.

Functionalized switching dispenses with pin jacks and binding posts. Full open



faced etched scale permits all a-c ranges to be engraved on the same meter dial.

Additional information may be obtained from the manufacturer.

(*Continued on page* 502)

HIGHLIGHTS . . .

CONSOLIDATED APPOINTMENT

Sam Sharp, known by the radio industry of the middle west for his activities in parts sales, is now connected with Consolidated Wire & Associated Corporations, Peoria and Harrison Sts., Chicago, where he will handle manufacturer's sales on condensers.

•

ALDEN NA-ALD BULLETIN

Alden Products Co., Brockton, Mass., manufacturers of Na-ald moulded products, have issued a bulletin illustrating and describing their multi-wire connectors and plugs.

Copies of the bulletin may be obtained directly from the manufacturer.

•

BIRNBACH DISPLAY

Birnbach Radio Co., Inc., 145 Hudson St., New York City, are offering display boards free with initial orders of push-back, lead-in wire, etc., and with orders for magnet wire.

A bulletin illustrating and describing the offer may be obtained upon request.

•

NORMAN B. NEELY MOVES

Norman B. Neely, Pacific Coast representative for Webster-Racine, Presto Recording, Allan B. Dumont and other nationally known lines has moved to new and larger headquarters at 5334 Hollywood Blvd., Hollywood, Cal.

•

UTAH DISTRIBUTORS

The distribution of Utah amateur transmitting kits has been taken over by the Lew Bonn Co., in Minneapolis, Radio Accessories Co., in Omaha and by Burstein Applebee Co., in Kansas City.

•

MEISSNER COIL CATALOG

Meissner Mfg. Co., Mt. Carmel, Ill., have issued a 32 page catalog listing their complete line of r-f and i-f coils. Copies may be obtained directly from Dept. K, at Meissner's.

•

ARCTURUS SIGN

Made available to dealers and Service Men by the Arcturus Radio Tube Co., Newark, N. J., a new metal sign for attaching to the exterior of store fronts, establishes the store as radio service and tube headquarters.

The color combination of blue and white makes this dignified sign harmonize with any type of store front. The same message, in weather-resistant enamel, appears on both sides of the sign.

•

TRANSDUCER SALES REPRESENTATIVES

Appointment of sales representatives in eleven trade centers was announced last week by J. T. Kane, sales manager of Transducer Corp., manufacturers of microphones and interoffice communication equipment, located at 30 Rockefeller Plaza, New York City.

•

SOLAR COUNTER DISPLAY

Jobbers featuring the Solar "Little Giants" can obtain a three color display card with an easel back for wall, counter or window.

For additional details write to the Solar Mfg. Corp., 599 Broadway, New York City.

GHIRARDI BULLETIN

The Radio & Technical Publishing Co., 45 Astor Place, New York City has issued a two color bulletin which describes the "Home-Radio" and "Auto-Radio"—"Twin Pocket Trouble Shooter Gadgets" which have been devised by Alfred A. Ghirardi, author of "Radio Physics Course," "Modern Radio Servicing," etc.

Write for bulletin No. G. 36.

•

HOYT METER BULLETIN

A two color bulletin describing their line of round and square meters for radio service applications is available from the Hoyt Electrical Instrument Works, 755 Boylston St., Boston, Mass.

•

AEROVOX CATALOG

The 15th Aniversary edition of the Aerovox catalog is ready for distribution.

In the catalog condensers are grouped first under their general type classification, then under working voltage, and finally by capacity. Concise but adequate descriptive text is included where necessary. Eight pages of exact duplicate replacement condensers are included covering standard set requirements. A copy of the Aerovox Fifteenth Anniversary catalog may be had by addressing Aerovox Corp., 70 Washington St., Brooklyn, N. Y.

•

B-L ELECTRIC APPOINTMENTS

Irvin W. Veigel, newly appointed treasurer of the B-L Electric Mfg. Co., St. Louis, Mo., has been associated with the company since August 1931; employed as accountant, and now comptroller and treasurer.

Carl E. Peters, newly appointed secretary has been connected with the company and its affiliate, the Benwood-Linze Co., since 1921.

The B-L Electric Mfg. Co. manufacture a complete line of rectifiers and rectifier assemblies.

•

WRIGHT DECOSTER BULLETIN

A recently released bulletin by Wright-DeCoster, Inc. describes methods of calculating the correct load impedance of a number of unlike impedances in parallel.

In the same bulletin it is shown how to calculate the proper impedance of each speaker when it is desired to have one or more speakers in a multiple speaker installation operated at a higher level than others.

If you are interested in this subject, you may secure this free bulletin by writing to Wright-DeCoster, Inc., St. Paul, Minnesota, and requesting bulletin A-16.

MANUFACTURERS—continued

N. U. 2-IN. CATHODE-RAY TUBE

National Union factories have swung into production on the new N. U. cathode-ray tube type 2002. This size is used in smaller oscillograph units and will find its way into other application where compact size combined with similar performance to larger size cathode-ray tubes is desired.

Characteristics of the type 2002 can be obtained from National Union Radio Corp., 570 Lexington Ave., New York City.

SOUND SYSTEMS KITS

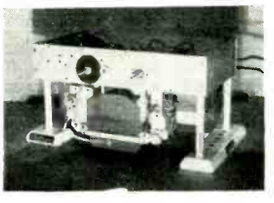
Sound Systems, Inc., 1311 Terminal Tower, Cleveland, Ohio, are planning to offer intercommunicating systems in kit form. Several different types will be available.

Descriptive literature may be obtained directly from Sound Systems, Inc.

•

"RADIOJAC"

A new Tool named "Radiojac" has been placed on the market by Cooks Mfg. Co., 274 Mile Sq. Rd., Yonkers, N. Y. It is a device designed to give support for any chassis, when inverted. A series of 36 hardwood rods, varying in length from 1½" to 8" are supplied, from which any required length can be chosen and inserted into a tight-fitting base thereby setting up a support for any set without size limitation and without screwing or clamping. For convenience and saving of space, a holder similar to a drill stand is provided.



Additional information may be obtained from the manufacturer.

•

REMLER PORTABLE P-A SYSTEM

The Remler APS-177 p-a system uses metal tubes and a push-pull beam-power output stage.

Speaker units are contained in a portable, baffle equipped carrying case. A Remler floor stand or banquet crystal microphone is included in the outfit.

Matched phonograph units are also available. All speakers, microphones and phonograph units are furnished with plugs and connectors for quick set-up.

Additional information may be obtained from Remler Co., Ltd., 19 and Bryant Sts., San Francisco.

•

DUMONT 5-IN. OSCILLOGRAPH

A popular-priced 5-inch cathode-ray oscillograph is announced by the Allen B. DuMont Laboratories, Inc., Upper Montclair, N. J.

In general appearance and working details, this Type 168 resembles the Type 164, 3-inch instrument introduced several months ago. The new instrument also features a polished chrome panel, black lettering, and red and black control knobs. It is readily portable.

Controls

Wire-wound mixers, L-pads, T-pads, Input Attenuators, etc.

●

Any resistance value; taper; single, double and triple units.

●

Also carbon-element controls for higher resistances.

●

Ballasts and voltage-dropping resistors.

●

Armored strip resistors, tapped resistors, hum balancers, etc.

Constant-impedance Output Attenuator. 25-watt rating. Linear up to 45 db. in 3 db. steps.

Write on business letterhead for copy of loose-leaf engineering data book that solves your resistance problems.

CLAROSTAT
MANUFACTURING CO. Incorporated
285 North Sixth St.
Brooklyn, N. Y.

SMALL SIZE
WITH TOP PERFORMANCE
NEW V-1 VELOCITY MICROPHONE

- The Smallest High - Fidelity Velocity Microphone
- Zero Cavity Resonance
- Integral Shock Absorber
- Cable and Connector
- Dependable—Suitable for Tropical Service
- Thoroughly Hum-Free
- Reduces Feed-Back

● The new V-1 has all the features of microphones in the higher priced brackets. . .

SEE YOUR JOBBER
Write for Catalog

List Price **$25**

ELECTRO-VOICE
MANUFACTURING COMPANY

332 E. Colfax Ave. **South Bend, Ind.**
Export Office: 100 Varick Street **New York, N. Y.**

DUMONT
ELECTROLYTIC CONDENSERS
GUARANTEED QUALITY
NOW AT REDUCED PRICES

MR. SERVICE MAN

Regardless of the prices you pay for condensers, you will find DUMONT QUALITY far superior. Self-healing prevents any possibility of breakdown even if overloaded. This exclusive feature (patent pending) is found only in DUMONT Electrolytics. Try an assortment today and be convinced. Used by the U. S. Government in large quantities —ample testimony of their true quality.

Exact duplicates for every radio.

Licensed under U. S. A. Patent reissue No. 19604.

For free catalog and your nearest Dumont jobber, write to us.

SALES AND JOBBER TERRITORY OPEN

Manufactured by

Dumont Electric Co., Inc.
514-516 BROADWAY
NEW YORK, N. Y.

"America's Leading Manufacturer of Condensers"

Halldorson
Vacuum Sealed Transformers

- Impervious to Moisture
- Choice of leading Service Experts
- Construction and Shell Assemblies make possible universal mounting.

Use Halldorson Transformers for trouble-free service work. Vacuum Sealed means impervious to moisture, an impregnation that does not crack, flake off or open up even in tropical climates.

The NEW VARI-VOLT

Have you obtained your FREE VARI-VOLT TRANSFORMER?

Makes your test bench voltage exactly what you want it. Improve your test work . . . find troubles quickly with over voltage judiciously applied. 0 to 256 V. in one-volt steps, 0 to 128 V. in half-volt steps.

The Halldorson Company, 4500 Ravenswood Ave., Chicago, Ill. S837

Please send me

☐ New Catalog on Halldorson Vacuum Sealed Transformers.

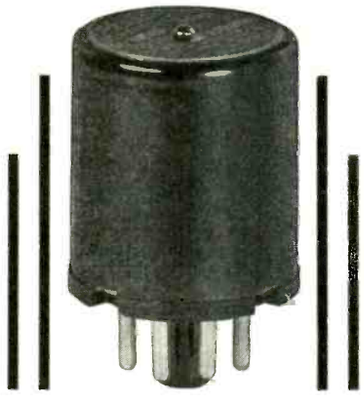
☐ Information on how I can obtain Vari-Volt Transformer Free.

Name .....

Address .....

City ..... State .....

INDEX TO ADVERTISERS



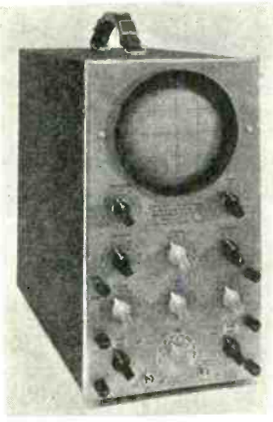
THE BRUSH TRANSFILTER FILLS THE GAP

The transfilter fills the selectivity gap between the electrically tuned circuit and the quartz filter. A transfilter can be employed in any superheterodyne whose intermediate frequency amplifier can be tuned to 465 kilocycles.

Technical data on request

The BRUSH
Development Company
3317 Perkins Avenue, Cleveland, Ohio

NEW...
DU MONT TYPE 168
5 INCH ALL-PURPOSE
OSCILLOGRAPH



THE new Type 168 is designed for service engineers, experimenters or research engineers. It incorporates all the many advantages of the popular Type 164, 3-inch oscillograph plus a DU MONT Type 54-XH 5-inch cathode ray tube, a two-stage vertical amplifier with a gain of 450 and many other outstanding features.

If you require the best, ask your jobber about this new 5-inch oscillograph.

Allen B. Du Mont Laboratories, Inc.
Upper Montclair, New Jersey

SERVICE
for
SEPTEMBER

• • •

NEW YORK RADIO TRADE SHOW ISSUE
(October 1 - 2 - 3)

• • •

Extra distribution to trade members attending.

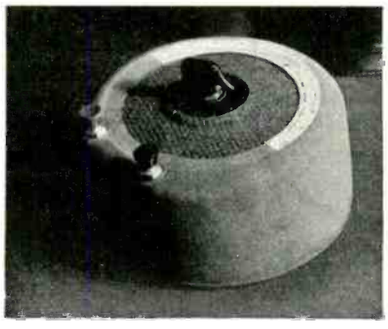
• • •

Make your space reservations now to insure good position.

Last Forms Close September 10th

TALK-BAK*

Model TBU 1700



Size 6½" diameter 3" high

Lasting Wear, Pefect Operation, Attractive Appearance

The most complete, best looking Talk-Bak* Unit manufactured. A steel cabinet with a taupe suede finish so soft as to protect the finest furniture.

FREE NEW TECHNICAL AND SALES PAMPHLET

gives complete information regarding all known inter-communication systems. Method of connecting different Talk-Bak* Units and full detail information on what they will accomplish. Write for it and be sure to include your distributor's name.

Wright-DeCoster Distributors are always anxious to cooperate.

WRIGHT-De COSTER, Inc.
2253 UNIVERSITY AVENUE, ST. PAUL, MINN.
Export Dept.: M. Simons & Son Co., New York
Cable Address: "Simontrice'

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BROWN'S RADIO SERVICE
F. L. BROWN, PROP.
BRUCE, MISS.

7-4-37

Solar Mfg. Corp. N.Y.

Gentlemen

On Nov. 23rd-36 I bought a Solar Condenser Checker from Orgill Bro.s Memphis Tenn. And I must tell you this tester cannot be beat no way you take it in fact I use it more than anything else now, I could not run my shop without it it has been used and put thru some hard service and it is still as good it seems as the day I bought it. I cannot Prise it to high as it is the most reliable instrument I have seen in 10 year of Radio. there is not a thing at present wrong with it but if it ever goes bad I want to know if it would be best to send this one to the factory to be overhauled or rebuilt, or buy a new one? which would be the cheapest, and best? and another thing, we have T.V.A. power here and the voltage varies from 105 to 130 volts I dont know why it does. but do you think it will hurt this tester, or effect the readings of it? let me have your advice soon

Yours truly
F.L. Brown
Bot 167

RCA PRESENTS

NEW HIGH FIDELITY CRYSTAL PICKUP ARM

with top needle loading!

It's the same high quality arm RCA uses in RCA Victor combination instruments that sell for $250 and up!

Brown wrinkle finish...Trimmed in Chrome

SEALED CRYSTAL
keeps out moisture

40,000 OHMS IMPEDANCE

SPRING COUNTER-BALANCED ARM
with adjustable needle pressure

WIDE FREQUENCY RESPONSE
45-7000 cycles

BALL BEARING, RUBBER-CUSHIONED PIVOT IMPROVES QUALITY

TOP NEEDLE LOADING, TOO!

needle positioning bracket included—insures proper location of needle.

RCA MAGNETIC PICKUPS

RCA offers a complete line of magnetic pickups—both Viscoloid Damped and Junior types. RCA Viscoloid Damped pickups range in price from $6.50 to $7.50 list—provide impedance from 8.5 to 8500 ohms at 1000 cycles. RCA Junior Type pickup and arm assemblies—from $6.75 to $8.50—offer impedance of 1400 ohms at 1000 cycles. Both types assure fine performance.

RCA *Parts* FOR PROFIT

RCA Manufacturing Co., Inc., Camden, N. J.

A Service of the Radio Corporation of America