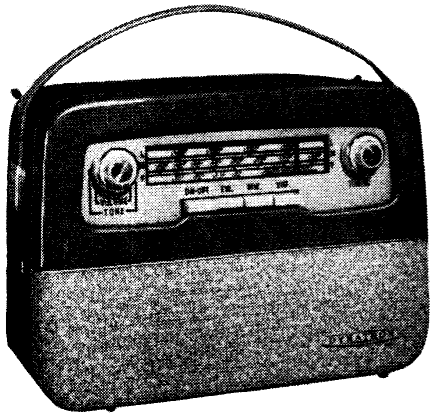
"TRADER" SERVICE SHEET

1559

DYNATRON TP15

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



Appearance of TP15 " Commodore "

NINE transistors and five crystal diodes are employed in the Dynatron TP15 battery operated portable A.M./F.M. radio receiver. Twin telescopic aerials are incorporated for F.M. reception and an internal ferrite rod aerial for A.M. A socket is provided for the connection of a car-type A.M. external aerial. A second socket to which an external loudspeaker, earphone or tape recorder may be connected is wired across the receiver output. Waveband ranges are 183-555m (M.W.), 1,110-2,000m (L.W.) and 88-108Mc/s (F.M.).

Release date and original price: August, 1961, £25 8*s* 9*d*. *Purchase tax extra.*

Transistor Table

Transistor	Emitter (V)	Base (V)	Collector (V)
TR1 OC171)	Inaccessible for voltage measurements		
TR2 OC171)			
TR3 AF116	3·3	3·5	9·0
TR4 AF116	2·8	3·0	7·0
TR5 AF116	3·0	1·2	9·0
TR6 OC71	4·0	3·5	6·0
TR7 OC81D	1·75	2·0	9·2
TR8 OC81	—	0·25	9·5
TR9 OC81	—	0·25	9·5

TRANSISTOR ANALYSIS

Transistor voltage readings given in the table above were taken from information supplied by the manufacturers. They were measured on a model 8 Avometer switched to its 10V D.C. range. All readings are negative with respect to battery positive (not chassis) and care should be taken during measurement not to short-circuit transistor electrodes to chassis. Battery voltage was 9.5V. The receiver volume control was turned fully anti-clockwise.

CIRCUIT DESCRIPTION

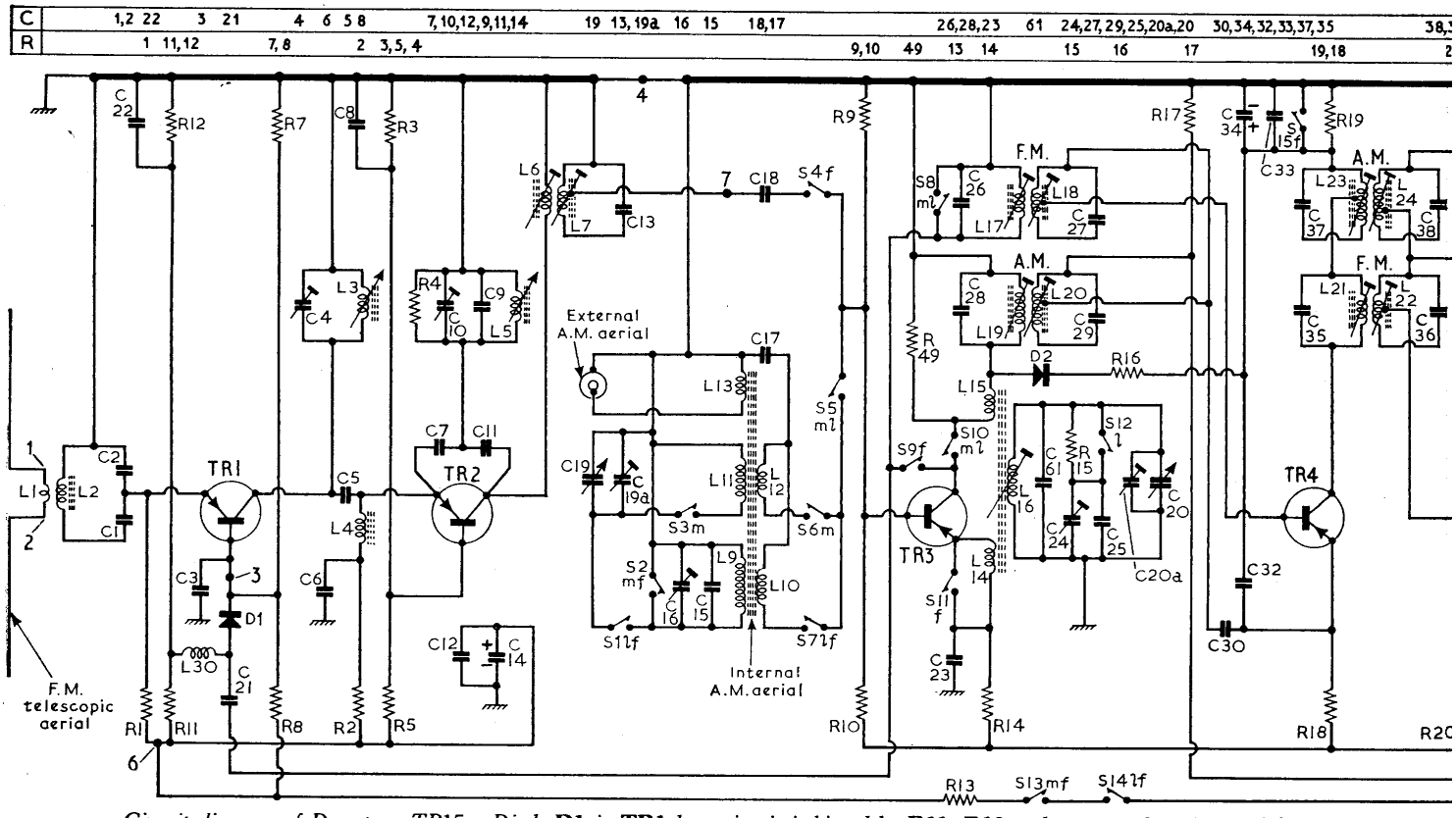
Operation on A.M.—M.W. aerial coils **L11, L12,** and L.W. **L9** and **L10** together with external coupling coil **L13** are mounted on a ferrite rod to form an internal aerial. On M.W., **S3** is closed and **L11** is tuned by **C19** and **C19a,** the received signal being fed from **L12** via **S6** and **S5** to the base of the mixer **TR3.**

On L.W. **S1** is closed and **L9** is tuned by **C19, C19a** with **C15** and **C16** in parallel, the received signal then being fed from **L10** via **S7** and **S5** to the base of **TR3.**

Correct operating bias is provided by the potentiometer **R9, R10. TR3** operates as a self-oscillating mixer, regeneration is obtained by feedback from collector to emitter provided by the coupling of **L14** and **L15.**

The frequency of operation is determined by the tuned circuit comprising on M.W., **L16, C20, C20a** and **C61. R15** in series with **C25** and **C24** provide frequency dependant damping and helps maintain constant oscillator amplitude over the medium wave band. On L.W. **R15** is short circuited by **S12, L16** being tuned by **C20, C20a, C61, C24** and **C25** in parallel.

D.C. stabilization of the emitter current of **TR3** is provided by **R14,** degeneration at R.F. is prevented by the decoupling capacitor **C23.** The intermediate frequency signal generated by **TR3** is fed via the double tuned coupling transformer **L19, L20** to the base of the first I.F. amplifier **TR4.** Base bias is provided by **R17, R30** and **R48;** emitter current stabilization by **R18** decoupled by **C30, C32.** The amplified signal from **TR4** is coupled by means of a second double tuned transformer **L23, L24** to the base of the



Circuit diagram of Dynatron TP15. Diode **D1** *in* **TR1** *base circuit is biased by* **R11, R12** *and prevents the R.F. amplifier from being overl*

second I.F. amplifier. **TR5.** Base bias is provided by **R20, R21** and emitter current stabilization by **R22** decoupled by **C40, C41.** The output of **TR5** is fed to the diode detector **D5** via the single tuned transformer **L28, L29.** The audio signal resulting from the rectification of the I.F. signal by **D5** is developed across **R48. C47** prevents the formation of R.F. voltage across **R48.**

The audio signal is fed via **R47** and **S19** or **S17, S18** to the volume control **R31.**

The D.C. component of the rectified signal is fed via **R30,** decoupled by **C31** to the base of **TR4.** This voltage is of positive polarity and thus reduces the bias on **TR4,** resulting in a decrease of emitter current and a reduction in gain, thus providing A.G.C. action.

A.G.C. action is further assisted on strong signals by the action of **D2** and **R16** as follows:—The cathode of **D2** is connected via **R16** to the junction of **R19, C33, C34** and the cold end of **L23** primary. Under no signal conditions the potential of the cathode of **D2** is about 2 volts less negative than the HT line by virtue of the voltage drop due to the collector current of **TR4** flowing through **R19** (2.2K ohms).

The anode of **D2** is connected to the "live" end of the primary of **L19,** and is maintained almost at HT potential.

Diode **D2** is thus reversed biased and presents a high impedance, having a negligible effect on the circuit. When a strong signal is received the collector current of **TR4** is reduced by the A.G.C. action described above, this decrease in current causes the voltage dropped across **R19** to decrease reducing the reverse bias on **D2** and lowering its impedance, thus damping **L19,** resulting in a further reduction in gain.

With the reception of a very strong signal, the bias on **D2** is reversed, causing **D2** to conduct strongly and heavily damp **L19.**

D2 also operates as a "catching diode" and prevents the collector voltage of **TR3** from "bottoming," as might otherwise occur with strong impulsive interference, causing blocking and other troubles.

Operation on F.M.—The signal from the telescopic "V" dipole aerial is coupled by the broad-band input transformer, **L1, L2,** to the emitter of the RF amplifier **TR1.** The amplified output of **TR1** is tuned by **L3, C4,** and is fed to the emitter of the mixer **TR2.**

L4, C6 is an I.F. rejection circuit. The frequency of oscillation is determined by the circuit consisting of **L5, C9, C10, R4.**

I.F. output of the mixer is coupled by the

(*Continued overleaf col.* 1)

COMPONENT VALUES AND LOCATIONS

Resistors

R1	560Ω	E3
R2	3·3kΩ	E3
R3	10kΩ	E3
R4	10kΩ	E3
R5	10kΩ	E3
R6	—	†
R7	22kΩ	B1
R8	3·9kΩ	B1
R9	27kΩ	B2
R10	6·8kΩ	B2
R11	1·5kΩ	A2
R12	5·6kΩ	A2
R13	150Ω	C1
R14	1kΩ	A1
R15	270kΩ	A2
R16	820Ω	B2
R17	56kΩ	B2
R18	680Ω	B2
R19	2·2kΩ	B2
R20	3·9kΩ	C2
R21	18kΩ	C2
R22	1kΩ	C2
R23	220Ω	C2
R24	470Ω	C2
R25	1·5kΩ	C2
R26	18kΩ	D2
R27	5·6kΩ	C2
R28	4·7kΩ	C2
R29	330Ω	C2
R30	8·2kΩ	C2
R31	5kΩ	C1
R32	47kΩ	D1
R33	120kΩ	C1
R34	8·2kΩ	D1
R35	12kΩ	C1
R36	470Ω	D1
R37	12kΩ	D1
R38	100kΩ	D1
R39	680Ω	D1
R40	270kΩ	D2
R41	68Ω	D2
R42	8·2kΩ	D2
R43	8·2kΩ	D2
R44	5·6Ω	D2
R45	5kΩ	D1
R46	10kΩ	D1
R47	15kΩ	§
R48	5·6kΩ	§
R49	82kΩ	§

Capacitors

C1	470pF	E3
C2	30pF	E3
C3	1,000pF	E3
C4	20pF	E3
C5	5·6pF	E3
C6	470pF	E3
C7	3·3pF	E3
C8	1,000pF	E3
C9	30pF	E3
C10	8pF	E3
C11	68pF	E3
C12	1,000pF	E3
C13	68pF	E3
C14	350μF	B1
C15	68pF	H5
C16	30pF	H5
C17	0·02μF	F6
C18	1,000pF	B1
C19, C19a	—	H6
C20, C20a	—	H6
C21	1,000pF	B2
C22	0·04μF	A2
C23	0·02μF	A1
C24	30pF	H5
C25	330pF	H5
C26	180pF	G5
C27	180pF	G5
C28	560pF	G5
C29	560pF	G5
C30	2,200pF	B2
C31	8μF	B2
C32	0·25μF	B2
C33	1,000pF	B2
C34	2μF	C2
C35	180pF	G5
C36	180pF	G5
C37	300pF	G5
C38	300pF	G5
C39	2,200pF	C2
C40	0·04μF	C2
C41	0·1μF	B2
C42	1,000pF	C2
C43	300pF	G5
C44	10pF	G5
C45	250pF	G5
C46	0·01μF	G5
C47	0·01μF	C2
C48	330pF	D2
C49	8μF	D2
C50	470pF	C2
C51	3,000pF	D2
C52	0·1μF	C2
C53	0·25μF	C1
C54	100μF	D1
C55	1μF	D1
C56	100μF	D1
C57	100μF	C1
C58	100μF	A2
C59	0·25μF	F5
C60	100μF	D1
C61	15pF	H6

Coils

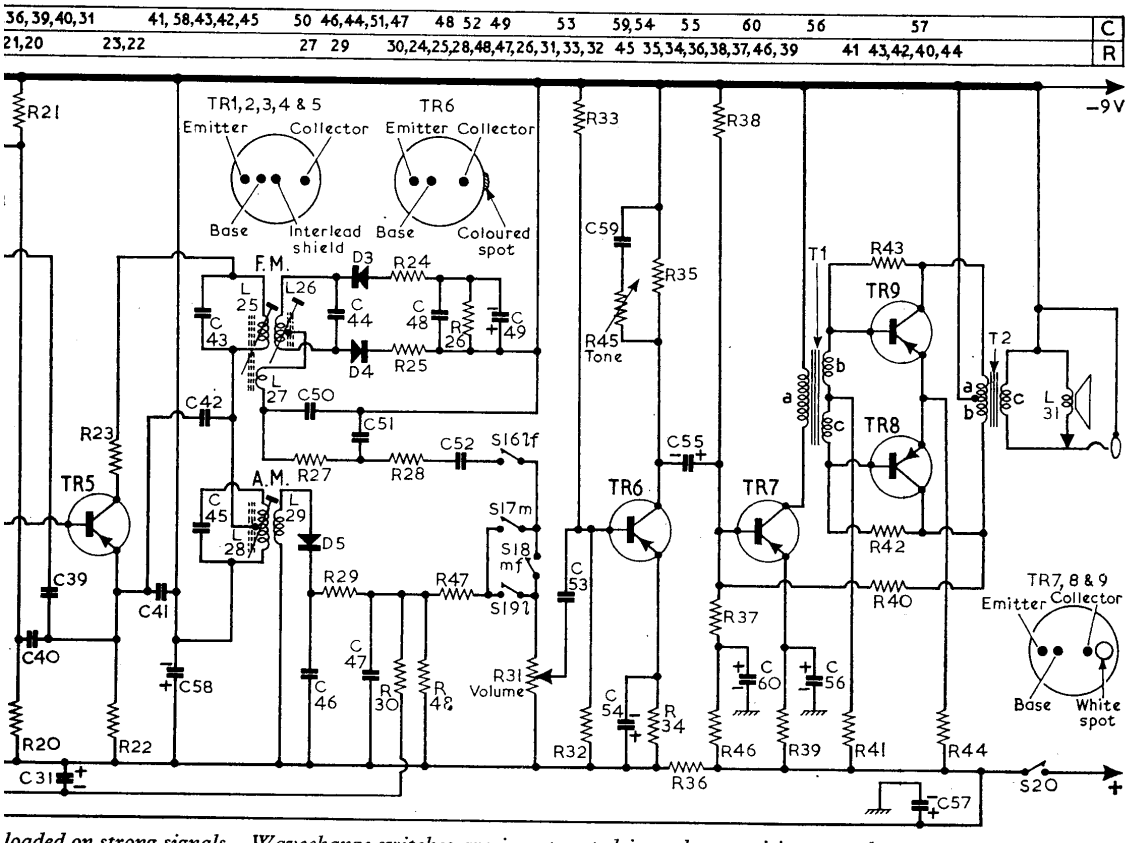
L1	—	E3
L2	—	E3
L3	—	E3
L4	—	E3
L5	—	E3
L6	—	E3
L7	—	E3
L8	—	†
L9	—	H6
L10	—	H6
L11	—	F6
L12	—	F6
L13	—	G6
L14	—	A2
L15	—	A2
L16	—	A2
L17	—	B2
L18	—	B2
L19	—	B2
L20	—	B2
L21	—	B2
L22	—	B2
L23	—	B2
L24	—	B2
L25	—	C2
L26	—	C2
L27	—	C2
L28	—	C2
L29	—	C2
L30	—	A2
L31	—	—

*Transformers**

T1	a	100·0	D2
	b	25·0	
	c	25·0	
T2	a	1·25	D2
	b	1·25	
	c	—	

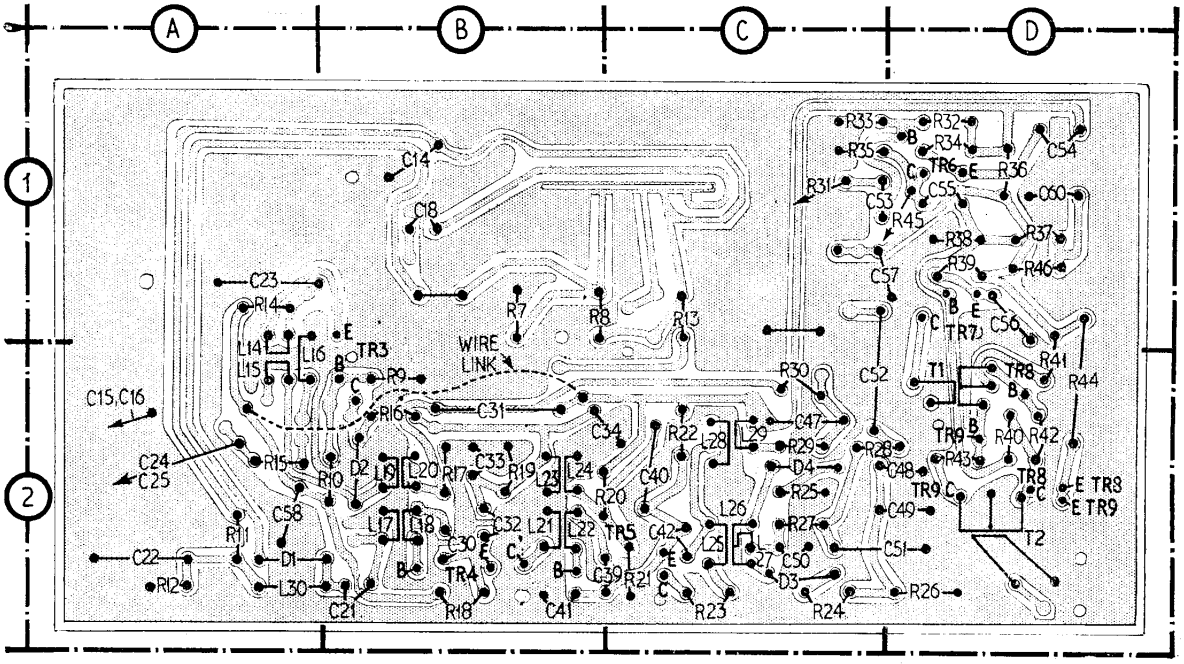
Miscellaneous

D1	OA79	A2
D2	OA79	B2
D3	OA79	C2
D4	OA79	C2
D5	OA70	G5
S1-S19	→	G5
S20	—	G5



loaded on strong signals. Wavechange switches are incorporated in a three-position press-button unit

**Approximate D.C. resistance in ohms.*
†No Component.
§Wired on press button unit.



Foil-side view of the main receiver printed circuit panel as it appears when looking into the rear of the receiver. A metal screening cover (not shown) normally obscures the lower part of the panel and is punched with holes to allow access to the cores of the I.F. and A.M. oscillator coils. It should be in position during alignment

Circuit Description—*continued*

I.F. transformer **L6, L7** via **S4** to the base of **TR3** which becomes the 1st FM I.F. amplifier. The output of **TR3** is fed via **S9** to the 2nd FM I.F.T. **L17, L18.** The signal also feeds the diode **D1** via **C21,** to provide AGC on strong signals, by reducing the gain of **TR1.** A suitable delay voltage is provided by **R11, R12.**

The signal is further amplified by **TR4, TR5,** a composite AM/FM I.F. amplifier.

Audio modulation of the I.F. signal is recovered by the ratio detector circuit consisting of **L25, L26, L27, C43, C44, D3, D4, R24, R25, R26, C48, C49.** R.F. filtering and de-emphasis is carried out by **R27, R28, C50, C51.** The audio signal is then fed via **C52** and **S16** and **S18** to the volume control **R31,** and hence as for AM through the audio amplifier to the loudspeaker.

CIRCUIT ALIGNMENT

Equipment Required.—A signal generator with the necessary frequency coverage, modulated 30% at 400c/s; an R.F. coupling loop which can be constructed by winding three turns of insulated wire to a diameter of 10ins; an output meter; a 20,000Ω/V meter (model 8 Avometer is suitable); a bladed type non-metallic trimming tool for the I.F. cores; two capacitors, 0.1μF and 0.04μF and two matched 100kΩ resistors.

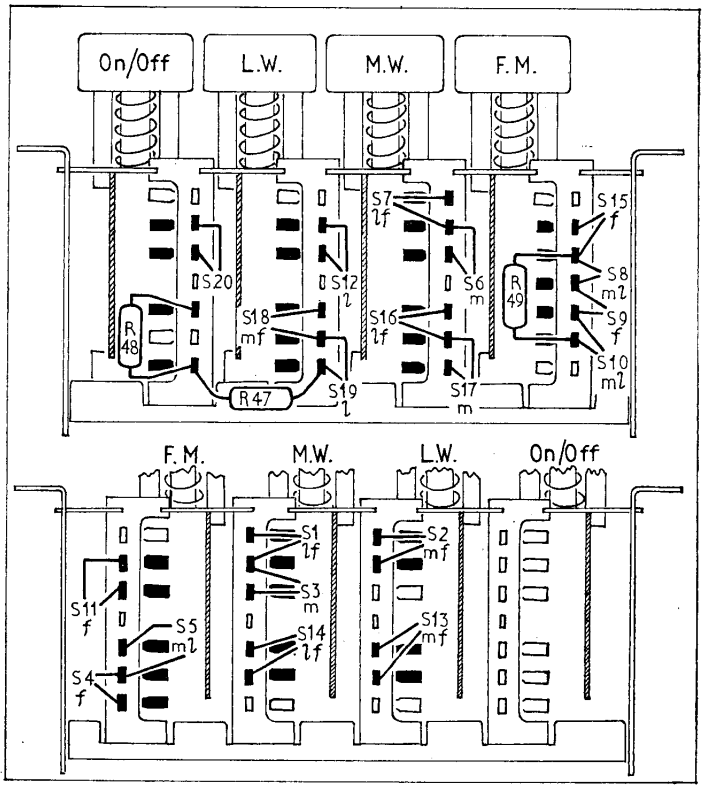
A.M. I.F. Alignment

1.—Connect the output meter in place of the loudspeaker. Connect the signal generator via the 0.1μF capacitor between chassis and the base of **TR3** i.e. across **R9** (location reference B2).
2.—Switch receiver to M.W., set the volume control to maximum output and the tone control fully anti-clockwise. Tune receiver to the low frequency end of the scale.
3.—Feed in a 470kc/s modulated signal and adjust **L28** (C2), **L24** (B2), **L23** (B2), **L20** (B2) and **L19** (B2) in that order for maximum output, adjusting the input to maintain an output of about 50mW as the circuits come into line. Repeat until no further improvement can be obtained.

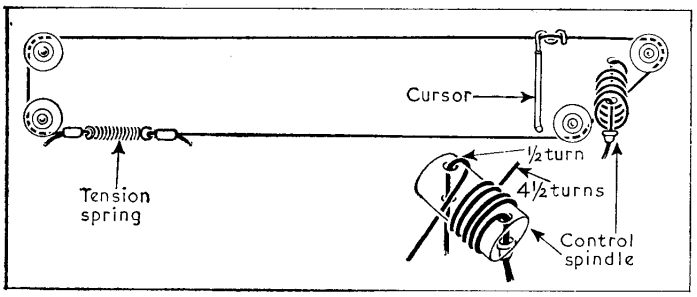
A.M. R.F. Alignment

1.—Check that the scale cursor travels symmetrically within the scale aperture between the limits of the tuning gang travel. Connect the output from the signal generator to the ends of the coupling loop. Place the loop 24 inches from the centre of the ferrite rod coaxial with the rod.
2.—Switch to M.W. and tune receiver to the L.F. end of scale. Feed in a 540kc/s signal and adjust **L16** (A2) for maximum output.
3.—Tune receiver to the H.F. end of scale, feed in a 1,640kc/s signal and adjust **C20a** (H6) for maximum output.
4.—Repeat operations 2 and 3 until no further improvement can be obtained.
5.—Switch to L.W. and tune receiver to a point midway between the 1,400m and 1,600m marks on scale. Feed in a 200kc/s signal (or use B.B.C. Light programme) and adjust **C24** (H5) for maximum output.
6.—Switch to M.W. Feed in a 600kc/s signal and tune receiver to this signal. Adjust **L11** (F6) for maximum output.
7.—Feed in a 1,300kc/s signal and tune receiver to this signal. Adjust **C19a** (H6) for maximum output.

Right: Two views of the switch unit, from above (top) and below the chassis with the chassis rear facing the observer



Below: Scale drive cord assembly with (inset) details of the method of threading round the tuning spindle



8.—Repeat operations 6 and 7 until no further improvement can be obtained.
9.—Switch to L.W. Feed in a 160kc/s signal and tune receiver to this signal. Adjust **L9** (H6) at the same time slightly rock the tuning control for maximum output.
10.—Feed in a 260kc/s signal and tune receiver to this signal. Adjust **C16** (H5) for maximum output.
11.—Repeat operations 9 and 10 until no further improvement can be obtained.

F.M. I.F. Alignment

1.—Connect the two matched 100kΩ resistors across **C49** (location reference D2). Connect the model 8 Avometer across **C49** for use as an output meter. Connect the signal generator via the 0.04μF capacitor to the base of **TR5.**
2.—Switch to F.M., feed in a 10.7Mc/s signal and adjust **L25** (C2) for maximum output on the D.C. meter.
3.—Transfer the voltmeter between the junction of the two 100kΩ resistors and the junction of **R27** and **R28.** Adjust **L26** (C2) for *zero* reading on meter (the meter reading should swing from one polarity to the other through zero).
4.—Repeat operations 2 and 3 until no further improvement can be obtained.
5.—Reconnect D.C. meter as in operation 1. Transfer signal generator to the base of **TR4.** Feed in a 10.7Mc/s signal and adjust **L21** (B2) and **L22** (B2) for maximum output on the meter.
6.—Transfer signal generator to the base of **TR3.** Feed in a 10.7Mc/s signal and adjust **L17** (B2) and **L18** (B2) for maximum output.
7.—Connect signal generator across **L1** (across tuner unit terminals 1 and 2). Feed in a 10.7Mc/s signal and adjust the tuning control to select the strongest signal, i.e. avoid receiving harmonics of 10.7Mc/s. Adjust **L6** and **L7** (G6) for maximum output.
8.—Check the adjustment of **L25, L22, L21, L18, L17, L7** and **L6.**

F.M. Tuner Unit

1.—Connect the signal generator across **L1,** feed in a 99Mc/s signal and tune receiver to this signal.
2.—Slacken the grub screw in the collar of the tuning gang spindle, holding the collar to retain the receiver tuning. Rotate the tuning knob to bring the cursor in line with the 99Mc/s calibration mark then tighten the grub screw. Correct small errors by adjustment to **C10** (G6).
3.—Feed in a 92Mc/s signal and tune receiver to this signal. Adjust **C4** (G6) for maximum output at the same time rock the tuning control slightly to prevent oscillator pulling.

GENERAL NOTES

Dismantling:—Open rear cover and unplug aerial leads from F.M. aerial terminals.

Disconnect batteries and unplug output socket leads from output transformer.

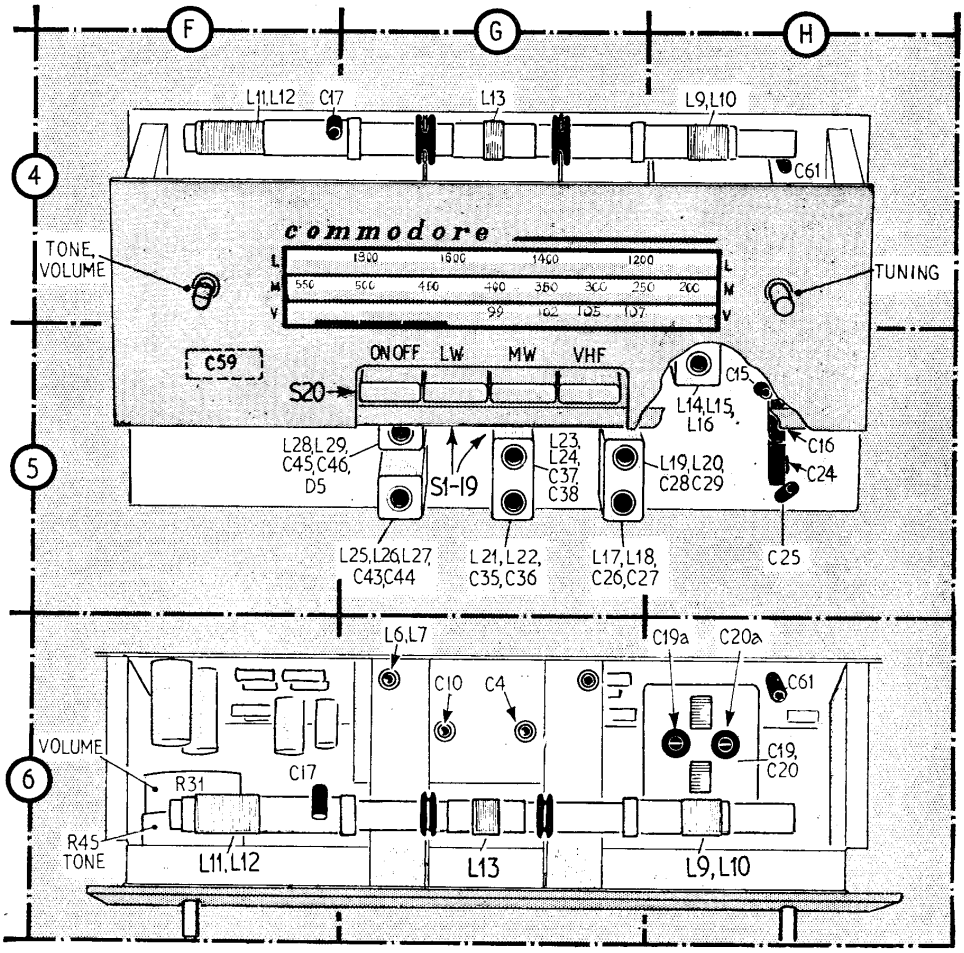
Unplug both leads from car aerial socket.

Remove the four cheese-headed screws and shake proof washers from securing brackets.

Withdraw chassis from case ensuring that the ferrite rod is not damaged by being brought into contact with the cover retaining clip.

Drive Cord Replacement:—Remove the chassis from its case as previously described. Place chassis with the scale facing operator and remove the scale by undoing two securing screws. Make up new cord as shown in the illustration col. 1.

Turn tuning control fully clockwise (tuning gang fully open). Take shortened end of cord and pass it from the rear through bottom hole in tuning spindle. Crimp the eyelet on white mark on cord and pull eyelet tight against spindle.



Front and top views of the receiver illustrating all the adjustments required for alignment

Wind the cord half a turn round spindle clockwise, and lay it along the two bottom pulleys. Turn the tuning spindle anti-clockwise by four turns when the tuning gang should be fully closed.

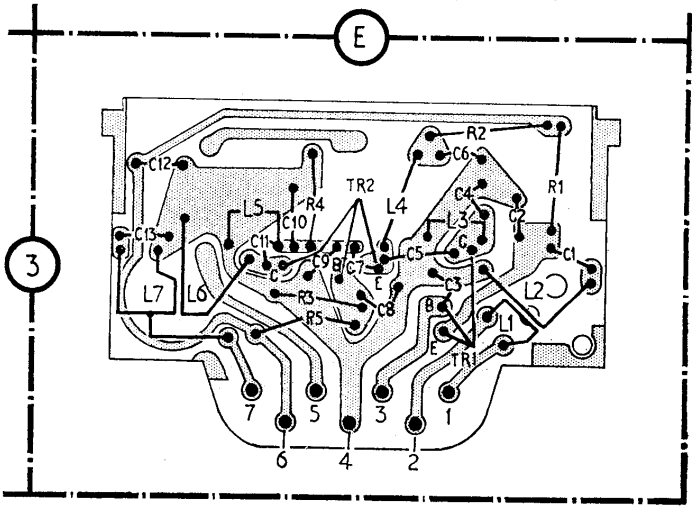
Pass the cord round bottom left-hand pulley, lay it along the two top pulleys and make a half turn clockwise round the tuning spindle.

Pass cord from the rear through the top hole in spindle, slip eyelet on cord and tension cord until white spot marker appears. Crimp eyelet over white spot.

Fully close the tuning gang and attach cursor at the black left-hand line of scale aperture. Varnish cursor in position.

Switches. **S1-19** are the waveband switches, **S20** is the battery on/off switch. They are housed in a press-button unit shown in location ref. G5. The individual switch contacts are given in a separate drawing of the unit in col. 3. In this drawing the switch numbers are given suffix letters, as are the switch numbers in the circuit diagram, indicating the positions in which they are closed, where *m* means closed on M.W., *l* means closed on L.W., and *f* means closed on F.M. For example, **S7lf** means **S7** is closed in both L.W. and F.M. positions of the press-button unit. **S20** is operated independently by the on/off press-button.

Batteries.—Two batteries are required, connected in parallel. Suitable types are Ever Ready PP9, Drydex DT9, Vidor T6009.



Foil-side view of the F.M. tuner unit printed circuit panel. The F.M. unit is assembled to the main receiver panel with the flange carrying connections 1–7 protruding at right-angles through a slot in the panel. At this point interconnections are made by direct soldering between the two panels

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