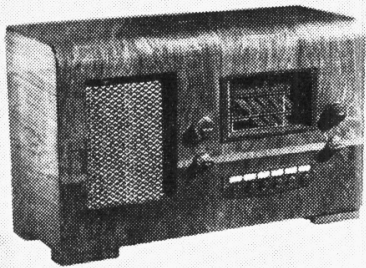


# MARCONIPHONE 855, 868, 869, 870 AND H.M.V. 658, 665, 666

## CIRCUIT DESCRIPTION



The Marconiphone 855 press-button superhet.

**P**RESS-BUTTON tuning of the permeability type is included in the Marconiphone 855 and caters for six stations. The receiver is a 4-valve (plus rectifier) AC 3-band superhet suitable for mains of 195-255 V, 50-100 C/S, and has a short-wave range of 16.5-50 m and provision for both a gramophone pick-up and an extension speaker.

An identical chassis is fitted in the H.M.V. 668 table model receiver, and the Marconiphone 868 console, while the chassis of the Marconiphone 869 and H.M.V. 665 radiograms and Marconiphone 870 and H.M.V. 666 radiograms with record changers are very similar, the differences being explained under "Models 869, 870, 665 and 666 Modifications." This Service Sheet was prepared on a 855.

Release dates: 855 and 658, August, 1938; 868, 869, 665 and 666, September, 1938; 870, October, 1938.

The automatic tuning circuits in this receiver operate quite independently of the manual tuning circuits. A fourth position on the waveband switch effects the change-over from manual to auto tuning and when the switch control is turned from the auto position, any depressed button is automatically released.

Aerial input for manual operation is via switch **S19**, which is closed, and then via coupling condenser **C1** (SW), **L1** and **L3** (MW) or **L1**, **L2** and **L4** (LW) to single tuned circuits **L5**, **C32** (SW), **L6**, **C32** (MW) or **L7**, **C32** (LW), which precede first valve (**V1**, Marconi **X63**). Condensers **C2** and **C3**, and coils **L1** and **L2** provide IF and image rejection.

For automatic operation, when **S6** opens and **S7** closes, aerial input is via **S19** (MW) or **L19** (LW) and **C42** to one of the pre-set iron-cored tuning coils **L20** to **L25** via selector switches **S21** to **S26** according to which button is depressed. **C43** is a fixed tuning condenser and **R24** prevents **V1** tetrode CG from becoming free. **L19** and **C41** form an image rejector but are in circuit only when a LW button is depressed.

Manual oscillator tuning coils **L8** (SW), **L9** (MW) and **L10** (LW) are tuned by **C33**; parallel trimming by **C34** (SW), **C35** (MW) and **C36** (LW); series tracking by **C7** (SW), **C8** (MW) and **C9** (LW). Reaction is obtained by connecting the coils from **V1** oscillator grid to anode via **C11**, with the addition of **L11** on SW.

For automatic tuning in the oscillator

circuit **S9** opens and **S8** closes so that any one of the evenly numbered coils **L26** to **L36** may be connected between **V1** oscillator control grid and chassis via the odd numbered switches **S27** to **S37** according to which button is pressed. These coils have pre-set iron-core adjustments and are tuned by condensers **C44**, **C45** and **C46**. **S13** is now closed, and **S14** open, so that the reaction coils, which bear odd numbers in the diagram **L27** to **L37**, are connected between **V1** oscillator anode and **R5**, **C13** via **L11**, **S13** and one of the evenly numbered switches **S28** to **S38**.

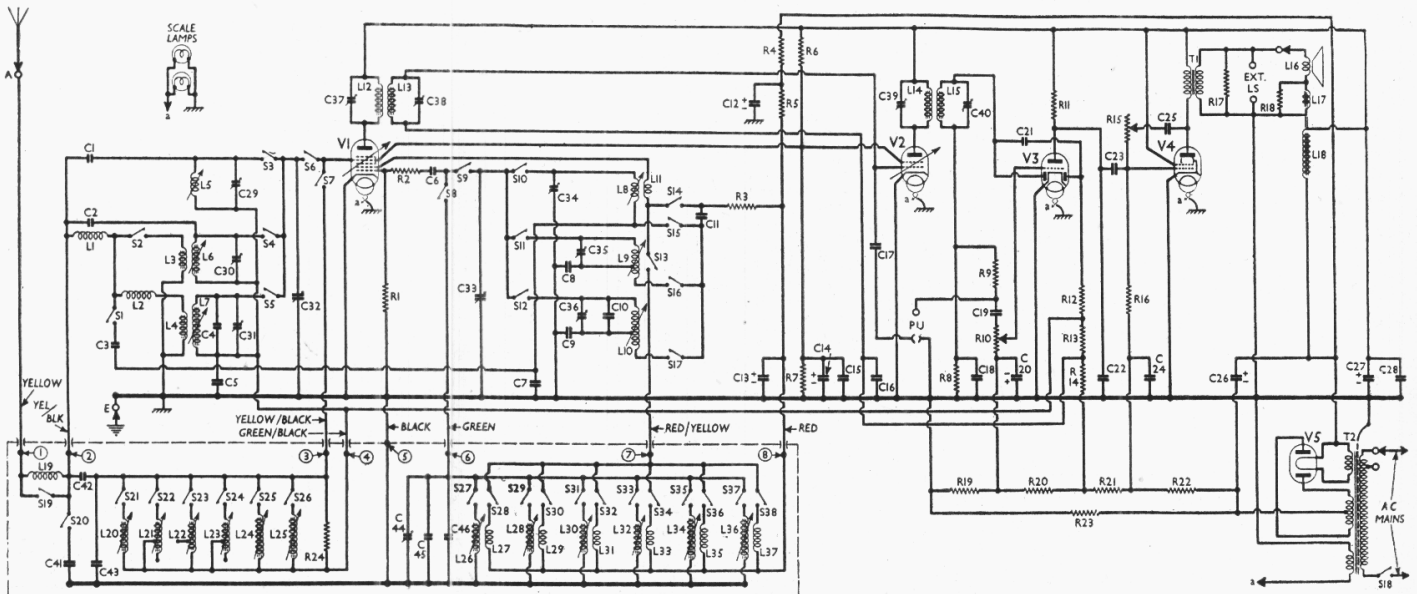
Second valve (**V2**, Marconi **KTW63**) is a RF tetrode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C37**, **L12**, **L13**, **C38** and **C39**, **L14**, **L15**, **C40**.

### Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3**, Marconi **DH63**). Audio frequency component in rectified output is developed across load resistance **R8** and passed via IF stopper **R9**, AF coupling condenser **C19** and manual volume control **R10** to CG of triode section, which operates as AF amplifier. Provision for connection of gramophone pick-up between **R9** and chassis, radio being muted by **C17** between **V2** CG and chassis.

Second diode of **V3**, fed from **L15** via **C21**, provides DC potentials which are developed across load resistances **R12**, **R13**, **R14** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R11**,



Circuit diagram of the table and console models. The radiogram versions are similar, the divergencies being given in col. 3 overleaf.

**C23** and **R16** between **V3** triode and beam tetrode output valve (**V4**, Marconi **KT63**). Variable tone control by **R15** and **C25**.

Voltage for bias potentials is developed across **R23** in HT negative lead to chassis, the individual potentials being obtained at junctions of resistances **R19**, **R20**, **R21**, **R22**, which form a potential divider across **R23**, to provide fixed GB for **V1** and **V2**, AVC delay voltage, **V3** triode GB and **V4** GB.

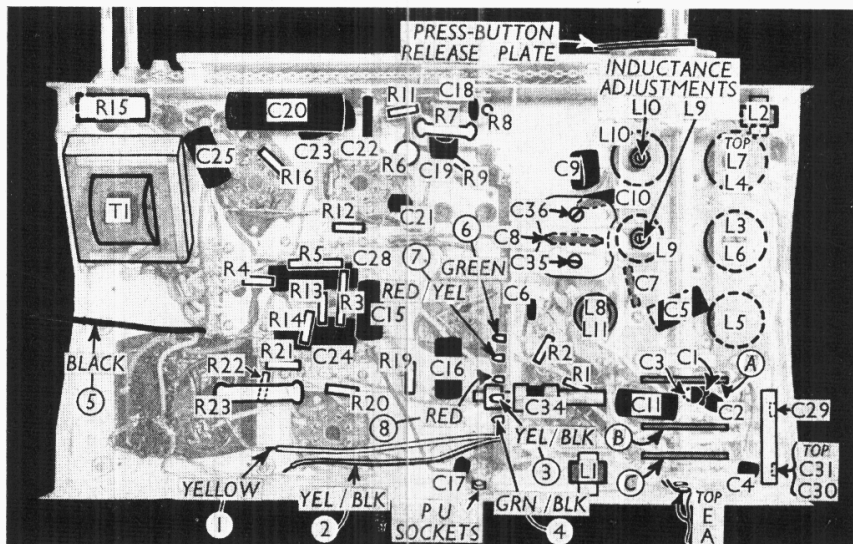
HT current is supplied by full-wave rectifying valve (**V5**, Marconi **U50**). Smoothing by speaker field **L18** and dry electrolytic condensers **C26**, **C27**.

**COMPONENTS AND VALUES**

RESISTANCES		Values (ohms)
R1	V1 osc. CG resistance ..	50,000
R2	V1 osc. CG stabiliser ..	75
R3	V1 osc. anode HT feed resistances ..	15,000
R4		5,000
R5	V1, V2 SG's HT feed potential divider resistances ..	15,000
R6		23,000
R7	V3 signal diode load ..	23,000
R8	IF stopper ..	500,000
R9	Manual volume control ..	230,000
R10	V3 triode anode load ..	2,000,000
R11		75,000
R12	V3 AVC diode load resistances ..	1,000,000
R13		500,000
R14	Variable tone control ..	2,300,000
R15		2,000,000
R16	V4 CG resistance ..	2,000,000
R17	T4 sec. artificial loading ..	230,000
R18	Hum neut. coil shunt ..	50
R19	Automatic bias potential divider for V1, V2 fixed GB; V3 triode, V4 GB; AVC delay ..	1.2
R20		100,000
R21	V1 tetrode CG on auto. ..	1,000,000
R22		100,000
R23		270
R24		2,300,000

CONDENSERS		Values (μF)
C1	Aerial circuit SW coupling ..	0.000015
C2	Image rejector condensers ..	0.0000023
C3		0.00005
C4	Aerial LW fixed trimmer ..	0.00005
C5	V1 tetrode CG decoupling ..	0.05
C6	V1 osc. CG condenser ..	0.00005
C7	Osc. circuit SW tracker ..	0.005
C8	Osc. circuit MW tracker ..	0.00055
C9	Osc. circuit LW tracker ..	0.0003
C10	Osc. circuit LW fixed trimmer ..	0.000175
C11	V1 osc. anode coupling ..	0.005
C12*	V1 osc. anode decoupling condensers ..	4.0
C13*	V1, V2 SG's decoupling ..	4.0
C14*		4.0
C15	V1, V2 SG's RF by-pass ..	0.05
C16	V2 CG decoupling ..	0.05
C17	Radio muting condenser ..	0.0001
C18	IF by-pass ..	0.0001
C19	AF coupling to V3 triode ..	0.001
C20*	V3 triode CG decoupling ..	50.0
C21	Coupling to V3 AVC diode ..	0.000075
C22	IF by-pass ..	0.00035
C23	V3 triode to V4 AF coupling ..	0.023
C24	V4 CG decoupling ..	0.23
C25	Part of variable tone control ..	0.001
C26*	HT smoothing condensers ..	16.0
C27*		8.0
C28	HT circuit RF by-pass ..	0.1
C29†	Aerial circuit SW trimmer ..	—
C30†	Aerial circuit MW trimmer ..	—
C31†	Aerial circuit LW trimmer ..	—
C32†	Aerial circuit tuning ..	—
C33†	Oscillator circuit tuning ..	—
C34†	Osc. circuit SW trimmer ..	—
C35†	Osc. circuit MW trimmer ..	—
C36†	Osc. circuit LW trimmer ..	—
C37†	1st IF trans. pri. tuning ..	—
C38†	1st IF trans. sec. tuning ..	—
C39†	2nd IF trans. pri. tuning ..	—
C40†	2nd IF trans. sec. tuning ..	—
C41	Aerial auto tuning MW image rejector ..	0.0001
C42	Aerial series (auto) ..	0.00001
C43	Aerial auto tuning fixed trimmer ..	0.00014
C44‡	Osc. circuit auto trimmer ..	—
C45	Osc. circuit auto tuning fixed trimmers ..	0.00005
C46		0.000015

\* Electrolytic. † Variable. ‡ Pre-set.



Under-chassis view, with the press-button unit removed. Diagrams of the rotary switch units are in col. 6 overleaf.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Parts of IF and image rejector circuit ..	9.5
L2	Aerial MW coupling coil ..	33.0
L3	Aerial LW coupling coil ..	0.4
L4	Aerial SW tuning coil ..	1.6
L5	Aerial MW tuning coil ..	0.1
L6	Aerial LW tuning coil ..	2.0
L7	Aerial LW tuning coil ..	9.0
L8	Osc. circuit SW tuning coil ..	0.1
L9	Osc. circuit MW coil, total ..	2.8
L10	Osc. circuit LW coil, total ..	3.6
L11	Oscillator SW reaction ..	1.2
L12	1st IF trans. { Pri. .. 4.5 Sec. .. 4.5	
L13		
L14	2nd IF trans. { Pri. .. 4.5 Sec. .. 4.5	
L15		
L16	Speaker speech coil ..	4.0
L17	Hum neutralising coil ..	0.7
L18	Speaker field coil ..	1,660.0
L19	Auto LW image rejector ..	78.0
L20		0.8
L21	Aerial circuit MW automatic tuning coils, totals ..	1.4
L22		1.4
L23		2.3
L24	Aerial circuit LW automatic tuning coils ..	11.5
L25		14.0
L26		1.5
L27		1.25
L28		1.9
L29	Oscillator circuit MW automatic tuning and reaction coils ..	1.3
L30		1.9
L31		1.3
L32		2.6
L33		1.6
L34	Oscillator circuit LW automatic tuning and reaction coils ..	4.5
L35		2.5
L36		4.5
L37		2.5
T1	Output trans. { Pri. .. 280.0 Sec. .. 0.5	
T2	Mains trans. { Pri., total .. 30.0 Heater sec. .. 0.1 Rect. heat. sec. .. 0.1 HT sec., total .. 690.0	
S1-S17	Waveband and auto/manual change switches ..	—
S18	Mains switch, ganged R10 ..	—
S19, 20	Automatic circuit image rejector switches ..	—
S21-26	Aerial auto. selector switches ..	—
S27-38	Oscillator automatic selector switches ..	—

tapping screws) and the four bolts (with claw and spring washers) holding the chassis to the bottom of the cabinet. Next free the speaker leads from the cleat, when the chassis can be withdrawn to the extent of the speaker leads.

If the valves are removed from the chassis, note that the screening cap should be replaced on **V1**.

Before access can be gained to those components beneath the chassis which are grouped round **V1** it is necessary to remove the screen (three self-tapping screws), while before access can be gained to the components in the front centre of the under-side of the chassis, the press-button unit must be removed. This can be done by removing the bracket holding the unit to the rear member of the chassis (two self-tapping screws) and the four self-tapping screws holding the two brackets to the front member of the chassis. To free the press-button unit entirely, unsolder the connecting leads to the main chassis. These are coded and numbered in our illustration.

To free the chassis entirely from the speaker, unsolder the speaker leads and when replacing, connect them as follows, noting that the tags are numbered:— 3, black; 6, red; 7, red/black; 8, yellow.

**Removing Speaker.**—The speaker can be removed from the cabinet by unsoldering the leads and removing the four bolts (with washers) holding it to the sub-baffle. When replacing, see that tags 1 to 4 are on the right and connect the leads as follows:—2, yellow to extension speaker panel; 3, black to chassis and black to extension speaker panel; 5, red; 7, red/black; 8, yellow and yellow/black.

**VALVE ANALYSIS**

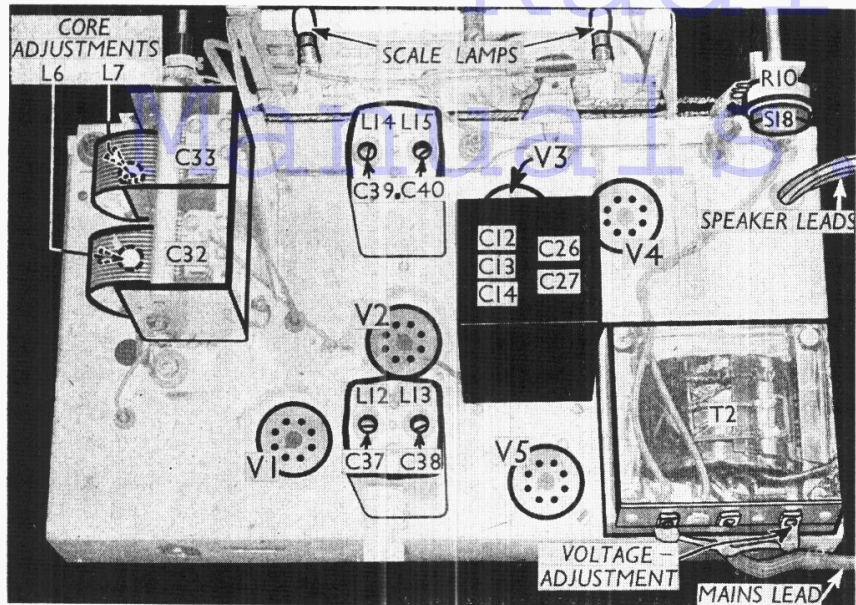
Valve voltages and currents in the table overleaf are those measured in our receiver when it was operating on mains of 230 V, using the 224-255 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

**DISMANTLING THE SET**

A detachable bottom is fitted to the cabinet and upon removal (four round-head wood screws) gives access to some of the components beneath the chassis.

**Removing Chassis.**—If it is desired to remove the chassis from the cabinet, remove the tuning knob (recessed screw), the other three knobs (recessed self-





Plan view of the chassis. Note the holes through which the core adjustments for L6, L7 are reached.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X63	243 178	1.5 4.0	75	2.5
V2 KTW63	243	5.2	75	1.0
V3 DH63	105	1.3	—	—
V4 KT63	231	35.0	243	6.0
V5 U50	335†	—	—	—

† Each anode, AC.

**GENERAL NOTES**

**Switches.**—S1-S17 are the waveband and auto/manual change switches, in three rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams in col. 6, where they are drawn as seen looking from the rear of the underside of the chassis. The table (col. 5), gives the switch positions for the four control settings, starting from fully anti-clockwise.

S18 is the QMB mains switch, ganged with the volume control R10.

S19, S20 are on a small unit fixed to the auto tuning unit, and shown in our underneath view of this unit. When any of the MW buttons is depressed, S19 remains closed, and S20 open. If either of the LW buttons is depressed, S20 closes, and S19 opens.

S21-S38 are the auto selector switches, operated by the six press-buttons, each button controlling three of the switches. They are all indicated in our view of the top of the auto unit. All the switches controlled by each button are open when the button is out, and closed when it is depressed.

**Coils.**—L1; L2; L3, L6; L4, L7; L5; L8, L11; L9; and L10 are in eight unscreened units beneath the main chassis. L3, L6 and L4, L7 are iron-cored, the cores of L6 and L7 being adjustable. The

inductances of L5 and L8 are adjustable by wire loops inside the coil formers. L9 and L10 are also adjustable in inductance by metal "spade" trimmers.

L12, L13 and L14, L15 are the IF transformers, in two screened units on the chassis deck.

L19 is the image rejector coil, mounted on the S19, S20 unit, and shown in the top view of the auto-unit.

L20 to L37 are the auto tuning coils, shown in our underneath view of the auto unit. Note that L21-L23 are tapped for alternative ranges. Each of these coils is provided with a screw core adjustment.

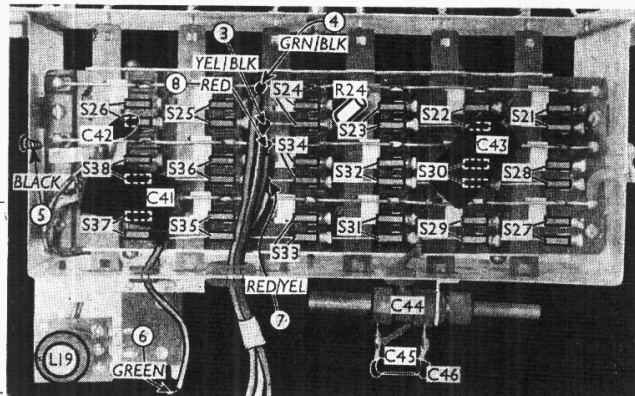
**Scale Lamps.**—These are two Osram MES types, rated at 6.5 V, 0.3 A, and fitted with tubular bulbs.

**External Speaker.**—Two sockets are provided on a panel at the rear of the cabinet for a low impedance (5 Ω) external speaker. The internal speaker can be muted by a plug and socket device, and R17 is a safety load resistance, connected behind the Ext. LS panel.

**Pick-up.**—Sockets are provided for this, a high resistance type being recommended. It should have a 7,500 Ω resistor wired in parallel with it.

Note that the lower pick-up socket is split, and when the plug is inserted C17 is connected to chassis, and so mutes radio. To revert to radio reception, both pick-up plugs should be removed.

View of the top of the auto unit, showing the press-button switches S21-S38.



**Condenser Block.**—This is in a rectangular metal case, on the chassis deck, with the connecting leads emerging beneath the chassis. It includes the dry electrolytic condensers C12, C13, C14, C26 and C27. The coding of the leads is: Brown, negative of C26 (16 μF); red, positive of C28; black, negative of all the other condensers; yellow, positive of C27 (8 μF); blue, positive of C14 (4 μF); green lead to junction of R4, R5, positive of C12 (4 μF); green lead to junction of R3, R5, positive of C13 (4 μF). The unit is a Dubilier type 3231.

**Valve Connections.**—Base connections for the octal valves used were given on page 1 of *Radio Maintenance* for November 13, 1937.

**Condensers C34, C44.**—These are two special air dielectric tubular trimmers, adjusted by sliding plungers, which can be fixed in position by locknuts.

**Auto Unit Connections.**—Eight leads connect the auto unit to the main chassis, and these are indicated by numbers in circles and arrows in the circuit diagram, the under-chassis view and the underneath view of the auto unit.

**MODELS 869, 870, 665 AND 666 MODIFICATIONS**

The radiogram models employ a similar circuit, but with the following modifications. A radio-gram switch is fitted, which really consists of three single pole shorting switches. One section of the switch is fitted between the screens of V1 and V2 and the junction of R6, R7, and this switch closes on radio and opens on gram, thus muting radio. C17 and the split pick-up socket are therefore not used.

The top of R10 is disconnected from C19 and another section of the switch inserted between them, while the top of R10 also goes to the third section of the switch, the other side of which goes, via a 0.005 μF condenser, to one of the pick-up sockets. On radio, C19 and R10 are joined, as in our diagram, while on gram C19 is disconnected, and the pick-up, via the extra condenser, is connected to the top of R10.

An extra 50 μμF condenser is connected from the slider of R10 to the bottom of C19. (This also applies to the console model 868).

There are three pick-up sockets altogether, that mentioned above, and two which go to chassis. One of these is for earthing the pick-up casing. Across the pick-up are connected a 0.001 μF condenser and also a circuit consisting

TABLE AND DIAGRAMS OF THE SWITCH UNITS

of a 0.01  $\mu$ F condenser and a 100,000  $\Omega$  resistance in series.

The pick-up is provided with a matching transformer (primary, 0.1  $\Omega$ , secondary 620  $\Omega$ ) and its DC resistance is 6.0  $\Omega$ .

An induction motor working on the hysteresis principle is fitted. The speaker is different from that of the table model, and has a speech coil resistance of 4.0  $\Omega$ .

CIRCUIT ALIGNMENT

**IF Stages.**—Switch set to LW, turn gang to maximum, volume control to maximum and tone control fully anti-clockwise. Connect signal generator via a 0.1  $\mu$ F condenser to fixed vane tag of C32 and chassis, leaving top cap connection of V1 in place. Feed in a 465 KC/S signal, and adjust C37, C38, C39 and C40 in that order for maximum output. Check these adjustments.

**RF and Oscillator Stages.**—With gang at maximum, pointer must coincide exactly with the small mark at the bottom right-hand corner of the scale.

Turn volume control to maximum, and tone control fully anti-clockwise, and connect signal generator to A and E sockets.

**MW.**—Switch set to MW, and tune to 225 m on scale (yellow spot). Feed in 225 m (1,333 KC/S) signal and adjust C35 for maximum output. Tune to 530 m on scale (yellow spot) and feed in a 530 m (566 KC/S) signal. Adjust inductance ("spade" trimmer) of L9 (screw on paxolin coil mounting strip) for maximum output. Repeat these operations until no further improvement results. Return to 225 m, and adjust C30 for maximum output.

Return to 530 m, and rotate upper core of L6 for maximum output. This is reached through a hole in the chassis deck by means of a special tool (EMI Service, Part No. 20730A) which consists of a pointed rod of insulating material with a rubber bush. It should be inserted through the hole in the chassis, the point located in the hole in the paxolin coil mounting strip, and the rubber bush bearing on the core. The core may now be rotated by turning the tool.

Repeat the adjustments of C30 and L6.

**LW.**—Switch set to LW, tune to 1,100 m on scale (white spot), and feed in a 1,100 m (272.7 KC/S) signal. Adjust C36 for maximum output. Tune to 1,900 m on scale (white spot), feed in a 1,900 m (158 KC/S) signal, and adjust inductance ("spade" trimmer) of L10 (screw on paxolin coil mounting strip) for maximum output. Repeat these adjustments.

Switch	SW	MW	LW	Auto
S1	—	—	C	—
S2	—	C	—	—
S3	C	—	—	C
S4	—	C	—	—
S5	—	C	C	—
S6	C	C	—	—
S7	—	—	—	C
S8	—	—	—	C
S9	C	C	C	—
S10	C	—	—	C
S11	—	C	—	—
S12	—	—	C	—
S13	—	—	—	C
S14	C	C	C	—
S15	—	—	—	C
S16	—	C	—	—
S17	—	—	C	—

Return to 1,100 m and adjust C31 for maximum output. Return to 1,900 m and adjust hexagonal-headed screw core of L7 (through hole in chassis deck) for maximum output. Re-adjust C31 at 1,100 m, then tune to 1,400 m on scale, feed in a 1,400 m (214 KC/S) signal, and re-adjust C31 if necessary.

**SW.**—Switch set to SW, tune to 16.5 m on scale, feed in a 16.5 m (18.2 MC/S) signal, and adjust C34 (by slackening locknut and sliding plunger) and C29 for maximum output.

Then tune to 50 m on scale, feed in a 50 m (6 MC/S) signal and adjust loop of L8 (inside its coil former) for maximum output. This can be reached through a hole in the shield. A strip of insulating material with a slot in it should be used to move the wire up or down. Then adjust loop of L5 (through hole in chassis deck) for maximum output in the same way. Repeat the 16.5 m and 50 m adjustments until no further improvement results.

Do not alter the position of the pointer, after ganging, or rock the gang, while aligning.

PRESS-BUTTON ADJUSTMENT

To change a station, turn the receiver on to its left side, and remove the card panel from the aperture in the underside of the cabinet. Tune the desired station manually and note the programme. Switch to Auto, and adjust the screw of the oscillator coil associated with the button it is desired to change, until the same programme is heard.

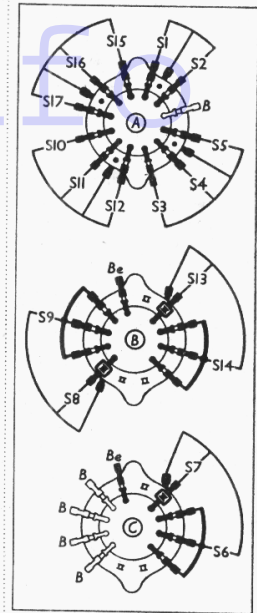
Next adjust the screw of the corresponding aerial coil. If the tuning is very flat, use a 2 ft. length of wire in place of the normal aerial.

Screwing in the coil adjustments increases the wavelength, and vice versa.

Finally, replace the card cover, and stick the new station name over the previous one.

The tables in the next column give the wavelength ranges of the various buttons.

Diagrams of the rotary switch units, as seen from the rear of the under-side of the chassis.



AERIAL COIL		
Button	Range (metres)	Colour Spot
1	195-262	Yellow
2	258-345 (300-395)	Green
3	300-395 (258-345)	Green
4	366-475 (400-580)	White
5	1,200-1,500	Blue
6	1,442-1,700	Slate

OSCILLATOR COIL		
Button	Range (metres)	Colour Spot
1	195-262	Yell./Wh.
2	258-395	Green/Wh.
3	258-395	Green/Wh.
4	366-580	Brown/Wh.
5	1,200-2,000	Blue/Wh.
6	1,200-2,000	Blue/Wh.

It will be noted that two ranges for the aerial coils of buttons 2, 3 and 4 are given. Reference to the circuit diagram will show that these coils (L21, L22 and L23) are tapped, and normally part of L21, the whole of L22 and part of L23 are used. By using the whole of L21 part of L22 and the whole of L23, the ranges in brackets are obtainable on these three buttons.

To alter the coils, remove the existing lead from the appropriate looped wire tag nearest the press-button side of the auto unit, and in its place solder the lead which will be found secured to the coil former by a piece of white tape or a rubber band.

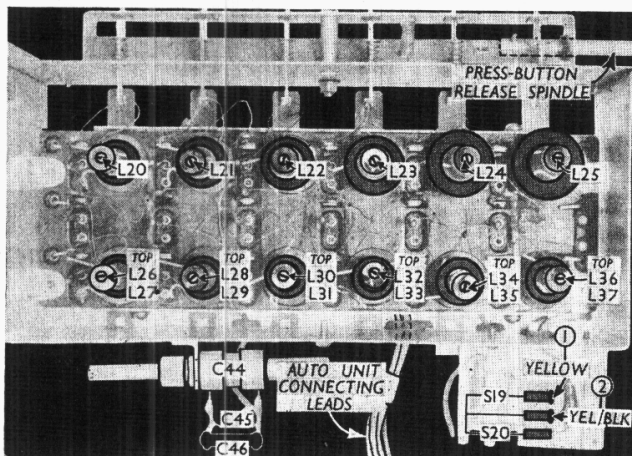
The discarded lead should then be taped to the coil former.

The entire MW band (195-580 m) and the LW band from 1,200-1,700 m can be covered with the coils fitted. A special aerial coil (Part No. 28728 L) covering the ranges of 1,648-1,895 m (tapping) and 1,744-2,050 m (whole coil) can be supplied by E.M.I. Service Ltd. The standard LW oscillator coil already covers this range. To fit the coil, unsolder the existing coil leads from their tags, grasp the coil former firmly and twist anti-clockwise, when the whole coil can be withdrawn. Reverse the operations to fit the new coil, ensuring that the paper washer is in place. The connections are: Inner end of coil to the straight wire tag; outer end, or tapping, to the looped wire tag. Note that buttons 5 and 6 must be retained for the LW coils, since they are the only ones which operate S19, S20.

If the correct wave ranges are not obtainable, or if the C44 setting has been accidentally altered, it may be re-set as follows.

Connect a signal generator to A and E sockets, and an output meter, and fully unscrew the inductance trimmer of L26. Feed in a 180 m (1,667 KC/S) signal, switch set to Auto, and press button 1. Adjust C44 by loosening locking nut and sliding the plunger until maximum output is obtained. Lock the adjustment.

Now re-set L26 to the required station in the usual way, and also check the settings of all the other auto coils.



View of the underneath of the auto unit, showing the various coils, and also S19, S20.