



RADIO SERVICE NEWS

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

MARCH, 1937

CAMDEN, NEW JERSEY

Vol. 3, No. 2

STREAMLINED MICROPHONE ANNOUNCED

Pressure-Operated Pickup Device Has List Price Of Only \$26.50

A brand new microphone that is as striking in appearance as it is outstanding in performance and price is now on sale at all RCA Parts, Commercial Sound, and Amateur distributors. Known as the RCA Aerodynamic Microphone, the new pickup unit sells for a list price of only \$26.50, a remarkable price for a high quality instrument.

The table stand illustrated may be had for use with the new microphone for \$3.75 list. At a list price of \$16.50, a handsome adjustable floor stand for this or other microphones having standard 1/8 inch pipe fittings is available.

Pressure Operated

The new RCA Aero-Dynamic Microphone is of the pressure-operated dynamic type which is rapidly gaining popularity with all microphone users. It is insensitive to mechanical vibration, requires no excitation or power supply and may be located at a considerable distance from the input amplifier. It also is impervious to changes in tempera-



Aerodynamic Microphone

ture, humidity and barometric pressure, has a minimum wind response and is well shielded and not affected by r-f or a-c fields.

A host of other features invite
(Continued on Page 7, Column 3)

YOUR SUBSCRIPTION EXPIRES WITH THIS ISSUE

Do you want to continue to receive RCA Radio Service News? If so, don't fail to return the Free Subscription Card enclosed with this issue. Otherwise your name will be taken off the mailing list. Send the card today before you forget.

Radio's Rosemarie



Rosemarie Brancato, looking beautifully pensive in this picture, made an impressive debut with the Chicago Opera Company last year, but radio claims her since she attained her greatest fame as a singer over the networks of the National Broadcasting Company

MANY SELLING AIDS FOR NEW AUTO RADIOS

Sales Campaign On New RCA Line Features Novel Display Racks

For auto radio's biggest year, RCA this season presents an outstanding line of receivers backed by a great program of national advertising and sales helps for dealers.

The receivers range from a six-tube, twin-speaker model with 25 points of superiority to a six-tube single-unit model. The higher-priced instruments, with 8-inch speakers, bring the famous Magic Voice to auto radio for the first time.

Mechanical Salesmen

Realizing that one of the dealer's problems in auto radio merchandising is effective display, RCA offers dealers an assortment of display pieces, and racks that meet every need. The largest unit is a handsome cabinet mounted on rubber-tired casters so that it can easily be rolled to any convenient location. It displays three auto receivers with their dash mountings. Space is provided for batteries so that the receivers can be hooked up and kept in readiness for actual demonstrations right in the store. A smaller rack does the same job with only one receiver. Still another display piece, for the counter, shows samples of the seven dash mounting plates that
(Continued on Page 4, Column 5)

TIP FILE AND 420 TIPS NOW ON NEW DEAL

Four hundred and twenty time-saving ideas for \$1.25! That's a bargain in any language and a bargain that will appeal particularly to service engineers who realize that unnecessary time spent on one job can cost much more than \$1.25. And that is the bargain now available
(Continued on Page 2, Column 5)

BONUS KIT OFFERED FREE WITH NEW DISPLAY SERVICE

Early Subscribers For Window Displays Save \$5.00 and Get Extra Material

Even before the full details of the sensational 1937 RCA Radiotron Window Display Service had been announced, orders began to pour in from dealers and service engineers who were eager to get the valuable Bonus Kit of sales promotional material offered to the first 1,500 subscribers to the service.

After reading the brief preliminary announcement in the last issue of RCA Radio Service News, S. A. Schink of Chilton, Wisconsin, wrote, "Count me in. I want to be among those who get the Bonus Kit." Theo. Critzon, Detroit, Michigan, was another early bird who made sure he would not lose the Bonus Kit by subscribing even before he knew the price of the Service.

The enthusiastic response from the trade indicates the high esteem in which RCA Radiotron window displays have always been held by dealers who know the sales value of RCA Radiotrons in their windows. This year RCA Radiotron has surpassed all its previous efforts.

Subscribers Save \$5

The complete 1937 RCA Window Display Service is supplied to advance subscribers for only \$2.85. At this price the dealer saves \$5 by subscribing in advance rather than ordering the displays individually. The price of \$2.85 for the complete service, providing elaborate displays for use throughout the year, includes transportation charges on the displays, which are shipped at the appropriate times of the year.

Since the Bonus Kit sent to the first 1,500 subscribers is conservatively valued at \$3.00, those who lose no time in getting their subscriptions into their distributors can be said to get the Display Service for less than nothing. The Bonus Kit includes an assortment of time-tested sales aids:

1. Talkie Strips, envelope enclosed
(Continued on Page 8, Column 1)

RCA SERVICE MEETINGS TO BE HELD BY RADIO

New Series of 13 Lectures Will Be Broadcast. Prizes Given

Sit in your easy chair and go to an RCA Service Meeting! That is the invitation now extended to every service engineer. So popular have RCA Service Meetings been during the last four years that RCA and RCA distributors are now making arrangements to have a series of 13 "Service Meetings of the Air" broadcast via electrical transcriptions from stations throughout the country.

These transcription programs should not be confused with the final series of "personal appearance" meetings on "Training the Eye and Ear for Radio Servicing," which are now being held by RCA distributors.

Realizing that the public will also listen to the new type of service lectures, each broadcast has been so written that instead of encouraging the layman to attempt home
(Continued on Page 5, Column 5)

CHISELING SPENDTHRIFTS—An Editorial By F. B. Ostman, Manager, RCA Service Division

One of the mysteries of life is why many service engineers or dealers will chisel here and there to save pennies and yet will throw money out the window every day in the year. They are chiseling spendthrifts.

Yes, I mean out the window. Not to use your display window to the greatest possible advantage is the same as throwing money away.

Wealthy chain store operators cannot afford not to keep their windows working every minute. Certainly the service engineer or dealer cannot afford to allow his window to go to waste.

One reason many service shops do not make better use of their windows is that their stock in trade is composed chiefly of two intangibles: ability and integrity.

Ability and integrity are not so easily displayed as toothpaste or dry goods. But it can be done.

One way to display your ability is to display your modern test equipment. One way to display your integrity is to display your tangible merchandise that reflects your integrity—your tubes, for instance.

Tubes are the natural "leader" for the radio service business. Tubes should occupy all of your window part of the time and part of your window all of the time. That is why I am glad to see RCA Radiotron doing its part by offering such an outstanding display service.

The 1937 RCA Radiotron Window Display Service will go far toward making your display window the asset it should be. Subscribe for it today.



F. B. Ostman

TELLS HOW TO HOOK UP NEW INSTRUMENTS

Oscillograph and Oscillator Shop Methods Described In Simple Language

By M. M. BRISBIN
RCA Service Division



M. M. Brisbin

Although the cathode ray oscillograph is revolutionizing the radio service business, the actual use of the instrument on the service bench presents no serious problems to any competent service engineer. The new No. 150 RCA Electronic Sweep Oscillator which obviates the need for a separate frequency modulator has further simplified the use of the oscillograph in radio service work. The methods of hooking up the new Oscillator and the new No. 151 RCA Oscillograph for everyday use on the bench are worth a few minutes' study by any service engineer.

The Electronic Sweep Oscillator is entirely AC operated with a power consumption of only 30 watts. Its range is from 90 to 3,200 kilocycles. This oscillator is sufficiently flexible to fulfill any need which may arise in connection with receiver testing. On the front panel is a three position switch which controls the modulation. In the left position the switch is marked "CW" which means, "continuous wave." When in this position the oscillator emits a constant frequency unmodulated RF signal. The middle position marked "AMP" means, "amplitude modulation." In this position the output of oscillator is modulated in the usual manner with a 400 cycle audio note and can be used in this manner for receiver calibration checking and so forth. The right position is marked "FREQ." meaning, "frequency modulation." In this position the frequency of the output is rapidly varied over a certain range for the purpose of visual alignment of a receiver with a Cathode Ray Oscillograph.

Constant Dial Calibration

The band width over which the frequency varies is controlled by the knob in the upper left corner of the front panel. This control has a dial calibrated in kilocycles

Nipper Helps



The tremendous popularity and pulling power of the famous old trademark dog is currently being demonstrated in Washington, D. C., where "Nipper" stands in front of the shop of E. F. Droop & Son, RCA Victor dealers, soliciting funds for the flood victims. According to William E. O'Connor, President of Southern Wholesalers, "Nipper" has been averaging two and three times as large a collection daily as the average Salvation Army Lass.

NEW PARTS CATALOG

A new RCA Parts and Test Equipment Catalog will soon be available at RCA Parts distributors.

The page size of the new catalog is larger than the last previous edition. More instruments are shown. The replacement parts guide for General Electric, Westinghouse, and Graybar sets, which was a useful feature of the old catalog, has been brought up to date and appears again in the new catalog, which will be distributed free by RCA Parts jobbers. Place your order now to be sure of getting your copy.

which gives the frequency width over which the output varies. A convenient feature is that it is not necessary to retune the instrument when using frequency modulation. The calibration of the tuning dial still holds. In order that the Cathode Ray Oscillograph may be synchronized with this sweeping action, two terminals are provided which furnish an AC voltage for connection to the synchronizing terminals of the oscillograph.

The Oscillograph itself is housed in a case the same size as the oscillator and has a one inch tube which projects through the front of the case at the top center. The end of the tube has a removable hood to which is attached a graph screen. The controls on this oscillograph are similar to the controls on the three inch RCA Oscillograph, TMV-122-B, with the exception of the horizontal and vertical centering controls, which on the new instrument are on the front panel instead of being screwdriver adjustments.

For detailed instructions concerning the alignment of a receiver using these two new instruments one

Mr. Egglemud, Service Engineer



"And for the third time, Mr. Egglemud, NO, the radio is NOT in here!"

cur is controlled by the sweep control in the upper left corner of the oscillator. This should be adjusted to give a picture of the shape which is most readily studied. With the proper adjustment of the equipment, two lines will appear on the oscillograph screen, one lying on top of the other. When the receiver is slightly out of adjustment these lines

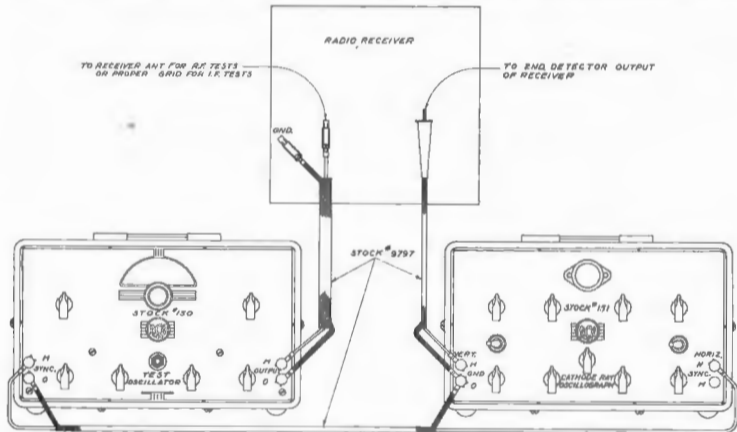


Figure 1—Hookup of Oscillograph and Oscillator.

should carefully follow the instructions contained in the service data and technical information bulletin published for that particular receiver. However, it may be well for us to go into the general set-up of the equipment.

Hook-Up Circuit

The two instruments should be connected together as shown in Figure 1. Figure 1 gives a suggested layout for the placement of the two instruments and the connection is shown between the horizontal synchronizing post, which is the top post on the left of the oscillator, and the top post on the right of the cathode ray oscillograph. This connection takes the synchronizing voltage away from the oscillator and applies it to the sweep oscillator in the cathode ray oscillograph so that a steady image will appear on the screen of the cathode ray tube. This means that the sweep oscillator in the cathode ray oscillograph must be tuned to the frequency of the synchronizing voltage. Tuning will occur at 60 cycles for equipments being operated from a 60 cycle power line.

The output of the oscillator should be applied to the receiver under test at such a point as will give us the desired test condition. Thus, when aligning the I-F stages of a receiver, begin by applying the output of the oscillator to the last I-F tube so that the I-F transformer between the last I-F tube and the second detector can be aligned. The output of the second detector should be applied to the two terminals on the left side of the cathode ray oscillograph. In order to get an image showing the alignment of this transformer the oscillator should be tuned to the proper I-F frequency, the modulation control switch should be in the extreme right position which will give frequency modulation to the output. The band over which this modulation will oc-

will move apart and give a double image. When adjusting the receiver, adjustments should be so made that these lines will appear as only one line. Both the I-F and the R-F stages can be adjusted in this manner.

Many Tests Possible

Other types of tests can also be made with this equipment. By turning the modulation control to amplitude modulation a 400 cycle note at 30% modulation is applied to the output of the oscillator. This is useful in making rough checks of adjustments and with the oscillograph connected to the output of the audio system, voltage measurements can be made. Also, by synchronizing with the 400 cycle note, the wave shape can be seen and in case of distortion being developed in the receiver under test, the input to the oscillograph can be taken from various points in the circuit which will aid in determining where this distortion occurs.

External Modulation

The oscillator also has a jack on the front panel for purposes of external modulation. A phonograph pickup or a microphone can be fed into this jack and will modulate the R-F output so that receiver testing can be carried on when there are no available or suitable programs. This is very convenient because you will find that there may be certain phonograph records which give you a good idea of the operating conditions of the receiver or it may be that you wish to run a response curve by applying the output of the beat frequency oscillator to the R-F oscillator. By doing this and measuring the output of the receiver on the cathode ray oscillograph, it is possible to run overall response curves of a receiver so that its exact operating characteristics can be known.

system installed by NBC for the occasion.

More than 50 RCA Directional-Baffle Loudspeakers were installed on top of the Capitol and along the route of the march. A central control room was established in the basement of the Capitol. A man was stationed in the park facing the Inaugural Stand and provided with a telephone connection to the control room so that a proper volume level could be maintained.

There were 18 speakers on the Capitol alone, arranged in banks so that should one group fail the volume could be stepped up on the remaining speakers. It is a tribute to the quality of the apparatus and the skill of the installation engineers that not a piece of the equipment failed despite the conditions.

Much credit for the splendid performance of the job is due to Messrs. Gilpin and Keough of National Electric Supply Company, who cooperated with RCA engineers in the installation.

FILE AND 420 TIPS NOW ON NEW DEAL

(Continued from Page 1, Column 3)

able in the RCA Radio Service Tip File.

The steel file in which the Tip Cards are neatly filed is alone worth more than \$1.25. It was especially designed and built to accommodate RCA Service Tips, and has a positive-action follower block, slide rails, and a return-flange front for strength.

Each Tip is printed on a 3 inch x 5 inch card, indexed under make of set, model number, and name of trouble, so that the appropriate Tip can be found quickly and filed again easily when it has served its purpose. The Tips were selected from thousands received by RCA Radio Service News. Two hundred came filed in the cabinet. Eleven packets containing 220 additional Tips are now furnished with the File.

The complete outfit, ready to help



It solves the puzzling cases.

service engineers solve the puzzling cases, can now be had at RCA Parts and RCA Radiotron Distributors for only \$2.00 cash, and 75¢ will be refunded when \$40 worth of RCA Parts, which may include any RCA test instrument, have been purchased. Those who already have the File may obtain any of the available packets with the purchase of \$5.00 worth of RCA Parts or \$8.00 worth of RCA Radiotrons.

Inauguration Sound System Defies Storm

Second Largest Sound Job Used in Washington January 20th

During the President's inauguration ceremonies in Washington on January 20th, the downpour of rain could neither be stopped nor silenced, but otherwise it was not allowed to interfere with the perfect operation of the second largest temporary sound amplification and broadcast pickup systems on record.

The largest known temporary sound installation was that which covered the Shriners' Convention in Washington two years ago. Both installations were made by National Electric Supply Company of Washington and both used RCA apparatus exclusively.

Over Fifty Loudspeakers Used

The sound installation at the inauguration which enabled over 200,000 persons in front of the speaker's platform and along the line of march to hear everything that was broadcast by NBC was hooked up to the elaborate microphone pickup

Inauguration P. A. System



More than 50 RCA Directional-Baffle Loudspeakers were used to carry the President's inauguration ceremonies to more than 200,000 persons in front of the stand and along the route of the parade. Arrows in view above point to speakers on the Capitol.

NEW OSCILLOGRAPH ANALYZED AND DESCRIBED BY ENGINEER

A. C. Stocker Shows Why Small-Screen Instrument Meets All Demands Of Radio Service Work

By A. C. STOCKER, RCA Engineer



A. C. Stocker

The RCA No. 151 Cathode Ray Oscillograph is a perfect example of the ability of modern industry to combine research, engineering, and manufacturing to produce a better product at a lower price. The one-inch cathode ray tube, RCA-913, is the result of intensive research on electron optics and glass-to-metal seals, making possible the unusually low operating voltages and the glass screen affixed to a metal tube shell.

The researches in electron optics which made practical the low-potential electron gun made it possible also to use one power supply for both the cathode ray tube and the amplifiers, thus contributing materially to the small size, light weight, and low cost of the new RCA instrument by rendering unnecessary the costly high voltage power supply components. In Figure 1 it may be seen that the RCA-913 obtains its negative grid bias from R-23, is focused by first anode voltage control, R-21, and centering voltages are obtained from potentiometers, R-16 and R-17, whose limbs are set astraddle the second anode potential to permit moving the spot both directions from center. In other words, it is operated as any cathode ray tube would be operated.

In the RCA-913, the metal tube shell is connected to the second anode to maintain the electrostatic fields used for focusing, thus exposing the second anode potential, much as the plate of a water cooled transmitting tube is exposed. To promote safety for the operator, the second anode has, therefore, been grounded and the negative terminal of the power supply, feeding the grid and cathode, operated at a high voltage to ground.

Unusual Circuit Design

Operating the amplifiers from the common power supply results in their operating with the positive pole grounded, making a rather unusual circuit layout, for the plates of the tubes connect through their plate circuits to ground. While this is radical in appearance, it is actually quite simple, being merely a moving of the ground tap from one part of the bleeder to another as is shown more clearly in Figure 2 wherein the return circuits of one

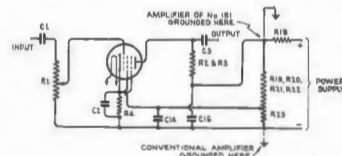


Figure 2.

amplifier tube have been shown in full. The circuit element numbers agree with Figure 1. As may be seen the grid still operates about two volts negative of the cathode, suppressor and cathode are connected, the screen operates at about forty volts positive and the plate still more positive. Actually the grid caps are nearly four hundred volts negative of the chassis so are provided with insulated grid caps.

The gain of a resistance coupled amplifier of the type used is highest over a frequency range limited at the low end by the bypass capacitor reactance becoming too large to effectively shunt the self bias resistor, and at the high end by the circuit and tube capacities too effectively bypassing the plate resistor. In the No. 151 Oscillograph the two effects have been combined by so proportioning the circuit elements that they take place at the same frequency. Thus, at low audio frequencies the gain of the tube is held low by the degen-

erative effect of the un-bypassed self bias resistor, but is sufficiently high under this condition to deflect the oscillograph. While the gain is lower with the small bypass capacitor, it is maintained more nearly constant, it is accomplished with less distortion, and is accomplished with less plate supply hum as a result of the stabilizing inverse feedback. At the higher frequency at which the circuit capacity effectively bypasses the plate resistor causing a drop in gain, the bypass condenser across the bias resistor also becomes effective and raises the gain in an equal amount, resulting in the gain being constant over the wide frequency range of 20 cycles to 10 kilocycles. Beyond these limits the gain drops gradually. In some instruments the fortuitous values of the circuit elements will be such as give perfect correction, resulting in constant gain to nearly 40 kilocycles, and it would have been possible to claim such performance in assurance that some instruments would fulfill and others be within a reasonable distance from these values, but the RCA Manufacturing Company's policy is to claim only such performance as all instruments will have.

Conventional Oscillator Circuit

The time axis oscillator is a conventional, time-tried circuit using an 885 gaseous triode, the circuit being altered for use in the No. 151 Oscillograph only by the replacement of grounds necessitated by the power supply.

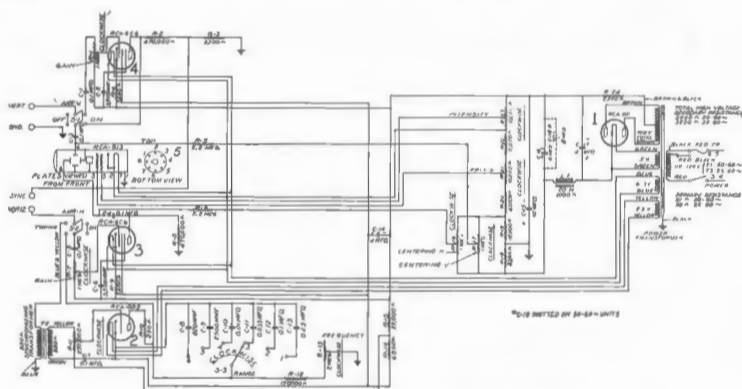


Figure 1—Schematic of Oscillograph.

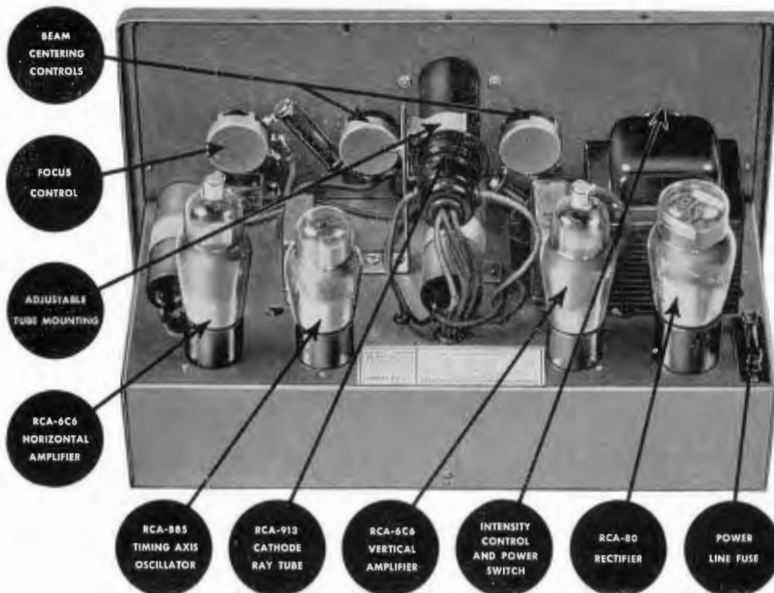
The plate voltage supply circuit is conventional except for the addition of R-24 whose duty is to limit the surge currents in capacitors, C-16 and C-17, to safe values, thus materially increasing their life expectancy. The low total plate current makes the voltage drop and dissipated wattage quite negligible.

The switch, S-1, provides the desired switching in the vertical circuit by connecting the amplifier in the circuit when thrown to "on" and connecting the input terminal direct to the cathode ray tube through the blocking condenser, C-3, when in the "off" position. The former connection is used for all tests at audio frequencies where a low voltage circuit is to be tested—the latter circuit is used for all high frequency tests. When the amplifier is used, a portion of the amplified voltage is tapped off at R-3 for use as a source of internal synchronizing.

External or Internal Synchronizing

The switch, S-2, controls the deflection on the horizontal plates, the "on" position applying any signal on the "horizontal" input binding post to the horizontal amplifier giving high sensitivity for those tests requiring other than a sawtooth horizontal deflection. When the sawtooth timing wave is required, the switch, S-2, is thrown to "Timing," when the output of the sawtooth oscillator is applied to the input of the horizontal amplifier and the "horizontal" input binding post becomes the input terminal for the synchronizing signal. The synchronizing circuit has been so phased that the synchronizing signal from any of the RCA Manufacturing Company's frequency modulating

Oscillograph's Chassis



This interior view of the new RCA Oscillograph, No. 151, shows how the new 1" Cathode Ray Tube lends itself to compact design and neat chassis arrangement.

equipment (TMV-28 or No. 150 oscillator) will give a response curve properly centered on the screen. If internal synchronizing is desired it is necessary simply to jumper from the "Sync." to the "Horiz." binding posts.

Performance Specifications

The performance of the No. 151 oscillograph is as follows:
 Amplifier response: 20 to 15,000 cycles \pm 3 d.b.
 Amplifier sensitivity: $1\frac{1}{4}$ V RMS for full scale.
 Amplifier input impedance: 1 Megohm and 30 mmf.
 Direct response: unlimited.
 Direct sensitivity: 85V RMS for full scale.
 Direct input impedance: 2 megohm and 40 mmf.

the instrument was primarily designed. The advantages of cathode ray equipment for receiver alignment have been discussed so completely elsewhere that they will not be gone into here—anyone who has ever used cathode ray equipment will agree that further discussion is unnecessary. The only question remaining is the accuracy of alignment with the small one-inch cathode ray tube. All the RCA Manufacturing Company's alignment equipment operates on the double trace method, wherein correct alignment is shown by the two traces coinciding and blending into one. In other words, mis-alignment is shown by the presence of two traces and since the presence of two lines where one should be is as apparent on a small tube screen as on a large one, equal accuracy of alignment may be expected.

By actual test, an intermediate transformer has been aligned using the No. 150 oscillator and No. 151 Oscillograph, and then the latter replaced with a laboratory precision oscillograph using a nine-inch cathode ray tube. No improvement in adjustment could be effected. Of course, the larger instrument showed up the failings of the transformer, and, for transformer development would be the instrument to use, but for obtaining the best possible adjustment of a given receiver the one-inch oscillograph is the equal of any of its bigger brothers.

Shows Envelope Characteristics

The next most likely use, and the application kept second in mind during the design, is in the measurement of envelope characteristics of modulated or keyed R.F. waves. It was to this end that direct operation of the vertical circuit was included. The R.F. envelope may be examined by either the time plot (sawtooth horizontal deflection) or trapezoid (modulating signal on the horizontal) method, either one giving positive indication of the point of 100% modulation by the appearance of a straight horizontal line. Of course, due to the difficulty of measuring the small distances involved, measurements of modulations less than 100% cannot be made with the accuracy afforded by a larger cathode ray tube, but this measurement is immaterial anyway as the only critical point in the modulation range is the 100% point and this is definitely indicated.

All Measurements Possible

As seen by the list of characteristics, the usefulness of the instrument is practically unlimited—any type of measurement possible on larger and more expensive equipment may be performed on the No. 151. Probably its most common use will be in receiver alignment in conjunction with the No. 150 Oscillator, and it was this use for which

SOUND ON FILM USED IN PLAY "ETERNAL ROAD"

Ultra-Violet Recording Process Makes Possible New Stage Technique

A revolutionary development in stage and sound technique is currently making its world premier at the remodeled Manhattan Opera House in New York, where the stupendous Biblical musical drama, "Eternal Road," is thrilling thousands of theater-goers and proving to be one of the hits of the season. The result of over four years' effort on the part of the world's foremost producer, Max Reinhardt; Fritz Werfel, renowned author of the best-seller, *Forty Days of Musa Dagh*; Norman Bel Geddes, noted stage designer; and Kurt Weill, composer of many popular operas, the vivid, emotional effects of "Eternal Road" are created without the use of an orchestra that is visible to the audience. All the music is heard and felt by the audience as an integral part of the production, in accordance with the composer's theory that the physical presence of a body of musicians detracts from the illusion of the stage.

Use RCA Photophone Equipment

Concealed in various parts of the auditorium and stage are RCA Photophone loudspeakers of the new multi-cellular type. At a panel behind the scenes sits an engineer who controls the output of sound which originates from several sources and is picked up by microphones. Only the soloists on the stage are heard directly. Most of the thrilling music has been recorded on film with the new realism made possible by the RCA Photophone Ultra-Violet Method of Recording. Choral music and sound effects are picked up from a small off-stage room where the singers use microphones and wear RCA Photophone bone-conduction hearing apparatus so that they can follow the action taking place on the stage.

The No. 151 Oscillograph again offers proof of a fact long accepted by photographers, that while a large picture is more "catchy," the same information may be gotten on a small picture—in fact a large picture is almost invariably held at a greater distance so that it subtends the same angle at the eye as the small picture. The author has often observed laboratory workers equipped with nine-inch instruments who when forced by lack of space to work close to their oscillographs would reduce the gain to give a pattern from one to three inches in size—this being about the field over which the human eye can focus.

Result of Long Experience

For those who will say the characteristics claimed for the little oscillograph cannot be produced at so low a price, it should be mentioned that the RCA Manufacturing Company has, during the last year, produced nearly a quarter of a million dollars worth of oscillographs exclusive of the No. 151, that these instruments ranged from the familiar TMV-122 to a four-thousand dollar instrument designed especially for television research, and that the same engineering group that designed these instruments, designed the No. 151. The combination of high performance and low price offered in the No. 151 would have been impossible without the experience gained on the larger units.

Recording for "Eternal Road"



Most of the music for the stage success, "Eternal Road," was recorded on film by the RCA Photophone Ultra-Violet process long before the play opened. Above is shown a recording scene.

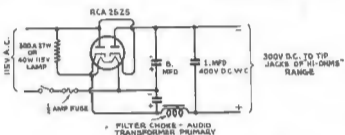
Service Tips



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.

An Economical 300 Volts DC Supply for "Hi-Ohms" Range Using 25Z5 as a Voltage Doubler

The two 8-mf. units happened to be old G-E 800-volt paper condensers which I had laying around. If any desired voltage is wanted a tapped voltage divider can be used to get voltage desired. For example, using an 0-1 ma. meter and a supply of 270 volts you merely need to multiply the 4 1/2 volt scale range by 60 to get measurements. The "Hi-Ohms" range will thus be extended to very accurate readings of about 6,000,000 ohms. I have been using this above method for my ohmmeter and also to supply a 6G5 Magic Eye Tester and Output Indicator and a variable supply with tap switch to vary voltage from 50



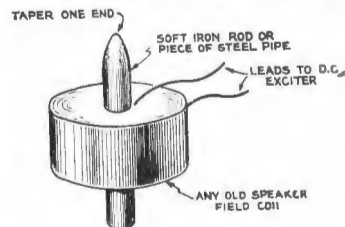
to 300 volts for my Neon Paper and Electrolytic Condenser Analyzer, with very good results and I recommend it to anyone. The uses of the 25Z5 are diverse and it will be used in many more ways than at present.

If volt-ohmmeter has tip-jacks and internal resistor for use on a 45-volt battery (external) and it is desired to use the above Hi-Voltage supply, or any certain portion of it, 1,000 ohms of resistance per volt must be added to the original internal resistor if meter movement is a 1-mil one, and if it is a 500-microampere movement, 2,000 additional ohms per volt is needed. Example: if 270-volt supply is used, simply add an external wire-wound resistor of 225,000 ohms (270 - 45 = 225 volts added) in series with one tip jack and one side of power supply. With a 500 microampere meter, 450,000 ohms must be added.

Norman Nelson, Clifford, N. D.

Cleaning Filings From Speakers

As most experimenters and hams do considerable steel drilling and grinding in the near vicinity of their equipment, these steel shavings and dust particles are bound to collect and lodge in all of the equipment. As most fellows keep their radio going while working, the dynamic speaker, since it is excited, becomes a powerful electromagnet which will pull these slivers from out of the air and lodge them between the voice coil iron core. This results in extreme distortion and will eventually ruin the speaker cone. To remove these slivers from hard to get at places, I have devised the following instrument. A piece of soft iron rod 3/4" x 4" was inserted into an old 800 ohm field coil. A 10-watt exciter was used. The radio



was shut off and the end of the soft iron rod was held near the voice coil and at the same time the cone was gently moved in and out. The steel chips literally flew to this electromagnet and when the radio was turned on the music seemed to flow out of it, it was so clear and undistorted.

This tool can also be used to remove steel dust from velocity mikes, D. C. motors or a hundred other different things.

The electromagnet lifted a 30 lb. anvil when excited with 125 volts at 150 ma., demonstrating the pull it has.

Matly J. Socha, 1958 Coney Island Ave., Brooklyn, N. Y.

Ground From Aerial Connections

Where two wires lead into a house in such a way that they are difficult to trace, it is a very simple matter to tell the ground from the antenna. Push a small screwdriver into one side of an a-c outlet, hold the center of the base of a 110-volt bulb against the screwdriver, and try each of the unknown wires, one at a time, against the threaded part of the bulb. If the light fails to light, place the screwdriver in the other side of the a-c outlet, and proceed as before. If the ground wire is not broken, the light will burn when it is placed against the threaded part of the bulb, with the screwdriver in one of the sides of the outlet.

L. T. Moore, 4039 Washington Ave., Fresno, Calif.

Crosley Radio Model 6H2

Complaint: Radio would work perfectly at high frequencies, but reception would drop off at frequencies from 1000 k.c. to 550 k.c.

Trouble Found: After a careful check of the radio, I found a high resistance contact in the wave-changing switch.

Cure: For a permanent job, I cleaned all the points of the wave switch with carbon tetrachloride and then oiled them with Nujol, a non-corrosive mineral oil. Radio worked perfectly afterwards.

Lawrence Schafer, 320 Garfield Street, McMechen, W. Va.

Belmont Midgets

A Belmont midget was recently serviced, the complaint being that the set would oscillate when the volume was turned up. The owner had coiled up the antenna wire in the rear of the receiver cabinet. When the wire was uncoiled, the trouble was solved, and with a word of caution for future times, another customer was satisfied.

Al Zeitzer, 2008 East 3rd Street, Brooklyn, N. Y.

Wheel Static Elimination

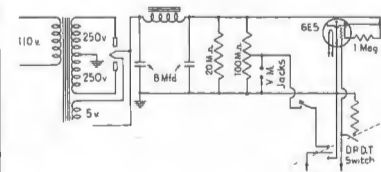
My method of eliminating static discharges, caused by friction between brake shoes and brake drums or in the wheel hubs is to install in the space where the two halves of the brake shoes are connected to the brake adjusting shaft, a small carbon brush and brush holder of the type used, as third or adjusting brush on auto generators. This brush is continually in contact with the inside surface of the brake drum, and collects any static discharges coming from the brakes, hubs, etc., and grounds it, due to the fact that the brush holder and pigtail on the brush is securely fastened to the brake housing.

The brush holders used in this installation can be easily made, and the brushes, of course, if too long, must be cut down to fit. One brush is installed on the inside of each brake housing, and this installation clears up a lot of static discharge on auto radios that is sometimes a problem to service men.

Frank H. Perry, 139 Lily Street, Paterson, N. J.

Vacuum Tube Voltmeter

Here is a variation of a vacuum tube voltmeter that does not require calibration. To use, insert any good voltmeter in the V.M. jacks and set the variable resistance to the point where pressing the push button makes no change in the magic eye. The reading on the voltmeter will be the same as the voltage being



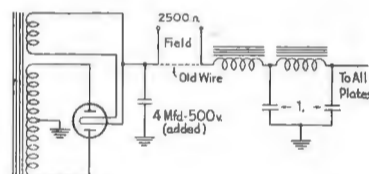
measured. There is no current drain from the measured voltage at the proper adjustment. It also serves other purposes. When the test leads are connected across a doubtful condenser, if the pushbutton is pressed the eye should give a violent movement. If it does not, the condenser is open. If when the button is held the eye does not return to normal, there is a leak. When the D.P.D.T. switch is thrown, the eye can be used as an output meter by connecting the test leads into the AVC circuit or the R.F. cathodes.

Glen Nye, 1592 Front St., San Diego, Calif.

Dynamic Speaker for Radiola 18

I'm enclosing a drawing showing a method I have used in connecting a dynamic speaker to a Radiola 18.

To make this change I installed a pair of binding posts on extruding fibre washers on the rear of the power pack next to the speaker jacks for the field coil connections. A compact 4 MFD electrolytic fits nicely in the available space under the power pack. This condenser of course raises the voltage output of the rectifier by approximately 100 volts, and the 100 volts in turn is taken up by the IR drop through the 2500 ohms speaker field, thus the plate current of set remains virtually the same.



The output connection may be used as is or may be changed to suit load conditions which may be encountered in various types of speakers.

I find this a better system from the standpoint of economy and quality than simply replacing the old magnetic speaker with a new one.

Stanley Schaff, 4449 N. Damen Ave., Chicago, Ill.

Improving Short Wave Efficiency

To improve the efficiency of a radio especially on the short-wave and ultra-short wave bands, reheat all the soldered joints which are grounded, until the solder flows, thus insuring good contacts. This is especially true regarding the grounds of the tuning variable capacitors and other condensers.

Henri Fraise Fils & Cie, Boite Postale No. 28, Tananarive (Madagascar).

Zenith 6 & 8 Tube Sets, 1932, 1933

These sets are very critical in tuning and either the slightest misalignment or detuning will cause bad quality. I've had many complaints that "the set never played right." It was the customer's fault right along—he didn't tune the set right. It must be "on the nose" or bad quality. Solution: "Modernize" the set with a tuning meter! Get a 0-15 MA tuning meter and connect it in series with the RF and 1st DET plate return (negative of meter to plates). The cost is about \$1 and the customer will be glad to pay \$5 maximum, especially when you explain that right after the particular set Zenith put tuning meters in all their better sets. A shadow or needle type meter may be used.

George Zwick, 1268 Spofford Ave., New York, N. Y.

Editor's Note: The RCA Cathode Ray Tuning Kit was designed for just such jobs. Everything needed for the job is included, including the RCA-6E5 Tube. Stock No. 9688; List Price, \$3.00.

STORM SWEEP TOWN HELPED BY SHOW CAR

Generator on Show Coach Provides Power for Texas Ham

Any of the fleet of Traveling Show Coaches that travel the country demonstrating RCA products will undoubtedly be assured of a sincere welcome in Tyler, Texas, judging by a letter written by H. J. Bryant of Tyler's Chamber of Commerce in appreciation of the service rendered by an RCA Show Coach recently when a sleet storm cut all communication lines leading into Tyler.

Each RCA Show Coach carries an elaborate and fascinating display of RCA products. Because they have their own electric power plants as well as a variety of RCA transmitting and receiving equip-



An RCA Show Coach, parked outside the station of Amateur John Burk, Jr., at Tyler, Texas.

ment set up ready for use, the Coach piloted by RCA representative Harold Knapp was able to render real public service when it found itself in Tyler at a critical time. Let Mr. Bryant's letter tell the story:

January 14th, 1937. R.C.A. Manufacturing Company, Camden, New Jersey.

We want you to know the valuable service that was performed for our citizens on Sunday and Monday, January 10th and 11th, by your representative, Mr. Harold Knapp, who was here with his RCA Show Coach.

One of the most disastrous and freakish ice storms in the history of our city struck over that week-end and, as a result, all lines of communication out of our city were out of order.

Send Messages for Wire Companies

Mr. Knapp kindly placed his equipment on the Show Coach at the disposal of Mr. John Burk, Jr., one of our citizens who is a radio enthusiast and who operates short wave transmitter W-5EME, and, with these facilities, they were able to transmit and receive messages to Dallas and Houston when no other communication was available. Between 50 and 75 messages were

RCA SERVICE MEETINGS NOW HELD BY RADIO

(Continued from Page 1, Column 4)

radio repairs it emphasizes the technical knowledge and equipment required for radio servicing and the necessity of having a competent radio service engineer inspect the listener's radio. The advertising value of having the public listen-in will be of tremendous value to the service profession.

Plan Endorsed by Association

A thorough test of the new method of holding service meetings was made in Philadelphia. Some members of the Philadelphia Radio Service Men's Association were skeptical at first. After several of the meetings had been held, the Association voted enthusiastic approval of the plan.

The electrical transcriptions for the unique new service meetings have been prepared and recorded by leading engineers from the RCA laboratories.

Each lecture treats of one subject, and the broadcast takes just fifteen minutes. The following are some of the subjects: Antenna Systems, R-F Amplifiers, Oscillator-Detector Circuits, I-F Amplifiers and Second Detectors, Audio Systems, Questions and Answers, Power Supplies, Loudspeakers, Tubes, Test Equipment, and Records.

Prizes for Letters

Approximately fifty valuable prizes are awarded after each "Service Meeting of the Air" for the best letters on a subject announced during the broadcast. The subjects are such as "How I Sell Antenna Systems," or "How I Sell Alignment Jobs." The First Prize for the best answer each week is one of the RCA test instruments, such as an Oscilloscope or Oscillator. The Second Prize may be the book *Radio Service Business Methods*.

Distributors are now making arrangements for the broadcasts, which are scheduled to start late in March. Ask your RCA distributor for dates, the hour, and name of station, so that you will not miss a single meeting.

sent and received for the Western Union and Postal Telegraph; Southwestern Bell Telephone; Texas Power and Light Company and the Courier-Times-Telegraph, our local newspapers.

In fact, it was possible through this hook-up for our newspapers to capture news bulletins and put out a paper that was, of course, condensed and abbreviated but which had news from the outside that would have been impossible otherwise.

H. J. Bryant, Vice-President, Mgr., Chamber of Commerce.

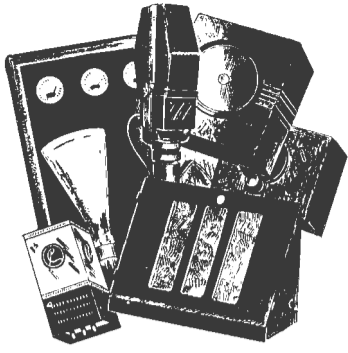
Coaches Help Dealers

Thousands of persons are visiting the coaches every month learning more about RCA's many products—thus making it easier for retailers to sell them.

Power In An Emergency

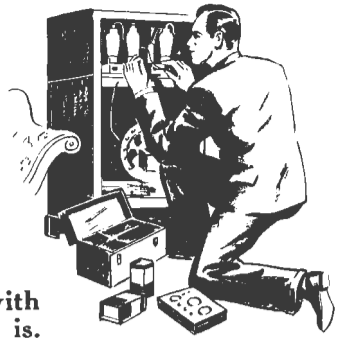


Above is shown an interior of the RCA Show Coach which supplied power for Amateur Station W5EME, only means of communication Tyler, Texas, had during a recent storm. In foreground is D. E. Chapman, Tyler amateur seated at RCA Amateur Receiver ACR-175. RCA representative Harold Knapp at right.



Directory of RCA Parts Distributors

Only leading firms are appointed to handle RCA Parts. If you are not now acquainted with an RCA Parts Distributor, look the nearest one up in this list and learn what real service is. Distributors are listed alphabetically by state, city, and name.



ALABAMA
Auto Service Co.
1920 4th Ave., S., Birmingham
E. E. Forbes & Sons Piano Co.
1922 3rd Ave., Birmingham
R. P. McDavid & Co.
2104 1st Ave., No., Birmingham
McGowin Lyons Hdw. Co.
113 N. Water St., Mobile
Teague Hdw. Co., Montgomery

ARIZONA
Tidmarsh Engr. Co.
817 N. Central Ave., Phoenix
Tidmarsh Engr. Co.
Scott at Bway, Tucson

ARKANSAS
Beem Radio Co., Little Rock
Gunn Distributing Co.
417 W. Capitol St., Little Rock

CALIFORNIA
Motor Supply Co.
4th & Broadway, Chico
B. J. De Jarnett Whse. Radio Parts
2501 Tullare St., Fresno
Motor Supply Co.
110 E. Main St., Grass Valley
Braun Corp.
2260 E. 15th St., Los Angeles
Leo J. Meyberg Co., Inc.
2027 Figueroa St., Los Angeles
Pacific Radio Exchange, Inc.
729-31 S. Main St., Los Angeles
Radio Specialties Co.
1956 Figueroa St., Los Angeles
Radio Supply
912 S. Broadway, Los Angeles
Radio Television Supply Co.
1701 S. Grand St., Los Angeles
Motor Supply Co.
515 Fourth St., Marysville
Electric Supply Co.
12th & Fallon Sts., Oakland
E. C. Wenger Co.
1020 Oak St., Oakland
Motor Supply Co.
2034 Montgomery St., Oroville
Motor Supply Co.
Market & Placer Sts., Redding
Electric Supply Co.
711 "M" St., Sacramento
Henderson Bros.
1501 K Street, Sacramento
Western Radio & Elect. Co.
1002 "B" St., San Diego
Braun Knecht Heimann Co.
584 Mission St., San Francisco
Coast Radio Supply Co.
123 10th St., San Francisco
Leo J. Meyberg Co.
70 10th St., San Francisco
Offenbach Electric Co.
1452 Market St., San Francisco
San Francisco Radio Exchange
1284 Market St., San Francisco
Zack Radio Supply Co.
1470 Market St., San Francisco
Motor Supply Co.
249 N. Tehama St., Willows
Motor Supply Co.
810 Main St., Woodland

COLORADO
Auto Equipment Co.
14th & Lawrence St., Denver
Hendrie & Bolthoff Mfg. & Sup. Co.
1635 17th St., Denver
Inter State Radio & Supply Co.
1639 Tremont Place, Denver

CONNECTICUT
D'Elia Elect. Co.
1330 Fairfield Ave., Bridgeport
Hatry & Young, Inc., Bridgeport
Post & Lester, Elm St., Bridgeport
Hatry & Young, Inc.
203 Ann St., Hartford
Post & Lester
10 Chestnut St., Hartford
Thomas H. Brown Co., New Haven
Mac's Radio
200 Bank St., Waterbury

DELAWARE
F. R. Gooding Co.
5th & French Sts., Wilmington
Radio Elect. Service Co.
107 W. 6th St., Wilmington

FLORIDA
Glover Weiss Co.
2 E. Bay St., Jacksonville
Southern Hdw. & Bicycle Co.
2236 Liberty St., Jacksonville
Major Appliance Co.
839 Flagler St., Miami
Electric Supply Co.
121 S. Franklin St., Tampa
Thurow Radio Distributors
110 E. Cass St., Tampa

GEORGIA
Dixie Radio Distributors, Inc.
490 Peachtree St., N. E., Atlanta
Polk Musical Supply Co.
29 Pryor St., N. E., Atlanta
Wholesale Radio Service Inc.
430 Peachtree St., N. E., Atlanta
Radio Sales & Service Co., Columbus
A. S. Hatcher Co.
598 3rd St., Macon
Radio Repair Service
140 Whitaker St., Savannah

ILLINOIS
Allied Radio Corp.
833 W. Jackson Blvd., Chicago
Walter C. Braun, Inc.
601 W. Randolph St., Chicago
Englewood Electrical Supply Co.
5801 S. Halstead Ave., Chicago
Lukko Sales Corp.
5024 Irving Park Blvd., Chicago
Midwest Radio Mart
520 S. State St., Chicago
Montgomery Ward & Co., W. Chicago
& N. Larrabee St., Chicago
Newark Electric Co.
226 W. Madison St., Chicago
RCA Victor Dist. Corp.
111 N. Canal St., Chicago
Sears, Roebuck & Co., W. Arthington
& S. Homan Sts., Chicago
Triangle Elect. Co.
600 W. Adams St., Chicago
Wholesale Radio Service
901 W. Jackson Blvd., Chicago
Fox Electric Supply Co.
67 N. State St., Elgin
Herberger Radio Supply Co.
136 First St., Peoria
Klaus Radio & Elec. Co.
707 Main St., Peoria
Bruce Co., Inc.
206 E. Monroe St., Springfield

INDIANA
Smith Distributing Co., Inc.
15 N. Main St., Evansville
The Protective Elect. Supply Co.
130-32 W. Columbia St., Fort Wayne
State Distributing Co.
1040 N. Meridian St., Indianapolis
Cloud Brothers
902 S. Mich. St., South Bend

IOWA
Checker Electric Supply Co., Inc.
600 Second Ave. S. E., Cedar Rapids
Klaus Radio & Elect. Co., Inc.
320 E. 4th St., Davenport
Brown Camp Hdw. Co.
1st & Elm St., Des Moines
Hieb Distributing Co.
905 Walnut St., Des Moines
Iowa Radio Corp.
1212 Grand Ave., Des Moines
Siddles Co., Des Moines
J. F. Stampfer Co.
800 Main St., Dubuque
Warren Elect. Co.
647 Water St., Sioux City

KANSAS
Home Appliance Co.
149 N. Rock Island Ave., Wichita
Lyons & Wyatt
330 S. Broadway, Wichita

KENTUCKY
P. I. Burks & Co.
911 W. Broadway, Louisville
Smith Distributing Co.
331 E. Broadway, Louisville
Universal Radio Supply Co.
715 S. 7th St., Louisville

LOUISIANA
Electrical Supply Co.
201 Magazine St., New Orleans
Shuler Supply Co.
902-04 Poydras St., New Orleans
Interstate Electric Co.
300 Spring St., Shreveport

MAINE
Parker's, 35 Cony St., Augusta
James Bailey Co.
264 Middle St., Portland

MARYLAND
Mattson's
631-35 W. North Ave., Baltimore
Radio Elect. Service Co.
3 N. Howard St., Baltimore
Southern Wholesalers, Inc.
1511 Guilford Ave., Baltimore

MASSACHUSETTS
Central Scientific Co., 79 Amherst St.,
Cambridge A Station, Boston
The Eastern Co.
620 Memorial Drive, Boston
H. Jappe Co.
46 Cornhill, Boston
Sager Elect. Supply Co.
201 Congress, Boston
Woodrow Radio
166 Prospect St., Cambridge

MICHIGAN
Purchase Radio, Ann Arbor
Radio Distributing Co.
100 Selden Ave., Detroit
Radio Specialties Co.
171 E. Jefferson Ave., Detroit
Reno Radio Co.
1314 Broadway, Detroit
Rissi Brothers, Inc.
5027 Hamilton Ave., Detroit
Serlin Stores, Inc.
1419 Broadway, Detroit
Delta Hardware Co.
400 Ludington St., Escanaba
Shand Radio Specialties Co.
205 W. Kearsley St., Flint
Radio Distributing Co.
235 Market St., S. W., Grand Rapids
Radio Equipment Sales Co.
120 S. Division St., Grand Rapids
Radio Equipment Sales Co., 11845
Woodward Ave., Highland Park
Budd's Music House
318 S. Washington St., Lansing
L. J. Chapman Co., Plainwell

MINNESOTA
Northeast Radio Co.
109 E. 1st St., Duluth
Southern Minnesota Supply Co.
2nd & Main Sts., Mankato
Lew Bonn Co.
1124-26 Harmon Place, Minneapolis
Lucker Sales Co.
601-08 N. First Ave., Minneapolis

MISSISSIPPI
Davis Plumbing Co.
115 S. State St., Jackson

MISSOURI
Burstein Applebee Co.
1012 McGee St., Kansas City
E. J. Goetze Co., Inc.
2002 Grand Ave., Kansas City
Jenkins Music Co.
1217 Walnut St., Kansas City
Radio Laboratories
1515 Grand Ave., Kansas City
Interstate Supply Co.
10th & Walnut Sts., St. Louis
Van Sickle Radio Co.
1113 Pine St., St. Louis
Walter Ashe Radio Co.
1100 Pine St., St. Louis
Ozark Motor Supply Co.
308 S. Jefferson St., Springfield

MONTANA
Northwestern Auto Supply Co.
Billings

NEBRASKA
Sidles Co., 1228 P St., Lincoln
Radio Accessories Co.
2866 Farnam St., Omaha
Sidles Co., Omaha

NEW HAMPSHIRE
Radio Service Lab.
1008 Elm St., Manchester

NEW JERSEY
Radio Electric Service
811 Federal St., Camden
Krich Radisco, Inc.
422-32 Elizabeth Ave., Newark
Aaron Lippman & Co.
246 Central Ave., Newark
Wholesale Radio Service Co.
219 Central Ave., Newark
J. Harry Hearnen Co.
Front & Warren Sts., Trenton

NEW YORK
Capitol City Distributing Co.
33 Orange St., Albany
Fort Orange Radio & Dist. Corp.
356 Broadway, Albany
Wholesale Radio Service Co.
542 E. Fordham St., Bronx
Dymac Radio
216 E. Genesee St., Buffalo
Kronson Radio Parts Co.
423 E. Genesee St., Buffalo
RCA Victor Dist. Corp.
769 Main St., Buffalo
Barker Rose & Kimball
511 Baldwin St., Elmira
Stallman of Ithaca
128 Seneca St., Ithaca
Chanrose Radio
170-12 Jamaica Ave., Jamaica
Bruno New York, Inc.
460 W. 34th St., New York City
Pflatz & Bauer, Inc., 3027 Empire
State Bldg., New York City

Sanford Samuels Corp.
136 Liberty St., New York City
Wholesale Radio Service Co.
100 6th Ave., New York City
Capitol City Distributing Co.
331 Mill St., Poughkeepsie
Chapin Owen Co.
205 St. Paul St., Rochester
Kronson Radio & Parts Co.
252 St. Paul St., Rochester
W. E. Berndt
111 S. State St., Syracuse
Morris Distributing Co.
407 S. Clinton St., Syracuse
Vaeth Electric Co.
701 Varick St., Utica

NORTH CAROLINA
Freck Radio & Supply, Asheville
Radio Supply Co., Inc.
218 W. 4th St., Charlotte
Southern Radio Corp.
208 S. Tryon St., Charlotte
Brower Elec. Supply Co.
201 N. Green St., Greensboro
Lewis Sporting Goods Co.
112 W. Hargett St., Raleigh

NORTH DAKOTA
Dakota Electric Supply Co.
123 Broadway, Fargo
Fargo Glass & Paint Co.
648 Northern Pacific Ave., Fargo
Fargo Glass & Paint Co., Minot

OHIO
Brighton Sporting Goods Corp.
110 E. Market St., Akron
Mooch Electric Co., Akron
Mooch Electric Co.
504 Cleveland Ave., N. W., Canton
E. L. Chambers & Co., 142-44 E.
McMicken Ave., Cincinnati
Johnson Elect. Supply Co.
329 Main St., Cincinnati
Schuster Elect. Co.
2169 Spring Grove Ave., Cincinnati
Steinberg's, Inc.
633 Walnut St., Cincinnati
United Radio, Inc.
1103 Vine St., Cincinnati
Goldhamer, Inc.
610 Huron Road, Cleveland
Mooch Elect. Supply Co.
2905 Chester Ave., Cleveland
Radio Servicemen's Supply Co.
628 Prospect Ave., Cleveland
The Hughes-Peters Elect. Corp.
178 N. Third St., Columbus
Burns Radio Co.
140 E. Third St., Dayton
Schuster Elect. Co.
125 E. Second St., Dayton
Standard Radio Parts Co.
25 N. Jefferson St., Dayton
Radio Supply Co.
119 W. Main St., Springfield
Baumgardner Distributing Co.
1013-15 Jefferson St., Toledo
J. W. Greene Co.
801-03-05 Jefferson Ave., Toledo
Warren Radio Co.
1014 Madison Ave., Toledo
Mooch Electric Co.
239 Wick Street, Youngstown
Ross Radio Co.
325 W. Federal St., Youngstown

OKLAHOMA
Hales Mullaly, Inc.
1-7 N. E. 6th St., Oklahoma City
K. & S. Electric & Supply Co.
1405-7-9 E. 11th St., Tulsa
Radio, Inc.
219 S. Boulder Ave., Tulsa

OREGON
Carlson Hatton & Hay
96 E. 10th St., Eugene
Harper Meggee, Inc., Portland
Stubbs Electric Co.
33 N. E. Park Ave., Portland

PENNSYLVANIA
Radio Electric Service Co.
1024 Hamilton St., Allentown
Hollenback Radio Supplies
2221 8th Ave., Altoona
James V. Duncombe
1011 W. 8th St., Erie
The Winter Co. of Erie
1015 State St., Erie
Radio Distributing Co.
1124 Market St., Harrisburg
Cambria Equipment Co.
12 Iron St., Johnstown
Consolidated Radio Corp.
612 Arch St., Philadelphia
Herback & Rademan, Inc.
438 Market St., Philadelphia
Radio Electric Service Co.
5133 Market St., Philadelphia
Radio Electric Service Co.
7th & Arch Sts., Philadelphia
Radio Electric Service Co.
N. Broad St., Philadelphia
Raymond Rosen & Co.
32nd & Walnut Sts., Philadelphia
Cameradio
603 Grant St., Pittsburgh

Hamburg Bros.
305 Penn Ave., Pittsburgh
Tydings Co., 9th St., Pittsburgh
Sylvester Radio & Supply Co.
E. Norwegian & George, Pottsville
Radio Service Co.
30 Hazle St., Wilkes-Barre
The Careva Co., Inc.
145-47 W. Market St., York

RHODE ISLAND
Kraus & Co.
89 Broadway, Providence
Post & Lester Co. of R. I., Inc.
92 Broadway, Providence

SOUTH CAROLINA
Siegling Music House, Inc.
243 King St., Charleston
Dixie Radio Co.
1714 Main St., Columbia
Payne's for Music, Inc.
Main St. at Wash., Greenville
Wallace DuPre
138 W. Main St., Spartanburg

SOUTH DAKOTA
Power City Radio Co.
123 S. Main St., Sioux Falls
Tri-State Electric Co.
407 E. 8th St., Sioux Falls
Dakota Radio Service Co.
304 Broadway, Yankton

TENNESSEE
Bryant & Trimble
406 Broad St., Chattanooga
Radio & Sound Service Co.
204 W. Clinch Ave., Knoxville
Tennessee Valley Appliances
Knoxville
McGregor's, Inc.
680 Union Ave., Memphis
Riechman Crosby Co.
223 S. Front St., Memphis
Tennessee Valley Appliances
171 N. 8th St., Nashville

TEXAS
Amarillo Hardware Co.
506 Tyler St., Amarillo
Radio City Dist. Co.
800 Jackson St., Dallas
Southwestern Music Co.
1707 Young St., Dallas
Wilkinson Brothers
2501 Commerce St., Dallas
W. G. Walz Co.
500 San Francisco St., El Paso
Automatic Sales Corp.
325 M & M Bldg., Houston
Southern Equip. Div. (A. B. Frank Co.)
Navarro & Villita Sts., San Antonio

UTAH
Felt Radio Co.
150 S. Main St., Salt Lake City
Radio Supply, Inc.
46 Exchange Place, Salt Lake City

VERMONT
Vermont Hardware Co., Burlington

VIRGINIA
Radio Supply Co.
408 Monticello Ave., Norfolk
Benj. T. Crump Co.
1310 Franklin St., Richmond
Johnston Gasser Co.
1402 E. Main St., Richmond
H. C. Baker, Inc.
29 Franklin Road, Roanoke

WASHINGTON
Harper Meggee, Inc.
960 Republican St., Seattle
Seattle Radio Supply, Inc.
2117 Second Ave., Seattle
Harper Meggee, Inc.
Spokane

WASHINGTON, D. C.
Capital Radio Wholesalers, Inc.
2120 14th St.
Southern Wholesalers, Inc.
1519 L St., N. W.
Star Radio, 409 11th St., N. W.

WEST VIRGINIA
Sigmon Radio Supply Co.
104 E. Wash. St., Charleston
White Electric Co.
903 West Pike St., Clarksburg
Air-Ola Radio Co., Inc.
708 8th Ave., Huntington
Jones Cornett Elect. Co., Welch
Hamburg Bros., Wheeling

WISCONSIN
Taylor Elect. Co.
201 E. Washington St., Madison
Radio Parts Co., Inc.
332 W. State St., Milwaukee
Taylor Elect. Co.
720 N. Jackson St., Milwaukee
The Wirtz Co.,
2532 N. 3rd St., Milwaukee

METHOD OF DETERMINING INTERIOR ACOUSTICS

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

Part II



A. K. Ward

This is the second in a series of articles dealing with acoustic problems. In the first article it was stated that an open window is considered a "perfect" absorber due to the fact that all sound passes through and none of it is reflected back into the room area. Therefore using the out-of-doors as our perfect absorber, we define one absorption unit as being equal to the sound absorption of an area one foot square opening to the atmosphere.

Generally speaking, it has been found from a good many years' study and in practical experience that if the absorption units are calculated at 512 cycles per second, or one octave above middle C, the absorption at other frequencies will be generally satisfactory.

In this article we will try to show that there is no mystery in solving acoustic problems but just simple mathematics, common sense and experience.

Sabine's Formula

Sabine's formula for acoustics of rooms is

$$T = \frac{.05V}{a}$$

T = Reverberation period in seconds.
.05 = A constant determined for the greatest number of rooms.

V = Volume in cubic feet.
a = Absorption present in absorption units, or Sabines.

Reverberation is the persistence of sound in a room after the sound has stopped. It results from the many reflections of the sound bounding back and forth from one surface to another in the room and is measured in seconds.

While opinions do vary somewhat, the following list contains "Optimum Reverberation Periods," in various size rooms which are considered acceptable by most Acoustical Engineers in calculating sound absorption necessary to give acceptable time for speech and music. However, the effect of reverberation up to a certain length of time is beneficial because it increases the loudness of the sound and by the many complex reflections makes the sound of music more pleasing and lively. Obviously, there is a reverberation period for each auditorium which will give the most satisfactory condition for hearing in that room. This reverberation period is known as the Optimum Reverberation Time.

Cubic feet of volume	Seconds
1000	.84
2000	.92
4000	1.00
10000	1.13
25000	1.27
40000	1.35
100000	1.52
250000	1.72
400000	1.82
700000	1.96
1000000	2.05

It has been found that the reflected sound should follow the direct sound within .05 seconds to generate satisfactory speech, while for satisfactory hearing the loudness of the first word should drop to about one-third the loudness of the succeeding word about to be heard.

Temperature Disregarded

Sound travels at the rapid rate of 1120 feet per second at average room temperature. Yes, even temperature has to be considered, but as all included charts have taken this factor into consideration, it can be disregarded. With sound traveling at 1120 feet per second, the reflected sound cannot be more than 56 feet (.05 x 1120 = 56) back of the direct sound. In a large auditorium with reflecting walls, this difference in distance is likely to cause a blurring of the sound. With these walls acoustically treated, a large percentage of the sound will then be absorbed by the walls, and that portion of the sound which is reflected back into the auditorium will be of such a low level that it will not cause interference with the stronger signals coming from the point

of origin, and in this case no blurring will be noticeable to the general public.

One fact is always noticeable to an Acoustical Engineer when making listening tests: the loudness of words in an acoustically corrected room is almost as great as in the uncorrected rooms; that is, the presence of a considerable amount of sound deadening material has but little effect on the loudness of sound. This is due to the fact that loudness is proportional to the logarithm of the intensity. For example, if two sounds have intensities of 100 and 200, their relative loudnesses are 2 and 2.3 (log 100 = 2, log 200 = 2.3).

The above is one of the hardest facts that an engineer has to make clear to a layman not versed in sound theory. It must be realized that the loudness of sound from a 200-watt amplifier is not twice that of a 100-watt amplifier, but is just enough for the average ear to distinguish the difference. This point will be explained in more detail in a future article on Amplifiers.

Absorption Varies

All enclosed rooms have some absorption regardless of wall, floor and ceiling materials used. The same material may be used on two different rooms but the absorption factor may be different due to the method of using the material. For instance, plaster placed on lath backed up with 2 x 4 and an air space will absorb more low tones than the same plaster applied to a solid substance such as brick or concrete without an intervening air space.

In general, the following table of coefficients per square foot can be used for common materials.

Material	Coefficients per square foot
Open window (absorbs all sound falling on it)	1.00
Hair Felt, 1" thick	.55
Plastered Surface	0.025 to 0.034 average .03
Glass	0.027
Concrete	0.015
Varnished Wood	0.03
Carpets	0.10 to .25
Loose Heavy Drapes	.10 to .50
Exit Curtains	.03 to .10

Absorption of Objects

Object	Absorbing Units Each
Plywood Seats	0.1 to 0.2 units
Audience (per person about 15 square feet of clothing)	4.7
Stuffed Seats	2 to 3 1/2

Note that when calculating audi-

STREAMLINED MICROPHONE ANNOUNCED

(Continued from Page 1, Column 1) point-by-point comparison with any type of microphone in any price range.

Specifications

- Type—Pressure operated.
- Frequency Range—100 to 6000 cycles.
- Impedance—250 ohms.
- Average Operating Level—68 db. (10 bar signal across open circuit).
- Dimensions—2 3/8 inches wide, 3 inches high, 3 3/8 inches deep.
- Net Weight—1 1/4 pounds.
- Finish—Polished Chromium.
- Stand Fitting Size—1/8 inch pipe thread.

ence absorption, the seat absorption must also be deducted.

From the first article, it will be recalled that the absorbing unit of a person varies from 2 to 6 1/2 depending on the clothes worn.

Folded cloth or velour drapes vary greatly in absorption, however, the area used is so small that little error is introduced in the final answer. Folded heavy velour drapes vary from 10 to 50% absorption, depending on the fold constant, that is, for example, should one hundred linear feet of the material be folded in drapes to 25 feet, the ratio would be 4 to 1 and the absorption would be 40%.

Most calculations for auditoriums are figured at 3/4 audience, but quite often it is demanded that acoustic material be applied to give optimum reverberation time for small audiences, as an average.

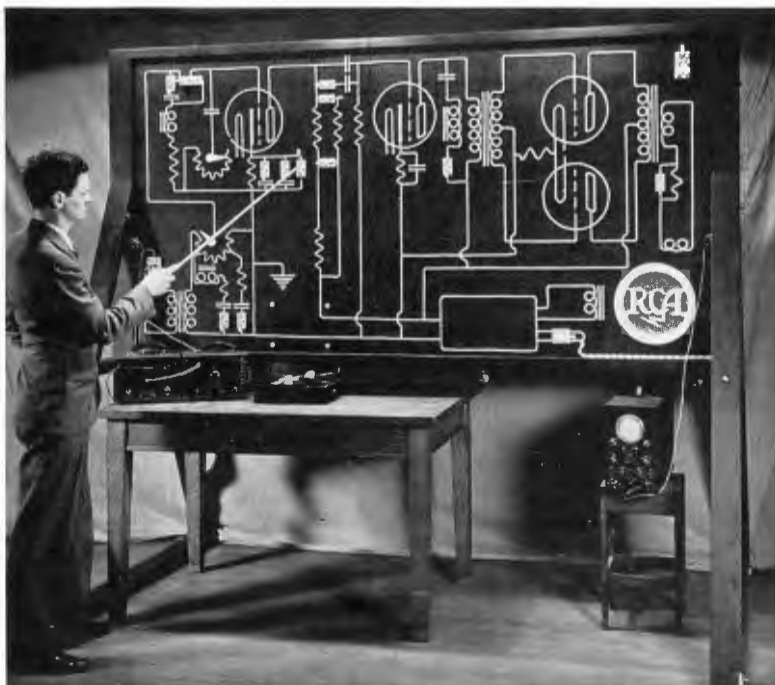
Comparison of Materials

We are not advising the use of any particular manufacturer's products, but we would like, at this point, to list only a few of the available materials in order to give some idea of their absorption.

Material	Absorption at 512 cycles
C1 Celotex	48%
C2 Celotex	69%
C3 Celotex	76%
C4 Celotex	98%
U. S. Gyp. Quietile	73%
U. S. Gyp. Perfatile	96%
J. M. Servacoustic Tile	95%
J. M. Transite Tile	71%
J. M. Sound Blanket	67%
Corkoustic 60 1 1/2 thick	62%

While it is always best to obtain an optimum period of reverberation, there is an allowable deviation from this time which will give satisfaction. Nevertheless, this acceptable limit cannot be increased beyond the point where the overlapping of successive spoken syllables would be sufficient to appreciably lower the percentage of intelligibility.

A "Working" Diagram



With the aid of this unique board, RCA service engineers are able to demonstrate both visually and audibly a variety of conditions pertaining to audio frequency circuits. It's a feature of RCA's current series of service meetings on "Training the Ear and the Eye for Radio Servicing." Behind the board are mounted apparatus, various parts of whose circuits are connected to the switches on corresponding parts of the schematic diagram. Certain effects may be heard through a loudspeaker concealed behind the monogram and their characteristics studied on a cathode ray oscillograph. Dates and places where meetings are being held can be learned from RCA distributors.

Barn Dance Attraction



Sally Foster, pretty, flaxen-haired balladist on NBC programs, is a big city girl but she sings the old time songs and hillbilly tunes the way the listeners like them.

NEW CHECK-UP SELLING PLAN STARTS SOON

National Advertising and New Sales Aids Ready For April Use

Spring is coming—and so is a brand new Check-Up selling plan that will enable dealers and service engineers to make plenty getting the millions of home and auto radios in shape for the summer season. National advertising and special dealer material will be used to promote the plan.

Essentially, the Check-Up, whether applied to home radios or auto radios, is a method of obtaining for the radio dealer an opportunity to inspect radios—and having him paid a profitable price for doing so. RCA originated the plan and has fostered it for years, knowing that a service engineer who inspects a number of radios will find a goodly proportion which badly need new parts, new tubes, and service work done on them. RCA realizes also that service engineers and dealers will sell the products of the manufacturer who helps them get the business. Hence the large sums of money RCA has spent to promote the Check-Up Plan for dealers. It helps everyone concerned, including the customers.

National Advertising Tells Story

The new Auto Radio Check-Up Plan embodies all the knowledge RCA has gained in several years of successful use of the Check-Up method. New material especially designed to appeal to the radio owner just at the time in the Spring when he is in the mood to check over his home or car radio has been prepared. To give the RCA Auto Radio Check-Up national prominence, RCA Radiotron has scheduled ads in the *Saturday Evening Post* and *Colliers*, to start in April.

Regular Check-Up Continues

During March, RCA Radiotron distributors' salesmen will call on dealers to explain the new plan. A special booklet entitled "Make the Prospect Pay for Being Discovered" has been furnished to distributor salesmen. The title aptly sums up the advantages of this selling method.

"Get ready for a big season with the new RCA Spring Radio Check-

RCA ANNOUNCES NEW SERIES OF SERVICE MEETS

Distributors to Sponsor Service Lectures In 100 Cities

Inauguration of a new series of service lecture meetings to be conducted under joint sponsorship with its wholesale distributors in over 100 cities, was announced by the Service Division of the RCA Manufacturing Company. The first of the meetings have already begun in some localities and the rest are scheduled to be held throughout the months of February and March until every section of the country has been covered.

The subject of the new service training series is titled "Training the Eye and the Ear for Radio Servicing," and includes analyses of audio circuits of current radio sets, discussion of fundamentals of sound as applied to radio reception, methods of correcting audio amplifier response and a wide variety of demonstrations using the cathode ray oscillograph. A unique feature of the demonstrations will be the use of a specially designed board showing a large schematic diagram of various radio circuits in relief so that it will be visible to large audiences. Mounted behind the board are apparatus whose circuits are connected to corresponding parts of the schematic demonstration board with suitable switches for cutting circuits in and out and creating conditions analogous to those encountered by service engineers in the field. In this way certain effects will be seen on the board, heard through the loudspeaker and studied on the cathode ray oscillograph.

Starting in 1934, the RCA Service Division has conducted thirteen series of meetings on a wide variety of subjects of special interest to service engineers. As in the past, the meetings will be conducted under the auspices of the RCA radio and parts wholesalers, who will announce the dates and meeting places for their respective territories.

This is the last scheduled series of meetings at which RCA engineers appear in person. A new program of meetings by radio broadcast is now starting. See story on page 1, column 4.

Up," is the word sent out from RCA Radiotron sales headquarters. "In the meantime, keep busy with the regular Check-Up Plan. Use the material shown in the November issue of RCA Radio Service News."

The Only One



Nola Luxford, shown above, is believed to be the only feminine announcer regularly on the networks. She began more than four years ago at the Los Angeles Olympic Games and has recently been the announcer for the La Salle Fashion Show.

DEALERS RUSH TO GET BONUS WITH DISPLAYS

(Continued from Page 1, Column 5)

- ures or counter give-aways in the form of the familiar "strip" style ad, with nationally-known radio stars as the characters of the "strip."
2. Spare Tube Clips, for attaching to inside of receiver cabinet to encourage customer to keep spare tubes. Also useful over work bench.
 3. Carrying Cartons, for customers' use in bringing tubes to store.
 4. Guarantee Slips, to be given to customer on completion of job.
 5. Check-Up Card (Form 731), an effective direct-mail piece.

First Unit Now Ready

Even without the Bonus Kit, the 1937 RCA Radiotron Window Display Service is a wonderful bargain for any dealer who capitalizes on his windows. Subscribers receive immediately a fascinating "Balanced Selling Fool" Display. The center piece of this unit is a replica of the famous Radiotron Doll poised on a tight wire stretched between a large RCA Radio Tube and a carton. Curiosity as to "how he does it" stops a remarkable percentage of all who see this display. And before they discover the secret, the side pieces have told them about the advantages of a "check-up."

In April, subscribers to the Display Service will receive a display of never-ending usefulness. The main piece is a large replica of a slate. It has an actual writing surface and is furnished with chalk and eraser, so that the dealer can write special announcements under the caption "Special Today" at the top of the slate.

For August delivery, the Service provides a display that combines the attention value of a life-size cut-out of a pretty girl and two tubes, one a 100,000 watt, the other a standard metal receiving tube.

Motion in Football Display

For the Fall selling season, subscribers will receive a display that has tremendous pulling power for the ten best weeks of the year. It features a co-ed carrying a pennant and has 10 side pieces showing the animal mascots of ten famous college football elevens. For only \$1.50 added to the price of the subscription—making a total of \$4.35—this display will be furnished with motion, so that the co-ed actually

waves the pennant back and forth.

Special Streamers and Pictorials

The four major displays described are not all of the RCA Radiotron Window Display Service by any means. Special window streamers to capitalize events occupying the attention of the public will be furnished. An example of this part of the service is a set of window streamers for displaying the inning-by-inning score of World's Series baseball games. Another feature of the Service is a series of News Pictorial Window Streamers. These Pictorials never fail to attract considerable attention wherever dealers have used them.

An ample quantity of the first unit of the Service was ordered and is now ready for delivery to dealers. The quantity of the other units to be ordered will be determined by the number of advance subscriptions received and therefore dealers should order at once to be sure of getting the complete service. "Only by this method," says RCA Radiotron Advertising Manager D. J. Finn, "can we avoid waste and thus be able to provide such elaborate displays at this nominal price."

INFLUENCE OF RADIO

Parks Johnson and Wally Butterworth recently asked a woman who was being interviewed on their NBC "Vox Pop" program to name the most famous father of five girls. She nominated Eddie Cantor.

Apparently, she never heard of Papa Dionne, which demonstrates the influence of radio.

Transcription Announcements Offered Trade

Record Provides Dealers With 13 Station Break Announcements

No longer need the small dealer or service engineer think that he cannot afford to use radio advertising. Spot announcements of the "station break" variety and using the finest professional talent to sell service work and service sales specialties can now be had at surprisingly low cost.

For a small cost any dealer or service engineer can now obtain from his RCA Radiotron distributor a new Victor Program Transcription that supplies all the continuity and talent needed for the announcements except for the dealer's "signature" at the end which is supplied by the announcer of the local station. The record is known as "RCA Radiotron Service Spots." The full series of thirteen announcements is on the one record.

13 "Spots" on Record

There are thirteen announcements on the record because radio time is usually sold in units of 13 programs, or for one-fourth of a year if only one program per week is bought. Each of the announcements requires 50 seconds, leaving 10 seconds for the announcement of the dealer's name, address, etc. This is ample for this purpose.

Professional Actors and Writers

Each announcement dramatizes a specific trouble encountered by radio listeners and offers a solution in the form of a call to the XYZ Radio Service Shop. In one announcement, for example, a man and woman are heard talking as they tune in a favorite program while they roll along in an automobile. Shortly the car's radio goes phfft, and the local station's announcer fades in to tell about the facilities of XYZ Radio Service for keeping auto radios in tip-top condition.

Other announcements dramatize and sell noise elimination, antenna systems, alignment jobs, selectivity improvement, interference reduction, Record Players, and the 10-point Check-Up. In each case professional actors and script writers have been used to give an interest and effectiveness to the announcement that could seldom be attained by a dealer working independently.

Time Cost Is Low

"Station break" spot announcements are undoubtedly one of the greatest advertising values. The cost for 13 announcements over many local stations is no more than for one small ad in a newspaper. With the new record now offered by RCA Radiotron distributors, dealers and service men can now make highly profitable use of this effective medium.

Reporting in Flood Zone



Never was the value of radio during great disasters better proved than during the recent Ohio River floods. All branches of radio helped in the rescue work. Above is shown an NBC reporter equipped with a short-wave pack transmitter broadcasting from a boat.

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. All Selling Tips printed will win one of the new RCA Service Engineer's Pencils. Let's have yours.

Big Ones Sold the Little Ones

I have discovered a very effective method of increasing RCA Tube sales and general service calls.

Recently, I secured six large transmitting tubes (dead ones, of course) from the local broadcasting stations. I mounted these on racks and attached small cards, listing the original price of each. Directly in front of the rack I placed a sign with copy as follows: "These Tubes Are Checked Hourly in a Broadcast Station to Assure You of Good Quality Reception."

In front of this huge broadcasting tube display rack I placed six average size receiving tubes for an ordinary home radio and a card giving the price of the entire set of tubes (less than \$5.00). On the card I also explained that this set of tubes constituted the complement for the average small radio.

Above the entire display, I spread a sign, "Why Not Check Your Radio and Tubes at Least Twice a Year to Get the Most from Broadcast Reception?"

Scarcely a person passed this eye-catching display without stopping to satisfy his curiosity concerning the large transmitting tubes. As he looked over the tube display the object lesson was brought home forcibly, resulting in many questions, an increase in tube sales and a greater number of profitable service calls.

C. V. MacLellan,
Paramount Radio Sales and Service Company,
5712 Warren Street,
Detroit, Mich.

Drawing Crowds to Tell the Story

During the recent service campaign we put a number of RCA Tubes in our window with RCA Tube streamers. Then we installed a unique lighting device which worked from a capacity indicator similar to the one shown in RCA Radio Service News. This indicator attracted large crowds of people and increased our sales of RCA Tubes. By telling potential customers that the window unit was operated with RCA Tubes we brought home the importance of well-made, sensitive tubes. The display of RCA Radio Tubes in the window associated the capacity indicator lighting device with tubes for the home radio receiver. We gave the window added appeal by showing an opened metal tube and its interior. Several sales on sets were made and our tube sales showed a decided increase. The capacity unit which was worked hundreds of times and the tin foil contact on the window, had a sign on it telling passersby of the importance of tube renewals. It worked O. K.

Ben Wolf,
Tremont Electrical Supply Co.,
10 Boylston Street,
Boston, Mass.

[Editor's Note: The capacity relay mentioned above was described in the March, 1936, issue of RCA Radio Service News.]

The Proof Is in the Testing

A short time ago one of my customers asked me why I chose to sell RCA Radio Tubes. He asked me if I made a greater profit than on other brands.

This set me thinking and I decided to reassure all customers along these lines. I made a tube checker with 12 sockets. One row of six, I labeled RCA Radio Tubes and the other row, X Tubes. I put RCA Tubes in one set of sockets and a competitive brand in the other, using tubes that have all been used an equal amount of time. By means of a switch arrangement which the customer, himself, can operate, I let him prove to his own satisfaction why I handle RCA Radio Tubes. The indicator always shows the RCA Tubes to be in better condition than the competitive brands. Then I point out the moral of RCA Radio Tubes—longer life, better service, more for the customer's money.

Henry Sargent,
108 Hopkins Street,
Brooklyn, N. Y.

Saves Time and Money

My shop is located in a "DC" district in which are located numerous rooming houses, hotels and office buildings. I have discovered that no matter how many times you tell a purchaser to reverse the plug for DC operation, you get a service call with a complaint that the set "doesn't work."

I find that by selling and installing polarized attachment plugs and receptacles I can eliminate the bulk of these "nuisance" service calls. By merchandising these plugs I have convinced people of my integrity, stopped the possibility of their becoming antagonistic because their radio won't operate, and save valuable time that may be devoted to more constructive things.

Sidney Multz,
90 West 27th Street,
New York, N. Y.

Service Sticker

Recently I hit upon the idea of leaving a large sticker on the cabinet of each radio I repaired. The following is the wording I used, although this may be changed as required:

J. L. Davis

Radio Sales & Service
Box 65, Basin, Wyo., Phone 67R
All work and material guaranteed for 90 days Providing you notify me at once in case of TROUBLE. And further, get in touch with me at the end of 60 days and I will make a personal call and check its performance.

This has brought me more business than any plan I have tried and it makes a thoroughly satisfied customer.

J. L. Davis,
Radio Sales & Service,
Basin, Wyo.
Box No. 65.

Describe Job in Code on Chassis

To write in code (backwards, for example) the date, parts replaced, and price, on the chassis of a repair job, will save lots of time in case of a call-back on that receiver.

James White,
Official Radio Repair,
3522 W. 3rd St.,
Los Angeles, Calif.

Teach How to Test Tubes

Customers, coming in to have their tubes tested, are generally skeptical as to your ability to test tubes. We keep a box of old tubes on the shelf below the tester, which stands on a side counter so a customer can watch you test his or her tubes.

After we've tested the customer's tubes, we reach down into the box, pull tubes out at random and test a couple of bad ones, then suggest that the customer manipulate the tester, under our direction, and make a test on tubes. This is the easiest way to sell tubes, the customer becomes more than interested, and instead of saying, "I'll be in to get new tubes," winds up with buying them right then and there—and he comes back also when he has other radio troubles.

Joseph Turek, Jr.,
6828 Windsor Avenue,
Berwyn, Ill.

Selling Alignment Jobs

Most customers know little of the scientific terms used in radio, so I find it advisable to make an analogy of the operation in simple, understandable terms. Example:

If there are several lights evenly divided in a room, the room will be lit brightly and evenly. If any one or several of these lights are put out the brilliancy decreases and we may have dark corners.

The lights may be compared to tuned circuits; the brilliancy to the volume; and the shadows to the unequal frequency response or side band cutting.

William F. Hockin,
3622 N. Camac St.,
Philadelphia, Pa.