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M. W. TILDEN

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NEW RC-15 MANUAL PACKED WITH VITAL TUBE INFORMATION

**Authoritative Guide Designed
for Wide Usage By Dealers
and Servicemen**

Here is your daily servicing companion, brought up-to-date and better than ever! Available now, the new RC-15 Edition of RCA's Receiving Tube Manual is packed with vital technical information on RCA Receiving Tubes, including the new miniatures, kinescopes and numerous other post-war types for AM, FM, and Television receivers.

Designed particularly for use by dealers and servicemen, the new RC-15 is easily the most authoritative guide of its kind in the field.

Up-to-the-Minute Data

A complete revision of the previous RC-14 Manual, it contains application data and circuits on ratio detectors, discriminators, limiters and multi-vibrators. The introductory section on tube and circuit theory has been expanded to 55 pages and a new 17-page circuit section, showing a wide variety of electron tube applications, is included.

Complete formulas and examples for the calculation of power output, load resistance, and distortions for A₁, AB₁, AB₂, and B classes of service are placed in a separate section for ready reference.

The section on resistance-coupled amplifiers has been rearranged and expanded. Twenty-seven different sets of operating conditions are given in convenient reference charts for each of more than 8 tube types.

The Receiving Tube Classification Chart, which classifies receiving tube types by cathode voltages and tube functions, has been brought completely up-to-date, and a separate ready-reference list of miniature tubes has been added for reader convenience.

Easy to use, with an abbreviated style of presentation, and packed with authoritative data, this new RC-15 will be a useful addition to any serviceman's library. Available now at all RCA Tube and Parts Distributors at \$.35 per copy. Be sure to pick one up on your next trip in for parts

THE MANUAL YOU'VE BEEN WAITING FOR



This is the RC-15, a new edition of the famous RCA receiving tube manual. Providing more information than ever before, it is a time-saving asset for every member of the radio industry.

TECHNICAL EDUCATIONAL REQUIREMENTS OF THE MODERN RADIO INDUSTRY

By PAUL L. GERHART

Chief Instructor, RCA Institutes, Inc., New York, N. Y.

Up to the past decade a course in radio servicing was intended to give the student a working knowledge of operation and maintenance of broadcast and short wave receivers. Such courses covered the circuit refinements employed in receivers of that day. The all-electric receiver had such features as single tuning control, automatic volume control or delayed automatic volume control, wide response or, in some cases, variable band width intermediate-frequency amplifiers and band-changing switches.

Training courses covered these points by teaching the operation and adjustment of such circuits, giving practice in tracking and alignment of the receiver circuits as well as in checking signal sensitivity and power output. Available commercial testing and servicing equipment permitted the trainees to service the receivers using standardized procedure. Receivers having all of the existing refinements were in the numerical minority and the typical servicing task was handled with facility upon completion of such a course of training.

Requirements Advanced

The appearance of commercial

frequency modulation and television broadcasting has introduced servicing techniques of more advanced nature. Receivers for these services operate upon principles which in many respects were not formerly employed. Tracking and alignment procedure must be taught in greater detail to prepare students for the more critical adjustments necessary. Sweep frequency oscillators are now used more extensively than before, and their functions and use must be included in a course of training. Square-wave testing devices are now commercially used in servicing procedure. The latter two pieces of equipment

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QUALITY CONTROL STRESSED IN RCA'S TUBE MANUFACTURE

**Sales-Service Profit From
High Calibre of RCA
Production**

Quality control has made possible outstanding tube performance, long tube life, and economies in production costs which have been passed on to RCA customers in the form of lower tube prices.

A representative example of RCA's high tube quality is revealed by the results of a series of detailed studies recently concluded by the Tube Department's Merchandise Division. Ranging over an extended period of time and covering the sale of 100,000,000 receiving tubes on which field records were obtained, the investigation disclosed that claims of defective tubes involved less than 1½% of the total. Only 1% were found to be actually defective.

At RCA, there is no compromise with tube standardization requirements. Tubes which do not meet RCA standards are destroyed. RCA has but one standard of quality, regardless of the channel of sale.

Series Scheduled

What is quality control? To better explain this ever important feature of RCA's manufacturing methods and the vital, yet indirect role it plays in the successful operation of a service shop, two of the RCA Tube Department engineers in charge of quality control have prepared a series of notes for RADIO SERVICE NEWS.

These informal chats will present a vivid picture of the unending efforts spent in producing tubes that radio service technicians can use with utmost confidence.

Experience gained in nearly 10 years of miniature tube manufacturing, which RCA pioneered in 1939, will be the subject of the first of these discussions. It is authored by Mr. W. L. Van Keuren, Manager of the Quality Control Section of the RCA Tube Department in Harrison, N. J. Be sure to watch for the March-April issue of RSN and this interesting and informative data.

— BUILT TO LAST LONGER —
RCA'S NEW FARM PACK BATTERY



The VS-099 Farm Battery Pack, powered by RCA's special radio mix is "Radio engineered for Extra Listening Hours". In an efficient 4-tube battery-operated receiver, it provides 35% more listening hours than the average farm pack.

Sealed-in-steel, the VS-099 eliminates the possibility of damage to floors, rugs, etc., by leakage. Its metal jacket also excludes dryness and moisture, protecting it against high humidity or extreme temperature changes. At your distributor—Suggested List Price \$9.50.

EDUCATIONAL REQUIREMENTS

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provide means for checking rapidly the characteristics of frequency-modulation receivers and especially of television receivers where the wide frequency response is a prerequisite to good receiver performance.

The additional theory required for this work should be based upon the performance at higher frequencies of the circuits found in such equipment, with emphasis upon the features which have been introduced as a result of the functional changes in the receiver parts. The associated laboratory practice should provide an opportunity for learning the use of such equipment. The interpretation of the results obtained in the laboratory projects must be correlated with the theory.

Practice Essential

The modern course in radio servicing and repair should recognize the value of early opportunity to acquire manipulative skill and familiarity with the tools and equipment of the trade. For this reason beginners in such a course profit by practice work in assembly and wiring while acquiring their basic theory. Laboratory work should continue throughout the course, advancing in level with the theory lessons. As a result of the need for the servicing of the new types of receivers, today's course of training must necessarily be more extensive in total training time than were the earlier courses with the lesser objectives.

Students training for employment as radio operators are now required to pass more comprehensive examinations than formerly in order to become licensed operators. In

keeping with this requirement it is necessary that a course of study cover receivers more thoroughly and include more extensive study and practice on transmitters. The highly-refined communication receiver of today with its wide range of useful frequencies and the available crystal-controlled tuned circuits calls for skill and understanding in its maintenance.

Transmitters have become more compact and some of the service frequencies are now much higher. Whether the graduate is employed in marine, airline or broadcast stations he finds today's equipment of more complex design than formerly. The scope of training on basic transmitter principles must now be augmented to include more thorough understanding of power amplifiers at radio frequencies, of neutralization and of the special problems introduced by operating in the higher frequency bands, both with continuous wave and modulated wave transmission. Oscillator theory and performance must be more intensively treated. More time should be allotted to breadboard practice with oscillators and other fundamental circuits which are component parts of transmitters.

As in the case of receiver repair courses, students should find early opportunity in the course to acquire manipulative skills. Additional work on the directivity of antenna structures for special service in the higher frequency range becomes a useful part of the training, especially in connection with such equipment as is used by the airlines for guide beams and landing beams. Marine equipment for safety at sea makes use of the circuit refinements of receivers in the design of the automatic alarm re-

Talking Things Over

With W. L. ROTHENBERGER
Manager, Renewal Sales

A new edition of the Serviceman's much relied upon reference, the RCA Receiving Tube Handbook, is now ready for you. The RC-15 is the first completely new and revised edition of this popular receiving tube manual published by RCA since the war, and is now available at your local distributor. I would like to point out a few of the features of this handy reference book.

You are all familiar with the old RC-14 and, perhaps, the newer RC-15 Receiving Tube Manuals, but I wonder how many of us realize the magnitude of the reference data within the covers. In other words, just what is in this book that makes it the standard reference that it is? Let's look at it carefully, section by section.

The first fifty-five pages of data are brief, technical paragraphs, brilliantly prepared to present the most important data on vacuum tubes. There are sections on Shielding, Voltage Supplies, Oscillation, Conversion, AVC, Detection, Amplification and many other electron tube applications. There is a complete discussion of triodes, pentodes and all of the other basic classes of tube construction.

Next, we find a detailed chart on receiving tube classifications. This segregates the various types according to functions and cathode voltages.

Complete Tube Charts

The following one hundred and thirty pages present complete technical specifications on nearly 400 tubes of all classifications. There are miniatures, metal tubes, glass tubes, television kinescopes, and other special receiving types. The data on the current types are complete to the "nth" degree, with socket connections, operating volt-

age specifications, plate characteristic curves, and pertinent circuit information.

Circuit Applications

This material is augmented by proven schematic diagrams of typical circuits, an expanded section on resistance coupling, tube testing requirements, definitions, and tube outline dimensions.

Here is a hook so complete in tube and application information, that it should be in every service shop, laboratory and engineering library. In these days of advanced equipment design, constant referral to a reliable source of information on vacuum tubes is a "must".

We are very proud of this manual and its completeness. This aggregation of engineering "know-how" is only one of the many reasons why we can constantly maintain the high standards of production characteristic of RCA products.

My allotted space won't allow me to expend my enthusiasm over this new RC-15, but I am confident that all of you will realize the potential benefits the serviceman, amateur, experimenter, and design engineer can gain from this manual. I am firmly convinced that this collection of technical material cannot be duplicated anywhere for its selling price of 35¢. Stop by your RCA distributor today and see for yourself.

ceiver, and in direction finders. The maintenance of radio equipment on shipboard today requires a complete course of training as a technician.

In courses which lead toward higher objectives in technology the student is preparing to fill a position in research and development or in production work. His success and prospect for more responsible work are determined by the thoroughness and completeness with which he is trained in fundamental principles and brought upward through the steps of an organized training program.

Math and Physics Stressed

Courses in mathematics and physics form the foundation. Mathematics courses must now go well

beyond introductory levels; advanced studies in analysis of circuits and of radiation problems require the more powerful mathematical methods. The mathematics courses should, from the beginning, be based on the specialized requirements in the field of radio and should regularly be related to the applications in radio. They must provide the tools for solving any of the radio problems which arise. It is necessary that the student acquire facility in identifying the problem and determining the appropriate approach toward its solution, often the most difficult step.

Specialized courses in physics should include work in the subject of mechanics, so that such basic

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EDUCATIONAL REQUIREMENTS

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concepts as work, power and energy can be understood in more advanced applications. Electrical physics will form the foundation for studies in the operation of electrical circuits for radio applications. The physics of heat and sound are directly applicable in the necessary courses of study of vacuum tubes and associated apparatus and in acoustical studies. The student trained in technology must acquire an understanding of the relations between mechanical, acoustical and electrical systems. These analogies require for their analysis a firm background in mathematics and physics. Design and development assignments in industry require a background in the pure sciences.

As an approach toward training in the analysis of radio circuits it is necessary to introduce electrical theory, starting with simple concepts of direct currents. Mesh circuits should be introduced in their simpler forms, and magnetic circuits should be covered thoroughly. Alternating current courses should be carefully designed for application to steady-state problems, with applications to the radio field shown as the course progresses. Methods of transforming circuits should be introduced, and the simpler network theorems taught. When the student has acquired this understanding of alternating current circuits he should be given the more advanced work in networks and filters.

Coordination A "Must"

His mathematics courses should by this time have reached a sufficiently advanced stage so that he is able to solve transient problems in connection with these networks. The latter study is becoming more significant as a result of the numerous electronic devices which have become common in the war years and the post-war period. Television and radar equipment depend for their successful operation upon circuits designed to accommodate complex wave shapes and signal impulses whose timing and wave form are critical. At a later point in the course the student should have an opportunity to learn the methods of transient solution with the aid of operational methods. It is important that this work be accompanied by coordinated training in laboratory procedure, so that the student may improve his ability in checking analytical work with experimental procedure. In this manner he becomes competent in measurements and learns the limitations of measuring equipment.

The square-wave excitation method commonly used today in determining circuit response, yields more information than the former laborious method. The interpreta-

tion of these results calls for more intensive courses in testing procedure and analysis.

The study of the vacuum tube and its associated circuits must today be carried into the field of microwaves. The relation between internal structure and high frequency performance is important in the electronic devices used in television relay equipment, and in other high frequency apparatus. Communication frequencies today are commercially successful in the microwave bands and the gap between these frequencies and the quasi-optical frequencies is becoming continually narrower. Electron tubes of all types must be treated as a part of the course. Industrial electronic equipment makes use of a wide variety of the newer types of electron tubes. Cathode-ray tubes should be carefully studied, and the analysis of their operation given in considerable detail.

VHF and Composite Signals

In the courses on transmitters and receivers it becomes necessary to include the higher frequencies and the wider frequency response. Pulse transmission and composite television signal transmission call for apparatus which must be designed with a full understanding of circuit and component performance, and this understanding can come only from the analytical methods mentioned earlier. Recent improvements in both the picture signal and the associated sound of commercial television programs are the result of refinements which are the fruit of experience and engineering skill.

The student well-schooled in the basic principles and whose skill has been developed by laboratory practice should, upon graduation, be able to enter the communications field and handle assignments on modern electronic devices in the field of radio or any of the related subjects such as navigational aids, electronic equipment for diagnosis and treatment in the medical field, industrial heating apparatus, and location and detection equipment. In order that he can be employed in any or all of the above applications his training must be of a broad scope. Navigational aids and detection equipment require training in the high frequencies and in the use of accurately timed pulses of transmission and critically adjusted circuits together with exacting design of antennas. Employment in industrial heating tasks makes demands upon his schooling in the field of high power at radio frequencies and his knowledge of dielectrics. In the medical field his understanding of very low and very high frequency phenomena will be of importance, and his ability to analyze complex wave shapes will depend upon his competence in the mathematical analysis of these shapes. This again em-

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THE NEW TV MAGNIFIER LENS IN USE



RCA model 630TS television receiver without magnifier.



The same receiver with the new RCA Television Picture Magnifier lens in position.

MAGNIFIER LENS UP VIDEO PICTURE SIZE

Liquid-filled lens gives clear, bright picture, equal to 15"-tube image when placed in front of a 7" or 10" kinescope.

The RCA Television Picture Magnifier was conceived, designed and produced by the Plastics Section of the RCA Tube Department. The 203P1 is a television image magnifying lens consisting of a plastic envelope having one flat side and one spherical surface. The interior is filled with a special oil having the same optical properties as the plastic material. The result is a true optical lens.

The magnification obtained from the liquid-filled lens is equal to a similar lens of glass or plastic, yet it is much lighter in weight. The 203P1 is also superior to a solid lens in efficiency of light transmission, resulting in clearer and brighter images.

Designed specifically for use in conjunction with 7" and 10" di-

rectly-viewed television tubes, it is adaptable to many uses requiring large area, low-power magnification. Technical specifications are:

Size: 14½" high x 17½" wide
max. thickness 3¼"

Optical Aperture: 12" x 15"

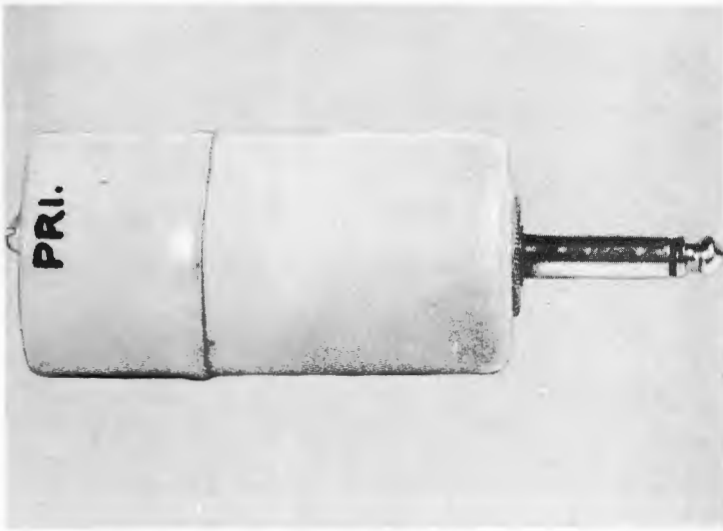
Weight: Approximately 20 lbs.

By centering the lens with its flat surface facing a television tube or other object, magnifications from about 2 to 4 times in area can be obtained by moving the lens from 4" to 10" in front of the object. In the case of a television picture, the lens gives a sharp, clear image, equivalent in size and brightness to that of a 15" tube.

See the RCA Television Picture Magnifier at your distributor.

Suggested List Price—\$59.50.

PLUG-IN MICROPHONE TRANSFORMER



Originally designed for the RCA Chanalyst, this plug-in type microphone transformer is now available for general use in a multitude of audio applications.

**VERSATILE PLUG-IN TRANSFORMER
AVAILABLE FOR GENERAL SERVICE USE**

**Proven Test Item Finds Many Uses in Audio Equipment
Repair and Installation**

The Plug-in Microphone Transformer No. MI-18758, which was originally designed for the type 170-A Audio Chanalyst, is now available for general service use through RCA Test Equipment Distributors.

The versatility of this transformer can easily be appreciated by any sound man who has been confronted with the problem of testing amplifiers at considerably different levels.

In the Audio Chanalyst, the inputs to the four stages of its internal test amplifier are available through phone jacks on the front panel of that instrument. This is done so that a shielded cable can be used for high-impedance signal tracing and to make it possible for the plug-in type audio transformer to be connected to any stage for various levels of line-to-grid matching.

The transformer has been compactly built into the small can which forms the body of the plug and has its high-impedance output connected to the phone plug terminals. The primary of this transformer is designed to match a 250-ohm microphone line or other line input. It is center tapped and a ground-to-case connection has been provided in order that the center tap or one side of the line can be grounded optionally. When half of the winding is used, the primary is approximately 68 ohms, which can be used to advantage with 50 or 75 ohm microphone lines.

Other Advantages

One great advantage that this

RCA Plug-in Microphone Transformer offers is its adaptability to physical placement outside of the strong hum fields that originate in power transformers. The placement of an input transformer in an amplifier has long been a problem with design engineers since the desire to keep the size of the amplifier to a minimum has often forced them to place the input transformer too near the power transformer for minimum hum conditions.

The RCA Plug-in Transformer, therefore, makes it possible to move a few more inches away from the power transformer by virtue of its placement outside of the amplifier. Incidentally, this versatile unit can be rotated in the phone jack to further reduce hum pickup by balancing out any interfering magnetic field within its windings.

The Plug-in Transformer is also useful as an output transformer in low level circuits. For example, it can be plugged into the output connections of an oscillator to match its high-impedance plate circuit to a line.

The RCA Plug-in Transformer (MI-18758) sells for \$15.00 net and is available for immediate delivery. Additional details and complete technical information may be obtained from any RCA Test Equipment Distributor.

A MODERN AGGRESSIVE SALES-SERVICE ORGANIZATION IS A COMMUNITY ASSET

Up-to-date business policies, modern servicing methods, and pleasant consumer relationships are fundamental to the well being and future progress of the modern sales-service technician.

There was once a man who said the auto would never replace the horse, and one who said that radio was just a passing fad. Nevertheless, despite those who are prone to sit back and cluck their tongues at progress, the auto, radio and other such innovations are here to stay.

Sad?

Consider the more pessimistic gentleman, and his conviction that he should "wait". We might assume he is the owner of a radio service shop. It is impossible to convince him that his 1930 model test instruments, his depression-era sales methods and his knowledge of 18-year-old receiving circuits have no more than token value today.

—or Glad?

On the other side of the picture there is the happy fellow, who devotes considerable time and effort to keeping his business up-to-the-minute. He is sure his shop is capable of handling every service job placed on his bench because

his equipment and service techniques are up-to-the-minute. His sales results are certain to be gratifying too, because he has also recognized the importance of modern merchandising trends and new sales techniques.

RCA Aids

Only you can decide which path your business will take and what profit your efforts will reap. Make full use of the many technical sales, business and promotional aids at your disposal—for example, RCA provides authoritative up-to-date publications such as the RC-15 Receiving Tube Manual, the 1275 pamphlet on receiving tubes, etc.,—a comprehensive array of displays and promotional material—modern test equipment that simplifies locating servicing difficulties and saves you time and effort.

The comic portrayal of the man who preferred to "wait" might well be the serviceman who perennially promises himself the "next" model of today's advancements. Will you wait?—or will you advance?

The Man Who Said The Auto Would Never Replace The Horse

<p>1 "Technical standards aren't set yet. Your television receiver will be obsolete tomorrow I'll wait!"</p>	<p>2 "Permanent channels haven't been assigned to television. When they are, your set will be obsolete. I'll wait!"</p>
<p>3 "Color television is just around the corner. Today's black-and-white sets will become obsolete. I'll wait!"</p>	<p>4 "Only 52 sq. in. picture? Bah! When they make sets with larger pictures, yours will be obsolete. I'll wait!"</p>
<p>5 "Manufacturers are always making improvements. Sets may be good now, but when those improvements come along, yours will become obsolete. I'll wait!"</p>	<p>6</p> <p>Still waiting!</p>

cartoons by '47 Magazine

SALES *and* SERVICE TIPS

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

MODERNIZE TUBE TESTERS FOR INCREASED PROFITS

The tube tester is one of the serviceman's best tube salesmen, and caring diligently for it will increase sales and profits.

By keeping in touch with the manufacturer of the tester, annual revisions and additions to the tube data lists may usually be obtained, thereby making it possible to use the instrument for checking newer types of tubes, as well as older types more accurately.

Time may be saved by typing a condensed ready-reference chart for the tubes tested most often.

Harry N. Johnson
71 Codman Park
Roxbury 19, Mass.

AVOID AC-DC GRIPES BY SIMPLE PRECAUTION

Ac-dc sets, with the pilot lamp and one half of the 35Z5 filament open, may be more permanently repaired if a simple and inexpensive precaution is taken.

Check the 35Z5 socket connections for a tubular bypass condenser on the filament, generally a .05 mfd. A short in this condenser

will put the line voltage through the pilot lamp and part of the rectifier filament, burning out both. The simplest and surest precaution is to replace this bypass before installing the new tube and lamp, and avoid a possible return call on the service job.

Fred Wittich
7202 Juniper Valley Rd.
Middle Village, N. Y.

HOUSEHOLD GADGETS AID RADIO SERVICING

Soda Straws

The problem of removing dust and foreign matter from small areas such as switches and coil cans can be solved by using a common soda straw. Blowing through the straw will concentrate the pressure in a small area, thereby removing dirt from hard-to-reach spots in a minimum of time.

F. Crape
1787 Rodney French Blvd.
New Bedford, Mass.

Clothes Pins

The perpetual trouble of gluing in a new speaker cone can be materially eased by fixing a few

SERVICEMEN'S ORGANIZATION GETS RCA SEND-OFF



RCA gave a send-off technical session to the newly formed Mid-State Radio Servicemen's Association at their recent meeting in Harrisburg, Pa. With Vic Williams as Master of Ceremonies, Art Liebscher, of RCA Test Equipment Sales demonstrated new equipment and lectured on FM servicing technique. D & H Distributing Co. did a bang-up job as a sponsor.

Pictured in the group above are, left to right standing: Vic Williams, (RCA Sales Rep.)—Art Liebscher (RCA Sales Engineer)—Jay Sweeney—T. L. Clarkson—Geo. Hardy—Wayne Hite—Vance Beachley—Wm. Deardoff—E. Lower (All Officials of Servicemen's Organization). Seated: Dick Buhsman—Bob Womack—Bob Miller—Art Mottern—Don Wallower.

clothes pins around the rim. Spacing these about the frame to hold the cone in place while the cement dries will eliminate loose spots and potential speaker rattles.

Bill Leigh
Allied Elec. Co.
214 So. 13th St.
Lincoln, Neb.

EDUCATIONAL REQUIREMENTS

Continued from page 3, column 2
phasizes the need for an adequate level of training in mathematics and its correlation with the electrical theory.

Today's heavy demand for educational facilities coincides with the need for the expanded scope of courses as indicated above. The expansion of opportunity for employment in all the levels of training mentioned leads to an increased number of opportunities for technically trained personnel to aid in producing the numerous newly-developed electronic devices which will become commonplace parts of modern industry. To bring these requirements together under a coordinated plan of training, the technical school of today must give continuous attention to the modern trends. Course organization must often be revised with a view to pointing always toward specific job objectives.

TRY THIS TRICK FOR DARK SPOTS

When soldering has to be done in dark corners and confined locations, a length of solder wrapped around a pen-size flashlight is a valuable aid. Extend the solder six or eight inches in front of the tip, turn on the light, and both light and solder are where they are needed.

P. W. Holbrook
West Swanzey, N. H.

VARIABLE TRANSFORMER FULFILLS MANY NEEDS

On many occasions the serviceman has need for a variable ac voltage to test various components. An inexpensive item to fill this need may be obtained by removing the transformer and the accompanying selector switch from an obsolete tube tester and installing it on the test panel. A pair of binding posts on the variable output, and a calibrated scale around the selector knob, completes the handy aid.

L. Clyde Butler, Jr.
Butler Radio & Electric
Urbana, Mo.

YOUR USEFUL IDEA MAY BRING A USEFUL PENCIL

The offer still stands—we'll swap you one of the popular RCA resistor color code pencils for each useful published service tip. This is one trade by which everyone gains—you win a prize—your buddies get new kinks—we enjoy printing the tips and sending out the pencils. Just a card or note to:

Editorial Office
RCA
Harrison, N. J.



"Pie plates, clothes pins, potato mashers. Maybe you'd like me to move the whole kitchen down here, Marconi."

REPLACEMENT PARTS

Section

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

SPEAKER REACTOR—STOCK No. 72934

Here's an opportunity to reduce the number of different speakers on your shelf. Stock RCA PM speakers and use them to replace all faulty units, PM or electro-dynamic. The RCA speaker reactor takes the place of the field coil.

This unit is ideal for use with PM speakers of the 4", 5", and 4" x 6" sizes. The combination will replace any electro-dynamic speaker having a 350 to 450 ohm field coil rated at not more than 50 ma.

The mounting holes of the reactor are 2" on center, making it mountable by two bolts. It is small enough to be used in many table model radios.

Here are a few of the RCA models in which this combination may be installed:

9TX50	34X	45X series	511
10X	35X	46X series	512
11X1	36X	94X series	513
Q11	40X52	95XLW	
Q11A	40X55	510	

Suggested List Price—\$1.60.

RCA FLASHLIGHT—STOCK No. RT22R

More competitively priced than ever—that's the new RCA Flashlight. Now available at your distributor in individual cartons bearing the familiar red-black-and-white RCA colors.

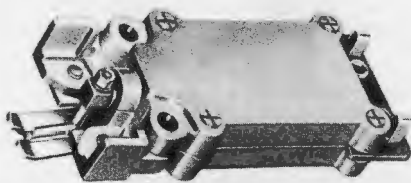
Suggested List Price per unit—\$1.19.

SILENT SAPPHIRE CRYSTAL PICKUP—STOCK No. 70338A

- Features Permanent Type, Jewel-Point Needle
 - Tracks Easily; Reduces Record Wear
 - Eliminates Needle Changing
 - Improves Record Reproduction
 - Reduces Needle-Chatter and Surface Noise,
- Extremely Sensitive ●
Lightweight, Durable Aluminum Case ●
Lanolin-Filled Cartridge ●
Flexible Tone Bridge ●
Tiny "Bumpers" Protect Sapphire Point ●

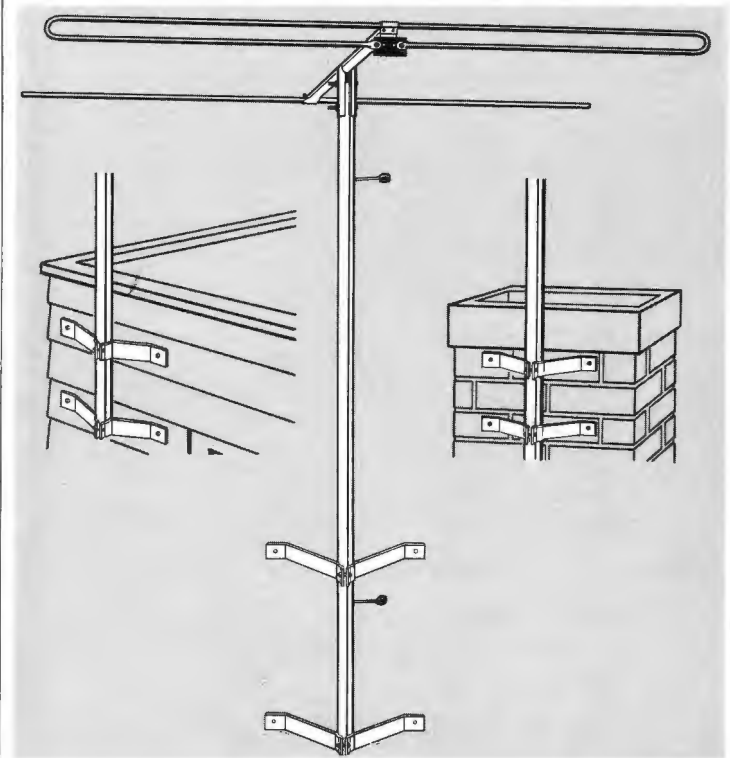
Suggested List Price—\$8.00

Maximum Length	2 3/8"
Maximum Width	7/8"
Thickness	3/8"
Mounting Holes	5/8"



Check the outstanding features of the new RCA Silent Sapphire Crystal Pickup. This versatile unit will replace 70 different types of cartridges, thereby minimizing your crystal stock requirements.

RCA'S FM ANTENNA ENGINEERED FOR DEPENDABLE HIGH PERFORMANCE



RCA FM FOLDED DIPOLE ANTENNA

AND KIT—STOCK No. 228

Here is the FM Antenna the radio industry has been looking for—a folded dipole and reflector engineered for top performance over the entire range of FM frequencies. It has an extremely flat frequency response between 88 and 108 Mc.

Heavy-duty construction from reflector to mounting brackets, it is built to withstand wear or damage from wind, rain, or ice storms. It features lightweight aluminum elements, weather-treated wooden mast and coated-steel mounting brackets.

The RCA FM Antenna is a folded dipole with a reflector,—giving it unidirectional characteristics. This feature, plus its high gain characteristics, makes this FM Antenna a natural for listeners in those areas located at a distant point from the transmitter.

Suggested List Price—\$13.50.

RCA RADIO-PHONO SWITCH KIT—KIT No. 205X1

This popular radio-phono switch is again available. It is designed specifically to provide a connection for record players to radios not already equipped with phono jacks. An attractive merchandising package for your counter contains ten of these switches individually boxed.

Suggested List Price—\$22.50 per kit of 10.

GRID ADAPTOR FOR RADIO-PHONO

SWITCH—STOCK No. 37798

An adaptor plug allowing the use of the above switch with radios having one of the following tubes in the first audio stage: 6SQ7, 6SR7, 12SQ7, or 12SR7. The tube is removed from the set and plugged into the adaptor, which is in turn placed in the tube socket. The switch leads are then connected to the tabs on the adaptor.

This item will be found particularly useful on the smaller ac-dc sets.

Suggested List Price—\$1.25.

NEW SIGNAL INJECTION TECHNIQUE SPEEDS SERVICING

(Based on a staff written article appearing in
RADIO MAINTENANCE)

Much has been written about the different methods of radio servicing, particularly the methods of servicing by Resistance Measurement and Signal Tracing; but probably the most used and the least mentioned is the method known as Signal Injection. This term may seem a little confusing, but it describes one of the oldest types of servicing which has undoubtedly been practiced by most radio servicemen.

When asked for the quickest method of determining whether or not the audio section of a receiver is functioning, the average serviceman will reply, "Touch the grid cap of the first audio stage and if there is a hum in the speaker, then it can be assumed that the audio stages are amplifying."

What did you do when you touched the grid cap? Whenever ac flows through a circuit, there is a field set up in the surrounding area, and if a person is in this field, there will be a voltage induced in his body that is measured in microvolts, or perhaps even in millivolts. When the grid cap is touched, this induced voltage is "inserted" on the grid of the audio tube, and since the ac field frequency is within the audio range of the receiver, it is amplified and heard in the speaker. This is about the fastest way of checking the audio end of a radio receiver. It is a crude way of servicing by signal insertion.

Carrying the idea further, we have a method which will, nine times out of ten, allow us to locate a defective stage in a few minutes. All that is needed for the insertion method of servicing is a conventional type of signal generator such as is used in most shops. For the sake of convenience, the generator must have some means for the selection of either an rf output or an af output. This is possible with

about 90 per cent of the service-type signal generators. It is best to use an ordinary test prod and shielded lead, with a capacitor connected between the test prod and the generator output. This capacitor is used to protect the attenuator from burnout when the prod is placed on a point of high potential. The shielded lead from the generator output prevents stray ac pickup that would be impressed on the circuits under test along with the desired signal.

One difference between signal tracing and signal insertion is that with the former, one starts with the front end of the receiver under test and works toward the speaker; whereas, in the latter method, one starts with the back or audio end and works toward the antenna input.

For quick servicing by the insertion method, the following procedure is recommended. Turn on the receiver to be tested and allow it to warm up for a few minutes. Adjust the signal generator for audio output and set the attenuator control at maximum. Connect the ground wire from the generator to the ground on the set and insert the signal onto the plate of the output tube (Point A on Fig. 1). This is done simply by touching the plate terminal with the test prod. If a weak audio signal (usually 400 cps) from the generator is heard in the speaker, this means

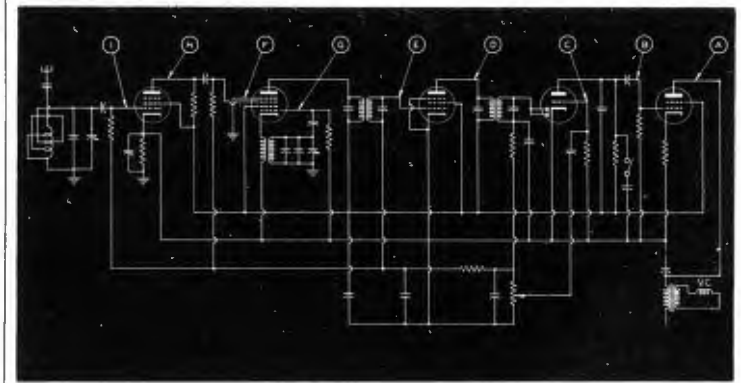


Figure 1—Typical superheterodyne receiver circuit. The letters indicate the points at which the signal is injected.

that the output transformer and speaker are functioning. Next, the signal is inserted on the control grid of the output tube (Point B on Fig. 1). The speaker responses should be much louder than obtained with the signal inserted on the plate.

The next step is to insert the signal on the grid of the first audio stage (Point C of Fig. 1). If this stage is functioning normally, it may be necessary to reduce the output from the generator. If all the circuits associated with the audio end of the receiver are functioning, then we must turn to the if and rf sections. If the receiver is a superheterodyne, tune the signal generator to the prescribed if for the set, and adjust it for modulated rf output. Place the test prod on the plate of the last if stage (Point D of Fig. 1). The signal heard in the speaker should be the same as in previous tests. Next, the prod is placed on the grid of the last if stage (Point E of Fig. 1), and once more a considerable gain in output should be noticed. Now we proceed back through the if stages, if there are more than one, checking each one as we checked the last if stage. As we progress to the grids of the preceding stages, it will be noticed that the gain increases greatly. To offset this increase in gain, the generator attenuator setting should be decreased.

Checking back through the if stages, we come to the mixer stage, or as it is sometimes called, the first detector. The if signal is inserted on the control grid of the mixer (Point F of Fig. 1), and if another gain in output is noticed, the mixer is amplifying. Tune the receiver to the frequency of the strongest broadcasting station in that particular locality, and if it is not heard, proceed as follows: Tune the signal generator to a frequency that is the sum of the frequencies of the broadcasting station and the if of the set. For example, if the station operates on a frequency of 1000 kilocycles and the if of the set is 455 kc, then 1000 plus 455 equals 1455—the frequency

to which the signal generator should be tuned. (This is the frequency at which the oscillator in the set should operate in order to receive a station with a frequency of 1000 kc.)

Turn the signal generator modulation off, and feed the signal to the oscillator grid, or to the place where the oscillator signal is normally fed to the mixer tube (Point G on Fig. 1). If the station is now heard, it is evident that the local oscillator in the set is not functioning. If the station is not heard, the trouble is ahead of the mixer, and we proceed to the rf section. The generator should now be tuned to the frequency at the set, which, for the present example happens to be 1000 kc. We now proceed from plate to grid (Points H and I on Fig. 1) with the test prod until the defective stage is found and we finally arrive at the antenna post.

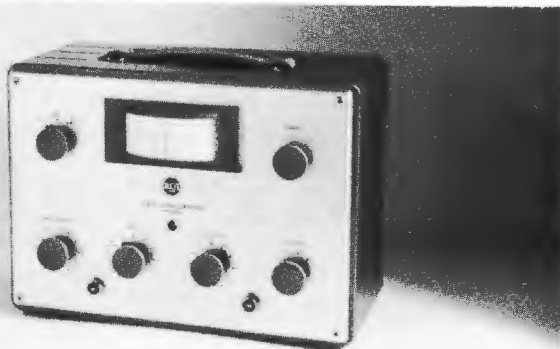
The above procedures and tests require less than five minutes to make. This is fast enough for most radio service requirements. As the serviceman gains experience with this method of checking, he will find many shortcuts and time-savers that are not described in this article.

Checking for Intermittents

If the set under test has an intermittent, then it is comparatively easy with the insertion method to locate the defective stage. Starting with the audio output stage, feed the signal to the grid of the tube and stop the preceding stage from functioning by removing the tube or by shorting out the grid with a jumper. If the set does not show an intermittent with just this stage working for a period of time, then proceed to the next stage and repeat the process until the stage that shows an intermittent is located.

Although the writer has been in the service business for about ten years and has used practically all the methods of servicing from resistance measurements to signal tracing, he has found that the method just described is as fast and efficient as any method he has yet tried.

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