PHILCO SERVICEMAN

• RADIO · MANUFACTURERS · SERVICE · NEWS •

OCTOBER, 1933

Radio Manufacturers Service Schools A BIG SUCCESS

THE SERVICE SCHOOLS which have recently been conducted by various Philco distributors throughout the country in connection with Radio Manufacturers Service were highly successful and have firmly established Radio Manufacturers Service with every serviceman and every Philco distributor.

A complete discussion of the plans and requirements for Radio Manufacturers Service was given at these meetings. The response on the part of servicemen was universal, for in every case the men realized that here at last was a real organization which could be of help to the serviceman and to the service dealer. In addition to the discussion of Radio Manufacturers Service, information was given on various ways for the serviceman to increase his income. Advertising in newspapers and direct mailing was suggested and practical examples were given. Suggestions for the serviceman to sell antenna installations, interference campaigns, as well as to merchandise his own services were explained in detail. Reports from all sections of the country have shown that the schools were highly appreciated, and the information that they offered was of great value to every serviceman present.

The first big step in publicizing Radio Manufacturers Service was taken when the Philco instruction sheets which are shipped with each new model from the factory went out with a paragraph referring the customer to Radio Manufacturers Service when his set was in need of attention. The second step in this publicity campaign took place on Monday night, September 18th, when Boake Carter announced Radio Manufacturers Service to the public for the first time. Mr. Carter explained briefly what Radio Manufacturers Service was and what it meant to the radio owner. These are just a few of the many plans which Philco has for the advancement of Radio Manufacturers Service in the radio industry.

Boake Carter, who first announced Radio Manufacturers Service to the public on September 18, 1933.

The technical discussions which were given during the service schools were greatly appreciated by all servicemen in attendance. A complete description of the new Philco Model 16 circuit was offered, as well as detailed information on such additional Philco features as interstation noise suppression, delayed automatic volume control, Philco balanced power class "A" amplification and detector oscillator circuits.

A complete discussion of the uses of the Philco 048 set tester was given and an explanation made of the methods employed by the Philco National Service Station in checking all radio sets by means of the 048 set tester.

Reports from many places indicated that it was difficult to close the service meetings because of the intense interest which existed during the session. Altogether the Radio Manufacturers Service School has been of the greatest value and of utmost success in every distributing center throughout the country. Philco extends its best wishes to all dealers and servicemen for a prosperous and successful radio season.

Trouble Shooting With the Philco Model 048 All-Purpose Set Tester

THE subject of simplifying radio trouble shooting is a timely one. The increasing complication of radio receivers and tubes during the past few years has, in many cases, made the serviceman's methods, as well as his test equipment, obsolete. Many of the various new tubes introduced recently do not submit to the methods of testing previously used with simpler types. In addition to these factors, the economic conditions confronting the serviceman have also changed. At the present time he finds himself in a highly competitive field, where the demands upon his ability are greater and where the financial return for his services is more limited.

Most service problems are really very simple and others can be greatly simplified by the use of the right kind of test equipment in a commonsense or logical manner. The up-to-date serviceman's test equipment must be complete, but yet sufficiently simple and basic that it will not become obsolete with every improvement made in receivers or tubes. In fact, the most complicated sets can be tested to best advantage with simple equipment.

Besides the continual cost of replacing obsolete test equipment there is often a natural reluctance on the part of the serviceman to changing his testing device after having become accustomed to it through constant use. For quite some time Philco has stressed the importance of obtaining voltage readings in a chassis by means of a simple voltmeter rather than through the use of plug-in adaptors. The cables connected with these adaptors on account of their high capacity between leads will often cause oscillation in high-gain amplifier stages, resulting in readings that are misleading. It is difficult enough for most servicemen to make proper allowances for high resistances in various circuits when taking voltage readings without having to calculate the complicated effects of oscillation produced by the wrong kind of test equipment.

A testing device that will be perfectly adapted to every conceivable test that may be necessary in radio servicing need consist only of a voltmeter and an oscillator. In testing a superheterodyne receiver, a calibrated oscillator covering the various intermediate frequencies used in sets of this type, as well as the broadcasting range, is an absolute necessity. Trying to test a receiver of this type without an oscillator is like groping in total darkness. A voltmeter with a sufficient number of scales to read all of the D. C. and A. C. voltages found in a radio set is of equal importance. If this instrument is also adapted for measuring resistance, it will complete the equipment needed for testing any type of radio receiver.

Probably the most exacting test of a serviceman's equipment is in the customer's home. Of course, it is not the equipment that is judged by the customer, but the serviceman's ability to use it intelligently and effectively. For shop use almost any equipment that will ultimately provide results may be satisfactory, but under the eyes of the customer the serviceman's test equipment plays an important part in his progress, from a business standpoint. It stands to reason, therefore, that the equipment which will simplify the serviceman's work will pay large dividends on his investment. A consideration of the problem of servicing a radio in the home will present a clear picture of the ideal test equipment and will also show how well the new Philco 048 Set Tester meets these requirements.

Trouble finding in the customer's home is usually a matter of locating the exact cause of the trouble in as short a time as possible and of making the necessary repairs if the trouble is of a simple nature. In order to eliminate unnecessary testing, it is advisable to first determine the approximate location of the trouble. The usual procedure is to first eliminate the audio amplifier as a possible source of the trouble. This may be done by such simple methods as checking the click produced in the loud speaker as one of the audio amplifier tubes is removed or replaced in its socket. A serviceman soon becomes accustomed to the intensity of the click to be expected as the plate circuit of any of these tubes is broken or re-established. Noting the amount of hum produced by touching the control grid of the detector tube also provides an indication of the functioning of the audio amplifier. Any trouble indicated at this point can be followed by a few voltage tests that will quickly run down the trouble.

Although these simple methods are satisfactory for quick tests, a more positive indication can be obtained by the use of a signal generator and output meter such as the Philco 048 All-Purpose Set Tester. By connecting the signal generator to the grid of the detector tube, the operation of the audio amplifier as a whole can be checked. For a visual test the output meter can be conveniently connected to the plate of one of the power output tubes and to the chassis ground. If no output reading is obtained, the plate connection to the output meter can be transferred to the plates of the preceding audio amplifier tubes to determine which stage is at fault. If an output reading is obtained at the first stage but not at the power output stage, the trouble will be found in the last stage.

After the audio amplifier has been tested, the oscillator coupling lead can be moved to the grid of the preceding intermediate or radio frequency

amplifier tube. This procedure can be followed through to the antenna stage and finally to the antenna connection itself. It is only necessary when making these tests to have the signal generator tuned to the frequency of the grid circuit to which it is connected. When the trouble has been localized to the stage at fault it is a simple matter to follow through that part of the set with resistance or voltage tests to find the actual cause of the trouble. Voltage or resistance measurements will not indicate defective parts in all cases. In the case of an intermediate frequency transformer, for example, if the coil has but very few shorted turns, no appreciable difference in its resistance will be noted. In attempting to tune this circuit, however, it will be found that a peak cannot be obtained with the padding condenser, regardless of how few turns are shorted. When making the individual stage tests with the signal generator adjusting the padding condenser in the stage being tested will reveal any defect in the elements of the tuned circuits. Obviously, this is one of the reasons an oscillator is an absolute necessity, especially when testing superheterodynes.

(To be continued next month)

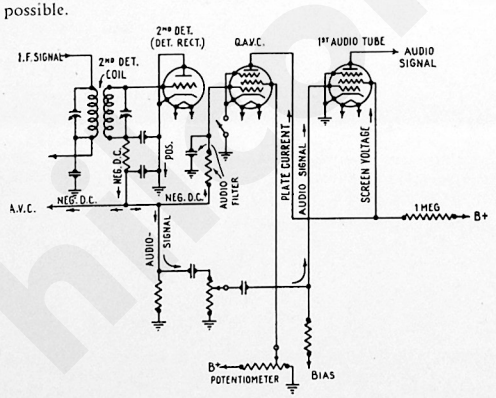
Explanation of the Philco System of Interstation Noise Suppression

INTERSTATION noise suppression in Philco sets is made possible by the action of the second detector (automatic volume control) stage, and a Q. A. V. C. tube.

When a station carrier is tuned in on the receiver, the second detector tube produces negative direct current and an audio signal, corresponding to music or whatever the station is broadcasting. This audio signal is sent to the audio circuit and the negative direct current is carefully filtered and used in the automatic volume control system. This same negative D. C. is applied to the Q. A. V. C. tube, which acts just like a shorting "switch" on the first audio tube.

This action turns off the flow of current through the Q. A. V. C. tube, and furnishes correct voltages to the first audio tube. The set operates so long as there is a station tuned in on the receiver.

When the set is tuned off a station there is no D. C. from the automatic volume control circuit to make the "switch" open. Therefore, it shorts out the screen supply of the first audio tube and turns off the set. In order to obtain this "switching" we use a type 78 tube and describe in detail below the actual connections which make this action possible.



The I. F. signal induced into the secondary of the second detector coil is rectified by the second detector or detector rectifier tube. In this circuit the plate and cathode are connected to ground, forming a path for the positive half of the I. F. signal to ground. This leaves only the negative part of the I. F. signal in the second detector secondary circuit. This negative D. C. signal is available for different purposes. One of these is to control the bias of the I. F. or R. F. tubes earlier in the circuit. Another use of the signal from the second detector tube is to carry the audio through the volume control to the audio stages. This negative signal, carefully filtered and separated from the audio signal by means of a high value resistor and a by-pass condenser, is applied to the grid of a Q. A. V. C. or interstation noise suppression tube. When the receiver is tuned to the carrier wave of a station an I. F. signal is applied to the second detector tube, is rectified there, and negative D. C. voltage is carried to these three points. As soon as the receiver is tuned off a station this negative voltage immediately disappears. The audio signal from the detector is passed around the filter to the volume control and the first audio tube.

The plate of this Q. A. V. C. tube is supplied from the B + source through a 1 meg resistor. The screen of the first audio tube is connected directly to the plate of this tube. Whenever the receiver is tuned to a carrier wave, negative voltage, rectified in the second detector tube circuit, is applied to the grid of the Q. A. V. C. tube, and puts a bias on that tube. With the tube biased the small flow of plate current through the 1 meg resistor from B + causes only a slight amount of drop in the 1 meg plate supply resistor. Therefore, the screen on the first audio tube receives its correct working voltage as long as the grid of the type 78 Q. A. V. C. tube is biased negatively. Whenever the receiver is tuned off a carrier wave the negative voltage in the second detector circuit disappears. Therefore, there is no bias applied to the grid of the type 78 Q. A. V. C. tube. Without grid bias the plate current of that tube is very much increased. Therefore, this large amount of current, drawn through the 1 meg ohm B + resistor causes a large voltage drop in the resistor.

Since the screen voltage of the first audio tube is also obtained through this same resistor, the first audio screen voltage drops as soon as the receiver is tuned off a station. It is characteristic of the type 77 tube that the tube will stop operating as soon as the screen voltage drops below its normal voltage. As a result, the receiver is silenced when tuned off a station.

The sensitivity of the 78 Q. A. V. C. tube to this controlling function may be altered by changing its screen voltage, so a potentiometer is placed in the screen circuit of the Q. A. V. C. tube, which regulates the sensitivity of the control system. Adjusting the potentiometer sets the weakest signal level to which the set will respond.

In order to tune in extremely distant stations a switch is provided which opens the cathode circuit of the Q. A. V. C. tube. With the cathode open it is impossible for the tube to draw plate current, and therefore the screen voltage of the first audio tube will remain normal. In operation, the system, controlled by a potentiometer, completely silences the receiver in between stations of desired sensitivity.

AVERAGE CHARACTERISTICS—PHILCO TUBES

Last month we published average characteristics of Philco Tubes in the 2-volt and rectifier series. This month we give characteristics of the miscellaneous Philco tubes. The diagrams below illustrate the types of bulbs used in all the different tubes listed.

MISCELLANEOUS TUBES

Type	Use	Base	Bulb	Type of Cathode	RATING			Plate Volts	Grid Volts	Screen Volts	Plate Current (M.A.)	Screen Current (M.A.)	Mutual Conductance Micromhos	Plate Resistance (Ohms)	Amp. Factor	Ohms Load for Output	Undistorted Power Output (Milliwatts)
					Volts	Amps.	Supply										
00A	Det.	4A	S14	Filament	5	0.25	DC	45	Grid Return To-Fil.	....	1.5	.....	666	30,000	20.0	.....	.....
01A	Det. Amp.	4A	S14	Filament	5	0.25	DC	90	— 4.5	....	2.5	.....	725	11,000	8.0	11,000	15
								135	— 9.0	....	3.0	.....	800	10,000	8.0	20,000	55
10	Power Amp.	4A	S19	Filament	7.5	1.25	AC	250	—22.0	....	10.0	.....	1330	6,000	8.0	13,000	400
								350	—31.0	....	16.0	.....	1550	5,150	8.0	11,000	900
								425	—39.0	....	18.0	.....	1600	5,000	8.0	10,200	1,600
12A	Det. Amp.	4A	S14	Filament	5.0	0.25	DC	90	— 4.5	....	5.2	.....	1500	5,650	8.5	5,600	30
								135	— 9.0	....	6.2	.....	1600	5,300	8.5	8,700	115
								180	—13.5	....	7.6	.....	1700	5,000	8.5	10,800	260
12A	Power Amp.	4A	S14	Filament	5.0	0.25	DC	135	— 9.0	....	6.2	.....	1600	5,300	8.5	8,700	115
								180	—13.5	....	7.6	.....	1700	5,000	8.5	10,800	260
14	Amp.	5B	S14C	Heater	14.0	0.3	DC	180	— 1.5	90	5.5	Not over	1150	300,000	330	.....	.....
								180	— 3.0	90	4.0	⅓ Ip	1000	400,000	400	.....	.....
								250	— 3	90	4.0	.....	1050	500,000	525	.....	.....
17	Amp.	5A	S14	Heater	14.0	0.3	DC	90	— 6	....	2.7	.....	820	11,000	9	.....	.....
								135	— 9.0	....	4.5	.....	1000	9,000	9	.....	.....
								180	—13.5	....	5.0	.....	1000	9,000	9	.....	.....
18	Power Amp.	6C	S17	Heater	14.0	0.7	DC	250	—16.5	250	34.0	7.5	2250	100,000	220	9,000	3,000
20	Power Amp.	4A	T8	Filament	3.3	0.132	DC	90	—16.5	....	3.0	.....	415	8,000	3.3	9,600	45
								135	—22.0	....	6.5	.....	525	6,300	3.3	6,500	110
26	Amp.	4A	S14	Filament	1.5	1.05	AC	90	— 6	....	3.8	.....	955	7,600	8.2	9,800	30
							or	135	— 9	....	6.3	.....	1135	7,200	8.2	8,500	80
							DC	180	—13.5	....	7.4	.....	1170	7,000	8.2	10,500	130
43	Power Amp.	6C	ST14	Heater	25.0	0.3	DC	95	—15.0	95	20.0	5.0	2000	45,000	90.0	4,500	900
48	Power Amp.	6C	ST16	Heater	30.0	0.4	DC	95	—20.0	95	47.0	9.0	2800	10,000	28.0	2,000	1,600
50	Power Amp.	4A	S21	Filament	7.5	1.25	AC	250	—54.0	....	35.0	.....	1900	2,000	3.8	4,600	1,600
								350	—63.0	....	45.0	.....	2000	1,900	3.8	4,100	2,400
								400	—70.0	....	55.0	.....	2100	1,800	3.8	3,670	3,400
								450	—84.0	....	55.0	.....	2100	1,800	3.8	4,350	4,600
71A	Power Amp.	4A	S14	Filament	5.0	.25	AC	90	—16.5	....	10.0	.....	1330	2,250	3.0	3,200	125
							or	135	—27.0	....	17.5	.....	1520	1,960	3.0	3,500	370
							DC	180	—40.5	....	20.0	.....	1620	1,850	3.0	5,350	700
V99	Det.	4G	T8	Filament	3.3	0.063	DC	90	— 4.5	....	2.5	.....	425	15,500	6.6	15,500	.....
X99	Amp.	4A	T8	Filament	3.3	0.063	DC	90	— 4.5	....	2.5	.....	425	15,500	6.6	15,500	.....
182B	Det. Amp.	4A	S17	Filament	5.0	1.25	AC	200	—29.0	....	18.0	.....	1500	3,330	5.0	.....	.....
183	Power Amp.	4A	S17	Filament	5.0	1.25	AC	200	—45.0	....	20.0	.....	1500	2,000	3.0	.....	.....
								250	—65.0	....	26.0	.....	2000	1,500	3.0	.....	.....
485	Det. Amp.	5A	S14	Heater	3.0	1.25	AC	90	— 3.0	....	5.0	.....	1150	10,800	12.5	.....	.....
								120	— 4.0	....	6.0	.....	1350	9,300	12.5	.....	.....

QUESTIONS and ANSWERS

1. What is the proper method of testing the new Philco Model 962 dry battery as used with the Philco Model 38 receiver?

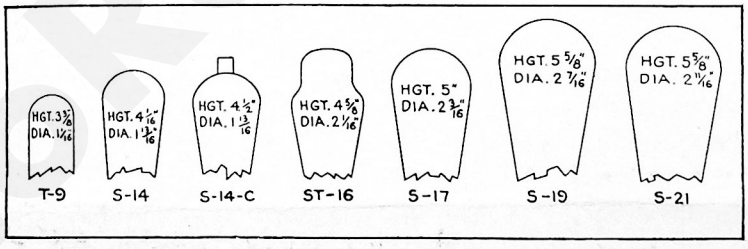
A. This battery consists of three 45-volt standard "B" battery sections and two 4½-volt "C" battery sections. The batteries can be tested by means of a voltmeter, connections being made at the socket terminals of the battery. A voltage test between the + 67½ volt tap and the minus — side of the "B" batteries will give an indication of one-half of the battery. Testing between the + 135-volt tap and the + 67½-volt tap will give an indication of the condition in the second half of the 135-volt group. The "C" batteries can be tested between "C" + and the two "C" — taps brought out to the receptacle on the battery.

2. What is the cause of 60-cycle hum in the Model 54?

A. There are several possibilities of hum in this model. One of these is leakage from the "B" supply through the insulating material of the wire-wound resistor to ground. Only the very first production had any of this trouble, which was corrected by replacing the resistor with the later type, which was darker in appearance. Any wire insulation defects, particularly where the wires pass over sharp metal corners, can cause a hum, due to the grounding conditions which is established. Grounded resistors can produce a hum, which condition can also be produced by a defective type 75 tube.

3. Can the Models 16 and 17 be used with additional speakers for high-power installations?

A. Yes. Both of these models have an undistorted output of 15 watts, which is sufficient power for the average installation in a large hall or for out-door use. The Philco R-3 extension speakers can be used when one or more additional speakers are required for the installation.



BULB ILLUSTRATIONS—HGT Designates Maximum Height of Tube when SEATED IN SOCKET.

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Printed in U. S. A.