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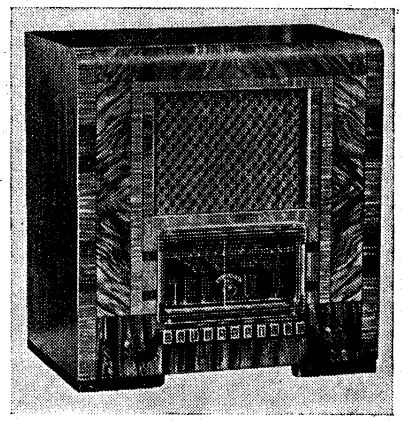
"TRADER" SERVICE SHEET

678

FERGUSON 771 AND 774 CONSOLE



The Ferguson 771 table model.

THE Ferguson 771 "Pressabutton" receiver is a 4-valve (plus rectifier) AC 3-band superhet with press-button trimmer tuning for seven stations and press-button switches for gramophone and wave-change purposes. It is suitable for mains of 200-250 V, 50-100 c/s, and has a short-wave range of 16-50 m, while provision is made for the connection of an external speaker.

An identical chassis is fitted in the 774 Console, but this *Service Sheet* was prepared on a 771.

Release date for both models: August, 1938.

Original prices: 771, £12 1*s.* 6*d.*; 774, £15 15*s.*

CIRCUIT DESCRIPTION

Throughout the circuit diagram the switches associated with the press-buttons have been numbered according to a code which indicates their functions, and once the code has been grasped the action of the switches can be read off from the circuit diagram.

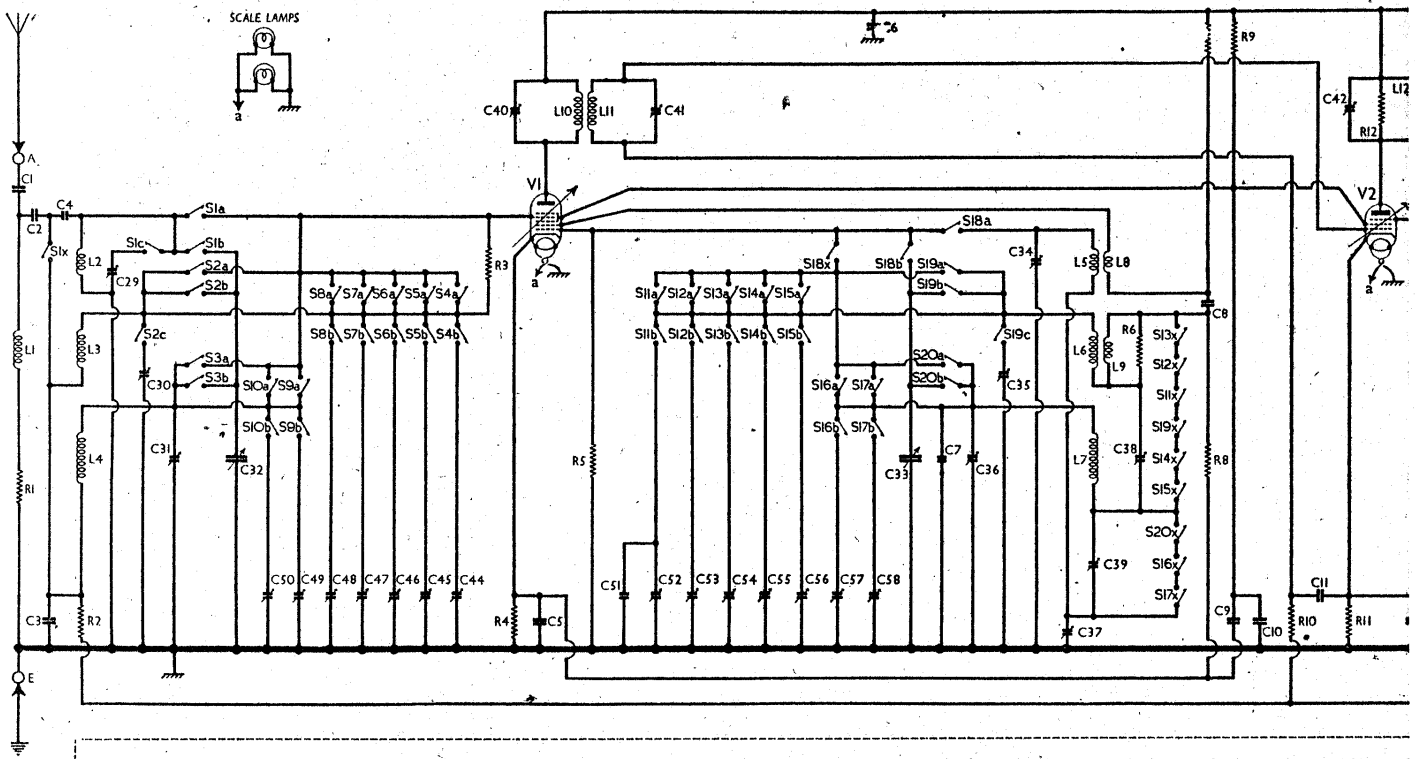
As the switches that are controlled by a single press-button fall naturally into groups, each switch in the group bears the group number. For instance, in the aerial circuit, the SW button controls all the switches in group one, which includes **S1a, S1b, S1c** and **S1x**; in the oscillator circuit, this button controls group eighteen : **S18a, S18b** and **S18x.**

For group two (MW manual button) we have in the aerial circuit **S2a, S2b** and **S2c**; and in the oscillator circuit group nineteen : **S19a, S19b, S19c** and **S19x.**

The LW manual button controls groups three (aerial circuit) and twenty (oscillator circuit). The remaining seven press-buttons control the automatic tuning switch groups, five of which are MW, and two LW.

The number, therefore, indicates to which group the switch is attached. The suffix letters **a, b, c** and **x** indicate the action of each switch when the button is pressed. Switches bearing the suffix **a, b** or **c** close when the button is pressed, while those bearing the suffix **x** open. When the button is released by pressing another button, the position is reversed, so that it must be borne in mind that an "**x**" switch is always closed except when its button is depressed. **S1x,** for instance, which is operated by the SW button, is closed when any MW or LW button is depressed.

Aerial input is fed on MW and LW via series condenser **C1** to coupling condensers **C2, C3,** which form a potential divider via **S1x,** that portion of the signal which appears across **C3** being coupled to the tuning coils **L3** (MW) and **L4** (LW). On SW, input is via **C1** and coupling condensers **C2, C4** to tuning coil **L2, S1x** then



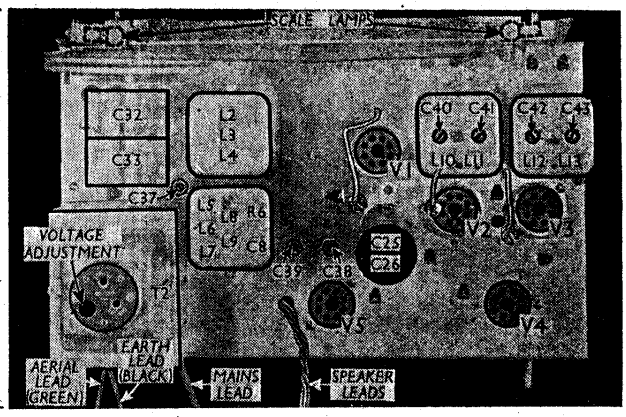
Circuit diagram of the Ferguson 771 table and 774 console "Pressabutton" superhets. All the switches with the exception of S22 are press-button operated, and they are code-numbered in the diagram to show their action. The coding is fully explained at the beginning of "Circuit Description." Differences in early models are described under "Chassis Divergencies" overleaf.

being open. Manual tuning is effected in the conventional manner by the variable condenser **C32** connected to the appropriate coil via switches **S1b** (SW), **S2b** (MW) and **S3b** (LW), **V1** tetrode control grid being connected similarly via switches **S1a** (SW), **S2a** (MW) and **S3a** (LW).

Automatic tuning is effected by pressing one of the automatic press-buttons which, in the aerial circuit, are associated with switches numbered **4** to **10**, numbers **4** to **8** being connected to the MW coil and **9** and **10** to the LW coil, thus applying one of the automatic tuning trimmers across the appropriate tuning coil according to which button is depressed.

Resistor **R3** is connected between **V1** tetrode CG and **L3** to prevent the grid becoming free when all switches are open.

First valve **(V1, 6A8G)** is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L5** (SW), **L6** (MW) and **L7** (LW) are tuned by **C33** via switches **S18a, b** (SW), **S19b** (MW) and **S20b** (LW) for manual tuning, or by one of the trimmers **C52** to **C58** for automatic tuning via switches numbered **11** to **15** (MW) and **16, 17** (LW). Normal parallel trimming by **C34** (SW), **C35** (MW —manual only) and **C7, C36** (LW); series tracking by **C37** (SW), **C38** (MW) and **C39** (LW). Reaction coupling by coils **L8** (SW), **L9** (MW) and by the common impedance of trackers **C37, C38** in grid and anode circuits via **C8** (LW). When a MW station is being received, auto or manual, one of the switches **S11x** to **S15x** and **S19x**, whichever is associated with the depressed button, is open, while if a SW or LW station is being received they are all closed, their buttons being out; when a LW station is being received **S16x, S17x** or **S20x** will be open, all three being closed when operating on SW or MW.



Plan view of the chassis. The tracker adjustments are indicated. **R6** and **C8** are inside the **L5-L9** coil unit screen.

Second valve **(V2, 6U7G)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C40, L10, L11, C41** and **C42, R12, L12, L13, C43.**

Intermediate frequency 465 kc/s.

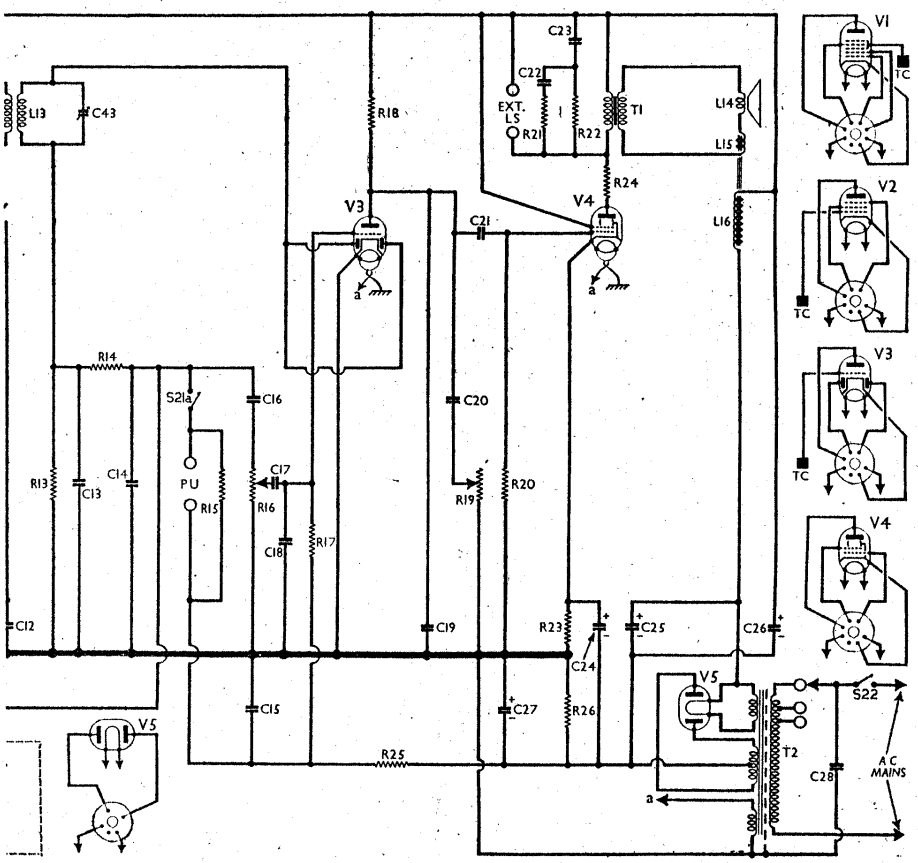
Diode second detector is part of double diode triode valve **(V3, 6Q7G),** both diode anodes being strapped together. Audio frequency component in rectified output is developed across load resistor **R13** and passed via IF stopper **R14,** AF coupling condenser **C16,** manual volume control **R16** and further AF coupling condenser **C17,** to CG of triode section, which operates as AF amplifier. IF filtering by **C13, R14, C14** in diode circuit, **C18** in grid circuit and **C19** in the triode anode circuit. Variable tone control by **C20, R19** in anode circuit. Provision for connection of gramophone pick-up across **C16, R16** via switch **S21a,** the **a** indicating of course that the switch closes when the "**GR**" button is depressed.

DC potential developed across **R13** is fed back through decoupling circuits as GB to FC (except on SW) and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R18, C21** and **R20** between **V3** triode and beam tetrode output valve **(V4, 6V6G).** Fixed tone correction in anode circuit by RC network **C23, R22** and **C22, R21.** Provision for the connection of a high impedance external speaker in anode circuit.

HT current is supplied by full-wave rectifying valve **(V5, 5Y3G).** Smoothing by speaker field **L16** and electrolytic condensers **C25, C26.** Mains RF filtering by **C28.**

GB potential for **V3** is obtained from the drop along resistor **R26** in the negative HT lead to chassis. On gram, this potential is also applied as a muting bias to the signal diode anode by the closing of **S21a.**



VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted in the makers' manual. Readings were taken on a receiver working from 240 V AC mains, the voltage adjustment being appropriately set. The receiver was tuned to the longest wavelength on the MW band, while the **A** and **E** leads were joined together and the volume control was at minimum.

Voltages were measured on a meter having a resistance of 1,000 ohms per

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A8G	240	5·2	90	3·4
	Oscillator			
	138	3·1		
V2 6U7G	240	7·2	90	2·1
V3 6Q7G	115	0·4	—	—
V4 6V6G	220	35·0	240	3·2
V5 5Y3G	315†	—	—	—

† Each anode, AC.

volt, and its negative lead was connected to chassis in each case.

If **V2** should become unstable when its screen current or anode is being measured, it can be stabilised by connecting a non-inductive condenser of about 0.1 μF from grid (top cap) to chassis.

DISMANTLING THE SET

Removing Chassis.—Remove the two control knobs (pull-off) and the eleven press-buttons (pull-off);

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

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder from the connecting panel on the speaker transformer the leads connecting it to chassis.

When replacing, take care that the press-button plungers do not foul the front of the cabinet, and fit the buttons in the following order, reading from left to right: National, Midland, London, Gram, SW, MW, North, Athlone, LW, Luxembourg, Droitwich (noting the differences in early chassis described under "Chassis Divergencies" in col. 4.

A felt washer should be fitted between each of the two control knobs and the cabinet.

The speaker leads should be connected as follows, reading from top to bottom, but using the numbers marked beside the tags on the connecting panel: F and 1 (joined together), red; 2, no tag fitted; 3, blue; F, red/white.

Removing Speaker.—The speaker can be removed from the cabinet by removing the nuts from the four screws holding it to the sub-baffle.

When replacing, see that the transformer is on the left. If the leads have been unsoldered, they should be connected as previously described.

GENERAL NOTES

Switches.—All the switches, with the exception of **S22,** the mains switch, are of the press-button type, and are contained in a single double-sided unit mounted inside the front of the chassis. The switches controlled by each press-button are assigned a number, followed by a suffix letter **a, b, c** or **x.** The **a, b** and **c** switches *close* when their button is pressed, while the **x** switches *open* when their button is pressed.

The action of the switches is explained in detail under "Circuit Description."

The switch unit is indicated in our under-chassis view, but for identification of the individual switches the diagrams on this side of this sheet must be consulted. These diagrams are of the two sides of the switch unit. The lower one shows the switches as seen when looking at the underside of the chassis, while the upper one shows the switches on the unit which are normally hidden from view by the chassis deck.

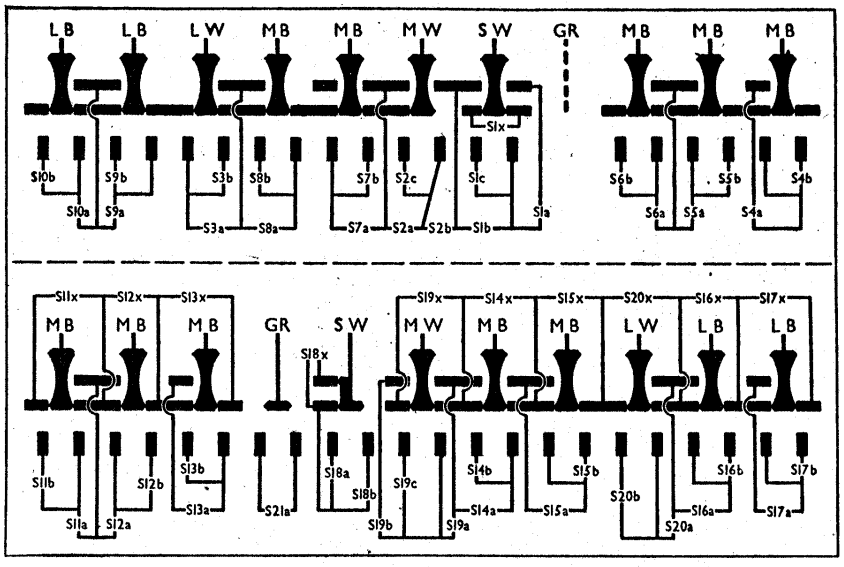
To examine the upper side, the whole switch unit must be removed. First unsolder the fourteen leads from the pre-set station trimmers tags and remove the trimmer assembly (two screws). Now code in a rough sketch the remaining external connecting wires to the switch unit and unsolder them. Then remove the screws holding the two banks of three trimmers (above and below the switch unit) and the two screws holding the unit to the chassis. When replacing, note that each wire from the switch unit to the pre-set station trimmers goes straight across to the nearest tag.

S22 is the QMB mains switch, ganged with the volume control **R16.**

Scale Lamps.—These are two National Union miniature bayonet cap types, marked N51. The rating is 6-8 V, 0.2 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a

(*Continued in col.* 4)



Diagrams showing both sides of the press-button switch unit. The lower view is that seen from beneath the chassis, and the upper one is that facing the underside of the chassis deck.

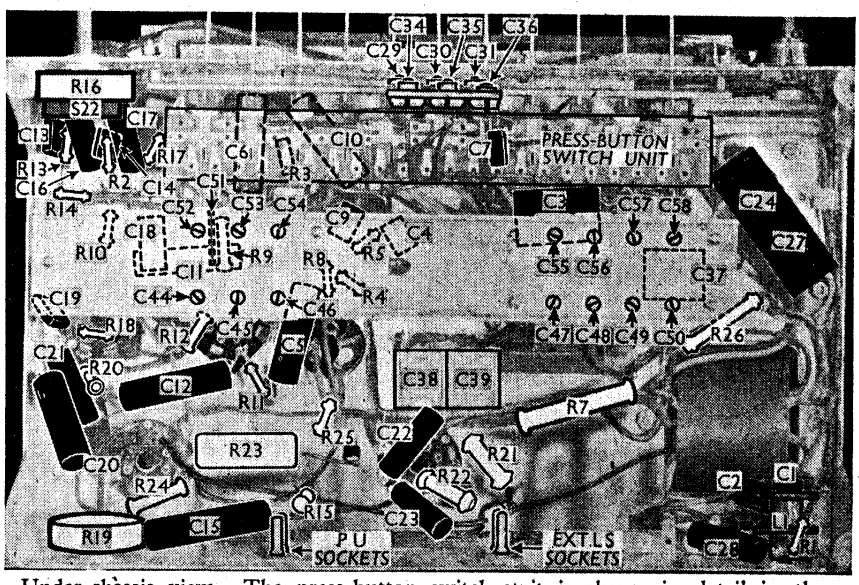
COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	Anti-modulation damping	10,000
R2	V1 tetrode CG decoupling	500,000
R3	V1 tetrode CG resistor	3,000,000
R4	V1 fixed GB resistor	150
R5	V1 osc. CG resistor	500,000
R6	Osc. MW reaction damping	2,500
R7	V1 osc. anode HT feed	25,000
R8	V1 osc. CG resistor	50,000
R9	V1, V2 SG's HT feed	25,000
R10	V2 CG decoupling	500, 000
R11	V2 fixed GB resistor	300
R12	2nd IF trans. pri. damping	600,000
R13	V3 diodes load resistor	500,000
R14	IF stopper	25,000
R15	Gramophone PU shunt	25,000
R16	Manual volume control	500,000
R17	V3 triode CG resistor	500,000
R18	V3 triode anode load	250,000
R19	Variable tone control	100,000
R20	V4 CG resistor	500,000
R21, R22	Parts of fixed tone corrector	10,000, 10,000
R23	V4 GB resistor	300
R24	V4 anode stopper	100
R25	V3 CG decoupling	250,000
R26	V3 GB resistor	35

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0005
C2, C3	Aerial circuit LW coupling potential divider	0·0001, 0·004
C4	Aerial SW coupling	0·00002
C5	V1 cathode by-pass	0·1
C6	HT circuit RF by-pass	0·1
C7	Osc. LW fixed trimmer	0·00006
C8	V1 osc. anode coupling	0·00025
C9	V1 SG RF by-pass	0·00025
C10	V1, V2 SG's decoupling	0·1
C11	V2 CG decoupling	0·1
C12	V2 cathode by-pass	0·1
C13, C14	IF by-pass condensers	0·00025, 0·00025
C15	V3 triode CG decoupling	0·25
C16, C17	AF coupling condensers to V3 triode	0·02, 0·02
C18, C19	IF by-pass condensers	0·00015, 0·00025
C20	Part tone control	0·01
C21	V3 triode to V4 coupling	0·01
C22, C23	Parts of fixed tone corrector	0·01, 0·01
C24*	V4 cathode by-pass	5·0
C25*, C26*	HT smoothing condensers	16·0, 8·0
C27*	V3 GB circuit by-pass	25·0
C28	Mains RF by-pass	0·01
C29‡	Aerial SW (manual) trimmer	—
C30‡	Aerial MW (manual) trimmer	—
C31‡	Aerial LW trimmer	—
C32†	Aerial manual tuning	—
C33†	Oscillator manual tuning	—
C34‡	Osc. circ. SW trimmer	—
C35‡	Osc. MW (manual) trimmer	—
C36‡	Osc. circ. LW trimmer	—
C37‡	Osc. circ. SW tracker	—
C38‡	Osc. circ. MW tracker	—
C39‡	Osc. circ. LW tracker	—
C40‡	1st IF trans. pri. tuning	—
C41‡	1st IF trans. sec. tuning	—
C42‡	2nd IF trans. pri. tuning	—
C43‡	2nd IF trans. sec. tuning	—
C44‡, C45‡, C46‡, C47‡, C48‡	Aerial circuit MW automatic tuning trimmers	—
C49‡, C50‡	Aerial circuit LW automatic tuning trimmers	—
C51		0·00005
C52‡, C53‡, C54‡, C55‡, C56‡	Oscillator circuit MW automatic tuning trimmers	—
C57‡, C58‡	Oscillator circuit LW auto tuning trimmers	

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Anti-modulation choke ...	20·0
L2	Aerial SW tuning coil ...	0·1
L3	Aerial MW tuning coil ...	3·0
L4	Aerial LW tuning coil ...	17·0
L5	Osc. SW tuning coil ...	0·1
L6	Osc. MW tuning coil ...	3·0
L7	Osc. LW tuning coil ...	5·0
L8	Osc. SW reaction ...	0·5
L9	Osc. MW reaction ...	1·0
L10, L11	1st IF trans. Pri. ...	9·0
	1st IF trans. Sec. ...	11·0
L12, L13	2nd IF trans. Pri. ...	12·0
	2nd IF trans. Sec. ...	9·0
L14	Speaker speech coil ...	2·0
L15	Hum neutralising coil ...	0·15
L16	Speaker field coil ...	1,800·0
T1	Speaker input trans. Pri. ...	500·0
	Speaker input trans. Sec. ...	0·5
T2	Mains trans. Pri., total ...	30·0
	Mains trans. Heater sec. ...	0·05
	Mains trans. Rect. heat. sec. ...	0·1
	Mains trans. HT sec., total ...	360·0
S1a, b, c, x, S18a, b, x	SW manual button groups	—
S2a, b, c, S19a, b, c, x	MW manual button groups	—
S3a, b, S20a, b, x	LW manual button groups	—
S4a, b to S8a, b, S11a, b, x to S15a, b, x	MW automatic button groups	—
S9a, b, S10a, b, S16a, b, x, S17a, b, x	LW automatic button groups	—
S21a	Gram PU switch ...	—
S22	Mains switch, ganged R16	—



Under-chassis view. The press-button switch unit is shown in detail in the diagrams at the foot of columns 1 and 2 opposite. The pre-set station trimmers are in two rows just behind the switch unit.

General Notes (*continued*)

high impedance (about 5,000 Ω) external speaker.

Condensers C25, C26.—These are two dry electrolytics in a single tubular metal case on the chassis deck. Beneath the chassis there are three tags. That spotted black is the common negative; that spotted red is the positive of **C25** (16 μF); while the plain tag is the positive of **C26** (8 μF).

Condensers C24, C27.—These are two dry electrolytics (35 V working) in a single carton beneath the chassis, having a common negative (black) lead. The red lead is the positive of **C24** (5 μF), while the yellow lead is the positive of **C27** (25 μF).

CHASSIS DIVERGENCIES

A few chassis went out at the beginning of the run with a rather different circuit. Our sheet has been prepared from one of the later chassis, which can be identified by the fact that the screw holding the **L1** unit at the back of the chassis has a black washer underneath its head, while the early models have no such washer. The arrangement of the press-buttons is also different. Reading from left to right, looking at the front of the set, our chassis has buttons as follows: Three MW pre-set; gram; SW; MW; two MW pre-set; LW; two LW pre-set. The arrangement in the early chassis was: Three MW pre-set; Gram; SW; MW; LW; two MW pre-set; two LW pre-set.

In early chassis also, the aerial coupling on SW was different, the bottom end of **L2** being returned to the junction of **R2, C3** and **S1x.** The oscillator circuit switching and coil arrangements were also slightly different, and trackers **C37** and **C38** were interchanged in position.

In some chassis, too, the fixed tone corrector may be modified, **R21, C22** being omitted, and **C51,** in the oscillator auto-tuning bank, may not be present.

CIRCUIT ALIGNMENT

IF Stages.—Remove the grid (top cap) connection of **V1,** and connect a 500,000 Ω resistor between the connection and the cap. Connect signal generator between the cap (via a 0.00025 μF condenser) and chassis. Switch set to MW, and turn gang and volume control to maximum.

Feed in a 465 kc/s (645.16 m) signal, and adjust **C43, C42, C41** and **C40** for maximum output. Re-check these settings, then remove the resistor and replace top cap.

RF and Oscillator Stages.—With the gang at maximum, pointer should be at the right hand terminations of the horizontal scales. Connect signal generator to **A** and **E** leads, via a suitable dummy aerial. Turn volume control to maximum.

SW.—Since the SW tracker is in series with the MW and LW trackers it is essential to align the SW band first.

Switch set to SW, tune to 15 Mc/s on scale, and feed in a 15 Mc/s (20 m) signal. Adjust **C34** for maximum output, using the peak involving the lesser trimmer capacity. Now adjust **C29** for maximum output.

Feed in a 6 Mc/s (50 m) signal, tune it in, and adjust **C37** for maximum output, while rocking the gang for optimum results. Return to 15 Mc/s and re-check **C29** and **C34.** Repeat until no further improvement results.

MW.—Switch set to MW and tune to 250 m on scale. Feed in a 250 m (1,200 kc/s) signal, and adjust **C35,** the **C30** for maximum output. Feed in a 520 m (580 kc/s) signal, tune it in, and adjust **C38** for maximum output, while rocking the gang for optimum results. Return to 250 m and re-check **C35** and **C30.** Repeat until no further improvement results.

LW.—Switch set to LW, and tune to 1,250 m on scale. Feed in a 1,250 m (240 kc/s) signal, and adjust **C36,** then **C31,** for maximum output. Feed in a 2,000 m (150 kc/s) signal, tune it in and adjust **C39** for maximum output, while rocking the gang for optimum results. Return to 1,250 m and re-check **C36** and **C31.** Repeat until no further improvement results.

STATION SETTING

In the model 771 the station trimmers may be adjusted through holes in the bottom of the cabinet. In Console 774 it is necessary to withdraw the chassis to re-set the trimmers.

Looking at the front of the set, the first three buttons counting from the left cover wavebands of 200-300 m, 250-350 m, and 300-400 m respectively. The seventh and eighth buttons cover 350-500 m and 400-550 m. The tenth and eleventh buttons (LW) cover 1,000-1,600 m and 1,400-2,000 m respectively.

The trimmer screws are indicated in our under-chassis view. Thus **C44** and **C52** belong to the first button (200-300 m), while **C50** and **C58** belong to the eleventh button (1,400-2,000 m).

Select the button covering the wavelength of the required station, and adjust the corresponding oscillator trimmer until the station is heard. Then adjust the corresponding aerial trimmer for maximum output. Finally readjust both trimmers.

If the station to which the button is being adjusted is not very strong, it may be difficult to hear it on the oscillator trimmer while its aerial trimmer is far off tune. It may then be necessary to tune both trimmers to the nearest strong known station, and then to take the aerial trimmer up or down in small steps, searching on the oscillator trimmer for the required station at each step.

Alternatively, a signal generator may be used for rough adjustment, and then final check can be made on the station itself.

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