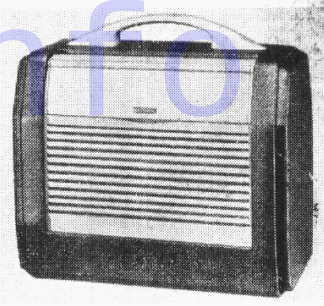
"TRADER" SERVICE SHEET 1088

FERGUSON 341 BU



PROVIDED with an isolated chassis, the Ferguson 341BU is a 4-valve (plus metal rectifier) 2-band superhet portable designed to operate from A.C. or D.C. mains of 200-240 V (50-100 c/s in the case of A.C.) or self-contained dry batteries. The waveband ranges are 187.5-550 m and 1,000-2,143 m. Differences in an early version are explained overleaf.

Release date and original price: December 1951; £15 8s 5d *without batteries. Purchase tax extra.*

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1, C29** (M.W.), or **L1,** loading coil **L2,** and **C29** (L.W.) to hexode valve **(V1, Mullard DK91)** which operates as frequency changer with electron coupling. Provision is made for the connection of an external aerial and earth via **C1** and **C2.**

Oscillator grid coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C32.** Inductive reaction coupling from anode by **L5** (M.W.) and **L6** (L.W.). Oscillator stabilization by **R3.** Oscillator voltage induced into the aerial circuit is neutralized by an anti-phase component fed from the oscillator grid via **C5.**

Second valve **(V2, Mullard DF91)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier, with tuned transformer couplings **C6, L7, L8, C7** and **C14, L9, L10, C15.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of diode pentode valve **(V3, Mullard DAF91).** Audio frequency component in rectified output is developed across volume control **R8,** which acts as diode load, and is passed via **C19** to control grid of pentode section, which operates as A.F. amplifier.

D.C. potential developed across **R8,** is fed back as bias via step-down potential divider **R6, R7** to **V1.** The bias applied to **V2** is fixed and is derived from the filament chain.

Resistance-capacitance coupling by **R13, C21** and **R14** between **V3** pentode anode and pentode output valve **(V4, Mullard DL94).**

For battery operation, power supplies are carried by switches **S8 (B), S10 (B)** and **S11 (B),** which close in that position as indicated by the suffix **(B).** For mains operation, **S7 (M), S9 (M), S12 (M)** and **S13 (M)** close. The power on/off switches **S14, S15** are operated by the control panel flap. Safety switches **S16, S17** automatically disconnect the mains from the chassis when the carrying case back cover is opened.

Mains H.T. current is supplied by metal rectifier **(MR1,** two **SenTerCel RM3** units in series**).** Smoothing by **R17, R19** and electrolytic capacitors **C25, C26** and **C27.** Filament current is taken from the H.T. circuit via ballast resistor **R18.**

The filaments are connected in series for both mains and battery operation, bias being obtained from points of appropriate potential in the filament chain. **R15** by-passes the H.T. current from **V4** past the filaments.

The H.T. negative circuit on both mains and battery operation is not taken to chassis in the normal way, but is "anchored" to it by **R16.** As the chassis has no direct connection to the mains input circuit, it is safe to handle. Although an earth may be directly connected to the chassis when it is being serviced on the bench, the earth socket itself is returned via **C2** to the H.T. negative line. **R20** protects **MR1** from current surges, and **C28** operates as a mains R.F. by-pass.

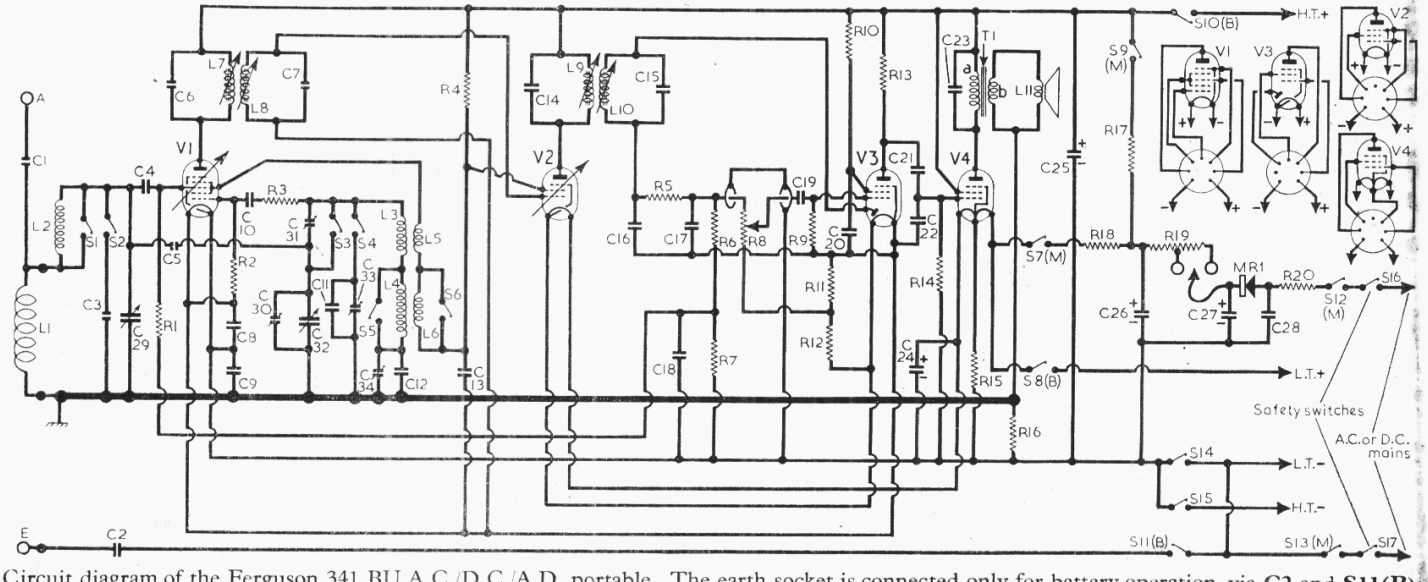
COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	V1 C.G.	1MΩ	G3
R2	V1 osc. C.G. ...	100kΩ	G3
R3	Osc. stabilizer ...	3·3kΩ	G3
R4	H.T. decoupling	15kΩ	G4
R5	I.F. stopper	100kΩ	B2
R6	A.G.C. pot. divider	2·2MΩ	F4
R7	A.G.C. pot. divider	3·3MΩ	F3
R8	Volume control ...	1MΩ	C1
R9	V3 C.G.	6·8MΩ	E4
R10	V3 S.G. feed ...	4·7MΩ	E4
R11	V3 diode delay	470Ω	E4
R12	V3 diode delay bias	270Ω	E4
R13	V3 pentode load ...	470kΩ	E4
R14	V4 C.G.	2·2MΩ	D4
R15	Filament shunt ...	680Ω	D4
R16	Chassis isolator ...	150kΩ	G3
R17	H.T. smoothing ...	470Ω	C1
R18	L.T. ballast ...	2kΩ	C2
R19	Voltage adjustment ...	*1,840Ω	C2
R20	Surge limiter ...	230Ω	C2

* Tapped at 1,450Ω+390Ω from R18.

	CAPACITORS	Values	Locations
C1	Aerial isolator ...	15pF	—
C2	Earth isolator ...	0·01μF	C2
C3	L.W. aerial trim. ...	80pF	A2
C4	V1 C.G. ...* ...	100pF	G3
C5	Osc. neutralizing ...	1·5pF	A1
C6	1st I.F. trans. tuning	47pF	A2
C7	1st I.F. trans. tuning	62pF	A2
C8	Filament by-passes	0·25μF	F4
C9	Filament by-passes	0·25μF	E4
C10	V1 osc. C.G. ...	100pF	G3
C11	L.W. osc. trim. ...	100pF	A2
C12	Osc. tracker ...	520pF	A1
C13	H.T. decoupling ...	0·1μF	G4
C14	2nd I.F. trans. tuning	100pF	B2
C15	2nd I.F. trans. tuning	180pF	B2
C16	I.F. by-passes ...	100pF	B2
C17	I.F. by-passes ...	100pF	B2
C18	A.G.C. decoupling	0·05μF	F3
C19	A.F. coupling ...	0·002μF	D4
C20	V3 S.G. decoupling	0·05μF	E4
C21	A.F. coupling ...	0·002μF	E4
C22	I.F. by-pass	220pF	E4
C23	Tone corrector ...	0·005μF	D4
C24*	Filament by-pass ...	30μF	E4
C25*	H.T. smoothing ...	40μF	D3
C26*	H.T. smoothing ...	30μF	D3
C27*	H.T. smoothing ...	20μF	D3
C28	Mains R.F. by-pass	0·05μF	F3
C29†	Aerial tuning ...	§530pF	B2
C30‡	M.W. osc. trim. ...	35pF	B1
C31‡	L.W. osc. tracker ...	750pF	A1
C32†	Oscillator tuning ...	§530pF	B1
C33‡	L.W. osc. trim. ...	40pF	A2
C34‡	M.W. osc. tracker ...	40pF	A1

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



Circuit diagram of the Ferguson 341 BU A.C./D.C./A.D. portable. The earth socket is connected only for battery operation, via **C2** and **S11(B).**

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Frame aerial ...	1·3	—
L2	L.W. loading coil...	13·8	G3
L3, L4	Oscillator tuning coils	2·5	A2
L5, L6	Oscillator reaction coils	1·9 6·8	A2 A2
L7	1st I.F. trans. Pri.	14·4	A2
L8	1st I.F. trans. Sec.	11·1	A2
L9	2nd I.F. trans. Pri.	8·0	B2
L10	2nd I.F. trans. Sec.	6·0	B2
L11	Speech coil ...	2·3	—
T1	O.P. trans. a ...	706·0	—
	O.P. trans. b ...	—	—
S1-S6	Waveband switches	—	A1
S7(M)-S13(M)	Mains/battery switches	—	C1
S14, S15	Flap operated sw....	—	—
S16, S17	Safety switches ...	—	F4

GENERAL NOTES

Switches.—S1-S6 are the waveband switches, ganged in a 2-position rotary unit mounted on the front chassis member, above the deck. This is indicated in our plan view of the chassis. It is shown in detail in the upper diagram inset beside the plan view, where it is drawn as seen from the rear of the chassis. **S1, S3, S5, S6** close on M.W. (control knob anti-clockwise); **S2** and **S4** close on L.W.

S7(M), S8(B)-S13(M) are the mains/battery change-over switches, ganged in a second 2-position rotary unit mounted on the front chassis member, above the deck, also indicated in our plan view. It is shown in detail in the lower diagram inset beside the plan view, where it is drawn as seen from the rear of the chassis. The **(M)** switches close for mains operation (control knob anti-clockwise), and the **(B)** switches for battery.

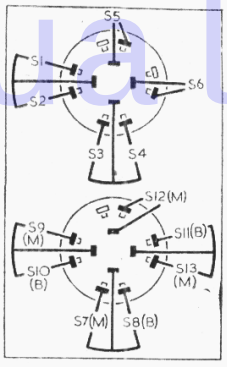
S14, S15 are the Q.M.B. mains switches, mounted in the hinge of the scale flap and operated by opening and closing the flap. They open when it is closed.

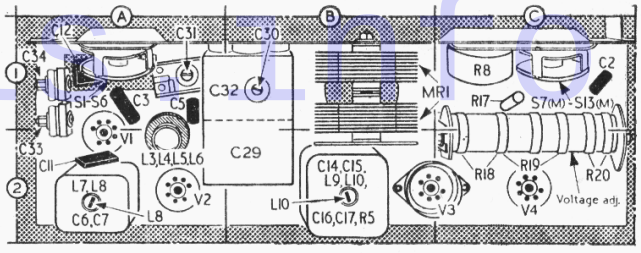
S16, S17 form a safety device, isolating the chassis from the mains when the back cover is opened. They are operated by a spring-loaded plunger which projects from the rear member of the chassis.

Drive Cord Replacement.—About 3ft 6in of high-grade flax fishing line, plaited and waxed, is required for a new drive cord, which should be run as shown in the accompanying sketch, where the system is drawn as seen from the front with the gang at maximum capacitance.

There are two types of gang drum: the early type, which was fitted to our sample chassis and is as shown in our sketch; and the later type, which was adopted to overcome a tendency for the cord to run off the groove.

In the early type, the drum groove flange turns inwards, on the same side of the drum as the centre boss; in the later type, the flange turns outwards, so the cord enters it on the *front* of the drum, instead of the rear. In the later type, anchor tags are provided for both ends of the cord. The entry slot in the flange is at about 3 o'clock, not at 6 o'clock as in our drawing.





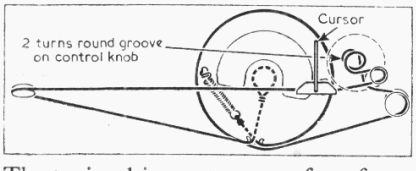
Left: Waveband and mains/battery switch units. *Right:* Plan view of chassis.

Modifications

In addition to the alternative tuning drive drum described earlier, certain electrical changes have been introduced since production started. In order to avoid I.F. instability that has been experienced in occasional samples, **R3** was increased to 3.3 kΩ (it was originally 2 kΩ) and **C9** was transferred from the positive side of **V1** filament to the negative side.

From serial No. 3001 the I.F. transformer **L9, L10** is as we show it, and the can is coded with an orange spot. In earlier models only the secondary was tuned, **C14** and **L9** core being omitted. **L9** and **L10** windings were 36.5 Ω and 14.0 Ω respectively. At the same time **R5** was increased from 47 kΩ to 100 kΩ. Previously a 3.5 pF neutralizing capacitor, made of twisted wires, was connected between the high potential side of **L10** and pin 4 (which is blank) on **V2** holder.

All the foregoing modifications should be made to early type models if instability is experienced. Other differences that may be found are that there may be a trimmer across **C29** (like **C30**), and a screening shield may be provided for **V3**.



The tuning drive system, seen from front.

DISMANTLING

Removing Chassis.—Turn locking screw in underside of carrying case, and sliding the back cover upwards for half an inch, hinge it open;

unsolder three leads from tags in back cover;

unplug batteries, if fitted, and removing the two self-tapping screws (each with two washers) from rear edges of chassis, withdraw chassis to extent of speaker and switch leads;

unsolder three leads from tags on speaker output transformer;

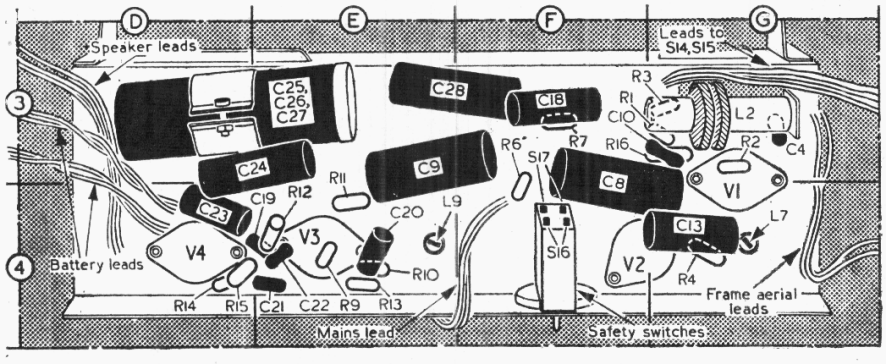
unsolder three leads from tags on left-hand side of carrying case.

When replacing, connect the blue speaker lead to the top right-hand tag, the orange lead to to the lower right-hand tag and the black lead to the lower left-hand tag on the output transformer.

Connect the three leads to the tags in the left-hand side of the carrying case in the following order, reading from top to bottom: yellow; blue; black.

Connect the green lead to the frame aerial tag bearing a capacitor, the black lead to the remaining tag, and the grey lead to the **E** socket.

A washer should be placed on each side of the chassis member when replacing the chassis fixing screws.



Underside view of the chassis. **S16, S17** are plunger-operated by pressure from the back cover.

CIRCUIT ALIGNMENT

I.F. Stages.—Remove chassis from carrying case as described under "Dismantling," but do not disconnect leads. Connect output of signal generator, via an 0.1 μF capacitor in each lead, to control grid (pin 4) of **V1** and H.T. negative (metal case of **C25, C26, C27**). Strap safely switch **S16, S17** (location reference F4) in the "on" position with adhesive tape. Turn gang and volume control to maximum. Feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L10** (B2), **L9** (E4), **L8** (A2) and **L7** (G4) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—Disconnect signal generator leads and lay them near the frame aerial winding. As the tuning scale remains fixed to the carrying case when the chassis is withdrawn, reference must be made during alignment to the six indentations on the scale backing plate. The two at the right-hand end indicate the highest wavelength end of the tuning scale, and the cursor should coincide with these marks when the gang is at maximum. The remaining four indentations indicate the trimming and tracking positions as follows, reading from left to right: 1, M.W. trim; 2, L.W. trim; 3, L.W. track; 4, M.W. track.

M.W.—Switch receiver to M.W., tune to trimming point, feed in a 1,500 kc/s (200 m) signal and adjust **C30** (B1) for maximum output. Tune receiver to tracking point, feed in a 550 kc/s (545.4 m) signal and adjust **C34** (A1) for maximum output. Repeat these adjustments.

L.W.—Switch receiver to L.W., tune to trimming point, feed in a 290 kc/s (1,035 m) signal and adjust **C33** (A2) for maximum output. Tune to tracking point, feed in a 150 kc/s (2,000 m) signal and adjust **C31** (A1) for maximum output. Repeat these adjustments.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers and are the average figures obtained on a number of receivers which were operated from new batteries. Readings taken with the receivers operating from 230 V A.C. mains, using the 220-240 V voltage adjustment tapping, were very similar.

Voltages were measured on the 400 V range of a Model 7 Avometer, the metal case of **C25, C26** and **C27** being the negative connection. Total H.T. current was 14.3 mA, and total L.T. current 51 mA.

VALVE		Anode		Screen	
		V	mA	V	mA
V1	DK91 ...	90	1·0	48	1·8
V2	DF91 ...	90	1·6	49	0·7
V3	DAF91 ...	*	*	*	*
V4	DL94 ...	84	7·3	90	1·5

* Negligible reading owing to high circuit resistance.

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