RADIO SERVICE NEWS

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Dealers Urged To Advertise By Direct Mail

Individual Store Publicity Increases Returns From Phone Promotion

The Central Telephone Check-Up Promotion plus free Check-Up sales promotion material is an usually happy combination, according to D. J. Finn, RCA Radiotron Advertising Manager, who points out that the sales promotion material supplements the telephone promotion and enables every dealer to have a well-rounded fall selling campaign with little expense except for the purchase of saleable merchandise.

Finn also suggests that dealers buy additional quantities of the same material in order to put on extensive direct mail campaigns, since the newspaper advertising of the central telephone service serves also to stimulate the returns from the direct-by-mail campaign.

Initiative Necessary

"Dealers should not rely entirely on the Central Telephone Check-Up for their Check-Up business," Finn told a meeting of Philadelphia dealers. "The telephone promotion is a cooperative endeavor and all participating dealers benefit, but it should be borne in mind that the individual dealer cannot expect a

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Antenna With List of $3.95 Added to Line

Three Ninety Five Is Name Number and Price Of New Aerial

Quality at a low price is found in a new RCA antenna that is as easy to erect as it is to remember. It is the RCA 395 Antenna, Stock No. 395, list price $3.95. When you need an efficient antenna at a moderate price, just think of 395.

This new low-priced RCA antenna, stable mate of the unique RCA Magic Wave Antenna which reduces noise on all wave bands and can be connected to almost any existing signal collector has a frequency range of from 140 to 23,000 kilocycles, the same as its big $6.95 brother. The 395, however, is simply an efficient antenna sys-

(*Continued on Page 2, Column 4*)

USE THE PICTORIAL

In the RCA Radio Service News pictorial insert, "Radio Stars of the Month," you have a very effective window streamer. It makes people stop and look—at the merchandise displayed in the window. For your convenience, stickers for attaching the streamer to the window are enclosed. Put this display to work for you.

Sea-Going Picnic

Janet Logan (left) and Patricia Dunlap take their lunches with them when motor-boating on Lake Michigan—or at least their publicity man thought it would make a good picture and we agree with him. Both are popular CBS radioactresses

September Buyers of RCA Test Instruments Get $8.75 Bonus

For One Month Only Complete 3-Point System Given Free to Purchasers of RCA Test Apparatus

Now is the time to buy your RCA Oscillograph or Oscillator, or any of the other famous RCA instruments for service engineers. During the month of September only you can get a bonus valued at $8.75 with any RCA Test instrument you buy except the neon Output Indicator!

The bonus, according to an announcement by J. A. Milling of the RCA Parts Division, is a complete RCA 3-Point Service System comprising the booklet *101 Service Selling Ideas* valued at 75c, the book *Radio Service Business Methods*, valued at $3.00, and the popular *RCA Service Tip File*, valued at $5.00. All three highly useful units, with a total value of $8.75, will be given to each purchaser of any RCA test instrument except the Output Indicator, which because of its low price of only $4.00 is excluded from the offer. Besides the 3-Point System, purchasers of RCA Test Equipment during September get a 12-page booklet on *Receiver Alignment*.

System Supplements Instruments

"Thousands of service engineers are already making profitable use of the RCA 3-Point Service System and we want even more to get the all-around benefits that this plan can bring to a service business," stated Milling in announcing the bonus offer. "For several years we have been pointing out that technical knowledge and good test equipment are not all that the successful service shop must have. It must know how to sell its services first, then it must be able to turn the jobs out quickly, and finally it must keep the necessary records to run the business in a business-like manner. The RCA 3-Point Service System is a real aid to the shop in each of these three phases of its work. The

(*Continued on Page 6, Column 1*)

Advanced Line Of P.A. Devices In New Catalog

Remote Mixing Notable Feature Of New Sound Systems

Notable for its eye-appeal and price-appeal as well as for several exclusive technical features is a remarkable new line of P. A. and sound amplification equipment which will soon make its bow to the trade in a handsome two-color catalog issued by the RCA Commercial Sound Section.

Outstanding among the engineering developments incorporated in the new line of RCA Sound Equipment is **remote mixing**—another RCA first. The remote mixer unit can be placed as far from the amplifier as required to mix the imputs in accordance with the way the audience is hearing them. This means that the operator of the mixer can be among the audience,

(*Continued on Page 5, Column 5*)

Telephone Check-Up Promotion Costs Dealers Nothing To Join

Factory Advertising Brings Calls To Central Bureau Which Apportions Them Among Shops

CHECK-UP MAILING PIECES FREE WITH TUBE ORDERS

Would you like to have your name listed with a local telephone exchange to receive a share of calls for the RCA 10-Point Check-Up, calls obtained by a great newspaper and radio advertising campaign RCA Radiotron is sponsoring in over 140 cities for the months of September and October?

If you would, all you have to do is to place an order for 50 RCA Radio Tubes with your distributor and show that you have the experience and equipment to handle the work properly.

This is the Central Telephone Check-Up Promotion, a method of using the famous Check-Up principle that will prove to be phenomenally profitable to dealers since the Check-Up calls cost them nothing beyond the order for 50 tubes.

HOW IT WORKS

Check-Up Telephone Exchange: Good morning. This is Main 2386.

Voice: I saw your ad in the paper (or heard it over the radio) to call this number for an RCA 10-Point Radio Check-Up. I'd like to have our radio checked over.

C. T. E.: Yes, m'am. This is the Central Check-Up Bureau representing radio service shops that have qualified to perform the RCA 10-Point Check-Up. We shall be glad to send a competent radio service engineer around to your house. Would tomorrow be convenient?

Voice: Yes, that will be fine.

C. T. E.: Now if you will just give me your name and address. . . . .

Conversations similar to the above will take place thousands of times during September and October, and thousands of service shops will benefit. The Check-Up Telephone Exchange apportions the calls among the shops participating in the promotion.

Powerful Advertising Support

Both newspapers and radio will be used to advertise the Central Telephone Check-Up Promotion. Examples of the attention-compelling newspaper ads that will be used are shown elsewhere in this issue of the News. All the ads feature a telephone number that is answered by a special operator at the telephone exchange. This operator takes the calls and relays them on to the dealers participating in the plan. The telephone number is also featured in the spot announcements that will be used in some cities either alone or in conjunction with newspaper advertising.

This new Check-Up campaign follows closely on the series of RCA Check-Up ads which have been appearing regularly twice a month in both *Colliers* and the *Saturday Evening Post*, driving home the need for calling in a service engineer at least once a year for a 10-Point Check-Up of the home or auto radio. The Central Telephone Check-Up ads are a direct tie-in with the regular Check-Up advertising RCA has been

(*Continued on Page 8, Column 3*)

A New P.A. System

A leader of the new line of RCA Commercial Sound equipment is the PG-112 shown above, a portable outfit of 12-watts undistorted output that lists at only $199.50. Note the chromium finished Junior velocity microphone. The 12-watt amplifier alone has a list price of only $78.60

Oscillographs Compared For Alignment Use

One Inch Screen Found Satisfactory For Service Work

By B. W. ROBINS
RCA Engineer

The question has often been discussed as to whether or not the one-inch oscillograph is satisfactory for servicing radio receivers. The greatest amount of doubt along this line seems to be in the matter of alignment, many people wondering just how effective an alignment job can be made when viewing the resonance curve trace on a cathode ray tube with a screen only one inch in diameter.

First, we might say that if a single-image system of alignment is employed, it may be quite difficult to obtain perfect alignment of a receiver when using an image as small as the one appearing on a one inch tube. We have not made many checks of this point, and the answer is beyond the scope of this article.

Double-Image Alignment Preferable

However, when the one inch tube is employed in a **double-image** alignment system, it is possible to obtain perfect alignment of a receiver as readily with the small tube as with a three inch, or even a nine inch tube. In order to check this point we set up a double-peaked I. F. amplifier in our laboratory, fed a frequency-modulated signal into it, and connected the output of the diode detector of the I. F. unit to the input circuits of a one inch and also of a nine inch oscillograph. Thus, the images on the screens of the two tubes of widely different size could be observed simultaneously.

After the I. F. transformer was aligned while observing only the image on the one inch tube, it was found that the two images on the nine inch tube coincided, indicating perfect alignment. The transformer was then promiscuously thrown out of alignment, its coupling changed several times, and aligned observing **only** the image on the one inch tube. In each instance the alignment checked perfectly when observed on the nine inch tube. Thus, for the alignment of circuits such as conventional I. F. and R. F. amplifiers, wherein symmetrical response is the prime consideration, perfect alignment can be readily obtained employing a one inch cathode ray tube with equipment designed to properly utilize the double-image method.

System Assures Accuracy

It may be in order here to briefly review the double-image system and explain why it affords effective alignment with a small tube. We will make the discussion as brief as possible, dispensing with technical details of the system which would unduly lengthen the article. The double-image method, as its name implies, requires a frequency-modulated R. F. signal source and an oscillograph with a timing axis supply so synchronized with the frequency modulation of the R. F. signal that normally two resonance curves appear on the screen. When the response of the circuit being aligned by this method is symmetrical and at the proper frequency the two images completely coincide at all points, that is, the two images merge into one. Thus, correct alignment is very definitely indicated, and any departure from it is quite obvious or "thrown in the operator's face." An analogy may be made at this point.

Analogy Explains Double-Image

Suppose it is desired to draw a "U" the sides of which are perfectly symmetrical about the center of the letter. One method would be to draw it on translucent paper, fold the paper at the center of the "U", and observe whether the two sides coincide. This may illustrate the advantages obtained by the double-image method of alignment, except that in the latter case the "folding-back," which is obtained by the super-position of the two images, is an automatic and continuous process. This is one reason why the one inch cathode ray tube can afford perfect alignment.

There are some applications of cathode ray tubes where the one inch tube is less satisfactory than the larger types, and some applications where the one inch tube is entirely inadequate. However, as explained above, it is entirely adequate to afford accurate alignment when employed properly.

On Magic Key

Vivid Ruth Bradley, NBC songstress, was recently heard on the Magic Key of RCA, a program to which millions tune every Sunday afternoon at 2:00, EDST. The need for a periodic Check-Up of the listeners' radios is frequently the subject of the Magic Key commercial announcements

The Voice of Radio Service

A forum for members of the radio service industry. Letters of general interest will be published even though the views expressed may not agree with ours.

SERVICE MEETINGS OF THE AIR

Words can hardly express my feelings when I read your letter that informed me that I had won the first prize in the second week's contest of RCA Manufacturing Company's "Service Meetings of the Air." The oscillator arrived in perfect condition, and I must say that it will well repay me for the few minutes it took to describe something that is done daily in my routine service work for my employers, R. H. Macy & Co., Inc., of this city, and in my own personal service work, and I wish to thank all concerned in awarding me this useful prize.

As a serviceman who attended all of the meetings held at the Hotel Pennsylvania under the splendid supervision of your Mr. Brisbin, I was sorely perturbed to hear that these meetings were to be discontinued, but I surely received a surprise when I first tuned in on the first RCA Service Meeting of the Air. I decided that here really was a way to get all the dope from the laboratory, without any inconvenience on my part. I have not missed any of the lectures that followed and do not know of any reasonable excuse for doing so, as the way these lectures are presented enables the service engineer to do so while he is busy in his shop.

I do not know how long these lectures will last, but I do hope they will run for a considerable time, as they now are the direct way the man in the field has of obtaining the full benefits of the designing engineers' constructive help. I also wish to extend thanks to the men of Wholesale Radio who are connected with this novel method of disseminating service data, and to all I say, "Keep up the good work"; we, the servicemen, sure do appreciate it.

George H. Minnerly,
440 East 182nd St.,
New York City, N. Y.

"Technaural" Service Meets Are Announced

RCA Engineers to Deliver Lectures In More Than 70 Cities

Camden, N. J., Aug. 28.—A series of RCA Service Meetings called the "Technaural" series because it deals with such subjects as inverse feedback, volume expansion and compression, band spread, and receiver alignment includes a demonstration of the remarkable new RCA 100-watt, permanent field loudspeaker, was announced today by RCA Service Department officials. This makes the fourth full year in which RCA and RCA distributors have offered service engineers of the nation a course of instructive and well-planned lectures of service subjects.

Because of the unusually interesting information and remarkable demonstrations to be presented, it is felt that this new series will surpass all others for attendance and place total attendance for all RCA Victor meetings beyond the 150,000 mark.

According to E. C. Cahill, Service Manager of RCA Manufacturing Co., Inc., no effort has been spared to make certain that the lecture and demonstration will appeal to every serviceman who is interested in keeping abreast with new developments.

The schedule which follows, although not yet complete, lists meeting dates for more than 70 major cities. Those for other points can be secured from the local RCA Victor Distributor or RCA District Office. Since there may be some change in the scheduled dates those interested should watch for definite notice from their RCA distributor or service association.

MEETING SCHEDULE

City	*Date*
ALBANY, N. Y.	11/9
ATLANTA, GA.	11/16
BALTIMORE, MD.	11/18
BIRMINGHAM, ALA.	11/9
BOSTON, MASS.	11/9
BRIDGEPORT, CONN.	11/2
BUFFALO, N. Y.	11/23
BURLINGTON, VT.	11/4
CEDAR RAPIDS, IA.	11/12
CHARLOTTE, N. C.	11/2
CHICAGO, ILL.	11/9
CINCINNATI, OHIO	11/9
CLEVELAND, OHIO	11/4
COLUMBUS, OHIO	11/9
DALLAS, TEXAS	11/30
DAVENPORT, IA.	11/18
DENVER, COLO.	11/16
DES MOINES, IA.	11/16
DETROIT, MICH.	11/9
ELMIRA, N. Y.	11/18
ERIE, PA.	11/2
ESCANABA, MICH.	11/4
EVANSVILLE, IND.	11/2
FARGO, N. D.	11/16
GRAND RAPIDS, MICH.	11/12
HARTFORD, CONN.	11/4
HOUSTON, TEX.	11/19
HUNTINGTON, W. VA.	11/4
INDIANAPOLIS, IND.	11/12
JACKSON, MISS.	11/16
JACKSONVILLE, FLA.	11/19
KANSAS CITY, MO.	11/23
KNOXVILLE, TENN.	11/2
LINCOLN, NEB.	11/9
LITTLE ROCK, ARK.	11/9
LONG BEACH, CAL.	11/23
LOS ANGELES, CAL.	11/18
LOUISVILLE, KY.	11/4
MADISON, WIS.	11/2
MEMPHIS, TENN.	11/12
MIAMI, FLA.	11/23
MILWAUKEE, WIS.	11/4
MINNEAPOLIS, MINN.	11/9
NASHVILLE, TENN.	11/4
NEW ORLEANS, LA.	11/23
NEW YORK, N. Y.	10/1
OAKLAND, CAL.	11/16
OKLAHOMA CITY, OKLA.	11/12
OMAHA, NEB.	11/18
PEORIA, ILL.	11/16
PITTSBURGH, PA.	11/9
PORTLAND, ORE.	11/16
PROVIDENCE, R. I.	11/16
RICHMOND, VA.	11/9
ROANOKE, VA.	11/5
SAGINAW, MICH.	11/4
ST. LOUIS, MO.	11/30
SALT LAKE CITY, UTAH	11/23
SAN ANTONIO, TEX.	11/23
SAN DIEGO, CAL.	11/16
SAN FRANCISCO, CAL.	11/18
SEATTLE, WASH.	11/23
SHREVEPORT, LA.	11/16
SIOUX FALLS, S. D.	11/19
SPOKANE, WASH.	11/19
SPRINGFIELD, MO.	11/2
SYRACUSE, N. Y.	11/16
TAMPA, FLA.	11/30
TOLEDO, OHIO	11/12
TULSA, OKLA.	11/9
WASHINGTON, D. C.	11/16
WELCH, W. VA.	11/2
WHEELING, W. VA.	11/12
WICHITA, KANS.	11/4

Antenna With List of $3.95 Added to Line

(Continued from Page 1, Column 1)

tem, without the noise reducing properties of the Magic Wave Antenna. The 395 is of the balanced doublet type and requires only two supports 40 feet apart in addition to the material in kit.

Assembled at Factory

To save time in installing, the 395 is assembled and all joints soldered at the factory. The antenna proper acts as an efficient pickup medium, giving high signal strength over a very wide frequency range.

The 395 antenna will be easily sold to customers who are not bothered by noise or who do not care to pay the slight extra charge for a noise-reducing Magic Wave Antenna. It is recommended that all radios be priced by the dealer to include the 395 Antenna, and that the customer then be "sold up" to the Magic Wave Antenna whenever possible.

395 All Around

—and it's a mighty good all around antenna, say the RCA engineers who designed this latest addition to the RCA line of antennas. This one is the RCA 395 Antenna, Stock No. 395, list price $3.95

Not That Kind of a Band

"But, Mrs. Doak, that isn't an alibi for the radio. You can't get music from the police band on any radio."

PHASE INVERTER CIRCUITS

by W. P. Maginnis
RCA Engineering Department

Push-pull audio power amplifiers require a grid excitation consisting of two equal voltages with a phase difference of 180 degrees. There are, in general, two methods of obtaining such voltages. The first method uses a transformer with a center tapped secondary. The center tap is connected to a point at the same AC potential as the cathodes of the power tubes. The voltages induced in the two halves of the secondary are then equal and 180 degrees out of phase with respect to the center tap if leakage inductances and stray capacities are negligible at the frequencies under consideration.

Several Types of Circuits

The second method for producing these voltages is by the use of phase inverter circuits. Several types of these circuits are in use and a few will be described.

Figure I shows a common type of phase inverter circuit. This circuit utilizes the fact that the plate and cathode potentials of the amplifier tube, A, are 180 degrees out of phase with respect to ground and are equal if $R_1 = R_2$. This circuit has two major disadvantages. One is that any heater-cathode leakage

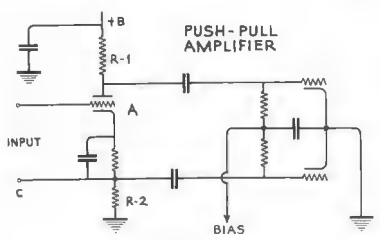


Figure I

in the phase inverter tube will impress hum on the one of the push-pull grids which is coupled to the cathode. The more serious drawback to the circuit, however, is that the input circuit will be at the potential of C. If the input circuit consists of a diode detector as is usual in modern receivers, this may produce serious regeneration or even instability in the intermediate or radio frequency amplifiers.

Circuit Using Pentode Output

Figure II illustrates another circuit which is in common use where pentode output tubes are used. Here the value of R_1 is adjusted to such a value that the amplification is unity in the triode consisting of the

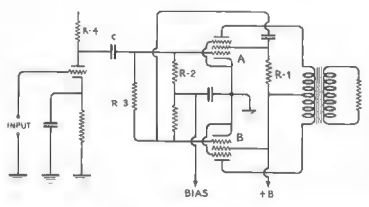


Figure II

control grid, cathode, and screen grid of output tube A. The AC screen potential is then equal to the AC potential on the control grid and 180 degrees out of phase with it. This voltage is fed to the control grid of the other output tube and proper grid excitation is then supplied to the push-pull stage.

This circuit has a grounded input and uses very few components to achieve the desired result. These are the major advantages of this system. But it has many drawbacks.

It has become common practice in the design of push-pull power amplifiers to take advantage of the current economy, low distortion, and high power output given by class AB amplifiers. This cannot be done in the amplifier of Figure II. Since, in a class AB amplifier one tube is biased beyond cutoff during a part of a cycle, it is obvious that it could not supply grid excitation for the other tube during this time and serious distortion would result. Hence the tubes in this amplifier must be operated strictly class A which is uneconomical in current consumption.

Keeping this same idea in mind, it is easily seen that the amplifier has an extremely poor overload characteristic. When the tube A draws grid current the coupling condenser C is charged to a voltage which completely cuts off the current in the tube. If this does not leak off immediately the grid of the other tube can receive no excitation for the next few cycles. Since the charge can only leak off quickly for small values of the time constant of the circuit R_4-R_2-C and since this time constant can only be small if low frequencies are attenuated, it is difficult to remedy this fault. A resistor, R_3, placed in the circuit as shown will help to some extent, but the overload characteristic is never much better than that of a single ended amplifier.

This circuit also requires more filtering of the B supply than is ordinarily required in push-pull amplifiers since the hum voltage on +B is impressed directly on the control grid of the phase inverted tube, B, and only to a less extent on the control grid of tube A. This unbalance will cause a serious hum in the output of the amplifier unless very effective filtering is provided.

Improved Circuit

In Figure III is shown the phase inverter circuit which has been chosen for use in the 1938 RCA Victor line of home receivers.

"A" is a tube containing two triodes in one bulb. An attenuator is provided in the plate circuit of the triode section #1, which provides a grid excitation voltage on triode #2 equal to that on the grid of triode #1 and 180 degrees out of phase. If the amplification of triode #1 is "a" then to provide the correct grid voltage on triode #2, $\frac{R_1}{R_1 + R_2} = \frac{1}{a}$ and if either R_1 or R_2 is assigned a value, the other may be calculated from this relation. It has been found that R_1 and R_2 need not be held to tolerances closer than ordinary commercial limits.

Eliminates Disadvantages

This circuit is more costly than either of the others which have been described due mainly to the cost of the twin triode tube, although it does require a few more component parts. But it has none of the disadvantages of the other two in performance.

This circuit is well balanced throughout and requires very little filtering. The only unbalance is caused by the fact that hum on the plate of triode #1 is reduced by a factor of 1/a and fed into the grid of triode #2. However, it has been found practical to permit this since the resistance R_3 and the plate resistance of triode #1 act as a voltage attenuator. It is possible to make R_3 large enough to reduce this hum to a satisfactory level.

Since the inverted voltage is not derived from the output stage, it is possible to operate the output stage class AB and to take advantage of the efficiency of this system.

In the design of an output stage the overload characteristic is an important consideration. In a transformer-coupled stage, this overload characteristic is often bad unless driving power is supplied to the grids of the output tubes and the leakage reactance of the driver transformer is reduced to a very low value. High impedance transformers having low leakage inductance are expensive units. If this leakage inductance is not low, damped oscillations appear in the grid circuits of the output stage when grid current is drawn. This characteristic of amplifiers with poor driving power has been found to produce an extremely disagreeable overload characteristic.

Listening tests have shown that the overload characteristic of the circuit in Figure III is considerably better than that of a transformer-coupled amplifier in which the transformer leakage reactance is high and the driver power low.

The only circuit which provides a demonstrably better overload characteristic than that of Figure III is a circuit using a low impedance driven tube and a driver transformer with low leakage reactances. But this system has the disadvantage of being extremely expensive.

Advantages of Inverters

Phase inverter circuits irrespective of type have several fundamental advantages over transformer coupling. They are entirely free of trouble from electro-magnetic hum pickup which is always a source of trouble in transformer-coupled amplifiers. A flat frequency response over a wide band in transformer coupled stages is only obtained by the use of transformers having high primary impedance and low leakage reactance. On the other hand, it is a simple matter to reproduce a wide band of frequencies with negligible amplitude distortion by the use of the phase inverter.

From the foregoing discussion it is evident that, although cost reduction is probably the main reason for the use of the phase inverter, it also has several fundamental advantages in performance.

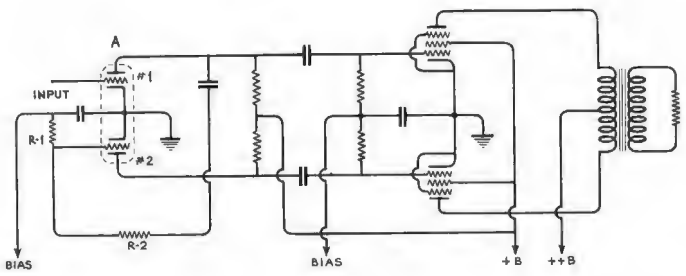


Figure III

Dealers Endorse Check-Up; Report Average Sale $4.00

The proof of the pudding may be in the eating, but the proof of the Check-Up plan as a potent sales-builder is found in experience of the dealers who have used the plan. Below are some excerpts from their enthusiastic letters.

JULY IS NOVEMBER!

"For the first time in our twelve years of radio service business, we have overcome the summer slump. The Check-Up has made it necessary to employ extra help and business is comparable to November or December. We averaged about eight dollars per call on this new business including tubes, parts and labor. The RCA Check-Up Plan is also responsible for bolstering up our service business."

Wood's Radio and Elec. Co.,
Seattle, Washington.

PROSPECTS.

"We were well pleased with the results of the RCA Check-Up. It materially increased our floor traffic and increased over-the-counter tube sales approximately 12%. It gave us hundreds of contacts both on the floor and in the customers' homes. We plan on a similar campaign this Fall and we anticipate still better results during this part of the year."

W. E. Beals,
The Bon Marche,
Seattle, Washington.

GREAT!

"We received forty-six returns from a Check-Up mailing to 200 names, on which we averaged $4.00 a call. This represents the largest return by us in our six years in the radio business."

Royal Radio Co.,
Hoboken, N. J.

World's Fair Television

Television will be demonstrated to millions of visitors at the World's Fair for which construction work is already under way in New York. Shown above is the signing of the agreement by officials of RCA and the Fair. The scene was televised so that press representatives in another part of the building could both see and hear the ceremony. Seated at desk, left to right, Lenox R. Lohr, president of NBC; David Sarnoff, president of RCA, and Grover A. Whalen, president of the Fair

AUTOMATIC FREQUENCY CONTROL CIRCUITS

By L. R. KIRKWOOD
RCA Engineering Dept.

L. R. Kirkwood

Automatic frequency control circuits are incorporated on the standard broadcast band in many of the new 1938 RCA radio receivers. These circuits will correct for inaccurate station tuning, when the set is tuned automatically, by changing the frequency of the local oscillator in the receiver in such a manner that the resultant i.f. frequency formed will be at approximately the resonant frequency of the intermediate amplifier circuits.

Humidity a Factor

The successful commercial application of such a circuit depends almost entirely upon the stability of the receiver with respect to changes in humidity, temperature and fatigue of the component parts. Unless the receiver circuits maintain their original factory adjustment over a considerable period of time, the automatic frequency control circuits are liable to completely mistune instead of accurately tune the receiver to the desired station. The use of magnetite core i.f. transformers and the elimination of compression type mica trimmers reduces this tendency toward frequency drift in the intermediate amplifier of RCA models to a minimum.

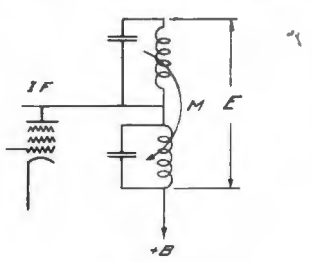


Figure I

Automatic frequency control circuits may be divided into two parts —the frequency discriminator and the oscillator control circuits.

Frequency Discriminator

The frequency discriminator consists of an intermediate frequency circuit that produces a direct current potential, which is applied to the oscillator control tube to change the frequency of the local oscillator in the receiver. The discriminator generates a negative bias with respect to ground on one side of the i.f. resonance curve, a positive bias on the other side of resonance, and a zero bias voltage at the resonant frequency. This phenomena depends upon the 90° phase difference that exists between the primary and secondary voltages of a double tuned loosely coupled transformer at resonant frequency, and the change in phase as the frequency is shifted through resonance.

Thus a circuit as shown in Fig. I, where both sections are tuned to the same frequency, will produce a voltage E of a magnitude indicated in Fig. I_a. If the mutual inductance between the circuits is reversed, the resultant voltage characteristic is also reversed, as shown in Fig. I_b.

If a center tapped circuit such as shown in Fig. II is used, the magnitude of E_1 and E_2 would be similar to Fig. II_a. Since the terminal connections of the output circuit are each connected to a diode rectifier, a differential voltage is obtained as indicated by the dotted curve.

The circuit employed in one of the new 1938 RCA receivers is shown in Fig. III.

Circuits (2) and (3) produce the discriminator voltage. Circuit (1) is added to improve the selectivity and to prevent excessive attenuation of side bands. Coil (X) is shunted across circuit (3) to adjust the inductance to i.f. resonance without affecting the electrical position of the mid tap on coil (2).

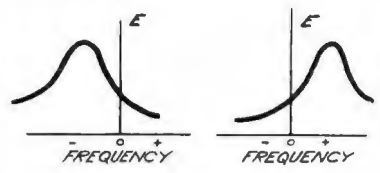


Figure I_a Figure I_b

The magnetite core in coil (2) is centered within the coil to improve the "Q" and is not changed for alignment purposes. AFC voltage is obtained for the oscillator control tube at (B). The audio voltage and AVC bias are obtained at (A).

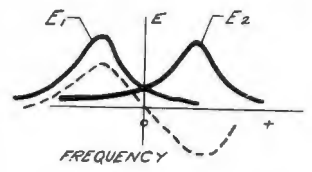


Figure II_a

The circuit employed to change the frequency of the local oscillator is shown in Fig. IV.

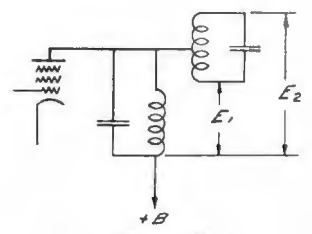


Figure II

Oscillator Control Circuit

The fundamental requirement for the control circuit is to convert the d.c. voltage from the discriminator circuit into reactance variations to be shunted across the oscillator-tuned circuit. The oscillator voltage E is impressed across the resistance—capacity network C_2 R_1 C_1. Condenser C_2 is used only as a blocking condenser for d.c. and has practically no reactance at the oscillator frequency. Condenser C_1 includes the input capacity of the control tube and the distributed capacity of the associated wiring. The value of R_1 is so chosen with respect to the reactance of C_1 that the proper amount of oscillator voltage is impressed upon the grid of the control tube. The voltage across C_1 lags the voltage E by approximately 90°. The vector sum of the voltage across C_1 and R_1 is equal to E, the oscillator voltage.

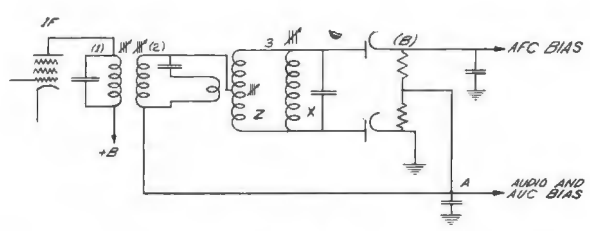


Figure III

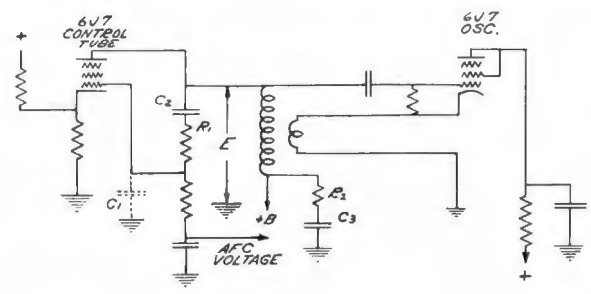


Figure IV

The voltage across C_1 is amplified by the control tube and adds vectorially to the original oscillator voltage and results in a change in oscillator frequency.

The degree of frequency shift of the oscillator depends in a large measure upon the mutual conductance of the control tube and the strength of the oscillator voltage E. To obtain maximum frequency variation it is necessary that the discriminator circuit provide a range of bias voltage for the control tube from plate current cut-off to grid current.

SHOP NOTES

FROM RCA SERVICE DIVISION

To keep the readers of Radio Service News posted on the latest changes in and additions to RCA Products and technical literature, the RCA Service Division will report changes in this column from time to time.

To get the most benefit from this column it is recommended that the readers of RCA Radio Service News transfer these changes and additions directly to their Service Notes on the particular model. By doing this, you are assured of always having the latest information handy.

ELECTRIC TUNING MECHANISMS

The electric tuning mechanisms of Models 811-K, 812-K, and U-109 are designed to be as simple in construction and as foolproof in operation as is possible. In order to maintain the accurate results possible with these devices, servicemen should use intelligent precaution in effecting any repairs or adjustments that may be necessary in the field. Principle adjustments and assembly details which may be of use in service work are given below:

Audio Shorting Switch

This switch is located on the motor bracket and closes due to solenoid action of the motor armature. The tension of the long contact finger is important in bringing about quick disengagement of the motor and in permitting the motor to pull into mesh with the drive mechanism. Normal adjustment is attained when the short fingers are aligned exactly straight with contact points separated approximately .030 inch, and the long finger spaced 3/16 inch from the adjacent short finger at the contact point. With the switch installed on the bracket, the lateral adjustment should be made so that the short finger contacts definitely close when the motor armature is pushed completely forward. The clamping screws should be tightened securely. If necessary in order to obtain positive pull-in and quick disengagement of the motor, the tension of the long finger should be decreased or increased by bending. Contacts of the switch must be kept clean. Crocus cloth or a relay burnisher may be used for this purpose.

Motor Reversing Switch

It is necessary to automatically stop and reverse the drive motor before the tuning condenser reaches the ends of its travel. Approximately 175 degrees of sweep is required, and the reversal *must* take place above 1700 Kc and below 540 Kc, but not too near the limits of scale. The coupling between the selector drum and condenser shaft should be attached so that when the condenser is in full mesh, the reversing switch trip lever is exactly vertical. The bracket holding the reversing switch has elongated mounting holes, allowing for fine adjustment of the reversing point. There should be definite clearance (1/32") between the end of the condenser shaft and the selector drum shaft. If the tripping lever becomes loose on the shaft, securely re-solder it into position using 50/50 solder and acid flux.

Main Pinion Gear

Clearance between the small high-speed pinion gear at top of front bracket and the intermediate gear determines the amount of mechanical noise produced. Correct adjustment gives approximately 1/64 inch of "gear slop" or movement at the teeth of the intermediate gear. The elongated hole in the front bracket allows for moving the pinion shaft to get the proper gear clearance. The pinion must also be adjusted for correct mesh with the motor shaft clutch pin. With motor completely forward and the pinion tight against its front bearing, the pinion shaft should be adjusted so that square pin of the shaft meshes its full thickness with the rotating pawl. The tip of the pawl should not overlap the rear edge of the pin, as this will tend to give poor disengagement and possible carry-over on tuning.

Vernier Tuning

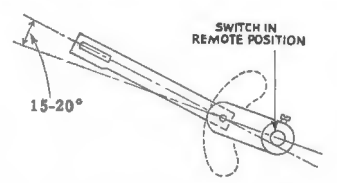
Binding or excessive friction at any part of the tuning mechanism may cause the vernier shaft to slip at some part of the range. The slider of the dial pointer may be hitting a burr on its guide channel, too much tension may be present at the selector drum wiper springs, condenser rotor contact springs may be too tight, or there may be binding at the vernier tuning shaft gear. If correction of these items does not effect a cure, replace the vernier tuning shaft assmbly. Remove by loosening the set screws of the gear on the large tuning shaft which meshes with the throw-out gear, removing screws holding support bearing of shaft and pulling shaft forward through opening in large pulley. The lip of metal at the center hub of the pulley must be bent forward to allow drive to pass through. Install the new drive in the reverse manner. Slide anti-backlash scissors gear on the condenser shaft apart so that compression amounting to two teeth on the gear is obtained in the springs. Adjust mesh of the gear on the vernier shaft before tightening screws so that smooth tuning is obtained throughout the range.

Selector Contact Springs

The eight contact springs which interrupt the push button circuits when the selector discs revolve are adjustable. Each spring should be aligned so as to ride in line with its corresponding disc, and adjusted so that it is exactly over the center of the insulating segment of the disc when the station adjustment key is engaged with the groove at the top of the disc. The tension of the fingers against the discs should not be increased. It is important that the discs be kept clean. A very small amount of Vaseline or petrolatum should be applied to the discs with a cloth after cleaning.

Manual-Electric-Remote Changeover

To properly line up the mechanical link assembly between the switch shaft and throw-out gear bracket, the set screws holding the lever on the switch shaft must be loosened, the switch turned to the remote position (extreme left), and the link lever revolved so that its center line makes an angle about 15-20 degrees with the center line of the link to



which it is attached and which in turn couples through a spring to the throw-out gear bracket. The illustration above gives the approximate relation of the parts for proper alignment. This adjustment affects the action of the change-over and may prevent correct operation of electric or remote tuning if not properly made.

Chassis Position

The position of the chassis in the cabinet must be adjusted in relation to the push buttons. The push buttons will tend to stick if the chassis is too far forward, and will not latch properly when the chassis is too far to the rear of the cabinet. Where necessary, the four chassis mounting screws should be loosened and the chassis shifted to give the correct latching and releasing of the buttons. This adjustment may be affected by shipment unless the rear packing cleat is kept intact.

Lubrication

The dial pointer slide should be greased with Vaseline or Petrolatum. This same lubricant should be applied lightly to all gear faces of the drive mechanism and sparingly with a cloth to the station selector discs. Three-in-One oil is suitable for the motor shaft bearings. A light grade of engine oil should be used for all gear bearings. Medium viscosity engine oil, similar to Pyroil "B," should be applied between the thrust washers on the motor shaft. Castordag, a mixture of graphite and Castor oil, is recommended for use at the selector drum end-bearing slots and at the bearings of cable pulleys.

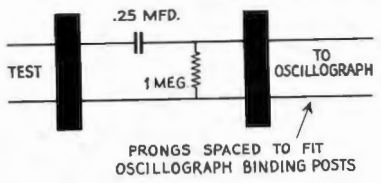
Service Tips

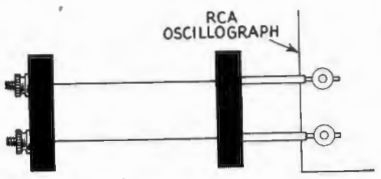
Now you can win your choice of a handsome RCA Service Engineer's Pencil or any volume of RCA Victor Service Notes by sending tips to RCA Radio Service News, Camden, New Jersey . . . Service Tips must be acceptable for either RCA Radio Service News or the RCA Radio Service Tip File. . . . All tips become the property of RCA to be used as they see fit. . . . Service Tips are our readers' ideas, not ours. While RCA Radio Service News believes they are worthwhile, we cannot be responsible for results.

Oscillograph Accessory

The drawing shows a method I use in connecting a 25 mfd. condenser and a 1 meg. resistor to my RCA Oscillograph Model 151, when voltages over 200 D.C. are encountered.

The prongs of the device are so





spaced as to fit easily into the binding posts of the oscillograph; the test leads are then clipped to the other end. This makes for a quick and easy way to connect the resistor and condenser into the circuit when wanted.

Henry M. Konitz,
91 Bishop St.,
New Haven, Conn.

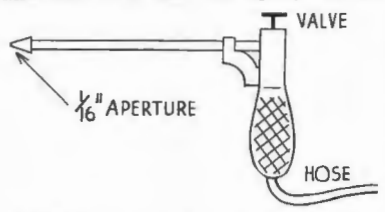
Intermittent Pilot, Crosley 128

Neon pilot light flashes intermittently when set is turned off. If all condensers in set are O. K., but a milliammeter in B+ lead shows an approximate drain of .2-ma. when set is turned off, and increases to about .3-ma. every 20 seconds or so, at which time the pilot flashes, change the wiring of set as follows: Remove lead from antenna coil to ground on chassis. Run new lead from coil terminal, under coil shields and up to center terminal of volume control. Run new lead from chassis terminal to point on 4-pole, single-throw switch to which the black and yellow or A-2 volt lead is attached. Use well insulated wire such as Lenzite or equal. Be sure that volume control is insulated from chassis, as sometimes the fibre washers have been removed. It is sometimes necessary to replace lead from pilot lamp socket to filament prong socket of the 30 oscillator. With this hookup, set and pilot lamp operate normally, but if antenna is grounded or lightning arrester is defective, the pilot lamp will glow continually with the set turned off and antenna switch is in distance position.

John M. Thompson,
529 N. Main St.,
Canandaigua, N. Y.

Cleaning Air Gun

For cleaning all parts of radios including the hard-to-clean condenser gangs I made a cleaner out of a paint spray gun. This gun was the type that used a fruit jar for the paint and also the syphon spray kind. I cut off the part that held the fruit jar and put on a longer brass tube in place of the shorter one that was on the gun and screwed on the spray nozzle



on this longer tube. This gun has the valve built in the gun and it was only necessary to connect it to an air supply. I have an air compressor system similar to the kind used in garages and operate this gun on pressure from 100 pounds to 150 pounds and found it is the only sure way of cleaning dust from between the condenser plates and other inaccessible places.

William Hansen,
Hansen Radio Service,
Niles, Michigan.

Broken Antenna Leads

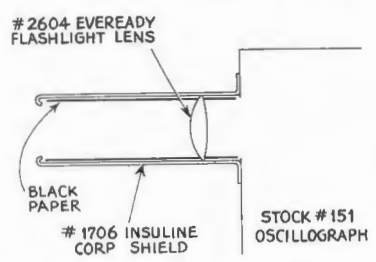
After a severe storm here we received a number of calls from owners reporting loss of volume. In all cases the sets were using all-wave aerials with twisted-pair transmission line. The usual inspection of the receiver would reveal nothing seriously wrong, but we did notice that the receivers would pick up if the ground wire was connected to the antenna post, suggesting that the trouble was in the antenna. A quick check of the antenna showed nothing wrong, but shaking it first caused a crackling in the radio, as of bad antenna contacts, then restored volume full blast. In each case the line was found to be broken inside the weatherproof covering at the first nail-in insulator. All that the sets were receiving on was the lead-in from that point to the set. The trouble was caused by constant swaying of the line. For a permanent repair, use a stand-off screw-eye insulator at this point.

Albert Rosenstein,
Chatham Radio Service,
Savannah, Ga.

Magnifying Hood for Oscillograph

In the past while making use of the model or stock No. 151 RCA Oscillograph I often found it necessary to rig up some device to shield the screen from various light sources or to move my work to some "dark" spot in order to see the image on the small screen.

Recently I hit upon the idea of removing the short screen hood or shield furnished with the oscillograph and placing a standard radio tube shield in its place. The tube shield fits the regular hood base very nicely. The idea was further improved by lining the inside of the tube shield with black paper and by inserting a flashlight magnifying lens. The lens happens to be of



the same diameter as the inside of the tube shield and when pushed down on the shield base is squared away and the right distance from the oscillograph screen.

This set-up makes it possible to use the oscillograph in any location and in any light, while the lens produces the effect of a two-inch screen greatly enlarging the image, which makes the instrument much easier to work with.

The parts necessary and which all fit without any alterations are:

1. One Insuline Corp. tube shield, Stock No. 1708.
2. One Eveready Flashlight lens, Stock No. 2604.
3. One 6 x 3 sheet of black paper unglazed or flat black.

Jesus Lorenz,
Southern Equipment Co.,
San Antonio, Tex.

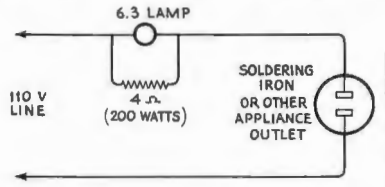
Philco 59 Oscillator Trouble

On a Philco Model 59 the oscillator-detector would jump out of oscillation. I changed the 6000-ohm bias resistor to 5000 ohms and it worked fine—until the day after the set was delivered. Returned to the shop, the set worked fine, but after a few taps with the chassis mallet it again stopped oscillating. All voltages checked O. K. The trouble remained after I tried all the usual tricks: new tubes, new mica between oscillator trimmer, hot iron to every connection, cooking oscillator coil in paraffin, checking condensers for flaking. Finally, using an oscillograph and the mallet, I happened onto the trouble. Completely removing the gang condenser from the chassis I found that both screws holding the stator plates on the side of the condenser which is covered by the speaker were loose. With these screws centered and tightened, the oscillator kept perfectly stable over the entire band. On another such case I found all four stator plate screws loose.

E. V. Henderson,
Henderson Radio Clinic,
Texarkana, Tex.

Pilot Light for Test Panel

When any apparatus or the soldering iron is plugged into the line outlet using this indicating pilot light, the light is automatically turned on. The 6.3-volt pilot lamp and resistor are connected in series with the 110-volt line, and, as there is no switch, the lamp will light when any load of from 50 to 150 watts is drawn from the outlet to



which the lamp is connected. The service engineer cannot go out and leave the soldering iron heating all night if it is plugged into this device. The 4-ohm resistor across the lamp is a piece of the heating element of an electric iron wound on a strip of mica or asbestos placed in a small metal box or behind the panel.

Herman A. Farrar,
137 W. 144th St.,
New York, N. Y.

Auto Radio Interference

I have found in General Motors cars, Hudson, and several others, that a very troublesome interference is caused by the electrically operated water level and gasoline gauges. This can be suppressed by by-passing the gauges at their respective beginnings, gasoline gauge at the tank, etc.

Wm. H. Meadows,
515 West 25th Street,
Huntington, W. Va.

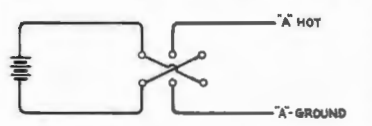
Testing Antenna Ground

Often it seems difficult to determine which of the two wires leading to the radio is the aerial or ground. This and the condition of the aerial and ground can be determined easily and quickly by use of the AC voltmeter in the analyzer. First, see if there is any voltage between the wires and either side of the AC line supply. There should be voltage between only one wire and one side of AC line. This wire is the ground. If both wires are live, the aerial is either shorted to ground, has fallen across an AC line outside the house, or has come in contact with the house wiring. The condition of the ground may be determined by comparing the AC line voltage with the voltage between the ground and the hot side of the AC line. If the line voltage is very much higher, a high resistance ground may be suspected.

J. D. McCullough,
779 Simpson Ave.,
Salt Lake City, Utah

Battery Polarity Changer

Below is a diagram for a battery polarity changer and current and voltage reading that we use on the service bench. This tool is very handy in changing the polarity of the "A" voltage when testing and



repairing car radios. It is especially useful with radios using the synchronous vibrator, as it is very easy to change the polarity for the radios that are polarized different from the test battery on the test bench.

T. J. Wilson,
Pocatello, Idaho.

Streamlined Amplifier

The new line of RCA sound amplification equipment offers systems of 6, 12, 24, 50 and 200 watts of power. Above is shown the 24-watt amplifier, with the handsome, streamlined design characteristic of the entire line. Its list price is $133.50

SERVICE MEN AND EXPERTS WROTE SYSTEM

Tips and Sales Ideas Were Selected From Thousands Submitted

Thousands of service men cooperated with specialists in three different fields to make the RCA 3-Point Service System, which is given as a bonus during September to purchasers of RCA test instruments, helpful in every phase of the service shop's activities, according to J. P. Allen, RCA Sales Promotion Department.

"To say that thousands of service engineers contributed to the 3-Point Service System is not an exaggeration," stated Allen. The 420 time-saving Tips in the Service Tip File were carefully selected from thousands that have been submitted to RCA Radio Service News. Again, in the book, *101 Service Sales Ideas*, the 101 selling ideas were selected from hundreds of schemes that had actually been used, with success, by service shops throughout the country. They are not hair-brained ideas that some one thought might work. It is this fact, that the Sales Ideas book and the service tips were actually written by service engineers themselves, that makes the 3-Point Service System so thoroughly practical and helpful.

Written by Experts

"When it came to record keeping methods, of course, we went to specialists. At considerable expense we employed two men that are recognized authorities in their fields: John F. Rider and J. Van Newenhizen. Every service engineer knows about Rider, publisher of Rider's Manuals, but not all of them may know that for several years before he collaborated with Van Newenhizen on the book *Radio Service Business Methods* he had made a study of this problem. Van Newenhizen, too, as an accountant specializing in the problems of the radio business, was able to bring practical knowledge to the task of devising a *simple* record keeping system that would meet the requirements of the radio service business. Thus the RCA Radio Service Record System, which is explained in *Radio Service Business Methods*, is just as practical as the other two units of the now-famous 3-Point Service System.

"You know, on this offer of a 3-Point System with each RCA Test Instrument, we are giving all the extra packets of Tips, so that the owner starts right off with 420 Tips in his file, to which he can add his own ideas on ordinary 3 x 5 file cards. The steel filing case alone would retail for at least $1.50. With the Tips and the books, it makes a combination that every service shop should have. It is RCA's contribution to a more profitable service industry and I hope a great many will take advantage of the September-October offer to get the whole system free."

Advanced Line of P.A. Devices In New Catalog

(*Continued from Page 1, Column 3*) or the orchestra leader can have the mixer unit on his stand and control the volume as he desires. No longer must the operator of the mixer be stationed at the amplifier and mix imputs in accordance with the way he thinks the audience is hearing the program.

Electronic Mixing

Remote mixing in the new RCA equipment is accomplished electrically in the amplifier rather than in the signal circuits. Noise is avoided because the control circuits handle simple d-c potentials that are not critical. They may be of any desired length.

Microphones, amplifiers, loudspeakers, record-playing apparatus —everything needed for any sound amplification job is shown in wide variety in the new catalog. Equipment is listed both as complete systems and as single units from which custom-built installations can be assembled.

In commenting on the new line of equipment, W. L. Rothenberger, manager of RCA Commercial Sound Section, stressed the fact that the policy of his department is not to issue new models of equipment annually but to improve the apparatus at any time as soon as better designs are developed by the laboratory.

Looks Alone Not Enough

"Good looking equipment impresses the customer and helps to sell the job, but beyond that it doesn't mean much to the man who has to make the apparatus perform," said Rothenberger. "Although our new line is outstanding for its handsome, streamlined appearance, it is far more outstanding for the engineering refinements that have been incorporated in the equipment. This is not just an old line in a new dress. The engineers have been hard at work for two years to design equipment that would surpass anything heretofore available. I am not joking when I say the results speak for themselves."

The new Catalog can be obtained from RCA Commercial Sound distributors or direct from RCA Commercial Sound Section, Camden, N. J., by asking for Catalog No. 211.

Good Mixer

The new RCA Remote Mixer permits mixing operator to sit with the audience

Get These Free!

These three units comprise the popular RCA 3-Point Service System, an $8.75 value given free to purchasers of RCA Test Instruments during September and October

NEVER REPLACES A REPLACEMENT

"To my way of thinking, one of the chief advantages of this transformer is the fact that I have never had to replace a replacement," writes Herbert H. Brown, service engineer for Gaumont Bros., Lowell, Mass. He was referring to the RCA Universal Transformers. Brown stated that he had been using RCA Universal Transformers for a year and a half and that, whereas formerly he was compelled to stock a large number of transformers of different makes, he now needs to carry in stock only the four sizes of RCA Universal Power Transformers and two RCA Audio Transformers. "I have used these transformers in the finest of high fidelity sets and have been more than satisfied with the results," declared Brown.

Buyers of Test Instruments Get An $8.75 Bonus

(*Continued from Page 1, Column 2*)

two books help the shop to get the business and to handle it properly. The time-saving Tip File helps on those difficult cases that do not yield to the usual remedies.

Offer Good In September Only

"Thus you can see that the RCA 3-Point Service System is a natural supplement of our test equipment, which also helps to turn out the jobs quickly. Hence this liberal offer good for September only: one complete RCA 3-Point Service System with each RCA Test Instrument except the Output Indicator."

List of Apparatus

The list of RCA test equipment to which the bonus offer applies includes the following high-quality instruments:

Cathode Ray Oscillograph, 1-in. screen, Stock No. 151, net price	$47.50
Cathode Ray Oscillograph, 3-in. screen, Stock No. 9545, net price	$84.50
Electronic Sweep Test Oscillator, for use with all type of oscillographs, Stock No. 150, net price, with tubes.....	$64.50
Battery-powered Test Oscillator, for use with external frequency-modulator, Stock No. 9595, net price	$34.50
Universal A-C Bridge, measures inductance, capacity, resistance, Stock No. 9600, net price ...	$49.65
Frequency Modulator, for use with oscillographs, Stock No. 9558, net price	$27.50
Piezo-Electric Calibrator, for checking frequency accurately, Stock No. 9572, net price.....	$29.95
Beat Frequency Oscillator, range 30-15,000 cycles, Stock No. 9633, net price	$64.50

Dealers Urged To Advertise By Direct Mail

(*Continued from Page 1, Column 1*)

cooperative project such as this to feature any individual store or to replace individual initiative.

"The greatest benefits of the telephone promotion come to those stores who also do their own Check-Up advertising. We have found direct-mail to be effective in most cases, especially where the way has been paved by cooperative newspaper advertising which 'breaks the ice' for the direct mail material.

"We know the Check-Up plan is a great way of getting set, repair, and tube business. Otherwise we would not have been pushing it so long. Although a very large percentage of the total sales secured as a result of Check-Up calls are for major appliances and labor, yet our tube business benefits enough to make our expense in promoting it worthwhile, so it certainly must be profitable to the dealer who benefits from the sales of other merchandise as well.

Results Vary

"Of course, the results obtained by dealers vary widely. Sometimes local conditions are responsible but usually I think it is the dealer. One dealer sent out 10 cards and complained because he got no results. Another spent $4 mailing out 200 of our Form 1341 letters, and even before the returns had stopped coming in he said the campaign was a failure because he had sold only $87 worth of tubes and service. As a postscript he said they had sold a $49.50 radio on one of the calls. $136.50 of sales at an advertising expense of $4.00! I know a lot of stores that would like to have bigger and better failures of that kind.

"The Central Telephone Check-Up has already proved its value and it costs dealers nothing. Working the Check-Up plan by direct mail has also proved its value many times over in the past, but if any dealer is skeptical he can now give the plan a trial at little cost to himself by taking advantage of our offer of free sales promotion material."

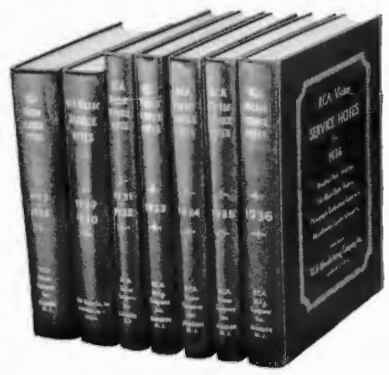
Service Notes Book For 1936 Now Available

Latest Volume Has Pictures of Receivers, Index, and Other Features

Bringing the number of bound volumes of RCA Victor Service Notes to seven, the 1936 book just off the press has several new and interesting features that will make the book of even greater usefulness to service engineers than the earlier volumes.

For the first time, all the pages of the 1936 book are numbered, and there is a complete index. There is also a table of contents covering all previous volumes as well as the new one.

All service data, wiring diagrams and schematic diagrams for 83 receivers issued by RCA Victor dur-



ing the calendar year 1936 are included in the book. Special service hints for many models are also given. Nine pieces of RCA Test Equipment are similarly treated. A new feature that will assist service engineers to quickly identify the particular instructions needed is the halftone picture of each receiver.

Loudspeaker Reference Table

Another feature is the complete loudspeaker reference table which lists 98 loudspeakers and gives the number stamped on the speaker, the stock number of the complete speaker and all replacement parts, d-c resistance of the field coil, voice coil and hum coil, diameter of speaker, and voice coil impedance in ohms.

Any of the bound volumes of RCA Victor Service Notes (covering also Radiola and Victor models) can be had from RCA Parts distributors for $1.25 net. The periods 1923-28, 1929-30, and 1931-32 are each covered in one volume. Each of the years 1933, 1934, 1935 and 1936 has a separate volume, making seven in all.

Check-Up Qualification Blank

Please ship the following RCA Tubes—C.O.D. ... : Open Account... :

Type	Quantity	Type	Quantity
24A			
26			
27			
35			
45			
47			
71A			
80			

In accordance with the Special RCA Free Promotional Material offer (effective Sept. 1, to Nov. 1) please ship in return for the tubes ordered in excess of 50 (amount required for telephone listing) the sales promotional items indicated below, using name and address shown under "Telephone Qualifications" for imprint information.

Form # ..... Form # .....

Form # ..... Form # .....

"TELEPHONE QUALIFICATIONS"

Service Work regularly done..... No. years.....

From Store or Home..... Service Notes used.....

Equipment Owned—Checker ☐ Oscillator ☐ Oscillograph ☐ Output Meter ☐

Name of Firm or Business .....

City ..... Telephone.....

Form 2245

Note to Distributor – After order has been filled send card to RCA District Office so eligibility for Telephone Listing can be determined

All a service engineer has to do to qualify and participate in the RCA Central Telephone Check-Up promotion is to fill in this postcard, which is the qualification card and order form combined. If you haven't received a qualification card, clip the illustration above and send it to your distributor.

SELLING TIPS

Selling Tips are our readers' contributions for selling their services or products. All readers of RCA Radio Service News are invited to submit their ideas for increasing business. Each Selling Tip printed will win one of the new RCA Service Engineer's Pencils. Let's have your ideas for bringing in business.

Antennas for Apartment Dwellers

I have found that a sure way to sell antennas to people who have just moved into a large apartment building and say, "Oh, but we have never had an antenna before," is to demonstrate to them without cost by making a temporary installation of an RK-40 Antenna on the roof. This not only sells an antenna but sometimes a new all-wave radio as well, when the customer learns how much reception is improved by a good antenna.

John Magnus,
5454 South Shore Drive,
Chicago, Ill.

(Editor's Note: The new RCA Magic Wave Antenna could be quickly installed temporarily in most cases and would make an even more convincing demonstration, since it reduces noise on both standard and short-wave and is easily adapted to different locations or to existing antennas.)

Effective Tuning Eye Demonstration

In my service kit, in addition to colored pilot lights, extension cords, three-way plugs and other accessories, I carry a 6G5 mounted in an attractive small box. The 6G5 is connected with long leads having spring clips. When I service a receiver having AVC, I hook up the 6G5 to the receiver and quickly demonstrate the value of a tuning indicator. Many sales result.

Eugene J. Krzysko,
2047 Cortez Street,
Chicago, Ill.

(Editor's Note: RCA Tuning Indicator Kit No. 9688, List Price $3.00, contains all parts needed for making the installation.)

Fuses Bring Jobs

Whenever a set comes in for repairs because the filter condensers have shorted out and ruined the power transformer, I try to sell the customer on letting me put small fuses on the high side of each condenser. A .1 ampere fuse is generally large enough; if the two sections of a double section condenser are paralleled I put a fuse in each lead. I tell the customer that, although I cannot guarantee the condensers not to fail, the addition of the fuses will prevent the transformer from burning out.

Robt. W. K. Smith,
1522 Ben Lomond,
Glendale, Cal.

Stickers for Phone Directory

From my RCA Radiotron tube stickers (Form 1402, $1 per roll) I clip the end which provides blank spaces for date tube was tested, etc., leaving my name and the Radiotron monogram. I stick this end on the front cover of the customer's telephone directory—a convenient and constant reminder of their radio man.

Raymond C. Wyman,
Medford, Mass.

$10.00 Reward

Here is an ad I have run several times when the repair work was slow:

$10.00 REWARD
for any Radio which we are unable to repair

This ad has brought in many repair jobs and also some sales. We have never been "stuck" on it as yet.

E. H. Darrow,
Radio Den,
Bakersfield, Calif.

Advertises *in* Tubes

I dug up all the old tubes I could find in the shop, then went out here and there and found still more, placed an advertising sticker on each of the tubes and in two of them placed a "coupon" good for a radio (slipped through hole under grid tap on top). Then I made a trip to the schools and contacted the right teachers who gave them out with instructions on care in breaking glass and to examine tube construction and at same time to look for coupon good for a radio.

C. B. Kirkpatrick,
Kirks Radio Shop,
McKinney, Tex.

Puts Radio in Store

I made a deal with the manager of a very busy confectionery store in my neighborhood whereby I installed a radio in his store at no cost to him. The instrument, a table model, was placed near the door where customers could see it as soon as they entered. Above the set I placed a neat card with my name and address and the statement that we carry RCA Tubes. This is an old idea but I have found that it is well worth the cost. I have obtained many customers in this way.

Fred McRobert,
West New Brighton,
Staten Island, N. Y.

Collection Method

Selling merchandise and collecting for it are two different things. A small service man has a lot of trouble collecting accounts no matter how careful he is, and the law gives him no protection, since the amount involved is too small to sue for it. I have adopted the following plan to protect myself:

I made a list of about thirty customers who had promised to pay later and then failed to do so. Now when a customer wants to pay later I simply show him the list and say, "Mister, I am sure you are honest and pay your bills, but I was also sure that all these people would pay when they said they would—but they didn't. So if you can't pay this bill now just phone me when you can and I'll bring the radio back."

Ninety times out of a hundred the customer digs up the money and pays you before you leave. The tactful use of my list of deadbeats has saved me many a dollar and made friends for me rather than lost them.

C. Dewall,
737 Kayton Ave.,
San Antonio, Texas.

Interesting Postcards

Service Engineer McRoberts of Long Island City conducts a direct mail campaign with interesting postcards of his own design. They are 3 inches by 5 inches, slightly smaller than government postcards, and printed on a light green stock. He tries to make every postcard genuinely interesting to the customer. One card, for instance, was headed "What to do when your radio stops" and had six simple suggestions, the last one being that McRoberts' well equipped shop be called if the other suggestions failed. Another card, illustrated here, is interesting both as a news item and as a mailing piece.

MAN INSTALLS MICROPHONE IN COFFIN

(News Note from RADIO TODAY)

"Dread of being buried alive fills many people. To safeguard against this possibility one middle-west tycoon has arranged with his local sound man to install a microphone in his coffin so that if he is accidentally interred before rigor-mortis sets in he can roll over and shout for help . . ."

Your radio can not turn over and shout for help when its dying . . . that's why the most modern equipment, such as the Cathode Ray (The Xray of radio) and its associated instruments of analysis are necessary in order to detect radio troubles.

When your set, even looks or sounds sick just call Dr.

McROBERTS HAvemeyer 9-9851
41-10 49th STREET SUNNYSIDE Long Island City

CALCULATING ACOUSTICS FOR AN AUDITORIUM

by Albert K. Ward, Commercial Engineer
RCA Manufacturing Company, Inc. Camden, N. J.

Part III

A. K. Ward

In this, the third in a series of articles dealing with acoustic problems we carry our discussion further and illustrate it by means of a simple problem—a practical method of calculating the amount of absorption material required to correct the acoustics of an auditorium.

For our problem, we will select an average auditorium. Auditoriums of this type can be found on nearly every school campus. It will be assumed that this auditorium will be used for such activities as basketball games, pageants, shows, dances and general meetings. It must be kept in mind that these articles are being written in very general terms, omitting technical details wherever possible. Whenever it becomes necessary to use technical terms or formulas, we will try to explain them fully as we go along.

Description of Room

We will assume that our problem auditorium is 125′ wide and 225′ in total length, from which must be deducted a stage of approximately 28′ in depth, making a total of free space in the auditorium of 197′. We will assume that the height to the eaves of the building will be 24′, and 38′ to the center ridge of the ceiling, which is open to the roof. Of course, the pitch section will be reinforced by structural steel channels, light beams and other reinforcing angles to amply support the roof, but these will not be taken into consideration because they are such a small portion of the whole absorption problem.

The side walls (197′ each) are divided into fourteen bays of 14′ each, while the far end will be divided into nine bays approximately 14′ each. The other wall in which the stage is located is solid, forming a part of the wall of another portion of the building.

The stage proper is 60′ wide and 28′ deep. The stage floor will be 40 inches above the auditorium floor line, while the bottom of the proscenium arch is 20 feet above the floor.

Twelve feet above the auditorium floor is a balcony running along both sides and back. This balcony is 15′ deep, the front of the balcony being 18′ high. There are also five risers on each balcony, each riser being 8″ high and 2½′ deep. We will also assume for this problem that for each of the fourteen bays on each side and nine bays at the end, we will have 48 square feet of glass surface.

The walls under the balcony will be covered with glazed brick. The balcony walls and ceiling will be of reinforced concrete. In the ceiling will be located two large glass sky-lights. Each sky-light will contain approximately 72 square feet of glass.

Effect of Audience

As this is a typical auditorium problem, we will assume that they will use portable, collapsible, wooden seats. We will not pay much attention to aisle widths and other requirements which are so necessary in a standard theatre but we will assume that the seating capacity, using this type chair for commencements and other parties will be approximately 4000 people. As stated in a previous article, the acoustics are generally figured for two-thirds capacity. Calculating for two-thirds of 4000 means that we will figure the acoustics when 2667 people are in the hall for optimum reverberation time. The optimum reverberation time of this auditorium is approximately two seconds. You will note from the previous articles that for an auditorium of 700,000 cubic feet of volume, the time is 1.96.

The cubic volume of this auditorium is as follows:

197 x 125 x 24 = 591,000 cubic feet

$197 \times 125 \times \frac{14}{2}$ = 172,375 cubic feet

TOTAL 763,375 cubic feet

You will note that this unit is 63,375 cubic feet larger than 700,000 cubic feet. Therefore, two seconds will be taken for the optimum time.

We will now calculate the absorption units in Sabines (absorption units) of the different parts of the auditorium.

Area of glazed brick walls under balcony sides and rear—

197 + 197 + 125 = 519 x 12 = 6228 sq. ft.

Less 175′ for doorway 175 sq. ft.

6053 sq. ft.

Area of wall stage end (125 — 60) =
65 x 12 = 780
60 x 3⅓ = 200
980

From this must be deducted 42 square feet for doorway, leaving a total of 938 sq. ft. of glazed brick wall at the stage end. The total square feet of the glazed wall is as follows: 6053 + 938 = 6991 sq. ft. of glazed area.

The absorption of the bottom and top area of balcony:

Balconies

In acoustic problems sometimes the area under a balcony is considered an opening and a certain formula is used in calculating this absorption, but because this balcony is so short, it can be considered as a part of the room surfaces and we will calculate its area as though it was a portion of a wall of the auditorium.

(15 x 2) (197 + 197 + 125 — 30) = 14,670 square feet of reinforced concrete.

In our calculations the area for the front of the balcony and the risers will be considered as part of the wall structure. The small discrepancy in the total area will not affect the results sufficiently to make a great deal of difference in the results. The area of the wall from the bottom of the balcony to the eaves of the building is therefore as follows:

197 + 197 + 125 = 519 x 12 = 6228 sq. ft.

From this will have to be deducted the windows—
48 x 37 ..... 1776 sq. ft.

Leaving a remainder of .. 4452 sq. ft.

Area of stage wall:
(125 — 60) x 12 = 780 sq. ft.

The area of the wall for each end above the eaves will be as follows:

$125 \times \frac{14}{2} \times 2$ = 1750 sq. ft.

The area of the proscenium arch is 4 x 60 = 240 sq. ft.

The area of the ceiling is as follows:

$\sqrt{\frac{125^2}{2^2} + 14^2} \times 197 \times 2 = 64 \times 197 \times 2 = 25{,}216$

Less sky-light area—
72 x 2 = 144

25,072 sq. ft.

There remains the area of the main floor, which is:
125 x 197 = 24,625 sq. ft. of maple wood.

Allowing for Stage Opening

We should now take into consideration the proscenium opening for the stage. We will assume that the stage has some scenery and, therefore, can be considered as an opening, because the scenery would absorb a good deal of the sound. If no scenery is included in the proscenium opening, then the walls of the stage should be considered as a portion of the walls of the auditorium, but for this problem, we will assume that the stage is a proscenium opening. The approximate opening will be

60 x 16⅔ or 1000 sq. ft. of area

Now that we have all the areas calculated, we will sum them up and find that the total area of glazed wall is 6991 square feet. The total area of concrete walls and ceiling will be as follows:

14,670 sq. ft.
4,452 sq. ft.
780 sq. ft.
1,750 sq. ft.
240 sq. ft.
25,072 sq. ft.

46,964 sq. ft.

Total area of doors:
42 sq. ft.
175 sq. ft.

217 sq. ft.

Total area of glass in windows:
1,776 sq. ft.
144 sq. ft.

1,920 sq. ft.

We will now take these areas and find the Sabine units of absorption:

Glazed walls—
6991 x .01¾ = ... 122.34 units

Concrete—
46,964 x .015 = ... 704.46 units

Doors—
(175 + 42) .03 = ... 6.51 units

Glass—
(1776 + 144) .02¾ = 52.80 units

Floor Wood—
24,625 x .03 = ... 738.75 units

4000 Wooden Seats—
(4000) (.1) = ... 400.00 units

⅔ Audience—
2667 x (4.7 — .1) = 12268.20 units

Absorption of proscenium opening—60′ x 16⅔ = 40 + 960 = (1000 sq. ft. x 25%) 250.00 units

14543.06

or

14,543 units

Now let us calculate just what the natural reverberation period would be of this room choosing the formula

$T = \frac{05(V)}{\text{abs.}}$

$T = .05 \frac{(763{,}375)}{14{,}543} = 2.62$ seconds

—while two seconds is the optimum time.

The absorption unit required to give us the optimum time is as follows:

$\text{Abs.} = \frac{.05 \times 763{,}375}{2} = 19{,}084.37$

19084 absorption units
14543 absorption units of walls, etc.

5541 absorption units still required

For this example, we will pick a material from our list in the second article which has an absorptivity of .76 at 512 cycles—

.76) 5541 = 7291 sq. feet required

The next problem is—where shall we place this material to give us the best results. When a speaker is on the stage, the voice travels to the rear of the hall and rebounds from that rear wall. It is, therefore, very essential that the rear wall be covered first. Since it is practically impossible to cover the entire rear wall due to cleaning consideration, we will assume that the absorption material is placed on the wall approximately a foot up from the floor. Therefore, the end area available for covering is as follows:

Glazed brick—125 x 11 = 1375 sq. ft.
Less doorway of 36′— 36 sq. ft.
1339 sq. ft.

From the top of the last row balcony to eaves will be 750 square feet, less window opening of 432 square feet, or 318 square feet.

From the eaves to the top of the ceiling—$125 \times \frac{14}{2}$ = 875 sq. ft.

Totaling these areas gives us the following:

1339 + 318 + 875 = 2532 square feet.

The side walls under the balcony will give us 197 x 11 x 2 = 4334′ from which must be subtracted 151 feet for doorway, leaving a total of 4183 sq. ft. This gives us a total of 6715 square feet of absorption material which can be placed on the wall.

As you recall, we require 7291 square feet; therefore 7291 minus 6715 sq. ft. equals 576 square feet to be placed in some other location. It is our advice that this be placed on each side of the proscenium arch and over the stage. It must be remembered that the placing of this material has been considered on the assumption that no amplification system is being used in the auditorium. There will be a slight difference in the placing of this absorption material and method of acoustic treatment when sound reinforcement is employed.

Small-Audience Considerations

Now let us consider the problem from another angle. Let us consider that there is sufficient money to do more treatment and we will assume that the hall will be used for small gatherings, say, for instance, five hundred couples or a total of one thousand people, for dances, small shows, etc. We will then see what absorption we need and how to place it. For this, we must subtract the total of 1667, equalling 1667 x (47-1) = 7668.2 more Sabine units needed.

7668.2 ÷ .76 = 1089 square feet of material required.

The logical place then to use this extra material would be on the ceiling, making a panel in each bay of approximately equal size so that the absorption will equal the total area.

Popular Convention Spot

The display shown above was a popular spot at both the IRE convention at the Hotel Pennsylvania in New York and the IRSM Convention at the Hotel Stevens in Chicago. It will be seen next at the Radio Parts Manufacturers National Trade Show in New York, Oct. 1, 2 and 3

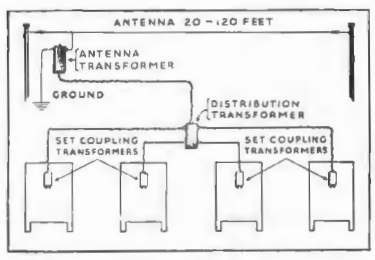
Magic Wave Is Popular Aerial For Store Use

Reduces Noise On All Bands; Will Operate Up To 16 Radios At Once

Although the recently-introduced RCA Magic Wave Antenna was designed primarily for home use, its adaptability to various types of installation and its ability to operate as many as 16 receivers at one time without noticeable loss of signal strength have already brought this remarkable new antenna system into widespread use for demonstration purposes in radio stores. The efficient noise-reducing properties of the antenna on all wave bands are appreciated by stores in noisy locations.

Extra Transformers Used

The standard Magic Wave Antenna Kit, for home use, supplies only the one antenna coupling transformer and one receiver coupling transformer required for connection to a single receiver. This kit lists at $6.95. Stores wishing to connect the antenna to a number of receivers buy an additional receiver coupling transformer for each additional receiver, plus one or more distribution transformers. One distribution transformer will handle four receivers. For more than four receivers, there must be a distribution transformer for each four receivers plus one more distribution transformer to which the others are connected. With five distribution transformers and sixteen receiver coupling transformers, a complete noise-reducing installation for 16 outlets can be made.



Typical Four Outlet Installation

The distribution transformers, Stock No. 9814, list at $3.00, and the set coupling transformers, Stock No. 9813, list at $2.50.

Frequently a vertical signal collector is found to be not only the easiest to install on top of a store but also the most desirable from the standpoint of locating the antenna in the most noise-free spot possible. A feature of the Magic Wave Antenna is that good results are obtained with either a vertical installation made with several lengths of ordinary iron pipe or from a customary single wire from 20 to 120 feet long. The antenna coupling transformer may be grounded to a piece of wire screen when the installation is on the roof of a store or apartment building.

Direct Mail Material Galore

There are direct mail pieces for almost every requirement shown in the new RCA Radiotron Sales Aid Catalog. Above are shown only part of the assortment. Stamped and imprinted these cards are $1.25 per 100. Nos. 1773, 1338, 1337, and 1774 are also available without imprint or stamp for 35c per 100. During September and October, as part of the Central Telephone Check-Up Promotion, any of the above cards may be obtained, unimprinted and without postage stamp, free with an order for 25 RCA Radio Tubes

New Speaker Heard Clearly For One Mile

Atlantic City Officials Test Remarkable New Sound Projector

Atlantic City, N. J., Aug. 6.—A powerful new loudspeaker capable of projecting speech and music upwards of a mile with full clarity was demonstrated by RCA Victor engineers for the first time this morning. The new speaker has many uses but city officials were interested in it principally as a valuable new means of promoting safety on Atlantic City's beaches.

Director of Public Safety, W. S. Cuthbert, head of the Beach Patrol, Dr. Charles L. Bossert, and other officials of this and nearby cities witnessed the demonstration from the South Carolina Avenue Beach Patrol Headquarters. All were amazed at the clarity and tone quality with which the sound was heard for great distances.

Chief value of the new development, according to W. L. Rothenberger, RCA Victor official, is that lifeguards will be able to maintain more complete control over the beach areas and adjoining waters by directing the powerful beam of sound on a movable swivel to the desired spot. By this means, bathers and even watercraft can be warned away from dangerous tides, order maintained on the beaches, lost children located and other beach patrol services greatly facilitated. Other possible uses for the new sound projector, which received its first public test here, is for communicating with the ground from airplanes, directing harbor craft, supervising boat races, and addressing great outdoor audiences in ball parks, stadiums, and fairs.

Only 100 Watts Amplification

The new speaker utilizes only 100 watts of power. Heretofore, all power speakers have required almost five times as much power to cover similar distances with far less intelligibility of speech and music. Its remarkable distance range and tone quality is made possible by the development of what is probably the world's largest permanent magnet ever made for the purpose. It weighs 25 pounds and measures 8-½" in diameter. This powerful magnet actuates a new type of molded diaphragm especially designed to withstand the terrific pressure of the sound, and which is impervious to all kinds of weather conditions. A new throat construction acts as an acoustic transformer of the mechanical vibrations into sound vibrations, and makes possible a remarkable clarity and uniform distribution of sound in the audible range of from 100 to 7000 cycles. The complete unit is 40 inches in height and 20 inches in diameter at the bell opening.

Commercial Production Started

The instrument demonstrated here today was a laboratory model and the demonstration served as a final test of the speaker. Rothenberger explained that commercial production of the remarkable new sound projector would start at once and that in a few weeks it would be available to sound amplification dealers through RCA Commercial Sound distributors.

Silas Egglemud

"I told her the Spider Web Antenna would keep out household static and she wanted to know if it was good for flies and mosquitoes too."

PHONE CHECK-UP COSTS DEALERS NOTHING TO JOIN

(*Continued from Page 1, Column 5*)

doing all year. Taken together, the two campaigns constitute a powerful sales-making force that will reach the great majority of all radio owners of America.

Free Promotion Material

In addition to participation in the Central Telephone Check-Up Promotion, service shops can obtain time-tested Check-Up direct-mail pieces, displays and other sales promotional material absolutely free as their tube orders exceed the 50 required to be listed in the telephone promotion.

Participation in the Central Telephone Check-Up Promotion is open to all qualified dealers in the territory economically served by the various cooperating telephone exchanges. Over 80% of the nation's service shops are thus eligible to participate. Those outside of the area served may still obtain the free sales promotion material with tube orders.

Booklet Explains Plan

The material which can be obtained free and the size of the tube order required to obtain specified quantities of the various items are shown in a booklet, "38 Sales Aids," which is now being distributed by RCA Radiotron distributors.

Among the items shown in the booklet are many that are familiar to service dealers as having a successful producing record. For instance, 100 of Form No. 1342, a form letter with a small wad of cotton attached which the prospect can use if he prefers not to call a service engineer, can be obtained, imprinted on letter and envelope, free with an order for only 100 tubes. Form No. 1335, a two-color self-mailer with business reply card attached, can be obtained in a quantity of 275 free with an order for 250 tubes. Other material such as displays, dummy cartons, log books are also offered free of charge with orders for tubes.

Plan Thoroughly Tested

Before it was offered to the trade the Central Telephone Check-Up plan was thoroughly tested, as are all RCA Radiotron selling plans. In Detroit where the test campaign was conducted at the quietest season of the year, dealers reported unusual success for a summer campaign, especially since there was no extra expense to them for the prospects turned over to them.

Qualifying for the Central Telephone Check-Up is easy. The dealer merely has to fill out an application postcard and mail it to his distributor. On the postcard the dealer writes his order, gives imprinting instructions for any sales promotional material he is entitled to with the order, and checks off which of the test instruments usually found in a reliable shop are in use by him. The application postcard is illustrated on page 6. Dealers should send it in at once to start receiving the benefits of the Central Telephone Check-Up Promotion right from the start.

Powerful Loudspeaker

Atlantic City visitors far out at the end of the famous Steel Pier recently were startled by a distant but clear voice asking them to cooperate in a test city officials were making of a new loudspeaker by waving their handkerchiefs to show that they could understand the voice. The crowd Promptly responded. The voice came from a new RCA loudspeaker that with only 100 watts of power transmits speech or music clearly for great distances. Above, the speaker is shown in its temporary rigging on the Beach, more than a mile from the end of the pier

New Pickup And Record Changer Now Available

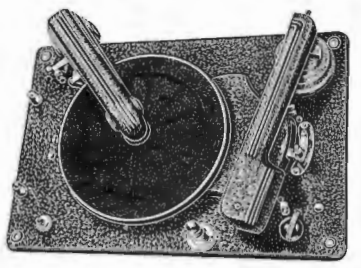
Phonograph Parts For Service Work Shown In Circular

Almost everyone who can possibly afford one today has a radio, but the ascending sales curve of the record business indicates clearly that more and more people are turning to recorded music as a supplement to the radio. For service shops that are cashing in on the opportunities presented by the trend toward recorded music, the RCA line of record playing apparatus now has several interesting new units.

Leading the parade of RCA record playing equipment available for service work is the well-known RCA DeLuxe Record Changer, which lists at $99.50, providing the dealer with a nice profit on the sale of the equipment as well as on the job of installing it. The DeLuxe Record Changer has been improved by giving it a newly-designed crystal pickup.

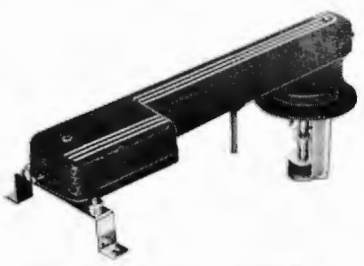
Pickup Available Separately

The crystal pickup of the DeLuxe Record Changer is also avail-



No. 9820 Deluxe Record Changer

able as a separate unit. It works directly into the grid circuit without coupling transformers. Its wide frequency response, from 45 to 7,000 cycles, assures splendid tone reproduction. Mechanically, the pickup and arm have several new advantages. It has a ball-bearing pivot mounting extending below the motor board. The arm is spring balanced and the needle pressure can be adjusted. An automatic switch cuts out the pickup except when it is in playing position. Best of all, needles are easily loaded



No. 14818 Crystal Pickup

from the top. A needle-positioning bracket is supplied with the pickup. Rest the arm on the bracket, drop the needle in from the top, tighten the screw, and the needle is in the correct playing position.

Inexpensive Record Changer

Appealing to a wider market than the DeLuxe Record Changer is the Junior Automatic Record Changer which sells for only $49.95, subject to usual trade discounts. At this price thousands of people who already have a good radio will want an automatic record changer installed in the radio cabinet to play through the radio, or perhaps installed in an old phonograph cabinet. The $49.95 Record Changer is of a new and remarkably

No. 9800 Record Changer

fool-proof design. It plays seven 10-inch records automatically or plays 12-inch records manually.

A large assortment of record-playing equipment for service work is shown in a circular, Form No. 2153, issued by the RCA Parts Division and available on request to RCA Parts distributors.

Test in Detroit Proves Value of Phone Check-Up

The Central Telephone Check-Up promotion was first tried out in Detroit. What many Detroit dealers think of the plan is exemplified by the following statement of a well-known dealer, W. A. Jacobi, known to thousands of Detroiters as "Radio Jake."

"The results of the RCA 10 Point Check-Up Plan are absolutely astounding," said Radio Jake. "More than 500 service calls have come in from April 1st to July 1st, as a result of a local newspaper campaign promoting the 10 Point Check-Up Plan for $1.50.

$10 to $15 per Call

"The Check-Up has made people tube conscious," continued Jacobi. "They are beginning to realize that a set equipped with old tubes is not giving the best in performance and tone quality. When customers call in and ask what they get for $1.50, I tell them they are getting a $2.50 service call for that amount, that I will check their tubes, check and clean their set, and also check for local interference. Business resulting from these calls many times runs as high as $10.00, $12.00 and $15.00, besides the dozens of sets sold through service call leads. Also, many hundreds of tubes were sold as a result of the Check-Up Campaign and all of them were RCA Radiotrons."

Formerly Interference Expert

"Radio Jake" is now an associate partner of Jones & Polk Co., 453 W. Jefferson Ave., Detroit, Michigan. After spending 14 years on radio interference work, he has decided to go into business for himself. He was formerly with WWJ, Detroit News, as radio interference engineer.

One of Many

This is but one of many of the Check-Up ads to be run in newspapers throughout the country. Radio advertising also will be used. The ads are paid for by RCA Radiotron and calls received at the Central Telephone Check-Up Exchange are apportioned among dealers who have qualified to participate in the plan