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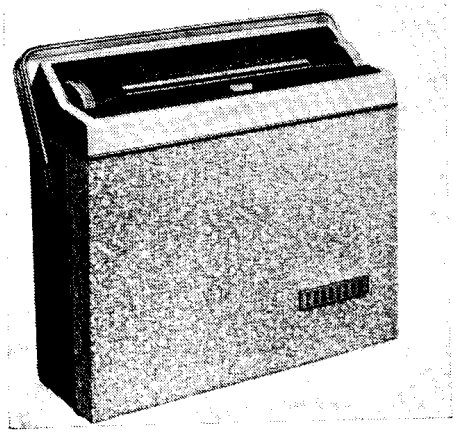
"TRADER" SERVICE SHEET

1480

FERGUSON 349BT

2-Band Transistorized Portable Receiver



Appearance of the Ferguson 349BT.

TWO versions of the Ferguson 349BT receiver are covered in this Service Sheet, a late version, which was used as our sample, and an early version. Both versions are covered, the differences in the early version being explained under "General Notes."

The receiver is a six transistor portable employing a ferrite rod aerial whose push-pull output stage delivers 400mW to a 4½in round speaker. Waveband ranges are 182-552m and 1,090-1,940m.

Release date and original price: May 1960, £13 18s 3d. Purchase tax extra.

TRANSISTOR ANALYSIS

Voltage readings only are given for the transistors, and the manufacturers recommend that no attempt should be made to take current readings excepting that of the total battery current, which should be 12mA with no signal, although it averages 20mA under normal operating conditions. Voltages quoted are all negative, and should be measured with a high resistance meter whose positive lead is connected to the common postive chassis line except where otherwise indicated.

Transistor Table

Transistor	Emitter	Base	Collector
TR1 OC44	1·1V	1·0V	7·5V
TR2 OC45	0·6V	0·7V	7·5V
TR3 OC45	1·2V	1·34V	7·6V
TR4 OC81D	3·5V	190mV*	7·2V*
TR5 matched pair	—	180mV*	6·0V†
TR6 OC81's	—	180mV*	6·0V

*Measured from emitter.
†Measured from TR6 collector.

CIRCUIT DESCRIPTION

High impedance tuning coils **L1, L2** mounted on ferrite rod aerial are tuned by **C1.** A car aerial coupling coil **L3** permits connection of an external aerial. Low impedance tappings match the coupling to the base of **TR1,** an R.F. transistor operating as self oscillating mixer. Oscillator coil **L6** is tuned by **C10** and **C9** on M.W., with addition of **C8** on L.W.

Tuned-primary tuned-secondary I.F. transformer coupling by **L7, L8** to **TR2,** and by

(Continued overleaf, col. 1)

COMPONENT VALUES AND LOCATIONS

Coils*

L1	—	C1
L2	—	B2
L3	—	B1
L4	—	D2
L5	—	D2
L6	3·2	D2
L7	6·0	C2
L8	6·0	C2
L9	3·7	C2
L10	—	C2
L11	5·2	B2
L12	—	B2
L13	35·0	—

Resistors

R1	10kΩ	C2
R2	56kΩ	C2
R3	3·9kΩ	D2
R4	68kΩ	C2
R5	1·2kΩ	C2
R6	680Ω	C2
R7	18kΩ	C2
R8	4·7kΩ	C2
R9	3·9kΩ	B2
R10	1kΩ	B2
R11	8·2kΩ	C2
R12	330Ω	B2
R13	5kΩ	A1
R14	330Ω	A2
R15	12kΩ	B2
R16	18kΩ	B2
R17	10Ω	A2
R18	1·5kΩ	B2
R19	3·3kΩ	B2
R20	120Ω	B2
R21	3·3kΩ	B2
R22	120Ω	A2
R23	3·3Ω	A2
R24	3·3Ω	A2
R25	2·2kΩ	B2
R26	1kΩ	B2

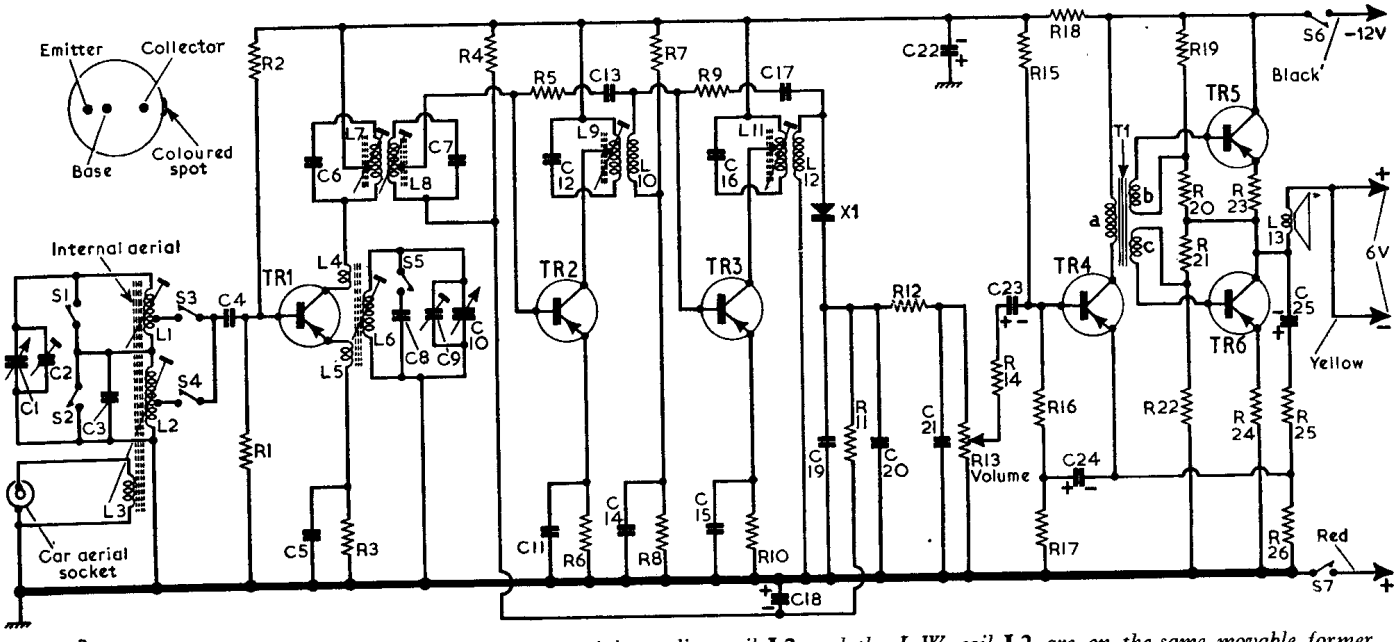
Capacitors

C1	196pF	D2
C2	30pF	D2
C3	68pF	C1
C4	0·1μF	C2
C5	0·01μF	D2
C6	250pF	C2
C7	250pF	C2
C8	233pF	C1
C9	30pF	C2
C10	111pF	C2
C11	0·1μF	C2
C12	250pF	C2
C13	56pF	C2
C14	0·1μF	C2
C15	0·1μF	B2
C16	250pF	B2
C17	18pF	B2
C18	8μF	C2
C19	0·01μF	†B2
C20	0·02μF	B2
C21	0·02μF	B2
C22	100μF	B2
C23	8μF	A2
C24	100μF	B2
C25	100μF	B2

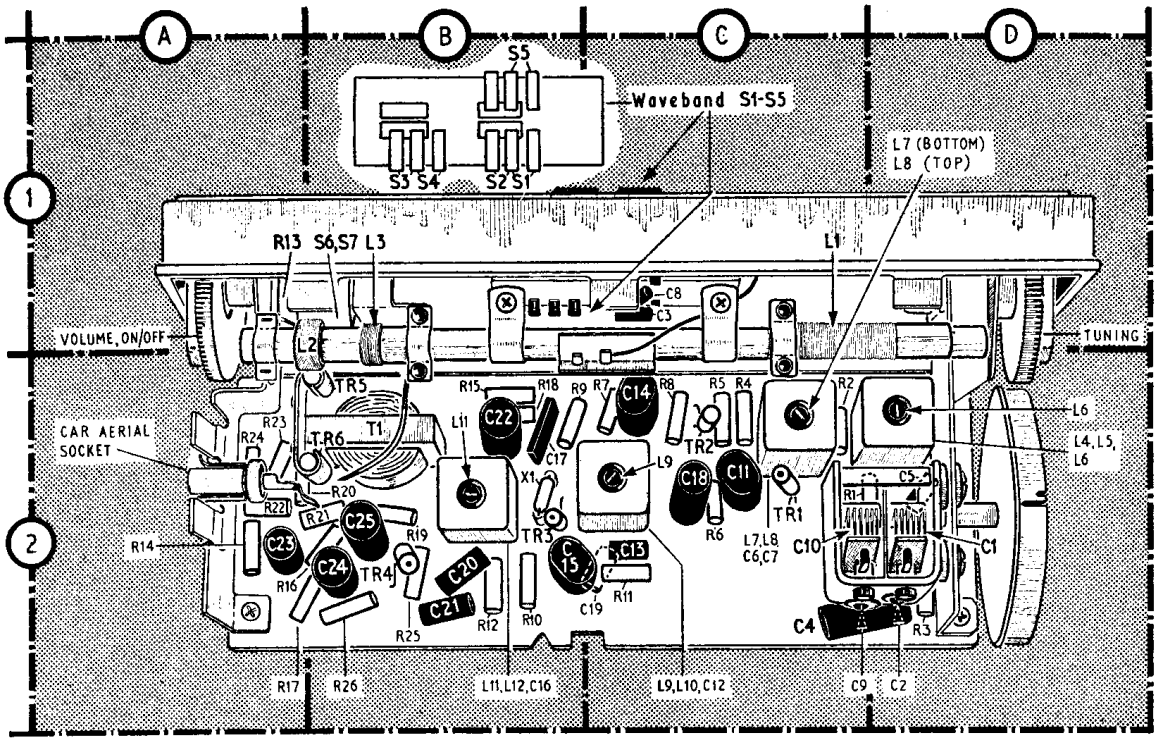
Miscellaneous*

T1	a	200·0	B2
	b	40·0	
	c	40·0	
X1		OA70	B2
S1-S5		—	C1
S6, S7		—	B1

*Approximate D.C. resistance in ohms.
†Fitted beneath chassis.



Circuit diagram of the Ferguson 349BT. The car aerial coupling coil **L3** *and the L.W. coil* **L2** *are on the same movable former.*



View of the component side of the printed circuit panel shown still attached to the top of the cabinet. Details of the waveband switch unit are given in a separate diagram in location B1. Edgewise type tuning and volume, on/off control knobs are used.

Circuit Description—*continued*

single-tuned transformer **L9, L10** to **TR3,** which operate as I.F. amplifiers.

Intermediate frequency 470kc/s.

Crystal diode second detector **X1** is coupled by **L11, L12,** and the audio frequency component in its rectified output is developed across the volume control **R13,** which constitutes the load resistance, shunted by the I.F. filter network **C19, C20, R12, C21.** Neutralizing of I.F. stages is effected by negative feed-back via **C17, R9, C13, R5.** D.C. potential developed along **R12, R13** is positive-going, and it opposes the negative base bias derived from the potential divider **R4, R11, R12, R13** according to signal strength, thus providing automatic gain control.

A.F. coupling from **R13** via electrolytic capacitor **C23** to driver stage **TR4** and **T1,** which applies the drive to the bases of output transistors **TR5, TR6.** These two output transistors are connected in series to operate in class B push-pull, each being supplied with current from a separate 6V battery. The junction between the two batteries is taken via the speaker speech coil **L13** to the transistors, each battery supplying the current for alternate half-cycles of signal.

Negative feed-back over the whole of the A.F. amplifier is provided from the network **C25, R25, R26, C24, R17.** Switches **S6, S7** are necessary to disconnect each battery when switching off.

CIRCUIT ALIGNMENT

An output meter with an impedance of 30Ω may be used in place of the loudspeaker, or alternatively an A.C. voltmeter may be connected directly across the speech coil, which must then remain connected. Throughout the alignment process the signal input level must be adjusted to prevent the output level from exceeding 5 mW (0.4V A.C.) with the volume control at maximum. Otherwise A.G.C. action will cause erroneous indications.

I.F. Stages.—Switch receiver to M.W. ("M" exposed on scale) and turn gang to minimum capacitance. Connect signal generator via a 0.1μF capacitor to the junction of **C1** and **L1,** and to chassis, feed in a 470kc/s signal, and adjust **L11** (B2), **L9, L8** (C2) and **L7** (from underside) in that order for maximum output. Repeat these adjustments until no improvement can be obtained.

R.F. Stages.—Two slightly different sets of instructions are given for the adjustments in the later chassis, which applied to our sample, and the earlier version. Those for the later type are given first; those for the earlier version follow and are enclosed in brackets.

M.W.—Connect signal generator output to a loop of wire loosely coupled to the ferrite rod aerial. With set switched to M.W., first ensure that the cursor registers with the high wavelength end of the scale aperture when the gang is at maximum capacitance, then tune to the spot close to "Luxembourg" on the scale (mark between 200m and 250m in early versions). Feed in a 1,500kc/s (1,300kc/s) signal and adjust **C9** and **C2** (D2) for maximum output. Tune to "Allouis" on scale (mark at 500m), feed in a 580kc/s (600kc/s) signal and adjust **L6** core (D1) and **L1** (by sliding it along rod) for maximum output.

L.W.—Switch receiver to L.W., and tune to "Light" (1,400kc/s) on scale (215kc/s). Feed in a 210kc/s (215kc/s) signal, and adjust position of **L2** on ferrite rod for maximum output.

GENERAL NOTES

Switches.—S1-S5 are the waveband switches, ganged in a slide-type unit mounted on the ferrite rod assembly. **S2** and **S3** close for M.W. operation (letter "M" visible on control panel), while **S1, S4, S5** close for L.W. (letter "L" showing). **S6, S7** are the battery switches, ganged with the volume control **R13.**

Batteries.—The 12V battery comprises two 6V units connected in series. Suitable 6V units are Ever Ready PP1's, Drydex DT1's, G.E.C. BB21's and Vidor T6001's. Average current demand is said to be 20mA.

Transistors.—The output transistors **TR5, TR6** are a matched pair of OC81's. If one is replaced, they must both be. Similarly, if the two batteries are not equally fresh, the unbalance will cause distortion.

Whether the OC44 mixer **TR1** is oscillating can be checked by measuring the base and emitter voltages, which should be approximately as shown in the valve table, provided that two new batteries are used. If the relationship is reversed, and the base is more negative than the emitter, that indicates that the transistor is not oscillating.

Early Version of 349BT.—The sample chassis on which this Service Sheet was prepared was a fairly late version. The ferrite rod aerial and the waveband switching was slightly different in the early versions, and the 0.01μF capacitor **C19** was not present. The two versions are most easily distinguished by the fact that **C3** in the early version was mounted in the wiring between the switch unit and the tuning gang, while in the later version it is mounted directly on the switch unit with **C8.**

Where an aerial assembly is to be replaced one of the later type should be fitted. Its part No. is Y33414. A slight wiring rearrangement is involved, because in the early version **C3** was connected between the top of **L1** and the top of **S1,** and the common of **S1, S2** went to chassis, closing on L.W., while **S1** was connected across **L2,** closing on M.W. Thus on L.W. **L1** and **L2** were connected in series. **S2** remained across **L2.**

Differences occurred in the alignment procedure in the early version, but these are explained under "Circuit Alignment."

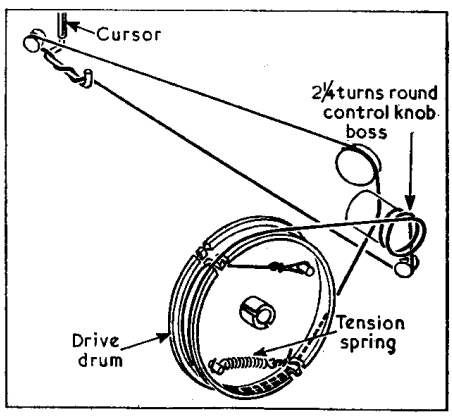


Diagram of the tuning drive system. When replacing the cord, begin with the loop shown above the centre of the drum.

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