"TRADER" SERVICE SHEET

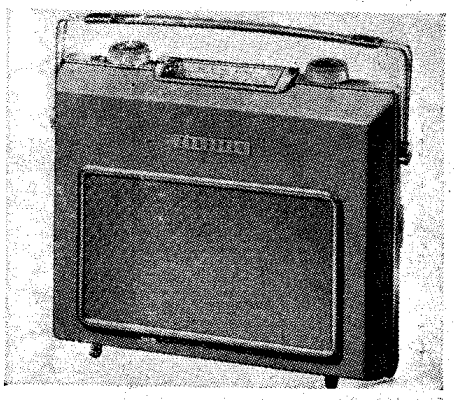
1430

FERGUSON 348BT

2-band Transistor Portable with Printed Circuit

THE Ferguson 348BT "Fieldfare" is a 2-band portable receiver designed to operate from two 6V batteries. It employs 6 Mullard p-n-p transistors, 2 Mullard germanium diodes, a printed circuit and a ferrite rod aerial. A socket is provided for the connection of an external aerial. The waveband ranges are 182-552m (M.W.) and 1,090-1,940m (L.W.).

Release date and original price: May, 1959, £15 10*s*. *Purchase tax extra.*



CIRCUIT DESCRIPTION

Aerial coils **L1** and **L3** are mounted at opposite ends of a length of ferrite rod to form an internal aerial. For M.W. operation, **L3** is short circuited by **S1**. The M.W. aerial coil **L1** is then tuned by **C1** and **C2**. For L.W. operation, **S2** is closed and **L1** and **L3** are connected in series and are tuned by **C1, C2** and **C3.** Provision is made for the connection of an external aerial via a co-axial socket and coupling coil **L2.**

The signal is fed via low impedance tappings on **L1** and **L3** via **S3** (M.W.) and **S4** (L.W.) to the base of **TR1,** which operates as a self-oscillating mixer. Local oscillations are produced by feedback between collector and emitter via low impedance windings **L4, L5.** Oscillator coil **L6** is tuned by **C8, C9** on M.W. and, in addition, by **C6** and **C7** on L.W. Correct tracking is obtained by the shaped vanes of the oscillator section of the tuning gang **C8.** Base bias is provided by the potential divider **R1, R2.** Collector current is stabilized by **R3.**

TR2 and **TR3** operate as a two-stage earthed-emitter I.F. amplifier with transformer couplings **L8, L9; L10, L11;** and **L12, L13** to germanium diode detector **W2.** Positive feedback due to the inherent internal coupling in **TR2** and **TR3** is neutralized by **R6, C15** and **R10, C20.** Base bias for **TR2 and TR3** is obtained from the potential dividers **R4, R5, R13, R14** and **R28, R8, R9** respectively.

Intermediate frequency 466kc/s

The A.F. output of **W2** is developed across the combined diode load and volume control **R14** and is passed via **R15** and electrolytic coupling capacitor **C25** to the base of the driver stage **TR4.** Filtering by **R13, C23.**

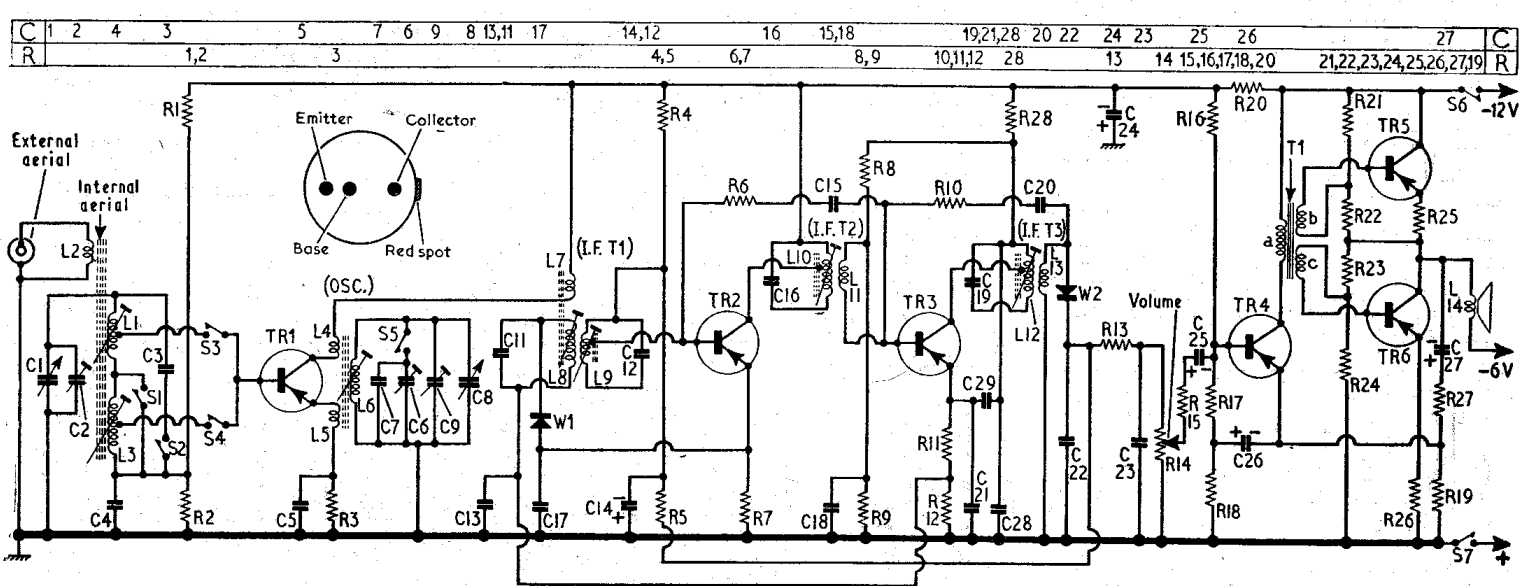
The D.C. component of the rectified signal developed across **R13, R14** is fed back as a positive A.G.C. bias to the base of **TR2.** The forward bias applied to the detector **W2** from the A.G.C. circuit serves to improve the detector efficiency under weak signal conditions and also maintains the input resistance of **W2** constant at all signal levels.

To enable large signal inputs to be handled, the normal A.G.C. action is supplemented by the variable damping effect of the damping diode **W1** on the primary of I.F. transformer **L8, L9.** The cathode of **W1** is connected via **L8** to the steady poten-

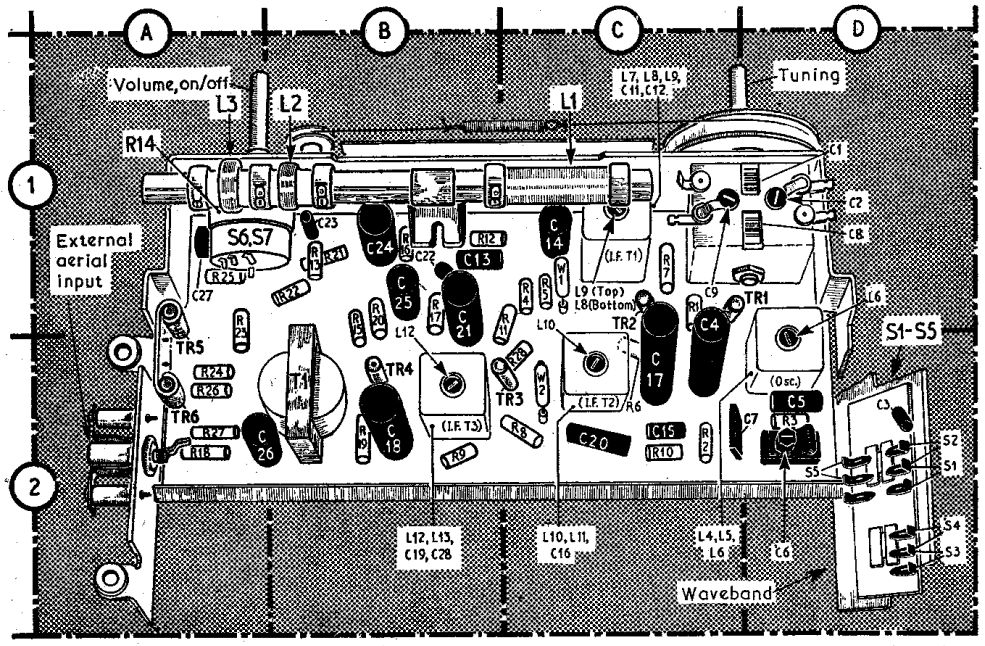
(*Continued overleaf col.* 1)

Resistors			C2	25pF	D1	L2	3·0	B1
R1	56kΩ	C1	C3	35pF	D2	L3	15·0	A1
R2	10kΩ	C2	C4	0·1μF	C2	L4	—	D2
R3	3·9kΩ	D2	C5	0·02μF	D2	L5	—	D2
R4	68kΩ	C1	C6	30pF	D2	L6	3·2	D2
R5	8·2kΩ	C1	C7	200pF[1]	C2	L7	2·2	C1
R6	1·2kΩ	C2	C8	111pF	D1	L8	4·0	C1
R7	680Ω	C1	C9	25pF	C1	L9	3·8	C1
R8	22kΩ	C2	C10†	—	—	L10	5·5	C2
R9	4·7kΩ	B2	C11	400pF	C1	L11	—	C2
R10	3·9kΩ	C2	C12	400pF	C1	L12	3·75	B2
R11	750Ω	C1	C13	0·01μF	B1	L13	—	B2
R12	220Ω	B1	C14	8μF	C1	L14	30·0	—
R13	470Ω	B1	C15	56pF[1]	C2			
R14	5kΩ	A1	C16	250pF	C2	***Miscellaneous****		
R15	330Ω	B1	C17	0·01μF	C2	W1	OA79[3]	C1
R16	12kΩ	B1	C18	0·1μF	B2	W2	OA70[3]	C2
R17	18kΩ	B1	C19	250pF	B2	T1 a	200·0	B2
R18	10Ω	A2	C20	18pF[1]	C2	T1 b	40·0	B2
R19	1kΩ	B2	C21	0·1μF	B1	T1 c	40·0	B2
R20	1·5kΩ	B1	C22	0·02μF	B1	S1- S5	—	D2
R21	3·3kΩ[1]	B1	C23	0·02μF	B1	S6, S7	—	A1
R22	120Ω[1]	B1	C24	100μF	B1			
R23	3·3kΩ[1]	A1	C25	8μF	B1			
R24	120Ω[1]	A2	C26	100μF	A2			
R25	3·3Ω[2]	A1	C27	100μF	A1			
R26	3·3Ω[2]	A2	C28	0·01μF	B2			
R27	2·2kΩ	A2	C29	0·04μF	§			
Capacitors			***Coils****					
C1	157pF	D1	L1	2·2	C1			

**Approximate D.C. resistance in ohms.*
†*No component.*
§*On printed circuit side of panel.*
[1]*5 per cent.*
[2]*±0·5Ω.*
[3]*Mullard.*



Circuit diagram of the Ferguson 348BT. As the component numbers are printed on the circuit panel, the same numbering is used in our circuit diagram. A location key is provided at the top of the diagram.



Rear view of the chassis. The waveband switch unit **S1-S5** *is drawn slightly out of position in order to show the individual contacts.*

Circuit Description—*continued*

tial developed across **R12**, while its anode is connected to the variable potential developed across **TR2** emitter resistor **R7**.

Under no-signal conditions the negative potential developed across **R7** exceeds the steady negative potential developed across **R12**. **W1** is then reverse biased, its impedance is high and its damping effect is negligible.

When a strong signal is tuned in, however, the positive A.G.C. voltage fed back from **R13, R14** to the base of **TR2** causes **TR2** emitter potential to fall below the steady potential developed across **R12**. **W1** is then biased in a forward direction, its impedance is reduced and **L8** is heavily damped. This results in an increase in bandwidth and a reduction in the gain of the receiver.

The amplified output of **TR4** is coupled via phase-splitting transformer **T1** to the bases of the matched transistors **TR5, TR6**, which operate in a single-ended push-pull output stage. D.C. coupling to high impedance speech coil **L14**. Base bias is provided by the potential divider **R21-R24**. Collector currents are stabilized by **R25, R26**. Negative feedback is applied to **TR4** from the speech coil via **C27, R27**.

CIRCUIT ALIGNMENT

Equipment Required.—A signal generator, modulated 30 per cent at 400c/s; an A.C. voltmeter for use as output meter; a 0.1μF capacitor; and a screwdriver-type trimming tool.

As the tuning scale remains fixed to the cabinet when the chassis is removed for alignment purposes, calibration notches are provided on the front edge of the scale backing plate. Considered from the tuning drive drum end of the backing plate, the first notch marks the cursor datum position and the remaining three indicate the 600kc/s, 220kc/s and 1,300kc/s calibration points, in that order.

Maintain the signal generator output as low as possible at all times during the alignment procedure.

1.—Connect the output meter across the speaker speech coil **L14**. Connect the signal generator output, via the 0.1μF capacitor in its live output lead, across the aerial section of the tuning gang **C1**.

2.—Switch the receiver to M.W. Turn the tuning gang to minimum and the volume control to maximum.

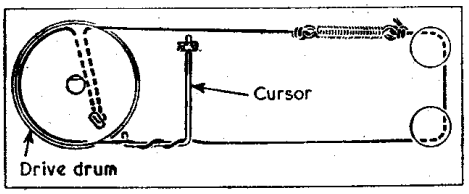
3.—Feed in a modulated 466kc/s signal and adjust the cores of **L12** (B2), **L10** (C2), **L9** (C1) and **L8** (C1), in that order, for maximum output. Repeat these adjustments.

4.—With the tuning gang at maximum capacitance check that the cursor coincides with the cursor datum notch.

5.—Loosely couple the signal generator output via a loop of wire to the ferrite rod aerial. Tune the receiver to the 1,300kc/s calibration notch. Feed in a modulated 1,300kc/s signal and adjust **C9** (C1) and **C2** (D1) for maximum output.

6.—Tune the receiver to the 600kc/s calibration notch. Feed in a modulated 600kc/s signal and adjust the core of **L6** (D2) for maximum output. Then slide the former of **L1** (C1) along the ferrite rod for maximum output.

7.—Switch the receiver to L.W. and tune it to the 220kc/s calibration notch. Feed in a modulated 220kc/s signal and adjust **C6** (D2) for maximum output. Then slide the former of **L3** (A1) along the ferrite rod for maximum output.



Sketch of the tuning drive system drawn as seen with the gang at maximum.

GENERAL NOTES

Switches.—**S1-S5** are the waveband switches ganged in a single slide-type unit. The unit is shown in the rear view illustration of the chassis (location reference D2), where the individual switch contacts are identified. **S1** and **S3** are closed on M.W.; **S2, S4** and **S5** are closed on L.W.

Drive Cord Replacement.—About 20in of nylon-braided glass yarn is required for a new drive cord. It should be run as indicated in the sketch in col. 1, where it is drawn as seen from the top of the chassis, with the tuning gang at maximum capacitance.

Batteries.—The batteries recommended by the manufacturers are: Two Ever Ready PPI's, Drydex DTI's, G.E.C. BB21's or Vidor T6001's, rated at 6V each, connected in series. Both batteries should be replaced at the same time.

Modifications.—The following variations will be found in earlier versions of this receiver.

C3 is 42pF and is connected in parallel with **L3**. **C29** is omitted. An 8.2pF capacitor is connected in parallel with **C8** and **C9**. The intermediate frequency is 470kc/s.

TRANSISTOR ANALYSIS

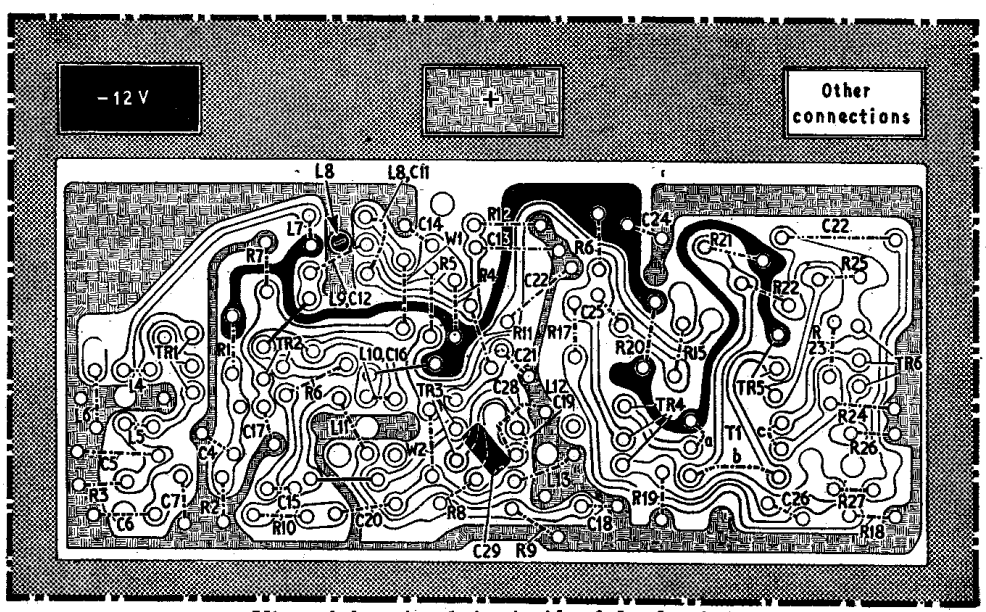
Voltages given in the table below are those derived from the manufacturer's information. They were measured on the 2.5V and 10V ranges of a model 8 Avometer. Except where otherwise indicated, the positive terminal of the voltmeter was connected to chassis.

The total current consumption is approximately 12mA with no signal input, and 20mA when receiving a signal at average listening volume. No other current measurements should be attempted.

Oscillator operation may be checked by measuring the emitter and base voltages of **TR1**. When **TR1** is oscillating the emitter voltage should be slightly more negative than the base as shown in the table below. Failure to oscillate is indicated when the base voltage is more negative than the emitter.

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 OC44 ..	1·0	0·97	7·6
TR2 OC45 ..	0·68	0·77	7·6
TR3 OC45 ..	1·04	1·15	7·6
TR4 OC78D ..	4·0	190mV[1]	6·8[1]
TR5 OC78* ..	—	190mV[1]	6·0[2]
TR6 OC78* ..	—	190mV[1]	6·0

[1] *Positive meter terminal to emitter.*
[2] *Positive meter terminal to junction of* **R22, R23** *and* **R25.**
***TR5** and **TR6** must be a matched pair.*



View of the printed circuit side of the chassis.

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