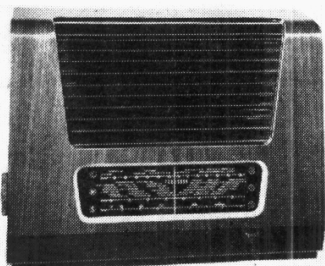


"TRADER" SERVICE SHEET

881

FERGUSON 209A & L



THREE wavebands are provided in the Ferguson 209A, a 3-valve (plus rectifier) superhet designed for operation from A.C. mains of 200-250 V, 50-100 c/s. The S.W. range is 15.7-55.7 m. An auto-transformer is used for the mains input, and the chassis is "live" to the mains.

The 209L is similar to the 209A, but its mains transformer is fitted with tapings for 100-115 V, 120-130 V, 200-220 V and 230-250 V, 50-100 c/s. The 120-130 V tapping may be used for 110 V mains of 40 c/s.

Release date and original price: September 1948; £16 5s 6d, plus purchase tax, either modtl.

CIRCUIT DESCRIPTION

Aerial input is via series capacitors C2, C5 (S.W.) and C3 (M.W., L.W.) and coupling coils L1 (S.W.), L2 (M.W.), and L3 (L.W.) to single-tuned circuits L4, C29 (S.W.), L5, C29 (M.W.) and L6, C29 (L.W.), which precede a triode hexode valve (V1, Mullard metallized ECH35) operating as frequency changer.

Triode oscillator anode coils L9 (S.W.), L10 (M.W.) and L11 (L.W.) are tuned by C35, with parallel trimming by C32 (S.W.), C33 (M.W.) and C34 (L.W.) and series tracking by C10 (S.W.), C11, C30 (M.W.) and C31 (L.W.).

Second valve (V2, Mullard metallized EF39) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings C36, L12, L13, C37 and L14, L15, C38.

Intermediate frequency 470 kc/s.

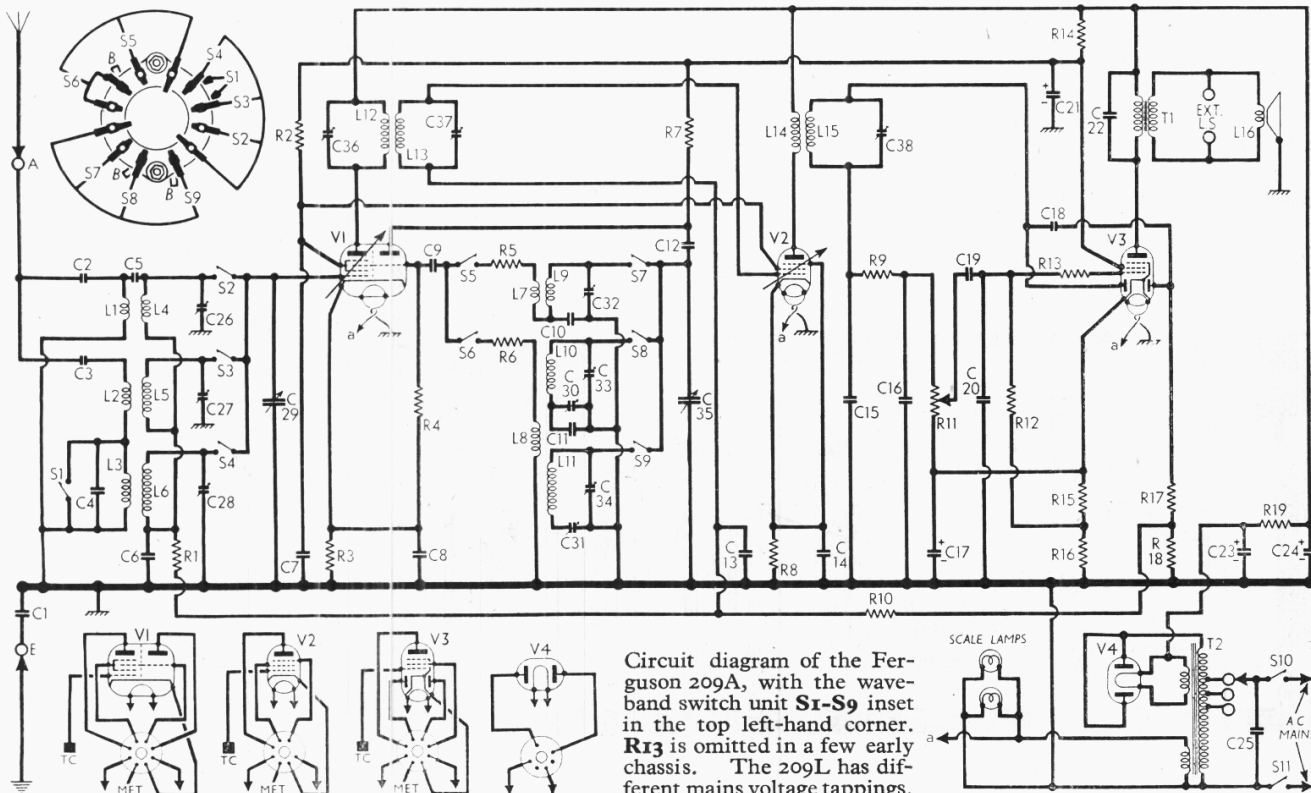
Diode second detector is part of double diode pentode output valve (V3, Mullard metallized EBL31). Audio frequency component in rectified output is developed across manual volume control R11, which is the diode load resistor, and passed via A.F. coupling capacitor C19, C.G. resistor R12, and grid stopper R13, to control (Continued Col. 1 overleaf)

COMPONENTS AND VALUES

RESISTORS		Values (ohms)	Locations
R1	V1 hex. C.G. decoup.	1,000,000	G4
R2	S.G.'s H.T. feed	22,000	F5
R3	V1 fixed G.B.	220	H5
R4	V1 osc. C.G.	50,000	H5
R5	Oscillator stabiliz- resistors	47	H4
R6	Osc. anode load	22,000	G5
R7	V2 fixed G.B.	330	G5
R8	I.F. stopper	50,000	F5
R9	A.V.C. decoupling	470,000	F5
R10	Volume control	500,000	C3
R11	V3 C.G. resistor	680,000	D4
R12	V3 C.G. stopper	50,000	D4
R13	H.T. feed resistor	3,300	D5
R14	V3 fixed G.B.	100	D5
R15	A.V.C. delay re- sistors	220	D5
R16	A.V.C. diode load	680,000	E5
R17	resistors	680,000	E5
R18	H.T. smoothing re- sistor	1,200	B1

CAPACITORS		Values (μF)	Locations
C1	Earth isolator	0-005	H5
C2	Aerial series capaci- tors	0-00003	F4
C3	Aerial L.W. shunt	0-00007	F4
C4	S.W. "top" coup- ling	0-000015	F3
C5	V1 hex. C.G. de- coup.	0-1	G4
C6	S.G.'s decoupling	0-1	F4
C7	V1 cath. by-pass	0-1	H4
C8	V1 osc. C.G.	0-0001	H5
C9	Osc. S.W. tracker	0-00355	H4
C10	Osc. M.W. tracker	0-00025	H4
C11	Osc. anode coup.	0-0001	H4
C12	V2 C.G. decoup.	0-1	F4
C13	V2 cath. by-pass	0-1	G5
C14	I.F. by-passes	0-0001	F5
C15	V3 cath. by-pass	25-0	C4
C16	A.V.C. coupling	0-00005	D5
C17*	A.F. coupling	0-01	C4
C18	I.F. by-pass	0-0001	C3
C19*	H.T. feed decoup.	8-0	B1
C20	Tone corrector	0-005	B1
C21*	H.T. smoothing ca- pacitors	24-0	B1
C22	Mains R.F. by-pass	0-01	C3
C23	Aerial S.W. trim	0-00005	G4
C24	Aerial M.W. trim	0-00005	G3
C25	Aerial L.W. trim	0-000528§	A1
C26	Aerial tuning	0-0003	G4
C27	Osc. L.W. track	0-0003	G4
C28	Osc. S.W. trim	0-00005	H3
C29	Osc. M.W. trim	0-00005	H3
C30	Osc. L.W. trim	0-000528§	A1
C31	Oscillator tuning	0-00018	A2
C32	1st I.F. trans- former tuning	0-00018	A2
C33	2nd I.F. sec. tuning	0-0002	A2
C34			
C35			
C36			
C37			
C38			

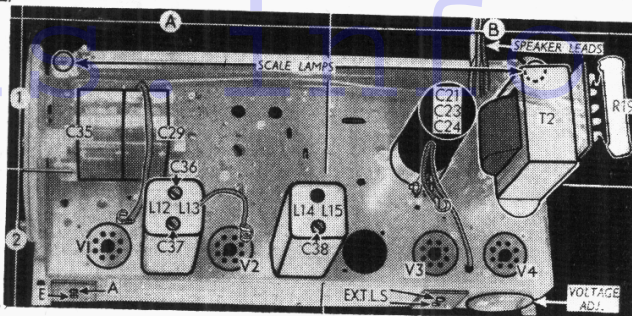
\* Electrolytic. † Variable. ‡ Pre-set. § "Swing" value, min. to max.



Circuit diagram of the Ferguson 209A, with the waveband switch unit S1-S9 inset in the top left-hand corner. R13 is omitted in a few early chassis. The 209L has different mains voltage tapings.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils	3-8	G4
L2		6.2	F3
L3		62.0	F3
L4	Aerial tuning coils	Very low	G4
L5		3-8	F3
L6		28.0	F3
L7	Oscillator reaction coils	0.2	H4
L8		4.3	H3
L9		Very low	H4
L10	Oscillator tuning coils	2.5	H3
L11		6.5	H3
L12		7.5	A2
L13	1st I.F. trans.	7.5	A2
L14		45.0	A2
L15	2nd I.F. trans.	7.5	A2
L16		1.5	A2
T1	Speaker	350.0	—
T2	Mains trans.	Pri., total	73.0
		Heat. sec., Rect. heat sec.	Very low
S1-9	W/band switches...	Very low	B1
S10, S11	Mains sw., g'd R11	—	H5

Plan view of the chassis. R19 is a wire-wound resistor, rated at 5W, mounted on the mains transformer T2. C22 is mounted on the speaker unit, and is not seen in our illustration.



GENERAL NOTES

**Switches.**—S1-S9 are the waveband switches ganged in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis view, where an arrow indicates the direction in which it is viewed in the diagram inset in the top left-hand corner of the circuit diagram overleaf, where the unit is shown in detail. The table below gives the switch positions for the three control settings, starting from the

at the rear of the chassis for a low impedance (2.3 Ω) external speaker.

**Mains Voltage Adjustment.**—A strap which bridges together two sockets on an octal valve holder provides the adjusting device, the strap consisting of a three-pin plug, two pins of which are connected together. Two of the pins are diametrically opposite each other (say pins 1 and 5), while the third is off-set (say at pin 4). The two connected together are then 1 and 4, pin 5 being blank.

**Drive Cord Replacement.**—About five feet of flax fishing line is required for the drive cord, which is run as shown in the sketch (col. 2), where it is viewed at a three-quarter angle from the drum end, with the gang at maximum and the chassis lying on its back. The cord turns through a right-angle round the front bottom right-hand corner of the chassis.

CIRCUIT ALIGNMENT

**I.F. Stages.**—Connect signal generator via an 0.1 μF capacitor in the "live" lead, to control grid (top cap) of V1 and the E socket, after removing the original top cap connector and connecting a 500,000 Ω resistor between the top cap of the valve and chassis. Switch set to M.W., tune to 200 m on scale, turn the volume control to maximum, feed in a 470 kc/s (638.3 m) signal, and adjust C36, C37 and C38 (location reference A2) for maximum output. Finally, remove the 500,000 Ω resistor and replace the original top cap connector.

**R.F. and Oscillator Stages.**—With the gang at maximum capacitance the cursor should be coincident with the first wavelength ends of the three scales. Transfer "live" signal generator lead to A socket, via a suitable dummy aerial. Three alignment calibration points are marked on the top edge of the scale.

**S.W.**—Switch set to S.W., tune to 19 m on scale, feed in a 19 m (15.79 Mc/s) signal, and adjust C32 (H3) and C26 (G4) for maximum output. Tune to 50 m on scale, feed in a 50 m (6 Mc/s) signal, and check calibration, correcting any error by adjustment to the position of the end turn of L9 (H4).

**M.W.**—Switch set to M.W., tune to 214.3 m on scale, feed in a 214.3 m (1,400 kc/s) signal, and adjust C33 (H3) and C27 (G3) for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust C30 (G4) for maximum output. Repeat these operations.

**L.W.**—Switch set to L.W., tune to 800 m on scale, feed in an 800 m (375 kc/s) signal, and adjust C34 (H3) and C28 (G3) for maximum output. Tune to 1,875 m on scale, feed in a 1,875 m (160 kc/s) signal, and adjust C31 (G4) for maximum output. Repeat these operations.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH35	260	4.3	107	3.0
	103	4.4		
	Oscillator	—		
V2 EF39	260	7.2	107	2.1
V3 EBL31	248	35.0	217	4.0
V4 AZ31	†	—	—	—

† 315 V A.C.

Circuit Description—Continued

grid of pentode section. I.F. filtering by C15, R9, C16 in diode circuit and C20, R13 in pentode C.G. circuit.

Second diode of V3, fed from L15 via C18, provides D.C. potentials which are developed across load resistors R17, R18, tapped off, and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving A.V.C.

H.T. current is supplied by half-wave rectifier (V4, Mullard AZ31) operating with its anodes wired in parallel from the extended primary winding of the heater transformer T2, which forms an auto transformer.

DISMANTLING THE SET

Almost unimpeded access to the chassis underside may be obtained upon sliding out the detachable bottom cover (two round-head wood screws and metal tongues, inside cabinet).

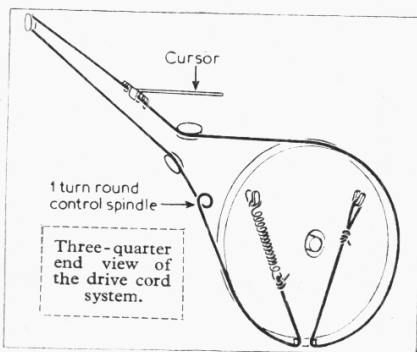
**Removing Chassis.**—Remove the three control knobs (two recessed grub screws each, inside cabinet), and the four 2BA screws (with metal washers) securing the side members to the base of the cabinet;

To free the chassis entirely unsolder the four coloured leads at tags on the speaker transformer, and the brown earthing lead.

**When replacing,** note that the retaining screws are covered by discs of insulating material. The four leads to the speaker transformer should be resoldered as follows, numbering the tags on the connecting panel from top to bottom: 1, yellow; 2, black; 3, no connection; 4, red; 5, green. The brown lead goes to a soldering tag beneath the upper right-hand fixing nut.

**Removing Speaker.**—Remove chassis as previously described, loosen the nuts of the three speaker retaining clamps.

**When replacing,** the transformer should point to the upper left-hand corner of the cabinet, and the leads should be reconnected as previously described.

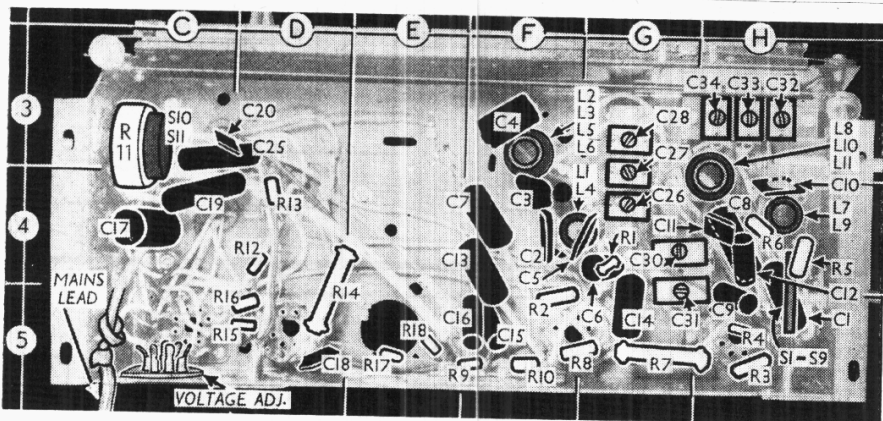


fully anti-clockwise (S.W.) position of the control. A dash indicates open, and C, closed.

**Scale Lamps.**—The scale is edge-lit by two amps, with M.E.S. bases and small clear spherical bulbs, rated at 6.5 V, 0.3 A.

**External Speaker.**—Two sockets are provided

Switch	S.W.	M.W.	L.W.
S1	—	C	—
S2	C	—	—
S3	—	C	—
S4	—	—	C
S5	C	—	—
S6	—	C	—
S7	C	—	—
S8	—	C	—
S9	—	—	C



Under-chassis view. The voltage adjustment socket is an octal valve holder.

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