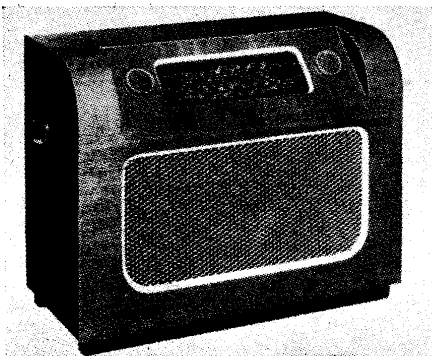


"TRADER" SERVICE SHEET
1000

FERGUSON 238U

3-band A.C./D.C. Superhet



THE Ferguson 238U is one of a series, of which it is the only A.C./D.C. model. It is a 4-valve (plus rectifier) 3-band superhet designed to operate from A.C. or D.C. mains of 200-250 V, 50-100 c/s in the case of A.C. The waveband ranges are 16-54 m, 190-570 m and 750-2,000 m. Provision is made for the connection of a gramophone pick-up and an external speaker. The A.C. models will be covered in Service Sheet 1,001.

Release date and original price : October 1950; £13 16s 6d, plus purchase tax.

CIRCUIT DESCRIPTION

Aerial input via couplings L1 (S.W.), L2 (M.W.) and "bottom" coupling capacitor C3 (L.W.) to single tuned circuits L3, C36 (S.W.), L4, C36 (M.W.) and L5, C36 (L.W.).

First valve (V1, Mullard UCH42) is a triode hexode operating as frequency changer with internal coupling. Oscillator grid coils L6 (S.W.), L7 (M.W.) and L8 (L.W.) are tuned by C37. Parallel trimming by C38 (S.W.), C39 (M.W.) and C9, C40 (L.W.); series tracking by C11 (S.W.), C12 (M.W.) and C13 (L.W.). Reaction

coupling from anode via C15 and oscillator anode coils L9 (S.W.), L10 (M.W.) and L11 (L.W.). C14, L12 form a "boost" circuit and resonate with the S.W. reaction circuit to maintain the level of oscillation at the high wavelength end of the band.

Second valve (V2, Mullard UF41) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings.

Intermediate frequency 470 kc/s.

Diode signal detector is part of double diode triode valve (V3, Mullard UBC41), whose second diode is connected to chassis. A.F. component in rectified output is developed across volume control R8, which acts as diode load, and passed (Continued col. 1 overleaf)

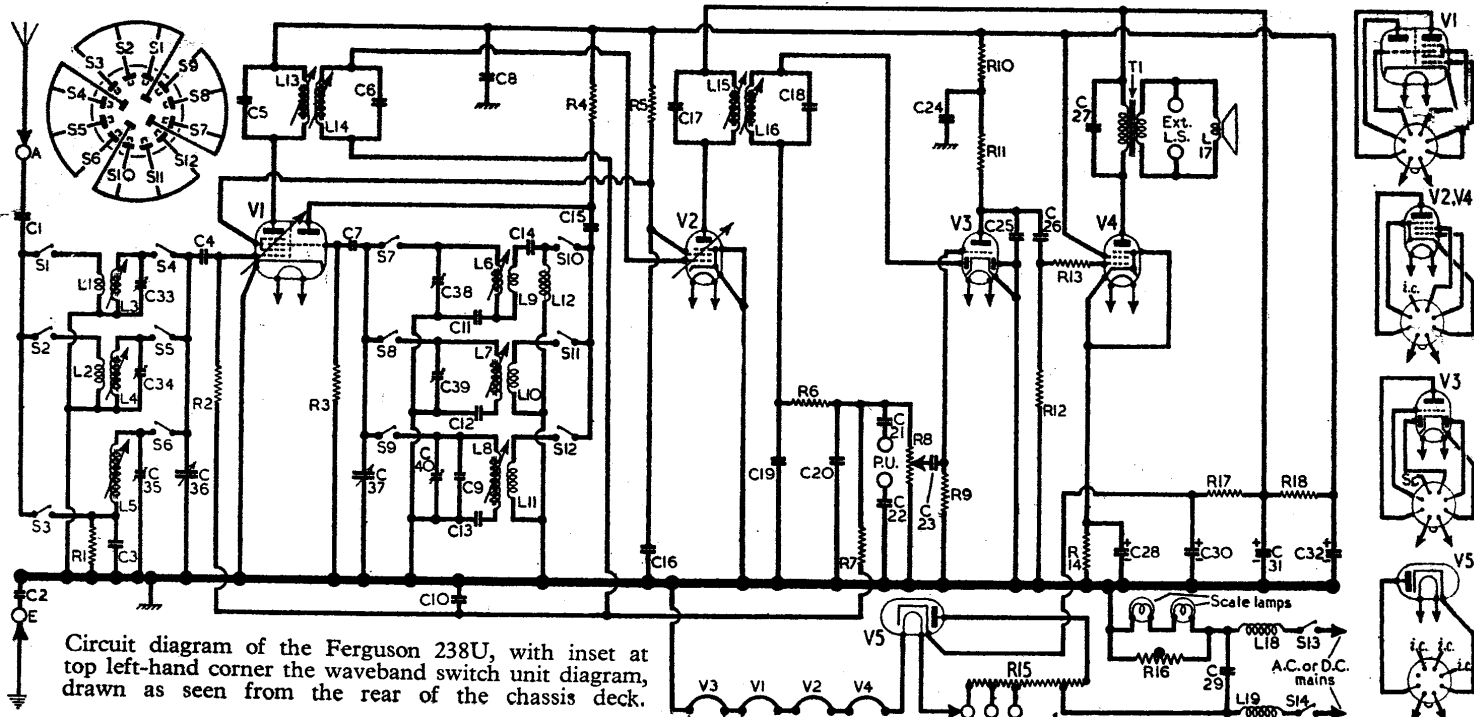
COMPONENTS AND VALUES.

RESISTORS		Values	Locations
R1	L.W. aerial shunt...	4.7kΩ	H3
R2	V1 hex. C.G.	1MΩ	H3
R3	V1 osc. C.G.	47kΩ	H4
R4	Osc. H.T. feed	22kΩ	H4
R5	V1, V2 S.G. feed ...	22kΩ	F3
R6	I.F. stopper	100kΩ	E3
R7	A.G.C. decoupling ...	1MΩ	E4
R8	Volume control	500kΩ	D2
R9	V3 C.G.	20MΩ	E4
R10	H.T. decoupling	100kΩ	F4
R11	V3 anode load	220kΩ	F4
R12	V4 C.G.	680kΩ	E4
R13	V4 C.G. stopper	4.7kΩ	E4
R14	V4 G.B.	150Ω	E4
R15	Ballast resistor ...	†1.36kΩ	—
R16	Brimistor, type CZ3 ...	—	D1
R17	H.T. smoothing ...	470Ω	F3
R18		1.2kΩ	F3

CAPACITORS		Values	Locations
C1	Aerial series ...	0.005μF	H4
C2	Chassis isolator ...	0.05μF	H4
C3	L.W. aerial coup....	0.0025μF	H3
C4	V1 hex. C.G.	200pF	A2
C5	1st I.F. trans. ...	100pF	C2
C6		tuning ...	100pF
C7	V1 osc. C.G.	50pF	H4
C8	H.T. decoup.	0.1μF	E3
C9	S.W. osc. trimmer	30pF	B2
C10	A.G.C. decoup.	0.1μF	G4
C11	S.W. osc. tracker ...	0.008μF	R2
C12	M.W. osc. tracker ...	605pF	G4
C13	L.W. osc. tracker ...	155pF	B2
C14	Oscillator coupling	100pF	A2
C15		200pF	H4
C16	V1, V2 S.G. decoup.	0.1μF	G4
C17	2nd I.F. Trans. ...	100pF	D2
C18	tuning ...	180pF	D2
C19	I.F. by-passes ...	100pF	E4
C20		100pF	E4
C21	P.U. isolators ...	0.01μF	E3
C22		0.1pF	F3
C23	A.F. coupling ...	0.002μF	E4
C24	H.T. decoupling ...	0.1μF	F4
C25	I.F. by-pass ...	100pF	F4
C26	A.F. coupling ...	0.002μF	E4
C27	Tone corrector ...	0.005μF	B1
C28*	V4 cath by-pass ...	25μF	E4
C29	R.F. filter ...	0.01μF	D1
C30*		16μF	D1
C31*	H.T. smoothing ...	24μF	D1
C32*		82μF	D1
C33†	S.W. aerial trim. ...	50pF	A2
C34†	M.W. aerial trim....	50pF	A2
C35†	L.W. aerial trim. ...	50pF	A2
C36†	Aerial tuning ...	528pF	B1
C37†	Oscillator tuning ...	528pF	B1
C38†	S.W. osc. trimmer	50pF	B2
C39†	M.W. osc. trimmer	50pF	B2
C40†	L.W. osc. trimmer	50pF	B2

† Tapped at 200Ω + 200Ω + 830Ω + 130Ω from V5 heater.

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Ferguson 238U, with inset at top left-hand corner the waveband switch unit diagram, drawn as seen from the rear of the chassis deck.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils	—	H3
L2			A1
L3			H3
L4	Aerial tuning coils	3.0	A1
L5			H3
L6	Oscillator tuning coils	1.6	B2
L7			G4
L8			B2
L9	Oscillator reaction coils	—	B2
L10			G4
L11	S.W. booster coil	3.0	B2
L12			B2
L13	1st I.F. trans.	8.0	C2
L14			C2
L15	2nd I.F. trans.	8.0	D2
L16			D2
L17	Speech coil	2.8	—
L18	Mains R.F. chokes	3.7	D1
L19			D1
T1	Primary	380.0	C1
	Secondary	—	C1
S1-S12	Waveband switches	—	A2
S13	Mains sw., g'd R8...	—	D2
S14			D2

Circuit Description—continued

via C23 to grid of triode section. D.C. potential developed across R8 is fed back as bias to R.F. and I.F. stages giving automatic gain control. I.F. filtering by C19, R6, C20 and C25. Provision is made for the connection of a gramophone pick-up across R8 via C21 and C22.

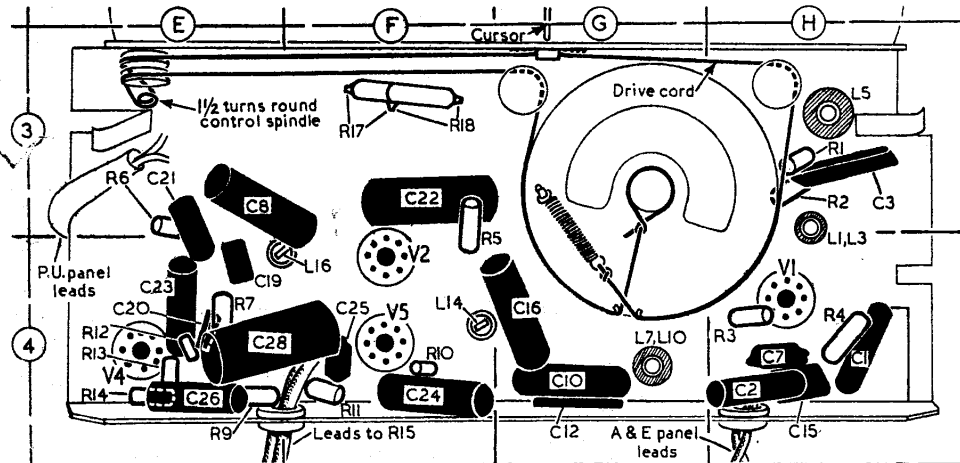
Resistance-capacitance coupling between V3 and pentode output valve (V4, Mullard UL41) via R11, C26 and R12. Fixed tone correction in anode circuit by C27.

H.T. current is supplied by I.H.C. rectifying valve (V5, Mullard UV41). Valve heaters, together with ballast resistor R15, scale lamps (lamped by thermistor R16), and filter chokes L19, are connected in series across the mains input.

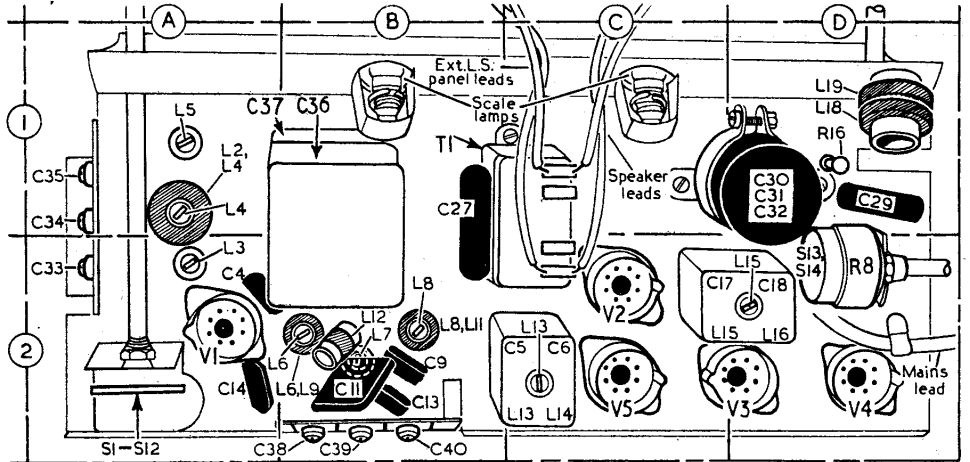
CIRCUIT ALIGNMENT

F.I. Stages.—Remove chassis from cabinet and stand it on bench so that adjustments are easily accessible. Disconnect C4 (location reference A2) from its junction on C36 and connect the signal generator, via a 0.01µF capacitor in the earth lead, to the free end of C4 and chassis. Switch set to M.W. and turn gang and volume controls to maximum. Feed in a 170 kc/s (638.3 m) signal and adjust the cores of L16 (E4), L15 (D2), L14 (F4) and L13 (C2), reducing the input as the circuits come into line to avoid A.G.C. effects. Remove "live" lead from C4 and reconnect the free end of C4 to C36.

R.F. and Oscillator Stages.—As the tuning scale remains fixed in the cabinet when the chassis is removed, reference must be made during alignment to the three calibration marks on the bottom edge of the scale backing plate. For this chassis these calibration marks took the form of holes drilled through the backing plate, and they will be numbered from 1-3 (looking at the front of the chassis and counting from left to right) in the following instructions.



Underside view of the chassis, with the course of the tuning drive cord indicated.



Plan view of the chassis. The waveband switch unit is at bottom left corner.

Check that with the gang at maximum capacitance the cursor coincides with calibration mark 3. This may be adjusted by slackening the two grub screws on the drive drum.

S.W.—Switch set to S.W., tune to calibration mark 1, feed in a 18.75 m (16 Mc/s) signal and adjust C38 (B2) and C33 (A2) for maximum output. Tune to calibration mark 2, feed in a 52.2 m (5.75 Mc/s) signal and adjust the cores of L6 (B2) and L3 (A2) for maximum output. Repeat these adjustments until no further improvement results.

M.W.—Switch set to M.W., tune to calibration mark 1, feed in a 212 m (1,415 kc/s) signal and adjust C39 (B2) and C34 (A1) for maximum output. Tune to calibration mark 2, feed in a 555.5 m (540 kc/s) signal and adjust the cores of L7 (B2) and L4 (A1) for maximum output. Repeat these adjustments until no further improvement results.

L.W.—Switch set to L.W., tune to calibration mark 1, feed in a 845 m (355 kc/s) signal and adjust C40 (B2) and C35 (A1) for maximum output. Tune to calibration mark 2, feed in a 1,935 m (155 kc/s) signal and adjust the cores of L8 (B2) and L5 (A1) for maximum output. Repeat these adjustments until no further improvement results.

DISMANTLING THE SET

Removing Chassis.—Pull off two front control knobs, and, slackening the two grub screws securing the metal coupler to the volume control spindle, disengage it; release the A and E, P.U., and Ext. L.S. brackets from the sides of the cabinet; release the ballast resistor from its clip in the bottom of cabinet; unsolder the two leads from the speaker coil tags on the speaker; remove the two chassis fixing bolts from the ends of the rear chassis member; remove two wood screws securing top of scale backing plate to cabinet, and withdraw chassis.

VALVE ANALYSIS

Valve voltages and currents given below are derived from the manufacturer's information and are representative figures taken from receivers which were operating on 225 V A.C. mains. The receivers were tuned to the highest wavelength end of M.W., with the volume controls set at maximum, but there was no signal input.

Voltage measurements, with the exception of cathode readings, were taken on the 400 V scale of a model 7 Avometer, chassis being the negative connection.

Valves	Anode		Screen		Cath.
	V	mA	V	mA	
V1 UCH42	152.0	1.84	56.5	2.6	—
	Oscillator				
	80.7	2.93			
V2 UF41	169.5	4.4	56.5	1.26	—
V3 UBC41	47.5	0.33	—	—	—
V4 UT41	152.0	41.0	151.0	7.2	2.44
V5 UY41	†213.0	—	—	—	202.0

† A.C. Volts.

GENERAL NOTES

Switches.—S1-S12 are the waveband switches, ganged in a single 3-position unit on the chassis deck. This is indicated in our plan chassis illustration, and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram overleaf, where it is drawn as seen from the rear of a chassis standing on its base.

The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and C closed.

S13, S14 are the Q.M.B. mains switches, ganged with the volume control R8.

Scale Lamps.—These are two Osram lamps, with small clear spherical bulbs and M.E.S. bases, rated at 6.5 V, 0.3 A. They are shunted by a thermistor R16.

External Speaker.—Two sockets are mounted on a panel at the rear of the cabinet (top right) for the connection of a low impedance (2-3 Ω) external speaker.

Drive Cord Replacement.—About 30 inches of high-grade fishing line, plaited and waxed, is required for a new drive cord, which should be run as shown in our underside drawing of the chassis.

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