PHILCO A539 P.B. FIVE

Four valve, plus rectifier, three waveband manual and mechanical push-button tuned table superhet for 200-250 volt, 50-100 cycle AC supplies, price 11½ gns.

CIRCUIT OUTLINE

AERIAL input voltages are produced across a choke which is coupled through a condenser network to the input windings of the long, medium and short wave coils. A single inductance is used in the long wave position. These coils are selected by the wave switch connected to the grid of the first valve, V1, a frequency changer.

The anode circuit of V1 contains the primary winding of the first intermediate frequency transformer. This has both fixed and variable tuning condensers. Single oscillator coils are used, the short-wave coil having extra coupling.

For I.F. amplification, use is made of a pentode. A further IFT works into one diode of V3, a double diode triode. The second diode is used for AVC and, through a single decoupling network, provides control for the grids of V1 and V2, control also being applied to the suppressor grid of V2.

Signal voltages are taken through an H.F. filter to the coupling condenser which isolates the volume control operating on the triode section of V3.

Bias for this valve, as well as for the output valve and also the delay voltage, is obtained from a series network in the H.T. return circuit.

Resistance capacity coupling is used between the anode of V3 and the grid circuit of V4, the output pentode. The grid stopper is actually connected in series with the coupling condenser.

In some models negative feedback is provided between the anode and the grid through a variable tone condenser. In other cases the condenser is across the grid circuit without feedback. Power is obtained from V5, a full-wave rectifier, and smoothed by the speaker field and dry electrolytic condensers.

CONSTRUCTIONAL FEATURES

THERE are several "runs" of this receiver showing appreciable variations The service engineer must expect a little difficulty in identifying and locating some of the components.

In our chassis R3, the oscillator grid leak, was 65,000 ohms. The grid stopper in the LF coupling circuit was 200,000 ohms, another resistance of the same value being used as the anode load for V3. The HT sub-line decouple was 5,000 ohms instead of the nominal 6,500 ohms.

It should be noted that in certain chassis the grid return of V3 is not decoupled, and therefore R12 and C20, the decoupling condenser, will be missing, as in our chassis.

In certain sets there is no feedback, and therefore R16 is absent. Some chassis incorporate additional filtering in the signal diode circuit, in which case R17 and C16 will be found.

It appears that in some sets the first anode circuit is not decoupled, in which case R18 will be missing. This is used in conjunction with a .09 decoupling condenser.

Attention is called to the moulded condenser cases, which may contain more than one condenser. In other cases blank tags are used as anchorage points.

It will be noted that there is provision for a pick-up by means of sockets carried on the aerial and earth plate, as well as a pair of sockets for an extension speaker. These sockets are carried on the speaker strip and are on the low impedance side.

Wavechange Switches

All the wave switching is carried out on a single wafer. The drawing shows how this appears when viewed from the underside of the chassis with the control shafts pointing away from the observer.

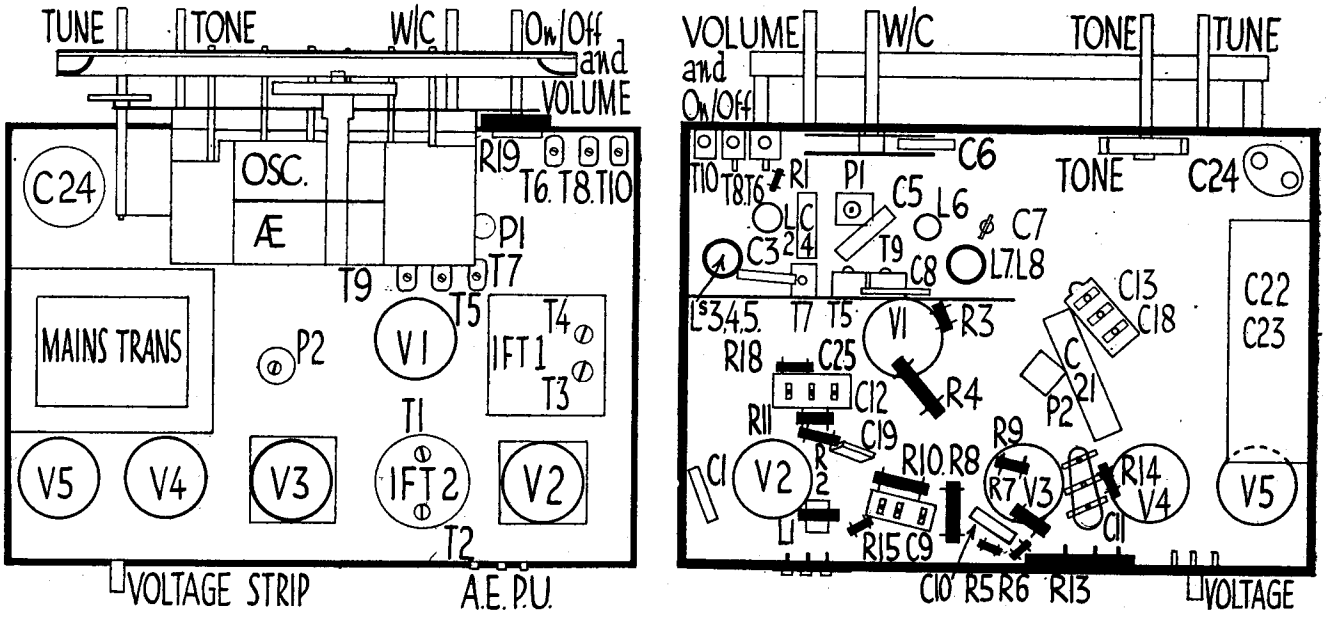
There are three main wipes, of which W1 controls the grid of the V1. Wipes W3 and W4 control the oscillator circuits. The wipe W2 is produced by means of shorting plates on the rotor.

It will be noticed that there are four special contacts on the back of the wafer. All the contacts are accessible, and there should be no difficulty in identifying any of the wiring.

Chassis Removal

Removal of this chassis is very easy. First of all, take off the four control knobs

(*Continued on page* 56)



These drawings of the A539 chassis (top view, left, and underside on right) identify the valves, trimmers and other components.

10-MINUTE FAULT-FINDER

PHILCO A539

Power Test.—This reveals any main H.T. circuit or output valve defects. The two measurement points, *A* and *B*, in common with all the test points given below, are indicated on the circuit diagram. In the receiver they will be found on the speaker connection tags, *A* being green and *B* green-white.

Voltages : *A-E* (chassis), 330; *B-E*, 270.
Resistance : *A-B*, 1,140 ohms.
Total feed = 330−270÷1,140=53 ma.
If defective, check V5 anodes (330 volts AC) and resistance *B-E*, 230,000 ohms.

Output Stage, V4.
Inject 2 volts AF between V4 and *E*. If defective, check :—
Voltages : *C-E*, 260; *D-E*, 270.
Resistances : *C-B*, 500; *F-E*, 250,000 ohms.

AF Stage, V3.
Inject 0.5 volt AF V3 grid and *E*. If defective, check :—
Voltage : *G-E*, 180.
Resistances : *G-B*, 256,500 ohms; *H-E*, 1.5 megohms.

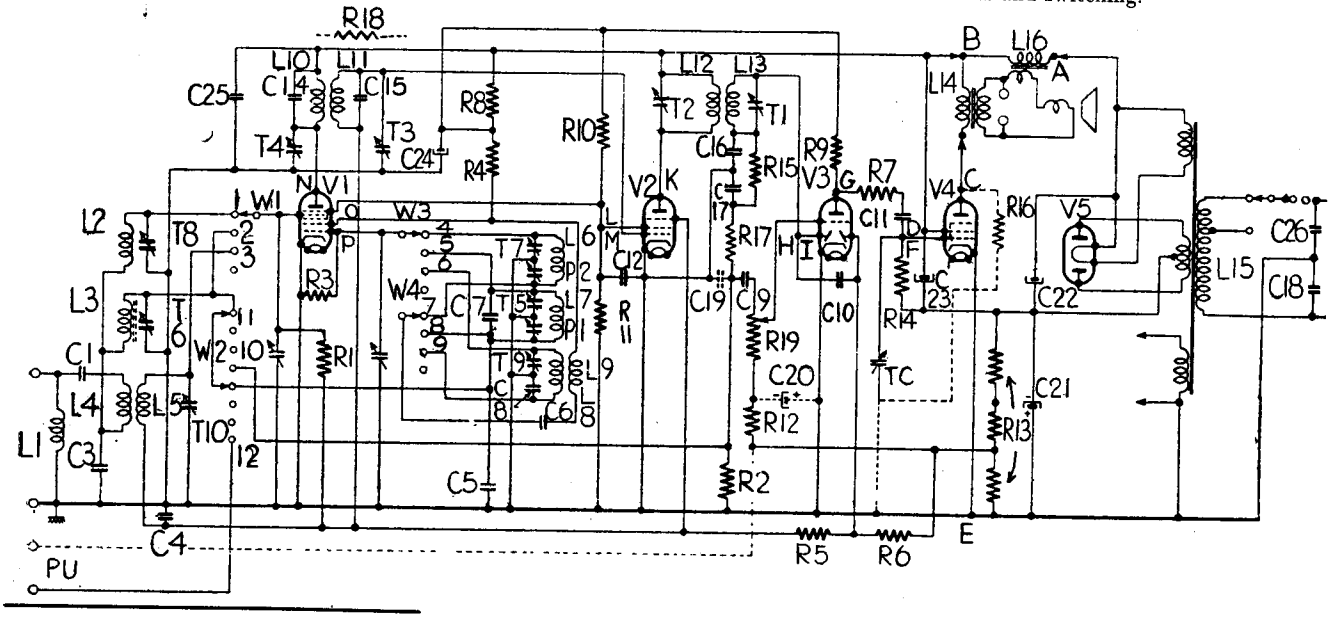
Demodulation Stage.
Inject 475 kc. V2 anode and adjust T1. If defective, check :—
Resistances : *I-E*, 350,000; *L12*, 12; *L13*, 8 ohms.

IF Stage, V2.
Inject 474 kc. signal V2 grid and trim T2. If defective, check :—
Voltages : *K-E*, 270; *L-E*, 75.
Resistances : *L-B*, 51,000 ohms; *M-E*, 2 megohms.

Mixer Section, V1.
Inject 475 kc. signal V1 anode and trim T3. If defective, check :—
Resistances : *L11*, 8; *L10*, 12 ohms.
Inject 475 kc. signal at V1 grid and trim T4. If defective, check :—
Voltage : *N-E*, 270.

Oscillator Section.
Voltage : *O-E*, 180.
Resistances : *O-B*, 90,000; *P-E*, 70,000 ohms.

Signal Tests.
If no signals are obtained, tune to local station and inject that frequency plus 475 kc. at *P*.
If still no signals, check pre-selector circuits and switching.

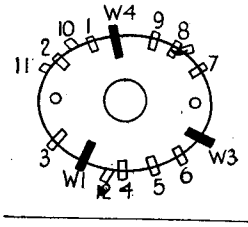


VALVE READINGS

V.	Type.	Make.	Electrode.	Voltage.
1	6A7	Cossor	Anode	270
			Screen	75
			Osc. anode	180
1	78E	Philco	Anode	270
			Screen	75
3	75	Cossor	Anode	180
4	42E	Cossor	Anode	260
			Screen	270
5	80	Philco	Heater	330
			Anodes	330 A.C.
Pilot lamps	"Tung Sol," MBC tubular.			6.3 volts 350 ma.

WINDINGS (D.C. Resistances)

L.	Ohms.	Range.	Where measured.
1	25	—	Aerial and earth sockets.
2	30	LW	V1 grid and C3.
3	3.5	MW	V1 grid and C3.
4	Very low	SW	C1 and C3.
5	Very low	SW	V1 grid and C3.
6	25	LW	W3 and W4.
7	3.5	MW	W3 and W4.
8	Very low	SW	W3 and W4.
9	Very low	SW	V1 osc. anode and W4.
10	8.0	—	V1 anode and HT positive.
11	12	—	V2 grid and C4+R5.
12	12	—	V2 anode and HT positive.



The switch bank with wipes and contacts numbered as in the circuit above.

Windings (continued)

13	8	—	Signal diode and R15 + C16.
14	500	—	V4 anode and HT positive.
15	20	—	Mains plug.

CONDENSERS

		Mfds.
1	Aerial coupling	.006
2	HT line shunt	.25
3	Aerial input network	.00225
4	AVC decouple	.04
5	Osc. grid	.0008
6	Osc. anode coupling	.00025
7	MW osc. fixed trimmer	.000012
8	SW padding	.0025
9	LF coupling	.015
10	AVC coupling	.00011
11	LF coupling	.03
12	V2 screen decouple	.18
13	Mains filter	.05
14	IFT1 primary tune	.000115

Condensers (continued)

15	IFT1 secondary tune	.000055
16	HF filter	.00011
17	HF filter	.00011
18	Mains filter	.05
19	HF filter	.000140
20	V3 bias decouple	60
21	Series bias shunt	35
22	HT smoothing	8
23	HT smoothing	8
24	Osc. anode decouple	16
25	V1 anode decouple	.09
26	Mains filter	.05

RESISTANCES

		Ohms.
1	V1 grid return	1.5 megs.
2	Signal diode load	250,000
3	V1 osc. grid	70,000
4	Osc. anode load	25,000
5	AVC decouple	1 meg.
6	AVC diode load	1 meg.
7	HF stopper	250,000
8	Sub HT line decouple	6,500
9	V3 anode load	250,000
10	V2 screen pot. (part)	51,000
11	V2 screen pot. (part)	150,000
12	V3 bias decouple	10,000
13	Series bias (tapped)	500
14	V4 grid leak	250,000
15	HF filter	51,000
16	Feed back	1.6 megs.
17	HF filter	51,000
18	V1 anode decouple	3,500
19	Volume control	500,000

Cossor 71 Alignment Notes

Continued from page 54)

IF Circuits (Frequency 465 kcs.).

The intermediate transformers should not require adjustment as they are permeability tuned. If one is replaced the method of alignment is as follows.

Connect an output meter to the set and the generator to the grid of V1, tuning the set to maximum and switching to the MW position.

Inject a low 465-kc. signal, adjusting the two iron cores from the insides of the can. Reduce the input as they come into line. The input must be below the AVC level.

Short Waves (16 to 52.5 metres).

With the generator connected to the input of the set, tune set and generator to 18 megacycles and adjust T1 for resonance and T2 for maximum output.

There are no padding adjustments, but check the ganging through the band.

Medium Waves (195 to 560 metres).

Tune set and generator to 1,400 kcs. (214 metres) and adjust T3 for resonance and T4 for maximum.

The medium wave padding is fixed but alignment should be checked near the top of the band.

Long Waves (810 to 2,058 metres).

Tune set and generator to 250 kcs. (1,200 metres) and adjust T5 for resonance and T6 for maximum.

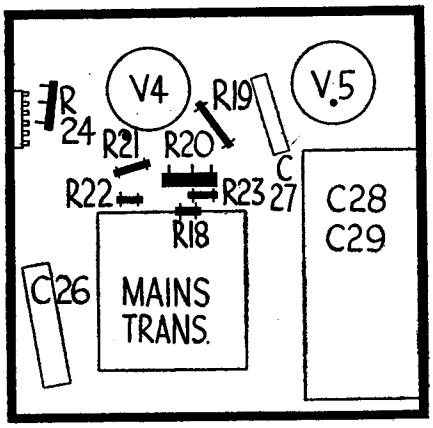
Tune set and generator to 160 kcs. (1,875 metres) and adjust P1 simultaneously rocking the gang.

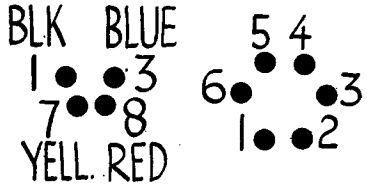
Repeat both operations until no improvement results.

Before checking the ganging it is important that the pointer coincides with the last calibration mark.

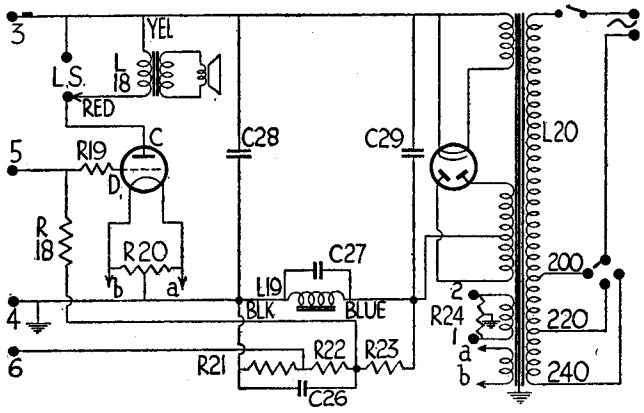
Replacement Condensers

REPLACEMENT electrolytics are available from A. H. Hunt, Ltd., who make the units in the set. List numbers and prices are : C28 + 29, 2860B, 7s. 3d.; C26, 3723B, 1s. 6d.; C22, 2915D, 1s. 9d.





Left, diagram identifying components underneath the power chassis and right, the circuit for this section of the model 71. Below, left, are connection details of the speaker plug (looking at back of pins) and power socket (looking at back).



Philco A539 Push-button

(*Continued from page 52*)

—these simply push on to the shafts. Then pull off the push-button knobs, which are similarly fixed.

On removing the four chassis retaining bolts from the bottom of the cabinet the chassis may be withdrawn. If it is desired to remove it completely, the speaker must be disconnected. This is joined to the set by a three-lead multiple cable.

Looking at the speaker strip from the back of the set, the leads, reading from left to right, are green-white, white, green.

Alignment

I.F. Circuits. (Intermediate Frequency, 475 kcs.)

Connect an output meter to the set and a signal generator to the grid circuit of V1. Maintain the grid return path and inject a low-level 475 kcs. signal.

Adjust progressively for maximum output T1, T2, T3 and T4. Reduce the input as the circuits come into line, always keeping below AVC level.

Medium Waves. (200-540 metres.)

See that the pointer hub is on the fourth green line from the top. Open the tuning condenser vanes to minimum and insert a .006 feeler gauge under the *heel* of the rotor vanes and close the condenser on to the feeler.

Check that the pointer reads on the white dot under the letter "P" in the word "Plymouth." Remove the feeler and proceed as follows.

Tune generator to 214 metres (1,400 kcs.) and set pointer to this position, shown by the white dot against the word "Dublin." Adjust T5 for resonance and T6 for maximum.

Tune set and generator to 500 metres (600 kcs.) and adjust P1, simultaneously rocking the gang.

Check the trimming at 214 metres, and repeat the operations until no further improvement results.

Long Waves. (1,000 to 1,950 metres.)

This band can be aligned in the normal manner, but for correct coincidence of certain medium and long-wave stations for a single push-button setting the following method should be used.

(1) In the MW position inject and tune to 296.2 metres (1,013 kcs.), corresponding to Midland Regional. Without moving the pointer, turn to LW and then (2) inject 232 kcs. (1,293 metres), corresponding to Luxembourg. Adjust T7 and T8. (3) Tune set and generator to 160 kcs. (see red dot at 1,875 metres), rock condenser and adjust P2 for maximum.

Repeat operations (1) and (2). Then repeat operations (3), (1) and (2) until there is no improvement.

Short Waves. (16.6-60 metres.)

Inject a signal of 18 mcs. through resistive dummy aerial. Tune set to this frequency and adjust T9.

There are two peaks very close together. The correct one is that first heard after unscrewing T9 from maximum.

Push-buttons

THE push-button control is effected through a rocking arm and lever link motion which operates the gang condenser. The displacement of the rocker arm is controlled by push-button plungers carrying adjustable pallets, locked by a screw operated by the push-button knob.

The method of setting up the buttons is as follows.

First of all tune in accurately the desired station. Then release the push-button locking screw on the button which it is desired to use for the station. About half a turn will generally release the locking screw.

Push the button inwards and re-lock the screw. After locking the screw, check that the setting has not slipped, which can be observed by movement of the pointer when the button is depressed.

If it has slipped, re-tune the set and readjust the button.

Replacement Condensers

EXACT replacement condensers are available from A. H. Hunt, Ltd.

For C24 there is unit 1,284, price 6s.; for C22 + C24, unit 1,979, 6s. 9d., and for C21, unit 2,970, price 2s.