PHILCO SERVICEMAN

• SERVICE · NEWS · FOR · PHILCO · DEALERS •

OCTOBER 1932

Reducing Radio Noise Interference

THE reduction of interference noises or man-made static is an important factor in the sale of modern radio, particularly in the congested areas. Many people in these sections refuse to have a radio in their homes because of the electrical noises which are invariably present when the listener wants to hear a favorite program.

There are several known facts about radio noises which should be thoroughly understood by every radio dealer and serviceman before he tries to talk intelligently to a customer on the subject. Get these facts now:

1. Regardless of advertised claims, there is no method or device known to radio science which will eliminate natural static. Static is produced by electrical interference in the atmosphere, and is carried through the air in much the same way as radio from a broadcasting station. It can be reduced in some instances by means of a tone control.

2. Man-made static is produced by various kinds of electrical machines and motors, trolley lines and high tension power lines. It can be reduced in most cases and in many instances can be completely eliminated by filtering, shielding, and by proper erection of the aerial.

3. Man-made static which is picked up on the flat portion of the aerial cannot be eliminated any more than natural static except by moving the aerial farther away from the source of interference, or by suppressing the interference at its point of origin.

4. Man-made static cannot be eliminated by connecting any kind of a device to the power cord of a radio receiver. This type of interference is radiated from the particular power line in which the interfering noise originates. It is carried through the air and is picked up in the aerial and lead-in wires just the same as any other radio signal. A certain amount of this noise does come in on the power line to the radio set, and can be suppressed; every Philco radio is equipped with a line condenser built into the chassis for this purpose.

5. The only correct way to eliminate man-made static is to suppress it at its source. For example, radio noises produced by an automatic oil burner can be reduced by placing a suitable filter unit at the motor and automatic switch terminals, but the same filter would be worthless if placed at any other point in the power line.

6. Shielded lead-in wire, either with or without impedance changing devices to reduce losses, will not eliminate or even reduce man-made static which is picked up in the aerial. For this reason, a shielded lead-in is of little or no value in reducing noise in the average home installation. The only condition under which shielding has any effect in reducing noise is where the lead-in wire passes close to interference-carrying power lines, either inside or outside the building. A greater percentage of this noise is picked up in the lead-in wire than in the aerial wire; thus if the lead-in is shielded by means of a grounded metal covering, the interference will be reduced.

7. Ordinary shielded lead-in produces a definite loss in signal strength for which compensation must be made in the form of a higher and longer aerial to afford greater pickup of signal.

8. A good outside aerial installation produces less interference noise in the receiver for a given volume of music than a faulty installation or an inside aerial. This is true of every radio from the cheapest to the most expensive. With a good aerial, the radio set can be operated at a lower volume control setting for a given volume in the speaker than it can with a poor aerial. This means that the receiver does not have to work so hard to bring in the signal. Hence the amount of interference noise which is picked up is reduced proportionately.

Summing up all of the above points, it is obvious that the noise of natural static cannot be eliminated, but that the performance of any radio set can be improved from a noise standpoint by the correct application of filter units and the use of a good aerial installation, in some cases with shielded lead-in wire. When so installed, even an inexpensive set will give performance equal to

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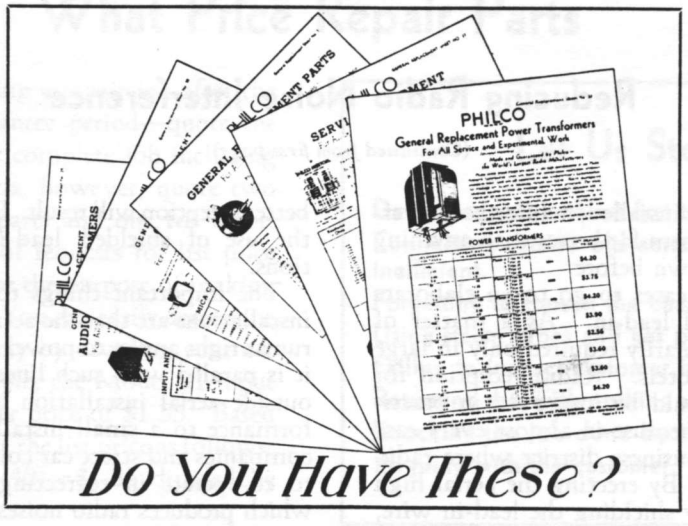
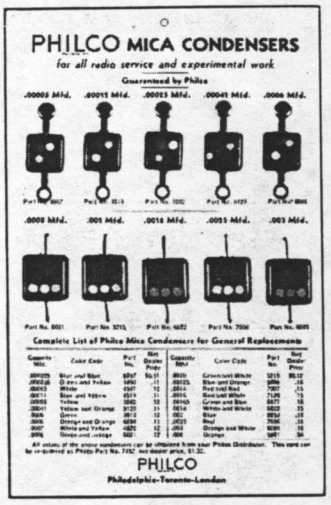


New Philco Parts Kits



Philco Mica Condenser Kit

PHILCO has just announced three new parts kits for general service and replacement use. The new Mica Condenser kit comprises ten small mica condensers ranging in capacity from .00005 Mfd. to .003 Mfd. These condensers are attractively arranged on a card holder convenient for carrying in the tool bag on the job or for hanging on the wall in the service shop. The Philco Mica Condenser card complete sells at a net dealer price of $1.32.

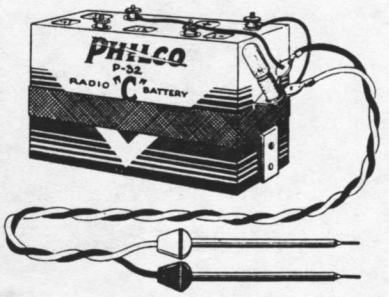
Another Philco condenser kit consists of fifteen of the most commonly used by-pass condensers in the black bakelite housing. These range in capacity from .01 Mfd. to .18 Mfd. These condensers are also mounted on a card which, in turn is packed in a cardboard box. The kit complete with fifteen condensers and mounting screws sells at a net dealer price of $1.81.

The third new kit is a group of five Philco volume controls, for general replacement use. These range in resistance value from 5,000 ohms to 1,000,000 ohms. This kit complete sells at a net dealer price of $3.57.

These three new kits and the Philco Resistor kit are extremely popular with the serviceman. They afford a complete and handy assortment of the most commonly used parts for general replacement work.

A Convenient Coil Tester

A CONVENIENT and inexpensive tester for the quick location of trouble in r.f. coils can be made with a 2.7 volt pilot light (Philco part 3463), two flashlight cells or a 4½ volt C battery, a pilot light socket, and a pair of test leads.



R.F. Coil Tester

The two flashlight cells are connected in series, and the terminals then connected to the pilot light socket. If the C battery is used, connection is made across the 3 volt terminals. When the unit is not in use, the light can be unscrewed in the socket until it does not make contact. The test leads are connected across the two pilot light socket terminals.

A shorted coil which could not be located conveniently with a voltmeter or ohm meter in a continuity test can be located readily with the pilot light test. Touching the test prods across the terminals of the coil having a direct short is equivalent to putting a short across the battery, and the pilot lamp will not light. If the coil is O.K., the lamp will decrease in brilliancy slightly when the test prods are touched across the coil terminals since this condition is equivalent to placing an additional resistance load across the battery. If the coil is partially shorted, the lamp brilliancy will be less than that obtained with a known good coil. If the coil is open or if it has an extremely high resistance, no change in brilliancy will be noted when the test prods are touched across the coil terminals.

Reducing Radio Noise Interference

(Continued from first page)

many larger sets carelessly installed, while the powerful and costly set will perform far better than anything the customer has ever known before.

It is unnecessary in all cases to go to an elaborate installation using shielded lead-in. As a matter of fact, such shielding is ordinarily required only in large apartment buildings or hotels. Radio reception for demonstration purposes could be improved in practically every dealer's store because in almost every case the store is located in a business district where radio noises are at their worst. By erecting the aerial high above these noises, and by shielding the lead-in wire, better reception will result. Philco has always advocated the use of shielded lead-in wire in such installations.

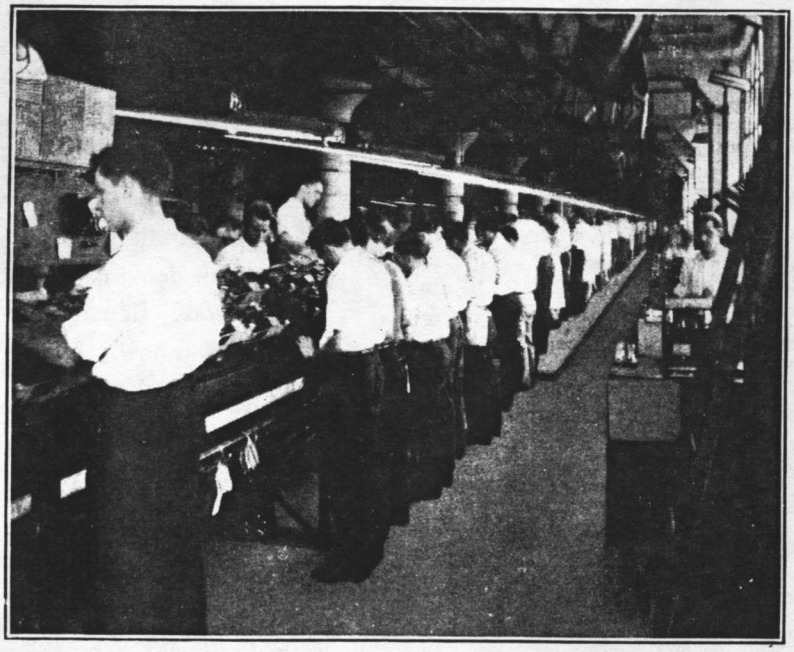
The important things to remember in your home installations are that the aerial picks up less noise when run at right angles to power and trolley lines than when it is parallel with such lines; that a carefully installed outside aerial installation always gives superior performance to a small installation; that electric power companies and street car companies are always willing to co-operate in correcting faulty power equipment which produces radio noises.

Assuring Philco Quality

THE next time you open a shipment of Philco Radios, should you find one that does not operate, do not be too hasty in blaming the Philco factory for turning out poor merchandise. Just remember that the set has taken a lot of punishment in the freight shipment from the factory to you and that it is possible for some slight fault to develop during this time. You must admit that the number of such sets is small and that only on the rarest occasion do you find anything seriously wrong.

There is a story in back of Philco quality which is the chief factor in Philco's success and leadership in the radio industry — that is the story of Philco's quality manufacturing and inspection methods. Space does not permit our giving you the complete picture, but here are some of the outstanding facts:

Raw materials are purchased in accordance with rigid Philco Engineering specifications and are inspected, upon arrival at the factory, in accordance with these same specifications.



One of the three main assembly lines in the Philco factory. The chassis starts at the beginning of this line, which is 365 feet in length, as a bare sub-base. As the slow moving belt conveyor carries the base along, trained operators perform the various assembly, wiring and inspection jobs. When the chassis comes off at the end of the line it is completely assembled, wired, and tested.

Individual parts are inspected at various intervals during the course of their assembly, and are given a final inspection and test before being sent to the chassis assembly lines.

Complete speakers are tested electrically and mechanically both before and after they are mounted in the cabinets.

Each operator

(*Continued on page 4*)

What Price Repair Parts

MOST dealers when making a repair job after the expiration of the guarantee period—quote the customer a flat charge for the complete job including parts and labor. Some dealers, however, quote two separate prices—one for the parts and one for labor. We have received a number of requests for list price information on Philco parts for the purpose of making up quotations on repair jobs. You can easily determine the list price of any part simply by dividing your net dealer price by .6. For example, the Model 91 input transformer sells at a net dealer price of $1.35. Based on a 40% discount, we calculate the list price as follows:

$1.35 divided by (1.00 — .40) = $1.35 divided by .6 = $2.25.

Let Us Stop —

Delivering sets without first testing them.
Connecting sets to old aerials that are noisy and inefficient.
Forgetting to loosen the chassis hold down bolts.
Using steam pipes and gas pipes as ground.
Failing to instruct customer in correct operation.
Returning sets with nothing wrong but a tube.
Knocking the job done by the last serviceman.
Arguing with the customer.

Assuring Philco Quality

(*Continued from page 3*)

on the main chassis assembly line has his own particular job to perform in the assembly or wiring of the chassis as it slowly moves past him on the moving belt conveyor. A penalty is imposed on the operator for every unsoldered joint or missing wire. There is an inspection for an average of every six operations along the chassis assembly line.

At the end of the assembly line, continuity test by trained radio men using specially developed meters assures the correctness of wiring.

Final chassis test after the tubes are placed in their sockets includes adjustment of all compensating condensers for best operation with the particular set of tubes; and complete testing of sensitivity, selectivity, and general performance of the radio chassis.

Final test, after assembly in the cabinets, includes mechanical and electrical inspections and playing of sets on stations at five different points on the dial.

Check inspection—a percentage recheck—further assures quality output by affording a running check on each final inspector's work.

Sales acceptance test under the direct supervision of the Engineering Department assures constant adherence of the factory to Engineering quality standards.

PHILCO TRANSITONE

Three new motor radio suppressor kits such as used in all standard Transitone installations are now available. These kits are made up with the necessary parts for a four cylinder car, a six, and an eight. The small kit consists of four spark plug resistors, a distributor resistor, and two 1 Mfd. suppressor condensers. The larger kits contain the same equipment plus the necessary additional spark plug resistors. The four cylinder kit sells at a net dealer price of $2.70, the six at $3.30, and the eight at $3.90.

These kits will be found indispensable to the serviceman doing motor radio installation and service work. Be sure to obtain your necessary requirements now.

Questions and Answers

1. Q. What are the factors in the circuit of the new Philco Model 37 Superheterodyne battery receiver which are responsible for the marvelous tone and volume of this model?

A. The new Philco type 19 tube is one of the most important features. This is a class B amplifier, and is a push pull tube having two control grids and two plates. The volume which is thus available is equal to that afforded by two separate tubes in a push pull class B amplifier circuit.

The new Philco permanent magnet dynamic speaker used in this model is far in advance of any speaker of this type ever before developed. The special magnet construction gives a speaker field strength practically equal to that of a dynamic speaker in an A.C. operated set. The new cone construction is extremely light and strong affording excellent response at all musical frequencies. The air gap between the voice coil and the magnetic field is extremely small so that all of the available magnetic energy is utilized to produce greater speaker efficiency.

2. Q. Can the present Philco Model 095 oscillator be altered so as to provide a 450 K.C. signal for adjustment of the intermediate frequency stages in the Model 43?

A. Yes. This can be done by adding a compensating condenser and a snap switch to the circuit. Complete information from the Service Department is available to those interested.

3. Q. Can substitutions be made in the case of Philco bypass condensers in the black bakelite containers?

A. It is possible in practically all cases to substitute one part for another when the only differences are in the terminal lug arrangement. For example, part 3615-W can be substituted for part 3615 AE since the only difference between these two is in the arrangement of the terminals. All 3615 condensers are .05 Mfd.; the letter after the part number indicates the terminal arrangement, twin condensers, and wire wound resistor combinations. Part 3903 is .01 Mfd.; part 3793 is .015 Mfd.; and part 4989 is .09 Mfd. A complete list of these condensers with their terminal lug arrangement is shown on page 16 of the Philco parts catalog.

4. Q. Can Philco shadow tuning be used as an indicator when adjusting the antenna, high frequency, and low frequency condensers?

A. Yes. Shadow tuning operates on the carrier of a station, and unlike an output meter, it is independent of any variations produced by voice or music. Thus if a station of known frequency is tuned in at or near 1400 K.C., the high frequency and antenna condensers can be adjusted for minimum shadow width when the dial reading is set at the correct station frequency. The same adjustment can be made on the low frequency condensers by tuning in a station near the low frequency end of the dial.

5. Q. How can the ratios of Philco input and output transformers be obtained?

A. This information is contained in Philco General Replacement Sheet No. 29. All of these sheets contain complete technical information on all the parts listed. If you do not have your copies, they can be obtained from the Service Department.

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SUPPLEMENT TO

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Circuit Description Philco Model 15

By David Earnshaw, Philco Research Department

THE Model 15 Receiver is an 11 Tube Superheterodyne embodying all the best features known in radio set designing.

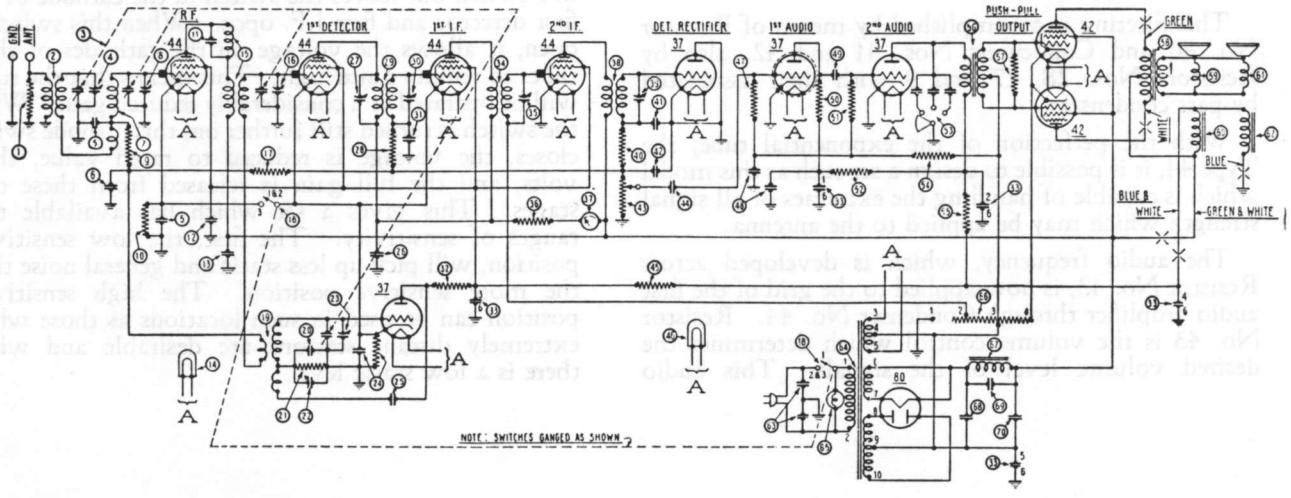
The analysis of the circuit should be followed on the wiring diagram shown in Figure 3 of Philco Service Bulletin No. 130, reproduced below.

The antenna is connected to Coil No. 2 which is shunted by Resistor No. 1. Coil No. 2 and No. 7 comprise what is actually termed a "Pre-Selector Circuit", that is, the signal which is applied to the first 44 Tube is very carefully selected from unwanted signals by means of two tuned circuits. These two circuits are coupled by means of the small coil at the bottom of No. 7. The signal being applied to the 44 Tube is amplified and the signal in the plate circuit is coupled to the secondary of Coil No. 15 by means of two primaries.

The top primary in the diagram is tuned by Condenser No. 11. These two primaries are used in order to secure uniform amplification throughout the range of frequencies covered by this set. Also coupled to Transformer No. 15, is the Oscillator Coil No. 19. At this point the signal is heterodyned against the local oscillator in the set to produce the heterodyne frequency which will be amplified by the I.F. system.

In this receiver, the oscillator will always be tuned to 175 Kilocycles higher than the incoming signal. This oscillator circuit is rather unique, in that it gives a uniform output over the broadcast frequency band. This is accomplished by the fact that the circuit combines both inductive and capacitive coupling by means of the Plate Coil and Series Condensers Nos. 20 and 22. By using this circuit, no danger of overloading the first detector is encountered by having too strong oscillator voltage at one end of the band. This oscillator is also of the fixed bias type, thereby keeping harmonics generated in the oscillator to a very low order.

The resultant frequency, which is generated when the signal and the oscillator beat together, appears in the plate circuit of the first detector and is amplified by the first I.F. amplifier stage. The transformer feeding



Wiring Diagram Philco Superheterodyne Model 15

this first I.F. Tube is a double tuned transformer in order to obtain a very high order of selectivity. It is tuned both primary and secondary so that none other than the desired frequency can be amplified by the first tube.

A pure signal thus being obtained in the I.F. Amplifier, this signal is amplified by the two succeeding stages which are tuned only in their secondary circuit. By tuning only the secondary circuit and properly designing the transformer, an I.F. system can be made which does not cut as many side bands as would be cut by an I.F. system in which both primary and secondary coils are tuned. The question as to whether all transformers must be tuned both primary and secondary, must be answered by the amount of total selectivity required in the set.

The signal has now reached the stage where it must be converted into its audio modulation, that is, demodulated. This is accomplished in the Type 37 Detector Rectifier. This tube, when connected in the manner shown, is a Diode Rectifier, that is, any signal which is impressed upon it is directly proportional to the output. This means that when receiving a given signal and the modulation is increased, the audio output will go up in direct proportion. This is a very important feature which is very difficult to obtain except by using a diode type rectifier.

At the same time that this signal is rectified, two components are developed in Resistors Nos. 40 and 43. One is the D.C. component and the other is the audio frequency envelope which was impressed upon the carrier. This D.C., which is generated, is proportional to the strength of the carrier voltage which is being developed on the diode rectifier. Therefore, if this D.C. voltage is fed back and allowed to control the grids of the R.F. and I.F. Amplifiers, it will tend to make the voltage which is developed across the diode constant for all signal levels impressed between antenna and ground. Of course this voltage, which is generated in the diode, contains a certain amount of the intermediate frequency which must be filtered out before it is applied to these tubes.

This filtering is accomplished by means of Resistor No. 40 and Condensers Nos. 41 and 42, also by Resistors Nos. 28, 17 and 9 with their associated by-pass condensers.

With the perfection of the exponential tube, the Type 44, it is possible to design a set such as this model which is capable of handling the extremes of all signal strength which may be applied to the antenna.

The audio frequency, which is developed across Resistor No. 43, is now applied to the grid of the first audio amplifier through Condenser No. 44. Resistor No. 43 is the volume control which determines the desired volume level of the signals. This audio frequency is amplified by the first and second audio tubes which are resistance coupled in order to secure good frequency characteristics. It is then applied through the push-pull transformer to the grids of the push-pull 42 Tubes, and thence to the speakers.

The tone control on this set is accomplished by placing various capacity condensers (53) across the plate of the second audio tube.

On this model there is incorporated shadow tuning, that is, an indicator which will show when the set is correctly tuned. This is accomplished by placing the device so that it receives the plate current of the first I.F. and the first detector circuits.

As can be seen from the previous discussion regarding the action of the automatic volume control, a variable voltage is applied to the grids of these tubes in order to accomplish automatic volume control. This causes the variation in gain in these circuits which is accompanied by a variation in plate current. Therefore, as the signal is tuned through when tuning the gang condenser, the voltage developed in the diode circuit reaches a maximum when the signal is correctly tuned. Consequently this means that the plate current in the first detector and I.F. Tubes will reach a minimum for that given signal when the carrier is correctly tuned. This is indicated by the width of the shadow in the shadow tuning box; the smaller the shadow, the lower is the current in these tubes.

As can be seen from this explanation, the width of the shadow is dependent entirely upon the strength of the carrier of the transmitting station. When a distant station is tuned in, the carrier voltage is much lower than when a local station is tuned. Therefore, when the set is correctly tuned for either signal, that is, when it is tuned to a minimum shadow width for that signal, the two widths will be different in proportion to their signal strength.

There is also embodied in this receiver, a two position sensitivity control. This is Switch No. 18. The first position in the rotation of this switch closes the line switch but leaves the switch in the cathode of the first detector and first I.F. open. When this switch is open, it allows the voltage on the cathodes of these tubes to remain quite high. This means that the tubes will be operated at a considerably reduced gain. When the switch is turned still further on, this cathode switch closes, the voltage is reduced to rated value, three volts, and the full gain is released from these two stages. This gives a set which has available two ranges of sensitivity. The first, the low sensitivity position, will pick up less static and general noise than the more sensitive position. The high sensitivity position can be used in such locations as those where extremely distant stations are desirable and where there is a low static level.