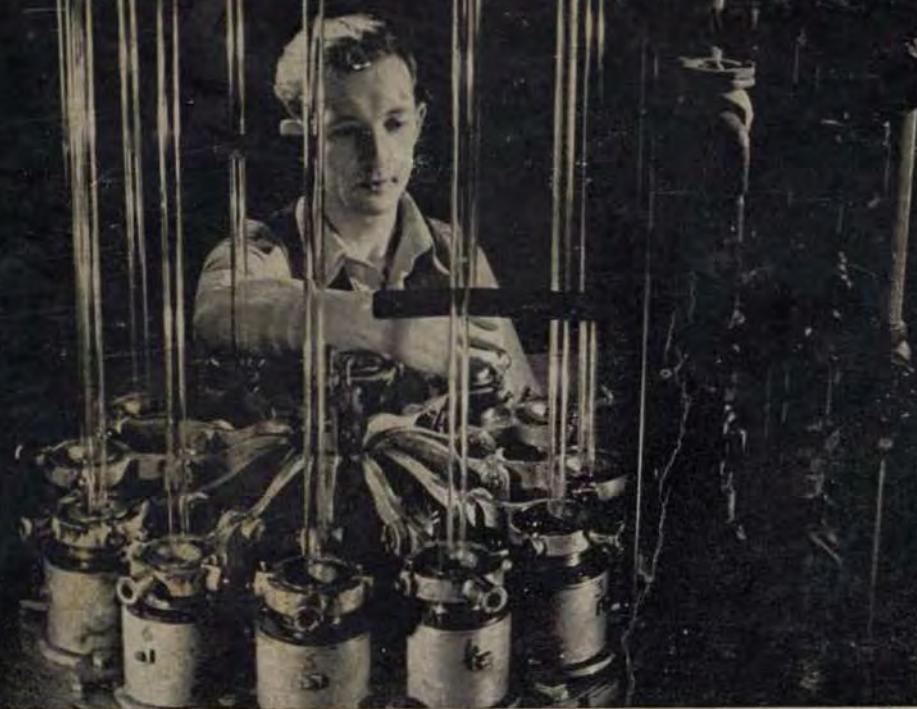


VALVES AND Electron Tubes



TECHNICAL DATA



With the compliments of

MULLARD - AUSTRALIA PTY. LTD.,
35 Clarence Street,
SYDNEY;
and at
592 Bourke Street,
MELBOURNE.

Commonwealth representatives for:—

Mullard Limited, London;
Mullard Overseas Limited.

South Australian Distributors:

GERARD & GOODMAN LTD.
192-196 Rundle Street,
Adelaide

\$5-

A CATALOGUE OF
MULLARD RADIO
RECEIVING VALVES
A N D S P E C I A L
ELECTRON TUBES



Mullard is the Registered Trade Mark of Mullard Ltd. and is registered in most of the principal countries of the world.

MULLARD OVERSEAS LTD.,
CENTURY HOUSE, SHAFTESBURY AVE., LONDON, ENGLAND.

INTRODUCTION

To millions of people throughout the world the Mullard name is associated with electronic products of the most advanced techniques and the highest quality. To those who have visited the Mullard organisation in this country, it means much more. For they have seen something of the company's extensive research facilities and great manufacturing resources.

The first few pages of this catalogue give some impression of these ramifications; we hope they will be read with interest.

For the rest, this is a catalogue of Mullard radio valves and electron tubes, and it contains descriptive details of every type in the current manufacturing programme. The most important of these to the designer of new equipment are indicated by **HEAVY PRINT** in the "Valve Data" section. These are the "Preferred Types" which embody the latest advances; which are in large scale production; and which will be available for maintenance for many years.

The remaining valves and tubes are, generally, normal maintenance types, the majority of which are in production or readily available from stock. A small number, however, are not being manufactured, but they have been included because they may still be available in the Trade. This means that inclusion in this catalogue of any particular type of valve or tube does not necessarily imply that it can be supplied.

It has, of course, only been possible to include abridged technical data but this should be adequate for normal requirements. Those who need more comprehensive information on the complete range of Mullard valves and tubes are invited to subscribe to the Technical Handbook Service, details of which will be found on page 66.

Advice on the use and applications of Mullard valves and electron tubes is freely available to designers and manufacturers of equipment, and to research workers. The world-wide network of Mullard distributors is constantly supplied with technical information from England, but where it is not possible for users to avail themselves of these services, they are invited to write direct to Head Office.

CONTENTS

	pages
The Mullard Organisation	5-10
Alphabetical Index to Valve Data	11-13
Valve Application Index of Preferred Types	14-17
References	18
Valve Base Diagrams	19-27
Valve Data	28-51
Direct Replacement Guide	52-57
Near Equivalent Guide	58-65
The Mullard Technical Handbook Service	66



THE MULLARD ORGANISATION

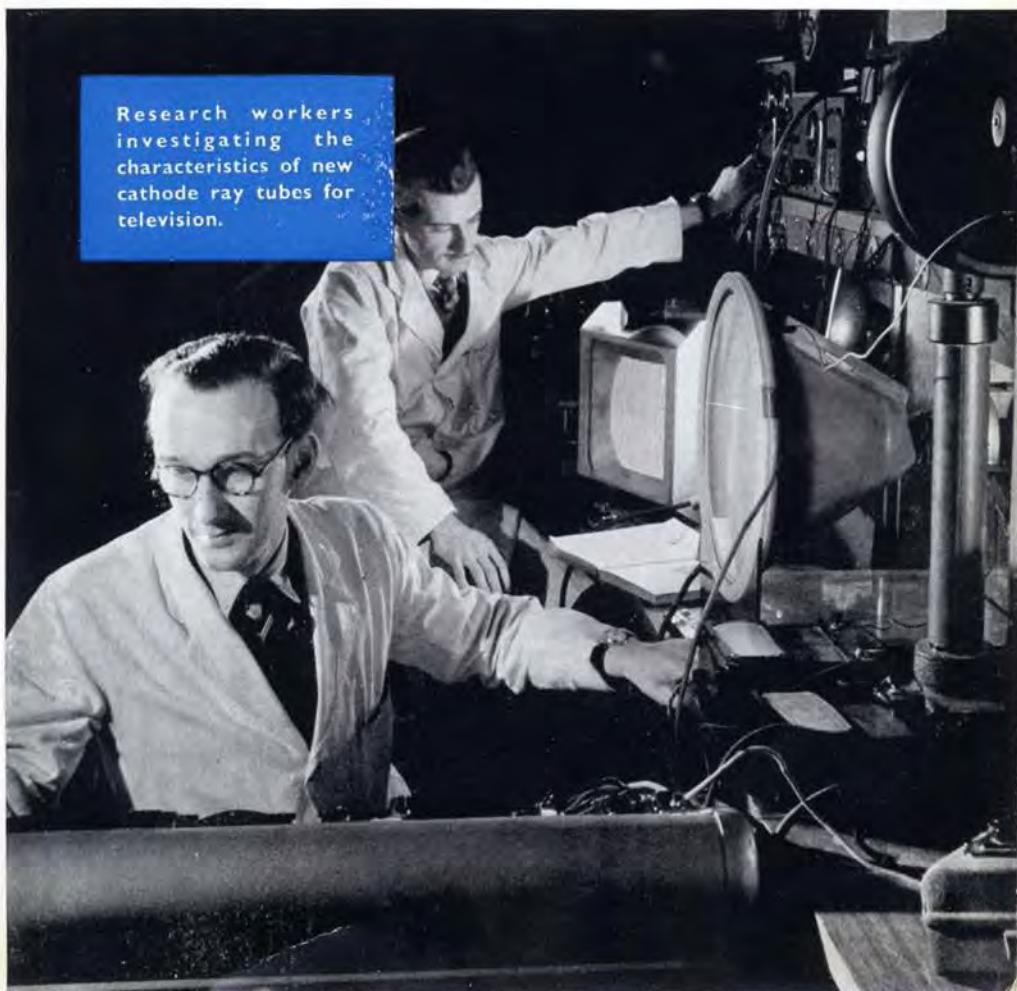
The Mullard production and research organisation is the largest of its kind in the British Commonwealth. Its products range from all types of valves and electron tubes for radio, television, industry, and research to a wide variety of magnetic materials and components. For certain specialised applications complete electronic equipments are also manufactured.

The quality of these products is carefully controlled at every stage of manufacture, and in many cases processing actually starts with the raw materials. By working to these critical standards the full benefits of Mullard research are realised in the finished products.

ELECTRONICS RESEARCH

Mullard leadership in electronics is, indeed, largely due to the unceasing work of its team of research workers. Electronics research on the broadest lines is conducted in the Mullard Research Laboratory,

Research workers
investigating the
characteristics of new
cathode ray tubes for
television.

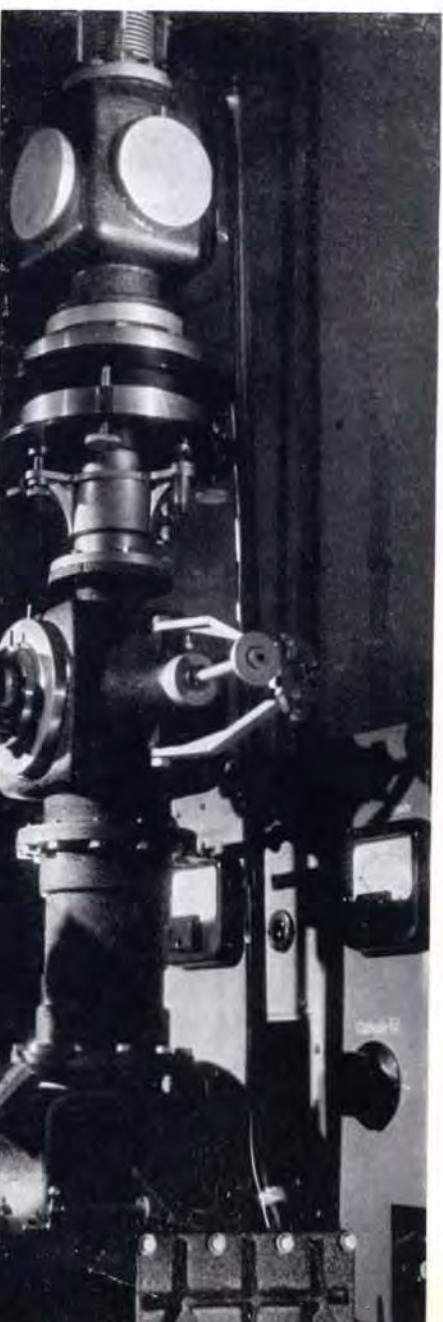


situated near Redhill, Surrey. Here physicists, chemists, metallurgists, mathematicians, engineers, and glass technologists collaborate in the design and development of new and special electron tubes, and new techniques and processes. Here, too, investigations are made of specific problems affecting the applications of electronics to other branches of research, and to the fields of industry, communications, and medicine.

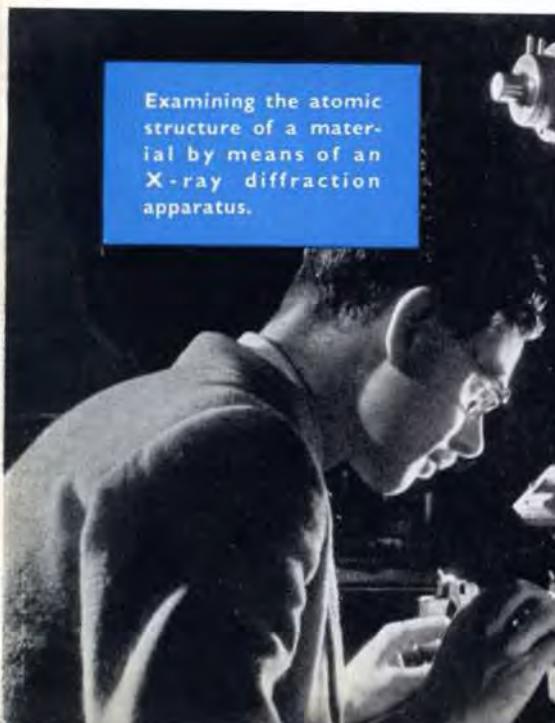
Two other vitally important links in the Mullard research organisation are the Valve Measurement and Applications Laboratory and the Materials Research Laboratory, both at Mitcham, Surrey.

The Valve Measurement and Applications Laboratory collaborates with Development Departments, in the main production units, in the design of new and improved valves and cathode ray tubes. Data and circuitry resulting from this work are distributed by the Electronic Tube Department of Mullard Overseas Limited to electronic equipment designers throughout the world.

At the Materials Research Laboratory investigations are



Examining the atomic structure of a material by means of an X-ray diffraction apparatus.





Fine tungsten wire is used for the filaments of valves and electron tubes. The picture shows an early stage in wire drawing.

made into the physical and chemical properties of the great variety of materials used in the manufacture of electron tubes. This laboratory also provides a comprehensive service on materials to the Mullard factories in solving production problems and improving manufacturing processes.

WIRE AND GLASS MANUFACTURE

This emphasis on the quality of materials is vitally necessary in view of the high performance and reliability demanded of modern valves and electron tubes. To maintain the highest possible standard in the finished products it is essential to control the quality of raw materials at the earliest possible stage. The wire and glass used in Mullard valves and tubes, for example, are produced from the actual raw materials in the company's own factories at Blackburn. In this way it is not only possible to control quality throughout every stage of manufacture, but also to ensure continuity of supply.

On an average, more than five million yards of fine wire—tungsten for valve filaments, and molybdenum for grids, filament supports, and mandrels—are produced at the Blackburn plant each week. Some of this will be less than 8 microns (3/10,000th inch) diameter or 1/10th the thickness of an average human hair.

The manufacture of this wire is a fine example of the application of science to modern industry. Through a long and elaborate series of operations, a handful of powder is transformed into miles of wire, every inch of which conforms to the most exacting standards. To ensure that these high standards are maintained, the diamond dies, through which the finer wire is drawn, are also manufactured at Blackburn.

The manufacture of glass for electron tubes also involves a number of highly technical operations. In the Mullard glass plant, the raw materials—silica (sand), soda ash, potash and red lead—are converted into thousands

A high-speed, automatic machine cuts standard "sticks" of glass tubing into the lengths required for miniature valve bulbs.

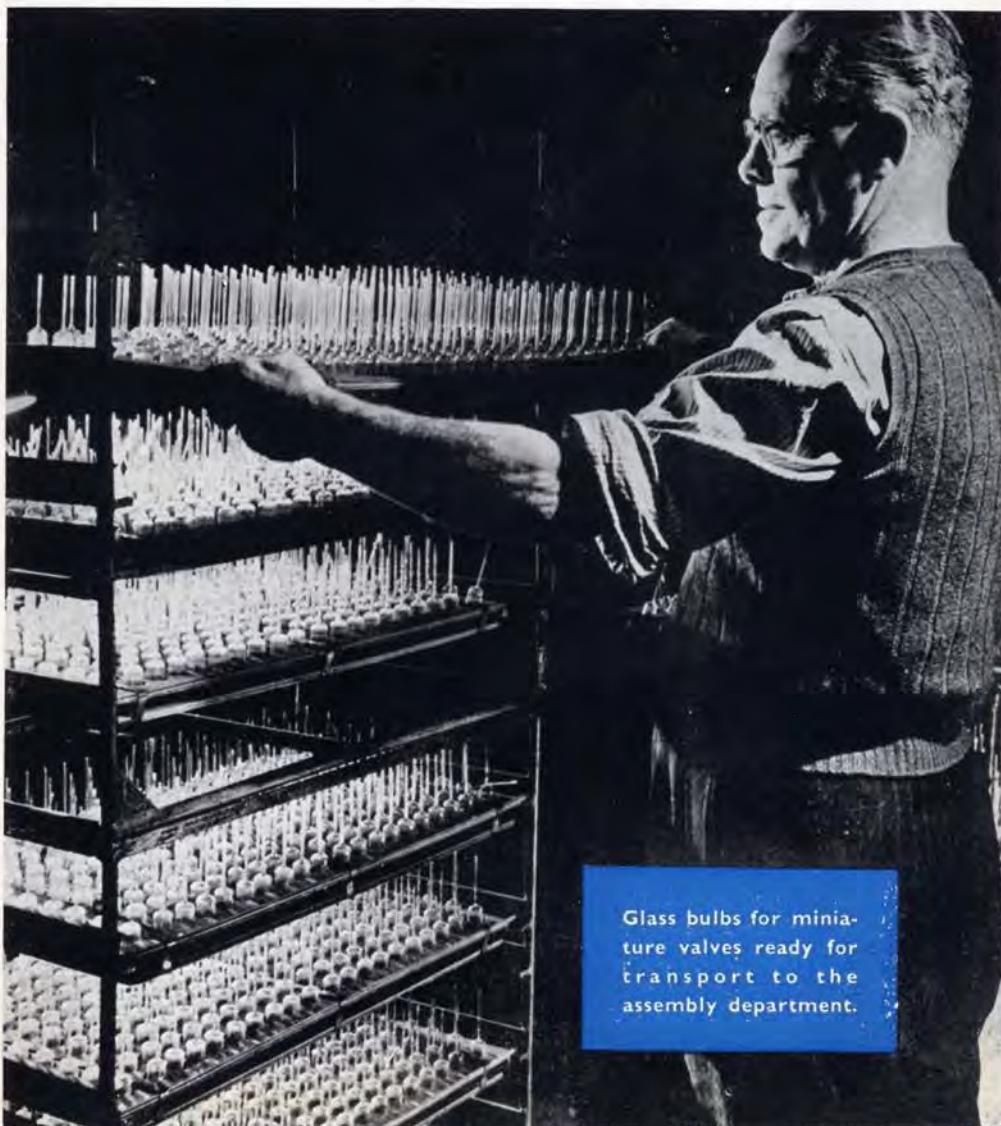


of feet of glass tubing having a wall thickness controlled to tolerances as close as 1/500th inch.

From these standard "sticks" of tubing the bulbs and bases for the latest all-glass valves are made, as well as parts for the older, pinch-type valves. The Blackburn glass factory produces millions of glass components every year for distribution to the various valve production units within the Mullard organisation. Some of the glass parts for cathode ray tubes are also made here, and glass bulbs for the tubes are assembled in large quantities.

VALVE PRODUCTION

The strict control of quality, applied throughout the raw material stage, is continued in the manufacture of valve and cathode ray tube components—filaments, grids, anodes, mica discs, etc. With few exceptions,



Glass bulbs for miniature valves ready for transport to the assembly department.

The final inspection of gun assemblies for cathode ray tubes.



these parts are produced on intricate machines, designed and constructed in the company's own engineering department.

The highly skilled operations involved in assembling the components can only be carried out by hand. A high degree of mechanisation, however, is again employed in sealing the assemblies into their glass envelopes, and then exhausting these to a hard vacuum.

Careful inspections are made at every stage of manufacture and the finished products are subjected to rigorous production tests. Before the valves and cathode ray tubes are released for use, however, further intensive tests are carried out in specially-equipped technical departments.

The two main Mullard production units situated in Lancashire and Surrey, supported by five feeder factories, produce a major portion of the total output of valves and electron tubes made in the British Isles. Whilst radio valves and television picture tubes account for the greater part of the Mullard output, special tubes for industrial, medical, and research applications are also produced in vast quantities.

ALPHABETICAL INDEX TO VALVE DATA

TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE
AB2	129	33	DF21	133	28	DPI3-2	163	44
ABC1	45	36	DF22	133	28	DR7-5	162	44
ABLI	50	40	DF33	67	28	DR7-6	162	44
ACO44	3	34	DF66	121	28	DW2	1	41
AF3	47	28	DF70	16	28	DW4/350	1	42
AF7	47	28	DF91	38	28	DW4/500	1	42
AK2	33	31	DF92	38	28	EA50	118	33
AL4	46	36	DG4-1	162	44	EAC91	36	36
AZ1	43	41	DG4-2	162	44	EAF42	93	31
AZ4	43	41	DG7-5	162	44	EB4	139	33
AZ11	130	41	DG7-6	162	44	EB34	58	33
AZ12	130	41	DG13-2	163	44	EB41	92	33
AZ31	55	41	DK21	134	31	EB91	37	34
AZ41	131	41	DK32	77	31	EBC3	45	36
CBL1	50	40	DK40	135	32	EBC33	62	36
CBL31	75	40	DK91	41	32	EBC41	97	36
CCH35	82	31	DK92	21	32	EBF2	140	31
CL4	48	36	DL21	136	37	EBFI1	141	31
CL33	70	36	DL33	69	37	EBF32	75	31
CY1	42	41	DL35	66	37	EBF80	103	31
CY31	53	41	DL36	66	37	EBL1	50	40
DA90	113	33	DL41	137	37	EBL21	87	40
DAC21	132	36	DL66	121	37	EBL31	75	40
DAC32	65	36	DL68	121	37	EC31	60	34
DAF91	40	31	DL71	16	37	EC52	89	34
DB4-1	162	44	DL72	16	37	EC53	120	34
DB4-2	162	44	DL92	39	37	EC54	15	34
DB7-5	162	44	DL93	115	37	EC91	59	34
DB7-6	162	44	DL94	30	37	ECC31	142	34
DBI3-2	163	44	DLL21	138	37	ECC32	64	34
DCC90	114	34	DP4-1	162	44	ECC33	64	34
DDR100	164	51	DP4-2	162	44	ECC34	64	34

ALPHABETICAL INDEX TO VALVE DATA

TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE
ECC35	64	35	EK2	33	32	HLI3C	19	35
ECC40	100	35	EK32	81	32	HVR2	2	42
ECC81	63	35	EL2	48	37	HVR2A	2	42
ECC91	80	35	EL3	46	38	IW4/350	7	42
ECFI	143	28/35	EL11	146	38	IW4/500	7	42
ECH3	52	32	EL12	146	38	KB2	129	34
ECH11	144	32	EL31	73	38	KBC1	153	36
ECH21	88	32	EL32	71	38	KBC32	61	36
ECH33	82	32	EL33	70	38	KCF30	170	32
ECH35	82	32	EL34	149	38	KF3	154	29
ECH42	94	32	EL35	70	38	KF35	68	29
ECL11	145	35/37	EL37	70	38	KK2	155	33
ECL80	102	35/37	EL38	73	38	KK32	79	33
ECR30	165	44	EL41	96	38	KL4	156	38
ECR35	166	44	EL42	96	38	KL35	66	38
ECR35P	166	44	EL81	122	38	KLL32	84	38
ECR60	166	44	EL91	78	38	LSD2	167	46
EF9	47	28	EM1	150	41	LSD3	110	46
EF11	146	28	EM4	51	41	LSD3A	111	46
EF12	146	28	EM34	76	41	LSD4	112	46
EF22	86	28	EN31	83	45	LSD5	112	47
EF36	72	29	EQ80	151	40	LSD7	110	47
EF37	72	29	EY51	119	42	LSD8	168	47
EF37A	72	29	EY91	54	42	LSD9	110	47
EF39	72	29	EZ2	152	42	LSD10	—	47
EF40	98	29	EZ35	56	42	LSD12	—	47
EF41	96	29	EZ40	5	42	LSD13	—	47
EF42	95	29	EZ41	5	42	LSD14	—	47
EF50	90	29	FC2A	32	32	LSD15	—	47
EF54	91	29	FC4	34	32	LSD16	—	47
EF55	90	29	FC13	33	32	LSD17	—	47
EF80	104	29	FC13C	34	32	LSD18	—	47
EF91	74	29	FW4/500	1	42	ME1001	169	50
EF92	74	29	FW4/800	1	42	ME1005	169	50
EF95	147	29	GZ32	57	42	ME1100	—	51
EFM1	148	41	HL13	44	35	ME1101	—	51

ALPHABETICAL INDEX TO VALVE DATA

TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE	TYPE	Base Diagram No.	PAGE
ME1200AA	171	49	PY80	124	42	UR3C	18	43
ME1201AA	172	50	PY81	185	42	UYIN	160	43
ME1202CA	173	50	PY82	124	43	UYII	161	43
ME1400	72	51	PZ30	17	43	UY2I	85	43
ME1401	174	51	QP22B	35	39	UY4I	14	43
ME1503	175	45	SP2	24	29	VP2	24	30
MF13-I	176	45	SP4	13, 27	30	VP2B	28	30
MF31-22	116	45	SP4B	26	30	VP4	13, 27	30
MT17	177	46	SP13	47	30	VP4A	13, 27	30
MT57	178	46	SP13C	26	30	VP4B	26	30
MT105	179	46	TDD2A	10	36	VP13A	47	30
MT5544	180	46	TDD4	20	36	VP13C	26	30
MT5545	180	46	TDD13C	20	36	2D4A	8	34
MW6-2	117	45	TH4B	31	33	2D2I	181	46
MW31-16	116	45	TH21C	31	33	20AV	106	48
MW36-22	116	45	TH30C	31	33	20CG	107	48
MW41-I	116	45	UAF42	93	31	20CV	107	48
PENA4	25	38	UB4I	92	34	52CG	125	48
PENB4	25	38	UBC4I	97	36	55CG	126	48
PEN4DD	29	40	UBF1I	141	31	57CV	182	48
PEN4VA	12, 25	39	UBF80	103	31	58CG	183	48
PEN36C	25	39	UBL1	157	40	58CV	183	48
PL33	70	39	UBL2I	87	40	85A1	127	43
PL38	73	39	UCH1I	144	33	85A2	128	43
PL81	122	39	UCH2I	88	33	90AG	108	49
PL82	123	39	UCH42	94	33	90AV	108	49
PL83	105	39	UCL1I	145	35/39	90CG	109	49
PM2A	3	35	UF9	158	30	90CV	109	49
PM2HL	3	35	UF1I	146	30	150B2	186	43
PM12M	4	29	UF2I	86	30	354V	9	35
PM22A	11	39	UF4I	96	30	1267	184	46
PM22D	11	39	UF42	95	30	4687	49	43
PM24A	11	39	UL4I	96	39	4687A	23	43
PM24M	11	39	UM4	159	41	7475	23	43
PM202	3	35	UM34	76	41	13201A	23	43
PY31	53	42	URIC	6	43			

VALVE APPLICATION INDEX OF PREFERRED TYPES

TYPE	V _h or V _f (V)	I _h or I _f (A)	DESCRIPTION	PAGE
VOLTAGE AMPLIFYING PENTODES				
DF66	0.625	0.015	Hearing-aid pentode.	28
DF91	1.4	0.05	Variable-mu R.F. pentode.	28
DF92	1.4	0.05	Short grid base R.F. pentode.	28
EF37A	6.3	0.2	Low microphony, low hum A.F. pentode.	29
EF40	6.3	0.2	Low noise A.F. pentode.	29
EF41	6.3	0.2	Variable-mu R.F. pentode.	29
EF80	6.3	0.3	High slope R.F. pentode.	29
EF95	6.3	0.175	High slope R.F. pentode.	29
UF41	12.6	0.1	Variable-mu R.F. pentode.	30
VOLTAGE AMPLIFYING PENTODES WITH DIODES				
DAF91	1.4	0.05	Short grid base A.F. pentode with single diode.	31
EBF80	6.3	0.3	Variable-mu R.F. pentode with double diode.	31
UBF80	17	0.1	Variable-mu R.F. pentode with double diode.	31
FREQUENCY CHANGERS				
DK92	1.4	0.05	Heptode.	32
ECH42	6.3	0.23	Triode hexode.	32
UCH42	14	0.1	Triode hexode.	33
SINGLE AND DOUBLE DIODES				
DA90	1.4	0.15	Indirectly heated single diode.	33
EB91	6.3	0.3	Double diode with separate cathodes.	34
TRIODES AND DOUBLE TRIODES				
DCC90	{ 1.4 2.8 }	0.22 { 0.11 }	R.F. double triode, suitable for portable transmitters.	34
ECC33	6.3	0.4	A.F. double triode with separate cathodes.	34
ECC35	6.3	0.4	A.F. double triode with separate cathodes.	35
ECC40	6.3	0.6	A.F. double triode with separate cathodes.	35
ECC81	{ 6.3 12.6 }	0.3 { 0.15 }	R.F. double triode with separate cathodes.	35
ECC91	6.3	0.45	R.F. double triode with common cathode.	35
ECL80	6.3	0.3	Triode combined with output pentode.	35
TRIODES WITH DIODES				
EBC41	6.3	0.23	Double diode triode.	36
UBC41	14	0.1	Double diode triode.	36

VALVE APPLICATION INDEX OF PREFERRED TYPES

TYPE	V _h or V _f (V)	I _h or I _f (A)	DESCRIPTION	PAGE
OUTPUT PENTODES				
DL66	1.25	0.015	Hearing-aid output pentode.	37
DL68	1.25	0.025	Hearing-aid output pentode.	37
DL92	{ 1.4 2.8 }	{ 0.1 0.05 }	A.F. output pentode.	37
DL93	{ 1.4 2.8 }	{ 0.2 0.1 }	R.F. or A.F. output pentode.	37
DL94	{ 1.4 2.8 }	{ 0.1 0.05 }	A.F. output pentode.	37
ECL80	6.3	0.3	Output pentode (pa max.=3.5 W) combined with triode	37
EL37	6.3	1.4	Output pentode (pa max.=25 W).	38
EL38	6.3	1.4	Line time base output pentode.	38
EL41	6.3	0.7	Output pentode (pa max.=9 W)	38
EL42	6.3	0.2	Output pentode (pa max.=6 W).	38
EL81	6.3	1.05	Series stabiliser and line time base output pentode.	38
PL81	21.5	0.3	Line time base output pentode.	39
PL82	16.5	0.3	Output pentode (pa max.=9 W).	39
PL83	15	0.3	Video output pentode.	39
UL41	45	0.1	Output pentode (pa max.=9 W).	39
NONODE				
EQ80	6.3	0.2	F.M. detector and limiter.	40
ELECTRON BEAM TUNING INDICATOR				
EM34	6.3	0.2	Dual sensitivity tuning indicator.	41
RECTIFIERS				
EY51	6.3	0.09	High voltage rectifier for E.H.T. supplies.	42
EZ40	6.3	0.6	Indirectly heated full-wave rectifier.	42
EZ41	6.3	0.4	Indirectly heated full-wave rectifier.	42
GZ32	5.0	2.3	Indirectly heated full-wave rectifier.	42
PY80	19	0.3	Booster diode.	42
PY81	17	0.3	Booster diode.	42
PY82	19	0.3	Indirectly heated half-wave rectifier.	43
UY41	31	0.1	Indirectly heated half-wave rectifier.	43
GAS-FILLED TRIODES AND TETRODES				
ME1503	6.3	3.75	Hydrogen-filled triode.	45
MT17	2.5	5.0	Mercury-vapour triode.	46
MT57	5.0	4.5	Mercury-vapour triode.	46
MT105	5.0	10	Mercury-vapour tetrode.	46
MT5544	2.5	12	Inert-gas-filled triode.	46
MT5545	2.5	21	Inert-gas-filled triode.	46
2D21	6.3	0.6	Inert-gas-filled tetrode.	46
I267	Cold cathode		Inert-gas-filled triode.	46

VALVE APPLICATION INDEX OF PREFERRED TYPES

TYPE	DESCRIPTION			PAGE	
VOLTAGE REFERENCE AND STABILIZING TUBES					
85A1	85-volt	Voltage reference tube.		43	
85A2	85-volt	Voltage reference tube.		43	
150B2	150-volt	Voltage stabilizer.		43	
CATHODE RAY TUBES					
DB4-1	1½ in.	Oscilloscope.	Blue screen.	Symmetrical.	44
DB4-2	1½ in.	Oscilloscope.	Blue screen.	Asymmetrical.	44
DB7-5	2½ in.	Oscilloscope.	Blue screen.	Symmetrical.	44
DB7-6	2½ in.	Oscilloscope.	Blue screen.	Asymmetrical.	44
DB13-2	5 in.	Oscilloscope.	Blue screen.	Symmetrical.	44
DG4-1	1¾ in.	Oscilloscope.	Green screen.	Symmetrical.	44
DG4-2	1¾ in.	Oscilloscope.	Green screen.	Asymmetrical.	44
DG7-5	2¾ in.	Oscilloscope.	Green screen.	Symmetrical.	44
DG7-6	2¾ in.	Oscilloscope.	Green screen.	Asymmetrical.	44
DG13-2	5 in.	Oscilloscope.	Green screen.	Symmetrical.	44
DP4-1	1¾ in.	Oscilloscope.	Long afterglow.	Symmetrical.	44
DP4-2	1¾ in.	Oscilloscope.	Long afterglow.	Asymmetrical.	44
DPI3-2	5 in.	Oscilloscope.	Long afterglow.	Symmetrical.	44
DR7-5	2¾ in.	Oscilloscope.	Long afterglow.	Symmetrical.	44
DR7-6	2¾ in.	Oscilloscope.	Long afterglow.	Asymmetrical.	44
MFI3-1	5 in.	Radar.	Orange screen.	Magnetic.	45
MF31-22	12 in.	Radar.	Orange screen.	Magnetic.	45
MW6-2	2½ in.	Projection television.		Metal-backed.	45
MW31-16	12 in.	Television.		Ion-trap.	45
MW36-22	14 in.	Television.	Rectangular.	Ion-trap.	45
MW41-1	16 in.	Television.	Metal cone.	Ion-trap.	45
FLASH-TUBES					
LSD2	35 joule	Microsecond flash-tube.		46	
LSD3	100 joule	Photographic flash-tube.		46	
LSD5	1,000 joule	Photographic flash-tube.		47	
LSD7	200 joule	Photographic flash-tube.		47	
LSD8	Stroboscopic tube.	30 W mean dissipation.		47	
PHOTOCELLS					
20CG	Gas-filled.	Incandescent light and infra-red radiation.		48	
20CV	Vacuum.	Incandescent light and infra-red radiation.		48	
52CG	Gas-filled.	Incandescent light and infra-red radiation.		48	
55CG	Gas-filled.	Incandescent light and infra-red radiation.		48	
57CV	Photometric cell.			48	
58CG	End-on wire-in.	Gas-filled. Incandescent light and infra-red radiation.		48	
58CV	End-on wire-in.	Vacuum. Incandescent light and infra-red radiation.		48	
90AG	Gas-filled.	Daylight and blue radiation.		49	
90AV	Vacuum.	Daylight and blue radiation.		49	
90CG	Gas-filled.	Incandescent light and infra-red radiation.		49	
90CV	Vacuum.	Incandescent light and infra-red radiation.		49	

VALVE APPLICATION INDEX OF PREFERRED TYPES

TYPE	DESCRIPTION	PAGE
U.H.F. TUBES		
ME1001	Disc seal triode oscillator.	50
ME1005	Disc seal triode voltage amplifier.	50
ME1100	3 cm. local oscillator reflex klystron.	51
ME1101	3 cm. fixed frequency packaged magnetron.	51
IMAGE CONVERTER TUBES		
ME1200AA	Image converter. Daylight and blue radiation.	49
ME1201AA	Grid-controlled image converter. Daylight and blue radiation.	50
ME1202CA	Small image-converter. Infra-red radiation.	50
	Variants of these tubes with different photocathodes and luminescent screens are also available.	
ACCELEROMETER TUBE		
DDR100	Accelerometer double diode.	51
ELECTROMETER VALVES		
ME1400	Electrometer pentode.	51
ME1401	Subminiature electrometer triode.	51

REFERENCES

- a Anode. C.R.T. anodes marked a1, a2, etc., a1 being nearest the cathode.
g Grid. Grids marked g1, g2, etc., g1 being nearest the cathode.
k Cathode.
f Filament.
h Heater.
s Internal shield.
M External metallising.
T Trigger electrode (Flash-tubes).
IC Internal connection; not to be used for external connections.
Va Anode voltage.
Vg2 Screen grid voltage.
Vg1 Control grid voltage.
Vf Filament voltage.
Vh Heater voltage.
va(pk) Peak anode voltage.
P.I.V. Peak inverse voltage.
 Ia Anode current.
 Ig2 Screen grid current.
 If Filament current.
 Ih Heater current.
 It Target current.
Iout Output current.
ia(pk) Peak anode current.
Pout Output power.
 pa Anode dissipation.
 Ra External anode load.
 Rk Cathode bias resistor.
 ra Internal anode impedance.
 μ Amplification factor.
gm Mutual conductance.
gc Conversion conductance.
S Sensitivity (cathode ray tubes).

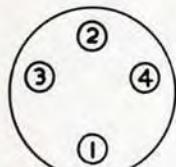
*Not applicable to frequency changers
with additional oscillator electrodes.*

BASE REFERENCES

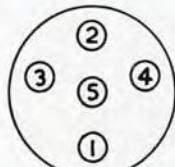
- A** British 4-pin.
K International octal.
M British 7-pin.
MO Mazda octal.
O British 5-pin.
P Side contact (8-contact).
UX American base.
V Side contact (5-contact).
Y European 8-pin.
B2A 2 wire-in leads.
B3A American Pee-wee 3-pin.
B3G 3-pin all-glass.
B4D Super Jumbo 4-pin.
B5A Flat subminiature.
B7G 7-pin miniature.
B8A 8-pin miniature.
B8D 10 mm. round subminiature.
B8G Locatal.
B9A 9-pin miniature (naval).
B9G 9-pin all-glass.
BI2A Duodecal.
BI4A Dipeptal.

VALVE BASE DIAGRAMS

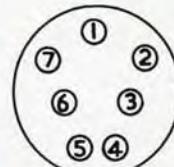
viewed from free end of pins



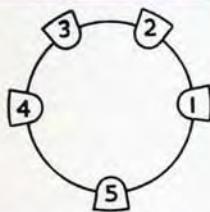
British 4-pin (A Base)



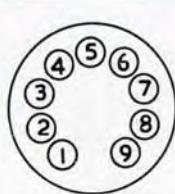
British 5-pin (O Base)



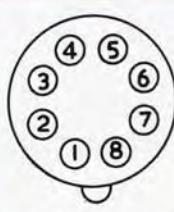
British 7-pin (M Base)



Side Contact (V Base)



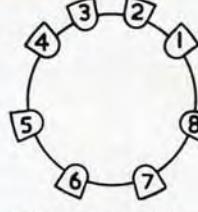
Noval (B9A)



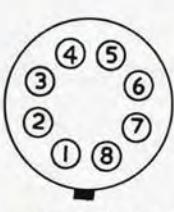
8-pin Miniature (B8A)



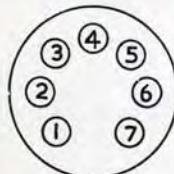
Duodecal (B12A)



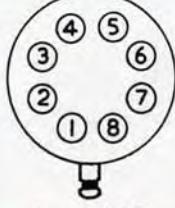
Side Contact (P Base)



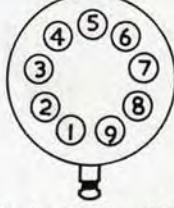
Octal (K Base)



7-pin Miniature (B7G)

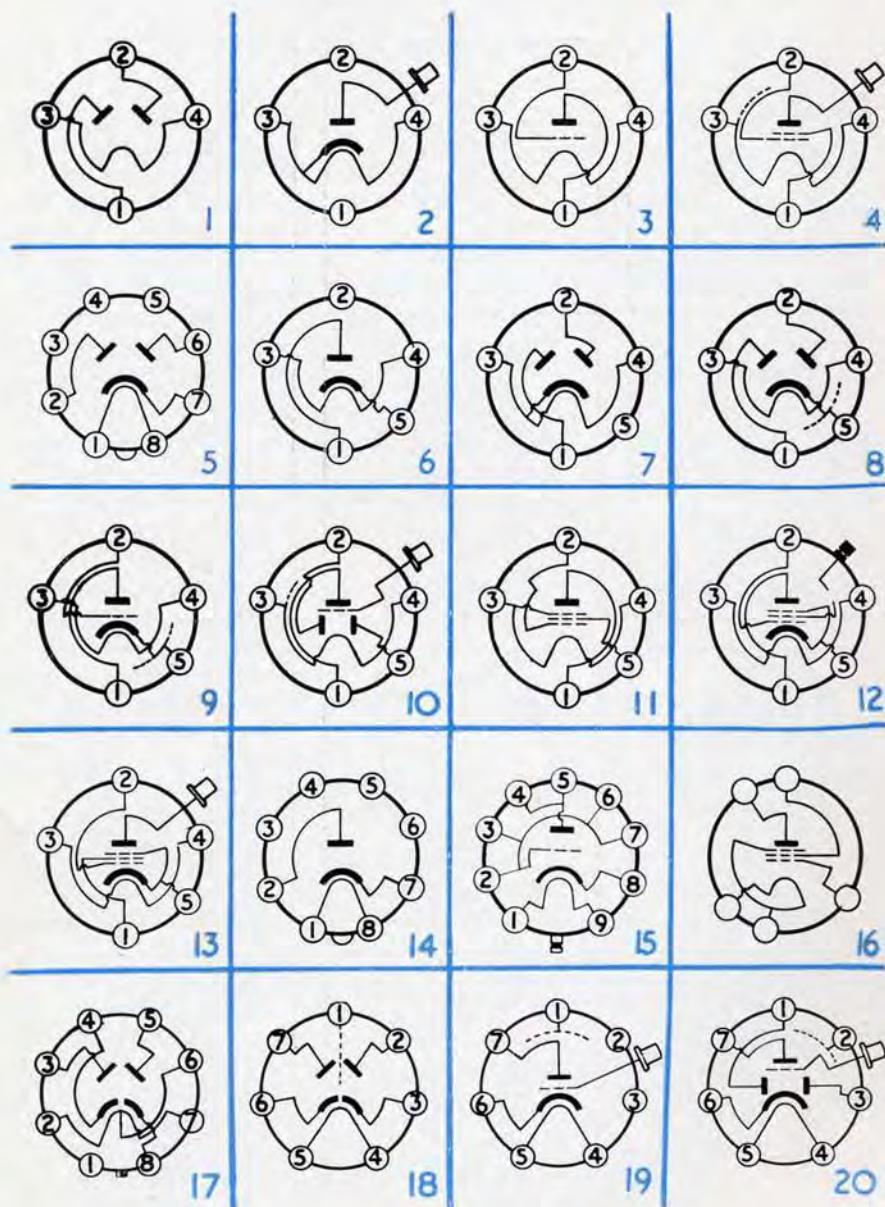


Loctal (B8G)



9-pin All glass (B9G)

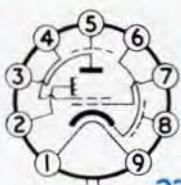
VALVE BASE DIAGRAMS



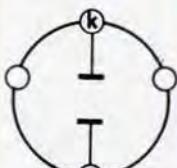
VALVE BASE DIAGRAMS



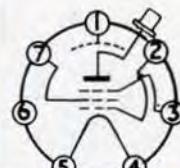
21



22



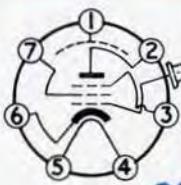
23



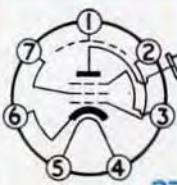
24



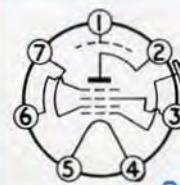
25



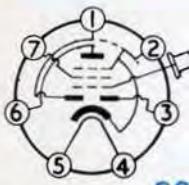
26



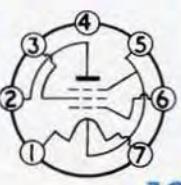
27



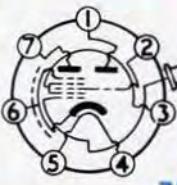
28



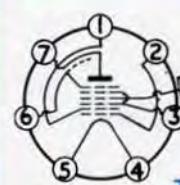
29



30



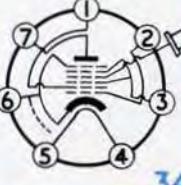
31



32



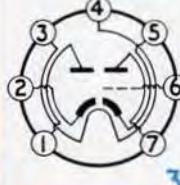
33



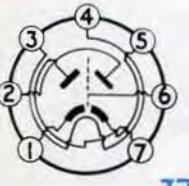
34



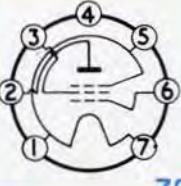
35



36



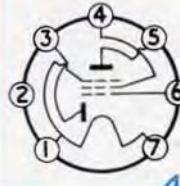
37



38



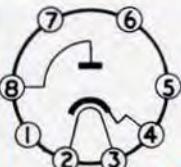
39



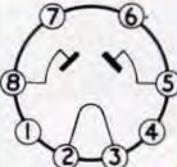
40



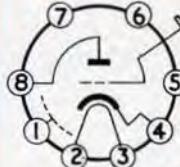
41



42

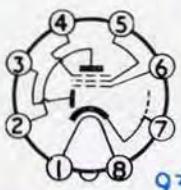


43



44

VALVE BASE DIAGRAMS



93



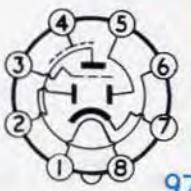
94



95



96



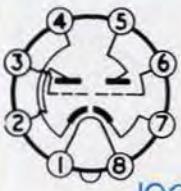
97



98



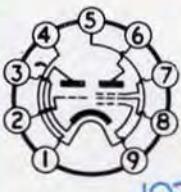
99



100



101



102



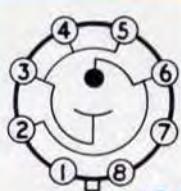
103



104



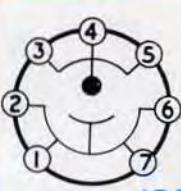
105



106



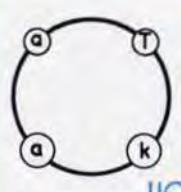
107



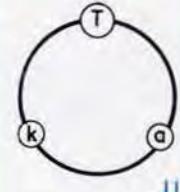
108



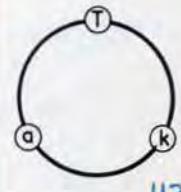
109



110



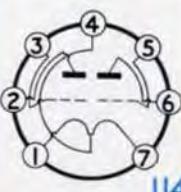
111



112



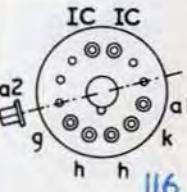
113



114

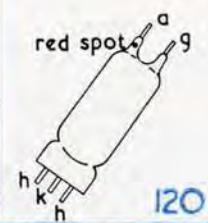
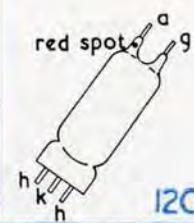
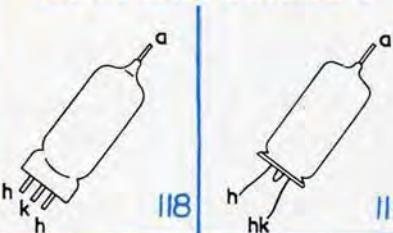
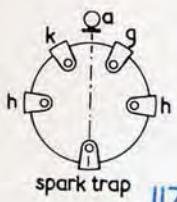


115

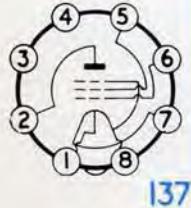
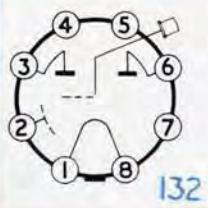
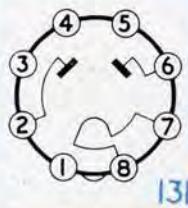
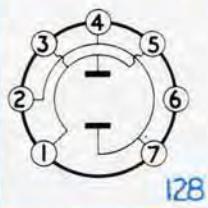
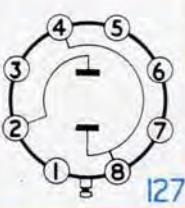
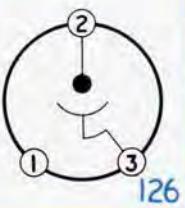
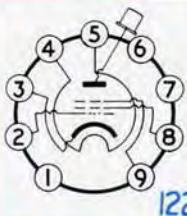


116

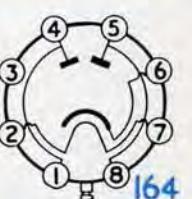
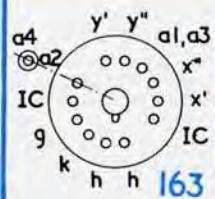
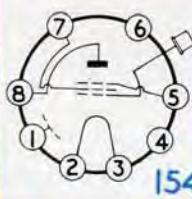
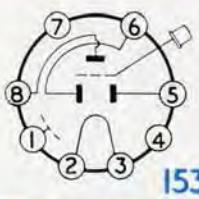
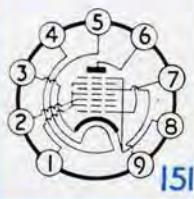
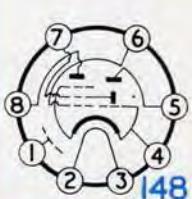
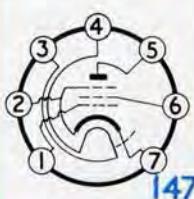
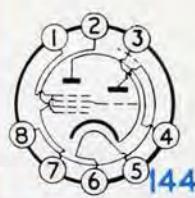
VALVE BASE DIAGRAMS



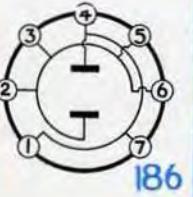
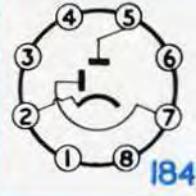
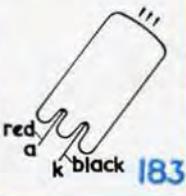
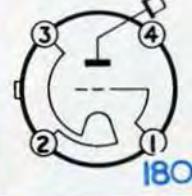
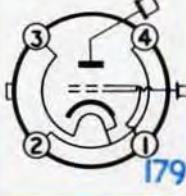
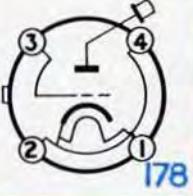
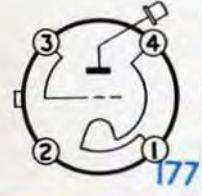
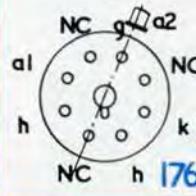
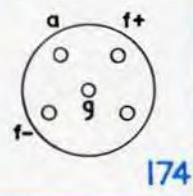
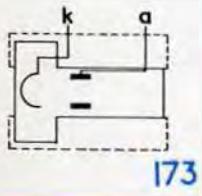
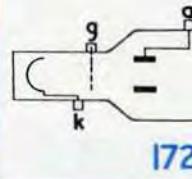
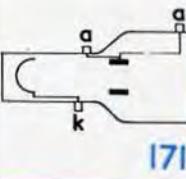
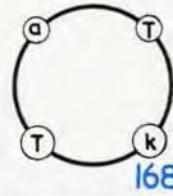
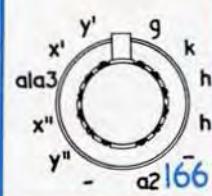
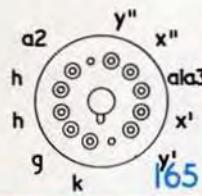
a f+ f- 93
92 91
Red spot 121



VALVE BASE DIAGRAMS



VALVE BASE DIAGRAMS



These diagrams are referred to in the Alphabetical Index and the Base column of the Valve Data section.

VALVE DATA

VOLTAGE AMPLIFYING PENTODES

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	r _a (MΩ)
AF3	Variable-mu R.F. Pentode	P. (47)	4-0	0-65	250	100	3-0	8-0	2-6	1-8	1-2
AF7	Short Grid Base R.F. Pentode	P. (47)	4-0	0-65	250	100	2-0	3-0	1-1	2-1	2-0
DF21	Short Grid Base R.F. or A.F. Pentode	Octal (133)	1-4	0-025	90	90	0	1-2	0-25	0-7	2-0
DF22	Variable-mu R.F. Pentode	Octal (133)	1-4	0-05	90	90	1-5	1-4	0-3	1-1	1-5
DF33	Variable-mu R.F. Pentode	Octal (67)	1-4	0-05	90	90	0	1-2	0-3	0-75	1-5
DF66	Hearing-aid Pentode	B5A (121)	0-625	0-015	22-5	22-5	1-05	0-05	0-015	0-1	2-0
DF70	Hearing-aid Pentode	B8D (16)	0-625	0-025	30	30	0	0-375	0-125	0-22	0-5
DF91	Variable-mu R.F. Pentode	B7G (38)	1-4	0-05	90	67-5	{ 0	3-5	1-4	0-9	0-5
DF92	Short Grid Base R.F. Pentode	B7G (38)	1-4	0-05	90	67-5	17	3-7	1-4	0-009	0-5
ECFI	Variable-mu R.F. Pentode combined with Triode (for Triode data see p. 35)	P. (143)	6-3	0-2	250	100	2-0	5-0	2-0	2-0	1-6
EF9	Variable-mu R.F. Pentode	P. (47)	6-3	0-2	250	R _{g2} = 90 KΩ	2-5	6-0	1-7	2-2	1-25
EF11	Variable-mu R.F. Pentode	Y. (146)	6-3	0-2	250	R _{g2} = 75 KΩ	2-0	6-0	2-0	2-2	2-0
EF12	Short Grid Base R.F. Pentode	Y. (146)	6-3	0-2	250	100	2-0	3-0	1-0	2-1	2-0
EF22	Variable-mu R.F. Pentode	B8G (86)	6-3	0-2	250	R _{g2} = 90 KΩ	2-5	6-0	1-7	2-2	1-2

VOLTAGE AMPLIFYING PENTODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	r _a (MΩ)
EF36	Short Grid Base R.F. or A.F. Pentode	Octal (72)	6·3	0·2	250	100	2·0	3·0	0·8	1·8	2·5
EF37	Low Microphony A.F. Pentode	Octal (72)	6·3	0·2	250	100	2·0	3·0	0·8	1·8	2·5
EF37A	Low Microphony, Low Hum A.F. Pentode	Octal (72)	6·3	0·2	250	100	2·0	3·0	0·8	1·8	2·5
EF39	Variable-mu R.F. Pentode	Octal (72)	6·3	0·2	250	R _{g2} = 90 KΩ	{ 2·5 39	6·0 —	1·7 —	2·2 0·022	1·25 >10
EF40	Low Noise A.F. Pentode	B8A (98)	6·3	0·2	250	140	2·0	3·0	0·55	1·85	2·5
EF41	Variable-mu R.F. Pentode	B8A (96)	6·3	0·2	250	R_{g2}= 90 KΩ	{ 2·5 39	6·0 —	1·7 —	2·2 0·022	1·0 >10
EF42	High Slope R.F. Pentode	B8A (95)	6·3	0·33	250	250	2·0	10	2·3	9·5	0·44
EF50	High Slope R.F. Pentode	B9G (90)	6·3	0·3	250	250	2·0	10	3·0	6·5	1·0
EF54	High Slope R.F. Pentode	B9G (91)	6·3	0·3	250	250	1·7	10	1·45	7·7	0·5
EF55	High Slope R.F. Pentode for use in Video Amplifiers	B9G (90)	6·3	1·0	250	250	4·5	40	5·5	12	0·055
EF80	High Slope R.F. Pentode	B9A (104)	6·3	0·3	170	170	2·0	10	2·5	7·4	0·4
EF91	High Slope R.F. Pentode	B7G (74)	6·3	0·3	250	250	2·0	10	2·5	7·6	1·0
EF92	Variable-mu R.F. Pentode	B7G (74)	6·3	0·2	250	200	2·5	8·0	2·1	2·5	0·5
EF95	High Slope R.F. Pentode	B7G (147)	6·3	0·175	180	120	2·0	7·7	2·4	5·1	0·69
KF3	Variable-mu R.F. Pentode	P. (154)	2·0	0·045	135	135	0·5	2·0	0·6	0·65	1·3
KF35	Variable-mu R.F. Pentode	Octal (68)	2·0	0·05	120	60	1·5	1·45	0·5	1·0	—
PM12M	Variable-mu R.F. Tetrode	British 4-pin (4)	2·0	0·18	150	90	0	2·5	0·5	1·4	—
SP2	Short Grid Base R.F. Pentode	British 7-pin (24)	2·0	0·18	135	135	0	3·0	1·0	1·8	0·7

VOLTAGE AMPLIFYING PENTODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	r _a (MΩ)
SP4	Short Grid Base R.F. Pentode	British 5- or 7-pin (13 or 27)	4·0	1·0	200	100	2·0	3·0	1·1	2·3	2·2
SP4B	Sharp Cut-off R.F. Pentode	British 7-pin (26) P. (47)	4·0	0·65	250	250	2·4	4·0	1·5	3·4	2·0
SPI3	Sharp Cut-off R.F. Pentode	British 7-pin (26)	13	0·2	200	100	2·0	3·3	1·2	2·2	1·3
SPI3C	Sharp Cut-off R.F. Pentode	British 7-pin (26) Octal (158)	13	0·2	200	200	2·2	2·5	0·9	2·8	2·5
UF9	Variable-mu R.F. Pentode	Y. (146)	12·6	0·1	200	R _{g2} = 60 KΩ	2·5	6·0	1·7	2·2	1·2
UF11	Variable-mu R.F. Pentode	B8G (86)	15	0·1	200	R _{g2} = 70 KΩ	2·0	6·0	1·7	2·2	1·5
UF21	Variable-mu R.F. Pentode	B8A (96)	12·6	0·1	200	R _{g2} = 60 KΩ	2·5	6·0	1·7	2·2	1·0
UF4I	Variable-mu R.F. Pentode	B8A (95)	12·6	0·1	170	R _{g2} = 39 KΩ	{ 2·5 28	6·0	1·75	2·2 0·022	1·0 } >10
UF42	High Slope R.F. Pentode	British 7-pin (24)	21	0·1	170	170	2·0	10	2·8	8·5	0·2
VP2	Variable-mu R.F. Pentode	British 7-pin (28)	2·0	0·18	135	135	0	3·0	1·25	1·5	0·4
VP2B	Variable-mu R.F. Hexode	British 5- or 7-pin (13 or 27)	2·0	0·135	135	60*	1·5	2·0	0·95	1·4	1·3
VP4	Variable-mu R.F. Pentode	British 5- or 7-pin (13 or 27)	4·0	1·0	200	100	2·0	4·5	1·9	2·3	1·0
VP4A	Variable-mu R.F. Pentode	British 5- or 7-pin (13 or 27)	4·0	1·2	200	100	2·0	4·25	1·8	2·5	1·4
VP4B	Variable-mu R.F. Pentode	British 7-pin (26) P. (47)	4·0	0·65	250	250	3·0	11·5	4·25	2·0	—
VPI3A	Variable-mu R.F. Pentode	British 7-pin (26)	13	0·2	200	100	2·0	4·0	1·4	2·2	—
VPI3C	Variable-mu R.F. Pentode	British 7-pin (26)	13	0·2	200	200	2·0	9·0	3·6	2·2	—

* V_{g3} = V_{g2}, V_{g4} = 0

VOLTAGE AMPLIFYING PENTODES WITH DIODE(S)

Type	Description	Base	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	r _a (MΩ)
DAF91	Short Grid Base A.F. Pentode with Single Diode	B7G (40)	1.4	0.05	90	90	0	2.7	0.5	0.72	0.5
EAF42	Variable-mu R.F. Pentode with Single Diode	B8A (93)	6.3	0.2	250	R _{g2} = 110 KΩ	{ 2.0 43	5.0	1.5	2.0	1.4
EBF2	Variable-mu R.F. Pentode with Double Diode	P. (140)	6.3	0.2	250	R _{g2} = 95 KΩ	2.0	5.0	1.6	1.8	1.3
EBFI	Variable-mu R.F. Pentode with Double Diode	Y. (141)	6.3	0.2	250	R _{g2} = 85 KΩ	2.0	5.0	1.8	1.8	2.0
EBF32	Variable-mu R.F. Pentode with Double Diode	Octal (75)	6.3	0.2	250	R _{g2} = 95 KΩ	2.0	5.0	1.6	1.8	1.3
EBF80	Variable-mu R.F. Pentode with Double Diode	B9A (103)	6.3	0.3	250	R _{g2} = 95 KΩ	{ 2.0 41.5	5.0	1.75	2.2	1.5
UAF42	Variable-mu R.F. Pentode with Single Diode	B8A (93)	12.6	0.1	170	R _{g2} = 56 KΩ	{ 2.0 28	5.0	1.5	2.0	0.9
UBF11	Variable-mu R.F. Pentode with Double Diode	Y. (141)	20	0.1	200	R _{g2} = 70 KΩ	2.0	5.0	1.7	1.8	1.5
UBF80	Variable-mu R.F. Pentode with Double Diode	B9A (103)	17	0.1	170	R _{g2} = 47 KΩ	{ 2.0 26.5	5.0	1.75	2.2	0.9
										0.022	>10

FREQUENCY CHANGERS

Type	Description	Base	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2+4} (V)	-V _{g1} (V)	I _a (mA)	I _{g2+4} (mA)	g _c (mA/V)	r _a (KΩ)
AK2	Octode	P. (33)	4.0	0.65	250	70 (V _{g3+5})	1.5 (V _{g4})	1.6	3.8 (lg ₃₊₅)	0.6	1,600
CCH35	Triode Hexode	Octal (82)	7.0	0.2	● { 200	100	2.0	3.0	3.0 (lg ₃₊₅)	0.65	900
DK21	Octode	Octal (134)	1.4	0.05	△ { 100	—	0	10	— (lg ₅)	0.5	8.6
DK32	Heptode	Octal (77)	1.4	0.05	120	R _{g5} = 120 KΩ	0 (V _{g4})	1.5	0.25 (lg ₅)	0.5	500
					90	45 (V _{g3+5})	0 (V _{g4})	0.6	0.7 (lg ₃₊₅)	0.25	600

● Mixer Section.

△ Triode Section.

FREQUENCY CHANGERS—continued

32

TYPE	DESCRIPTION	BASE	Vf or Vh (V)	If or Ih (A)	Va (V)	Vg2+4 (V)	-Vgl (V)	Ia (mA)	Ig2+4 (mA)	gc (mA/V)	ra (KΩ)
DK40	Octode	B8A (135)	1·4	0·05	135	Rg5= 270 KΩ (Vg4) (Vg3)	0 0 0	1·0 1·6 0·7	0·25 (Ig5) 3·2 0·15 (Ig4)	0·425	1,000
DK91	Heptode	B7G (41)	1·4	0·05	90	67·5	0 0	1·6 3·2	0·3	600	
DK92	Heptode	B7G (21)	1·4	0·05	90	60 (Vg4)	0 (Vg3)		0·15 (Ig4)	0·325	650
ECH3	Triode Hexode	P. (52)	6·3	0·2	● { 250 △ { 100	100 —	2·0 0	3·0 10	3·0	0·65	1,300
ECH11	Triode Hexode	Y. (144)	6·3	0·2	● { 250 △ { 150	100 —	2·0 0	2·3 15·5	3·0	0·65	8·6
ECH21	Triode Heptode	B8G (88)	6·3	0·33	● { 250 △ { 100	100 —	2·0 0	3·0 12	6·2	0·75	1,200
ECH33	Triode Hexode	Octal (82)	6·3	0·2	● { 250 △ { 100	100 —	2·0 0	3·0 10	3·0	0·65	6·5
ECH35	Triode Hexode	Octal (82)	6·3	0·3	● { 250 △ { 100	100 —	2·0 0	3·0 10	3·0	0·65	1,300
ECH42	Triode Hexode	B8A (94)	6·3	0·23	● { 250 △ { 100	85 —	2·0 0	3·0 10	3·0	0·75	1,000 8·0
EK2	Octode	P. (33)	6·3	0·2	250	50 (Vg3+5)	2 (Vg4)	1·0	0·8 (Ig3+5)	0·55	2,000
EK32	Octode	Octal (81)	6·3	0·2	250	50 (Vg3+5)	2 (Vg4)	1·0	0·8 (Ig3+5)	0·55	2,000
FC2A	Octode	British 7-pin (32)	2·0	0·13	135	45 (Vg3+5)	0·5 (Vg4)	0·7	0·7 (Ig3+5)	0·27	2,500
FC4	Octode	British 7-pin (34)	4·0	0·65	250	70 (Vg3+5)	1·5 (Vg4)	1·6	3·8 (Ig3+5)	0·6	—
FC13	Octode	P. (33)	13	0·2	200	70 (Vg3+5)	1·5 (Vg4)	1·6	3·8 (Ig3+5)	0·6	—
FC13C	Octode	British 7-pin (34)	13	0·2	200	70 (Vg3+5)	1·5 (Vg4)	1·6	3·8 (Ig3+5)	0·6	—
KCF30	Triode Pentode	Octal (170)	2·0	0·2	{ ● 120 △ 100	60 (Vg2) —	1·5 0	0·53 5·5	1·0 (Ig2) —	0·26	10·5

● Mixer Section.

△ Triode Section.

FREQUENCY CHANGERS—continued

EE

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	V _{g2+4} (V)	-V _{g1} (V)	I _a (mA)	I _{g2+4} (mA)	g _c (mA/V)	r _a (KΩ)
KK2	Octode	P. (155)	2·0	0·13	135	45 (V _{g3+5})	0·5 (V _{g4})	0·7	0·7 (I _{g3+5})	0·27	2,500
KK32	Octode	Octal (79)	2·0	0·13	135	45 (V _{g3+5})	0·5 (V _{g4})	0·7	0·7 (I _{g3+5})	0·27	—
TH4B	Triode Heptode	British 7-pin (31)	4·0	1·45	● { 250 △ { 100	100 —	2·5 0	3·25	6·0	0·75	1,500
TH21C	Triode Hexode	British 7-pin (31)	21	0·2	● { 250 △ { 125	70 —	1·5 0	1·6	3·8	0·6	—
TH30C	Triode Heptode	British 7-pin (31)	29	0·2	● { 250 △ { 100	100 —	2·5 0	3·25	6·0	0·75	1,500
UCH11	Triode Hexode	Y. (144)	20	0·1	● { 200 △ { 150	80 —	2·0 0	2·5	3·0	0·75	1,000
UCH21	Triode Heptode	B8G (88)	20	0·1	● { 200 △ { 100	100 —	2·0 0	3·5	6·5	0·75	1,000
UCH42	Triode Hexode	B8A (94)	14	0·1	● { 170 △ { 100	70 —	1·85 0	2·1	2·6	0·67	1,000 8·0

● Mixer Section.

△ Triode Section.

DIODES

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a max. (V)	I _a max. (mA)
AB2	Double Diode	V. (129)	4·0	0·65	200	0·8
DA90	Indirectly-heated Single Diode	B7G (113)	1·4	0·15	330 (P.I.V. max.)	0·5
EA50	Single Diode	B3G (118)	6·3	0·15	50	5·0
EB4	Double Diode with separate Cathodes	P. (139)	6·3	0·2	200	0·8
EB34	Double Diode with separate Cathodes	Octal (58)	6·3	0·2	200	0·8
EB41	Double Diode with separate Cathodes	B8A (92)	6·3	0·3	150	9·0

DIODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a max. (V)	I _a max. (mA)
EB91	Double Diode with separate Cathodes ..	B7G (37)	6.3	0.3	420 (P.I.V. max.)	9.0
KB2	Double Diode	V. (129)	2.0	0.095	125	0.5
UB41	Double Diode with separate Cathodes ..	B8A (92)	19	0.1	150	9.0
2D4A	Double Diode	British 5-pin (8)	4.0	0.65	200	0.8

TRIODES AND DOUBLE TRIODES

34

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	-V _g (V)	I _a (mA)	μ	gm (mA/V)	r _a (KΩ)
ACO44	Directly-heated Output Triode	British 4-pin (3)	4.0	1.0	300	38	50	6.0	5.0	1.2
DCC90	R.F. Double Triode suitable for portable transmitters ..	B7G (114)	{ 1.4 2.8 } 0.22 0.11 }	90	2.5	3.7	15	1.8	8.3	
EC31	Low Impedance Triode	Octal (60)	6.3	0.65	250	16	20	10.5	3.2	3.3
EC52	Low power V.H.F. Oscillator Triode	B9G (89)	6.3	0.43	250	2.6	10	60	6.5	9.2
EC53	Low power U.H.F. Oscillator Triode	B3G (120)	6.3	0.25	200	3.3	7.5	33	4.0	11.4
EC54	Earthed Grid Triode	B9G (15)	6.3	0.43	250	1.5	10	98	9.0	11.1
EC91	Earthed Grid Triode	B7G (59)	6.3	0.3	250	1.5	10	100	8.5	12
ECC31	Medium Impedance Double Triode	Octal (142)	6.3	0.95	250	4.6	6.0	32	2.3	14
ECC32	Medium Impedance Double Triode with separate Cathodes	Octal (64)	6.3	0.95	250	4.6	6.0	32	2.3	14
ECC33	High Slope, Low Impedance Double Triode with separate Cathodes	Octal (64)	6.3	0.4	250	4.0	9	35	3.6	9.7
ECC34	Low Impedance Double Triode with separate Cathodes	Octal (64)	6.3	0.95	250	16	10	11.5	2.2	5.2

TRIODES AND DOUBLE TRIODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	-V _g (V)	I _a (mA)	μ	gm (mA/V)	r _a (K Ω)
ECC35	High-gain Double Triode with separate Cathodes	Octal (64)	6.3	0.4	250	2.5	2.3	68	2.0	34
ECC40	Low Microphony Double Triode with separate Cathodes	B8A (100)	6.3	0.6	250	5.2	6.0	30	2.7	11
ECC8I	Double Triode with separate Cathodes for use as Frequency Changer or R.F. Amplifier	B9A (63)	{ 6.3 12.6 } 0.3 0.15		170	1.5	7.0	57	4.8	12
ECC9I	Double Triode for use as a R.F. Amplifier or Oscillator	B7G (80)	6.3	0.45	100	0.85	8.5	38	5.3	7.1
ECFI	Triode combined with R.F. or I.F. Pentode (for Pentode data see page 28)	P. (143)	6.3	0.2	150	3.0	8.0	20	2.2	9.0
ECLII	Triode combined with an Output Tetrode (for Tetrode data see page 37)	Y. (145)	6.3	1.0	250	2.5	2.0	70	2.0	35
ECL80	Triode combined with an Output Pentode (for Pentode data see page 37)	B9A (102)	6.3	0.3	100	2.3	4.0	17.5	1.4	12.5
HL13	Medium Impedance Triode	P. (44)	13	0.2	200	3.7	5.0	40	3.3	12
HL13C	Medium Impedance Triode	British 7-pin (19)	13	0.2	200	3.7	5.0	40	3.3	12
PM2A	Output Triode	British 4-pin (3)	2.0	0.2	135	6.0	5.0	12	2.0	6.0
PM2HL	Medium Impedance Triode	British 4-pin (3)	2.0	0.1	135	1.5	2.2	30	1.4	21.5
PM202	Power Triode	British 4-pin (3)	2.0	0.2	150	14	14	7	3.5	2.0
UCLII	Triode combined with Output Tetrode (for Tetrode data see page 39)	Y. (145)	60	0.1	200	2.0	2.0	65	2.1	30
354V	Medium Impedance Triode	British 5-pin (9)	4.0	0.65	250	4.5	6.5	40	3.5	11.5

TRIODES WITH DIODES

9c

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	-V _{g1} (V)	I _a (mA)	μ	gm (mA/V)	R _a (K Ω)	
ABC1	Double Diode Triode	P.	(45)	4.0	0.65	250	7.0	4.0	27	2.0	13.5
DAC21	Single Diode Triode	Octal	(132)	1.4	0.025	90	0	0.45	40	0.3	130
DAC32	Single Diode Triode	Octal	(65)	1.4	0.05	90	0	0.15	65	0.275	240
EAC91	Single Diode Triode with separate Cathode for Diode	B7G	(36)	6.3	0.3	200	2.8	7.5	36	2.8	12.8
EBC3	Double Diode Triode	P.	(45)	6.3	0.2	250	5.5	5.0	30	2.0	15
EBC33	Double Diode Triode	Octal	(62)	6.3	0.2	250	5.5	5.0	30	2.0	15
EBC41	Double Diode Triode	B8A	(97)	6.3	0.23	250	3.0	1.0	70	1.3	54
KBC1	Double Diode Triode	P.	(153)	2.0	0.115	135	4.5	2.5	16	1.0	16
KBC32	Double Diode Triode	Octal	(61)	2.0	0.05	100	0	2.4	25	1.2	21
TDD2A	Double Diode Triode	British 5-pin (10)		2.0	0.12	135	1.5	1.95	30	1.2	25
TDD4	Double Diode Triode	British 7-pin (20)		4.0	0.65	250	7.0	4.0	27	2.0	13.5
TDD13C	Double Diode Triode	British 7-pin (20)		13.0	0.2	200	5.0	4.0	27	2.0	13.5
UBC41	Double Diode Triode	B8A	(97)	14.0	0.1	170	1.6	1.5	70	1.65	42

OUTPUT PENTODES

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a =V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	P _{out} (W)	R _a (K Ω)	
AL4	Output Pentode (pa max.=9 W)	P.	(46)	4.0	1.75	250	6.0	36	40	9.0	4.5	7.0
CL4	Output Pentode (pa max.=9 W)	P.	(48)	33.0	0.2	200	8.5	45	6.0	8.0	4.0	4.5
CL33	Output Pentode (pa max.=9 W)	Octal	(70)	33.0	0.2	200	8.5	45	6.0	8.0	4.0	4.5

OUTPUT PENTODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a =V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	P _{out} (W)	R _a (KΩ)
DL21	Output Pentode	Octal (136)	1·4	0·05	120	4·8	5·0	0·9	1·4	0·27	24
DL33	Output Pentode	Octal (69)	{ 1·4 2·8	0·1 0·05	90 90	90 90	4·5 4·5	9·5 8·0	1·3 1·0	0·27 0·23	8·0 8·0
DL35	Output Pentode	Octal (66)	1·4	0·1	90	7·5	7·8	3·5	1·55	0·24	8·0
DL36	Output Pentode	Octal (66)	1·4	0·1	90	4·5	9·5	1·3	2·2	0·27	8·0
DL41	Output Pentode	B8A (137)	{ 1·4 2·8	0·1 0·05	90 90	3·6 3·6	8·0 6·0	1·3 0·95	2·45 2·2	0·36 0·235	11·3 15
DL66	Hearing-aid Output Pentode	B5A (121)	1·25	0·015	22·5	1·4	0·3	0·075	0·35	0·0027	75
DL68	Hearing-aid Output Pentode	B5A (121)	1·25	0·025	22·5	2·2	0·6	0·15	0·43	0·005	37·5
DL71	Hearing-aid Output Pentode	B8D (16)	1·25	0·025	45	1·25	0·6	0·15	0·55	0·0063	100
DL72	Hearing-aid Output Pentode	B8D (16)	1·25	0·025	45	4·5	1·25	0·4	0·5	0·0195	30
DL92	Output Pentode	B7G (39)	{ 1·4 2·8	0·1 0·05	90* 90*	7·0 7·0	7·4 6·1	1·4 1·1	1·57 1·42	0·27 0·235	8·0 8·0
DL93	Output Pentode suitable for R.F. or A.F. applications	B7G (115)	{ 1·4 2·8	0·2 0·1	150†	8·4	13·3	2·2	1·9	0·7‡	8·0
DL94	Output Pentode	B7G (30)	{ 1·4 2·8	0·1 0·05	90 90	4·5 4·5	9·5 7·7	2·1 1·7	2·15 2·0	0·27 0·24	10 10
DLL21	Double Output Pentode	Octal (138)	{ 1·4 2·8	0·2 0·1	135 135	9·4 9·5	2×8·8 2×8·2	2×2·3 2×2·4	— —	1·5 1·5	15§ 15§
ECL11	Output Tetrode (pa max.=9 W) combined with Triode (for Triode data see page 35)	Y. (145)	6·3	1·0	250	6·0	36	4·0	9·0	3·8	7·0
ECL80	Output Pentode (pa max.=3·5 W) combined with Triode (for Triode data see page 35)	B9A (102)	6·3	0·3	170	6·7	15	2·8	3·2	1·0	11
EL2	Output Pentode (pa max.=8 W)	P. (48)	6·3	0·2	250	18	32	5·0	2·8	3·6	8·0

* V_{g2}=67·5 V.

† V_{g2}=90 V.

‡ P_{out}=1·2 W as R.F. Power Amplifier at 50 Mc/s (intermittent operation).

§ Ra-a.

OUTPUT PENTODES *continued*

8E

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (mA)	V _a =V _{g2} (V)	-V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	P _{out} (W)	R _a (KΩ)
EL3	Output Pentode (pa max.=9 W)	P. (46)	6·3	0·9	250	6·0	36	4·0	9·0	4·5	7·0
EL11	Output Pentode (pa max.=9 W)	Y. (146)	6·3	0·9	250	6·0	36	4·0	9·0	4·5	7·0
EL12	Output Pentode (pa max.=18 W)	Y. (146)	6·3	1·2	250	7·0	72	8·0	15	8·0	3·5
EL31	Output Pentode (pa max.=25 W)	Octal (73)	6·3	1·4	275	9·0	91	11	14	120*	10*
EL32	Output Pentode (pa max.=8 W)	Octal (71)	6·3	0·2	250	18	32	5·0	2·8	3·6	8·0
EL33	Output Pentode (pa max.=9 W)	Octal (70)	6·3	0·9	250	6·0	36	4·0	9·0	4·5	7·0
EL34	Output Pentode (pa max.=25 W)	Octal (149)	6·3	1·5	250	13·5	100	14	11	12	2·0
EL35	Output Pentode (pa max.=18 W)	Octal (70)	6·3	1·35	250	15·5	72	8·0	5·0	6·0	2·5
EL37	Output Pentode (pa max.=25 W)	Octal (70)	6·3	1·4	250	13·5	100	13·5	11	69*	3·25*
EL38	Line Time Base Output Pentode (pa max.=25 W)	Octal (73)	6·3	1·4	275	9·0	91	11	14	va(pk) max.= 8 KV	
EL41	Output Pentode (pa max.=9 W)	B8A (96)	6·3	0·7	250	7·0	36	5·2	10	4·2	7·0
EL42	Output Pentode (pa max.=6 W)	B8A (96)	6·3	0·2	225	10·5	26	4·1	3·2	2·5	9·0
§EL8I	Line Time Base Output Pentode (pa max.=8 W)	B9A (122)	6·3	1·05	250	38·5	32	2·4	4·6	va(pk) max.= 7 KV	
EL91	Output Pentode (pa max.=4 W)	B7G (78)	6·3	0·2	250	12·5	16	2·4	2·6	1·4	16
KL4	Output Pentode	P. (156)	2·0	0·15	135	5·0	7·0	1·1	2·1	0·44	19
KL35	Output Pentode	Octal (66)	2·0	0·15	135	4·8	5·0	—	2·2	0·31	20
KLL32	Double Output Pentode	Octal (84)	2·0	0·3	120	10·2	3·3	—	2·6†	0·94	16
PenA4	Output Pentode (pa max.=9 W)	British 7-pin (25)	4·0	1·95	250	5·8	36	5·0	9·5	3·8	8·0
PenB4	Output Pentode (pa max.=18 W)	British 7-pin (25)	4·0	2·1	250‡	12	72	7·0	8·5	8·8	3·5

* Two valves in push-pull (fixed bias).

† gm at V_a=V_{g2}=100 V, V_{g1}=0 V.

‡ V_{g2}=275 V.

§ Provisional information.

OUTPUT PENTODES—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a =V _{g2} (V)	V _{g1} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	P _{out} (W)	R _a (KΩ)
Pen4VA	Output Pentode (pa max.=9 W)	British 5- or 7-pin (12 or 25)	4·0	1·35	250	19·5	36	3·0	2·8	3·8	6·0
Pen36C	Output Pentode (pa max.=9 W)	British 7-pin (25)	33	0·2	200	8·5	45	6·0	8·0	4·0	4·5
PL33	Output Pentode (pa max.=9 W)	Octal (70)	19	0·3	225	5·3	32	3·4	9·0	3·3	7·0
PL38	Line Time Base Output Pentode (pa max.= 25 W)	Octal (73)	30	0·3	200	5·5	75	9·0	13·5	va(pk) max= 8 KV	
PL81	Line Time Base Output Pentode (pa max.=8 W)	B9A (122)	21·5	0·3	170	22	45	3·0	6·2	va(pk) max= 7 KV	
PL82	Output Pentode (pa max.=9 W) ..	B9A (123)	16·5	0·3	170	10·4	53	10	9·0	4·0	3·0
PL83	Video Output Pentode (pa max.=9 W)	B9A (105)	15	0·3	170	2·3	36	5·0	10	V _{out} (pk) into CRT cathode= 70 V at V _b =170 V	
PM22A	Output Pentode	British 5-pin (11)	2·0	0·15	135	4·5	5·6	—	2·2	0·34	19
PM22D	Output Pentode	British 5-pin (11)	2·0	0·3	135	2·4	5·0	0·8	3·0	0·3	24
PM24A	Output Pentode	British 5-pin (11)	4·0	0·275	300*	22·5	20	—	1·7	2·8	15
PM24M	Output Pentode (pa max.=7·5 W)	British 5-pin (11)	4·0	1·1	250	17	30	5·6	3·0	2·8	7·0
QP22B	Double Output Pentode	British 7-pin (35)	2·0	0·3	135	11·7	3·8	0·5	—	1·33	14·7
UCLII	Output Tetrode (pa max.=9 W) combined with Triode (for Triode data see page 35)	Y. (145)	60	0·1	200	8·5	45	6·0	9·0	4·0	4·5
UL4I	Output Pentode (pa max.=9 W) ..	B8A (96)	45	0·1	170	10·4	53	10	9·5	4·0	3·0

* V_{g2}=200 V.

OUTPUT PENTODES WITH DIODES

TYPE	DESCRIPTION	BASE	V _h (V)	I _h (A)	V _a =V _{g2} (V)	-V _{gl} (V)	I _a (mA)	I _{g2} (mA)	gm (mA/V)	P _{out} (W)	R _a (KΩ)
ABLI	Double Diode Output Pentode (pa max.=9 W) ..	P. (50)	4.0	2.4	250	6.0	36	4.0	9.0	4.5	7.0
CBLI	Double Diode Output Pentode (pa max.=9 W) ..	P. (50)	44	0.2	200	8.5	45	6.0	8.0	4.0	4.5
CBL3I	Double Diode Output Pentode (pa max.=9 W) ..	Octal (75)	44	0.2	200	8.5	45	6.0	8.0	4.0	4.5
EBLI	Double Diode Output Pentode (pa max.=9 W) ..	P. (50)	6.3	1.2	250	6.0	36	5.0	9.5	4.3	7.0
EBL2I	Double Diode Output Pentode (pa max.=11 W) ..	B8G (87)	6.3	0.8	250	6.0	36	5.0	9.0	4.5	7.0
EBL3I	Double Diode Output Pentode (pa max.=9 W) ..	Octal (75)	6.3	1.2	250	6.0	36	5.0	9.5	4.3	7.0
Pen4DD	Double Diode Output Pentode (pa max.=9 W) ..	British 7-pin (29)	4.0	2.25	250	6.0	36	5.0	9.5	4.3	7.0
UBLI	Double Diode Output Pentode (pa max.=11 W) ..	Octal (157)	55	0.1	200	11.5	55	11	8.5	5.2	3.5
UBL2I	Double Diode Output Pentode (pa max.=11 W) ..	B8G (87)	55	0.1	200	13	55	9.5	8.0	4.8	3.5

NONODE

TYPE	DESCRIPTION	BASE	V _h (V)	I _h (A)	TYPICAL OPERATION			
EQ80	Nonode for use as F.M. Detector and Limiter	B9A (151)	6.3	0.2	V _b V _{g2+g4+g6} V _{g5} V _{g3} V _{gl}	170 V 20 V -4 V -4 V 0 V	V _{in(g3)} r.m.s. V _{in(g5)} r.m.s. Phase angle between signals on g ₃ and g ₅ = 90° Ra	I2 V I2 V Ra 0.33 MΩ

TUNING INDICATORS

Type	Description	Base	V _h (V)	I _h (A)	V _a (V)	-V _{gI} (V)	I _t (mA)	Optimum Load (MΩ)
EFM1	Tuning Indicator combined with A.F. Pentode	P. (148)	6.3	0.2	250	2-20	0.65	0.13
EM1	Tuning Indicator	P. (150)	6.3	0.2	250	0-5	0.13	2.0
EM4	Dual Sensitivity Tuning Indicator	P. (51)	6.3	0.2	{ 250 250 } 0-5 }	0-16	0.75	1.0*
EM34	Dual Sensitivity Tuning Indicator	Octal (76)	6.3	0.2	{ 250 250 } 0-5 }	0-16	0.75	1.0*
UM4	Dual Sensitivity Tuning Indicator	Octal (159)	12.6	0.1	{ 200 200 } 0-4.2 }	0-12.5	1.4	1.0*
UM34	Dual Sensitivity Tuning Indicator	Octal (76)	12.6	0.1	{ 200 200 } 0-4.2 }	0-12.5	1.4	1.0*

* Each Anode.

+

RECTIFIERS

Type	Description	Base	V _f or V _h (V)	I _f or I _h (A)	V _a max. (V r.m.s.)	I _{out} max. (mA)
AZ1	Directly Heated Full Wave Rectifier	P. (43)	4.0	1.1	2×300	100
AZ4	Directly Heated Full Wave Rectifier	P. (43)	4.0	2.3	2×300	200
AZ11	Directly Heated Full Wave Rectifier	Y. (130)	4.0	1.1	2×300	100
AZ12	Directly Heated Full Wave Rectifier	Y. (130)	4.0	2.3	2×300	200
AZ31	Directly Heated Full Wave Rectifier	Octal (55)	4.0	1.1	2×300	100
AZ41	Directly Heated Full Wave Rectifier	B8A (131)	4.0	0.72	2×300	70
CY1	Indirectly Heated Half Wave Rectifier	P. (42)	20	0.2	250	120
CY31	Indirectly Heated Half Wave Rectifier	Octal (53)	20	0.2	250	120
DW2	Directly Heated Full Wave Rectifier	British 4-pin (1)	4.0	1.0	2×250	60

RECTIFIERS—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a max. (V r.m.s.)	I _{out} max. (mA)
DW4/350	Directly Heated Full Wave Rectifier	British 4-pin (1)	4·0	2·0	2×350	120
DW4/500	Directly Heated Full Wave Rectifier	British 4-pin (1)	4·0	2·0	2×500	120
EY51	Indirectly Heated H.V. Rectifier suitable for C.R.T., E.H.T. supplies	Wired-in B2A (119)	6·3	0·09	5,000	3·0
			For pulsed input:		I _{out} max. I _{k(pk)} max. = 0·35 mA	
			P.I.V. max. = 17 KV		I _{k(pk)} max. = 80 mA	
EY91	Indirectly Heated Half Wave Rectifier	B7G (54)	6·3	0·42	250	75
EZ2	Indirectly Heated Full Wave Rectifier	P. (152)	6·3	0·4	2×350	60
EZ35	Indirectly Heated Full Wave Rectifier	Octal (56)	6·3	0·6	2×325	70
EZ40	Indirectly Heated Full Wave Rectifier	B8A (5)	6·3	0·6	2×350	90
EZ41	Indirectly Heated Full Wave Rectifier	B8A (5)	6·3	0·4	2×250	60
FW4/500	Directly Heated Full Wave Rectifier	British 4-pin (1)	4·0	3·0	2×500	250
FW4/800	Directly Heated Full Wave Rectifier	British 4-pin (1)	4·0	3·0	2×850	125
GZ32	Indirectly Heated Full Wave Rectifier	Octal (57)	5·0	2·3	2×300	300
HVR2	Indirectly Heated Half Wave Rectifier	British 4-pin (2)	4·0	0·65	6,000	3·0
HVR2A	Indirectly Heated Half Wave Rectifier	British 4-pin (2)	2·0	1·5	6,000	3·0
IW4/350	Indirectly Heated Full Wave Rectifier	British 4-pin (7)	4·0	2·0	2×350	120
IW4/500	Indirectly Heated Full Wave Rectifier	British 4-pin (7)	4·0	2·5	2×500	120
PY31	Indirectly Heated Half Wave Rectifier	Octal (53)	17	0·3	250	125
PY80	Indirectly Heated Booster Diode for use in Energy Recovery Circuits	B9A (124)	19	0·3	I _{a(av)} max. = 180 mA	
			P.I.V. max. = 4 KV		vh-k(pk) max. = 650 V	
*PY81	Indirectly Heated Booster Diode for use in Energy Recovery Circuits	B9A (185)	17	0·3	I _{a(av)} max. = 150 mA	
			P.I.V. max. = 4·5 KV		vh-k(pk) max. = 4·5 KV	
			I _{a(pk)} max. = 450 mA			

* Provisional information.

RECTIFIERS—continued

TYPE	DESCRIPTION	BASE	V _h (V)	I _h (A)	V _a max. (V r.m.s.)	I _{out} max. (mA)
PY82	Indirectly Heated Half Wave Rectifier	B9A (124)	19	0.3	250	180
PZ30	Indirectly Heated Rectifier with two separate Half Wave Sections, suitable for use as Half Wave or Voltage Doubling Rectifier	Octal (17)	52	0.3	240	200*
URIC	Indirectly Heated Half Wave Rectifier	British 5-pin (6)	20	0.2	250	75
UR3C	Indirectly Heated Multiple Rectifier	British 7-pin (18)	30	0.2	2×250	120
UYIN	Indirectly Heated Half Wave Rectifier	Octal (160)	50	0.1	250	140
UYII	Indirectly Heated Half Wave Rectifier	Y. (161)	50	0.1	250	140
UY21	Indirectly Heated Half Wave Rectifier	B8G (85)	50	0.1	250	140
UY4I	Indirectly Heated Half Wave Rectifier	B8A (14)	31	0.1	250	100

43

* As voltage doubler V_{out} = 480 V.

VOLTAGE REFERENCE AND STABILIZING TUBES

TYPE	DESCRIPTION	BASE	V Ignition max. (V)	V Burning (V)	I max. (mA)	I min. (mA)	I Quiescent (mA)	A.C. Resistance max. (Ω)
85A1	Neon-filled Voltage Reference Tube	B8G (127)	125	83–87	8.0	1.0	4.5	450
85A2	Neon-filled Voltage Reference Tube	B7G (128)	125	83–87	10	1.0	6.0	450
*150B2	Inert-gas-filled Voltage Stabilizer	B7G (186)	180	143–157	15	5.0	10	500
4687	Neon-filled Voltage Stabilizer	P. (49)	130	90–110	40	10	20	250
4687A	Neon-filled Voltage Stabilizer	British 4-pin (23)	130	90–110	40	10	20	250
7475	Neon-filled Voltage Stabilizer	British 4-pin (23)	140	90–110	8	1.0	4.0	300
13201A	Neon-filled Voltage Stabilizer	British 4-pin (23)	135	90–110	200	15	100	80

* Provisional information.

CATHODE RAY TUBES

Type	Description	Luminescent Colour	Persistence	Base	V _h (V)	I _h (A)	Maximum Final Anode Voltage	Deflection Sensitivity
DB4-I DG4-I DP4-I	1½" Electrostatic Oscillograph Tubes for symmetrical operation	Blue Green Blue with Green afterglow	Short Medium Long	B9G (162)	6.3	0.3	1,000	S _x = 0.13 mm/V S _y = 0.21 mm/V
DB4-2 DG4-2 DP4-2	1½" Electrostatic Oscillograph Tubes X plates suitable for asymmetrical operation	Blue Green Blue with Green afterglow	Short Medium Long	B9G (162)	6.3	0.3	1,000	S _x = 0.13 mm/V S _y = 0.21 mm/V
DB7-5 DG7-5 DR7-5	2½" Electrostatic Oscillograph Tubes for symmetrical operation	Blue Green Blue with Green afterglow	Short Medium Long	B9G (162)	6.3	0.3	1,000	S _x = 0.16 mm/V S _y = 0.26 mm/V
DB7-6 DG7-6 DR7-6	2½" Electrostatic Oscillograph Tubes. X plates suitable for asymmetrical operation	Blue Green Blue with Green afterglow	Short Medium Long	B9G (162)	6.3	0.3	1,000	S _x = 0.16 mm/V S _y = 0.26 mm/V
*DBI3-2 *DGI3-2 *DPI3-2	5" Electrostatic Oscillograph Tubes with post-deflection accelerator. Suitable for symmetrical operation	Blue Green Blue with Green afterglow	Short Medium Long	B14A (163)	6.3	0.3	2,500 (Va4 max. = 5 KV)	S _x = 0.3 mm/V S _y = 0.35 mm/V (with acceleration)
ECR30	3" Electrostatic Oscillograph Tube for symmetrical operation	Green	Medium	B12B (165)	4.0	1.0	1,000	S _x = 0.21 mm/V S _y = 0.21 mm/V
ECR35 ECR35P	3½" Electrostatic Oscillograph Tubes for symmetrical or asymmetrical operation	Green Blue with Green afterglow	Medium Long	B12D (166)	4.0	1.0	2,500	S _x = 0.3 mm/V S _y = 0.65 mm/V
ECR60	6" Electrostatic Oscillograph Tube for symmetrical or asymmetrical operation	Green	Medium	..	B12D (166)	4.0	1.0	2,500

* Provisional information.

† Design centre ratings.

CATHODE RAY TUBES—continued

TYPE	DESCRIPTION	LUMINESCENT COLOUR	PER-SISTENCE	BASE	V _h (V)	I _h (A)	MAXIMUM FINAL ANODE VOLTAGE	DEFLECTION SENSITIVITY
*MF13-1	5" Magnetic Radar Tube with metal-backed screen	Orange with Orange afterglow	Long	Octal (176)	6.3	0.3	11,000 (absolute)	$\frac{0.3 P.c.L}{\sqrt{V_a L}} \text{ cm./gauss}$ <p>Where—</p> <p>P is the distance of effective centre of the deflector coils from the screen centre.</p> <p>L is the length in cm. of the electron path through the field of the deflector coils.</p> <p>c is a correction factor depending upon the shape of the coils, normally about 0.5.</p>
*MF31-22	12" Magnetic Radar Tube with metal-backed screen	Orange with Orange afterglow	Long	B12A (116)	6.3	0.3	12,000 (absolute)	
MW6-2	2½" Magnetic Projection Tube with metal-backed screen	White	Medium	V (117)	6.3	0.3	25,000	
MW31-16	12" Magnetic Television Tube incorporating an ion trap and with external conductive coating	White	Medium	B12A (116)	6.3	0.3	9,000	
*MW36-22	14" Rectangular Television Tube incorporating an ion trap and with external conductive coating	White	Medium	B12A (116)	6.3	0.3	14,000	
MW41-1	16" Metal Cone Television Tube incorporating an ion trap	White	Medium	B12A (116)	6.3	0.3	14,000	

* Provisional information.

† Design centre ratings unless otherwise specified.

THYRATRONS

TYPE	DESCRIPTION	BASE	V _h (V)	I _h (A)	v _{a(pk)} max. (KV)	P.I.V. max. (KV)	i _{a(pk)} max. (A)	i _a max. (A)	VALVE VOLTAGE DROP (V)
EN31	Helium-filled Triode . . .	Octal (83)	6.3	1.3	1.0	1.5	0.75	0.01	33
*ME1503	Hydrogen-filled Triode . . .	B4D (175)	6.3	3.75	8.0	8.0	60	0.015	—

* Provisional information.

THYRATRONS—continued

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	v _a (pk) max. (KV)	P.I.V. max. (KV)	i _a (pk) max. (A)	I _a max. (A)	VALVE VOLTAGE DROP (V)
MT17	Mercury Vapour Triode ..	4-pin UX (177)	2.5	5.0	2.5	5.0	2.0	0.5	16
MT57	Mercury Vapour Triode ..	4-pin UX (178)	5.0	4.5	1.0	1.0	15	2.5	16
*MT105	Mercury Vapour Tetrode	B4D (179)	5.0	10	2.5	2.5	40	6.4	16
*MT5544	Inert-gas-filled Triode ..	B4D (180)	2.5	12	1.5	1.5	40	3.2	16
*MT5545	Inert-gas-filled Triode ..	B4D (180)	2.5	21	1.5	1.5	80	6.4	16
2D21	Inert-gas-filled miniature Tetrode .. .	B7G (181)	6.3	0.6	0.65	1.3	0.5	0.1	8
† I267	Cold Cathode Gas-filled Triode .. .	Octal (184)	Cold Cathode		0.225	—	0.1	0.025	70

* Provisional information.

FLASH-TUBES

TYPE	DESCRIPTION	BASE	MAX. ENERGY OF DISCHARGE (Joules)	ANODE VOLTAGE RANGE (KV)	MIN. TRIGGER VOLTAGE (KV)	APPROX. FLASH DURATION (μ secs.)	PEAK LIGHT OUTPUT (Megalumens)	INTEGRATED LIGHT OUTPUT (Lumen-secs.)
LSD2	Microsecond Flash- Tube	Edison Screw (167)	35	7-10	8	1.0 (peak)	100	1,500
LSD3	Flash-Tube for port- able equipment	4-pin UX (110)	100	2.2-7	4	100	35	3,000
LSD3A								
LSD4	Flash-Tube for studio photography	3-pin special (112)	400	2.2-7	4	300	66	26,000

FLASH-TUBES—continued

Type	Description	Base	Max. Energy of Discharge (Joules)	Anode Voltage Range (KV)	Min. Trigger Voltage (KV)	Approx. Flash Duration (μ secs.)	Peak Light Output (Megalumens)	Integrated Light Output (Lumen-secs.)
LSD5	Flash-Tube for studio set, stage, and commercial colour photography	3-pin special (112)	1,000	2-2.7	6	500	80	40,000
LSD7	Flash-Tube for studio or portable equipment	4-pin UX (110)	200	2-2.7	5	200	44	7,000
*LSD8	Stroboscopic Flash-Tube	4-pin UX (168)	30W†	2-2.7	4	50	0.06	—
*LSD9	Quartz Flash-Tube for ultraviolet operation	4-pin UX (110)	1,000	2-2.7	4	600	40	25,000
LSD10	Flash-Tube for stage, studio set, and colour photography	Wired-in	10,000	2.5-4	17	3,000	250	500,000
LSD12	9" Linear Glass Tube	Wired-in	100	2-2.7	External trigger required	80	60	4,500
LSD13	18" Linear Glass Tube	Wired-in	600	2-2.7	"	400	65	27,000
LSD14	24" Linear Glass Tube	Wired-in	2,500	2-2.7	"	1,300	70	150,000
LSD15	12" Linear Glass Tube	Wired-in	200	2-2.7	"	200	50	8,000
LSD16	9" Linear Quartz Tube	Wired-in	500	2-2.7	"	150	140	16,000
LSD17	12" Linear Quartz Tube	Wired-in	1,000	2-2.7	"	500	100	45,000
LSD18	18" Linear Quartz Tube	Wired-in	2,500	2-2.7	"	1,200	43	95,000

* Provisional information.

† Mean power dissipation.

Max. repetition rate 500 c/s (30,000 r.p.m.).

PHOTOCELLS

Type	Description	Base	Max. Anode Supply Voltage (V)	Max. Dark Current at Max. Anode Supply Voltage (μ A)	Max. Cathode Current (μ A)	Sensitiv- ity* (μ A/Lumen)	Max. Gas Amplifi- cation Factor	Projected Cathode Area (sq. cm.)
20AV	Vacuum Photocell with caesium/antimony cathode	B8G (106)	150	0.05	10	45	—	11
20CG	Gas-filled Photocell with caesium/oxidised silver cathode	B8G (107)	90	0.1	5.0	150	10	6.7
20CV	Vacuum Photocell with caesium/oxidised silver cathode	B8G (107)	150	0.05	20	25 (Va=100 V)	—	6.7
52CG	Gas-filled Photocell with caesium/oxidised silver cathode	British 4-pin (125)	90	0.1	3.0	125	10	4.0
55CG	Gas-filled Photocell with caesium/oxidised silver cathode	B3A (American Pee-Wee) (126)	90	0.1	2.0	125	10	2.2
57CV	Photometric Cell with caesium/oxidised silver cathode	British 4-pin (182)	100	10 ⁻⁴ (Va=50 V)	0.5	13 (Va=50 V)	—	4.5
58CG	Gas-filled Photocell with caesium/oxidised silver cathode for end-on incidence of illumination	Wired-in (183)	90	0.1	1.5	100	9	1.1
58CV	Vacuum Photocell with caesium/oxidised silver cathode for end-on incidence of illumination	Wired-in (183)	100	0.05	3.0	20 (Va=50 V)	—	1.1

* Sensitivity measured at max. anode supply voltage with the whole cathode area illuminated by a lamp of colour temperature 2700° K and with a series resistor of 1 M Ω .

PHOTOCELLS—continued

Type	Description	Base	Max. Anode Supply Voltage (V)	Max. Dark Current at Max. Anode Supply Voltage (μ A)	Max. Cathode Current (μ A)	Sensitiv- ity* (μ A/Lumen)	Max. Gas Amplifi- cation Factor	Projected Cathode Area (sq. cm.)
90AG	Gas-filled Photocell with caesium/antimony cathode	B7G (108)	90	0·1	2·5	150	7	4·0
90AV	Vacuum Photocell with caesium/antimony cathode	B7G (108)	100	0·05	5·0	45	—	4·0
90CG	Gas-filled Photocell with caesium/oxidised silver cathode	B7G (109)	90	0·1	2·0	125	10	3·1
90CV	Vacuum Photocell with caesium/oxidised silver cathode	B7G (109)	100	0·05	10	20	—	3·1

* Sensitivity measured at max. anode supply voltage with the whole cathode area illuminated by a lamp of colour temperature 2700°K and with a series resistor of 1 M Ω .

NOTE.—Caesium/antimony cathode is particularly sensitive to daylight and bluish light.

Caesium/oxidised silver cathode is particularly sensitive to incandescent light and to near infra-red radiation.

IMAGE CONVERTERS

Type	Description	Base No.	Photo- Cathode	Sensitivity of Photocathode (μ A/Lumen)	Lumin- escent Screen	V _{a-k} max. (KV)	Linear Magnifi- cation of Image	Screen Resolution (Lines/cm.)
*MEI200AA	Magnetically focused Image-converter sensitive to daylight and bluish light	171	Caesium/ Antimony	20	Blue Short persistence	6	3·7	200

* Provisional information.

IMAGE CONVERTERS—continued

Type	Description	Base No.	Photo-Cathode	Sensitivity of Photocathode ($\mu\text{A}/\text{Lumen}$)	Lumin-Escent Screen	V _{a-k} max. (KV)	Linear Magnification of Image	Screen Resolution (Lines/cm.)
*MEI201AA	Grid controlled magnetically focused Image-converter sensitive to daylight and bluish light	172	Caesium/Antimony	20 For typical operation, V _{g-k} = 3 KV For extinction of image V _{g-k} = -20 V	Blue Short persistence	6	2.5-3.5	200
*MEI202CA	Magnetically focused Image-converter sensitive to near infra-red radiation	173	Caesium/oxidised silver	15	Blue short persistence	6	1	200

Variants of these tubes with different photocathodes and luminescent screens are also available, and are distinguished by the last two letters of the type number.
 * Provisional information.

50

U.H.F. VALVES

Type	Description	Base No.	V _h (V)	I _h (A)	Characteristics
ME1001	Disc Seal Triode for use as a common-grid earthed-anode concentric line oscillator	169	6.3	0.4	$V_a = 250 \text{ V}$ $V_g = -3.5 \text{ V}$ $I_a = 20 \text{ mA}$ $\mu = 30$ $gm = 6 \text{ mA/V}$
*ME1005	Disc Seal Triode for use as a voltage amplifier	169	6.3	0.4	$V_a = 250 \text{ V}$ $V_g = -1.3 \text{ V}$ $I_a = 10 \text{ mA}$ $\mu = 70$ $gm = 6.5 \text{ mA/V}$

* Provisional information.

U.H.F. VALVES—continued

TYPE	DESCRIPTION	BASE NO.	V _h (V)	I _h (A)	CHARACTERISTICS
*MEI100	Mechanically Tuned Reflex Klystron for use as a 3 cm. local oscillator	—	6.3	0.6	Frequency Range = 8,500-9,660 Mc/s. Max. resonator voltage = 350 V Max. resonator current = 30 mA Max. reflector voltage = -350 V Min. power output = 20 mW Base:—Octal with coaxial line at pin 4
*MEI101	3 cm. Fixed Frequency Packaged Magnetron	—	6.3	0.5	Frequency range = 9,345-9,405 Mc/s. Va max. = 5.7 KV } pulsed Ia max. = 7 A } Max. duty cycle = 0.001 Max. pulse length = 2.5 μ sec. Max. power output = 14 KW

* Provisional information.

15

ACCELEROMETER TUBE

TYPE	DESCRIPTION	BASE	V _h (V)	I _h (A)	CHARACTERISTICS
DDRI00	Accelerometer Double Diode	B8G (164)	6.3	0.6	V _a max. = 10 V †Sensitivity = 7.5 mv/g Max. acceleration = 100 g

† Across resistance bridge.

ELECTROMETERS

TYPE	DESCRIPTION	BASE	V _f or V _h (V)	I _f or I _h (A)	V _a (V)	I _{g2} (V)	-V _{gl} (V)	I _a (μ A)	I _{gl} (μ A)	gm (μ A/V)	μ
MEI400	Electrometer Pentode	Octal (72)	4.5	0.16	△ 45 ● 45	45	2.0 2.0	80 100	<10 ⁻¹¹ <10 ⁻¹¹	240 300	— 20
*MEI401	Subminiature Electrometer Triode	Wired-in (174)	1.25	0.013	9	—	2.5	100	<12.5 × 10 ⁻¹⁴	80	1.7

* Provisional information.

△ Pentode connected.

● Triode connected.

DIRECT REPLACEMENT GUIDE

(including obsolete Mullard Valves)

Types marked with asterisk () are replacements in AC receivers only. In AC/DC receivers it will be necessary to shunt the heater of the replacement valve, as the heater current of this valve differs from that of the original type.*

The data provided on this chart assumes that the valve to be substituted was being operated under the manufacturer's recommended conditions.

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
ABI	†	AZ3	†	CBI	†
AC/DD (Hivac)	2D4A	AZ32	†	CB2	†
AC/DD (Mazda)	†	AZ33	†	CBC1	†
AC/DDT	TDD4	A11B	IW4/350	CC2	HLI3
AC/HL	354V	A11C	IW4/500	CF1	SPI3
AC/HLDD	TDD4	A11D	IW4/350	CF2	VPI3A
AC/HP	SP4	A20B	2D4A	CF3	†
AC/PEN	PEN4VA	A23A	TDD4	CF7	SPI3
AC/Q	†	A27D	PEN4DD	CK1	FCI3
AC/Qa	†	A30D	354V	CL6	†
AC/SG	†	A36A	TH4	CY1C	URIC
AC/SGVM	†	A36B	TH4B	CY2	†
AC/SH	†	A36C	TH4B	CY32	†
AC/SL	SP4	A40M	†	C10B	URIC
AC/SIVM	VP4	A50A	SP4	C12FM	MW31-16
AC/S2	SP4	A50B	SP4B	C20C	†
AC/S2PEN	†	A50M	VP4 (7-pin)	C23B	TDD13C
AC/TH1	TH4B	A50N	VP4A	C27D	†
AC/VH	†		(7-pin)	C30B	HLI3C
AC/VP (5-pin)	†	A50P	VP4B	C36A	TH21C
AC/VP (7-pin)	VP4A	A70B	PEN4VA	C36C	TH30C
AC/VPB	VP4B		(7-pin)	C50B	SPI3C
AC/VPI	†	A70C	PENA4	C50N	VP13C
AC/VP2	VP4B	A70D	PENA4	C70D	PEN36C
AC/Y	†	A70E	PENB4	C80B	FCI3C
AC/Z	PENA4	A80A	FC4	DA	†
AC/2DD	†	A430N	354V	DAC1	†
AC2/PEN	PENA4	BVA211	DW4/350 or IW4/350	DD4	2D4A
AC2/PENDD	†	BVA214		DD4s	AB2
AC4/PEN	PENB4	BVA215		DD6 { Cossor Ferranti }	EB91
AF2	†	BVA216		DD6	
AL5	†	BVA243			
AL60	†	BVA246	EF39	(Tungsram)	†
APP4A	PEN4VA	BVA247		DD6ds	EB4
APP4As	†	BVA264		DD13	†
APP4B	PENA4	BVA265	EL33	DD13s	†
APP4Bs	AL4	BVA266		DD465	†
APP4E	PENB4	BVA267		DD620	†
APV4	IW4/350	BVA274		DDAI	2D4A
AS4120	SP4	BVA275	ECH35	DDL4	2D4A
AS4125	†	BVA276		DDPP4B	†
AZ2	†	B228	PM2HL	DDPP4Bs	ABLI

† No direct replacement available. Please refer to Near Equivalent Guide.

DIRECT REPLACEMENT GUIDE

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
DDPP4M	PEN4DD	ECH4I	†	HP210nc (4-pin)	†
DDPP6B	†	EF2	†	HP211c	VP2
DDPP6Bs	EBLI	EF5	EF9	HP215 (Hivac)	†
DDPP39	†	EF6	†	HP4101c	SP4
DDPP39M	†	EF8	EF9	HP4105	VP4
DDPP39s	CBLI	EF38	EF39	HP4106c	VP4
DDT	†	EK3	†	HP4115c (5-pin)	†
DDT2	TDD2A	EL3N	EL3	HP4115c (7-pin)	VP4A
DDT4	TDD4	EL5	†	HR210	PM2HL
DDT4s	ABC1	EL6	†	H2	PM2HL
DDT6s	EBC3	EL36	†	H2D	TDD2A
DDT13	TDD13C	EZ1	†	H4D	†
DDT13s	†	E220B	PM2B	H210	PM2HL
DDT215	†	E235	PM202	IW3	IW4/350
DDT220	TDD2A	FG17	MT17	IW4	IW4/500
DET22	ME1001	FG57	MT57	KT2	PM22A
DF1	†	FG105	MT105	KT24	PM22A
DH42	TDD4	GN24	DW4/350	KT41	†
DH63	†	G431	DW2	KT42	PEN4VA
DH63M	EBC33*	G470	DW2	KT61	†
DH142	UBC41	G2080 (5-pin)	UR1C	KT63	†
DH147	EBC33	G2080 (P base)	CY1	KT66	EL37
DH150	EBC41	G4120	DW4/500	KTW61	†
DK1	†	G4120N	IW4/500	KTW61M	†
DL2	†	HAD	†	KTW63	†
DL63	EBC33*	HD14	DAC32	KTZ63	†
DL91	†	HD22	TDD2A	K23B	TDD2A
DN41	†	HD23	TDD2A	K30A	PM2HL
DN143	EBL21	HD24	TDD2A	K30B	†
DO42	PEN4DD	HL2	PM2HL	K30C	PM2HL
DP61	EF95	HL2K	PM2HL	K30D	PM2HL
DP495	PEN4DD	HL4+	354V	K30G	PM2A
DP4480	†	HL4g	†	K30K	PM2HL
DT41	TDD4	HL4gs	†	K40B	†
DT436	TDD4	HL13	HL13C	K40N	PM12M
DT1336 (7-pin)	TDD13C	(Tungsram)		K50M	VP2
DTU1	TDD13C	HL13 (Hivac)	†	K50N	VP2B
DW3	DW4/350	HL13s	HL13	K70B	PM22A
DW4	DW4/500	HL21DD	TDD2A	K70D	PM22D
D4	354V	HL22	†	K77B	QP22B
D41	2D4A	HL23DD	†	K80A	FC2
D63	EB34*	HL41	†	K80B	FC2A
D77	EB91	HL41DD	†	K435/10	ACO44
D152	EB91	HL133DD	†	LD210	†
D400	2D4A	HL210	PM2HL	LL2	PM2HL
D1300	†	HLA2	354V	LL2s	†
EAF41	†	HLB1	†	LN152	ECL80
EC50	†	HL/DDI320	†	LP2 (Osram)	PM2A
EC55	ME1001	HP13	†	LP2 (Ferranti)	PM202
ECH2	†	HP13s	VPI3A	LP4	ACO44
ECH4	†	HP210nc (7-pin)	SP2	LP220	PM2A

* See note at beginning of section.

† No direct replacement available. Please refer to Near Equivalent Guide.

DIRECT REPLACEMENT GUIDE

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
L2 (Ferranti)	PM2A	OM5	EF36	PP6BG	EL33
L2 (Mazda)	PM2HL	OM5A	EF37	PP6Bs	EL3
L2/B	PM2HL	OM5B	EF37A	PP34	†
L2/DD	†	OM6	EF39	PP34s	CL4
L2I	PM2HL	OM7	EF39	PP35	PEN36C
L2I/DD	TDD2A	OM9	EL32	PP36	†
L2I0	PM2HL	OM10	ECH35*	PP220	PM202
ME6s	EMI	OP4I	PENB4	PP3/250	ACO44
MH4	354V	OP42	PENA4	PT2	PM22A
MHD4	†	O202	FC2	PT4 {Marconi Osram}	PM24M
MHL4	†	O406	FC4	PT4 (Ferranti)	PENA4
MKT4	PEN4VA	O1307 (P base)	FC13	PT4D	†
MM4V	†	O1307 (7-pin)	FC13C	PT4I	PM24M
MP4106c	VP4	PBI	PM2A	PTZ	†
MP/PEN	PEN4VA	PEN4V	†	PV4	DW4/350
MPT4	PEN4VA	PEN4VB	PENA4	PV29s	†
MS4B	SP4	PEN24	†	PV30	UR3C
MS4C	SP4	PEN25	†	PV30s	†
MSG/H.A.	SP4	PEN26	†	PV495	DW2
MSG/L.A.	SP4	PEN40DD	†	PV4200	DW4/500
MSP4	SP4	PEN220	PM22A	PVB6s	†
MS/PEN	SP4	PEN230	†	PX4	ACO44
MS/PENA	SP4	PEN23I	PM22D	PX230	PM202
MU12	IW4/350	PEN3520	PEN36C	P2	PM202
MU12/14	IW4/500	PENA1	PM24M	P12/250	ACO44
MU14	IW4/500	PENBI	PM22A	P220	†
MV/SG	†	PENDD4020	†	MT17	(Tungsram)
MVS/PEN	†	PL17	†	2D21	P220 {Mazda Hivac}
(5-pin)		PL21	†	MT57	PM2A
MVS/PEN	VP4A	PL57	†	MT105	P220A
(7-pin)		PL105	†	I267	P225 (5-pin)
MVS/PENB	†	PL1267	†	PM2HL	PM22A
N14	DL35	PM1A	PM2HL	P240	PM202
N15	†	PM1HF	PM2HL	P435	PM24M
N16	DL33	PM1HL	PM2HL	P440N	PEN4VA
N17	DL92	PM1LF	†	P441N	PEN4VA
N19	DL94	PM2	†	P495	PENA4
N40	†	PM2DL	PM2HL	QP230	QP22B
N41	PENA4	PM2DX	PM2HL	QP240 (Mazda)	†
N63	†	PM12	†	QP240 (Hivac)	†
N66	EL37	PM12A	†	QPT2	†
N77	EL91	PM22	†	QS83/3	85A2
N142	UL4I	PM24	†	RV120/350	DW4/350
N144	EL91	PM24B	†	RV120/350s	AZ1
N147	EL33	PM24C	†	RV120/500	DW4/500
N150	EL4I	PM252	†	RV120/500s	†
N151	EL42	PP2	PM22A	RV200/600	FW4/800
N152	PL8I	PP2s	KL4	RZ	URIC
OM1	CY3I	PP4	PM24M	R1	DW2
OM3	EB34	PP4s	†	R2	IW4/350
OM4	EBC33	PP6As	EL2	R3	IW4/500

* See note at beginning of section.

† No direct replacement available. Please refer to Near Equivalent Guide.

DIRECT REPLACEMENT GUIDE

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
R4	DW4/350	S1324	†	U84	†
R4A	DW4/500	S1328	SPI3	U101	†
R12	EY5I	TDD2	†	U142	UY4I
R14	PZ30	TDD13	†	U143	AZ3I
R4I	DW4/500	TH4	†	U145	UY4I
R42	IW4/350	TH4A	TH4B	U147	EZ35
R52	GZ32	TH22C	TH30C	U149	†
SD2	PM2HL	TH29	TH30C	U150	EZ40
SE211c	PMI2M	TH30	TH30C	U151	EY5I
SG215	PMI2M	TH41	†	U152	PY80
SG215A	PMI2M	TH62	†	U201	CY3I
SP4 (Tungsram)	†	TH233	†	U403	†
SP4C	†	TH232I	TH30C	U404	UY4I
SP4s	AF7	TP25	†	U4020	†
SP6	EF9I	TT4	†	VHT2	FC2
SP6s	†	TV4	†	VHT2A	FC2A
SP13	†	TV6	EMI	VHT4	FC4
(Tungsram)		TX4	†	VHTA	†
SP13B	SPI3C	TX2I	TH21C	VM4V	†
SP13s	SPI3	TX4I	TH4B	VMP4	VP4
SP22	†	T4I (Ekco)	354V	VMP4G	†
SP210	SP2	UAF4I	†	VMS4	†
SP215	†	UCH4	†	VMS4B	†
SP220	PM202	UCH4I	†	VO2	FC2A
SP1320	SPI3C	UD2	PM202	VO2s	KK2
SPT2	SP2	URI	CY1	VO4	FC4
SPT4A	SP4 (7-pin)	UR2	†	VO4s	AK2
SS210	†	UR3	†	VO6s	EK2
SU61	EY5I	UU3	IW4/350	VO13	FC13C
S4V	SP4	UU4	IW4/350	VO13s	FC13
S4VA	SP4	UU5	IW4/500	VP4C	†
S4VB	SP4	UU6	†	VP6	EF92
S11A	DW2	UU8	†	VP13	†
S11D	DW4/350	UU9	EZ40	VP13B	VPI3C
S21	†	UU60/250	IW4/350	VP22	†
S22	†	UU120/350	DW4/350	VP4I (Mazda)	†
S23	†	UU120/350A	IW4/350	VP4I (Ekco)	VP4B
S24	†	UU120/500	DW4/500	VP133	†
S30C	ACO44	(Mazda)		VP210	†
S30D	†	UU120/500	IW4/500	VP215	†
S213	PMI2M	(Hivac)		VPI32I	†
S215	†	UY3I	†	VPI322	VPI3C
S215A	†	UI0	DW2	VPT2	†
S215B	†	UI2/I3	DW4/350	VPT4	VP4 (5-pin)
S215VM	PMI2M	UI4	DW4/500	VPT4B	VP4A
S217	VP2	UI8/20	{ F4/500 } FW4/800	VPU1	VPI3C
S218	SP2	U3I	FW4/800	VS2	PMI2M
S420	VP4B	U50	PY3I	VS24	PMI2M
S434N (5-pin)	†	U70	†	VS24K	PMI2M
S434N (7-pin)	VP4A	U82	EZ35	VS210	PMI2M
S435N	SP4		†	VS215	PMI2M

† No direct replacement available. Please refer to Near Equivalent Guide.

DIRECT REPLACEMENT GUIDE

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
VX2	VP2B	IA7VG	DK32	4D1	†
VX2s	†	IAC6	DK92	4G/280K	2D2I
VX32	ME140I	IC1 (Mazda)	DK9I	4THA	†
V20	URIC	IC5G	DL35	4XP	ACO44
V20s	CYI	IC5GT/G	DL35	4/100BU	FW4/500
V30	†	IC6	†	5CPI-A	DGI3-2
WDI42	UAF42	IC7G	†	5CP7-A	DPI3-2
WDI50	EAF42	ID5	†	5FP7-A	MFI3-I
W17	DF9I	ID6	†	5V4G	GZ32
W21	†	ID7G	†	5Y3G	†
W42	†	ID13	DA90	5Y4G	†
W63	†	IE5G	†	5Z4G	GZ32
W77	EF92	IF2	DF92	6A6	†
W142	UF4I	IF3	DF9I	6A7	†
W143	EF22	IF4	†	6A7E	†
W147	EF39	IF5G	KL35	6A8G	†
W150	EF4I	IFD9	DAF9I	6A8GT	†
X14	DK32	IH5G	DAC32	6AB8	ECL80
X17	DK9I	IH5GT/G	DAC32	6AG6G	EL33
X21	FC2	IH6G	†	6AK5	EF95
X22	FC2	IL4	DF92	6AK6	†
X42	†	ILA6	†	6AL5	EB9I
X61M	ECH35	ILC5	†	6AM5	EL9I
X65	†	ILD5	†	6AM6	EF9I
X142	UCH42	ILH4	†	6AT6	†
X143	ECH2I	ILN5	†	6BD6	†
X147	ECH35	IN5G	†	6BE7	EQ80
X150	ECH42	IN5GT/G	DF33	6BT6	†
YD2	†	IN5VG	DF33	6BX6	EF80
Y61	†	IPI0	DL92	6C6	†
Y62	†	IPII	DL94	6C10	ECH42
Y63	†	IQ5GT	DL36	6CJ6	EL8I
Y220	†	IR5	DK9I	6D1 (Mazda)	EA50
ZD17	DAF9I	IS4	†	6D2	EB9I
ZD152	EBF80	IS5	DAF9I	6D6	†
Z14	DF33	IT4	DF9I	6E8G	ECH35
Z21	†	IUS	†	6F12	EF9I
Z22	SP2	2D4	†	6F16	EF4I
Z77	EF9I	2D13	†	6H6GT	EB34*
Z90	EF50	2D13A	†	6J6	ECC9I
Z142	UF42	2D13C	†	6J7G	†
Z150	EF42	2D2I	2D2I	6J7GT	EF37A*
Z152	EF80	2J42	ME110I	6J8G	†
0A4G	I267	3A4	DL93	6K7G	†
0E3	85AI	3A5	DCC90	6K7GT	EF39*
IA3	DA90	3NP4	MW6-2	6K8G	†
IA4E	†	3Q4	†	6K8GT	†
IA4P	†	3Q5GT/G	DL33	6L6G	†
IA7G	†	3S4	DL92	6L34	EC9I
IA7GT/G	DK32	3V4	DL94	6M6G	EL33

* See note at beginning of section.

† No direct replacement available. Please refer to Near Equivalent Guide.

DIRECT REPLACEMENT GUIDE

Type Number	Replacement	Type Number	Replacement	Type Number	Replacement
6N7GT/G	†	I6A5	PL82	210SPG	FC2
6N8	EBF80	I7Z3	PY8I	210SPT	†
6P8G	ECH35*	I9X3	PY80	210VPT (4-pin)	†
6P28	†	I9Y3	PY82	210VPT (7-pin)	†
6Q7G	†	20A1	TH4B	215P	†
6Q7GT	†	20A3	2D2I	215SG	PMI2M
6S7	EF39*	21A6	PL8I	220HPT	PM22A
6S7G	†	25RE	†	220/OT	PM22A
6SC7	†	25Y5	†	220P	†
6SJ7	†	25Z4G	†	220PA	PM2A
6SK7	†	25Z5	†	220SG	†
6SL7GT	ECC35*	25Z6G	†	220VS	PMI2M
6SN7GT	†	35RE	†	220VSG	PMI2M
6U5/6G5	†	36	†	230PT	†
6U7G	†	39/44	†	230XP	†
6V6G	†	40SUA	†	240QP	QP22B
6W7G	†	41E	†	244V	354V
6X2	EY5I	41/MHF	354V	302THA	TH30C
6X5G	EZ35	41/MHL	354V	332PEN	CL33
6X5GT/G	EZ35	41/MPG	FC4	408BU	DW2
6ZY5G	†	41/MPL	354V	442BU	DW4/350
7A2	PEN4VA	41/MSG	SP4	460BU	DW4/500
7A3	PENA4	41/MTL	354V	484V	†
7A7	†	41STH	†	506BU	DW2
7B7	†	42/42E	†	723A/B	ME1100
7C5	†	42MP/PEN	PENA4	927	55CG
7D6	PEN36C	42/OT	PENA4	1267	I267
7D9	EL9I	43IU	IW4/350	1561	DW4/500
7F7	†	44IU	IW4/500	1821	DW2
7K7	†	45IU	†	1861	IW4/500
7S7	†	54KU	GZ32	1867	IW4/350
7Y4	†	62DDT	EBC4I	1877	HVR2
8AI	SP4	62TH	ECH42	1881	IW4/350
8D2	†	62VP	EF4I	2101	†
8D3	EF9I	63SPT	EF50	2102	†
9A1	VP4	64ME	EM34	4065	ME1401
9D2	†	66KU	EZ40	5544	MT5544
9D6	EF92	67PT	EL4I	5545	MT5545
I0D1	†	77/77E	†	5557	MT17
I1A2	†	78/78E	†	5559	MT57
I2AT7	ECC8I	80	†	5802	ME1401
I2XP4	MW3I-16	84/6Z4	†	5861	ME1001
I2Z3	†	I2IK	MW3I-16	55035	ME1101
I3PGA	†	202DDT	TDD13C		
I3SPA	†	202STH	TH21C		
I3VPA	†	210DDT	TDD2A		
I5	†	210DET	PM2HL		
I5A2	†	210HF	PM2HL		
I5A6	PL83	210LF	†		
I5DI	†	210PG	FC2		

* See note at beginning of section.

† No direct replacement available. Please refer to Near Equivalent Guide.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
ABI	O	2D4A	O	No circuit change. 2D4A has no top cap.
AC/DD (Mazda)	O	2D4A	O	No circuit change. 2D4A has no top cap.
AC/Q	M	PENB4	M	Bias may require adjustment.
AC/Qa	K	EL37	K	Bias may require adjustment.
AC/SG	O/M	SP4	O/M	Raise Vg2 to 100V for R.F. amplifier.
AC/SGVM	O/M	VP4	O/M	Raise Vg2 to 100V for R.F. amplifier.
AC/SH	M	SP4	M	Bias may require adjustment.
AC/S2PEN	M	SP4	M	Bias may require adjustment.
AC/VH	O	VP4	O	Bias may require adjustment.
AC/VP (5-pin)	O	VP4A	M	Change base.
AC/VPI	M	VP4B	M	Rewire base.
AC/Y	O/M	PEN4VA	O/M	Bias may require adjustment.
AC/2DD	M	PEN4DD	M	Interchange connections to pins 2 and 6.
AC2/PENDD	M	PEN4DD	M	Rewire base.
AF2	O	VP4A	M	Change base.
AL5	P	PENB4	M	Change base.
AL60	M	PENB4	M	Rewire base. Change Rk to 175Ω.
APP4As	P	PEN4VA	O/M	Change base.
AS4125	O	VP4	O	Volume control will be less gradual in operation.
AZ2	P	FW4/500	A	Change base.
AZ3	P	IW4/350	A	Change base.
AZ32	K	FW4/500	A	Change base.
AZ33	K	IW4/350	A	Change base.
A40M	O	VP4	O	Volume control will be less gradual in operation.
CB1	V}	EB34	K	Change base. When rewiring connect separate cathodes of EB34 together. EB34 : Vh=6-3V.
CB2	V}		K	
CBC1	P	TDD13C	M	Change base.
CF3	P	VPI3C	M	Raise Vg2 to Va.
CL6	P	CL4	P	Change Rk to 170Ω. Raise Vg2 to 200V.
CY2	P	UR3C	M	Change base.
CY32	K	UR3C	M	Change base.
C20C	O	EB34	K	Change base. When rewiring connect separate cathodes of EB34 together. EB34 : Vh=6-3V.
C27D	M	CBL3I	K	Change base.
DA	M	HL13C	M	Bias may require adjustment.
DAC1	P	DAC32	K	Change base.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
DD6 (Tungsram)	O	EB34	K	Change base.
DD13	O	EB34	K	Change base. When rewiring connect separate cathodes of EB34 together.
DD13s	V			EB34 : Vh=6.3V.
DD465	O	2D4A	O	Rewire base.
DD620	O	EB34	K	Change base.
DDPP4B	M	PEN4DD	M	Rewire base.
DDPP6B	M	EBL3I	K	Change base.
DDPP39	M	CBL3I	K	Change base.
DDPP39M	M	CBL3I	K	Change base.
DDT	M	TDD4	M	Bias may require adjustment.
DDTI3s	P	TDD13C	M	Change base.
DDT215	O	TDD2A	O	Bias may require adjustment.
DF1	P	DF33	K	Change base.
DH63	K	EBC33*	K	Earth pin I.
DK1	P	DK32	K	Change base.
DL2	P	DL35	K	Change base.
DL91	B7G	DL92	B7G	Rewire base so that Vf is between pin 5 and pins 1 and 7 connected together.
DN41	M	PEN4DD	M	Rewire base. Raise Vg2 to Va. Increase Rk to 140Ω.
DP4480	M	CBL3I	K	Change base.
DI300	P	EB34	K	Change base. When rewiring connect separate cathodes of EB34 together. EB34 : Vh=6.3V.
EAF41	B8A	EAF42	B8A	Connect pins 4 and 7 together.
EC50	P	EN3I	K	Change base.
ECH2	P	ECH3	P	ECH3 : Ih=0.3A.
ECH4	P	ECH2I	B8G	Change base.
ECH4I	B8A	ECH42	B8A	Screen grid resistors may need alteration.
EF2	P	EF9	P	Bias may require adjustment.
EF6	P	EF36	K	Change base.
EK3	P	EK2	P	Raise Vg2 to 200V. EK2 : Ih=0.2A.
EL5	P	EL35	K	EL35 : Vg2=250V max. Change Rk to 180Ω. Change base.
EL6	P	EL35	K	EL35 : Vg2=250V max. Change Rk to 180Ω. Change base.
EL36	K	EL35	K	EL35 : Vg2=250V max. Change Rk to 180Ω.
EZ1	P	EZ35	K	Change base. EZ35 : Ih=0.6A.
HAD	M	TDD13C	M	Bias may require adjustment.
HL4g	M	354V	O	Change base.
HL4gs	P	354V	O	Change base.
HL13 (Hivac)	M	HL13C	M	Shunt heater with 130Ω, 2W resistor.
HL22	MO	PM2HL	A	Change base.
HL23DD	MO	KBC32	K	Change base.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
HL4I	MO	354V	O	Change base.
HL4IDD	MO	TDD4	M	Change base.
HLI33DD	MO	TDD13C	M	Change base.
HLBI	A	PM2HL	A	Bias may require adjustment.
HL/DDI320	M	TDD13C	M	Bias may require adjustment.
HPI3	M	VP13A	P	Change base.
HP210nc (4-pin)	A	SP2	M	Change base.
HP215 (Hivac)	M	SP2	M	Raise Vg2 to Va.
HP4115c (5-pin)	O	VP4A	M	Change base.
H4D	M	TDD4	M	Bias may require adjustment.
KT4I	M	PENA4	M	Bias may require adjustment.
KT6I	K	EL33	K	Bias may require adjustment.
KT63	K	EL32	K	Rewire base.
KTW61	K	EF39*	K	Earth pin 1. Bias may require adjustment.
KTW61M	K	EF39*	K	Bias may require adjustment.
KTW63	K	EF39*	K	Earth pin 1.
KTZ63	K	EF37A*	K	Connect pin 5 to pin 8.
K30B	A	PM2HL	A	Change Vg1 to -1.5V.
K40B	A	PM12M	A	Raise Vg2 to 90V.
LD210	A	PM2HL	A	Bias may require adjustment.
LL2s	P	PM2HL	A	Change base.
L2/DD	O	TDD2A	O	Change Vg1 to -1.5V. Not suitable as Class B driver.
MHD4	M	TDD4	M	Bias may require adjustment.
MHL4	O	354V	O	Bias may require adjustment.
MM4V	O	VP4	O	Volume control less gradual in operation.
MV/SG	O	VP4	O/M	Bias may require adjustment.
MVS/PEN	O	VP4A	M	Change base.
(5-pin)				
MVS/PENB	M	VP4B	M	Raise Vg2 to Va.
N15	K	DL33	K	Increase bias.
N40	O	PEN4VA	O/M	Bias may require adjustment.
N63	K	EL32	K	Rewire base.
PEN4V	O	PEN4VA	O	Change Vg1 to -22V. No change with automatic bias.
PEN24	MO	KL35	K	Change base. Change Vg1 to -4.5V.
PEN25	MO	KL35	K	Change base.
PEN26	P	CL4	P	Change Rk to 170Ω. CL4 : Vg2=200V.
PEN40DD	M	CBL3I	K	Change base.
PEN230	A/O	PM22A	A/O	Change Vg1 to -4.5V at Va=Vg2=135V and Ra to approximately 19KΩ.
PENDD4020	M	CBL3I	K	Change base.
PM1LF	A	PM2HL	A	Change Vg1 to -1.5V.
PM2	A	PM2A	A	Change Vg1 to -6V.
PM12	A	PM12M	A	Raise Vg2 to 90V.

*See note at beginning of Direct Replacement Guide.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
PM12A	A	PM12M	A	Raise Vg2 to 90V.
PM22	A/O	PM22A	A/O	Change Vg1 to -4.5V at Va=Vg2=135V and Ra to approximately 19KΩ.
PM24	A/O	PM24A	O	Change base, if necessary.
PM24B	O	PM24M	O	Redesign circuit. PM24M : Va=Vg2=250V max.
PM24C	O	PM24M	O	Redesign circuit. PM24M : Va=Vg2=250V max.
PM252	A	PM2A	A	Change Vg1 to -6V. Ra=7KΩ.
PP4s	P	PM24M	O	Change base.
PP34	M	PEN36C	M	Connect g1 to T.C.
PP36	M	PEN36C	M	Rewire base.
PT4D	M	PEN4DD	M	Rewire base.
PTZ	M	PEN36C	M	Rewire base.
PV29s	P	UR3C	M	Change base.
PV30s	P	UR3C	M	Change base.
PVB6s	P	EZ35	K	Change base. Check Ih when series heated.
P220 (Tungsram)	A	PM202	A	Bias may require adjustment.
QP240 (Mazda)	9-pin	QP22B	M	Change base.
QP240 (Hivac)	M	QP22B	M	Bias may require adjustment.
QPT2	M	QP22B	M	Bias may require adjustment.
RV120/500s	P	DW4/500	A	Change base.
SP4 (Tungsram)	M	SP4	M	Rewire base.
SP4C	P	SP4B	M	Change base.
SP6s	P	EF37A	K	Change base.
SP13 (Tungsram)	M	SPI3	P	Change base.
SP22	MO	SP2	M	Change base.
SP215	M	SP2	M	Bias may require adjustment.
SS210	A	PM12M	A	Raise Vg2 to 90V.
S21	A	PM12M	A	Raise Vg2 to 90V.
S22	A	PM12M	A	Raise Vg2 to 90V.
S23	A	PM12M	A	Raise Vg2 to 90V.
S24	A	PM12M	A	Raise Vg2 to 90V.
S30D	A	ACO44	A	Change Vf to 4V.
S215	A	PM12M	A	Raise Vg2 to 90V.
S215A	A	PM12M	A	Raise Vg2 to 90V.
S215B	A	PM12M	A	Raise Vg2 to 90V.
S434N (5-pin)	O	VP4A	M	Change base.
S1324	M	SPI3C	M	Raise Vg2 to Va.
TDD2	O	TDD2A	O	Change Vg1 to -1.5V. Not suitable as Class B driver.
TDD13	P	TDD13C	M	Change base.
TH4	M	TH4B	M	Change Rk to 140Ω. Grid leak to be increased to 50KΩ between grid and cathode.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replacement	BASE	CONVERSION
TH4I	MO	TH4B	M	Change base. Receiver may require re-aligning.
TH62	K	{ CCH35 ECH35 }	K	For AC/DC receivers—CCH35. For AC receivers—ECH35.
TH233	MO	TH30C	M	Change base. Receiver may require re-aligning.
TP25	MO	KCF30	K	Change base.
TT4	O	EC31	K	Change base. Raise V_h to 6.3V.
TV4	P	EMI	P	Raise V_h to 6.3V.
TX4	M	TH4B	M	Change R_k to 140Ω . Grid leak to be increased to $50K\Omega$ between grid and cathode.
UAF4I	B8A	UAF42	B8A	Connect pins 4 and 7 together.
UCH4	K	UCH2I	B8G	Change base.
UCH4I	B8A	UCH42	B8A	Screen grid resistor may need alteration.
UR2	P	UR3C	M	Change base.
UR3	P	UR3C	M	Change base.
UU6	MO	IW4/350	A	Change base.
UU8	MO	GZ32	K	Change base. $GZ32, V_h=5V$.
UY3I	K	UY2I	B8G	Change base.
U50	K	GZ32	K	$GZ32$ has indirectly heated cathode.
U82	B8G	EZ35	K	Change base.
U84	B8G	AZ31	K	Change base.
U10I	B8G	UY2I	B8G	Join pins 2, 4 and 6 together.
U149	B8G	EZ35	K	Change base.
U403	MO	CY3I	K	Change base. Check $I_h=0.2A$.
U4020	O	URIC	O	Check $I_h=0.2A$.
VHTA	M	FC13C	M	Vg_2 max.=90V. Receiver may require realigning.
VM4V	O	VP4	O	Volume control less gradual in operation.
VMP4G	M	VP4A	M	Bias may require adjustment.
VMS4	O	VP4	O	Volume control will be less gradual in operation.
VMS4B	O	VP4	O	Volume control will be less gradual in operation.
VP4C	M	VP4B	M	Rewire base.
VP13	M	VP13A	P	Change base.
VP22	MO	KF35	K	Change base.
VP4I (Mazda)	MO	VP4B	M	Change base.
VP133	MO	VP13C	M	Change base. Bias may require adjustment.
VP210	M	KF35	K	Change base.
VP215	M	VP2	M	Increase Vg_2 to V_a .
VP132I	M	VP13C	M	Change base connections.
VPT2	M	VP2	M	Increase Vg_2 to V_a .
VX2s	P	VP2B	M	Change base.
V30	O	URIC	O	Check $I_h=0.2A$.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
W21	M	VP2	M	Join pins 3 and 4 together.
W42	M	VP4A	M	Rewire base.
W63	K	EF39*	K	Bias may require adjustment.
X42	M	FC4	M	Bias may require adjustment.
X65	K	ECH35	K	Earth pin 1. Receiver may require re-aligning.
YD2	A	PM2A	A	Bias may require adjustment.
Y61	K	EM34	K	Supply a ₂ (pin 6) from H.T., through $1M\Omega$ resistor.
Y62	K	EM34	K	Interchange connections, to pins 4 and 5.
Y63	K	EM34	K	
Y220	O	PM22A	O	Bias may require adjustment.
Z21	M	SP2	M	Earth pin 3.
IA4E	UX	KF35	K	Change base.
IA4P	UX	KF35	K	Change base.
IA7G	K	DK32	K	Earth pin 1.
IC6	UX	KK32	K	Change base.
IC7G	K	KK32	K	Earth pin 1.
ID5	O	URIC	O	Check I _h =0.2A.
ID6	UX	PY3I	K	Change base. Check I _h =0.3A.
ID7G	K	KK32	K	Earth pin 1.
IE5G	K	KF35	K	Earth pins 1 and 5.
IF4	UX	KL35	K	Change base.
IH6G	K	KBC32	K	Rewire base.
ILA6	B8G	DK32	K	Change base.
ILC5	B8G	DF33	K	Change base.
ILD5	B8G	DAF9I	B7G	Change base.
ILH4	B8G	DAC32	K	Change base.
ILN5	B8G	DF33	K	Change base.
IN5G	K	DF33	K	Change base.
IS4	B7G	DL92	B7G	Rewire base so that V _f is between pin 5 and pins 1 and 7 connected together.
IU5	B7G	DAF9I	B7G	Rewire base.
2D4	O	2D4A	O	Rewire base. 2D4A has no top-cap.
2D13	V	EB34	K	Change base, when rewiring connect cathodes of EB34 together. EB34 : V _h = 6.3V.
2D13A	V	EB34	K	
2D13C	O	EB34	K	
3Q4	B7G	DL94	B7G	Rewire base.
4DI	M	HLI3C	M	Earth pin 1.
4THA	M	TH4B	M	Receiver may require realigning.
5Y3G	K	GZ32	K	GZ32 is indirectly heated.
5Y4G	K	GZ32	K	Rewire base. GZ32 is indirectly heated.
6A6	UX	ECC33	K	Change base. ECC33 unsuitable for use as Class B output valve.
6A7	UX	EK32*	K	Change base. Earth pin 1. Receiver may require realigning.
6A7E	UX	EK32*	K	

* See note at the beginning of Direct Equivalent Guide.

NEAR EQUIVALENT GUIDE

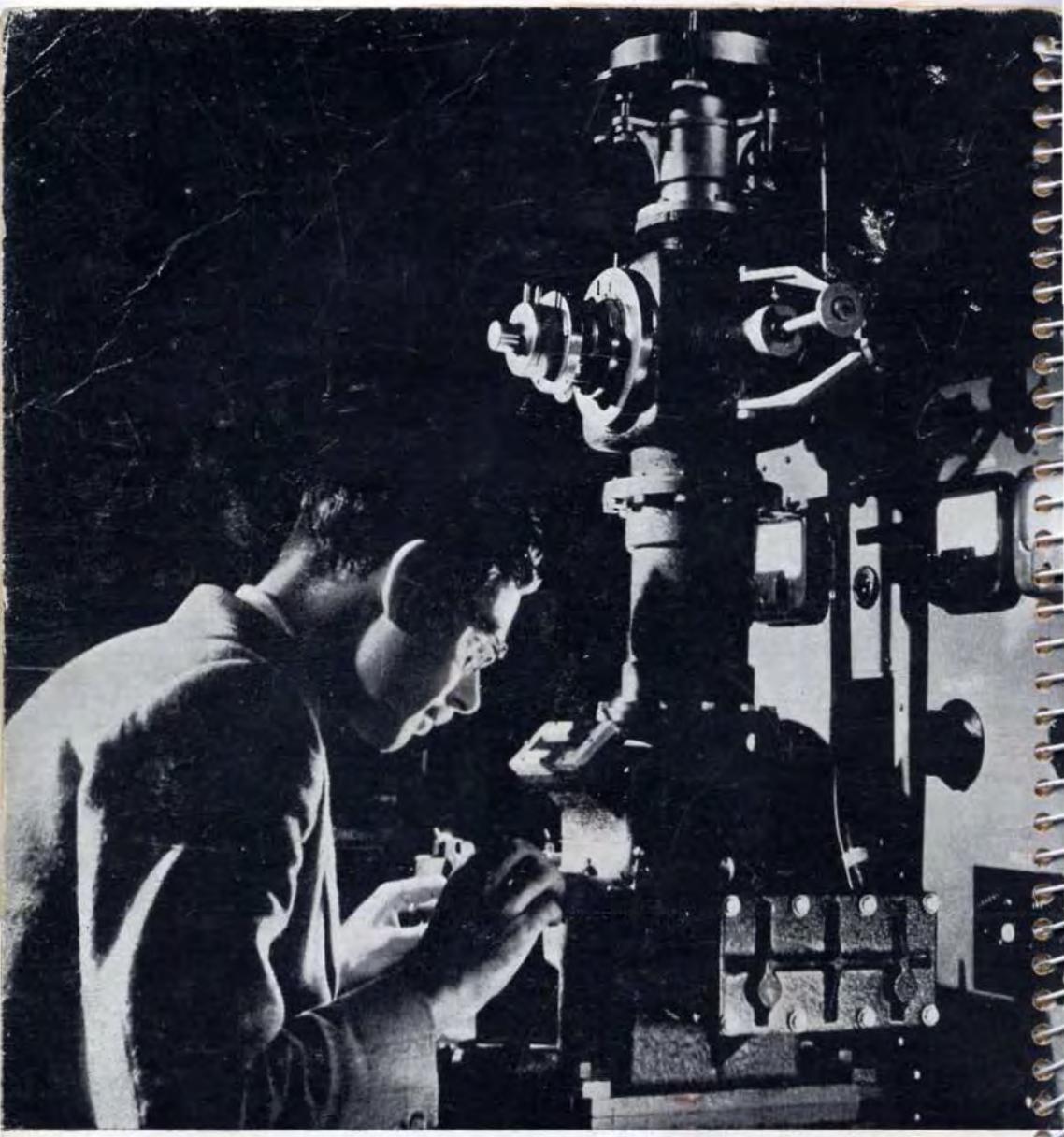
Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
6A8G	K	EK32*	K	Earth pin I. Receiver may require re-aligning.
6A8GT	K	EK32*	K	Receiver may require realigning.
6AK6	B7G	EL91	B7G	Rewire base.
6AT6	B7G	EBC41	B8A	Change base.
6BD6	B7G	EF41*	B8A	Change base.
6BT6	B7G	EBC41*	B8A	Change base.
6C6	UX	EF37A*	K	Change base.
6D6	UX	EF39*	K	Change base.
6J7G	K	EF37A*	K	Earth pin I.
6J8G	K	ECH35	K	Earth pin I. Bias may require adjustment.
6K7G	K	EF39*	K	Earth pin I.
6K8G	K	ECH35	K	Earth pin I. Receiver may require re-aligning.
6K8GT	K	ECH35	K	Receiver may require realigning.
6L6G	K	EL37	K	Bias may require adjustment.
6N7GT/G	K	ECC33	K	Rewire base. ECC33 unsuitable as Class B output valve.
6P28	K	EL38	K	Rewire base.
6Q7G	K	EBC33*	K	Earth pin I. Bias may require adjustment.
6Q7GT	K	EBC33*	K	Bias may require adjustment.
6S7G	K	EF39*	K	Earth pin I.
6SC7	K	ECC35*	K	Rewire base.
6SJ7	K	EF36*	K	Rewire base.
6SK7	K	EF41*	B8A	Change base.
6SN7GT	K	ECC33	K	Bias may require adjustment.
6U5/6G5	UX	EM34*	K	Change base. Supply a2 from H.T. through $1M\Omega$ resistor.
6U7G	K	EF39*	K	Earth pin I.
6V6G	K	EL33	K	Bias may require adjustment.
6W7G	K	EF37A*	K	Earth pin I.
6ZY5G	K	EZ35	K	EZ35 $I_h=0.6A$, 6ZY5G $I_h=0.3A$.
7A7	B8G	EF22*	B8G	Bias may require adjustment.
7B7	B8G	EF22*	B8G	Bias may require adjustment.
7C5	B8G	EL41	B8A	Change base. Bias may require adjustment.
7F7	B8G	ECC35*	K	Change base.
7K7	B8G	EBC41	B8A	Change base.
7S7	B8G	ECH21*	B8G	Rewire base. Receiver may require re-aligning.
7Y4	B8G	EZ35	K	Change base.
8D2	M	SPI3C	M	Increase V_{g2} to V_a .
9D2	M	VPI3C	M	Earth pin I. Raise V_{g2} to 200V.
10DI	O	EB34	K	Change base. When rewiring connect cathodes of EB34 together. EB34 : $V_h = 6.3V$.

*See note at the beginning of Direct Equivalent Guide.

NEAR EQUIVALENT GUIDE

Type Number	BASE	Mullard Replace- ment	BASE	CONVERSION
11A2	M	TDD4	M	Earth pin 2. Bias may require adjustment.
12Z3	UX	PY3I	K	Change base. Check $I_h=0.3A$.
13PGA	M	FCI3C	M	V_{g2} max.=90V.
13SPA	M	SPI3C	M	Increase V_{g2} to V_a .
13VPA	M	VPI3C	M	Increase V_{g2} to V_a .
15	UX	KF35	K	Change base.
15A2	M	FC4	M	V_{g2} max.=90V.
15DI	M	FCI3C	M	V_{g2} max.=90V.
25RE	UX	PY3I	K	Change base. Check $I_h=0.3A$. Only suitable as half-wave rectifier.
25YS	UX	PY3I	K	Change base. Check $I_h=0.3A$. Only suitable as half-wave rectifier.
25Z4G	K	PY3I	K	Check $I_h=0.3A$.
25Z5	UX	PY3I	K	Change base. Check $I_h=0.3A$. Only suitable as half-wave rectifier.
25Z6G	K	PY3I	K	Rewire base. Check $I_h=0.3A$. Only suitable as half-wave rectifier.
35RE	UX	PZ30	K	Change base. Check $I_h=0.3A$.
36	UX	EF36*	K	Change base.
39/44	UX	EF39*	K	Change base.
40SUA	O	URIC	O	Check $I_h=0.2A$.
41E	UX	EL32	K	Change base.
41STH	M	TH4B	M	Bias may require adjustment.
42/42E	UX	EL32	K	Change base.
45IU	A	FW4/500	A	FW4/500 is directly heated.
77/77E	UX	EF37*	K	Change base.
78/78E	UX	EF39*	K	Change base.
80	UX	GZ32	K	Change base.
84/6Z4	UX	EZ35	K	Change base.
210LF	A	PM2HL	A	Bias may require adjustment.
210SPT	M	SP2	M	Increase V_{g2} to V_a .
210VPT (4-pin)	O	VP2	M	Change base. Increase V_{g2} to V_a .
210VPT (7-pin)	M	VP2	M	Increase V_{g2} to V_a .
215P	A	PM2A	A	Increase V_{g1} to -6V.
220P	A	PM2A	A	Bias will require adjustment.
220SG	A	PM12M	A	Increase V_{g2} to 90V.
230PT	A/O	PM22A	A/O	Change V_{g1} to -4.5V at $V_a=V_{g2}=135V$ and R_a to approximately $19K\Omega$.
230XP	A	PM202	A	Bias may require adjustment.
484V	O	354V	O	Change V_{g1} to -4.5V or R_k to 700Ω .
210I	UX	KL35	K	Change base.
2102	UX	KBC32	K	Change base.

* See note at the beginning of Direct Equivalent Guide.



TECHNICAL DATA

