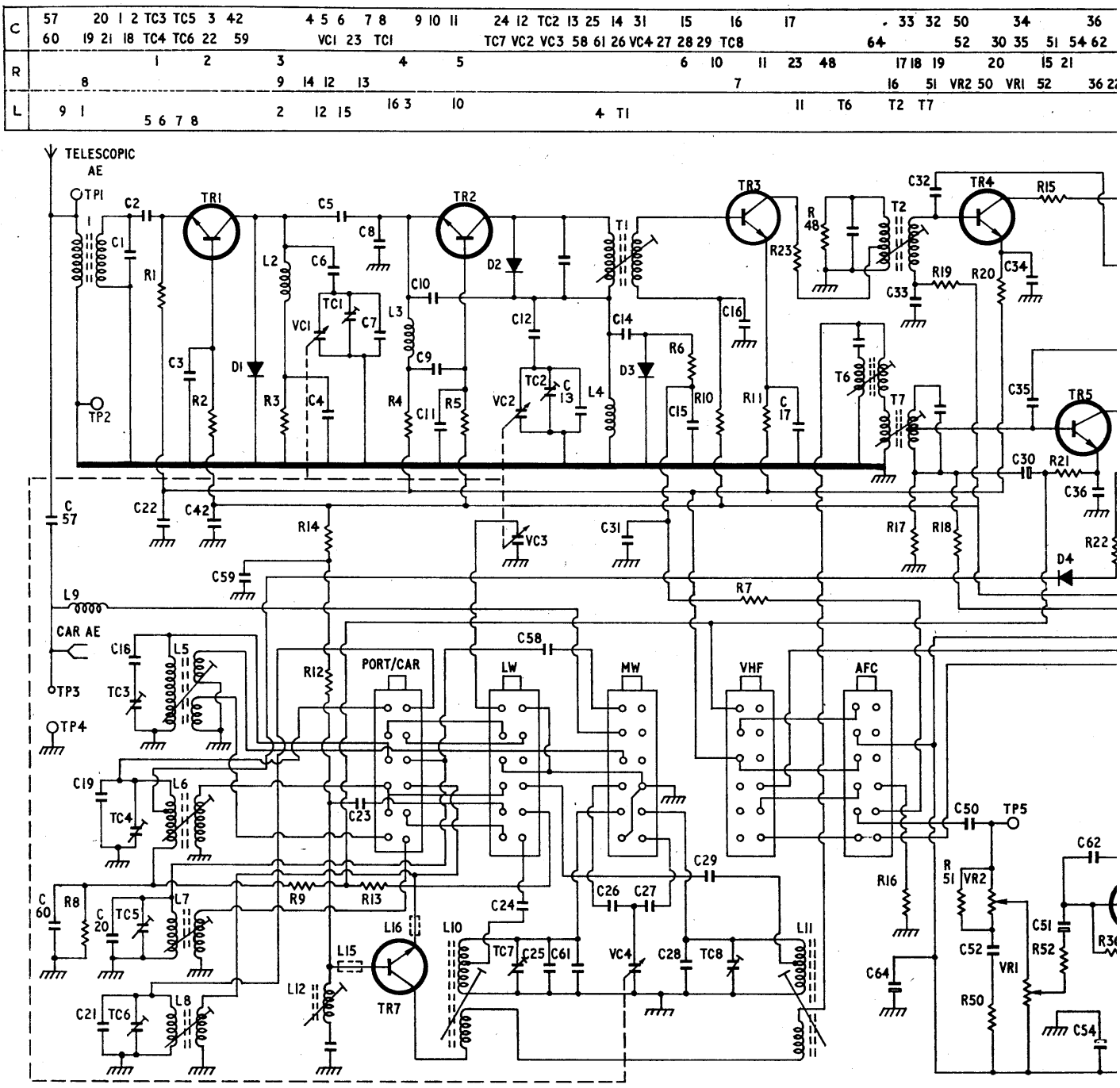
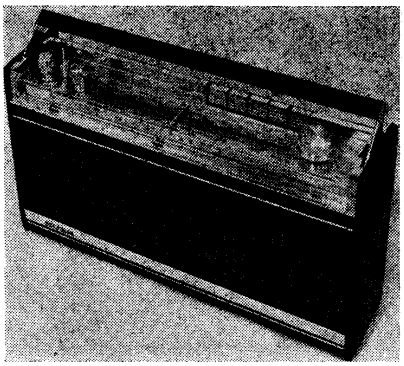
Supplement to Electrical and Electronic Trader
20 October 1972

Bush VTR 165 'Automaster' 3051

A.m./f.m. portable radio receiver





Introduction

Employing eleven transistors and a press-button waveband switch, the Bush VTR165 is a three band a.m./f.m. portable radio receiver.

Housed in a grained dark blue plastics case with simulated wood-grain finish this RBM receiver features switched a.f.c. on v.h.f. and switched car aerial/portable operation. When the 'CAR' press-button is depressed separate r.f. matching transformer networks are introduced instead of the ferrite rod aerial assembly for m.w. and l.w. reception.

Wavebands covered are l.w. 1050-2000m (285-150kHz), m.w. 186-582m (1620-515kHz) and v.h.f./f.m. 87·5-

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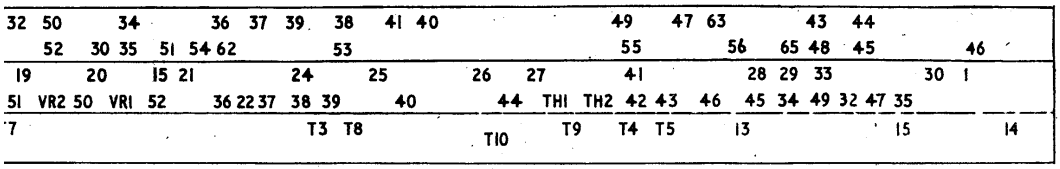

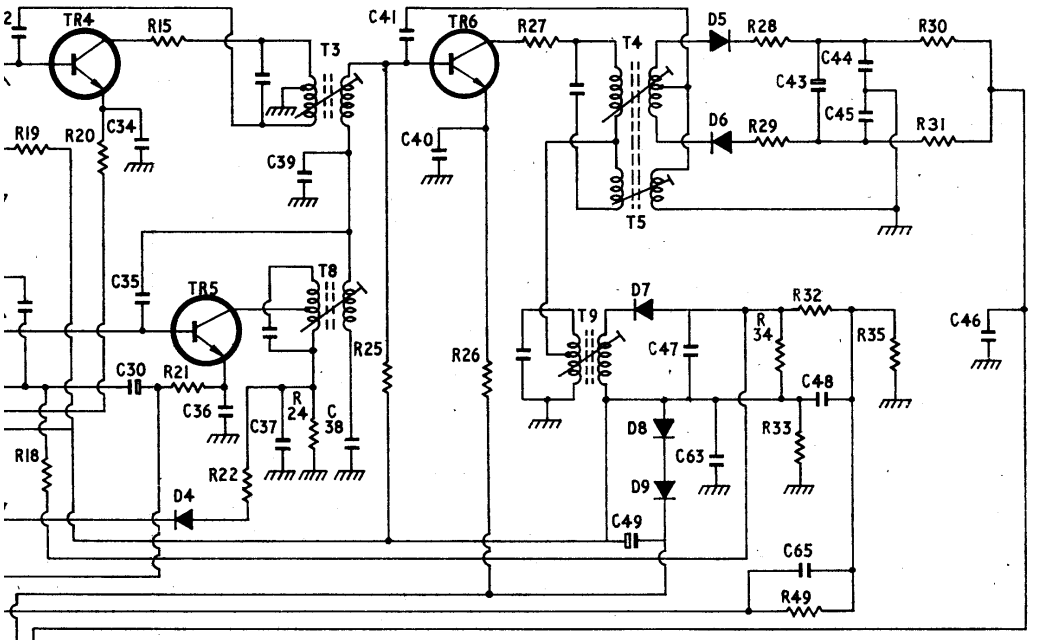

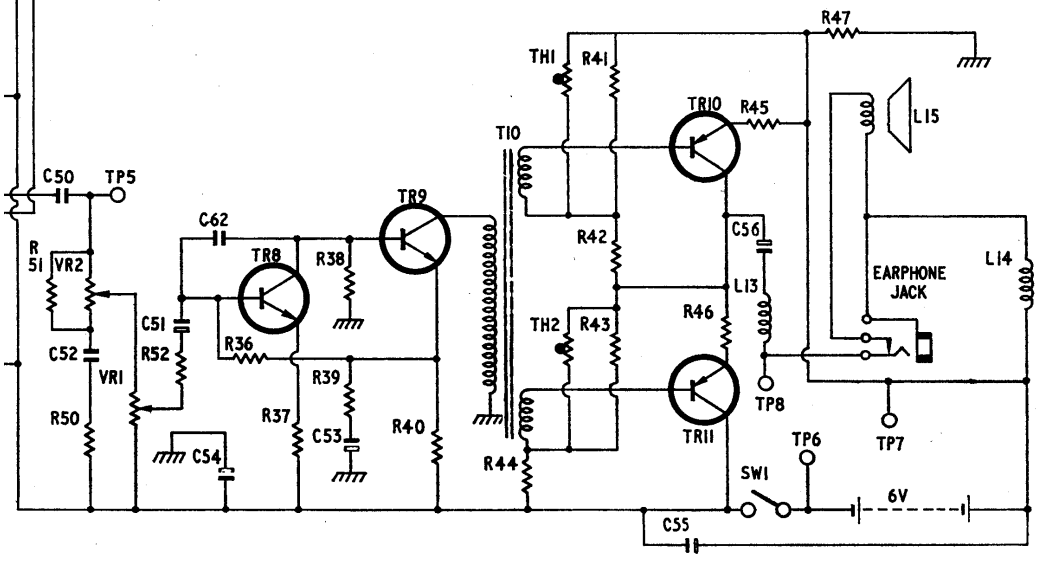

Resistors

R1	680Ω	A2
R2	1·2kΩ	A2
R3	180Ω	A2
R4	2·2kΩ	A2
R5	1·2kΩ	A2
R6	180kΩ	A2
R7	180kΩ	B1
R8	1kΩ	B2
R9	33kΩ	B2
R10	1·2kΩ	B2
R11	1·5kΩ	B2
R12	1·2kΩ	A2
R13	1·5kΩ	A2
R14	180Ω	A2
R15	330Ω	B2
R16	3·3kΩ	B1
R17	180kΩ	B2
R18	6·8kΩ	—
R19	2·2kΩ	B2
R20	680Ω	B2
R21	820Ω	B2
R22	470Ω	B2
R23	560Ω	B2
R24	470Ω	B2
R25	3·9kΩ	B2
R26	560Ω	B1
R27	560Ω	B2
R28	680Ω	B1
R29	680Ω	B1
R30	3·3kΩ	B1
R31	3·3kΩ	B1
R32	4·7kΩ	B2
R33	5·6kΩ	B2
R34	4·7kΩ	B2
R35	100kΩ	B2
R36	82kΩ	C1
R37	120Ω	C1
R38	3·3kΩ	C1
R39	120Ω	C1
R40	560Ω	C1
R41	220Ω	C2
R42	2·2kΩ	C2
R43	220Ω	C2
R44	2·2kΩ	C2
R45	0·5Ω	C2
R46	0·5Ω	C2
R47	100Ω	C2
R48	33kΩ	—
R49	8·2kΩ	—
R50	330Ω	—
R51	12kΩ	—
R52	1kΩ	C1
VR1	—	—
VR2	—	—

Capacitors

C1	30pF	A2
C2	20pF	A2
C3	5000pF	A2
C4	0·01μF	A2
C5	3pF	A2
C6	100pF	A2
C7	15pF	B2
C8	40pF	A2
C9	300pF	A2
C10	3pF	A2
C11	5000pF	A2
C12	200pF	B2
C13	5pF	B2
C14	10pF	A2
C15	0·04μF	B1
C16	5000pF	B2
C17	5000pF	B2
C18	5pF	A1
C20	10pF	A2
C21	35pF	A1
C22	0·01μF	B2
C23	0·02μF	A1
C24	0·015μF	B1
C25	60pF	B2
C26	80pF	B1
C27	270pF	B1
C28	10pF	B2
C29	8200pF	B2
C30	4·7μF	B2
C31	0·02μF	A2
C32	2pF	B2
C33	5000pF	B2
C34	5000pF	B2
C35	35pF	B2
C36	0·04μF	B2
C37	0·02μF	B2
C38	0·04μF	B2
C39	1000pF	B2
C40	0·04μF	B2
C41	3pF	B2
C42	0·02μF	A2
C43	4·7μF	B1
C44	2000pF	B1
C45	2000pF	B1
C46	0·01μF	B1
C47	0·01μF	B2
C48	0·01μF	B2
C49	100μF	C2
C50	4·7μF	B1
C51	4·7μF	C1
C52	0·04μF	—
C53	47μF	C1
C54	470μF	C1
C55	470μF	C2
C56	1000μF	C2
C57	5pF	—
C58	50pF	A1
C59	0·02μF	A2
C60	0·02μF	B2
C61	8pF	B2
C62	1000pF	C1
C63	0·02μF	B2
C64	470μF	—
C65	0·01μF	—
VC1	—	B2
VC2	—	B2
VC3	—	B2
VC4	—	B2
TC1	—	B2
TC2	—	B2
TC3	—	A2
TC4	—	A1
TC5	—	A2
TC6	—	A1
TC7	—	B2
TC8	—	B2

Inductors

L1	—	A2
L2	—	A2
L3	—	A2
L4	—	B2
L5	—	A1
L6	—	C1
L7	—	A2
L8	—	B1
L9	—	C1
L10	—	A2
L11	—	B2
L12	—	A1
L13	—	C2
L14	—	C2
L15	—	A2
L16	—	A2
L17	4Ω	†
T1	—	B2
T2	—	B2
T3	—	B2
T4	—	B2
T5	—	B1
T6	—	B2
T7	—	B2
T8	—	B2
T9	—	B2
T10	—	C2

Miscellaneous

D1	1N34A	A2
D2	1N34A	B2
D3	1S85	A2
D4	1N34A	B2
D5	1N60	B1
D6	1N60	B1
D7	1N34A	B2
D8	1S990	C2
D9	1S990	C2
TH1	NTC	C2
TH2	NTC	C2

† *Loudspeaker.*

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Bush VTR 165

continued from overleaf

104MHz. Reception is via a ferrite rod aerial assembly for l.w. and m.w. or car-type aerial when the appropriate press-button is depressed. A telescopic aerial is fitted for reception on v.h.f. or, alternatively, an external aerial may be used via the car aerial socket.

Rotary controls are fitted for volume-on/off tone and tuning, press-buttons for a.f.c., v.h.f., m.w., l.w. and car in that order.

An audio output power of 600mW is handled by a 6 x 3in elliptical, 4Ω impedance loudspeaker. A normally closed miniature jack is fitted for connecting either an extension loudspeaker or earpiece – inserting the jack-plug automatically operates the internal loudspeaker muting switch.

Power is supplied by a 6V battery made up with four 1·5V cells type SP2 or their equivalent.

Transistor analysis

Transistor voltages given in the table were obtained from data supplied by the manufacturers. They were measured under quiescent conditions with a 20,000Ω/V meter and are positive with respect to the negative supply line.

Transistor table

Transistor		Emitter (V)	Base (V)	Collector (V)
A.m.				
TR5	2SC454B	0·88	0·68	4·77
TR6	2SC460B	0·66	0·66	4·7
TR7	2SC454B	0·79	0·6	5·28
TR8	2SC458B	0·13	0·66	2·16
TR9	2SC458B	1·51	0·69	5·12
F.m.				
TR1	2SC535B	0·64	0·74	4·98
TR2	2SC535B	0·73	0·68	5·15
TR3	2SC460B	0·74	0·65	4·9
TR4	2SC460B	0·69	0·67	4·85
TR6	2SC460B	0·66	0·66	4·53
TR8	2SC458B	0·13	0·66	2·15
TR9	2SC458B	1·49	0·69	5·03
A.m./f.m.				
TR10	2SB370C	6·0	0·15	2·87
TR11	2SB370C	2·85	0·15	0

Quiescent current: a.m. 18mA, f.m. 19mA.

Circuit alignment

Equipment required. – An a.m./f.m. signal generator, an r.f. coupling coil, a 4Ω impedance output meter, a sweep generator and a c.r.o.

Allow about fifteen minutes for test equipment to warm up and stabilize and ensure that car press-button is in the outer – portable operation – position unless instructed otherwise.

Terminate output meter in a miniature jack-plug and insert plug into earphone jack. Set volume control to maximum and maintain an audio output power of approximately 50mW by attenuating input signal as necessary.

Terminate signal generator in an r.f. coupling coil and loosely couple to ferrite rod aerial assembly.

1. – Switch receiver to m.w. and rotate tuning gang to maximum capacitance. Feed in a 470kHz a.m. signal then adjust **T6, T7, T8** and **T9** in that order for maximum output. Adjust **L12** for minimum output.

2. – Tune receiver to 505kHz and feed in a 505kHz a.m. signal. Adjust **L11** for maximum output.

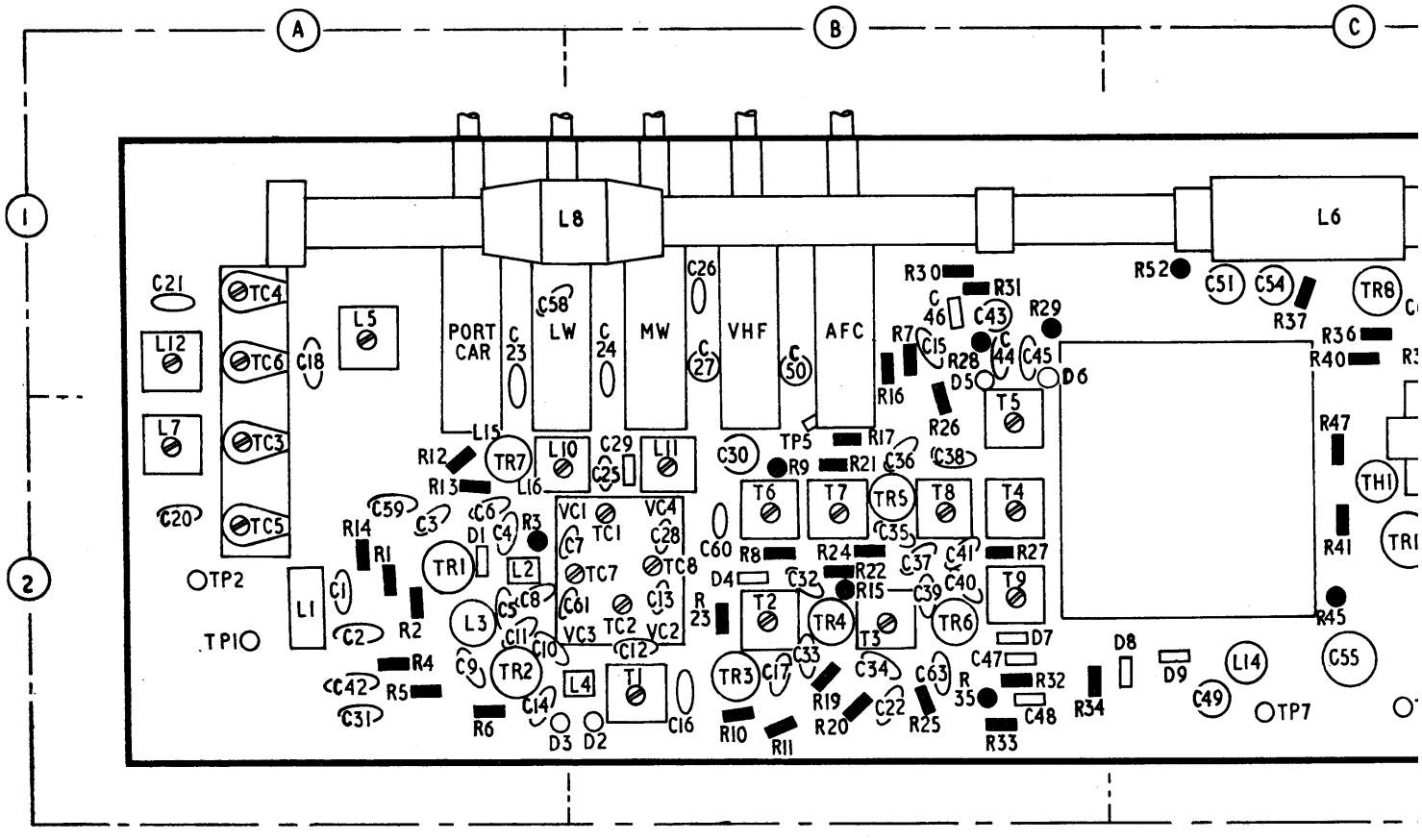
3. – Rotate tuning gang to minimum capacitance and feed in a 1650kHz a.m. signal. Adjust **TC8** for maximum output.

4. – Repeat operations 2 and 3 to establish frequency range.

5. – Tune receiver to 600kHz and feed in a 600kHz a.m. signal. Adjust position of **L6** on ferrite rod for maximum output.

6. – Tune receiver to 1400kHz and feed in a 1400kHz a.m. signal. Adjust **TC4** for maximum output.

7. – Depress car press-button, tune



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receiver to 600kHz then feed in a 600kHz a.m. signal. Adjust **L5** for maximum output.

8. – Tune receiver to 1400kHz and feed in a 1400kHz a.m. signal. Adjust **TC3** for maximum output.

9. – Repeat operations 5 to 8 for optimum calibration.

10. – Switch receiver to l.w., rotate tuning gang to maximum capacitance then feed in a 145kHz a.m. signal. Adjust **L10** for maximum output.

11. – Rotate tuning gang to minimum capacitance then feed in a 300kHz a.m. signal. Adjust **TC7** for maximum output.

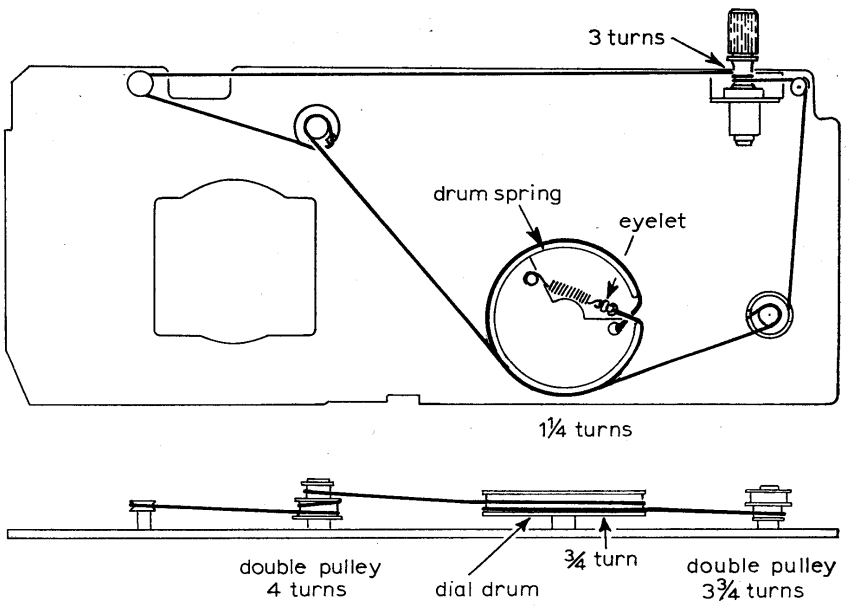
12. – Repeat operations 10 and 11 to establish frequency range.

13. – Tune receiver to 175kHz and feed in a 175kHz a.m. signal. Adjust position of **L8** on ferrite rod for maximum output.

14. – Tune receiver to 250kHz and feed in a 250kHz a.m. signal. Adjust **TC6** for maximum output.

15 – Depress car press-button, tune receiver to 175kHz then feed in a 175kHz a.m. signal. Adjust **L7** for maximum output.

16. – Tune receiver to 250kHz and feed in a 250kHz a.m. signal. Adjust **TC5** for maximum output.



17. – Repeat operations 13 to 16 for optimum calibration then disconnect test equipment.

F.m.

1. – Connect c.r.o. to TP5 – junction **C56/VR2** – and sweep generator output to TP1 – telescopic aerial input to **L1.** Switch receiver to v.h.f./f.m., rotate tuning gang to minimum capacitance and feed in a frequency sweep centred on 10·7MHz. Adjust **T1, T2, T3, T4** and **T5** for maximum symmetrical response about 10·7MHz. Repeat adjustments as necessary for a linear S curve.

2. – Disconnect sweep generator and c.r.o. and reconnect output meter. Connect f.m. signal generator output to TP1 via a 75Ω matching pad if necessary and rotate volume control to maximum.

3. – Rotate tuning gang to maximum capacitance then feed in an 87MHz f.m. signal. Adjust turns spacing of **L4** for maximum output.

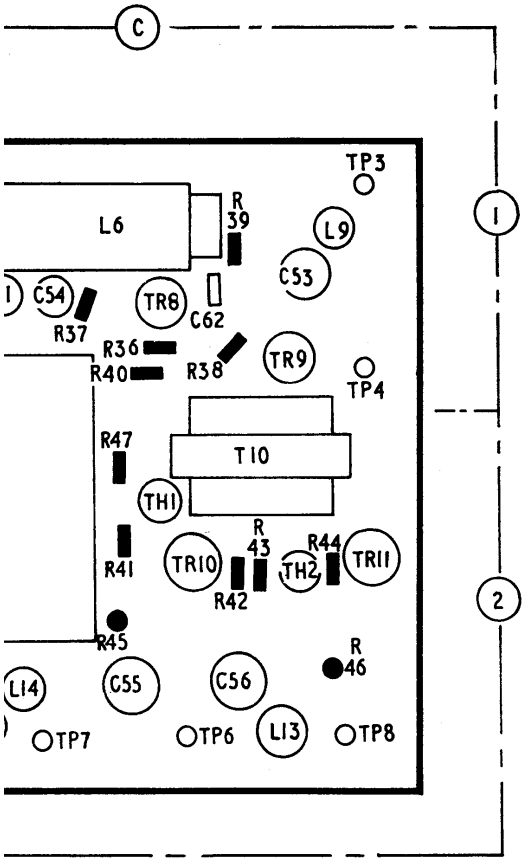
4. – Rotate tuning gang to minimum capacitance then feed in a 104·5MHz f.m. signal. Adjust **TC2** for maximum output.

5. – Repeat operations 3 and 4 to establish frequency range.

6. – Tune receiver to 88MHz and feed in an 88MHz f.m. signal. Adjust turns spacing of **L2** for maximum output.

7. – Tune receiver to 104MHz and feed in a 104MHz f.m. signal. Adjust **TC1** for maximum output.

8. – Repeat operations 6 and 7 for optimum calibration. Disconnect test equipment.



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