

## VOLTAGE READINGS

A table of voltage readings is included to assist in servicing. Some variation of the figures must be expected because of component tolerances and allowance must be made correspondingly. Readings were taken employing an Avometer Model 8, the highest range compatible with reading accuracy being used in each instance. Controls and switches were positioned as given below.

E.H.T. links to 2 kV  
 A2 SENSITIVITY 10 V/mm  
 A1 Volts Range at 1000  
 A1 VOLTS to 0  
 Y1 SHIFT to centre the trace  
 Y2 SHIFT to centre the trace  
 TIME SCALE to 0  
 Time Range at OFF  
 Sync Selector to REPETITIVE EXT.

X SHIFT to centre the spots  
 FOCUS for sharp outline  
 TRIGGER OR SYNC fully counter-clockwise  
 TIME BASE FREQUENCY fully counter-clockwise  
 Time Range at 50 msec.  
 Intensity Modulation Selector at OFF  
 BRIGHTNESS fully counter-clockwise  
 Normal /X5 to NORMAL

### A1 AMPLIFIER

V9 Anode	pin 3	76 V					
V9 Screen	pin 4	36 V					
V9 Cathode	pin 8	0.87 V					
V10 Anode	pin 3	87 V					
V10 Screen	pin 4	19 V					
V10 Cathode	pin 8	0.23 V					
V11 Anode	pin 3	325 V					
V11 Grid	top cap	76 V					
V11 Cathode	pin 8	84 V					
V12 Anode	pin 3	330 V					
V12 } Screens V13 }	pins 2	325 V					
V12 } Cathodes V13 }	pins 6	87 V					
V13 Anode	pin 3	320 V					
Across R55	(see Fig 8)	330 V					

**A1 Amplifier**

Across R57	(see Fig 8)	55.8 V					
Across R58	(see Fig 8)	216 V					
Across R59	(see Fig 8)	260 V					
Across R60	(see Fig 8)	75 V					
Across R62	(see Fig 8)	15 V					
Across R63	(see Fig 8)	38 V					
Across R64-R65	(see Fig 8)	550 V					
Across R67	(see Fig 8)	335 V					
Across R68	(see Fig 8)	280 V					
Across R74	(see Fig 8)	320 V					
Across R77	(see Fig 8)	300 V					
Across R78	(see Fig 8)	57 V					
Across R79	(see Fig 8)	308 V					
Across R82	(see Fig 8)	555 V					
Across R131	(see Fig 8)	81.5 V					

**A2 AMPLIFIER**

V21 Anode	pin 3	322 V					
V21 Screen	pin 2	340 V					
V21 Cathode	pin 6	3.85 V					
V22 Anode	top cap	860 V					
V22 Cathode	pin 8	490 V					
Across R105	(see Fig 8)	2.5 V					
Across R127	(see Fig 8)	162 V					
Across R130	(see Fig 8)	134 V					

### TIME-BASE

V5 Anode	pin 2	280 V					
V5 Cathode	pin 3	60 V					
V5 Anode	pin 5	275 V					
V5 Cathode	pin 6	12.5 V					
V6 Cathode	pin 8	483 V					
V7 Anode	pin 3	603 V					
V7 Cathode	pin 6	480 V					
V8 Anode	pin 3	482 V					
V8 Screen	pin 2	138 V					
V8 Cathode	pin 6	0 V					
Across R17	(see Fig 9)	63 V					
Across R20	(see Fig 9)	11 V					
Across R21	(see Fig 9)	46 V					
Across R70	(see Fig 9)	65 V					
Across R22	(see Fig 9)	162 V					
Across R23	(see Fig 9)	150 V					
Across R29	(see Fig 9)	3.1 V					
Across R30	(see Fig 9)	610 V					
Across R34	(see Fig 9)	36 V					
Across R35	(see Fig 9)	0 V					
Across R36	(see Fig 9)	460 V					
Across R40	(see Fig 9)	174 V					

### INTENSITY MODULATION

V19 Anode	pin 1	640 V					
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*Intensity Modulation*

V19 Cathodes	pins 3 or 8	400 V					
V19 Grid	pin 7	385 V					
V20 Anode	pin 3	330 V					
V20 Screen	pin 4	63.5 V					
V20 Cathode	pin 8	1.12 V					
Across R100–R102	(see Fig 9)	390 V					
Across R103	(see Fig 9)	245 V					
Across R104	(see Fig 9)	318 V					
Across R107	(see Fig 9)	67 V					
Across R108	(see Fig 9)	335 V					

**650 V H.T. CIRCUIT**

V1 Cathode	pin 8	920 V					
V3 Anode	top cap	870 V					
V3 Cathode (H.T.)	pin 8	640 V					
V4 Screen	pin 4	312 V					
V4 Grid	top cap	132 V					
V4 Cathode	pin 8	159 V					
V16 Grids	pins 2 or 7	320 V					
V16 Cathode	pin 8	340 V					
V16 Cathode	pin 3	325 V					
Across R3	(see Fig 8)	545 V					
Across R4	(see Fig 8)	263 V					
Across R9	(see Fig 8)	95 V					
Across R10	(see Fig 8)	290 V					

**650 V H.T. Circuit**

Across R11	(see Fig 8)	132 V				
Across R41	(see Fig 9)	295 V				
Across R43	(see Fig 9)	318 V				

**2 kV or 4 kV E.H.T. CIRCUIT**

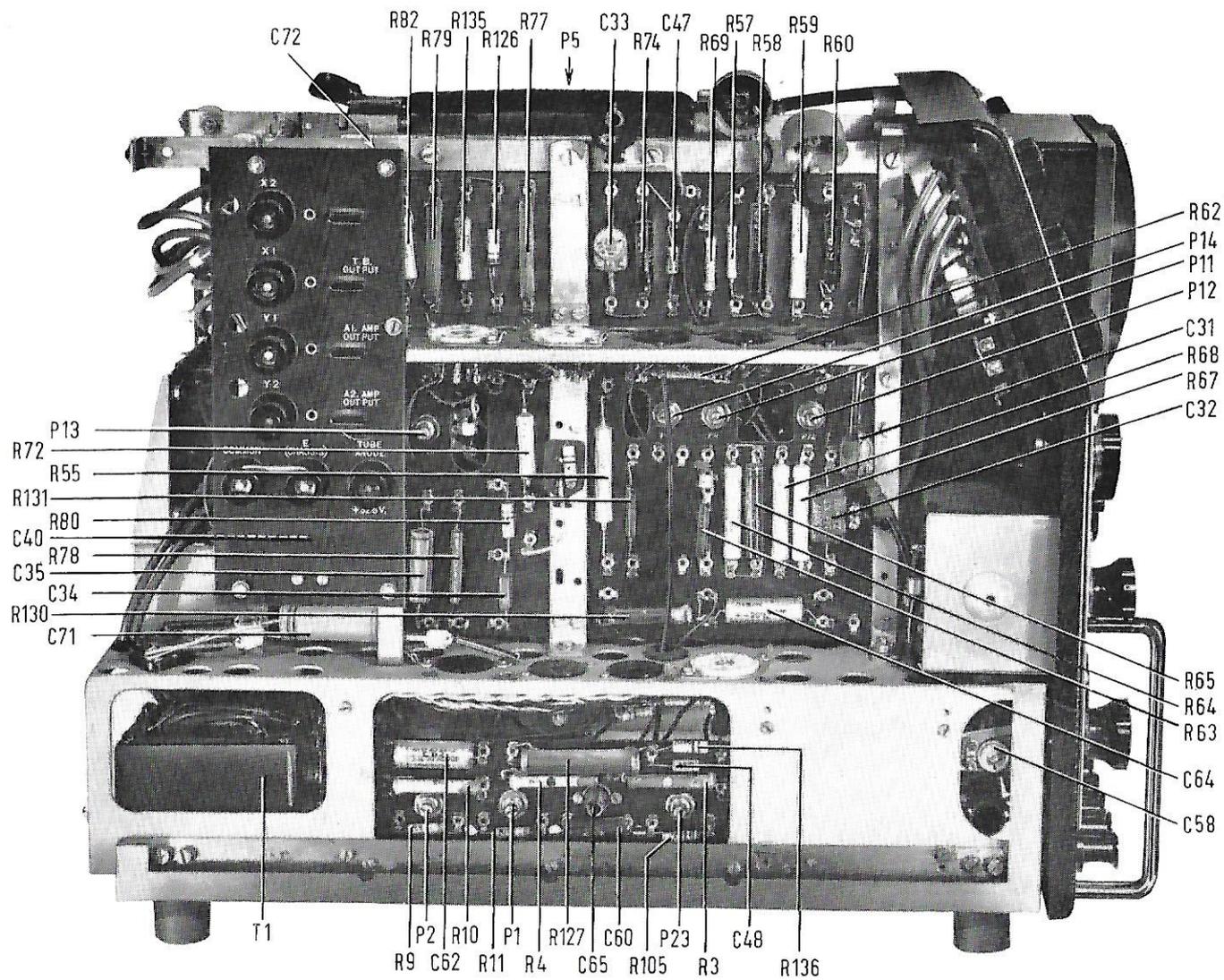
V15 Anode	top cap	550 V POS*				
V14 Anode	top cap	1650 V NEG*				
FOCUS slider		1310 V-1110 V clockwise NEG*				
BRIGHTNESS slider		1575 V-1635 V clockwise NEG*				
Across R12	(see Fig 9)	315 V				
Across R89	(see Fig 9)	39 V				
Across R90	(see Fig 9)	985 V				
Across R91	(see Fig 9)	395 V				
Across R92	(see Fig 9)	465 V				
Across R95	(see Fig 9)	3.8 V				

\*Electrostatic meter

**POTENTIOMETERS**

Y1 SHIFT slider	592 V-648 V clockwise	
Y2 SHIFT slider	138 V-650 V clockwise	
TIME BASE FREQUENCY	480 V-152 V clockwise	
A1 VOLTS end tag	Scale 0-100 650 V-600 V	
X SHIFT slider	230 V-465 V clockwise	
TIME SCALE slider (earthy)	0 V-228 V clockwise	
TIME SCALE slider	242 V-462 V clockwise	





*Fig. 8 Left-hand View*

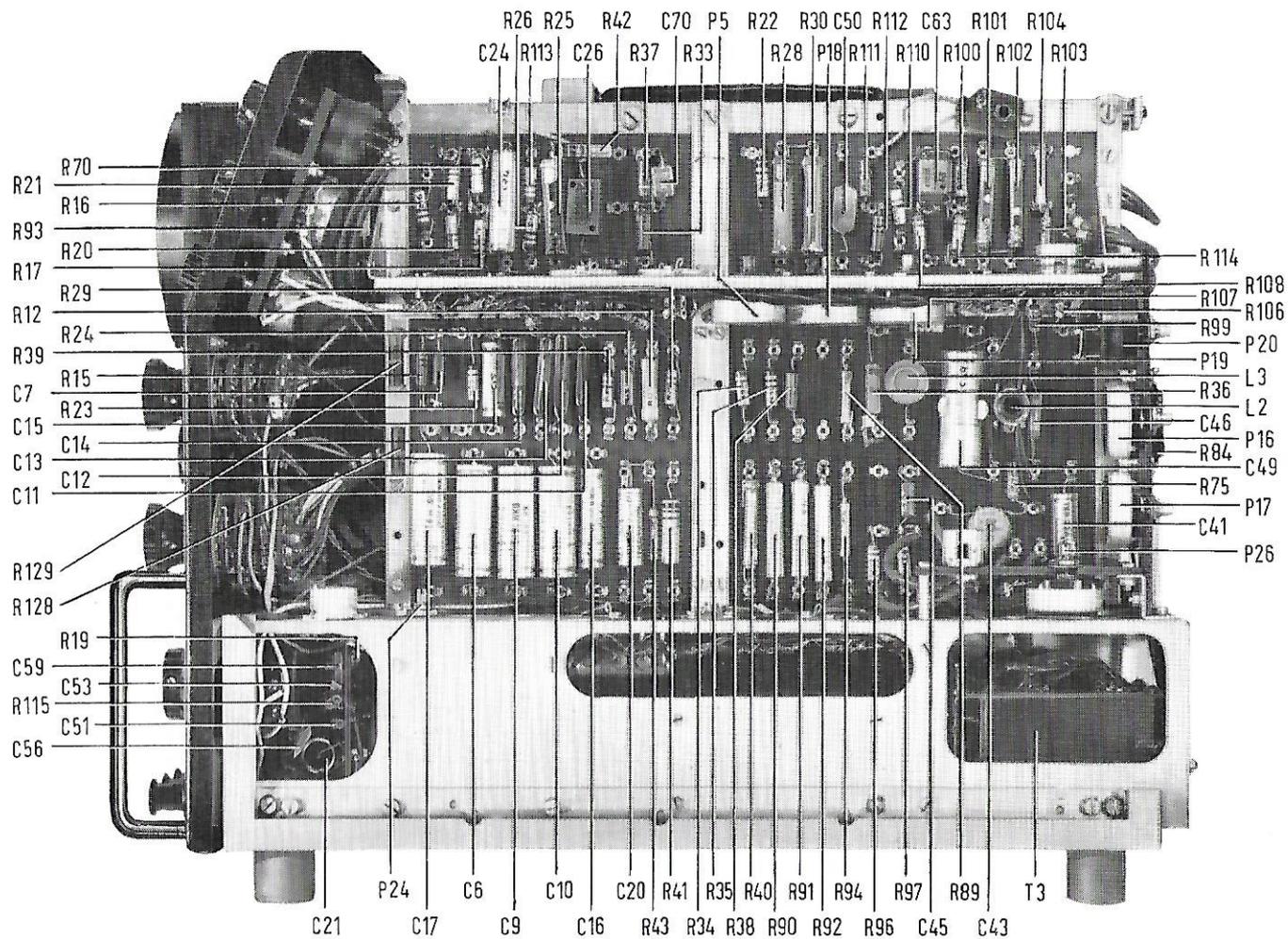


Fig. 9 Right-hand View

## CIRCUIT COMPONENTS

**N.B.** Orders for spare parts must include the instrument serial number which is marked above the mains selector panel.

Ref.	Value	Tolerance	Rating	Part Number
R1	68 kΩ	±5%	2 W	M132510/41
R2	68 kΩ	±5%	2 W	M132510/41
R3	680 kΩ	±20%	1 W	DR02/68420
R4	4.7 MΩ	±20%	1 W	DR08/47520
R5	470 Ω	±20%	1 W	DR08/47120
R6	470 Ω	±20%	1 W	DR08/47120
R7	47 Ω	±20%	1 W	DR08/47020
R8	470 Ω	±20%	1 W	DR08/47120
R9	390 kΩ	±20%	1 W	DR08/39420
R10	470 kΩ	±20%	1 W	DR02/47420
R11	390 kΩ	±20%	1 W	DR08/39420
R12	820 kΩ	±5%	1 W	M132510/38
R13	560 kΩ	±10%	1 W	DR02/56410
R14	68 kΩ	±10%	1 W	DR08/68310
R15	1 MΩ	±20%	1 W	DR08/10520
R16	1 MΩ	±20%	1 W	DR08/10520
R17	27 kΩ	±10%	1 W	DR08/27310
R18	68 kΩ	±5%	2 W	M132510/41
R19	4.7 MΩ	±1%	1 W	M132510/98
R20	4.7 kΩ	±10%	1 W	DR08/47210
R21	22 kΩ	±10%	1 W	DR08/22310
R22	150 kΩ	±10%	1 W	DR08/15410
R23	150 kΩ	±10%	1 W	DR08/15410
R24	680 kΩ	±20%	1 W	DR08/68420
R25	150 kΩ	±5%	2 W	M132510/114
R26	1 MΩ	±20%	1 W	DR08/10520
R27	470 Ω	±20%	1 W	DR08/47120
R28	82 kΩ	±20%	2 W	DR01/82320
R29	4.7 kΩ	±10%	1 W	DR08/47210
R30	270 kΩ	±20%	2 W	DR01/27420
R31	470 Ω	±20%	1 W	DR08/47120
R32	1.2 MΩ	±10%	1 W	DR08/12510
R33	68 kΩ	±20%	1 W	DR08/68320
R34	220 kΩ	±10%	1 W	DR08/22410
R35	1.5 MΩ	±10%	1 W	DR08/15510
R36	1.2 MΩ	±5%	1 W	M132510/99
R37	390 kΩ	±10%	1 W	DR08/39410
R38	220 kΩ	±20%	1 W	DR08/22420
R39	2.2 MΩ	±20%	1 W	DR08/22520
R40	39 kΩ	±10%	1 W	DR02/39310
R41	1 MΩ	±2%	1 W	M132510/119
R42	22 kΩ	±10%	1 W	DR08/22310
R43	1 MΩ	±2%	1 W	M132510/119
R44	2.2 MΩ	±20%	1 W	DR08/22520
R45	560 kΩ	±2%	2 W	M132510/31

Ref.	Value	Tolerance	Rating	Part Number
R46	250 k $\Omega$	$\pm 2\%$	1 W	M132510/47
R47	63 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/118
R48	17.4 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/117
R49	5.6 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/22
R50	220 k $\Omega$	$\pm 1\%$	1 W	M132510/97
R51	1.6 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132574/32
R52	535 $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132574/31
R53	160 $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132574/30
R54	4.7 M $\Omega$	$\pm 1\%$	1 W	M132510/98
R55	220 k $\Omega$	$\pm 5\%$	2 W	M132510/110
R56	150 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/15120
R57	15 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/52
R58	100 k $\Omega$	$\pm 5\%$	2 W	M132510/104
R59	120 k $\Omega$	$\pm 5\%$	2 W	M132510/105
R60	60 k $\Omega$	$\pm 2\%$	1 W	M132510/106
R61	250 $\Omega$	$\pm 2\%$	$\frac{1}{4}$ W	M132510/103
R62	15 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/52
R63	30 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/111
R64	470 k $\Omega$	$\pm 5\%$	2 W	M132510/112
R65	560 k $\Omega$	$\pm 5\%$	2 W	M132510/113
R66	150 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/15120
R67	150 k $\Omega$	$\pm 5\%$	2 W	M132510/114
R68	120 k $\Omega$	$\pm 5\%$	2 W	M132510/105
R69	9.6 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/96
R70	39 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/39310
R71	150 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/15120
R72	39 k $\Omega$	$\pm 5\%$	1 W	M132510/116
R73	1 M $\Omega$	$\pm 20\%$	2 W	DR01/10520
R74	330 k $\Omega$	$\pm 2\%$	1 W	M132510/107
R75	56 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/56310
R76	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R77	56 k $\Omega$	$\pm 5\%$	15 W	DR43/56305
R78	5.6 k $\Omega$	$\pm 5\%$	6 W	M132511/19
R79	56 k $\Omega$	$\pm 5\%$	15 W	DR43/56305
R80	4.7 M $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/47510
R81	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R82	560 k $\Omega$	$\pm 1\%$	1 W	M132510/108
R83	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R84	470 k $\Omega$	$\pm 5\%$	1 W	M132510/36
R85	1 M $\Omega$	$\pm 5\%$	2 W	M132510/37
R86	1 M $\Omega$	$\pm 5\%$	2 W	M132510/37
R87	1 M $\Omega$	$\pm 5\%$	2 W	M132510/37
R88	820 k $\Omega$	$\pm 5\%$	1 W	M132510/38
R89	56 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/53
R90	1.8 M $\Omega$	$\pm 5\%$	2 W	M132510/90

Ref.	Value	Tolerance	Rating	Part Number
R91	1.2 M $\Omega$	$\pm 5\%$	2 W	M132510/91
R92	1.5 M $\Omega$	$\pm 5\%$	2 W	M132510/92
R93	470 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/67
R94	270 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/93
R95	2.7 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/27210
R96	82 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/82310
R97	82 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/82310
R99	100 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/10120
R100	330 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/33410
R101	180 k $\Omega$	$\pm 10\%$	1 W	DR02/18410
R102	180 k $\Omega$	$\pm 10\%$	1 W	DR02/18410
R103	390 k $\Omega$	$\pm 5\%$	$\frac{1}{4}$ W	M132510/100
R104	510 k $\Omega$	$\pm 5\%$	$\frac{1}{2}$ W	M132510/101
R105	330 $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/33110
R106	100 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/10120
R107	33 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/33310
R108	270 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/27410
R109	470 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/47120
R110	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R111	220 k $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/22420
R112	1 M $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/10520
R113	6.8 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/68210
R114	82 k $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/82310
R115	470 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/30
R116	4.7 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/21
R117	9.6 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/96
R118	25 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/25
R119	53 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/95
R120	120 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/28
R121	520 k $\Omega$	$\pm 2\%$	$\frac{1}{2}$ W	M132510/94
R122	220 k $\Omega$	$\pm 1\%$	1 W	M132510/97
R123	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R124	470 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47120
R125	47 k $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/47320
R126	680 k $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/68420
R127	30 k $\Omega$	$\pm 5\%$	15 W	DR43/30305
R128	400 k $\Omega$	$\pm 1\%$	1 W	ITB.3500/C24/40401
R129	100 k $\Omega$	$\pm 1\%$	$\frac{1}{4}$ W	ITB.3500/C21/10401
R130	180 k $\Omega$	$\pm 20\%$	1 W	DR02/18420
R131	82 k $\Omega$	$\pm 1\%$	$\frac{1}{2}$ W	M132510/115
R132	470 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/47120
R133	47 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47020
R134	47 $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/47020
R135	330 k $\Omega$	$\pm 2\%$	1 W	M132510/107

Ref.	Value	Tolerance	Rating	Part Number
R136	4.7 M $\Omega$	$\pm 10\%$	$\frac{1}{2}$ W	DR08/47510
R137	47 k $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/47320
R138	470 $\Omega$	$\pm 20\%$	$\frac{1}{4}$ W	DR09/47120
R139	560 k $\Omega$	$\pm 20\%$	$\frac{1}{2}$ W	DR08/56420
C1	4 $\mu$ F	$\pm 20\%$	750 V	M129523
C2	4 $\mu$ F	$\pm 20\%$	750 V	M129523
C3	6 $\mu$ F	$\pm 20\%$	1500 V	M129527
C4	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/14
C5	0.5 $\mu$ F	$\pm 20\%$	1000 V	M129521
C6	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/13
C7	68 pF	$\pm 10\%$	350 V	M129580/18
C8	.01 $\mu$ F	$\pm 20\%$	5000 V	M129508
C9	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/13
C10	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/13
C11	250 pF	$\pm 5\%$	500 V	M129526/4
C12	860 pF	$\pm 5\%$	500 V	M129526
C13	2700 pF	$\pm 5\%$	750 V	M129593/8
C14	9000 pF	$\pm 5\%$	750 V	M129593/3
C15	0.026 $\mu$ F	$\pm 5\%$	500 V	ISB.6031
C16	0.09 $\mu$ F	$\pm 5\%$	500 V	ISB.6032
C17	0.26 $\mu$ F	$\pm 5\%$	500 V	ISB.6033
C18	0.9 $\mu$ F	$\pm 5\%$	500 V	ISB.6034
C19	2.6 $\mu$ F	$\pm 5\%$	500 V	ISB.6035
C20	.01 $\mu$ F	$\pm 25\%$	1000 V	M129701/3
C21	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/14
C22	27 pF	$\pm 2\%$	500 V	M129579/8
C23	62 pF	$\pm 2\%$	350 V	M129579/13
C24	0.1 $\mu$ F	$\pm 20\%$	350 V	M129701/10
C25	230 pF	$\pm 2\%$	350 V	M129580/118
C26	330 pF	$\pm 10\%$	350 V	M129580/42
C27	610 pF	$\pm 2\%$	350 V	M129580/116
C28	27 pF	$\pm 5\%$	500 V	M129579/51
C29	1400 pF	$\pm 5\%$	350 V	M129580/124
C30	1000 pF	$\pm 20\%$	350 V	M129544
C31	45 pF Trimmer		350 V	M128517
C32	1500 pF	$\pm 2\%$	350 V	M129580/114
C33	3.5-12 pF Trimmer		350 V	M128517/2
C34	27 pF	$\pm 10\%$	350 V	M129581/7
C35	0.1 $\mu$ F	$\pm 20\%$	350 V	M129620
C36	27 pF	$\pm 2\%$	500 V	M129579/8
C37	6.8 pF	$\pm \frac{1}{3}$ pF	750 V	M129579/71
C38	0.5 $\mu$ F	$\pm 20\%$	1000 V	M129521
C39	0.1 $\mu$ F	$\pm 20\%$	6000 V	M129520
C40	0.01 $\mu$ F	$\pm 20\%$	5000 V	M129508
C41	0.1 $\mu$ F	$\pm 20\%$	350 V	M129701/10

Ref.	Value	Tolerance	Rating	Part Number
C42	27 pF	$\pm 2\%$	500 V	M129579/8
C43	100 pF	$\pm 20\%$	6000 V	M129636
C44	27 pF	$\pm 2\%$	500 V	M129579/8
C45	22 pF	$\pm 10\%$	350 V	M129580/5
C46	10 pF	$\pm 10\%$	350 V	M129580
C47	3.9 pF	$\pm \frac{1}{2}\%$	500 V	M129579/63
C48	27 pF	$\pm 10\%$	500 V	M129581/7
C49	0.1 $\mu$ F	$\pm 20\%$	1000 V	M129701/13
C50	120 pF	$\pm 10\%$	750 V	M129512/16
C51	22 pF	$\pm \frac{1}{2}\%$	500 V	M129579/61
C52	27 pF	$\pm 2\%$	500 V	M129579/8
C53	2950 pF	$\pm 2\%$	350 V	M129580/119
C54	1420 pF	$\pm 2\%$	350 V	M129580/120
C55	510 pF	$\pm 2\%$	350 V	M129580/121
C56	210 pF	$\pm 2\%$	350 V	M129580/122
C57	68 pF	$\pm 2\%$	350 V	M129580/20
C58	45 pF Trimmer		350 V	M128517
C59	1000 pF	$\pm 5\%$	350 V	M129580/112
C60	1500 pF	$\pm 5\%$	350 V	M129580/113
C61	0.5 $\mu$ F	$\pm 20\%$	350 V	M129701/19
C62	0.01 $\mu$ F	$\pm 25\%$	1000 V	M129701/13
C63	470 pF	$\pm 10\%$	350 V	M129580/48
C64	0.01 $\mu$ F	$\pm 25\%$	1000 V	M129701/3
C65	500–3000 pF Trimmer		250 V	M128512/3
C66	270 pF	$\pm 2\%$	350 V	M129580/123
C67	470 pF	$\pm 20\%$	1750 V	M129622/2
C68	1000 pF	$\pm 20\%$	500 V	M129646/9
C69	3000 pF	$\pm 20\%$	500 V	M129646/25
C70	27 pF	$\pm 10\%$	350 V	M129581/7
C71	0.5 $\mu$ F	$\pm 20\%$	350 V	M129701/19
C72	0.01 $\mu$ F	$\pm 25\%$	1000 V	M129701/4

Ref.	Value	Rating	Part Number
P1	1 M $\Omega$	2 W	KY9988/38
P2	500 k $\Omega$	2 W	KY9988/74
P3	250 k $\Omega$	2 W	KY9988/18
P4	250 k $\Omega$	2 W	KY9988/18
P5	1 M $\Omega$	1½ W	KS92135/3
P6	50 k $\Omega$	4 W	M158520
P7	50 k $\Omega$	4 W	} M158522
P8	50 k $\Omega$	4 W	
P9	15 k $\Omega$	4 W	
P10	15 k $\Omega$	4 W	M158520/10
P11	500 $\Omega$	1 W	M158520/10
			M158526/4

Ref.	Value	Rating	Part Number
P12	30 k $\Omega$	2 W	M158513
P13	0.5 M $\Omega$	2 W	KY9988/74
P14	4 k $\Omega$	1 W	M158526/6
P16	250 k $\Omega$	2 W	KY9988/72
P17	250 k $\Omega$	2 W	KY9988/72
P18	500 k $\Omega$	$\frac{1}{4}$ W	KS92135/6
P19	500 k $\Omega$	$\frac{1}{4}$ W	KS92135/6
P20	1 M $\Omega$	2 W	KY9988/38
P21	500 k $\Omega$	1 $\frac{1}{2}$ W	M158521/11
P22	50 k $\Omega$	2 W	KY9988
P23	500 $\Omega$	1 W	M158526/4
P24	1 M $\Omega$	$\frac{1}{4}$ W	IUB.8007/2
P25	500 k $\Omega$	2 W	KY9988/22
P26	250 k $\Omega$	1 $\frac{1}{2}$ W	KS92135/7

Ref.	Description	Function	Part Number
S15 } S1 } S2 } S3 }	6-position	Sync Selector	M154519 4-pole
S4 } S5 } S6 }	11-position	Time Range	M154508 3-pole
S7 } S8 }	8-position	A1 Volts Range	MC460056
S9	On/Off Double-pole		ISB.4002
S11 } S12 }	4-position	Intensity Modulation Selector	M154510 2-pole
S13 } S14 }	7-position	A2 Sensitivity	MC460055
S16 } S17 }	2-position	Normal X5	ISB.4002 2-pole
T1	—	—	KA30285
T2	—	—	KA30309 (200/250 V) or KA30310 (105/130 V)
T3	—	—	KA30284

Ref.	Description	Rating	Part Number
L1	—	—	MC414013
L2	—	—	MC430457
L3	—	—	MC430458
F1	—	3 A	M157503/11
F2	—	3 A	M157503/11
F3	—	500 mA	M157503/15
F4	—	2 A	M157503/4
M1	Metrosil	130 V	M199573
M2	Metrosil	130 V	M199573
LP	0.3 A	6.5 V	M201505

#### Replacement of V15 in Model 1049

The valve used in Model 1049 at position V15 is either type 61BT or type EL38. These types of valve may be replaced by type EL360 for the V15 position.

To replace a 61BT valve:

transfer to pin 6 of the valve base the wire which connects C40 to R83; and connect R83 between pins 5 and 6.

To replace an EL38 valve:

on the valve base, disconnect pin 1 from common; and proceed as given above for the replacement of a 61BT valve.

The pin connections for EL360 are:

IC; h; IC; g2; g1; NP; h; k; g3;  
top-cap anode  
Octal Base

ADD.1/1049/6/60/20

V16	12AU7
V18	6AL5
V19	12AU7
V20	OM5B
V21	63SPT
V22	EL38
CRT	89J

Ref.	Description	Rating	Part Number
L1	—	—	MC414013
L2	—	—	MC430457
L3			

V1	53KU
V2	53KU
V3	12E1
V4	OM6
V5	6SN7GT
V6	OM4
V7	63SPT
V8	63SPT
V9	OM5B
V10	OM5B
V11	OM4
V12	63SPT
V13	63SPT
V14	SU42
V15	EL38
V16	12AU7
V18	6AL5
V19	12AU7
V20	OM5B
V21	63SPT
V22	EL38
CRT	89J