

PHILCO SERVICEMAN

• RADIO • MANUFACTURERS • SERVICE • NEWS •

DECEMBER, 1933

Take Advantage of the World's Finest Service Plan

MEMBERS of Radio Manufacturers Service are now in a position to capitalize on advantages never before offered to servicemen. They have available at practically no cost the services of two of the world's outstanding advertising agencies. The very highest grade advertising copy is at the disposal of members of R. M. S. in the form of mats priced as low as 6 cents.

In back of Radio Manufacturers Service is the famous Philco organization, which has built up Philco to its enviable position of the world's largest radio manufacturer. Boake Carter, the most popular news commentator ever to go on the air, is broadcasting for Philco every weekday evening except Saturday. He is telling the public about Radio Manufacturers Service—advertising for you in millions of homes throughout the country. The chance to tie in with such a marvelous service plan as R. M. S. and to utilize the many helps and suggestions offered is something which is being taken advantage of by every progressive serviceman and dealer.

Your Philco distributor is your local headquarters for Radio Manufacturers Service. Philco urges you to take every advantage of the many desirable helps offered through close contact with your local headquarters. It will mean more business and more profit for you. There will be available for you from your Philco distributor about the same time you receive this copy of the Philco Serviceman a free copy of a booklet on adjusting superheterodynes—prepared and printed by Philco specially for mem-

bers of Radio Manufacturers Service. The radio lessons which have previously been announced have been delayed a bit through the press of other work in connection with the further organization of Radio Manufacturers Service. The first of these helpful booklets, which every member is looking forward to receiving, will be available within a very short time, and we can assure you that it will be worth the waiting.

Remember that your Philco distributor's service department is desirous of helping you in your service problems. Don't go there merely to reminisce and talk shop, but go there with your service problems and with the idea of getting some helpful information. We can assure you of success beforehand, and if it is impossible to obtain an immediate answer, you will get it if it is necessary for your distributor's service manager to write to the factory for the information.

New service data from the Philco factory is received at your distributor's every week. This information is not printed in sufficient quantity to permit general distribution, but you can get these many service helps from your Philco distributor's service manager. Service bulletins on new Philco models are available to you from time to time as they are sent out from the factory.

Be sure that you keep in touch with Philco and Radio Manufacturers Service activities through regular association with your local R. M. S. headquarters. Be among those who are alive to what is going on in the radio service world, and profit through your knowledge.

Trouble Shooting with the Philco Model 048 All-Purpose Set Tester*

MOST of the voltage and resistance readings required to trace the trouble to the individual part at fault can be made without removing the chassis from the cabinet. When making voltage tests in a socket where the tube draws considerable plate current, as in the case of a power output stage, it is usually advisable to make these measurements with the tube in place.

To facilitate such voltage readings, the Philco All-Purpose Set Tester is provided with a pair of test leads having special connectors, which can be slipped over the tube prongs, as well as a pair of leads with test prods that may be inserted in the socket holes. Should the socket readings indicate a lack of plate voltage at one of the amplifier tube sockets, the positive voltmeter lead can be moved to the filament prong of the rectifier tube to determine whether the lack of voltage is due to an open circuit between the plate and the power supply, or to a shorted by-pass condenser. If desired, this possibility can also be checked by the point-to-point resistance method. An abnormally low resistance between the plate and cathode will indicate a shorted by-pass condenser, while no reading from the plate of the amplifier socket to the rectifier filament will indicate an open plate circuit. When reading plate voltage it is easy to overlook the fact that an open cathode circuit will also result in a zero reading. In this case a plate voltage reading would be obtained by transferring the negative test lead from the cathode of the socket to the chassis.

Grid Voltage Measurements

In making measurements of control grid voltages, it is important to remember that these circuits often contain very high resistances, especially in the case of resistance coupled audio stages or intermediate radio frequency stages that are operated through automatic volume control action. When the resistance in the circuit is far greater than the resistance of the voltmeter being used, the voltage indicated will be only a small fraction of the true value. If no reading is obtained and it is desired to check the continuity of the grid circuit, the positive test lead may be inserted in the plate contact of the socket. If a test of the actual grid voltage is desired, it can be measured to best advantage directly across the grid bias resistor. This reading, of course, will not indicate the additional bias supplied by the automatic volume control.

The adjustment of the various tuned circuits of a radio set is a point which has been given very little attention by the serviceman. These adjustments, which are so vital to the proper performance of the receiver, are often disturbed through tampering and, in some cases, by mishandling in shipment. It is not always necessary to go over these adjustments when servicing a receiver, as the serviceman will usually know whether or not the set is operating at maximum sensitivity and selectivity, but in all cases the serviceman should

remember that his job is not only to correct the immediate trouble, but to place the receiver in the same condition as when it left the factory. The Philco All-Purpose Set Tester is ideally suited to making these adjustments in any receiver, as it covers the range of intermediate frequencies used in practically all superheterodyne sets on the market, as well as the broadcast range. It is also adapted for adjusting police call bands in sets provided with this feature—its frequency range extending to 2,000 K. C.

Tube Testing in the Home

The testing of tubes in the customer's home, and at the same time proving to the customer that new tubes are required, has been up to this time an unsolved problem to the serviceman. Exhaustive tests in the Philco Research Laboratories have shown that the mutual conductance of an amplifier tube in a radio set will vary in almost direct proportion to its effect upon the total amplification in the set. In other words, if a signal generator is connected to the input circuit of a receiver and an output meter to the output circuit, a variation in the mutual conductance of any one amplifier tube will produce the same amount of variation in the output meter. By comparing the readings obtained with any one tube in the set with a new tube substituted in its place, the condition of the tube being tested can be definitely determined. Our tests have indicated that when the mutual conductance of a tube varies more than 35 per cent. from the normal value it is no longer fit for service and should be replaced. As the output reading is directly proportional to this variation, the tube producing an output reading over 35 per cent. less than that obtained with a new tube should be rejected. Obviously, this method of testing tubes is equally suited to all amplifier tubes.

In testing rectifier tubes, an emission test will be satisfactory. It is not actually necessary to measure this current, as a plate voltage reading at one of the power output tube sockets will give just as satisfactory an indication.

Ohmmeter and Capacity Tests

In addition to making all of the tests which we have described, the Philco 048 Set Tester is equally adapted to the measurement of the characteristics of any individual part of a receiver. The ohmmeter, covering a range of 1 ohm to 1 ½ meg ohms, may be used for this purpose, or the A. C. Voltmeter in conjunction with a potentiometer may be used to measure the capacity of a condenser, ranging from .01 to 2 microfarads, as well as the inductance of choke coils or iron core transformer windings.

From this discussion it will be seen that the term "All-Purpose"—applied to the Philco 048 Set Tester—is not merely a name, but a complete and accurate description.

*The first half of this article on the method of using the Philco 048 All-Purpose Set Tester appeared in the October issue of the Philco Serviceman.

How to Obtain World-wide Radio Reception

THE PRIMARY FACTOR in the successful operation of Philco All-Wave Receivers is quality performance. These are quality receivers, and when a customer buys one of these de luxe Philcos he expects to get the very best in broadcast reception, as well as the best in short waves. It is up to the serviceman more than anyone else to see that the customer obtains everything to which he is entitled. The serviceman must instruct in the correct operation of the receiver, for unless the very best in broadcast reception is obtained and a number of short-wave stations are heard, interest in the receiver will be lost and the customer will be dissatisfied with his purchase. There is enough on the air in the fascinating field of short waves to arouse the keenest enthusiasm of every listener. London, Paris, Berlin, Rome and other European stations afford a real thrill to anyone. If the quality of these programs is good, the owner of the Philco All-Wave Receiver will be a real booster for Philco and for the serviceman.

Such reception is available to every one of these owners, providing the serviceman does his job properly in the beginning. It is necessary that the installation be made correctly. A good aerial for broadcast reception may not be particularly good for short-wave reception. It is most important that the short-wave aerial be away from large metal objects or other obstructions which may absorb the short-wave signals. It is further necessary that the lead-in wire be kept as far away from the side of the house as possible and that it be away from the ground wire and from any water pipes, which may produce a capacity loss to ground.

The Philco Three-Purpose Antenna System has been designed for broadcast reception and is not recommended for short waves. The Philco Short-Wave Antenna System is essentially a high-quality standard aerial kit, using the very best parts available for quality reception. The use of the Short-Wave Antenna Kit is highly recommended for every Philco Model 16 and Model 44 receiver. Remember that the aerial should be as high as possible and should be located at a distance from any large objects, such as metal

roofs, trees, etc. The lead-in wire must be short and should go directly to the receiver. The use of a flat window strip lead-in should be avoided for short-wave reception because of the high capacity loss. Use a porcelain tube.

Customer instruction on the operation of a short-wave receiver is just as important as a good aerial installation. Reception of foreign stations is obtained not on rare occasions only, but with a comparative degree of regularity. Such reception, however, cannot be heard simply by turning the dial. Tuning is extremely sharp. The comparatively small distance on the dial between 11 and 12 megacycles, for example, affords a greater tuning range in kilocycles than the entire distance from top to bottom on the broadcast dial. It is necessary to use one of the various short-wave station logs to know where to find the station; and it is also necessary to know *when* stations are on the air. In the eastern part of the United States, for example, it is almost impossible to hear any European stations after 7 o'clock in the evening, as almost all of them are off the air. It is midnight in London and 1 A. M. in most of Continental Europe. Let the customer know that he cannot expect reception at all times of the day and that he cannot tune a short-wave receiver as carelessly as he might a broadcast receiver.

Divide tuning time in the following manner: 23 to 15 megacycles from daybreak until about 2 P. M. From 15 to 9 megacycles stations to the East are heard from noon until about 10 P. M. and stations to the West are heard from 10 P. M. to shortly after daybreak. From 9 to 4 megacycles darkness is required to give the signal-carrying power. The above applies to distant stations only. Local and near-by stations may be heard at all hours, and there are many times when freak distant reception will be heard at odd times of the day or night.

Distant reception will be impossible if the compensating condensers have been tampered with. The Philco Model 091 crystal-controlled 3600-kilocycles signal generator must be used for making any adjustments of these condensers.

Intermediate Frequencies of Philco Superheterodynes

Model No.	Kilocycles
5	460
6	260
7	175
8	175
9	260
10	260
12	175 (code 121)
12	260 (code 122)
14	260 (code 121)
14	175
15	175
16	460
17	175
18	260
19	260
35	260
36	260
37	175
38	460
43	460
44	460
47	260
48	175
51	175
52	175
53	450
54	460
57	460
60	460
70	260
71	260
80	450
81	460
89	260
90	175 (PP 45 or single 47 output)
90	260 (PP 47 output)
91	260
111	175
112	175
470	260
490	175 (PP 45 or single 47 output)
490	260 (PP 47 output)

Action of Philco Delayed Automatic Volume Control Explained

IN THE NEW PHILCO MODEL 17 a more uniform level of volume under a greater variation in signal strength is obtained through the use of delayed automatic volume control.

The usual purpose of the automatic volume control is to reduce the sensitivity of a receiver in proportion to the strength of the signal being received. A strong carrier will have a maximum effect upon the AVC, resulting in a great decrease in the sensitivity of the set. A weaker signal will produce less AVC action and will not be reduced in intensity nearly as much as a stronger signal, so that the volume in the two cases will be practically equal. Ordinarily, an extremely weak carrier will operate on automatic volume control to some extent and will, therefore, produce less volume at the speaker than a moderately strong signal.

This latter tendency is eliminated in the Philco Model 17 by preventing automatic volume control action on very weak signals, permitting them to build up to the same volume as the stronger stations. In

other words, the receiver will operate when receiving an extremely weak signal just as though no automatic volume control were present. The point at which the AVC becomes operative is so selected that stations below a certain field strength will be received at approximately the same volume as stations which are just strong enough to operate the AVC.

In all Philco models equipped with shadow tuning the variation in the width of the shadow is an indirect result of AVC action. In the Model 17 a signal which is not sufficiently strong to operate the AVC will therefore produce no variation in the width of the shadow. When operating a set of this model, this effect will at once denote the reception of a station having very low field strength. While this condition is perfectly normal, as will be apparent from the foregoing explanation, the failure of the shadow to move on some of the stronger stations will indicate a defect in the antenna system and the need for correction at this point.

Questions and Answers

1 Q. Is it possible on some of the smaller Philco chassis to correct bent tuning condensers, caused by forcing a tight-fitting knob over the drive shaft, without replacing the condenser?

A. Yes. When the condenser is bent in this way, the rotor is forced back, causing the ball race to spread and the stop at the rear bearing to bend outward. In some cases the rotor plates actually short against the stator plates. With the chassis out of the cabinet the condition can be corrected by removing the ball race from the condenser frame and bending the spring portion of the ball race inward to its normal position. It is also necessary to remove the stop at the rear bearing and bend this part inward to its normal position. After these parts are re-assembled, be sure that the rotor plates no longer touch the stator plates. Now readjust the high-frequency, R. F., and low-frequency compensating condensers in accordance with the instructions given in the service bulletins.

2 Q. How is it possible to eliminate interference from commercial code stations transmitting on frequencies equal to or near the intermediate frequencies of Philco superheterodynes?

A. In the case of the Philco Model 16, such interference can usually be eliminated by tuning the wave trap for minimum signal from the interfering station rather than for minimum oscillator signal at 460 kilocycles, the I. F. of the receiver. If this does not correct the trouble, and in the case of Philco broadcast receivers which do not have a wave trap, it is necessary to lower the intermediate frequency of the receiver to a different value at which point no interference is present. In the case of a set with 460 kilocycles I. F., the I. F. service oscillator should be set at 440 kilocycles and the I. F. compensating condensers adjusted for maximum receiver output at this frequency. The high-frequency and low-frequency compensating condensers should then be readjusted so as to produce a 440 kilocycle I. F. instead of 460 kilocycles. In the case of a set with a 260 K. C. I. F., it is suggested that a change be made to 240 kilocycles in the same manner.

3 Q. On some of the earlier production of the Philco Model 38 battery receivers, is it possible to increase sensitivity?

A. Yes. Those few sets of the early production which seem to be weaker than standard can be corrected by reversing the connections to the primaries of both I. F. transformers and then readjusting the I. F. compensating condensers.

PHILCO RADIO & TELEVISION CORPORATION

218 Fremont Street

San Francisco, Cal.

PHILCO

REG. U.S. PAT. OFF.

Radio Service

TEST EQUIPMENT

**SIGNAL GENERATORS AND METERS
FOR EVERY SERVICE REQUIREMENT**

Philco has designed a complete line of quality test equipment. All of the equipment illustrated and described in this folder is built in the Philco factories and is subject to the rigid engineering inspection standards of Philco. The prices are extremely low because Philco is able to build in quantity at the highest quality standards. Philco has gone to the servicemen through Radio Manufacturers Service to determine the exact type of equipment needed for high quality and speedy service tests. The test units presented in this folder are the result of years of service experience and contact between Philco and the serviceman on the job.

Prices Effective June 15, 1934. Subject to change

PHILCO

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TORONTO

PHILADELPHIA

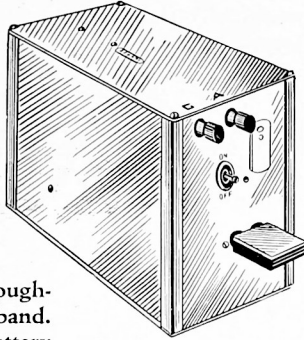
LONDON

PHILCO TESTING EQUIPMENT AND TOOLS

Philco Short-Wave Signal Generator Model 091

Modern radio means short wave and standard broadcast combined—be prepared to service these sets.

Crystal controlled signal generator for the adjustment of short wave converters and receivers. Furnishes a constant and accurate 3600 KC modulated signal, the harmonics of which can be used for adjusting throughout the short-wave band. Uses a 4½-volt "C" battery and a 45-volt "B" battery, both contained in the case.

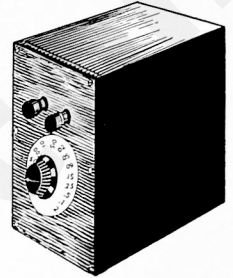


Serviceman's Net Price, complete with 3600 KC crystal, batteries and two Type 30 tubes\$36.00

Philco Condenser Test Box Model 093

Test condensers quickly by substitution method.

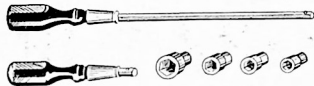
A convenient switch box designed for use in testing by-pass condensers in all receivers by the substitution method. Contains 15 different fixed condensers, which can quickly be connected through a multipolar switch to obtain desired capacities from .00025 mfd. to 2 mfd. Two binding posts on the box provide the necessary connections for external test leads.



Serviceman's Net Price\$8.64

Philco Socket Wrench Kit

Will handle all commonly used sizes of nuts, bolts, screws used in radio work.



A kit of four sockets and two handles, long and short, for hex head nuts, screws and bolts. Specially hardened steel of the highest grade. Kit contains the following parts: 1 handle (long); 1 handle (short); one socket, ¼"; one socket, 5/16"; one socket, 3/8"; one socket, 7/16".

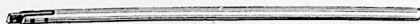
Part No. 7016—Wrench Kit Complete—Net Dealer Price\$1.65
Part No. 7019—¼" socket only—Net Dealer Price12
Part No. 7020—5/16" socket only—Net Dealer Price12
Part No. 7021—3/8" socket only—Net Dealer Price12
Part No. 7022—7/16" socket only—Net Dealer Price12

Philco Special Adjusting Tools

For Adjusting Padding Condensers



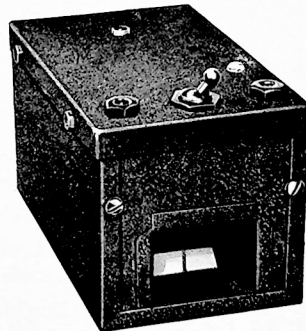
Part No. 3164. Fibre Wrench for hex head adjusting screws. 8" long. Net Dealer Price\$0.12



Part No. 27-7059. Insulated Screw-driver, Fibre shank, 7" long, 1/8" steel blade. Serviceman's Net Price\$0.36

Philco Shadow Output Meter Model 012

An essential output indicator for adjusting receivers.



Something new for the serviceman—An inexpensive output meter with the accuracy and convenience of PHILCO shadow tuning. Connects to the output tube of any radio set. Affords an accurate indication of output volume when adjusting compensating condensers.

Maximum shadow width indicates maximum signal—strong signal produces a wide shadow and weak signal a narrow shadow. Width of shadow is directly proportional to signal strength, thus permitting accurate adjustment of radio by means of shadow indication. Can be connected to plate and cathode prongs of output tube or across two plates of push-pull output using clips and leads provided. Makes an ideal output meter for use with the PHILCO 024 or other signal generator.

Serviceman's Net Price\$7.50

PHILCO CIRCUIT TESTER

• MODEL 025 •

A.C. VOLTS—D.C. VOLTS—MILLIAMPERES—
AMPERES—OHMS—OUTPUT METER—
CAPACITY METER

The latest addition to PHILCO'S line of testing equipment—an accurate, compact tester for all types of radio sets. Affords simple and quick tests by means of resistance, voltage and current methods.

Modern radio test methods require a unit of this kind for speed, simplicity and accuracy. The many different applications of the meter and the convenient rotary control switch make this instrument unusually valuable to the serviceman, both for outside and shop service work.

Serviceman's Net Price \$36.60



Philco Model 025

5 A. C. Voltage Ranges: 0-10 volts; 0-30 volts; 0-100 volts; 0-300 volts; 0-1000 volts. 5 D. C. Voltage Ranges: Same as A. C. Ranges listed above. 5 Output Meter Voltage Ranges: Same as A. C. Ranges listed above. 3 Millammeter Ranges: 0-1 Mil.; 0-10 mils.; 0-100 mils. Special 10 ampere shunt available for automobile radio current tests. 3 Ohmmeter Ranges: 0-1½ megohms; 0-15000 ohms; 0-150 ohms. Meter adaptable for capacity tests. Rotary Switch controls all meter ranges and connections. All necessary Leads, Adaptors and Batteries furnished complete.



Philco 024 Signal Generator

A compact, smoothly operating and beautifully finished instrument. Frequency-range scales and designations of controls are etched in brass and lettering on black panel. Top, sides and back have special black "crackle" finish. Brass handle provides easy portability. Ball-bearing tuning condenser provides extremely fine adjustment. Shielded antenna lead with Universal clip included for connection to receiver. The "A" battery is held in place by a special spring cap, removable without tools. Entire instrument mounted on special felt feet. At the price quoted, no serviceman can afford to be without one.

PHILCO SIGNAL GENERATOR

• MODEL 024 •

INTERMEDIATE AND BROADCAST FREQUENCIES

The Model 024 Philco Signal Generator is a complete, self-contained, accurately calibrated instrument, designed to cover all frequencies from 105 K. C. to 2000 K. C. All necessary batteries and tubes are included within the container. No external connections of any kind required.

Modern Superheterodynes cannot be adjusted properly without a high-grade signal generator, but many servicemen have been unable to pay the high prices previously asked for quality equipment. The PHILCO MODEL 024 now makes it possible for every serviceman to own a high quality Signal Generator at a figure about equivalent to the sum collected on his first six RADIO MANUFACTURERS SERVICE jobs.

MODEL 024 SIGNAL GENERATOR

Complete with Batteries and Tube

Serviceman's Net Price \$13.50

PHILCO ALL-PURPOSE SET TESTER

• MODEL 048 •

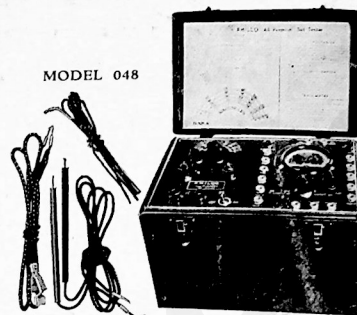
PORTABLE! . . . COMPACT! . . . ACCURATE!

CIRCUIT TESTER + SIGNAL GENERATOR

Handles every Service Job and meets all Testing Requirements from the Crystal Set up to the latest Super with duo-diode-triode tubes. Will not become obsolete with future radio developments.

- | | |
|-----------------------------|--|
| 5 A. C. Voltage Ranges | Complete Tube Test |
| 5 D. C. Voltage Ranges | Variable Frequency I. F. and R. F. Signal Generator from 105 K. C. to 2000 K. C. |
| 3 D. C. Milliammeter Ranges | |
| 3 Ohmmeter Ranges | |
| 5 A. C. Output Meter Ranges | All Test Prods, Leads, Batteries, Tube, etc. included— |
| Capacity Meter | |

Serviceman's Net Price Complete \$48.60



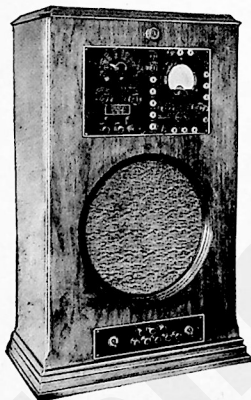
READ THESE SPECIFICATIONS!

Twenty-two meter ranges and signal generator at a price made possible by Philco laboratory design and construction. Rugged instrument—easy to read, quick change of scales, no danger of taking false readings. Accurate signal generator, calibrated in K. C. on the instrument panel (no graphs to consult). Finest type precision movement meter. All test leads designed to simplify your service job. Real universal clip for connections of screen grid tubes or antenna post, sturdy test prods designed for long service. New exclusive Philco output circuit adapters, will fit 4-, 5-, 6-, 7 and 8-prong sockets, connect output meter to any type output circuit without removing tubes from chassis. All leads plug into tester panel.

PHILCO UNIVERSAL TEST CABINET

• MODEL 059 •

BUILT-IN POWER SPEAKER WITH EXCITER
ELIMINATES BRINGING IN THE CUSTOMER'S SPEAKER
ABSOLUTELY UNIVERSAL—TESTS ANY RADIO



SPECIFICATIONS OF MODEL 059

Auditorium speaker capable of handling up to 15 watts, or the full output from the most powerful modern receivers. Speaker may be operated from sets having either single or push-pull output tubes. Field exciter, including type 80 tube, built into the tester. Four dummy fields built in for connecting in place of speaker on set being tested. Output meter on panel can be immediately connected to set by turning the switch at the top of the cabinet. Complete facilities for every necessary test to a receiver are provided in the "All-Purpose" tester, which is built into the Universal Test Cabinet.

Dimensions: Height, 27 1/4 in.; width, 18 in.; depth, 9 in. Weight (with batteries), 62 lbs.

Designed especially for members of Radio Manufacturers Service, this De Luxe Complete Testing Cabinet presents an unusually rich appearance, commanding immediate interest and respect by the customer and public. In addition to being in the most convenient and economical form for high-speed testing, its appearance alone will add prestige to your place of business. Precision-built, and housed in an artistic cabinet, it is bound to return ample dividends on your investment.

Everything a Well-Equipped Service Department Needs:

- | | |
|---|---|
| Built-in 15-watt Speaker, for radio chassis test. | 3 D. C. Milliammeter Ranges. |
| Universal Speaker Plug and Socket, with necessary Cables. | 3 Ohmmeter Ranges. |
| Signal Generator, variable 105 to 2000 K. C. | 5 A. C. Output Meter Ranges. |
| Visual and Audible Output Indicators. | Capacity Meter. |
| 5 A. C. Voltage Ranges. | Tube Tester. |
| 5 D. C. Voltage Ranges. | Necessary Tubes and Batteries included. |
| | All Necessary Connecting Leads, Test Prods and Adapters included. |

No longer necessary to have many types of extra speakers available to test chassis. The built-in speaker in the Model 059 automatically eliminates this expense and bother. Strictly Universal Speaker Plug and Socket.

Cuts your trouble in half. Now you can remove only the chassis on service calls.

TESTS A. C. SETS, BATTERY SETS, AUTO SETS.

Complete . . . Convenient . . . Attractive . . . Efficient
Serviceman's Net Price Complete \$90.00