Supplement to Electronic Trader,

"TRADER" SERVICE SHEET
1825

DECCA TP90/A

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

DECCA TP90/A a.m./f.m. transistor portable radio receiver covers m.w. (187·3-571m), l.w. (1150-2006m) and v.h.f. (87·5-101Mc/s).

It has an internal ferrite rod aerial for medium and long wavebands and a socket for an external aerial. For v.h.f. a telescopic aerial is fitted.

Nine transistors and five diodes are incorporated in a circuit dispersed over four printed circuit panels, made up as follows: V.h.f. tuner, mains chassis, preamplifier and audio. Plug and socket connections are used throughout with the exception, v.h.f. tuner to main chassis.

Controls consist of four press-buttons for waveband switching and on-off, and two knobs, one each for volume and tuning. All are situated on the top of the case.

Sound output is by a 5in round speaker and a socket is provided for an earphone or external loudspeaker of 15Ω impedance. The internal loudspeaker is muted when this socket is in use.

A socket for the connection of a tape recorder is also provided. This gives direct access to the top of the volume control via a blocking capacitor.

Power is supplied by a 9V (Ever-Ready PP9 type) battery.

The whole is contained in a vinyl covered case with carrying handle.

Battery replacement is facilitated by the removal of the case back after turning two plastic coin slotted screws one quarter turn.

TRANSISTOR ANALYSIS

Voltages given in the table opposite were obtained from information supplied by the manufacturers. They were measured with a model 8 Avometer with respect to the negative line.

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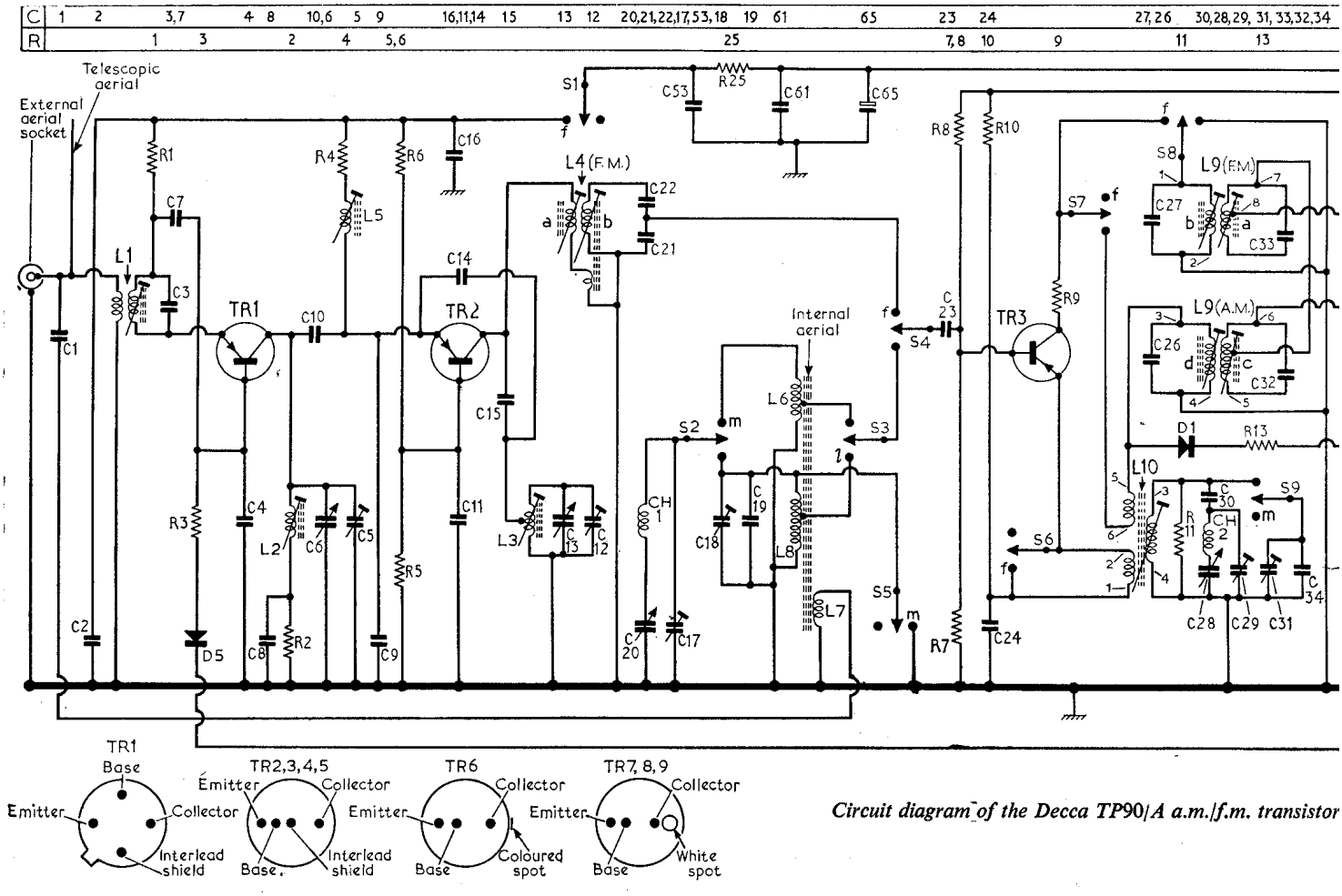
Three-quarter front view of the Decca TP90/A.



Circuit diagram of the Decca TP90/A a.m./f.m. transistor

COMPONENT VALUES & LOCATIONS

Resistors

R1	330Ω	F4
R2	100Ω	F4
R3	1kΩ	F4
R4	3·3kΩ	F4
R5	10kΩ	F4
R6	10kΩ	F4
R7	33kΩ	C1
R8	6·8kΩ	B1
R9	220Ω	C1
R10	1kΩ	B1
R11	270kΩ	B1
R12	2·2kΩ	C2
R13	680Ω	B2
R14	56kΩ	B2
R15	3·3kΩ	B2
R16	330Ω	B2
R17	470Ω	B2
R18	1·5kΩ	B2
R19	3·3kΩ	B2
R20	10kΩ	B2
R21	2·2kΩ	B2
R22	220Ω	B2
R23	470Ω	B2
R24	47Ω	B2
R25	47Ω	B1
R26	390Ω	B2
R27	680Ω	B2
R28	82Ω	B2
R29	6·8kΩ	B1
R30	2·2MΩ	B2
R31	6·8kΩ	B2
R32	22kΩ	B2
R33	1kΩ	B1
R34	180kΩ	E3
R35	10kΩ	E3
R36	3·9kΩ	E3
R37	1kΩ	E3
R38	56kΩ	E3
R39	18kΩ	E3
R40	1kΩ	E3
R41	100Ω	D3
R42	47kΩ	E3
R43	2·2kΩ	D3
R44	100Ω	D3
R45	2·2kΩ	D3
R46	100Ω	D3
R47	2·2Ω	D3
R48	2·2Ω	D3
VR1	5kΩ	B2
VR2	25kΩ	A1

Capacitors

C1	35pF	B1
C2	0·01μF	F4
C3	47pF	F4
C4	1,000pF	F4
C5	20pF	F4
C6	—	F4
C7	1,000pF	F4
C8	1,000pF	F4
C9	560pF	F4
C10	5·6pF	F4
C11	1,000pF	F4
C12	20pF	F4
C13	—	F4
C14	8·2pF	F4
C15	68pF	F4
C16	0·1μF	C1
C17	30pF	B1
C18	30pF	B1
C19	35pF	B1
C20	238pF	F4
C21	1,000pF	F4
C22	300pF	F4
C23	0·01μF	C1
C24	0·02μF	B1
C25	0·1μF	B1
C26	560pF	C2
C27	180pF	C2
C28	238pF	F4
C29	30pF	B1
C30	186pF	B1
C31	30pF	B1
C32	560pF	C2
C33	180pF	C2
C34	150pF	B1
C35	0·1μF	C2
C36	0·1μF	B2
C37	10μF	B2
C38	1,500pF	B2
C39	0·1μF	B2
C40	300pF	B1
C41	180pF	B1
C42	1,000pF	B2
C43	2μF	B2
C44	300pF	B2
C45	180pF	B2
C46	0·1μF	B2
C47	0·1μF	B2
C48	1,000pF	B2
C49	0·1μF	B2
C50	300pF	B2
C51	250pF	B2
C52	0·1μF	B2
C53	0·1μF	B1
C54	50pF	B2
C55	0·01μF	B2
C56	1,000pF	B2
C57	0·02μF	B2
C58	10μF	B2
C59	1,000pF	B2
C60	0·22μF	B1
C61	0·1μF	B1
C62	0·047μF	B2
C63	1,000pF	B2
C64	0·022μF	B1
C65	500μF	B2
C66	0·22μF	B1
C67	0·1μF	E3
C68	10μF	E3
C69	50μF	E3
C70	100μF	E3
C71	100μF	E3
C72	500μF	E3
C73	500μF	B1
C74	50μF	E3
C75	500μF	E3

Coils and Transformers

L1	—	F4
L2	—	F4
L3	—	F4
L4	—	F4
L5	—	F4
L6	—	B1
L7	—	A1
L8	—	A1
L9	—	C2
L10	—	B1
L11	—	B2
L12	—	B2
L13	—	D3
L14	15Ω	‡
CH1	—	C1
CH2	—	C2

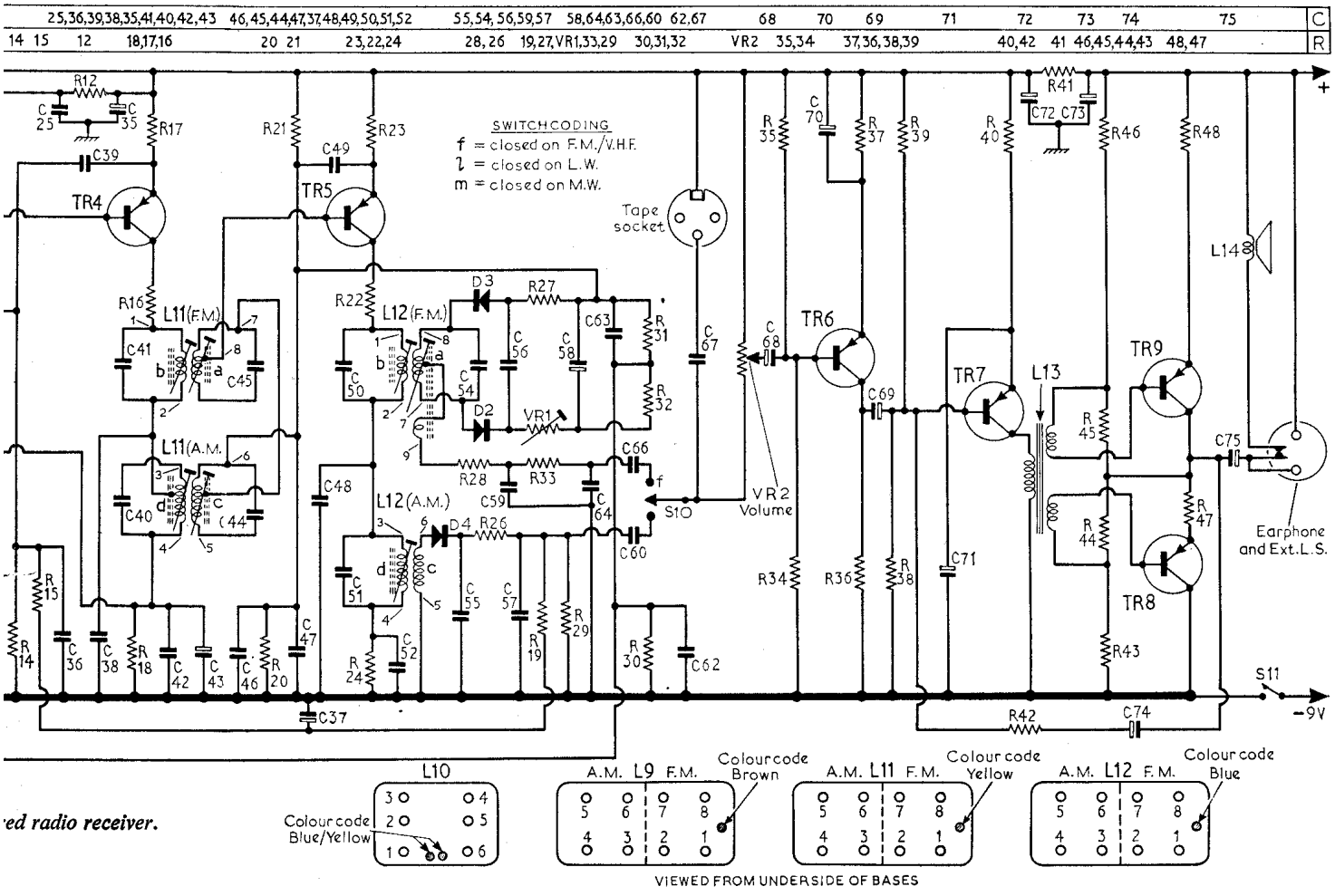
Miscellaneous

D1	—	B2
D2	—	B2
D3	—	B2
D4	—	B2
D5	—	C2
S1-S11	—	B1

‡ *Loudspeaker*

Transistor Table

Transistor		Emitter (V)	Base (V)	Collector (V)
TR1	AF180	5·2	4·5	0·1
TR2	AF115	3·0	2·5	—
TR3	AF114	4·5	4·0	0·1
TR4	AF114	6·0	5·5	1·5
TR5	AF114	5·9	5·5	0·5
TR6	OC71	7·3	6·7	0·3
TR7	OC81/D	7·7	7·3	1·2
TR8	OC81	4·6	4·2	0
TR9	OC81	9·0	6·9	4·6



ed radio receiver.

Continued from overleaf—

CIRCUIT DESCRIPTION

With the receiver switched to v.h.f. **S1** connects the v.h.f. tuner to the power supply. Signals received by either telescopic aerial, or via the external aerial socket are coupled by the broadly tuned r.f. transformer **L1** into the emitter of earthed base amplifier **TR1,** then top capacity coupled by **C10** into emitter of mixer/oscillator **TR2.**

Bandpass coupling components **L2, C5, L5** and **C9** are tuned over the band by **C6, L5** also provides rejection of i.f. at 10·7Mc/s. **C13** which is ganged with **C6** is the variable capacitance providing oscillator tuning in conjunction with **L3** and **C12.**

The i.f. component selected by transformer **L4,** is coupled by impedance matching capacitors **C21, C22** via **S4** and **C23** into the base of **TR3** the f.m./i.f. amplifier.

A short-circuit is placed across the a.m. oscillator feed back winding by the closure of **S6,** while **S7** isolates the a.m./i.f. transformer **L9c** and **d** and coupling winding of **L10** from **TR3** collector. **S8** in position *f* completes the signal path from **TR3** collector via i.f. transformer **L9a** and **b** to **TR4** base.

No more switching is required within the i.f. amplifier and after further amplification by **TR4** and **TR5** the signal is demodulated by a ratio-detector incorporating diodes **D2** and **D3.** After demodulation the a.f. component is fed via the de-emphasis and i.f. filter network **R28, C59, R33** and **C64** to **S10** for connection to the a.f. amplifier.

A potential divider consisting of the series connected resistors **R31** and **R32** is in parallel with **C58,** and is designed to provide a suitable proportion of the d.c. voltage developed across **C58** for use as a.g.c. bias. The bias thus derived is then applied via diode **D5** to the base of the r.f. amplifier **TR1** thereby controlling the gain.

When switched for m.w. or l.w. operation **S1** and **S6** open. **S4, S7, S8** and **S10** make at a.m.

Signals induced into the ferrite rod aerial windings are tuned by **L6, C17** and **C20** for m.w. and **L8, C17, C18, C19** and **C20** for l.w. Switches **S2, S3** and **S8** provide the necessary connections for the waveband in use. The signal is conducted via **S4** and **C23** into the base of the a.m. mixer/oscillator **TR3.** Oscillator tuning for m.w. is obtained from the tuned circuit comprising **L10, C29, C30** and tuning capacitor **C28. S9** includes **C31** and **C34** for l.w. tuning.

After mixing in **TR3** the signal component centered at 472kc/s is selected and coupled by i.f. transformer **L9d** and **c** into the base of **TR4.** Amplitude limiting in **TR3** collector circuit is provided by the damping diode **D1.**

The signal after amplification by **TR4** is coupled by **L11c** and **d** into **TR5** for further amplification then fed via **L12c** and **d** into the series diode demodulator **D4. C55, R26** and **C57** filter out the residual i.f. component and **R29** is the detector load. A.g.c. applied to **TR4** base is derived from the d.c. component present in the rectified signal and filtered by **R19** and **C37.**

Audio frequencies from either system are selected by **S10** and fed to the volume control **VR2. TR6** the first a.f. amplifier is r/c coupled into **TR7,** which has in its collector load the phase splitting transformer **L13,** by which means the signal is fed in anti-phase into the bases of the single ended Class B power amplifier **TR8** and **TR9.** Energy at a.f. from the junction of **R47** and **TR9** collector is a.c. coupled by **C75** into the loudspeaker load **L14.** Non-selective negative feedback is applied between **TR9** collector and **TR7** base via **C74** and **R42.**

CIRCUIT ALIGNMENT

Equipment Required.—An f.m./a.m. signal generator with the following outputs. 10·7Mc/s, 88Mc/s, 100Mc/s, all with 22kc/s deviation. 150kc/s—2Mc/s amplitude modulated 30 per cent; An a.c. voltmeter, 300mV f.s.d. One 1kΩ resistor.

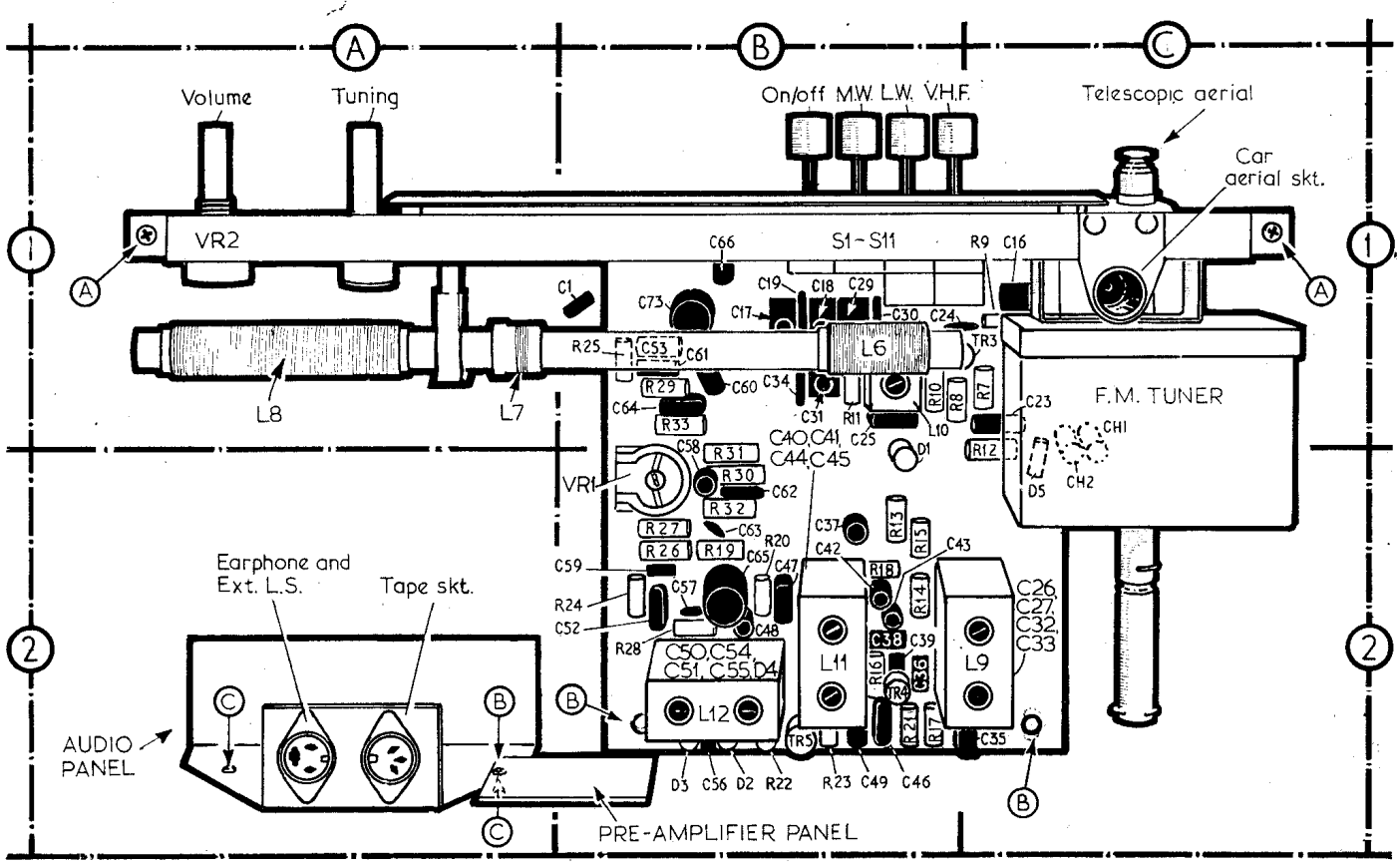
Because the scale is attached to the case, it is advisable to make a temporary scale, with calibration marks indicated, before attempting r.f. alignment. This calibrator could then be clipped to the card, backing the cursor.

Remove the chassis from the case. Instructions for this will be found under "General Notes".

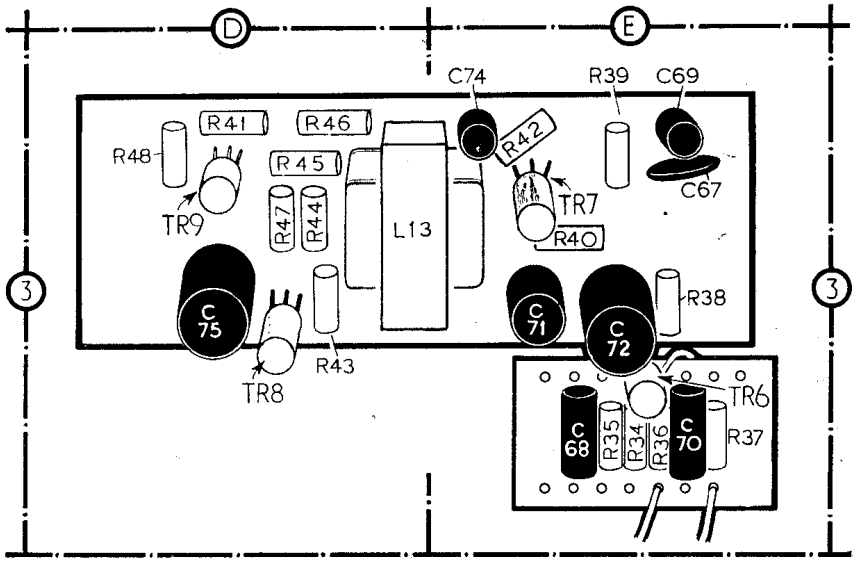
Set the voltmeter to the 300mV a.c. range and connect it across the loudspeaker coil. Turn the volume control to maximum. To avoid a.g.c. action, the input signal level should be kept as low as possible consistent with a reasonable indication on the output meter.

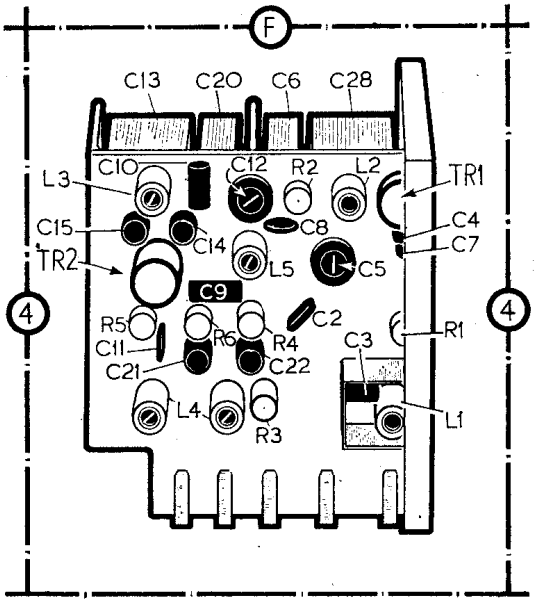
1.—Switch on signal generator and allow 15 minutes to warm up.

2.—Turn tuning capacitor to maximum capacitance switch radio to f.m. and



Rear view of receiver with the back cover removed, showing component locations on the main chassis.





Above: Component locations on the a.f. pre-amplifier and power amplifier panels. Right: F.m. tuner with screen removed showing location of components.

connect f.m. signal generator output lead to junction of **S4** and **C23**, the other lead should be connected to chassis on the printed panel.

3.—Feed in a 10·7Mc/s (22kc/s deviation) signal. Adjust **L9a** and **b, L11a** and **b, L12a** and **b** for maximum output. Repeat until no further increase can be obtained.

4.—Connect signal generator to aerial input terminals. Increase signal. Adjust **L4a** and **b** for maximum output.

5.—Switch signal generator to a.m. position, feed in 10·7Mc/s a.m. 30 per cent modulated signal. Adjust **VR1** for minimum output.

6.—Repeat operations 3, 4 and 5.

7.—Check that the cursor lines up with calibration marks at the low frequency end of tuning scale with tuning gang fully closed.

8.—Tune receiver to 88Mc/s as marked on scale. Switch signal generator to f.m. Feed in an 88Mc/s (22kc/s deviation) signal via aerial socket. Adjust **L2** and **L3** for maximum output.

9.—Feed in 100Mc/s (22kc/s deviation) signal, tune receiver to 100Mc/s as marked on scale. Adjust **C12** and **C5** for maximum output. Tune to 95Mc/s as marked on scale. Maintain input at 100Mc/s. Adjust **L1** and **L5** for maximum output.

10.—Set signal generator to a.m. Switch radio to m.w. disconnect at **L6,** the lead connecting **L6** to **S3.** Connect signal generator between the free end of lead and chassis. Rotate tuning capacitor to maximum capacitance.

11.—Feed in a 472kc/s signal. Adjust **L9c** and **d, L11c** and **d, L12d,** for maximum output. Repeat as necessary.

12.—Disconnect signal generator and reconnect lead to **L6.** Connect signal generator output via the 1kΩ resistor to aerial socket, the other lead to chassis.

13.—Tune receiver to 500 metres as marked on scale. Feed in a 600kc/s signal. Adjust **L10** for maximum output.

14.—Position **L6** on ferrite rod for maximum output.

15.—Tune receiver to 200 metres as marked on scale. Feed in a 1·5Mc/s signal. Adjust **C29** and **C17** for maximum output.

16.—Repeat operations 13-15 until no further improvement is effected.

17.—Switch receiver to l.w. Tune to 1,765 metres as marked on scale. Feed in a 170kc/s signal. Adjust position of **L8** on ferrite rod, and **C31** for maximum output.

18.—Tune receiver to 1,250 metres as marked on scale. Feed in a 240kc/s signal. Adjust **C18** for maximum output.

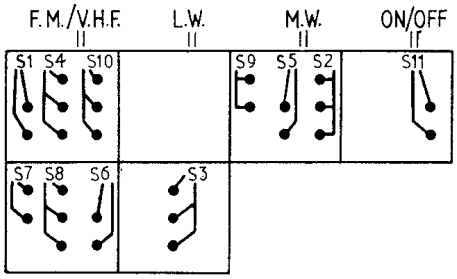
19.—Repeat operations 17 and 18 until no further improvement is effected.

GENERAL NOTES

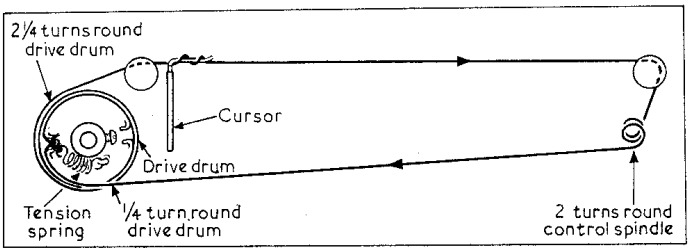
Dismantling.—Remove the case back after turning the two plastics coin slotted screws one quarter turn. Remove the battery. Unscrew two Phillips head screws "A", three 4BA nuts "B", and two Phillips head 4BA screws "C". (See main chassis illustration). Disconnect the loudspeaker leads. Withdraw chassis to the extent of the telescopic aerial lead, and unsolder this lead at the aerial end. The main chassis and subsidiary panels can now be removed.

Audio sockets.—A suitable plug for the earphone socket is a McMurdo TRP3 two pin D.I.N. plug switch. A normal three-pin D.I.N. plug is used for tape recorder connection. Note: Pin 2 is the signal connection.

Press Button Switch Assembly.—The switch diagram below is drawn with the connecting tags as they appear when looking at the chassis from the front (printed circuit side) of the panel. The centre tag of each trio is the common connection which makes contact with the remote tag when the button is depressed and with the near tag when the button is released.



Drive cord assembly viewed from above, with tuning gang at maximum capacitance.



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