

"TRADER" SERVICE SHEET

776

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SERVICE SHEET No. 402

# MARCONIPHONE 874 AND H.M.V. 1102

THE Marconiphone 874 is a five-valve (plus rectifier) AC 3-band press-button superhet. The S.W. range is 13.8-50 m. There are twelve press-buttons, including eight for pre-set stations, three for manual waveband switching, and one for switching off.

Automatic frequency control is incorporated, and is in operation on the eight pre-set station buttons only. A tuning indicator is fitted, and there is provision for an external speaker and for a pick-up. The receiver is for 195-255 V, 50-100 c/s mains.

The H.M.V. 1102 has an identical chassis, but this Service Sheet was prepared on a Marconiphone 874.

Release date and original price, both models: March, 1939; £16 5s. 6d.

### CIRCUIT DESCRIPTION

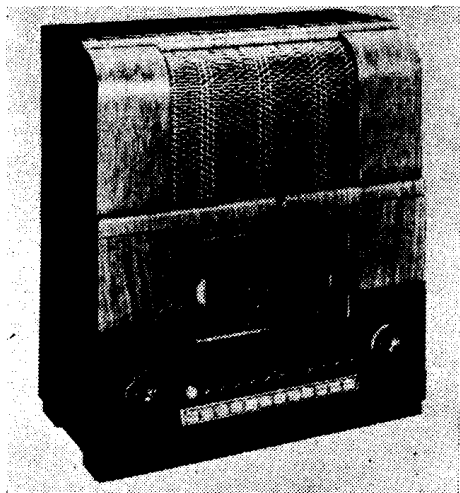
All the switches in the press-button unit, with the exception of S23 and S24, have been numbered and lettered in such a manner as to indicate their functions. All switches bearing the same number are operated by the same button; a suffix letter a, b or c indicates that the switch to which it is attached closes, while an x, y or z indicates that its switch opens, when its button is pressed; when the button is released,

by pressing another button, the a, b and c switches open, and x, y and z switches close. S24 closes during the movement of any button to mute the speaker during the operation.

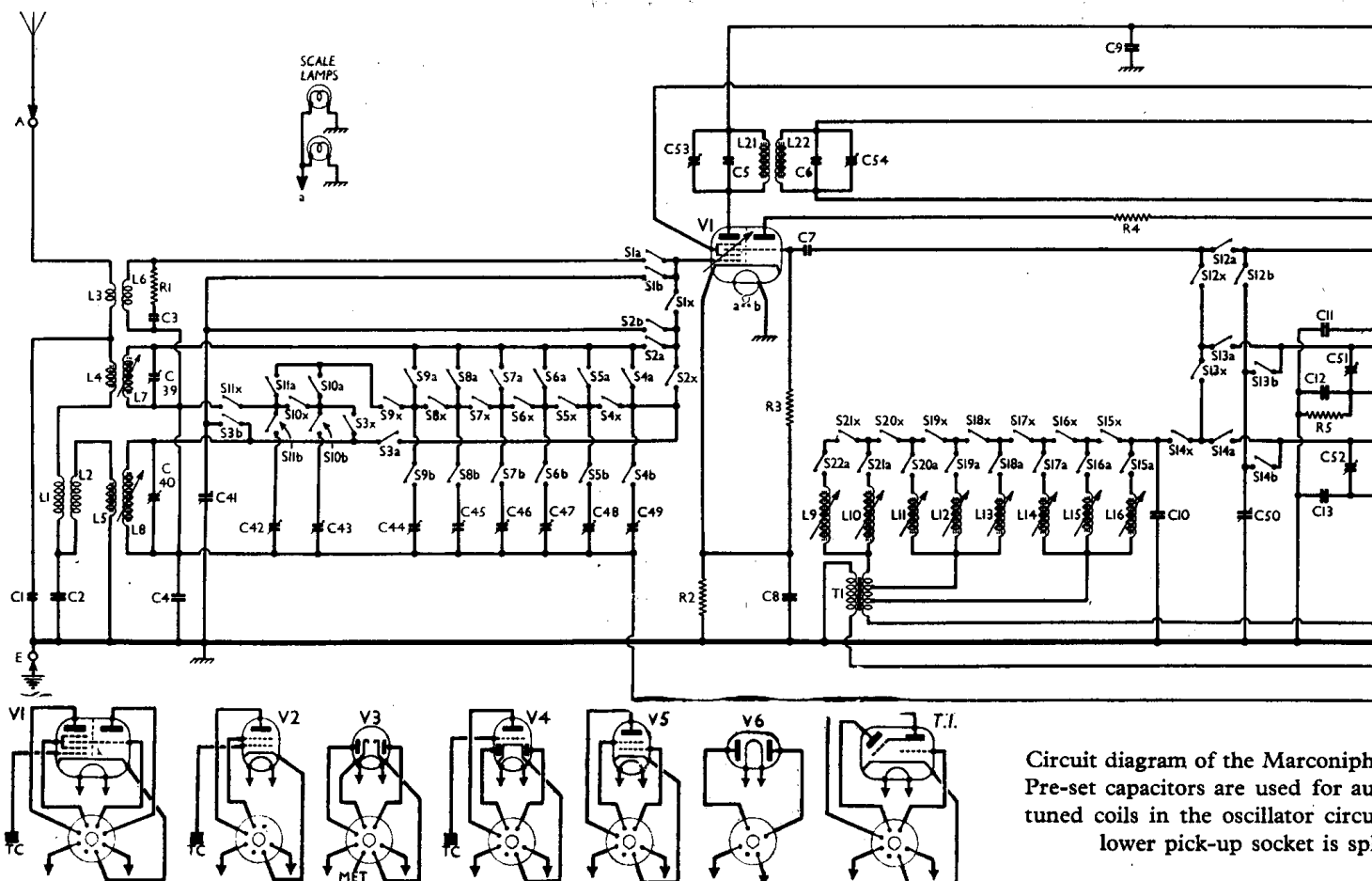
Aerial input is via coupling coils L3, L4 and (via image rejector circuit L1, L2, C2) L5 to single-tuned circuits comprising coils L6 (S.W.), L7 (M.W.) and L8 (L.W.), which are tuned manually by C41 or automatically (M.W. and L.W. only) by pre-set trimmer capacitors C42 to C49 via switches S4a, S4b to S11a, S11b, according to which button is depressed.

First valve (V1, Marconi X65) is a triode hexode operating as frequency changer with internal coupling. For manual operation, triode grid coils L17 (S.W.), L18 (M.W.) and L19 (L.W.) are tuned by C50; parallel trimming by C51 (M.W.) and C14, C52 (L.W.); series tracking by C11 (S.W.), C12 (M.W.) and C13 (L.W.). Reaction by direct coupling between anode and coils via C16 and switches S12c (S.W.), S12z, S13c (M.W.) and S13z, S14C (L.W.). On S.W. additional coupling is obtained via L20.

For automatic operation, independent tuned circuits are employed comprising coils L9 to L16 tuned by fixed capacitor C10. They are connected between the control grid (via x switches) and the

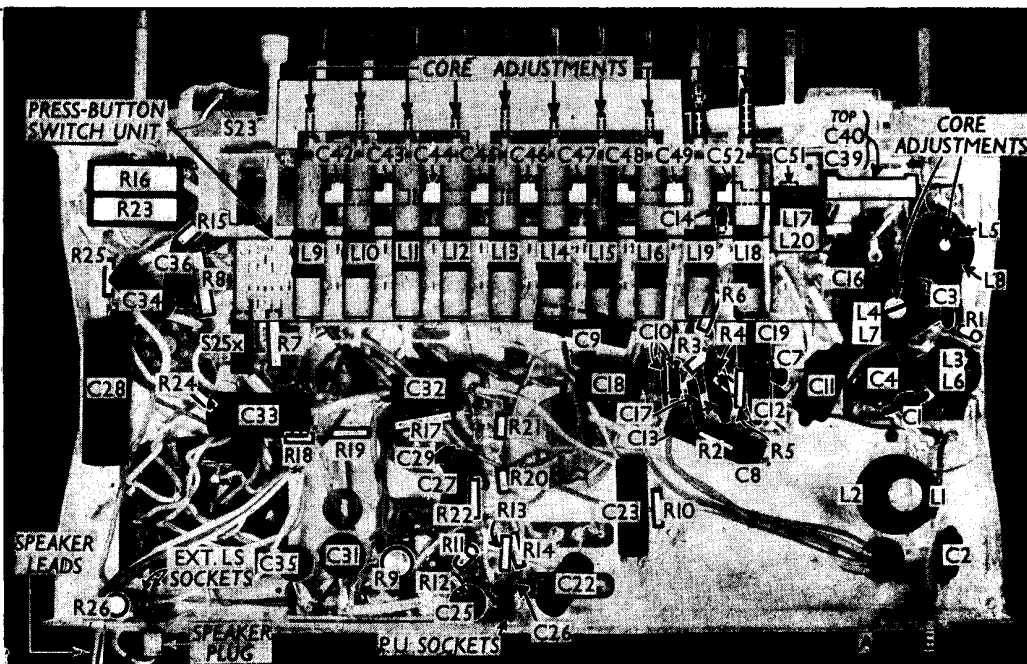


The Marconiphone 874 press-button A.C. superhet.



Circuit diagram of the Marconiph Pre-set capacitors are used for au tuned coils in the oscillator circu lower pick-up socket is sp

Under-chassis view, showing the positions of the press-button core and trimmer adjustments and the press-button unit. Diagrams showing both sides of the press-button unit appear at the foot of cols. 2 and 3 overleaf. S23 automatically eliminates A.F.C. action when the escutcheon plate is removed for press-button adjustments.



anode (via  $z$  switches) via the secondary of the A.F.C. control transformer **T1**. The appropriate coil is selected by one of the switches **S15a** to **S22a**, according to which button is pressed.

Second valve (**V2**, Marconi **KTW63**) is a variable-mu R.F. tetrode operating as

intermediate frequency amplifier with iron-cored transformer couplings **C53**, **L21**, **L22**, **C54** and **C55**, **L23**, **L24**, **L25**, **C56**. **L25**, **C56** is associated with the A.F.C. circuit, described later.

Intermediate frequency 465 kc/s.

Diode second detector is part of double

diode triode valve (**V4**, Marconi **DH63**) and is fed from the untuned secondary winding **L24**. Audio frequency component in rectified output is developed across load resistors **R13**, **R14** and passed via A.F. coupling capacitor **C27** and manual volume control **R16** to C.G. of triode section, which operates as A.F. amplifier.

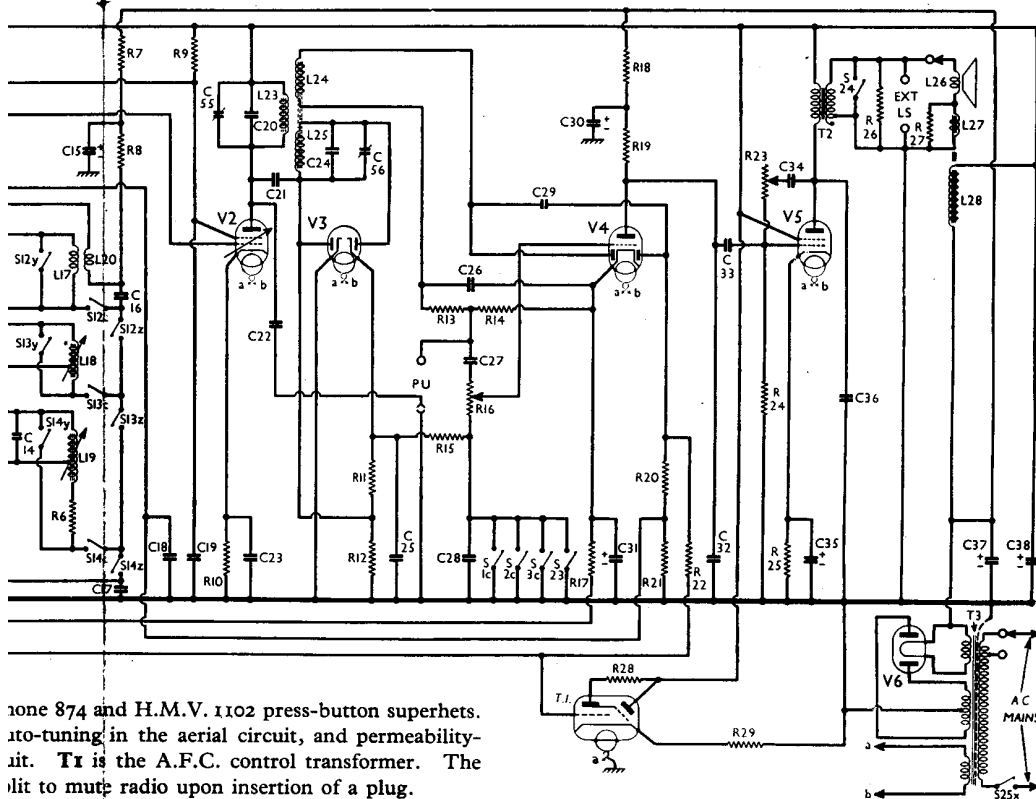
Provision for connection of gramophone pick-up between top of **C27** and chassis. The chassis socket is split, and the isolated half is connected via **C22** to **V2** anode, so that when a plug is inserted in the split socket, the two halves are connected together and thus **C22** short-circuits the output from **V2** and mutes radio.

Second diode of **V4**, fed from **L24** via **C29**, provides D.C. potentials which are developed across load resistors **R20**, **R21** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from same source as G.B. for triode section, which is mentioned later. A.V.C. line controlling F.C. valve is also connected to control grid of cathode ray tuning indicator (**T.I.**, Marconi **Y63**) to provide control voltage.

Resistance-capacitance coupling by **R19**, **C33** and **R24** between **V4** triode and tetrode output valve (**V5**, Marconi **KT63**). Variable tone control by **R23**, **C34** between grid and anode. Fixed tone correction by **C36** between anode and chassis. Provision for connection of low-impedance external speaker across secondary of output transformer **T2**, while internal speaker may be muted by withdrawal of speaker plug. **S24** momentarily short-circuits **T2** secondary while any of the press-buttons is being operated.

H.T. current is supplied by full-wave rectifying valve (**V6**, Marconi **U50**). Smoothing by speaker field **L28** and dry electrolytic capacitors **C37**, **C38**.

(Continued col. 3 overleaf)



tone 874 and H.M.V. 1102 press-button superhets. auto-tuning in the aerial circuit, and permeability-unit. **T1** is the A.F.C. control transformer. The plug to mute radio upon insertion of a plug.

COMPONENTS AND VALUES

RESISTORS		Values (ohms)
R1	Aerial circuit S.W. damping	23
R2	V1 fixed G.B. resistor	350
R3	V1 osc. C.G. resistor	50,000
R4	V1 osc. anode stabiliser	150
R5	Osc. circ. M.W. damping	2,300
R6	L.W. reaction damping	1,000
R7	V1 osc. anode decoupling	23,000
R8	V1 osc. anode H.T. feed	23,000
R9	S.G.'s H.T. feed	35,000
R10	V2 fixed G.B. resistor	350
R11	V3 diodes load resistors	2,300,000
R12	V4 signal diode load resistors	2,300,000
R13	V4 triode C.G. decoupling	100,000
R14	V4 triode C.G. decoupling	500,000
R15	Manual volume control	1,000,000
R16	V4 triode fixed G.B. A.V.C. delay	2,000,000
R17	V4 anode decoupling	2,300
R18	V4 triode anode load	50,000
R19	V4 A.V.C. diode load resistors	150,000
R20	A.V.C. line decoupling	1,500,000
R21	Variable tone control	1,000,000
R22	V5 C.G. resistor	2,000,000
R23	V5 G.B. resistor	500,000
R24	V5 G.B. resistor	400
R25	T1 sec. artificial loading	50
R26	Hum neut. coil shunt	0.4
R27	T.I. anode H.T. feed	1,000,000
R28	T.I. G.B. resistor	500

CAPACITORS		Values (μF)
C1	Part aerial S.W. coupling	0.000015
C2	Part L.W. image rejector	0.00035
C3	Aerial circ. S.W. trimmer	0.00001
C4	V1 hex. C.G. decoupling	0.05
C5	1st I.F. transformer fixed trimmers	0.000075
C6	V1 osc. C.G. capacitor	0.000075
C7	V1 cathode by-pass	0.00005
C8	H.T. circuit R.F. by-pass	0.1
C9	Osc. auto. tuning	0.1
C10	Osc. circuit S.W. tracker	0.00015
C11	Osc. circuit M.W. tracker	0.005
C12	Osc. circuit L.W. tracker	0.00055
C13	Osc. L.W. fixed trimmer	0.00023
C14	V1 osc. anode decoupling	0.000075
C15*	V1 osc. anode coupling capacitors	4.0
C16	V2 C.G. decoupling	0.005
C17	V1, V2 S.G.'s decoupling	0.00015
C18	I.F. trans. trimmer	0.05
C19	Part coupling to V3	0.00013
C20	Radio muting on gram	0.0001
C21	V2 cathode by-pass	0.05
C22	I.F. trans. trimmer	0.1
C23	I.F. by-pass capacitors	0.00013
C24	A.F. coupling to V4 triode	0.001
C25	V4 triode C.G. decoupling	0.0001
C26	V4 A.V.C. diode coupling	0.0023
C27	V4 anode decoupling	0.5
C28	V4 cathode by-pass	0.000075
C29*	I.F. by-pass	4.0
C30*	A.F. coupling to V5	50.0
C31*	Part of variable tone control	0.001
C32*	V5 cathode by-pass	0.1
C33*	Fixed tone corrector	0.001
C34*	H.T. smoothing capacitors	0.0035
C35*	Aerial M.W. trimmer	16.0
C36*	Aerial L.W. trimmer	8.0
C37†	Aerial circ. manual tuning	—
C38†	Aerial circuit L.W. auto. tuning trimmers	—
C39†	Aerial circuit M.W. auto. tuning trimmers	—
C40†	Osc. circ. manual tuning	—
C41†	Osc. circ. M.W. trimmer	—
C42†	Osc. circ. L.W. trimmer	—
C43†	1st I.F. trans. pri. tuning	—
C44†	1st I.F. trans. sec. tuning	—
C45†	2nd I.F. trans. pri. tuning	—
C46†	2nd I.F. trans. discriminator sec. tuning	—

\* Electrolytic. † Variable. ‡ Pre-set.  
§ Two 0.000075 μF in parallel.

OTHER COMPONENTS		Approx. Values (Ohms)
L1	Aerial L.W. image rejector coils	18.0
L2	Aerial S.W. coupling coil	10.0
L3	Aerial M.W. coupling coil	5.5
L4	Aerial L.W. coupling coil	0.6
L5	Aerial S.W. tuning coil	4.0
L6	Aerial M.W. tuning coil	0.1
L7	Aerial L.W. tuning coil	2.0
L8	Oscillator circuit L.W. auto. tuning coils	9.5
L9	Oscillator circuit L.W. auto. tuning coils	10.5
L10	Oscillator circuit L.W. auto. tuning coils	10.5
L11	Oscillator circuit L.W. auto. tuning coils	6.5
L12	Oscillator circuit L.W. auto. tuning coils	6.5
L13	Oscillator circuit L.W. auto. tuning coils	6.5
L14	Oscillator circuit L.W. auto. tuning coils	2.3
L15	Oscillator circuit L.W. auto. tuning coils	2.3
L16	Oscillator circuit L.W. auto. tuning coils	2.3
L17	Osc. S.W. tuning coil	0.1
L18	Osc. manual M.W. coil, total	4.5
L19	Osc. manual L.W. coil, total	11.0
L20	Osc. S.W. reaction coil	0.6
L21	1st IF trans. { Pri. ...	6.5
L22	1st IF trans. { Sec. ...	6.5
L23	1st IF trans. { Pri. ...	5.0
L24	1st IF trans. { Sec. ...	10.5
L25	2nd IF Trans. { Discriminator sec. ...	4.0
L26	Speaker speech coil	3.0
L27	Hum neutralising coil	0.5
L28	Speaker field coil	1,660.0
T1	A.F.C. control { Pri. ...	430.0
T2	A.F.C. control { Sec. total ...	1.75
T3	Output trans. { Pri. ...	280.0
T4	Output trans. { Sec. ...	0.6
T5	Mains { Pri. total ...	30.0
T6	Mains { Heater sec. ...	0.1
T7	Mains { Rect. heat, sec. ...	0.1
T8	Mains { H.T. sec., total ...	0.30
S1a, b, x to S3a, b, x	Aerial circuit waveband switches (manual tuning)	—
S11a, b, x to S11c	Aerial circuit auto tuning selector switches	—
S3c, S23, S12a, b, c, z	A.F.C. eliminator switches	—
S14a, b, c, z	Oscillator circuit waveband switches (manual tuning)	—
S15a, x to S22a	Osc. circuit auto tuning selector switches	—
S24	Speaker muting switch	—
S25x	Mains switch	—

A.F.C. CIRCUIT

The tuned secondary **L25, C56** of the second I.F. transformer operates as a discriminator coil and its output, together with that from **C21**, is applied across the anodes of a double diode discriminator valve (**V3, Marconi metallised D63**). If the I.F. signal is off resonance, a higher peak voltage is applied to one anode than the other, and correspondingly unbalanced currents flow in their load circuits **R11** and **R12**. These resistors are of equal value, but the current through each flows in an opposite direction, so that the voltage developed across one tends to neutralize that across the other and the total voltage appearing across **C25** is the algebraic sum of the two voltages, and may be positive or negative with respect to chassis.

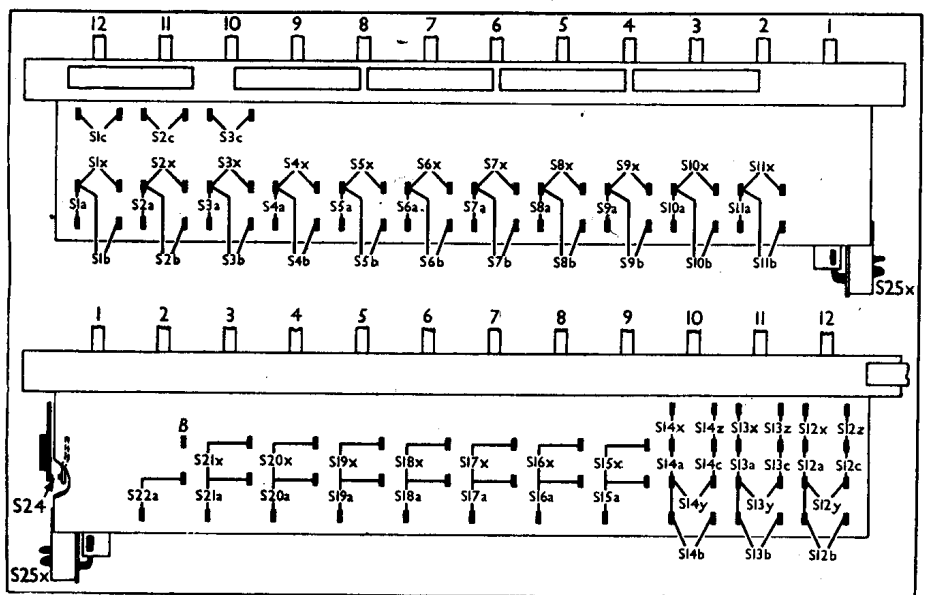
The voltage so obtained is applied via **R15, R16** to the control grid of **V4**, so that this valve behaves as a D.C. amplifier, and its anode current varies according to the discriminator output; further, as the cathode is returned to chassis via the primary winding of the A.F.C. control transformer **T1**, a change in the anode current of **V4** triode produces a change of inductance in the secondary winding of **T1**, which, in turn, is in series with the oscillator circuit auto tuning coils, so that the oscillator frequency is altered in such a way as to tend to correct the intermediate frequency.

Frequency control is intended to operate only in association with the automatic tuning system; during manual operation, A.F.C. action is automatically suppressed by switches **S1c** to **S3c**, and during alignment, by **S23**.

DISMANTLING THE SET

The chassis is fitted with a detachable bottom, upon removal of which access may be gained to the underside of the chassis.

**Removing Chassis.**—Remove the three control knobs; remove the two round-head wood screws holding the scale assembly to the front of the cabinet;



Diagrams of the press-button switch unit. The lower diagram is drawn as seen from beneath the chassis, and the upper one shows the side facing the underside of the chassis deck. **S24** is the speaker muting switch, and **S25x** the mains switch.

remove the four bolts (with lock-washers and claw washers) holding chassis to base of cabinet.

If the speaker leads are now freed from the cleat on the side of the cabinet, the chassis may be withdrawn; and if these leads are unsoldered from the speaker, the chassis may be freed entirely.

When replacing, connect the leads to the larger paxolin panel, to tags which are numbered as follows: 1, yellow; 3, red/black; 4, red. The black lead goes to the right-hand tag on the small speech coil panel above.

**Removing Speaker.**—Unsolder the four leads, and remove the three nuts (with washers) holding it to the sub-baffle.

When replacing, the small panel should be at the top, and the leads should be connected as explained previously.

### VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 226 V, using the 224-255 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the M.W. 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 currents are being measured, it can be stabilized by connecting a non-inductive capacitor (about 0.1  $\mu$ F) between its top cap and chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X65	250	1.2	90	3.1
	Oscillator	95		
V2 KTW63	250	6.3	90	1.5
V3 D63	—	—	—	—
V4 DH63	120	0.8	—	—
V5 KT63	236	35.0	250	5.2
V6 U50	330†	—	—	—
T.I. Y63	18	2.5	—	—
	Target	246	—	—

† Each anode, A.C.

### GENERAL NOTES

**Switches.**—All the switches, except S23, are associated with the press-button unit. S1a, b, x to S22a are of the normal press-button type, those with the suffix a, b, or c closing when their button is pressed, and those with x, y or z suffixes opening when their button is pressed.

All these switches are indicated in the diagrams of the two sides of the press-button unit in cols. 2 and 3.

S24 is the speaker muting switch (shown in the lower of the two diagrams) which is normally open, but closes while any one of the press-buttons is being operated.

S25x is the Q.M.B. mains switch operated by the press-button numbered 1 ("Off"). It opens when the button is pressed, and switches the set off. Operation of any other button causes this switch to close, and switch the set on.

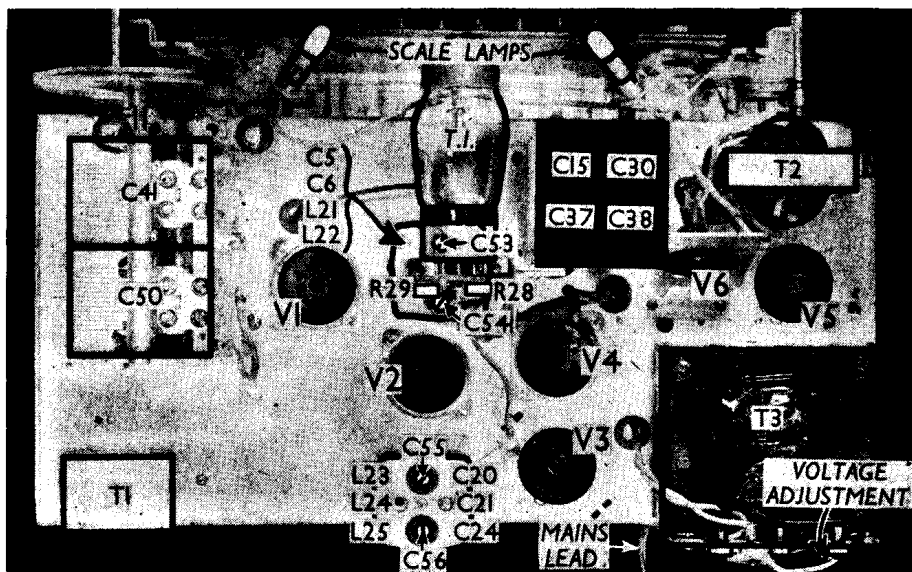
S23 is normally open, but closes when the press-button escutcheon moulding is removed for station setting and alignment, thus eliminating the A.F.C. action. S23 is actually in parallel with S16, S2c and S3c, which eliminate the A.F.C. action when one of the manual waveband buttons is depressed.

**Coils.**—L1, L2; L3, L6; L4, L7 and L5, L8 are in four units beneath the chassis, to the right of our under-chassis view. L9-L16 are the eight permeability-tuned oscillator auto coils, in a row above the press-button unit. L17, L20; L18 and L19, which are the oscillator manual coils, are in the same row, at the right-hand end in the under-chassis view. L9-L16 and L18, L19 all have adjustable cores.

The I.F. transformers L21, L22 and L23-L25 are in two screened units on the chassis deck, with their associated trimmers and certain other components. The transformers T1-T3 are all on the chassis deck.

**Scale Lamps.**—These are two Osram M.E.S. types, rated at 6.5 V, 0.3 A. They have tubular bulbs.

**External Speaker.**—Two sockets are provided at the rear of the chassis for a low impedance (5  $\Omega$ ) external speaker. There is also another



Plan view of the chassis. The only trimmer adjustments indicated here are those of the discriminator and I.F. transformers.

socket, into which a plug on a flying lead fits. On removal of this plug the internal speaker is muted.

**Pick-up Connections.**—Note that the lower pick-up socket is split, and when a plug is inserted C22 is connected to chassis, thus muting radio. Hence, for radio reception, both pick-up plugs must be removed.

**Capacitors C15, C30, C37, C38.**—These are four dry electrolytics (570 V D.C.) in a rectangular metal case on the chassis deck. The brown lead is the negative and the red lead the positive of C37 (16  $\mu$ F). The black lead is the common negative of the other three capacitors. The yellow lead is the positive of C38 (8  $\mu$ F); the green lead to the junction of R7, R8 is the positive of C15 (4  $\mu$ F), while the green lead to the junction of R18, R19 is the positive of C30 (4  $\mu$ F).

**Pre-Set Capacitors.**—The eight aerial auto trimmers, C42-C49, are in four dual units in a row, adjustable from the front of the chassis. C39, C40 and C51, C52 are in two further dual units, also adjustable from the front of the chassis. The remaining trimmers are in the I.F. units on the chassis deck.

**Capacitor C10.**—This consists of two 75  $\mu$ F capacitors, one flat and one tubular, in parallel.

### CIRCUIT ALIGNMENT

**I.F. and A.F.C. Stages.**—Press the Droitwich button, turn tone control fully anti-clockwise, and short-circuit C17. Connect signal generator to control grid (top cap) of V2 and chassis. Connect a D.C. milliammeter in series with the earth return of the A.F.C. unit (T1 primary, yellow lead).

Screw C56 fully in. Feed in a 465 kc/s signal, and adjust C55 for maximum output. Note the exact reading of the D.C. milliammeter, then insert a piece of paper between the contacts of S23, and adjust C56 for exactly the same milliammeter reading as before. Remove paper from S23, and re-adjust C55 for maximum output.

Repeat these adjustments, and finally remove paper from S23 and connect signal generator to control grid (top cap) of V1 and chassis. Adjust C53 and C54 for maximum output.

To check A.F.C. action, connect signal generator to A and E sockets, feed in a 1,293 m (232 kc/s) signal, adjust attenuator to 1 mV input and press Luxembourg button. Check up the pre-set trimmers for this button, then open S23 with a piece of paper. De-tune signal generator, then slowly tune towards 1,293 m. Note the point at which the signal is "pulled in"; the frequency should be not more than 226 kc/s or less than 238 kc/s (that is, plus or minus 6 kc/s from the nominal 232 kc/s). Repeat the test on 274 m (button 8).

To check whether C56 is correctly set, first see that the press-button trimmers are correct for a given station (S23 closed), then open S23.

This should have no effect on the tuning indicator.

**RF and Oscillator Stages.**—Turn gang to maximum and see that the pointer registers accurately on the small mark below the L.W. calibration line at the bottom right-hand corner of the scale. If adjustment is necessary, slacken the two grub screws securing the drive disc to the gang spindle. Connect signal generator to A and E sockets via a suitable dummy aerial, set tone control fully anti-clockwise, and volume control to maximum.

**S.W.**—Switch set to S.W. feed in a 50 m (6 Mc/s) signal, tune to 50 m on scale, and adjust loop of wire inside L17 for maximum output. Feed in a 30 m (10 Mc/s) signal, tune to 30 m on scale, and adjust loop of wire inside L6 for maximum output. Repeat these adjustments.

**M.W.**—Switch set to M.W. and tune to 225 m on scale. Feed in a 225 m (1,333.3 kc/s) signal, and adjust C51, then C39, for maximum output. Tune to 530 m on scale, feed in a 530 m (566 kc/s) signal, and adjust the cores of L18 and L7 for maximum output. Unless these coils have been changed, little adjustment should be necessary. Repeat the M.W. adjustments.

**L.W.**—Switch set to L.W., tune to 850 m on scale, and feed in an 850 m (352.9 kc/s) signal. Adjust C52, then C40, for maximum output. Tune to 1,900 m on scale, feed in a 1,900 m (157.9 kc/s) signal, and adjust cores of L19 and L8 for maximum output if necessary. Repeat the L.W. adjustments.

**Press-buttons.**—Adjustments to the press-button trimmers should always be made after I.F. alignment and after any adjustments to the M.W. and L.W. aerial coils. Final press-button adjustments must be made on the mains on which the set is to work.

### Press-button Ranges

The wavelength ranges of the eight station buttons are given in the table below, the buttons being numbered in accordance with the moulded numbers on the escutcheon.

Button Nos.	Wavelength Ranges
2, 3	1,140—2,150 m
4, 5, 6	300—600 m
7, 8, 9	195—335 m

The setting of each button involves two tuning adjustments, one (above, and slightly to the right) for the aerial circuit trimmer, and the other (directly below) for the oscillator coil core. The A.F.C. is out of action when the escutcheon is removed (S23 closed) and the tuning indicator is used for accurate setting.