



RADIO SERVICE NEWS

PUBLISHED - IN - THE - INTEREST - OF - RADIO - SERVICE - SALES - ENGINEERS

VOL. XII, No. 5

EDITORIAL OFFICES, RCA, HARRISON, NEW JERSEY

October-November, 1947

BATTERY GIFT KIT NOW AVAILABLE TO RCA DEALERS

Kit Provides Dealers With
Unique Christmas Item

At last . . . a consumer gift item for the serviceman and dealer! RCA's new Battery Gift Kit, designed for users of personal-type portable radios, is now available through RCA battery distributors.

Packaged and promoted for Christmas business, this new matched performance kit contains an RCA VS-016 "B" battery and six RCA VS-036 "Sealed-in-Steel" "A" batteries . . . ample "A" power for the full life of the "B" battery. It is designed to power virtually every type of personal-type portable radio now on the market.

This new convenient way to buy battery power will appeal to every Christmas shopper in search of a practical gift and will be a source of increased unit sales now and long after the holidays are over. See it at your RCA battery distributor's today.

NEW AB FARM PACK BATTERY MAKES BOW

An AB Farm Pack that lasts 35% longer than the average farm pack has just been announced by RCA. Designed for radio use only, this new "Sealed-in-Steel" 1½-volt "A" and 90-volt "B" pack is the finest "AB" farm pack to be developed thus far.

Powered by RCA's special radio-mix, the new VS099 Farm Pack is guaranteed for 1500 hours of average use in an efficient 4-tube set.

The VS099 eliminates the possibility of damage to floors, rugs, etc., from leakage. Its metal jacket construction locks the power in and excludes dryness and moisture. An excellent unit for areas of high humidity or extreme temperature changes.

Lithographed in the familiar red-white-and-black combination, the VS099 is a logical sell-up from the VS022. Available for immediate delivery at your nearest RCA Battery Distributor.

RCA BATTERY GIFT KIT



Packaged and promoted for the Christmas trade, this new "matched performance" kit contains one RCA VS016 "B" battery and six RCA VS036 "Sealed-in-Steel" "A" batteries. Here is a convenient new way to power personal type radios that will be a source of repeat sales long after the holidays are over. See it at your RCA Tube Distributor today.

TEN YEARS OF RADIO SERVICING

By JOHN F. RIDER

Looking back at the past ten years of radio servicing we do not see the full span of its past life, but we can observe its most profitable and most progressive years.

Many changes have taken place in these years and fortunately for all concerned, the changes have been for the better. Technically the industry may not have advanced as much as many would like to see but the forced greater familiarity with test equipment during the war years, plus ten added years of experience on equipment, has resulted in better and more profitable service operations.

Although this increased familiarity with test equipment has brought about better appreciation of what is behind the panel and a knowledge of how to get the most from the equipment, right now the test-equipment manufacturer has something of a problem in the form of resistance to the cost of this equipment. Perhaps some day the issue will be settled, but the greater understanding of what test equipment is and can do will never be lost. That knowledge is important, for most big things stem from little things, and complicated devices are elaborations of simple ones. If the basis is solid, the foundation on

which to build is strong and capable of carrying the necessary load.

But, returning once more to what has been happening commercially in the servicing field, national income from receiver servicing is up more than 100 per cent from what it was ten years ago. To a limited extent this can be attributed to the dearth of new receiver production during the war years—that is, more receivers were coming in for service—but even that does not reduce the importance of the increase in the national average service charges from \$3.74 to \$5.70, of which the national average percentage represented by parts was 47 per cent.

Editor's Note: The views expressed in this article are Mr. Rider's and do not necessarily reflect the policies of this company.

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RCA TELEVISION PRODUCTION DATA OFFERED INDUSTRY

Two-Day "Television Clinic"
Designed to Help Manufacturers
Expand Production

A two-day clinic designed to help radio manufacturers enter the television receiver manufacturing field or to advance their operations in that field was recently sponsored by the RCA Victor Division of the Radio Corporation of America.

The Television Clinic was undertaken by RCA in the interest of accelerating the growth of the television industry as a whole.

The two-day program consisted of a series of discussions by RCA officials on television receiver and tube operations and included a tour of both the television assembly lines in Camden, New Jersey and television tube production in the company's Lancaster, Pa., plant.

At the Lancaster tube plant the visitors saw unique automatic tube-making machinery and a complete plant set-up already in operation for mass production, which enables the RCA Tube Department to turn out television picture tubes at the rate of one a minute.

Mr. L. W. Teegarden, Vice President in charge of the RCA Tube Department, pointed out that, in addition to showing the visitors how RCA Victor builds television sets, the company is making available the tubes and major television components for receiver production.

The importance of this meeting from the radio service-dealer's point of view cannot be over-estimated. Every step that is taken to place television on a nation-wide industrial basis is certain to improve his position as far as television sales and service are concerned.

Alert dealers and servicemen are actively promoting and exploiting every aspect of the television sales and service picture . . . establishing their stores and shops as television headquarters in their areas. Not only is this resulting in increased sales now, but it is regarded as laying the foundation for a vastly expanded tube and parts operation in the profitable television era that is just ahead.

AN ANALYSIS OF FM SERVICING

By NORMAN L. CHALFIN

Except for the limiter-discriminator circuits, FM receivers have basically the same elements as the familiar AM superheterodyne receivers. Those circuits preceding the limiter and discriminator in an FM receiver differ only in their bandwidth and the fact that they generally operate at higher frequencies than those of the AM superheterodyne.

Therefore, troubleshooting an FM receiver presupposes a familiarity with generally-encountered troubles in superheterodynes such as undesired signals, weak signals, or a dead receiver. In addition to these, there are noise and distortion to be considered.

However, unlike the AM receiver the presence of noise or distortion in an FM receiver can have causes which will not apply to a similar condition in the AM receiver. Furthermore, it is quite common for certain faults to exist in an FM receiver which make no noticeable indication upon which the servicer can put his finger, while the same condition in an AM set would cause noises, beat notes, and other readily-identified symptoms.

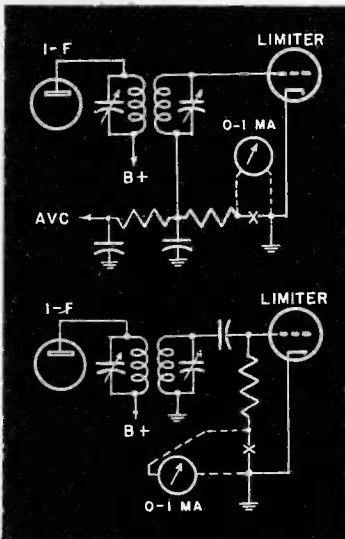


Figure 1. Method for connecting alignment meter to limiter depends on circuit used in receiver.

We shall avoid in this discussion any reference to conditions in the audio systems due to the usual defects common to all radios, or to failures of the sets which are primarily due to component defects in the power supply or controls. Also we will assume that normal voltages are present and that the tubes are all in good operating condition.

The tube checker and multimeter are the only tools necessary for this service.

For thoroughly testing the FM receiver, an FM signal generator is a necessity. In addition, some means should be available to measure the limiter grid current, the center frequency and to observe the discriminator cross-over character-

(Reprinted from Radio-Television Retailing, March, May 1947)

istics. The last is best accomplished with the oscilloscope, although it is also possible with a high-impedance dc vacuum-tube voltmeter.

The center frequency deviation can be observed with a sensitive zero-center meter having a range of 150.0-150 microamperes dc. This is connected through a series current-limiting resistance of about 1 megohm across the discriminator diode output as illustrated in Figure 5. Shown as an alternate is a dc vacuum-tube voltmeter.

Limiter grid current is measured by means of a dc 0-1 milliammeter placed in the ground end of the limiter gridleak. Two types of limiter gridleak circuits are shown with the meter correctly inserted.

Having provided a means for observing the limiter grid current, center frequency, and general discriminator action, the receiver should now be set up for alignment and overall response characteristics.

If an FM receiver is set up with the signal generator and oscilloscope as shown in Figure 2, any difficulty due to the failure of some portion of the rf system in the set can be immediately observed when a response check is attempted, and steps taken for its correction. A number of conditions that have been encountered in the author's experience are shown in Fig. 3 as patterns observed on the oscilloscope.

Continued on page 3, column 1

Talking Things Over

With W. L. ROTHENBERGER
Manager, Renewal Sales

There has been considerable talk recently about the buyers' market we are in and how servicemen and dealers will soon have to get out and start hustling for business. These remarks seem to indicate that such a condition is entirely new to our economy and has never before faced the radio business.

This is certainly not true. Servicing has always been a hardy and essentially a competitive business. Otherwise it could never have survived and made money during the unparalleled shortages and business difficulties of World War II.

But regardless of individual viewpoint on the competitive aspects of servicing, there would seem a real need for aggressive operation right now to insure survival.

Publicizing Facilities

There is no easy way to prosperity in a buyers' market. The serviceman who waits for customers to come to him will generally lose out. The man who is out pounding pavements and ringing doorbells will get the lion's share of new business . . . as he has always done, regardless of the ups and downs of business.

In some instances, however, a serviceman with plenty of repair work on hand may not be able to get out and do a real job of plugging his services.

However, there are many effective, inexpensive methods, other than personal calls, that are available to help him publicize his sales and service facilities wherever it will do the most good.

Unobtrusive reminders of your

facilities, ranging from stickers imprinted with your name and placed on the back of repaired sets, to desk calendars and thermometers bearing a short selling message, will do an effective on-the-spot selling job right in your customers' homes.

Ingenuity Counts

Many service dealers have an arrangement whereby the local real estate agents supply them with the names of new families moving into the area. Contacting these new arrivals by phone often results in a set installation or repair job, plus the long-term advantage of having acquired a new customer.

One serviceman we know lends his sound truck free to the local high-school athletic association for use at their Saturday afternoon games. These games are well attended by both parents and children and the promotional value of such a good-will gesture is considerable. The sound truck, bearing the dealer's name and address and situated in a prominent spot on the field, also serves to publicize his facilities to the crowd.

The important thing to remember is that the business is there, and your own efforts will determine just how much of it will come your way.

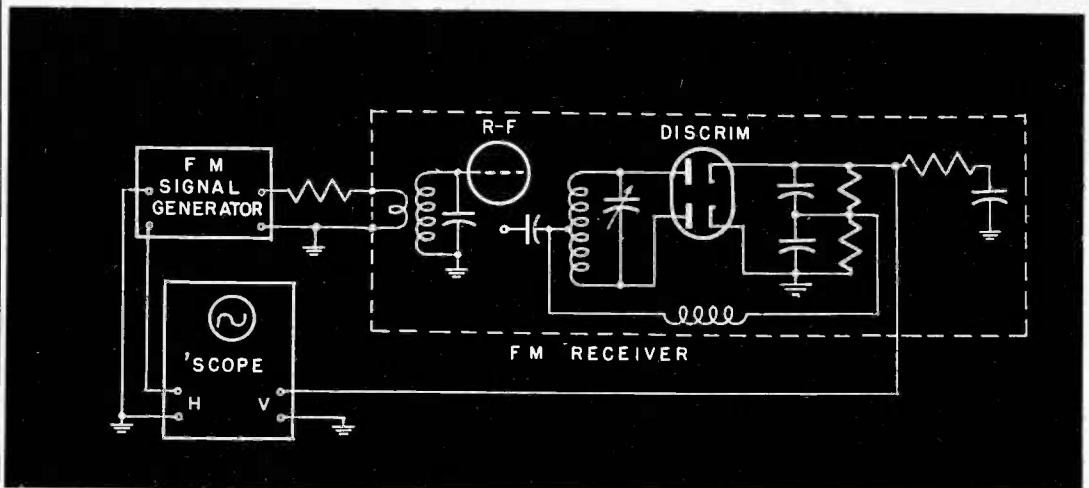


Figure 2. FM receiver set up with signal generator and oscilloscope.

FM SERVICING

Continued from page 2, column 2

How to Make S-Curves

These patterns are made by applying the rf output of FM signal generator (or sweep generator) to the radio's input, while feeding a portion of the generator's modulating voltage to the oscilloscope.

If the generator's modulating voltage is a saw-tooth wave, and provision is made for connecting a portion to some external apparatus, the modulation may be applied directly to the horizontal amplifier terminals of the oscilloscope. If the sweep voltage is a sine wave, however, better results may be obtained by connecting to the external synchronization input, and using the internal saw-tooth of the oscilloscope.

What S-Curves Tell You

The vertical plates are connected to the output of the discriminator. As a result of the repetitive sweeping of an rf signal through the FM receiver, the discriminator output voltage varies in value and polarity, producing the well-known discriminator S-curve as shown in Fig. 3, illustration "A", when it is operating correctly.

In illustration "B" the pattern reveals an S-curve which is acceptable except for its narrowness, indicating a narrow overall bandwidth which would result in loss of high pitched tones.

The severe unbalance of pattern "C" shows the result of a discriminator which is not tuned to the center frequency of the rf-if circuits, while the next view "D" demonstrates the case of a local oscillator which is not tuned to the center frequency of the if and discriminator circuits. It is presumed, of course, that a well-calibrated FM generator is used.

The fifth illustration "E" in Fig. 3 shows the pattern observed when the FM generator sweeps through an if amplifier with a bad tendency to regeneration. The trace in illustration "F" is caused by a detuned or non-tracking rf amplifier.

While the combination of FM generator and oscilloscope permits very rapid determination of the S-curve and overall response of the receiver, approximately the same information can be developed by other more tedious means, namely, the rf oscillator and vacuum-tube voltmeter.

In the latter case, a check of the output voltages polarity and value should be taken every 10 kc across the full 200 kc bandwidth, and the results plotted on graph paper. After working with a set for a while, approximations can be made by eye without actually plotting the values. This will permit relatively rapid alignment and adjustments, provided a careful plot is again made at the end of alignment.

There are other points in an FM set which differ from AM receivers and from which trouble will be found to arise. Such is particularly true of the rf section of the receiver, which employs new tuning units such as the General Electric "Guillotine", the Dunont "Inputuner" embodying the Mallory-Ware "Inductuner" and various coaxial devices. Since most of these devices differ greatly from each other, the servicer must study them on an individual basis.

Microphonic howls are far more frequent in high-frequency systems than in low-frequency tuned circuits. Make a quick check to see if the howl is present when no signal is received. If it is, an audio or detector stage tube is the likeliest suspect.

When the howl rides in on the signal, use probe stick made of some good insulation material to press against and steady elements in the rf circuits which might vibrate due to the acoustic output of the speaker, such as variable capacitor plates, coils, etc.

Miniature Tubes

Miniature tubes, and generally small sizes of components, require particular care in handling. Short leads are necessary to maintain satisfactory operation at high frequency and one should bear in mind that, in changing a part, replacement should be made in exactly the same position as the original part with all leads trimmed to the same size and length.

It may seem surprising, but it is true that an inch or two of wire added in an rf circuit component at 100 Mc can cause a detuning of the affected circuit by as much as 20 Mc due to the increased inductance resulting from its length.

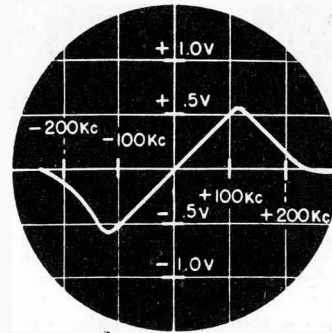
Most of the troubles which appear in FM sets can best be detected by means of S-curve observations of which several patterns were briefly mentioned before, together with an explanation of the means used to obtain them. A closer examination is now in order. These patterns are drawn from the experience of the author.

S-Curve Patterns

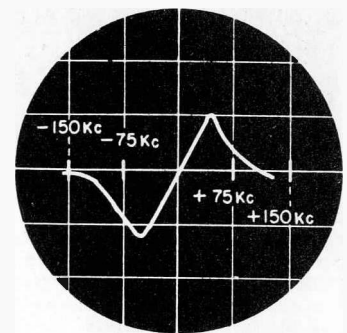
In a normally functioning FM receiver properly aligned and after stabilizing for at least half an hour, the discriminator curve should look like pattern A in Figure 3. This shows a negative peak of voltage from the discriminator as the frequency modulated if signal passes a point 100 kc lower than the center frequency, an equal positive peak produced by the signal passing 100 kc higher than center frequency and a smooth straight line joining the two peaks.

If the bandwidth of the receiver is insufficient, the pattern will appear as in B. If AVC is not present it may be necessary to turn up the gain. This pattern is a result of the

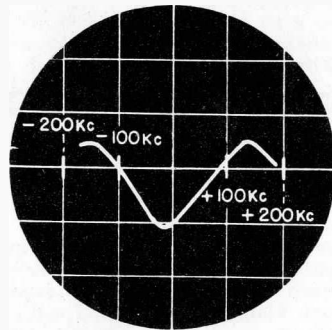
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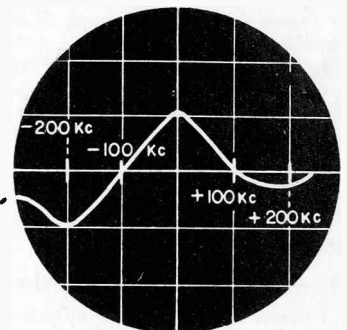
A—Normal discriminator S-curve.



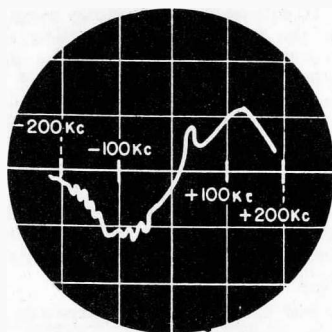
B—Insufficient receiver band width.



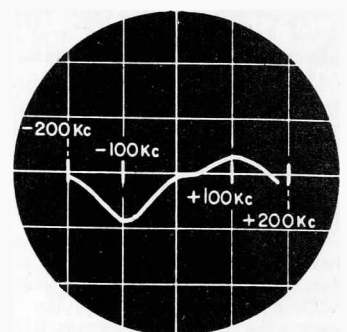
C—Discriminator off center frequency.



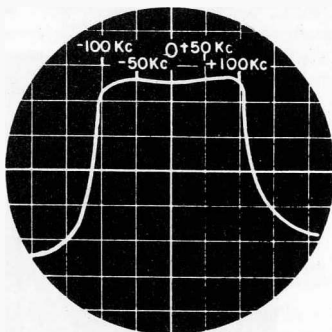
D—Result of frequency drift.



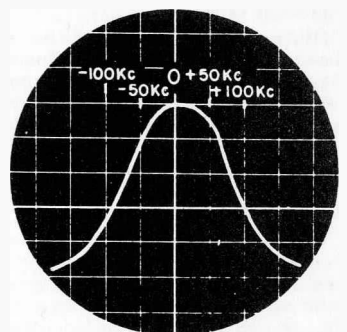
E—Evidence of feedback or oscillation.



F—Weak signal response, rf detuned.



G—Oscilloscope curves on the response of the discriminator should show a broad, flat top without marked peaks or depressions.



H—Narrow and peaked overall response curve, taken at limiter load, shows the effect of an incorrect alignment of the IF stages.

Figure 3. Oscilloscope Wave Forms

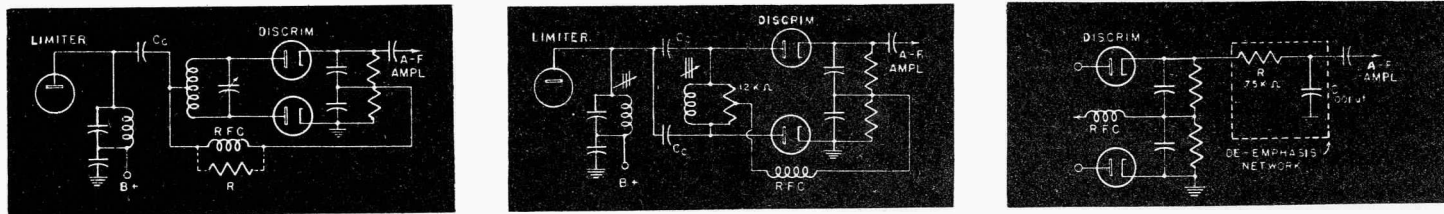


Figure 4. At left is shown a typical discriminator circuit, indicating the alternative methods of making a dc return. In the center is seen an adaptation to permit the use of iron-slug tuning. At the right is an example of a de-emphasis network found in some FM receivers.

FM SERVICING

Continued from page 3, column 2

overall receiver response dropping off before the limit of the discriminator's response range is reached, as shown in another pattern, H depicting a poor if alignment.

Insufficient band width in the system will result in audio clipping at the higher modulation levels and a very noticeable distortion to the listener. High-frequency sounds such as "S" are chopped and sound rough. In a severe case of this kind the sound is actually garbled.

Common Cause of Distortion

Pattern C indicates an off-center discriminator. The sound output in this instance is badly distorted and, as can be seen by the pattern, a check on the center frequency by means of a vacuum-tube voltmeter would probably show a value which would knock the pointer over to stop on the far side of the meter.

Unequal positive and negative peaks from the discriminator output are caused by the attenuation through the if system of the frequencies which ordinarily result in equal positive output peaks from the discriminator.

Readjustment is possible with an insulated tool. This should be employed because at the usual intermediate frequencies (10.7 Mc on many new FM sets) any metallic element would detune the discriminator. The centering adjustment is made on the secondary side of the discriminator transformer and this is usually a "floating" or ungrounded capacitor.

Other causes of this condition as shown in the typical discriminator diagrams in Figure 4 are an open coupling capacitor Cc between the limiter and discriminator circuits or an open rfc or load resistance R, which serves the same function in some receivers, coming from the discriminator center tap.

If the coupling capacitor is open it will be virtually impossible to establish any set frequency adjustment which is true also of an open rfc or decoupling load resistor. This is likewise true for either coupling capacitor in the case of slug-tuned discriminator coils.

Since S-curves are made with the signal generator feeding into the receiver input, to definitely estab-

lish a trouble to be within the if stages requires the taking of another curve at the output of the limiter stage.

Pattern D is typical of that which may appear about five minutes after a set has been turned on. This condition, caused by frequency drift, requires returning. It will be wise to allow the set to stabilize for about half an hour before setting the oscillator and rf trimmer adjustment to track with the dial designation.

Pattern E indicates the presence of oscillation within the if or rf sections of the receiver. The elimination of these conditions involves much attention to by-pass capacitors, filaments, screen and cathode circuits, and if and rf amplifier tubes. It can also result from feedback in the B supply or avc lines from other stages in the amplifier string.

It will be found that the wiggles in the pattern will vary their appearance and position in the discriminator pattern as the hand is brought near to the offending stages. The strong pip to the right of the center line in pattern E results from a regenerative condition within the if amplifier. Readjustment of the if trimmers can be made to slide this pip over and out of the range of the discriminator pattern.

For Comparative Purposes

A similar condition can be produced artificially for purposes of comparison, by feeding a 10.7 Mc modulated rf signal into the set along with the FM signals. This condition seems to be caused by

some feedback path from the high-level stage back to one of the first if stages. The "grass" at the left of this figure is the type of condition that is associated with oscillation in the rf section.

Pattern F is typical of a weak signal response. In the instance illustrated the set had a good limiter and so no noise appeared but if the limiter action were poor, this same pattern would appear with considerable noise figures, or grass superimposed upon the S-pattern. Generally the rf circuits are detuned in this condition and it can be corrected by simple adjustment.

Considerable background noise or the failure of the set to limit such noise as produced by automobile ignition would indicate poor limiter action and this circuit should be investigated for defective components. A typical condition would be an open limiter grid leak, in which instance no limiter grid current flows.

Trouble Shooting Limiters

The manufacturers of the sets will normally supply voltage information charts for the limiter. Generally, limiter voltages are about 1/3 or less than the voltages on other if amplifier tubes in the circuit (excluding the heater voltage, of course). If the set under test departs radically from this condition, look for trouble in the resistors generally used for bleeder service and voltage dividers for screen and plate.

Reverse limiting is a condition which is sometimes encountered. This occurs when some stage pre-

ceding the usual limiter stage becomes overloaded, saturates and starts drawing grid current. This results in higher signal levels being received at lower audible volume than some lower-level signals.

This condition is normally not encountered in sets having avc. Avc voltages in these sets is generally derived from the drop across the limiter grid leak and fed through filter resistances and suitable by-pass condensers, as shown in Fig. 1.

Cascade Limiters

Because, at low signal levels, limiters are not satisfactory, some sets employ "double" or "tandem" or "cascade" limiters. However named, these are two stages, one following the other, in which any failure of the first limiter to remove a noise amplitude pulse will be accomplished in the second stage of limiting.

The second limiter is often rc coupled with the first, and troubles with limiting can sometimes be traced to failure of the second tube due to voltage or other conditions which become apparent only upon voltage-resistance analysis.

One more point of difference between FM and AM receivers is the use of the de-emphasis circuit to correct for the pre-emphasized transmission characteristic in the audio modulation. This circuit has a time constant of 75 microseconds and results in a af frequency response curve not illustrated. The circuit of a de-emphasized network is shown, along with the typical discriminator. The values for the proper characteristic are 75,000 ohms and .001 uf.

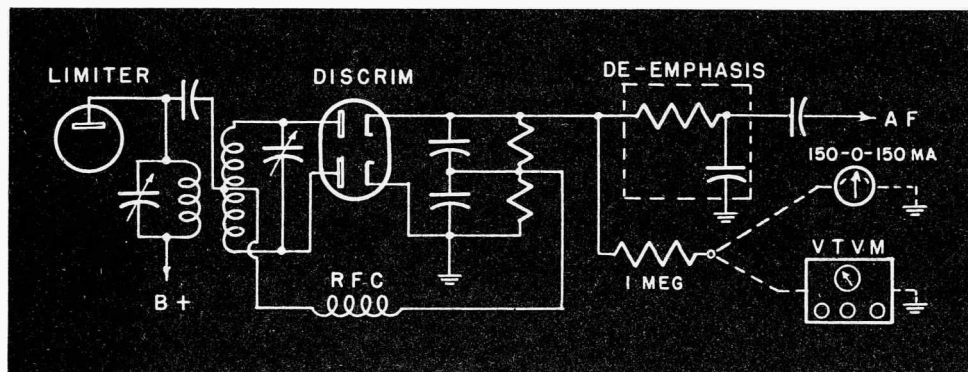


Figure 5. Alternative methods for connecting indicating meter for alignment of discriminator. Zero-center meter is preferable, but VTVM is also handy if it has a polarity-reversing switch.

SALES *and* SERVICE TIPS

Once again you can win a handsome RCA Resistor-Code Pencil by sending tips to RCA Radio Service News, Harrison, New Jersey . . . All tips become the property of RCA to be used as it sees fit . . . Service Tips are our readers' ideas, not ours. While we believe they are worthwhile, we cannot be responsible for them.

SAFER AND EASIER WAY TO HANDLE HOT TUBES

Here's a tube handling trick that has saved me quite a few wrist and finger burns. I've found that the nipples used to protect auto distributor wiring make excellent grips for handling hot 6AG5's, 50B5's, and 35W4's when removing these tubes for testing and replacement while the set is in operation. These nipples are available at any service station or auto supply store.

M. Ohringer
11 Brooklyn Ave.
Westbury, New York

LOCATING CONTROL SHAFT HOLES IN BLANK CABINETS

When installing radio chassis' in a new blank cabinet, the following method will prove very useful in determining the correct position of the various controls on the front panel: Carefully place a small quantity of paint on the end of each control shaft. Then place the chassis in the cabinet and against the front panel. Upon removing the chassis you will find that the

shaft ends have left marks on the inside of the front panel that will exactly indicate the correct position for drilling the control shaft holes.

Sherman M. Wolf
Tremont Elec. Supply Co., Inc.
672 Tremont Street
Boston 16, Mass.

CARRYING SPARE TUBES FOR TEST EQUIPMENT

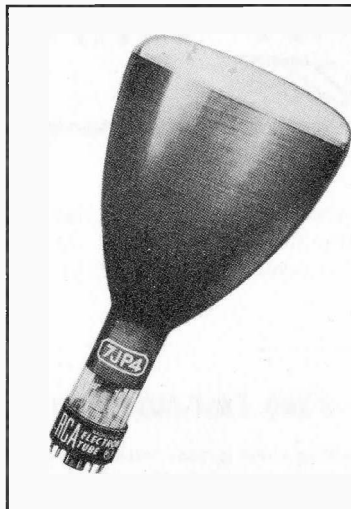
When a serviceman takes his test equipment out on a job the possibility of tube failure increases and the likelihood of having a replacement tube on hand is somewhat remote. To guard against this I have fastened a series of spring clips inside the carrying case of each of my test instruments to hold spare tubes. The clips, originally designed to hold capacitors, may be obtained from your parts distributor. To save space and increase versatility type 80 tubes have been replaced with 5Y3GT's, in my test equipment.

Raymond C. Wyman
3711 - 31st Avenue
Hyattsville, Md.



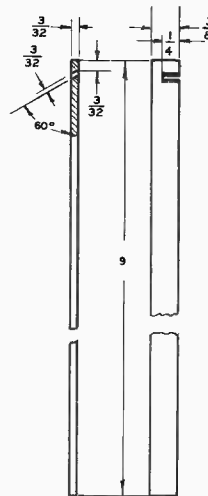
"I got it to round out the line."

NEW RCA KINESCOPE



The new RCA 7" directly viewed kinescope 7JP4 supersedes and replaces the 7GP4. The new tube, an improved version of the 7GP4, incorporates a structural change in gun design to permit operation at a higher anode—No. 1 and anode—No. 2 voltage with resultant increase of approximately 60 per cent in light output. It also has a modified basing arrangement necessitated by the higher anode—No. 1 voltage, but this modification does not affect interchangeability with the 7GP4 provided no connections are made to the 7GP4 socket contacts for pins 4 and 12. Thus far no commercial sets use these pins on their socket assemblies. Suggested List Price of the 7JP4 is \$24.25.

ADJUSTING TOOL FOR R. P. RECORD CHANGERS



METAL STOCK

age and are unexcelled in lifting tubes out of corners or in between transformers. If a tack remover is unobtainable, one can easily be made by heating the end of a long-stemmed screwdriver until red-hot and then quickly bending it to the proper angle and placing it in oil to cool.

Ben Wolf
372 Tremont St.
Boston 16, Mass.

POSITION IMPORTANT IN SERVICING RADIO-PHONOS

In servicing noisy and intermittent radio-phonograph combinations where the panel is horizontal and the chassis is vertical, I have found that good results may be obtained by mounting the chassis on the bench in exactly the same position it occupied in its cabinet. This procedure precludes any possible shifting of components when the receiver is not operated in its normal position — eliminating troublesome intermittents or other defects that temporarily "heal" when the physical position of the receiver is changed for servicing. This precaution has saved me considerable time in locating shorting tubes, touching connections and other difficulties.

George E. Shott
46 Jefferson Blvd.
Annadale, Staten Island 12, N. Y.

REPEATED DIAL CORD BREAKAGE REMEDIED

Repeated dial cord breakage on the Super Deluxe RCA Model # 984172 may be eliminated by filing the sharp edge from the hole in the tuning drum through which the dial cords pass.

Don De Mars
A. T. Hansord Pontiac Co.
1328 Hennepin Avenue
Minneapolis, Minn.

TACK REMOVER USED TO REMOVE STUBBORN TUBES

One of the best tools we have found thus far for lifting out stubborn tubes is the everyday tack remover . . . a screwdriver-like tool with a tip bent at a 45° angle. These tack removers really do a nice job in removing metal and GT tubes without injury or break-

REPLACEMENT PARTS

Section

Here are values available in limited quantities only. Many are hard-to-get items for use in the older RCA Victor models. At these special prices, our stock will soon be depleted; orders will be filled in the sequence they are received.

RCA RADIO PHONO-SWITCH #240 FAST-MOVING ITEM

Alert dealers everywhere are boosting their profits with RCA's new Radio-Phono-Switch. The demand for this new item is increasing rapidly and it is just the ticket for the thousands of homes that have separate record players and radios.

With it the listener can change from radio to phonograph at the flick of a switch. In "phono" position it suppresses radio reception. In "radio" position it cuts out the record player but in no way interferes with the radio's operation.

In many instances, the RCA Radio Phono-Switch can be easily installed without removing the receiver chassis from the cabinet. Can be used with nearly all radio receivers having at least two stages of audio amplification. It is designed to maintain and isolate bias and other dc voltages in the receiver circuit. There is no loss in tonal quality and no hum is introduced.

You can sell and install this fast-moving item with complete confidence. To the set owner it represents increased satisfaction and more listening enjoyment. Don't pass up this profit-maker. Shipped complete with simplified instructions under stock number 240. List price \$2.25.

To further increase your sales, order type 205X1 self-selling display kit which consists of ten switches. The display kit is yours FREE: you pay only for the switches.

RCA SOUND BOXES

Now you can replace the phonograph sound boxes of most portable, spring-motor phonographs with only three RCA stock items. The diaphragms are extremely sensitive, and give excellent fidelity and reproduction. Each sound box is quickly installed and requires only one screw to mount it to the tone arm.

These new sound boxes may also be used in many other phonographs not in the RCA Victor line.

The table below provides an excellent replacement guide.

Stock No.	Victrola Models	Sug. List Price
6933	0-1, 2-19	\$3.00
30368	0-2, 0-3, 0-6, 0-10 0-11, 0-12, 0-15, 0-19	3.35
72929	All Orthophonic models except VV2-35	3.00

RCA TELEVISION COIL KIT #204X1

The new RCA television coil kit contains all the if and video coils for a complete television receiver. Carefully manufactured and checked under actual operation in their respective circuits, these coils are very useful for the serviceman or experimenter. This new kit consists of 15 individual coils incorporating the latest in design, the finest in construction, and the utmost in performance. The type number is 204X1; ask your RCA distributor about it today.

PHONOGRAPH MOTOR-TURNTABLE ASSEMBLY No. 70121

RCA has announced the availability of a new motor-turntable assembly with a diameter of nine inches. Wide-awake dealers will use this new assembly to build their own record players or to modernize old-style spring-driven phonographs.

The unit has a 117-volt, 60-cycle motor designed for instantaneous starting, neat appearance, and constant-speed operation at 78 RPM. Other outstanding features include cushioned mounting plate, shock-absorbing rim drive and die-cast bearing brackets. The motor is fan-cooled and may be used in partially closed cabinets. The turntables are attractively finished in a brown flock which blends well with nearly any cabinet. Suggested List Price \$6.95. Order Stock #70121.

RCA DIAL DRIVE CORD

Just released is the new RCA dial drive cord. Dial belts made from this improved cord cannot stretch and cause troublesome slipping. The secret of its non-stretch feature is a special fibreglass core covered with the finest nylon braid. Available in two handy sizes (1) NF-28 with a diameter of 0.028 and (2) NF-40 with a 0.040 diameter. Both types are shipped in 250-foot spools under the following stock numbers:

No. 72953—NF-28 Suggested list price \$5.00

No. 72913—NF-40 Suggested list price \$7.00

Also available is Stock number 38201, consisting of 100 dial belt clamps designed for fastening the two dial belt ends together. Suggested list price for the clamps is \$.65 per envelope of 100.

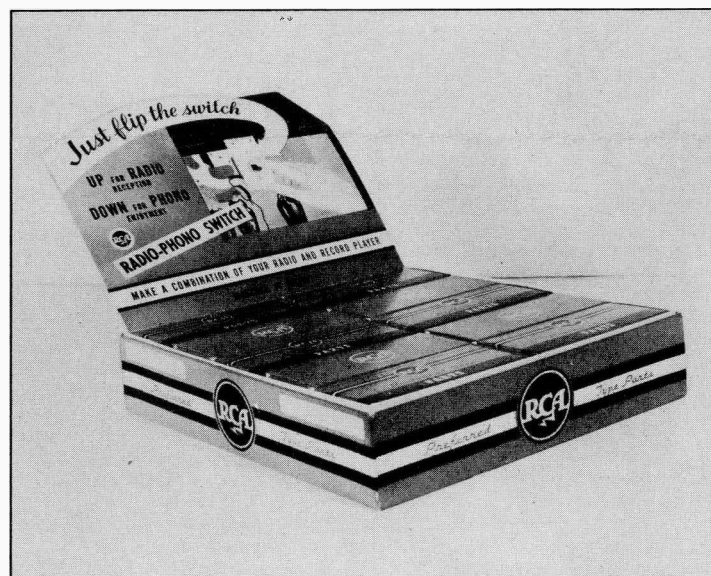
RCA REPLACEMENT CONES FOR

12" TYPE NUMBER SPEAKERS

Replacement cones for Type Number speakers apply as follows:

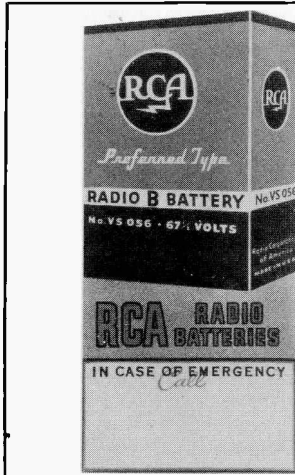
Speaker Type No.	Use Cone Stock No.	Suggested List.
312S1	36145	\$2.00
312S4	36145	2.00
412S1	36145	2.00
412S4	72828	2.25

RADIO PHONO-SWITCH DISPLAY KIT



Step up your sales of RCA's Radio Phono-Switch with this new self-selling display kit. This attractive merchandiser is free, you pay only for the ten Phono-Switches it contains. Available at your nearest RCA Tube and Parts Distributor. Suggested list price—\$22.50. Type No. 205X1.

NEW RCA BATTERY DECAL



RCA's new red-black-and-gold battery decal, No. 2F277, is now available. This colorful item is designed for dealer and service shop use and contains ample space for inserting store-owner's name for after-hours emergency service. Address space may be removed if desired and decal used separately. An ideal way to identify your store as RCA battery headquarters, these new decals may be obtained free from your nearest RCA distributor. Stop in and get yours today.

TEN YEARS

Continued from page 1, column 3

In comparison with conditions ten years ago, the charge for labor is up about 100 per cent and the part of the over-all charge apportionable to parts is down—which is the way it should be.

At first thought, one might say that a national average service charge of \$5.70 is high enough—that is, when the labor portion is about \$3.00. Such a fee seems ample when we think in terms of receivers which are brought into the shop for service. Three dollars as an average base charge per hour is reasonable, especially when the average repair time should not be more than one hour—in fact it should be less. However, if the national average involves income from pickup and delivery, then the income from labor portion of the over-all fee is still subject to a slight increase.

Special Conditions

That this kind of thinking is not too much out of line is indicated by the fact that the national average is as high as it is only because of the operations of three parts of the country. In the Pacific Coast States, the Mountain States, and the Middle Atlantic States, the average service charge is very much higher than the national average. For example, in the Pacific States, it is \$6.70 in contrast to the national average of \$5.70, and in the East South Central States it reaches a low of \$4.80. Recognizing that the Pacific States are big users of radio receivers with many broadcast stations in daily operation, no one can say that other special conditions exist—except possibly, more intense and more progressive merchandising tactics and techniques.

While it is true that the West Coast average service charge cannot be regarded as possible of attainment all over the United States,

nevertheless it is difficult to understand why that level of charge cannot be established in the well-populated and highly industrialized sections of the country.

At any rate it is a figure to shoot at, and one which should be possible of approach.

Need of New Equipment

Of course, one might say that competition in the highly industrialized sections of the country is responsible for the lower averages in those areas. Frankly we do not think so, for it is doubtful that the public is doing much shopping for prices when the differential between estimates is less than \$1.00. If anything, the difference in area averages, with some justifiable exceptions, is of local making; that is, the repair shops themselves harbor the belief—and we think it erroneous—that competition dictates the lower of two possible prices. Naturally competition is a factor in all business—but there is a limit to how low one may go and still make a profit.

When we take into account the trend of electronic development—disregarding entirely what is now regarded as high-priced equipment—the fact remains that the progressive service shop will be called upon to spend money for improvements. In fact the word improvements is not the most appropriate; we should say for the continuation of the business—so as to stay in business. Maybe the replacement of existing old equipment can be put off, but the need for new equipment to enable continued operation as new devices appear on the market cannot be denied.

Most repairmen take their testing equipment for granted, without ever realizing that were it not for testing equipment, radio repair operations positively could not be carried on at a profit. And so far as this is concerned, sooner or later it will face all repair shops no matter where they may be; fur-

thermore the cost of new equipment is the same throughout the nation regardless of the immediate local economies.

Thus one must realize that service charges must embrace more than just personal income—they must supply the surplus which is the pool for the wherewithal to stay in business as the radio industry advances technologically.

Service Field Expanding

These few words about the amount of the charge are not said in criticism. If anything is to be said relative to the development of the proper charge, the service industry is to be commended for it has learned its lesson well. At least the old timers in the business have learned their lesson; the comparative youngsters who have been in the business less than five years, have yet to learn the full meaning of the service charge. They charge much less on the national as well as the area averages than the old timers, but then again, a greater proportion of the newcomers are part time than the old timers. Given time they, too, will acquire business as well as technical experience, as a comparison between operations of ten years ago and today shows.

Contrary to many beliefs, the total number of independent servicemen actively engaged in radio service work has remained fairly static. But, the electronic field is expanding. Not only is it doing so at a slow rate with respect to maintenance activities, but also many of the fields which are developing will require maintenance personnel to specialize in those activities to the total exclusion of home electronic equipment.

Among those who are doing the

nation's home radio and allied equipment repair there has taken place a great increase in the number of receivers handled annually. This writer feels that given reasonably normal financial conditions throughout the nation, the number of receivers of all varieties put into use during the next two to five years will more than double the present number of users. This, plus more active sales promotion by the repair industry, should raise, rather than lower, the national average of receivers serviced per serviceman.

So far we have considered servicing solely. Before closing it might be well to examine, even if only casually, the other activities of the average radio service shop. More than 60 per cent of the radio service establishments are selling receivers—they have become merchandising minded. And they will become even more so as time passes.

Television Servicing

In conclusion, and perhaps as an attempt to offset over-optimism, let us present one more thought—just a possibility which may grow out of the television situation which is in such a state of flux. Television service outfits are, as a rule, much larger than the average service shop.

Today they may be devoting 100 per cent of their effort to television work . . . the same equipment and personnel are useful for other kinds of service. This may mean greater centralization of servicing activity. The finger points that way. In self-defense every serviceman capable of doing so and interested in his future should work toward a more solid technical background, no matter how great the sacrifice in time and sleep.

RCA LEADS THE WAY IN TUBES FOR TELEVISION

RCA's line of Television Kinescopes now consists of the following:

- RCA-7DP4: A 7" directly viewed kinescope with electrostatic focus and magnetic deflection.
- RCA-7JP4: A 7" directly viewed kinescope with electrostatic focus and electrostatic deflection.
- RCA-10BP4: A 10" directly viewed kinescope with magnetic focus and magnetic deflection.
- RCA-5TP4: A 5" projection kinescope with electrostatic focus and magnetic deflection.
- 9AP4: A 9" directly viewed kinescope.
- 12AP4: A 12" directly viewed kinescope.

To complete the renewal picture, RCA continues to offer the following pre-war types:

During 1947, Commercial Television has taken enormous forward strides. The active television areas are expanding rapidly and many additional television transmitters are scheduled to go on the air in the near future. Be sure you have in stock NOW adequate quantities of these tubes to service the rapidly growing requirements of your customers.

You're in the lead with RCA ...*here's why*



Completeness...RCA brings you the widest range of tubes in the field

Practically every make and model of radio you are called upon to service can be re-equipped with *standard available* RCA tubes.

When you supply a set owner with a tube he couldn't get next door . . . he becomes a steady customer! RCA's tube line has a wide range of the most popular types of tubes . . . from glass and metal types to the latest miniatures. And . . . your RCA distributor carries extensive stocks for your convenience.

In power tubes, too . . . for broadcast transmitters, amateur equipment, and industrial applications . . . RCA has the most comprehensive line in the field. A family of tubes that is setting the highest standards for quality and dependability, and accounting for universal customer preference.

"Completeness of line" is another important reason why you're in the lead with RCA! So . . . push RCA tubes and watch your business grow.

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA



RADIO SERVICE NEWS

RCA Radio Service News is published by the RCA Tube Department in the interest of radio servicemen and dealers everywhere. It is distributed free of charge to members of the radio-service fraternity through the courtesy of RCA and its tube, battery, test equipment and parts distributors.