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"TRADER" SERVICE SHEET
1792

BUSH VTR133

A.M./F.M. Portable Transistored Radio Receiver

FEATURING press-button waveband selection, Bush VTR133 is an a.m./f.m. portable radio receiver. It is powered by a 9V dry battery and employs nine transistors and three crystal diodes.

Waveband ranges are 1,070–1,900m (l.w.), 187–565m (m.w.), 187–210m (bandspread m.w.) and 87.5–100Mc/s (f.m.), with reception via a ferrite rod a.m. aerial and a telescopic f.m. aerial. A socket is provided for the connection of a car type aerial.

Audio output of 1W is available which is handled by the internal 7 in by 4 in loudspeaker. A socket is provided for the connection of an external loudspeaker or earphone (with an impedance of 15Ω), the internal speaker being muted on insertion of the plug.

The receiver is housed in a wooden case with plastics front grill and back cover, trimmed with padded leather cloth.

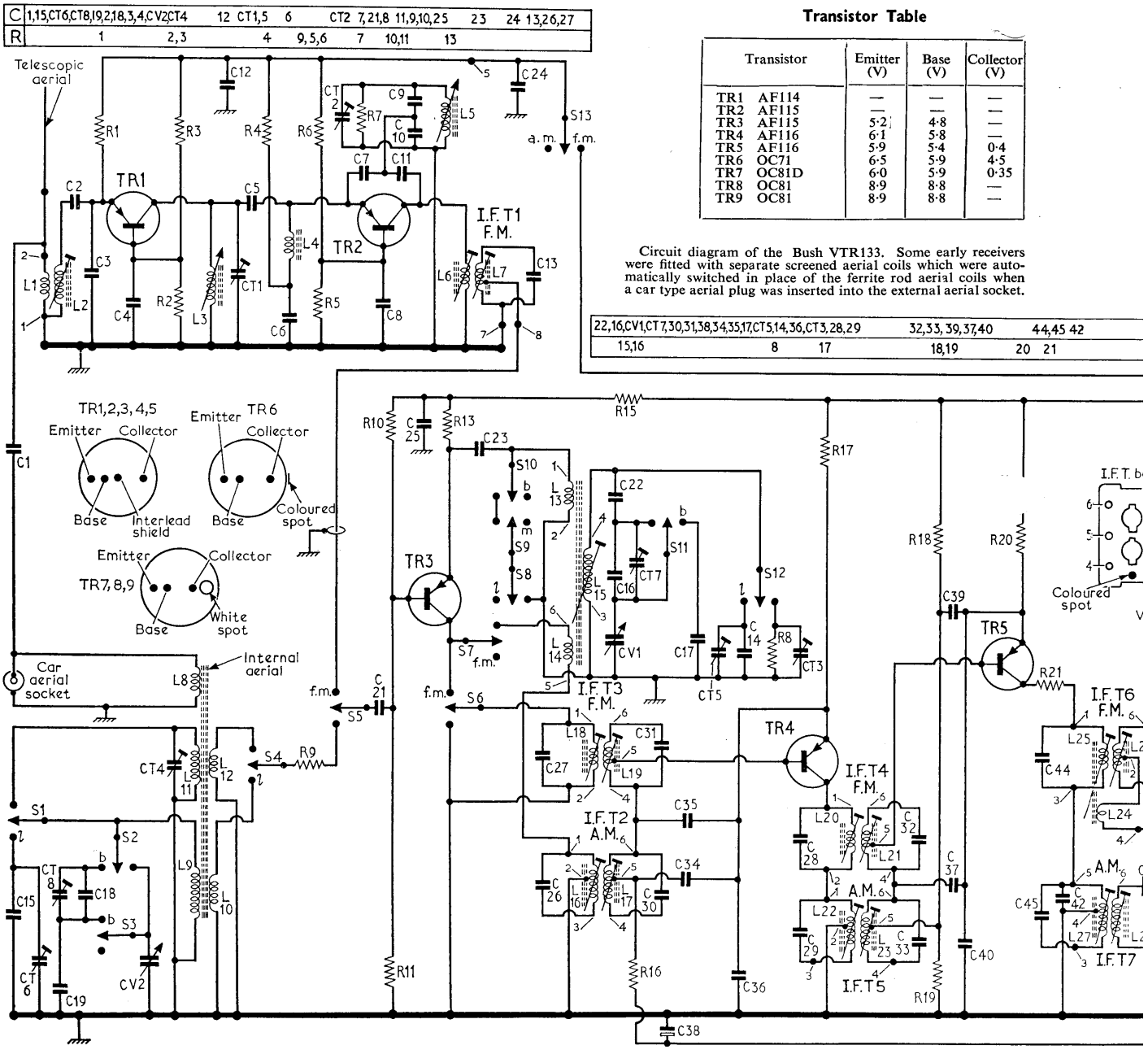
TRANSISTOR ANALYSIS

Transistor voltages given in the table below were taken from data supplied by the manufacturer and were measured under no

(*Continued overleaf col.* 1)

Transistor Table

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 AF114	—	—	—
TR2 AF115	—	—	—
TR3 AF115	5·2	4·8	—
TR4 AF116	6·1	5·8	—
TR5 AF116	5·9	5·4	0·4
TR6 OC71	6·5	5·9	4·5
TR7 OC81D	6·0	5·9	0·35
TR8 OC81	8·9	8·8	—
TR9 OC81	8·9	8·8	—



Circuit diagram of the Bush VTR133. Some early receivers were fitted with separate screened aerial coils which were automatically switched in place of the ferrite rod aerial coils when a car type aerial plug was inserted into the external aerial socket.

Resistors

R1	560Ω	G4
R2	27kΩ	G4
R3	4·7kΩ	G4
R4	560Ω	G4
R5	6·8kΩ	G4
R6	1·5kΩ	G4
R7	15kΩ	G4
R8	180kΩ	E3
R9	150Ω	E3
R10	6·8kΩ	A1
R11	22kΩ	A1
R12	120Ω	E3
R13	1·2kΩ	A1
R14	120Ω	E3
R15	470Ω	A1
R16	1kΩ	A1
R17	1kΩ	A2
R18	6·8kΩ	A2
R19	22kΩ	A2
R20	680Ω	A2
R21	220Ω	A2
R22	15kΩ	A2
R23	1·8kΩ	B1
R24	1·8kΩ	A2
R25	330Ω	A2
R26	1kΩ	A2
R27	12kΩ	A2
R28	15kΩ	C2
R29	82kΩ	D2
R30	1kΩ	D1
R31	5·6kΩ	C2
R32	8·2kΩ	D2
R33	39kΩ	D2
R34	330Ω	D2
R35	68Ω	D2
R36	820Ω	D2
R37	150Ω	D2
R38	3·9kΩ	D2
R39	3·3Ω	D2
R40	150kΩ	D2
R41	150Ω	D1
RV1	5kΩ	B1
RV2	10kΩ	B1
RV3	50kΩ-160kΩ	A2
RV4	500Ω-1·8kΩ	A2
RV5	1·5kΩ-5kΩ	D2

Capacitors

C1	10pF	B2
C2	47pF	G4
C3	22pF	G4
C4	1,000pF	G4
C5	5·6pF	G4
C6	470pF	G4
C7	4·7pF	G4
C8	1,000pF	G4
C9	47pF	G4
C10	47pF	G4
C11	220pF	G4
C12	1,000pF	G4
C13	70pF	G4
C14†	470pF	E3
C15	150pF	A1
C16	33pF	E3
C17	33pF	E3
C18	12pF	E3
C19	33pF	E3
C20	350μF	E3
C21	0·01μF	A1
C22	566pF	A1
C23	0·02μF	A1
C24	0·02μF	G4
C25	0·047μF	A1
C26	560pF	A1
C27	180pF	B1
C28	180pF	B2
C29	560pF	A2
C30	560pF	A1
C31	180pF	A1
C32	180pF	A1
C33	560pF	A2
C34	0·047μF	A1
C35	3,000pF	A1
C36	0·047μF	A2
C37	3,000pF	A2
C38	8μF	A2
C39	3,000pF	A2
C40	3,000pF	A2
C41	300pF	A2
C42	1,000pF	A2
C43	0·047μF	B1
C44	300pF	B2
C45	250pF	A2
C46	0·01μF	A2
C47	0·01μF	A2
C48	50pF	A2
C49	0·22μF	B1
C50	0·02μF	A2
C51	4μF	A2
C52	1,000pF	A2
C53	8μF	A2
C54	0·1μF	A2
C55	8μF	C2
C56	120μF	D1
C57	8μF	C2
C58	350μF	D1
C59	100μF	D2
C60	0·1μF	D1
C61	100μF	D2
CT1	25pF	G4
CT2	10pF	G4
CT3	30pF	A1
CT4	30pF	A1
CT5	30pF	A1
CT6	30pF	A1
CT7	40pF	B2
CT8	40pF	B2
CV1	523pF	B2
CV2	523pF	B2

Coils*

L1	—	G4
L2	—	G4
L3	—	F4
L4	—	G4
L5	—	F4
L6	—	F4
L7	—	G4
L8	—	D1
L9	—	D1
L10	—	D1
L11	—	B1
L12	—	B1
L13	—	A1
L14	—	A1
L15	2·5	A1
L16	7·0	A1
L17	7·5	A1
L18	—	A1
L19	—	A1
L20	—	A2
L21	—	A1
L22	7·5	A2
L23	7·5	A2
L24	—	A2
L25	—	B2
L26	—	A2
L27	5·25	A2
L28	—	A2
L29	—	D1

Transformers

T1	a	125	D2
	b	54·5	
	c	54·5	
T2	a	2·27	D2
	b	2·65	
	c	1·73	

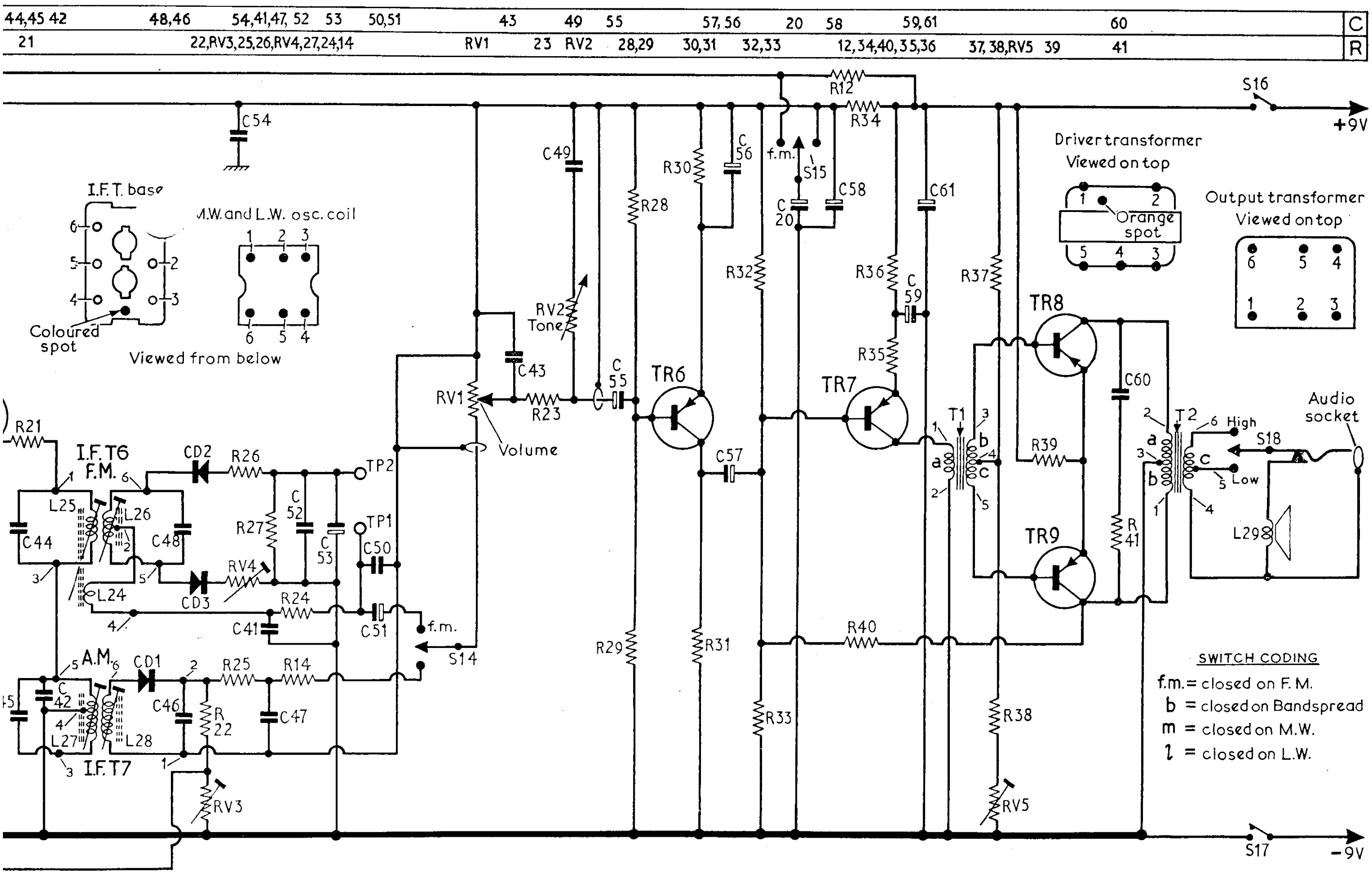
Miscellaneous

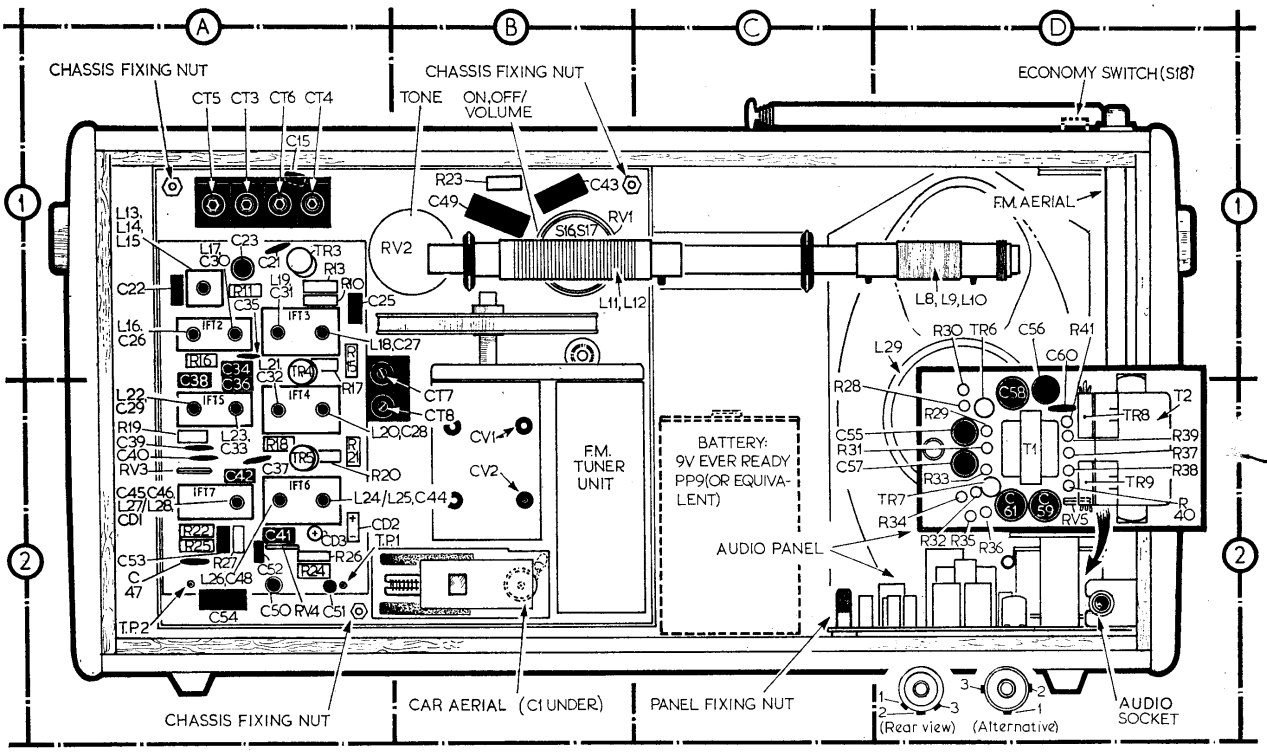
CD1	OA90	A2
CD2	OA79	A2
CD3	OA79	A2
S1-S15	—	E3
S16-S17	—	B1
S18‡	—	D1

† *490pF in some models.*

* *Approximate d.c. resistance in ohms.*

‡ *Not fitted to some receivers.*





General view of the receiver as seen with the back cover removed, showing component locations and alignment adjustments.

Transistor Analysis—*continued*

signal conditions on a model 8 Avometer. The receiver was switched to v.h.f. and the volume control set at minimum. All readings are *positive* with respect to chassis.

CIRCUIT ALIGNMENT

Equipment Required.—An a.m. signal generator covering the ranges 158-1,605kc/s, 10.7Mc/s, and 87.5-100Mc/s, with provision for both modulated and unmodulated output; an audio output meter with an impedance to match 15Ω; a model 8 Avometer; a matched pair of 220kΩ resistors; a 0.1μF isolating capacitor; a suitable non-ferrous trimming tool and an r.f. coupling loop.

Adjustment of RV3.—Before commencing alignment ensure that the battery voltage is at least 9V then adjust **RV3** to give 1V across **R17** with no signal input and with the volume control at minimum.

A.M. Circuits

During alignment the input level should be adjusted to maintain an output of 50mW with the volume control at maximum.

1.—Switch on signal generator and allow to warm up for 15 minutes. Connect the audio output meter in place of the loudspeaker. (By means of the earphone socket if a suitable plug is available.)
Set the volume control to maximum and the tone control to maximum treble response. Ensure that economy switch is in the normal (H) position.

2.—Switch receiver to m.w. and tune to approximately 300m. Connect the output of the signal generator via a 0.1μF capacitor to the base of **TR3** and feed in a 470kc/s modulated signal. Adjust the cores of **IFT7, IFT5** and **IFT2** to their outer peaks for maximum audio output. Align each transformer once only.

3.—Loosely couple the output of the signal generator to the receiver by means of the r.f. coupling loop, placed about 3 feet from the receiver with its plane at right-angle the ferrite rod aerial.
Ensure that the cursor is in line with the calibration marks at the low frequency end of the scale when the tuning gang is at maximum.

4.—Switch receiver to m.w. and tune receiver to 500m. Feed in a 600kc/s signal and adjust **L13/L14/L15** for maximum output.

5.—Tune receiver to 200m and feed in a 1,500kc/s signal. Adjust **CT3** for maximum output.

6.—Repeat operations 4 and 5 and check calibration.

7.—Switch to l.w. and tune receiver to 1,400m. Feed in a 214 kc/s signal and adjust **CT5** for maximum output.

8.—Switch to b.s. and tune receiver so that the cursor lines up with the "m" in "Luxembourg". Feed in a 1,439kc/s signal and adjust **CT7** for maximum output.

9.—Tune receiver so that the cursor lines up with the "o" in "Caroline" and feed in a 1,500kc/s signal. Adjust **CT3** for maximum output.

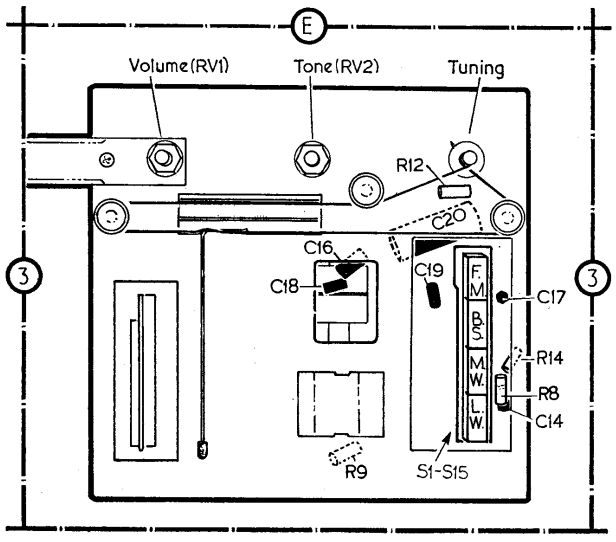
10.—Switch to m.w. and tune receiver to 200m. Feed in a 1,500kc/s signal and adjust **CT4** for maximum output.

11.—Tune receiver to 500m and feed in a 600kc/s signal. Adjust the aerial coils **L11/L12** for maximum output by sliding the coil former along the ferrite rod.

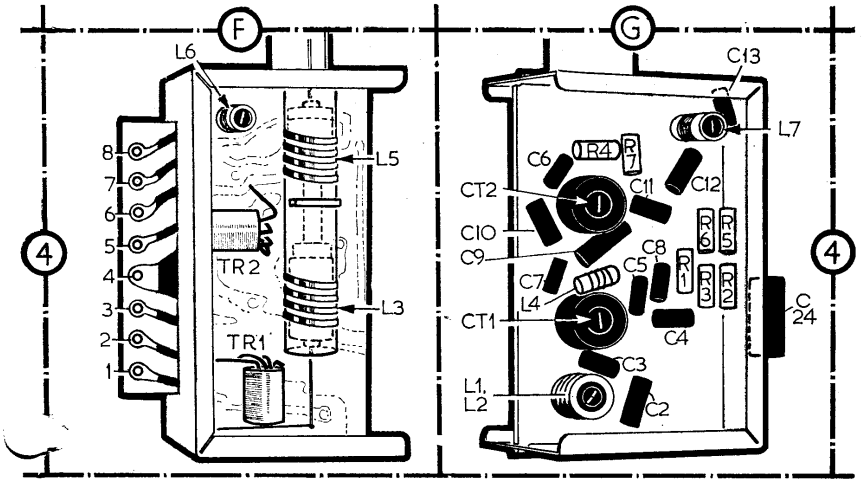
12.—Repeat operations 10 and 11 for optimum results.

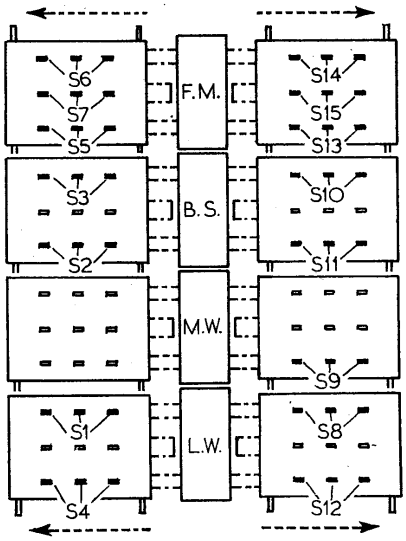
13.—Switch to l.w. and tune receiver to 1,400m. Feed in a 214kc/s signal and adjust **CT6** for maximum output.

14.—Switch to b.s. and tune receiver so that the cursor lines up with the "m" in

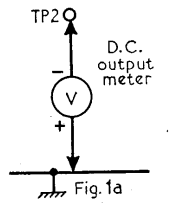


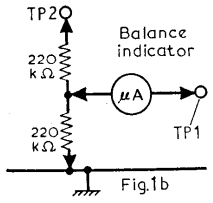
Front view of chassis when removed from case, showing components not visible from rear.





Above: F.M. tuner unit. Right: Waveband switch and meter connection diagrams.





"Luxembourg". Feed in a 1,439kc/s signal and adjust **CT8** for maximum output.

F.M. Circuits

Before commencing alignment of the f.m. circuits, detune the primary of **IFT3** by screwing the core *in* two turns and the secondary of **IFT4** by screwing the core *out* by the same amount.

Connect the model 8 Avometer as shown in Fig. 1a to function as a d.c. output meter and switch to the 10V d.c. range.

The test points are located at the lower end of the i.f. printed panel, **TP1** on the right-hand side and **TP2** on the left.

During alignment the signal input level should be adjusted to maintain an output of approximately 1V on the Avometer.

When using the Avometer as a balance indicator (see Fig. 1b) two matched 220kΩ resistors should be connected in series between TP2 and chassis and the Avometer (50μA range) connected between their junction and TP1.

1.—Switch to f.m. and tune to approximately 94Mc/s. Set volume control to *minimum*.
2.—Connect the signal generator output via a 0.1μF capacitor to the base of **TR3**.
3.—Feed in a 10.7Mc/s, 30% modulated signal and adjust the primary core of **IFT6 (L25)** for maximum output on the d.c. output meter, using the outer peak.
Transfer the connections of the Avometer to between TP1 and the junction of the two 220kΩ resistors connected as shown in Fig. 1b. Switch to 50μA range. The meter now functions as a balance indicator.
5.—Adjust the secondary core of **IFT6 (L26)** for zero output on the balance indicator, using the outer peak. Reconnect the Avometer as d.c. output meter.
6.—Adjust the primary core of **IFT3** to its outer peak for maximum output on the d.c. output meter and the secondary of **IFT3** to its inner peak for maximum output. Readjust the primary core for maximum output.
7.—Similarly adjust the primary of **IFT4** to its outer peak for maximum output and the secondary of **IFT4** to its inner peak for maximum output. Readjust the primary core for maximum output.
8.—Turn volume control to maximum and adjust **RV4** for minimum audio output.
9.—Return the volume control to minimum and readjust the primary of **IFT6** for maximum output.
10.—Transfer connections to the Avometer as shown in Fig. 1b (balance indicator) and readjust the secondary of **IFT6** for zero output on the meter. Reconnect Avometer as d.c. output meter.
11.—Switch off the modulation on the signal generator and transfer the output to the external aerial socket. Feed in a 10.7Mc/s signal and adjust **IFT1** for maximum output on the d.c. output meter.
12.—Check that the screening cover of the v.h.f. tuner unit is securely in position and that the cursor is in line with the calibration marks at the low frequency end of the tuning scale, when the gang is at maximum.
13.—With receiver still switched to v.h.f. connect the signal generator output to the external aerial socket and connect the Avometer as shown in Fig. 1a (d.c. output meter).
14.—Tune receiver to 94Mc/s and feed in an unmodulated 94Mc/s signal. Slacken the locking screw on the v.h.f. calibration adjuster (see diagram below) located on the tuning drive drum. Adjust the lever for maximum output on the d.c. output meter.
15.—Adjust the core of **L1/L2** for maximum output.
16.—Check the calibration at 87.5Mc/s and 100Mc/s and if necessary make small adjustments to the calibration adjuster.

The manufacturers do not recommend adjustment of either **CT1** or **CT2** as these are set at 94Mc/s during production and their settings are not likely to vary.

GENERAL NOTES

Dismantling.—To remove the r.f. chassis, pull off the three control knobs, remove the back cover and disconnect the battery. Undo the three 4BA nuts that secure the chassis to the baffle board and withdraw the assembly to the extent of the connecting leads.

To remove the a.f. panel, undo the knurled fixing screw and lift the panel clear of the slot in the side of the case, to the extent of the leads.

Should both units have to be completely removed, it will be necessary to release the interconnecting leads from the baffle board and unsolder them as necessary.

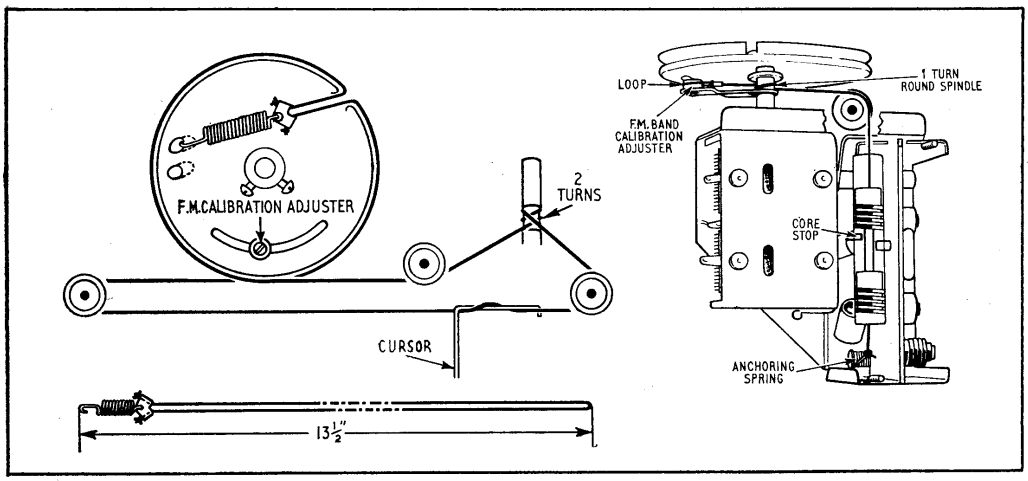
To remove the v.h.f. tuner unit from the r.f. chassis, first remove the tuning scale backing plate and unsolder the connections to the tuner unit. Set the tuning gang to minimum and undo the locking screw on the v.h.f. calibration adjuster. Slip the loop of the v.h.f. tuning cord off the boss of the calibration adjuster. (See diagram).

Remove the four Phillips head screws securing the unit to its mounting bracket, together with the single screw adjacent to the drive cord entry point.

Lift the tuner clear of the chassis and slip the loop in the drive cord through the hole in the bracket.

When replacing the unit ensure that the earthing tags are correctly positioned under their respective screws.

Output Stage Bias Adjustment.—Adjusting the bias level on the output transistors involves inserting an 0-10mA meter in series with the common emitter resistor **R39** and adjusting **RV5** for a reading of 7mA on the meter. This adjustment should be made with the volume control set to minimum and with a battery supply voltage of not less than 9V.



Left: A.m. and f.m. drive cords.

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