

RADIO SERVICE NEWS

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CAMDEN, NEW JERSEY

Vol. I, No. 7

\$84.⁵⁰ OSCILLOGRAPH ANNOUNCED

RCA UNIVERSAL TRANSFORMERS FIT ALL SETS

Assortment of Four New Power Transformers Offered at Low Cost

Now service engineers can install true RCA quality in replacement power transformers for any make or model of a-c set manufactured to date and do so from a stock of only four transformers. The new line of four types of RCA Universal Power Transformers is priced surprisingly low, yet has really universal mounting brackets, removable end-bells, wide range of windings and taps, and is truly universal both electrically and mechanically.

Since the charge for replacing a power transformer is the one at which customers most frequently balk, many service shops will welcome the opportunity to be able to offer a replacement transformer carrying the famous RCA trade mark with its assurance of quality and established value.

Four Units Handle Any Job

The transformers have been divided into four classes, for ten or twelve tube receivers, for class "B" receivers, for five to nine tube receivers, and also for four tube receivers. RCA Parts distributors now have in stock all models except the small transformer for four tube receivers. The latter will be available shortly.

Sufficient windings and taps have been brought out in all the new transformers to cover any of the receivers that have been manufactured under the particular tube designation indicated. Mechanically, these transformers have mounting slots which permit a wide variety of mounting arrangements. An exclusive feature is the removable end-bell, which permits all connections to be

(Continued on page 2, column 4)

An Eyeful and an Earful



Patrons of the recently-opened Roxy-Mastbaum Theater of Philadelphia get both an "eyeful" and an "earful." Above are shown twelve of the thirty-two Roxyettes, the world's most famous precision dancers, who lend their charms to the Roxy stage productions. To give patrons the very finest "earful," Roxy-Mastbaum, one of the world's largest amusement palaces, has installed the latest type of RCA Photophone High Fidelity Sound Equipment.

MANY PENCILS AWARDED FOR ANTENNA SALES

RCA Antenna Popularity Brings Remarkable Pencil to Many Service Men

With RCA World-Wide Antenna sales booming as a result of the proven performance of this product and the national advertising it is receiving, radio service engineers the country over are rapidly equipping themselves with the unique RCA Service Engineer's Pencil, which automatically calculates resistor values from the Code and which is given free for the labels from any RCA World-Wide Antenna Kits.

The patented pencil, which is an exclusive RCA contribution to radio serv-

(Continued on page 2, column 2)

1935 RCA Service Meetings Attracting Many Service Men

The first of the 1935 series of RCA Victor Service Meetings was held in the Hotel Pennsylvania in New York City, on January 21, 1935. This meeting inaugurated a great new series of meetings for service engineers that will extend over the entire country with meetings in both large and small cities and towns. The exact dates of these meetings in any locality can be obtained from the nearest RCA Parts distributor.

The subject for the first series of meetings is one that is of extreme interest to all service engineers, inasmuch as it has been a source of considerable profit to them during the past year and will be to a greater extent in the forthcoming year. This subject

(Continued on page 6, column 1)

PRICE OF COMPLETE NEW RCA INSTRUMENT INCLUDES RAY TUBE

Linear and Vertical Amplifiers, Sweep Circuit, and Beam Centering are Among Desirable Features

(See advertisement, page 8)

It's here! And it costs only \$84.50 net with full complement of tubes, including RCA-906 Cathode Ray Tube! The RCA Cathode Ray Oscillograph, a complete laboratory-type instrument, is now ready for every Service Engineer who wishes to render factory-precision service to complicated modern receivers.

For years radio manufacturers have used highly-expensive oscillographs for accuracy in testing and aligning and have regretted that the cost of the equipment prevented the men who serviced their products from having similar equipment. The development and perfecting of a low-priced cathode ray tube by the RCA Radiotron organization was the first step toward making possible an oscillograph of moderate costs. While simple oscilloscopes without variable-frequency sweep circuits or vertical and horizontal amplifiers are easily and cheaply produced, they have only limited uses and are not suitable for radio service work.

RIDER SPEAKS

"I believe that the cathode ray oscillograph will prove to be the most useful instrument ever developed for use by the servicing industry. Its versatility will enable service operations hitherto beyond the capabilities of the industry with equipment developed and these operations will not only raise the standards of servicing, but will materially enhance the financial income. The obstacles presented to the service technician as a result of modern receiver design trends and the limitations of existing meter-type of servicing equipment will be overcome by the proper application of the cathode ray tube."

JOHN F. RIDER
Publisher of "Rider Manuals"

It remained for RCA to design and produce a complete and inexpensive oscillograph suitable not only for radio service work but also for amateur radio operators, high schools and colleges, radio manufacturers, radio dealers, or anyone who needs an instrument for visual study of alternating currents.

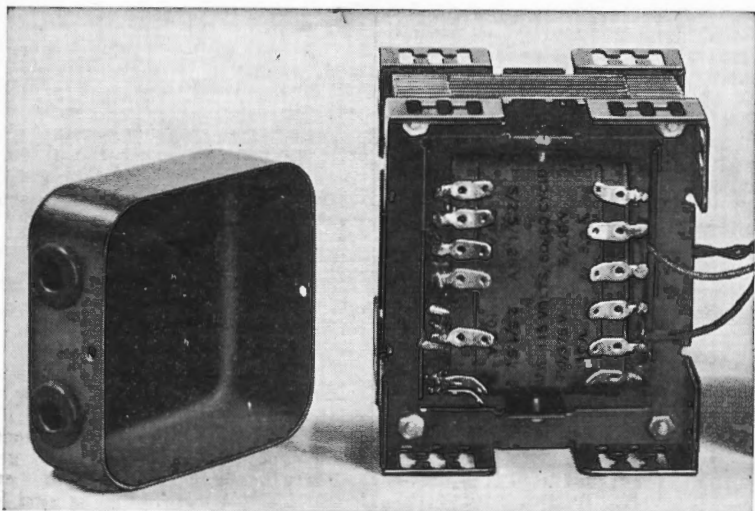
Sight-unseen, so many of the remarkable new oscillographs have been ordered by manufacturers, utilities, and others, who have heard of or seen the advance models made for field test purposes, that already it has been necessary to double and redouble the original production schedule. RCA Parts Distributors now have samples and are demonstrating and making deliveries.

Officials Enthusiastic

RCA Parts Division officials are jubilant over their new product. Said E. M. Hartley, Manager, "Here is a job of which we are proud. One must know the engineering problems involved to appreciate the worth of the RCA Cath-

(Continued on page 7, column 5)

No Diagrams Needed for Connecting



Voltages printed on the terminal board permit quick installation of the RCA Universal Transformer. Removable end-bells give a workmanlike job and pass underwriters. RCA quality and low cost to the dealer give customer satisfaction and dealer profits.

HE ALSO SERVES — An Editorial

By E. M. Hartley, Manager, RCA Parts Division

"He also serves who only sits and waits"—but in most cases he doesn't serve enough customers to spend his waiting time figuring how to invest his surplus income.

Too many radio service engineers are sitting and waiting for customers to call.

There are approximately 18,000,000 radio sets in the United States. If every one of them were merely checked over and inspected once a year, the radio service business would be rolling in prosperity.

Surveys have shown that four out of five radios need one or more new tubes. The great majority of sets operate with woefully inadequate antenna systems. And how many sets are struggling along with unbalanced circuits, burned-out parts, etc., there is no way of knowing, but anyone in the radio service business knows that it is far too many.

True, we have been through a depression, but it has not been lack of money on the owners' parts that has kept these sets from getting the attention of the radio service engineer that they badly need. In most cases they just don't know how much extra satisfaction they would get from a few dollars spent for radio service.

(Continued on page 2, column 1)



E. M. Hartley

extra satisfaction they

Modern Machinery Reduces Costs



Winding five coils at once helps to reduce the cost of high quality RCA Universal Transformers. Automatic machinery is used to insure precision windings.

NEW CORPORATE FORM ADOPTED BY RCA SET AND TUBE COMPANIES

RCA Manufacturing Co., Inc. Is Organized. Present Policies Continued

The RCA Victor Company and the RCA Radiotron Company, the two wholly owned manufacturing subsidiaries of the Radio Corporation of America, have been consolidated into a single organization to be known as "RCA Manufacturing Company, Inc."

No Change in Policies

Consolidation of the activities of the two companies into a single organization to be known as the RCA Manufacturing Company, Inc., January 1st, entails no changes in any of the sales, advertising or management policies of either of the two former companies, nor any change whatever in the products or trade marks heretofore used, according to Mr. E. T. Cunningham, President of the new RCA Manufacturing Company.

Factories and Trademarks Continue

"The formation of the new Company is the final step in the process of centralization which has been going on for more than a year in the interests of greater operating economy and efficiency," Mr. Cunningham said. "As in the past, the RCA Victor Division and the RCA Radiotron Division will operate independently of each other as their different problems warrant. The same separate sales organizations and advertising programs will be maintained as in the past."

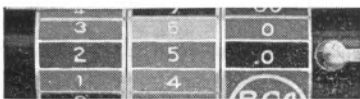
Many Pencils Awarded For Antenna Sales

(Continued from page 1, column 2) ice men, is becoming as famous as the RCA Antenna Systems. Service engineers have long needed some means of solving the RMA Color Code markings of resistors. By means of three colored bands that turn on the barrel of the pencil, anyone can immediately read the value of any coded resistor by simply aligning the colored bands to correspond with the colors on the resistor.

The pencil is given free to any service engineer or dealer who sends 20 labels from any type RCA World-Wide Antenna System to RCA Parts Division, Camden, New Jersey. There are two labels on each kit. On the RCA Dealer Demonstration World-Wide Antenna Kit, which permits dealers to connect four radio sets to one antenna system, there is only one label and it counts as much as four labels from any of the other RCA Antenna Systems.

Offer Extended Indefinitely

According to the original pencil offer, labels had to be sent in not later than



By turning these bands on the barrel of the pencil, the value of any resistor appears in plain figures according to its RMA code

February 1st. So many shops with several employees have requested an extension of time that the offer has been extended indefinitely so that every service engineer can win a pencil.

Antenna Line Complete

The recent additions to the RCA antenna line make it even easier to win a pencil. For a list price of only \$7.75, there is now a De Luxe RCA World-Wide Antenna which reduces noise on all broadcast bands, including the standard domestic broadcast.

BETTER TIMES PROMISED BY TRADE SURVEY

Dun and Bradstreet Says 1935 Will Be Busy Year For Radio Business

The radio industry has turned the famous corner and is headed straight for prosperity judging from a survey recently completed by no less an authority than the credit-reporting house of Dun & Bradstreet, Inc. 1934 was the biggest year yet in number of sales and 1935 promises to be even better.

Although all previous records were outdistanced during 1934, current indications reveal a stronger upturn of demand during the first quarter of 1935, with some new peaks to be established during the last six months of that year, according to the Dun & Bradstreet survey of the radio industry.

Sales at New Peak

In spite of the encouraging progress made during the first six months of the current year, the increase in sales has been abrupt since the new models were displayed early in the Fall. In the comparison with the totals for the corresponding period of 1933, losses were reported in no parts of the country, while the increases ranged from 25 to 100 per cent.

Higher Units of Sale

The cheaper sets have been bought freely, but the proportion is not so large as it was last season, as there has been a decided shift to the higher-priced all-wave sets during the last three months. Based on the returns for the elapsed eleven months, with the returns of the Christmas season yet to be tallied, it is estimated that sales for the country, as a whole, average 40 per cent larger than for the comparative period of 1933. This would bring total sales for 1934 around 5,350,000 sets, as compared with the previous peak of 4,438,000 units set down for 1929.

From 60 to 65 per cent of the units sold represented replacements, which is about the same ratio as in 1933, as new enthusiasts are being added daily to the country's radio audience. Considerable replacement business has been received from agricultural districts, where sales had been few more than three years, owners now turning in their old sets for the new all-wave models.

Wider Interest in Broadcasts

In October, the highest sales in broadcast history were reached at \$4,527,000, a gain of 59.0 per cent over the 1933 comparative figures, and 49.1 per cent higher than in October, 1932. For the ten months of 1934, these sales amounted to \$33,780,000, or 38.8 per cent ahead of the 1933 comparative figures, and 2.2 per cent in excess of the 1932 total, which represented the all-time high.

Price Trend Upward

Wide fluctuations in prices have been absent since last Spring, and the current level is holding steady at 10 to 25 per cent higher than at this period a year ago. The present firmness, however, is inclining upward, and advances already have taken place in some of the medium and better grades of console types of all-wave sets. The popularity of the smaller radio sets, however, apparently is waning, as the price inclination in this division is downward. Manufacturers thus far have succeeded in withholding from retailers most of the increases which have resulted from the higher operating costs under the code.

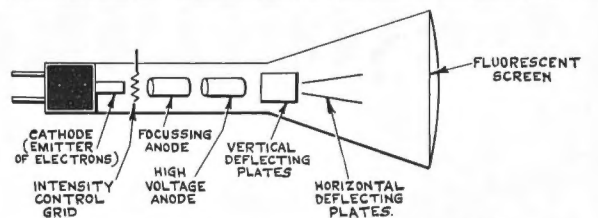
CATHODE RAY OSCILLOGRAPH EXPLAINED IN SIMPLE TERMS

Electrical Principles of Amazing Device Are Easily Understood By All Service Engineers

The Cathode Ray Oscillograph is a new device in the field of service equipment. Its operation is extremely simple, it being merely a voltmeter that also records time. The following explanation covers the essential fundamental functions of the device. A thorough explanation is included in an instruction book which accompanies the new RCA Cathode Ray Oscillograph and which may

which controls the location of the light-spot on the screen, is a direct function of the voltage at any particular instant on the deflecting plates.

From the foregoing it is seen that a pattern of light may be traced on the screen by the simultaneous application of voltages to the horizontal and vertical deflecting plates. If this action is repeated twenty or more times per



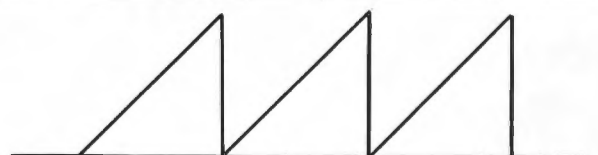
Elementary Diagram of Cathode Ray Tube

be obtained from RCA Parts Distributors for a nominal charge.

The heart of the Cathode Ray Oscillograph is the Cathode Ray Tube, a development of RCA Engineers to its present practical form. The Cathode Ray tube has often been called the "Electron Gun," as this describes its functions. The illustration shows an elementary diagram of the tube.

second, the retentive power of the eye is such that the tracing will not be discernible and the entire pattern will be seen.

Focusing of the light beam on the fluorescent screen is accomplished by adjusting the voltage on the anode nearest the cathode. The intensity of light is controlled by the negative voltage applied to the grid.



Saw-Tooth Oscillator

For the purpose of understanding the action of the "electron gun," one may consider the cathode as emitting electrons which are accelerated by the high voltage anodes and which strike the fluorescent screen at the end of the tube, thereby creating light. The course of the electrons is controlled by the two sets of deflecting plates, one for horizontal deflection and one for vertical deflection. The amount of deflection,

The Saw-Tooth Oscillator

The external voltage under test is always connected to the vertical deflecting plates. However, unless some means is provided for moving the beam simultaneously in a horizontal direction, a beam rising and falling vertically will be obtained. As this would merely give an indication of the maximum voltage available, a means must be provided for simultaneously deflecting the beam horizontally. For this, the so-called variable frequency "saw-tooth" oscillator is necessary. The "saw-tooth" refers to the wave shape of the oscillator and is required because of the necessity for having the horizontal deflection increase in a linear manner and then abruptly return to zero and again shift across the screen. The frequency of the oscillator must have a definite relationship to the frequency of the voltage under test. For example, to examine one cycle, the saw-tooth oscillator must be the exact frequency of the voltage under test, then two cycles will be shown on the screen at one time.

With the saw-tooth oscillator provided in the new RCA Oscillograph the minimum number of cycles for the highest frequency is six, being obtained when a 90,000-cycle voltage is observed with the saw-tooth oscillator at 15,000 cycles. Higher frequencies may be examined by connecting directly to the vertical plates and using an external timing oscillator.

Amplifiers

The sensitivity of the Cathode Ray Tube is such that a voltage of .75 is required for either a vertical or horizontal deflection of one inch. Because many voltages used in radio circuits are very small, an amplifier has been provided for each set of deflecting plates. Both amplifiers use an RCA-57 tube and have a high gain and wide frequency range. The gain is approximately 40 and the frequency range is 20 to 90,000 cycles ± 10%.

Designing an amplifier circuit of such wide frequency range is a difficult engineering problem. Its solution greatly increases the flexibility of the equipment.

Power Supply

The high voltage anode of the Cathode Ray Tube requires 1000 volts DC for proper operation. Also DC voltages are required for the amplifier. The RCA-879 rectifier is used in a half-wave rectifying circuit for providing the necessary anode voltage for the RCA-906. The RCA-80, connected in a full-wave rectifying circuit, provides plate and grid voltages for the two RCA-57 amplifiers. While a single transformer is used for both rectifiers, individual filter circuits are provided. The transformer is oversized to prevent stray magnetic leakage that would otherwise affect the operation of the Cathode Ray Tube.

Must Pass Severe Tests

Of unusual interest to service engineers is the attention given to the design and manufacture which places these transformers definitely in the quality class. Not only do the RCA Universal Transformers receive every check that is given to all RCA parts, but they also receive a special baked varnish impregnation. This permits them to be operated under the most severe tropical conditions. The electrical test consists of a "hi-pot" test of 1000 volts between the low voltage windings and ground and a 2500-volt test between the high voltage plate and filament windings to ground. A 100% test of all transformers with a primary voltage of 460 volts ensures as nearly a perfect product as it is possible to manufacture. Individual windings are thoroughly tested at each stage of manufacture.

Competitively Priced

The RCA Universal Power Transformer carries the standard RCA 90-day guarantee against all defects and design in manufacture. List prices, subject to usual discounts to the trade, are: Stock No. 9551 for 10-12 tube sets, \$6.00; Stock No. 9552, for all Class B sets, \$6.50; Stock No. 9553, for all 5-9 tube receivers, \$4.75; Stock No. 9556, for four tube receivers—price to be announced.

HE ALSO SERVES—An Editorial

(Continued from page 1)

It is time for radio service engineers to stop sitting and waiting. In justice to ourselves and to the public, we must tell the public what it needs, what we have to offer. *We must advertise.*

The people who beat a path through the woods to the door of the man who makes a better mouse trap do so because the mice are getting bad at home—and they know they don't like mice. But they will not beat a path to the radio service store until they know that the old radio isn't performing as well as it should and that all it takes to bring back its performance is a comparatively small amount spent for service.

No longer can the radio service engineer expect the simple business card—"John Jones, Radios Repaired"—to bring customers flocking to him. He must tell people how much they will enjoy a properly serviced radio set and that John Jones is the man with the knowledge, the equipment, and the integrity to do the job.

So much of the radio service advertising that has been done has been of misleading nature that a rich reward awaits those legitimate service engineers who advertise in a straightforward manner, making no rash promises but offering simply honest work and high-quality parts for honest prices.

RCA Oscillograph Production Line



Quantity production of the RCA Cathode Ray Oscillograph has brought the "X-Ray of Radio" within the reach of all service engineers. This sensational new instrument is complete in all details for the most complex circuit analysis, yet has a net price of only \$84.50 with full tube complement, including the RCA-906 Cathode Ray Tube and all other tubes.

TEXAS GROUP FIGHTS RADIO RACKETEERING

Vigilance Committee and Association Trap and Prosecute Gyps

SAN ANTONIO, TEX.—Spurred on by the "Caesar's Wife" editorial in the August 18th issue of RCA RADIO SERVICE NEWS, legitimate radio service men of San Antonio are conducting a successful plan to clean up competitive conditions in the radio service business. With the local Vigilance Committee lending the full weight of its support to the campaign, gyp advertising has been exposed and the public is being educated to the fact that the work of cut-price artists is usually worth just what it costs—or less.

Results: Several so-called service men who are defrauding the public have been brought to the bar of justice and fined, and more profitable conditions are coming into being for legitimate service engineers who give the public a fair dollar's worth and expect a dollar in return.

Receivers "Planted"

T. J. Turner, Secretary of the San Antonio Vigilance Committee, conducted the exposé of the racketeers. "A month or more ago," he reports, "a Committee of the Radio Repairmen's Association waited on me and asked my assistance in helping to stamp out this racket. This Committee provided three radios. The sets were carefully examined by seven or eight competent radio service men, who signed statements that the radios were in first-class condition. New tubes were then installed and the radios were sent to my investigator's home and my own home. There the various radio companies called to repair the instruments."

"The case is clearly defined in a radio talk that I made over station KABC on September 22nd. You will notice that part of my thunder for this talk came from a former issue of RCA RADIO SERVICE NEWS.

Gyp Fined

"The Vigilance filed charges in Corporations' Court against three individuals," continued Turner. "After two postponements the cases were tried on October 10th. In one case the defendants were acquitted on account of a technicality or faulty complaint. In another case, an employee of a gyp outfit was found guilty and assessed the fine of \$20.00. This employee later signed an affidavit stating that customers were over-charged and charged for parts and tubes that were not actually installed by express orders of his employer. It seemed to be a regular practice to substitute their used tubes for comparatively new tubes and to charge for tubes that were not actually installed. The employee stated that such practices were the regular procedure in that shop."

In each case prosecuted by the Vigilance Committee, indisputable evidence was prepared of the dishonest practices. The parts and tubes in the receivers submitted to the gyp operators were marked before the set was given to them to repair and were checked after the set was returned. On one set a connection was purposely broken. The bill for repairing it was \$4.50, including \$3.00 for new parts which were not in-

stalled. The surprising thing about the tactics of the racketeers was that the amount of the charges might not have been considered excessive if honestly billed as a fee for professional service.

Service Engineers Organized

Turner states that it is his desire to see service men organized on a business basis and have standard service and repair charges to which all repair shops would adhere. He stated that if each service organization had a good business man at the head of it to teach them the business side, they would go far. In his radio broadcast report of the exposé, Turner quoted liberally from the "Caesar's Wife" editorial. The Vigilance Committee proposes to continue its Anti-Racketeering Campaign unabated.

FUTURE RADIO WONDERS SEEN BY GOLDSMITH

Says Radio May Transmit Sensations of Touch and Taste in Future

CLEVELAND, OHIO.—Speaking through a tiny microphone no larger than a matchbox, fastened to his coat lapel, a device he described as "permitting one man to be heard above a multitude," Dr. Alfred N. Goldsmith, noted scientist and consulting engineer of the RCA Manufacturing Company, described and demonstrated some recent scientific developments from the leading radio research laboratories to more than 400 guests of the Cleveland Chamber of Commerce, meeting in the Statler Hotel here.

Broadcast Touch, Taste, Smell!

Pointing out that we already hear and will eventually see by radio, Dr. Goldsmith suggested that in the remote future radio might appeal to man's other senses, such as touch, taste and smell. For example, he said, there was the possibility of transmitting three-dimensional replicas of objects in the studio through "Teletactile Broadcasting," so that a solid representation which "might even be touched as well as viewed could be sent into the home." "Telegustatory Broadcasting," or the transmission of taste, might make it possible to "taste" a fine brand of coffee, for instance, by radio. The transmission of smells would perhaps be easier, he said, since the "Telolfactory" receiver need only spray into the air a duplicate of the odor transmitted. He emphasized, however, that these possibilities were now "only whimsical and remote imaginings."

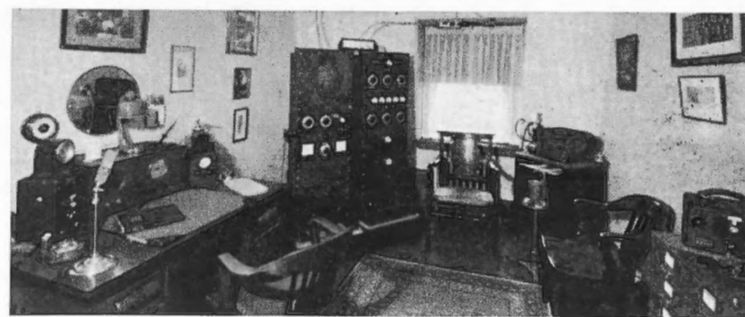
Better Talkies

To illustrate the remarkable progress which has been made in improving the quality of sound motion pictures, Dr. Goldsmith demonstrated for the first time in public a radically new system of high quality sound-on-film recording which according to the RCA Victor engineers who developed it will be the "motion picture sound of tomorrow," because it completely eliminates background hissing noises and theoretically, makes possible the ultimate of realism in sound-on-film recording and reproduction. Using a special film recording of a musical performance in the Radio City Music Hall in New York, Dr. Goldsmith called attention to the ability of the new system to reproduce the full definitions and shadings of all the instruments in the orchestra.

"The X-Ray of Radio Service"

A remarkable new RCA device called an oscillograph was connected to a number of radio receivers to permit everyone to "see" the characteristics of the human voice or other sound in the form of fluctuating waves. A stream of electrons, otherwise known as a cathode ray, paints a continuous picture of the sound waves on a glowing, or "fluorescent" screen. The oscillograph, according to Dr. Goldsmith, is expected to become to electrical, physical and mechanical research and development what the X-ray is to diagnosis in medicine. Originally designed for radio service men and engineers it is finding seemingly limitless applications in many other fields, including certain phases of the aviation, automotive, and public utility industries.

Well-Arranged Amateur Station



Dr. H. A. D. Baer, Director of the Baer Hospital, Allentown, Pa., reports excellent results from the new R. C. A. Communications Receiver, ACR-136, recently installed in his amateur station W3EEY. A remarkable value at \$69.50, this new RCA receiver has already become favorably known with a large number of progressive amateurs.

Using a separate R. F., oscillator and detector coil system similar to that of the famous RCA Victor "Magic Brain" receivers, this instrument has excellent performance in every operating requirement.

Dr. Baer is to be congratulated on the fine appearance and excellent equipment used in his station, which also includes an RCA Test Oscillator, Type TMV-97-B.

Chassis View Shows Details of Quality Construction

RCA leadership in engineering and manufacturing is evident in every constructional detail of the RCA Cathode Ray Oscillograph. Symmetrical layout of parts, elimination of shielding, advanced circuit design and fool-proof construction are visible evidence of the built-in quality of the RCA Cathode Ray Oscillograph.

POWER TRANSFORMER — SUPPLIES POWER FOR ALL TUBES AND RECTIFIER CIRCUITS — OVER-SIZE TO PREVENT STRAYMAGNETIC FIELDS.

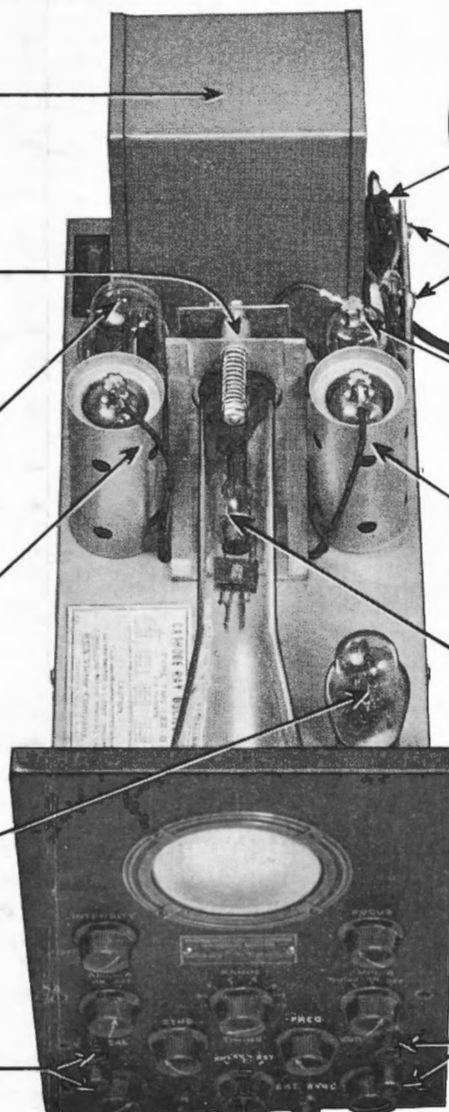
SPRING MOUNTED CATHODE RAY TUBE SOCKET — PERMITS QUICK CHANGING OF TUBES — ALSO ALLOWS FOR VARIATION IN CATHODE RAY TUBE LENGTH.

RCA-80 — LOW VOLTAGE FULL-WAVE RECTIFIER — SUPPLIES AMPLIFIER TUBES.

RCA-57 VERTICAL AMPLIFIER — HIGH GAIN, WIDE FREQUENCY RANGE.

RCA-885 — GAS TRIODE — "SAW-TOOTH" TIMING AXIS OSCILLATOR.

INPUT BINDING POSTS — FOR CONNECTING TO VOLTAGE TO BE OBSERVED.



SAFETY SWITCH — TURNS POWER "OFF" AUTOMATICALLY WHEN CHASSIS IS REMOVED FROM HOUSING.

VERTICAL AND HORIZONTAL BEAM CENTERING ADJUSTMENTS — PROVIDE A SIMPLE MEANS OF CENTERING BEAM ON SCREEN.

RCA-879 — HIGH VOLTAGE HALF-WAVE RECTIFIER — SUPPLIES 1,200 VOLTS TO CATHODE RAY TUBE.

RCA-57 — HORIZONTAL AMPLIFIER — HIGH GAIN, WIDE FREQUENCY RANGE.

RCA-906 CATHODE RAY TUBE — 3-INCH SCREEN.

BINDING POSTS FOR EXTERNAL HORIZONTAL DEFLECTING VOLTAGE.

BINDING POSTS FOR EXTERNAL SYNCHRONIZING VOLTAGE.

CHURCH USES SOUND SYSTEM TO CORRECT POOR ACOUSTICS

Velocity Microphones, Directional Speakers, and Twenty-Watt Amplifier Solve Problem

Tremendous sales possibilities for service engineers and dealers in every city, town and village are revealed by the story of how RCA engineers corrected a poor-acoustics condition in St. Gregory's Church, Brooklyn, New York.

Similar problems confront thousands of churches—and few now realize that radio dealers have the solution. RCA Victor distributors will gladly co-

operate to help any retailer cash in on this market.



Interior of St. Gregory's Church, Brooklyn, showing the RCA sound system units that solved a difficult problem of poor acoustics.

operate to help any retailer cash in on this market.

A beautiful, spacious church, St. Gregory's of Brooklyn, with acoustic conditions that made it difficult for all the congregation to hear the sermons distinctly. Only those in the front pews heard the addresses clearly, the majority of the congregation being unable to understand what was being said.

To correct this condition, St. Gregory's turned to an RCA Victor Sound Reinforcing System for a solution that was rapidly forthcoming. Moreover, the facilities of the Sunday School were extended through the installation of a radio-phonograph and two loudspeakers. The latter were used not only in connection with the radio and record programs, but also for reproduction of the sermons in the church itself.

Since any service engineer may run up against conditions similar to those prevailing in the church proper, it will be interesting to follow the steps that were taken to eliminate the undesirable acoustic conditions. The entire installation was made with RCA Victor Sound Reinforcing units.

The Amplifier

The size of the church indicated that a 20-watt amplifier was required. Known as Model MI-4275, this amplifier is a five-stage, high-quality, high-gain unit, employing seven RCA Radiotrons. It consists of a power-supply unit and a voltage-amplifier unit mounted on separate bases in order to keep hum at a minimum when mounted on a shelf or bracket. Designed to take the input from a standard MI-4000 (velocity) microphone and phonograph units, compensation has been provided to accentuate the reproduction of voice alone and, if desired, to use voice pick-up against a background of phonograph music. Controls and switches mounted on the units include AC power switch, tone control, voice to music transfer switch and velocity microphone to carbon microphone switch.

Dimensions and ratings: PB-89 power-supply unit, 16½ inches wide, 6 inches deep, 8¾ inches high. PB-88 voltage amplifier unit, 14 inches wide, 4¾ inches deep, 6¾ inches high.

One hundred and ten watts, 105-125 volts, 50-60 cycles, AC; 115 db. gain, output impedance 7½ ohms, 20 watts output. Radiotrons: 1 RCA-57, 2 RCA-56, 3 RCA-59, 1 RCA-83.

As you will notice in the illustration, these two units have been installed in a steel cabinet, conveniently located for easy accessibility.

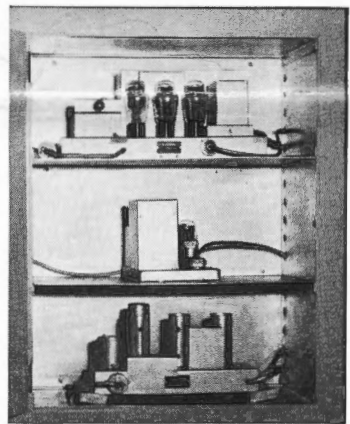
The Velocity Microphone

The RCA Victor velocity microphone has met with such popular favor that it is in service in the studios of both major networks and many of the prominent independent stations. It is also an important unit in the sound reinforcement systems of the leading theatres in the country, including Radio City's famous Music Hall.

The usual stiff diaphragm used in all previous types of microphones is displaced in the new Velocity Microphone by a thin, light-weight, aluminum ribbon. This ribbon is suspended between

the poles of a permanent magnet, thus eliminating the necessity of any field supply. The unique, simplified, rugged construction, together with high-quality performance, makes the Velocity Microphones ideally suited for public-address and sound-reinforcing applications in churches or other public halls.

Directional Feature an Asset
The most important characteristic of the velocity microphone in comparison



Amplifier and field supply

with the pressure-operated microphone, such as the condenser, electro-dynamic and carbon types, is its directional property, which is practically independent of frequency within the working range of the microphone. This directional characteristic is particularly valuable in the solution of some of the difficulties usually encountered in reverberant lo-

selectivity in sound pickup, and in the reduction of resonance and other disturbing acoustic phenomena.

REFINISHING OF RCA CABINETS EASILY DONE

Gloss Finish Requires Different Treatment For Removing Blemishes

Retouching of any type of cabinet finish is a simple matter with the recently introduced RCA Cabinet Refinishing Kit. The new RCA Victor Cabinets have a special high gloss finish that requires special touch-up methods for scratches or other types of damage. The following instructions cover the usual refinishing that is required. It is important that these instructions be followed carefully both as to procedure and materials used.

Equipment

The RCA Cabinet Refinishing Kit contains the necessary equipment for remedying minor scratches and blemishes that occur. In addition, an intermediate lacquer, Stock No. 4822 and a spraying lacquer (Du Pont 1740 or Pittsburgh CD-10701) may be required for more extensive refinishing. The RCA Cabinet Refinishing Kit is a collection of all the essential and hard-to-get materials needed for cabinet touch-up work. The materials are contained in convenient cans which are rolled neatly in a handy leatherette case that can be easily carried.

Scratches

Fine scratches may be removed from any cabinet finish by rubbing with the felt pad, using Valvoline Rubbing Oil and Tripoli. Care should be taken to rub with the grain until the scratches have been removed. Then rub over the spot with a soft rag and "Refco" Polishing Oil to bring back the lustre.

When a scratch or bruise is too deep to rub out by the above method the burning-in process should be used. This process makes use of stick shellac for filling in the scratch or bruise, and then refinish as described by the above method. The stick shellac should be blended to obtain the proper color, using a heated knife or spatula (alcohol lamp or electric heater preferred) to slightly melt the cement.

Sound Trucks Advertise RCA Victor



In the shadow of the nation's Capitol, two of RCA Victor's fleet of sound trucks pause in their travels to have their "picture took." Built—except for the chassis and body—by and for RCA Victor, these trucks are continually in the field helping dealers sell RCA products. RCA Victor has built sound trucks for Bayer Aspirin, Williamson Tobacco Company, General Baking Company, and many other well-known advertisers in this and other countries.

burning-in process should be used. This process makes use of stick shellac for filling in the scratch or bruise, and then refinish as described by the above method. The stick shellac should be blended to obtain the proper color, using a heated knife or spatula (alcohol lamp or electric heater preferred) to slightly melt the cement.

Deep Scratches and Bruises

Place enough shellac on the edge of the knife or spatula to fill the scratch or bruise, work the cement in the defect with edge of knife while hot, and level off with flat side of knife while still warm, leaving the cement slightly higher than the surrounding surface.

After the cement has set, level to the surrounding surface with fine sandpaper held over a felt pad and use Valvoline Rubbing Oil. Follow the rubbing with Refco Polish and Tripoli, using the felt

In the St. Gregory's installation, the fields of the two speakers were connected in series, using one field supply unit, MI-6143. This unit was mounted in the same cabinet with the amplifier.

Profitable Field for all Service Men

The inquiries received on Portable Public-Address Systems as a result of the recent article in SERVICE NEWS indicate that hundreds of service men are interested in obtaining their share of the profits in that lucrative field.

Any service engineer or dealer can get help in designing either permanent or temporary sound reinforcing systems by writing or calling on his RCA Victor instrument distributor, or in certain cities, the special RCA Victor Sound Distributors.

pad without sandpaper to bring back the lustre. Then wipe off the entire surface with a soft rag.

Light Spots

Where the finish has been rubbed white, a stain should be applied, the stain to be made as follows:

The two envelopes of the kit contain stain powders (red and black). These should be mixed to obtain the desired shade, using shellac and alcohol as a vehicle (1 part shellac and 3 parts alcohol) blending the two colors until the desired shade is obtained. Then apply the stain to the defects with the camel's hair brush.

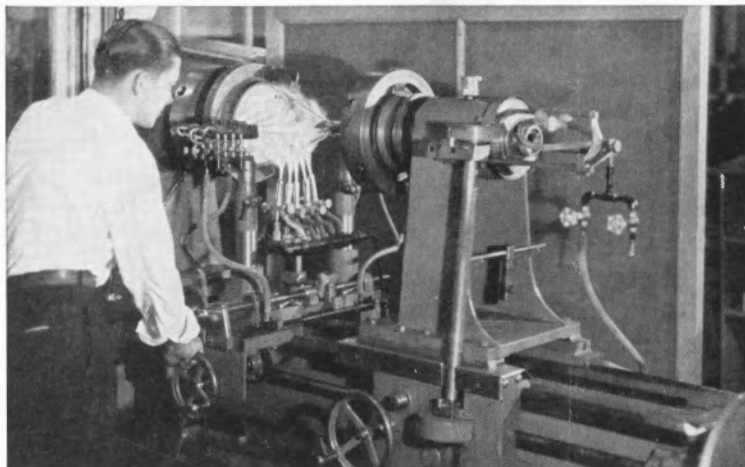
Blisters or Peel

Blisters or peeling of cabinets may be refinished in the following manner:

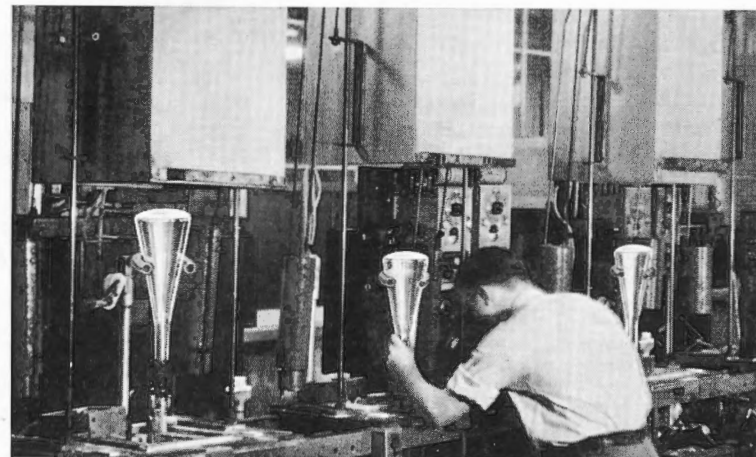
1. Sand off the checked or blistered surfaces with 9/0 fine sandpaper until the surface cracks or checks disappear and the coat is again level. This requires sanding down to the sealer coat.
2. Make a cotton pad and dampen with Ansol. (Ansol is the trade-name for Anhydrous Alcohol, a product of U. S. Industrial Alcohol Co.) Then rub the surface with this pad until the whole coated surface is fused into one continuous film.
3. Continue with the pad as an applicator and put a small amount of intermediate lacquer (mentioned above) into the surface until you again add a new surface with the intermediate lacquer, similar to that called "French Polish."
4. Again dampen the pad with Anso and a few drops of paraffin base oil, rubbing well into the surface until the original finish is reproduced.

Oscillograph Made by RCA from Start to Finish

The views shown here were taken in the cathode-ray tube factory of the RCA Radiotron Division, the largest makers of cathode-ray tubes in the world. The manufacture of these tubes is based on a vast amount of research development and manufacturing experience. Each tube is given a series of comprehensive tests to insure that quality and uniformity are maintained at the highest possible level.



A precision lathe for fusing the deflecting electrodes into the side wall of the glass bulb. In addition to this operation in the larger types of tubes, the bulbs are welded together in sections to facilitate manufacturing operations. Unlike the ordinary lathe, the head and tail chucks are gear-driven so that both units rotate at exactly the same speed. Three sets of intense fires melt and fashion the glass of the large bulb.



Sealing and exhausting Cathode-Ray Tubes. Each tube is glass-sealed to the high-vacuum pumps. The glass bulb is exhausted to a pressure of more than 1/100,000,000 of atmospheric pressure at sea-level. High-frequency bombardors are employed in the evacuating process to drive out gas from the metal parts. After exhausting and sealing, bases are cemented to the glass bulbs and the tubes are tested.

SERVICE TIPS

Win a handsome pigskin wallet. Until further notice, these popular wallets will be given to all whose tips on any phase of radio service are published in this column. Send your favorite idea to RCA RADIO SERVICE NEWS, Camden, N. J.

Service Tips are our readers' ideas, not ours. While RCA RADIO SERVICE NEWS believes they are worth while, we can not be responsible in any way for results obtained. Drawings or photographs submitted will be returned only on request.

Use of Wattmeter

The wattmeter I use is an integrating wattmeter which was manufactured by the Fort Wayne Electric Co., and has a rotating drum. I removed the gearing and indicating hands, lowered the damping magnet and attached a pointer to this. I attached a hair spring to the shaft carrying the drum, which limits the rotation of the drum, applying sufficient pressure to the drum to allow one rotation to 500 watts. No other changes are necessary and the calibration may be marked on the drum.

Then use the meter as it was primarily intended. That is, using the input terminals to the line, the output terminals to a convenient outlet.

The uses of such a meter are self-evident. Some I have found are as follows: I have a catalogue file I have contributed to for a number of years, giving me the readings on most machines. Those not known can easily be approximated. Power transformers, when no tubes or pilot light are in machine, should give no reading; with rectifier in socket the reading will increase to approximately 15 watts. Any greater increase should be investigated, of course. Any reading obtained without rectifier will indicate a transformer with one or more shorted turns. A reading above normal with rectifier will indicate an electrolytic condenser with too high leakage or a short either in condensers or circuits. In my opinion the greatest advantage lies in being instantly able to classify the trouble as short or open. Also, I have located a number of transformers with one side of the high-voltage secondary open and, too, it puts down lots of disputes as to cost of radio operation.

The meter used for this construction can be secured from most public service companies for ten cents. Purchase obsolete type. The hair spring can be obtained from a jeweler.

Harley H. McConnell,
Hub Music and Supply Co.,
106 North Main Street,
Crown Point, Indiana.

General Electric K-62

The persistence of an annoying audio noise or whistle may be traced to an open or shorting fixed condenser or condensers mounted on the end of the resistor strip at the front underside of the chassis. Check and replace if defective. Sometimes this trouble may be determined promptly if the resistor strip is bent or pushed in a little, in which instance the noise will cease; denoting that the condensers are shorting normally. Removing the strip will show that two sections are side by side and held firm with a metal ribbon strap. Often this may be corrected by inserting a small piece of waxed paper or mica so as to separate the two sections and prevent contact thereat.

L. F. B. Carini,
Carini Radio Laboratory,
246 Wolcott Hill Road,
Wethersfield, Conn.

Stewart Warner R102A, B & E

I had a condenser to cut in and out in a Stewart Warner R102A, B & E. I found a 100,000-ohm resistor color code, brown, black and yellow, which would cut in and out. This won't show up by voltmeter, as anything you touch in radio would cut back in and the radio would play normal for two or three days. The best way to find this trouble is to keep the radio playing and when the resistor starts breaking it will make a buzzing sound and the reproduction will get mushy.

Geo. Payad,
Payad Radio Service,
604 N. Adams,
Gillespie, Illinois.

Majestic Dial Cables

Wind one end of the cable on the shaft. Put a knob on the dial shaft and run a heavy rubber band from the dial shaft to the volume control or tone control.

If the dial shaft is a little loose after putting the rubber around the two shafts, turn the dial shaft tighter and also pull rubber band in whatever direction you tighten knob. In this way the knob will not spring back after it is tightened.

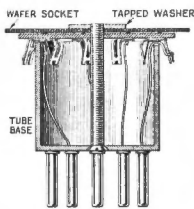
After adjusting cables as tightly as is necessary, wind the other end of cable on shaft and the job is done.

Alfonso Falletta,
21 18th Street,
Buffalo, N. Y.

Adapter

I have made and am using the simple adapter as shown in the sketch with good results. It does the following:

1. Brings the tube contacts above the receiver chassis for individual testing, doing away with having to turn it over.



2. Many analyzer plugs or their adapters are too large to fit in tube sockets using closely shielded tubes of the 6 and 7 prong type. This adapter does away with that difficulty.

These are the two main uses for this adapter, possibly there may be other uses also.

The tube bases of 6 and 7 prong tubes are used with corresponding wafer-type sockets and fastened together with a 6/32 flathead machine screw. The eyelet in the center of the wafer socket may be easily tapped to accommodate this screw.

Charles L. Levin,
Haddon Hall Electric Co.
3182 West Eighth Street,
Los Angeles, Calif.

Wells-Gardner 7A or Airline 103

Here is a service tip on Models 7A Wells-Gardner or Airline 103.

The tone control condenser has broken down. When this occurs the output plate voltage is applied across the tone-control resistor and in many cases the resulting current burns up the tone-control resistor. For this reason, if it is necessary to replace either the condenser or resistor in this model, connect the side of the condenser which formerly went to the ground to the "B" plus end of the output transformer primary. This connects the tone-control condenser and resistor across the primary of the output transformer. In this method of connection, should the tone control condenser break down, no damage will be done to the tone control.

Alex W. Inglis
533 South York Street,
Elmhurst, Ill.

Stromberg-Carlson 846-A

In the Stromberg-Carlson 846-A, I experienced a lack of volume. This was finally traced to an open antenna coil. Replacing this coil and the sensitivity control, which changed from 20,000 ohms to 35,000 or 40,000 ohms, the set worked normally again. This trouble was located after considerable trouble. Rebalance condenser at 1400 K.C.

Robert S. Sherman,
Dunn & Dunn,
25 Livingston Ave.,
New Brunswick, N. J.

Sterling Model F

After replacing a tube in a Sterling Model F, I went and turned the set on. Turning the dial, I found the set tuning very broad between 900 and 950 kilocycles. I then aligned the condensers, but with no success. I noticed a set screw in the rear of the gang condenser. After adjusting the set screw, the set tuned perfectly over the entire band.

Martin J. Oleszkiewicz,
Triangle Radio Service,
2904 Archer Avenue,
Chicago, Illinois.

G. E. J-83

Cutting on and off suddenly. Look for broken connection under paper insulation of choke coil (L-12 in A. V. C. circuit).

Any radio:
Suddenly cutting off to a faint signal on all except very powerful or nearby locals. Look for broken window strips. These nuisances make contact when window is closed, but when it is opened then the fun starts.

Max M. Goldberg,
New York Section,
I. R. S. M.,
21 Sherman Ave.,
New York City.

Loudspeaker Fields

The next time that you get a call and find an open speaker field, don't be in too much of a hurry to replace the field. Take the field out and remove the paper coating, and ten to one you will find the field open where the fine wire is joined to the heavy wire that is brought out from the field.

All that is necessary is to re-make the connection and the field is as good as new.

Henry E. Schurman,
W8DJE — WNBO,
105 Virginia Ave.,
Pittsburgh, Penna.

A Peak Voltmeter

This peak voltmeter is very essential on the repair bench and in the laboratory. It is especially valuable to measure the peak voltages on the filter condenser immediately after the rectifier. Thus you know how high the first condenser needs to be rated. The readings are very accurate, especially if a heavy-duty tube is used, to keep the tube drop low. The measuring terminals are connected across A. C. or D. C., observing polarity if D. C. The voltmeter terminals are connected to the proper range of the high-resistance voltmeter in the service kit. By switching to "DC" the D. C. voltage is read. The condenser should be about four microfarads and of voltage rating as high as will be needed. This also makes an excellent output meter of the high-resistance type.

Raymond C. Wyman,
51 Central Avenue,
Medford, Mass.

Zenith 52

Recently I was called to service a Zenith 52 for fading. The customer had two radio men service that set before; each changed condensers, but the set still faded. After checking the radio for an hour I found that the vernier control was loose, and a strong vibration would detune the station enough for fading to be noticed. Remedy—tighten the outside nut a little and set is as good as ever.

Irving Dosick,
Apex Radio Shop,
424 Kingston Ave.,
Brooklyn, N. Y.

RCA Model 80

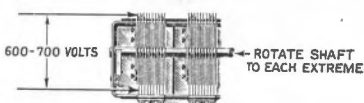
I have had a number of RCA Model 80 receivers that have had a great deal of distortion on low volume; however, when the volume is increased, the tone clears up. This is caused by a drop in resistance of the 110,000-ohm carbon resistor which is between the second detector cathode and the high-voltage plate supply circuit. This drop in resistance greatly increases the grid bias on the second, detector.

In this same receiver a steady crackling sound and an occasional cutting-out, regardless of the position of the volume control, is generally due to a defective push-pull input audio transformer.

Benner Essington,
Feliz Radio Service,
32 E. Carrillo Street,
Santa Barbara, Calif.

Radiola Model 48

Some of these sets have been causing trouble due to plating on condensers coming off. Scraping does not remove all of this. Disconnect coil from stator, connect high voltage (600-700 volts) secondary of a power transformer to rotor and stator, turn on 110 A. C. and



rotate condenser slowly. Do this to each section. Have had jobs out for over 18 months and still O. K.

Pat Daly Radio Service,
118 E. 2nd Street,
Beardstown, Illinois.

Editor's Note: Also recommended for all other receivers employing tuning capacitors having plated rotor plates. Duplicate award also made to Mr. A. J. Bernard, W. A. Kennedy Radio Service, Rayne, La., for similar tip.

SUBJECTS FOR SERVICE TIPS POINTED OUT

Intermittent Operation is Likely Subject for Wallet Winner

The "Service Tips" section of RCA RADIO SERVICE NEWS is rapidly becoming a recognized medium for exchanging worthwhile service ideas. While it is impossible to use all of the many tips sent in, the Technical Editor wishes to thank those who have sent in tips and ideas which have not been used.

Reviewing many of the tips sent in reveals that some of them are not really "tips," but may be classified as routine service procedure. For example, a number of letters merely mentioned that after thoroughly checking a receiver it was found that a tube caused the difficulty. Others have reported the failure of a particular part, such as a resistor or a capacitor, and still others have reported lack of alignment as being the cause of some difficulty.

Good Tips Usually Simple

While many service tips are extremely simple (usually the best tip is of an extremely simple nature), letters concerning the changing of tubes or the locating of defective parts are not usually considered suitable for the "Tips" column, since these ideas are fundamentals of servicing.

An example of the kind of tips that are of interest to all is a tip having to do with intermittent operation. The simple tip of placing a pig-tail on a main tuning capacitor to remedy intermittent operation caused by the RF circuit oscillating is an extremely worthwhile tip.

Suggested Subjects

Other tips of this sort concern poor welds in audio transformers, high voltage of heaters of AVC tubes, etc. All of these may cause intermittent operation which is due to a general condition rather than a specific failure of any part. The usual service methods will not disclose such difficulties.

A few suggestions for tips: How do you locate an open by-pass capacitor, especially if it is a small by-pass capacitor and the only indication is an

First Stage of Set Should be Retuned With New Antenna

A valuable tip on installing the RCA World-Wide Antenna is given by G. W. Kimball of the RCA Victor Service Department.

"In most factories a standard dummy antenna is used for alignment work. Almost invariably this dummy antenna has different characteristics from any short-wave antenna which may later be installed with the set. For highest efficiency, therefore, the first stage of the receiver should be retuned, using a weak signal in the 16 or 19 meter bands. A code signal outside the short-wave bands can be used if desired.

"With the RCA World-Wide Antenna, the first stage of the receiver should be retuned. It is only necessary to adjust one trimmer—the one used to trim the first stage and generally its capacity must be reduced. Making this adjustment usually increases the signal strength up to 100%.

"This trimming adjustment is very simple. A weak incoming signal is used and the set is trimmed for greatest signal strength. No oscillator or output meter are necessary for this adjustment."

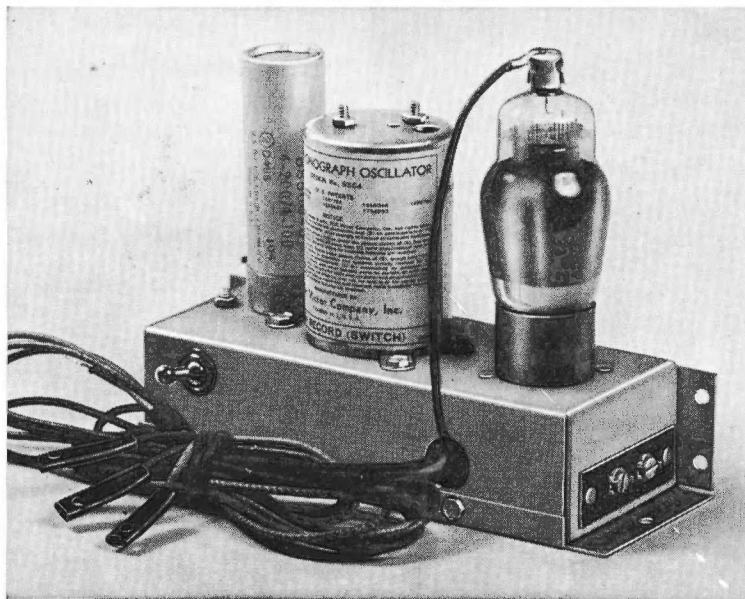
Better Service Demand Grows

Seattle Victims of Poor Work Complain to Local Papers, Dealer Reports

SEATTLE, WASH.—"Radio owners of this city are waking up to the fact that it pays to patronize radio service organizations who have the courage to charge fair and reasonably profitable prices instead of those who offer 'something for nothing.' Several letters on this subject have appeared recently in the 'Letters from Readers' column of the Seattle Times," reports Biz Nazarenus, well-known local radio service engineer.

oscillating circuit? How do you detect and remedy rosin joints? What are some of the causes of intermittent operation in specific receivers and what is your pet method of initially checking a receiver? Write your idea to "Service Tips" column and win a pigskin wallet.

Connects Pickup To Any Radio



Here's the new RCA Phonograph Oscillator which takes the "guesswork" out of phonograph modernization. Connecting any pickup to any radio receiver is but a few minutes work and proper operation is secured every time. Using the RCA-2A7 or 6A7 tube, the RCA Phonograph may be used with receivers using either 2.5 or 6.3-volt tubes. The circuit consists of a modulator-oscillator stage for broadcasting the phonograph output into the receiver at any frequency from 1400 KC to 1700 KC.

Note the special connectors for obtaining power supply by placing them under the heater prongs of the receiver. A radio-record switch gives a quick change from radio to phonograph operation and turns off the power supply when the phonograph is not in use. A complete description of the RCA Phonograph Oscillator and other essentials for phonograph modernization is included in the booklet "Phonograph Modernization," obtainable from any RCA Parts Distributor or from the RCA Parts Division, Camden, N. J. The list price of the RCA Phonograph Oscillator is \$7.75, subject to the usual trade discounts to radio service engineers or radio dealers.

1935 SERVICE MEETINGS ARE STARTING NOW

(Continued from page 1, col. 3)

is "Antenna Systems." History, theory and practical application of all antenna systems from the initial experiments of Professor Hertz up to the present famous RCA World-Wide Antenna Systems will be thoroughly discussed. Special demonstrations will be made and all lectures will be illustrated by a large number of slides.

Below are tentative dates for some of the meetings. The meetings to be held in smaller towns have not yet been definitely scheduled. RCA Parts Distributors can supply the dates for them upon request.

- Albany, N. Y. Feb. 11, 1935
- Atlanta, Ga. Feb. 11, 1935
- Baltimore, Md. Feb. 15, 1935
- Binghamton, N. Y. Feb. 20, 1935
- Birmingham, Ala. Feb. 15, 1935
- Charlotte, N. C. Jan. 29, 1935
- Chicago, Ill. Feb. 5, 1935
- Cincinnati, Ohio Feb. 8, 1935
- Columbus, Ohio Feb. 4, 1935
- Denver, Colo. Feb. 15, 1935
- Detroit, Mich. Feb. 19, 1935
- Des Moines, Ia. Feb. 6, 1935
- Elmira, N. Y. Feb. 19, 1935
- Grand Rapids, Mich. Feb. 12, 1935
- Harrisburg, Pa. Feb. 27, 1935
- Indianapolis, Ind. Feb. 14, 1935
- Jacksonville, Fla. Feb. 4, 1935
- Kansas City, Mo. Feb. 13, 1935
- Long Beach, Calif. Feb. 4, 1935
- Los Angeles, Calif. Feb. 1, 1935
- Miami, Fla. Feb. 8, 1935
- Milwaukee, Wis. March 1, 1935
- Minneapolis, Minn. Feb. 25, 1935
- Nashville, Tenn. Feb. 13, 1935
- Newark, N. J. Feb. 5, 1935
- New York, N. Y. Feb. 25, 1935
- Norfolk, Va. Feb. 8, 1935

CHECK AND DOUBLE CHECK



Testing at every stage of manufacture assures perfect products. The illustration shows continuity testing of the plate windings of RCA Universal Transformers.

- Omaha, Neb. Feb. 11, 1935
- Peoria, Ill. Feb. 19, 1935
- Philadelphia, Pa. Feb. 19, 1935
- Richmond, Va. Feb. 11, 1935
- Riverside, Calif. Feb. 7, 1935
- Rochester, N. Y. Feb. 18, 1935
- San Diego, Calif. Feb. 5, 1935
- San Francisco, Calif. Feb. 5, 1935
- Santa Barbara, Calif. Feb. 8, 1935
- St. Louis, Mo. Feb. 4, 1935
- Sioux City, Ia. Feb. 8, 1935
- Springfield, Mo. Feb. 1, 1935
- Syracuse, N. Y. Feb. 14, 1935
- Tampa, Fla. Feb. 6, 1935
- Toledo, Ohio. Feb. 5, 1935
- Utica, N. Y. Feb. 13, 1935
- Washington, D. C. Feb. 13, 1935
- Watertown, N. Y. Feb. 15, 1935
- Wilmington, Del. Feb. 5, 1935
- Wilkes-Barre, Pa. Feb. 26, 1935

ACKNOWLEDGMENT

The anonymous "Service Tip" entitled "Lightning Arrestors for RCA World-Wide Antenna" which appeared in the October 30th issue was the contribution of Ingvar Paulsen, 144 Cedar St., Roxbury, Mass. Because the "Tip" was received indirectly proper credit was not given to the author. RCA RADIO SERVICE NEWS thanks Mr. Paulsen and has sent him the pigskin wallet his "Tip" won.

RECEPTION IS PREDICTED BY SPOTS ON SUN

System Devised by RCA Expert Follows Cycle of Twenty-Seven Days

By H. H. Beveridge
R. C. A. Communications, Inc.

Through the combined efforts of R. C. A. Communications, Inc., and the United States Government, it is now possible to forecast probable radio reception conditions for a considerable period in advance. Although these predictions are not entirely accurate, they compare in accuracy with the ordinary weather forecasts, which are generally considered reliable.

Based on Earth's Magnetism
These predictions are based on the

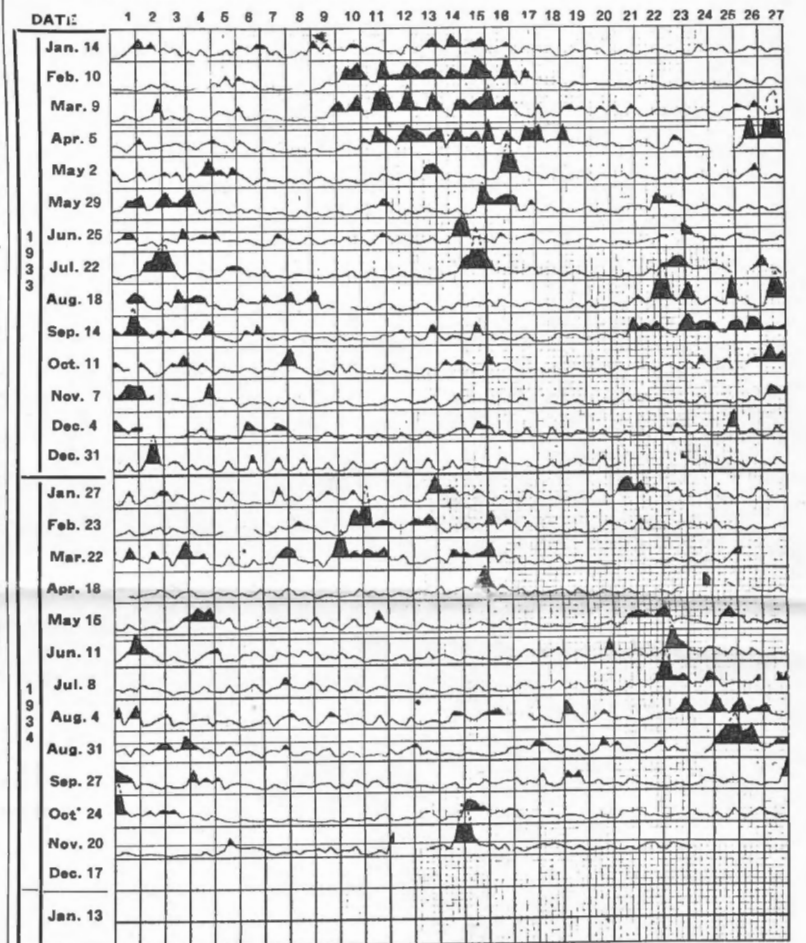
magnetic activity reports furnished by the United States Observatory at Tucson, Arizona. It has been found that the spots on the sun have a more or less direct relation to the magnetic conditions on earth, which in turn have a definite relation to the reception conditions for short waves.

The illustration shows a typical magnetic activity chart prepared for such predictions. On this chart, ordinates (vertical divisions) are magnetic range, one scale division being 30 gammas (a gamma is a measure of magnetic field intensity). If the magnetic range extends beyond 60 gammas it has been found that this range is sufficient to disturb the reception of short-wave signals. Accordingly, all range above 60 gammas have been filled in with black to make it apparent, in looking at the chart, where the disturbing magnetic conditions lie.

It has been found that the co-ordination between disturbed signals and magnetic range is very close, so that wherever a black peak appears on the chart, it has almost invariably been confronted with bad signal transmission.

It will be noted that the abscissa (horizontal divisions) extend from 1 to

MAGNETIC ACTIVITY SIX HOUR TOTALS OF HOURLY RANGES OF HORIZONTAL INTENSITY. ONE SCALE DIVISION = 30 GAMMAS



Sources of Signal and Profits



Because of its remarkable performance, small size and quality construction, the RCA Test Oscillator, TMV-97-B continues to lead in popularity with service engineers, although it was introduced more than a year ago. Its companion instrument, the RCA Output Indicator, Type TMV-121-A, which cannot be burnt out, also continues to be one of the most popular items of the RCA Service Equipment Line.

These two instruments enable service engineers to cash in on the tremendous popularity of all-wave receivers by placing in their hands equipment for rendering factory type service. When it is realized that the line-up problem of a five-band all-wave receiver is equal to that of five broadcast band receivers (there are also five times as many possibilities for mis-alignment) it is readily understood that this all important service function cannot be performed without proper equipment. Also because of the extremely high

frequencies of alignment points and because mis-alignment is much more evident due to the general low level of signals, a satisfactory job cannot be performed without proper equipment.

As more all-wave receivers are sold and those now sold become older, re-alignment will become a more important item of revenue for service engineers than it has been in the past. All radio receivers perform better if re-aligned periodically, at least once a year. All-wave receivers, especially their short-wave bands, require periodic re-alignment.

All RCA Parts Distributors are featuring these instruments. The RCA Test Oscillator, Type TMV-97-B, is sold with standard calibration, plus or minus 3% at \$29.50 net. Individual calibration guaranteed accurate plus or minus 1/2 of 1% is \$5.00 additional. The RCA Output Indicator, including its neon bulb, is sold by RCA Parts Distributors for \$4 net to service engineers.

MAT SERVICE ON ANTENNA ADS IS FREE TO DEALERS

Factory-Prepared Ads Give Dealers Tie-Up with National Ads

More and more service organizations and dealers appear to be going into the antenna business as a major activity. So many requests for mats for retailers to use in newspaper advertising on RCA World-Wide Antenna Systems have been received by the RCA Parts Division that they are now preparing an assortment of mats that dealers or service engineers may obtain for the asking.

Tie-Up With Factory Advertising
The ads now in preparation for dealer use will closely follow the style the RCA World-Wide Antenna System ads that are now running in national magazines. Thus the dealer will obtain the benefit of a close tie-up and identification with the largest advertising campaign now appearing on any antenna system.

Requests for Mats Invited
The mats for dealers' use will be ready for distribution early in February. They will be shown in the next issue of RCA SERVICE NEWS. Dealers wishing to use them at once are urged to write to RCA Parts Division, Advertising Department, Camden, New Jersey,

27, indicating that the magnetic ranges are plotted on the basis of a 27-day period. The date of the first division of each 27-day period is shown on the left of each period. To find a particular date it is but necessary to count the dates from left to right, from those given.

Effect of Sun's Rotation

Astronomers tell us that the Polar regions of the sun rotate once in approximately 34 days, while the Equator rotates once in approximately 24 days. Since the magnetic disturbances appear to repeat themselves on the average every 27 days, it seems probable that the sun spots which have the greatest effect on the magnetic conditions on the earth are located at such a latitude on the sun that the period of rotation is 27 days. This is the basis of the prediction service. That is, a magnetic disturbance on a certain day, say November 7th, would indicate a similar disturbance to appear again 27 days later, or on December 4th. In general, it will be noted that this repetition does occur, although it is not an invariable rule. For example, it will be noted that a severe storm occurred on August 5, 1933, but this storm did not repeat itself 27 days later, although it did appear again 54 days later with much less amplitude than on August 5th.

Accurate Predictions

In this case, we would have predicted disturbed conditions on September 1st, but actually we would have found that there was no disturbance; therefore, it is not possible to guarantee the predictions, but, in general, it is possible to predict the times which are subject to disturbances and the times which are almost certain to be free from disturbances.

PRINCIPLES OF NOISE-REDUCING ANTENNAE

PART II

By W. H. BOHLKE and V. D. LANDON

RCA VICTOR ENGINEERING DEPT.

The new De Luxe RCA World-Wide Antenna System, Stock No. 9555, has been developed to meet the growing demand for an antenna system in which the noise-reducing feature has been retained over the entire frequency spectrum of the average All-Wave Receiver. The unique design of this new system has also eliminated the need for a Switch on the Receiver Coupling transformer.

The De Luxe System, Stock No. 9555, differs from the first and standard system, Stock No. 9500 System, in that a transformer has been designed for use at the antenna end of the transmission line, and in that a new transformer without the "SW-STD" switch has been designed for use at the receiver end of the transmission line. The same "Double-Doublet" antenna arrangement is

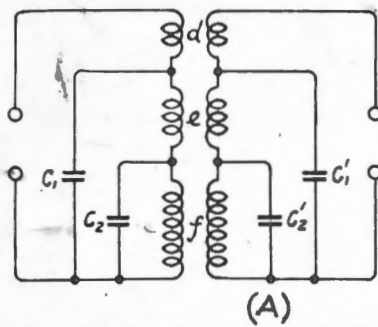
signals, since lead-in pick-up has been eliminated and only the "out-of-phase" signals from the two sides of the "Double-Doublet" are utilized.

To correct this a change must be made at the antenna end of the transmission line. One possibility is to add a third doublet of a suitable length to favor the broadcast band. This is ordinarily impractical because the required space is not available. (A doublet to tune to 1000 KC must have a span of 213.5 feet.)

The circuit of Figure 7 shows the result of the new De Luxe World-Wide Antenna System development to avoid erecting a third doublet, giving a good practical solution to the problem.

"Double-Doublet"

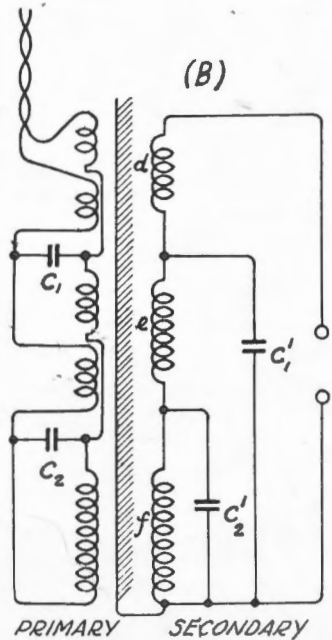
The "Double-Doublet" (same as in



TRANSFORMER SYSTEMS FOR EXTENDED FREQUENCY RANGES.

(NOT A SCHEMATIC OF THE DE LUXE RCA WORLD-WIDE ANTENNA)

FIG-6



PRIMARY SECONDARY

used and the same type of transmission line. The latter has been changed to a length of 80 feet and of a different type of wire.

De Luxe System Explained

The fundamental development which made the De Luxe System design possible is the idea of using different transformers for different frequency bands and placing the transformers in series to obtain transmission over the combined frequency ranges.

The circuit arrangement for doing this is shown in Figure 6-(A). The transformer (d), having the smaller inductance, transmits the highest frequency waves. These waves are by-passed around the other transformers (e) and (f) by condensers C and C2.

Lower frequency waves are transmitted, by the transformers (e) and (f). There is a certain intervening frequency at which the transformers (d) and (e) are equally effective in passing on the energy. At this frequency transformer (e) gives a double phase reversal due to the presence of the condensers C and C2 and the leakage reactance of the transformer. As a result the outputs of the two transformers (d) and (e) are additive, provided the sign of the mutual inductances of the transformers are the same.

In this manner any desired number of transformers may be connected in series and the frequency range extended almost without limit in either direction. The efficiency of transformation is high and practically constant over the extended frequency band.

In designing this transformer system the component transformers are designed separately for adjacent bands, providing a slight over-lap. These transformers are then connected together as shown.

Feeding an All-Wave Receiver

In feeding an All-Wave Receiver from a balanced transmission line with this system, it is best to maintain primary symmetry by using the circuit as shown in Figure 6-(B). The values of the inductances are the same as in Figure 6-(A), but the windings are split into two parts so that the stray capacities to ground are the same for each side of the line.

A transformer of the type of Figure 6-(B) may be used in place of the single-wire transformer as used with the original RCA World-Wide Antenna System, Stock No. 9500, and as illustrated schematically in Figure 2 and noise pick-up on the transmission line lead-in eliminated over the entire frequency band. Without further change, however, the pick-up is too weak for broadcast band (550 KC to 1500 KC)

passes the short-wave frequencies around the secondary of the broadcast transformer.

Similarly the "Double-Doublet" antenna impedance is matched to the transmission line impedance for short-wave frequencies by means of the short-wave transformer (a), the primary of the broadcast transformer acting as high impedance to ground for short-wave frequencies, and being connected to the center tap of the short-wave transformer primary has relatively little effect on short-wave reception.

The receiver coupling transformer (see Figure 7) is similar to the arrangements shown in Figure 6 and should need no further explanation.

Resistors (c) and (k) (see Figure 7) are used to prevent the system from collecting a high static potential and sparking to ground, which would cause disturbing and periodic clicks in the receiver.

Advantages of World-Wide Antenna

The advantages of the new De Luxe RCA World-Wide Antenna System, Stock No. 9555, should be readily apparent from the preceding technical discussion.

They may be summed up as follows:
1. Efficient All-Wave (550 KC-25000 KC) reception with only one antenna, the "Double-Doublet."

2. Effective elimination of noise pick-up on the lead-in over the all-wave frequency spectrum.

3. Elimination of all switches—circuits are electrically automatic.

4. Ease of installation—no transposition blocks, etc., necessary.

Results of operating tests held by the Radio News Technical Staff (reprinted from the September, 1934, issue of Radio News by permission of the publishers) prove again the outstanding performance of the RCA World-Wide Antenna System.

Operating Tests

(As conducted at the RADIO NEWS Listening Post at Fairfield Beach, Connecticut)

In the test installation at Fairfield the conditions were not ideal because the antenna, strung between the permanent masts at this location, points in a northeast-southwest direction and runs parallel to the road where motor traffic causes serious ignition-noise interference. As a doublet antenna provides maximum pick-up for signals (and noise) approaching it broadside, it will be seen that this test antenna was so directed as to provide the minimum pick-up of signals from Europe and Australia and the maximum pick-up of noise from the nearby road.

the Stock No. 9500 System) is connected to the transmission line lead-in through a special All-Wave Antenna Doublet transformer. By referring to Figure 7 it will be seen that both primary and secondary are divided into two parts. The center tap of the short-wave transformer (a) primary is connected to ground through the primary of the broadcast frequency (500-1500 KC) transformer (b). The secondary of the broadcast frequency transformer is in series with the split short-wave transformer secondary. If a suitable ground is not available it may be replaced by a counterpoise about 60 feet long.

"T" Type on Standard Broadcast

It can be seen from Figure 7 that the "Double-Doublet" becomes a "T" Type

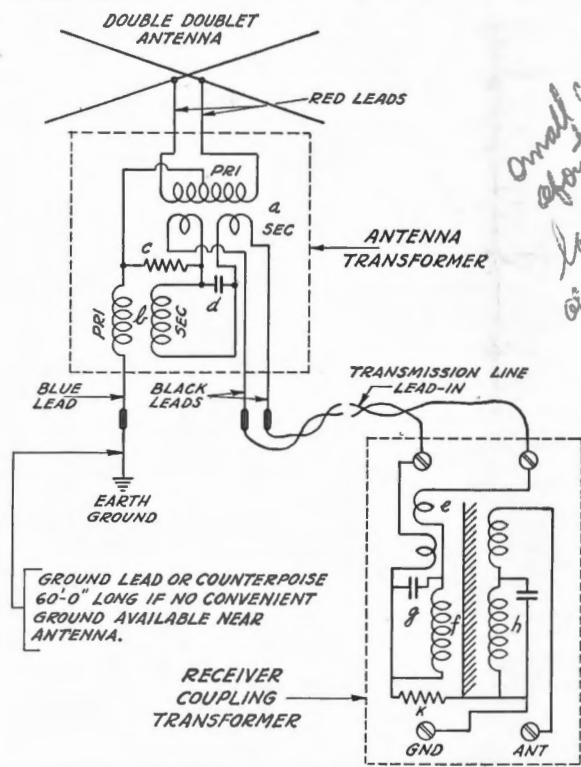


FIG-7

No Auto Noise in Test

One of the first tests was to borrow a four-cylinder Ford and "spot" it at different points along the road with its engine racing, to provide a source of ignition noise. An "L" type antenna with an ordinary single wire lead was also employed for purposes of comparison. The two antennas were controlled by a switch so that an instantaneous change-over could be made from one to the

Receiving Antenna for receiving standard broadcast frequencies (550 KC-1500 KC).

The antenna impedance is matched to the line impedance by means of the Primary of broadcast transformer (b) through the secondary of the broadcast transformer (b) in series with the split secondary of the short-wave transformer (a).

The condenser (d) (see Figure 7) by-

Will Sing On RCA Radio Program



Gabrielle DeLys, shown above, will be a featured singer on February 13, on the RCA-sponsored Radio City Matinee, NBC feature which is already a great favorite with all Wednesday afternoon (2 P. M. to 3 P. M.) radio listeners.

NEW YORK—Radio listeners—who have heard many novel broadcasts—listened in on the actual making of a phonograph record by a world famous symphony orchestra for the first time during the Radio City Matinee broadcast over an NBC-WJZ network on

Wednesday, January 23, at 2:00 p. m., E. S. T.

The Radio City Matinee is rapidly becoming one of the most popular of the afternoon programs. Dealers report that results in the form of increased sales of all RCA Victor products—from receivers to world-wide antenna systems—have already been noticeable.

The Boston Symphony Orchestra, under the direction of its famed conductor, Serge Koussevitzky, was the guest attraction at the broadcast on January 23, and made a new RCA Victor record while the program was on the air.

Program on Victor Records

The recording equipment in Symphony Hall, Boston, where the orchestra makes all of its phonograph discs and where the radio program originated, was set in action during the broadcast and a selection by the orchestra recorded for future release as a regular RCA Victor record.

The composition to be thus preserved in wax was the "piece de resistance" of the full hour broadcast by the famous orchestra.

The Radio City Matinees, featuring outstanding RCA Victor recording artists and one of radio's most impressive daytime programs, already has brought listeners such performers as Giovanni Martinelli, Efram Zimbalist, Rudy Vallée, Richard Himber and the Sisters of the Skillet, and future guests will include Richard Crooks, Nathaniel Shilkret and Paul Whiteman.

other. The Ford was stopped about 100 feet down the road from the house and its engine speeded up to provide maximum interference. With the "L" antenna the noise from the loudspeaker was sufficient to be heard outside the house, but with the doublet antenna not a sound could be heard. This procedure was repeated, moving the Ford along the road a few feet at a time, but the results were the same each time. Even when the Ford was directly opposite the antenna no interference could be heard when the doublet was connected, while with the "L" antenna connected the din from the loudspeaker was such as to preclude any possibility of hearing stations through it.

Silences Noise in House

A later test was made to determine the ability of the new antenna to eliminate electrical disturbances within the house. An a.c. operated oscillator (with a particularly raucous 60-cycle note) was hooked up and placed so that the transmission line from the "double-doublet" and the single-wire lead from the "L" antenna were equidistant from it. Under actual measurement, the noise (measured at the receiver output transformer) picked up by the "L" antenna was over twenty times as great as that picked up with the doublet connected.

Better Signal-to-Noise Ratio

So far as signal strength was concerned, the conclusion arrived at after several days, intermittent test was that at wavelengths of 50 meters and below the doublet provided appreciably greater signal strength—except at 25 meters, where the "L" antenna provided a little superior signal. On all of the short-wave bands the signal-to-noise ratio was better with the "double-doublet." Considering the fact that the antenna as installed did not take advantage of directional qualities, the above findings were considered excellent. Had it been properly installed it is probable that the signal strength and the signal-to-noise ratio would have been still further improved.

In conclusion it is pointed out that the receiver used in these tests was not an RCA set, but one of a well-known "laboratory-built" make. This is an important fact because it indicates that the practical application of this antenna system is by no means limited to RCA Receivers.

RCA Oscillograph Sells For Only \$84.50

(Continued from page 1, column 5)

ode Ray Oscillograph. One new feature for a moderately-priced oscillograph, for instance, is the vertical and horizontal amplifiers having a flat frequency range of from twenty to 90,000 cycles with an amplifier gain of 40. This is a feature without which the high sensitivity of two volts per inch could not be obtained.

"Another important feature is the linear variable timing-frequency oscillator which has a wide frequency range from 20 to 15,000 cycles. This permits the close observation of extremely high frequencies."

Although the many controls demanded by the completeness of the instrument make for a control panel that would bewilder a layman, the operation of the oscillograph is easily understood by any competent radio service man after a few minutes actual operation. RCA Parts Distributors gladly demonstrate this sensational new instrument.

Engineer Explains Oscillograph Uses For Service Men, Amateurs and Schools

Visual Alignment and Locating Overloads Among Valuable Uses for Service Men. Amateurs Can Monitor Modulation

By H. H. Schrader
RCA Development Engineer



H. H. Schrader

The Cathode Ray Oscillograph as presented in the RCA Stock No. 9545 is an instrument of many and varied uses in the entire electrical industry. The completeness of the instrument recommends it equally well to schools, universities, engineers and experimenters. To explain all of the uses of the instrument would be far beyond the scope of this article. We will content ourselves, therefore, by explaining a few of the more interesting uses of the instrument.

OSCILLOGRAPH USES IN RADIO SERVICE WORK

The uses of the Cathode Ray Oscillograph to the service engineer are many. For the first time he may actually see the wave form of current and voltage present in circuits. This means that the proper operating conditions for tubes and circuits may be readily determined and adjusted.

Visual Alignment

One of the first and perhaps most important uses which presents itself is that of visual alignment of receivers. For this application a test oscillator and a small motor-driven capacitor are required in addition to the oscillograph. If the motor-driven capacitor is connected in parallel with the tuning capacitor of the test oscillator, we have a source of radio frequency voltage which is varying at a uniform rate. The average frequency of this source may be adjusted to any intermediate or radio frequency within the range of the equipment. If this source of voltage is applied to any of the i. f. or r. f. stages of a radio receiver there will appear across the detector output circuit an a. c. voltage depending in amplitude upon the selectivity curve of the receiver. If this voltage is applied to the vertical deflecting circuit of the oscillograph and the timing axis adjusted to the same frequency as represented by the rate of rotation of the motor-driven capacitor, the response curve (Figure 1) of the receiver will appear on the screen. If the response characteristic of the receiver or amplifier stage under test is double humped the curve will be as in Figure 2. These curves represent proper alignment. If the transformers are improperly aligned a curve such as Figure 3 might appear on the screen.

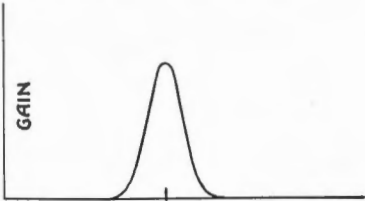


Figure 1

When aligning a receiver care must always be taken that proper input voltages are used so that no overloading of the tubes results. This means that only a small voltage is available at the detector output circuit and to obtain a usable size curve on the Cathode ray screen a suitable amplifier as contained in the No. 9545 must be provided.

Locating Overloads

One of the most annoying troubles which may arise in a radio receiver is overloading in the audio amplifiers. The point at which overloading occurs and the stage in which it first appears may be readily checked with the oscillograph. If the input of the receiver is connected to a test oscillator, modulated with 400 cycles and the voice coil of the speaker connected to the vertical deflecting circuits of the oscillograph, the wave form of the receiver output will appear on the screen. For this test the timing axis should be adjusted for 200 cycles and synchronized by means of the synchronization control. Two cycles of the 400 cycles receiver output will now appear on the screen. If the test oscillator output is slowly increased a point will be found where the output

wave form will vary from its original shape. Probably the peaks of the waves will become flat. This indicates an overload condition. By connecting the output of the various audio amplifier stages

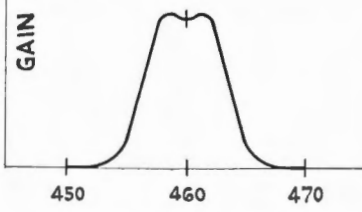


Figure 2

progressively to the vertical input of the oscillograph, the stage which overloads first may be found.

Many other uses will undoubtedly present themselves to the service engineer. The instrument in general may be considered as a tube voltmeter and by means of the timing axis supplied in the instrument, the wave form of this voltage may be observed.

OSCILLOGRAPH USES FOR AMATEUR OPERATORS

Items of major importance to the amateur are monitoring of the per-

centage modulation and purity of modulation of his transmitters. The No. 9545 oscillograph is very adaptable to these uses and eliminates any necessity of guessing. While the percentage modulation of a transmitter may be determined by observing the rise in antenna current during modulation, this can under the best of conditions only indicate the average modulation. Modulating peaks may be rising to over 100% and so bad operating conditions result. Also, due to improper operating adjustments, the percentage modulation might be even lower than that indicated by the antenna current meter.

Monitoring Modulation

The measuring and monitoring of the depth of modulation is a very simple matter with the No. 9545. Two methods present themselves, either of which is very satisfactory. If a coil is connected to the vertical input circuit of the oscillograph and coupled to the tank circuit of the transmitter, a wave form as Figure 4 will result. For this use the amplifier A switch should be turned to the "off" position. This connects the binding posts directly to the deflecting plates of the cathode ray tube. The timing axis should be adjusted to some sub-multiple of the modulating frequency. The frequency of modulation must be constant if the image on the screen is to remain fixed in position.

With these connections the wave form of the modulation may be readily observed and corrections to the transmitter made if improvement is desired.

If it is desired to monitor the percentage modulation and obtain an image on the screen which does not move as the modulating frequency is varied, a second method is perhaps preferable. Apply the r. f. voltage as before

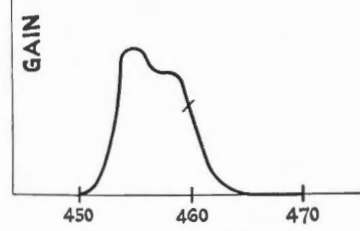


Figure 3

and in addition supply to the horizontal deflecting circuit a voltage of about two volts from the speech amplifier equipment. The amplifier B switch should be turned to the "on" position. An image as Figure 5 will now appear on the screen. For either of these two methods the percentage modulation may be readily calculated and equals (see Figures 4 and 5) $\frac{A-B}{A+B} \times 100$

Aligning and Measuring Distortion

Among other uses might be mentioned by measuring distortion in audio amplifiers and undoubtedly an amateur will be able to obtain better operation from his receiver if periodic tests of its alignment are made. Both of these uses are described in the paragraphs above concerning uses for service engineers.

THE OSCILLOGRAPH FOR SCHOOLS AND UNIVERSITIES

The teaching of tuned circuit theory is not a simple matter and visual ob-

servations of experiments with tuned circuits was virtually impossible until the introduction of the Cathode Ray Tube. Until the present time cathode ray equipment has been both costly and cumbersome and its upkeep a considerable item. The RCA No. 9545 Oscillograph offers a complete cathode ray instrument which is portable, and inexpensive both in original cost and upkeep. Sufficient brilliancy is provided so that the instrument may be readily used for actual demonstration of tuned circuit theory to classes or groups as well as for individual experimental work in the laboratory. A hood is not required to shade the tube.

Demonstrating Tuned Circuits

The method of obtaining resonance curves has been described in the section of uses for service engineers. By a similar method the resonance curve of a single tuned circuit or coupled circuits may be observed and the effect of resistance and degree of coupling studied. An amplifier tube should be provided to couple the test oscillator to the circuit

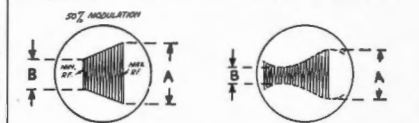


Figure 4

Figure 5

being studied and a detector or rectifier connected across the circuit to couple to the oscillograph.

For Study of Any Electric Phenomena

Studies of the wave form of generators, alternators and transformers under various conditions of load may be readily made by connecting the apparatus under test to the vertical deflecting circuit of the oscillograph and adjusting the tuning axis to the proper frequency. Frequency measurements can be made by comparing an unknown with a known frequency.

Complete .. Portable .. A-C Operated!



CATHODE RAY OSCILLOGRAPH

Stock No. 9545

\$84.50 With RCA Tubes, Including RCA-906 Cathode Ray Tube

Complete ...

The RCA Cathode Ray Oscillograph, Stock No. 9545 is complete in every essential requirement for immediate use. It includes two power supplies (one for the Cathode Ray Tube and one for the amplifier), vertical and horizontal amplifiers, saw-tooth frequency generator and six tubes, including the RCA-906 Cathode Ray Tube (3-inch).

2 Volts per Inch ...

Through the use of two wide-frequency-range high-gain amplifiers, the sensitivity is guaranteed at 2 volts A. C. per inch for both vertical and horizontal deflection. The amplifiers have flat frequency characteristics between 20 and 90,000 cycles ± 10 per cent. The amplifier gain is approximately 40.

20-15,000 Cycles ...

A linear saw-tooth timing frequency oscillator with a special synchronizing circuit is an integral part of the RCA Oscillograph. The frequency range extends from 20 to 15,000 cycles and permits the examination of a single cycle up to 15,000 cycles or the examination of six cycles up to the limit of the amplifier—90,000 cycles. Suitable switching is provided so that either the internal timing oscillator or an external source of frequency may be connected to the plates through the amplifier. The binding posts may be connected directly to the plates for operation above 90,000 cycles with a sensitivity of 75 volts per inch.

Beam Centering ...

Two screwdriver adjustments are provided for centering the beam on the fluorescent screen. This may be required because of changes in geographical location or variations in tubes and circuit constants.



● For Service Engineers

Visual alignment of tuned circuits, "flat-topping" I. F. circuits, measuring hum and checking distortion in audio amplifiers are but few of the problems which are easily solved through the use of the RCA Cathode Ray Oscillograph. A visual presentation of practically all alternating current circuit functions may be quickly and easily made.

● For Amateurs and Experimenters

The RCA Cathode Ray Oscillograph enables the amateur to monitor percentage modulation, to check modulated waveform for distortion and examine the phase shift in audio amplifiers. Through its use the experimenter may easily and quickly arrive at the solution of the most difficult problem.

● For High Schools and Universities

Now every high school and university may easily give students the benefit of visual presentation of alternating current phenomena through the use of an oscillograph. Studies of alternating current wave shapes and demonstrations of the effects of changing constants in circuits may be quickly and easily made.

● For Radio Dealers

The RCA Cathode Ray Oscillograph gives the Radio Dealer an instrument for comparison of receiver characteristics and for making extremely effective window displays. Selling-up from a low-priced instrument to a higher-priced one is much easier when the eye as well as the ear can note the difference in performance.

● For Manufacturers

The RCA Cathode Ray Oscillograph is a valuable instrument either for receiver development or production testing. Better engineering and quicker and better tests are a direct result of its use in the manufacturing field.