"TRADER" SERVICE SHEET

1401

EVER READY "SKY E

4-band A.M./F.M. battery operated portable receiver with

THE Ever Ready "Sky Emperor" is a 4-band A.M./F.M. portable receiver designed to operate from all-dry batteries and covering the frequency ranges 87.5-100Mc/s (F.M.); 5.8-16.5Mc/s (SW1); 1.6-4.7Mc/s (SW2); and 530-1,602kc/s (M.W.). It employs a ferrite rod aerial for M.W. reception, and an internal telescopic aerial for F.M. and S.W. operation. Provision is made for the connection of external F.M. and S.W. external aerials and a socket is fitted for the connection of a car aerial. Sockets are also provided for the connection of a gramophone pickup and an external speaker.

Release date and original price: October 1958, £25 0*s* 4*d. Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input on F.M. is coupled directly to the F.M. frequency changer valve **V1,** whose I.F. output is tuned-transformer coupled to V2. On A.M., separate aerial sockets are provided for S.W. and M.W. bands, while the M.W. coils **L10, L11** are wound on a ferrite rod to form an internal aerial.

The A.M. frequency changer valve **V3** is a heptode, but on F.M. switches **S2a, S2c** convert it to a pentode R.F. amplifier, grids 2 and 3 being joined to grid 4 to form a common screen grid. The (oscillator) grid 1 becomes the control grid, and **V2** output is coupled to it via **L9, C22, S1a.** At the same time **S2d** connects the earthy end of **L24** to grids 2, 3, 4 via **R14.**

Two further stages of I.F. amplification (**V4, V5**) follow, passing the signal on to a balanced ratio detector circuit on F.M. (**X1, X2**) or a conventional diode detector (in **V6**) on A.M., their outputs being applied via volume control **R38** to the A.F. amplifier and push-pull output stages.

Intermediate Frequencies 10.7Mc/s and 470kc/s.

On F.M., **V4** C.G. circuit acts as a limiter, **S1d** opening to admit the time-constant network **R19, C44.** C.G. of tuning indicator T.I. is then connected via **S5x** to **R31, C67,** but on M.W. it is switched via **S5b** to the A.M. diode circuit.

Output from A.F. amplifier **V6** is coupled directly to one side (**V7**) of push-pull output stage; and indirectly, via triode phase reversing valve comprising filament, C.G. and screen of **V2** in a reflex circuit, to the other side (**V8**). An "economy" device comprising the **S7** group of switches permits one or both halves of **V7, V8** filaments to be fed with current, while at the same time **S7a** (economy) or **S7y** (normal) adjusts the bias derived from resistors in the negative H.T. lead to chassis.

When the gram button is pressed, operating switch group **S6,** the bias resistors are changed in both "economy" and normal operation, by **S6b, S6c** or **S6y, S6z;** while **S6x** opens to disconnect the filaments of **V1, V3, V4, V5** on gram. On F.M., **V1** filament is connected to the L.T. circuit by **S1b,** which is open on S.W. and M.W.

CIRCUIT ALIGNMENT

Equipment Required.—An accurately calibrated signal generator covering the frequency range 100kc/s-100Mc/s, modulated 30 per cent at 400c/s; an A.C. voltmeter for use as audio output meter; a 20,000Ω/V meter for use as D.C. output meter; an R.F. valve-millivoltmeter; a coupling coil which may be constructed by winding 20 turns of 20-24 S.W.G. wire on a 10cm diameter former; a 4.7kΩ resistor for use as a damping shunt; a 330Ω resistor; and a non-metallic screwdriver type trimming tool.

The manufacturers stress that only if an R.F. valve-millivoltmeter is available should the adjustment of neutralizing capacitors **C5** and **C29** be attempted.

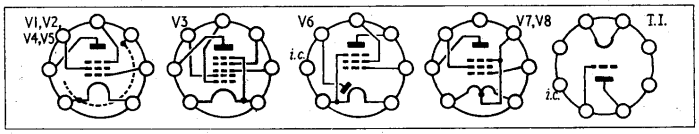
Before commencing the alignment process, screw the cores of all the R.F. and oscillator tuning coils fully in, so that they are at the bottoms of their coil formers. All alignment adjustments start from this position.

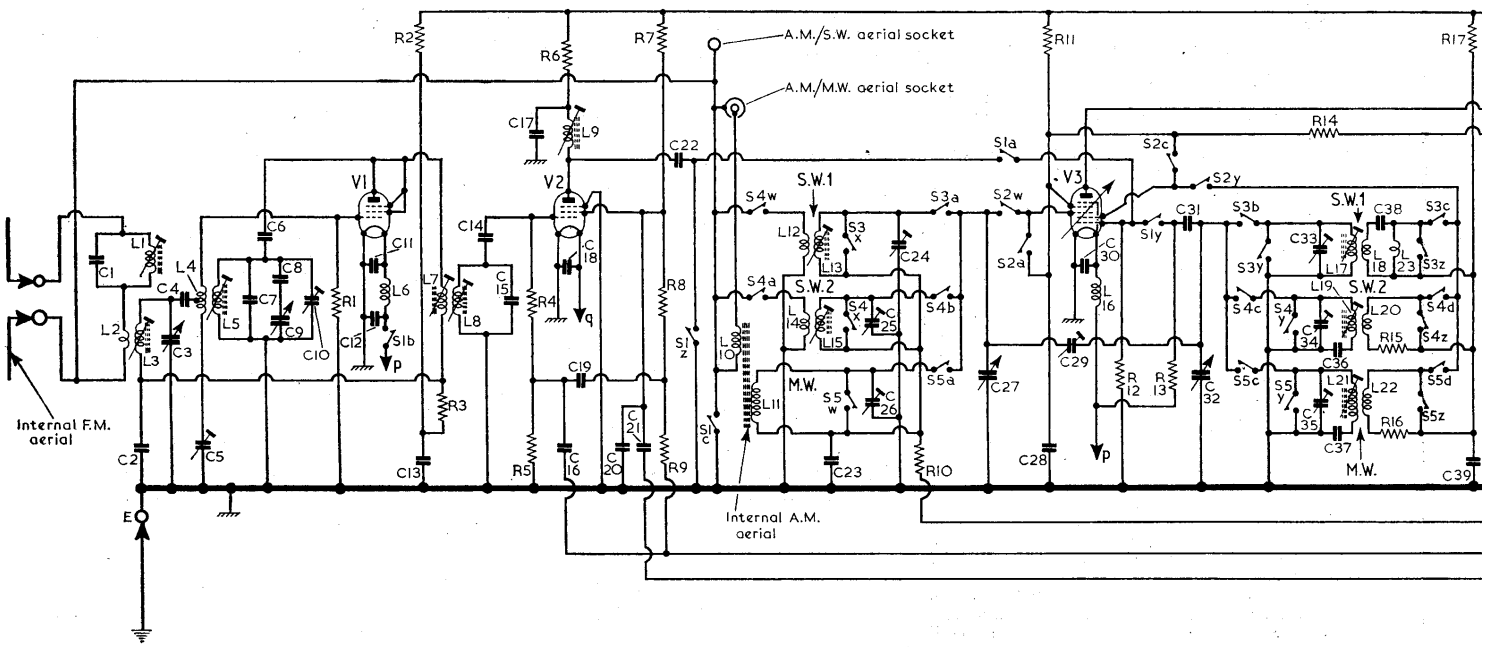
A.M. Alignment

1.—Remove chassis from the cabinet as described under "Dismantling." Connect A.C. voltmeter to the external speaker sockets. Connect signal generator to **V3** control grid (pin 4), earth lead to chassis. Switch receiver to M.W., set volume and tone controls to their maximum clockwise position.

2.—Feed in a modulated 470kc/s signal and

Valve base diagrams drawn as seen from the free ends of the pins.

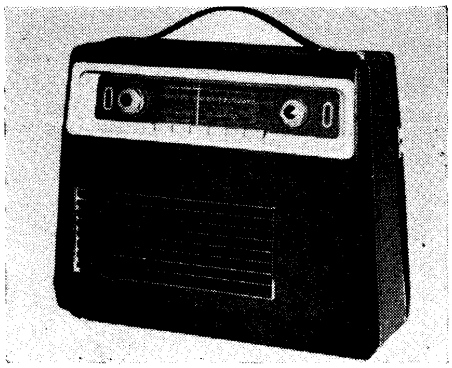




Circuit of the Ever Ready "Sky Emperor." The A.M./S.W. aerial socket provides for the use of an external aerial when S.W. reception by the internal

MPEROR"

press-button switching



adjust the cores of **L26** (F3), **L27** (C2), **L30** (G3), **L31** (C2), **L36** (G3) and **L37** (D2) for maximum output, progressively reducing the signal generator output as the circuits are brought into line. Remove signal generator.

3.—Check that with the tuning gang at maximum capacitance the cursor coincides with the extreme left-hand edges of the tuning scales.

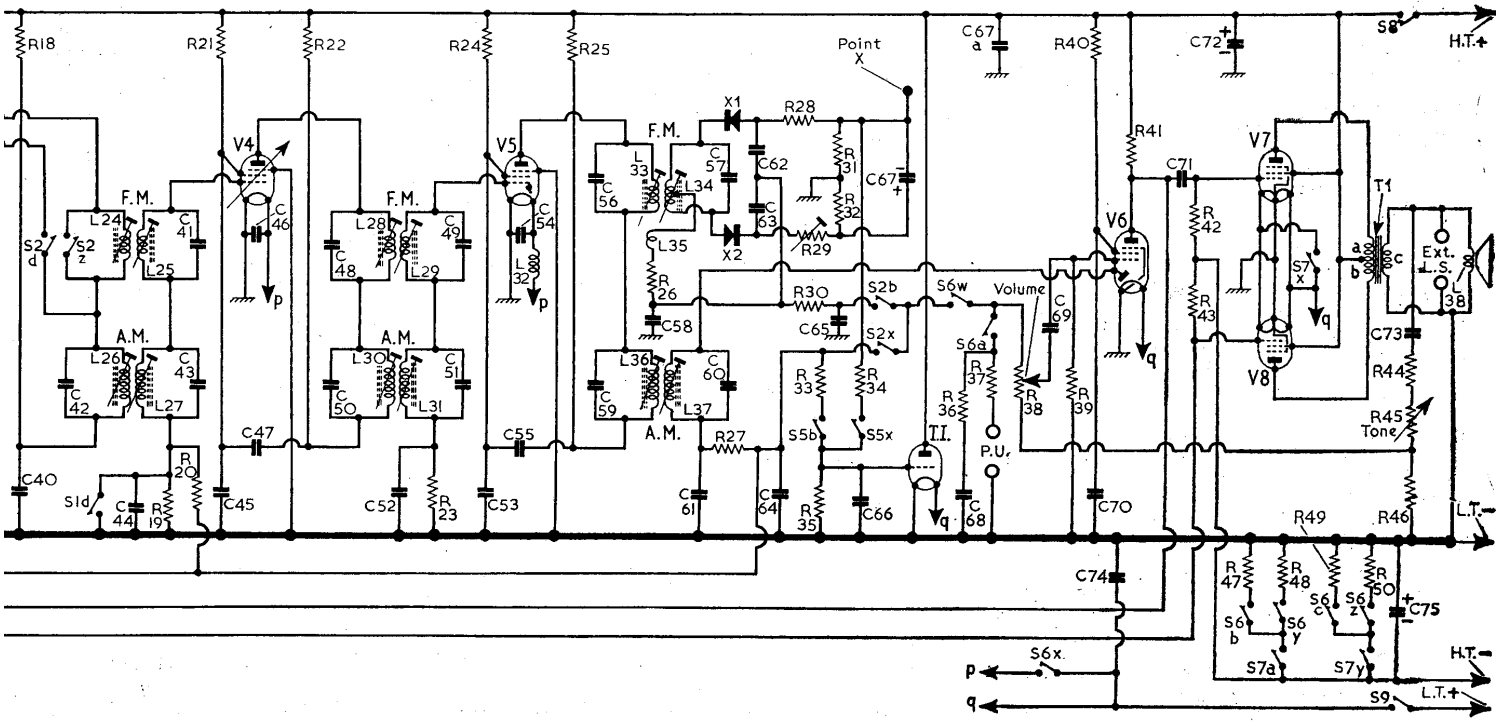
4.—Switch receiver to SW1 and tune it to 15Mc/s. Connect the R.F. valve-voltmeter across **C27** (B2) and adjust **C29** (B2)

(*Continued overleaf col.* 1)

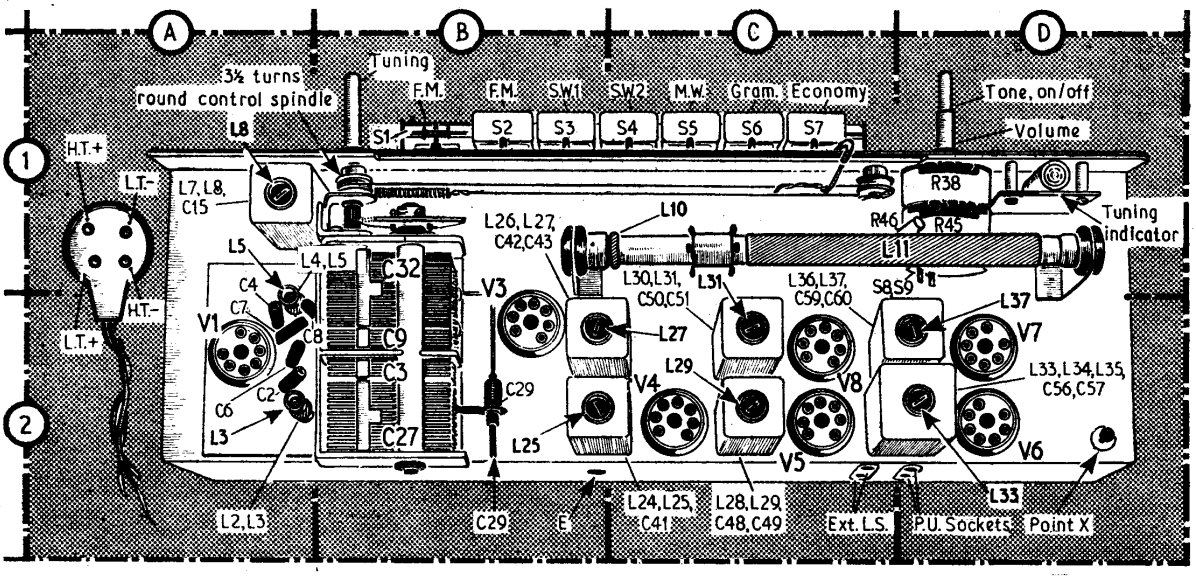
If the component numbers in these tables are used when ordering spare parts, dealers are requested to mention the fact on the order, as these numbers may differ from those used in the manufacturers' service manual.

Resistors		
R1	1MΩ	E3
R2	820Ω	E4
R3	4·7kΩ	E4
R4	220kΩ	E4
R5	2·7MΩ	E4
R6	820Ω	F4
R7	100kΩ	F4
R8	10MΩ	E4
R9	10MΩ	E4
R10	2·2MΩ	K6
R11	180kΩ	J6
R12	1MΩ	F3
R13	33kΩ	J6
R14	56kΩ	J6
R15	150Ω	K6
R16	1·5kΩ	L6
R17	33kΩ	K6
R18	820Ω	F3
R19	2·2MΩ	F3
R20	10MΩ	H4
R21	33kΩ	G3
R22	820Ω	G3
R23	220kΩ	G3
R24	33kΩ	G3
R25	820Ω	G3
R26	27Ω	H3
R27	47kΩ	H4
R28	1·5kΩ	H3
R29	4·7kΩ	H3
R30	47kΩ	H3
R31	15kΩ	H3
R32	15kΩ	H3
R33	4·7MΩ	K6
R34	470kΩ	H3
R35	10MΩ	G3
R36	100kΩ	H4
R37	470kΩ	H3
R38	500kΩ	D1
R39	10MΩ	H3
R40	5·6MΩ	H3
R41	1·2MΩ	H3
R42	2·2MΩ	H3
R43	2·2MΩ	G3
R44	820Ω	H3
R45	10kΩ	D1
R46	100Ω	D1
R47	910Ω	L6
R48	470Ω	L6
R49	560Ω	L6
R50	330Ω	L6
Coils*		
L1	—	E3
L2	—	A2
L3	—	A2
L4	—	A2
L5	—	A2
L6	—	E3
L7	—	A1
L8	—	A1
L9	—	F3
L10	1·75	B1
L11	—	C1
L12	—	J6
L13	—	J6
L14	—	K6
L15	—	K6
L16	—	F3
L17	—	K6
L18	—	K6
L19	—	K6
L20	—	K6
L21	3·0	L6
L22	1·0	L6
L23	—	K6
L24	—	C2
L25	—	C2
L26	17·0	B2
L27	17·0	B2
L28	—	C2
L29	—	C2
L30	6·0	C2
L31	6·0	C2
L32	—	G3
L33	—	D2
L34	—	D2
L35	—	D2
L36	16·0	C2
L37	16·0	C2
L38	2·5	—
Capacitors*		
C1	20pF	E3
C2	450pF	A2
C3	19pF	A2
C4	70pF	A2
C5	30pF	E4
C6	35pF	A2
C7	10pF	A2
C8	200pF	A2
C9	19pF	B2
C10	8pF	E3
C11	0·001μF	E3
C12	0·01μF	E4
C13	0·01μF	E4
C14	35pF	E4
C15	10pF	A1
C16	10pF	E4
C17	0·01μF	F4
C18	0·01μF	E4
C19	0·01μF	E4
C20	0·001μF	F4
C21	0·01μF	G3
C22	50pF	F4
C23	0·04μF	J6
C24	60pF	J6
C25	30pF	K6
C26	30pF	L6
C27	528pF	B2
C28	0·01μF	F3
C29	3·7pF	B2
C30	0·01μF	F3
C31	80pF	J6
C32	528pF	B1
C33	30pF	K6
C34	30pF	K6
C35	30pF	L6
C36	1,500pF	K6
C37	500pF	L6
C38	60pF	K6
C39	0·04μF	K6
C40	0·01μF	F3
C41	10pF	C2
C42	80pF	B2
C43	80pF	B2
C44	0·01μF	F3
C45	0·003μF	G3
C46	0·01μF	G3
C47	0·01μF	G3
C48	5pF	C2
C49	10pF	C2
C50	300pF	C2
C51	300pF	C2
C52	100pF	G3
C53	0·003μF	G3
C54	0·01μF	G3
C55	0·01μF	G3
C56	5pF	D2
C57	45pF	D2
C58	300pF	H3
C59	80pF	C2
C60	80pF	C2
C61	100pF	H4
C62	300pF	H3
C63	300pF	H3
C64	100pF	H4
C65	500pF	H3
C66	0·01μF	G4
C67	5μF	H3
C67a	0·01μF	G4
C68	0·005μF	H4
C69	0·01μF	H3
C70	0·01μF	H3
C71	0·01μF	H3
C72	8μF	F3
C73	0·1μF	H4
C74	0·1μF	H4
C75	100μF	G4
Miscellaneous*		
T1 a	320·0	H4
T1 b	320·0	H4
T1 c	—	H4
X1	OA70	H3
X2	OA70	H3
S1-S3	—	B1
S4-S7	—	C1
S8, S9	—	D2

**Approximate D.C. resistance in ohms.*



telescopic dipole is not good. The A.M./M.W. aerial socket is included to allow a car aerial to be connected when the receiver is used inside a car.



Plan view of the chassis. The F.M. tuner unit is shown in location A2 with its cover removed. A sketch of the drive wire is included; for replacement instructions see the notes in col. 4.

Circuit Alignment—*continued*

for *minimum* reading on the valve-voltmeter. If the reading obtained is too small for accurate adjustment, screw the core of **L13** (J5) in for maximum reading on the valve-voltmeter, then adjust **C29** for *minimum* reading. Disconnect valve-voltmeter.

5.—Connect signal generator via the 330Ω resistor to the S.W. aerial socket. Tune receiver to the dot at 6.6Mc/s on the tuning scale. Feed in a modulated 6.6Mc/s signal and adjust the core of **L17** (J5) to the first peak obtained from the farther end of the coil. To check that the correct peak has been selected, slowly swing the signal generator frequency approximately 1Mc/s above and below 6.6Mc/s (5.6Mc/s to 7.6Mc/s). If a second (image) signal is obtained at approximately 1Mc/s *above* 6.6Mc/s, then the oscillator is tuned to the correct peak. If the image signal is found below 6.6Mc/s, readjust **L17**.

6.—Feed in a modulated 6.6Mc/s signal and adjust the core of **L13** (J5) for maximum output.

7.—Tune receiver to 15Mc/s. Feed in a modulated 15Mc/s signal and adjust **C33** (J5) and **C24** (J5) for maximum output. If two peaks are obtained when adjusting **C33,** tune to the peak giving the lower capacitance setting.

8.—Recheck calibration at 6.6Mc/s and, if necessary, repeat operations 5-7.

9.—Switch receiver to SW2 and tune it to 1.8Mc/s. Feed in a modulated 1.8Mc/s signal and adjust the core of **L19** (K5) for maximum output, taking care that the correct peak is obtained. Then adjust **L15** (K5) for maximum output.

10.—Tune receiver to 4.5Mc/s. Feed in a modulated 4.5Mc/s signal and adjust **C34** (K5) and **C25** (K5) for maximum output. If two peaks are obtained when adjusting **C34,** tune to the peak giving the lower capacitance setting. Finally readjust **C34** for maximum output while rocking the tuning gang either side of 4.5Mc/s.

11.—Repeat operations 9 and 10 if necessary, then disconnect signal generator.

12.—Place the coupling coil approximately 4ft from the ferrite rod aerial coils **L10, L11** (location reference C1, D1) and on the same axis. Connect the signal generator output across the coupling coil.

13.—Switch the receiver to M.W. and tune it to 500m. Feed in a 600kc/s signal and adjust the core of **L21** (L5) for maximum output.

14.—Tune receiver to 200m. Feed in a 1,500kc/s signal and adjust **C35** (L5) and **C26** (L5) for maximum output.

15.—Repeat operations 13 and 14. Remove signal generator and audio output meter.

F.M. Alignment

1.—Connect signal generator to the junction of **L8, C14** (E4). Connect the 20,000Ω/V D.C. output meter, set to its 10V range, between "point X" (D2) and chassis, positive lead to chassis. Throughout the following operations, adjust the signal generator output to maintain a 3V reading on the D.C. output meter.

2.—Switch the receiver to F.M. Feed in an unmodulated 10.7Mc/s signal and adjust the core of **L33** (D2) for maximum output.

3.—Connect the D.C. output meter across **C58** (H3). Feed in an unmodulated 10.7Mc/s signal and unscrew the core of **L34** (G3). Starting with the core well out screw it inwards until a maximum positive or negative peak is obtained. Continue to screw the core in through a zero and then on to a peak in the opposite direction. The correct tuning point is the zero position between the two peaks.

4.—Connect the audio output meter to the external speaker sockets. Feed in a modulated 10.7Mc/s signal and adjust **R29** (H3) for *minimum* audio output. Remove audio output meter.

5.—Repeat operation 3.

6.—Transfer D.C. output meter to "point X" and chassis, positive lead to chassis. Feed in an unmodulated 10.7Mc/s signal, damp **L28** (G3) with the 4.7kΩ resistor and adjust the core of **L29** (C2) for maximum output.

7.—Transfer damping resistor to **L29** and adjust **L28** for maximum output.

8.—Transfer damping resistor to **L24** (F3) and adjust **L25** (B2) for maximum output.

9.—Transfer damping resistor to **L25** and adjust **L24** for maximum output. Remove damping resistor.

10.—Adjust **L9** (F3) for maximum output.

11.—Repeat operations 2, 3, 8 and 9.

12.—Transfer signal generator to the junction of **L1, L2** (A2). Connect damping resistor across **L7** (E3). Feed in an unmodulated 10.7Mc/s signal and adjust **L8** (A1) for maximum output.

13.—Transfer damping resistor to **L8** and adjust **L7** for maximum output.

14.—Repeat operations 2, 3, 8, 9, 12 and 13.

15.—Transfer signal generator to the F.M. aerial sockets. Feed in an unmodulated 10.7Mc/s signal and adjust **L1** (E3) for *minimum* output.

16.—To check the I.F. bandwidth, transfer signal generator to the junction of **L1, L2** (A2). Feed in an unmodulated 10.7Mc/s signal and adjust the generator output to obtain a 3V reading on the D.C. output meter. Then increase the signal generator output by 1.4 times and swing its frequency either side of 10.7Mc/s until the original 3V output reading is obtained. The total frequency swing to obtain this condition should be within the limits 120-170kc/s (60-85kc/s either side of 10.7Mc/s). If these conditions are not met, the I.F. circuits should be re-adjusted.

17.—Connect generator to the F.M. aerial sockets. Tune receiver to 98Mc/s. Feed in an unmodulated 98Mc/s signal and adjust **C10** (E3) for maximum output.

18.—Tune receiver to 89.5Mc/s. Feed in an unmodulated 89.5Mc/s signal and adjust the core of **L5** (A1) for maximum output. As two tuning peaks may be found when adjusting **L5,** the correct peak is the one nearer to the chassis.

19.—Feed in an unmodulated 94Mc/s signal and tune it in on the receiver. Adjust the core of **L3** (A2) for maximum output (tune to the peak nearer chassis).

20.—Disconnect signal generator and D.C. output meter.

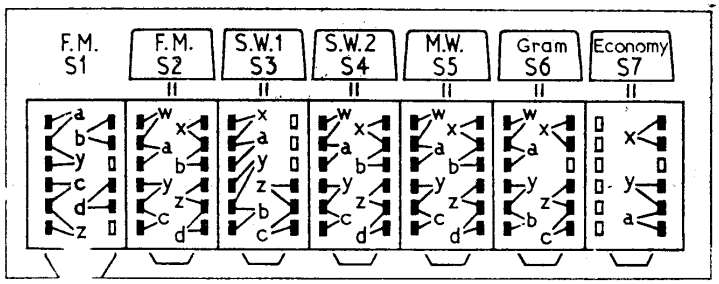
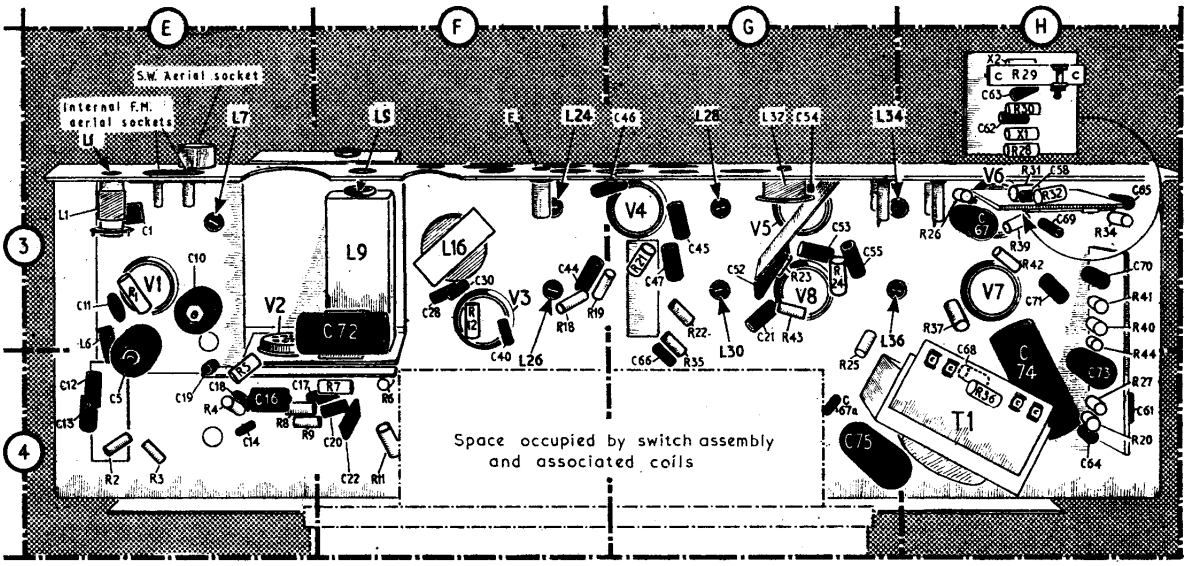


Diagram of the switch assembly as seen from the rear of an upright chassis. **S1** *and* **S2** *form a combined F.M. switch, operated by the press-button of* **S2**. *The wafers of these two switches move on and off in opposite directions so that all their individual switches which are lettered from* **a** *to* **d** *are closed when* **S2** *is pressed.*



Underside view of the chassis. As it is impossible from this point of view to see all the components on the front of the small, vertically mounted panel in location H3, a front view of the panel is provided above the illustration of the chassis. The switches and the coils and other components fitted behind them, are not shown; they are illustrated at the foot of this page.

21.—Connect the R.F. valve-voltmeter to the F.M. aerial sockets. Tune the receiver to 94Mc/s and adjust **C5** (E4) for *minimum* output.

GENERAL NOTES

Modifications.—**C7** may be omitted, and **C10** may be 30μF.

Switches.—**S1-S7** are the waveband, gramophone and battery economy switches ganged in a seven-way slide-type unit actuated by "piano-key" press-buttons. Switches associated with each press-button bear a suffix letter to indicate their function when the appropriate button is pressed. When a given button is pressed, those with letters **a-d** close, and those with **w-z** open. **S1** is coupled with **S2-S6** by means of a trigger mechanism. Individual switch groups are identified in the diagram of the unit shown at the foot of cols. 2 and 3.

Tuning Drive Replacement.—Remove the chassis from the cabinet as described under "Dismantling" (next col.). Unsolder the four leads from the ferrite rod aerial coils **L10, L11** (location references C1, D1) and remove the aerial rod from its mounting brackets.

About 19in of stranded steel wire (0.012in. dia.) is required for a new tuning drive. Bind one end of the wire back to form a small loop, then solder the binding, taking care that the solder does not run down the length of the wire.

Turn the tuning gang to maximum capacitance. Working from the rear of the chassis, attach the tension spring to the loop in the wire, then temporarily anchor the free end of the spring to a convenient point on the chassis below the tuning control spindle. Wind 3½ turns round the tuning control spindle in a clockwise direction, winding from front to back. Lead the wire over and round the right-hand pulley as indicated in the plan view of the chassis. Release the tension spring from the chassis and pass the free end of wire through the loop at the free end of the spring, pulling the wire so that the spring is under slight tension, then securing the wire to the spring by forming a loop as before.

Fit the cursor on the drive wire at the right-hand end of the tuning scale (viewed from the rear of the chassis) and slide it along until it coincides with the extreme edges of the tuning scales. Check that the cursor moves smoothly over the whole of its travel.

Battery.—The battery specified by the manufacturers is an Ever Ready "Batrymax" type B103 combined L.T. (1.5V) and H.T. (90V) unit. The pins of the battery plug are identified on the plan view of the chassis in location reference A1.

DISMANTLING

Removing Chassis.—Remove back cover (two self-tapping screws); remove internal F.M. aerial plug from its socket on the chassis. Lay receiver face downwards and unsolder the leads from the speaker and car aerial socket; remove two chassis fixing screws from the rear of the chassis.

Lift the chassis clear of the cabinet, taking care not to damage the ferrite rod aerial in the process.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 6) are those derived from the manufacturers' information. They were measured with the receiver operating from a new battery unit, with volume control at maximum and tuned to 530m when switched to A.M., 87.5Mc/s when switched to F.M.

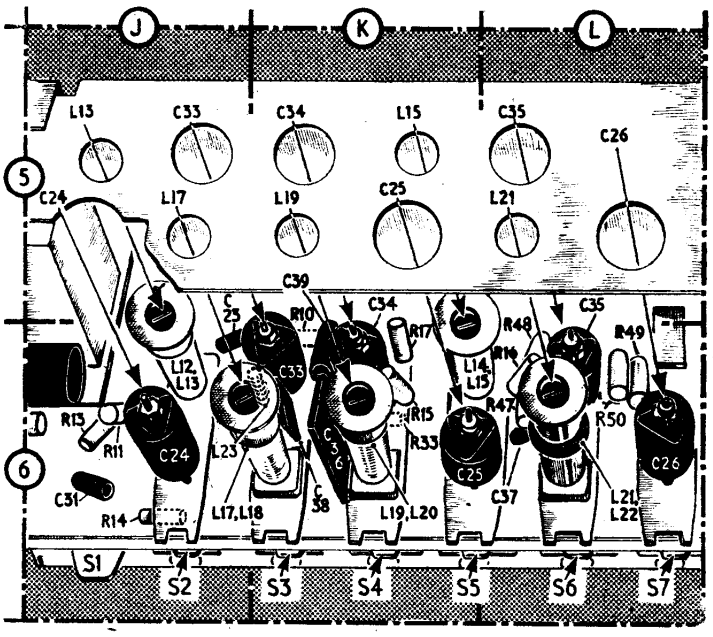
Voltages were measured on the 100V range of a 1,000Ω/V meter, chassis being the negative connection in every case, except in one or two instances, like **V6**, where an electronic meter was used.

The total H.T. current on **A.M.** was 17.6mA (12.7mA with economy switch depressed); on F.M., 18.1mA (13.7mA with economy switch depressed).

V7, V8 grid bias voltage on **A.M.** or **F.M.** was −5.8V (−6V with economy switch depressed).

Valve		Anode (V)	Anode (mA)	Screen (V)	Screen (mA)
V1 DF97†		65·0[1]	1·59	—	—
V2 DF97*		82·5	0·88	44·4	0·36
V3 DK92*	mixer	83·0	0·48[2]	63·0[3]	0·105[4]
	osc.	22·0	1·47	—	—
V4 DF97*		82·0	1·49	59·5	0·67
V5 DF97*		82·0	1·49	59·5	0·67
V6 DAF96*		42·0	0·04	28·5	0·01
V7 DL96*		82·5	3·8	83·5	0·62
V8 DL96*		82·5	3·8	83·5	0·62
T.I. DM70*		83·5	0·2	—	—

**Measured with receiver switched to A.M.*
†Measured with receiver switched to F.M.
[1]Measured with 1MΩ resistor in series with positive meter lead.
[2] 0.93 *mA*, [3] 27V, [4] 1.23 mA } *Measured with receiver switched to F.M.*



View of the coils and other components mounted behind the switch assembly as seen when looking upwards at an angle from the rear of the chassis. The wiring of this group of components is very compact and it may not be possible to see some of them, such as **R10** *and* **R33,** *without lifting the coil mounts.*

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