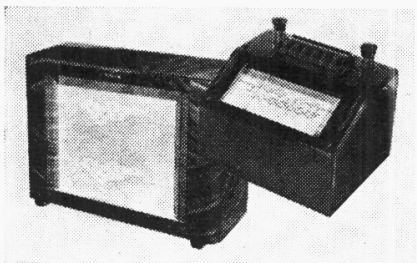
Supplement to The Wireless & Electrical Trader, February 25, 1939

"TRADER" SERVICE SHEET

387

PHILCO D732BG AND D732CG



The two units of the Philco D732BG remote control receiver.

A REMOTE control unit connected to the main chassis by a multi-way cable and comprising the complete frequency changer stage is employed in the Philco D732BG 6-valve (plus rectifier) AC 3-band superhet. This unit incorporates all of the controls, with the exception of a gramophone switch but including six press buttons operating on a mechanical system and catering for eight stations.

The main chassis is housed in a separate cabinet together with the speaker, and has provision for both a gramophone pick-up and an extension speaker. The receiver is for mains of 200-250 V, 50-60 C/S, and has a short-wave range of 16·6-50 m.

The D732CG is identical except that the main chassis is enclosed in a console cabinet, but this *Service Sheet* was prepared on a D732BG.

Release date for both models : October, 1938.

CIRCUIT DESCRIPTION

The aerial input, which is developed across the choke **L10** in the main chassis, is fed via the interconnecting cable to the aerial coupling circuit **L1** (SW) and **C1, C2** (MW and LW) in the remote control unit and thus to the aerial tuning circuits **L2, C40** (SW), **L3, C40** (MW) and **L4, C40** (LW) which precede heptode valve (**V1, Philco 6A7E**) operating as frequency changer with electron coupling. Oscillator grid coils **L5** (SW), **L6** (MW) and **L7** (LW) are tuned by **C41 ;** parallel trimming by **C42** (SW), **C6, C43** (MW) and **C44** (LW) ; series tracking by **C7** (SW), **C8, C9** and **C45** (MW) and **C46** (LW). Reaction by direct coupling to tuning coils, aided by reaction coil **L8** on SW.

Intermediate frequency appearing at **V1** tetrode anode is developed across anode tuning circuit **L9, C5, C47.** By tapping down **L9,** a low impedance coupling is effected and the IF signal is conveyed via the low impedance interconnecting cable which is terminated across a portion of **L11,** in the main chassis, which in turn steps up the voltage again and forms the tuned primary of the first IF transformer.

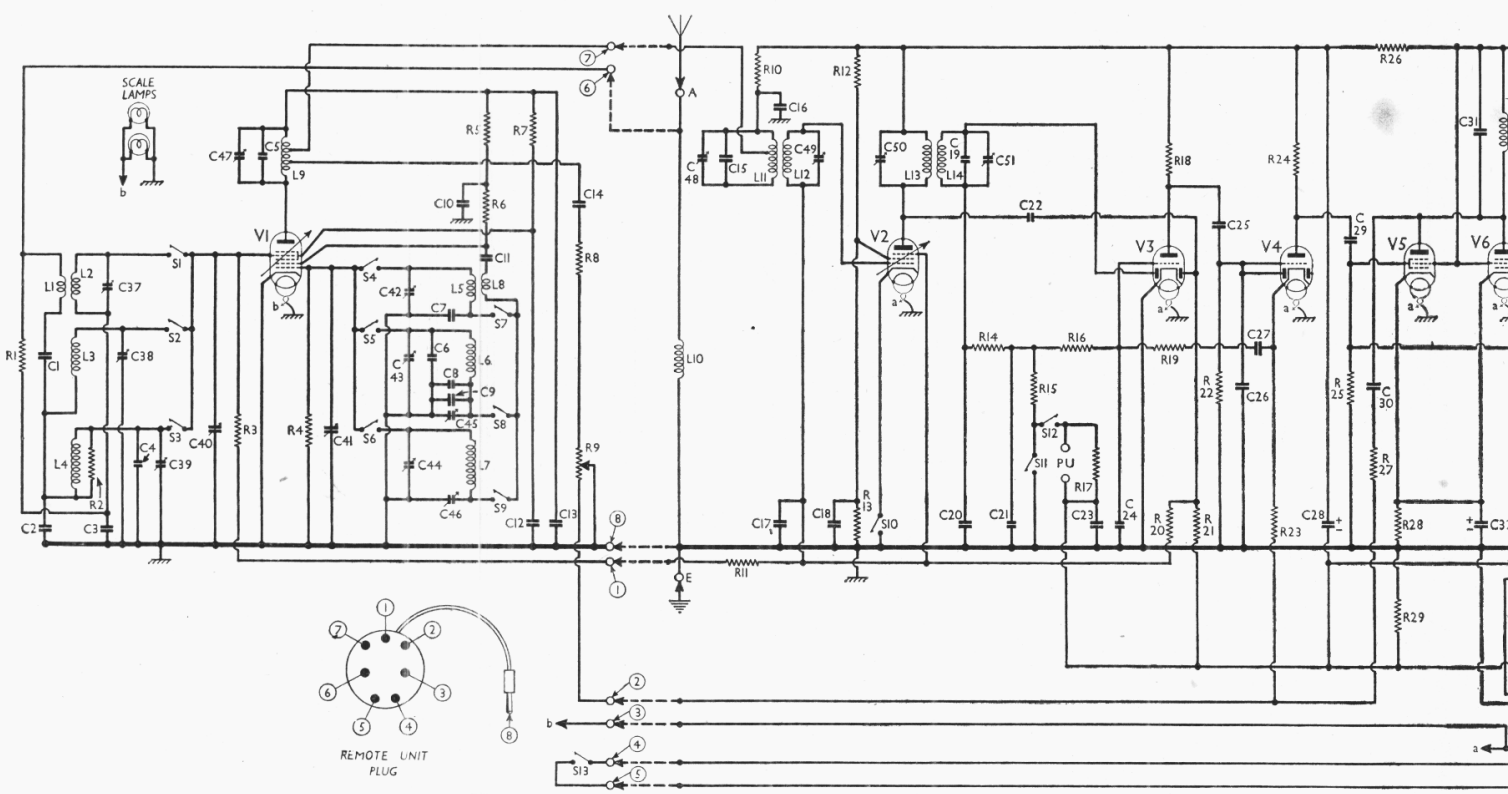
Second valve (**V2, Philco 78E**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C48, C15, L11, L12, C49** and **C50, L13, L14, C19, C51.**

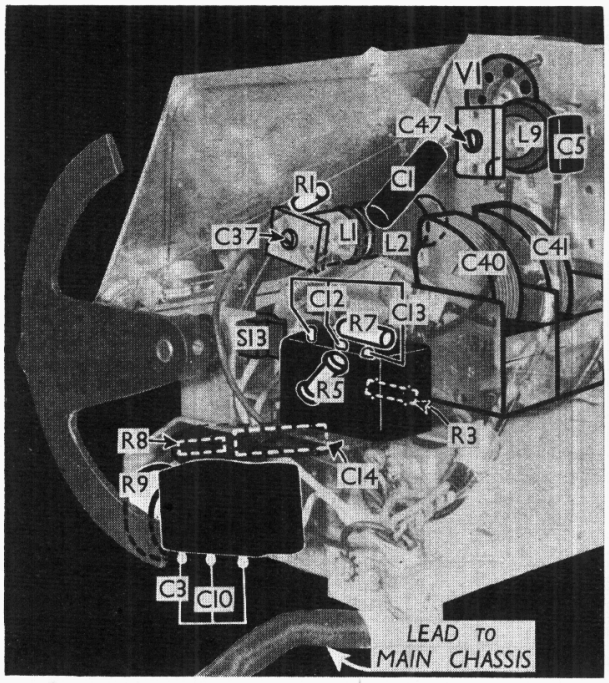
Intermediate frequency 475 KC/S.

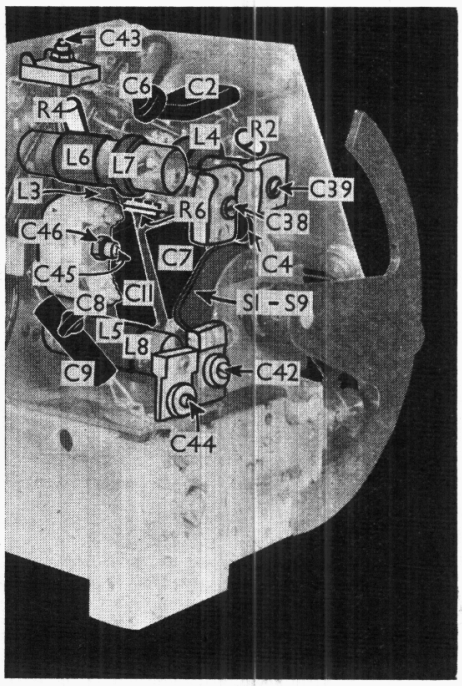
Diode second detector is part of double diode triode valve (**V3, Philco 85**). Audio frequency component in rectified output is developed across load resistance **R15** and passed via IF filter **R16, C24** to CG of triode section, which operates as AF amplifier. IF filtering by **C20, R14, C21** and **R16, C24.** Provision for connection of gramophone pick-up between low potential end of **R15** and, via bias circuit, chassis. For gramophone operation, **S10** in **V2** cathode circuit and **S11** in diode circuit open to mute radio, while **S12** closes.

Second diode of **V3,** fed from **V2** anode via **C22,** provides DC potential which is developed across load resistance **R21** and fed back through decoupling circuit as GB to FC (except on SW) and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R18, C25** and **R22** between **V3** triode and







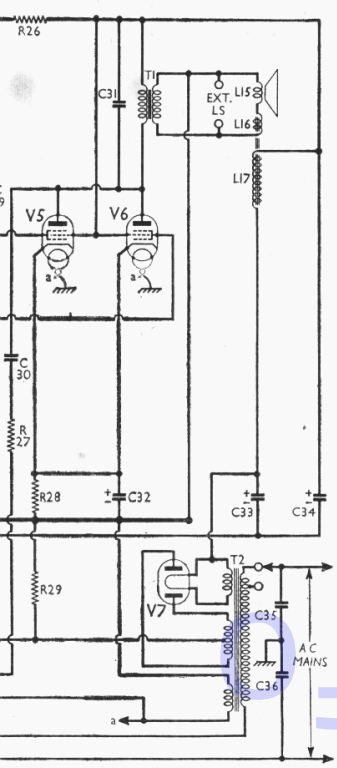
The remote unit, removed from its case, and viewed from two aspects to show all the components. On the left it is seen from the on-off switch end, and on the right the view from the wavechange switch end is given. Note the two double fixed condensers in the left-hand view, and the dual tracker unit in the right-hand view.

triode section of a second double diode triode valve (**V4, Philco 85**) which operates as a variable-mu AF amplifier for manual volume control purposes. Its cathode is returned to chassis via the fixed GB resistance **R23** and the manual volume control **R9.**

Resistance capacity coupling, by **R24, C29** and **R25,** is also employed between **V4** and the two parallel-connected pentode output valves (**V5, V6, Philco 42E's**). Fixed tone correction in anodes circuit by **C31.** Provision for connection of low impedance external speaker across secondary of **T1.** Tone compensation is automatically effected upon adjustment of volume control: **C30** and **R27** between **V5, V6** anodes and **R9** cause a progressively greater attenuation of "top" as the volume is increased, while at the same time the damping of **L9** by **C14, R8** is reduced.

Fixed GB for **V1** (except on SW) and **V2,** GB for **V3** triode (on gram only) and AVC delay voltage are obtained from drop along resistance **R29.**

HT current is supplied by full-wave rectifying valve (**V7, Philco 5X4G**). Smoothing by speaker field **L17** and electrolytic condensers **C33** and **C34.** Mains RF filtering by **C35** and **C36.**



Circuit diagram of Run 2 of the Philco D732BG. The console version is identical. Run 1 models are slightly different, the divergencies being given in col. 4 overleaf. The leads of the inter-connecting cable between the two units are shown by dotted lines, and are numbered to agree with the numbered pins on the plug shown beneath the circuit diagram.

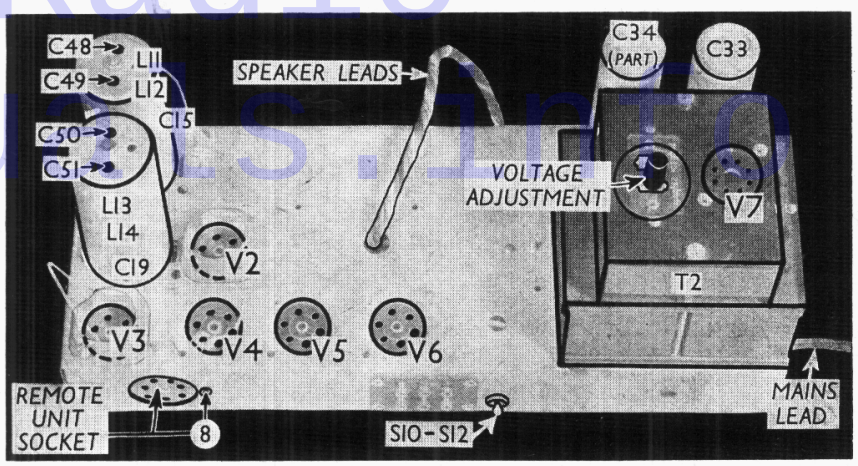
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt	99,000
R2	LW aerial circuit shunt	400,000
R3	V1 tetrode CG resistance	1,500,000
R4	V1 osc. CG resistance	65,000
R5	V1 osc. anode HT feed resistances	10,000
R6		20,000
R7	V1 SG HT feed resistance	35,000
R8	L9 damping limiter	100
R9	Manual volume control	100,000
R10	V1 anode HT feed resistance	2,900
R11	AVC line decoupling	99,000
R12	V2 SG HT feed potential divider	45,000
R13		20,000
R14	IF stopper	51,000
R15	V3 signal diode load	240,000
R16	IF stopper	10,000
R17	Gram. PU shunt	1,500,000
R18	V3 triode anode load	51,000
R19	Part V4 to V3 triode feed-back	250,000
R20	AVC line decoupling	490,000
R21	V3 AVC diode load	1,000,000
R22	V4 CG resistance	99,000
R23	V4 fixed GB resistance	450
R24	V4 anode load resistance	45,000
R25	V5, V6 CG's resistance	99,000
R26	V1, V2, V3 and V4 HT feed	700
R27	Part of tone compensator	65,000
R28	V5, V6 GB resistance	250
R29	V1, V2 fixed and V3 triode (gram), GB; AVC delay	25

	CONDENSERS	Values (μF)
C1	Aerial MW and LW coupling	0·01
C2		0·00225
C3	V1 tet. SW CG decoupling	0·09
C4	Aerial circuit LW fixed trimmer	0·000025
C5	V1 anode IF fixed trimmer	0·00005
C6	Osc. circuit MW fixed trimmer	0·00001
C7	Osc. circuit SW tracker	0·0025
C8	Oscillator circuit MW fixed trackers	0·000025
C9		0·00022
C10	V1 osc. anode decoupling	0·09
C11	V1 osc. anode coupling	0·0008
C12	V1 SG decoupling	0·09
C13	V1 HT circuit RF by-pass	0·09
C14	Part of tone compensator	0·01
C15	1st IF trans. pri. fixed trimmer	0·00025
C16	V1 HT circuit RF by-pass	0·25
C17	V2 CG decoupling	0·09
C18	V2 SG decoupling	0·01
C19	2nd IF trans. sec. fixed trimmer	0·000115
C20	IF by-pass condensers	0·00024
C21		0·000077
C22	Coupling to V3 AVC diode	0·000077
C23	V3 triode (gram) decoupling	0·09
C24	IF by-pass condenser	0·000077
C25	V3 triode to V4 AF coupling	0·01
C26	IF by-pass condenser	0·0007
C27	Part V4 to V3 triode feed-back	0·05
C28*	V1, V2, V3, V4 HT decoupling	8·0
C29	V4 to V5, V6 AF coupling	0·01
C30	Part of tone compensator	0·1
C31	Fixed tone corrector	0·05§
C32*	V5, V6 cathodes by-pass	35·0
C33*	HT smoothing condensers	8·0
C34*		16·0¶
C35	Mains RF by-pass condensers	0·09
C36		0·09
C37‡	Aerial circuit SW trimmer	—
C38‡	Aerial circuit MW trimmer	—
C39‡	Aerial circuit LW trimmer	—
C40†	Aerial circuit tuning	—
C41†	Oscillator circuit tuning	—
C42‡	Osc. circuit SW trimmer	—
C43‡	Osc. circuit MW trimmer	—
C44‡	Osc. circuit LW trimmer	—
C45‡	Osc. circuit MW tracker	—
C46‡	Osc. circuit LW tracker	—
C47‡	V1 anode IF coil tuning	—
C48‡	1st IF trans. Pri. tuning	—
C49‡	Sec. tuning	—
C50‡	2nd IF trans. Pri. tuning	—
C51‡	Sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Two 0·025 μF in parallel. ¶ Two 8 μF in parallel.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil	..	0·2
L2	Aerial SW tuning coil	..	Very low
L3	Aerial MW tuning coil	..	3·0
L4	Aerial LW tuning coil	..	28·0
L5	Osc. circuit SW tuning coil	..	0·1
L6	Osc. circuit MW tuning coil	..	3·5
L7	Osc. circuit LW tuning coil	..	21·5
L8	Oscillator SW reaction	..	0·35
L9	V1 anode IF tuning coil, total		9·0
L10	Aerial loading choke	..	12·0
L11	1st IF trans.	Pri., total	3·5
L12		Sec. ..	7·0
L13	2nd IF trans.	Pri. ..	7·0
L14		Sec. ..	4·75
L15	Speaker speech coil	..	2·2
L16	Hum neutralising coil	..	0·1
L17	Speaker field coil	..	400·0
T1	Speaker input trans.	Pri. ..	190·0
		Sec. ..	0·5
T2	Mains trans.	Pri., total ..	7·3
		Heater sec. ..	0·1
		Rect. heat. sec.	0·1
		HT sec., total	80·0
S1-S9	Waveband switches	.. ..	—
S10-12	Radio/gram. change switches		—
S13	Mains switch	.. .. ..	—



Plan view of the main chassis. The socket marked 8, next to the 7-pin remote unit socket, is only used on Run 2 models.

DISMANTLING THE SET

Removing Main Chassis.—The main chassis can be withdrawn from its cabinet by removing the four bolts (with washers) holding it to the bottom of the cabinet, when it can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unplug the leads from the control unit and unsolder the speaker leads. *When replacing*, note that the separate lead in the control unit cable should be plugged into the eyelet at the side of the socket, and connect the speaker leads as follows, numbering the tags from left to right :—1, red ; 2, black ; 3, green ; 4, white ; 5, green/white.

Removing Speaker.—The speaker can be removed from the cabinet by unsoldering the leads and removing the nuts and spring washers from the six screws holding it to the sub-baffle. *When replacing*, see that the transformer is at the top and connect the leads as above.

Removing Control Unit.—If it is desired to remove the control unit from its case, first take a note of the order in which the press buttons are arranged as when the top plate is removed they will probably fall out and they must be replaced in the correct order.

Then remove the two knobs (recessed grub screws), the four screws holding the top plate to the case and the three bolts (with washers) holding the unit to the bottom of the case. The unit can now be withdrawn.

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A7E	244	3·0	98	4·1
	Oscillator			
	106	4·3		
V2 78E	284	3·2	65	0·7
V3 85	45	4·2	—	—
V4 85	58	4·2	—	—
V5 42E	290	34·0	302	7·3
V6 42E	290	34·0	302	7·3
V7 5X4 G	322†	—	—	—

† Each anode, AC.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 226 V, using the 200-230 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

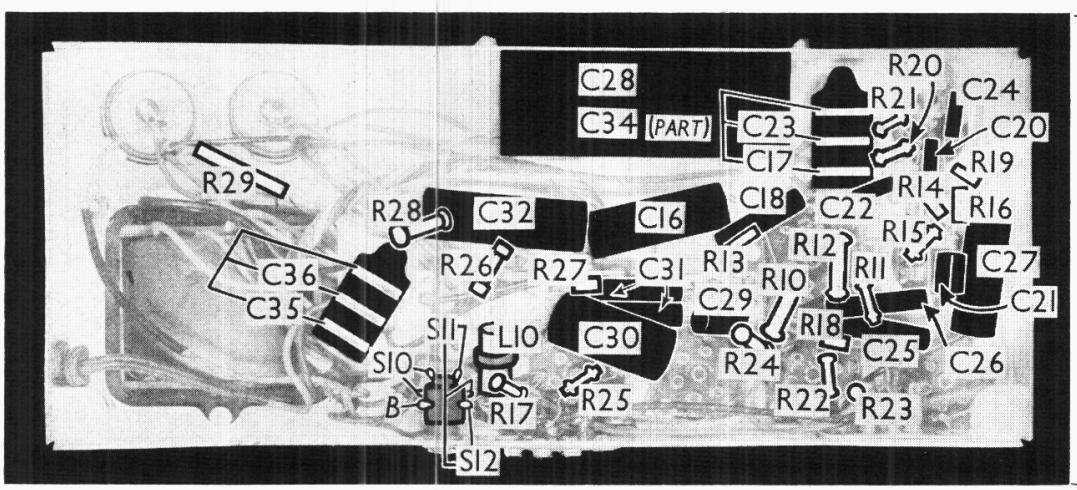
If, as in our case, **V2** should become unstable, when its screen current is being measured, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

GENERAL NOTES

Switches.—**S1-S9** are the waveband switches, in a single rotary unit at one end of the remote unit chassis. It is indicated at the right-hand side of our view of this chassis, and a diagram showing all the switches in the unit, as viewed from the end of the chassis, is in col. 6. The table (col. 5) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S10-S12 are the radio-gram change switches, in a single QMB unit at the rear of the main chassis. The individual switches are indicated in our underneath view of this chassis. In the radio (up) position of the switch **S10** and **S11** are closed, and **S12** open. In the gram (down) position, **S12** is closed, and **S10** and **S11** open.

S13 is the QMB mains switch, fitted at one end of the remote unit chassis,



Underneath view of the main chassis. Note the two double fixed condensers. The electrolytics **C28**, **C34** (and **C33** in the plan view) may be arranged differently in other chassis.

and shown at the left-hand side of our view of this chassis.

Coils.—L1, L2 ; L3 ; L4 ; L5, L8 ; L6, L7 and **L9** are in six unscreened tubular units mounted in the remote unit chassis on both sides of the vertical partition carrying **V1** valveholder. **L10** is beneath the main chassis, close to the **S10-S12** unit, while the IF transformers **L11, L12** and **L13, L14** are in two screened units on the main chassis deck, with their associated trimmers.

Scale Lamps.—These are two Tung-Sol miniature bayonet cap types, rated at 6·3 V, 0·35 A, and situated in the remote unit above the top of the tuning scale.

External Speaker. — Two sockets (marked S, S) are provided at the rear of the main chassis for a low impedance (2-3 O) external speaker.

Remote Unit Play.—The remote unit is connected to the main chassis by a screened cable terminating in a 7-pin plug and a separate single flying lead (8), which fit into a 7-socket connector and a separate single socket at the rear of the main chassis. The interconnecting leads in the cable are indicated by dotted lines in our circuit, and the plugs and sockets by numbered arrows and circles. The numbering agrees with that of the diagram of the plug inset at the bottom of the circuit.

The coding of the wires is: 1, red rubber and blue cotton ; 2, black rubber ; 3, red rubber ; 4, white rubber ; 5, white rubber ; 6, black rubber ; 7, black rubber and white cotton ; 8, screening of cable. Note that the two black rubber leads (2 and 6) cannot be interchanged, but the two white rubber ones (4 and 5) may be.

Condensers C28, C34. — **C28** and part of **C34** are in a single carton beneath the main chassis, having a common negative (black) lead. The yellow lead is the positive of **C28** (8μF) and the red the positive of part (8μF) of **C34.** The other 8μF of **C34** (making 16μF in all) is a tubular unit mounted on the main chassis deck, next to **C33.** Both **C33** and **C34** are insulated from chassis.

Black Moulded Condensers.—There are four of these units, two in each chassis, and each contains two paper condensers, one connection of each pair being common.

Pre-Set Condensers.—All these, except those belonging to the IF transformers, are in the remote unit, close to the coils with which they are associated. Note that the trackers **C45, C46** are in a dual unit, of which the screw adjusts **C45** and the nut, **C46.**

RUNS 1 and 2

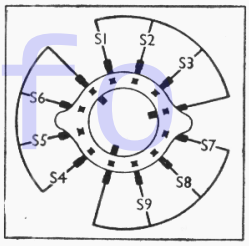
Our chassis was a Run 2 model, and in Run 1 versions there are several divergencies. **C1** was originally in the main chassis, between the aerial socket and connector socket. The connecting cable was somewhat different. **R3** was not present, the AVC being taken via the aerial lead to the remote unit. The lead to socket 6 went to socket 1, and the lead to plug 6 went to plug 1. Plug and socket 6 were used as the junction between the two chassis. The extra flying lead 8 was not used, but the metal braid of the cable was connected to the remote chassis.

C6 and **C8** were not present in Run 1 ; **R5** was 25,000 O.

TABLE AND DIAGRAM OF THE SWITCH UNIT

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	—	C	—
S6	—	—	C
S7	C	—	—
S8	—	C	—
S9	—	—	C

Diagram of the switch unit, as seen in the direction of the arrow in the right-hand view of the remote unit.



CHASSIS DIVERGENCIES

Apart from the differences between Run 1 and Run 2 models, there are many other possible divergencies.

C28, C33 and **C34** are present in various forms. In our chassis **C28** and half **C34** were in a carton unit beneath the main chassis, and the other half of **C34** and **C33** were two separate tubulars on the chassis deck.

In other models, there may be two dual tubulars, and no carton type. In this case, one section of each, in parallel, form **C34,** while the other sections of each are **C28** and **C33.**

In another version, there are two dual carton types beneath the chassis, again with one section of each forming **C34.**

C18, C25 and **C29** may be 0·006 μF each, and many of the other fixed condensers may have different values.

According to the makers' parts list, nearly all the resistors can have two or three alternative values, which do not differ considerably from our figures.

CIRCUIT ALIGNMENT

Setting Gang Condenser Crank.—Loosen set screw on tuning condenser crank and open condenser to fullest extent. Insert a 0·006 in. feeler gauge under the heel of the moving vanes and close the tuning condenser on to gauge. With the tuning condenser in this position and manual tuning knob pushed in, rotate the knob anti-clockwise to its fullest extent, and screw up firmly the set screw on the tuning condenser crank.

Setting up Scale Assembly.—Unscrew the screws holding the scale assembly, so that the large gear may be turned without moving the tuning knob and gear. With the scale assembly in this position, turn the scale gear clockwise until one or two turns of string are left on top side of gear spindle. Then screw scale assembly back into position, making sure that the gear is not shifted in the mounting process. Adjust pointer on string to read on 18 MC/S.

IF Stages.—Switch set to MW, and turn volume control to maximum. Connect signal generator, via a 0·1 μF condenser, to control grid (top cap) of **V1** and chassis, leaving existing connection in place. Feed in a 475 KC/S signal, and adjust **C51, C50, C49, C48** and **C47** for maximum output.

RF and Oscillator Stages.—Connect signal generator, via a suitable dummy aerial, to **A** and **E** sockets.

MW.—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust **C43,** then **C38,** for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C45** (screw) for maximum output, while rocking the gang for optimum results. Repeat the 214 m adjustments.

LW.—Switch set to LW, tune to 1,293 m on scale, feed in a 1,293 m (232 KC/S) signal, and adjust **C44,** then **C39,** for maximum output. Feed in a 1,875 m (160 KC/S) signal, tune it in, and adjust **C46** (nut) for maximum output, while rocking the gang. Repeat the 1,293 m adjustments.

SW.—Switch set to SW and feed in an 18 MC/S (16·67 m) signal via a SW dummy aerial. Tune to 18 MC/S on scale, and adjust **C42** for maximum output, choosing the second peak reached when unscrewing from the maximum position. In adjusting **C37** on the same signal, there may be a tendency for the oscillator circuit to be "pulled." To avoid this shunt the **C41** section of the gang with an external 0·00035 μF variable condenser and tune this condenser (about half open) to the second harmonic of the 18 MC/S input. Then adjust **C37** for maximum output.

Disconnect the external variable condenser and re-adjust **C42** for maximum output. Check that the 18 MC/S image is obtained at about 17·1 MC/S. Check calibration at 6 MC/S (50 m).

AUTOMATIC TUNING ADJUSTMENT

Set wavechange switch to the MW position (or the LW position in the case of single LW stations only), then press the manual tuning control and tune in the required station.

Pull out the Philco name plaque which is clipped in position above the tuning scale, and lift off the key from the plunger which it is desired to adjust ; this will expose the adjusting screw.

Ascertain whether the wavelength of the required station is higher or lower than that of the station to which the key was set. If higher, the adjusting screw will need to be turned anti-clockwise ; if lower, the adjusting screw will need to be turned clockwise, when re-adjusting.

Keeping the manual tuning control pressed in, insert blade of special screwdriver, supplied with the receiver, into slot of adjusting screw, press in plunger and turn screw in required direction until both manual tuning control and plunger remain down of their own accord.

Release manual tuning control and plunger by pressing any one of the remaining keys.

Press in plunger and accurately tune the required station by turning the adjusting screw.

Check accuracy of the setting by alternately pressing the manual tuning control and plunger.

Place correct station name-tab in bottom of key. Replace key on plunger and press Philco name plaque in position.