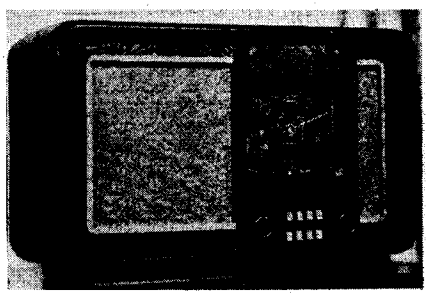
PHILIPS 660A PUSH-BUTTON FIVE



The Philips 660A is a 4-valve plus rectifier three-band superhet with a unique form of push-button mechanical tuning. The buttons operate a special "linear action" gang condenser and neither pre-set circuits or motor are required.

CIRCUIT.—The aerial input circuits consist of H.F. transformers on all wavebands, the secondaries being tuned and the signals fed to the grid of V1, a hexode valve operating as an H.F. amplifier. A series grid condenser, C18, enables the A.V.C. potentials to be applied direct to the grid.

H.F. intervalve transformers provide the coupling to the frequency changer, V2, with extra coupling in the form of C43 on the medium waveband. Here again a series grid condenser is used. A.V.C. potentials are not applied on the short waveband. The oscillator section follows standard practice, the grid coils being tuned.

An I.F. transformer of the driftless, non-trimmer type tuned to 470 kc. couples the frequency changer to the H.F. pentode I.F. amplifier, V3. It will be seen that when the receiver is acting as a gramophone reproducer, V3 is connected to operate as a triode L.F. amplifier.

Another I.F. transformer couples V3 to the demodulating diode of V4, a double-diode output pentode. The primary and secondary windings are both "tapped" down. The connection to the demodulating diode load is effected via an H.F. filter, and the rectified potentials fed to the grid of the pentode section of V4 via a tone-compensated volume control, coupling condenser and grid stopper resistance.

A pentode compensator condenser is included to conform with standard practice, while a tone-control circuit, C42, R32 and R33, is included.

The other diode of V4 provides a D.C. potential that operates the A.V.C. network controlling V1, V2 and V3. The

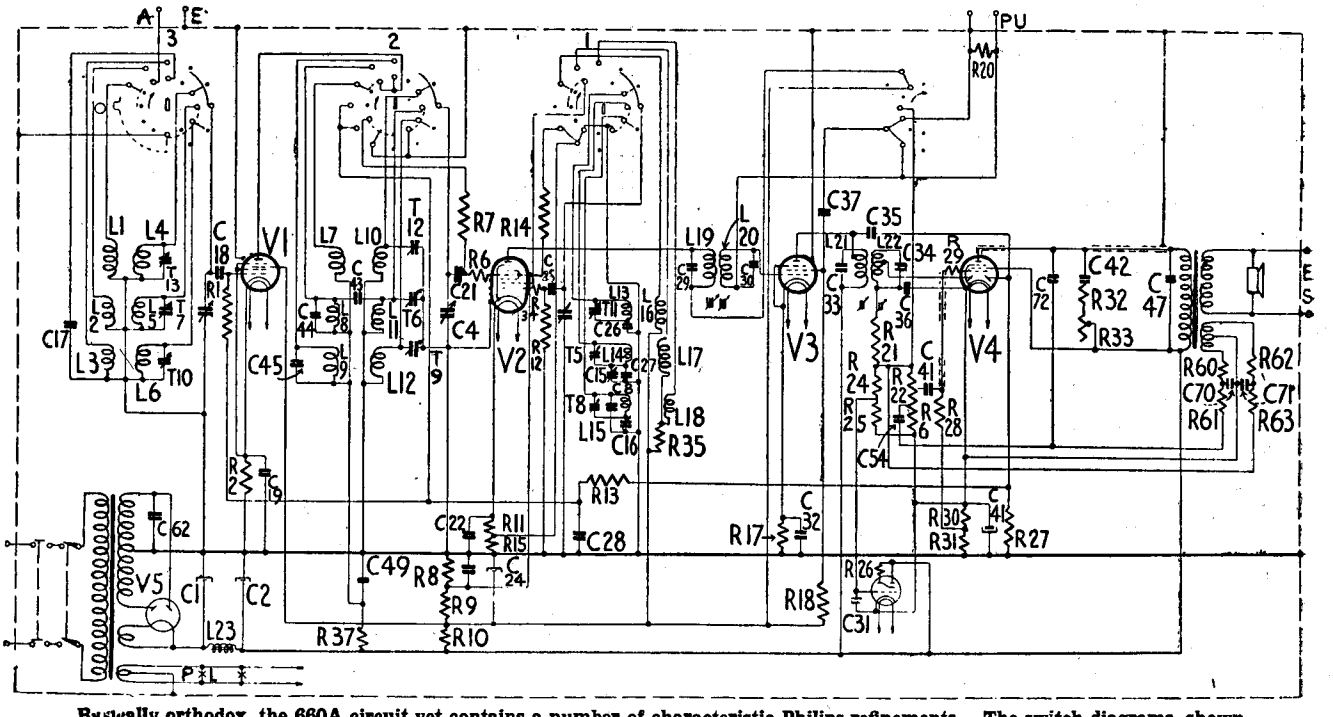
VALVE READINGS

No signal. Volume maximum. M.W. band 200 volt A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
	Mullard.			
1	EF8	Anode ..	265	4.3
		Screen ..	190	1
2	EK2	Anode ..	190	2.2
		Screen ..	180	3.5
		Osc.anode	90	1.3
3	EF9	Anode ..	260	6.4
		Screen ..	90	2
4	EBL1	Anode ..	235	34
		Screen ..	260	5.5
5	Philips AZ1 ..	Heater ..	290	—

RESISTANCES

R.	Purpose.	Ohms.	R.	Purpose.	Ohms.
1	V1 A.V.C. feed	800,000	27	A.V.C. diode load	640,000
2	V1 cathode bias	400	28	V4 grid leak	1 meg.
6	V2 series grid	32	29	V4 grid stopper	1,000
7	V2 A.V.C. feed	800,000	30	V4 cathode bias (shunt) ..	160
8	V2 screen potr. (part) ..	50,000	31	V4 cathode bias (part) ..	200
9	V2 screen potr. (part) ..	32,000	32	Tone control limiting ..	100
10	H.T. decoupling	8,000	33	Tone control	50,000
11	V2 cathode bias (part) ..	500	34	Regeneration modifier ..	50
12	Osc. grid leak	50,000	35	M.W. and L.W. osc. anode feed	2,000
13	A.V.C. decoupling	1.25 meg.	37	V1 anode decoupling ..	2,000
14	V2 screen feed	20,000	60	Negative feedback potr. (part)	1,250
15	V2 cathode bias (part) ..	160	61	Negative feedback potr. (part)	8,000
17	V2 cathode bias	320	62	Negative feedback potr. (part)	10,000
18	V3 screen load and feed ..	50,000	63	Negative feedback potr. (part)	800,000
20	Pick-up shunt	500,000	64	Volume control (part) ..	40.000
21	H.F. stopper	50,000			
22	Volume control (part) ..	660,000			
24	T.I. grid potr. (part) ..	500,000			
25	T.I. grid port. (part) ..	640,000			
26	T.I. anode feed	2 meg.			



Basically orthodox, the 660A circuit yet contains a number of characteristic Philips refinements. The switch diagrams, shown in the S.W. position, are drawn to represent the actual appearance of the units.

Potentials operating the pentode section of V4 also operate the visual tuning indicator.

Mains equipment consists of a mains transformer, a full-wave rectifying valve V5, electrolytic smoothing condensers and separate smoothing choke.

Chassis removal.—The cabinet has a false bottom secured by six screws, removal of which enables access to the underside of the chassis. The chassis should not be removed if avoidable. If it is necessary to remove the chassis, the following procedure should be followed :—

Remove the two grub-screw fixed control knobs from the front of the cabinet and also the back, which is secured by sliding clips. Then remove the four recessed chassis-securing bolts and washers from the base of the cabinet, taking care that the chassis does not fall.

Loosen the grub-screws securing the tone and volume knobs to the extension shafts inside the cabinet, then unhook the cable from the tuning pointer drum, and, still holding the drum, unscrew the fixing screw securing the drum and allow the spring tension on the drum to slowly adjust itself. Then unhook the cable from the wavelength indicator, unscrew the brass cable, insert rod, and remove. Unsolder the two speaker leads and the earthing lead to the plate at the rear of the chassis.

Unclip the dial lights and holders from their mountings and remove the visual tuning indicator and holder. The chassis may then be removed from the cabinet free of all leads.

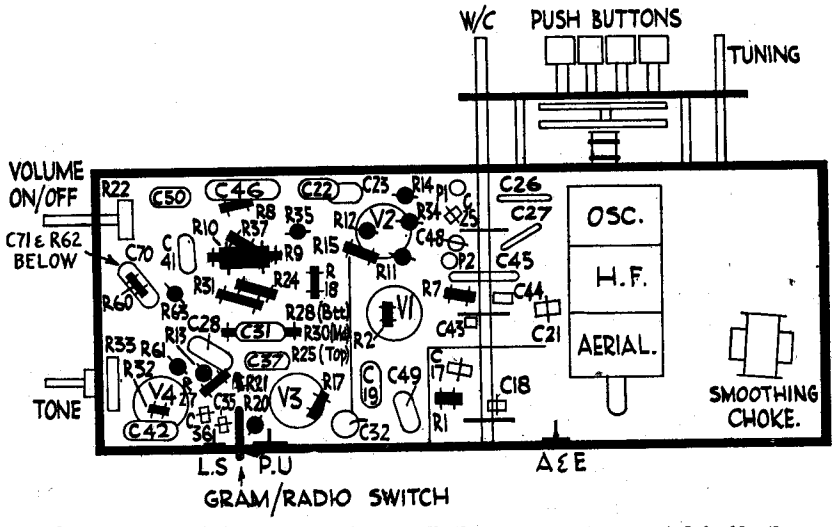
(*Continued on page* 24.)

CONDENSERS

C.	Purpose.	Mfds.
1	H.T. smoothing	28
2	H.T. smoothing	32
17	L.W. aerial shunt	.00008
18	V1 grid isolating	.0001
19	V1 cathode bias shunt	.1
21	V2 grid isolating	.0001
22	V2 cathode bias shunt	.1
23	V2 screen decoupling	.1
24	H.T. decoupling	32
25	Osc. grid	.00005
26	S.W. osc. fixed padder	.00475
27	M.W. osc. fixed padder	.0004
28	A.V.C. decoupling	.1
29	I.F. T.1 prim. fixed trimmer	.000091
30	I.F. T.1 sec. fixed trimmer	.000097
31	T.I. grid decoupling.	.05
32	V3 cathode bias shunt	.05
33	I.F. T.2 prim. fixed trimmer	.000103
34	I.F. T.2 sec. fixed trimmer	.000103
35	A.V.C. diode decoupling	.000008
36	H.F. by-pass	.00005
37	V3 screen coupling	.05
41	L.F. coupling.	.0032
42	Tone control	.05
43	M.W. H.F. coupling	.000002
44	M.W. H.F. primary tune	.00005
45	L.W. H.F. primary tune	.0002
46	V4 cathode bias shunt	25
47	Pentode compensator	.002
48	L.W. osc. fixed trimmer	.00004
49	V1 anode decoupling	.05
50	Tone compensator	.05
62	Rectifier by-pass	.02
70	Negative feedback injection	.064
71	Negative feedback injection	.002
72	Feed back coupling	.000125

WINDINGS (D.C. RESISTANCES)

L.	Ohms.	Range.	Where measured.
1	2.4	S.W.	Aerial socket and chassis.
2	25.1	M.W.	Aerial socket and chassis.
3	105	L.W.	Aerial socket and chassis.
4	.1	S.W.	C1 and chassis.
5	4.9	M.W.	C18 and chassis.
6	45	L.W.	C18 and chassis.
7	3	S.W.	Anode V1 and C49
8	276	M.W.	Anode V1 and C49
9	486	L.W.	Anode V1 and C49
10	Very low.	S.W.	C21 and chassis.
11	419	M.W.	C21 and chassis.
12	441	L.W.	C21 and chassis.
13	Very low.	S.W.	C25 and C26
14	8.8	M.W.	C25 and C27.
15	18	L.W.	C25 and P2.
16	1.2	S.W.	Osc. anode and C.24
17	3	M.W.	Osc. anode and R35
18	4.3	L.W.	Osc. anode and R35
19	9.3	—	Anode V2 and C24.
20	8	—	Top grid V3 and R20.
21 (part)	4.4	—	Anode V3 and C2.
22 (part)	3	—	R21 and demodulating diode V4.
23	400	—	Tags.
O.T. prim.	660	—	Tags.
M.T. prim. (200 v.).	38	—	Mains plug pins.
Total H.T.	460	—	Anode pins V5.



Above, a layout diagram identifying all the components mounted inside the Philips chassis. On the right is a diagram of the pointer drum (see notes on chassis removal and replacement).

Philips 660A on Test

MODEL 660-A.—For A.C. operation, 100-260 volts, 50-100 cycles. Price 13½ gns.

DESCRIPTION. — Four-valve, plus rectifier, push-button superhet covering three wavebands.

FEATURES. — Eight push-buttons give choice of any combination of medium and long wave stations. Mechanical system using "linear action" gang condenser. Full-vision circular scale calibrated in metres and station names. Nearly 360 degrees of pointer rotation. Speaker at side of chassis. Controls for tone, combined volume and master switch, tuning and wave selection. Wavechange switch operates indicator on scale. Visual tuning indicator. Sockets for pick-up with gram/radio switch. Sockets for speaker.

LOADING.—60 watts.

Sensitivity and Selectivity

SHORT WAVES (16.7-51 metres).—Excellent gain and selectivity. Very easy handling. No noticeable drift and particularly well maintained gain.

MEDIUM WAVES (198-585 metres).—Excellent gain and selectivity, with local station spread on adjacent channels only. Clean background and well maintained sensitivity.

LONG WAVES (708-2,000 metres).—Similar performance to medium wave band, with very little interference on Deutschlandsender.

Press-button Notes

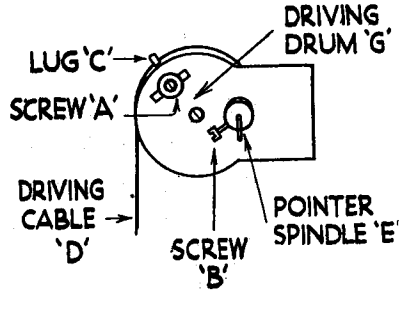
The press-button adjustment is easy. The setting was accurate when received and did not shift during our tests.

Acoustic Output

Ample volume for an ordinary room, with a pleasing characteristic, a reasonable amount of upper note response and crisp, clean attack and a not too vigorous tone control. Medium registers are free from resonance and the low note radiation is very good.

Replacement Condensers

EXACT replacement condensers available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18, are : for either C1 or C24, unit 4233, price 7s.; for C2, 4265, 7s.; and for C46, 2918, 1s. 9d.



Philips 660A Push-Button Superhet Five

(*Continued from page* 23.)

Chassis Replacement.—Replace the screwed cable, insert rod of the wavechange indicator and loop over the indicator tag. Replace chassis and resolder the speaker leads and earthing tag on rear of chassis.

Rotate the pointer indicator drum to the left about three times, so as to obtain a spring tension, and replace bowden wire loop on drum. Replace chassis-securing bolts and washers on base of cabinet. Replace tuning control knob and turn gang to minimum capacity.

Then, carefully holding the pointer drum to prevent rotation, unscrew the pointer-securing grub-screw and rotate the shaft of the pointer (see drawing) until the pointer indicates minimum, or preferably that the reverse of pointer indicates the "keyboard tuning" position. Then tighten up the pointer-securing grub-screws.

The other control knobs, dial lights and visual tuning indicator may then be replaced and the wavelength indicator adjusted. It should be noted that the cable passes through a bracket on the chassis. Access to the bracket can be obtained through the false bottom of the cabinet. Then insert the rod near the actual indicator, which may then be adjusted for correct position by screwing in or out as the case may be.

It should be noted when the chassis is withdrawn and replaced, the recalibrating procedure described below should be followed.

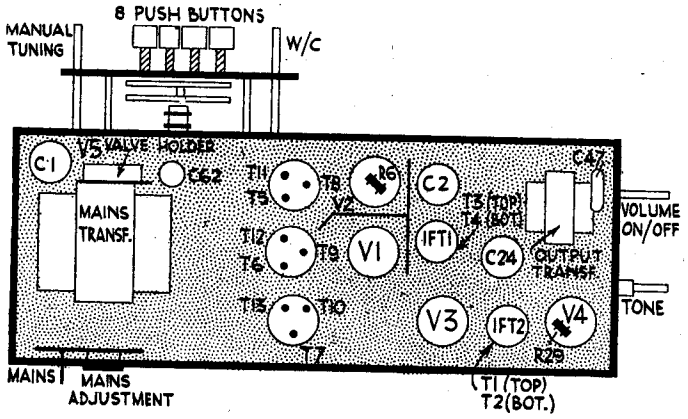
Special Notes.—A pair of sockets at the rear of the chassis are for connecting an extension speaker of approximately 7 ohms impedance. Pick-up sockets are provided at the rear of the chassis, while a gram-radio switch cuts off radio reception.

P1 and P2 are insulated bushes sprayed internally with a layer of metal and covered on the outside with a copper wire, the capacity being reduced as desired by unwinding the wire. In trimming, the wire is unwound until the output indicator, after having reached maximum deflection, commences to drop back. Turns are then replaced until maximum response is obtained. Surplus wire is cut off and the remainder sealed with wax.

It will be seen from the circuit that the wavechange switches are drawn to conform with the actual appearance of each switch, and these may be taken to correspond with our usual drawings of wavechange contacts.

Mains input leads are led through a safety device on the back of the cabinet whereby the receiver is switched off when the back is removed. The adjustment device is located on an insulated panel, and consists of a black disc on which six voltages are engraved. To alter the voltage pull the disc until it is free to rotate, and then turn it round so that the required voltage is visible through an aperture in the back of the cabinet, or, alternatively, the desired voltage is at the top range of travel of the disc.

The tuning indicator is a Philips type E.M.I. and the dial-illuminating lights are Philips type 8045 D-00.



The top-of-chassis diagram for the model 660A. The push-buttons are in two banks of four. Padding trimmers are below the chassis.

In our particular chassis, C1 was 32 mfd. and C24 was 28 mfd. R.26 is mounted on the visual tuning indicator valveholder. C29, C30, C33 and C34 are mounted inside the cans of their corresponding I.F. transformers.

Negative feed-back potentials derived from a tertiary winding on the speaker transformer are fed back to the last valve via the cathode circuit and also the grid.

Alignment Notes

I.F. Circuit.—Set receiver to M.W. band, turn gang to minimum, volume to maximum, tone to "high" position and short-circuit C28.

Connect an output meter across primary of speaker transformer or across extension L.S. sockets. Connect a service oscillator between the top grid-cap of V2 (via a .032 mfd. condenser) and chassis and tune service oscillator to 470 kc.

Shunt I.F. T2 primary with a .00008 mfd. condenser and adjust T1 for maximum. Remove .00008 mfd. condenser, connect across I.F. T2 secondary and adjust T2 for maximum. Remove .00008 condenser, reconnect across I.F. T1 primary and adjust T3 for maximum. Remove .00008 condenser, reconnect across I.F. T1 secondary and adjust T4 for maximum. Then seal all coil cores with wax and remove short from C28.

Signal Circuits.—Leave controls as before, but connect service oscillator to the aerial and earth sockets via a dummy aerial, only feeding sufficient input to obtain reliable peaks in the output meter and reducing the input as the circuits come into line.

Before trimming the signal circuits it is necessary to set the tuning condenser to a certain capacity. Therefore disconnect the leads to the oscillator section of the gang and connect a capacity tester to the gang by the shortest possible leads (about 3 in.). Set gang to minimum and depress the second push-button from the right (top), and by means of the push-button setting key accurately adjust the oscillator gang to read 28.3 micro-microfarad (.0000283 mfd.).

Then disconnect the capacity tester, reconnect the oscillator gang and do not alter the push-button setting throughout all signal circuit adjustments.

Medium Waves.- With gang still at minimum, depress the pre-set push-button, apply a 211.3-metres (1,420 kc.) signal and adjust T5, T6 and then T7 for maximum response.

Set receiver for manual tuning by pulling out the tuning knob, connect an aperiodic amplifer to anode of V2 across a .000025-mfd. condenser and connect output meter to aperiodic amplifier. Short-circuit oscillator section of gang.

Apply a 546-kc. signal, tune in on receiver (about 550 metres), tune aperiodic amplifier to about 550 metres, tune receiver to be trimmed, then disconnect auxiliary apparatus, remove short from oscillator gang and reconnect output meter to receiver on test.

Without altering tuning control setting trim P1 for maximum (see special notes).

Then set gang to maximum, depress the pre-set push-putton, apply a 211.3-metre (1,420 kc.) signal and adjust T5 for maximum.

Long Waves.—Set variable condenser to minimum and depress the pre-set push-button. Apply an 830-metre (390 kc.) signal and adjust T8, T9 and then T10 for maximum.

Reconnect oscillator and output meter as before, short-circuit oscillator gang and pull out tuning control knob to obtain manual tuning.

Apply a 160-kc. signal and tune receiver and oscillator to about 1,875 metres. Disconnect oscillator, remove short-circuit from gang and reconnect output meter to receiver.

Then set gang to minimum, depress pre-set push-button, apply an 830-metre (390 kc.) signal, adjust T8 for maximum.

Short Waves.—Set gang to minimum, depress the pre-set button, apply a 15.8-mc. signal, screw T11 right up and then unscrew until the second peak is heard. Then adjust T12 and T13 for maximum.

Short-wave padding is fixed, but check calibration to ensure that the correct peak has been selected.

Recalibration Setting. — Precautions should be taken when carrying out this operation to ensure that live parts are not touched by the operator. Connect an output meter to the receiver and feed the output from a service oscillator to the aerial and earth sockets.

Feed a 510-metre (588 kc.) signal, tune in on receiver, and if the pointer does not read 510 metres exactly, loosen screw A (see figure) and turn the pointer drum, so that the pointer indicates exactly 510 metres, holding the lug C to

(*Continued on opposite page.*)

Philips Model 660A

(*Continued from opposite page.*)

keep the driving wire D taut. Then tighten up screw A, making sure the tuning does not alter.

Repeat with a 250-metre (1,200 kc.) signal, and if the pointer does not tally, only adjust A to the extent of half the amount of deviation, on the other side of 250 metres.

Then loosen screw B, turn the pointer spindle or shaft E until the pointer reads 250 metres, tighten screw B and check at 510 metres.

If screw A cannot be moved far enough, the drum G should be turned slightly. Remove control knobs, loosen bottom chassis-securing bolts and the two grub-screws holding the drum on the spindle, tilt the chassis slightly to the rear and then turn the drum (taking care the spindle does not move). Then refix the drum, and, before proceeding, resecure the chassis in the cabinet.

Station Key Adjustment.—Pull off the cap from the station key which has to be adjusted, pull out the tuning knob, thereby releasing all keys, and carefully tune in the desired station.

Depress the key and insert the special screwdriver. If, when the key was depressed the desired station disappeared or another station was heard in its place, turn the screwdriver to the left until the desired station is again heard and remains unaffected by further anti-clockwise rotation of the screwdriver. Now turn the screwdriver to the right until the station is slightly detuned, as shown by a decrease of the green star in the tuning indicator.

If when the key was first depressed the desired station remained unaffected, turn the screwdriver to the right until the station is slightly detuned as shown by the tuning indicator.

Swing the wavelength pointer to "Keyboard tuning" position (lowest wavelength) and make a final adjustment with the screwdriver until the desired station is accurately tuned in on the tuning indicator.

Station Key Notes.—When using the special screwdriver, care must be taken not to press against the key, otherwise the latter will be depressed beyond its normal operating position and an incorrect tuning adjustment will result.

Although each of the keys can be adjusted to any wavelength in the medium and long wavebands, it is desirable to arrange that the shortest wavelength stations are allocated to the keys in the centre.

Your Experiences . . . .

YOUR experiences of tracing elusive faults and effecting difficult repairs may be of assistance to other engineers. Why not send useful tips along for publication, at the usual rates, in *Service Engineer?*

Hints are of most value if the line of reasoning which solves a problem is explained. Remember this when writing.

Letters are invited, also, on what articles should be published in *Service Engineer* and how set reviews can be improved.

Address your letter to The Editor, WIRELESS RETAILER AND BROADCASTER, 29, Bedford Street, London, W.C.2.

Decca Model PT-B

(*Continued from page* 27.)

The wavelength pointer should be vertical when the gang condenser is at maximum. Connect the service oscillator to the aerial and earth sockets via a dummy aerial. Only feed sufficient input to obtain reliable peaks.

Medium Waves.—Depress M.W. manual button, tune set and oscillator to 200 metres (1,500 kc.) and adjust T1 and then T2 for maximum response.

The padding is fixed, but check calibration at 550 metres, compensating slightly with T1 if very much out.

Long Waves.—Depress L.W. manual button, tune set and oscillator to 1,000 metres (300 kc.) and adjust T3 and then T4 for maximum.

The L.W. padding is fixed, but check calibration at 2,000 metres, compensating slightly with T3 if very much out.

Press-button Alignment. — Remove service oscillator and output meter and connect an aerial and earth system. Place the cabinet on its side so as to obtain access to the trimmer panel through the false bottom.

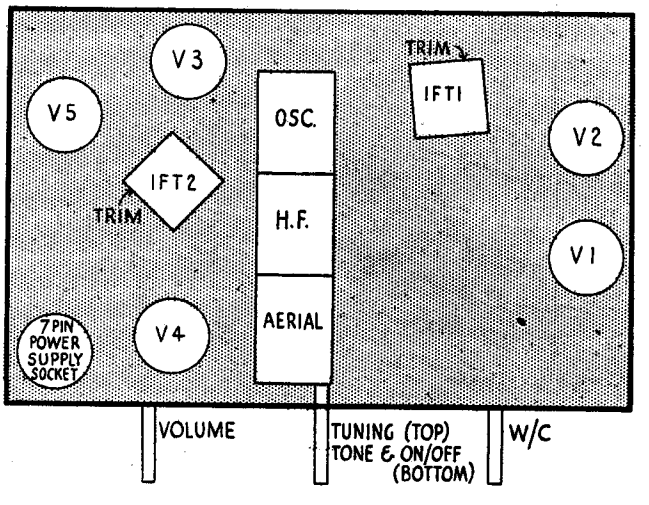
A choice of four medium-wave and two long-wave stations is obtained without recourse to wavechange switches. A button, when pressed automatically sets itself to the correct waveband.

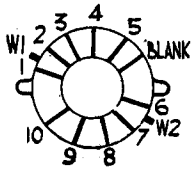
Each button should be calibrated on the actual station it is to receive. For example, press the button inscribed London Regional, adjust the corresponding oscillator trimmer (see sketch) to bring in the station, and then adjust the corresponding aerial trimmer.

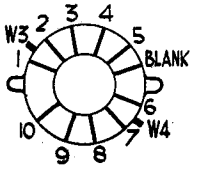
Ambassador 6778 Four-band Six

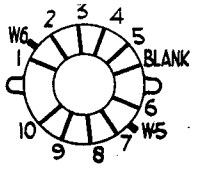
Valve positions and other components are identified by this top-of-chassis layout diagram of the model 6778. Below are details of the switch banks, one to four, from left to right.

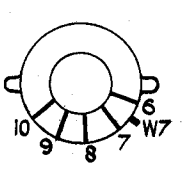
A replacement for the block containing C31 and C32 is available from A. H. Hunt Ltd. Unit list number 3659, it retails at 10s. 6d.











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signal, tune in on receiver and adjust T5 and T6 for maximum.

S.W.2 (34-96 metres).—Tune set and oscillator to 40 metres (7.5 mc.), screw T7 right up and then unscrew until the second peak from "tight" is heard. Then adjust T8 and T9 for maximum.

Check at 90 metres (3.3 m.c.) to ensure that the correct peak has been selected.

S.W.1 (12-35 metres).—Tune set oscillator to 13.9 metres (21.5 mc.), screw T10 right up and then unscrew until the second peak from "tight" is heard.

Then tune set and oscillator to 20 metres (15 mc.) and adjust T11 and T12 for maximum response. Check at 31 metres to ensure that the correct peak has been selected.

VALVE READINGS

No signal. Volume maximum. M.W. min. cap 200 volt A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
1	(Mazda) AC/VP2 ..	Anode ..	245	10.6
		Screen ..	245	3
2	AC/TH1 ..	Anode ..	245	1.6
		Screen ..	75	5.8
		Osc.anode	85	5
3	AC/VP2 ..	Anode ..	245	11
		Screen ..	245	1.8
4	AC/HL/DD ..	Anode ..	60	1
5	AC5/Pen. ..	Anode ..	235	34
		Screen ..	245	5.8
6	UU4	Heater ..	380	—