

Radio Ferguson 238U

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

"TRADER" SERVICE SHEET

1000



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- μ 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)

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 UGH42) 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

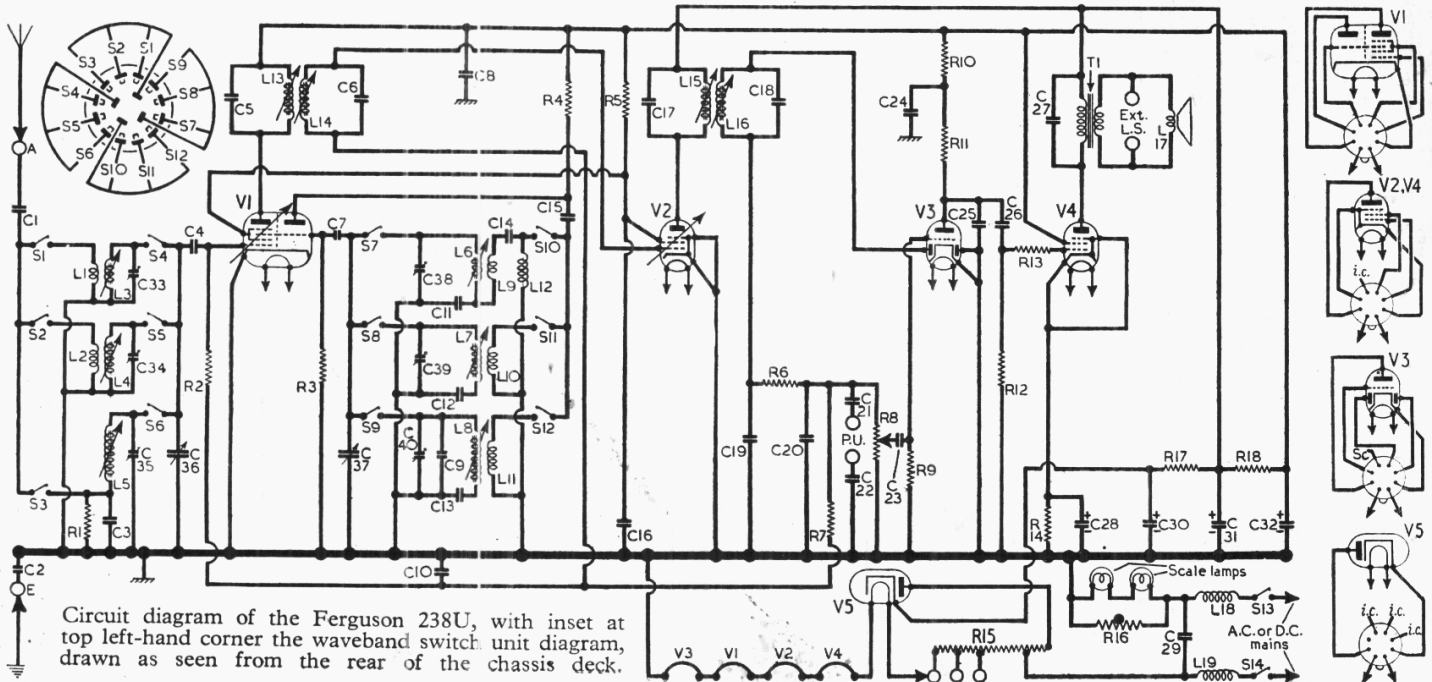
COMPONENTS AND VALUES

RESISTORS	Values	Locations
R1	L.W. aerial shunt...	4.7k Ω H3
R2	V1 hex. C.G. ...	1M Ω H3
R3	V1 osc. C.G. ...	47k Ω H4
R4	Osc. H.T. feed ...	22k Ω H4
R5	V1, V2 S.G. feed ...	22k Ω F3
R6	I.F. stopper ...	100k Ω E3
R7	A.G.C. decoupling ...	1M Ω E4
R8	Volume control ...	500k Ω D2
R9	V3 C.G. ...	20M Ω E4
R10	H.T. decoupling ...	100k Ω F4
R11	V3 anode load ...	220k Ω F4
R12	V4 C.G. ...	680k Ω E4
R13	V4 C.G. stopper ...	4.7k Ω E4
R14	V4 G.B. ...	150 Ω E4
R15	Ballast resistor ...	†1-36k Ω —
R16	Brimistor, type CZ3 ...	— D1
R17	H.T. smoothing ...	470 Ω F3
R18		1.2k Ω F3

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

CAPACITORS	Values	Locations
C1	Aerial series ...	0.005 μ F H4
C2	Chassis isolator ...	0.05 μ F H4
C3	L.W. aerial coup. ...	0.0025 μ F H3
C4	V1 hex. C.G. ...	200pF A2
C5	1st I.F. trans. ...	100pF C2
C6		tuning ...
C7	V1 osc. C.G. ...	50pF H4
C8	H.T. decoup. ...	0.1 μ F E3
C9	L.W. osc. trimmer ...	30pF B2
C10	A.G.C. decoup. ...	0.1 μ F G4
C11	S.W. osc. tracker ...	0.008 μ F B2
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. ...	0.1 μ F G4
C17	2nd I.F. Trans. ...	100pF D2
C18	tuning ...	180pF D2
C19	I.F. by-passes ...	100pF E4
C20	I.F. by-passes ...	100pF E4
C21	P.U. isolators ...	0.01 μ F E3
C22		0.1pF F3
C23	A.F. coupling ...	0.002 μ F E4
C24	H.T. decoupling ...	0.1 μ F F4
C25	I.F. by-pass ...	100pF F4
C26	A.F. coupling ...	0.002 μ F E4
C27	Tone corrector ...	0.005 μ F B1
C28*	V4 cath by-pass ...	25pF E4
C29	R.F. filter ...	0.01 μ F D1
C30*	H.T. smoothing ...	16 μ F D1
C31*		24 μ F D1
C32*	8 μ F D1	
C33†	S.W. aerial trim. ...	50pF A2
C34†	M.W. aerial trim. ...	50pF A1
C35†	L.W. aerial trim. ...	50pF A1
C36†	Aerial tuning ...	50pF 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

* 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	1-2	H3
L2			A1
L3			H3
L4	Aerial tuning coils	3-0	A1
L5			H3
L6	Oscillator tuning coils	26-0	B2
L7			G4
L8			B2
L9	Oscillator reaction coils	1-6	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, S14	Mains sw., g'd R8...		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.

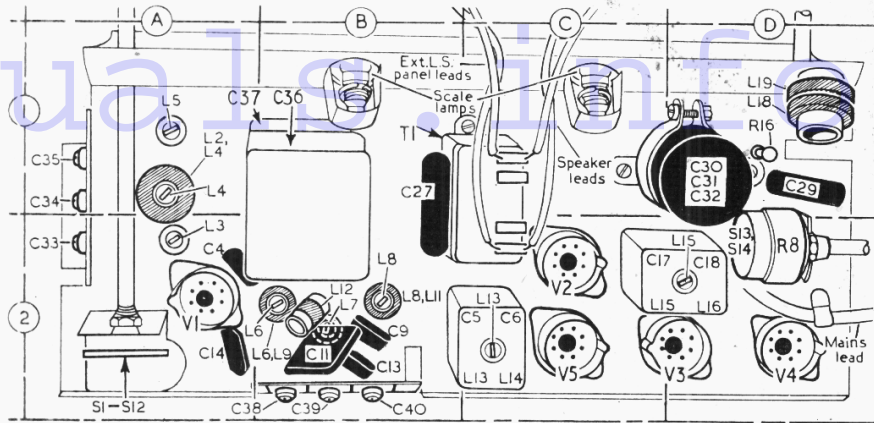
Resistance-capacitance coupling between V3 and pentode output valve (V4, Mullard UL41) via R11, C26 and R12. Fixed tone correction in anode circuit by C27.

H.T. current is supplied by I.H.C. rectifying valve (V5, Mullard UY41). Valve heaters, together with ballast resistor R15, scale lamps (shunted by thermistor R16), and filter chokes L18, L19, are connected in series across the mains input.

CIRCUIT ALIGNMENT

I.F. Stages.—Remove chassis from cabinet and stand it on a bench so that adjustments are easily accessible. Disconnect C4 (location reference A2) from its junction on C36 and connect the signal generator, via a 0.01 μF 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 470 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. In our 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.



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 515.5 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 speech 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 Oscillator 80-7	1-84 2-93	56-5	2-6	—
V2 UF41	169-5	4-4	56-5	1-26	—
V3 UBC41	47-5	0-33	—	—	—
V4 UL41	152-0	41-0	151-0	7-2	7-44
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.

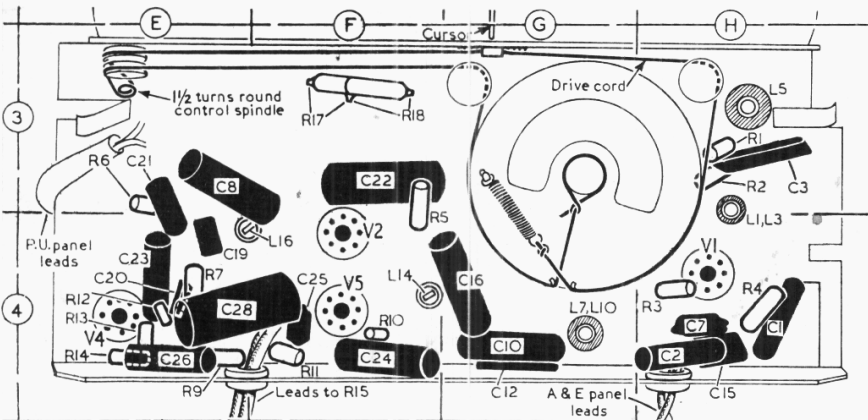
S13, S14 are the Q.M.B. mains switches, ganged with the volume control R8.

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	—	—	O



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