35
1 15 Incomplete
10p.

36 15 0
6
30 15 0

THE MULLARD VALVE CATALOGUE

22 0 0
6 0 0
28 0 0

36 15 0
25 15 0
11 0 0

August, 1937

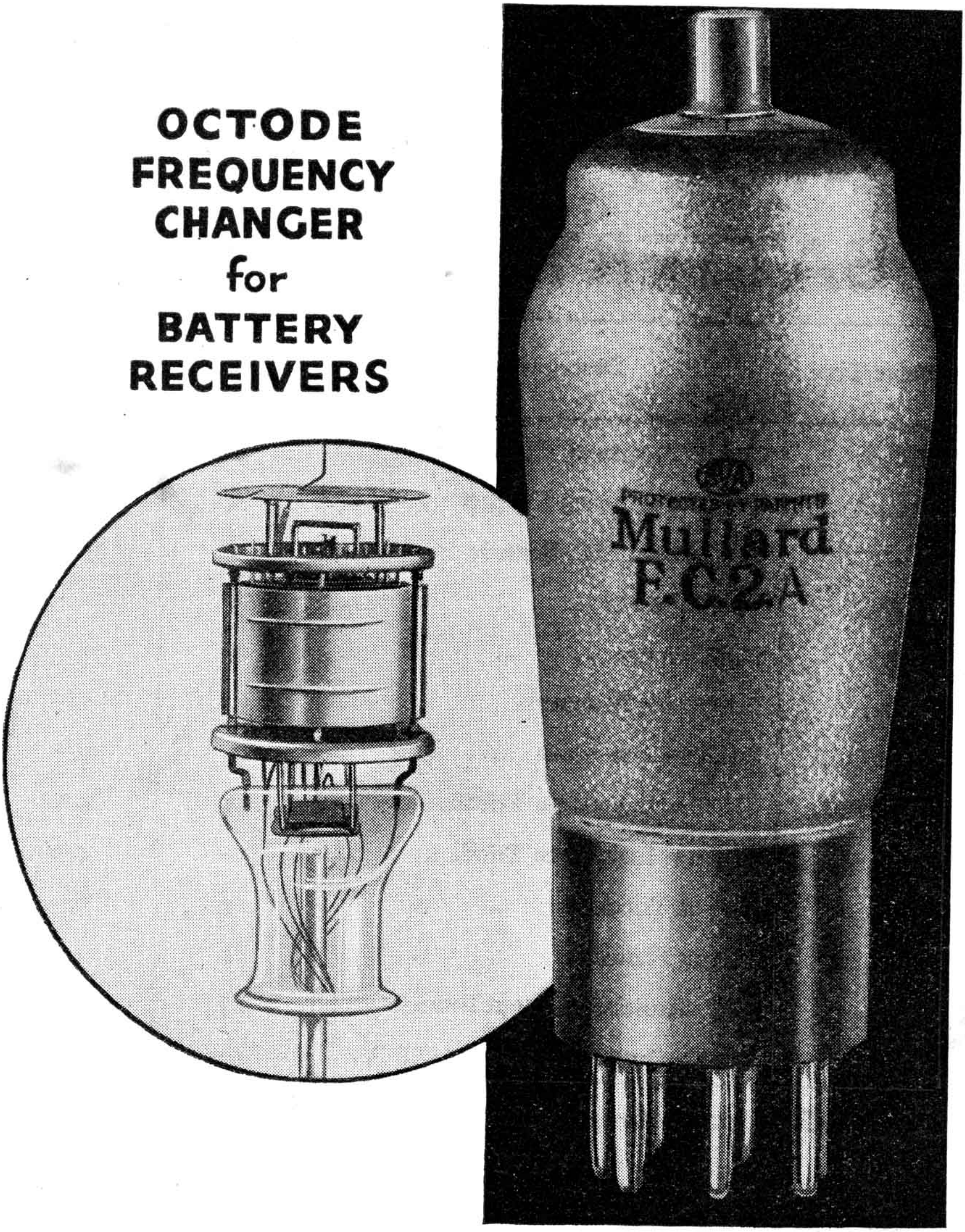
Ref. No. M V.648

A

INDEX

MULLARD F.C.2.A

**OCTODE
FREQUENCY
CHANGER
for
BATTERY
RECEIVERS**



PRICE LIST OF MULLARD 2-VOLT VALVES FOR BATTERY RECEIVERS

Valve Type.	Description.	For Details see Page	Price.
F.C.2	Octode Frequency Changer	5	14/-
F.C.2A	Octode Frequency Changer	6	14/-
V.P.2	Variable-mu H.F. Pentode	7	11/-
V.P.2B	Hexode Mixer	8	11/-
S.P.2	H.F. Pentode	9	11/-
2.D.2	Double-diode-detector	10	5/6
T.D.D.2A	Double-diode-triode	11	9/-
P.M.1HL	Medium Impedance Triode	12	4/9
P.M.2HL	Medium Impedance Triode	12	4/9
P.M.2A	Output Triode	13	6/-
P.M.22A	Output Pentode	14	11/-
P.M.22D	High Sensitivity Output Pentode ..	15	13/6
Q.P.22A	Double Output Pentode for Q.P.P. ..	16	17/6

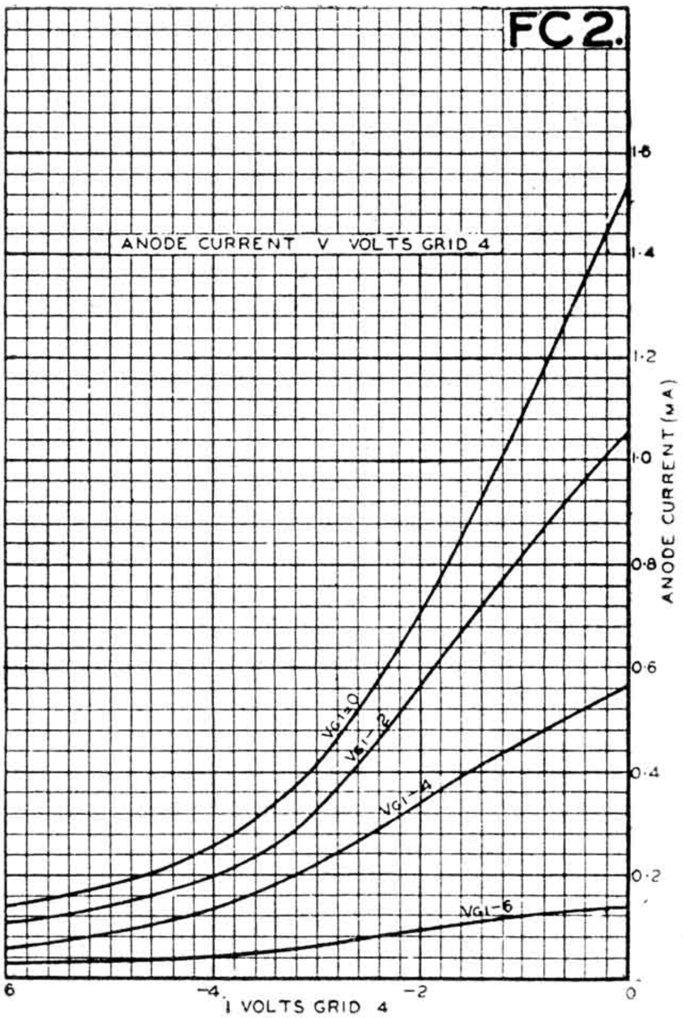
For details of replacement valves not indicated above see pages 81 to 85.

OCTODE FREQUENCY CHANGER

F.C.2

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·1 A.
Max. Anode Voltage	150 V.
Max. Osc. Anode Voltage ..	150 V.
Aux. Grid and Screen Voltage ..	70 V.



APPLICATION.

Electron-coupled frequency changer in superheterodyne receivers. The filament and grids 1 and 2 are operated as a triode oscillator; grid 3 acts as a screen between the oscillator and mixer portion of the valve; and grids 4, 5 and 6 with the anode form a pentode mixer with variable-mu characteristics.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

The F.C.2 is supplied with metallised bulb only.

PRICE 14/-

F.C.2A

OCTODE FREQUENCY CHANGER

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·12 A.
Max. Anode Voltage	135 V.
Max. Osc. Anode Voltage	135 V.
Max. Aux. Grid and Screen Voltage	100 V.

APPLICATION.

Electron-coupled frequency changer in battery all-wave superheterodyne receivers. The F.C.2A has been especially designed for operation at frequencies up to 19 megacycles (16 metres). The filament and grids 1 and 2 are operated as a triode oscillator; grid 3 acts as a screen between the oscillator and mixer portion of the valve; and grids 4, 5 and 6 with the anode form a pentode mixer with variable-mu characteristics.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

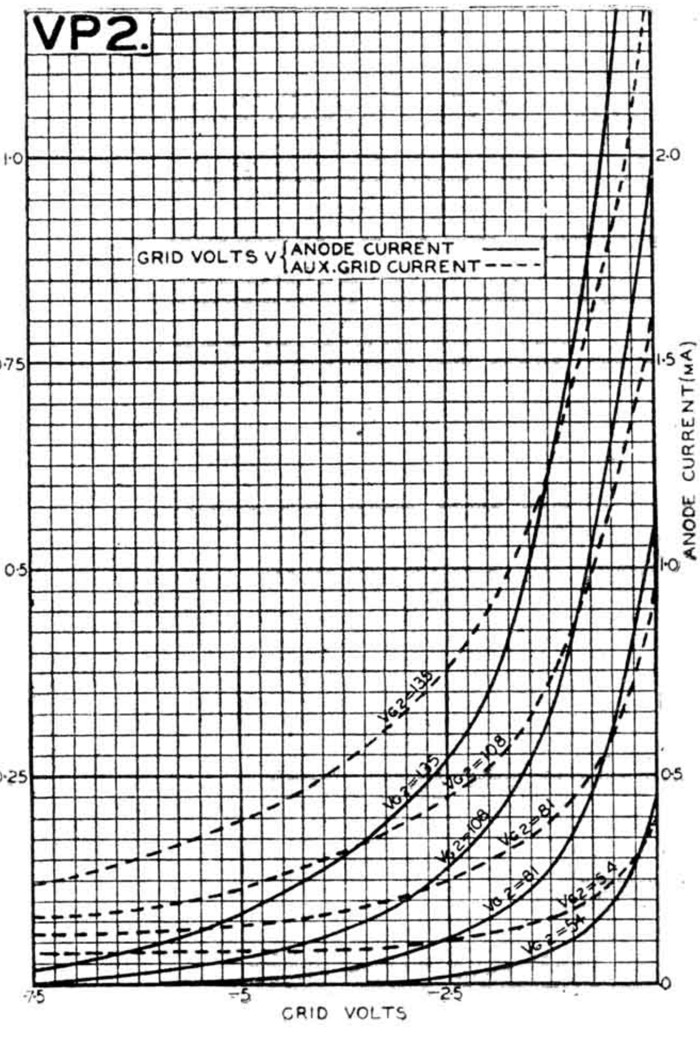
The F.C.2A is supplied with metallised bulb only.

PRICE 14/-

VARIABLE-MU H.F. PENTODE — V.P.2

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·18 A.
Max. Anode Voltage	150 V.
Max. Auxiliary Grid Voltage ..	150 V.



CHARACTERISTICS.

(1) At Anode Volts 150; Auxiliary Grid Volts 150; Control Grid Volts Zero.

Anode Impedance 750,000 ohms.
Mutual Conductance 1·75 mA/V.

(2) At Anode Volts 150; Auxiliary Grid Volts 150; Control Grid Volts —7·0.

Mutual Conductance 0·017 mA/V.

APPLICATION.

Radio frequency or intermediate frequency amplifier in receivers in which volume control is effected by manual or automatic adjustment of grid bias.

GRID BIAS.

Full control of volume can be obtained with a range of grid bias of approximately 9 volts.

BASE.

Standard 7-pin base. For connections see page 109.

BULB FINISH.

The V.P.2 is supplied with metallised bulb only.

PRICE 11/-

V.P.2B HEXODE MIXER

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·14 A.
Max. Anode Voltage	135 V.
Max. Screen Grid Voltages	60 V.

APPLICATION.

(1) The V.P.2B is a battery valve of the hexode type in which all the electrodes are brought out to separate pins. Used under these conditions with a separate oscillator it provides an extremely efficient frequency changer for short-wave operation as well as medium and long wave.

(2) Suitably connected the V.P.2B can also be used as a pentode or tetrode for R.F. or I.F. amplification.

BASE.

Standard 7-pin. For connections see page 109.

BULB FINISH.

The V.P.2B is supplied with metallised bulb only.

PRICE 11/-

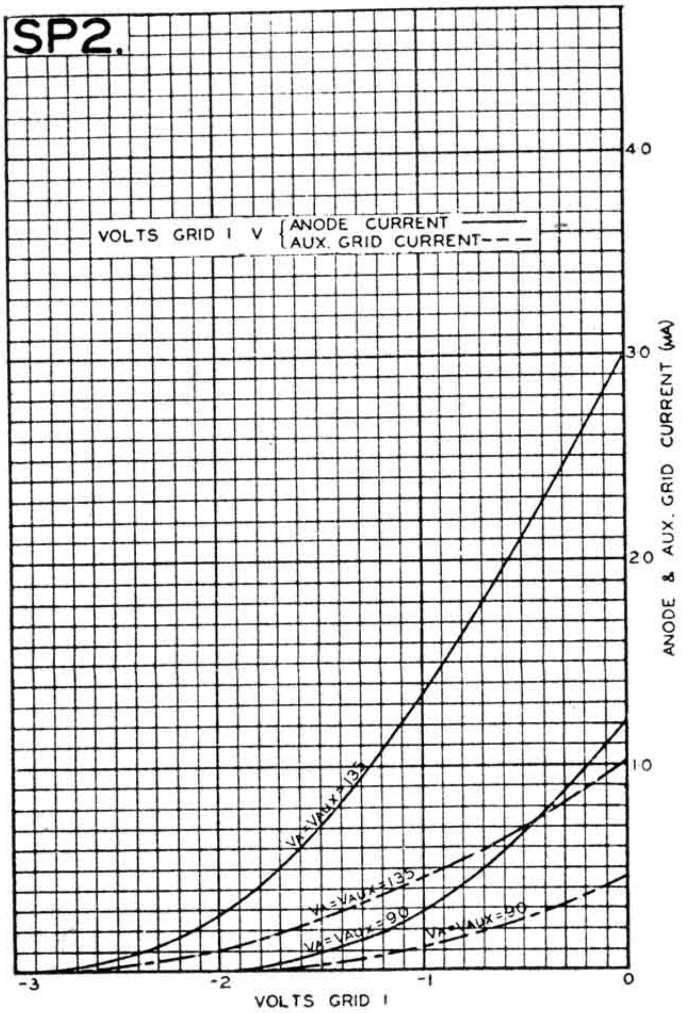
H.F. PENTODE S.P.2

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·18 A.
Max. Anode Voltage	150 V.
Max. Auxiliary Grid Voltage..	150 V.

CHARACTERISTICS.

(1) At Anode Volts 150; Auxiliary Grid Volts 150 Control Grid Volts Zero.



Anode Impedance	500,000 ohms.
Amplification Factor	1,100
Mutual Conductance	2·2 mA/V.

(2) At Anode Volts 100; Auxiliary Grid Volts 100, Control Grid Volts Zero.

Mutual Conductance	1·5 mA/V.

APPLICATION.

(1) When used as an anode bend detector the following conditions are recommended:

Anode Voltage	100/150 V.
Auxiliary Grid Voltage	100 V.
Grid Bias	— 2·0 V.
Anode Resistance	250,000 ohms.

(2) As leaky grid detector the recommended conditions are:

Anode Voltage	100/150 V.
Auxiliary Grid Voltage	50 V.
Anode Resistance	100,000 ohms.

(3) *H.F. Amplifier.*—No grid bias is normally required. As grid current reaches a value of 1·0 micro-amp. at + 0·5 grid volts, pre-H.F. volume control should be provided in order to limit the input signal to 0·2 V. peak.

BASE.

Standard 7-pin base. For connections see page 109.

BULB FINISH.

This valve is supplied with metallised bulb only.

PRICE 11/-

2D.2 DOUBLE-DIODE DETECTOR

OPERATING DATA.

Heater Voltage	2·0 V.
Heater Current	0·09 A.
Max. Diode Voltage	125 V.
Max. Diode Current	0·5 mA.

BASE.

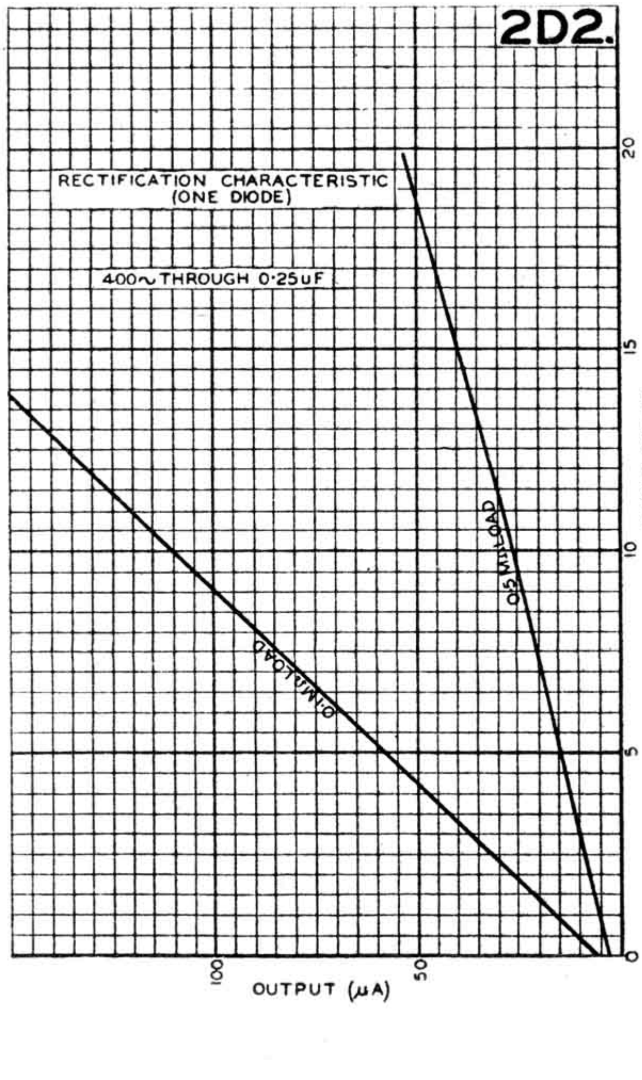
Standard 5-pin. For connections see page 109.

BULB FINISH.

This valve is supplied with metallised bulb only.

APPLICATION.

The 2D2 is an indirectly heated double-diode valve. The two diode Anodes surrounding a common cathode. One diode is intended to be used as speech rectifier and the other can be used for the application of delayed A.V.C.



PRICE 5/6

DOUBLE-DIODE-TRIODE T.D.D.2A

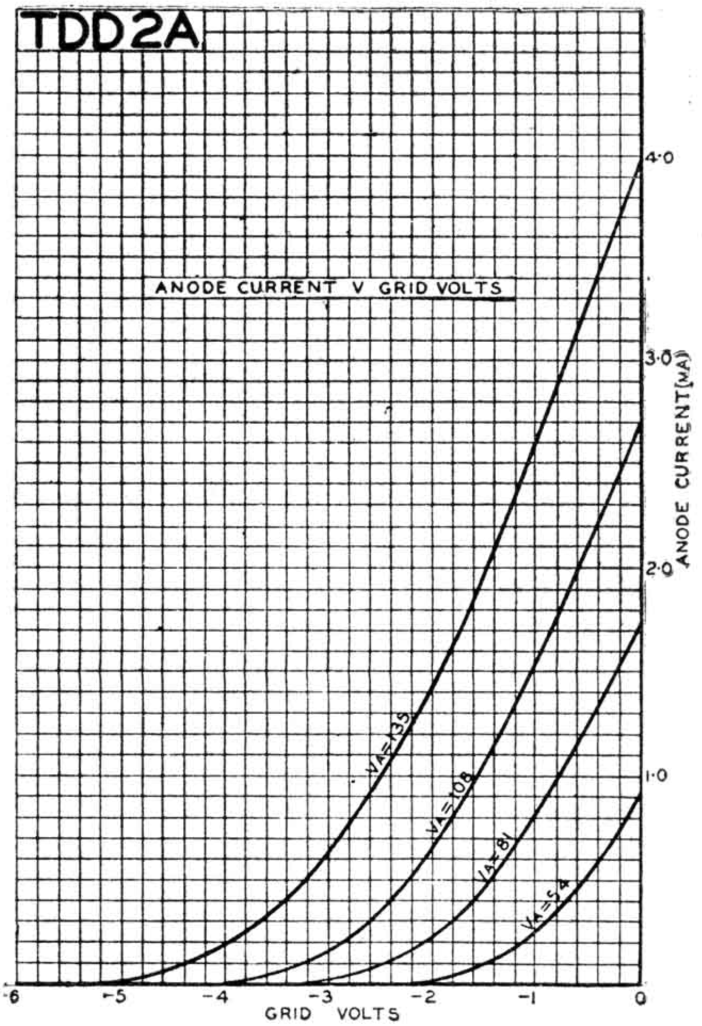
OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·12 A.
Max. Anode Voltage	150 V.

TRIODE CHARACTERISTICS.

At Anode Volts 100; Control Grid Volts Zero.

Anode Impedance	26,000 ohms.
Amplification Factor	31
Mutual Conductance	1·2 mA/V.



APPLICATION.

Of the two diode elements, that surrounding the negative limb of the filament (D.2) is intended for use as detector, and that surrounding the positive limb (D.1) for the application of automatic volume control. The triode portion is designed for use as an L.F. amplifier, when grid bias should be applied according to the following table:

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
125	1·5	1·3
150	1·5—3·0	1·4

When followed by a Class "A" amplifier, resistance-capacity coupling is recommended, the value of the anode resistance being of the order of 80,000 ohms.

BASE.

Five-pin, with top grid connection. For connections see page 109.

BULB FINISH.

Type T.D.D.2A is supplied with metallised bulb only.

PRICE 9/-

P.M.2HL/1HL MEDIUM IMPEDANCE TRIODE

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·1 A.
Max. Anode Voltage	150 V.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	21,500 ohms.
Amplification Factor	30
Mutual Conductance	1·4 mA/V.

APPLICATION.

(1) As leaky grid detector. Recommended values of grid condenser and leak are ·0001 mfd. and 1·0 to 1·5 megohms.

(2) As low frequency amplifier, operating with grid bias as indicated below.

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
100	1·5	1·0
125	2·0	1·5
150	2·5	2·0

BULB FINISH.

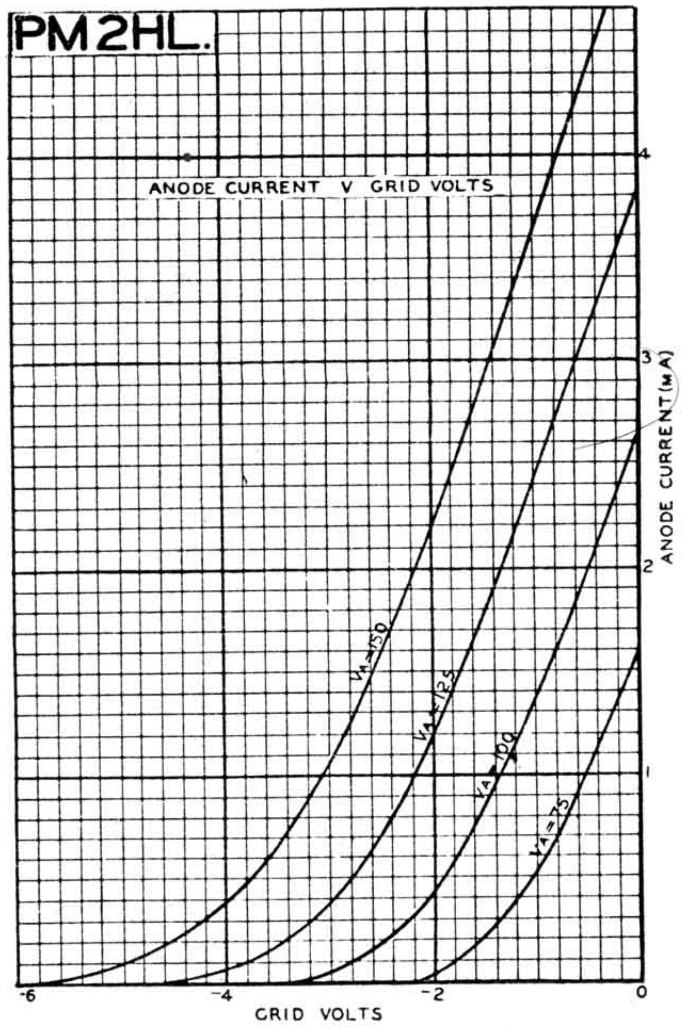
The P.M.2HL is supplied with either clear or metallised bulb.

BASE.

Standard 4-pin.

NOTE.

The P.M.2HL replaces the P.M.1HL in the majority of cases. Where the P.M.1HL is used as an oscillator the P.M.2HL must not be used as a replacement.



PRICE 4/9

OUTPUT TRIODE P.M.2A

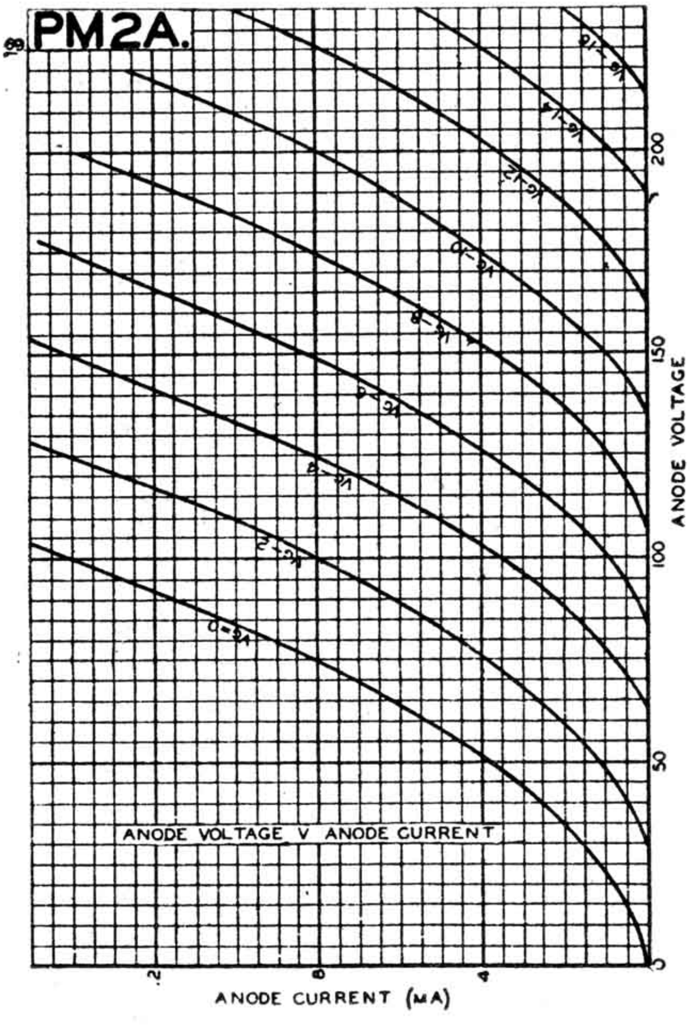
OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·2 A.
Max. Anode Voltage	150 V.
Optimum Load ..	7,000 ohms.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	3,600 ohms.
Amplification Factor	12·5
Mutual Conductance	3·5 mA/V.



APPLICATION.

As output valve when moderate volume is required from comparatively small signal inputs. Grid bias should be applied according to the following table:

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
100	4·0	4·0
125	5·0	5·0
150	7·0	6·0

BASE.

Standard 4-pin.

BULB FINISH.

This valve is supplied in clear bulb only.

PRICE 6/-

P.M.22A OUTPUT PENTODE

OPERATING DATA.

Filament Voltage .. .. 2·0 V.
Filament Current .. .. 0·15 A.
Max. Anode Voltage .. .. 150 V.
Max. Auxiliary Grid Voltage .. 150 V.
Recommended Load .. 20,000 ohms.

BASE.

Standard 5-pin, or 4-pin with side terminal.

CHARACTERISTICS.

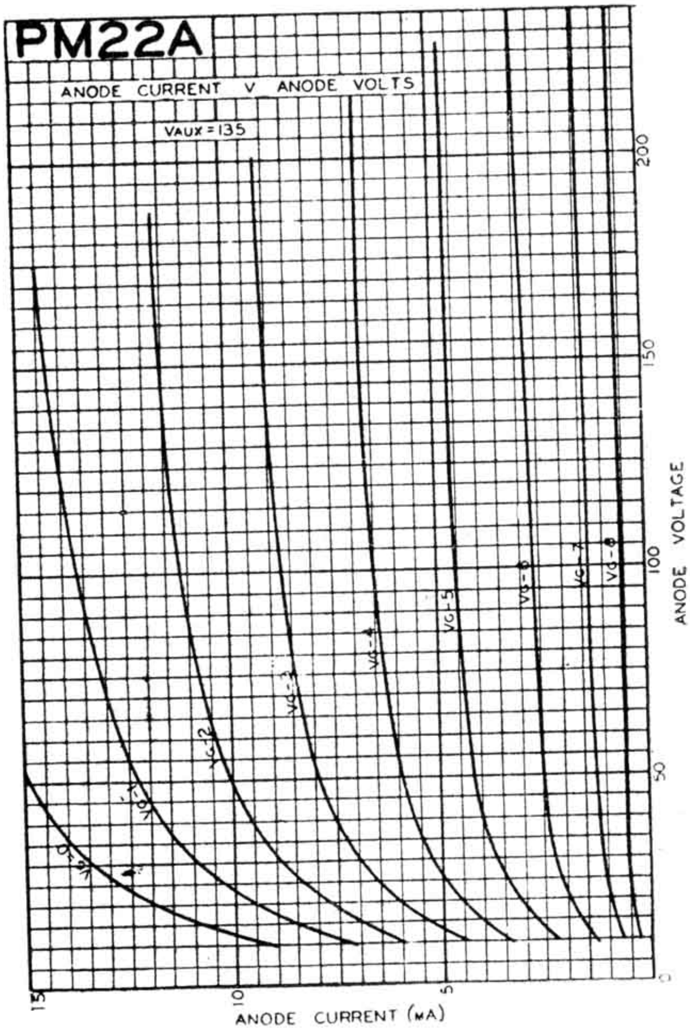
At Anode Volts 100; Auxiliary Grid Volts 100; Grid Volts Zero.

Mutual Conductance 2·5 mA/V.

APPLICATION.

As output valve when a large output is required from comparatively small signal input voltages. Excellent results are obtainable when the valve is operated at an anode and auxiliary grid voltage of 100 V. and negative grid bias of 3 volts, the anode current being only 4·5 mA.

Operated at an anode voltage and auxiliary grid voltage of 150 and 4·5 volts grid bias, still larger outputs are obtained, while the anode current does not exceed approximately 9·5 mA.



PRICE 11/-

HIGH SENSITIVITY OUTPUT PENTODE P.M.22D

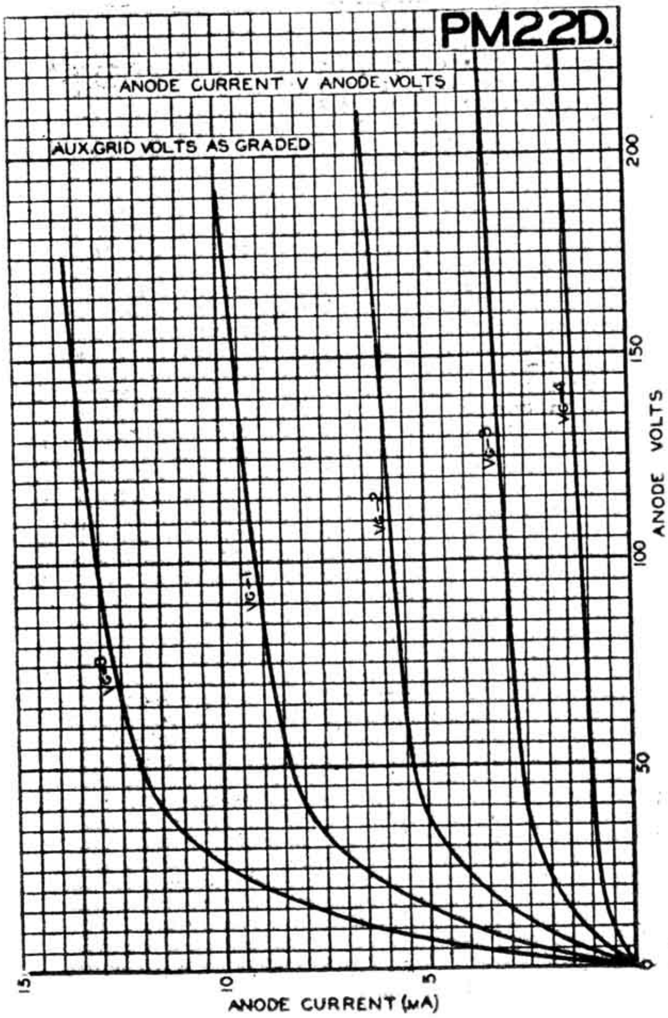
OPERATING DATA.

Filament Voltage .. .. 2·0 V.
Filament Current .. .. 0·3 A.
Max. Anode Voltage .. .. 150 V.
Max. Auxiliary Grid Voltage .. 150 V.
Optimum Load .. 24,000 ohms.

CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Grid Volts Zero.

Mutual Conductance 4·0 mA/V.



APPLICATION.

Output valve in receiver where maximum gain is required. It requires only a small input to give an excellent performance with great economy in H.T. consumption.

With a sensitive valve of this type it is necessary to employ a system of graded auxiliary grid voltage.

Two grades are employed; in the case of a 135 volt H.T. battery, "A" grade indicates an auxiliary grid voltage of 135 V., and "B" grade an auxiliary grid voltage of 120 V., the grades being indicated by the letter "A" or "B" marked on both the valve base and glass envelope.

The following table gives the appropriate grades of auxiliary grid voltage. etc., for both 135 and 120 volt HT., batteries.

Grade.	Vaux (Volts).	Va (Volts).	Vg (Volts).	Ia (Aver.) mA.
A	135	135	—2·4	5
B	120	135	—2·4	5
A	120	120	—2·4	3·8
B	110	120	—2·4	3·8

When automatic bias is employed it is of course unnecessary to use this system of grading.

BASE.

Standard 5-pin.

PRICE 13/6

Q.P.22A DOUBLE OUTPUT PENTODE FOR Q.P.P.

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·45 A.
Max. Anode Voltage	150 V.
Max. Aux. Grid Voltage	150 V.
Optimum Load— (Anode to Anode)	16,000 ohms.

CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Control Grid Volts Zero.

Mutual Conductance .. 4·0 mA/V.

APPLICATION.

The Q.P.22A comprises two matched power pentodes in a single bulb designed for use as a quiescent push-pull output stage in two-volt battery sets. The total quiescent current at various anode and auxiliary grid voltages, together with the recommended grid bias, are shown in the following table:

Anode and Aux. Grid Voltage.	Negative Grid Bias Voltages.	Total Quiescent Anode Current (mA).
150	13·5	4·0
135	12·0	2·5—3·0
120	10·5	2·5—3·0
100	9·0	2·5—3·0

In order that the two pentodes of the Q.P.22A may be completely matched, a system of grading has been instituted, the matching being effected by correct adjustment of auxiliary grid voltages.

To identify the two electrode assemblies of the valve the letters "A" and "B" are printed on the base in line with Pins 2 and 7 respectively.

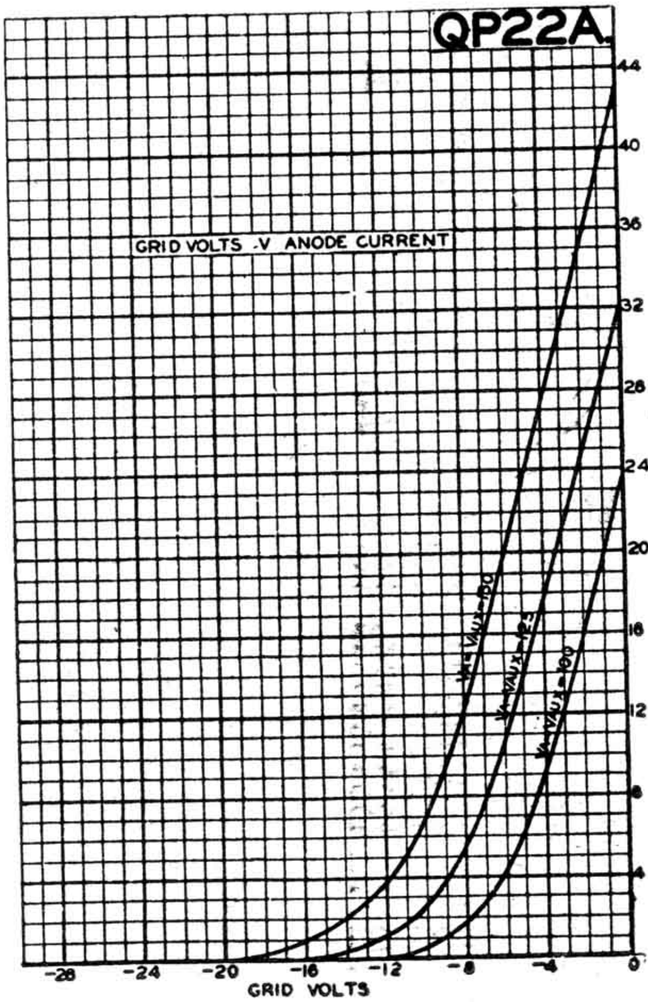
There are five grades and these are referred to by the letters "P," "Q," "R," "S" and "T." One of these letters will be found etched on each side of the bulb above the assembly identifying letters "A" and "B."

The H.T. battery should have five tappings at the higher voltage end to enable the specified auxiliary grid voltage to be used. With a 135 V.H.T. battery these tappings should be at $7\frac{1}{2}$ volts, the maximum tapping being 1·5 volts lower than the maximum voltage of the battery. The grades are thus:

T = 133·5 V., S = 126·0 V., R = 118·5 V., Q = 111·0 V. and P = 103·5 V.

BASE.

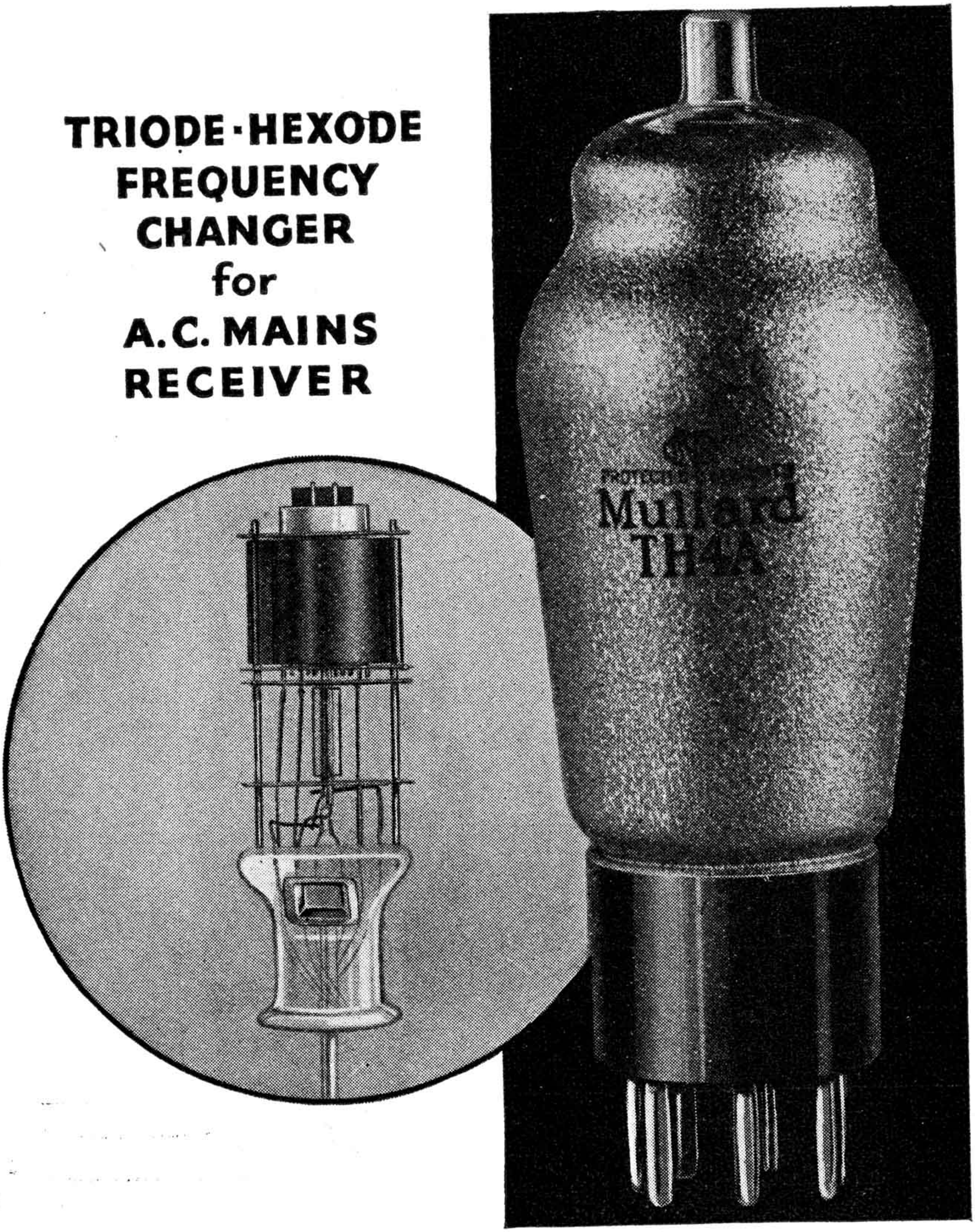
Standard 9-pin. For connections see page 110.



PRICE 17/6

MULLARD T.H.4.A.

TRIODE-HEXODE FREQUENCY CHANGER for A.C. MAINS RECEIVER



PRICE LIST OF MULLARD INDIRECTLY-HEATED A.C. VALVES

Valve Type.	Description.	For Details see Page	Price.
T.V.4	Tuning Indicator	19	10/6
T.H.4	Triode-hexode Frequency Changer ..	20	15/-
T.H.4A	Triode-hexode Frequency Changer ..	21	15/-
F.C.4	Octode Frequency Changer	22	15/-
V.P.4B	Variable-mu H.F. Pentode	23	12/6
S.P.4B	H.F. Pentode	24	12/6
2D.4A	Double-diode-detector	25	5/6
2D.4B.	Double-diode-detector	25	5/6
T.D.D.4	Double-diode-triode	26	12/6
354V	Medium Impedance Triode	27	9/6
T.T.4	Low Impedance Triode	28	10/-
PEN. A4	Output Pentode	29	13/6
PEN.B4	Large Output Pentode	30	18/6
PEN.4DD.	Double-diode Output Pentode ..	31	16/-
PEN.428	Large Output Pentode	32	25/-

For details of replacement valves not indicated above see pages 85 to 88.

ELECTRON BEAM TUNING INDICATOR — T.V.4

OPERATING CHARACTERISTICS AS VISUAL INDICATOR.

Heater Voltage	4·0 V.
Heater Current	0·3 A.
Max. Line Voltage	250 V.
Max. Target Voltage	250 V.
Series Triode Anode Resistor	2 megohms.
Grid Voltage (zero signal) .. (Ø = 10°)	0 V.
Grid Voltage (Max. signal) .. (Ø = 90°)	—4 V.

Grid Voltage (zero signal) 0 V. (Ø=10°).

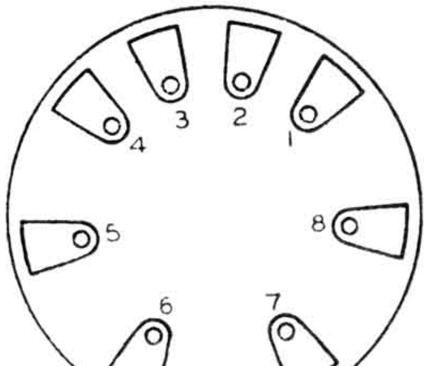
Grid Voltage (Max.signal) – 4 V. (Ø=90°).

APPLICATION.

A visual tuning indicator, operating on the Electron principle, for A.C. mains receivers. The TV4 should always be operated so that full illumination (Ø = 90°) is obtained under conditions of signal.

BASE.

"P" type 8-contact universal base. For connections see page 111.



PRICE 10/6

T.H.4

TRIODE-HEXODE FREQUENCY CHANGER

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	1·0 A.
Max. Anode Voltage	250 V.
Max. Screen Voltage (Grids 2 and 4)	90 V.
Max. Oscillator Anode Voltage	150 V.

BULB FINISH.

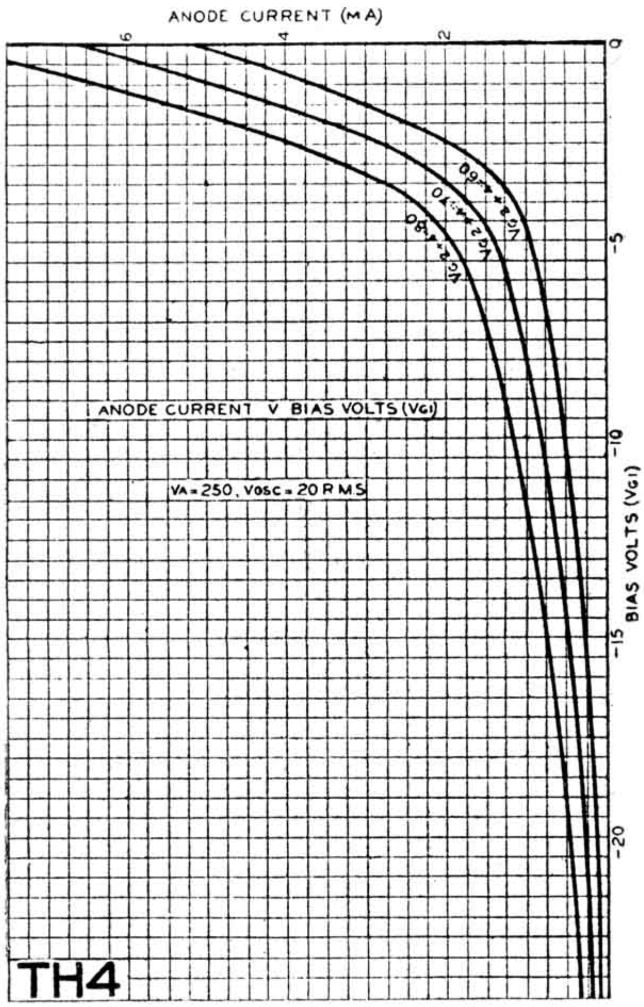
The T.H.4 is supplied with a metallised bulb only.

APPLICATION.

As frequency changer in super-heterodyne receivers covering short wavebands. It consists of a hexode mixer and triode oscillator located on a common cathode assembly with adequate screening between each electrode system. It maintains its efficiency excellently at the high frequencies.

BASE.

Standard 7-pin type. For connections see page 109.



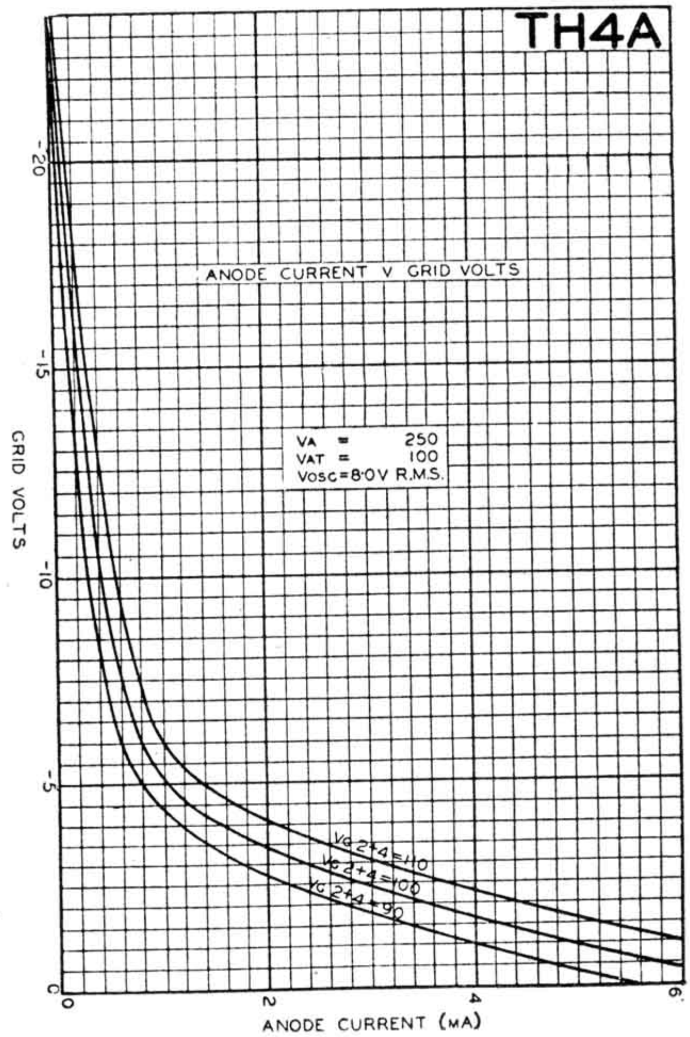
PRICE 15/-

TRIODE-HEXODE FREQUENCY CHANGER

T.H.4A

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	1·45 A.
Max. Anode Voltage ..	250 V.
Max. Screen Voltage (Grids 2 and 4)	150 V.
Max. Oscillator Anode Voltage	100 V.



APPLICATION.

As frequency changer in super-heterodyne receivers covering short wavebands. It consists of a hexode mixer and triode oscillator located on a common cathode assembly with adequate screening between each electrode system. It maintains its efficiency excellently at the high frequencies.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

The T.H.4A is supplied with a metallised bulb only.

PRICE 15/-

F.C.4

OCTODE FREQUENCY CHANGER

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Anode Voltage	250 V.
Auxiliary Grid and Screen Voltage (G3 and G5) ..	90 V.
Oscillator Anode Voltage (G2)	90 V.

APPLICATION.

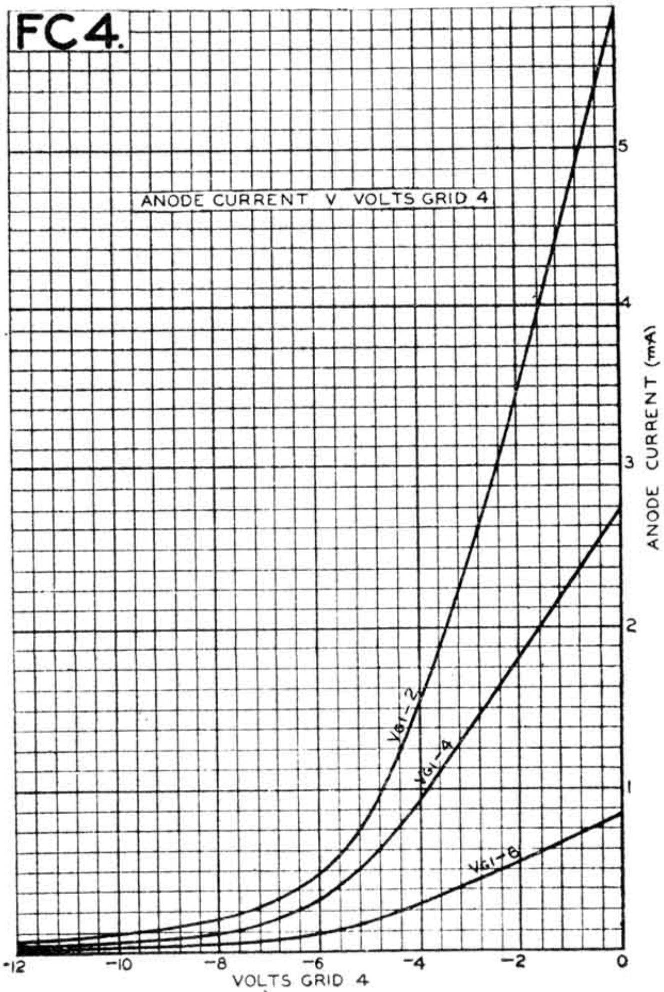
Electron-coupled frequency changer in superheterodyne receivers. The cathode and grids 1 and 2 are operated as a triode oscillator; grid 3 acts as a screen between the oscillator and mixer portion of the valve; and grids 4, 5 and 6 with the anode form a pentode mixer with variable-mu characteristics.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

The F.C.4 is supplied with metallised bulb only.



PRICE 15/-

VARIABLE-MU H.F. PENTODE V.P.4B

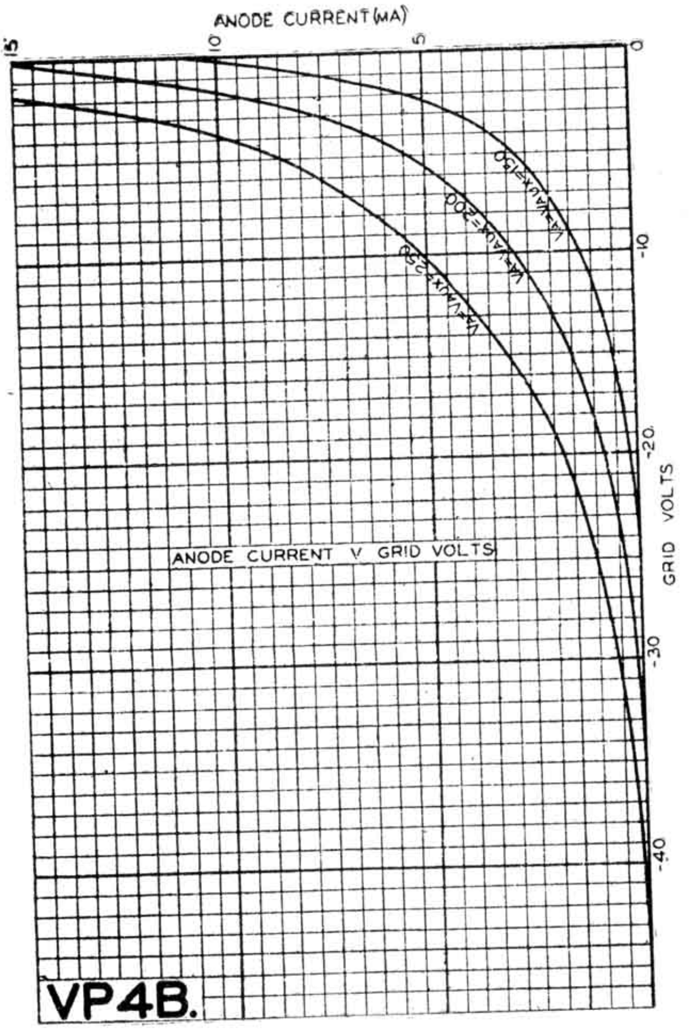
OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Anode Voltage	250 V.
Max. Aux. Grid Voltage ..	250 V.

CHARACTERISTICS.

At Auxiliary Grid Volts 250; Anode Volts 250; Grid Volts Zero.

Mutual Conductance 3·5 mA/V.



APPLICATION.

Radio frequency or intermediate frequency Amplifier in circuits arranged for volume control by variation of grid bias.

BASE.

Standard 7-pin. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.

PRICE 12/6

S.P.4B H.F. PENTODE

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Anode Voltage	250 V.
Max. Auxiliary Grid Voltage ..	250 V.

CHARACTERISTICS.

At Anode Volts 250; Auxiliary Grid Volts 250; Control Grid Volts Zero.

Mutual Conductance 4·0 mA/V.

APPLICATION.

Operating conditions as L.F. amplifier and speech detector are as follows:

(*a*) As L.F. Amplifier operated under the following conditions:

Anode Voltage (Line) 250 V.
Auxiliary Grid dropping resistance 0·5 megohm.
Cathode bias resistance 1,500 ohms.
Anode load 100,000 ohms.

(*b*) As leaky grid detector operated under the following conditions:

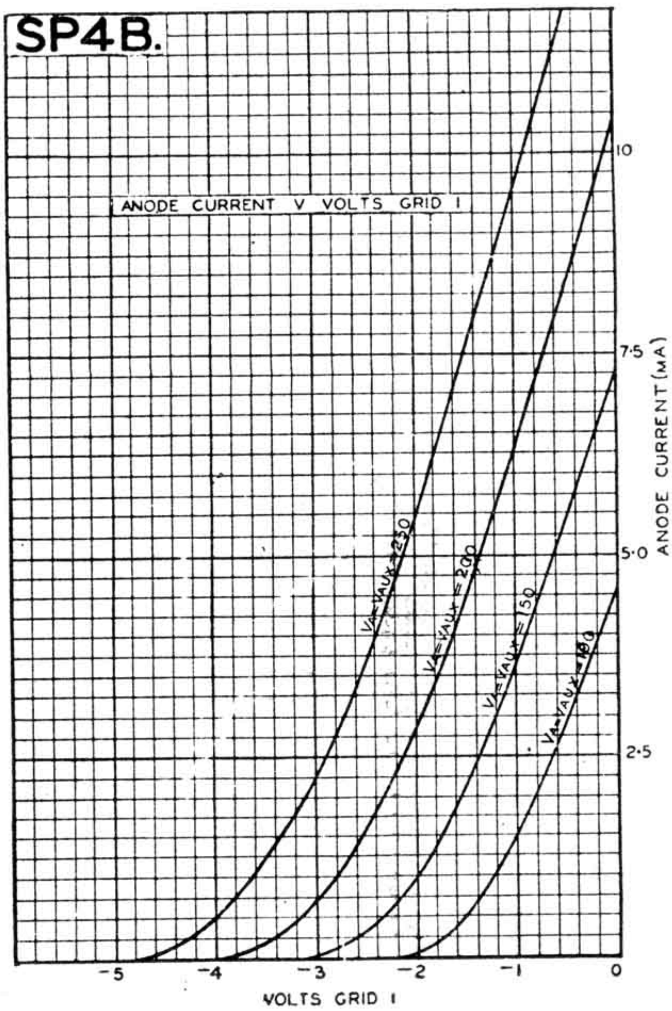
Anode Voltage (Line) 250 V.
Anode Load 100,000 ohms.
Auxiliary Grid resistance 0·5 megohm.

BASE.

Standard 7-pin. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.



PRICE 12/6

DOUBLE-DIODE-DETECTOR 2D.4A

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Diode Voltage	200 V.
Max. Diode Current	0·8 mA.

BULB FINISH.

This valve is supplied with metallised bulb only.

BASE.

Standard 5-pin. For connections see page 109.

APPLICATION.

The 2D4A consists of two diode anodes surrounding a common cathode. One diode is intended for use as a speech rectifier, while the other can be used for the application of A.V.C. or noise suppression.

PRICE 5/6

DOUBLE-DIODE-DETECTOR 2D.4B

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·35 A.
Max. Diode Voltage	200 V.
Max. Diode Current	0·8 mA.

BULB FINISH.

The valve is supplied with metallised bulb only.

BASE.

Standard 7-pin. For connections see page 110.

APPLICATION.

The 2D4B consists of two diode anodes located on separate cathode assemblies, with adequate screening between each electrode assembly. Since each cathode may be run at a different potential the applications of the 2D4B are much more flexible than those of the 2D4A. Apart from its normal use as a speech rectifier and A.V.C. device it may also be used to obtain automatic tuning control.

PRICE 5/6

T.D.D.4 DOUBLE-DIODE-TRIODE

OPERATING DATA.

Heater Voltage	4.0 V.
Heater Current	0.65 A.
Max. Anode Voltage	250 V.

TRIODE CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	10,000 ohms.
Amplification Factor	29
Mutual Conductance	2.9 mA/V.

APPLICATION.

The normal method of employing the T.D.D.4 is to use one diode as speech detector and the other diode for A.V.C., the triode portion being employed as a low frequency amplifier. Alternatively the two diodes can be used in push-pull for full-wave rectification. Grid bias should be applied to the triode amplifier according to the following table, while for auto-bias a 1,500-ohms resistor should be used.

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
150	2.5	6.5
200	3.5	8.5
250	4.0	12.5

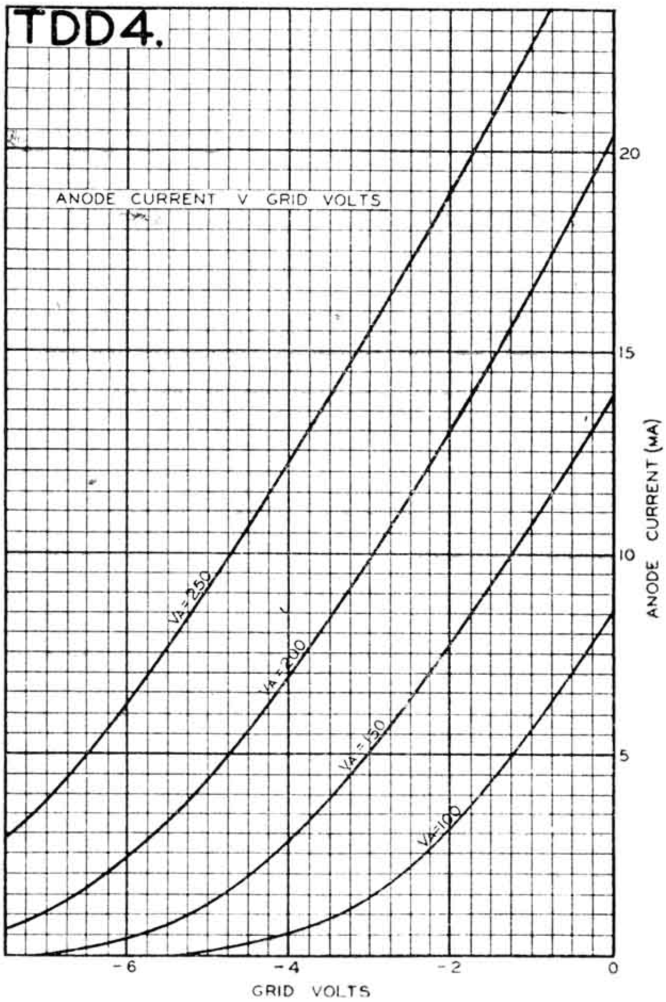
For resistance-capacity coupling the optimum value of load resistance is 60,000 ohms.

BASE.

Standard 7-pin. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.



PRICE 12/6

MEDIUM IMPEDANCE TRIODE — 354V

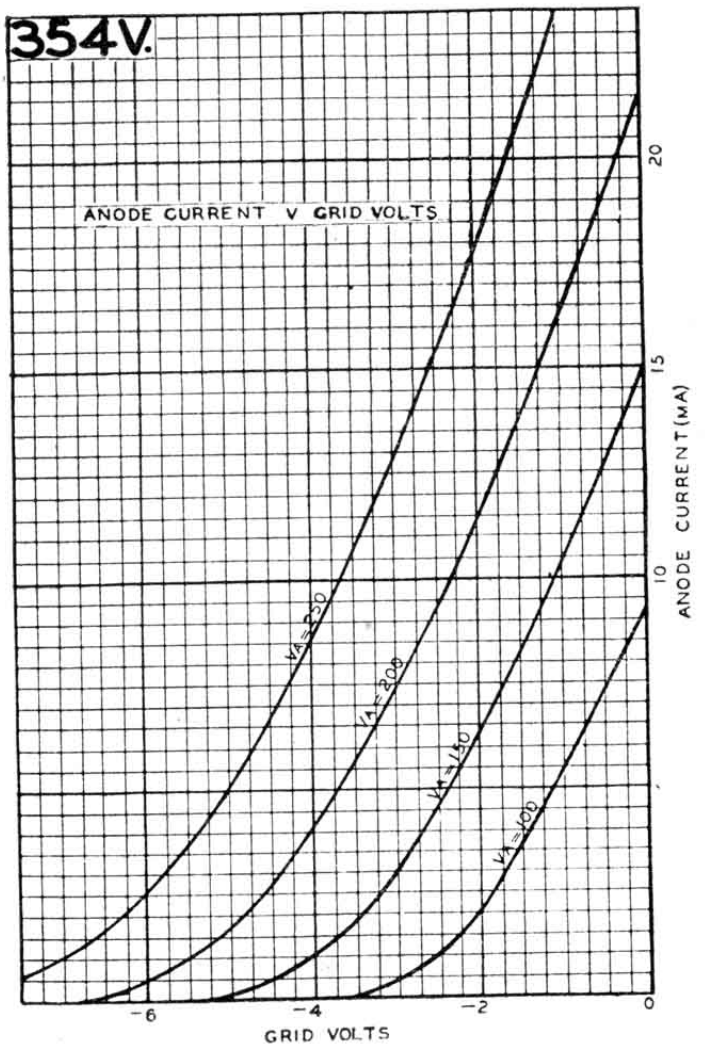
OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Anode Voltage	250 V.

CHARACTERISTICS.

At Anode Volts 100 ; Grid Volts Zero.

Anode Impedance	10,500 ohms.
Amplification Factor	40
Mutual Conductance	3·8 mA/V.



APPLICATION.

(1) Detector operated under "power grid" conditions, at an anode voltage of 250 V., grid condenser of ·0001 mfd., and grid leak of ·25 to ·5 megohm.

(2) Low frequency amplifier operated at a line voltage of 250 V. and negative grid bias according to the following table. For auto-bias a resistance of 1,800 ohms should be used.

If followed by a shunt-fed transformer, an anode resistance of 25,000 ohms is recommended.

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
150	3·0	3·0
200	4·0	4·0
250	5·0	5·0

BASE.

Standard 5-pin.

BULB FINISH.

This valve is supplied with either clear or metallised bulb.

PRICE 9/6

T.T.4 — LOW IMPEDANCE TRIODE

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	1·0 A.
Max. Anode Voltage ..	250 V.

BASE.

Standard 5-pin.

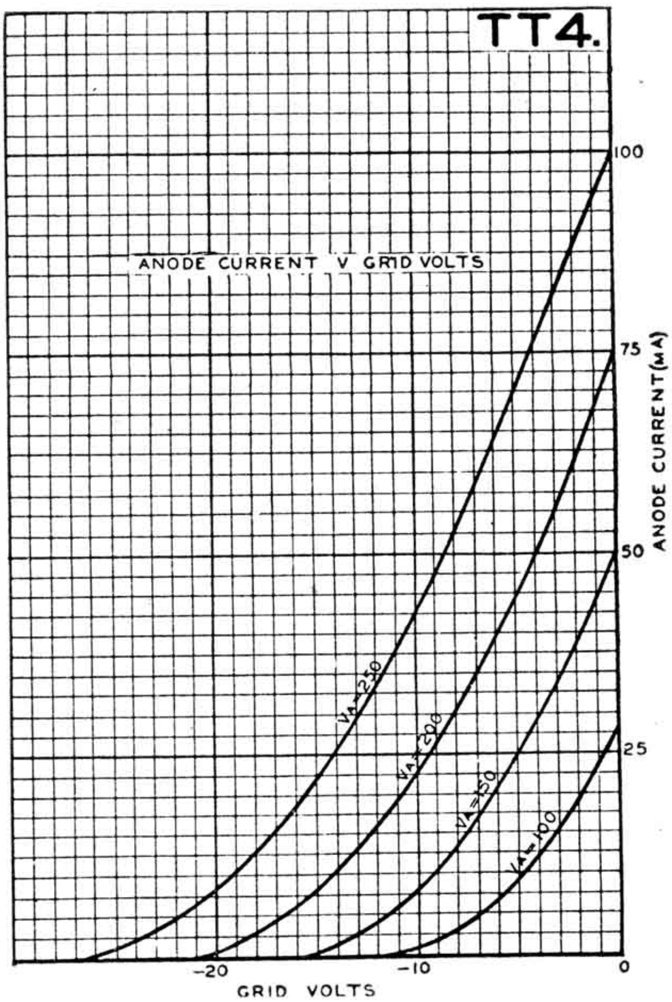
BULB FINISH.

The T.T.4 is supplied with a clear bulb only.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	2,200 ohms.
Amplification Factor	12
Mutual Conductance	5·5 mA/V.



APPLICATION.

As output or voltage amplifier valve in A.C. mains operated equipment.

(1) Class "A" Output operated at an anode voltage of 250 V. and an anode load of 10,000 ohms.

For auto-bias a resistance of 800 ohms should be used.

(2) R.C. Amplifier operated with a line voltage of 250 V. and an anode resistance of 80,000 ohms.

For auto-bias a resistance of 9,000 ohms should be used.

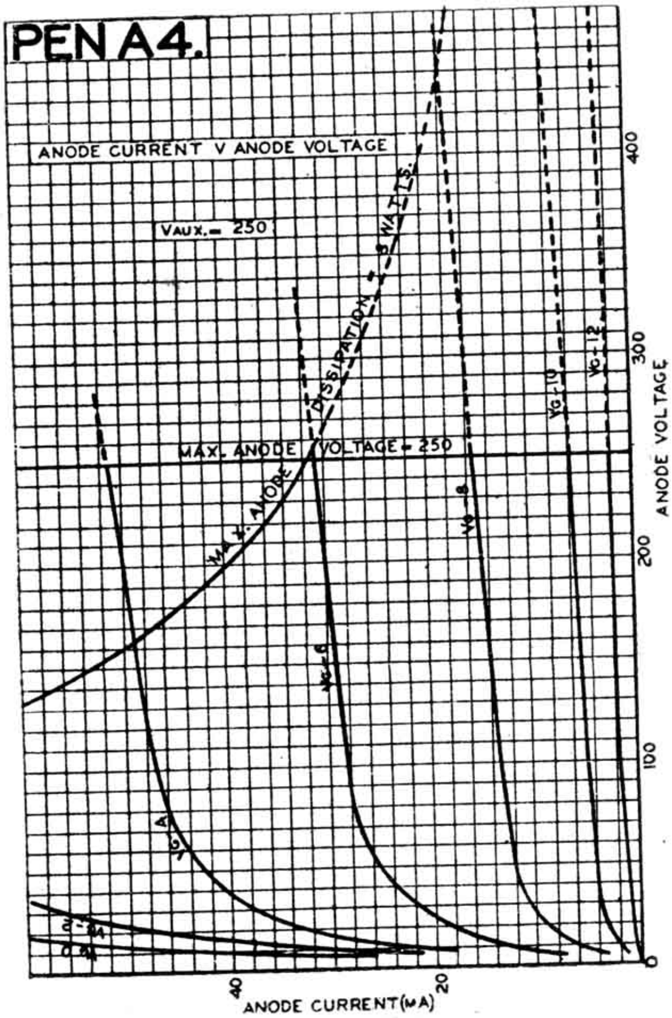
PRICE 10/-

INDIRECTLY-HEATED OUTPUT PENTODE

PEN.A4

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	1·95 A.
Max. Anode Voltage	250 V.
Max. Auxiliary Grid Voltage ..	250 V.
Optimum Load ..	8,000 ohms.



CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Control Grid Volts Zero.

Mutual Conductance 10.0 mA/V.

APPLICATION.

The PEN.A4 is a high sensitivity valve capable of a large output, and is particularly suitable for use in receivers as an output valve following a diode detector. With an anode and auxiliary grid voltage of 250 volts, the correct negative bias of approximately 5.8 V. should be obtained by means of a cathode bias resistor of 145 ohms.

BASE.

Standard 7-pin. For connections to 7-pin base see page 110.

NOTE.

This valve is identical with the PEN4VB. except in heating time and will replace the PEN4VB. in all cases.

PRICE 13/6

PEN.B4

INDIRECTLY-HEATED OUTPUT PENTODE

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	2·1 A.
Max. Anode Voltage ..	250 V.
Max. Auxiliary Grid Voltage	275 V.
Optimum Load ..	3,500 ohms.

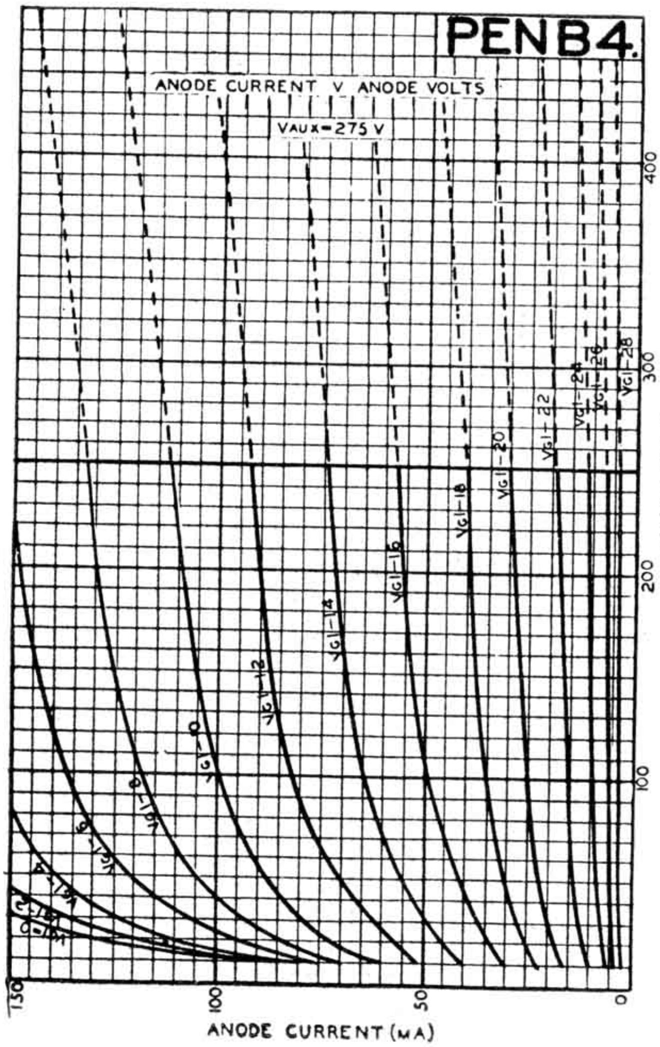
BASE.

The Pen.B4 is fitted with a standard 7-pin base. For connections see page 110.

CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Voltage 100; Control Grid Volts Zero.

Mutual Conductance 8·0 mA/V.



APPLICATION.

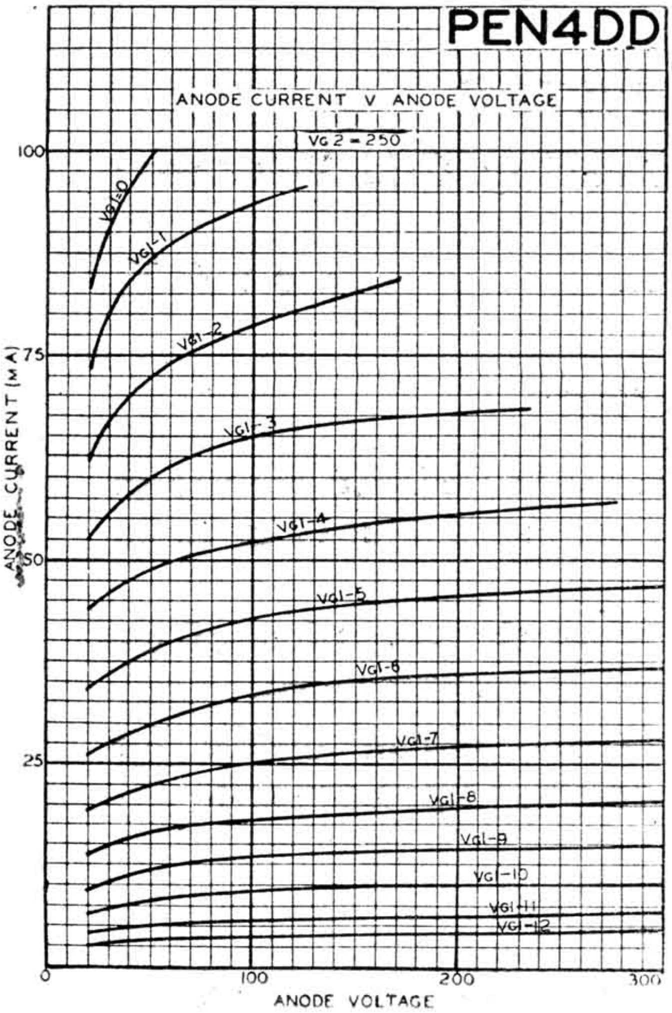
As output valve in A.C. mains receivers where a large output is required. Due to its high sensitivity it can be employed immediately following a diode detector. With an anode voltage of 250; and an auxiliary grid voltage of 275 volts, the correct negative bias of approximately 14 V. should be obtained by means of a cathode bias resistance of 175 ohms.

PRICE 18/6

DOUBLE-DIODE-OUTPUT PENTODE PEN.4DD

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	2·25 A.
Max. Anode Voltage ..	250 V.
Max. Auxiliary Grid Voltage	250 V.
Optimum Load ..	7,000 ohms.



PENTODE CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Control Grid Volts Zero.
Mutual Conductance 10·0 mA/V.

APPLICATION.

The Pen.4DD has been designed to combine the functions of detector, A.V.C. and output valve in one bulb, the diodes and the pentode are two separate assemblies, surrounding a common cathode.

With an anode and auxiliary grid voltage of 250 the correct negative grid bias is 6·0 V. approximately, and should be obtained by employing a cathode bias resistance of 150 ohms.

BASE.

Standard 7-pin. For connections see page 110.

PRICE 16/-

PEN.428 INDIRECTLY-HEATED OUTPUT PENTODE

OPERATING DATA.

Heater Voltage	4·0 V.
Heater Current	2·1 A.
Max. Anode Voltage	375 V.
Max. Auxiliary Grid Voltage...	275 V.
Optimum Load (Anode-anode) ...	6,500 ohms.

CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Grid Volts Zero.

Mutual Conductance	8·0 mA.V.

APPLICATION.

The Pen.428 has been primarily designed for use in power amplifying equipment where an output of 20 to 30 watts is required.

To meet these requirements the operation of 2x Pen.428 in Class A.B. push-pull is recommended.

Additional operating data and circuit details for operating the Pen.428 can be obtained upon request.

BASE.

Standard 7-pin. For connections see page 110.

PRICE 25/-

PRICE LIST OF DIRECTLY-HEATED OUTPUT VALVES

Valve Type.	Description.	For Details see Page	Price.
A.C.042	Output Triode	34	12/6
A.C.044	Output Triode	34	12/6
P.M.24M	Output Pentode	35	13/6
D.O.24	High-voltage Output Triode	36	25/-
D.O.26	High-voltage Output Triode	37	25/-

For details of replacement valves not indicated above see pages 88 and 89.

Valves of greater output designed specially for public address and similar equipment are available—details and circuits will be sent on application.

A.C.044/ A.C.042

DIRECTLY-HEATED OUTPUT TRIODE

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	2·0 A.
Max. Anode Voltage	250 V.
Optimum Load ..	2,500 ohms.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	950 ohms.
Amplification Factor	6·4
Mutual Conductance	6·8 mA/V.

APPLICATION.

Output valve in A.C. receivers designed for a directly-heated output triode with a maximum anode dissipation of 12 watts. Grid bias should be applied according to the following table:

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
150	16·0	33·0
200	22·0	40·0
250	30·0	48·0

The recommended value of biassing resistance is 600 ohms.

BASE.

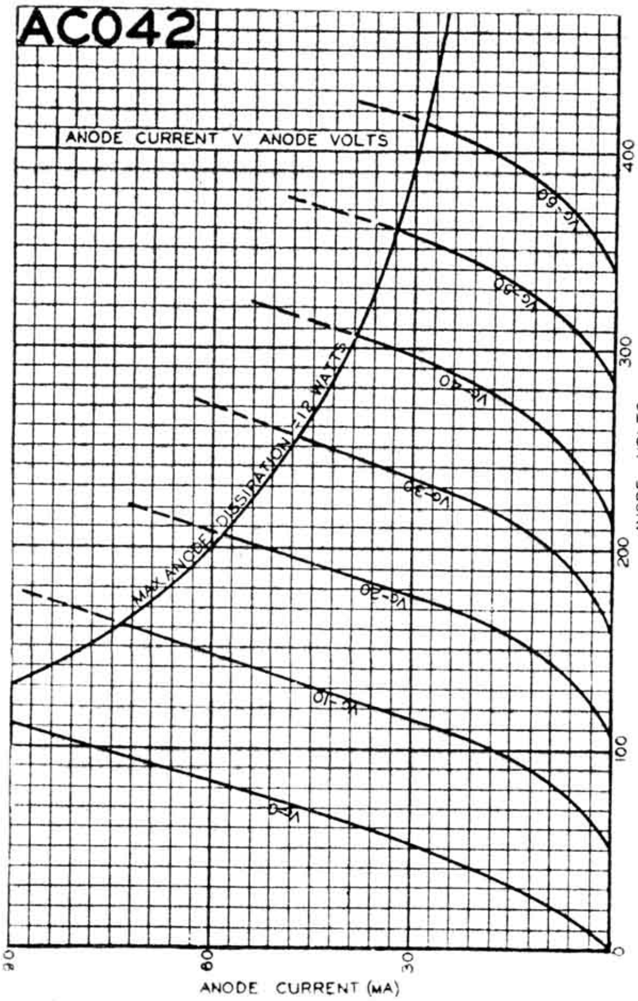
Standard 4-pin.

NOTE.

The operating data given opposite is for type A.C.042, and except for filament rating this is the same as that for the A.C.044, the filament characteristics of which are as follows:—

Filament Voltage	4·0 V.
Filament Current	1·0 A.

These valves are not, therefore, directly replaceable.

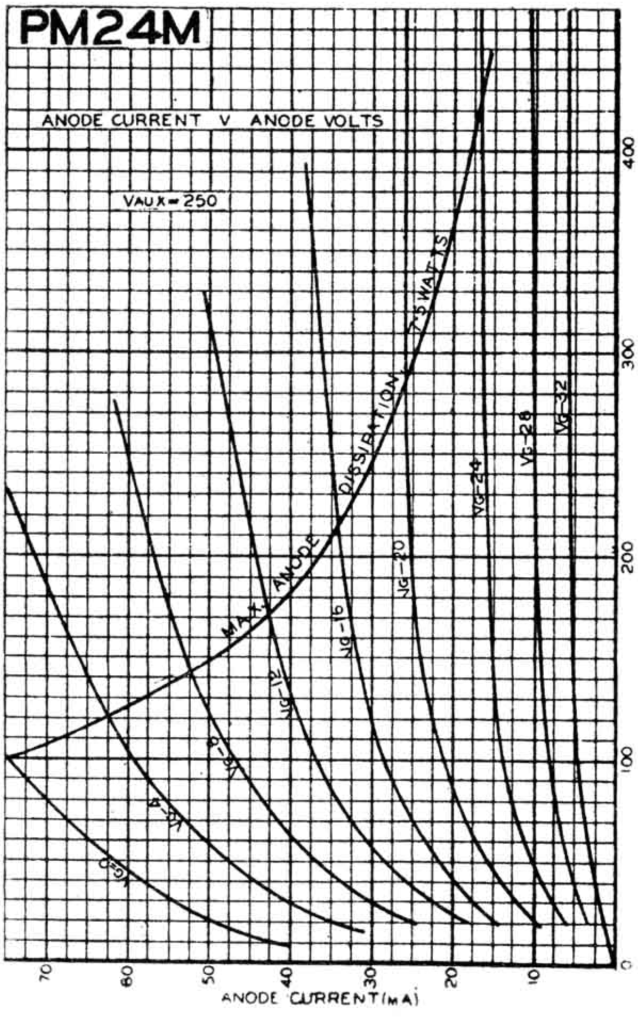


PRICE 12/6

DIRECTLY-HEATED OUTPUT PENTODE P.M.24M

OPERATING DATA.

Filament Voltage .. .. 4·0 V.
Filament Current .. .. 1·1 A.
Max. Anode Voltage .. .. 250 V.
Max. Auxiliary Grid Voltage.. 250 V.
Optimum Load .. 7,000 ohms.



CHARACTERISTICS.

At Anode Volts 100; Auxiliary Grid Volts 100; Grid Volts Zero.
Mutual Conductance 3·0 mA/V.

APPLICATION.

Type P.M.24M is suitable for use in A.C. receivers designed for a directly-heated output pentode.

Grid bias should be applied according to the following table:

Auxiliary Grid Voltage.	Approx. Neg. Grid Bias Voltage	Approx. Anode Current (mA).
150	9·0	20·0
200	12·0	30·0
250	18·0	30·0

For auto-bias, a resistance of 500 ohms is necessary. It is recommended that a fixed resistor of 400 ohms and a variable resistor of 250 ohms should be used in series, thus providing a margin for adjustment.

BASE.

Standard 5-pin.

PRICE 13/6

D.O.24 HIGH-VOLTAGE-OUTPUT-TRIODE

OPERATING DATA.

Filament Voltage	4·0 V.
Filament Current	2·0 A.
Max. Anode Voltage	400 V.
Optimum Load ..	2,500 ohms.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	1,390 ohms.
Amplification Factor	9
Mutual Conductance	6.5 mA/V.

APPLICATION.

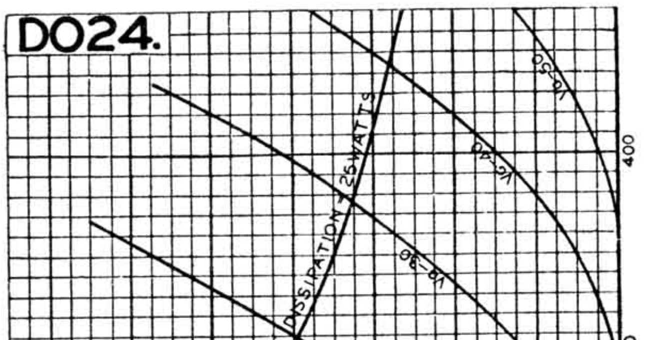
Output valve in powerful receivers amplifiers and medium-sized public address equipments, and particularly where a fairly high amplification is required in the output stage. The D.O.24 will give its full output for a grid input voltage of 24 V. r.m.s. Negative grid bias should be applied according to the following table:

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
200	13.0	40.0
300	24.0	50.0
400	34.0	63.0

For auto-bias the value of bias resistance is 540 ohms. This should consist of a fixed resistor of 450 ohms and a variable resistor of 250 ohms in series, in order to provide a margin for adjustment.

BASE.

Standard 4-pin.



PRICE 25/-

HIGH-VOLTAGE-OUTPUT-TRIODE D.O.26

OPERATING DATA.

Filament Voltage	4·0 V.
Filament Current	2·0 A.
Max. Anode Voltage	400 V.
Optimum Load ..	3,000 ohms

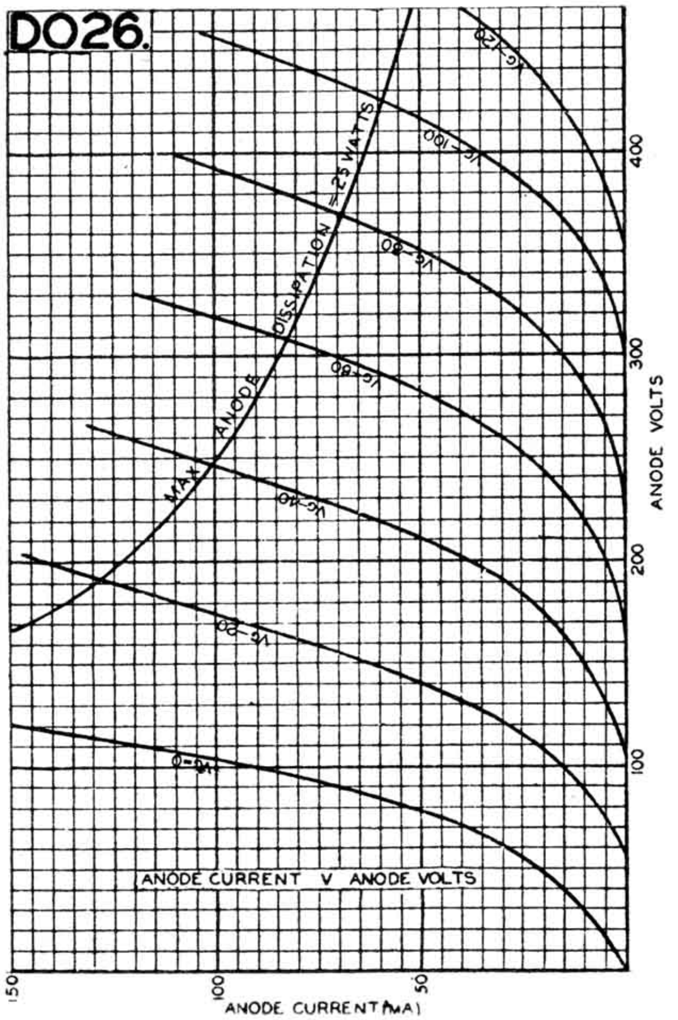
CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	600 ohms
Amplification Factor	3·8
Mutual Conductance	6·3 mA/V.

APPLICATION.

This output valve has a lower amplification factor than type D.O.24, and therefore needs a larger grid-excitation voltage, of the order of 65 V. r.m.s. to load it fully. At the same time, owing to its very low anode impedance, it will give a substantially greater output than type D.O.24. Negative grid bias should be applied according to the table below. For auto-bias the value of biassing resistance should be 1,500 ohms, but a fixed resistor of 1,250 ohms and a variable resistor of 500 ohms in series is recommended, thus providing a margin for adjustment.



Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
200	40·0	38·0
300	63·0	50·0
400	92·0	63·0

BASE.

Standard 4-pin.

PRICE 25/-

PRICE LIST OF FULL-WAVE RECTIFIERS

Valve Type.	Description.	For Details see Page	Price.
D.W.2	Directly-heated full-wave rectifier ..	39	10/6
D.W.4/350	Directly-heated full-wave rectifier ..	39	10/6
D.W.4/500	Directly-heated full-wave rectifier ..	39	15/-
I.W.3	Indirectly-heated full-wave rectifier ..	40	10/6
I.W.4/350	Indirectly-heated full-wave rectifier ..	40	10/6
I.W.4	Indirectly-heated full-wave rectifier ..	40	15/-

For details of replacement valves not indicated above see page 90.

DIRECTLY-HEATED FULL-WAVE RECTIFIER D.W.2

OPERATING DATA.

Filament Voltage .. .. 4·0 V.
Filament Current .. .. 1·0 A.
Max. Anode Voltage
250–0–250 V. r.m.s.

OUTPUT.

Maximum rectified current
60 mA D.C. at 250 V.

PRICE 10/6

DIRECTLY-HEATED FULL-WAVE RECTIFIER D.W.4/350

OPERATING DATA.

Filament Voltage .. .. 4·0 V.
Filament Current .. .. 2·0 A.
Max. Anode Voltage
350–0–350 V. r.m.s.

OUTPUT.

Maximum rectified current
120 mA D.C. at 350 V.

PRICE 10/6

DIRECTLY-HEATED FULL-WAVE RECTIFIER D.W.4/500

OPERATING DATA.

Filament Voltage .. .. 4·0 V.
Filament Current .. .. 2·0 A.
Max. Anode Voltage
500–0–500 V. r.m.s.

OUTPUT.

Maximum rectified current
120 mA D.C. at 500 V.

PRICE 15/-

I.W.3 INDIRECTLY-HEATED FULL-WAVE RECTIFIER

OPERATING DATA.

Heater Voltage .. .. .. 4·0 V.
Heater Current.. .. .. 2·4 A.
Max. Anode Voltage
350–0–350 V. r.m.s.

OUTPUT.

Maximum rectified current
120 mA D.C. at 350 V.

PRICE 10/6

I.W.4/350 QUICK-HEATING I.H. FULL-WAVE RECTIFIER

OPERATING DATA.

Heater Voltage .. .. .. 4·0 V.
Heater Current.. .. .. 2·0 A.
Max. Anode Voltage
350–0–350 V. r.m.s.

OUTPUT.

Maximum rectified current
120 mA D.C. at 350 V.

This valve must not be used with indirectly-heated output valves having a heating time greater than 20 seconds. It can be used with the PEN.A4, or any directly-heated output valve.

PRICE 10/6

I.W.4 INDIRECTLY-HEATED FULL-WAVE RECTIFIER

OPERATING DATA.

Heater Voltage .. .. .. 4·0 V.
Heater Current.. .. .. 2·4 A.
Max. Anode Voltage
500–0–500 V. r.m.s.

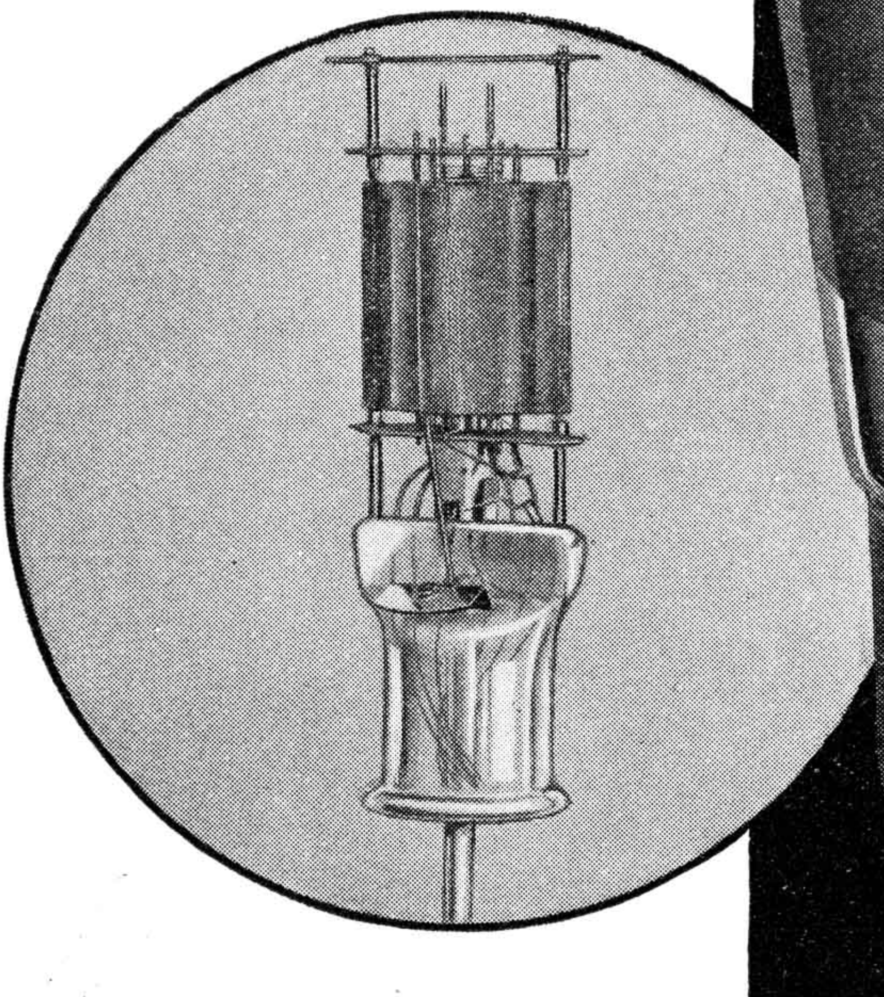
OUTPUT.

Maximum rectified current
120 mA D.C. at 500 V.

PRICE 15/-

MULLARD PEN 36C

**HIGH SENSITIVITY
OUTPUT
PENTODE
for
D.C./A.C.
RECEIVERS**



PRICE LIST OF MULLARD UNIVERSAL D.C./A.C. VALVES

Valve Type.	Description.	For Details see Page	Price.
T.V.6	Tuning Indicator	43	10/6
T.H.13C.	Triode-hexode Frequency Changer ..	44	15/-
T.H.21C.	Triode-hexode Frequency Changer ..	45	15/-
T.H.22C.	Triode-hexode Frequency Changer ..	46	15/-
F.C.13C.	Octode Frequency Changer	47	15/-
V.P.13C.	Variable-mu H.F. Pentode	48	12/6
S.P.13C.	H.F. Pentode	49	12/6
H.L.13C.	Medium Impedance Triode	50	9/6
2D.13C.	Double-diode-detector	51	5/6
T.D.D.13C.	Double-diode-triode	52	12/6
Pen. 36C.	Output Pentode	53	13/6
U.R.1C.	Half-wave Rectifier	54	10/6
U.R.3C.	Full-wave Rectifier	54	15/-

For details of replacement valves, including side contact types, not indicated above, see pages 91 to 93.

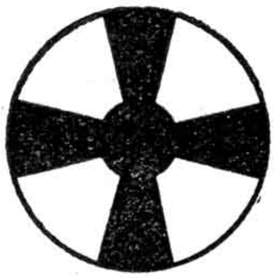
ELECTRON BEAM TUNING INDICATOR

T.V.6

OPERATING CHARACTERISTICS AS VISUAL INDICATOR.

Heater Voltage	6·3 V.
Heater Current	0·2 A.
Max. Line Voltage	250 V.
Max. Target Voltage	250 V.
Series Triode Anode Resistance	2 megohms.
Grid Voltage (zero signal) .. ($\varnothing = 10°$)	0 V.
Grid Voltage (Max. signal) .. ($\varnothing = 90°$)	— 4 V.

Grid Voltage (zero signal) .. 0 V.
$\varnothing = 10°$)



Grid Voltage (Max. signal) .. — 4 V.
($\varnothing = 90°$)

APPLICATION.

A visual tuning indicator operating on the Electron principle, for D.C./A.C. mains receivers and car radios. The T.V.6 should always be operated so that full illumination ($\varnothing = 90°$) is obtained under conditions of signal.

BASE.

"P" type 8-contact universal base. For connections see page 111.

PRICE 10/6

T.H.13C

TRIODE-HEXODE FREQUENCY CHANGER

OPERATING DATA.

Heater Voltage	13·0 V.
Heater Current	0 31 A.
Max. Anode Voltage	250 V.
Max. Screen Voltage (Grids 2 and 4)	90 V.
Max. Oscillator Anode Voltage	150 V.

BULB FINISH.

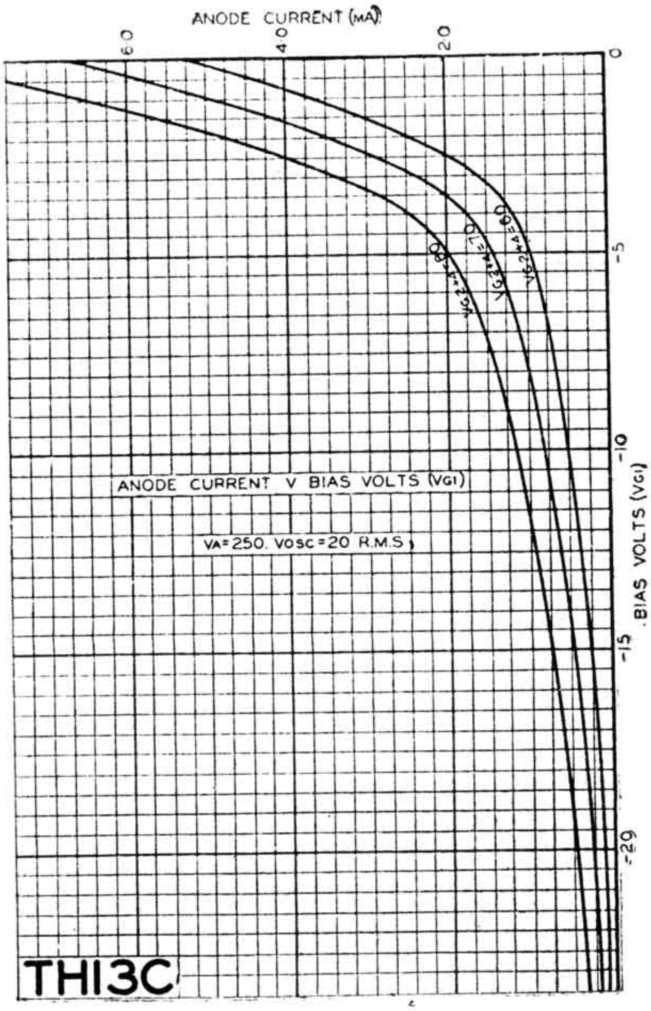
The T.H.13C is supplied with a metallised bulb only.

APPLICATION.

As frequency changer in superheterodyne receivers covering short wavebands. It consists of a hexode mixer and triode oscillator located on a common cathode assembly with adequate screening between each electrode system. It maintains its efficiency excellently at the higher frequencies.

BASE.

Standard 7-pin type. For connections see page 110.



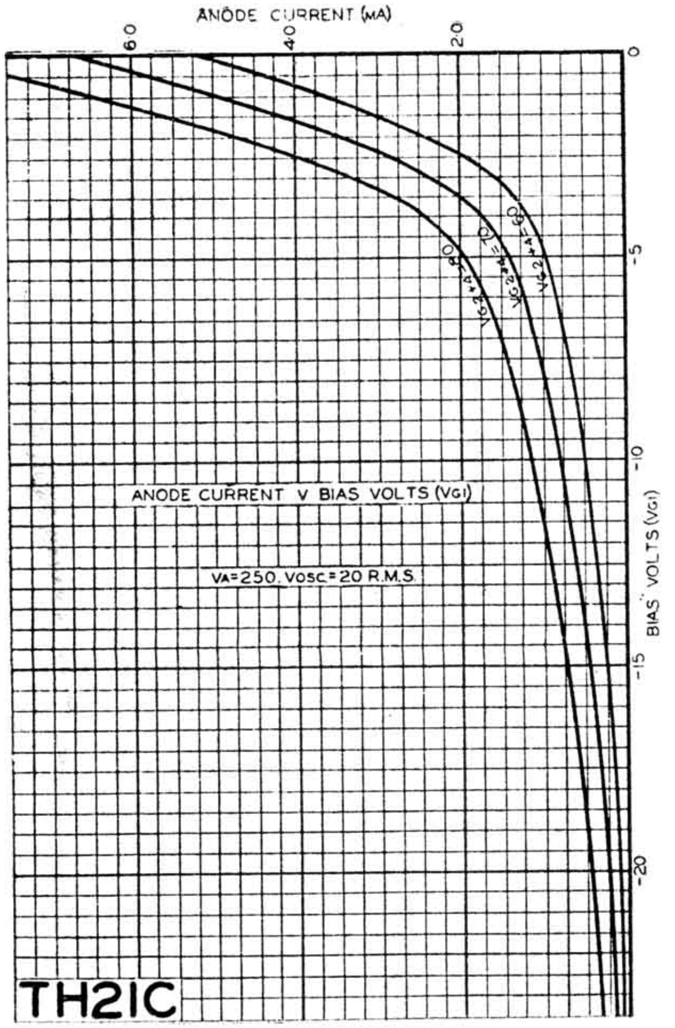
PRICE 15/-

TRIODE-HEXODE
FREQUENCY CHANGER

T.H.21C

OPERATING DATA.

Heater Voltage	21.0 V.
Heater Current	0.2 A.
Max. Anode Voltage	250 V.
Max. Screen Voltage (Grids 2 and 4)	90 V.
Max. Oscillator Anode Voltage	150 V.



APPLICATION.

As frequency changer in superheterodyne receivers covering short wavebands. It consists of a hexode mixer and triode oscillator located on a common cathode assembly with adequate screening between each electrode system. It maintains its efficiency excellently at the higher frequencies.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

The T.H.21C is supplied with a metallised bulb only.

PRICE 15/-

T.H.22C

TRIODE-HEXODE FREQUENCY CHANGER

OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	29 V.
Max. Anode Voltage	250 V.
Max. Screen Voltage (Grids 2 and 4) ..	150 V.
Max. Oscillator Anode Voltage	100 V.

APPLICATION.

As Frequency Changer in superheterodyne receivers covering short wavebands. It consists of a hexode mixer and triode oscillator located on a common cathode assembly with adequate screening between each electrode system. It maintains its efficiency excellently at the higher frequencies.

BASE.

Standard 7-pin type. For connections see page 109.

BULB FINISH.

The T.H.22C is supplied with a metallised bulb only.

PRICE 15/-

OCTODE FREQUENCY CHANGER

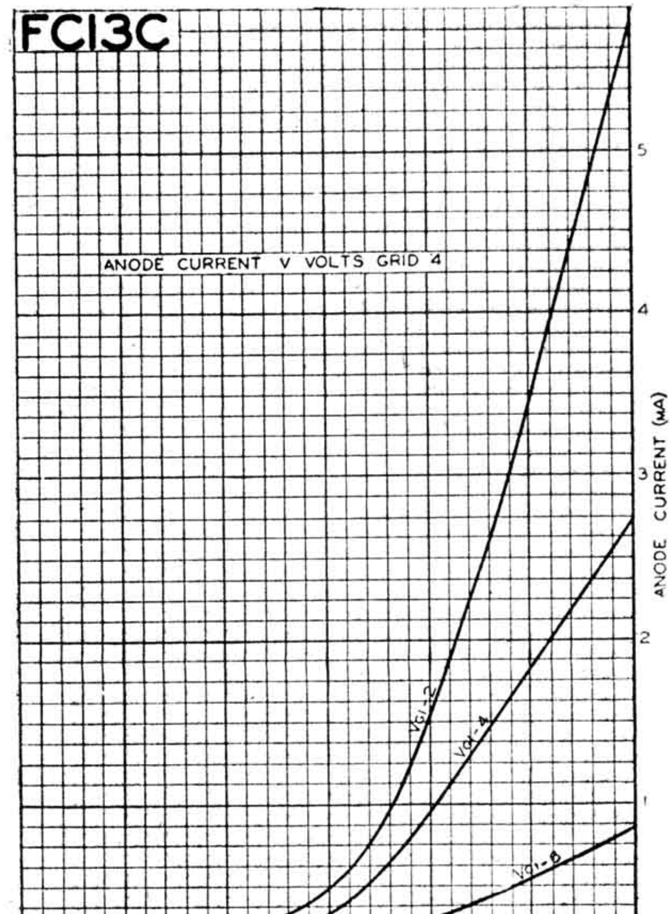
F.C.13C

OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	13·0 V.
Max. Anode Voltage	200 V.
Max. Auxiliary Grid and Screen Voltage (G3 and G5) ..	90 V.
Max. Oscillator Anode Voltage	90 V.

APPLICATION.

Electron-coupled frequency changer in superheterodyne receivers. The cathode and grids 1 and 2 are operated as a triode oscillator; grid 3 acts as a screen between the oscillator and mixer elements; and grids 4, 5 and 6 with the anode form a pentode mixer with variable-mu characteristics.



BASE.

Standard 7-pin base. For connections see page 109.

BULB FINISH.

This valve is supplied with metallised bulb only.

PRICE 15/-

V.P.13C VARIABLE-MU H.F. PENTODE

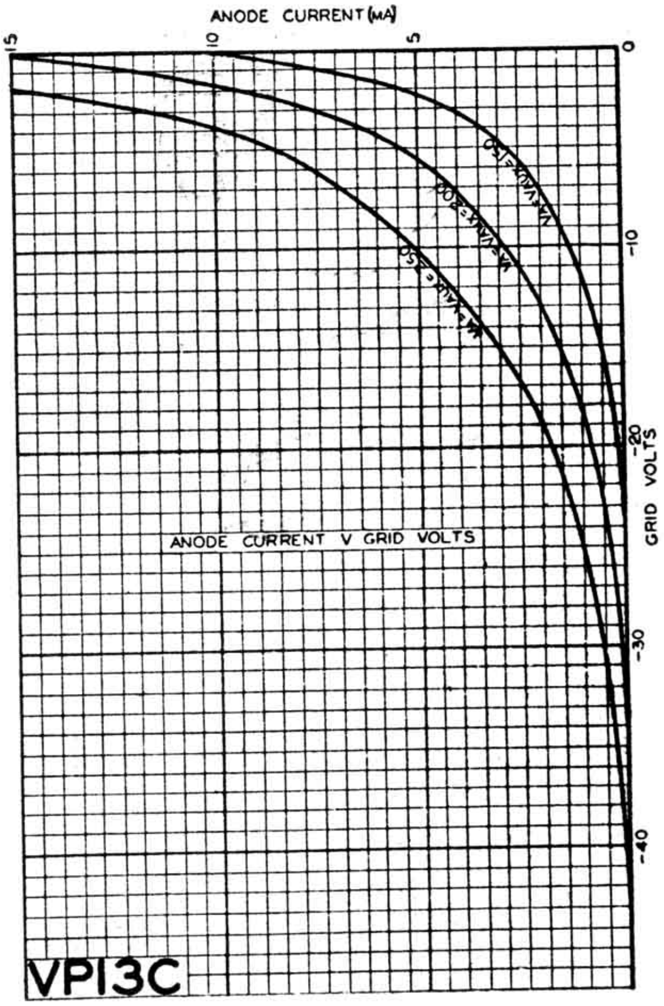
OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	13·0 V.
Max. Anode Voltage	200 V.
Max. Auxiliary Grid Voltage ..	200 V.

CHARACTERISTICS.

At Anode Volts 200; Auxiliary Grid Volts 200; Control Grid Volts Zero.

Mutual Conductance 3·0 mA/V.



APPLICATION.

Radio frequency or intermediate frequency amplifier in circuits where volume control is exercised either manually or automatically by adjustment of grid bias.

BASE.

Standard 7-pin base. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.

PRICE 12/6

H.F. PENTODE S.P.13C

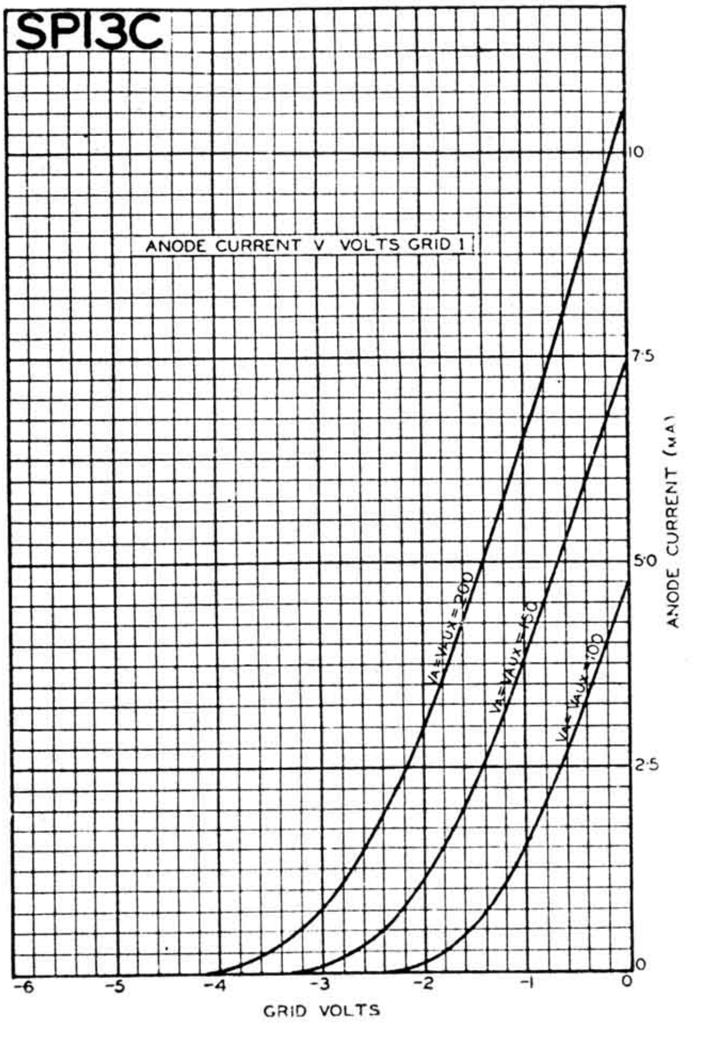
OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	13·0 V.
Max. Anode Voltage	200 V.
Max. Auxiliary Grid Voltage ..	200 V

CHARACTERISTICS.

At Anode Volts 200; Auxiliary Grid Volts 200; Control Grid Volts Zero.

Mutual Conductance 4·0 mA/V.



APPLICATION.

The S.P.13C is a straight H.F. Pentode for use in D.C./A.C. or Car Radio Receivers as:

(*a*) Speech Detector.

(*b*) Radio Frequency or Intermediate Frequency Amplifier.

(*c*) Low Frequency Amplifier.

BASE.

Standard 7-pin base. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.

PRICE 12/6

H.L.13C MEDIUM IMPEDANCE TRIODE

OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	13·0 V.
Max. Anode Voltage	200 V.

CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance	10,500 ohms.
Amplification Factor	40
Mutual Conductance	3.8 mA/V.

APPLICATION.

(1) As detector with applied voltage of 200. Shunt-fed transformer coupling is recommended. The value of anode resistance is 25,000 ohms. The rest current under these conditions is 4 0 mA.

(2) Low frequency amplifier operated at an anode voltage of 150 V. to 200 V. and negative grid bias according to the following table. For auto-bias a resistance of 4,000 ohms should be used.

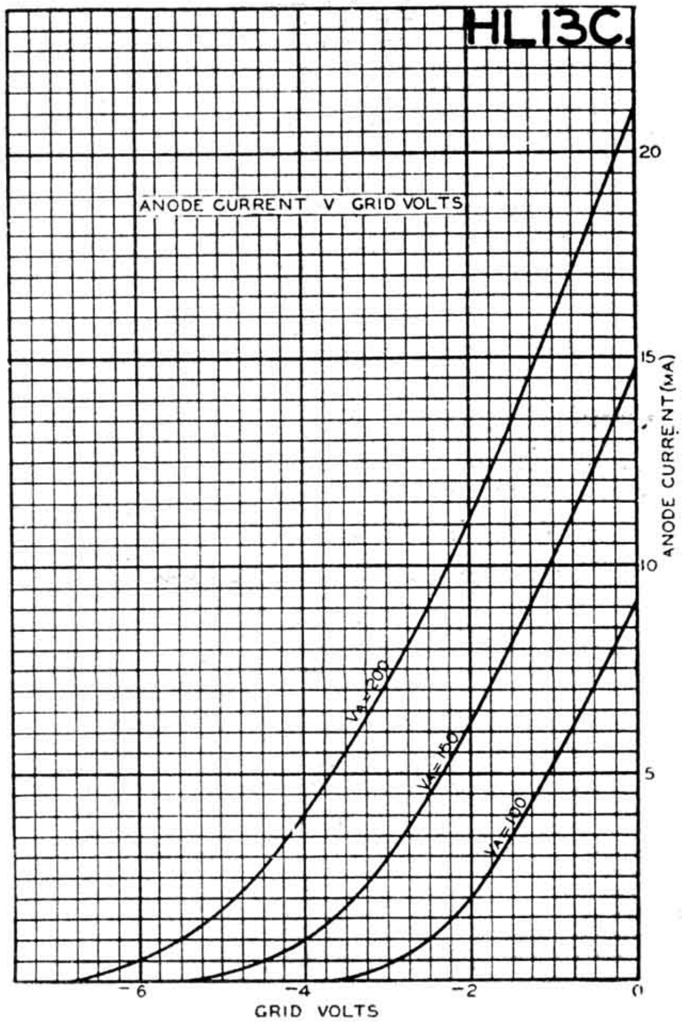
Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
100	2·0	2·0
150	3·0	3·0
200	4·0	4·0

BASE.

Standard 7-pin. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.



PRICE 9/6

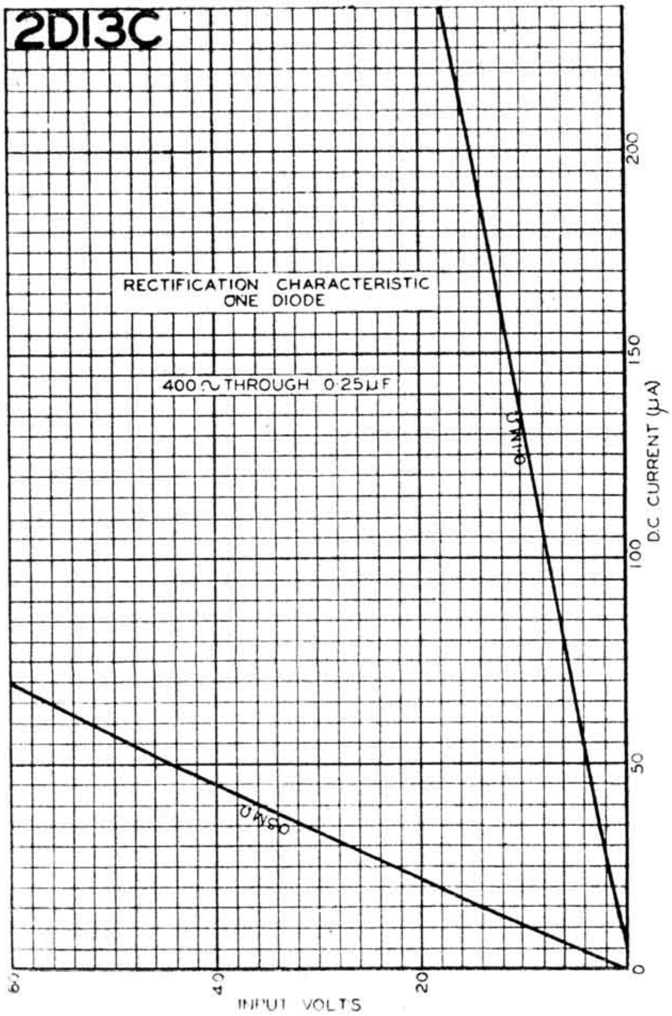
DOUBLE-DIODE DETECTOR 2D.13C

OPERATING DATA.

Heater Voltage ..	.. 13·0 V.
Heater Current ..	.. 0·2 A.
Max. Diode Voltage ..	.. 200 V.
Max. Diode Current ..	.. 0·8 mA.

APPLICATION.

The 2D.13C consists of two diode anodes surrounding a common cathode. One diode is intended to be used as speech rectifier and the other can be used for the application of A.V.C. or noise suppression.



BASE.

Standard 5-pin. For connections see page 109.

BULB FINISH.

The 2D.13C is supplied with metallised bulb only.

PRICE 5/6

T.D.D.13C DOUBLE-DIODE-TRIODE

OPERATING DATA.

Heater Current .. .. 0·2 A.
Heater Voltage .. .. 13·0 V.
Max. Anode Voltage .. .. 200 V.

TRIODE CHARACTERISTICS.

At Anode Volts 100; Grid Volts Zero.

Anode Impedance 10,000 ohms.
Amplification Factor 29
Mutual Conductance 2·9 mA/V.

APPLICATION.

The normal method of employing the T.D.D.13C is to use one diode as speech detector and the other diode for A.V.C., the triode portion being employed as a low frequency amplifier. Grid bias should be applied to the triode amplifier according to the following table, while for auto-bias a 5,500-ohms resistor should be used.

Anode Voltage.	Approx. Neg. Grid Bias Voltage.	Approx. Anode Current (mA).
100	1·5	4·5
150	2·5	6.5
200	3 5	8.5

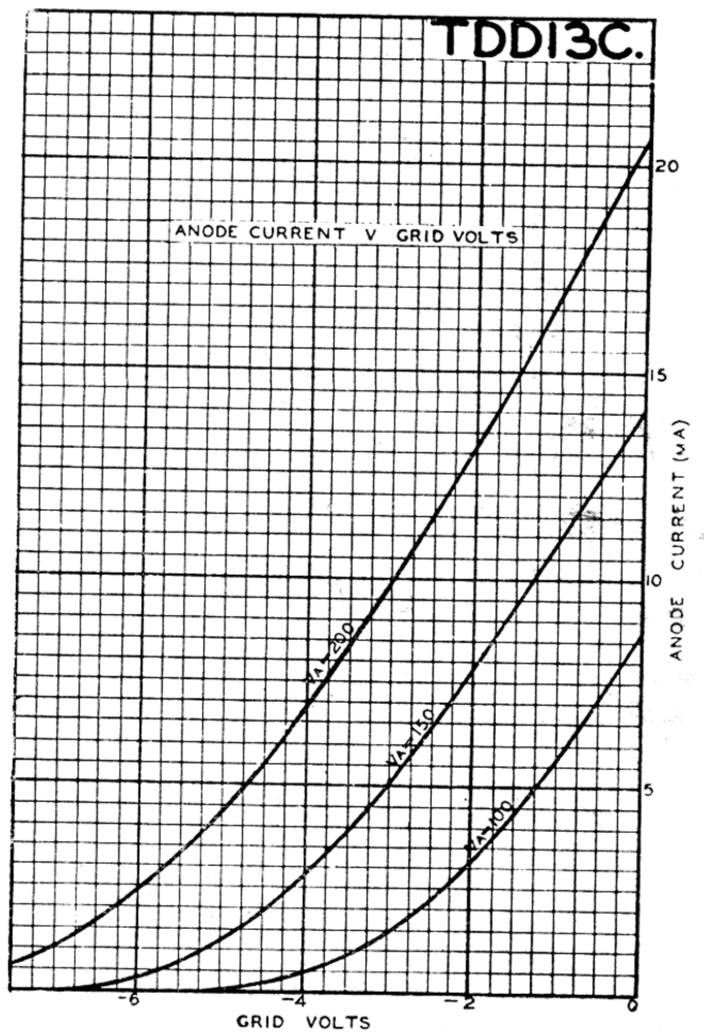
For resistance-capacity coupling the optimum value of anode resistance is 50,000 ohms.

BASE.

Standard 7-pin. For connections see page 110.

BULB FINISH.

This valve is supplied with metallised bulb only.



PRICE 12/6

OUTPUT PENTODE

PEN.36C

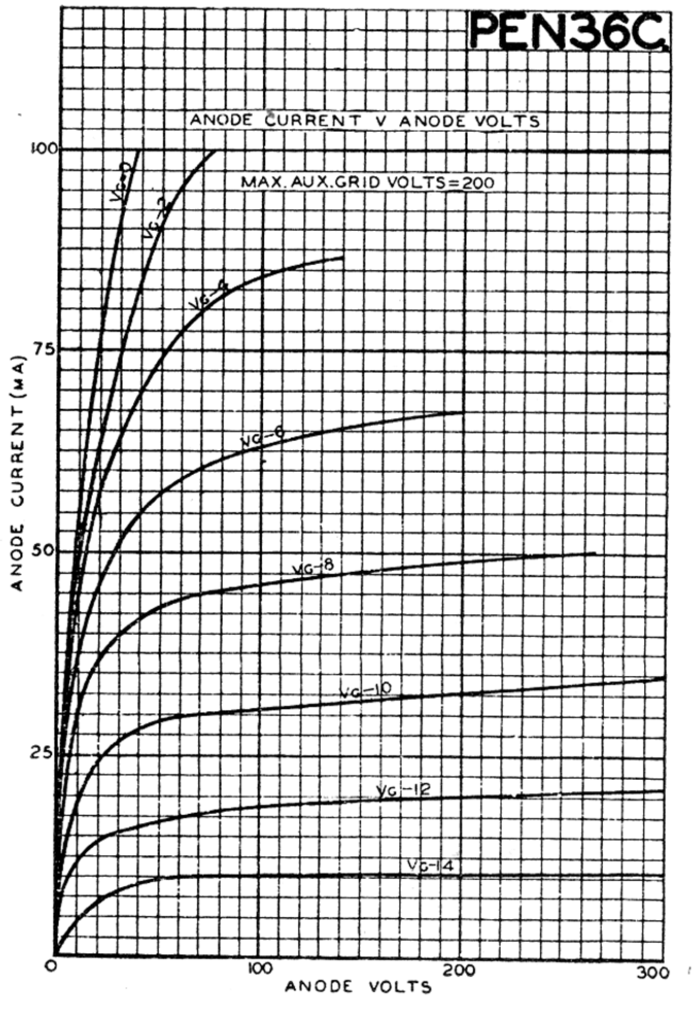
OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	35·0 V.
Max. Anode Voltage	250 V.
Max. Auxiliary Grid Voltage..	250 V.
Max. Anode Dissipation	9·0 watts.
Optimum Load ..	8,000 ohms.

CHARACTERISTICS.

Mutual Conductance:

At Anode Volts 100; Auxiliary Grid Volts 100; Control Grid Volts Zero 10·0 mA/V.



APPLICATION.

High sensitivity output Pentode for use in D.C./A.C. receivers. It is particularly suitable as output valve following a diode detector.

For auto-bias a resistance of 165 ohms is necessary. ($Va = Vg_2 = 200$)

BASE.

Standard 7-pin base. For connections see page 110.

PRICE 13/6

U.R.1C — HALF-WAVE RECTIFIER

OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	20·0 V.
Max. Anode Voltage	250 V. r.m.s.

OUTPUT.

Max. rectified output
75 mA D.C. at 250 V.

APPLICATION.

Half-wave rectifier in D.C./A.C. receivers not using a mains transformer.

BASE.

Standard 5-pin base. For connections see page 109.

PRICE 10/6

U.R.3C — MULTIPLE RECTIFIER

OPERATING DATA.

Heater Current	0·2 A.
Heater Voltage	30·0 V.
Max. Anode Voltage	2 × 250 V. r.m.s.

OUTPUT.

Max. rectified output
120 mA D.C. at 250 V.

APPLICATION.

Multiple rectifier for use in D.C./A.C. amplifiers and receivers not using a mains transformer.

BASE.

Standard 7-pin base. For connections see page 110.

PRICE 15/-

PRICE LIST OF SPECIAL VALVES

Valve Type.	Description.	For Details see Page	Price.
A.P.4	Pentode for Ultra H.F. Work ..	56	60/-
A.T.4	Triode for Ultra H.F. Work ..	57	50/-
D.A.1	Medium Impedance Triode for Deaf-Aids	58	15/-
D.A.2	Low Impedance Triode for Deaf-Aids	59	15/-
H.V.R.1	High Voltage Rectifier for Cathode Ray Equipment	60	20/-
H.V.R.2	High Voltage Rectifier for Cathode Ray Equipment	60	20/-
T.S.P.4	High Slope H.F. Pentode for Television Receivers	61	17/6
4687	Stabilising Tube	62	7/6

A.P.4

ACORN TYPE H.F. PENTODE

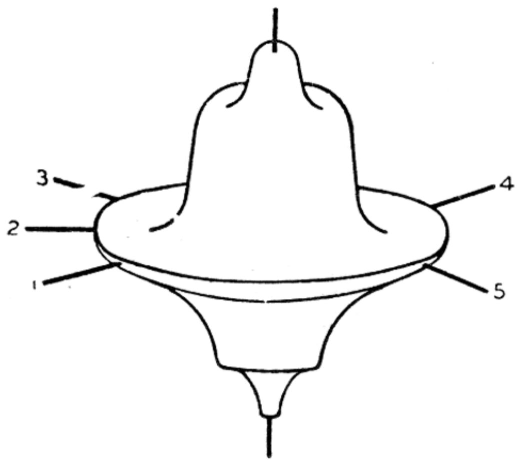
OPERATING CHARACTERISTICS.

Heater Voltage	4·0 V.
Heater Current	0·25 A.
Max. Anode Voltage ..	250 V.
Max. Aux. Grid Voltage .	100 V.

CHARACTERISTICS.

At Anode Volts	250
Aux. Grid Volts ..	100
Control Grid Volts ..	0
Mutual Conductance	2·6 mA/V.

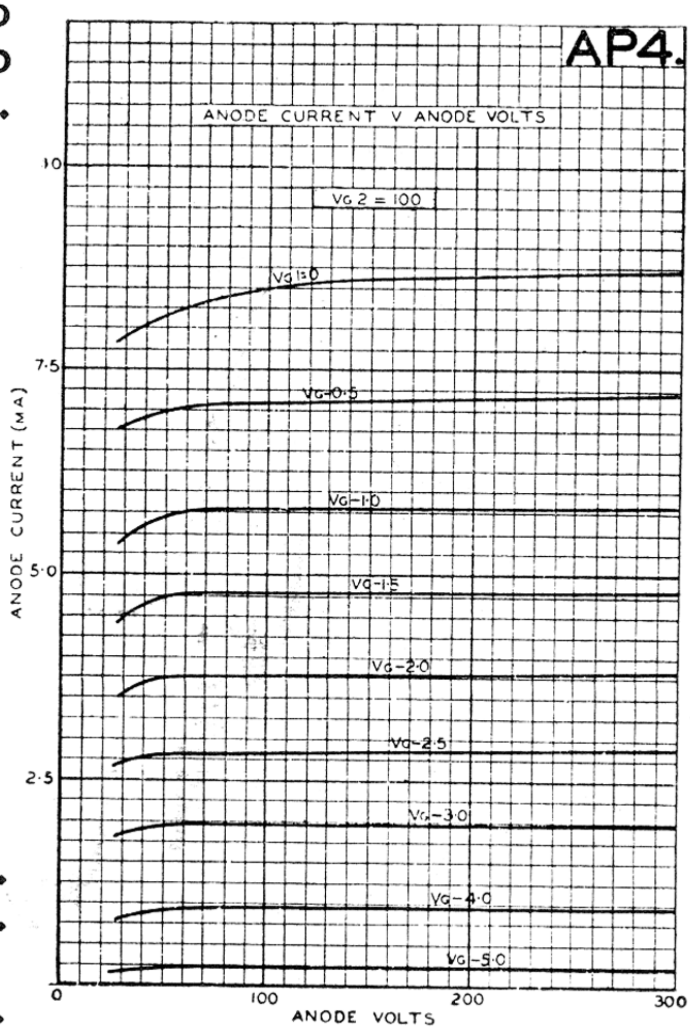
BASE CONNECTIONS.



Viewed from top of valve.
Lead No. 1. Heater.
" " 2. Cathode.
" " 3. Heater.
" " 4. Suppressor Grid (G_3).
" " 5. Screening Grid (G_2).
Top connection Anode.
Bottom connection.–Control Grid.

APPLICATION.

An indirectly heated H.F. pentode of "Acorn" type construction for operation as Detector or H.F. Amplifier at ultra high frequencies.



PRICE 60/-

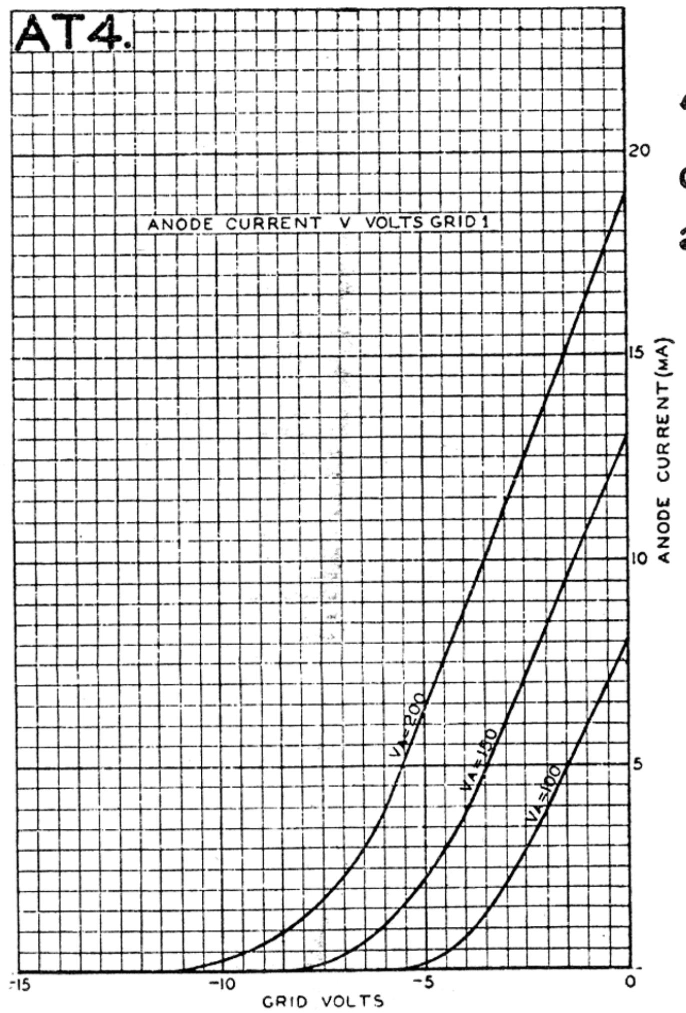
ACORN TYPE TRIODE A.T.4

OPERATING CHARACTERISTICS.

Heater Voltage	4·0 V.
Heater Current	0·25 A.
Max. Anode Voltage ..	200 V.

CHARACTERISTICS.

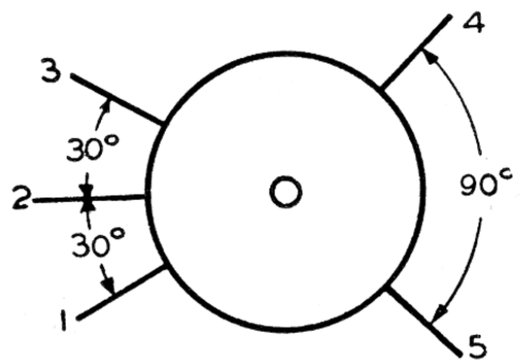
At Anode Volts	100
Grid Volts	0
Anode Impedance ..	11,400
Amplification Factor ..	25
Mutual Conductance	2·2 mA/V.



APPLICATION.

An indirectly heated triode of "Acorn" type construction for operation as Detector or Oscillator at ultra high frequencies.

BASE CONNECTIONS.



Viewed from top of valve.

Lead No. 1.	Heater.
,, ,, 2.	Cathode.
,, ,, 3.	Heater.
,, ,, 4.	Grid.
,, ,, 5.	Anode.

PRICE 50/-

D.A.1

MEDIUM IMPEDANCE TRIODE FOR DEAF AIDS

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·05 A.
Max. Anode Voltage	100 V.

CHARACTERISTICS.

At Anode Volts	45
Control Grid Volts	0
Anode Impedance ..	60,000 ohms.
Amplification Factor	30
Mutual Conductance ..	0·5 mA/V.

BASE CONNECTIONS.

Viewed from underside of valve base

Pin No. 1.	Anode.
,, ,, 2.	Grid.
,, ,, 3.	Filament.
,, ,, 4.	Filament.

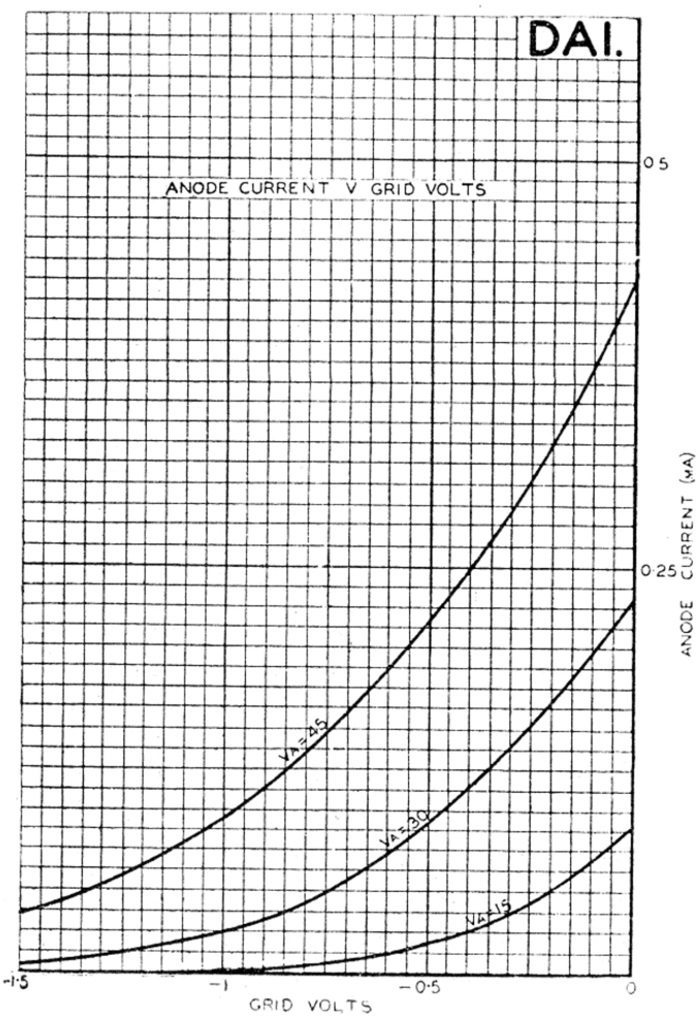
APPLICATION.

As low frequency amplifier in compact equipment such as Deaf-Aids, etc.

The DA1 is supplied in a metal case.

Overall dimensions being :—

Length	60 mm.
Diameter.. ..	19 mm.



PRICE 15/-

LOW IMPEDANCE TRIODE FOR DEAF AIDS

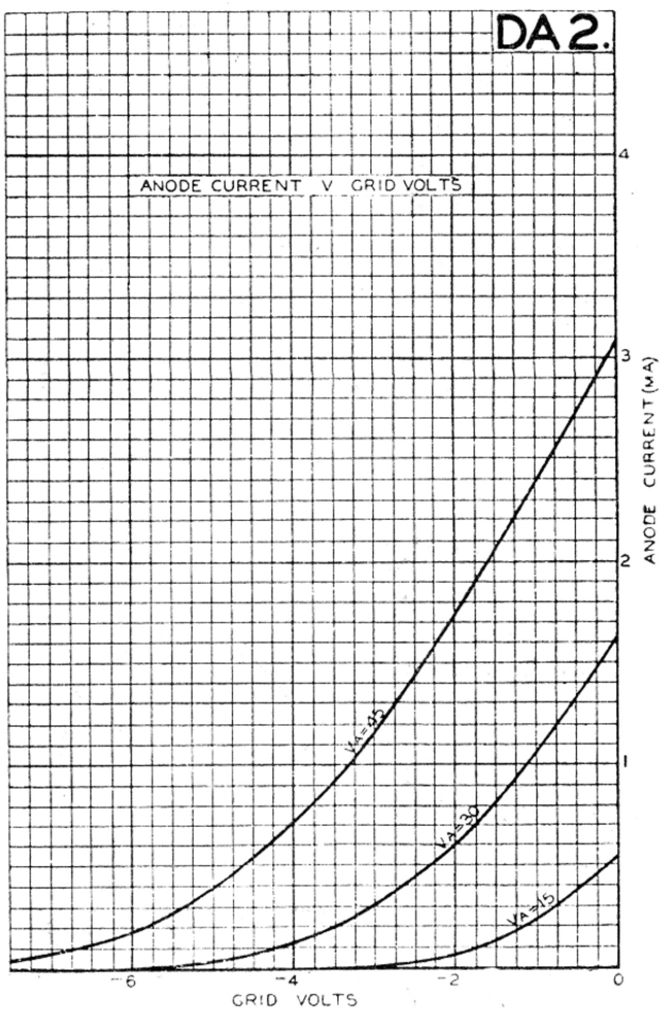
D.A.2

OPERATING DATA.

Filament Voltage	2·0 V.
Filament Current	0·05 A.
Max. Anode Voltage	100 V.

CHARACTERISTICS.

At Anode Voltage	45
Control Grid Volts	.. 0
Anode Impedance ..	9,000 ohms.
Amplification Factor	7·0
Mutual Conductance ..	0·78 mA/V.



APPLICATION.

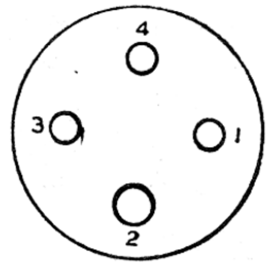
As voltage amplifier or output valve in compact equipment such as deaf-aids, etc.

The DA2 is supplied in a metal case.

Overall Dimensions being :—

Length	60 mm.
Diameter ..	19 mm.

BASE CONNECTIONS.



Viewed from underside of valve base.

Pin No. 1. Anode.
" " 2. Grid.
" " 3. Filament.
" " 4. Filament.

PRICE 15/-

H.V.R.1

HIGH VOLTAGE RECTIFIER

OPERATING DATA.

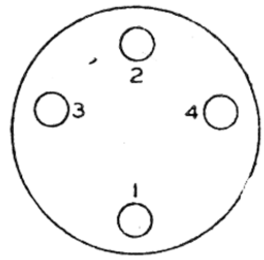
Filament Voltage	2·0 V.
Filament Current	0·3 A.
Max. Anode Voltage ..	6,000 V. r.m.s.
Max. Rectified Current ..	5·0 mA.

APPLICATION.

A directly heated rectifier for use in Cathode Ray Tube equipment.

BASE CONNECTIONS.

Pin No. 1.	—
Pin No. 2.	—
Pin No. 3.	Filament.
Pin No. 4.	Filament.
Top Cap.	Anode.



Viewed from free end of pins.

PRICE 20/-

H.V.R.2

HIGH VOLTAGE RECTIFIER

OPERATING DATA.

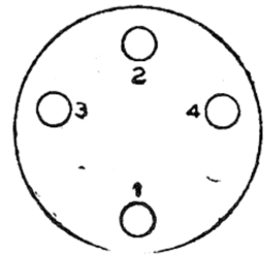
Heater Voltage	4·0 V.
Heater Current	0·65 A.
Max. Anode Voltage ..	6,000 V. r.m.s.
Max. Rectified Current ..	3·0 mA.

APPLICATION.

An indirectly heated rectifier for use in Cathode Ray Tube equipment.

BASE CONNECTIONS.

Pin No. 1.	—
Pin No. 2.	—
Pin No. 3.	Heater (Cathode internally connected).
Pin No. 4.	Heater.
Top Cap.	Anode.



Viewed from free end of pins.

PRICE 20/-

HIGH SLOPE H.F. PENTODE
FOR TELEVISION RECEIVERS

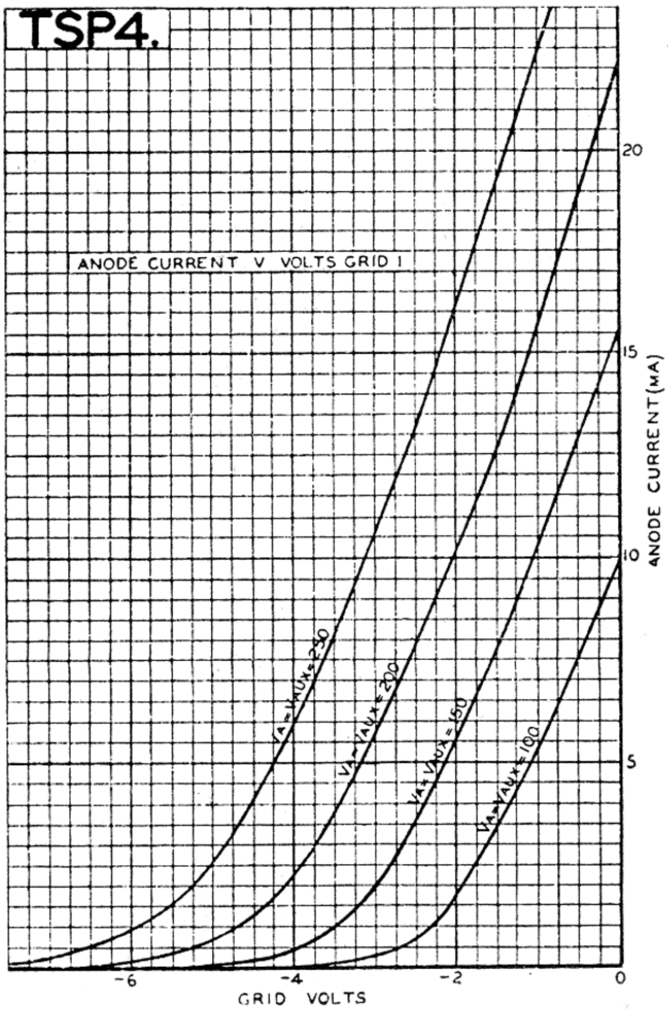
T.S.P.4

OPERATING CHARACTERISTICS.

Heater Voltage	4·0 V.
Heater Current	1·3 A.
Max. Anode Voltage	250 V.
Max. Aux. Grid Voltage ..	250 V.

APPLICATION.

A general purpose valve for use as high frequency or intermediate frequency amplifier, and as an output valve operating the cathode ray tube in Television receivers.



CHARACTERISTICS.

At Anode Volts	250
Aux. Grid Volts	250
Control Grid Volts	0
Mutual Conductance ..	7·1 mA/V.

BASE.

Standard 7-pin base, for connections see page 110.

BULB FINISH.

This valve is supplied with a metallised bulb.

PRICE 17/6

4687 NEON STABILISING TUBE

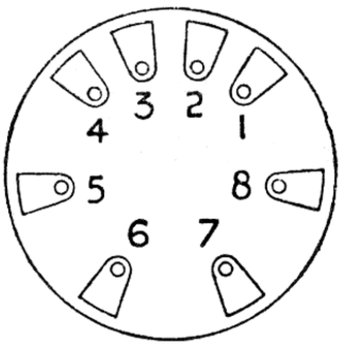
OPERATING CHARACTERISTICS.

Burning Voltage	90–100 V.
Striking Voltage	100–110 V.
Extinction Voltage	80 V. (approx.)
Maximum Average Current	20 mA.
Maximum Peak Current	45 mA.
Lower Current Limit for Stabilisation ..	4 mA. (approx.)
A.C. Resistance at 20 mA rest current	165 ohms. (approx.)
D.C. Resistance at 20 mA rest current	4,500–5,000 ohms.

APPLICATIONS.

Voltage regulating device for use in mains receivers, measuring instruments, signal generators, special amplifiers and any instrument demanding a constant voltage supply.

BASE CONNECTIONS.



Viewed from underside of valve base.

The electrodes are brought out to contacts 5 and 8.

Full details of the method of application of these tubes may be obtained from the Technical Service Department of the Mullard Wireless Service Co., Ltd.

PRICE 7/6

MULLARD CATHODE RAY TUBES

Type.	Base.	Approx. Screen Diameter.	Fluorescent Colour.	Deflection and Focussing.	Pages.
E40–G3	"P"	3 inches	Green	Electrostatic	64–65
4002	9-pin	4 ,,	,,	,,	66–67
4002A	9 ,,	4 ,,	Blue	,,	66–67
A41–G4	9 ,,	4 ,,	Green	,,	68–69
A41–B4	9 ,,	4 ,,	Blue	,,	68–69
E41–G4	9 ,,	4 ,,	Green	,,	70–71
E41–B4	9 ,,	4 ,,	Blue	,,	70–71
E42–G6	12-contact	6 ,,	Green	,,	72–73
E42–B6	12 ,,	6 ,,	Blue	,,	72–73
E46–G10	12 ,,	10 ,,	Green	,,	74–75
E46–B10	12 ,,	10 ,,	Blue	,,	74–75
E46–12	12 ,,	12 ,,	White	,,	76–77
M46–12	—	12 ,,	,,	Electro-Magnetic	78
M46–15	—	15 ,,	,,	,, ,,	79

E40-G3 OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tube type E40–G3 is of the high vacuum double electrostatic type. It is particularly suitable as an indicating or measuring instrument or as a means of investigating both high and low frequency phenomena.

The screen is approximately 3 inches in diameter and the fluorescent colour is green. Owing to the small bulb size and low operating voltages, this tube is well suited for use in portable oscillograph equipment.

TECHNICAL DATA.

Operating Conditions.

Heater Voltage (A.C. or D.C.)	4·0 V.
Heater Current	1·0 A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–30 V.
(Value adjusted to give required light intensity)	
Second Anode Voltage—	
Maximum	800 V.
Working Value	500–800 V.
First Anode Voltage—	
Maximum	300 V.
Working Value	140–200 V.

Deflection Sensitivity.

Plates nearest cathode	·30–·19 mm/V.
Plates nearest screen	·20–·12 mm/V.

Inter-electrode Capacities.

Grid to all other Electrodes	6·7 µµF.
Inter-plate Capacity D1–D1′	2·9 µµF.
Inter-plate Capacity D2–D2′	3·7 µµF.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £3 . 10 . 0

CATHODE RAY TUBE

E40-G3

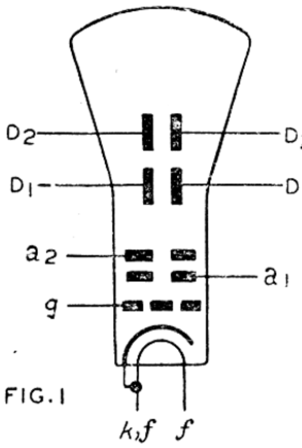


FIG. 1

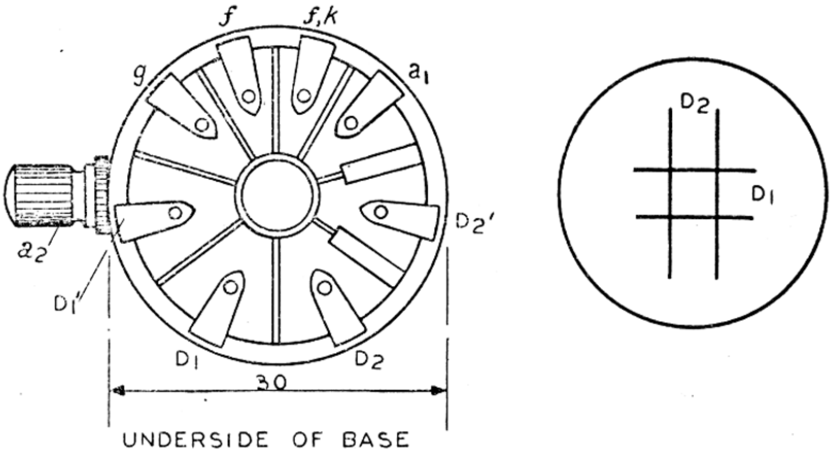


FIG. 2

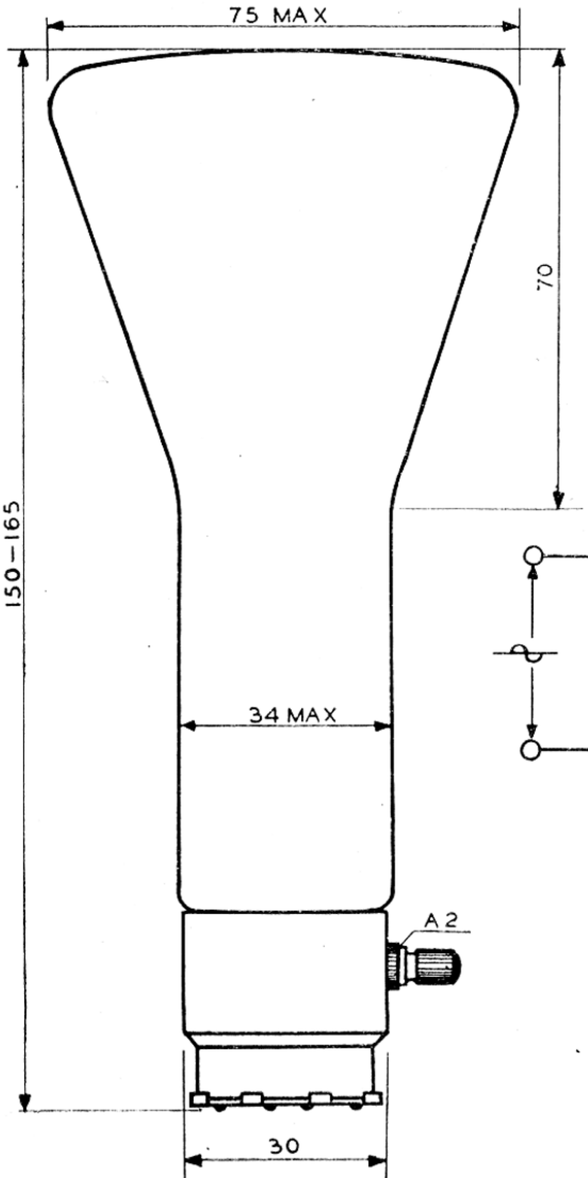


FIG. 3

DIMENSIONS IN M/M

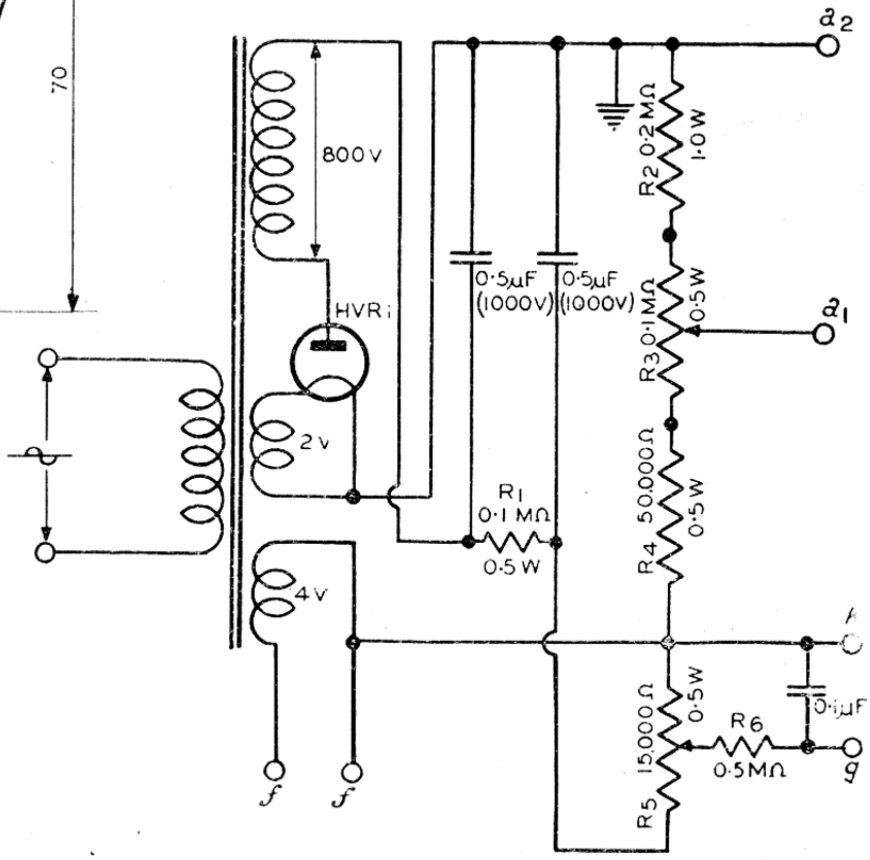


FIG 4

4002-4002A OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tubes types 4002 and 4002A are of the high vacuum double electrostatic type, and are therefore suitable for oscillographic use for investigating high or low frequency phenomena.

The fluorescent screen is approximately 4 inches in diameter. The type 4002 tube gives a green image suitable for visual observation. When it is desired to make photographic records the type 4002A should be employed. This tube has a screen which produces a blue violet image of high actinic value.

TECHNICAL DATA.

Operating Conditions.	
Heater Voltage (A.C. or D.C.)	4·0 V.
Heater Current	1·0 A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–45 V.
(Value adjusted to give required light intensity)	
Second Anode Voltage—	
Maximum	1,000 V.
Working Value	1,000 V.
First Anode Voltage—	
Maximum	600 V.
Working Value	200 V.
Deflection Sensitivity.	
Plates nearest cathode	·49 mm/V.
Plates nearest screen	·39 mm/V.
Inter-electrode Capacities.	
Grid to all other Electrodes	10 $\mu\mu$F.
Inter-plate Capacity D_1–D_1'	2 $\mu\mu$F.
Inter-plate Capacity D_2–D_2'	2 $\mu\mu$F.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £6 . 15 . 0

OSCILLOGRAPH TUBE

4002-4002A

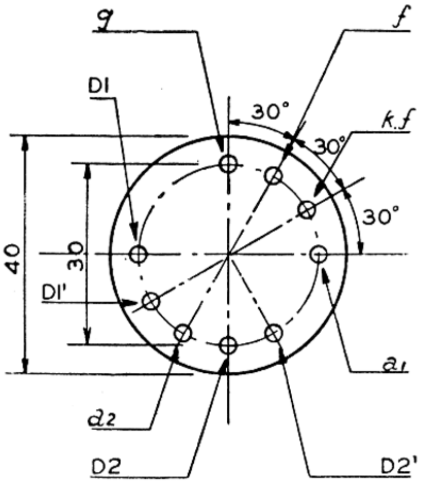


FIG 1

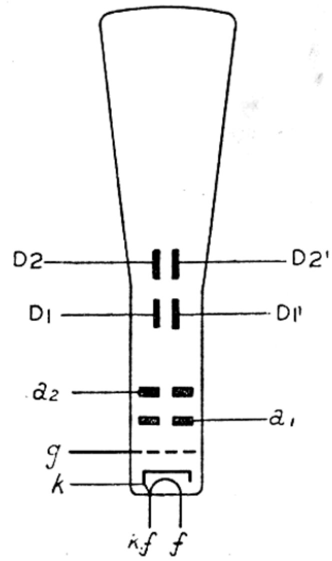


FIG 2

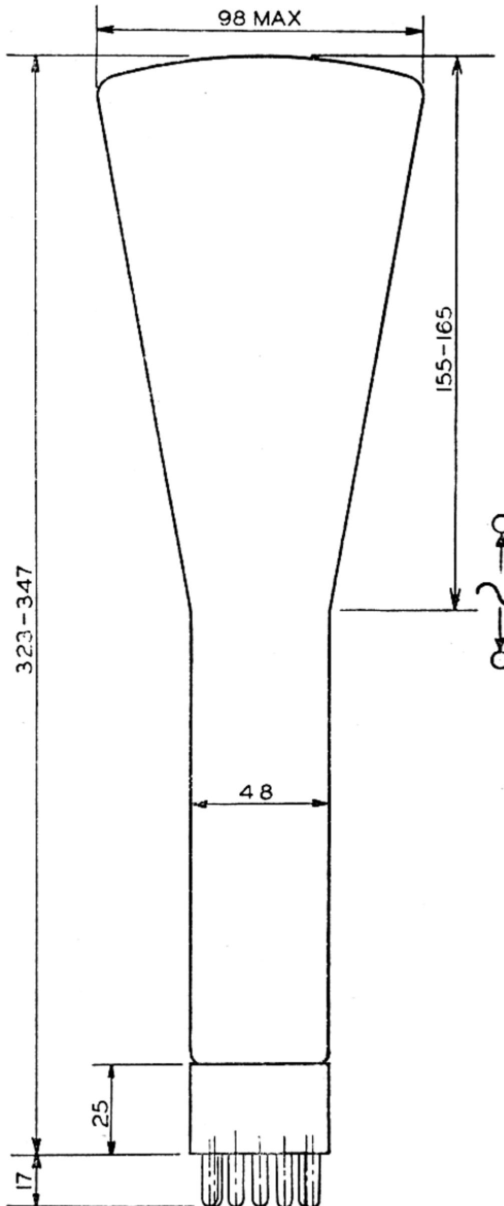


FIG 3

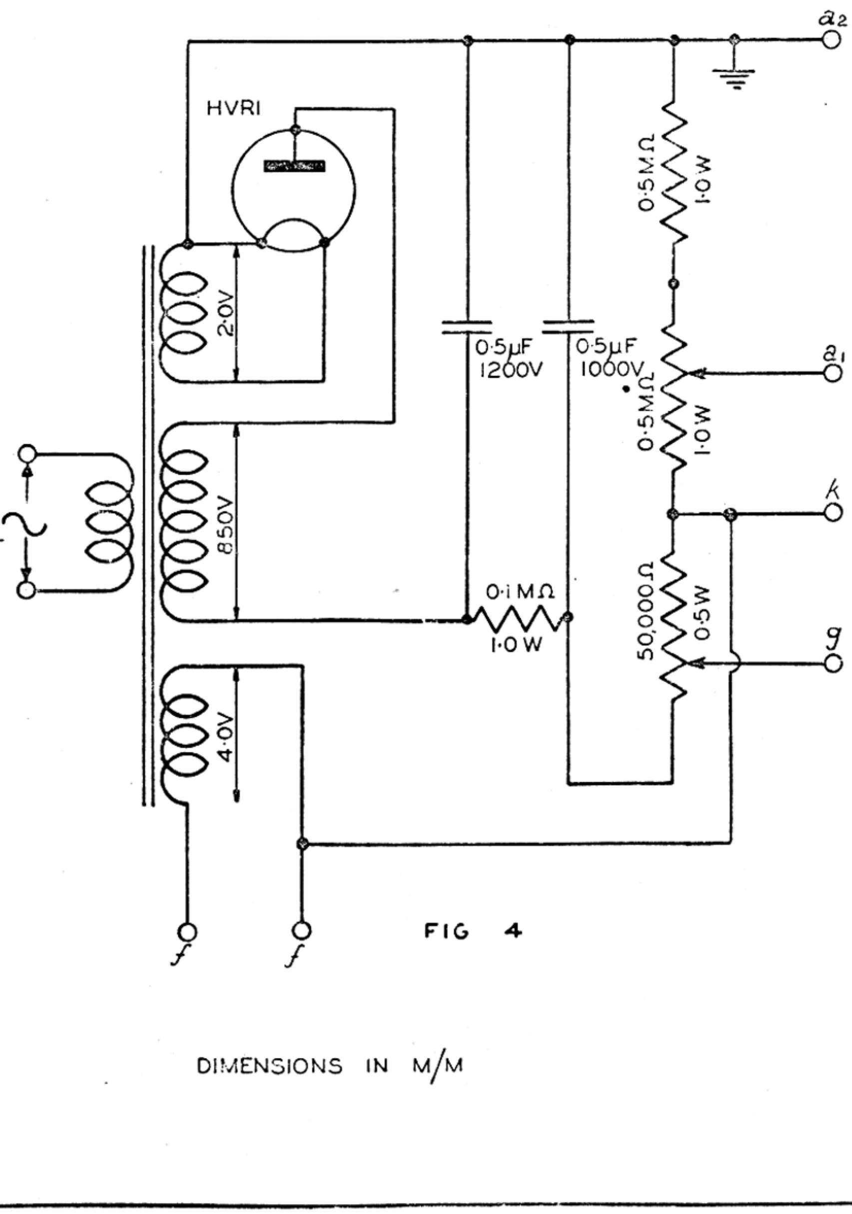


FIG 4

DIMENSIONS IN M/M

A41-G4/B4 OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tubes types A41–G4/B4 are of the high vacuum double electrostatic type and are, therefore, suitable for oscillographic use for investigating high or low frequency phenomena. A special electrode assembly is employed which enables the pair of plates nearer the screen to be used with a non-symmetrical deflection circuit, without introducing trapesium distortion.

The fluorescent screen is approximately 4 inches in diameter. The type A41–G4 tube gives a green image suitable for visual observation. When it is desired to make photographic records the type A41–B4 should be employed. This tube has a screen which produces a blue-violet image of high actinic value.

TECHNICAL DATA.

Operating Conditions.

Heater Voltage (A.C. or D C)	4·0V.
Heater Current	1·0A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–40V.
(Value adjusted to give required light intensity)	
Second Anode Voltage—	
Maximum	1,200V.
Working Value	1,000V.
First Anode Voltage—	
Maximum	500V.
Working Value	400V.

Deflection Sensitivity.

Plates nearest cathode	·39 mm/V.
Plates nearest screen (with non-symmetrical circuit)	·28 mm/V.

Inter-Electrode Capacities.

Grid to all other Electrodes	6·5 μμF.
Inter-plate Capacity D1–D1′	4·5 μμF.
Inter-plate Capacity D2–D2′	5·5 μμF.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

Note.—The Deflection Plate D2′ should be connected direct to the Second Anode a2.

PRICE £6.15.0

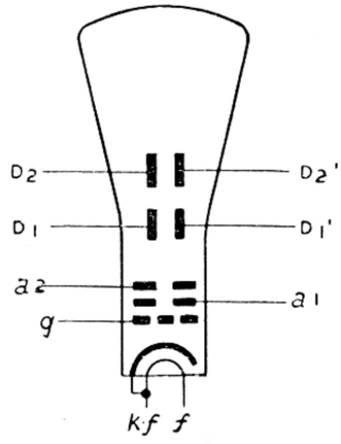


FIG 1

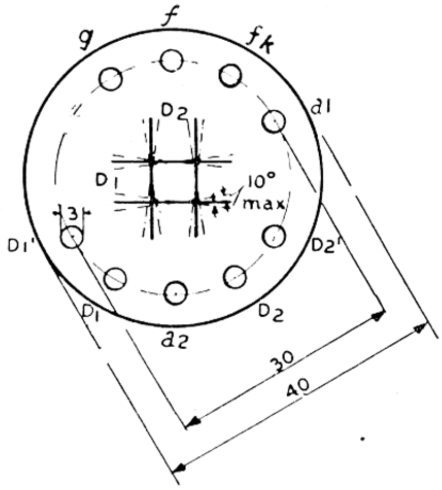


FIG 2

DIMENSIONS IN M/M

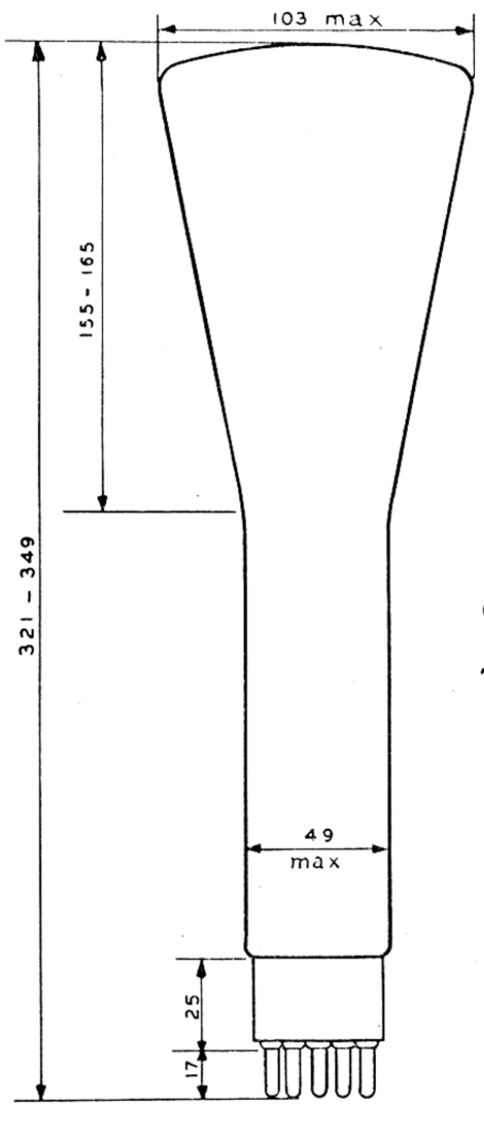


FIG 3

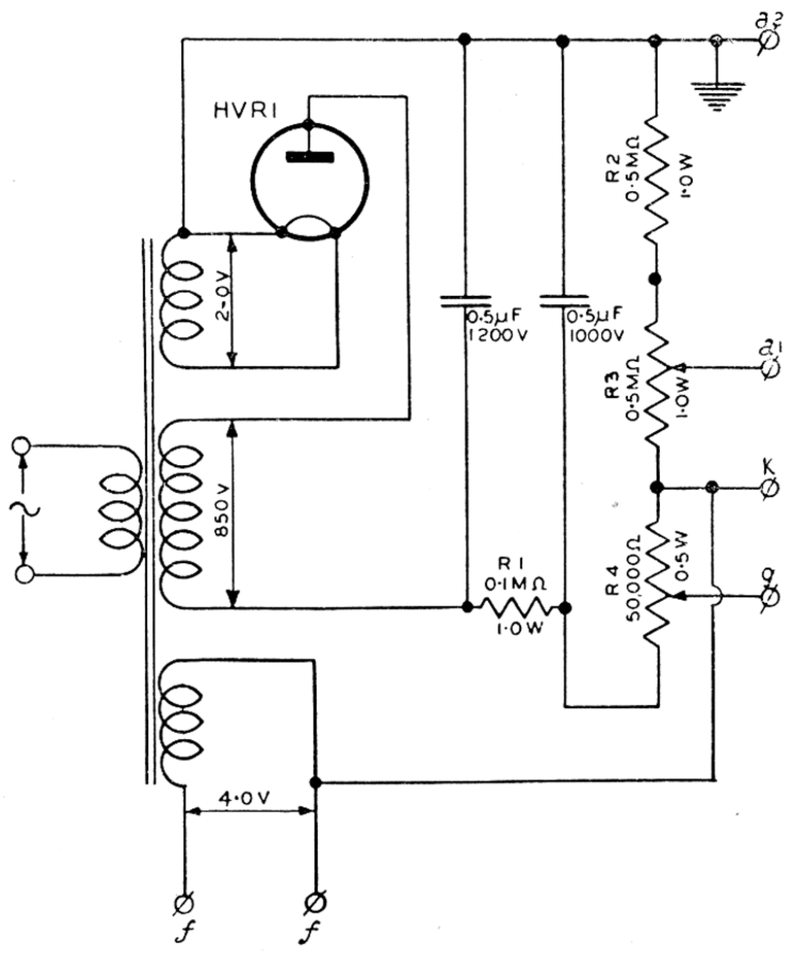


FIG 4

E41-G4/B4 OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tube types E41–G4/B4 are of the high vacuum double electrostatic type and are, therefore, suitable for oscillographic use for investigating high or low frequency phenomena.

The fluorescent screen is approximately 4 inches in diameter. The type E41–G4 tube gives a green image suitable for visual observation. When it is desired to make photographic records the type E41–B4 should be employed. This tube has a screen which produces a blue-violet image or high actinic value.

TECHNICAL DATA.

Operating Conditions.

Heater Voltage (A.C. or D.C.)	4·0V.
Heater Current	1·0A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–40V
(Value adjusted to give required light intensity)	

Second Anode Voltage—

Maximum	1,200V.
Working Value	1,000V.

First Anode Voltage—

Maximum	500V.
Working Value	400V.

Deflection Sensitivity.

Plates nearest cathode	·39 mm/V.
Plates nearest screen	·28 mm/V.

Inter-Electrode Capacities.

Grid to all other Electrodes	6·5 $\mu\mu$F.
Inter-plate Capacity D1–D1′	4·5 $\mu\mu$F.
Inter-plate Capacity D2–D2′	5·5 $\mu\mu$F.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £6.15.0

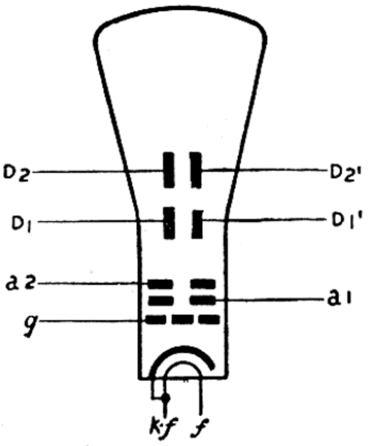


FIG 1

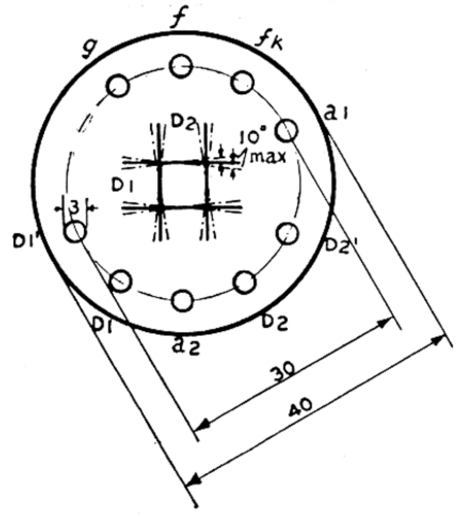


FIG 2

DIMENSIONS IN M/M

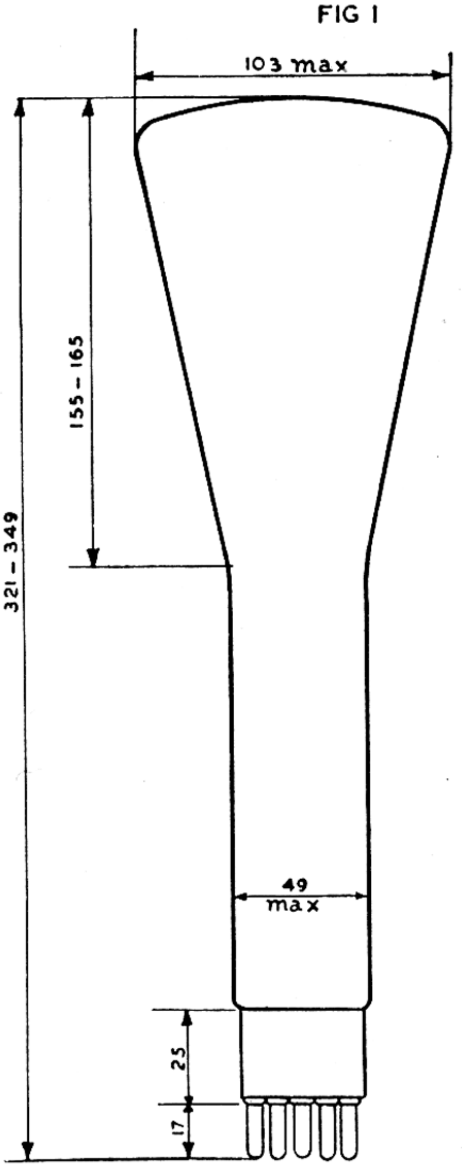


FIG 3

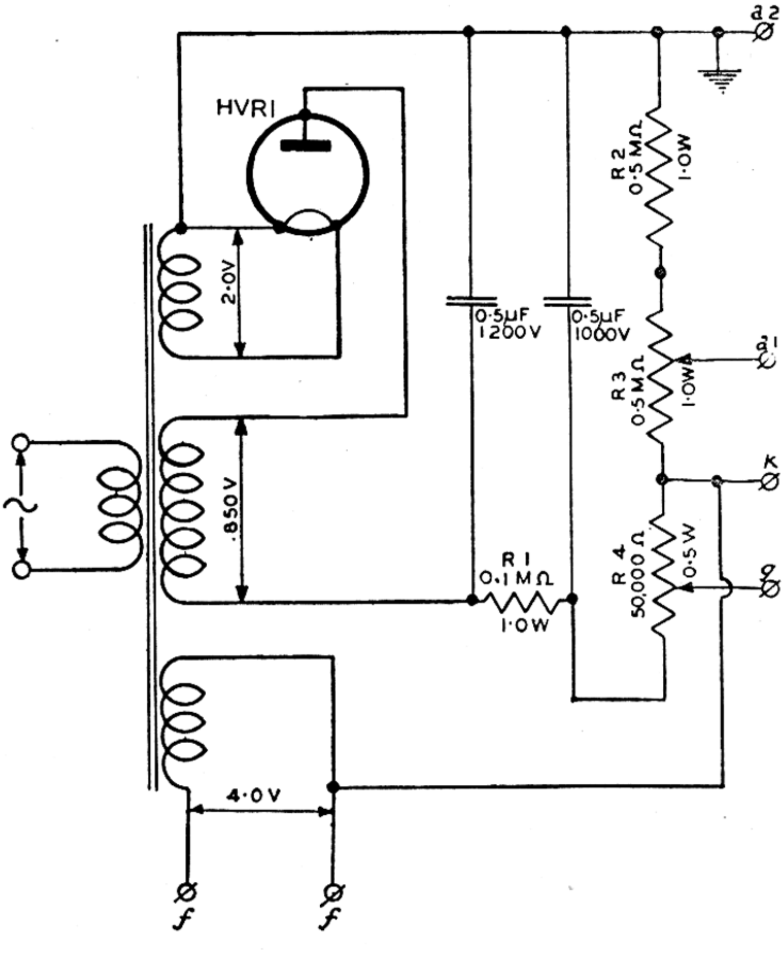


FIG 4

E42-G6/B6 OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tubes types E42–G6 and E42–B6 are of the high vacuum double electrostatic type and are, therefore, suitable for oscillographic use for investigating high or low frequency phenomena.

The fluorescent screen is approximately 6 inches in diameter. The type E42–G6 tube gives a green image suitable for visual observation. When it is desired to make photographic records the type E42–B6 should be employed. This tube has a screen which produces a blue-violet image of high actinic value.

TECHNICAL DATA.

Operating Conditions.	
Heater Voltage (A.C. or D.C.)	4·0 V.
Heater Current	1·0 A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–35 V.
(Value adjusted to give required light intensity)	
Second Anode Voltage—	
Maximum	2,000 V.
Working Value	1,000–2,000 V.
First Anode Voltage—	
Maximum	600 V.
Working Value	200–400 V.
Deflection Sensitivity.	
Plates nearest cathode	·54–·27 mm/V.
Plates nearest screen	·40–·20 mm/V.
Inter-electrode Capacities.	
Grid to all other Electrodes	12 μμF.
Inter-plate Capacity D1–D1′	6 μμF.
Inter-plate Capacity D2–D2′	7 μμF.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £8 . 8 . 0

OSCILLOGRAPH TUBE

E42-G6/B6

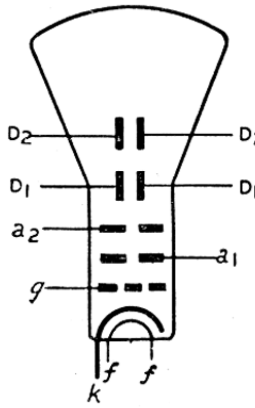


FIG 1

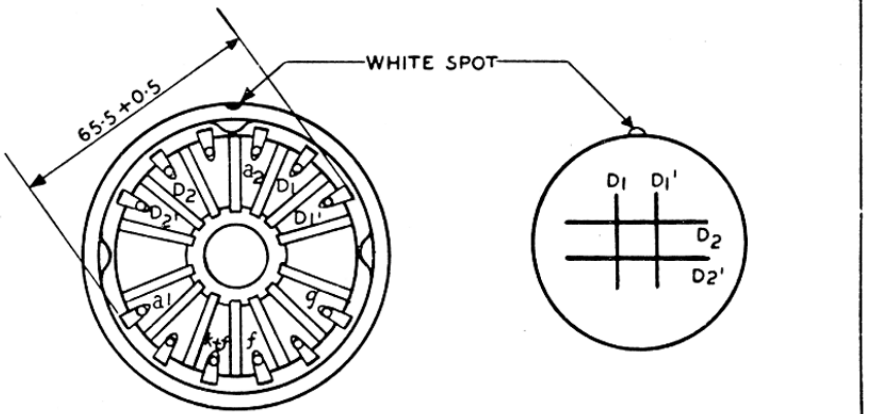


FIG 2

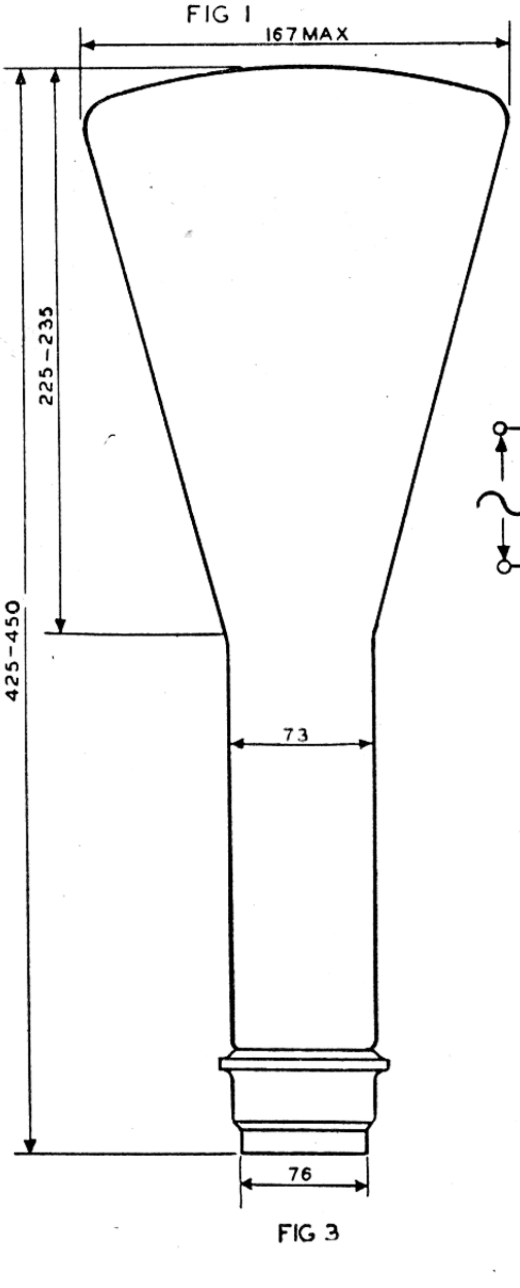


FIG 3

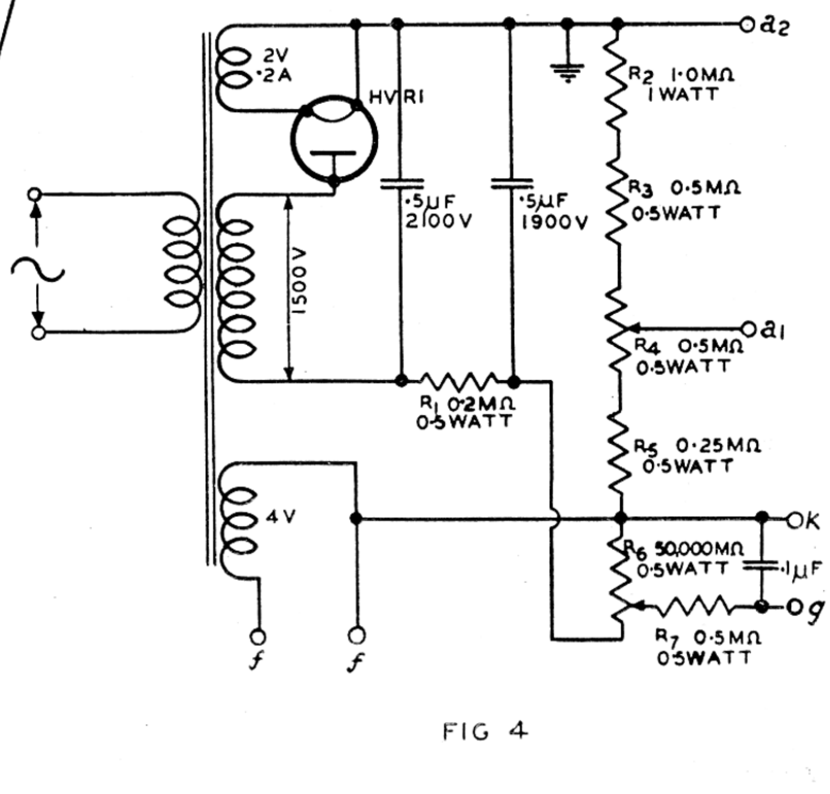


FIG 4

DIMENSIONS IN M/M

E46-G10/B10 OSCILLOGRAPH TUBE

GENERAL DESCRIPTION.

Cathode ray tubes types E46–G10/B10 are of the high vacuum double electrostatic type and are, therefore, suitable for oscillographic use for investigating high or low frequency phenomena.

The fluorescent screen is approximately 10 inches in diameter. The type E46–G10 tube gives a green image suitable for visual observation. When it is desired to make photographic records the type E46–B10 should be employed. This tube has a screen which produces a blue violet image of high actinic value.

TECHNICAL DATA.

Operating Conditions.	
Heater Voltage (A.C. or D.C.)	4·0 V.
Heater Current	1·0 A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–60 V.
(Value adjusted to give required light intensity)	
Third Anode Voltage—	
Maximum	5,000 V.
Working Value	4,000–5,000 V.
Second Anode Voltage—	
Maximum	1,700 V.
Working Value	1,100–1,400 V.
First Anode Voltage—	
Maximum	250 V.
Working Value	250 V.
Deflection Sensitivity.	
Plates nearest cathode	·16–·13 mm/V.
Plates nearest screen	·14–·11 mm/V.
Inter-electrode Capacities.	
Grid to all other Electrodes	15·0 μμF.
Inter-plate Capacity D1–D1′	5·5 μμF.
Inter-plate Capacity D2–D2′	6·5 μμF.

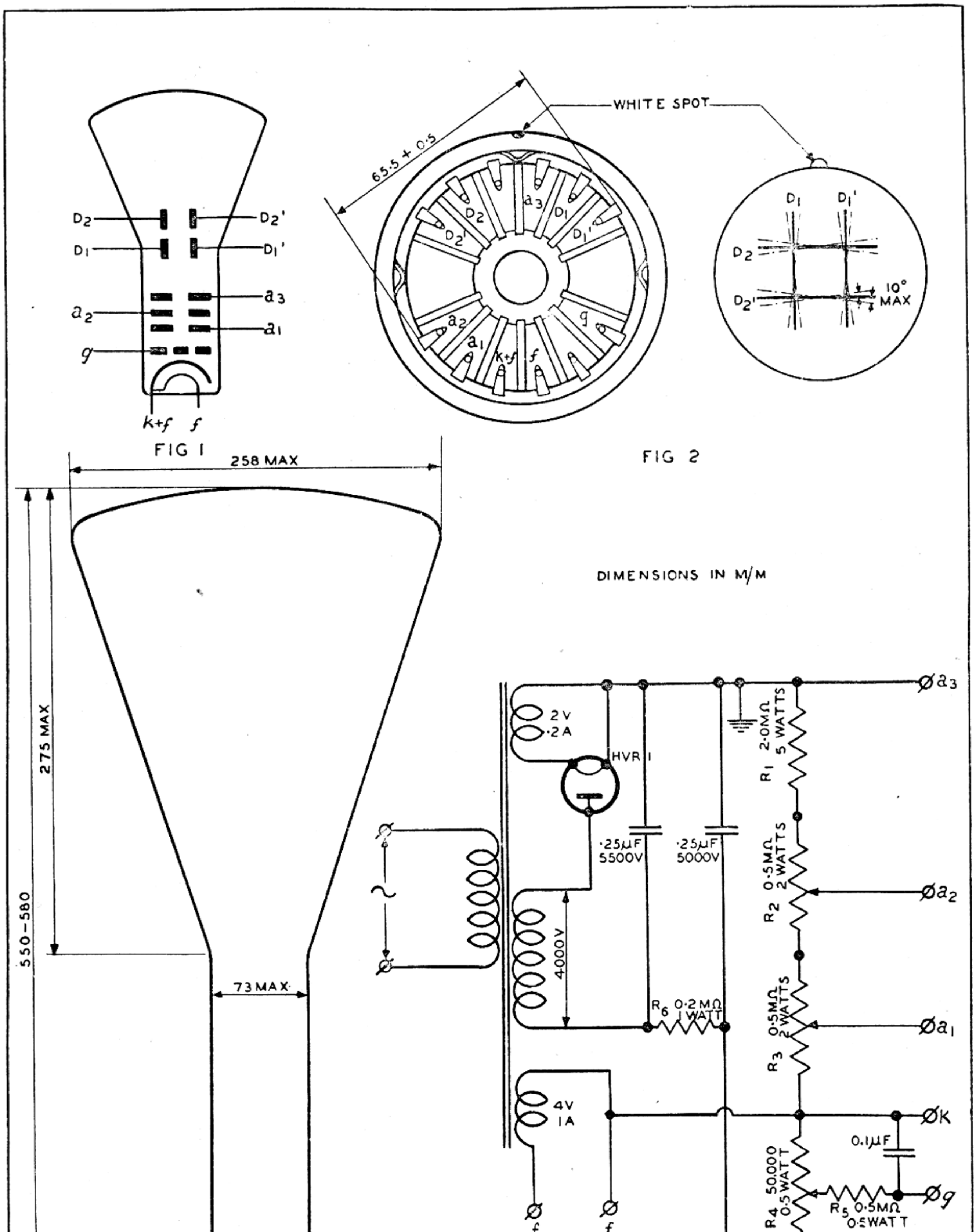
Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £12.12.0

OSCILLOGRAPH TUBE

E46-G10/B10



E46-12 TELEVISION TUBE

GENERAL DESCRIPTION.

Cathode ray tube type E46–12 is of the high vacuum double electrostatic type. It has been specially designed for television reception.

The fluorescent screen is approximately 12 inches in diameter and gives a black and white picture.

Owing to the special screen construction, an image of great brilliance is readily obtainable.

TECHNICAL DATA.

	V.
Operating Conditions.	
Heater Voltage (A.C. or D.C.)	4·0A. (approx.)
Heater Current	1·0
Cathode internally connected to Heater.	
Negative Grid Voltage	0–60 V.
(Valve adjusted to give required light intensity)	
Third Anode Voltage—	
Maximum	5,000 V.
Working Value	4,000–5,000 V.
Second Anode Voltage—	
Maximum	1,700 V.
Working Value	1,100–1,400 V.
First Anode Voltage—	
Maximum	250 V.
Working Value	250 V.
Deflection Sensitivity.	
Plates nearest cathode	·21–·17 mm/V.
Plates nearest screen	·16–·13 mm/V.
Inter-electrode Capacities.	
Grid to all other Electrodes	15·0 μμF.
Inter-plate Capacity D1–D1′	5·5 μμF.
Inter-plate Capacity D2–D2′	6·5 μμF.

Connections.

Figs. 1 and 2 show the connections to the electrodes and Fig. 4 a suitable circuit for the H.T. supply unit.

PRICE £15.15.0

'TELEVISION TUBE'

E46-12

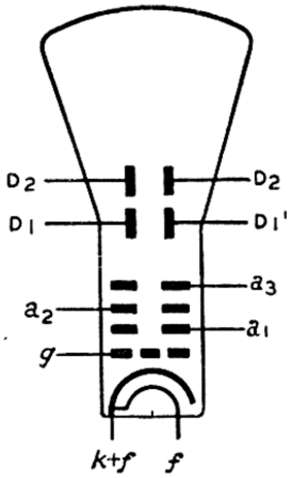


FIG 1

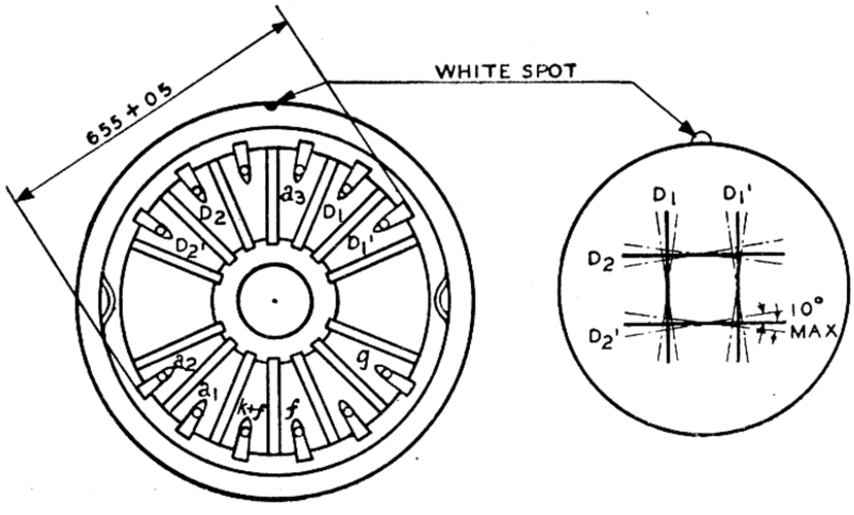


FIG 2

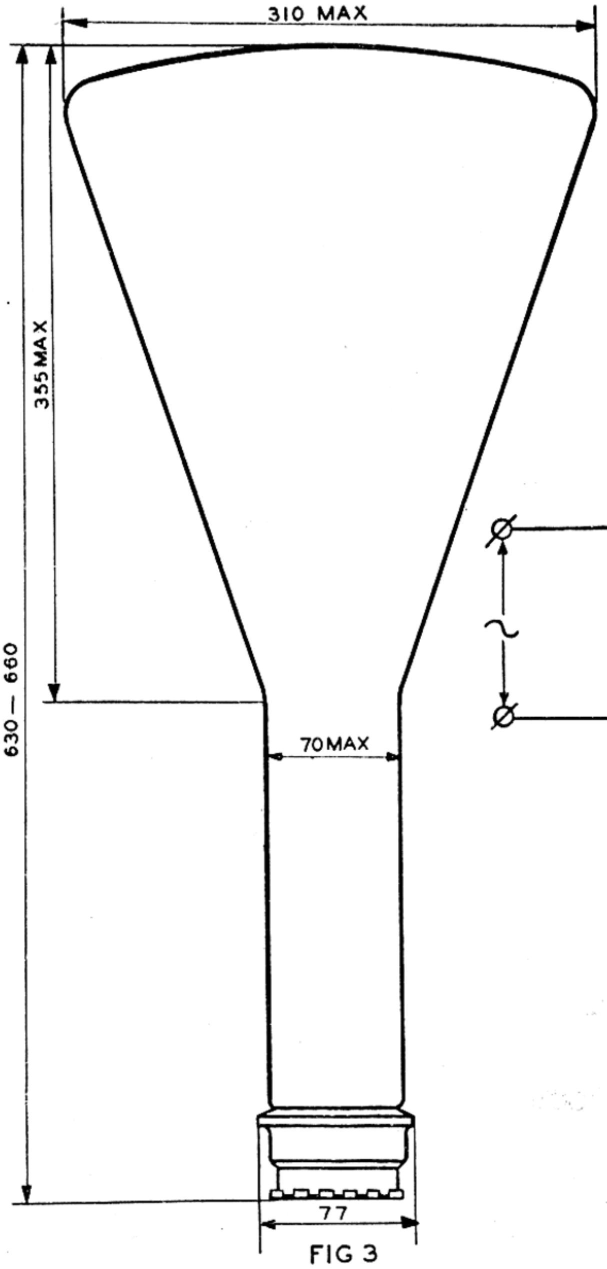


FIG 3

DIMENSIONS IN M/M

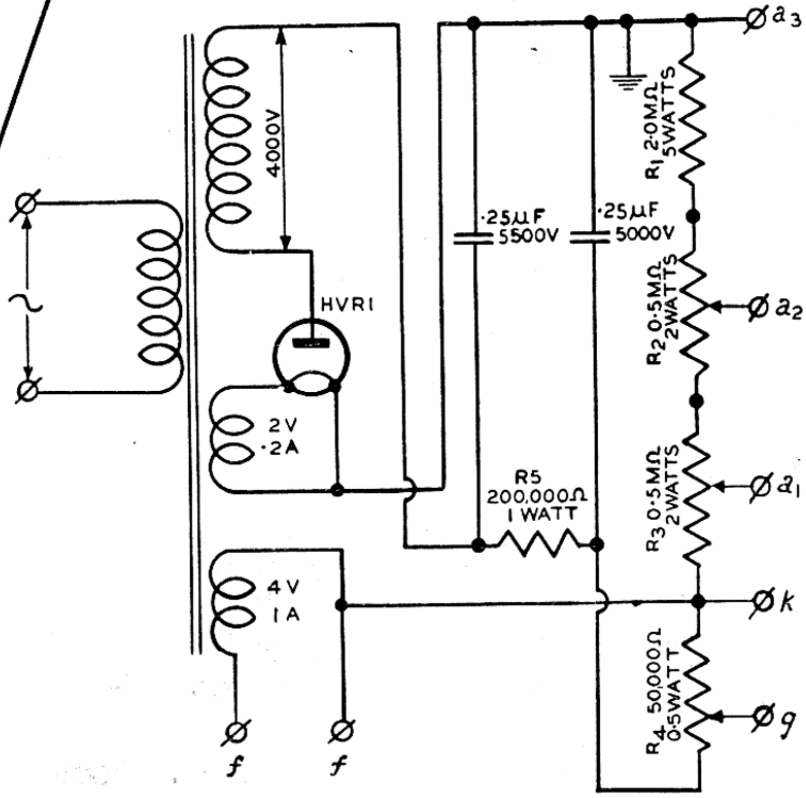


FIG 4

M46-12 TELEVISION TUBE

GENERAL DESCRIPTION.

Cathode ray tube type M46–12 is of the high vacuum fully electro-magnetic type. It has been specially designed for television reception.

The fluorescent screen is approximately 12 inches in diameter and gives a black and white picture.

Owing to the special screen construction an image of great brilliance is readily obtainable.

TECHNICAL DATA.

Operating Conditions.

Heater Voltage (A.C. or D.C.) .. .. .. 4·0 V.

Heater Current .. .. 1·0 A. (approx.)

Cathode internally connected to Heater.

Negative Grid Voltage .. .. 0–60 V.

(Value adjusted to give required light intensity)

Second Anode Voltage—

Maximum .. .. 5,000 V.

Working Value .. .. 4,000–5,000 V.

First Anode Voltage—

Maximum .. .. 250 V.

Working Value .. .. 250 V.

Maximum electro-magnetic deflection sensitivity $\frac{13L}{\sqrt{Va_2}}$ mm. per Gauss.

(Where L is the length of deflection zone in millimeters and Va_2 the second anode voltage)

Ampere turns for focussing coil .. .. .. 500 A/T.

PRICE £12 . 12 . 0

TELEVISION TUBE

M46-15

GENERAL DESCRIPTION.

Cathode ray tube type M46–15 is of the high vacuum fully electrc-magnetic type. It has been specially designed for television reception.

The fluorescent screen is approximately 15 inches in diameter and gives a black and white picture.

Owing to the special screen construction an image of great brilliance is readily obtainable.

TECHNICAL DATA.

OPERATING CONDITIONS.

Heater Voltage (A.C. or D.C.)	4·0 V.
Heater Current	1·0 A. (approx.)
Cathode internally connected to Heater.	
Negative Grid Voltage	0–60 V.
(Value adjusted to give required lighting intensity)	
SECOND ANODE VOLTAGE—	
Maximum	5,000 V.
Working Value	4,000–5,000 V.
FIRST ANODE VOLTAGE—	
Maximum	250 V.
Working Value	250 V.
Maximum electro-magnetic deflection sensitivity	$\frac{14L}{\sqrt{Va2}}$ mm. per Gauss.
(Where L is the length of deflection zone in millimeters and Va2 the second anode voltage)	
Ampere turns for focussing coil	500 A/T.

PRICE £15 . 15 . 0

CHARACTERISTICS
AND
OPERATING DATA

In the earlier part of this catalogue current types of Mullard receiving valves are described in detail.

The tables on the following pages are intended as a rapid guide, not only to the latest valves but also to earlier types which may be required for re-valving.

MULLARD 2-VOLT VALVES FOR BATTERY SETS

REFERENCES:

If = Filament or Heater Current. m = Amplification Factor. Va = Anode Voltage. Vaux = Auxiliary Grid Voltage.
ra = Anode Impedance. gm = Mutual Conductance. Vs = Screen Voltage. Ia = Anode current.

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
F.C.2	Octode Frequency Changer ..	7-pin	Met.	0·1	—	—	—	150	70	0	0·8	—	14/-
F.C.2A	Octode Frequency Changer ..	7-pin	Met.	0·12	—	—	—	135	45	0·5	0·7	—	14/-
V.P.2	Variable-mu H.F. Pentode ..	7-pin	Met.	0·18	750,000	—	1·75 0·017	150 150	150 150	0 7·0	3·75 0·1	—	11/-
V.P.2B	Hexode Mixer	7-pin	Met.	0·14	—	—	—	135	60	0·5	1·6	—	11/-
S.P.2	H.F. Pentode	7-pin	Met.	0·18	500,000	1,100	2·2 1·5	150 100	150 100	0 0	3·6 1·5	—	11/-
P.M.12A	Screened Tetrode	4-pin	Met. or Clear	0·18	330,000*	500*	1·5*	150 100	90 60	0 0	2·9 1·2	—	11/-
P.M.12	Screened Tetrode	4-pin	Met. or Clear	0·15	180,000†	200†	1·1†	150	75	—	4·25	—	11/-
P.M.12M	Variable-mu Screened Tetrode	4-pin	Met. or Clear	0·18	—	—	1·4‡ 0·014‡	150 150	90 90	0 7·0	2·5 0·1	—	11/-
2D2	Double-diode-detector ..	5-pin	Met.	0·09	—	—	—	—	—	—	—	—	5/6
T.D.D.2A	Double-diode-triode	5-pin	Met.	0·12	26,000	31·0	1·2	125 150	— —	1·5 1·5–3·0	1·3 1·4	—	9/-

* At Va = 125; Vs = 75; Vg = 0. † At Va = 150; Vs = 75; Vg = 0. ‡ At Va = 150; Vs = 90.

MULLARD 2-VOLT VALVES FOR BATTERY SETS—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
T.D.D.2	Double-diode-triode	5-pin	Met.	0·1	12,000	16·5	1·4	100 125 150	— — —	3·0 4·5 5·5	1·7 2·0 2·5	—	9/-
P.M.1A	High Impedance Triode ..	4-pin	Clear	0·1	41,600	50	1·2	100 125 150	— — —	0·5 0·75 1·0	0·5 0·75 1·0	—	4/9
P.M.1HF	Medium Impedance Triode ..	4-pin	Clear	0·1	22,500	18	0·8	100 125 150	— — —	1·5–3·0 3·0 3·0–4·5	0·9 1·2 1·5	—	4/9
P.M.1HL	Medium Impedance Triode ..	4-pin	Met. or Clear	0·1	20,000	28	1·4	100 125 150	— — —	1·5 1·5–3·0 1·5–3·0	1·0 1·5 2·0	—	4/9
P.M.2HL	Medium Impedance Triode ..	4-pin	Met. or Clear	0·1	21,500	30	1·4	100 125 150	— — —	1·5 2·0 2·5	1·0 1·5 2·0	—	4/9
P.M.1LF	Medium Impedance Triode ..	4-pin	Clear	0·1	12,000	11	0·9	100 125 150	— — —	4·5 6·0 7·5	2·5 3·0 4·0	—	4/9
P.M.2DX	Medium Impedance Triode ..	4-pin	Met. or Clear	0·1	12,000	18	1·5	100 125 150	— — —	1·5–3·0 3·0 3·0–4·5	2·0 3·0 4·0	—	4/9
P.M.2DL	Driver for Class B.	4-pin	Met.	0·1	12,000	18	1·5	100 135	— —	3·0 4·5	1·5 2·0	—	4/9
P.M.2A	Output Triode..	4-pin	Clear	0·2	3,600	12·5	3·5	100 125 150	— — —	4·0 5·0 7·0	4·0 5·0 6·0	7,000	6/-
P.M.2	Output Triode..	4-pin	Clear	0·2	4,400	7·5	1·7	100 125 150	— — —	7·5 9·0–10·5 12·0	4·0 5·3 6·6	9,000	6/-

MULLARD 2-VOLT VALVES FOR BATTERY SETS—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.202	Super-power Triode .. .. (Also replaces P.M.252)	4-pin	Clear	0·2	2,000	7	3·5	100 125 150	— — —	7·5 9·0–10·5 12·0–15·0	10·0 14·0 14·0	3,700	10/-
P.M.22	Output Pentode	4-pin or 5-pin	Clear	0·2	—	—	1·3	100 125 150	100 125 150	6·0 8·0 10·0	9·0 12·0 15·0	8,000	16/6
P.M.22A	Output Pentode	4-pin or 5-pin	Clear	0·15	—	—	2·5	100 150	100 150	3·0 4·5	4·5 9·5	20,000	11/-
P.M.22C	Super-power Pentode	5-pin	Clear	0·3	—	—	3·0	150	150	20·0	27·0	8,000	13/6
P.M.22D	High Sensitivity Output Pentode	5-pin	Clear	0·3	—	—	4·0	135	135	2·4	5·0	24,000	13/6
P.M.2B	Class "B" Double Triode ..	7-pin	Clear	0·2	—	—	2·5†	150	—	—	—	14,000	11/-
P.M.2BA	Class "B" Double Triode ..	7-pin	Clear	0·2	—	—	2·15	150	—	4·5	—	14,000	11/-
Q.P.22A	Q.P.P. Double Pentode ..	9-pin	Clear	0·45	—	—	4·0	150	150	13·5	4·0*	16,000	17/6

* Total Quiescent Current. † At Va = 120 ; Vg = 0.

MULLARD 4-VOLT VALVES FOR BATTERY SETS

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.14	Screened Tetrode	4-pin	Clear	0·075	230,000	200	0·87	150	75	0	2·75	—	20/-
P.M.3	Medium Impedance Triode ..	4-pin	Clear	0·075	13,000	14	1·05	100 125 150	— — —	3·5 4·5 6·0	1·6 2·2 2·8	—	8/6
P.M.4DX	Medium Impedance Triode ..	4-pin	Clear	0·1	7,500	15	2·0	100 125 150	— — —	1·5–3·0 3·0–4·5 4·5–6·0	1·5 2·0 2·5	—	8/6
P.M.4	Output Triode..	4-pin	Clear	0·1	4,000	8	2·0	100 125 150	— — —	5·0 7·0 8·0	5·5 7·5 10·0	9,000	10/6
P.M.254	Super-power Triode	4-pin	Clear	0·2	2,150	6·5	3·0	100 150 200	— — —	9·0 15·0 21·0	6·0 10·0 15·0	6,000	13/6

MULLARD 6-VOLT VALVES FOR BATTERY SETS

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.5X	Medium Impedance Triode ..	4-pin	Clear	0·075	14,700	17·5	1·2	100 125 150	— — —	1·5–3·0 3·0 3·0–4·5	1·2 1·6 2·0	—	8/6
P.M.6D	Medium Impedance Triode ..	4-pin	Clear	0·1	9,000	18·0	2·0	100 125 150	— — —	1·5–3·0 3·0–4·5 4·5	1·5 2·0 2·5	—	8/6
P.M.6	Output Triode..	4-pin	Clear	0·1	3,550	8·0	·25	100 125 150	— — —	6·0 7·5 9·0	4·5 7·0 9·5	8,000	10/6

MULLARD 6-VOLT VALVES FOR BATTERY SETS—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.256	Super-power Triode	4-pin	Clear	0·25	1,850	6·0	3·25	100 150 200 250	— — — —	7·5–9·0 10·5–13·5 18·0–21·0 27·0	6·0 10·0 15·0 20·0	6,000	13/6
P.M.256A	Super-power Triode	4-pin	Clear	0·25	1,400	3·6	2·6	100 150 200	— — —	12·0 22·5 33·0	17·0 23·5 30·0	2,200	13/6
P.M.25	Output Pentode .. .. (also replaces P.M.26)	4-pin or 5-pin	Clear	0·10	—	—	1·6	100 125 150	100 125 150	9·0 12·0 15·0	6·0 8·0 9·0	8,000	17/6

MULLARD INDIRECTLY-HEATED A.C. MAINS VALVES

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
T.V.4	Tuning Indicator	P.†	Clear	0·3	—	—	—	250	—	—	—	—	10/6
T.H.4	Triode-hexode Frequency Changer	7-pin	Met.	1·0	—	—	1·0	250	70	1·5	4·0	—	15/-
T.H.4A	Triode-hexode Frequency Changer	7-pin	Met.	1·45	—	—	—	250	100	2·0	3·5	—	15/-
F.C.4	Octode Frequency Changer ..	7-pin	Met.	0·65	—	—	1·0	250	90	1·5	—	—	15/-
V.P.4	Variable-mu H.F. Pentode ..	5-pin or 7-pin	Met.	1·0	—	—	2·5* 0·025*	200 200	100 100	1·5 22·0	6·0 0·25	—	12/6
V.P.4A	Variable-mu H.F. Pentode ..	5-pin or 7-pin	Met.	1·2	—	—	3·27*	200	100	1·5	5·0	—	12/6

* At Va = 200; Vs = 100. † 8-side contact.

MULLARD INDIRECTLY-HEATED A.C. MAINS VALVES—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
V.P.4B	Variable-mu H.F. Pentode ..	7-pin	Met.	0·65	—	—	3·5‡	250	250	3·0	12·0	—	12/6
S.P.4	H.F. Pentode	5-pin 7-pin	Met. or Clear Met.	1·0	900,000*	2,700*	3·0*	200	100	1·5	4·5	—	12/6
S.P.4B	H.F. Pentode	7-pin	Met.	0·65	—	—	4·0‡	250	250	2·0	4·5	—	12/6
M.M.4V	Variable-mu Screened Tetrode	5-pin	Met.	1·0	—	—	2·5† 0·01†	200 200	110 110	1·5 40·0	6·0 0·15	—	12/6
V.M.4V	Variable-mu Screened Tetrode	5-pin	Met.	1·0	—	—	1·2* 0·005*	200 200	100 100	1·5 40·0	8·5 0·025	—	17/6
S.4V	Screened Tetrode	4-pin or 5-pin	Clear	1·0	909,000	1,000	1·1	200	75	1·0	1·5	—	17/6
S.4VA	Screened Tetrode	5-pin	Met. or Clear	1·0	500,000†	1,000†	2·0†	200	110	1·5	2·75	—	12/6
S.4VB	Screened Tetrode	5-pin	Met. or Clear	1·0	300,000†	750†	2·5†	200	110	1·5	5·0	—	12/6
2D.4A	Double-diode	5-pin	Met.	0·65	—	—	—	—	—	—	—	—	5/6
2D.4B	Double-diode with separate Cathodes	7-pin	Met.	0·35	—	—	—	—	—	—	—	—	5/6
S.D.4	Diode-tetrode	7-pin	Met.	1·0	—	—	3·0*	200	100	—	—	—	20/-
T.D.D.4	Double-diode-triode	7-pin	Met.	0·65	10,000	29	2·9	250	—	7·0	4·0	—	12/6

* At Va = 200 ; Vs = 100. † At Va = 200 ; Vs = 110. ‡ At Va = Vg2 = 250 ; Vg = 0.

MULLARD INDIRECTLY-HEATED A.C. MAINS VALVES—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	g m	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
994V	High Impedance Triode ..	5-pin	Met.	0·65	35,000	125	3·6	200	—	1·5	1·35	—	13/6
904V	High Impedance Triode ..	5-pin	Met. or Clear	0·65	20,600	72	3·5	150 200	— —	1·5 2·0	1·6 2·2	—	9/6
484V	Medium Impedance Triode ..	5-pin	Met.	1·0	21,800	48	2·2	200	—	3·0	2·8	—	13/6
354V	Medium Impedance Triode ..	5-Pin	Met. or Clear	0·65	10,500	40	3·8	250	—	4·5	6·5	—	9/6
244V	Medium Impedance Triode ..	5-pin	Met.	0·65	9,000	25	2·8	100 150 200	— — —	3·0 4·0 5·5	3·0 4·0 5·5	—	13/6
164V	Medium Impedance Triode ..	5-pin	Clear	0·65	3,640	16·4	4·5	100 150 200	— — —	4·5 6·5 8·5	5·5 9·5 13·0	—	14/-
154V	Medium Impedance Triode ..	4-pin	Clear	0·65	7,500	15	2·0	200	—	6·0–7·5	9·0	—	14/-
T.T.4	Low Impedance Triode (Replaces 104V) ..	5-pin	Clear	1·0	2,200	12	5·5	250	—	16·0	20·0	10,000	10/-
Pen.4VA	Output Pentode	5-pin or 7-pin	Clear	1·5	—	—	3·5	150 200 250	150 200 250	12·0 18·0 22·0	20·0 25·0 32·0	6,000	13/6

MULLARD INDIRECTLY-HEATED A.C. MAINS VALVES—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	gm	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
Pen.4VB	Output Pentode	7-pin	Clear	1·95	—	—	10·0	250	250	5·8	32·0	6,000	13/6
Pen. A4	Output Pentode	7-pin	Clear	1·95	—	—	10·0	250	250	5·8	32·0	8,000	13/6
Pen.B4	Output Pentode	7-pin	Clear	2·1	—	—	8·0	250	275	14·0	72·0	3,500	18/6
Pen.4DD	Double-diode Output Pentode	7-pin	Clear	2·25	—	—	10·0	250	250	6·0	36·0	7,000	16/-
Pen.428	Output Pentode	7-pin	Clear	2·1	—	—	8·0	375*	275*	20·5*	62·0*	6,500*	25/-

* Data for 2xPen.428 used in Class "AB."

MULLARD DIRECTLY-HEATED OUTPUT VALVES FOR A.C. SETS

Vf = 4·0 V. unless otherwise stated.

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	gm	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
A.C.104	Triode	4-pin	Clear	1·0	2,850	10	3·5	150 175 200	— — —	10·0 12·0 14·0	8·5 9·75 11·0	6,000	16/-
A.C.064	Triode	4-pin	Clear	1·0	2,000	6·0	3·0	150 175 200	— — —	14·0 17·5 21·0	16·0 18·0 20·0	5,000	16/-
A.C.044	Triode	4-pin	Clear	1·0	950	6·4	6·8	150 200 250	— — —	16·0 22·0 29·0	33·0 40·0 48·0	2,500	12/6
A.C.042	Triode	4-pin	Clear	2·0V 2·0A	950	6·4	6·8	150 200 250	— — —	16·0 22·0 29·0	33·0 40·0 48·0	2,500	12/6
P.M.24	Pentode	4-pin or 5-pin	Clear	0·15	—	—	1·75	100 125 150	100 125 150	6·0 9·0 11·0	12·0 16·0 20·0	8,000	17/6

MULLARD DIRECTLY-HEATED OUTPUT VALVES FOR A.C. SETS—continued

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.24A	Pentode	5-pin	Clear	0·275	—	—	2·0	300	100 150 200	9·0 15·0 22·5	10·0 15·0 20·0	10,000	18/6
P.M.24M	Pentode	5-pin	Clear	1·0	—	—	3·0	250	150 200 250	9·0 12·0 18·0	20·0 30·0 30·0	8,000	13/6
P.M.24B	Pentode	5-pin	Clear	1·0	—	—	2·1	250 300 400	250 300 300	33·0 35·0 40·0	25·0 40·0 30·0	8,000	22/6
P.M.24C	Pentode	5-pin	Clear	1·0	—	—	3·0	400	200	28·0	30·0	12,000	22/6
P.M.24E	Pentode	5-pin	Clear	2·0	—	—	4·0	250 500	200 200	25·0 35·0	70·0 50·0	7,000	45/-
D.O.10	Triode	4-pin	Clear	6·0V 0·85A	2,850	2·4	0·85	200 300 400	— — —	60·0 90·0 130·0	17·0 25·0 25·0	6,000	25/-
D.O.20	Triode	4-pin	Clear	7·5V 1·1A	2,000	5·0	2·5	350 400 425	— — —	52·5 61·5 66·0	34·0 38·0 40·0	5,000	30/-
D.O.24	Triode	4-pin	Clear	2·0	1,390	9·0	6·5	200 300 400	— — —	13·0 24·0 34·0	40·0 50·0 63·0	4,000	25/-
D.O.25	Triode	4-pin	Clear	6·0V 1·1A	800	3·0	3·75	200 300 400	— — —	45·0 78·0 112·0	60·0 60·0 63·0	4,000	30/-
D.O.26	Triode	4-pin	Clear	2·0	600	3·8	6·3	200 300 400	— — —	40·0 63·0 92·0	38·0 50·0 63·0	4,000	25/-

MULLARD FULL-WAVE RECTIFIERS

Type.	Description.	Base.	Vf	If	Max. Va (r.m.s.)	Max. Rectified Output (mA).	Price.
D.W.2 ..	Directly-heated F.W. Rectifier	4-pin	4·0	1·0	250–0–250	60	10/6
D.W.3 ..	Directly-heated F.W. Rectifier	4-pin	4·0	2·0	350–0–350	120	10/6
D.W.4/350 ..	Directly-heated F.W. Rectifier	4-pin	4·0	2·0	350–0–350	120	10/6
D.W.4 ..	Directly-heated F.W. Rectifier	4-pin	4·0	2·0	500–0–500	120	15/–
D.W.4/500 ..	Directly-heated F.W. Rectifier	4-pin	4·0	2·0	500–0–500	120	15/–
I.W.2 ..	Indirectly-heated F.W. Rectifier	4-pin	4·0	1·2	250–0–250	60	10/6
I.W.3 ..	Indirectly-heated F.W. Rectifier	4-pin	4·0	2·4	350–0–350	120	10/6
IW4/350 ..	Indirectly-heated F.W. Rectifier	4-pin	4·0	2·0	350–0–350	120	10/6
I.W.4 ..	Indirectly-heated F.W. Rectifier	4-pin	4·0	2·4	500–0–500	120	15/–

MULLARD D.C. MAINS VALVES (DIRECTLY-HEATED)

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = 0.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
P.M.13	Screened Tetrode	4-pin 5-pin	Clear Met.	0·1	360,000	250	0·7	200	100	0	4·0	—	20/–
P.M.4DX	Medium Impedance Triode ..	4-pin	Clear	0·1	7,500	15	2·0	100 125 150	— — —	1·5–3·0 3·0–4·5 4·5–6·0	1·5 2·0 2·5	—	8/6
P.M.25	Output Pentode	4-pin or 5-pin	Clear	0·1	—	—	1·6	150	150	15·0	10·0	8,000	17/6

MULLARD D.C. MAINS VALVES (INDIRECTLY-HEATED)

Type.	Description.	Base.	Bulb Finish.	If.	Characteristics at Va = 100 ; Vg = o.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
					ra	m	gm						
V.P.20	Variable-mu H.F. Pentode ..	5-pin	Met.	0·18	—	—	2·5*	200	100	1·5	4·5	—	17/6
S.P.20	H.F. Pentode	5-pin	Met. or Clear	0·18	—	—	2·7*	200	100	1·5	4·5	—	17/6
S.G.20	Screened Tetrode	5-pin	Met.	0·18	375,000	750	2·0*	200	100	1·5	3·0	—	17/6
S.D.20	Diode-Tetrode..	7-pin	Met.	0·18	—	—	3·0	200	100	1·5	5·0	—	20/-
T.D.D.25	Double-diode-triode	7-pin	Met.	0·18	15,000	30	2·0	100 150 200	— — —	2·0 3·0 4·0	2·0 3·0 4·0	—	15/6
H.20	Medium Impedance Triode ..	5-pin	Met.	0·18	—	—	2·6	100 200	— —	0·75 1·5	0·75 1·0	—	13/6
H.L.20	Medium Impedance Triode ..	5-pin	Met.	0·18	14,000	35	2·5	150 200	— —	2·5 3·5	2·5 3·5	—	13/6
Pen. 20	Output Pentode	5-pin or 7-pin.	Clear	0·18	—	—	2·5	200	200	15·0	25·0	8,000	18/6

* Va = 200 ; Vs = 100 ; Vg = 1·5.

MULLARD UNIVERSAL (D.C./A.C.) MAINS VALVES (SIDE CONTACT BASES)

Type.	Description.	Base.*	Bulb Finish.	Vf.	If.	Characteristics at Va = 100 ; Vg = o.			(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
						ra	m	gm						
T.V.6	Tuning Indicator	P	Clear	6·3	0·2	—	—	—	250	—	—	—	—	10/6
F.C.13	Octode Frequency Changer	P	Met.	13	0·2	1,500,000	—	—	200	90	1·5	1·6	—	20/-
V.P.13A	Variable-mu H.F. Pentode..	P	Met.	13	0·2	1,000,000	2,200	2·2	200	100	2·0	4·0	—	17/6
S.P.13	H.F. Pentode	P	Met.	13	0·2	1,300,000	3,000	2·2	200	100	2·0	3·5	—	17/6
2D.13A	Double-diode-detector ..	V	Met.	13	0·2	—	—	—	—	—	—	—	—	5/6

*P Base = 8 contact ; V base = 5 contact.

MULLARD UNIVERSAL (D.C./A.C.) MAINS VALVES (SIDE CONTACT BASES)—continued

Type.	Description.	Base.*	Bulb Finish.	Vf.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	gm	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
2D.13	Double-diode-detector ..	V	Met.	13	0·2	—	—	—	—	—	—	—	—	5/6
H.L.13	Medium Impedance Triode	P	Met.	13	0·2	12,500	40	3·2	100 150 200	— — —	2·0 3·0 4·0	2·0 3·0 4·0	—	13/6
Pen.26	Output Pentode	P	Clear	24	0·2	—	—	8·0	100 200	100 100	15·0 19·0	50·0 40·0	9,000	18/6
						Max. Anode Volts (r.m.s.).				Max. Rectified Output (mA).				
U.R.1	Half-wave Rectifier	P	Clear	20	0·2	250				75				12/6
U.R.3	Multiple Rectifier	P	Clear	30	0·2	250–0–250				120				15/-

* P Base = 8 contact ; V base = 5 contact.

MULLARD D.C./A.C. VALVES (PIN BASES)

Type.	Description.	Base.	Bulb Finish.	Vf.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	gm	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
T.H.13C	Triode-hexode Frequency Changer	7-pin	Met.	13·0	0·31	—	—	—	250	70	1·5	4·0	—	15/-
T.H.21C	Triode-hexode Frequency Changer	7-pin	Met.	21·0	0·2	—	—	—	250	70	1·5	4·0	—	15/-
T.H.22C	Triode-hexode Frequency Changer	—	—	—	—	—	—	—	—	—	—	—	—	15/-

MULLARD D.C./A.C. VALVES (PIN BASES)—continued

Type.	Description.	Base.	Bulb Finish.	Vf.	If.	Characteristics at Va = 100 ; Vg = 0. ra	m	gm	(a) Va	(b) Vs or Vaux	(c) Vg for (a) or (b)	Ia for (c)	Optimum Load.	Price.
F.C.13C	Octode Frequency Changer	7-pin	Met.	13	0·2	—	—	—	200	90	1·5	1·6	—	15/-
V.P.13C	Variable-mu H.F. Pentode ..	7-pin	Met.	13	0·2	—	—	3·0*	200	200	2·0	9·0	—	12/6
S.P.13C	H.F. Pentode	7-pin	Met.	13	0·2	—	—	4·0*	200	200	1·5	2·5	—	12/6
2D.13C	Double-diode-detector ..	5-pin	Met.	13	0·2	—	—	—	—	—	—	—	—	5/6
T.D.D. 13C	Double-diode-triode ..	7-pin	Met.	13	0·2	10,000	29	2·9	200	—	5·0	4·0	—	12/6
H.L.13C	Det. or L.F. Triode ..	7-pin	Met.	13	0·2	10,500	40	3·8	200	—	3·7	5·0	—	9/6
Pen.13C	Output Pentode	7-pin	Clear	13	0·5	—	—	6·5	250	250	11·9	32·0	6,400	13/6
Pen.36C	Output Pentode	7-pin	Clear	35	0·2	—	—	8·0	200	200	9·0	40·0	4,000	13/6
						Max. Anode Volts (r.m.s.).				Max. Rectified Output (mA).				
U.R.I.C.	Half-wave Rectifier	5-pin	Clear	20	0·2	250				75				10/6
U.R.3C	Multiple Rectifier	7-pin	Clear	30	0·2	250–0–250				120				15/-

* At Va = Vg2 = 200 ; Vg = 0

MULLARD EQUIVALENTS—B.V.A. TYPES

These tables provide a guide to the Mullard equivalents of valves of other makes, but it should be remembered that all types are not directly interchangeable. Correct replacements for all sets will, however, be found in the booklet "Valves for Commercial Receivers" or the Valves-in-Sets Binder.

2-VOLT VALVES

COSSOR.	EVER-READY.	FERRANTI.	MULLARD.	MARCONI, OSRAM.	MAZDA.	STANDARD.	SIX-SIXTY.
210PG 210SPG	K80A	VHT2 VHT2A	**FC2**	X21	—	—	—
—	K80B	—	**FC2A**	X22	—	—	—
210VPT	K50M	—	**VP2**	VP21, W21	VP215 VP210	—	218VP
—	K50W	—	**VP2B**	—		—	—
210SPT	—	—	**SP2**	—	SP215 SP210	—	218HP
220SG	K40B	—	**PM12A**	S22, S24	S215B	5B1	218SG
215SG	—	—	**PM12**	S215, S23 S21	S215A SG215	—	215SG
220VS	K40N	VS2	**PM12M**	VS24	S215VM	—	218VSG
220DD	—	—	**2D2**	—	—	—	—
—	—	—	**TDD2**	HD22	L21DD L2/DD	—	—
210DDT	K23B	H2D	**TDD2A**	HD22	HL2/1DD	—	SS210DDT
210RC	—	—	**PM1A**	H2	H210, H2	—	210RC
210HF	K30A	—	**PM1HF**	HL210	—	—	210HF
210LF	K30B	—	**PM1LF**	L210	—	—	210LF
210HL	K30C	—	**PM1HL**	HL2	HL210 HL2	HLB1	210HL
210HL	K30K	—	**PM2HL**	HL2	HL210 HL2	HLB1	210HL
210 Det.	K30D	—	**PM2DX**	L2/B, L21	L210, L2	—	210D
—	K30E	—	**PM2DL**	—	—	—	—
220PA	K30G	L2	**PM2A**	LP2	P220	PB1	220PA
220P 215P	—	—	**PM2**	P215 LP2/C	P215	—	220P
230XP	—	—	**PM202**	P2/B P240	P220A P240	—	220SP 240SP
230PT 230HPT	—	—	**PM22**	PT240	Pen230	—	230Pen
220HPT, 220/OT	K70B	PT2	**PM22A**	PT2	Pen220	PenB1	220Pen
220PT	—	—	**PM22C**	—	Pen220A	—	—
—	K70D	—	**PM22D**	—	Pen231	—	—
220B, 240B	K33A	HP2	**PM2B**	—	PD220	—	220B
—	K33B	—	**PM2BA**	B21	PD220A	—	—
—	K77A	—	**QP22A**	—	QP240	—	—

MULLARD EQUIVALENTS (B.V.A.)—continued

4-VOLT VALVES

COSSOR.	EVER-READY.	FERRANTI.	MULLARD.	MARCONI, OSRAM.	MAZDA.	STANDARD.	SIX-SIXTY.
410SG	—	—	**PM14**	S410	—	—	4075SG
410SG	—	—	**PM13**	S410	—	—	—
410RC	—	—	**PM3A**	H410	—	—	4075RC
410HF	—	—	**PM3**	HL410	—	—	4075HF
410LF	—	—	**PM4DX**	L410	—	—	410D
410P	—	—	**PM4**	P410	—	—	410P
{425XP 415XP	—	—	**PM254**	P415 P425}	P425	—	420SP

6-VOLT VALVES

COSSOR.	EVER-READY.	FERRANTI.	MULLARD.	MARCONI, OSRAM	MAZDA.	STANDARD.	SIX-SIXTY.
610HF	—	—	**PM5X**	HL610	HL610	—	6075HF
610LF	—	—	**PM6D**	L610	—	—	610D
610P	—	—	**PM6**	P610	—	—	610P
625P	—	—	**PM256**	P625	P625B	—	625SP
610XP	—	—	**PM256A**	P625A	P625A	—	625SPA
615PT	—	—	**PM25**	PT625	—	—	617PP

MULLARD EQUIVALENTS (B.V.A.)—continued

INDIRECTLY-HEATED A.C. VALVES

Cossor.	Ever-Ready.	Ferranti.	**MULLARD.**	Marconi, Osram.	Mazda.	Standard.	Six-Sixty.
41STH	A36A	—	**TH4**	—	—	—	—
—	A36B	—	**TH4A**	X41	AC/TH1	—	—
41MPG 41PGD	A80A	VHT4	**FC4**	MX40, X42	—	15A2	—
MVS/PEN	A50M	VPT4, VPT4A	**VP4**	VMP4	AC/VP1	9A1	HP2AC
—	A50N	VPT4B	**VP4A**	VMP4G	—	—	—
—	A50P	—	**VP4B**	—	AC/VP2	—	—
MS/PenA	A50A	SPT4, SPT4A	**SP4**	MSP4	AC/S2Pen	8A1	HP1AC
—	A50B	—	**SP4B**	—	—	—	—
MV/SG	A40M	—	**MM4V**	VMS4 VMS4B	AC/SGVM	VSGA1	4MMAC
—	—	VS4	**VM4V**	—	ACS1VM	—	4VMAC
41MSG	—	—	**S4V**	MS/4/C	—	—	4SGAC
MSG/HA	—	—	**S4VA**	MS/4/B	AC/S2	SGA1	4XSGAC
MSG/LA	—	—	**S4VB**	MS/4B	AC/SG	SGA1	4YSGAC
DD4, DDL4	A20B	—	**2D4A**	D41	AC/DD V914	DDA1	—
DDT	A23A	H4D	**TDD4**	MHD4, DH42	AC/HLDD	11A1 11A2	4DDTAC
—	—	—	**994V**	—	—	HLA1	—

INDIRECTLY-HEATED A.C. VALVES—continued

COSSOR.	EVER-READY.	FERRANTI.	MULLARD.	MARCONI, OSRAM.	MAZDA.	STANDARD.	SIX-SIXTY.
41MH, 41MTA, 41MTB	A30B	—	**904V**	MH41	AC2/HL	—	4DXAC
41MRC	—	—	**484V**	—	—	—	—
41MHF, 41MTL	A30D	D4	**354V**	MH4	AC/HL	HLA2	4GPAC
41MHL	—	—	**244V**	MHL4	—	—	4HLAC
41MLF	—	—	**164V, 154V**	MHL4/C	—		4LAC
41MP	—	—	**TT4**	ML4	AC/P	—	4PAC
MP/PenA	A70B	—	**Pen4VA**	N40, N42	AC/Pen	7A2	4PenAAC
42MP/Pen	A70C	PT4	**Pen4VB**	N41	AC2/Pen	7A3	—
42/OT, 42MP/Pen	A70D	PT4	**PenA4**	N41	AC2/Pen	7A3	4PenAAC
—	A70E	—	**PenB4**	—	AC4/Pen	—	—
—	A27D	—	**Pen4DD**	—	—	—	—

DIRECTLY-HEATED A.C. OUTPUT VALVES

Cossor.	Ever-Ready.	Ferranti.	**MULLARD.**	Marconi, Osram.	Mazda.	Standard.	Six-Sixty.
—	—	P4	**AC064**	—	—	—	HV/4/1
4XP	S30C	LP4	**AC044**	PX4	PP3/250	—	HV/4/2
—	—	—	**AC042**	—	PA20	—	—
415PT 410PT	—	—	**PM24**	425PT	Pen425	—	415PP
—	—	—	**PM24A**	—	—	—	4PenSP
PT41	—	—	**PM24M**	PT4	—	PenA1	4PenM
PT41B	—	—	**PM24B**	—	—	—	—
—	—	—	**PM24E**	PT25	—	—	—
—	—	—	**D024**	PX25	PP5/400	—	—
620T	—	—	**D025**	LS6A	—	—	HV/65
—	—	—	**D026**	PX25A	—	—	—

FULL-WAVE RECTIFIERS

Cossor.	Ever-Ready.	Ferranti.	MULLARD.	Marconi, Osram.	Mazda.	Standard.	Philips.
{ 408BU 506BU }	S11A	—	DW2	U10	—	—	1821
442BU	S11D	R4	{ DW4/350 DW3 }	U12	UU120/350	—	1807
460BU	—	R4A	{ DW4/500 DW4 }	U14	UU120/500	—	1561
—	—	—	1W2	—	{ UU2 UU60/250 }	R1	1881
—	A11B	—	1W3	MU12	UU3, UU4	1A7, R2	1867
—	A11D	—	1W4/350	—	—	—	—
—	A11C	—	1W4	MU14	UU5	R3	1861

UNIVERSAL (A.C./D.C.) VALVES (Pin Base Types)

Cossor.	Ever-Ready.	Ferranti.	Mullard.	Marconi, Osram.	Mazda.	Standard.	Six-Sixty.
—	—	—	TH13C	X31	—	—	—
202STH	C36A	—	TH21C	—	—	—	—
13PGA 202MPG	C80B	VHTA	FC13C	—	—	15D1	—
—	C50N	—	VP13C	—	VP1322	—	—
—	—	ZD	2D13C	—	DD620	10D1	—
13DHA 202DDT	C23B	HAD	TDD13C	—	HL/DD1320	11D3	—
—	C30B	DA	HL13C	—	HL1320	4D1	—
—	C70D	—	Pen36C	—	Pen.3520	7D6	—
40SUA	C10B	RZ	UR1C	—	U4020	1D5	—
—	—	—	UR3C	—	—	—	—

MULLARD EQUIVALENTS

Non-B.V.A. Types

These tables provide a guide to the Mullard equivalents of valves of other makes, but it should be remembered that all types are not directly interchangeable. Correct replacements for all sets will, however, be found in the booklet "Valves for Commercial Receivers" or the Valves-in-Sets Binder.

2-VOLT VALVES

DARIO.	HIVAC.	**MULLARD.**	TRIOTRON.	TUNGSRAM.	362.
BK22	—	**FC2**	O202	MH206	—
—	—	**FC2A**	—	VO2	—
PF472	VP215	**VP2**	S217	HP211 HP221	VP2C
PF462	HP215	**SP2**	S218	HP210 HP220	—
TB622	SG220	**PM12A**	S207 S215	S220 SS210	SG2
—	SG215	**PM12**	S215	S210	SG2
TB452	—	**PM12M**	S208 S213	SV220 SE220 SE211	VS2
—	DDT220	**TDD2**	—	—	—
BBC12	—	**TDD2A**	DT215	DDT2	—
—	—	**PM1A**	W213	R208	H2
—	—	**PM1HF**	HD2	H210	—

MULLARD EQUIVALENTS (Non-B.V.A.)—continued

2-VOLT VALVES—continued

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
TB102	—	PM1LF	TD2	LG210	—
TB282	H210	PM1HL	WD2	HR210	HL2
TB172	D210 L210	PM2DX	SD2 A214	LD210 PD220	L2
TB122	P220	PM2A	YD2	LP220 P220	LP2
TB052	P215	PM2	ZD2	P215	—
TB062 TB032	PP220 PX230	PM202	UD2 E235 SP2	SP220 SP230	P2
—	Z220	PM22	P215	PP230, PP2	ME2
TC432	Y220	PM22A	P225	PP222	—
TB402	B230 B220	PM2B	E220B	CB215	BA2 BX2
—	—	PM2BA	—	CB220	—

MULLARD EQUIVALENTS (Non-B.V.A.)—continued

4-VOLT VALVES

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	PM14	S409	S407	SG4
—	—	PM3A	—	—	—
	—	PM3	H412	HL406	HL4
—	—	PM4DX	A430	{ LD408 LD410 }	L4
—	—	PM4	E414	L414	LP4
—	—	PM254	E425	SP414	P4

6-VOLT VALVES

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	PM5X	—	HR607	HL6
—	—	PM6D	—	LG607	L6
—	—	PM6	—	P615	LP6
—	—	PM256	—	SP614	P6
—	—	PM256A	—	—	—
—	—	PM25	—	PP610	ME6

MULLARD EQUIVALENTS (Non-B.V.A.)—continued

INDIRECTLY-HEATED A.C. MAINS VALVES

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	**TH4**	—	TX4	—
TK24	—	**FC4**	0407 0406	V04 MH4105	AC/FC4
TE474	AC/VP	**VP4**	S434N	HP4105 HP4106	ACVP4
—	—	**VP4A**	—	—	—
—	—	**VP4B**	—	VP4B	—
TE464	AC/HP	**SP4**	S435N	HP4100 HP4101	ACHN4
—	—	**SP4B**	—	SP4B	—
TE554	AC/VS AC/VH	**MM4V**	S431N	AS4125	ACVS4
—	—	**VM4V**	S415N S431N	AS4105 AS4125	—
—	—	**S4V**	S410N	AS494	—
TE424	AC/SH	**S4VA**	S430N 304AC	AS495	ACSG4
TE524	AC/SL	**S4VB**	S410N S412N	AS4120 AS4100	—
TB24	AC/DD	**2D4A**	D401, D400	DD465	—
TE444	—	**SD4**	B430N	DS4101	—
TBC14	AC/DDT	**TDD4**	DT436	DDT4160 DDT4	AC/HL4DD
—	—	**994V**	—	—	—
TE994	—	**904V**	A440N	AR495	—
TE384	—	**484V**	—	—	—
TE384 TE244	AC/HL	**354V**	A430N W415N	AR4101 AR4100	ACHL4
TE244	—	**244V**	—	—	—

MULLARD EQUIVALENTS (Non-B.V.A.)—continued

INDIRECTLY-HEATED A.C. MAINS VALVES—continued

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	**164V**	—	AG495	—
TE094	ACL	**TT4**	E430N YN4	AP495	ACPX4
TE634 TE534	AC/Y	**Pen4VA**	P441N P440N	APP4120	ACME4C
TL44	AC/Z	**PenA4**	P495	APP4B, APP4C	—
—	AC/YY	**PenB4**	—	APP4D	—

DIRECTLY-HEATED A.C. OUTPUT VALVES

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	**AC104**	E425	P430	—
—	PX41	**AC044**	K435/10	P460 O15/400	ACPX4A
—	—	**PM24**	—	PP415	ME4
TC434	—	**PM24A**	P425	PP431	—
TE434	FY	**PM24M**	P435	PP4101 APP4100	ACME4A ACME4B
—	—	**PM24E**	P440	—	—
—	—	**DO20**	—	210	—
—	—	**DO24**	K480	P25/500	—
—	—	**DO26**	—	P26/500	—

MULLARD EQUIVALENTS (Non-B.V.A.)—continued

D.C. MAINS VALVES

DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
—	—	**VP20**	S2034N	HP2118	—
—	—	**SP20**	S2035N	HP2018	MHM20
—	—	**SG20**	—	SS2018	MSG20
—	—	**SD20**	B2030N	DS2218	—
—	—	**H20**	A2040N	—	—
—	—	**HL20**	—	R2018	MHL20
—	—	**Pen20**	P2020N	PP2018	MME20

FULL-WAVE RECTIFIERS

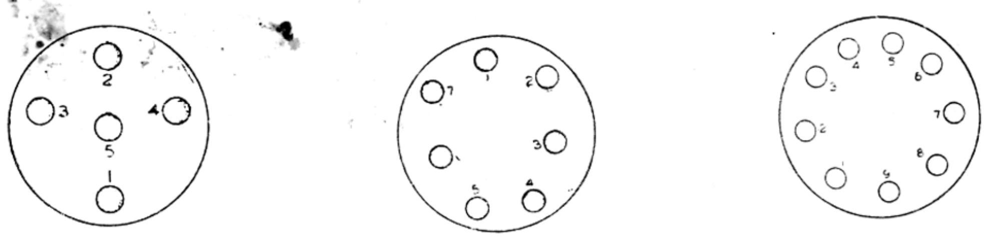
DARIO.	HIVAC.	MULLARD.	TRIOTRON.	TUNGSRAM.	362.
FW1	—	**DW2**	G470 G431 GN24 GA24	PV495	RB41
FW2	—	**DW4/350** **DW3**	G4110	PV495	RB/350/80
FW3	—	**DW4** **DW4/500**	G4120	PV4200 PV4201	RB42 RB500/120
—	UU/60/250	**IW2**	—	—	—
—	UU/120/350	**IW3**	—	APV4200, APV4	—
IFW1	UU/120/500	**IW4**	G4120N	—	—

UNIVERSAL (A.C./D.C.) VALVES (Pin Base Types)

Dario.	Hivac.	MULLARD.	Triotron.	Tungsram.	362
—	—	TH21C	—	TX21	—
TB5013	—	FC13C	O1307	VO13	—
TF313	—	VP13C	S1323	VP13B	—
TF713	—	SP13C	S1328	SP13B	—
—	—	2D13C	D1300	DD13	—
TBC113	—	TDD13C	DT1336	DDT13	—
—	—	HL13C	—	HL13	—
TL413	—	Pen36C	—	PP35	—
TW1	—	UR1C	G2080	V30	—
—	—	UR3C	G3060	—	—

APPENDIX

BASE CONNECTIONS FOR 5-pin, 7-pin & 9-pin VALVES



Valve bases viewed from the free ends of pins.

5-PIN BASE

Descripton.	Valve Type.	Pin Number.					Top Cap.
		1	2	3	4	5	
I.H. Battery Double-diode ..	2D2 ..	D2	D1	H	H	C	—
Battery Double-diode-triode ..	TDD2 .. TDD2A ..	A	D1	F	F	D2	G
I.H. Mains Double-diode ..	2D13C .. 2D4A ..	D2	D1	H	H	C	—
I.H. Half-Wave Rectifier ..	UR1C ..	A	—	H	H	C	—

7-PIN BASE

Description.	Valve Type.	Pin Number.							Top Cap.
		1	2	3	4	5	6	7	
I.H. Mains Triode Hexode Frequency Changer	TH4 .. TH4A .. TH13C .. TH21C .. TH22C ..	Ao	Go G3	G2 G4	H	H	C M	A	G1
I.H. Mains Octode	FC4 .. FC13C ..	G2	G1	G3 G5	H	H	C M G6	A	G4
Battery Octode	FC2 .. FC2A ..	G2	G1	G3 G5	F	F	M	A	G4
Battery H.F. Pentode	VP2 ; SP2	M	G1	G3	F	F	—	G2	A
Battery Hexode Mixer	VP2B ..	M	A	G3	F	F	G4	G2	G1

BASE CONNECTIONS—continued

7-PIN BASE—continued

Description.	Valve Type.	Pin Number. 1	2	3	4	5	6	7	Top Cap.
I.H. Mains H.F. Pentode ..	VP4 ; VP4A ; SP4 ..	M	G1	G3	H	H	C	G2	A
	VP4B .. SP4B .. VP13C .. SP13C .. TSP4 ..	M	A	G3	H	H	C	G2	G1
I.H. Mains Output Pentode ..	Pen4VA .. Pen4VB .. PenA4 .. PenB4 .. Pen428 .. Pen36C .. Pen13C ..	—	G1	G2	H	H	C	A	—
I.H. Mains Double-diode-triode	TDD4 .. TDD13C ..	D1	M	D2	H	H	C	A	G
I.H. Mains Double-diode Output Pentode	Pen4DD ..	D1	C	D2	H	H	A	G2	G1
I.H. Mains Triode	HL13C ..	M	—	—	H	H	C	A	G
Battery Class B Output ..	PM2B .. PM2BA ..	G2	G1	A1	F	F	—	A2	—
Mutiple Rectifier	UR3C ..	—	A1	C1	H	H	C2	A2	—
I.H. Double-diode (Separate Cathodes)	2D4B ..	M	D2	C2	H	H	C1	D1	—

9-PIN BASE

Description.	Valve Type.	Pin Number 1	2	3	4	5	6	7	8	9	Top Cap.
Battery Q.P.P. Output	QP22A ..	G1 (*a*)	A (*a*)	G2 (*a*)	F	F	—	G2 (*b*)	A (*b*)	G1 (*b*)	—