

PHILCO SERVICEMAN

• SERVICE • NEWS • FOR • PHILCO • DEALERS •

JUNE, 1933

For an Investment of Only \$18.00 YOU CAN HAVE THE PHILCO ALL PURPOSE SET TESTER

HOW would you like to get one of the new Philco All Purpose Set Testers at a cash outlay of only \$18.00?

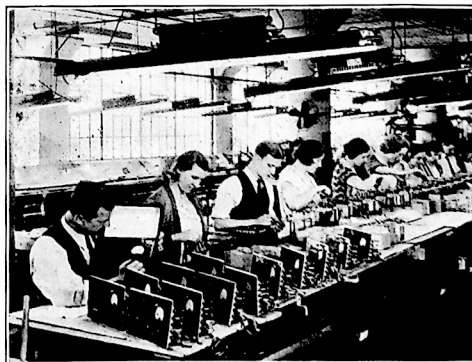
Every serviceman who has seen the new tester wants it. One man remarked recently upon seeing the Model 048 for the first time, "All of that for only \$40.50 is the best bargain I have yet seen in radio service equipment. It can't be duplicated under \$100."

The serviceman who can spare the money has already placed his order; if he doesn't have the money, he is hoping and saving. If you are one of those who has hopes, then here is your opportunity.

You purchase six Philco Three Purpose Antenna Kits at your net dealer price of \$18.00. By placing the proper amount of effort on the sale of these, you can install the six kits for your regular service customers in your spare hours within a comparatively short time. Tell people about it through personal calls and letters such as that in the April issue of the PHILCO SERVICEMAN. Take a sample kit with you to show the customer what he gets, and describe the complete antenna system with the aid of the illustrated instruction sheet in the kit. You will be surprised how soon you can make the six installations—and you collect \$60.00. Your profit is \$42.00, which is just \$1.50 more than your net cost of the Philco Model 048 All Purpose Set Tester.

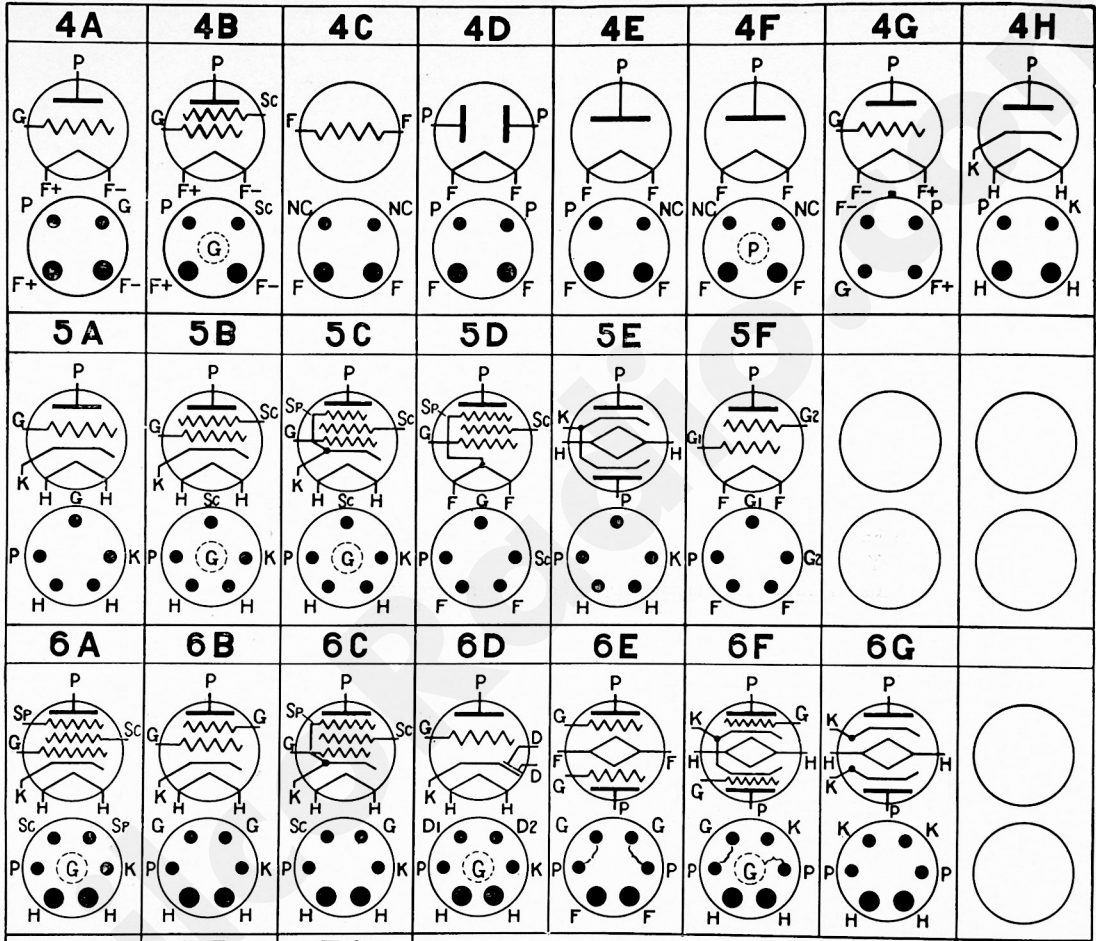
Remember that your best efforts are put forth when you have a definite goal or quota toward which you are working. Let the new All Purpose Set Tester be your goal. Decide now that you are going to have the 048, and start immediately to work for it.

**Straight line production
methods under engineer-
ing supervision permit
low cost and precision ac-
curacy in the Model 048
All Purpose Set Tester.**



Base and Schematic Layouts of All PHILCO TUBES

Key numbers with numeral 4 indicate four-prong tubes; those with numeral 5 indicate five-prong tubes, etc. (SEE CHART BELOW FOR FURTHER EXPLANATION OF TUBE TYPES)



BASE ARRANGEMENTS BY TUBE TYPES

Type	Base	Type	Base	Type	Base	Type	Base	Type	Base
00-A	4A	18	6C	39	5C	69	6B	1S2B	4A
01-A	4A	19	6E	41	6C	71-A	4A	1S3	4A
2	4C	20	4A	42	6C	75	6D	4S5	5A
3	4C	24	5B	43	6C	77	6A	866	4F
4	4C	26	4A	44	5C	78	6A	2A3	4A
5	4C	27	5A	45	4A	79	6F	2A5	7B
6	4C	30	4A	46	5F	80	4D	2A7	6C
7	4C	31	4A	47	5D	81	4E	3B7	7C
8	4C	32	4B	48	6C	82	4D	3B7	7C
9	4C	33	5D	49	6C	83	4D	5Z3	4D
10	4A	34	4B	50	6D	84	5E	6A7	7B
12-A	4A	35	5B	56	5A	85	6D	6B7	7C
14	5B	36	5B	57	6A	89	6A	12Z3	4H
15	5B	37	5A	58	6A	X99	99	25Z5	6G
17	5A	38	5C	59	7A	V99	4A		

SYMBOLS—F = Filament. H = Heater. P = Plate. K = Cathode. G = Grid. G1 = Inner Grid. G2 = Second Grid. G3 = Third Grid. G4 = Fourth Grid. SC = Screen Grid. D1-D2 = Diode Plate. NC = No Connection. SP = Suppressor Grid. { = Adjoining Elements

Correcting Oscillation Trouble in the 71 and 91

ON some models of the 71 and 91 series, difficulty is occasionally experienced with inoperation of the set from 800 to 1500 kilocycles, because the detector oscillator tube fails to oscillate. The remedy for this trouble is usually puzzling to the serviceman, since it is a rather uncommon type of service complaint.

The condition can usually be corrected by changing the type 36 tube in the detector oscillator socket. The tube change alters the overall characteristics of the oscillator circuit in such a way that oscillation is again established, and the set then operates properly.

In some instances the tube change is not sufficient, and it is then necessary to change the cathode resistor from 15,000 ohms to 10,000 ohms. This resistor is indicated at (15) Service Bulletin No. 128 and at (21) Service Bulletin No. 129. The 10,000 ohm resistor is known as Philco part 4412.

Locations which are subject to prolonged damp weather usually experience this difficulty more than locations having a dry atmosphere. In extreme cases it may be necessary to change the oscillator coil, making absolutely sure that the coil is entirely covered with paraffine to seal out all moisture.

THE 6A7 TUBE—What It Is and What It Does

By LESLIE WOODS, *Philco Research Department*

WITH the universal acceptance of the "super" in place of the T. R. F. circuit, economic demands have made necessary the design of sets using the minimum number of tubes. Superheterodynes in use several years ago made use of 7, 9 and 11 tubes with overall sensitivity no greater than that obtained with well-designed five-tube supers available today.

In order to better explain the reasons for the introduction of the 6A7, it seems desirable, first, to consider the principle of operation of the superheterodyne circuit. While sensitivity and other requirements may increase the number of i. f. and r. f. tubes, the basic superheterodyne circuit requires a detector, an oscillator, an i. f. stage, a second detector and an output tube. During the past

two years it has been possible practically to combine the functions of first detector and oscillator in one tube, thus reducing the number of essential tubes.

In a superheterodyne receiver a local oscillation is superimposed upon the incoming radio frequency signal, producing two resultant frequencies, one equal to the difference between the incoming and local frequencies and the other equal to the sum of both frequencies. In practice, the frequency equal to the difference between the two oscillations, usually 175, 260 or 460 K. C., depending on circuit demands, is applied to efficient transformers designed to amplify this one frequency which is subsequently demodulated of its audio frequency component by the second detector. It has been general practice to use the screen grid tube for the combined functions of first detection and oscillation, such tubes as Types 36 and 24 being suitable for the purpose.

In order to obtain satisfactory first detection, it is necessary to operate the tube at a point on the grid voltage plate current characteristic where the plate current changes abruptly with a small change in applied signal. In the case of Types 36 and 77, it is necessary to adjust the grid bias to about 8 volts for satisfactory operation as a detector. Under these conditions Types 36 and 77 can be made to oscillate and at the same time provide detection to demodulate the incoming r. f. signal and produce the beat frequency for i. f. amplification.

For automatic volume control it is necessary to control at least two tubes, and in a 5-tube a. c. receiver we have only an i. f. and detector-oscillator tube to control. It is not possible, however, to apply the control voltage to the grid of the 36 detector-oscillator, since we are already operating this tube at a critical point to obtain both the functions of detection and oscillation, and increasing the neg-



An Installation of the Philco Three Purpose Antenna System on top of a 21-story hotel building. The antenna transformer is mounted on top of the dome at the right, and is grounded to the steel framework of the supporting structure. The transmission line is carried from this point down to the radio set on the thirteenth floor.

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THE 6A7 TUBE—What It Is and What It Does*Continued from Page 3*

ative grid bias to reduce gain might result in stopping of the oscillator. It is, therefore, difficult to design a 5-tube a. c. receiver with automatic volume control as long as we use an ordinary screen grid tube as the detector-oscillator.

The 6A7 makes a 5-tube a. v. c. receiver entirely practical and at the same time offers possibility for increasing the translation gain of the first detector. The 6A7 is a 5-grid heater type tube with the elements so connected that grids 1 and 2 numbering from the cathode are used in the oscillator circuit and grid 4 and plate in the modulator circuit. Grids 3 and 5 function as screen grids to prevent undesirable degenerative or regenerative intercoupling. Since the cathode current is changing at the oscillator frequency, it follows that the r. f. signal also modulating the cathode stream at grid 4 will result in the beat frequency appearing in the plate circuit. If preferred, the oscillator section may be looked upon as a resistor in the cathode circuit of the screen grid section, this resistance varying in value at the oscillator frequency, thus

increasing or decreasing the supply of electrons to the screen grid section. With a modulator oscillator of this type it is possible to decrease the translation gain of the tube by increasing the negative bias on the control grid of the second section, grid 4, without affecting the performance of the oscillator section.

The 6A7, therefore, in permitting the gain to be controlled makes possible a receiver with automatic volume control with fewer tubes than hitherto has been possible.

... 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.

Questions and Answers

1.—Q. What is the continuity of the antenna and set transformers in the Three Purpose Antenna System?

A. In the case of the antenna transformer, a continuity reading is obtained between the "ANT" terminal and the "GND" and also between "ANT" and "BLK". A condenser is in the circuit marked "RED", so that no continuity reading will be obtained between this point and any other terminal of the transformer. In the case of the set transformer, continuity is obtained between "GND" and "ANT"; between "GND" and "RED"; and between "ANT" and "RED". The ground connection and "BLK" are the same both in the antenna and set transformers.

2.—Q. What may cause failure to obtain a zero adjustment of the 1500-ohm and 150,000-ohm scales of the 048 All Purpose Set Tester?

A. Low voltage of the two 22½-volt dry batteries is the cause of this condition. If the ohmmeter switch is not turned to the "High" position when the ohmmeter is not in use, battery current will flow

through the potentiometer, and will cause the battery to run down.

3.—Q. What are the essential differences in the Models 57C and 81B?

A. The 57C is essentially an 81B placed on a chassis similar in size to the 53C. The same number and type of tubes are used in both cases, and the circuits are almost identical. The performance of the 57C is not quite equal to that of the 81B because of the compact arrangement of the parts and the smaller speaker baffle.

4.—Q. Why are police and short-wave reception not as efficient with the Three Purpose Antenna System as standard broadcast reception?

A. The antenna and set transformers are designed for broadcast use, and greatest reception efficiency is obtained, therefore, within the broadcast band. Between 540 K. C. and 1500 K. C. the efficiency is good, but beyond these extremes the efficiency changes considerably with a change in frequency.

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