SERVICE SHEET FOR

F.M. – A.M.

Transistor Portable

Model 331

TRIMMING PROCEDURE (MW and LW Bands)

Apply a 30% modulated signal as below:—	Set receiver controls as below:—	Adjust in order for maximum output:—
1. 470 kc/s. across T3 secondary via 0·1 μF capacitor in each lead.	Volume control at maximum. M.W. low frequency end of band. Check that pointer is aligned with L.F. ends of tracks on tuning scale with gang fully closed.	Cores of T4, T7 and T9.
2. 600 kc/s. into standard loop placed at 15" from centre of M.W. aerial coil.	M.W. 500 metres.	Core of T6 and position of T3 on rod.
3. As 2, but 1500 kc/s.	M.W. 200 metres.	Trimmers C26 and C14.
4. Repeat 2 and 3 until calibration and tracking is correct.		
5. As 2, but 214 kc/s.	L.W. 1400 metres.	Trimmer C27 and position of T2 on rod.

Notes:—The Standard Loop should be wound on an air-cored former of 4 inches diameter, and consist of 20 turns 20 SWG enamelled wire evenly spaced over a total length of $2\frac{3}{8}$ inches. The inductance is approximately 40μH. Connection to the signal generator should be by a screened low-capacity cable.
The aerial coils T2 and T3 are sealed at the factory, and should not require adjustment unless the ferrite rod has to be replaced.

F.M. I.F. ALIGNMENT (Visual Indication)

Apply signal from sweep generator as below:—	Set receiver controls as below:—	Adjust in order for peak output:—
1. 10·7 Mc/s. to base of VT5, with oscilloscope across MR4 and one end of C42 disconnected.	Volume control at minimum. F.M. low frequency end of band.	Core of T10 primary.
2. As 1, but to base of VT4.	As 1.	Core of T8.
3. 10·7 Mc/s. to switch end of C20, with oscilloscope lead to junction of R23/C47, and C42 re-connected.	As 1.	RV1 and T10 secondary for symmetrical 'S' curve, and maximum A.M. rejection.
4. As 3, but with oscilloscope lead to top of MR4, and C42 disconnected. Input attenuation to —10bB.	As 1.	Core of T5.
5. Repeat 1, 2 and 4, ensuring that symmetrical curve is maintained.		
6. As 1, but to top of R6.	As 1.	Cores of T1 primary and secondary for best response shape.

Note:—Re-connect C42 on completion of I.F. alignment.

F.M. I.F. ALIGNMENT (Meter Indication)

Apply signal as below:—	Set receiver controls as below:—	Adjust as follows:—
1. 10·7 Mc/s. deviation ±75 kc/s. to base of VT5, with two 100K resistors (5% tol.) in series across R26 and R27. Connect a 0—50μA meter between junction of 100K resistors and chassis.	Volume Control at minimum. F.M. low frequency end of band.	Core of T10 primary for maximum reading.
2. As 1, but with meter connected between junction of 100K resistors and junction of T10 tertiary winding with R23.	As 1.	Core of T10 secondary for zero current. Observe swing from one polarity to the other.
3. As 1, but to base of VT4.	As 1.	Core of T8 for maximum reading.
4. As 1, but to switch end of C20.	As 1.	Core of T5 for maximum reading.
5. Repeat tests 1, 3 and 4. Remove meter and 100K resistors.		

Note:—RV1 can only be properly adjusted with Visual Test Gear. If mis-adjustment is suspected, set to mid-traverse.

F.M. R.F. ALIGNMENT

Apply signal as below:—(Input limited to give about 50mW output at loudspeaker)	Set receiver controls as below:—	Adjust in order for maximum output at loudspeaker:—
1. 92 Mc/s. deviation ±15 kc/s. via F.M. aerial socket SK1.	F.M. 92 Mc/s.	Cores of L4 and L2.
2. As 1, but 102 Mc/s.	F.M. 102 Mc/s. (Tune to response).	Trimmer C2.

CAPACITORS

Circuit No.	Description	±%	Volts	Fig.	Ref. No.
C1	8·2 pF type N750AD ...	½pF	750	1	106278/33
C2	2–40 pF Trimmer ...			1	108731/1
C3	0·001 μF Tubular type W99	20	350	1	41904/30
C4	0·001 μF Tubular type W99	20	350	1	41904/30
C5	1·5–8 pF Trimmer ...			1	133221
C6	10–196 pF swing Gang ...			1	133006
C7	82 pF type PSM1510 ...	2	350	2	105711/67
C8	0·001 μF Tubular type W99	20	350	1	41904/30
C9	3 pF type P100AD ...	½pF	750	1	49825/1
C10	220 pF type N4700AD	10	750	1	109895/2
C11	0·001 μF Tubular type W99	20	350	1	41904/30
C12	1·5–8 pF Trimmer ...			1	133221
C13	68 pF type N150CD ...	½pF	150	1	121397/4
*C14	Trimmer			1	133006
C15	15 pF type N150AD ...	½ pF	150	2	121397/3
C16	68 pF type PSM1106 ...	2	350	1	105711/8
C17	0·01 μF Tubular type W99	20	150	1	41904/3
C18	100 μF Electrolytic ...	+100–20	12	1	121210/2
	160 μF Electrolytic ...	+100–10	10	1	133289/5
C19	60 pF type PSM1106 ...	2	350	2	105711/76
C20	0·01 μF Tubular type W99	20	350	1	41904/3
C21	0·01 μF Tubular type W99	20	350	1	41904/3
C22	39 pF Polystyrene ...	5	125	1	121373/15
C23	250 pF Polystyrene ...	2½	125	1	121373/14
C24	0·001 μF Tubular type W99	20	350	1	41904/30
C25	260 pF type PSM2515 ...	1	3	1	105711/86
*C26	Trimmer			1	133006
C27	3–30 pF Trimmer ...			2	48247
C28	39 pF Polystyrene ...	5	125	1	121373/15
C29	250 pF Polystyrene ...	2½	125	1	121373/14
C30	0·001 μF Tubular type W99	20	350	1	41904/30
C31	8 μF Electrolytic ...	+100–20	3	1	123002/1
	5 μF Electrolytic ...	+100–10	2½	1	133289
C32	0·001 μF Tubular type W99	20	350	1	41904/30
C33	0·04 μF Tubular type W99	20	150	1	41904/10
C34	0·04 μF Tubular type W99	20	150	2	41904/10
C35	0·02 μF Tubular type W99	20	150	1	41904/8
C36	0·04 μF Tubular type W99	20	150	1	41904/10
C37	39 pF type PSM1106 ...	2	350	1	105711/76
C38	250 pF Polystyrene ...	2½	125	1	121373/14
C39	47 pF type PSM1106 ...	2	350	1	105711/41
C40	0·01 μF Tubular type W99	20	150	1	41904/3
C41	0·01 μF Tubular type W99	20	150	1	41904/3
C42	10 μF Electrolytic ...	+100–20	6	1	123244/1
	10 μF Electrolytic ...	+100–10	16	1	133289/3
C43	0·01 μF Tubular type W99	20	150	1	41904/3
C44	0·01 μF Tubular type W99	20	150	1	41904/3
C45	0·01 μF Tubular type W99	20	150	1	41904/3
C46	0·04 μF Tubular type W99	20	150	1	41904/10
C47	0·01 μF Tubular type W99	20	150	2	41904/3
C48	8 μF Electrolytic ...	+100–20	6	1	122353/1
	2 μF Electrolytic ...	+100–10	10	1	133289/1
C49	100 μF Electrolytic ...	+100–20	6	1	121210/1
	64 μF Electrolytic ...	+100–10	10	1	133289/4
C50	8 μF Electrolytic ...	+100–20	6	1	122353/1
	2 μF Electrolytic ...	+100–10	10	1	133289/1
C51	100 μF Electrolytic ...	+100–20	12	1	121210/2
	160 μF Electrolytic ...	+100–10	10	1	133289/5
C52	100 μF Electrolytic ...	+100–20	6	1	121210/1
	64 μF Electrolytic ...	+100–10	10	1	133289/4
C53	0·04 μF Tubular type W99	20	150	1	41904/10
C54	100 μF Electrolytic ...	+100–20	12	1	121210/2
	160 μF Electrolytic ...	+100–10	10	1	133289/5
C55	200 pF type PSM1510 ...	2	350	2	105711/72

*Integral part of Gang

RESISTORS

Circuit No.	Ohms	±%	Fig.	Ref. No.
R1	560	10	1	93559
R2	10 K	10	1	93574
R3	2·7 K	10	1	93567
R4	180	10	1	93553
R5	560	10	1	93559
R6	1·5 K	10	1	93564
R7	6·8 K	10	1	93572
R8	220	10	2	93554
R9	470	10	1	93558
R10	1·2 K	10	1	93563
R11	6·8 K	10	1	93572
R12	1 K	10	1	93562
R13	220	10	1	93554
R14	150 K	10	1	93588
R15	56 K	10	1	93571
R16	8·2 K	10	1	93573
R17	220	10	1	93554
R18	680	10	1	93560
R19	10 K	10	1	93574
R20	2·7 K	10	1	93567

RESISTORS (continued)

Circuit No.	Ohms	±%	Fig.	Ref. No.
R21	220	10	1	93554
R22	1 K	10	1	93562
R23	100	5	1	93635
R24	470	10	1	93558
R25	2·2 K	10	1	93566
R26	4·7 K	10	1	93570
R27	4·7 K	10	1	93570
R28	470	10	1	93558
R29	3·9 K	10	2	93569
R30	120 K	10	1	93587
R31	47 K	10	1	93582
R32	8·2 K	10	1	93573
R33	12 K	10	1	93575
R34	100 K	10	1	93586
R35	22 K	10	1	93578
R36	680	10	1	93560
R37	560 K	10	1	93595
R38	4·7 K	5	1	93675
R39	91	5	1	93634
R40	150	10	1	93552
R41	4·7	5	1	93928
R42	220	10	1	93554
R43	18	10	1	93541

TRANSFORMERS

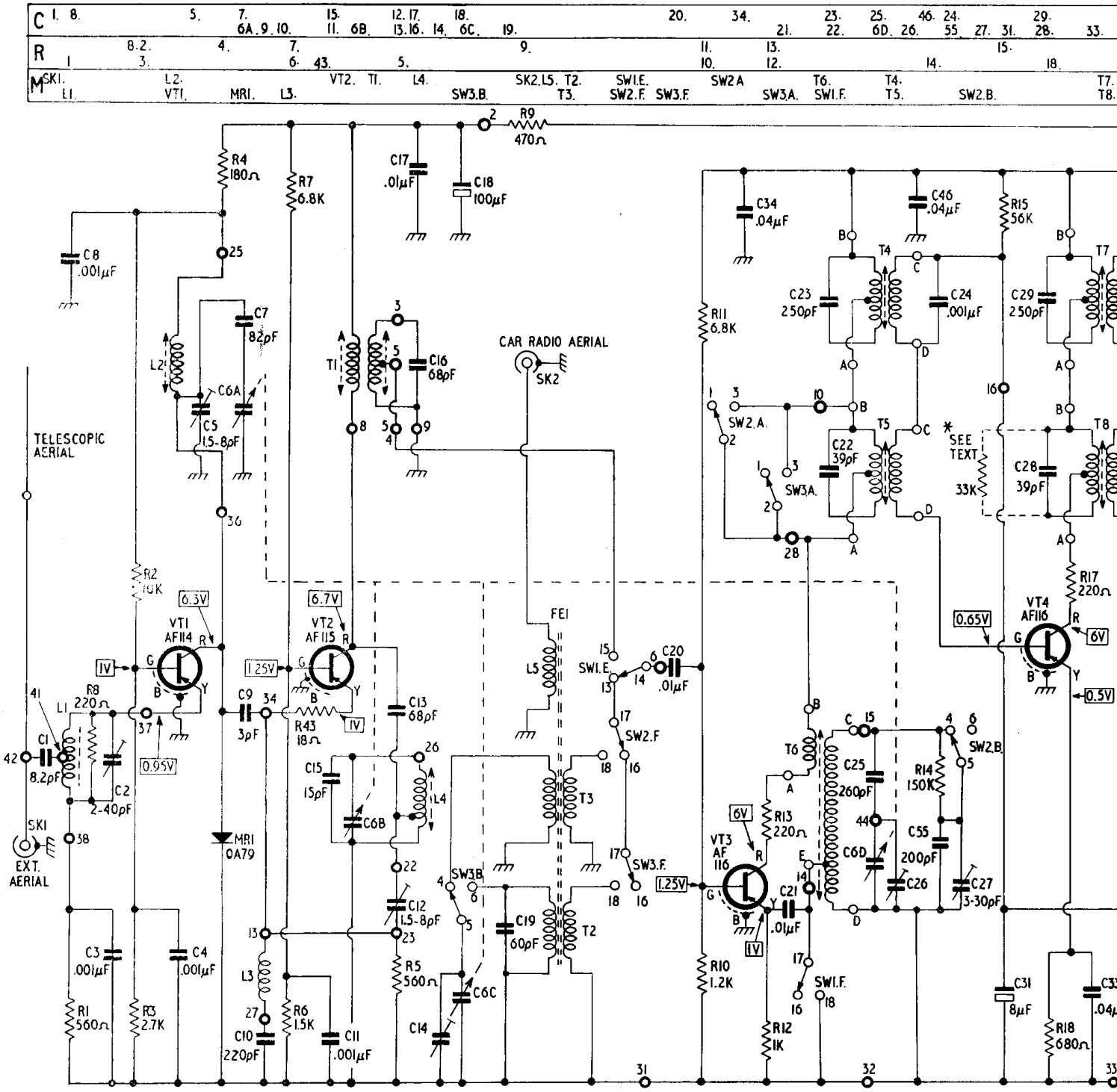
Circuit No.	Specification	Fig.	Ref. No.
T1	1st F.M. I.F. Prim.	1	DP 30871A
	1st F.M. I.F. Sec.	1	DP 30870A
T2	L.W. Aerial	1	DP 30880A
T3	M.W. Aerial	1	DP 30879A
T4	A.M. I.F.	1	SA 5947A
T5	F.M. I.F.	1	SA 5949A
T6	A.M. Oscillator	1	SA 5948B
T7	A.M. I.F.	1	SA 5947A
T8	F.M. I.F.	1	SA 5949A
T9	A.M. I.F.	1	SA 5947B
T10	F.M. Discriminator Prim.	1	DP 30876A
	F.M. Discriminator Sec.	1	DP 30877A
T11	Driver Prim. 150Ω / Sec. 80Ω	1	SA 5983A
T12	Output	1	SA 5984A

INDUCTANCES

Circuit No.	Specification	Fig.	Ref. No.
L1	F.M. Aerial	1	133108
L2	F.M. R.F.	1	133106
L3	F.M. I.F. Rejector	1	DP 30423A
L4	F.M. Oscillator	1	133107
L5	External Aerial Coil	1	DP 30930A

MISCELLANEOUS

Circuit No.	Item	Fig.	Ref. No.
FC1	Ferrite Rod	1	133209
LS1	Loudspeaker: 5" x 2¾"		D 133211
MR1	OA79 Diode	1	57972
MR2	OA70 Diode	1	121365
MR3	OA70 Diode Matched pair	1	121365
MR4	OA70 Diode Matched pair		
RV1	5 K Pre-set	1	133222
RV2	5 K Volume Control	2	133215
SW1–4	Push-button; 4 pole	2	133220
	Tuning Knob		055865
	Telescopic Aerial		717153
	Tuning Scale		072706
	Cabinet Assembly		074219
	Scale Clip		400154
	Knob Clip		709526
	Aerial Socket		58125



*The 33K resistor across T8 primary

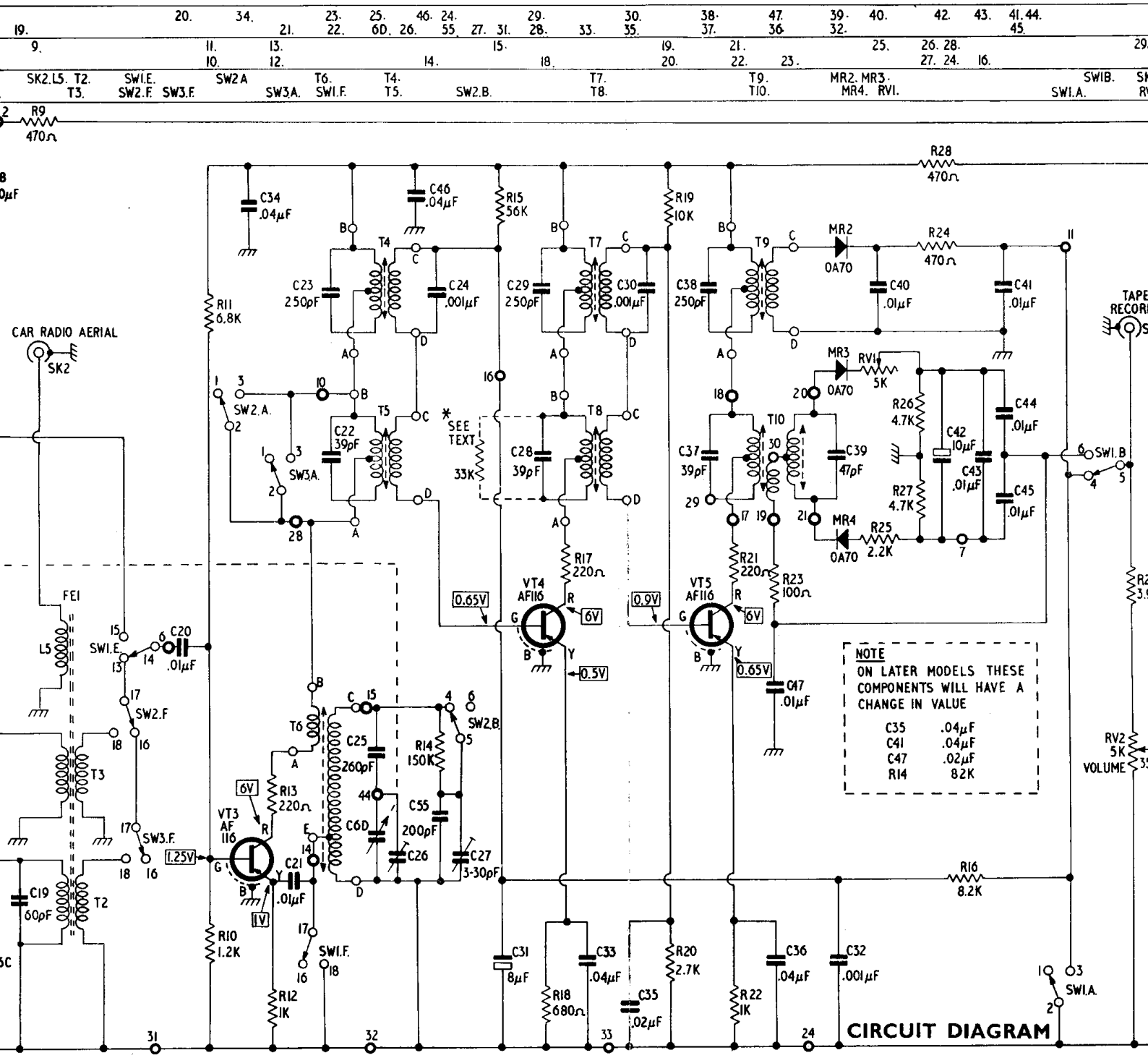
CIRCUIT ANALYSIS

Battery consumption: 40mA for 50mW output.

Code	Transistor Function	Type	Ec	Ic	Ee	Eb
VT1	F.M. R.F. Amplifier	AF.114	6·3	2·0	0·95	1·0
VT2	F.M. Oscillator Mixer	AF.115	6·7	2·0	1·0	1·25
VT3	A.M. Mixer and F.M. I.F. Amplifier	AF.116	6·0	0·65	1·0	1·2
VT4	A.M. & F.M. I.F. Amplifier	AF.116	6·0	0·85	0·5	0·65
VT5	A.M. & F.M. I.F. Amplifier	AF.116	6·0	0·85	0·65	0·9

Code	Transistor Function	Type	Ec	I
VT6	Audio Pre-Amplifier	NKT.255	4·7	0
VT7	Driver	NKT.252	8·6	2
VT8	Output	NKT.251	9·0	2
VT9	Output	NKT.251	9·0	2

Note:—All measurements taken on M.W. Band (approx. 450 metres) wi
Control at minimum. Using Avometer Model 8, which has a r
volt. All voltages negative with respect to chassis.



*The 33K resistor across T8 primary is omitted in some receivers.

Ee	Eb
0·95	1·0
1·0	1·25
1·0	1·2
0·5	0·65
0·65	0·9

Code	Transistor Function	Type	Ec	Ic	Ee	Eb
VT6	Audio Pre-Amplifier	NKT.255	4·7	0·25	1·8	2·0
VT7	Driver	NKT.252	8·6	2·0	1·3	1·35
VT8	Output	NKT.251	9·0	2·0	—	0·15
VT9	Output	NKT.251	9·0	2·0	—	0·15

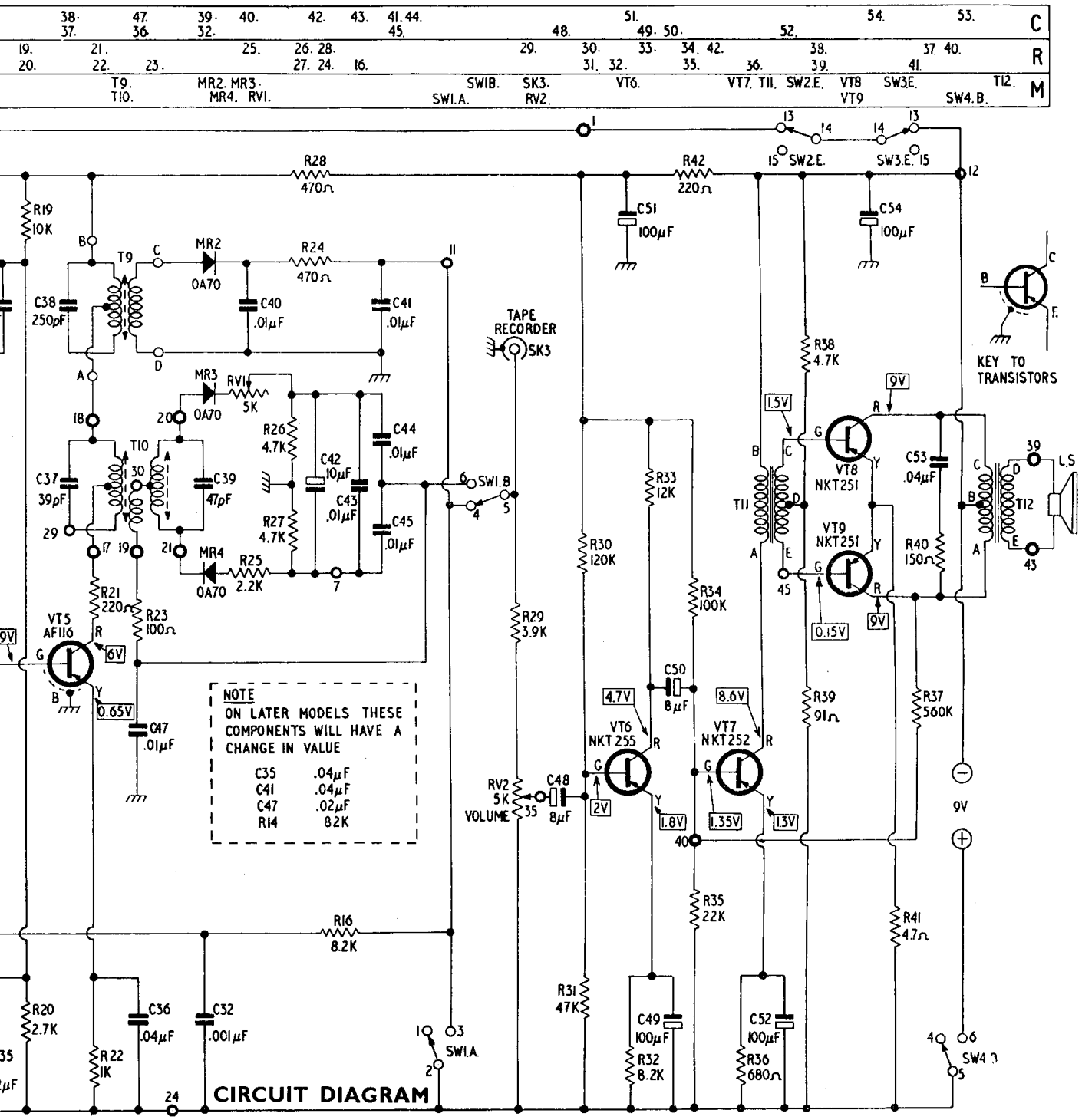
Note:—All measurements taken on M.W. Band (approx. 450 metres) with no signal input and Volume Control at minimum. Using Avometer Model 8, which has a resistance of 20,000 ohms per volt. All voltages negative with respect to chassis.

To remove Chassis.

1. Release captive screws at re
2. Pull off tuning control knob,
3. Insert screwdriver through aerial, and pull aerial upwar
4. Remove the 3 chassis fixing aerial sockets, and tape sock The chassis may now be wit When replacing chassis, car knob locates in slot at side

Battery.

9 volt. Ever Ready PP9 or e



NOTE
ON LATER MODELS THESE COMPONENTS WILL HAVE A CHANGE IN VALUE

C35	.04μF
C41	.04μF
C47	.02μF
R14	82K

nitted in some receivers.

Ee	Eb
1·8	2·0
1·3	1·35
—	0·15
—	0·15

signal input and Volume
nce of 20,000 ohms per

NOTES

To remove Chassis.

1. Release captive screws at rear of cabinet and lift out back cover.
2. Pull off tuning control knob, and disconnect battery.
3. Insert screwdriver through hole in bottom of cabinet, undo fixing screw at bottom end of telescopic aerial, and pull aerial upwards to top of cabinet.
4. Remove the 3 chassis fixing screws (at either side of printed panel), unsolder leads to loudspeaker, aerial sockets, and tape socket.
   The chassis may now be withdrawn from its cabinet.
   When replacing chassis, carry out the above procedure in reverse, ensuring that the volume control knob locates in slot at side of cabinet.

Battery.

9 volt. Ever Ready PP9 or equivalent.

072531

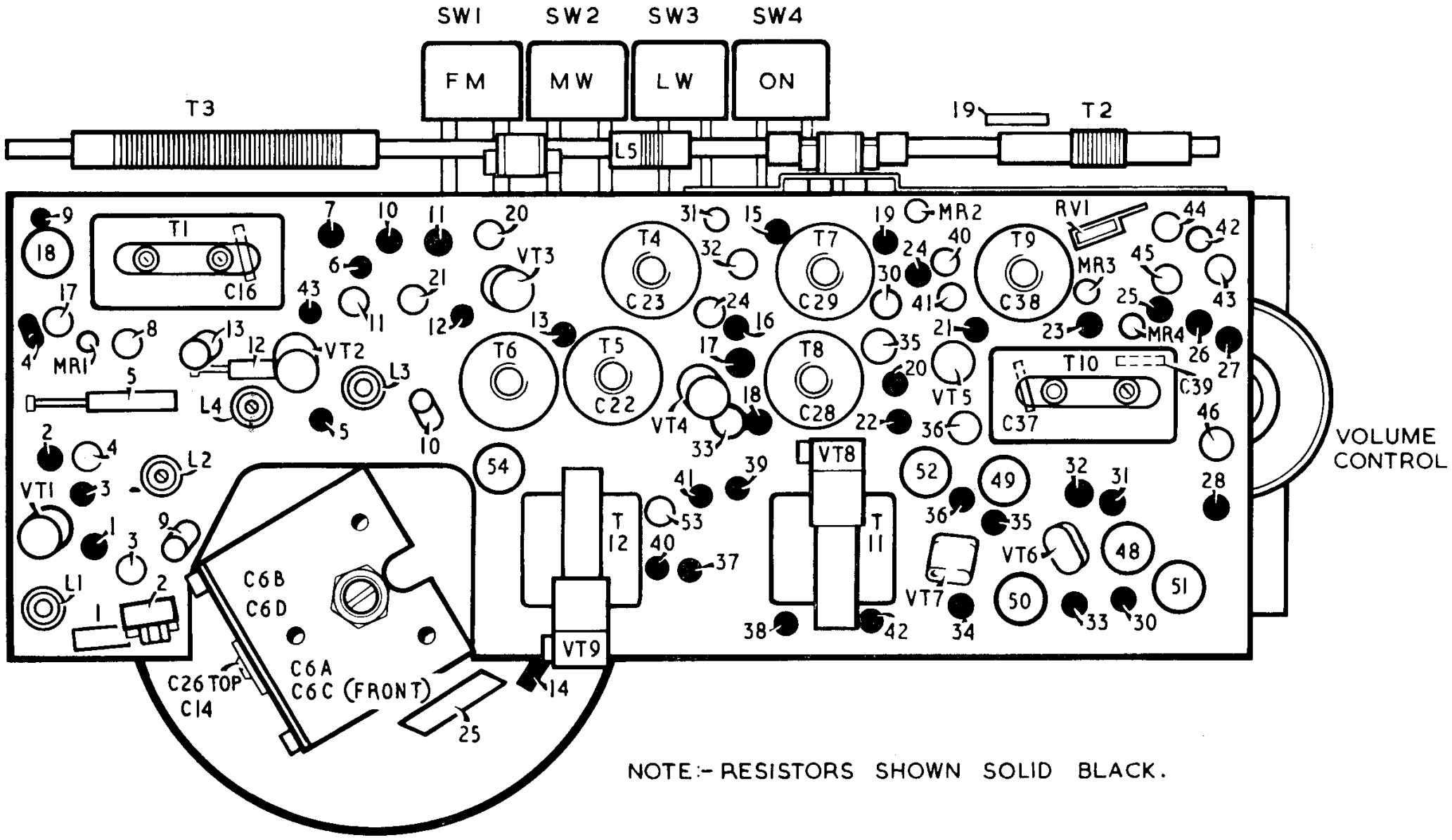
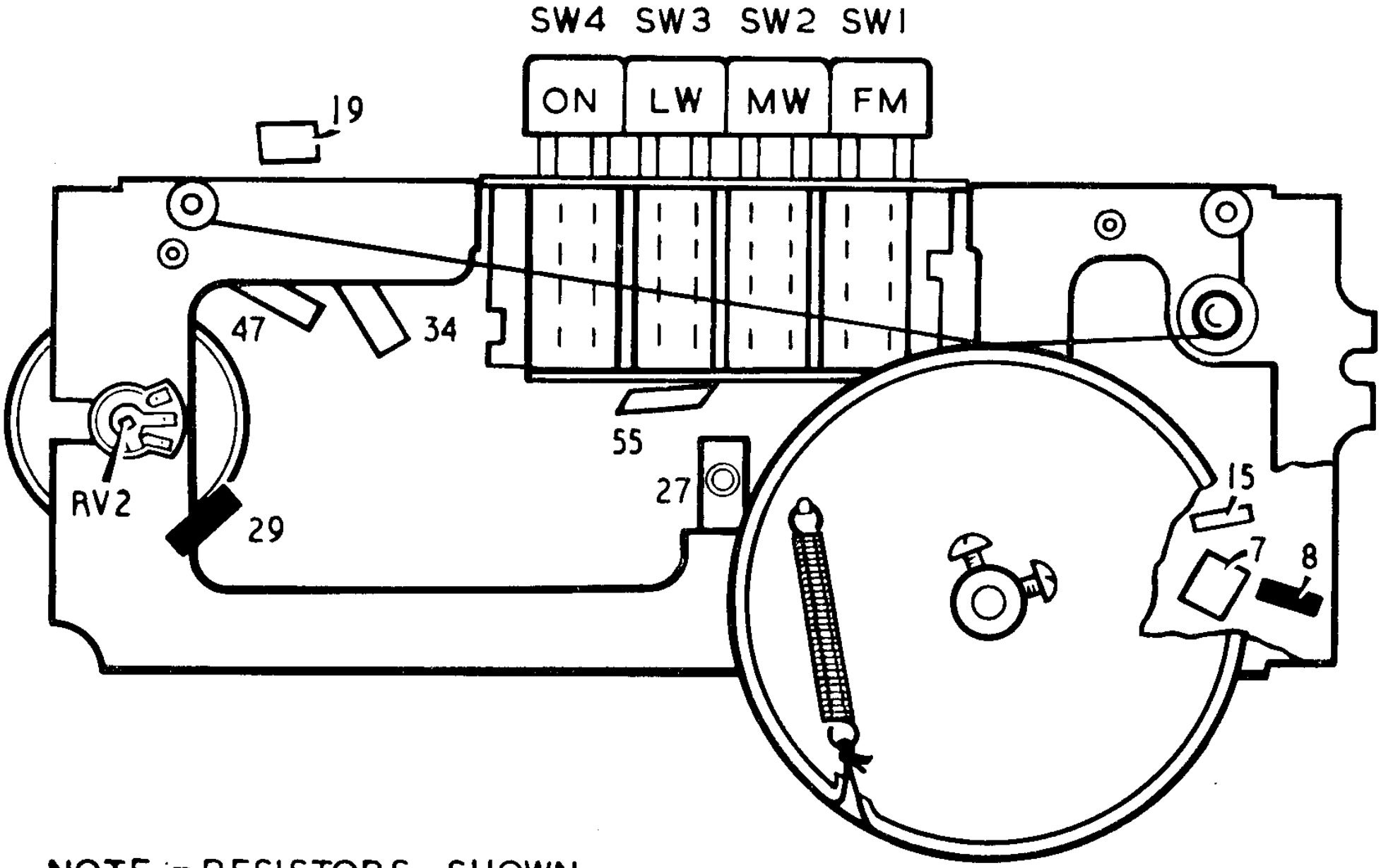
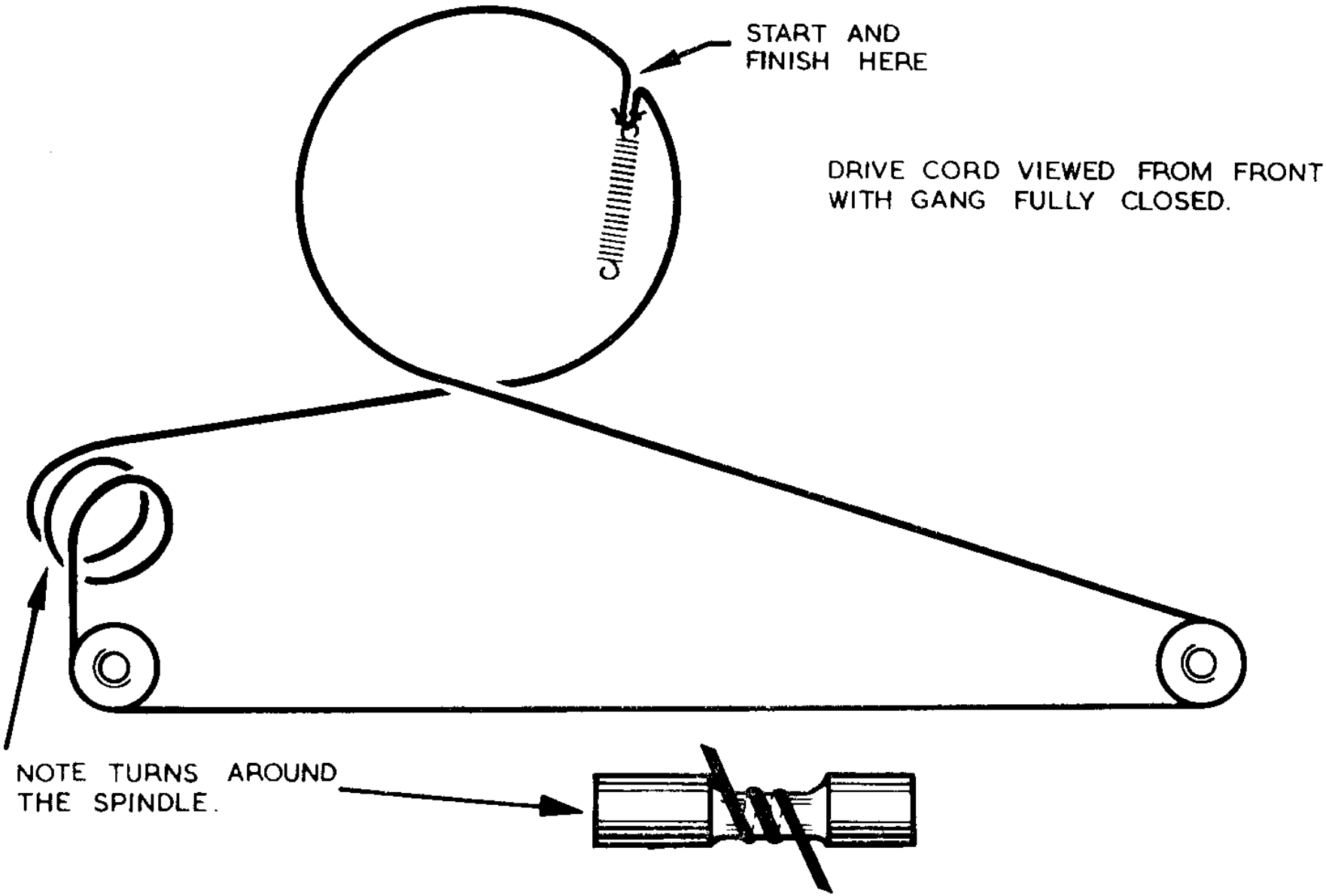

SW1
SW2
SW3
SW4
FM
MW
LW
ON
T3
T2
L5
19
T1
C16
T4
C23
T7
C29
T9
C38
RV1
MR2
MR3
MR4
VT3
VT2
VT4
VT5
VT6
VT7
VT8
VT9
T6
T5
C22
T8
C28
T10
C39
C37
L1
L2
L3
L4
MR1
T 12
T 11
C6B
C6D
C6A
C6C (FRONT)
C26 TOP
C14
VOLUME
CONTROL
NOTE:- RESISTORS SHOWN SOLID BLACK.

Fig. 1



NOTE :- RESISTORS SHOWN SOLID BLACK.

Fig. 2



DRIVE CORD SHOULD BE OF NYLON BRAIDED GLASS YARN. LENGTH BETWEEN CENTRE OF LOOPS IS 28 INS.

Fig. 3

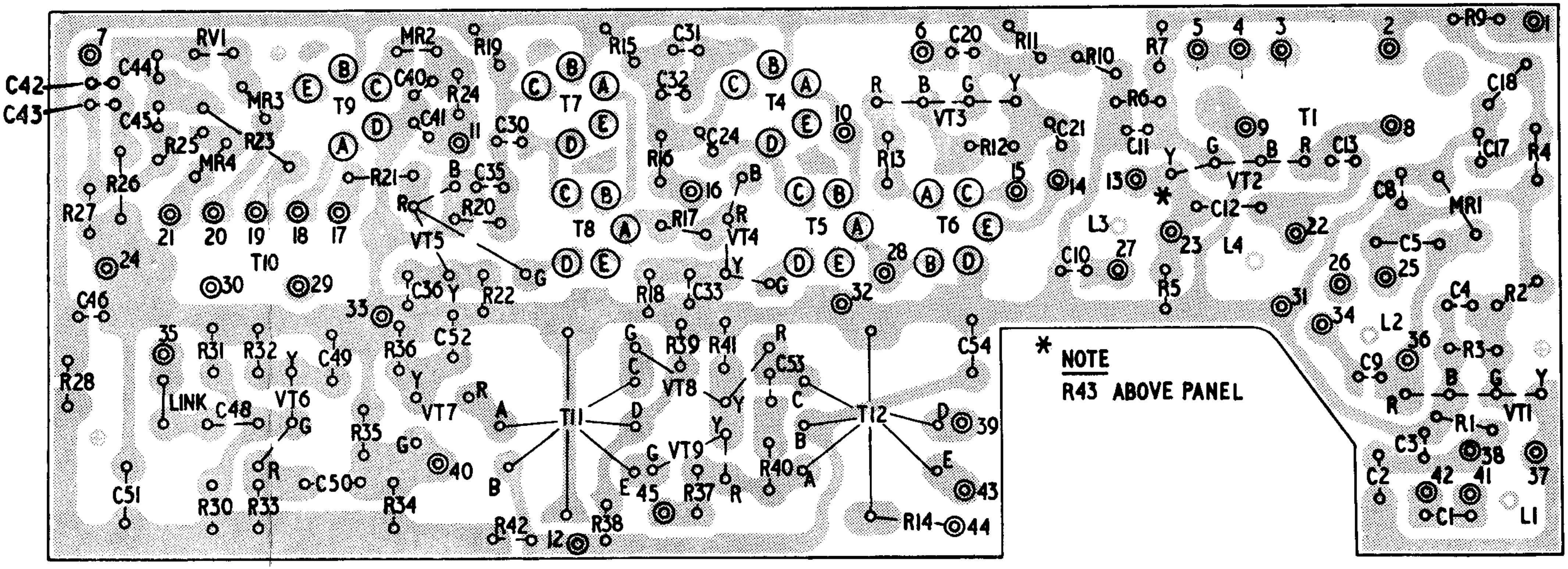

* NOTE
R43 ABOVE PANEL
RV1
MR1
MR2
MR3
MR4
T1
T4
T5
T6
T7
T8
T9
T10
T11
T12
VT1
VT2
VT3
VT4
VT5
VT6
VT7
VT8
VT9
L1
L2
L3
L4
LINK

Fig. 4