

PHILCO SERVICEMAN

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RADIO · MANUFACTURERS · SERVICE · NEWS



FEBRUARY, 1937

EDITORIAL

It's Easier to Sell When You Have a "Story"

IN SELLING any product, you know that it is easier to gain the interest of your customer and make an entering wedge toward the sale—if you have an interesting story—a subject around which you can build your sales talk.

An aerial is usually a commonplace sort of thing to talk about, and with ordinary aerials it might be difficult to get the customer interested to the point where you could sell him the need for one.

There are all sorts of so-called "special" aerials, "doublet" aerials and "matched" aerials on the market. These generally include some sort of "box" or container suspended in the air or between the aerial and the lead-in. If you examine the inside of the aerial transformer which is a part of the PHILCO All-Wave Aerial, you will see that it contains eight coils, five condensers and two resistors, thoroughly impregnated and completely waterproof in their metal container.

Philco gives the Serviceman a "Selling Story"

It is easy to explain interestingly and convincingly to your prospect how the tuned circuits in this aerial transformer match the circuits in his radio receiver, and thus automatically give him maximum radio performance on whichever waveband or station he desires to hear.

A definite tangible "reason why" this aerial will greatly improve radio reception—and one which you can make interesting and convincing—is, therefore, available to you. All you have to do is use it. And the next few months afford an ideal time to sell aerials. People use their radios most at this time of the year, and consequently desire best reception and are in the mood to hear about something that will give it to them.

Get this "sales story" on the aerial tuning system into your own words and style, and you'll be ready to cash in to the tune of many profitable sales. To help you put it over, use the PHILCO wall chart showing a cut-away view of the transformer, and also the new counter sheet—envelope insert (Form PR-489) recently announced. Both may be obtained from your distributor.

R. M. S. Direct-Mail Campaign Timely Business Help in February and March

THE R. M. S. direct-mail campaign announced in the November SERVICEMAN has been enthusiastically received and praised in all sections of the country. A number of orders have been received. However, some dealers hesitated to use it during December, believing the mailings might become lost in the delays of Christmas greetings and other mail.

Now that the holiday season is over and the radio owner is ready to settle down and enjoy his set, he is in a frame of mind to receive favorably the suggestion of having his radio tuned up or repaired. This suggestion is put to him in these mailings in such a way as to arouse interest and to require a minimum effort on his part to request your services. Each mailing includes a prepaid, imprinted return card, with spaces to check for the various troubles anyone might experience with an old radio.

The cost of this campaign is extremely low—only 2½ cents

for each mailing, and this price includes everything—imprinting, addressing and mailing. All you do is fill in a list of names of prospects in your locality on a blank form which your distributor's salesman will furnish you. You will be billed at 5 cents per name, which includes both mailings; in other words, 2½ cents for each mailing to each prospect.

If you select 100 names and get only one repair job out of it, the campaign will pay you. We suggest you submit at least 200 names—and if they are live prospects, your chances of getting a number of repair jobs and uncovering many aerial, tube and new-set prospects will be very good indeed.

If you have not as yet seen and read through the attractive portfolio booklet (illustrated here), explaining the campaign and containing samples of the mailings, ask your distributor's salesman to show it to you on his next visit—and sign up for this excellent "booster" for your February and March business.

PHILCO
presents
A CO-OPERATIVE
CAMPAIGN

—to find and sell
NEW Set Prospects
thru Service Calls

MAILING NO. 1

MAILING NO. 2

HUM
BOOING
HOWLING
VIBRATION
FADING
SQUEAKS
WHISTLING
OVERLAPPING STATIONS

BASS AMPLIFICATION DESCRIBED FOR THE SERVICEMAN

Sensitivity of Human Ear Varies With Volume and Frequency

THE function of a radio set is to convert a faint electrical signal originating somewhere in a microphone or phonograph into sound waves for the benefit of some listener. The ideal set is one which enables this listener to forget that there is an electrical link between him and the initial sound source. This ideal criterion implies that the set will reproduce every audible frequency. It does not, however, require that the amplitude of the several sound waves of different frequencies correspond to the amplitudes of the original sound waves. Rather, this correspondence is dependent upon both frequency and volume.

Physiological Considerations

It is a characteristic of the human ear that its sensitivity varies widely with frequency and volume. At moderate volume a sound wave of a given energy level will have the same loudness regardless of its frequency. At a lower volume level a sound wave of a given energy level will sound louder at medium-high frequencies than at low frequencies or very high frequencies. The energy level at which a radio set is operated is generally lower than that at which the sound is originated. It is, therefore, necessary to amplify the low audio frequencies more than the middle tones to compensate for this physiological effect. However, as the volume level at the set is increased, the amount by which the bass tones are augmented should decrease.

In the practical radio set the range of audible sounds which can be reproduced is limited by the capability of the set, the amount of the radio frequency spec-

trum which can be devoted to the transmission of the electrical signal, the amount of noise signal, etc. The lower audio frequencies should be amplified more than the higher frequencies by an amount dependent upon the volume level of the reproduced sound to compensate for the physiological effect. In addition, the set should make up for the deficiencies incurred in the wire and space transmission to the set.

Philco 690 Audio System

The PHILCO 37-690 provides for this additional amplification of the lower audio frequencies by use of a separate channel in the audio amplifier. To obtain the necessary variation in amplification of the lower frequencies in accordance with the total volume level, the degree of amplification in this channel is controlled by a special gain-control system. The two separately amplified signals are then combined and amplified in a power output system and again divided and supplied to appropriate loud speakers.

The functional diagram given below shows the entire 690 audio amplifier and sound-reproducing system. For simplicity, many power-supply filters, bypass condensers, voltage dividers, etc., have been omitted, only the essential elements being included. The main signal paths have been indicated by the heavy lines. The amplifiers and circuits have further been segregated in units to indicate their particular function.

Signals are supplied by the detector through suitable filters to the volume-control potentiometer. The filters are so chosen that the signal across this unit is

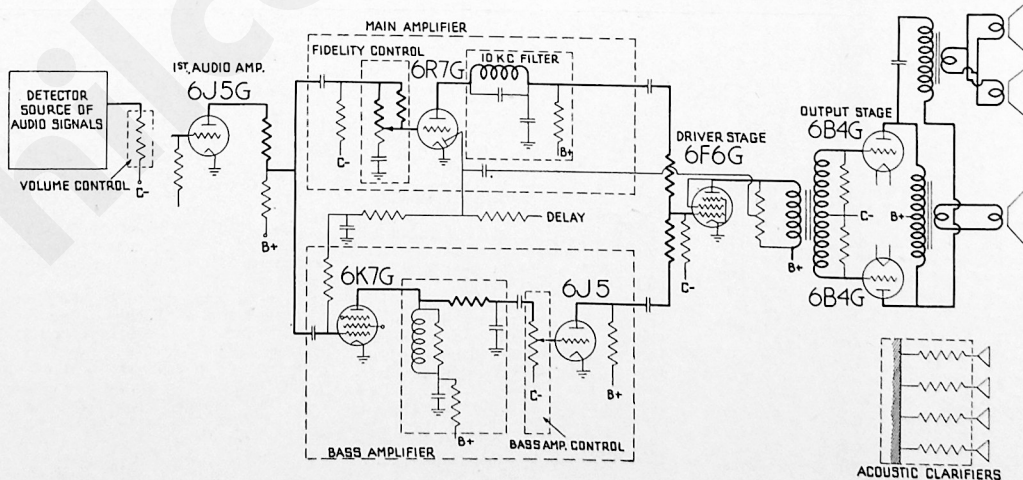
substantially a pure audio signal devoid of any intermediate frequency components. The a.v.c. system is so arranged as to maintain this audio signal at a constant level independently of the strength of the received signal, but directly proportional to the degree of modulation of the carrier wave. The user selects the volume level at which the sound is reproduced by manipulation of the volume control. Signals thus adjusted for strength and amplified in the first audio amplifier are supplied to the main amplifier and bass amplifier channels.

Main Amplifier Channel

In the main amplifier channel the whole audio signal is transmitted to an adjustable fidelity control, which in turn passes it on to the 6R7G amplifier stage.

The fidelity control consists of an adjustable resistor and condenser and operates as a low pass filter. At the cut-off frequency the impedances of the condenser and resistor are equal, and if the contact is at the junction of the resistor and condenser, signals above the cut-off frequency will be attenuated. Signals of lower frequency will not be attenuated as much, however, for with lower frequencies the condenser impedance is greater. If, on the other hand, the contact arm is at the other end of the potentiometer, that is, the end connected to the preceding amplifier, then the amount of signal transferred will be substantially independent of frequency, since the amount of signal across the whole unit is substantially independent of the impedance of the unit. For intermediate positions

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Bass Amplification Described

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of the contact, the amount of signal attenuation will vary accordingly. At low frequencies the signal will be transmitted without attenuation regardless of the position of the contact arm. In the 37-690 this control is mechanically gauged to the intermediate frequency band-expander so that the band widths of both the audio and i.f. stages are jointly controlled.

From the fidelity control the signal is transferred to a second amplifier tube (6R7G), which also contains the diode for the bass amplifier gain control. The load circuit of this tube contains a 10 k.c. filter to eliminate any adjacent channel whistle. This filter is a tuned circuit having a high impedance at its resonant frequency (10 k.c.), but low impedance for frequencies off resonance. At resonance its impedance is much greater than that of the load resistor and high-frequency by-pass condenser, but for audio signals up to about 8 k.c. the reverse is true. Thus audio signals up to about 8 k.c. will build up across the resistor and be transferred to the driver stage, whereas a 10 k.c. whistle builds up across the tuned circuit and forms practically no signal across the resistance and condenser. Only signals formed across the resistor are transferred to the driver stage.

Bass Amplifier Channel

Signals similar to those supplied to the main amplifier are likewise supplied to the bass amplifier channel and first amplified in the 6R7G tube, whose gain is controlled by a special control system. The transfer impedance for this tube has the characteristic that the amplitude of the signal transformed decreases with frequency in such a way as to compensate for the normal deficiencies of the ear. The net result is that the bass frequencies are amplified by an amount which decreases with increasing frequency, while the high frequencies are not transmitted. The amplified signals are thus transferred to a bass volume control which enables the listener to select the degree of bass amplification which he desires.

The output signals of the main and bass amplifier channels are combined in the grid circuit of the driver stage and then amplified in a push-pull, high-power output stage. A bridge circuit is used to combine the output signals of the two channels and at the same time prevent any interaction between the two output tubes which might cause distortion. Throughout the system the amplifiers are operated at power and voltage levels well below their rated values to keep any possible distortion at an absolute minimum and to insure a tremendous overload capacity.

The cathedral speaker is directly coupled to the output stage and is energized by the whole audio signal. Two additional speakers responsive only to high-frequency signals are used to improve the high-frequency response. A condenser in series with the output trans-

former forms, in combination with the leakage reactance of the latter, a high pass filter which transmits the higher frequency signals to the additional speakers, but prevents the transmission of the lower frequency signals, which, having a larger amplitude, would tend to overload these speakers.

The output signal from the driver stage is also used to control the gain of the bass amplifier channel. This is accomplished by rectifying a portion of this signal in the diode unit of the 6R7G and using the rectified signal, appropriately filtered, to bias the input grid of the control tube in the bass amplifier channel. As will be apparent, the input grid will be made more negative as the output signal increases in amplitude. In this fashion the amount by which the lower frequencies are augmented is caused to decrease with increasing output level. A delay voltage is used to prevent the control from functioning until the output signal exceeds a certain threshold value.

Acoustic Clarifiers

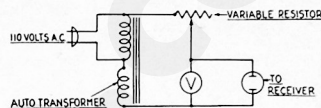
It is not sufficient that a sound-reproducing system reproduce sustained signals which appear to the listener to be the same as the originating signals. It is further necessary that the reproduced signals have no distortion. In other words, when a kettle drum is thumped, that initial thump should be clearly and distinctly heard, and when the drum is stopped by the player damping it with his hand the reproduced sound of the drum should stop instantly and not drag on and slowly die out. This requires that the cabinet, which is acoustically resonant at some low frequency, be sufficiently damped to prevent the formation of acoustic reverberations. The acoustic clarifiers serve this purpose. In the functional diagram they are indicated as diaphragms connected to a base through a resistance. The resistance corresponds to the damping material between the apex of the cone of the clarifier and the frame. The diaphragms are tuned to the resonant frequency of the cabinet and at these frequencies absorb sound energy from it which is dissipated in the damping material. Thus the acoustic clarifiers damp the cabinet and prevent it from resonating in an analogous way to that in which a resistance will damp a resonant electrical circuit and prevent it from oscillating. Transient distortion is thus prevented.

The sound-reproducing system of the 37-690 thus serves three purposes. It brings to the listener sounds of every audible frequency which it is practical to transmit. It modifies the amplitude of the sounds of the several different frequencies in such a way as to compensate for the physiological difference in hearing at different energy levels. It enables sounds of all frequencies, and especially low frequencies, to build up and die out in such a manner as to reproduce faithfully the variations in amplitudes of these signals at the originating source.

Stepped-Up Voltage Helps Find Intermittents

VARIOUS articles have appeared recently in the PHILCO SERVICEMAN on the subject of locating intermittents. These suggestions have prompted Mr. Marvin Wilson, R. M. S. member and Service Manager of Rumbaugh-MacLain, a PHILCO dealer in Everett, Washington, to send in his description of an additional interesting arrangement.

An auto transformer is connected, as shown in the diagram, to give approximately 150 volts. A series resistor and a voltmeter are placed in the circuit so as



to control the operating voltage to the radio receiver. In many instances the higher line voltage will show up intermittent troubles which could not otherwise be located quickly. Care should be observed, of course, to avoid placing too much voltage on the radio set to the extent of causing damage to the transformer or any of the other parts in the set. In most cases, however, it will not be necessary to operate the set for any length of time at the increased voltage, and in this way danger of burn-outs is reduced.

The transformer can be constructed from an ordinary power transformer by removing the high-voltage secondary and rewinding one of the secondary filament windings. An old transformer with an open high-voltage secondary can be used, since in this case only the primary and low-voltage secondary are needed. The voltage in the filament winding is directly proportional to the number of turns in the winding, which means that if a 6.3-volt winding is used, a sufficient number of turns should be added to provide 40 volts. This voltage, when added to the 110 volts of the primary, as shown in the diagram, gives a total of 150 volts.

New Eyeletting Tools Available

IN THE Question and Answer Column of the January PHILCO SERVICEMAN we listed several new eyeletting tools which have recently been added to the PHILCO line of service equipment. Space did not permit a detailed explanation of these new tools.

In the new eyeletting kit the anvil consists of a point which is placed in a cast-iron base. This point is removable from the base, so that various sizes of points and punches can be employed. The new tools are adequate to take care of any kind of eyeletting or rivetting job that may be encountered in a radio set. The new kit retains the old part

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Questions and Answers

1. Q. What is one cause of hum in the Model 37-650?

A. A leaky electrolytic condenser, Part No. 30-2163, may sometimes be the cause. This condenser is indicated as Nos. 59 and 59A in the wiring diagram of Service Bulletin No. 254. Replacement of the condenser will correct the trouble.

2. Q. What occurs in a battery receiver if the set is operated without bias cells?

A. If the bias cells have been removed or are not making proper contact in the clip holders, the control grid of the tube on which the bias cell normally operates is floating. This means that there is no grid bias, with the result that the plate current in the tube increases tremendously. This increased plate current, if allowed to flow for any period of time, will paralyze the tube.

3. Q. Is there a special tool available which can be used with the PHILCO Socket Wrench Kit to adjust the new-type hex screws in the PHILCO dial assemblies.

A. Yes. There is a new wrench which fits the handle of the PHILCO Socket Wrench Kit. This part is known as Part No. 45-2424 and sells at a list price of \$0.20.

New Eyeletting Tools

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number, 45-1162, and the same list price of \$2.25. This kit number includes the base and a removable 3/16-inch point and a 3/16-inch punch. All of the additional-size points and punches are listed under separate part numbers and are priced separately, as shown below.

Part No.		List Price
45-2389	1/8" Point	\$.75
45-2390	1/8" Punch	1.00
45-2391	1/4" Point	.75
45-2392	1/4" Punch	1.00
45-2393	5/16" Point	.75
45-2394	5/16" Punch	1.00
45-2395	3/8" Point	.75
45-2396	3/8" Punch	1.00
45-2397	Point with 1/8" hole for Transitone control heads	.40
45-2398	Point with 5/32" hole for Transitone con- trol heads	.40

Large Radio Chain Store Adopts Philco All-Wave Aerial and Multiple Aerial Switches

THE largest radio chain in New York City, Davega, has adopted the PHILCO multiple aerial switch for all of its stores. In one store alone there are eighty of these switches installed.

Another dealer in one of the most congested sections of New York City has a big sign in his window: "Come in and listen to foreign radio reception on a new PHILCO." Every day, all day



long, this dealer plays the new PHILCO sets on the European short-wave stations. This is made possible only through the use of the PHILCO All-Wave Aerial and the multiple aerial switch installation. Hundreds of additional sales have been made in this one store simply because of the ability to demonstrate foreign reception in the store.

The PHILCO multiple aerial switches are being used successfully by thousands of dealers all over the country. In every case where an installation of the multiple aerial switches has been made in a dealer's store, improved sales have resulted immediately. The ability to give a prospect a high-quality demonstration of foreign reception in the store is one of the most powerful factors in selling modern all-wave radios.

The PHILCO multiple aerial switch is the only device which makes it possible to operate the various sets on a dealer's floor from a single all-wave aerial. Ordinarily, as soon as more than one set is hooked onto the transmission lead-in of the all-wave aerial system the sensitivity of the circuit is almost entirely lost, making it possible to receive only local broadcasting stations. By using the multiple aerial switches, however, the all-wave aerial is automatically hooked onto the one radio set which the sales-

man wishes to demonstrate and is automatically disconnected from all other sets on the floor. This means that the same high-quality performance from the PHILCO All-Wave Aerial is obtained in the store as that obtained when the all-wave aerial is installed in the customer's home.

If you do not have a high-quality PHILCO All-Wave Aerial installation with multiple aerial switches for your store, we urge you to contact your PHILCO distributor immediately for a special price on a complete installation of this kind. It means a relatively small investment to you which is more than repaid from the profits of your first additional radio sale.

Engineers Say: "Not Good Enough for Philco"

A TEST was recently made in the PHILCO Research Department on two sample tubular condensers submitted by the PHILCO Service Department. These condensers were of a competitive make which are being used by some servicemen in the larger centers. The following is a quotation from the report submitted by the Research Department:

"The one sample each of — tubular condenser and — condenser, as manufactured by the — Company, were both found to have a very low-melting-point sealing wax in the ends, and both had very low dielectric resistance both before and after humidity tests. Neither one of these units would be satisfactory for use on our sets."

The safety factor which has been allowed in PHILCO parts is one of the most important reasons why servicemen everywhere are demanding PHILCO parts instead of other makes. These men realize that when they put in a PHILCO part as a replacement they can be sure that the job will last. They know that the cost of such a part is no greater than the cost of an inferior-make part. They feel confident in the work they have done, for they know that there will be no chance for a come-back.

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