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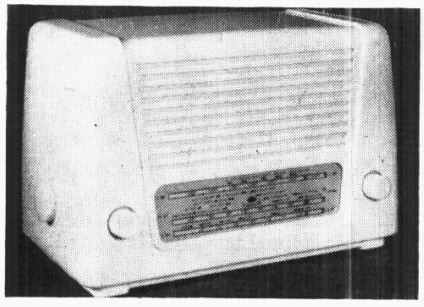
"TRADER" SERVICE SHEET
954

FERGUSON 208U

Transportable A.C./D.C. Superhet



THREE valves (plus rectifier) are used in the Ferguson 208U, a 3-band superhet designed to operate from A.C. or D.C. mains of 200-250 V, 40-100 c/s in the case of A.C. The waveband ranges are 16-54 m, 190-570 m and 750-2,000 m. An attached aerial permits the receiver to be used as a transportable.

Release date and original price: December 1949; £9 10s. 1d. Purchase tax extra.

CIRCUIT DESCRIPTION

Aerial input on S.W. and M.W. is via capacitor **C1** and coupling coils **L1, L2** to single tuned circuits **L3, C29** (S.W.) and **L4, C29** (M.W.). On L.W., **C1** and **C2** form a potential divider, from which "bottom" coupling is applied to the L.W. circuit **L5, C29.**

First valve **(V1, Mullard UCH42)** is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L6** (S.W.), **L7** (M.W.) and **L8** (L.W.) are tuned by **C30.** Parallel trimming by **C31, C32** and **C7, C33**; series tracking by **C8, C9** and **C10.** Reaction by anode coils **L9, L10** and **L11,** with additional capacitative coupling via **C8** on S.W. Reaction sensitivity on S.W. is increased by the "Booster" circuit **L9, C11, L12, C8** which resonate just outside the low frequency end of the band.

Second valve **(V2, Mullard UAF42)** is a variable-mu R.F. pentode-diode operating as intermediate frequency amplifier and detector with tuned transformer couplings.

Intermediate frequency 470 kc/s.

Audio frequency component in diode detector output is developed across

(Continued col. 1 overleaf)

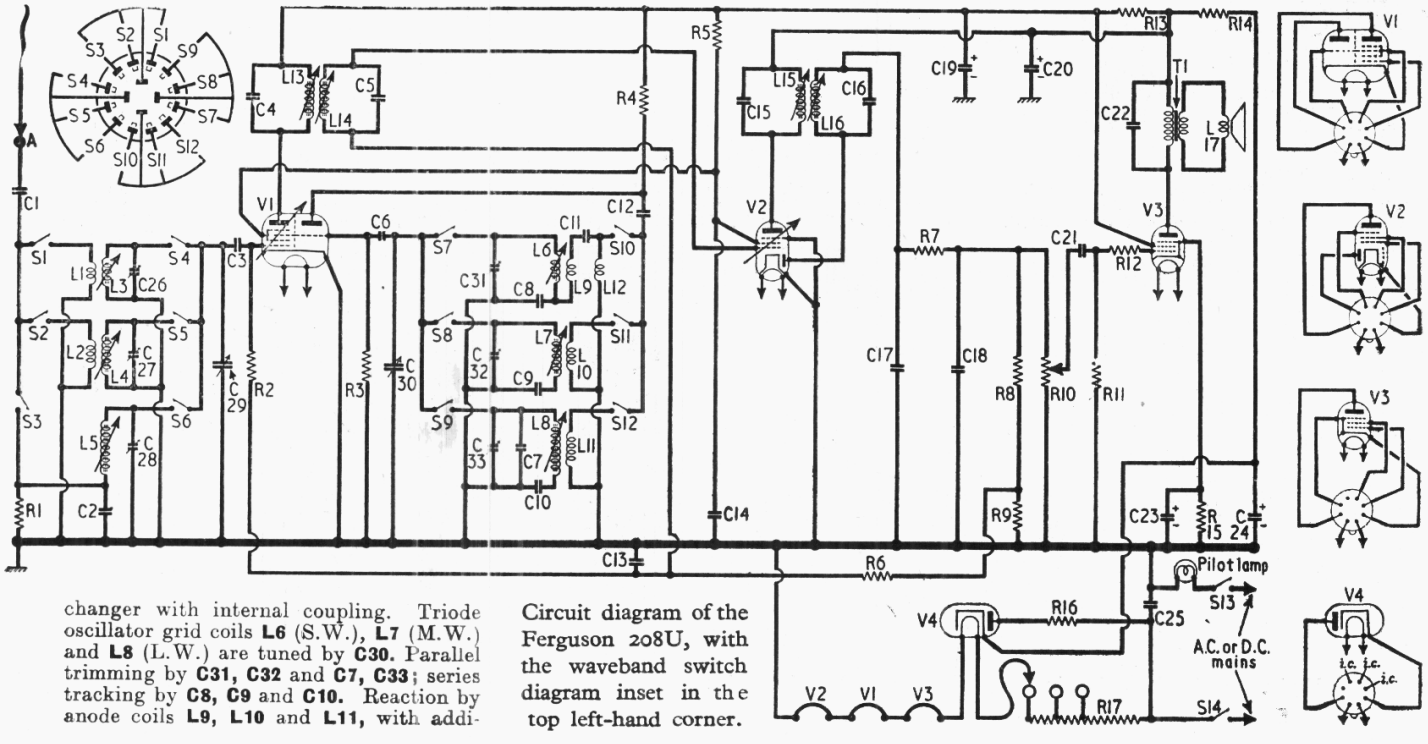
COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	Aerial coupling ...	27kΩ	H3
R2	V1 hex. C.G. ...	1MΩ	H4
R3	V1 osc. C.G. ...	47kΩ	H4
R4	V1 osc. H.T. feed	22kΩ	H4
R5	V1, V2 S.G. H.T. feed	22kΩ	H4
R6	A.G.C. line decoupling ...	1MΩ	F3
R7	I.F. stopper ...	47kΩ	E4
R8	A.G.C. feed potential divider ...	2MΩ	E3
R9		1MΩ	F3
R10	Volume control ...	500kΩ	D1
R11	V3 C.G. resistor ...	1MΩ	E4
R12	V3 grid stopper ...	4·7kΩ	E4
R13	H.T. smoothing	1·2kΩ	F4
R14		470Ω	F4
R15	V3 G.B.	150Ω	E4
R16	Surge limiter ...	150Ω	B2
R17	Heater ballast* ...	1·4kΩ	B2

* Tapped at 200Ω + 200Ω from V4 heater.

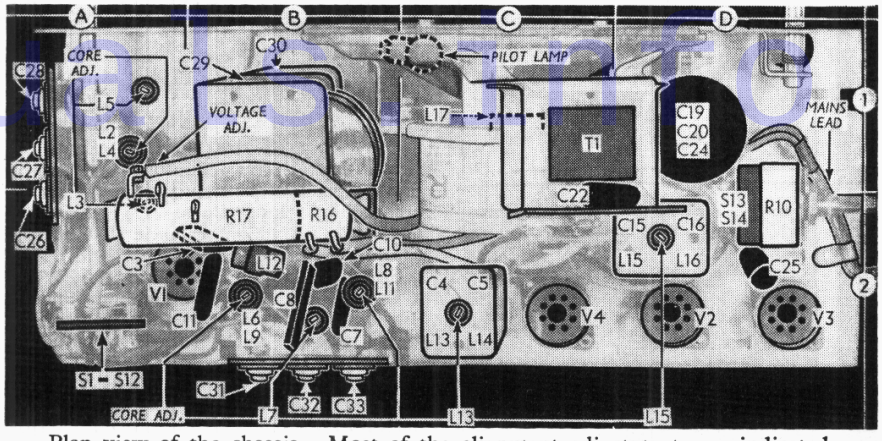
	CAPACITORS	Values	Locations
C1	Aerial series ...	0·005μF	H4
C2	"Bottom" coupling	0·0025μF	H3
C3	V1 hex. C.G. ...	200pF	B2
C4	1st I.F. transformer tuning ...	100pF	C2
C5		100pF	C2
C6	V1 osc. C.G. ...	50pF	H4
C7	Osc. L.W. trimmer	30pF	B2
C8	Osc. S.W. tracker	0·008μF	B2
C9	Osc. M.W. tracker	605pF	G4
C10	Osc. L.W. tracker	155pF	B2
C11	S.W. "Boost" ...	100pF	B2
C12	Osc. anode coupling	200pF	H4
C13	A.G.C. line decoupling ...	0·02μF	F3
C14	V1, V2 S.G.'s decoupling	0·1μF	H4
C15	2nd I.F. transformer tuning ...	100pF	D2
C16		180pF	D2
C17	I.F. by-passes ...	100pF	E4
C18		100pF	E3
C19*	H.T. smoothing ...	8μF	D1
C20*		24μF	D1
C21	A.F. coupling ...	0·002μF	E4
C22	Tone corector ...	0·005μF	C2
C23*	V3 cath. by-pass...	25μF	E4
C24*	H.T. smoothing ...	16μF	D1
C25	Mains R.F. by-pass	0·01μF	D2
C26‡	Aerial S.W. trimmer	50pF	A2
C27‡	Aerial M.W. trimmer	50pF	A1
C28‡	Aerial L.W. trimmer	50pF	A1
C29†	Aerial tuning ...	§ 528pF	B1
C30†	Oscillator tuning ...	§ 528pF	B1
C31‡	Osc. S.W. trimmer	50pF	B2
C32‡	Osc. M.W. trimmer	50pF	B2
C33‡	Osc. L.W. trimmer	50pF	B2

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



Circuit diagram of the Ferguson 208U, with the waveband switch diagram inset in the top left-hand corner.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial S.W. coup....	0·1	H3
L2	Aerial M.W. coup.	1·2	A1
L3	Aerial S.W. tune....	0·1	H3
L4	Aerial M.W. tune.	3·0	A1
L5	Aerial L.W. tune....	26·0	H3
L6	Osc. S.W. tuning ...	0·1	B2
L7	Osc. M.W. tuning...	1·6	G4
L8	Osc. L.W. tuning...	9·5	B2
L9	Osc. S.W. reaction	0·1	B2
L10	Osc. M.W. reaction	1·6	G4
L11	Osc. L.W. reaction	3·0	B2
L12	Osc. S.W. "Booster"	0·9	B2
L13	1st I.F. trans. Pri.	8·0	C2
L14	1st I.F. trans. Sec.	8·0	C2
L15	2nd I.F.trans. Pri.	8·0	D2
L16	2nd I.F.trans. Sec.	6·0	D2
L17	Speech coil ...	2·5	C1
T1	Output trans. Pri.	500·0	C1
	Output trans. Sec.	0·7	
S1-S12	Waveband switches	—	A2
S13, S14	Mains sw., g'd R10	—	D2



Plan view of the chassis. Most of the alignment adjustments are indicated.

Circuit Description—*continued*

manual volume control **R10,** which is the load resistor, and passed via **C21** and **R12** to control grid of pentode output valve **(V3, Mullard UL41). V3** suppressor and cathode are connected internally but are brought out to separate pins, and the external components **C23, R15** are connected to the suppressor as shown in our diagram. This has exactly the same effect as connecting them to cathode.

I.F. filtering by **C17, R7, C18.** D.C. potential across **R10** is tapped by means of the potential divider **R8, R9** and fed back as G.B. to F.C. and I.F. valves, giving automatic gain control.

H.T. current is supplied by half-wave rectifying valve **(V4, Mullard UY41)** which, with D.C. mains, behaves as a low resistance. Smoothing is effected by resistors **R13, R14** and electrolytic capacitors **C19, C20, C24.**

GENERAL NOTES

Switches.—**S1-S12** are the waveband switches, ganged in a single rotary unit on the chassis deck. The unit is indicated in our plan chassis view, and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram overleaf. The table (col. 2) gives the switch positions for the three control settings, starting from the fully anti-clockwise (S.W.) position of the control knob. A dash indicates open, and **C,** closed.

S13, S14 are the Q.M.B. mains switches, ganged with the volume control **R10.**

Pilot Lamp.—This is an M.E.S. type lamp, with a large frosted spherical bulb, rated at 6.2 V, 0.3 A. In early chassis it was omitted.

Chassis Divergencies.—In earlier chassis than our sample, the pilot lamp was not fitted. In later samples, a different speaker was fitted. Ours was a Rola, with its transformer mounted on its frame, but in the later version, the transformer is mounted on the chassis deck. The primary resistance then becomes 310.0 Ω. Small differences may be found in the values of some resistors and capacitors, but replacements should be of the value stated in our tables.

Drive Cord Replacement.—The course of the tuning drive cord is shown in our under-chassis view, where the gang is at maximum capacitance. About 3ft of cord is required.

Turn the gang to minimum, make 1½ turns of cord round the tuning control spindle, and pass the two ends through the opening in the chassis deck. Then follow the course shown in our photograph, tying off the upper (front) cord length first to the anchor tag on the drum face and pulling against the gang stop while fitting the remaining length of cord. The tension spring should be extended to 1¼in. Set the cursor as explained under "Circuit Alignment."

Switch Table

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
S10	C	—	—
S11	—	C	—
S12	—	—	C

CIRCUIT ALIGNMENT

I.F. Stages.—Switch set to M.W., turn the gang and volume control to maximum. Disconnect **C3** from **C29,** connect the "live" signal generator lead to the free end of **C3** and the other lead via 0.1 μF capacitor to chassis. Feed in a 470 kc/s (638.3 m) signal, and adjust the cores of **L13, L14, L15** and **L16** (location references C2, D2 and F4) for maximum output, keeping input low to avoid A.G.C. action. Reconnect **C3** to **C29.**

R.F. and Oscillator Stages.—Transfer "live" signal generator lead via a suitable dummy aerial to the tag marked **A** in our under-chassis view (H4). Before commencing this part of the work, it is necessary to mark three calibration points on the scale backing plate, as the scale panel remains in the cabinet.

Slip the chassis into the cabinet, and adjust the cursor to 2,000 m on scale; remove the chassis, and mark the position of the cursor on the scale backing plate. Repeat the procedure at 212 m, then at 555.5 m. Name these three positions "Max," "Trim" and "Track." "Max" is the correct position for the cursor when the gang is at maximum capacitance. Location references are A1, A2 and B2.

S.W.—Switch set to S.W. tune to "Trim," feed in a 16 Mc/s (18.75 m) signal, and adjust **C31,** then **C26,** for maximum output. Tune to "Track," feed in a 5.75 kc/s (52.2 m) signal, and adjust the cores of **L6** and **L3** for maximum output. Repeat these adjustments until no improvement can be obtained.

M.W.—Switch set to M.W., tune to "Trim," feed in a 212 m (1,415 kc/s) signal and adjust **C32,** then **C27,** for maximum output. Tune to "Track," feed in a 555.5 m (540 kc/s) signal, and adjust **L7** and **L4** for maximum output. Repeat these adjustments until no improvement can be obtained.

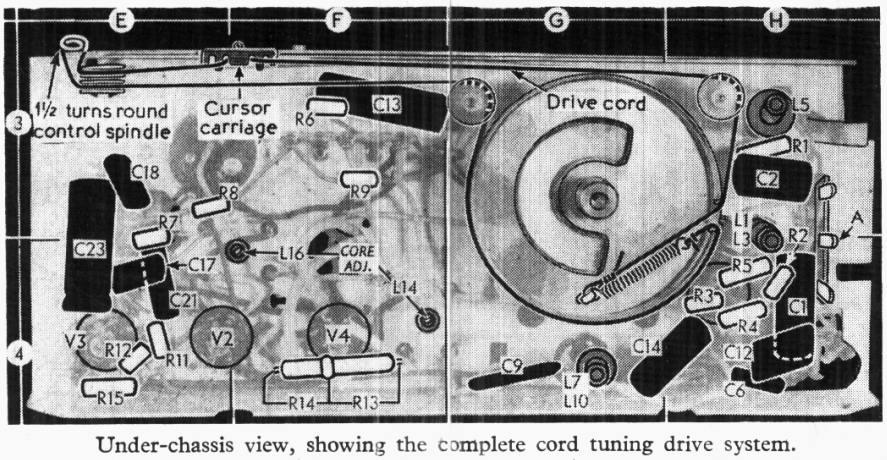
L.W.—Switch set to L.W., tune to "Trim," feed in an 845 m (355 kc/s) signal, and adjust **C33,** then **C28,** for maximum output. Tune to "Track," feed in a 1,935 m (155 kc/s) signal, and adjust **L8** and **L5** for maximum output. Repeat these adjustments until no improvement can be obtained.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the makers for an average receiver when tuned to the longest wavelength on the M.W. band, with no signal input, while operating on A.C. mains of 225 V. Anode and screen voltages were measured on the 400 V scale of a model 7 Avometer, with chassis as negative.

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 UCH42	155	2·7	72	2·4	—
	Oscillator				
	84	3·0			
V2 UAF42	178	4·5	72	1·45	—
V3 UL41	159	42·0	155	7·1	7·1
V4 UY41	225†	—	—	—	210·0

† A.C.



Under-chassis view, showing the complete cord tuning drive system.

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