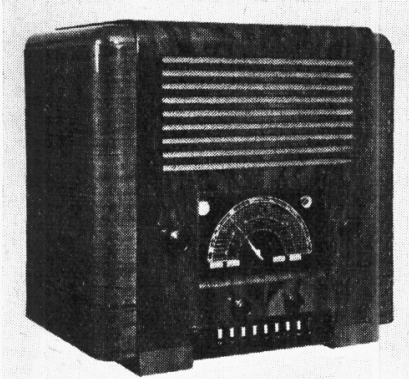


“TRADER” SERVICE SHEET

416

TRUPHONIC MA7

MOTOR-TUNED AC SUPERHET



CIRCUIT DESCRIPTION

With the exception that the HT supply to the tuning indicator is broken during automatic operation, the receiver circuit remains unaltered when the change-over is effected from manual to automatic tuning. In the following description, therefore, no reference will be made to the automatic tuning circuit except at the end of the receiver circuit description, where it is fully dealt with under a separate heading.

Aerial input is via coupling coils L1 (SW), L2 (MW) and L3 (LW) to single tuned circuits L4, C42 (SW), L5, C42 (MW) and L6, C42 (LW) which precede a variable-mu RF pentode valve (V1, Mullard metallised VP4B) operating as signal frequency amplifier.

Tuned-secondary RF transformer coupling by L7, L10, C46 (SW), L8, L11, C46 (MW) and L9, L12, C46 (LW) between V1 and triode pentode valve (V2, Mullard metallised TH4B) which operates as frequency changer. Triode oscillator grid coils L13 (SW), L14 (MW) and L15 (LW) are tuned by C47; parallel trimming by C48 (MW) and C11, C49 (LW); series tracking by C12 (SW), C13, C50 (MW) and C14, C51 (LW). Reaction by L16 (SW) and direct coupling via C15 (MW and LW).

Third valve (V3, Mullard metallised VP4B) is a second variable-mu RF pentode, operating as intermediate frequency amplifier with iron core tuned primary and secondary transformer couplings C9, L17, L18, C10 and C18, L19, L20, C19.

Intermediate frequency 465 KC/S.

Diode second detector is part of separate double diode valve (V4, Mullard metallised 2D4B) with independent cathodes which are, however, both connected directly to chassis. Audio frequency component in rectified output is developed across load resistances R8 and R9, that across R9 being passed via IF stopper R13, switch S45, manual volume control R15 and tone control filter to CG of triode section of double diode triode valve (V5, Mullard metallised

TDD4) which operates as AF amplifier, and in which neither of the diodes is used. Provision for connection of gramophone pick-up across R15 via switch S46, which closes when the waveband control is turned to the “Gram” position, when S44 and S45 open to mute radio. Variable tone control by R17, C25 which are interposed between R15 and V5 CG.

Second diode of V4, fed from L20 via C21, provides DC potentials which are developed across load resistances R10 and R11 and fed back on all bands through decoupling circuits to RF, FC and IF valves, giving automatic volume control. The voltage developed across R11 is applied via R28, C36 to the grid of the CR tuning indicator (T.I., Mullard TV4).

Resistance-capacity coupling by R18, C26 and R19, via grid stopper R20, between V5 and pentode output valve (V6, Mullard PenA4). Fixed tone correction in anode circuit by C28. Provision for connection of low impedance external speaker across secondary of output transformer T1. On MW and LW bands, part of the output from T1 secondary is developed across resistances R22 and R24 via switch S47, that across R24 being common also to V5 cathode circuit to provide negative feed-back. On gramophone, the feed back circuit is modified by the introduction of R23 via S48 which then closes, while S47 opens. On SW, both S47 and S48 open so that the feed back circuit is inoperative.

HT current is supplied by IHC full-wave rectifying valve (V7, Mullard IW4/350). Smoothing by iron-cored choke L23 (the speaker field coil is by-passed by C31) and dry electrolytic condensers C29 and C30. RF filtering in mains and HT circuits by C4, C32 and C33; in addition C34, when it is not used as a mains aerial coupling, is inserted into a second earth socket.

Fixed GB voltages for V1, V2 and V3, GB for V5 and AVC delay voltage, are obtained automatically from drop along resistances R25 and R26 in the negative HT lead to chassis.

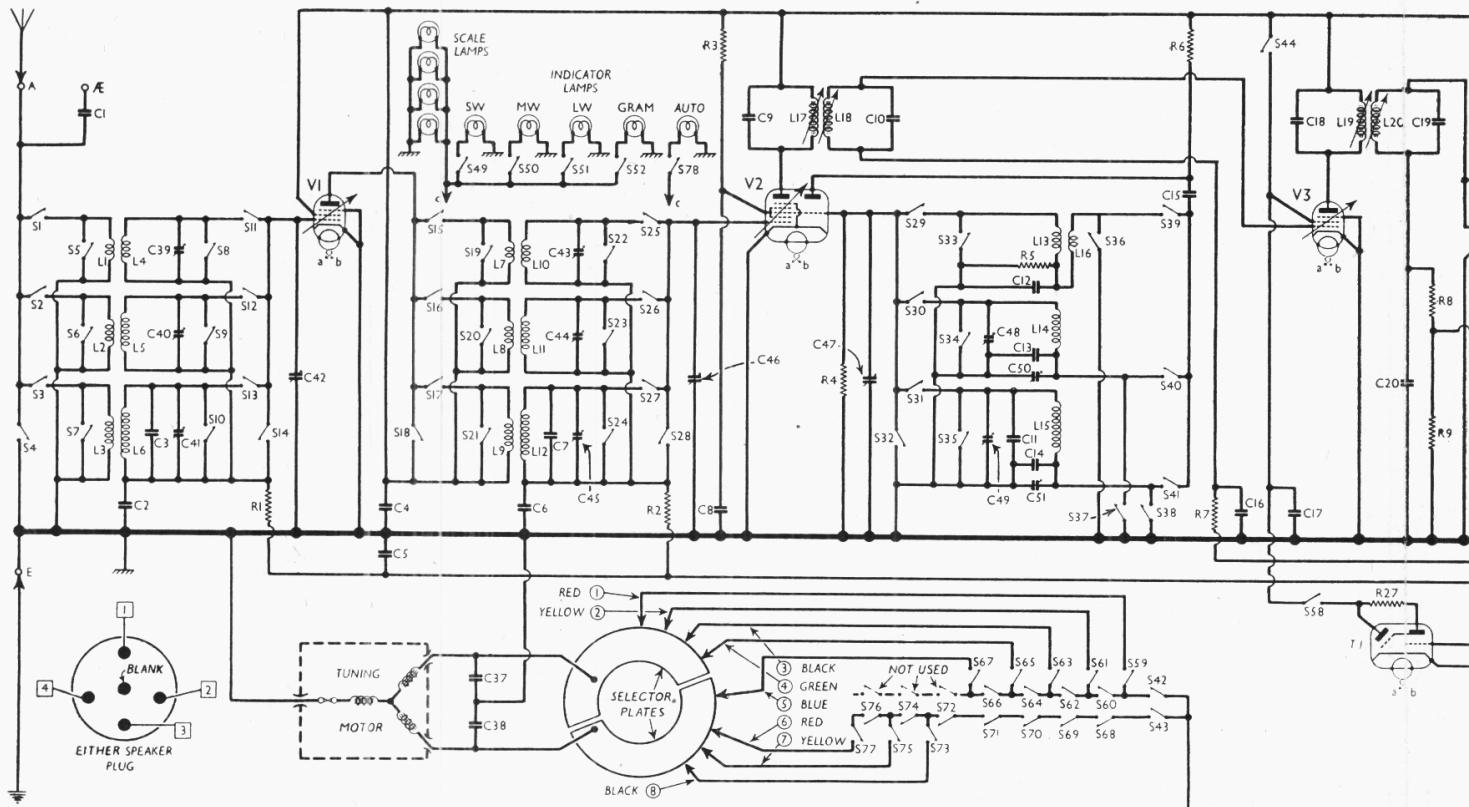
THE Truphonic MA7 receiver is a 3-band 6-valve (plus rectifier) AC superhet, with press-button motor tuning for eight stations, the buttons selecting five MW and three LW stations. An extra button is provided for manual tuning.

The motor tuning arrangement is of the direct homing type, employing a split selector disc, with two semi-circular rails carrying the adjustable contacts.

Provision is made for a pick-up and an extension speaker (with a switch for internal speaker muting). A mains aerial device is incorporated.

The SW range is 16.8 to 50 m, and the set is suitable for use on 200-250 V, 40-80 C/S AC mains.

Release date : August, 1938.



Circuit diagram of the Truphonic MA7 motor-tuned press-button AC superhet. Note that only the

Automatic Tuning Circuit

The mains transformer **T2** is provided with a fourth secondary winding, which provides the power to drive the tuning motor and, from a tapping **c** near one end, which end is connected to chassis, to light the scale and indicator lamps.

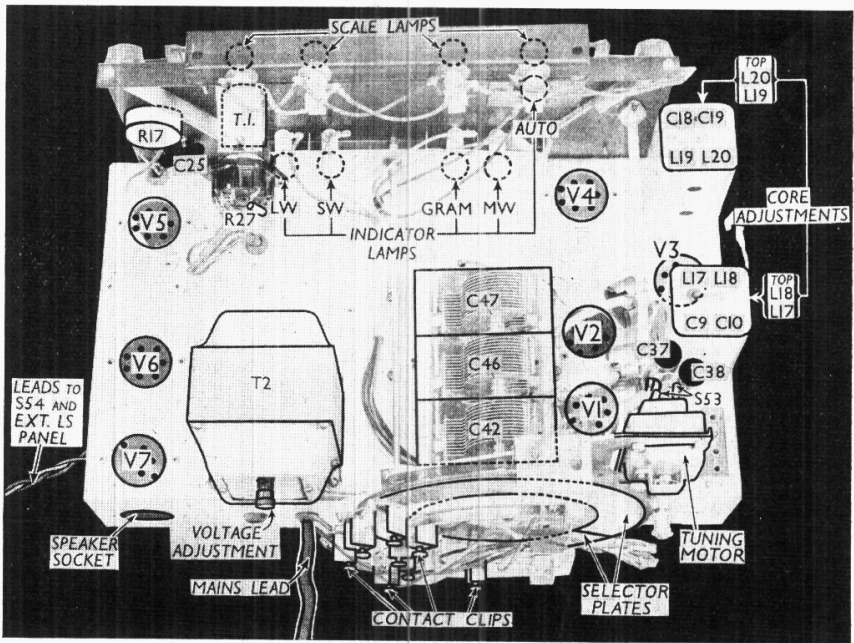
When a MW button is pressed, one end of the motor secondary is connected via **S57** (which closes when any automatic button is pressed), **S42** (which closes when the waveband control is turned to "Medium"), one of the switches **S59, S61, S63, S65, S67** which are controlled by the five MW press-buttons via as many of the series switches **S60, S62, S64** and **S66** as are necessary, thence via the appropriate lead and contact clip (numbered 1 to 5) to one of the selector plates, according to the position of the disc against which they are mounted, to that side of the motor windings to which the plate is connected, and so via chassis to the other end of the motor secondary of **T2**.

When a long wave button is pressed, the circuit follows the same path, except that the waveband control is then turned to LW, so that **S42** opens and **S43** closes. Thus the current flows via **S57, S43**, all the series switches **S68** to **S71** (which are operated by MW buttons and therefore now remain closed), **S72** to **S77** according to which of the three LW buttons is depressed, one of the selector plates via the appropriate lead and contact clip (numbered from 6 to 8), and thus via one side of the motor to chassis.

The motor spindle is geared to the selector plate disc, so that when the motor runs the disc is rotated, in such a direction that the insulating gap between the selector plates always approaches the contact clip through which the current is flowing. When the gap reaches this clip, the circuit is thus broken and the motor stops running. As the selector plate disc is mounted on the condenser gang drive shaft, the gang is rotated with the disc.

For station setting, when the manual and one of the auto buttons are depressed, **S56** closes and **S57** opens, and the motor circuit is then connected, via the setting lamp, across scale lamp circuit; the motor will not run under these conditions, but the lamp will light until the contact clip point is so placed that its tip lies on the gap, when the light goes out. The tuning indicator is switched out of circuit during automatic operation by **S58** which opens when any auto button is pressed. The muting switch **S53**, which is automatically closed by a lateral movement of the motor spindle while the motor is running, silences the receiver during the process of automatic tuning.

The procedure for station setting is dealt with under "Auto-Tuning Adjustments."



CONDENSERS		Values (μF)
C1	Alternative aerial series	0.00005
C2	V1 CG decoupling	0.05
C3	Aerial LW fixed trimmer	0.000067
C4	HT circuit RF by-pass	0.05
C5	AVC line decoupling	0.05
C6	V2 pentode CG decoupling	0.05
C7	RF LW sec. fixed trimmer	0.000067
C8	V2 SG decoupling	0.05
C9	1st IF transformer fixed tuning condensers	0.00015
C10	Osc. circuit LW fixed trimmer	0.000145
C11	Osc. circuit SW tracker	0.00028
C12	Osc. circuit MW fixed tracker	0.000395
C13	Osc. circuit LW fixed tracker	0.000215
C14	V2 osc. anode coupling	0.002
C15	V3 CG decoupling	0.05
C16	HT circuit RF by-pass	0.05
C17	2nd IF transformer fixed tuning condensers	0.00015
C18	IF by-pass	0.000125
C19	Coupling to V4 AVC diode	0.00005
C20	V1, V2, V3 anodes decoupling	8.0
C21	AF coupling to V5	0.01
C22	V5 CG decoupling	0.5
C23	Part of variable tone control	0.0004
C24	V5 to V6 AF coupling	0.1
C25	V6 cathode by-pass	25.0
C26	Fixed tone corrector	0.0005
C27	HT smoothing condensers	24.0
C28	Speaker field shunt	8.0
C29	V7 cathode RF by-pass	1.0
C30	Mains RF by-pass	0.002
C31	Mains aerial coupling	0.01
C32	Auto GB circuit by-pass	0.0005
C33	T.I. CG decoupling	50.0
C34	Tuning motor by-pass condensers	0.03
C35	Aerial circuit SW trimmer	0.02
C36	Aerial circuit MW trimmer	0.00003
C37	Aerial circuit LW trimmer	0.00003
C38	Aerial circuit tuning	0.00003
C39	RF trans. sec. SW trimmer	0.00003
C40	RF trans. sec. MW trimmer	0.00003
C41	RF trans. sec. LW trimmer	0.00003
C42	RF trans. sec. tuning	0.00003
C43	Oscillator circuit tuning	—
C44	Osc. circuit MW trimmer	0.00003
C45	Osc. circuit LW trimmer	0.00003
C46	Osc. circuit MW tracker	0.00003
C47	Osc. circuit LW tracker	0.00003

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil	0.2
L2	Aerial MW coupling coil	20.0
L3	Aerial LW coupling coil	90.0
L4	Aerial SW tuning coil	0.3
L5	Aerial MW tuning coil	5.6
L6	Aerial LW tuning coil	13.0
L7	RF trans. SW pri. coil	0.3
L8	RF trans. MW pri. coil	1.4
L9	RF trans. LW pri. coil	6.6
L10	RF trans. SW sec. coil	0.1
L11	RF trans. MW sec. coil	5.5
L12	RF trans. LW sec. coil	13.0
L13	Osc. circuit SW tuning coil	0.05
L14	Osc. circuit MW tuning coil	2.3
L15	Osc. circuit LW tuning coil	4.4
L16	Oscillator SW reaction	16.25
L17	1st IF trans. Pri.	12.0
L18	1st IF trans. Sec.	12.0
L19	2nd IF trans. Pri.	12.0
L20	2nd IF trans. Sec.	12.0
L21	Speaker speech coil	2.5
L22	Speaker field coil	1,000.0
L23	HT smoothing choke	530.0
T1	Output trans. Pri.	700.0
	Output trans. Sec.	0.3
	Pri., total	23.0
	Heater sec.	0.05
	Rect. heat. sec.	0.1
	HT sec., total	470.0
	Motor sec., total	1.0
Tuning Motor	Between either selector disc and chassis	6.3
S1-S43	Waveband switches	—
S44-46	Radio/gram change switches	—
S47,48	Feed-back control switches	—
S49-52	Waveband indicator switches	—
S53	Receiver muting switch	—
S54	Internal speaker switch	—
S55	Mains switch, ganged R15	—
S56-58	Manual/auto change switches	—
S59-67	MW auto selector switches	—
S68-77	LW auto selector switches	—
S78	Auto indicator lamp switch	—

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.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B	220	5.7	220	2.0
V2 TH4B	220	2.1	85	5.3
	Oscillator			
V3 VP4B	85	5.4	220	3.4
V4 2D4B	220	9.2	—	—
V5 TDD4	152	1.9	—	—
V6 PenA4	225	38.0	252	5.9
V7 IW4/350	350†	—	—	—
T.I. TV4	18	0.13	—	—
	Tar get			
	220	0.48		

† Each anode, AC.

GENERAL NOTES

Switches.—S1-S52 are all ganged in nine rotary units beneath the chassis, the units being indicated in the under-chassis view, and shown in detail in the diagrams in col. 6. The arrows in the under-chassis view show the directions in which the units are to be viewed. The table (col. 5) gives the switch positions for the four control settings, starting from fully anticlockwise. A dash indicates open, and C, closed.

S53 is the receiver muting switch, mounted on the tuning motor, and indicated in our plan chassis view. It is operated by a sliding movement of the motor spindle and is closed while the motor is running.

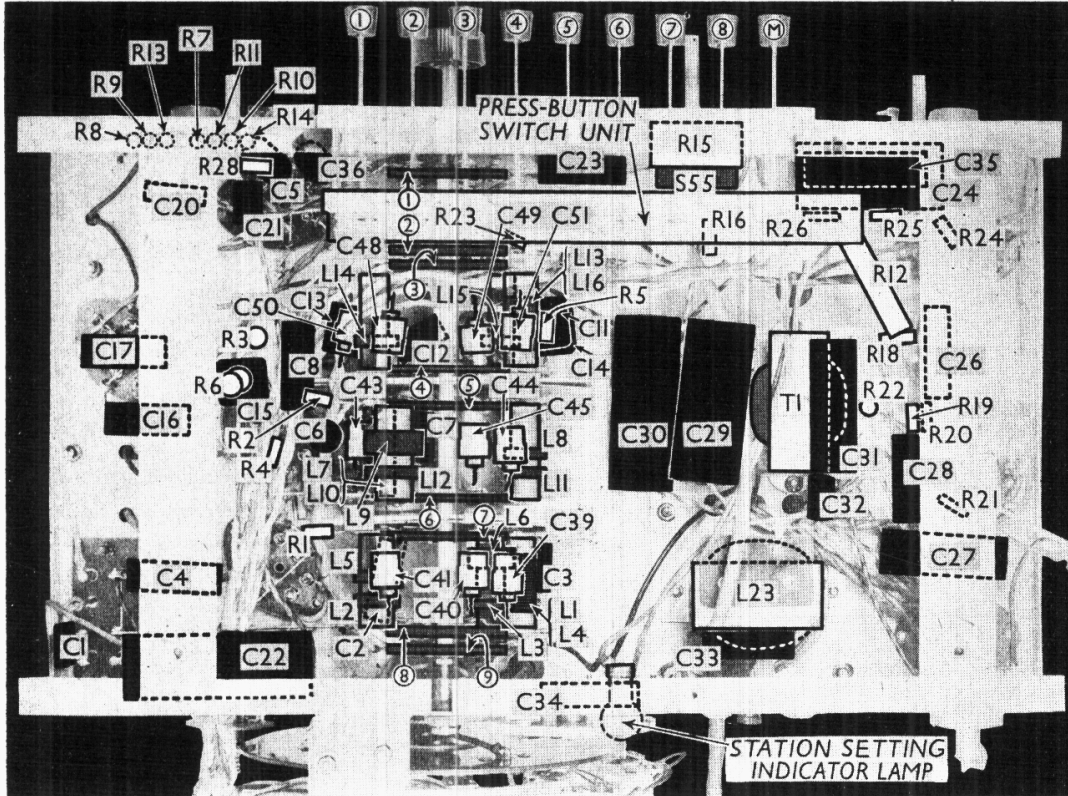
S54 is the internal speaker switch, associated with the external speaker sockets at the rear of the cabinet. When the special plug is inserted and rotated anticlockwise, S54 opens and mutes the internal speaker.

S55 is the QMB mains switch, ganged with the volume control R15.

S56-S78 are all contained in the press-button unit, indicated in our under-chassis view, and shown in detail in cols. 4 and 5. It is drawn as seen looking from the rear of the underside of the chassis, the tags on the lower strip being staggered forward slightly for clarity. The functions of the various switches, and their action are described under "Automatic Tuning Circuit."

Coils.—All the RF and oscillator coils (L1-L16) are in nine unscreened tubular units beneath the chassis, disposed around the rotary switch assembly.

VALVE ANALYSIS
Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on mains of 230 V, using the 230 V tapping on the mains transformer. The "Manual" button was depressed, the receiver was tuned to the lowest wavelength on the medium band and the volume control



Under-chassis view. Note the directions, shown by arrows, in which the nine rotary switch units are viewed in the diagrams in col. 6. The press-button switch unit is shown in cols. 4 and 5. The press-buttons are numbered to agree with the numbers in circles in the circuit diagram.

TABLE AND DIAGRAMS OF ROTARY SWITCH UNITS

Each unit contains two coils, except **L14** and **L15**, which are separate.

The IF transformers **L17**, **L18** and **L19**, **L20**, are in two screened units on the chassis deck, with their associated fixed trimmers. They have iron-core adjustments, their approximate positions at the sides of the cans being indicated in the plan chassis view. **L21** and **L22** are in the speaker, while the smoothing choke **L23** is beneath the chassis.

Scale and Indicator Lamps.—There are four scale lamps, five indicator lamps for the wave ranges, etc., and one station setting indicator lamp (on the rear member of the chassis). They are all Osram MES types, rated at 3.5 V, 0.15 A, having small bulbs. They are run from a tapping on the motor secondary of **T2**.

External Speaker.—Two sockets are provided on a panel at the rear of the cabinet for a low impedance (20) external speaker. Rotation of the special plug opens **S54** and mutes the internal speaker.

Speaker Connector.—The speaker is connected to the chassis by a 4-way cable with a 5-pin plug at each end, corresponding sockets being fitted on the speaker and the back of the chassis. The centre pin and socket is blank in each case. A diagram of one of the plugs (looking from the free ends of the pins) is inset beneath the circuit diagram, the numbers in squares corresponding to those in the diagram itself. The colour coding of the leads to the plugs is: Pin 1, red; 2, black; 3, blue; 4, yellow.

Pre-Set Condensers.—The ten pre-set condensers are all of the interleaving air-dielectric type, consisting of two die castings which can be screwed in or out of mesh. They are all disposed round the rotary switch units.

Chassis Divergencies.—**R14** is given as 1.5 MO by the makers, but was 0.25 MO in our chassis. **C1** is shown as 0.00007 μ F (0.00005 μ F in our chassis). In the makers' diagram **C22** is on the opposite side of **R12**, and **C33** is on the opposite side of **S55**. The makers show a 0.0003 μ F condenser from anode of **V5** to chassis, which was not present in our receiver. **C15** is given as 0.003 μ F by the makers (0.002 μ F in our chassis).

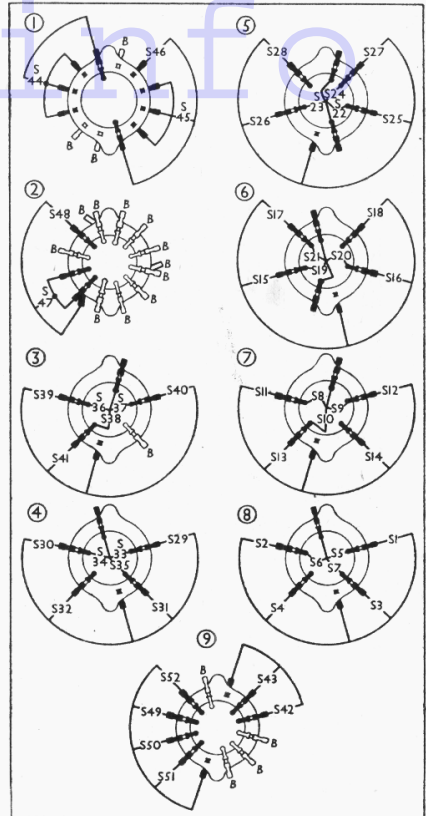
AUTO-TUNING ADJUSTMENT

The circuit details of the automatic tuning arrangement is described under "Automatic Tuning Circuit." For fuller information on the direct homing type of motor tuning, see *Radio Maintenance Supplement* for July 23, 1938, or the *ABC of Automatic Tuning*, pages 15 to 18.

Setting up Stations.—Switch set to the appropriate waveband, tune to the required station manually, and then press the button which is to select the station, and the manual button at the same time, so that both remain depressed. Locate the contact clip on the selector rails which has the same number as the auto button chosen, and slide the clip towards the white line on the selector disc. If other contacts are in the way, the clip must be removed from the rail (by unscrewing knurled screw) and replaced where there is no obstruction between it and the white line. If another clip is in the way, being close to the white line, place clip under adjustment on the other rail. The station setting lamp (rear of chassis) should be alight until the clip is over the white line (gap between the two sections of selector plate). Move clip carefully until the lamp goes out, and it is mid-way between the two settings at which the lamp lights up. Screw up knurled screw, and place correct name tab in es-cutehon at front of receiver.

Altering No. of MW and LW Stations.—When the set is sent out, it is set up for five MW and three LW stations. If, say, four MW and four LW are required, certain of the press-button switch wiring must be

Switch	LW	MW	SW	Gram.
S1	—	—	C	—
S2	—	C	—	—
S3	C	—	—	—
S4	—	—	—	C
S5	C	C	—	C
S6	C	—	C	C
S7	—	C	C	C
S8	C	C	C	C
S9	C	—	C	C
S10	—	C	C	C
S11	—	—	C	—
S12	—	C	—	—
S13	C	—	—	—
S14	—	—	—	C
S15	—	—	C	—
S16	—	C	—	—
S17	C	—	—	—
S18	—	—	—	C
S19	C	C	—	C
S20	—	—	C	C
S21	—	C	C	C
S22	C	C	C	C
S23	C	—	C	C
S24	—	C	C	C
S25	—	—	C	C
S26	—	C	—	—
S27	C	—	—	—
S28	—	—	—	C
S29	—	—	C	—
S30	—	C	—	—
S31	C	—	—	—
S32	—	—	—	C
S33	C	C	—	C
S34	C	—	C	C
S35	—	C	C	C
S36	C	C	C	C
S37	C	—	C	C
S38	—	C	C	C
S39	—	—	C	C
S40	—	C	—	—
S41	C	—	—	—
S42	—	C	—	—
S43	C	C	—	—
S44	C	—	C	C
S45	C	C	C	C
S46	—	—	—	C
S47	C	C	—	C
S48	—	—	—	C
S49	—	—	C	—
S50	—	C	—	—
S51	C	—	—	—
S52	—	—	—	C



Diagrams of the nine rotary switch units, as seen looking at the underside of the chassis, in the directions of the arrows in the under-chassis view.

altered. If the circuit diagram and press-button switch diagram are examined it will be seen that certain switches are dotted in, and are marked "not used." These are brought into use when transferring buttons to another band. The leads from the contact clips which go to switch contacts in the upper row on the unit (looking from beneath the chassis) belong to MW stations; those from contact clips going to contacts in the lower row belong to LW stations. To change a button from MW to LW, or vice-versa, its lead is unsoldered from the tag on the press-button unit and transferred to the corresponding tag in the other row of contacts. Thus to set up for eight MW stations, all the leads from the clips will be on tags in the upper row.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator between control grid (top cap) of **V2** and chassis. Switch set to MW, turn volume control to maximum, and short-circuit **C47**. Feed in a 465 KC/S signal, and adjust cores of

L17, **L18**, **L19** and **L20** in turn for maximum output. Check these settings, then remove short from **C47**.

RF and Oscillator Stages.—With gang at maximum, pointer should be under small green cross about $\frac{1}{2}$ in. below left-hand end of MW scale.

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

MW.—Switch set to MW, and turn gang to minimum. Feed in a 200 m (1,500 KC/S) signal, and adjust **C48** for maximum output. Feed in a 214 m (1,400 KC/S) signal, tune it in on set, and adjust **C40** and **C44** for maximum output. Feed in a 545 m (550 KC/S) signal, tune it in, and adjust **C50** for maximum output, while rocking the gang for optimum results. Return to 200 m, with gang at minimum, and re-adjust **C48**. Repeat MW alignment until no further improvement results.

LW.—Switch set to LW, then proceed as for MW, except that **C49** is adjusted at 1,000 m (300 KC/S), with gang at minimum; **C41** and **C45** are adjusted at 1,034 m (290 KC/S); **C51** is adjusted at 1,875 m (160 KC/S).

SW.—Switch set to SW, and turn gang until it is about 5 degrees in mesh. Feed in a strong 17 m (17.6 MC/S) signal, and swing generator slightly above and below this setting. Two signals should be heard; set signal generator accurately on the lower frequency (higher wavelength) signal. Adjust **C39** and **C43** for maximum output. Check at 46 m (6.5 MC/S).

ABC OF AUTOMATIC TUNING

For full illustrated descriptions of motor-driven, and other automatic tuning systems, reference should be made to *The Trader* booklet, *The ABC of Automatic Tuning*.

Copies of this are available from *The Trader* offices, price 1s., post free.

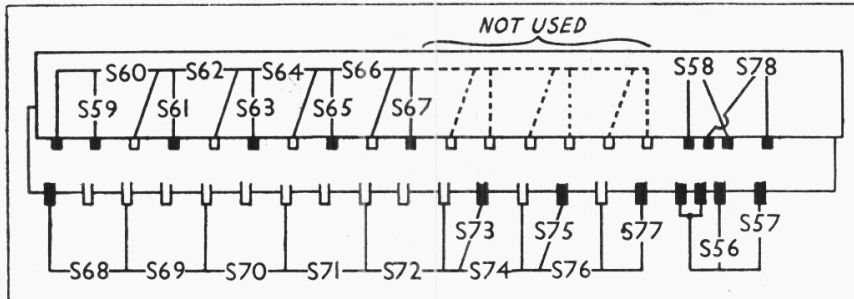


Diagram of the press-button switch unit, looking from beneath the chassis, as in the under-chassis view. The lower row of tags is slightly displaced towards the bottom of the diagram for clarity.