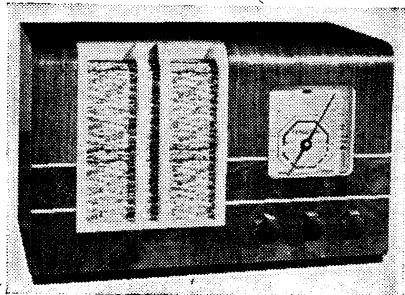


# FERGUSONIC 909

## SW MAINS MINOR (AC/DC)



THE Fergusonic Mains Minor model 909 is a SW and MW AC/DC superhet for mains of 200-250 V. It employs four valves (plus rectifier), and is for use with an external aerial, but no earth must be connected. The SW range is 13.5-50 m.

Release date: April, 1940

### CIRCUIT DESCRIPTION

Aerial input via **C1** and coupling coils **L1** (SW) and **L2** (MW) to single tuned circuits **L3** (SW), plus **L4** (MW), tuned by **C23**.

First valve (**V1**, Mullard ECH33) is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator anode coils **L7** (SW) and **L8** (MW) are tuned by **C27**. Parallel trimming by **C25** (SW) and **C26** (MW); series tracking by **C5** (SW) and **C24** (MW). Reaction by **L5** (SW) and **L6** (MW) and common impedance of trackers.

Second valve (**V2**, Mullard EF39) operates as IF amplifier with tuned-primary, tuned-secondary transformer couplings. Intermediate frequency, 470 KC/S.

Diode second detector is part of double diode triode valve (**V3**, Mullard EBC33). Audio frequency component in rectified output is developed across load resistance **R8** and passed via **C13** and manual volume control **R9** to CG of triode section. IF filtering by **C10**, **R7**, **C11**.

Second diode of **V3**, fed from **V2** anode via **C12**, provides DC potentials which are developed across load resistances **R12**, **R13** and fed back through decoupling circuits as GB to FC and IF valves, giving AVC.

Resistance-capacity coupling by **R11**, **C16**, **R14** between **V3** triode and pentode output valve (**V4**, Brimar 7D6).

On AC mains, HT current is supplied by IHC rectifying valve (**V5**, Mullard CY31), which on DC mains behaves as a low resistance. Smoothing by speaker field **L15** and condensers **C18**, **C19**. Valve heaters, together with scale lamp and ballast resistance **R17**, are connected in series across mains input.

### VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH33	195	0.8	87	2.6
	Oscillator			
V2 EF39	93	4.1	87	1.4
	195	4.8		
V3 EBC33	95	1.6	195	5.6
V4 7D6	172	30.0	195	5.6
V5 CY31	256†	—	—	—

† Cathode to chassis, DC.

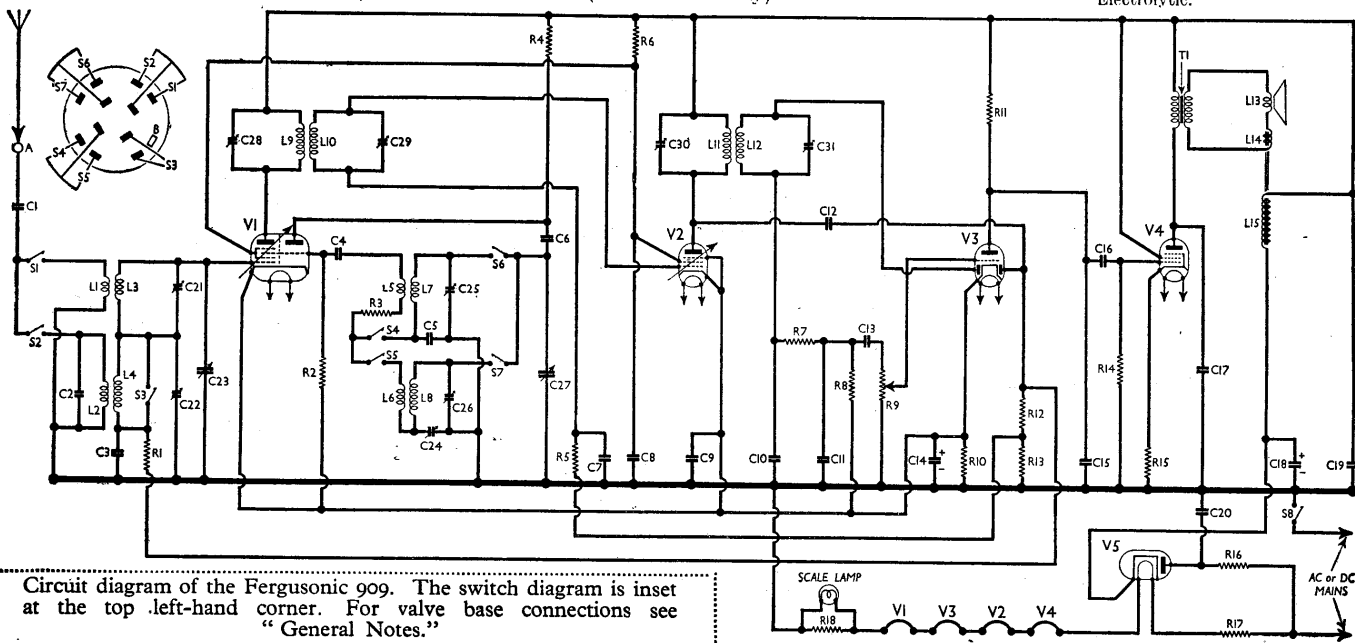
Valve voltages and currents given in the table above are those measured in (continued overleaf)

### COMPONENTS AND VALUES

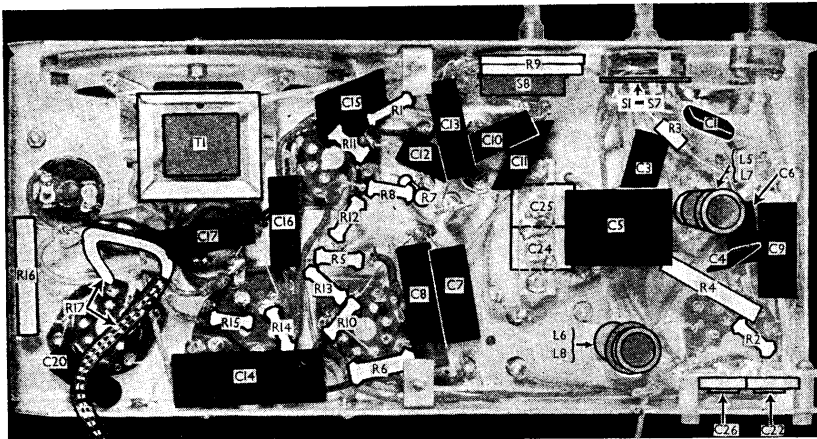
RESISTANCES		Values (ohms)
R1	V1 hexode CG decoupling	500,000
R2	V1 osc. CG resistance	50,000
R3	Oscillator reaction damping	20
R4	V1 osc. anode HT feed	25,000
R5	V2 CG decoupling	500,000
R6	V1, V2 SG's HT feed	25,000
R7	IF stopper	100,000
R8	V3 signal diode load	500,000
R9	Manual volume control	2,000,000
R10	V1, V2, V3 GB; AVC delay	150
R11	V3 triode anode load	50,000
R12	V3 AVC diode load	500,000
R13	V3 AVC diode load resistances	500,000
R14	V4 CG resistance	1,000,000
R15	V4 GB resistance	100
R16	V5 surge limiter	100
R17	Heater circuit ballast	655
R18	Scale lamp shunt	50

CONDENSERS		Values (μF)
C1	Aerial isolating condenser	0.0005
C2	Aerial MW shunt	0.00002
C3	V1 hexode CG decoupling	0.1
C4	V1 osc. CG resistance	0.0001
C5	Osc. circuit SW tracker	0.005
C6	V1 osc. anode coupling	0.0001
C7	V2 CG decoupling	0.1
C8	V1, V2 SG's decoupling	0.1
C9	V1, V2, V3 cathodes RF by-pass	0.1
C10	IF by-pass condensers	0.00025
C11	IF by-pass condensers	0.00025
C12	Coupling to V3 AVC diode	0.0001
C13	AF coupling to V3 triode	0.02
C14*	V1, V2, V3 cathodes AF by-pass	25.0
C15	IF by-pass	0.00025
C16	V3 triode to V4 coupling	0.02
C17	Fixed tone corrector	0.005

\* Electrolytic.



Circuit diagram of the Fergusonic 909. The switch diagram is inset at the top left-hand corner. For valve base connections see "General Notes."



Under-chassis view. The switch unit S1-S7 is indicated here, and shown in detail in the diagram at the top left-hand corner of the circuit diagram overleaf. R17 is the line cord ballast resistance.

**Resistance R17.**—This is the wire-wound asbestos covered line cord resistance, incorporated in the mains lead.

**Chassis Divergencies.**—C10 is returned to cathode of V3 in the makers' diagram, but to chassis in our model. C15 is given as 0.0005 μF by the makers, but is 0.00025 μF in our chassis.

**Pre-Set Condensers.**—Apart from the IF trimmers in their respective cans, there is one trimmer on the L1, L3 coil unit assembly, two trimmers reached through holes in the rear member of the chassis, and one trimmer and one tracker reached through holes in the chassis deck.

**Valve Base Connections.**—Except in the case of the output valve V4, the base connections of the valves are the same as those given in Service Sheet 507.

V4 is a Brimar 7D6, fitted with a standard English seven-pin base. The pin connections are: pin 1, blank; 2, control grid; 3, screen; 4 and 5, heaters; 6, cathode; 7, anode.

**CIRCUIT ALIGNMENT**

**IF Stages.**—Remove top cap connector of V1, and connect a 0.5 MO resistance in series between connector and the top cap of the valve. Connect signal generator from top cap of valve to chassis, via isolating condensers of about 0.1 μF. Switch set to MW, turn gang to maximum, and feed in a 470 KC/S (638.3 m) signal. Adjust C31, C30, C29 and C28 in turn for maximum output.

**RF and Oscillator Stages.**—With gang at maximum, pointer should be horizontal. Connect signal generator via a suitable dummy aerial to aerial lead of set, and via a 0.1 μF condenser to chassis.

**MW.**—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust C26, then C22, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust C24 for maximum output, while rocking the gang for optimum results.

**SW.**—Switch set to SW, tune to 16 m on scale, feed in a 16 m (18.75 MC/S) signal, and adjust C25, then C21, for maximum output. Tracking is fixed, but calibration should be checked at about 49 m (6.125 MC/S).

**GENERAL NOTES**

**Switches.**—S1-S7 are the waveband switches, in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram inset at the top left hand of the circuit, where it is drawn as seen looking from the rear of the underside of the chassis. On SW (knob anti-clockwise), S1, S3, S4 and S6 are closed, and the other switches are open; on MW (knob clockwise), S2, S5 and S7 are closed, and the other switches are open.

S8 is the QMB mains switch, ganged with the volume control R9.

**Coils.**—The aerial coils L1-L4 are in two unscreened tubular units on the chassis deck, while the oscillator coils are in two similar units beneath the chassis. The IF transformers L9, L10 and L11, L12 are in two screened units on the chassis deck with their trimmers.

**Scale Lamp.**—This is a National Union type N51 with a miniature bayonet cap base. It is rated at 6.8 V, 0.2 A.

**Condensers C18, C19.**—These are two 16 μF dry electrolytics in a single metal-cased tubular unit on the chassis deck, the can being the common negative.

CONDENSERS (continued)		Values (μF)
C18*	HT smoothing condensers	16.0
C19*		16.0
C20	Mains RF by-pass ...	0.02
C21†	Aerial circuit SW trimmer ...	0.00003
C22†	Aerial circuit MW trimmer ...	0.00003
C23†	Aerial circuit tuning ...	—
C24†	Osc. circ. MW tracker ...	0.00065
C25†	Osc. circ. SW trimmer ...	0.00003
C26†	Osc. circ. MW trimmer ...	0.00003
C27†	Oscillator circuit tuning...	—
C28†	1st IF trans. pri. tuning...	—
C29†	1st IF trans. sec. tuning...	—
C30†	2nd IF trans. pri. tuning...	—
C31†	2nd IF trans. sec. tuning...	—

\* Electrolytic † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling ...	1.2
L2	Aerial MW coupling ...	30.0
L3	Aerial SW tuning ...	Very low
L4	Aerial MW tuning ...	3.0
L5	Oscillator SW reaction	Very low
L6	Oscillator MW reaction	1.0
L7	Osc. circ. SW tuning ...	Very low
L8	Osc. circ. MW tuning...	1.6
L9	1st IF trans. { Pri. ...	9.0
L10		Sec. ...
L11	2nd IF trans. { Pri. ...	9.0
L12		Sec. ...
L13	Speaker speech coil ...	2.5
L14	Hum neutralising coil...	0.1
L15	Speaker field coil ...	1,200.0
T1	Speaker input j Pri. ...	650.0
	trans. { Sec. ...	0.3
S1-S7	Waveband switches ...	—
S8	Mains switch, ganged R9	—

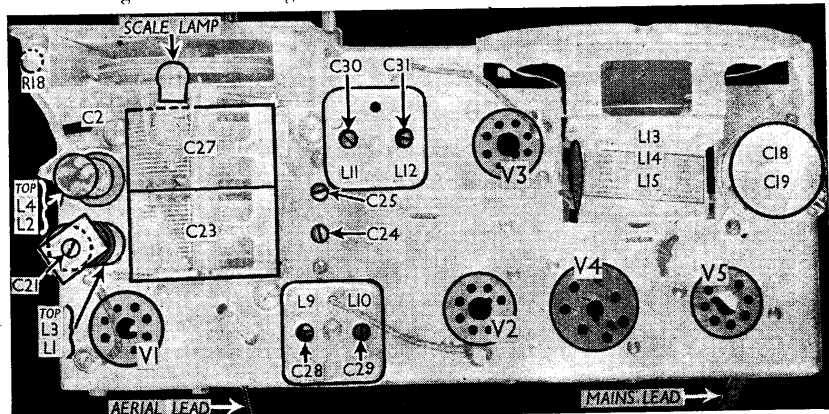
**Valve Analysis—(continued)**

our receiver when it was operating with AC mains of 230 V. 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.

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

**DISMANTLING THE SET**

**Removing Chassis.**—Remove the three control knobs (pull-off), and the two screws (with washers and lock-washers) holding the chassis to the bottom of the cabinet.



Plan view of the chassis. The speaker unit is mounted directly on the front chassis member and held by three small bolts. The aerial SW trimmer C21 is mounted at the top of the SW aerial coil unit L1, L3. The MW aerial trimmer C22 is reached through the rear chassis member.