CIRCUIT ANALYSIS OF MODEL 908 PHILCOPHONE INTERCOMMUNICATOR

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AN intercommunicator is a two-way device for voice communication between two or more points. For short-distance work, its superiority over the telephone is unquestioned. No switchboard or special operator is required, and reproduction is from loudspeakers rather than an earpiece. Switches at both master and remote stations enable either to talk or listen at will.

There are hundreds of uses for intercommunicators. To name a few, doctors and business men can use them to connect their private offices with the reception desk. Stockrooms, hospitals, factories, schools, etc., can make good use of these inexpensive systems.

Today, with the present shortage of labor, any device which cuts down on extra steps, extra help and wasted time is welcomed by all as an aid to our war effort. If you want to make extra money selling, installing and servicing intercommunicators, you should have no trouble getting all the business you can handle.

Although radio sets are fast vanishing from show rooms, ample stocks of Philcophone intercommunicators are still available to radio servicemen for resale at attractive profits. The Model 910 Philcophone is a complete system consisting of the master station, one remote speaker-microphone station and 50 feet of connecting cable, and has a retail selling price of only $29.95. The Model 908 is identical except that the master station has push-button switching to accommodate up to 5 remote stations. The selling price is $34.95 for the master station and one remote; extra remote stations are $8 each. All distributors of Philco radio parts carry these units, and will grant a discount of 35% on them to N. R. I. graduates and students.

The Philcophone Model 905A portable 15-watt complete public address amplifier system is another profitable item still available at Philco distributors. It lists at $90 complete with desk microphone and two loudspeakers and carries a discount of 40%.

Fig. 1—Close-up of Philcophone with one remote loud speaker.

The following statement by Mr. C. E. Gerhard, Manager of Parts Sales for Philco, is of interest to N. R. I. men:

"Several industrial publications have approached us on the subject of running full length articles on intercommunicating systems and amplifiers for use in industrial plants. We plan to tie in with some of these articles with advertisements on Philco equipment. We know from past experience that many inquiries will be received as a result of this publicity, which in the ordinary course of events are forwarded to Philco Distributors in the proper territories. We can now recommend to our Philco Distributors that the prospects be referred to N. R. I. members wherever possible."

By all means get acquainted with your nearest Philco distributor, for he may be able to give you some hot prospects for this Philco equipment.

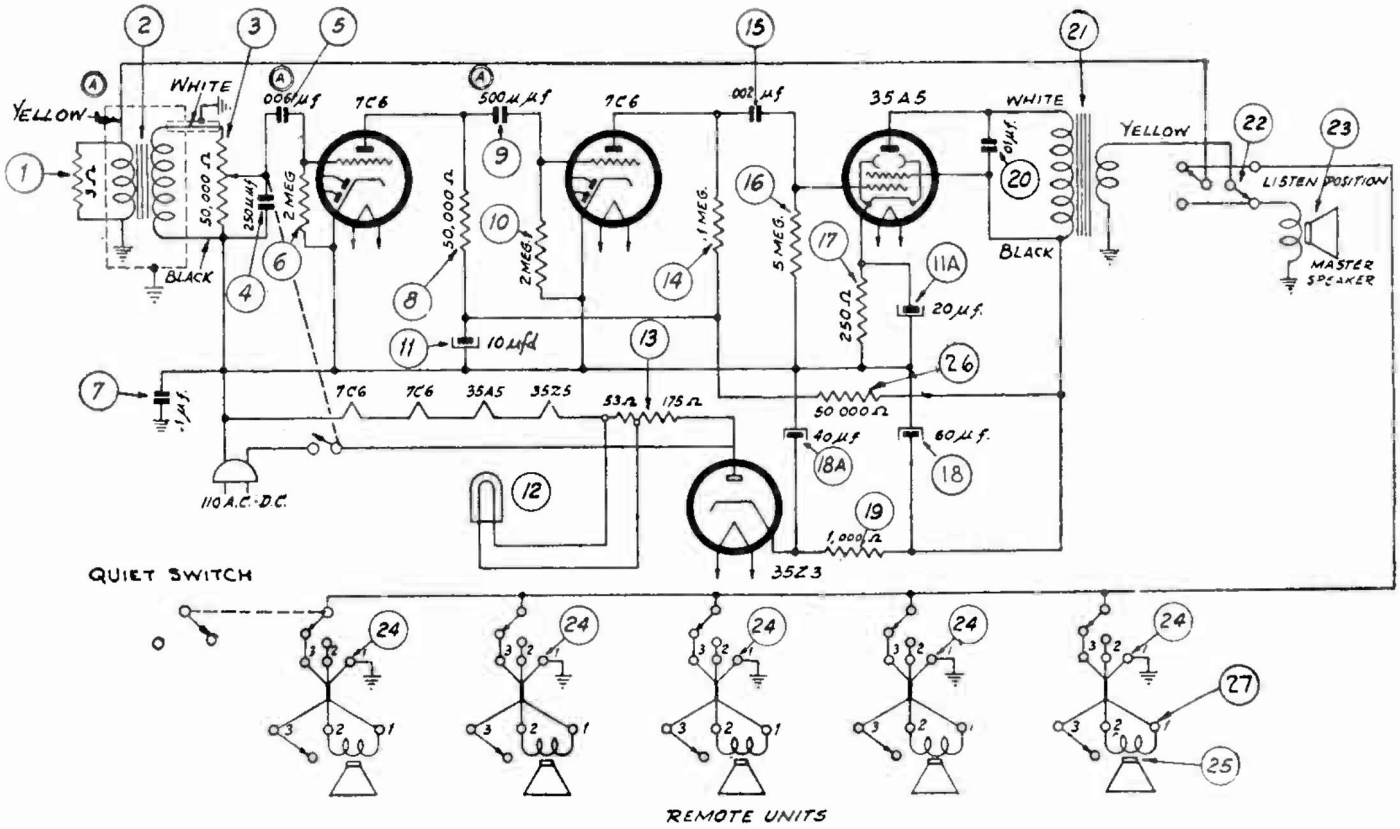

Fig. 2

PHILCOPHONE ANALYSIS

The diagram of the Model 908 Philcophone is shown in Fig. 2. The set consists of a three-stage amplifier and built-in power supply. Between two and six loudspeakers can be used, one at the master station and one at each of the five remote stations. Three-wire cables connect push-button switch 24 in the master station to each of the remote units. (The cable terminals are numbered 1, 2 and 3 respectively at each end.)

Notice that with the push-buttons in the positions shown, none of the remote loudspeakers are connected. However, if the button which is located at the back of a remote loudspeaker is pushed, terminals 3 and 2 on that remote speaker are connected together. This connects the remote loudspeaker across the primary of the audio input transformer (2), with the circuit being completed through the chassis.

The remote loudspeakers are of the permanent magnet dynamic type, so any movement of the cone causes the voice coil to cut through the flux produced by the permanent magnet. As a result, there is induced in the voice coil a voltage which is proportional to the strength of the sound wave causing the cone movement. Thus, these loudspeakers also act as microphones and feed the input of the a.f. amplifier.

The audio current flowing through the primary of the input transformer induces a voltage in the secondary. This voltage is applied across the 50,000-ohm volume control (3), and a portion of it (depending on the volume control setting) is fed through condenser 5 to the control grid and cathode of the 7C6. The amplified signal voltage of this tube appears across plate load resistor 8 and is transferred across grid resistor 10, through coupling condenser 9 and decoupling condenser 11. This signal, being in the input circuit of the second 7C6 tube, is amplified by it and appears across plate load 14. By way of condensers 15 and 11, the signal is developed across grid resistor 16. The signal is now at the input of the 35A5 power tube, and this tube delivers sufficient power through output transformer 21 to drive master loudspeaker 23.

When the operator at the master station desires to talk to one of the remote stations, he pushes the button for that station. This throws the push-button switch to terminal 2, connecting straight through to the loudspeaker of that station only. He then sets switch 22 (on the master station panel) to the "talk" position, so the left-hand section of this switch connects the master loudspeaker to the input of the amplifier, and the right-hand section connects the remote loudspeaker to output transformer 21. By throwing his switch back to "listen," he can hear the reply

of the party at the remote loudspeaker when the button on the back of the remote loudspeaker is depressed.

There is, as you can see from the schematic, a "quiet" push-button. When this is depressed, the lead from talk-listen switch 22 to all the push-buttons is grounded. The remote stations cannot then interrupt conferences by calling the master station.

Fig. 3—This illustration shows the Philcophone in use. Since in most cases the master and remote stations are fairly close together, fifty feet of cable is supplied with each remote unit. Extra lengths of cable are available for special installations.

The amplifier is of straightforward design, and there are no trick circuits employed to make servicing difficult. Anyone who understands and has serviced a.c.-d.c. receivers can easily maintain these outfits in first-class condition.

One point of interest is the 3-ohm resistor (1) shunted across the primary of the input transformer. This resistor acts as a load on the transformer at all times, particularly when the speakers are entirely disconnected while switching from talk to listen. If the resistor were not there, howling would occur each time the talk-listen switch was thrown.

Bias for the 7C6 tubes is provided by the voltage drops due to convection currents through 2-meg. grid resistors 6 and 10. The 50,000-ohm plate load for the first 7C6 tube is used instead of a larger resistor, to improve tone quality and prevent hum.

The decoupling filter network consisting of resistor 26 and condenser 11 is rather unusual in an a.c.-d.c. device, and shows that the manufacturer has taken every precaution to prevent hum from getting into the amplifier. The weakest points in this or any a.c.-d.c. device are the tubes and the electrolytic condensers.

In making point-to-point voltage measurements, do not be confused in locating B-. This, contrary to most a.c.-d.c. receivers, is not the on-off switch. A glance at the schematic shows this switch to be in the rectifier plate supply line. Therefore, B- is the other power cord lead, and this goes to the low (a.f.) potential side of the volume control as well as to the cathodes of the 7C6 tubes. Thus, any of these points may be used as B- when making point-to-point voltage or resistance measurements.

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New Radio Beam System

A new two-course ultra-high-frequency radio range development is expected to replace the radio beam system now in use on the airways of the United States.

The new development operates on 125 megacycles, a wave length 400 times shorter than the wave length in use at present. Experimentation indicates that this ultra high frequency system eliminates static entirely and greatly diminishes the danger of multiple courses and the distortive effects which mountains, rivers, ore deposits and other influences of terrain exert upon radio beams, factors which have been held responsible for airline accidents. The new system provides precise and complete information to the pilot. It shows him whether or not he is to the left or right of his correct line of flight and whether he has flown beyond the radio range station or has not yet reached it, an extremely important point of information in bad weather.

In addition to its safety factors and more complete information for the pilots, the new development points the way much further toward the automatic gyroscopic control of the plane. The instrument indicator actuated by the ultra high frequency range transmitter may in the future be used to direct the automatic pilot and thus keep the plane on its course automatically.