Standard Valves

1947

Standard Telephones and Cables Limited

LONDON

Standard Valves

Standard Telephones and Cables Limited
(VALVE DIVISION)

CONNAUGHT HOUSE, ALDWYCH,
LONDON, W.C.2

Telephone : Holborn 8765 *Telegrams "Relay, Telex, London"*

PRICE 15/-

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Standard Telephones and Cables Limited

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CONNAUGHT HOUSE,
ALDWYCH, LONDON, W.C.2

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PREFACE

This handbook is intended primarily for equipment designers and gives comprehensive technical information on *Standard* valves, cathode ray tubes, cold cathode gas tubes, etc. The data sheets forming the bulk of the handbook have been arranged in numerical order of commercial code so that valves of similar type are grouped together.

All constants and curves are to be taken as average values and the power output and other ratings given under "Typical Operating Conditions" are approximate only.

Additional loose sheets will be issued periodically. Applications for these, and all technical enquiries, should be addressed to:—

The Chief Valve Engineer,
Standard Telephones and Cables Limited,
Connaught House, Aldwych, London, W.C.2

Valves for broadcast receiving sets are not covered by this publication. For information on such valves enquiries should be addressed to :—

Standard Telephones and Cables Limited,
Brimar Valve Division,
Footscray, Kent.

The Company reserves the right to make any modifications to any of the valves listed in this handbook without prior notice.

LIST OF CONTENTS

Definitions

MAXIMUM RATINGS

The maximum ratings specified in this catalogue are limiting values. Each maximum rating must be considered in relation to all other maximum ratings, so that under no condition of operation will any maximum rating be exceeded.

As an example a valve may be rated at a maximum D.C. anode voltage of 3 kV and a maximum anode dissipation of 1 kW. The anode dissipation of 1 kW should not be exceeded even if the operating D.C. anode voltage is only 1.5kV.

The filament or heater voltage given in the data sheets is a normal value unless otherwise stated. Variations from this rated value due to line voltage fluctuations or other causes should not exceed $\pm$ 5 per cent unless otherwise specified.

In general, the filament of a transmitting valve may be operated with either A.C. or D.C. A.C. is usually employed unless D.C. is necessary for the reduction of hum. With A.C. operation the return from the grid and anode should be connected to the mid-point of the filament transformer secondary. When D.C. is used, the return leads should be connected to the negative filament terminal.

If it is essential to use D.C. filament excitation on any filament type valve for which the data is given for A.C. operation, the grid-bias values specified should be decreased by an amount approximately equal to one-half the rated filament voltage, and be referred to the negative filament terminal instead of the mid-point.

CLASS A AMPLIFIER.—Grid bias and alternating grid voltages such that the anode current flows continuously throughout the electrical cycle.

CLASS AB AMPLIFIER.—Grid bias and alternating grid voltages such that the anode current flows for more than half the electrical cycle but grid current just does not flow.

CLASS B AMPLIFIER.—Grid bias is approximately equal to cut off value so that anode current is approximately zero when no grid drive voltage is applied. Anode current flows for approximately one-half of each cycle when alternating grid voltage is applied.

CLASS C AMPLIFIER.—Grid bias is appreciably greater than the cut off value so that the anode current is zero when no grid drive voltage is applied. A flow angle of 140 degrees has been used in calculations for typical operating conditions in this book.

Cathodes

PURE TUNGSTEN FILAMENTS

Some valves, particularly large transmitting types, employ tungsten filaments. The life of the cathode depends upon the rate of evaporation of the tungsten and failure will occur through decreased emission or burn-out of the filament. Pure tungsten filaments give best life performance when they are operated so as to conserve their emitting capability. In applications where the normal emission at rated voltage is not required the filament may be operated at a reduced voltage. The extent of the reduction depends upon the peak emission requirements of the application. A reduction of 5 per cent in the filament voltage applied to valves with pure tungsten filaments will approximately double their life.

Note.—It is important that when starting up or shutting down heavy duty filaments of tungsten or thoriated-tungsten the current should be applied or cut off, in a number of steps. At no time should the peak current exceed 150 per cent of the normal value.

THORIATED TUNGSTEN FILAMENTS

The use of thoriated-tungsten filaments has recently been extended to the Standard range of Air Blast Cooled Valves, these filaments are operated at such a temperature that diametric evaporation is negligible. Since the life of the valve is not controlled by the reduction of the filament the life cannot be increased by operating the filament at reduced voltage as in the case of pure tungsten filaments.

The source of emission in a thoriated tungsten filament is a layer of thorium on the surface of the wire. The thorium in this layer is constantly being removed by evaporation and bombardment during operation and is replenished from within the wire. To maintain a balance between the loss and replacement of an active layer of thorium the filament must be operated within a relatively narrow predetermined range of temperature.

Unusually short life may result from the operation of thoriated tungsten filaments much above or below their rated values. Consequently it is essential that the filament voltage be maintained at all times within $\pm$ 5 per cent of the rated value unless otherwise stated.

Thoriated tungsten filaments should not in general be operated at or near saturation. In cases where severe overload has temporarily impaired the emission the activity can sometimes be restored by operating the filament, with anode and grid voltages at zero, at 30 per cent above the normal filament voltage for ten minutes and then at normal filament voltage for twenty to thirty minutes.

OXIDE-COATED CATHODES

A coating of alkaline-earth compounds on a metallic base when heated forms a source of electron emission.

Oxide-coated cathodes may be directly heated or indirectly heated. The latter type consists of a small metallic sleeve coated on the outside with the emitting compound ; the insulated heater is inserted inside the sleeve.

Care should be taken with cathodes of this type to determine whether the cathode has been designed for operation at a constant current or a constant voltage rating. It is, in general, extremely undesirable to operate valve heaters in series and this may be done only with cathodes having a constant current rating.

Cooling of Valves

RADIATION COOLED VALVES

Valves up to 1 kW anode dissipation in the majority of cases radiate their heat into the surrounding air by radiation. Free circulation of air should be provided for all valves and is essential in the case of large radiation cooled valves. If it is necessary to enclose a valve in a compartment for reasons of screening, due consideration must be given to the dissipation of the heat generated. When this cannot be effected by free convection of air, a fan may be employed so directed as to cool the entire valve as uniformly as possible. Valves with an anode dissipation in excess of 1 kW are usually cooled by water or an air-blast.

WATER COOLING

Water cooled valves should be mounted with the filament vertical and the filament terminals uppermost. Filament leads should not be allowed to come into contact with the glass bulb.

A water circulating system capable of passing a sufficient quantity of water through the jacket and returning it to the source for recooling must be provided.

The water is circulated under pressure through an interconnecting piping system and lengths of rubber hose or ceramic pipes carry the water from an earthed position in the system to and from the water jackets.

It is of extreme importance that the hose or pipe be of sufficient length to reduce the possibility of current leakage to a minimum. Water used for cooling should have a resistance of not less than 4000 ohms per cubic centimetre ; distilled water is recommended.

Under normal operating conditions there is the possibility of scale formation on the anode of the valve if the hardness of the circulating water exceeds 10 grams per gallon. Formation of this scale prevents efficient cooling of the valve, and if allowed to persist may result in a breakdown. If it is absolutely necessary to use hard water in an emergency, the anode should be cleaned periodically by dipping into a 10 per cent solution of hydrochloric acid until the scale is dissolved. All traces of acid should be rinsed off before returning the valve to its socket. This procedure should be avoided whenever possible, as frequent removal of the valve from its water jacket increases the danger of accidental damage.

Standard water jackets, available for each type of valve, have been designed to give a thin turbulent stream of water evenly distributed over the surface of the anode. The water flow must be sufficiently fast to prevent steam bubbles from forming on the anode surface—recommended flow is specified for each valve type.

The water flowing through a water jacket should never reach boiling point. Localised boiling may be detected by a singing noise.

The filament and anode supply must be interconnected with the water supply, so that in case of failure of the water supply the filament and anode voltages are cut off from the valve. The heat from the filament alone is sufficient to cause serious damage if operated without cooling water.

It is recommended that water flow around the jacket should be maintained for a sufficient time after the filament and anode supplies are cut off to prevent unequal cooling.

Extreme care must be taken when inserting or removing a valve from its water jacket so that no strains are placed on the copper to glass seals.

When putting a valve into a water jacket the gland should be tightened just sufficiently to prevent any water leak. Screwing the clamping ring right down hard may distort the anode clamping ring.

AIR BLAST COOLING

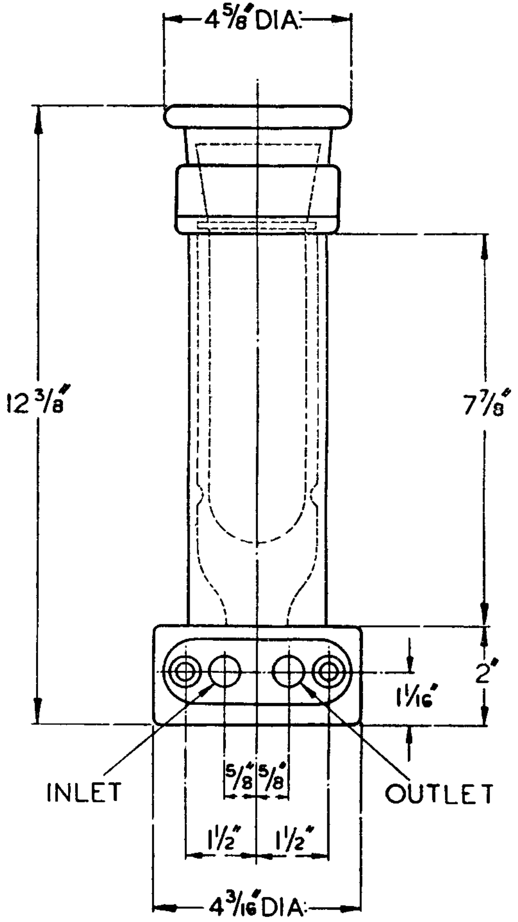
Air blast cooled valves possess the advantage over water cooled types that they are more transportable. This is of a considerable advantage for H.F. heating applications.

A fan capable of delivering the maximum volume of air specified for the valve at the required pressure must be installed. Air flow must be started before the application of any supply voltages, and it is recommended that it should be continued for at least ten minutes after the removal of all supply voltages.

Provision should be made for automatic removal of all supplies from the valve immediately the air-flow falls below the minimum requirements.

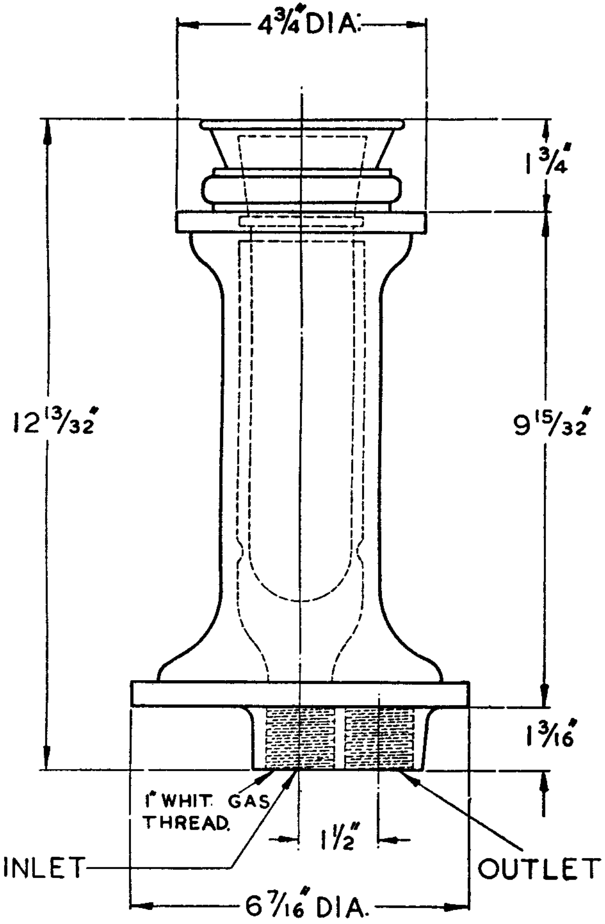
Water Jacket

235/LU—2A



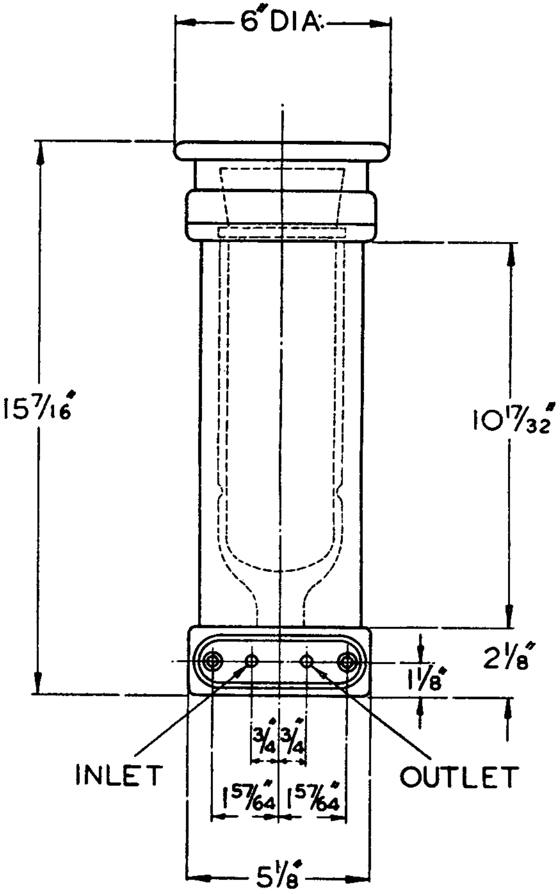
Water Jacket

3001 A



Water Jacket

3005 A



Hot Cathode Mercury Vapour Rectifiers and Thyratrons

The conditions for correct operation of H.C.M.V. rectifiers and thyratrons depend very largely on the circuit in which the valves are used and on the local conditions. The following general remarks are intended as a guide to obtain optimum conditions.

An important factor for the correct operation of these valves is the temperature of that part of the bulb on which the mercury condenses. This is normally approximately $\frac{1}{4}$in. above the top of the base. The temperature of the condensed mercury must not be too high as it would be liable to cause arc-backs due to the high vapour pressure of the mercury and it must not be too low as this would give a low vapour pressure of the mercury producing an excessive voltage drop inside the valve, which would be liable to cause the deactivation of the oxide coated cathodes. Provided that the temperature of the condensed mercury is kept within allowable limits, the voltage drop inside a mercury vapour rectifier valve is low (8 to 20 volts).

The limits of condensed mercury temperature are given on the information sheet for each valve.

Also listed, for each valve, are the recommended condensed mercury temperature conditions which allow the operation of the valve under natural conditions of ventilation. The extension of the condensed mercury temperature range by using forced air cooling is also shown.

In certain cases, not covered by the information listed, the use of forced air cooling is recommended.

(1) For valves used under conditions where the current is appreciably below the maximum peak current and the inverse voltage is very high, it is recommended that air at ambient temperature should be blown on the base of the valve at the point where the mercury condenses. The blowing device should be started when the condensed mercury temperature exceeds 35°C.

(2) For valves of high powers, used under conditions such that the current is near the maximum peak current, it is recommended that the voltage drop be kept as low as possible. The pressure of the mercury vapour should therefore be kept as high as possible in relation to the inverse voltage the valve has to stand and a system circulating air at constant temperature should be employed. Such a system would blow air

through controlled heating resistances on to the base of the valve, the valve itself being surrounded with a screen to prevent circulation of free air.

CATHODE HEATING

It is very important that the cathode of the valve shall be operated under the correct heating conditions when the anode voltage is applied. If the temperature of the cathode is too low, the resultant decrease in emission produces an increase in the voltage drop and a quick deactivation of the oxide coated cathode. For this reason the voltage variation in the main supply feeding the filament transformer should not be more than $\pm$ 5% (these limits include the effect of variation of load on the rectifier).

The filament transformer should be connected so that when the mains voltage is at its minimum value the voltage measured at the filament terminals corresponds to the rated value. This adjustment of voltage can be obtained by providing tappings on the primary of filament transformer. It can be seen that in many cases specially designed transformers will have to be used as normal transformers would not be suitable.

Where valves are operated with the filaments connected in parallel, each separate bank of valves should be fitted with a filament voltmeter having an accuracy of $\pm$ 2% so that the filament voltage can be controlled at any moment.

When the current is passed through the filament a certain length of time elapses before the filament reaches its normal operating temperature. For this reason a certain delay period between the time of switching on the filament and anode voltages must be incorporated. The necessary time delay for each type of valve is specified on the information sheet and can be obtained by time delay relays operating from the filament supply.

CIRCUIT REQUIREMENTS

In cases where a peak inverse voltage greater than 10,000 volts is used the primary voltage should be applied in steps by means of an induction regulator or similar device, or by short circuiting resistances connected in series with the supply feeding the high tension transformer.

Protection against overloads should be provided by means of overload relays in the supply lines and in the earthed side of the rectified current. These relays should be quick acting and cause the release of the feeding contactors and the oil switches.

The filter circuit used with the rectifier should never begin with a condenser and should be designed so that the resonant frequencies of the filter cells are lower than those of the A.C. supply or of any frequency which may appear during the operation.

INSTALLATION

Mercury vapour valves should always be mounted in a vertical position with the filament terminals at the bottom.

Due to the large currents at low voltage which are required for the heating of the filaments, the filament terminals should make good contact with the contacts in the socket.

OPERATION OF VALVES

After shipment or transit to or from the operating position the valve must be preheated with filament at rated voltage for the full period stated on the data sheet for the valve. By this means the mercury adhering to the electrode structure as a result of jolting, may be distributed correctly.

If peak inverse voltages in excess of 10 kV are to be used, it is very desirable, after transport or handling, that the anode voltage be applied in steps, as explained under "Circuit Requirements".

THYRATRON OPERATION

The grid as employed in the thyratron controls only the starting of the discharge. After starting, under usual operating conditions, it neither modulates, limits, nor extinguishes the arc. This is the fundamental difference between the thyratron as ordinarily used and the high vacuum valve. In order to allow the grid to affect the anode current the anode voltage must be reduced substantially to zero, or made negative for a period long enough for the gas or vapour to become deionized. Once this deionization takes place the grid can resume control.

The critical grid potential is defined as the grid voltage, which is sufficient to prevent conduction at any particular anode voltage. The ratio of the positive anode potential to the critical grid potential is known as the control ratio.

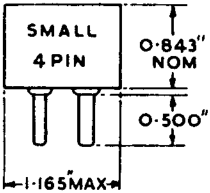
When accurate control of the thyratron output is desired, the grid should be biased beyond the limiting value for the maximum peak anode voltage and to strike the valve should be pulsed positive with a pulse having a leading edge as near vertical as possible. The control of the output of the valve is made by variation in phase of the grid pulse relative to the phase of the applied anode voltage. Variation of the output from zero to maximum is adjusted by this means.

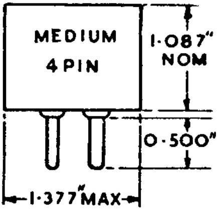
VALVE BASES

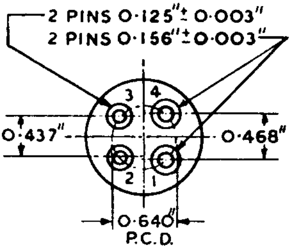
All British valve bases conform to British Standards specification BS448. Dimensions of American bases are shown on the following pages.

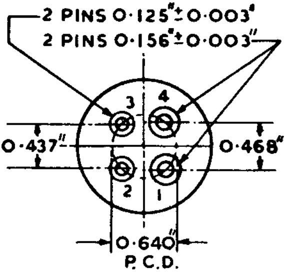
Valve Bases

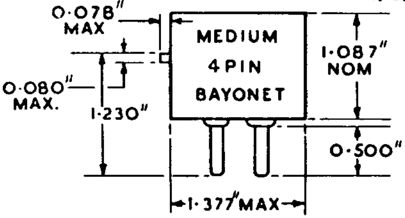
SMALL 4 PIN
MEDIUM 4 PIN
MEDIUM 4 PIN BAYONET

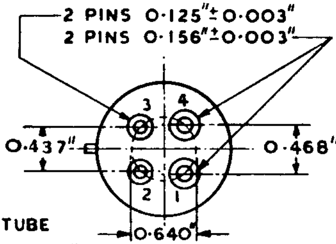










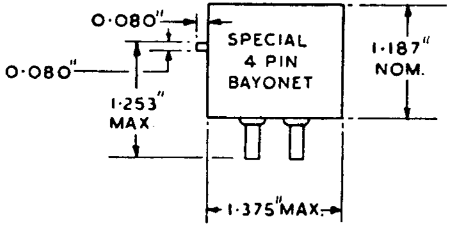


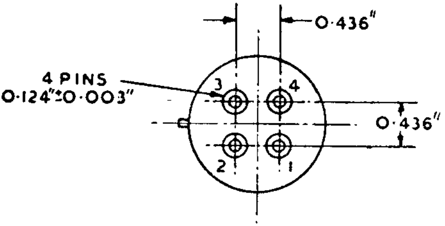
ON FINISHED TUBE
ADD 0·030" TO LENGTH OF PIN FOR SOLDER

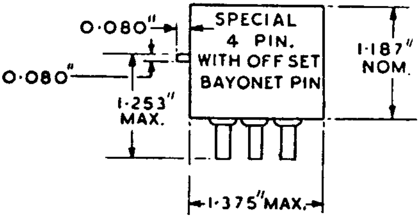
Valve Bases

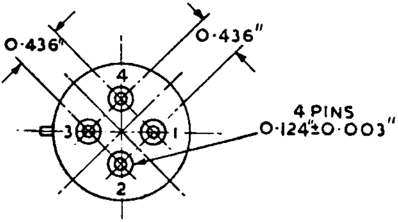
SPECIAL 4 PIN BAYONET

SPECIAL 4 PIN WITH OFFSET BAYONET PIN



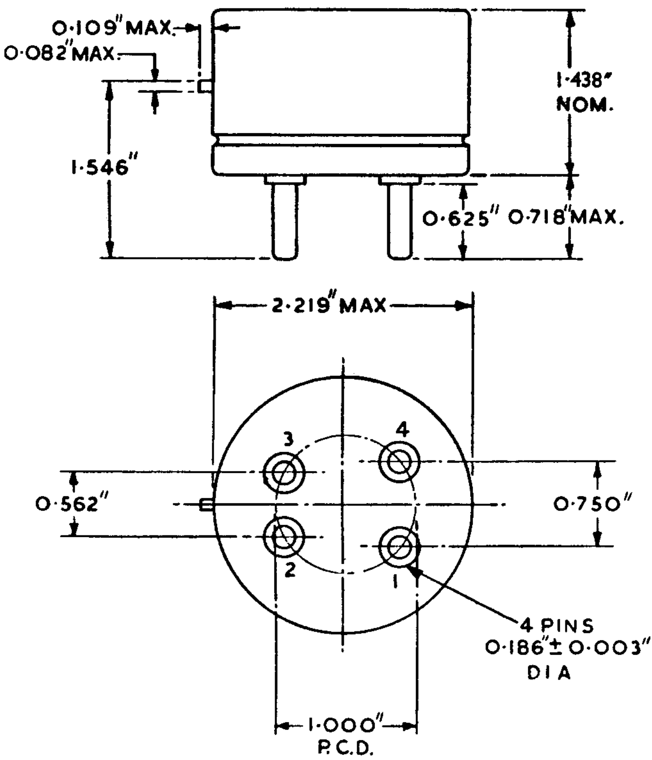






Valve Bases

SUPER JUMBO 4 PIN BAYONET

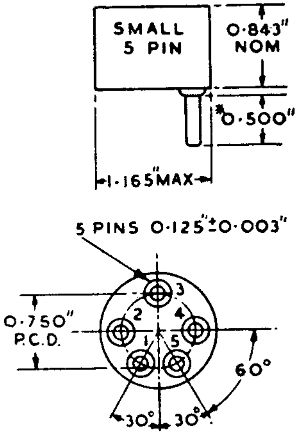


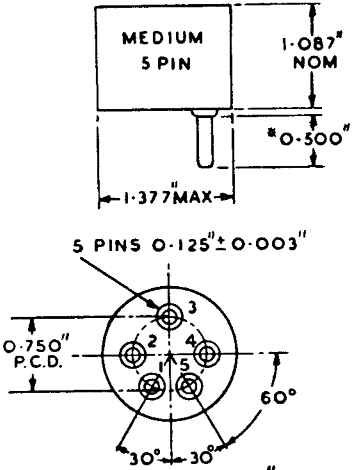
ON FINISHED TUBE ADD 0·030" TO LENGTH OF PIN FOR SOLDER.

Valve Bases

SMALL 5 PIN

MEDIUM 5 PIN

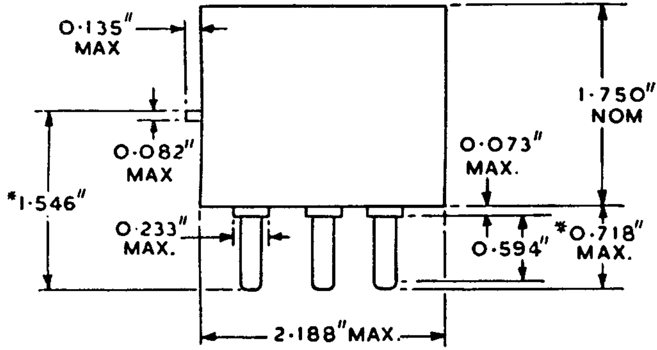


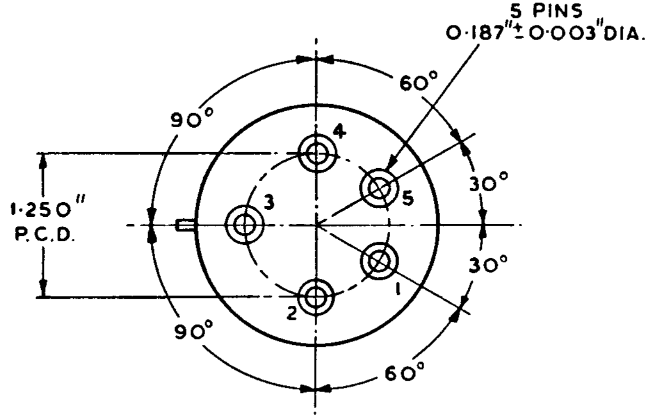


* ON FINISHED TUBE ADD 0·030" FOR SOLDER.

Valve Bases

GIANT 5 PIN





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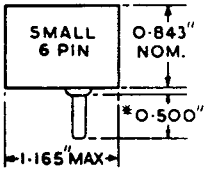
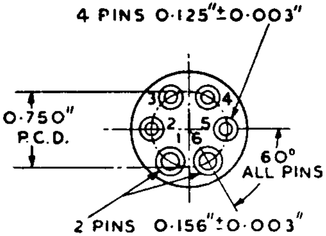
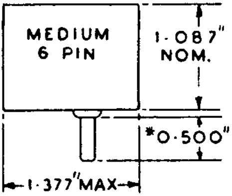
Valve Bases

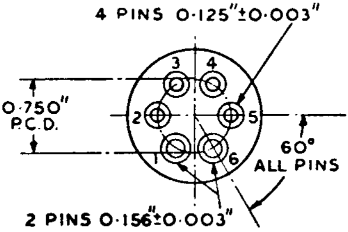
SMALL 6 PIN

MEDIUM 6 PIN





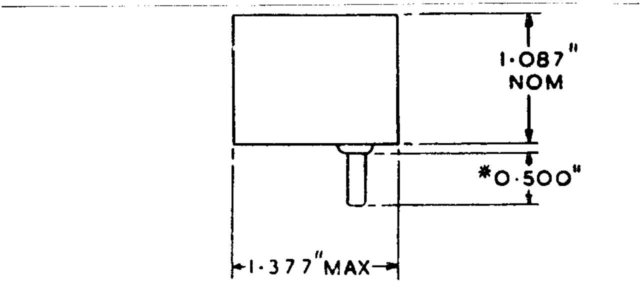


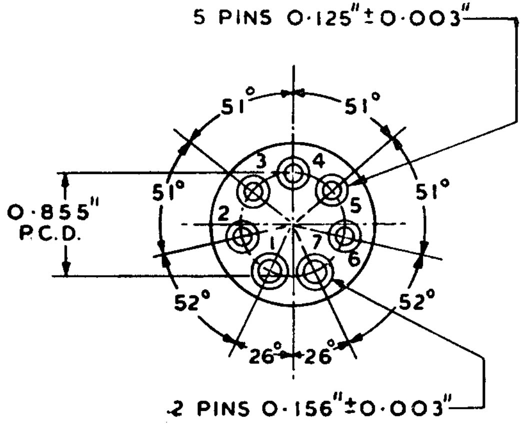


* ON FINISHED TUBE ADD 0·030 FOR SOLDER

Valve Bases

MEDIUM 7 PIN





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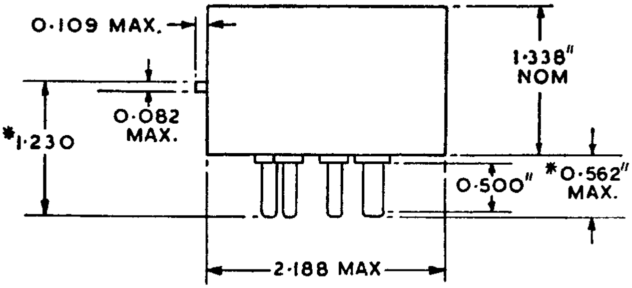
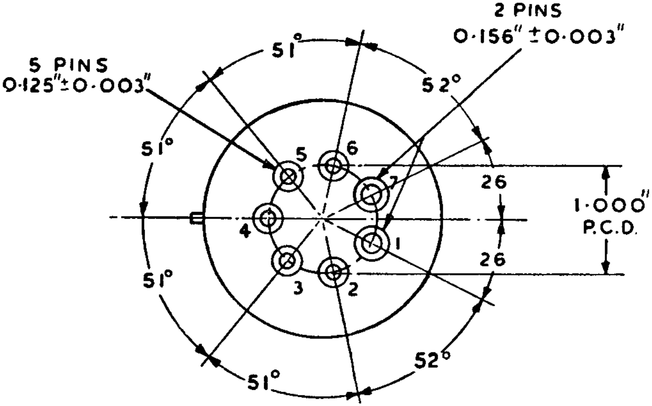
Valve Bases

GIANT 7 PIN

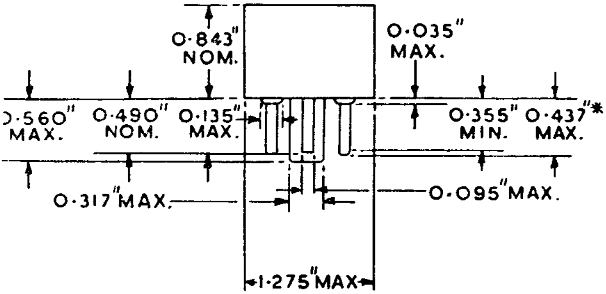


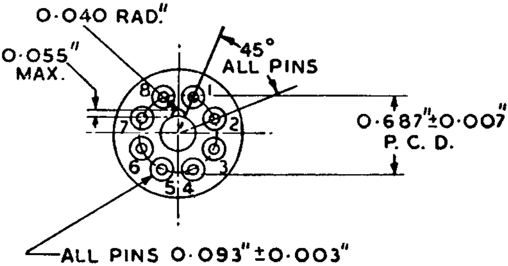


* ON FINISHED TUBE ADD 0·030" FOR SOLDER

Valve Bases

INTERMEDIATE SHELL OCTAL

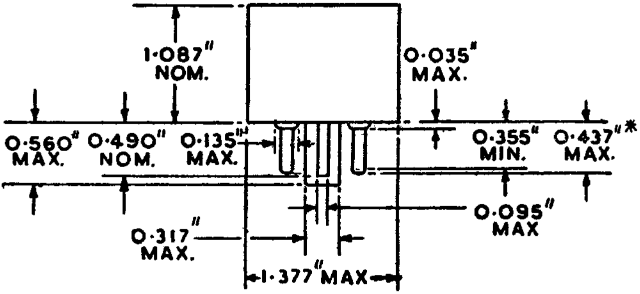


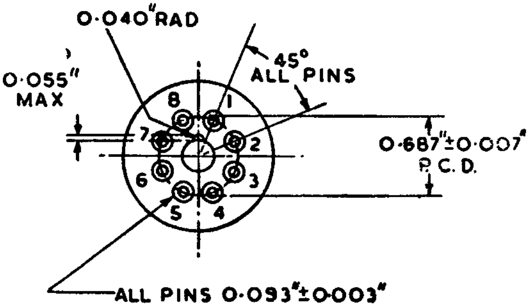


* ON FINISHED TUBE ADD 0·030" FOR SOLDER

Valve Bases

MEDIUM SHELL OCTAL





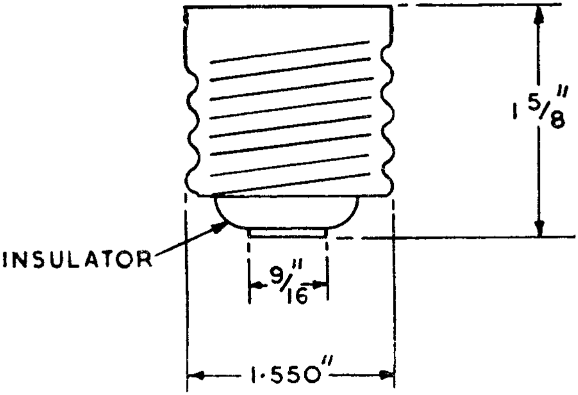
* ON FINISHED TUBE ADD 0·030" FOR SOLDER

Valve Bases

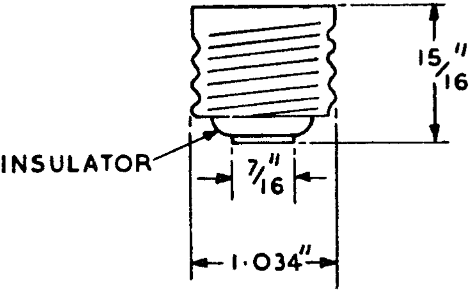
GIANT EDISON SCREW

MEDIUM SCREW

GIANT EDISON SCREW



MEDIUM SCREW



The Commercial Valve Code

The object of the commercial code is to enable classification of valves, cathode ray tubes, thermocouples, etc., to be made according to their electrical sizes and types, and to ensure that the technical information when filed in numerical order will group components of a similar type and rating together.

Where a valve has been marketed under a 4000 code (e.g. 4220C, 4357A, etc.), the valve should be referred to and ordered by that number. It appears at the top centre of each page of data. In these cases a commercial code, for reference purposes only, appears at the top corner of the sheet.

The general valve coding takes the following form : a number indicative of the number of electrodes ; a letter which designates the type, followed by a dividing bar ; a three figure number, the first two figures of which usually indicate the electrical size, the third figure being a serial number. The type of base is indicated by the letter following and in a few cases a further letter is used to denote physical or test limit variations.

Coding for special types such as cathode ray, cold cathode, velocity modulated tubes, etc., commences with a letter instead of a figure. The subsequent combination of figures and letters indicates electrical size, characteristics, serial number and basing according to the requirements of each type.

Examples of the coding are shown on sheets N—1 and N—2. If a detailed explanation of the code is required a descriptive pamphlet is available on application to the Publicity Department, Connaught House, Aldwych, W.C.2.

EXAMPLES OF CODING

General Valves ...	2S/300A	2 = diode, S = Low voltage rectifier, 30 = Function of Peak current and P.I.V. 0 = serial number, A = American standard base.
	2T/270K	2 = diode, T = High voltage rectifier, 27 = function of Peak current and P.I.V. 0 = serial number, K = miniature button base.
	2V/400C	2 = diode, V = Mercury Vapour rectifier, 40 = function of Peak current and P.I.V. 0 = serial number, C = Edison screw base.
	22V/310A	22 = double diode, V = Mercury vapour rectifier, 31 = function of Peak current and P.I.V. 0 = serial number, A = American standard base.
	3A/107B	3 = triode, A = Anode diss. below 10 watts, 107 = serial number, B = British standard base.
	3B/401J	3 = triode, B = Anode diss. between 10 and 100 watts, 40 = Anode diss. 40 watts, 1 = serial number, J = Mounted by disc seal.
	3V/320B	3 = triode, V = Mercury vapour, 32 = function of Peak current and P.I.V. 0 = serial number, B = British standard base.
	3J/170E	3 = triode, J = Air blast cooled, 17 = function of Peak current and Max. Anode voltage, 0 = serial number, E = Special base.
	3Q/213E	3 = triode, Q = Water cooled, 21 = function of Peak current and Max. Anode voltage, 3 = serial number, E = Special base.
	33A/100A	33 = double triode, A = Anode diss. below 10 watts, 100 = serial number, A = American standard base.
	4C/800E	4 = tetrode, C = Anode diss. between 100 and 1,000 watts, 80 = Anode diss. 800 watts, 0 = serial number, E = Special base.
	5A/102D	5 = Pentode, A = Anode diss. below 10 watts, 102 = serial number, D = International Octal base.

Examples of Coding—*continued.*

	5D/100A	5 = Pentode, D = Anode diss. between 1,000 watts and 10,000 watts, 10 = Anode diss. 1,000 watts, 0 = serial number, A = American standard base.
Ballast Lamps ...	... B1C/1G	1C = Indicates the average stabilising current, C denotes the range 1 to 9A ∴ current is 1A./1 = serial number, G = No base leads brought out.
	B4B/2C	4B = Indicates the average stabilising current, B denotes the range 0.1 to 9A ∴ current is 0.4A, /2 = serial number, C = Edison screw base.
Cathode Ray Tubes	... C16GS/1B	16 = The approximate screen diameter 16/4 which is 4in., G = Gas focused, S = Electrostatic deflection, /1 = serial number, B = Colour of screen blue.
	C22SM/2G	22 = The approximate screen diameter, 22/4 which is 5½in., S = Electrostatic focus, M = Magnetic deflection, /2 = serial number, G = Colour of screen Green.
Cold Cathode Tubes ...	G150/2D	150 = The approximate minimum breakdown voltage of main gap, /2 = serial number, D = International Octal base.
Vacuum Condenser	... K50/2L	50 = 50 pF capacity, /2 = serial number, L = Mounting by end caps.
Vacuum Thermocouples	T4A/40TA	4 = 4 terminals, A = Normal LF type direct contact, /40 = Max. safe heater current 40 mA, T = Mounted in box with 4 terminals, A = serial letter.

Classification System

Valves are listed according to availability into four categories.

1.	Preferred list	Valves for use in new equipment should be chosen from this list.
2.	Current list	Valves which are in current production in addition to those in the Preferred list.
3.	Maintenance list	Valves which will be supplied for replacement purposes in existing designs of equipment only. Not to be used in new designs.
4.	Obsolete list	Valves in this list are no longer manufactured and may be supplied subject to being in stock.

Data sheets for valves in the first two categories will be found in this handbook. Data sheets for maintenance types are available on demand from Publicity Dept. No data sheets will be supplied on obsolete types.

CLASSIFIED LIST OF *STANDARD* VALVES—"PREFERRED" TYPES

VACUUM RECTIFIERS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Peak Ia A	Av. Ia A	D.C. OUTPUT ½ wave V	D.C. OUTPUT bi-phase A
	2T/270K	IH	4	0.5	12.5	0.04	0.005		

MERCURY VAPOUR RECTIFIERS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Peak Ia A	Av. Ia A	D.C. OUTPUT ½ Wave kV	D.C. OUTPUT bi-phase A
	2V/400A	OCF	2.5	5.0	10	1.0	0.25	3.2	0.5
2V/500C	4049D	OCF	4	11	20	5	1.25	6.4	2.5
2V/530E	4078A	OCF	5	20	20	10	2.5	6.4	6
2V/560E	4079A	OCF	5	38	20	20	7.5	6.4	12.5
2V/590E	4080A	OCF	5	100	16	50	20	5.0	31

RADIATION COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a k	gm mA/V	V_a V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
	3A/146J	IH	4	0.65	100	—	5	350	2	450	—
	3A/147J	IH	4	0.65	35	—	6	350	6	750	—
	3A/148J	IH	6.3	0.3	100	—	5	350	2	800	—
33A/138A	4074A	IH	6.3	0.8	14	4.7	—	300	5	100	300
3B/252B	4033L	IH	6	1.4	15	1.67	—	600	25	45	—
	3B/401J	TTF	6.3	2.0	6	—	3	1,000	40	800	—
3B/850A	4242A	TTF	10	3.25	12	3	—	1,250	85	6	30
3C/270A	4212E	TTF	14	6.2	16	1.9	—	3,000	275	1.5	4.5
3C/350E	4270A	TTF	10	9.75	16	2.8	—	3,000	350	7.5	22.5

(1) Twin Triode—Characteristics given are for one section only, both sections being identical.

AIR BLAST COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r kΩ	Max. Va kV	W_a kW	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
	3J/160E	TTF	10	20	19	1.3	3	1	120	—
	3J/170E	TTF	10	22	20	3.3	6	3.5	50	—
	3J/191E	TTF	10	33	26	3.45	10	5	50	—
	3J/192E	TTF	5	66	17	1.5	7.0	4.5	22	—
	3J/221E	TF	22	70	26	2.9	17.5	20	22	—
	3J/221S	TF	22	70	26	2.9	17.5	10	22	—

WATER COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a k Ω	Max. Va kV	W_a kW	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
3Q/150E	4228A	TF	22	41	18	2.2	6	5	3	6
	3Q/191E	TTF	10	33	26	3.45	7.5	5	22	—
	3Q/221E	TF	22	70	26	2.9	17.5	20	22	—
3Q/292E	4030C	TF	25	248	36	1.8	17.5	80	2	22
	3Q/331E	TF	27.5	600	44	750	17.5	160	22	—

MERCURY VAPOUR THYRATRONS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Max. Peak Ia A	Max. Av. Ia A	Grid Control ratio approx.
	3V/340B	OCF	2.5	5	1.5	2	0.5	120
	3V/420B	IH	5	5.5	1.5	12.5	2.5	40
3V/500A	4049GD	OCF	4	11	20	5	1.25	3,000
3V/530E	4078GA	OCF	5	20	20	10	2.5	1,000
3V/560E	4079GA	OCF	5	38	20	20	7.5	1,000
3V/590E	4080GA	OCF	5	100	16	50	20	1,000

RADIATION COOLED PENTODES

Reference	Code	Cathode	Vf V	I_f A	Screen μ	gm mA/V	Max. Va V	Max. Vg_2 V	W_a W	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
	5A/152M	IH	6.3	0.46	—	7.5	300	200	3	—	—
	5B/110M	IH	6.3	0.80	—	6.5	300	200	11	—	—
	5B/250A	IH	6.3	0.9	8	6	600	300	25	60	125
	5B/251M	IH	6.3	0.9	8	6	600	300	16	60	125
	5C/100A	TTF	10	5	10	3.3	2,000	400	100	30	60
5C/101A	4069A	TTF	10	5.4	11	5	2,000	400	100	—	20
	5C/450A	TTF	10	12.5	5	4.5	3,000	850	450	10	20

AIR BLAST COOLED PENTODE

Reference	Code	Cathode	V_f V	I_f A	Screen μ	gm mA/V	Max. Va kV	Max. Vg^2 kV	W_a kW	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mcs
	5J/180E	TTF	10	28	6	5	6	1.5	3.5	25	—

COLD CATHODE GAS TUBES

Reference	Code	Type	Main Gap Striking V	Main Gap Maintaining V	Control Gap Striking V	Control Gap Maintaining V	Cathode Current mA	Regulation Volts	Regulation Current mA
	G120/1B	Stabiliser	120	55	—	—	20	4	30
	G150/2D	Relay	150	75	75	65	20	—	—
	G240/2D	Relay	240	90	75	65	20	—	—

VACUUM CONDENSERS

Reference	Code	Length mm.	Diam. m	Capacity pF	Peak RF kV	Peak RF A
	K12/2L	170	70	12 ± 10%	32	12
	K25/2L	170	70	25 ± 10%	32	12
	K50/2L	170	70	50 ± 10%	32	12

MISCELLANEOUS TUBES

Reference	Code	Description
	V230A/1K	V.M. Oscillator. Wave length range 8.9 cm. to 11 cm. and 8 cm. to 16 c.m. Approximate output 0.3W
	V246A/1K	V.M. Oscillator. Wave length range 6 cm. to 7 cm. Approximate output 0.5 W.
	VLS631	Miniature Thermal Delay Switch. V_h 6.3 V. I_k 0.5 A. Delay approximately 50 seconds. Maximum contact current 1 A. Maximum contact o/c Voltage 220 V.
	VLS640	Vacuum Antenna Relay. Equivalent of Bendix 3926E. 4 kV. 1 A.
X63C/1	4072A	X-Ray Tube. 6.3 kV peak at 10 mA.

D

CLASSIFIED LIST OF *STANDARD* VALVES—"CURRENT" TYPES

RADIATION COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a kΩ	gm mA/V	Max. Va V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
	3A/107B	OCF	4	0.25	7	5.5	—	190	—	—	—
	3A/108B	OCF	2	0.25	30	50	—	190	—	—	—
	3A/109B	OCF	4	0.25	6	2	—	190	—	—	—
	3A/110B	OCF	4	0.25	.12	5.5	—	190	—	—	—
	3A/141A	OCF	4.5	1.0	6	6	—	190	—	—	—
	3A/142A	OCF	4.5	1.0	30	60	—	190	—	—	—
	3A/144A	OCF	4.5	1.0	2.3	20	—	190	5	—	—
	3B/100B	IH	4	1.1	10	2	—	200	10	—	—
	3B/151A	OCF	4.5	1.6	7	3.5	—	400	15	—	—
3B/505E	4356A	TTF	5	5	45	12	—	1,500	50	100	250
	3C/150A	TTF	10	3.4	18	3.8	—	2,500	150	20	60

RADIATION COOLED TETRODES

Reference	Code	Cathode	V_f V	I_f A	μ	ra kΩ	Max. Va V	Max. Vg_2 V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
4A/137B	4045A	OCF	5	1.6	5.3	3.6	250	150	—	—	—

RADIATION COOLED PENTODES

Reference	Code	Cathode	V_f V	I_t A_t	Screen μ	gm ma/V	Max. Va V	Max. V_{g2} V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
	5A/102D	IH	7.5	0.83	—	2.5	180	150	—	—	—
5A/128B	4046A	IH	4	1	—	3	200	100	—	—	—
5A/136D	4328D	IH	7.5	0.45	19	2	250	180	—	—	--
5A/150A	4310A	IH	10	0.32	19	2	250	180	—	—	—

CATHODE RAY TUBES

Reference	Code	V_f V	I_f A	Useful Screen Diam. inches	Focus	Deflector	Final Anode Voltage kV	First Anode Voltage Vk	Screen Type	Base
C6SS/1B	VLS492AB	2	1.8	1½	Electro-statically	Electrostatic	1	0.5	Blue	Medium Shell Octal
C6SS/1G	VLS492AG	2	1.8	1½	Electro-statically	Electrostatic	1	0.5	Green	Medium Shel lOctal
C10SS/1B	4096AB	2	1.7	2½	Electro-statically	Electrostatic	2	0.25	Blue	International Octal
C16GS/2B	4050AB	0.75	1.1	4	Gas	Electrostatic	1.5	0.5	Blue	Standard British 9 Pin
C16GS/2G	4050AG	0.75	1.1	4	Gas	Electrostatic	1.5	0.5	Green	Standard British 9 Pin
C22SS/1B	4063AB	2	1.9	5½	Electro-statically	Electrostatic	5	0.15	Blue	12 Side Contact Base
C22SS/2B	4063YB	2	1.9	5½	Electro-statically	Electrostatic	5	0.15	Blue	12 Side Contact Base
C28GS/1B	4050BB	0.75	1.1	6½	Gas	Electrostatic	1.5	0.5	Blue	Standard British 9 Pin
C28GS/1G	4050BG	0.75	1.1	6½	Gas	Electrostatic	1.5	0.5	Green	Standard British 9 Pin

COLD CATHODE GAS TUBES

Reference	Code	Type	Main Gap Striking V	Main Gap Maintaining V	Control Gap Striking V	Control Gap Maintaining V	Cathode Current mA	Regulation	
								Volts	Current mA
G150/1A	4313C	Relay	150	75	70	60	20		
	G180/1G	Storage Lamp	180	80	—	—	0.1		

MISCELLANEOUS TUBES

P535/IE	Tetrode Pulse Modulator. Max. Va 15 kV. Peak Ia 15 A
P552/1E	Tetrode Pulse Modulator. Max. Va 20 kV. Peak Ia 15 A
VLS612	Manometer valve. 3A/141A type
VLS668A	Manometer valve. 110 mm., bulb length 76 mm. tubulation
VLS668B	Manometer valve. 200 mm., bulb length 26mm. tubulation

CLASSIFIED LIST OF *STANDARD* VALVES—"MAINTENANCE" TYPES

VACUUM RECTIFIERS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Peak Ia A	Av. Ia A	D.C. OUTPUT ½ wave V	D.C. OUTPUT bi-phase A
2T/200E	4065A	TF	4	7.5	20	—	0.005	—	—
22S/200A	4274A	OCF	5	2	1.5	0.5	—	500	0.160

MERCURY VAPOUR RECTIFIERS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Peak Ia A	Av. Ia A	D.C. OUTPUT ½ wave kV	D.C. OUTPUT bi-phase A
2V/401B	4017B	OCF	2.7	8.25	7	1.5	0.5	2.25	1.0
2V/470C	4049C	OCF	4	9.5	10	5	1.25	3.2	2.5
2V/471A	4064B	OCF	5	10	10	5	1.25	3.2	2.5

WATER COOLED RECTIFIERS

Reference	Code	Cathode	V_f V	I_f A	Max. PIV kV	Peak Ia A	Av. Ia A	D.C. OUTPUT ½ wave kV	D.C. OUTPUT bi-phase A
2W/540E	4222B	TF	22	41	45	6	1.5	14	3.0
2W/541E	4007A	TF	20	50	45	7	—	14	3.0

RADIATION COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a kΩ	Max. Va V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
	3A/107A	OCF	4	0.25	7	5.5	190	—	—	—
	3A/107AY	OCF	3A/107A selected to special limits					—	—	—
	3A/107BY	OCF	3A/107B selected to special limits					—	—	—
	3A/108A	OCF	2	0.25	30	50	190	—	—	—
	3A/108AY	OCF	3A/108A selected to special limits					—	—	—
	3A/108BY	OCF	3A/108B selected to special limits					—	—	—
	3A/109A	OCF	4	0.25	6	2	190	—	—	—
	3A/109AY	OCF	3A/109A selected to special limits					—	—	—
	3A/109BY	OCF	3A/109B selected to special limits					—	—	—
	3A/110A	OCF	4	0.25	12	5.5	190	—	—	—
3A/135A	4264A	OCF	1.5	0.3	6.3	12	100	—	—	—

RADIATION COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a kΩ	Max. V_a V	W_a W	MAX. FREQUENCY Full Ratings Mc/s	Reduced Ratings Mc/s
	3A/141AY	OCF	3A/141A selected to special limits					—	—	—
	3A/142AY	OCF	3A/142A selected to special limits					—	—	—
	3A/142AW	OCF	3A/142A selected to special limits					—	—	—
	3A/144AY	OCF	3A/144A selected to special limits					—	—	—
	3A/145J	IH	4	0.65	100	—	350	2	800	—
	3B/101B	IH	4	1	20	10	200	—	—	—
3B/170A	4275A	IH	5	1.2	2.8	1	300	17	—	—
3B/351A	4043C	OCF	7.5	1.2	8	3.5	600	35	2	10
3B/351B	4043D	OCF	7.5	1.2	8	3.5	600	35	2	10
3B/352A	4056B	TTF	6	1.9	12	5.5	1,000	35	15	30
3B/400A	4300A	IH	5	1.2	3.9	0.75	450	40	—	—

RADIATION COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a k Ω	Max. Va V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
3B/504A	4304CA	TTF	7.5	3.3	10.5	6.4	1,250	50	100	300
3B/504B	4304CB	TTF	7.5	3.3	10.5	6.4	1,250	50	100	300
3B/851A	4094A	TTF	10	3.25	35	7.8	1,250	85	6	—
3C/351H	4357A	TTF	10	10	32	5	4,000	350	100	300
	3D/100A	TTF	10	21	22	3.2	3,000	1,200	20	40
3D/150G	4015A	TF	11	41	21	8	5,000	1,500	—	—

WATER COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a kΩ	Max. Va kV	w_a kW	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
	3P/270B	TF	18	58	26	3.45	10	5	50	—
3Q/120G	4013C	TF	14	36	21	5.7	6	5	15	22

WATER COOLED TRIODES

Reference	Code	Cathode	V_f V	I_f A	μ	r_a kΩ	Max. Va kV	w_a kW	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
3Q/151G	4013D	TF	20	41	21	4.2	6	5	15	22
3Q/180E	4014A	TF	22	41	40	7.5	12	12	15	22
3Q/181E	4006A	TF	20	50	40	7.5	13	10	3	6
3Q/184E	4220C	TF	22	41	40	7.5	13	10	1	2
	3Q/200A	TF	20	59	12.5	3.6	17.5	20	5	—
3Q/211E	SS.1971	TF	20	64	21.5	3.5	12	15	15	22
3Q/212E	4081A	TF	20	59	33	6.0	17.5	20	5	—
	3Q/213E	TF	20	64	21.5	3.5	12	15	15	22
3Q/220E	4009B	TF	20	61	40	6	15	20	3	6
3Q/290E	4030A	TF	25	250	45	1.8	17.5	80	2	22
3Q/330E	4067A	TF	27.5	600	44	750	17.5	160	—	—

MERCURY VAPOUR THYRATRONS

Reference	Code	Cathode	V_f V	I_f A_f	Max. PIV kV	Peak Ia A	Av. Ia A	Grid Control ratio approx.
3V/280B	4039A	1H	4	1	1.5	0.45	0.1	40
3V/281B	VLS.432	1H	10	0.43	1.5	0.45	0.1	40

RADIATION COOLED TETRODES

Reference	Code	Cathode	V_f V	I_f A	Screen μ	gm mA/V	Max. Va	Max. Vg_2	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
4B/700A	4282B	TTF	10	3	2	1.4	1.0	250	70	30	60
4C/100A	4260A	TTF	10	3.25	2	1.1	3	500	100	30	50
4C/800E	4278A	TTF	10	15.6	9	4	3,000	750	800	30	60

WATER COOLED TETRODES

Reference	Code	Cathode	V_f V	I_f A	μ	gm mA/V	Max. Va kV	Max. Vg_2 kV	w_a kW
	4Q/230A	TF	21	70	300	4	11	2	15

RADIATION COOLED PENTODES

Reference	Code	Cathode	V_f V	I_f A	Screen μ	gm mA/V	Max. Va V	Max. Vg_2 V	w_a W	MAX. FREQUENCY Full Ratings Mc/s	MAX. FREQUENCY Reduced Ratings Mc/s
	5A/102A	IH	7.5	0.85	—	2.5	180	150	—	—	—
	5A/104B	IH	4	2.25	—	12	250	250	—	—	—
5A/116B	4070A	IH	4	2.25	—	12	250	250	—	—	—
5A/117B	4070C	IH	4	1	—	12	250	250	—	—	—
5A/136A	4328A	IH	7.5	0.425	—	2	250	180	—	—	—
5B/100A	4061A	IH	6.3	0.8	6	3	500	250	10	30	—
5B/150B	4071A	IH	4	2.25	—	10	250	250	15	—	—
5B/151A	4307A	IH	5.5	1	—	4	500	250	15	—	—
	5B/300B	IH	10	0.8	—	6	500	300	30	40	70
	5B/502A	TTF	12	2	12	3	1,500	300	60	20	60
5B/600A	4052A	TTF	7.5	3	10	3.4	1,500	300	60	20	60
	5D/100A	TTF	10	16	—	4.5	3,000	850	1,000	10	25

CATHODE RAY TUBES

Reference	Code	V_f V	I_f A	Useful Screen Diam. inches	Focus	Deflector	Final Anode Voltage kV	First Anode Voltage kV	Screen Type	Base
C10SS/1G	4096AG	2	1.7	2½	Electro-statically	Electrostatic	2	.25	Green	International octal
C16GS/1B	4018AB	0.75	1.1	4	Gas	Electrostatic	1.5	0.5	Blue	5-pin bayonet
C16GS/1D	4018AD	1.1	0.75	4	Gas	Electrostatic	1.5	0.5	Long Delay	5-pin bayonet
C16GS/1G	4018AG	0.75	1.1	4	Gas	Electrostatic	1.5	0.5	Green	5-pin bayonet

COLD CATHODE GAS TUBES

Reference	Code	Type	Main Gap Striking V	Main Gap Maintaining V	Control Gap Striking V	Control Gap Maintaining V	Cathode Current mA	Regulation Volts V	Regulation Current mA	
G83/1G and GZ	VLS405A and AS	Indicator Lamp	83	65	—	—	0.1	—	—	AS. Specially selected

LIST OF STANDARD VALVES "OBSOLETE" TYPES

Code	Description	Remarks
4008B ...	Half wave water cooled rectifier 45 kV	Replaced by 4222B
4016A ...	Triode. Tungsten filament. Radiation cooled 400 W.	
4016B ...	Triode as above but in hard glass	
4018BB ...	Gas focused cathode ray tube	Replaced by 4050BB
4018BD ...	Gas focused cathode ray tube	
4018BG ...	Gas focused cathode ray tube	Replaced by 4050BG
4019A ...	¼ amp. Repeater Triode	Replaced by 3A/107A
4019AS ...	Specially selected 4019A	Replaced by 3A/107AY
4019B ...	¼ amp. Repeater Triode	Replaced by 3A/107B
4019BS ...	Specially selected 4019B	Replaced by 3A/107BY
4020A ...	¼ amp. Repeater Triode	Replaced by 3A/108A
4020B ...	¼ amp. Repeater Triode	Replaced by 3A/108B
4020C ...	¼ amp. Repeater Triode	
4020AS ...	Specially selected 4020A	Replaced by 3A/108AY
4020BS ...	Specially selected 4020B	Replaced by 3A/108BY
4021A ...	¼ amp. Repeater Triode	Replaced by 3A/109A
4021B ...	¼ amp. Repeater Triode	Replaced by 3A/109B
4021C ...	¼ amp. Repeater Triode	G_1 to top cap
4021AS ...	Specially selected 4021A	Replaced by 3A/109AY
4021AT ...	¼ amp. Repeater Triode specially selected 4021A	
4021BS ...	Specially selected 4021B	Replaced by 3A/109BY
4022AR ...	¼ amp. Repeater Triode	Replaced by 3A/110A
4022B ...	¼ amp. Repeater Triode	Replaced by 3A/110B
4024AS ...	Triode 10W Micromesh construction	
4024B ...	Triode 10W Micromesh construction	Nearest replacement 3B/100B

Code	*Description*	*Remarks*
4030B ...	Double ended water cooled triode 80 kW	Replaced by 4030C
4033A ...	Triode	Replaced by 4033L
4036A ...	Micro-ray transmitting triode	Barkhausen-Kurtz. 17cm. oscillator
4036B ...	Micro-ray receiving triode	Barkhausen-Kurtz. 17cm. oscillator
4043A ...	Triode	Replaced by 4043C
4043B ...	Triode	Replaced by 4043D
4047A ...	Single ended water cooled triode 10 kW	Replaced by 4047B
4047B ...	Single ended water cooled triode 10 kW	
4048A ...	Half wave hot cathode mercury vapour rectifier	
4049GA ...	Half wave mercury vapour thyratron	Replacement 4049GD
4053A ...	Single ended water cooled triode 12 kW	Nearest replacement 4058B
4056A ...	Triode 35 W	Nearest replacement 4043C
4056C ...	Triode 35 W	Similar to the 4056A with the anode connected to the top cap
4058B ...	Single ended water cooled triode 12 kW	
4059A ...	Half wave rectifier, Tungsten filament 25 kW	
4060A ...	Tungsten filament. Triode 200 W	Nearest replacement 4212E
4062A ...	Radiation cooled triode 75 W	
4064A ...	Hot cathode mercury vapour rectifier	Replaced by 4064B
4066A ...	High slope output pentode	Nearest replacement 7A3
4075A ...	Half wave high vacuum rectifier 15 kW	Nearest replacement 2T/270K
4077A ...	Half wave mercury vapour rectifier P.I.V. 16 kW	Replacement 4049D
4097A ...	Triode 35 W	Nearest replacement 4043C
4251A ...	Triode 1 kW	
4251AX ...	Triode 1 kW	

List of *Standard* Valves—" Obsolete " Types—*continued.*

Code	*Description*	*Remarks*
4279A ...	Transmitting triode 1.2 kW	
4282BZ ...	Screen grid tetrode. Air-force base 70 W	Replaced by 4282B
4304CBX ...	H.F. Triode 50 W British 4-pin ceramic base	
4305A ...	Screen grid tube 60 W	Nearest replacement 4282B
4307AB ...	15 W transmitting pentode. British 7-pin base	Use 4307A
3A/101B ...	Indirectly heated equivalent of 4101D	
3A/102B ...	Indirectly heated equivalent of 4102D	
3A/104B ...	Indirectly heated equivalent of 4104D	
3A/105B ...	Microphone amplifier quiet tube	Replacement under development
3A/106B ...	Television output triode. British 7-pin base	
3A/106D ...	Television output triode on American octal base	
3A/149J ...	Grounded grid triode oscillator	
33A/100A ...	Double triode	
3B/102B ...	10 W Triode	Replaced by 4033L
3B/200B ...	20 W Triode	Nearest replacement 4033L
3B/501A ...	50 Watt H.F. triode	Replacement 4356A
3C/250A ...	250 watt H.F. triode	Nearest replacement 4270A
3J/190E ...	$3\frac{1}{2}$ kW air blast cooled triode Tungsten Fil.	Air blast cooled version of 3P/270B replaced by 3J/191E
4C/250A ...	250 watt tetrode	
4C/251A ...	250 watt tetrode	
5A/100B ...	RF screened pentode	Replacement Brimar 9A1
5A/101B ...	Variable μ copper cathode pentode	Nearest replacement 5A/104B
5A/103B ...	Modified 4071 with copper cathode	Nearest replacement 4071A
5B/111A ...	11 watt power-amplifier pentode	Nearest replacement 5B/250A

Code	*Description*	*Remarks*
5B/300BF ...	30 watt power pentode	Specially tested for Standard Aircraft radio.
5B/300D ...	5B/300B on American medium octal base	Replacement 5B/300B
5B/350A ...	35 watt R.F. pentode	Nearest replacement 5B/300B
5B/500B ...	50 watt R.F. pentode	Nearest replacement 5B/502A
5B/501B ...	50 watt R.F. pentode	Nearest replacement 5B/502A
5B/501BF ...	50 watt R.F. pentode	Specially tested for Standard Aircraft radio
5B/503A ...	60 watt R.F. pentode	
G210/1C ...	Gas gap relay	
G240/2A ...	Cold cathode relay	Replaced by G240/2D
V230C/1D	Velocity-modulated coaxial-line oscillator with A.F.C.	
VLS.559/10	10pF vacuum condenser	Replacement K12/2L
VLS.559/25	25pF vacuum condenser	Replacement K25/2L
VLS.559/50	50 pF vacuum condenser	Replacement K50/2L
VLS.559/100	100 pF vacuum condenser	

Miniature Half-Wave High-Voltage Rectifier
2T/270K

CATHODE.

Indirectly-heated oxide-coated		
Voltage	4	V
Nominal current	0.5	A

DIMENSIONS.

Maximum seated height	51.5	mm.
Maximum diameter	19.1	mm.
Top cap	Miniature skirted	
Base	Miniature 7 pin button	

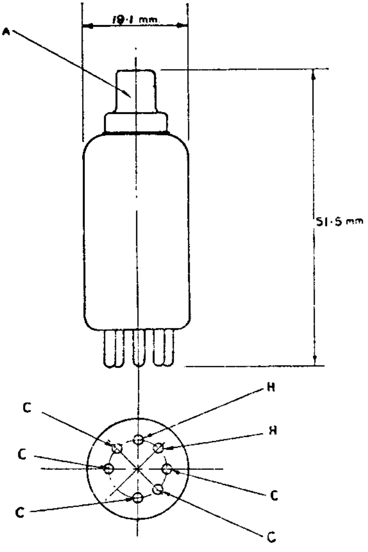
MAXIMUM RATINGS.

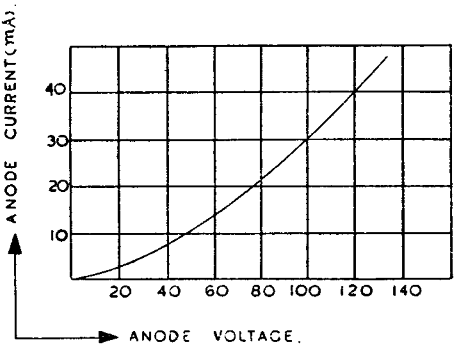
Maximum applied RMS voltage	5.5	kV
Maximum applied RMS voltage for simultaneous switching of heater anode supplies	3.5	kV
Maximum working peak inverse voltage	12.5	kV
Maximum no load peak inverse voltage	15.5	kV
Maximum DC mean rectified current	5	mA
Maximum peak anode current	40	mA
Recommended reservoir condenser	0.25	μF
Minimum limiting equivalent resistance introduced externally for a RMS voltage of 5.5 kV	62,000	Ω
Minimum delay in switching anode supply after heater voltage at maximum applied voltage	30	sec.

The above ratings apply to operation with a condenser input filter and a supply frequency of 50 c/s.

Tentative data
January 1946

Miniature Half-Wave High-Voltage Rectifier
2T/270K





Tentative data
January 1946

Hot Cathode Mercury Vapour Rectifier

2V/400A

CATHODE.

Oxide-coated filament, shielded		
Voltage	2.5	V
Nominal current	5.0	A

DIMENSIONS.

Maximum overall length	170	mm.
Maximum bulb diameter	66	mm.
Base—American medium 4 pin		
Net weight	125	g.

MAXIMUM RATINGS.

Maximum peak inverse voltage	10	kV
Maximum peak anode current	1.0	A
Maximum average anode current	0.25	A
Condensed mercury temperature range (with forced ventilation)	25°-65°C	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM P.I.V. VOLTAGE RATINGS AND CONDENSED MERCURY TEMPERATURE

Natural ventilation... ...	25°—55°C	20°C—40°C
Forced ventilation	25°—65°C	20°C—60°C
Peak Inverse Voltage ...	up to 5kV	5kV to 10kV

Hot Cathode Mercury Vapour Rectifier

2V/400A

TYPICAL OPERATING CONDITIONS

Circuit No.	No. of valves	Maximum D.C. output voltage	Maximum D.C. output current
2	2	3.200V	0.5A
3	4	6.500V	0.5A
4	3	4.500V	0.75A
5	6	4.500V	1.5A
6	6	9.500V	0.75A

This rectifier being directly heated, it is recommended that the output circuit be returned to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

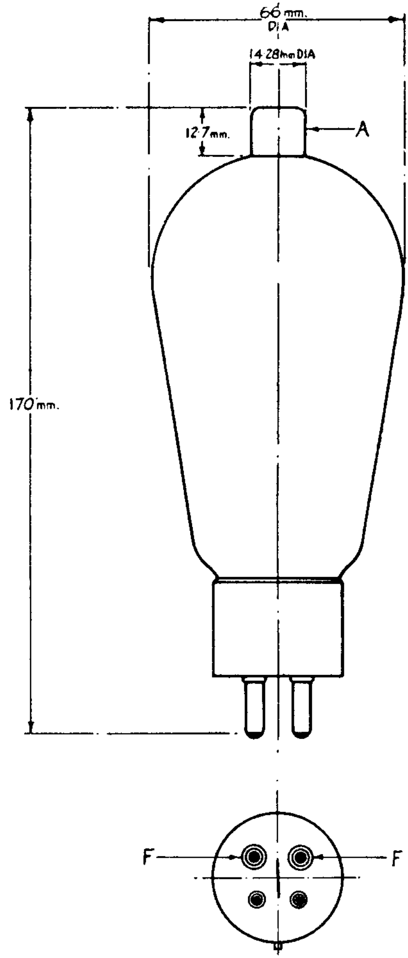
Minimum pre-heating period 30 seconds. After shipment or transit the pre-heating period must not be less than 5 minutes before any anode voltage is applied, so that the mercury may be correctly distributed.

Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation forced air blast being required for operation up to the maximum condensed mercury temperature limit.

NOTE.—Before putting a valve of this type into service it is recommended that reference be made to General Information Sheet K.

Hot Cathode Mercury Vapour Rectifier

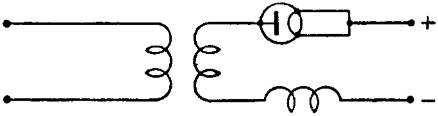
2V/400A



Hot Cathode Mercury Vapour Rectifier

2V/400A

Circuit No.
1



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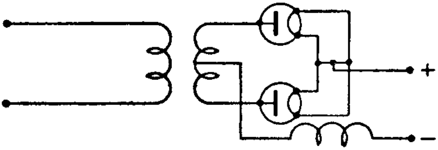

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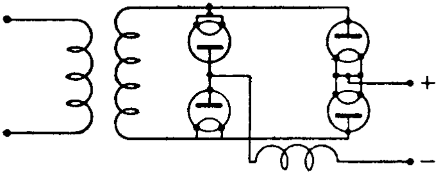

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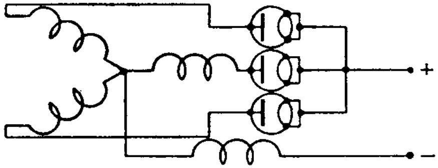

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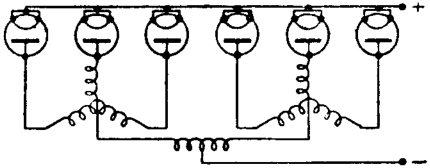

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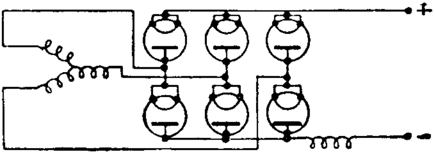


Half Wave Mercury Vapour Rectifier

4049D

CATHODE.

Oxide-coated shielded filament

Voltage	4	V
Nominal current	11	A

DIMENSIONS.

Maximum overall length	270	mm.
Maximum bulb diameter	63	mm.
Base	Giant Edison Screw	
Net weight	220	g.

MAXIMUM RATINGS.

Maximum peak inverse voltage	20	kV
Maximum peak anode current	5	A
Maximum average anode current	1.25	A
Condensed mercury temperature range with forced ventilation	20°C.-65°C.	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation Forced Ventilation	20°C.-55°C. 20°C.–65°C.	20°C.-40°C. 20°C.-55°C.
Peak inverse voltage	Less than 10 kV	10kV to 20 kV

Tentative data
June 1946

Half Wave Mercury Vapour Rectifier

4049D

TYPICAL OPERATION.

Circuit No.	No. of Valves	Maximum DC Output Volts	Maximum DC Output Amps.
2	2	6,400 V	2.5 A
3	4	13,000 V	2.5 V
4	3	9,500 V	3.75 V
5	6	9,500 V	7.5 V
6	6	18,500 V	3.75 V

This rectifier being indirectly heated, it is recommended that the output circuit be returned to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

Ambient Temperature	10° to 15°	15° to 30°	above 30°
Min. pre-heating period	30 min.	15 min.	5 min.

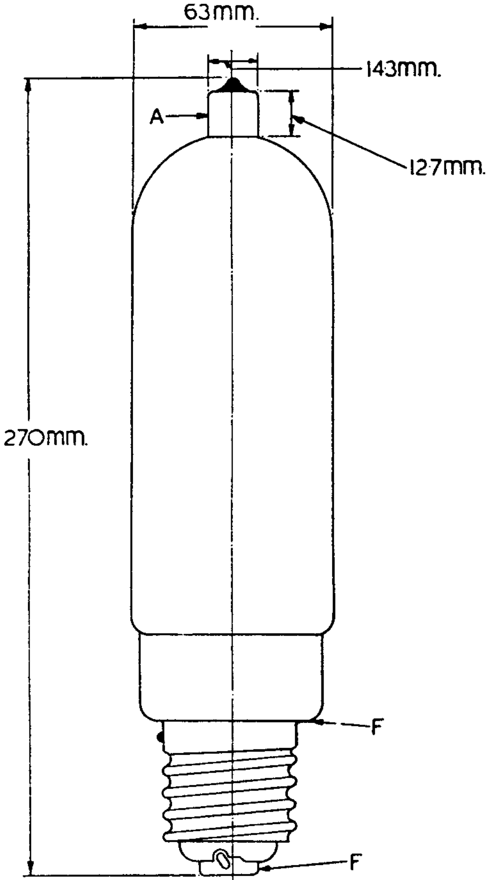
After shipment or transit the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly. Temperature limits given under "Natural Ventilation" are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

Note.—Before putting a valve of this type into service it is recommended that reference be made to the General Information Sheet K.

Tentative data
June 1946

Half Wave Mercury Vapour Rectifier

4049D



Tentative data
June 1946

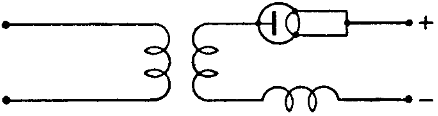
2V/500C
(4049D)

Half Wave Mercury Vapour Rectifier

4049D

Circuit No.

1



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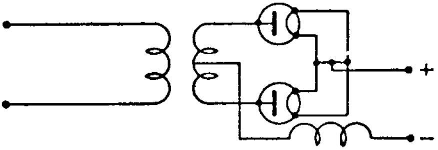

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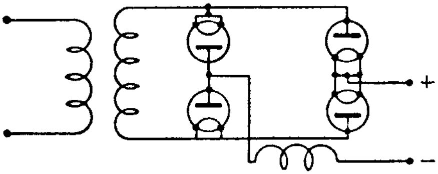

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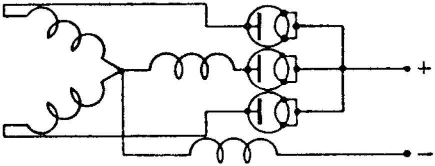

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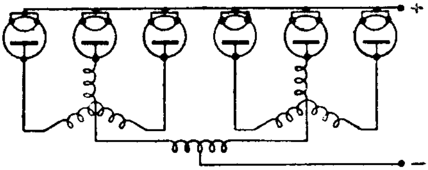

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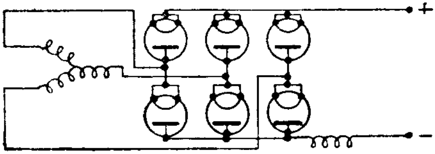


Tentative data
June 1946

Hot Cathode Mercury Vapour Rectifier

4078A

CATHODE.

Oxide-coated shielded filament

Voltage	5	V
Nominal current	20	A

DIMENSIONS.

Maximum overall length	412	mm.
Maximum bulb diameter	157	mm.
Net weight	900	g.

Base—Special 2-pin—(*see drawing*)

Top cap—Special—(*see drawing*)

MAXIMUM RATINGS.

Maximum peak inverse voltage	20	kV
Maximum peak anode current	10	A
Maximum average anode current	2.5	A
Condensed mercury temperature range with forced ventilation	15°C. to 65°C. maximum	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15°C. to 50°C.	15°C. to 40°C.	—	—
Forced Ventilation	15°C. to 65°C.	15°C. to 55°C.	15°C. to 45°C.	15°C. to 40°C.
Peak inverse Voltage	Less than 7,000 V	7,500 to 10,000 V	10,000 to 12,500 V	Greater than 12,500 V

Hot Cathode Mercury Vapour Rectifier

4078A

TYPICAL OPERATION.

Circuit No.	No. of Valves	Maximum DC Output Volts	Maximum DC Output Amps
2	2	6,400 V	5 A
3	4	12,500 V	5 A
4	3	9,500 V	7.5 A
5	6	9,500 V	15 A
6	6	18,500 V	7.5 A

This rectifier being directly heated, it is recommended that the output circuit be returned to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

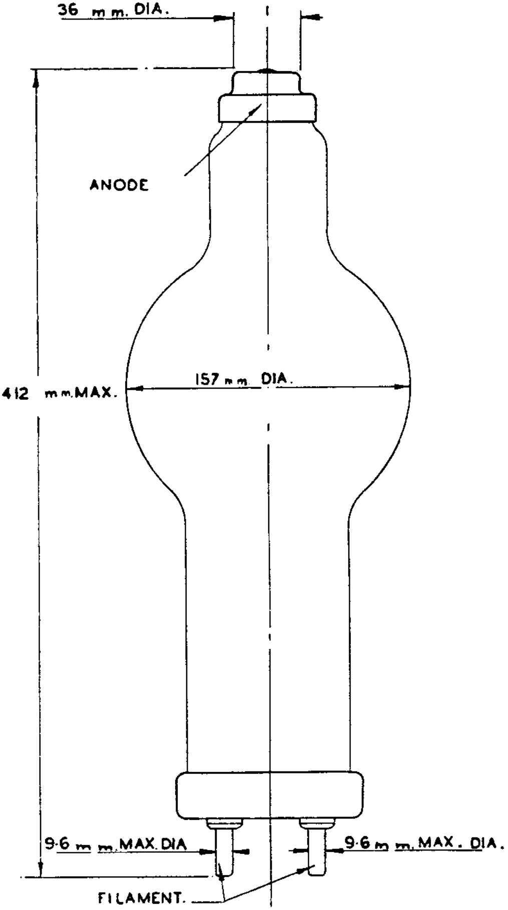
Ambient temperature	10°C. to 15°C.	15°C. to 20°C.	20°C. and above
Min. pre-heating period	30 min.	15 min.	5 min.

After shipment or transit the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly. Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

Note.—Before putting a valve of this type into service it is recommended that reference be made to the General Information Sheet K.

Hot Cathode Mercury Vapour Rectifier

4078A

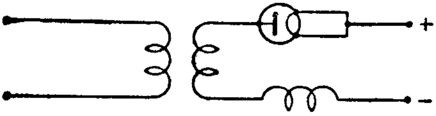


Hot Cathode Mercury Vapour Rectifier

4078A

Circuit No.

1



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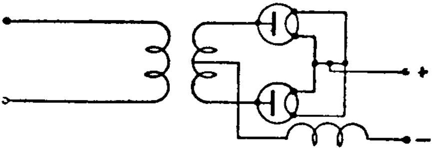

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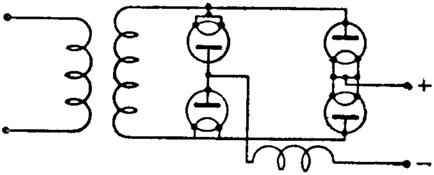

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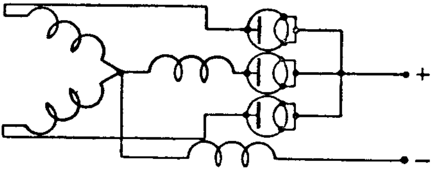

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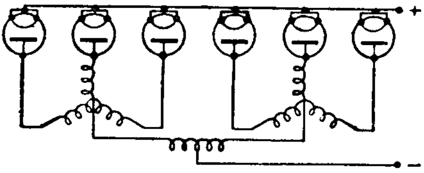

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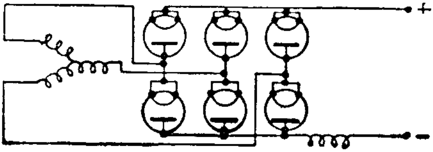


Hot Cathode Mercury Vapour Rectifier

4079A

CATHODE.

Oxide-coated shielded filament

Voltage	5	V
Nominal current	38	A

DIMENSIONS.

Maximum overall length	540	mm.
Maximum bulb diameter	195	mm.
Net weight	1.9	kg.

Base—Special 2-pin—(*see drawing*)

Top cap—Special—(*see drawing*)

MAXIMUM RATINGS.

Maximum peak inverse voltage	20	kV
Maximum peak anode current	20	A
Maximum average anode current	7.5	A
Condensed mercury temperature range with forced ventilation	15°C. to 65°C. maximum	

The above ratings apply to operation with a choke-input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15°C. to 45°C.	15°C. to 35°C.	—	—
Forced Ventilation	15°C. to 60°C.	15°C. to 50°C.	15°C. to 40°C.	15°C. to 35°C.
Peak inverse Voltage	Less than 7,000 V	7,500 to 10,000 V	10,000 to 12,500 V	Greater than 12,500 V

Hot Cathode Mercury Vapour Rectifier

4079A

TYPICAL OPERATING CONDITIONS.

Circuit No.	No. of Valves	Maximum DC output volts	Maximum DC output Amps.
2	2	6,400 V	12.5 A
3	4	13,000 V	12.5 A
4	3	9,500 V	16 A
5	6	9,500 V	30 A
6	6	18,500 V	16 A

This rectifier being directly heated it is recommended that the output circuit be returned to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

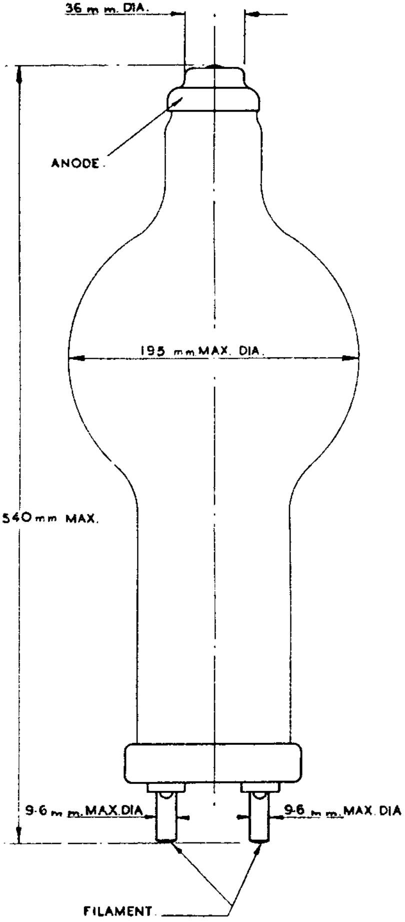
Ambient Temperature	10°C. to 15°C.	15°C. to 20°C.	20°C. and above
Min. Pre-heating period	30 min.	15 min.	5 min.

After shipment or transit the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly. Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

Note.—Before putting a valve of this type into service it is recommended that reference be made to the General Information Sheet K.

Hot Cathode Mercury Vapour Rectifier

4079A



June 1946

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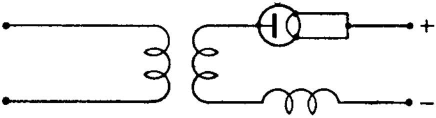
Hot Cathode Mercury Vapour Rectifier

4079A

Circuit No.

1



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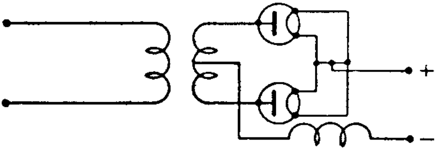

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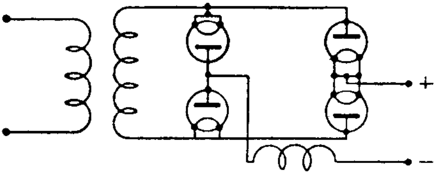

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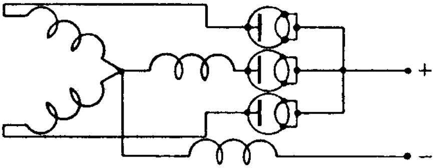

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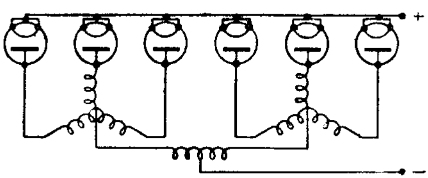

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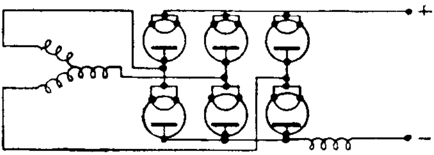


Hot Cathode Mercury Vapour Rectifier

4080A

CATHODE.

Oxide-coated shielded filament		
Voltage	5	V
Nominal current	100	A

DIMENSIONS.

Maximum overall length	685	mm.
Maximum bulb diameter	266	mm.
Net weight	4	kg.
Base. Special 3 pin.	See Drawing.	
Top Cap. Special.	See Drawing.	

MAXIMUM RATINGS.

Maximum peak inverse voltage	16,000	V
Maximum peak anode current	50	A
Maximum average anode current	20	A
Condensed mercury temperature range with forced air cooling	15° C. to 60° C. maximum	

The above ratings apply to operation with choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15° C. to 45° C.	15° C. to 35° C.	—	—
Forced Ventilation	15° C. to 60° C.	15° C. to 50° C.	15° C. to 40° C.	15° C. to 35° C.
Peak inverse voltage	Less than 7,500 V	7,500 V to 10,000 V	10,000 V to 12,500 V	Greater than 12,500 V

Hot Cathode Mercury Vapour Rectifier

4080A

TYPICAL OPERATING CONDITIONS
(for ideal choke-input filter).

Circuit No.	No. of Valves	Maximum D.C. Output Volts	Maximum D.C. Output Current
2	2	5,000 V	31 A
3	4	10,000 V	31 A
4	3	7,500 V	38 A
5	6	7,500 V	76 A
6	6	15,000 V	47 A

This rectifier being directly heated, the output circuit must be connected to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

Ambient Temperature	15° to 20° C.	20° C. and above
Min. pre-heating period	30 min.	10 min.

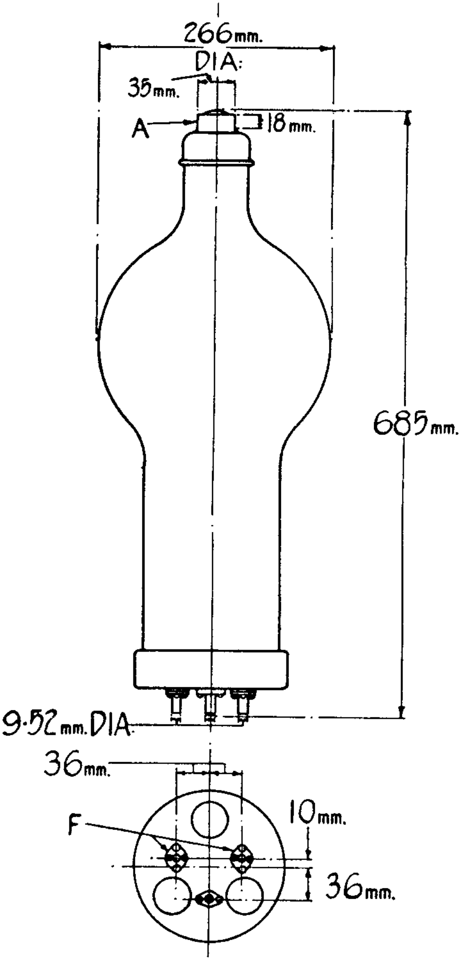
After shipment or transit the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly.

Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

NOTE.—Before putting a valve of this type into service it is recommended that reference be made to the General Information Sheet K.

Hot Cathode Mercury Vapour Rectifier

4080A



2V/590E
(4080A)

Hot Cathode Mercury Vapour Rectifier

4080A

Circuit No.

1

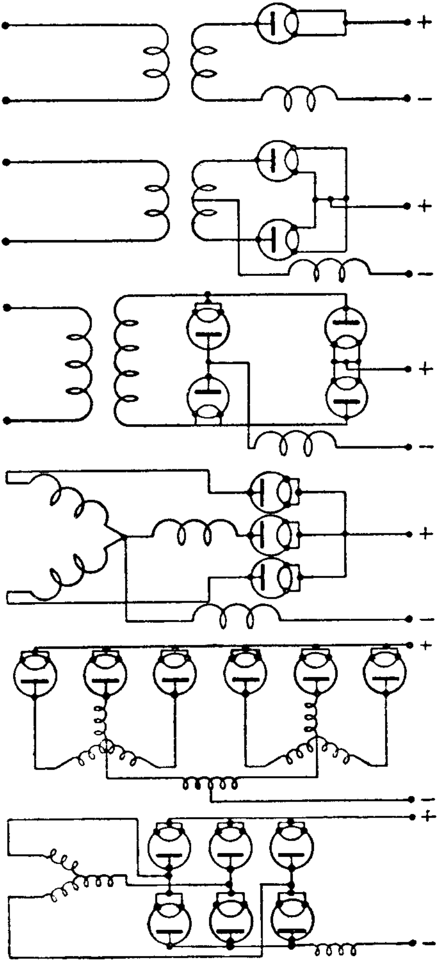
2

3

4

5

6



Repeater Triode

3A/107A
3A/107B

(3A/107A is for replacement purposes only)

CATHODE.

Oxide-coated filament		
Current	0.25	A
Nominal voltage	4	V

RATING.

Amplification factor	Measured at Va 130V	7	
Impedance	V_{g1}–8V, I_f 0.25A D.C.	5,500	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	4.7	pF
Grid to filament	6.2	pF
Anode to filament	2.1	pF

BASE.

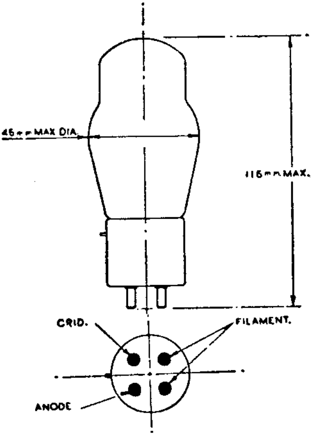
3A/107A American 4-pin bayonet
3A/107B Standard 5-pin British

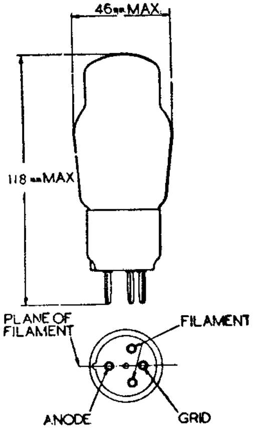
DIMENSIONS.

Maximum overall length		
3A/107A	116	mm.
3A/107B	118	mm.
Maximum bulb diameter	46	mm.
Net weight	44	g.

MAXIMUM RATINGS.

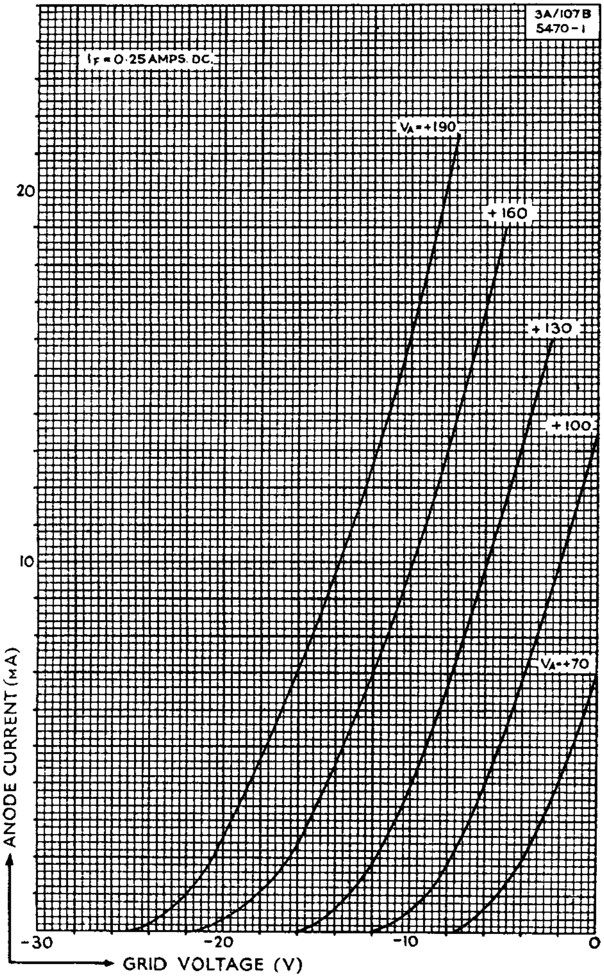
Maximum direct anode voltage	190	V





Repeater Triode

3A/107A
3A/107B



May 1947

Repeater Triode

3A/108A
3A/108B

(3A/108A is for replacement purposes only)

CATHODE.

Oxide-coated filament		
Current	0.25	A
Nominal voltage	2	V

RATING.

Amplification factor	Measured at Va 130V	30	
Impedance	V_{g1}-1.5V, I_f 0.25A D.C.	50,000	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	5.0	pF
Grid to filament	5.0	pF
Anode to filament	2.5	pF

BASE.

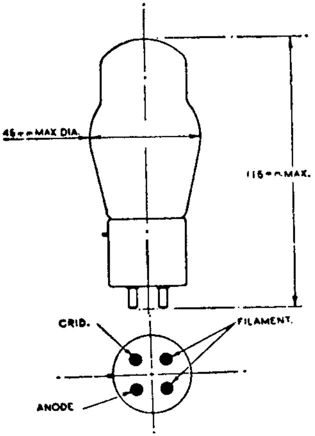
3A/108A American 4-pin bayonet
3A/108B Standard 5-pin British

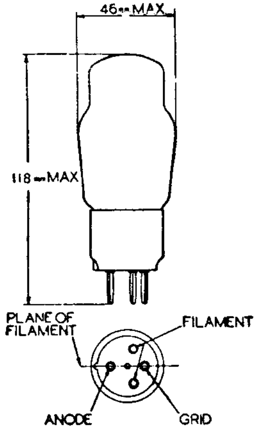
DIMENSIONS.

Maximum overall length		
3A/108A	116	mm.
3A/108B	118	mm.
Maximum bulb diameter	46	mm.
Net weight	44	g.

MAXIMUM RATINGS.

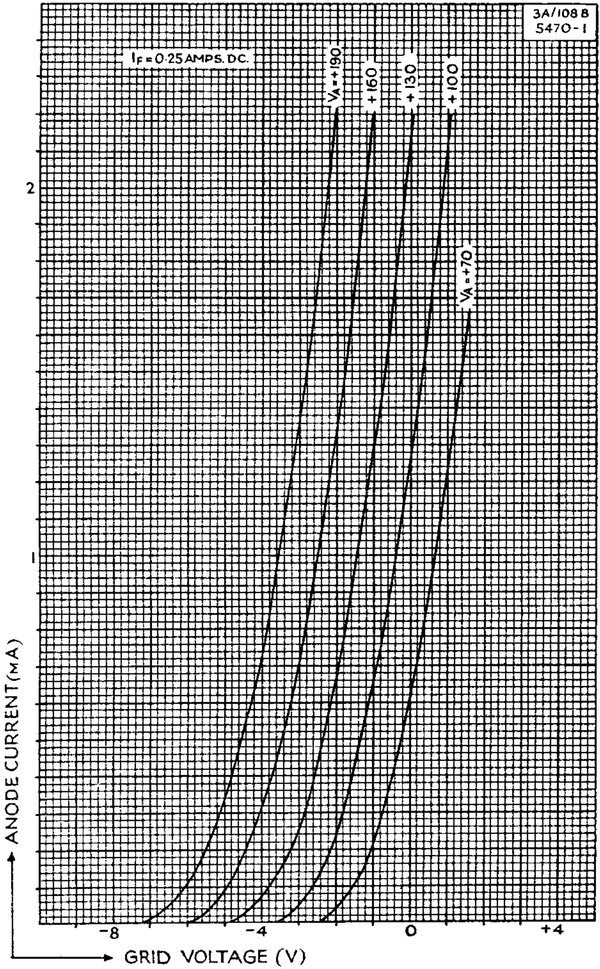
Maximum direct anode voltage	190	V





Repeater Triode

3A/108A
3A/108B



Repeater Triode

3A/109A
3A/109B

(3A/109A is for replacement purposes only)

CATHODE.

Oxide-coated filament		
Current	0.25	A
Nominal voltage	4	V

RATING.

Amplification factor	Measured at Va 130V V_{g1}-8 V, I_f 0.25A D.C.	6	
Impedance		2,000	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	9.0	pF
Grid to filament	6.0	pF
Anode to filament	3.6	pF

BASE.

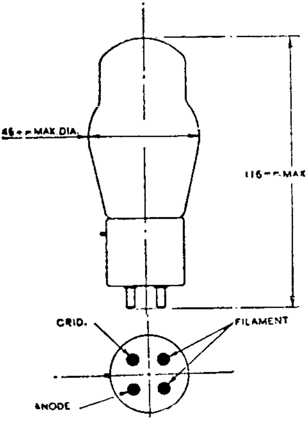
3A/109A American 4-pin bayonet
3A/109B Standard 5-pin British

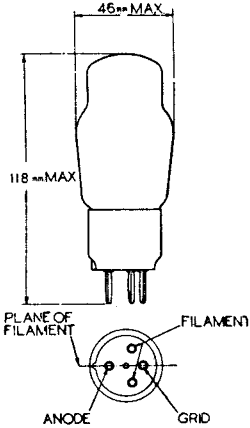
DIMENSIONS.

Maximum overall length		
3A/109A	116	mm.
3A/109B	118	mm.
Maximum bulb diameter	46	mm.
Net weight	44	g.

MAXIMUM RATINGS.

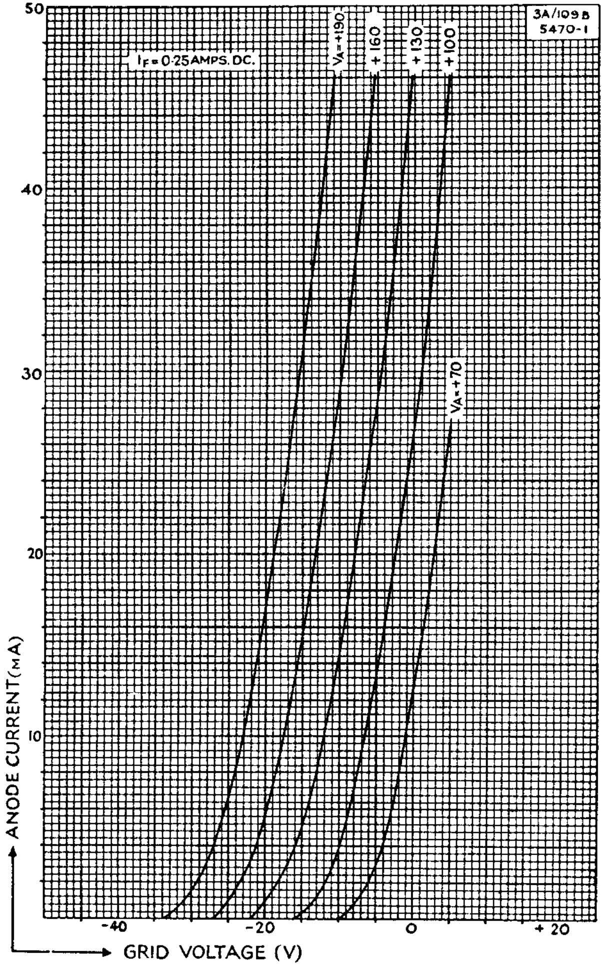
Maximum direct anode voltage	190	V





Repeater Triode

3A/109A
3A/109B



Repeater Triode

3A/110A
3A/110B

(3A/110A is for replacement purposes only)

CATHODE.

Oxide-coated filament		
Current	0.25	A
Nominal voltage	4.0	V

RATING.

Amplification factor	Measured at Va 130V V_{g1}-4.5V, I_f 0.25A D.C.	12	
Impedance		5,500	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	9.7	pF
Grid to filament	6.5	pF
Anode to filament	2.5	pF

BASE.

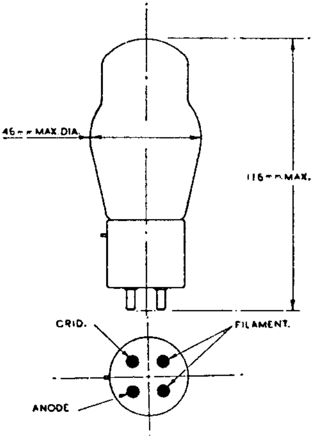
3A/110A American 4-pin bayonet
3A/110B Standard 5-pin British

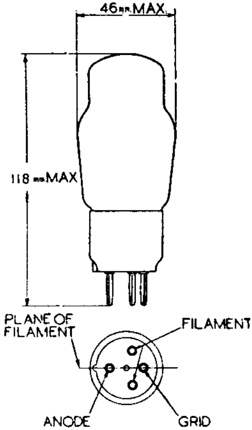
DIMENSIONS.

Maximum overall length		
3A/110A	116	mm.
3A/110B	118	mm.
Maximum bulb diameter	46	mm.
Net weight	44	g.

MAXIMUM RATINGS.

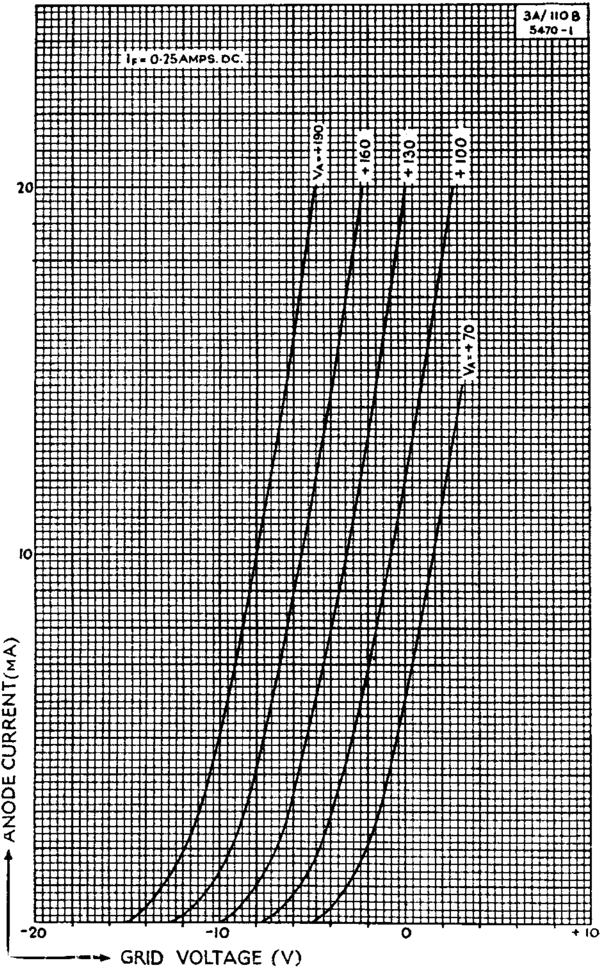
Maximum direct anode voltage	190	V





Repeater Triode

3A/110A
3A/110B



May 1947

Repeater Triode
3A/141A
Replaces 4101D

(3A/141AY is the 3A/141A tested to special limits for replacement purposes only.)

CATHODE.

Oxide-coated filament		
Current	1.0	A
Nominal voltage	4.5	V

RATING.

Amplification factor	Measured at Va 130V, Vg_1—9V	6	
Impedance	Measured at Va 130V, Vg_1—9V	6,000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	8.1	pF
Grid to filament	6.4	pF
Anode to filament	5.6	pF

DIMENSIONS.

Maximum overall length	118	mm.
Maximum bulb diameter	46	mm.
Base : American medium 4-pin bayonet		
Net weight	60	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	190	V
Maximum direct anode current	12	mA

Repeater Triode

3A/141A

Replaces 4101D

(3A/141AY is the 3A/141A tested to special limits for replacement purposes only.)

TYPICAL OPERATING CONDITIONS.

							*			*	*	*
Anode voltage	volts	100	100	130	130	130	160	160	160	190	190	190
Grid bias	volts	—4	—6	—6	—9	—12	—10	—12	—16	—16	—18	—20
Anode current	mA	7.3	5.5	11.1	7.8	5.0	12.3	10.1	6.3	11	9.0	7.2
Amplification factor		6.1	6.0	6.1	6.0	5.9	6.1	6.0	5.9	6.0	5.9	5.9
Impedance r_a	ohms	5,500	6,200	4,900	5,700	7,000	4,700	5,200	6,600	5,100	5,600	6,300
For load impedance $R=r_a$												
Output	mW	14	26	35	65	90	100	130	175	235	265	285
2nd harmonic	db	33	27	32	26	21	29	25	19	24	21	19
For lead impedance $R=2r_a$												
Output	mW	12	24	30	60	80	90	115	155	210	235	250
2nd harmonics	db	38	32	38	31	26	34	30	25	29	26	24

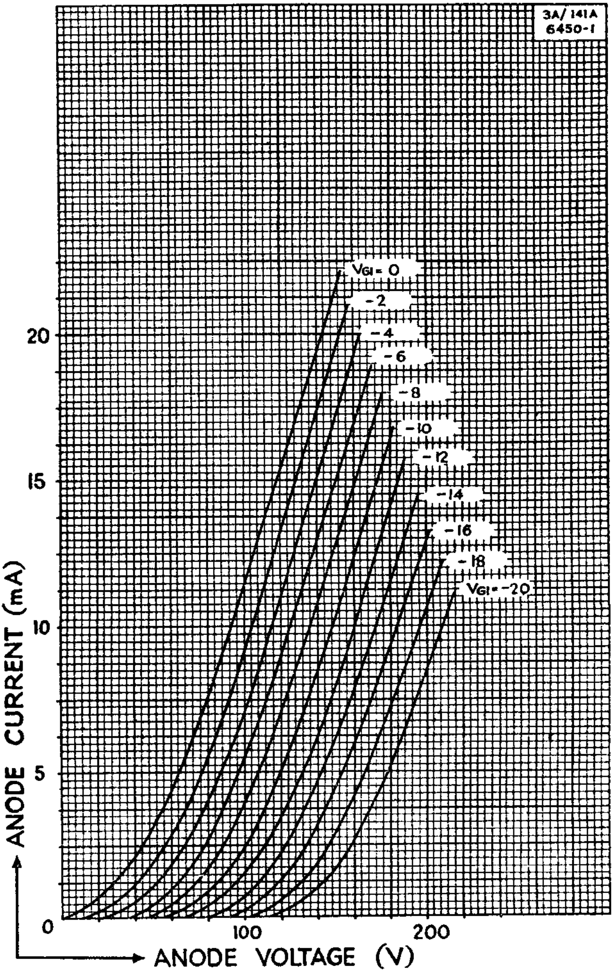
* Maximum operating conditions.

Repeater Triode

3A/141A

Replaces 4101D

(3A/141AY is the 3A/141A tested to special limits for replacement purposes only.)

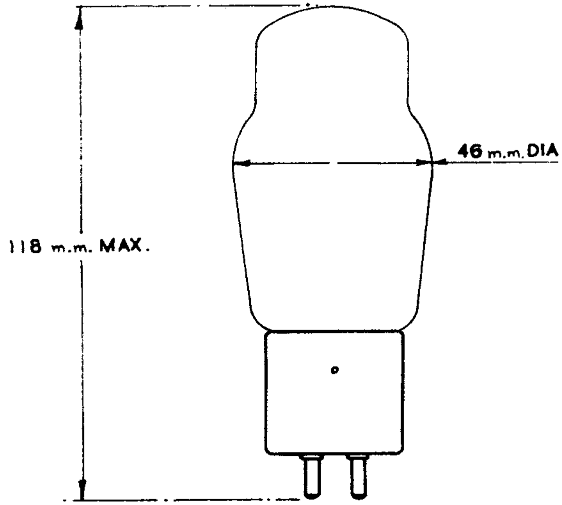


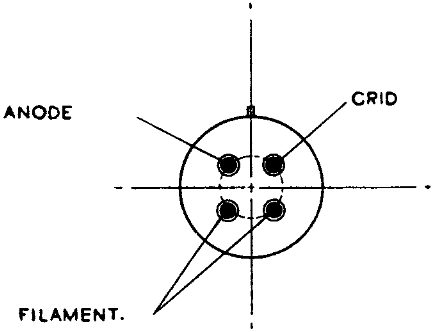
Repeater Triode

3A/141A

Replaces 4101D

(3A/141AY is the 3A/141A tested to specia limits for replacement purposes only.) I





Repeater Triode

3A/142A

Replaces 4102D

(3A/142AY is the 3A/142A tested to special limits for replacement purposes only)

CATHODE.

Oxide-coated filament		
Current	1.0	A
Nominal voltage	4.5	V

RATING.

Amplification factor	Measured at Va130V, Vg —1.5V	30	
Impedance		60,000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	7.6	pF
Grid to filament	5.5	pF
Anode to filament	5.0	pF

DIMENSIONS.

Maximum overall length	118	mm.
Maximum bulb diameter	46	mm.
Base American medium 4 pin bayonet		
Net weight	60	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	190	V
Maximum direct anode current	1.5	mA

Repeater Triode

3A/142A

Replaces 4102D

(3A/142AY is the 3A/142A tested to special limits for replacement purposes only)

TYPICAL OPERATING CONDITIONS.

Anode voltage volts	Grid Bias volts	Anode current milli-amps	Amplification factor	Anode resistance ohms ra	Load resistance R	Output voltage peak volts	Second harmonic db
130	—2.0	0.36	29.4	80,000	R=ra	27	20
					R=3ra	38	24
					R=5ra	41	25
130	—1.5	0.58	29.8	63,000	R=ra	20	26
					R=3ra	30	31
					R=5ra	34	33
130	—1.0	0.85	30.1	53,000	R=ra	15	33
					R=3ra	20	39
					R=5ra	23	40
160	—3.0	0.34	29.2	81,000	R=ra	40	18
					R=3ra	57	21
					R=5ra	62	22
160	—2.0	0.80	29.9	54,000	R=ra	28	27
					R=3ra	42	33
					R=5ra	45	34
160	—1.0	1.45	30.3	42,000	R=ra	15	38
					R=3ra	21	43
					R=5ra	24	48
190*	—3.0	0.83	29.8	54,000	R=ra	42	23
					R=3ra	63	28
					R=5ra	68	30
190*	—2.0	1.46	30.2	43,000	R=ra	30	31
					R=3ra	43	38
					R=5ra	48	41

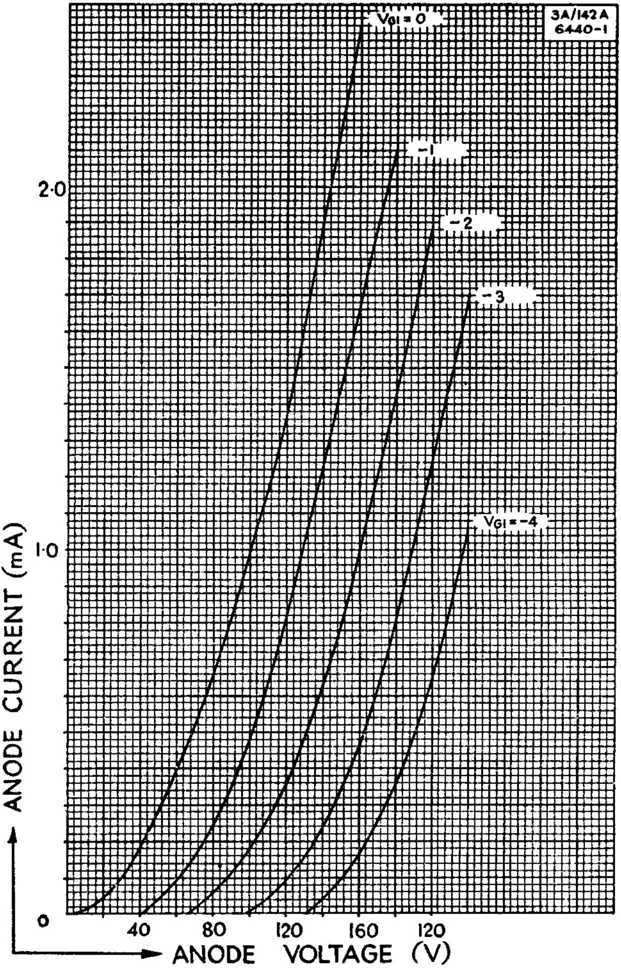
* Maximum operating conditions.

Repeater Triode

3A/142A

Replaces 4102D

(3A/142AY is the 3A/142A tested to special limits for replacement purposes only)



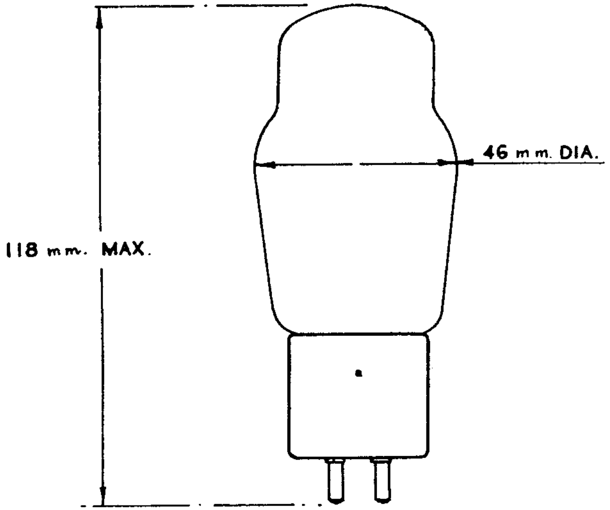
April 1946

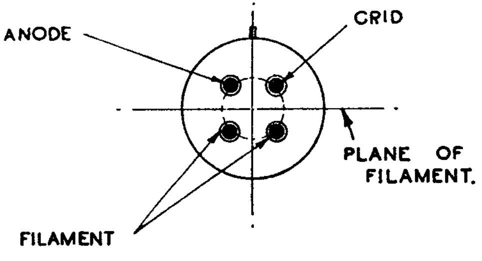
Repeater Triode

3A/142A

Replaces 4102D

(3A/142AY is the 3A/142A tested to special limits for replacement purposes only)





Repeater Triode
3A/144A
Replaces 4104D

3A/144AY is the 3A/144A tested to special limits for replacement purposes only

CATHODE.

Oxide-coated filament		
Current	1.0	A
Nominal voltage	4.5	V

RATING.

Amplification factor	Measured at Va 130V	2.3	
Impedance	Vg_1—20V	20,000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	6.8	pF
Grid to filament	5.8	pF
Anode to filament	5.5	pF

DIMENSIONS.

Maximum overall length	118	mm.
Maximum bulb diameter	46	mm.
Base : American medium 4 pin bayonet		
Net weight	60	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	190	V
Maximum direct anode current	60	mA
Maximum anode dissipation	5	W

Repeater Triode

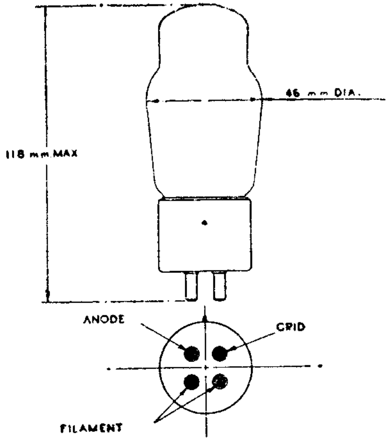
3A/144A

Replaces 4104D

3A/144AY is the 3A/144A tested to special limits for replacement purposes only

TYPICAL OPERATING CONDITIONS.

Anode voltage volts	Grid bias volts	Anode current mA	Anode resis-tance ohms	Load imped-ance ohms	Output watts	2nd Harmonic db below funda-mental
130	—15	31.3	1,900	1,900	.090	27.6
				3,800	.078	28.4
				5,700	.065	26.6
130	—20	25.2	2,000	2,000	.135	25
				4,000	.126	28.2
				6,000	.103	28.4
130	—25	20.5	2,100	2,100	.190	25.6
				4.200	.167	28.2
				6,300	.145	30
160	—25	35	1,900	1,900	.230	27.8
				3,800	.177	31.4
				5,700	.170	33.2
160	—30	29	1,900	1,900	.300	26.2
				3,800	.284	27.2
				5,700	.236	30.2

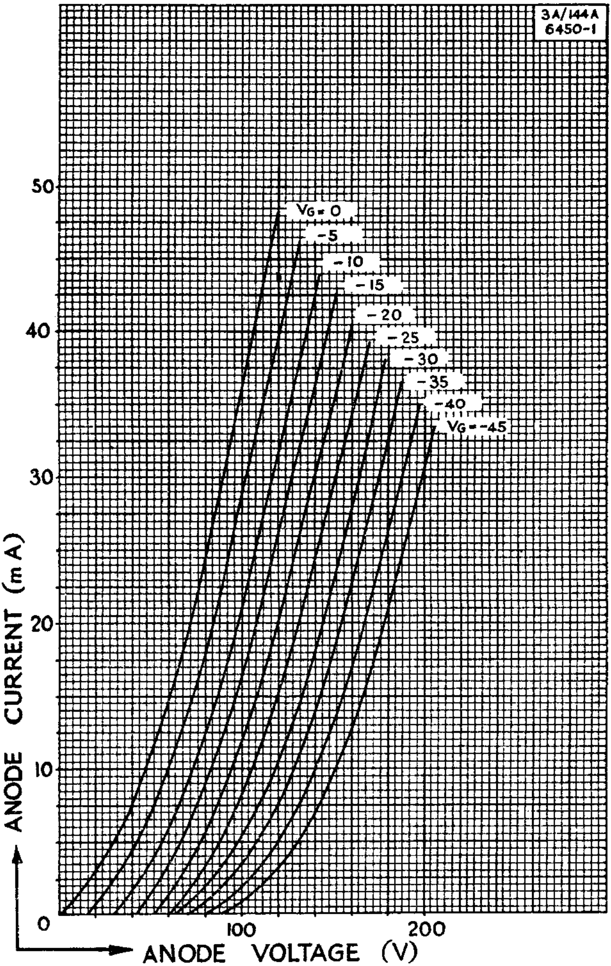


Repeater Triode

3A/144A

Replaces 4104D

3A/144AY is the 3A/144A tested to special limits for replacement purposes only



April 1946

Grounded Grid Triode

3A/146J (CV53)

This is a special triode for UHF operation designed primarily for use as an amplifier at frequencies between 50 and 450 Mc/s. It will operate as an efficient amplifier up to 350 Mc/s with tuning coil and condenser circuits. At higher frequencies, up to 450 Mc/s, coaxial line resonators will be necessary.

CATHODE.

Indirectly-heated oxide-coated. The cathode is strapped inside the glass bulb to one heater lead.

Voltage	4.0	V
Nominal current	0.65	A

RATING.

Amplification factor	Measured at Va250V Auto-bias resistance 150 ohms	100	
Mutual conductance		5	mA/V

DIRECT INTER-ELECTRODE CAPACITIES.

Anode to grid	Measured with an earthed shield around the bulb	1.6	pF
Anode to cathode		0.035	pF
Grid to cathode		4.0	pF

DIMENSIONS.

Maximum overall length	82.55	mm.
Maximum diameter of disc	51.3	mm.
Maximum bulb diameter	31.5	mm.
Net weight	24	g.

MAXIMUM RATING.

Maximum direct anode voltage	350	V
Maximum anode dissipation	2	W

MOUNTING.

The valve may be mounted by means of the grid disc. Spade tags are attached to the heater leads, one of which, that connected to the cathode, is painted red.

Tentative data
May 1947

Grounded Grid Triode

3A/146J (CV53)

TYPICAL OPERATION

Amplifier for frequencies of 250 to 300 Mc/s

The valve is mounted in a screening box so that the grid disc is integral with the screening system and the input circuit well shielded from the output circuit. The anode resonant circuit must be a high quality coil condenser unit and is mutually coupled to the output by a coupling coil the position of which may be varied to increase or decrease the coupling and hence vary the load transferred to the anode circuit. By increasing the coupling the band width is widened.

The cathode circuit consists of two similar coils—one in the heater lead and one in the heater and cathode lead —tuned by a condenser. The coils are decoupled for H.F by small condensers at the end remote from the valve. The input is tapped on the coil in the cathode lead to match the input impedance to that of the facing impedance, i.e., aerial or preceding valve.

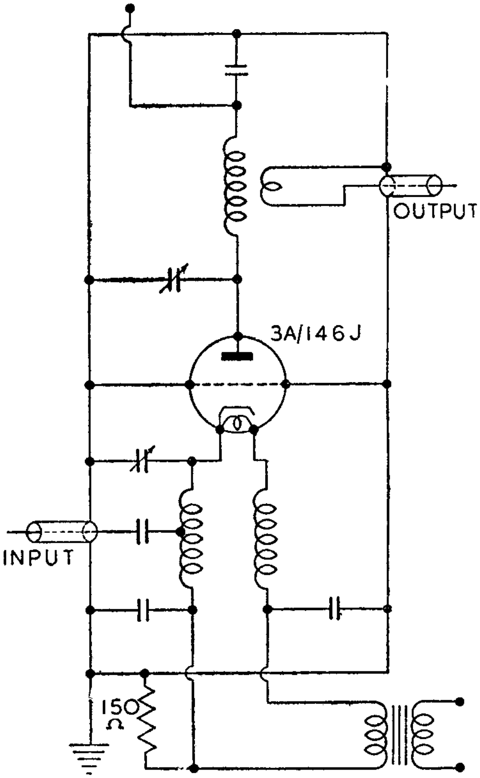
With care given to the design of the tuned circuit, and stray capacities kept at a minimum, a compact and efficient amplifier may be built for frequencies up to 350 Mc/s with a stage gain of 16 db over a band width of 1.5 Mc/s ; or 13 db may be obtained for a band width of 4 Mc/s.

Tentative data
May 1947

Grounded Grid Triode

3A/146J (CV53)

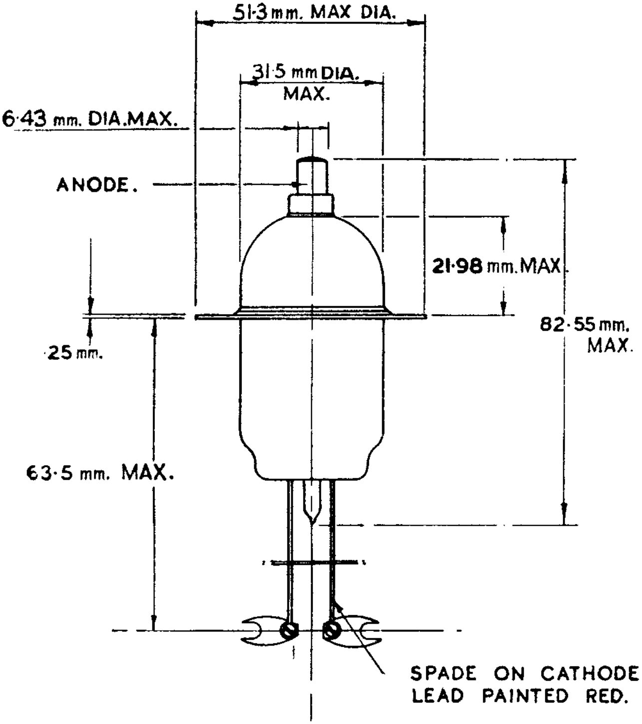
50—300 Mc/s AMPLIFIER.



Tentative data
May 1947

Grounded Grid Triode

3A/146J (CV53)



Tentative data
May 1947

Grounded Grid Oscillator Triode

3A/147J (CV82)

This valve is intended primarily as an oscillator at frequencies up to 750 Mc/s. In this range outputs between 1 and 2 watts are readily obtainable.

CATHODE.

Indirectly heated oxide-coated. The cathode is strapped inside the glass bulb to one heater lead.

Voltage	4	V
Nominal current	0.7	A

RATING.

Amplification factor	Measured at Va250V Vg_1—3	35	
Mutual conductance		6	mA/V

DIRECT INTER-ELECTRODE CAPACITIES.

Anode to grid	Measured with an earthed shield around the bulb	1.4	pF
Anode to cathode		0.4	pF
Grid to cathode		4.2	pF

DIMENSIONS.

Maximum overall length	82.55	mm.
Maximum disc diameter	51.3	mm.
Maximum bulb diameter	31.5	mm.
Maximum disc thickness	0.25	mm.
Net weight	24	g.

MOUNTING.

The valve is designed to mount by means of the grid disc between coaxial lines. Spade tags are attached to the heater leads one of which, that connected to the cathode, is painted red.

MAXIMUM RATINGS.

Maximum direct anode voltage	350	V
Maximum direct anode current	28	mA
Maximum anode dissipation	6	W
Maximum grid dissipation	0.5	W

Tentative data
November 1945

Grounded Grid Oscillator Triode

3A/147J (CV82)

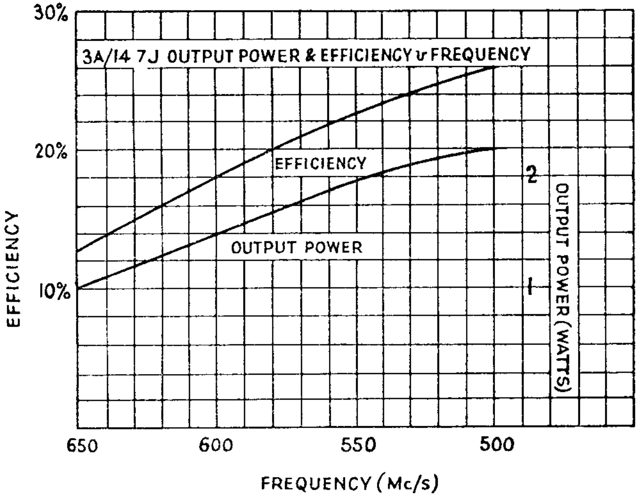
TYPICAL OPERATION

Oscillator at 550 to 650 Mc/s.

A convenient oscillator circuit takes the form of that shown in the accompanying sketch, the anode resonator being the only variable and the cathode being choked back by either the inductance of its own leads or small chokes. Using this circuit, an output of from 1 to 2 watts at an efficiency varying between 13 and 26 per cent. has been obtained over the above frequency band. The curve below indicates the variation of efficiency and output with frequency over the range.

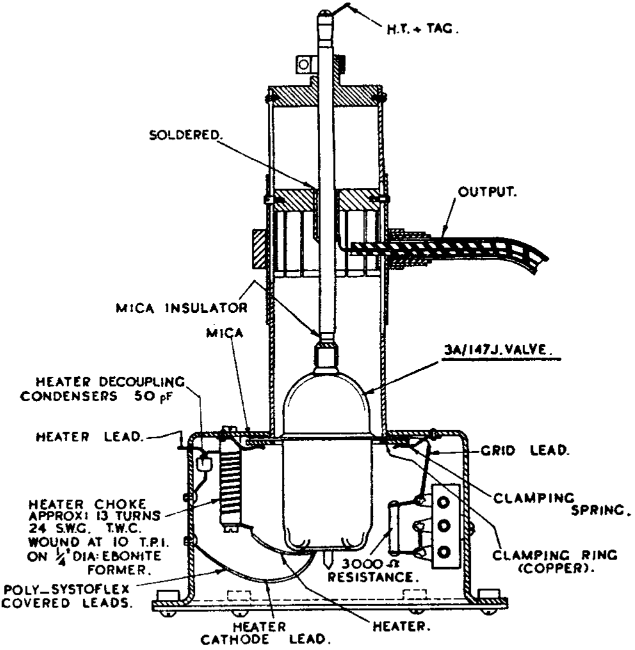
650 Mc/s is the highest frequency obtainable with a closed resonator owing to physical limitations, i.e., the length and diameter of the anode lead. Higher frequencies can be obtained with an open line. The highest frequency at which the valve will oscillate is about 850 Mc/s. Appreciable power has been obtained at frequencies as high as 750 Mc/s.

NOTE : The internal diameter of the outer conductor of any coaxial line system employed with this valve should not be less than 1.38 inches if possible damage to the grid disc seal is to be avoided.



Grounded Grid Oscillator Triode

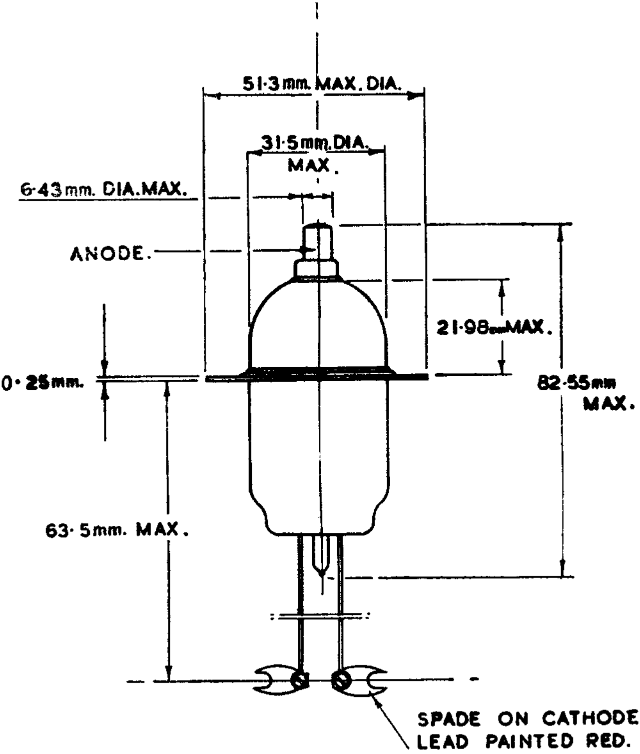
3A/147J (CV82)



Tentative data
November 1945

Grounded Grid Oscillator Triode

3A/147J (CV82)



Tentative data
November 1945

Grounded Grid Triode

3A/148J (CV88)

This is a special triode for UHF operation designed primarily for use at 600 Mc/s. The grid being operated at ground potential and the feedback capacity low, the input is well shielded from the output. It differs from the 3A/145J in heater voltage, 6.3 V instead of 4 V, and the heater and cathode are brought out to a concentric thimble suitable for direct attachment to a concentric resonator. Used in a pre-amplifier, improvements of the order of 12 to 15 db resulted in the signal to noise ratio performance of UHF receivers, an improvement of 4 to 5 db over the 3A/145J.

CATHODE.

Indirectly heated oxide-coated. The cathode is strapped internally to one heater lead.

Voltage	6.3	V
Nominal current	0.4	A

RATING.

Amplification factor	Measured at Va250V Auto-bias resistance 150Ω	100	
Mutual conductance		> 5	mA/V

DIRECT INTER-ELECTRODE CAPACITIES.

Anode to grid	Measured with an earthed shield around the bulb	1.5	pF
Anode to cathode		0.035	pF
Grid to cathode		4.0	pF

DIMENSIONS.

Maximum overall length	80.9	mm.
Maximum diameter over disc	51.3	mm.
Maximum bulb diameter	31.5	mm.
Nominal disc thickness	0.25	mm.
Net weight	30	g.

MOUNTING.

The valve is designed to mount by means of the grid disc between coaxial lines.

MAXIMUM RATINGS.

Maximum direct anode voltage	350	V
Maximum anode dissipation	2	W
With adequate cooling the anode dissipation may be increased to	3	W

Tentative data
October 1945

Grounded Grid Triode

3A/148J (CV88)

TYPICAL OPERATING CONDITIONS

A suitable amplifier for 600 Mc/s operation is shown in the accompanying sketch.

The valve is mounted between two coaxial lines, suitable blocking condensers being inserted to isolate the D.C. potentials.

The inherent negative feedback limits possible gain, but together with the marked reduction of impedances common to both circuits, makes for greater stability. The impedance of the ouput circuit must be high with the result that the tuning adjustment is critical. The input impedance, however, is normally low, no tuning or coupling adjustment being necessary for fixed frequency working.

The output coupling controls the band width ; 2 to 6 Mc/s has been obtained in practice. The anode load and gain of the valve may be varied by the output coupling ; this has the advantage that it may be pre-set.

The grid is auto-biased through 150 ohms in parallel with the 0.01*u*F.

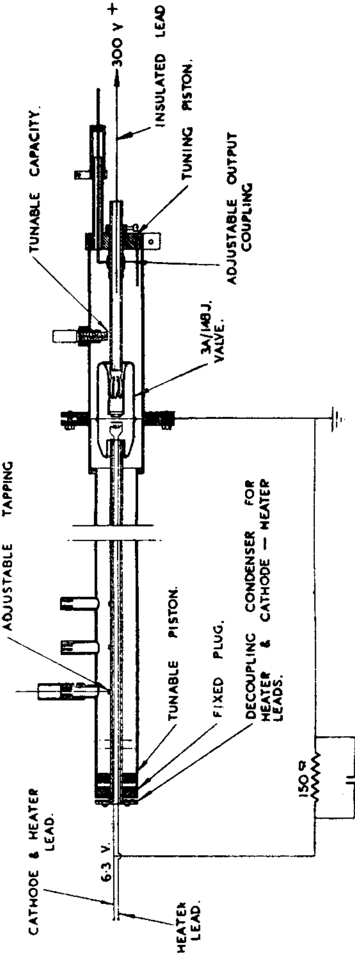
In this design of circuit the frame of the amplifier is at ground potential, it is therefore necessary to insert a capacity in series with the centre conductor of the anode resonator since this is at anode potential. The cathode is coupled to the input resonator by the capacity of the cathode and heater leads to the centre conductor.

Input is fed to the adjustable tapping on the input resonator. Output power is taken from the slider on the centre line of the anode resonator.

Tentative data
October 1945

Grounded Grid Triode

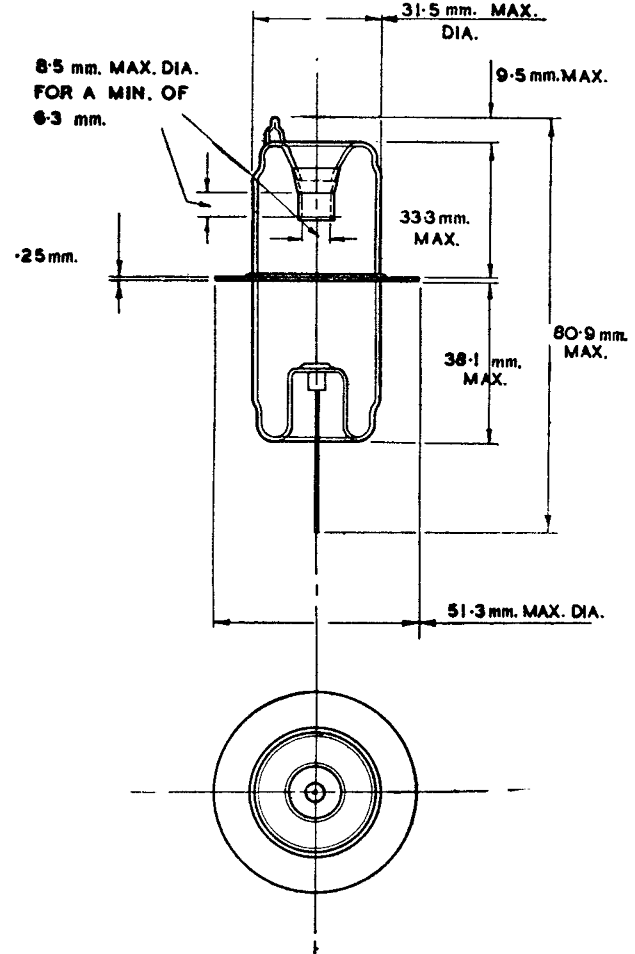
3A/148J (CV88)



Tentative data
October, 1945

Grounded Grid Triode

3A/148J (CV88)



Tentative data
October 1945

Twin Triode

4074A

Characteristics are for one section only unless otherwise specified. Both sections are identical.

CATHODE.

Indirectly-heated Oxide-coated		
Voltage	6.3	V
Nominal current	0.8	A

RATING.

Amplification factor	Measured at Va 250V, V_{g_1}—7V	14	
Impedance		4,700	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	2.7	pF
Grid to cathode	6.0	pF
Anode to cathode	1.3	pF

DIMENSIONS.

Maximum overall length	132	mm.
Maximum bulb diameter	46	mm.
Base American medium 7 pin		
Net weight	75	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	300	V
Maximum direct anode current	50	mA
Maximum anode dissipation	5	W
Maximum frequency for above ratings	100	Mc/s
Maximum frequency of operation	300	Mc/s

Twin Triode

4074A

Characteristics are for one section only unless otherwise specified. Both sections are identical.

TYPICAL OPERATING CONDITIONS.

AUDIO FREQUENCY.

Class A. Amplifier.

(Two sections in parallel).

Direct anode voltage	300	V
Grid bias	—13	V
Anode current—2 sections	30	mA
Load resistance	7,000	Ω
Power output	1.0	W

The output power may be increased to 1.2 W by connecting the two sections in push-pull.

Class B. Power Amplifier.

(Two sections in push-pull).

Direct anode voltage	300	V
Grid bias	—16	V
Direct anode current per section—zero signal	7	mA
Direct anode current per section—max. signal	37	mA
Peak AF grid to grid voltage	120	V
Power output—2 sections	12	W. approx.

RADIO FREQUENCY.

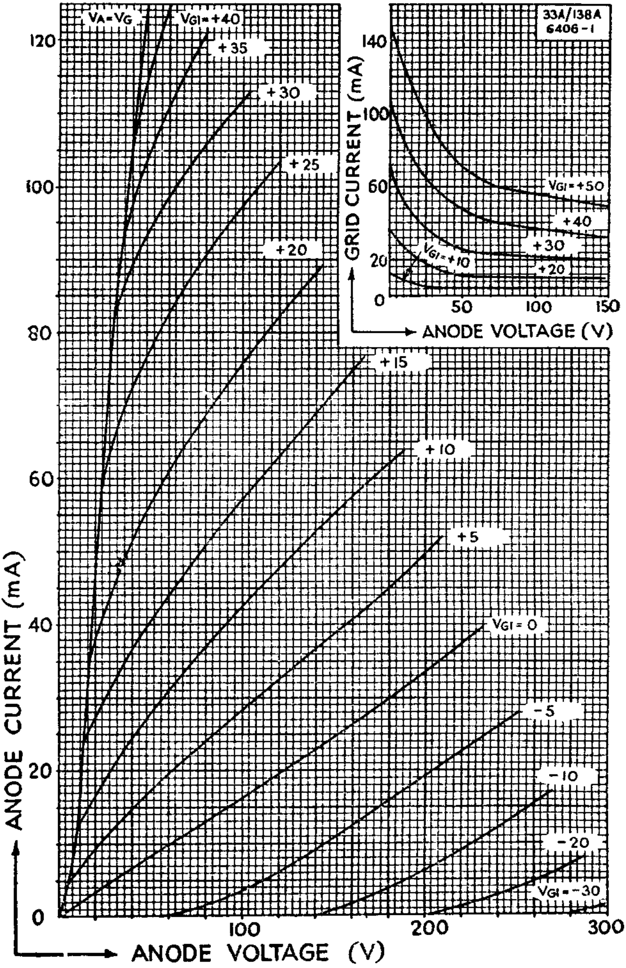
Class C. Push-pull Power Amplifier or Oscillator Unmodulated.

Direct anode voltage	300	V
Grid bias	—36	V
Direct anode current	80	mA
Direct grid current	18	mA
Power output	14	W approx.

Twin Triode

4074A

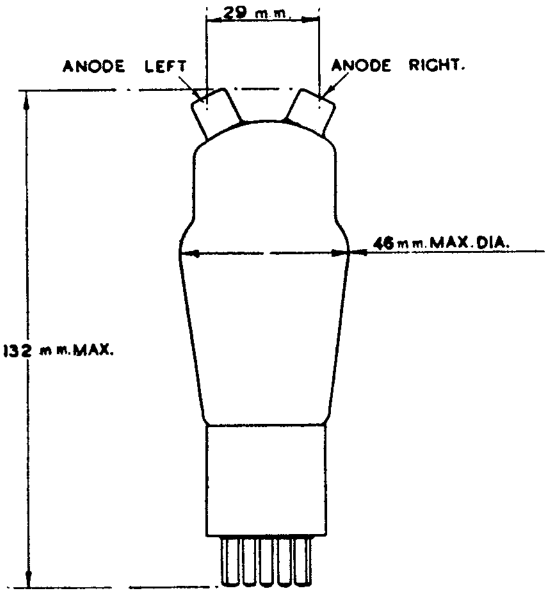
Characteristics are for one section only unless otherwise specified. Both sections are identical.

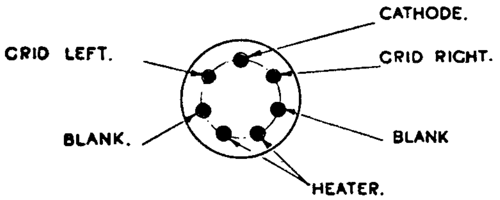


Twin Triode

4074A

Characteristics are for one section only unless otherwise specified. Both sections are identical.





Triode

3B/100B

CATHODE.

Indirectly-heated oxide-coated		
Voltage	4	V
Nominal current	1.1	A

RATING.

Amplification factor	Measured at Va 200V Vg_1 —10V	10	
Impedance		2,000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	7.5	pF
Grid to cathode	10.3	pF
Anode to cathode	4.8	pF

DIMENSIONS.

Maximum overall length	122	mm.
Maximum bulb diameter	46	mm.
Base : British 5 pin		
Net weight	50	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	200	V
Maximum direct anode current	50	mA
Maximum anode dissipation	10	W

Triode

3B/100B

TYPICAL OPERATING CONDITIONS.

AUDIO FREQUENCY.

Class A Amplifier.

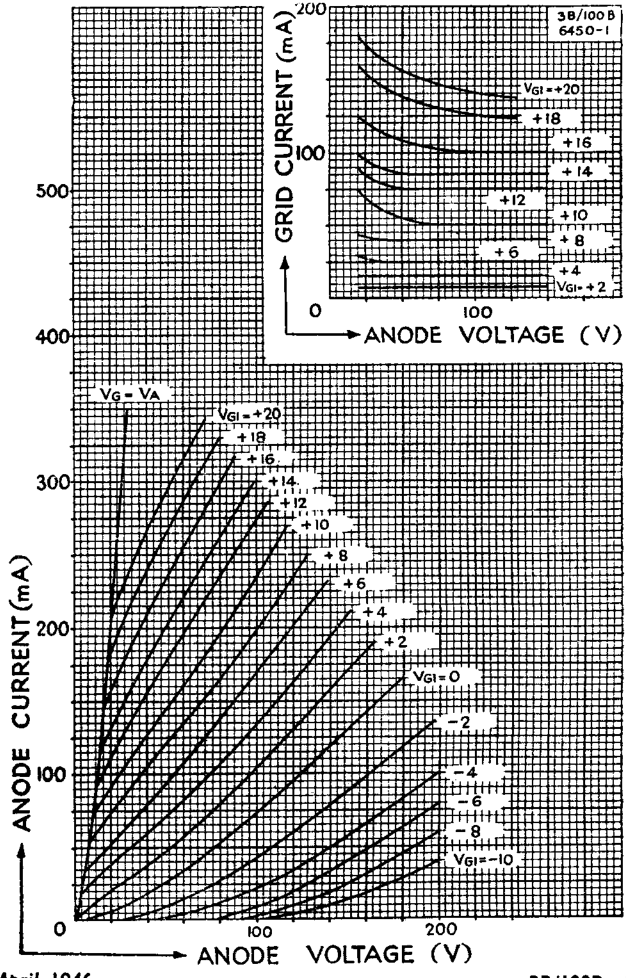
Anode voltage volts	Grid bias volts	Anode current mA	Load resistance ohms	Power output mW	Total harmonics db
100	—4	23	8,000	10	38
100	—4	23	8,000	50	31
150	—6	40	10,000	50	35
150	—6	40	10,000	100	32
200	—10	40	10,000	50	37
200	—10	40	10,000	250	30

Class B Power Amplifier or Modulator.
(For balanced 2-valve circuit).

Direct anode voltage	200	V
Grid bias	—16	V
Direct anode current per valve—minimum signal	8	mA
Direct anode current per valve—maximum signal	50	mA
Load resistance—anode to anode	4,200	Ω
Power output for 2 valves	12.5	W approx.

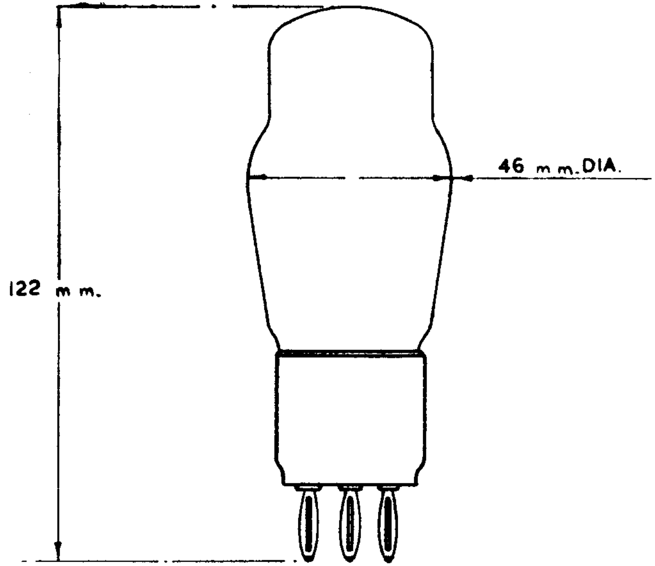
Triode

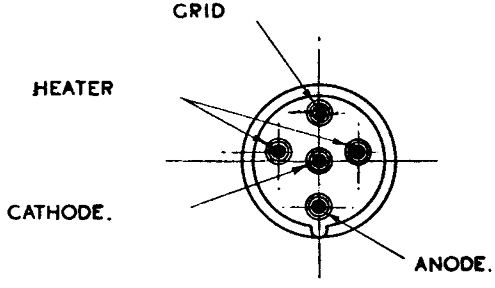
3B/100B



Triode

3B/100B





Triode

3B/151A

CATHODE.

Oxide-coated filament		
Voltage	4.5	V
Nominal current	1.6	A

RATING.

Amplification factor	measured at Va 250V	7	
Impedance	Vg_1—15V	3500	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	6.2	pF
Grid to filament	5	pF
Anode to filament	3.2	pF

DIMENSIONS.

Maximum overall length	138	mm.
Maximum bulb diameter	46	mm.
Base—American medium 4 pin bayonet with offset pin		
Net weight	60	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	400	V
Maximum direct anode current	50	mA
Maximum anode dissipation	15	W
Maximum direct grid current	10	mA

Tentative data.
June 1946

Triode

3B/151A

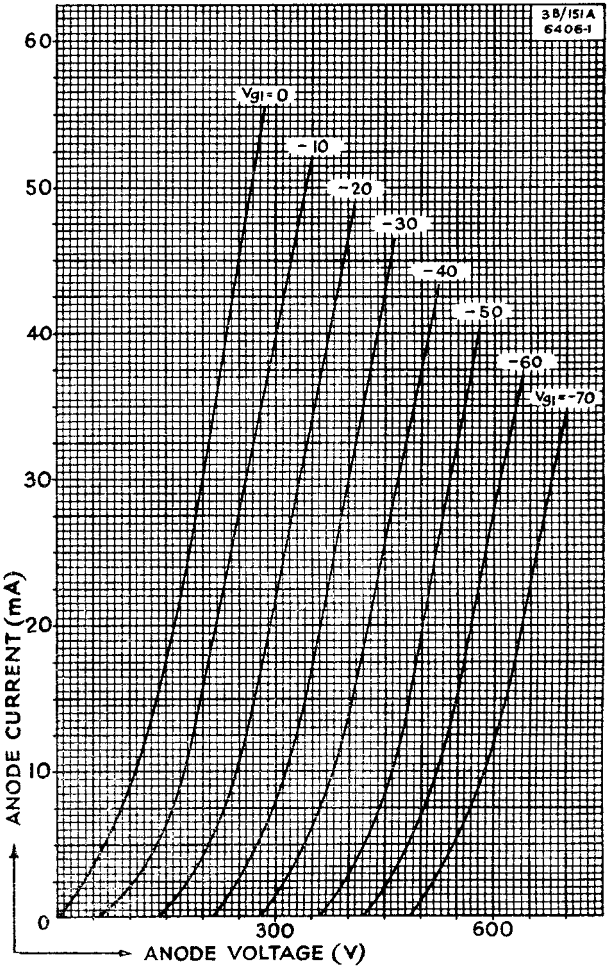
TYPICAL OPERATING CONDITIONS

Anode voltage (volts)	Grid bias (volts)	Anode current (mA)	Amplification factor	Anode Resistance (ohms)	Load Resistance (ohms)	Power Output (mW)	Second Harmonic (db)
200	— 6	22.5	7.4	4,000	4,000	60	35
					8,000	55	40
250	—22	9	6.9	6,000	6,000	500	18
					12,000	450	22
					18,000	380	26
250	—15	19	7.2	4,350	4,350	310	26
					8,700	280	30
250	—10	27.5	7.4	3,800	3,800	180	33
					7,600	160	38
250	— 5	37.5	7.5	3,500	3,500	50	40
					7,000	45	43
300	—30	8	6.7	6,700	6,700	800	15
					13,400	720	20
					19,100	600	24
300	—24	15.5	7.1	4,800	4,800	750	20
					9,600	670	25
300	—18	25	7.3	4,000	4,000	540	27
					8,000	480	31
350	—22.5	29	7.3	3,800	3,800	875	26
					7,600	800	30
375	—30	22	7.1	4,300	4,300	1,300	20
					8,600	1,200	26
*300	—10	41	7.4	3,350	3,350	200	37
					6,700	180	41
*350	—20	34	7.3	3,600	3,600	750	28
					7,200	675	32
*375	—24	32	7.3	3,650	3,650	1,000	26
					7,300	900	30
*400	—29	30	7.2	3,800	3,800	1,400	23
					7,600	1,300	28

* Maximum operating conditions.

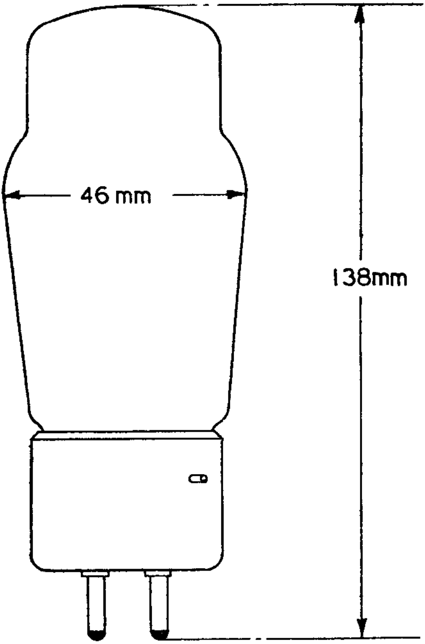
Triode

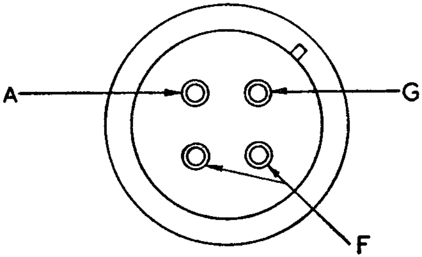
3B/151A



Triode

3B/151A





Triode

4033L

CATHODE.

Indirectly heated oxide-coated.

Heater voltage	6	V
Nominal current	1.4	A

RATING.

Amplification factor	Measured at V_a 400 V V_g —20 V	15
Impedance		1,670 ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	8	pF
Grid to cathode	4	pF
Anode to cathode	10	pF

DIMENSIONS.

Maximum overall length	125	mm.
Maximum bulb diameter	56	mm.
Base : Standard 5 pin British		
Net weight	60	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	600	V
Maximum direct anode current	0.170	A
Maximum anode dissipation	25	W
Maximum direct grid current	0.030	A
Maximum frequency for above ratings	45	Mc/s

Tentative Data
September, 1945

Triode

4033L

TYPICAL OPERATION
AUDIO FREQUENCY

Class B Power Amplifier and Modulator (For balanced 2-valve circuit).

Direct anode voltage	600	600 V
Grid bias	—55	—55 V
Direct anode current per valve —zero signal	17	17 mA
Direct anode current per valve —maximum signal	82	71 mA
Load resistance—anode to anode	6,800	6,800 ohms
Peak A.F. Grid to grid voltage	132	112 V
*Direct grid current per valve	7	1.5 mA
Output	48	40 W
Distortion	9%	5%

RADIO FREQUENCY

Class C Power Amplifier or Oscillator unmodulated.

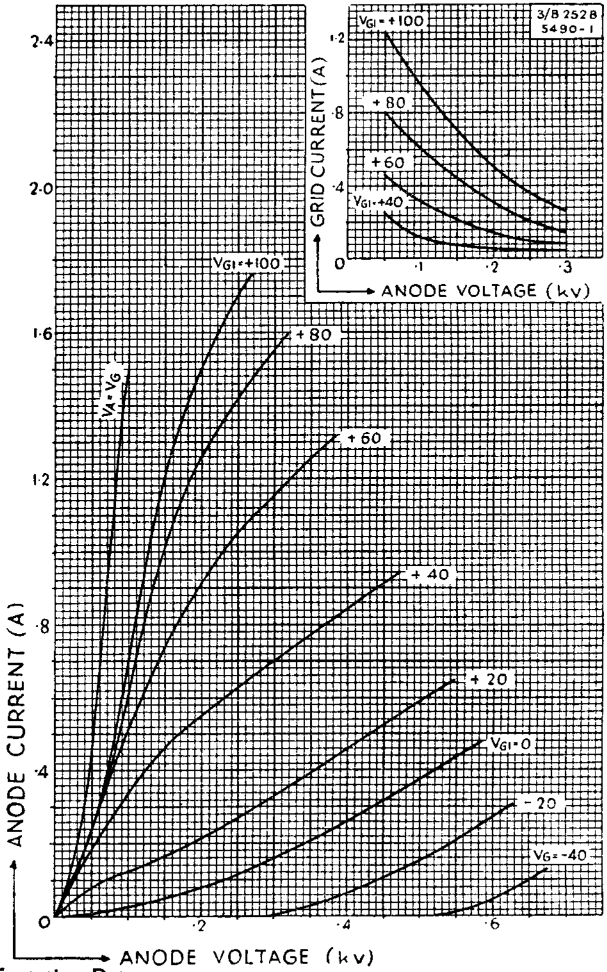
Direct anode voltage	600	V
Grid bias	—65	V
Direct anode current	120	mA
Peak R.F. grid voltage	140	V
*Direct grid current	20	mA
Power output	55	W

***Subject to wide variation depending upon the impedance of the load circuit.**

Tentative Data
September, 1945

Triode

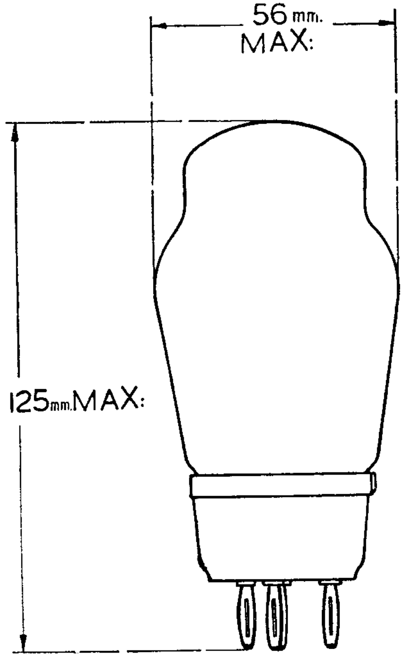
4033L

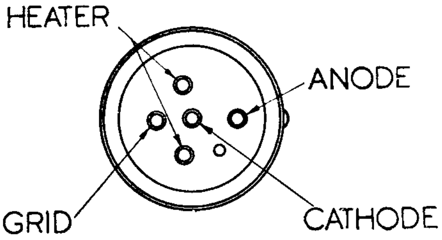


Tentative Data
September, 1945

Triode

4033L





Tentative Data
September, 1945

Double-disc-seal U.H.F. Triode

3B/401J (CV127)

CATHODE.

Thoriated tungsten filament		
Voltage	6.3	V
Nominal current	2.0	A
Peak emission	0.75	A

RATING.

Amplification factor	Measured at Va 800V Ia 40 mA	6	
Impedance		2000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Anode to grid	4	pF
Anode to filament	0.2	pF
Grid to filament	5	pF

DIMENSIONS.

Overall length	130	mm.
Maximum diameter	51.3	mm.
Base	Special, see sketch	
Net weight	92	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	1,000	V
Maximum direct anode current	100	mA
Maximum anode dissipation when mounted in apparatus providing adequate heat radiation	40	W
Maximum direct grid current	15	mA

Tentative data

September, 1945

Double-disc-seal U.H.F. Triode

3B/401J (CV127)

TYPICAL OPERATION

Variable Wavelength Oscillator, 34cm. wavelength upwards.

The anode/grid and filament/grid oscillatory circuits consist of concentric lines ; a common tube forms the inner element of the anode/grid line and the outer element of the grid/filament line. The anode is joined via a condenser to the outer tube of the resonator to hold the D.C. from the grid. Change of wavelength is made by a sliding piston in the anode/grid line (See A in sketch). The filament/grid line must be tuned to match (See B in sketch).

The ends of the filament and the centre tap are all connected through 100 pF capacitors to the centre conductor, and leads are brought from the filament and centre tap through the centre conductor for D.C. connections.

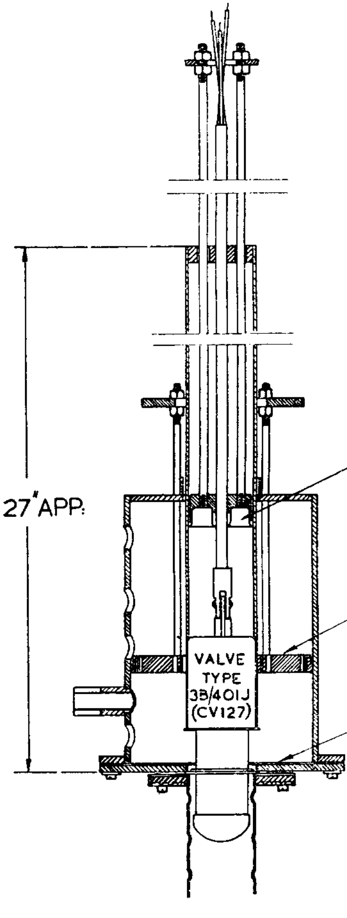
R.F. power may be extracted by a pick-up loop inserted into one of a series of holes in the outer element of the anode/grid line. A suitable tapping point is selected to match the output circuit.

Outputs of approximately 20 watts may be obtained at wavelengths of 50 cm. upward, falling to approximately 6 watts at 34 cm. To obtain the highest frequencies care must be taken to keep the anode/grid piston short.

Tentative data
September, 1945

Double-disc-seal U.H.F. Triode

3B/401J (CV127)

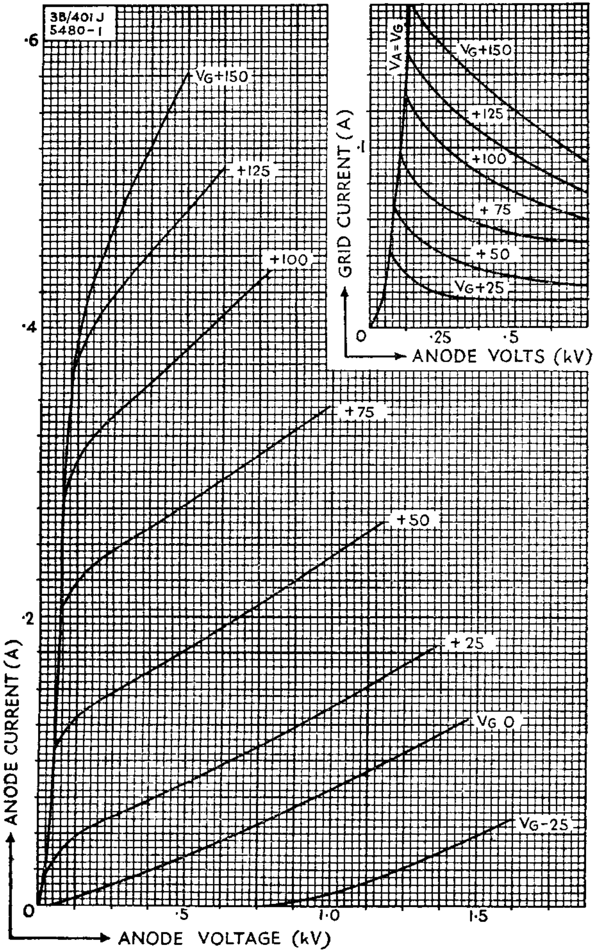


VARIABLE FREQUENCY OSCILLATOR

Tentative data
September, 1945

Double-disc-seal U.H.F. Triode

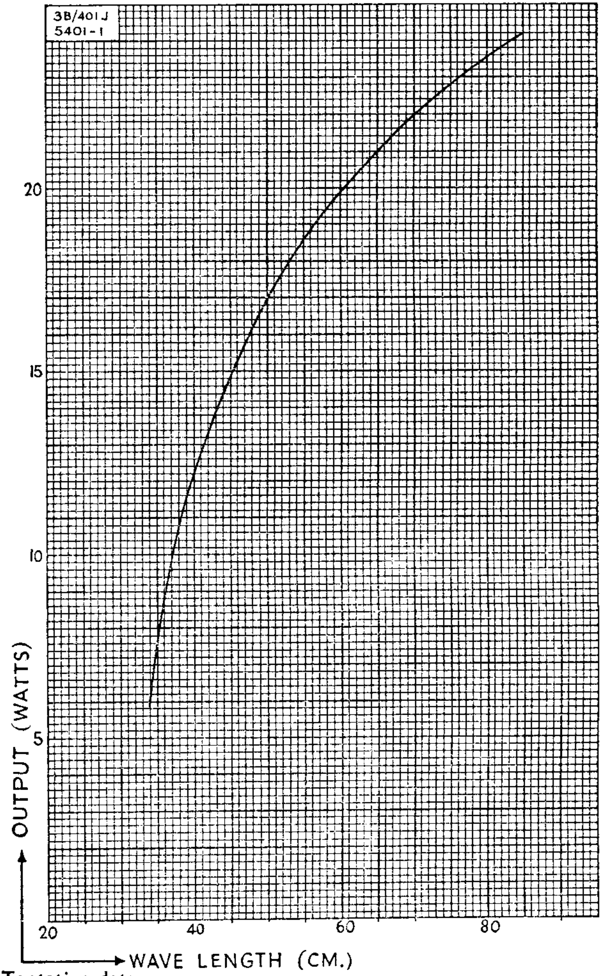
3B/401J (CV127)



Tentative data
September, 1945

Double-disc-seal U.H.F. Triode

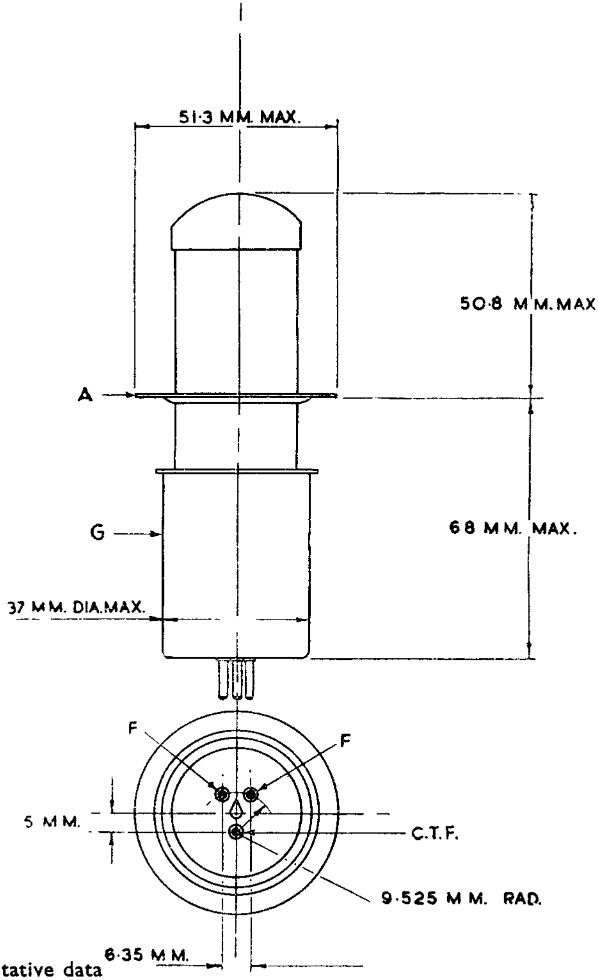
3B/401J (CV127)



Tentative data
September, 1945

Double-disc-seal U.H.F. Triode

3B/401J (CV127)



Tentative data
September, 1945

R. F. Triode

For Operation at full input rating up to 100 Mc/s

4356A

CATHODE.

Thoriated tungsten filament		
Voltage	5	V
Nominal current	5	A
Peak emission	2	A

RATING.

Amplification factor	Measured at Va 500 V	45	
Impedance	Ia 100 mA	12,000	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	2.25	pF
Grid to filament	4.0	pF
Anode to filament	0.9	pF

DIMENSIONS.

Maximum overall length	133	mm.
Maximum diameter	63.5	mm.
Base		Special
Net weight	100	g.

MAXIMUM CONDITIONS FOR SAFE OPERATION.

Maximum direct anode voltage	1,500	V
Maximum direct anode current	120	mA
Maximum anode dissipation	50	W
Maximum direct grid current	35	mA
Maximum frequency for above ratings	100	Mc/s
Maximum anode voltage for maximum frequency limit of 250 Mc/s	1,000	V

The valve should be operated in a vertical position and a free circulation of air must be provided to ensure adequate cooling of the bulb. This is of particular importance when two or more valves are used.

Tentative data
January 1946

R. F. Triode

For Operation at full input rating up to 100 Mc/s

4356A

TYPICAL OPERATING CONDITIONS.

RADIO FREQUENCY.

Class B Telephony. Modulated Carrier applied to Grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1,500	V
Grid bias	—30	V
Direct anode current	50	mA
Peak R.F. grid voltage peak of modulation cycle	145	V
Power output	25	W

Class C Power Amplifier. Anode subjected to modulation

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1,250	V max.
Grid bias	—160	V
Direct anode current	100	mA
Peak R.F. grid voltage	290	V
Power output	88	W

Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	1,500	V
Grid bias	—72	V
Direct anode current	100	mA
Peak R.F. grid voltage	190	V
*Direct grid current	22.5	mA (approx.)
Power output	100	W

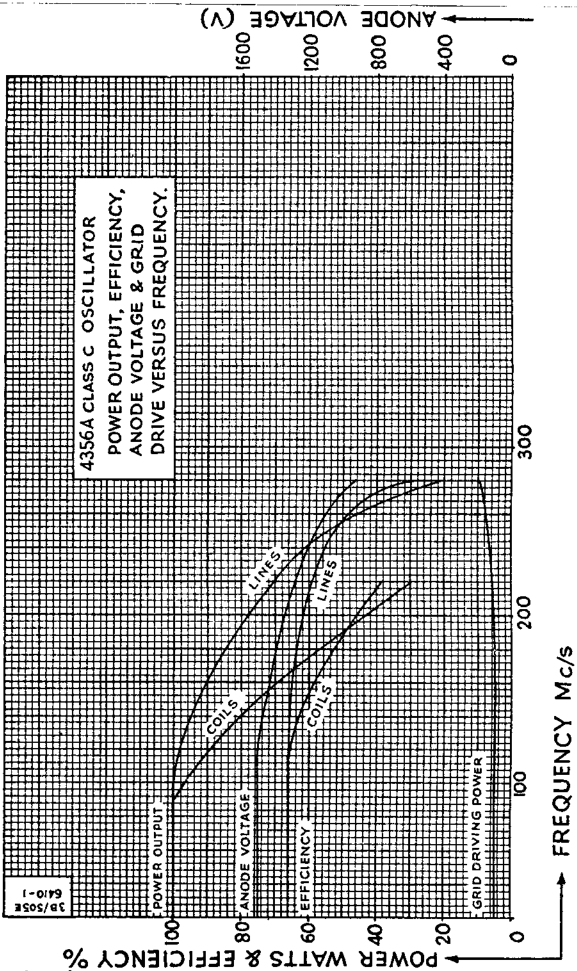
* Subject to wide variation depending upon the impedance of the load circuit.

Tentative data
January 1946

R. F. Triode

For Operation at full input rating up to 100 Mc/s

4356A

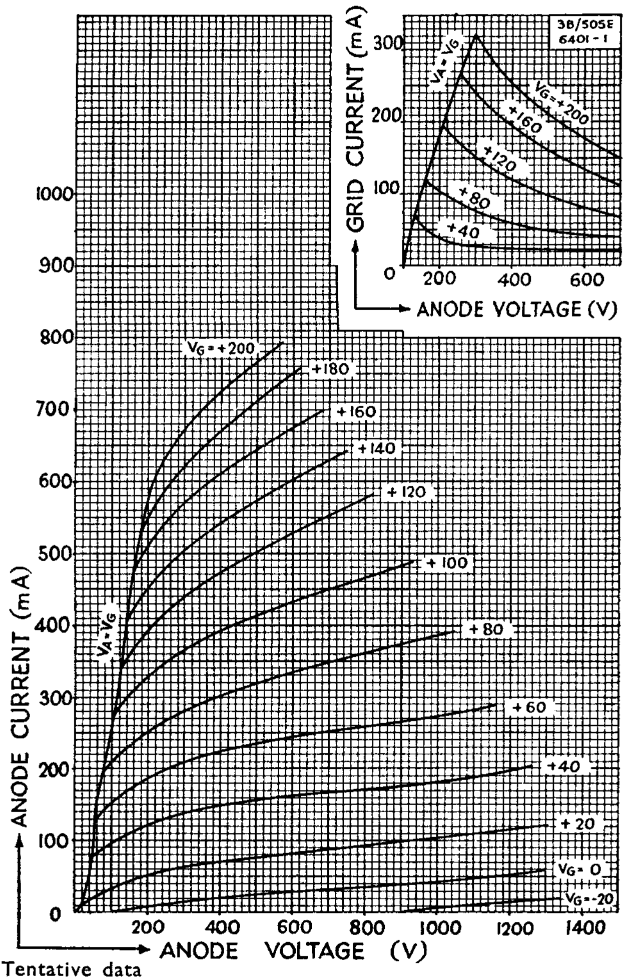


Tentative data
January 1946

R. F. Triode

For Operation at full input rating up to 100 Mc/s

4356A

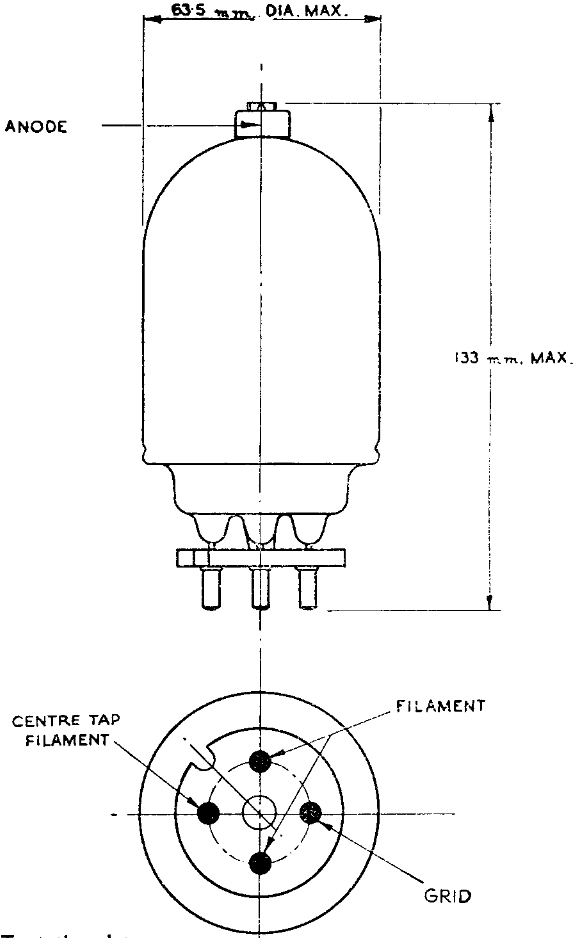


Tentative data
January 1946

R. F. Triode

For Operation at full input rating up to 100 Mc/s

4356A



Tentative data
January 1946

Triode

4242A

CATHODE.

Thoriated tungsten filament.

Voltage	10	V
Nominal current	3.25	A
Peak emission	2	A

RATING.

Amplification factor	Measured at Va—1kV, Vg_1—55 V	12.0	
Impedance		3,000	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	13	pF
Grid to filament	6.5	pF
Anode to filament	4	pF

DIMENSIONS.

Overall length	204	mm.
Maximum diameter	59	mm.
Base	Large 4-pin bayonet	
Net weight	160	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	1,250	V
Maximum direct anode current	150	mA
Maximum anode dissipation	85	W
Maximum direct grid current	50	mA
Maximum frequency for above rating	6	Mc/s
Maximum anode voltage for frequency of 30 Mc/s	600	V

NOTE.—This valve should be mounted so that the plane of the filament is vertical.

August 1945

Triode

4242A

TYPICAL OPERATING CONDITIONS.
AUDIO FREQUENCY.

Class B. Amplifier or Modulator.
For balanced 2-valve circuits.

Direct anode voltage	1,250	1,000 V
Anode current per valve zero signal	25	25 mA
Anode current per valve maximum signal	150	150 mA
Grid bias	—95	—75 V
Anode dissipation	64	56 W
Load resistance	9,600	8,000 ohms
Peak signal grid to grid	165	140 V
*Approximate grid driving power	4	2 W
Maximum output 2 valves	245	185 W

RADIO FREQUENCY.

Class B. Telephony. Modulated Carrier applied to Grid.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1,250	1,000 V
Grid bias	—100	—80 V
Direct anode current	100	125 mA
*Direct grid current	2	1.5 mA approx.
Peak R.F. grid voltage	112	105 V
Power output	41	40 W

Class C. Amplifier. Anode subjected to modulation.
(Carrier conditions per valve for use with 100% modulation.)

Direct anode voltage	1,000 V max.	750 V
Grid bias	—195	—180 V
Direct anode current	150	150 mA
Peak R.F. grid voltage	295	285 V
*Direct grid current	17	17 mA approx.
Power output	110	80 W

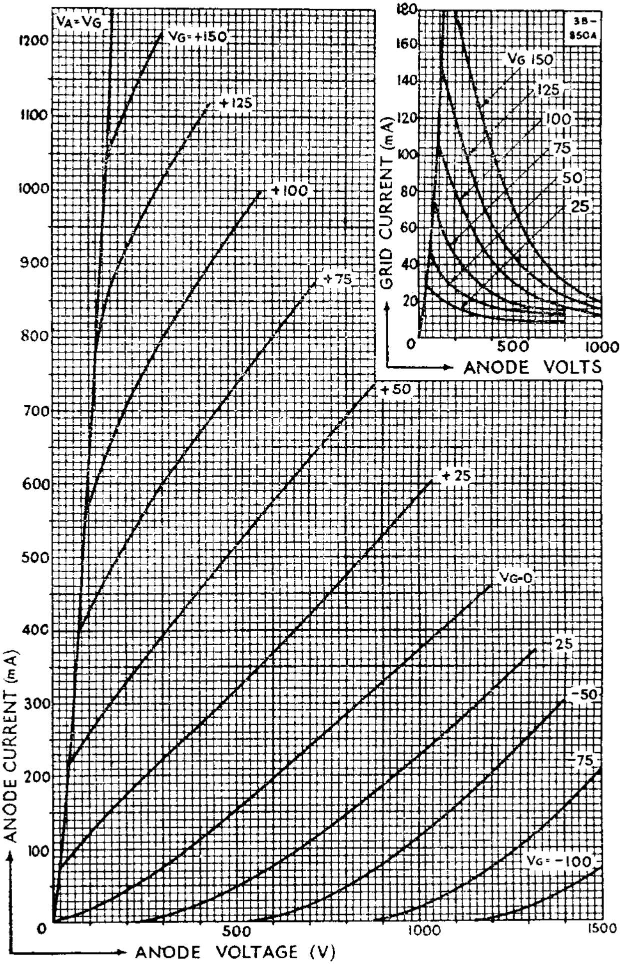
Class C. Amplifier or Oscillator, Unmodulated.

Direct anode voltage	1,250	1,000 V
Grid bias	—153	—133 V
Direct anode current	150	150 mA
Peak R.F. grid voltage	243	223 V
*D.C. grid current	11.5	10 mA approx.
Power output	140	108 W

* Subject to wide variation dependent upon the impedance of the load circuit.

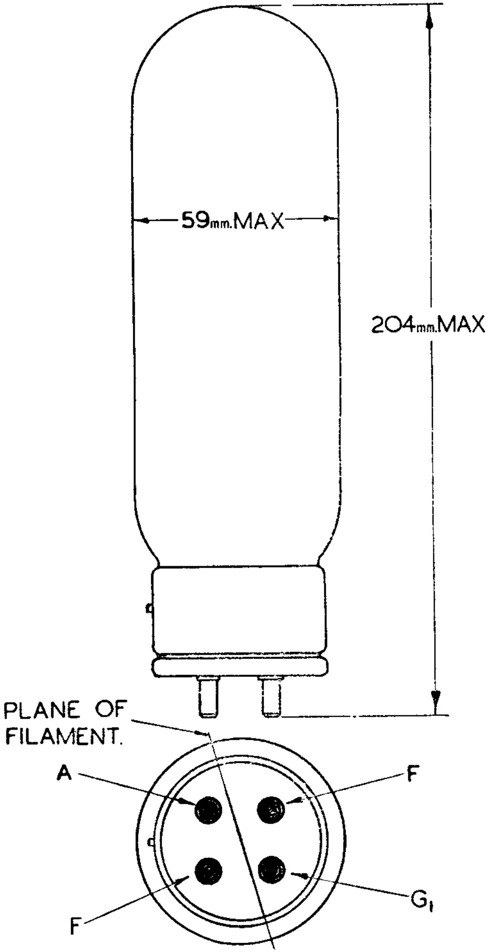
Triode

4242A



Triode

4242A



R.F. Triode

3C/150A

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	3.4	A
Peak emission	2.5	A

RATING.

Amplification factor	Measured at Va 1kV	18	
Impedance	Ia 150 mA	3,800	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	7.3	pF
Grid to filament	8.6	pF
Anode to filament	1.1	pF

DIMENSIONS.

Maximum overall length	246	mm.
Maximum overall width	88	mm.
Base : Large 4-pin bayonet		
Net weight	320	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	2.5	kV
Maximum direct anode current	0.2	A
Maximum anode dissipation	150	W
Maximum RF grid current	10	A
Maximum frequency for above ratings	20	Mc/s
Maximum anode voltage for frequency of 60 Mc/s	2	kV

R.F. Triode

3C/150A

TYPICAL OPERATING CONDITIONS.

AUDIO FREQUENCY.

Class B Power Amplifier or Modulator.

(Balanced two valve circuit).

Direct anode voltage	2	2.5	kV
Grid bias	—100	—130	V
Direct anode current per valve—minimum signal	0.03	0.03	A
Direct anode current per valve—maximum signal	0.19	0.18	A
Peak AF grid to grid voltage	420	460	V
Load resistance anode to anode	11,200	16,000	Ω
Power output—2 valves	500	600	W approx.

RADIO FREQUENCY.

Class B Power Amplifier Telephony.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	2	2.5	kV
Grid bias	—110	—140	V
Direct anode current	0.11	0.09	A
Peak RF grid voltage	125	150	V
*Direct grid current	0.5	0	mA approx.
Power output	80	80	W approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1.75	2	kV
Grid bias	—300	—350	V
Direct anode current	0.2	0.16	mA
Peak RF grid voltage	475	500	V
*Direct grid current	30	20	mA approx.
Power output	270	250	W approx.

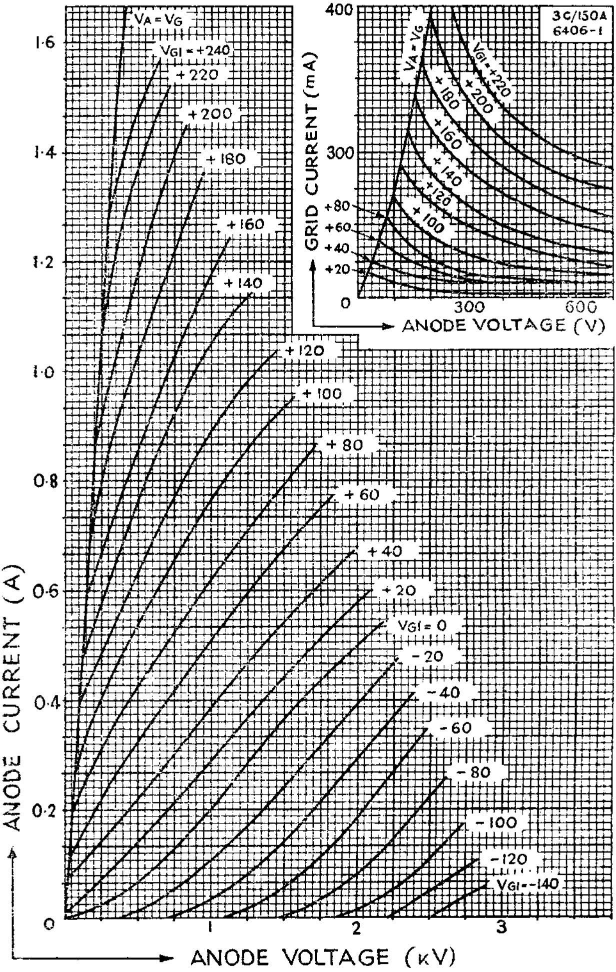
Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	2	2.5	kV
Grid bias	—250	—300	V
Direct anode current	0.2	0.2	A
Peak RF grid voltage	410	455	V
*Direct grid current	23	18	mA approx.
Power output	300	380	W approx.

* Subject to wide variation depending upon the impedance of the load circuit.

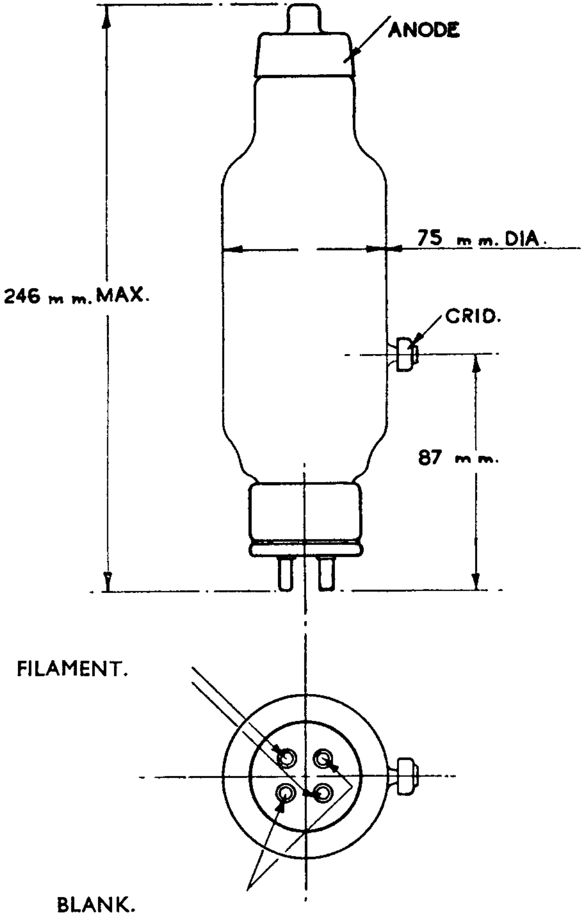
R.F. Triode

3C/150A



R.F. Triode

3C/150A



Triode

4212E

CATHODE.

Thoriated tungsten filament		
Voltage	14	V
Nominal current	6.2	A
Peak emission	4.5	A

RATING.

Amplification factor	Measured at	16	
Impedance	V_a 2,000V V_{g1} −90V	1,900	ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	19	pF
Grid to filament	14.8	pF
Anode to filament	8.5	pF

DIMENSIONS.

Overall length	352	mm.
Max. diameter	93	mm.
Base	Giant 4-pin bayonet	
Net weight	750	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	3,000	V
Maximum direct anode current	350	mA
Maximum direct grid current	75	mA
Maximum anode dissipation	275	W
Maximum freq. for above ratings	1.5	Mc/s
Maximum anode voltage for frequency of 4.5 Mc/s	1,000	V

This valve may be supplied in either one of the four impedance groups :

Group 1.	I_a 110–129 mA	Measured at V_a 1,500V V_g −68V
2.	I_a 130–148 mA	
3.	I_a 149–167 mA	
4.	I_a 168–185 mA	

It is recommended that the valve be operated in a vertical position. When operated horizontally the plane of the filament must be vertical. Free circulation of air must be provided to ensure adequate cooling of the glass during operation.

Triode

4212E

TYPICAL OPERATING CONDITIONS

AUDIO FREQUENCY

Class A Power Amplifier or Modulator.

Direct anode voltage	1,500	1,250 V
Grid bias	—57	—40 V
Direct anode current	0.170	0.200 A
Load resistance	5,000	3,000 Ω
Undistorted output	50	40 W approx.

Class B Power Amplifier or Modulator.
(For balanced 2-valve operation.)

Direct anode voltage	2,500	1,500 V
Grid bias	—145	—80 V
Direct anode current per valve—zero signal	50	60 mA
Direct anode current per valve max. signal	300	350 mA
Peak A.F. grid to grid drive voltage	420	300 V
*Direct grid current	13.5	38 mA approx.
Load resistance anode to anode	9,100	4,600 Ω
*Grid driving power per valve	3	6 W approx.
Recommended grid driving power	50	50 W
Power output	960	660 W

Triode

4212E

RADIO FREQUENCY

Class B Telephony. Modulated carrier applied to grid.
(Carrier conditions per valve for use with 100% modulation.)

Direct anode voltage	2,000	1,500 V
Grid bias	—125	—90 V
Direct anode current	0.200	0.275 A
Peak R.F. grid voltage	110	110 V
*Direct grid current	0	34 mA approx.
Power output	130	130 W

Class C Power Amplifier. Anode subject to modulation.
(Carrier conditions per valve for use with 100% modulation.)

Direct anode voltage	2,000	1,500 V
Grid bias	—240	—215 V
Direct anode current	0.300	0.300 A
Peak R.F. grid voltage	330	315 V
*Direct grid current	15	22 mA approx.
Power output	420	300 W

Class C Power Amplifier or Oscillator, unmodulated.

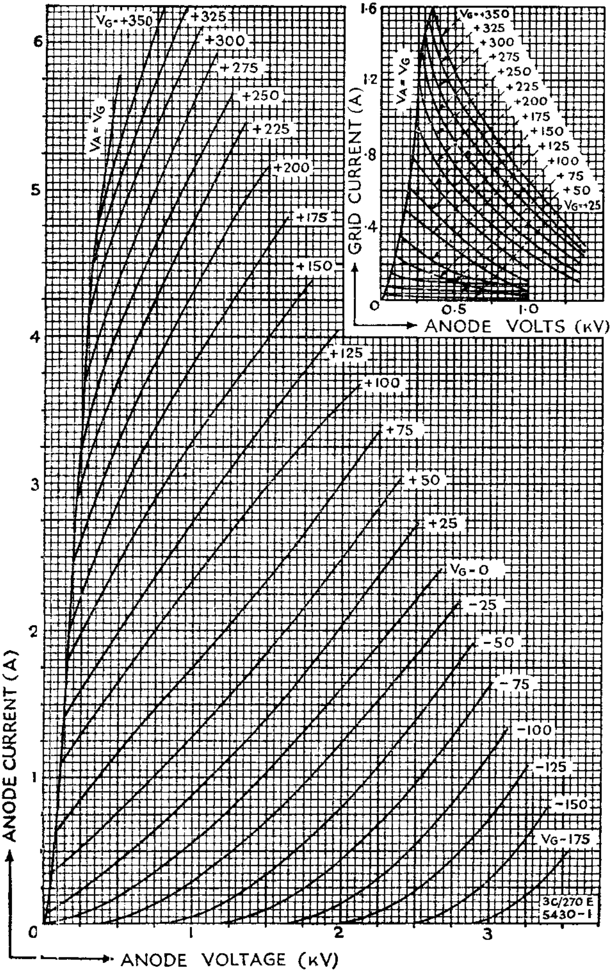
Direct anode voltage	3,000	2,000 V
Grid bias	—250	—180 V
Direct anode current	0.250	0.300 A
Peak R.F. grid voltage	345	272 V
*Direct grid current	15	22 mA approx.
*Driving power	5	6 W approx.
Power output	550	440 W

* Subject to wide variation, depending upon the impedance of the load circuit.

3C/270A
(4212E)

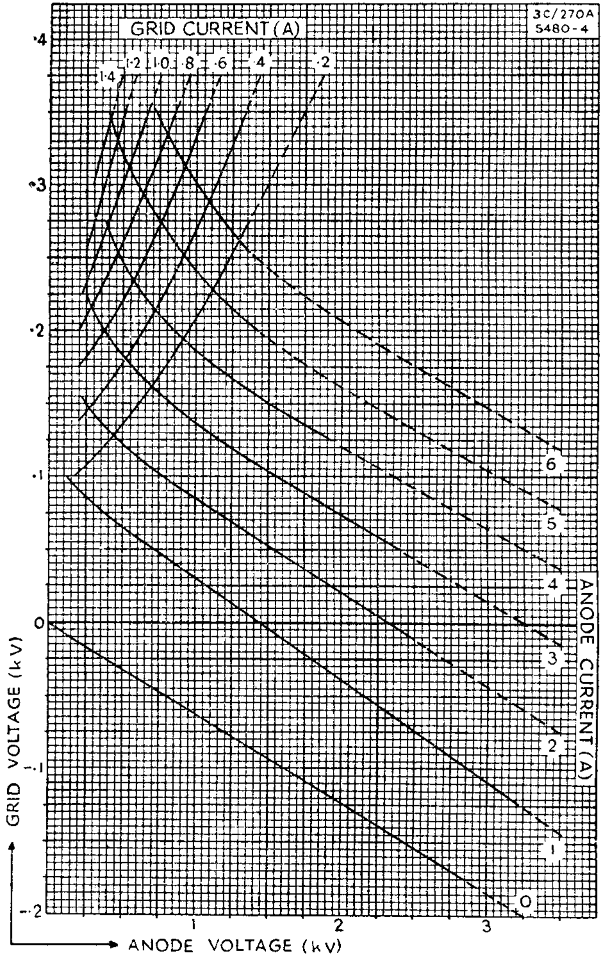
Triode

4212E



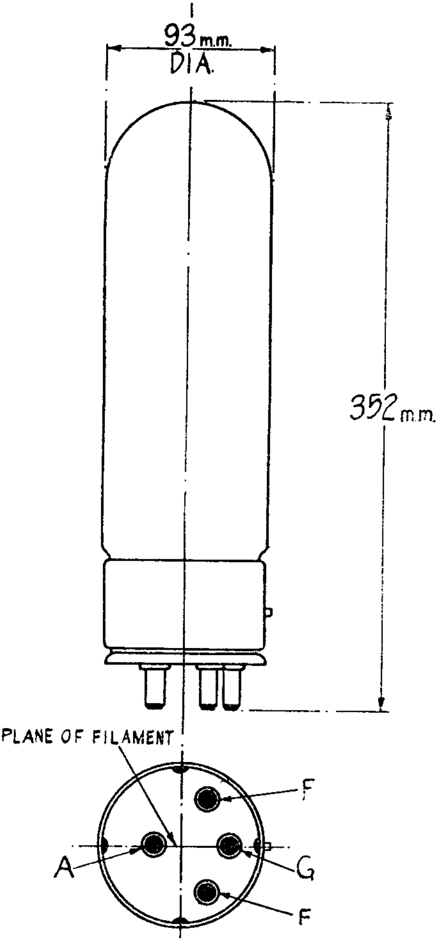
Triode

4212E



Triode

4212E



Triode

4270A

CATHODE.

Thoriated tungsten filament.

Voltage	10.0	V
Nominal current	9.75	A
Peak emission	4.0	A

RATING.

Amplification factor	Measured at Va 2,500V	16
Impedance	Ia 120 mA	2,800 ohms

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	21	pF
Grid to filament	18	pF
Anode to filament	2	pF

DIMENSIONS.

Maximum overall length	433	mm.
Maximum diameter	102	mm.
Base. Special (see sketch)		
Net weight	600	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	3,000	V
Maximum direct anode current	0.375	A
Maximum anode dissipation	350	W
Maximum direct grid current	0.075	A
Maximum frequency for above ratings	7.5	Mc/s.
Maximum anode voltage for frequency 22.5 Mc/s.	1,000	V

It is recommended that the valve be operated in a vertical position. When operated horizontally the plane of the filament must be vertical.

Triode

4270A

TYPICAL OPERATING CONDITIONS.
AUDIO FREQUENCY.

Class A. Amplifier and Modulator.

Direct anode voltage	2,500	2,000 V
Grid bias	—130	—95 V
Direct anode current	0.120	0.150 A
Load impedance	15,000	10,000 ohms
Undistorted output	90	70 W

Class B. Power Amplifier or Modulator.
(For balanced 2-valve operation.)

Direct anode voltage	2,500	2,000 V
Grid bias	—140	—100 V
Anode current per valve—zero signal	60	60 mA
Anode current per valve—maximum signal	375	357 mA
Peak A.F. grid drive voltage grid to grid	480	400 V
Load resistance—anode to anode	7,500	5,700 ohms
*Direct grid current per valve	9	12 mA approx.
Power output for 2 valves	1,200	940 W approx.

RADIO FREQUENCY

Class B. Power Amplifier Telephony.
(Carrier conditions per valve for use with 100% modulation.)

Direct anode voltage	3,000	2,000 V
Grid bias	—186	—155 V
Direct anode current	0.175	0.210 A
*Direct grid current	0	0 mA approx.
Power output	175	180 W

Class C. Power Amplifier. Anode subject to modulation.
(Carrier conditions per valve for use with 100% modulation.)

Direct anode voltage	2,250	1,750 V
Grid bias	—320	—260 V
Direct anode current	0.300	0.375 A
Peak RF grid voltage	420	380 V
*Direct grid current	12	17 mA approx.
Power output	450	430 W approx.

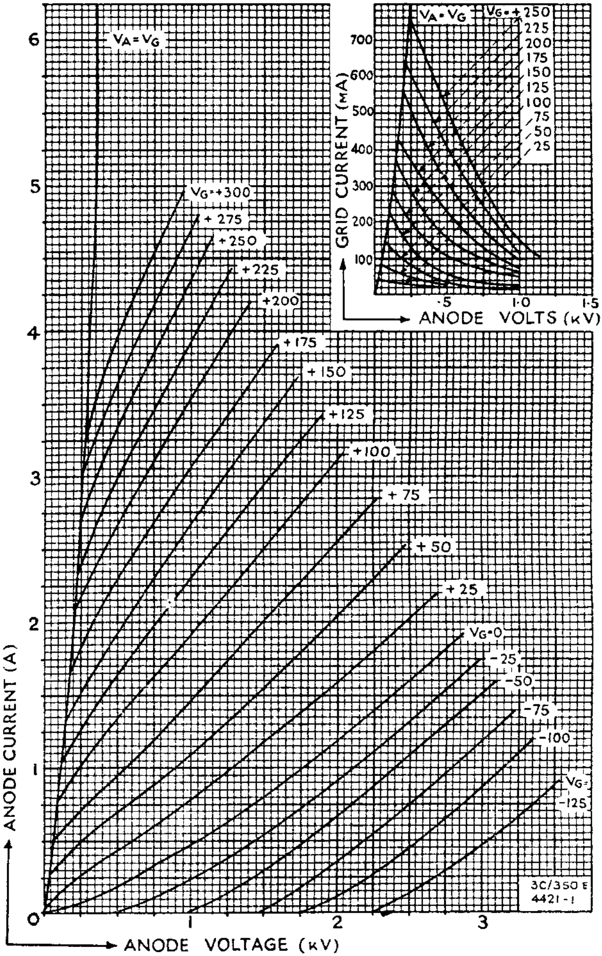
Class C. Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	3,000	2,000 V
Grid bias	—270	—200 V
Direct anode current	0.375	0.375 A
Peak R.F. grid voltage	385	335 V
*Direct grid current	10	31 mA approx.
Power output	800	540 W

* Subject to wide variation depending upon the impedance of the load circuit.

Triode

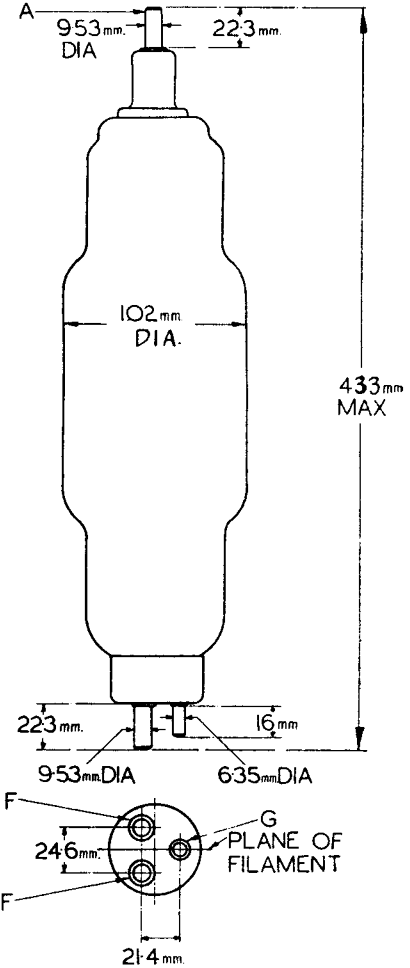
4270A



July 1945

Triode

4270A



July 1945

Air-Blast-Cooled U.H.F. Triode

3J/160E

CATHODE

Thoriated tungsten filament		
Voltage	10	V
Nominal current	29	A
Peak emission	10	A

RATING

Amplification factor	Measured at Va 2.5 kV. Ia 0.8A	19	
Impedance		1,300	Ω—

DIRECT INTERELECTRODE CAPACITIES

Grid to anode	8.8	pF
Grid to filament	12	pF
Anode to filament	0.7	pF

AIR COOLING. For 1 kW. anode dissipation

Volume of air at pressure of 2in. of water	80	cu. ft./min.
Maximum temperature of radiator core	150°	C.

DIMENSIONS

Maximum overall length	133	mm.
Maximum diameter over cooler	65	mm.

MAXIMUM RATINGS

Maximum direct anode voltage	3	kV
Maximum anode dissipation	1	kW
Maximum frequency for above ratings	120	Mc/s

Tentative data
July 1947

Air-Blast-Cooled U.H.F. Triode

3J/160E

TYPICAL OPERATING CONDITIONS
RADIO FREQUENCY

Class B Telephony. Modulated carrier applied to grid.

(Carrier conditions per valve for use with 100% modulation)

Direct anode voltage	2	kV
Grid bias	—100	V
Direct anode current	0.7	A
Peak R.F. grid voltage at crest of modulation cycle	320	V
Power output	0.45	kW

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	2	kV
Grid bias	—400	V
Direct anode current	0.75	A
Peak R.F. grid voltage	660	V
*Direct grid current	0.225	A approx.
Power output	1.0	kW

Class C Power Amplifier or Oscillator, unmodulated.

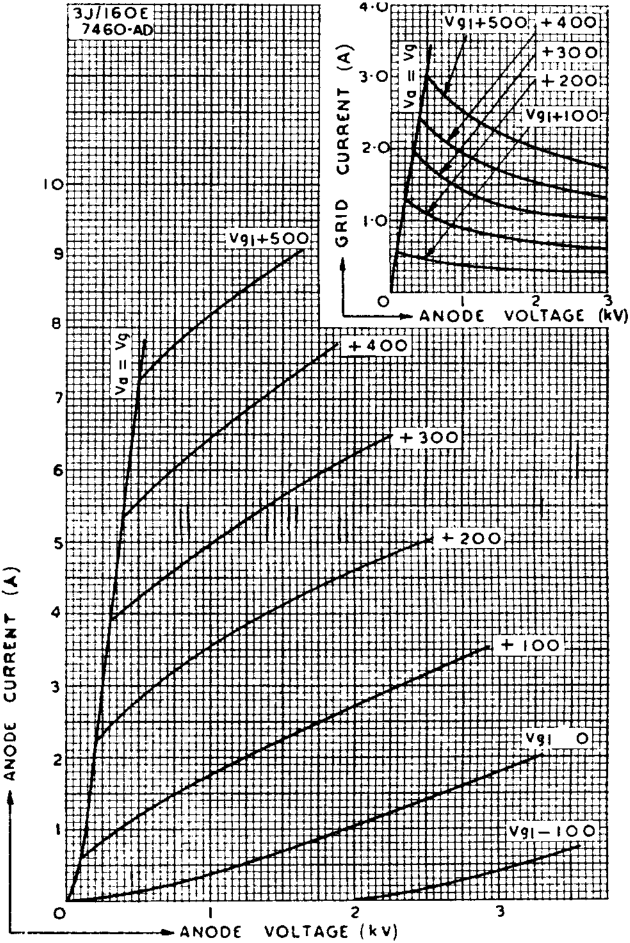
Direct anode voltage	3	kV
Grid bias	—325	V
Direct anode current	1	A
Peak R.F. grid voltage	600	V
*Direct grid current	0.26	A approx.
Power output	2.15	kW

* Subject to wide variation depending upon the impedance of the load circuit.

Tentative data
July 1947

Air-Blast-Cooled U.H.F. Triode

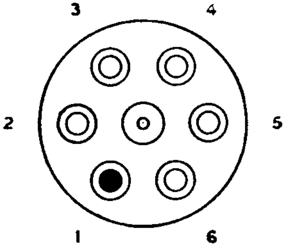
3J/160E



Tentative data
July 1947

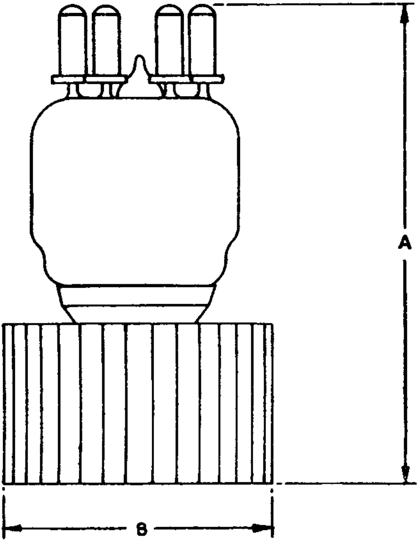
Air-Blast-Cooled U.H.F. Triode

3J/160E



BASING

1 FILAMENT C.T. (RED TIP)
2 GRID
3 FILAMENT
4 GRID
5 FILAMENT
6 GRID



DIM	MILLIMETRES	INCHES
A	133 MAX	5·2 MAX
B	65 MAX	2·6 MAX

NOTE BASIC FIGURES ARE MILLIMETRES

Tentative data
July 1947

Air-Blast-Cooled Triode

3J/170E

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	22	A
Peak emission	6	A

RATING.

Amplification factor	measured at Va 4 kV	20	
Impedance	Ia 0.5A	3,300	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	6	pF
Grid to filament	9.5	pF
Anode to filament	1.5	pF

COOLING.

For anode dissipation of 3½ kW		
Volume of air at pressure of 1 inch of water.	300	cu. ft./min.
Maximum radiator core temperature	130°	C
Maximum ambient temperature	45°	C

DIMENSIONS.

Maximum overall length	225	mm.
Maximum diameter over radiator	155	mm.

MAXIMUM RATINGS.

Maximum direct anode voltage	6,000	V
Maximum direct anode current	1.25	A
Maximum anode dissipation	3½	kW
Maximum grid dissipation	150	W
Maximum frequency for above ratings	50	Mc/s.

Air-Blast-Cooled Triode

3J/170E

TYPICAL OPERATING CONDITIONS

RADIO FREQUENCY

Class B Telephony. Modulated Carrier applied to grid.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	5	kV
Grid bias	—260	V
Direct anode current	0.9	A
Peak R.F. grid voltage	960	V
Power output	1.4	kW

Class C Power Amplifier. Anode subject to modulation.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	4	kV
Grid bias	—900	V
Direct anode current	1.0	A
Peak R.F. grid voltage	1,500	V
* Direct grid current	0.230	A
Power output	2.5	kW

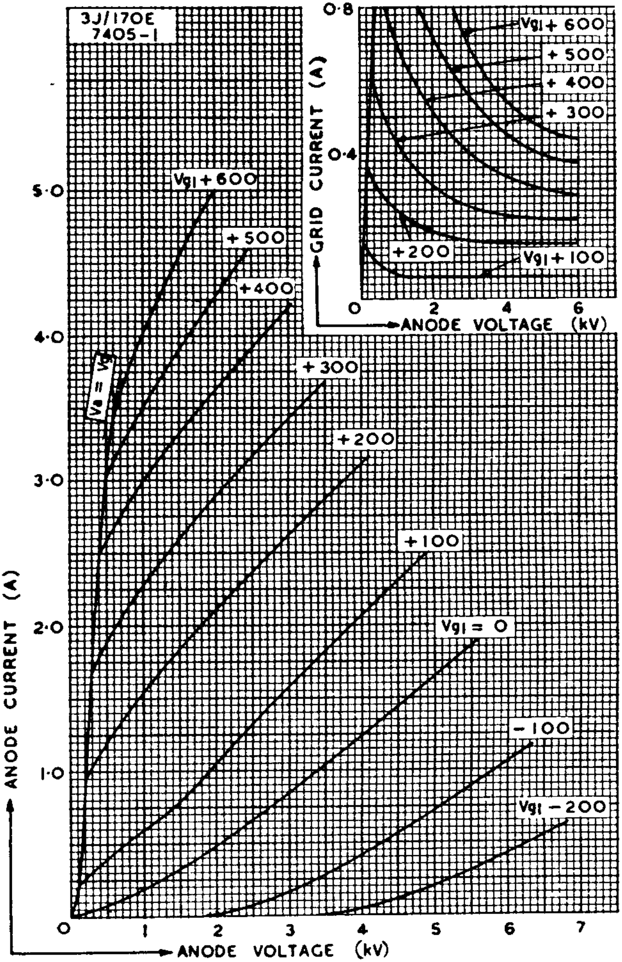
Class C. Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	6	kV
Grid bias	—700	V
Direct anode current	1.25	A
Peak R.F. grid voltage	1,400	V
* Direct grid current	0.262	A appx.
Power output	5	kW. appx.

* Subject to wide variation, depending upon the impedance of the load circuit.

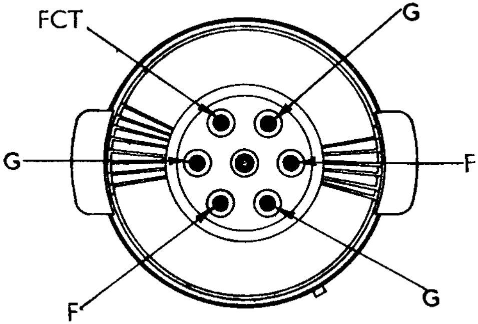
Air-Blast-Cooled Triode

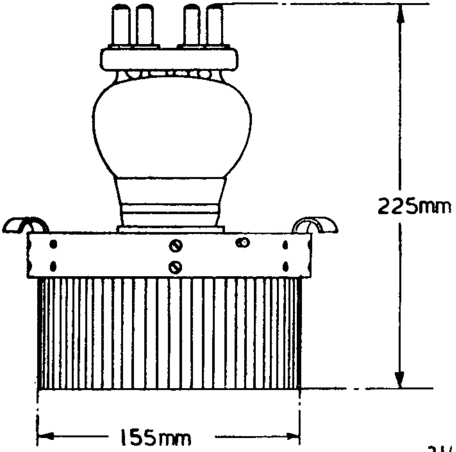
3J/170E



Air-Blast-Cooled Triode

3J/170E





Air-Blast-Cooled R.F. Triode

3J/191E

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	33	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va5kV Ia 0.8A	26	
Impedance		3,450	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Anode to grid	12.5	pF
Anode to filament	2	pF
Grid to filament	11	pF

DIMENSIONS.

Maximum overall length	370	mm.
Maximum diameter over cooler	155	mm.

AIR COOLING.

For 5.0kW Anode dissipation		
Volume of air at a pressure of 1.5in. of water	600	cu. ft./min.
Ambient temperature of air	25°	C
Outlet air temperature above ambient	15°	C

MAXIMUM RATINGS.

Maximum direct anode voltage	10	kV
Maximum direct anode current	2	A
Maximum direct grid current	0.25	A
Maximum anode dissipation	5.0	kW
Maximum frequency for above ratings	50	Mc/s

Air-Blast-Cooled R.F. Triode

3J/191E

TYPICAL OPERATING CONDITIONS

RADIO FREQUENCY

Class B Telephony. Modulated carrier applied to grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	8	kV
Grid bias	—480	V
Direct anode current	0.8	A
Peak R.F grid voltage	700	V
*Direct grid current	20	mA approx.
Output	2	kW approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	8	kV
Grid bias	—1,000	V
Direct anode current	0.8	A
Peak R.F. grid voltage	1,700	V
*Direct grid current	120	mA approx.
Output	4.5	kW approx.

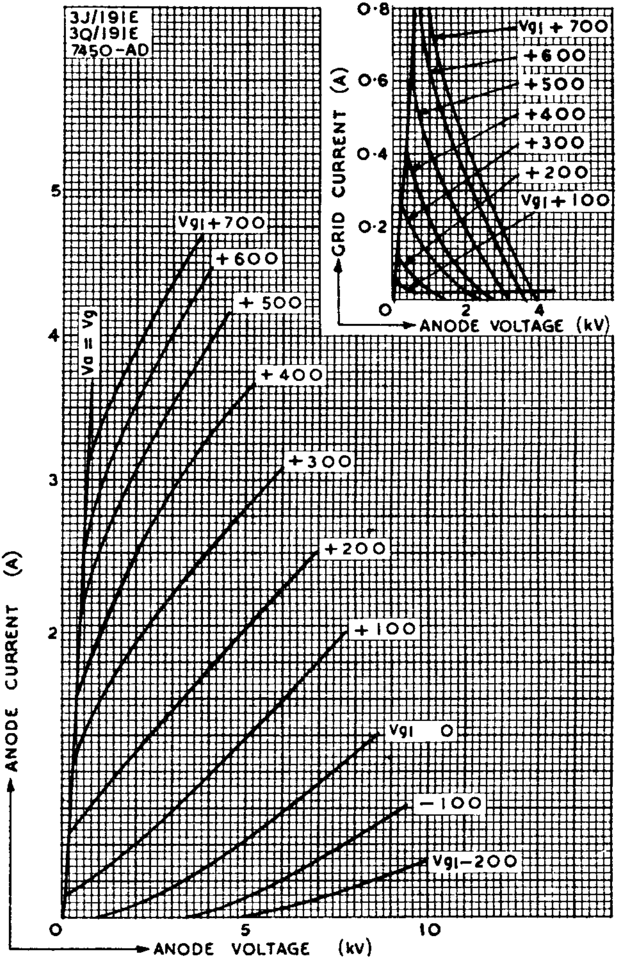
Class C Power Amplifier or Oscillator—unmodulated.

Direct anode voltage	10	kV
Grid bias	—800	V
Direct anode current	1	A
Peak R.F. grid voltage	1,500	V
*Direct grid current	120	mA approx.
Output	7.3	kW approx.

* Subject to wide variation depending upon the impedance of the load circuit.

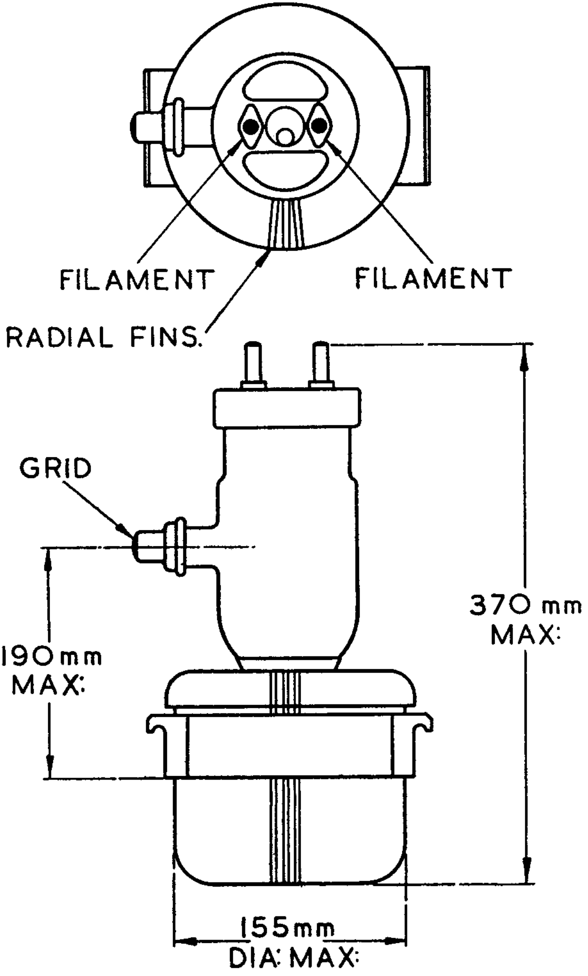
Air-Blast-Cooled R.F. Triode

3J/191E



Air-Blast-Cooled R.F. Triode

3J/191E



Air-Blast-Cooled R.F. Triode

3J/192E

CATHODE.

Thoriated tungsten filament		
Voltage	5	V
Nominal current	66	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va 6kV, Ia 0.9A	17	
Impedance		1,500	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	35	pF
Grid to filament	27	pF
Anode to filament	1.5	pF

COOLING.

Air blast for anode dissipation of 4.5 kW		
Volume of air at a pressure of 1.5 inches of water	350	cu. ft./min.
Maximum radiator core temperature	130°	C.
Maximum ambient temperature	45°	C.

DIMENSIONS.

Maximum overall length	240	mm.
Maximum diameter over cooler	150	mm.

MAXIMUM RATINGS.

Maximum direct anode voltage	7	kV
Maximum direct anode current	2	A
Maximum anode dissipation	4.5	kW
Maximum grid dissipation	350	W
Maximum frequency for above ratings	22	Mc/s

Air-Blast-Cooled R.F. Triode

3J/192E

TYPICAL OPERATING CONDITIONS
RADIO FREQUENCY

Class B Telephony Modulated Carrier applied to Grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	5	kV
Grid bias	—300	V
Direct anode current	1	A
Peak R.F. grid voltage at crest of modulation cycle	750	V
Power output	1.6	kW approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	5	kV
Grid bias	—750	V
Direct anode current	1.25	A
Peak R.F. grid voltage	1,170	V
Power output	4.4	kW approx.

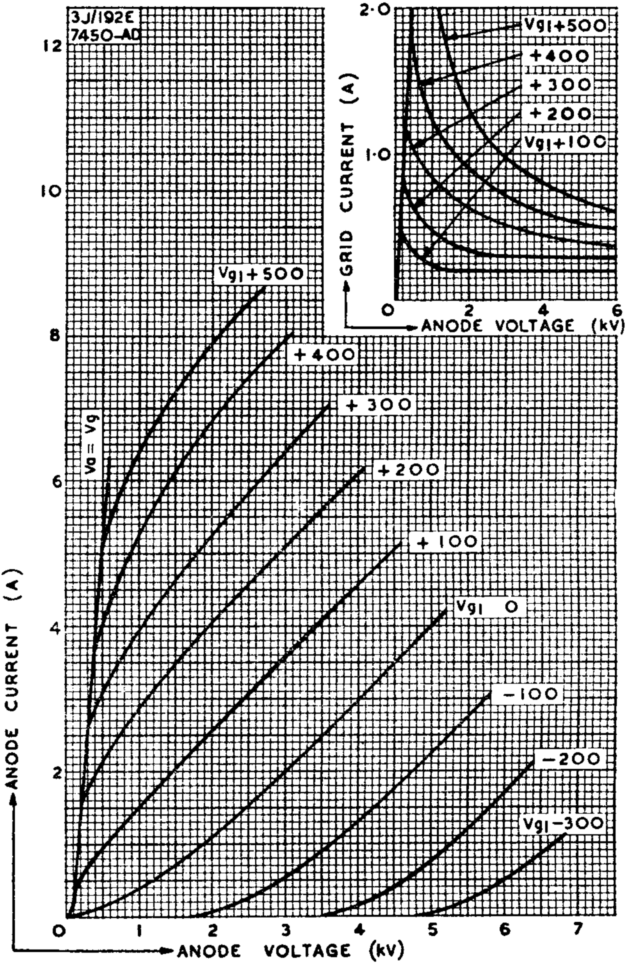
Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	7	kV
Grid bias	—650	V
Direct anode current	2	A
Peak R.F. grid voltage	1,100	V
*Direct grid current	0.35	A approx.
Power output	10	kW

* Subject to wide variation depending upon the impedance of the load circuit.

Air-Blast-Cooled R.F. Triode

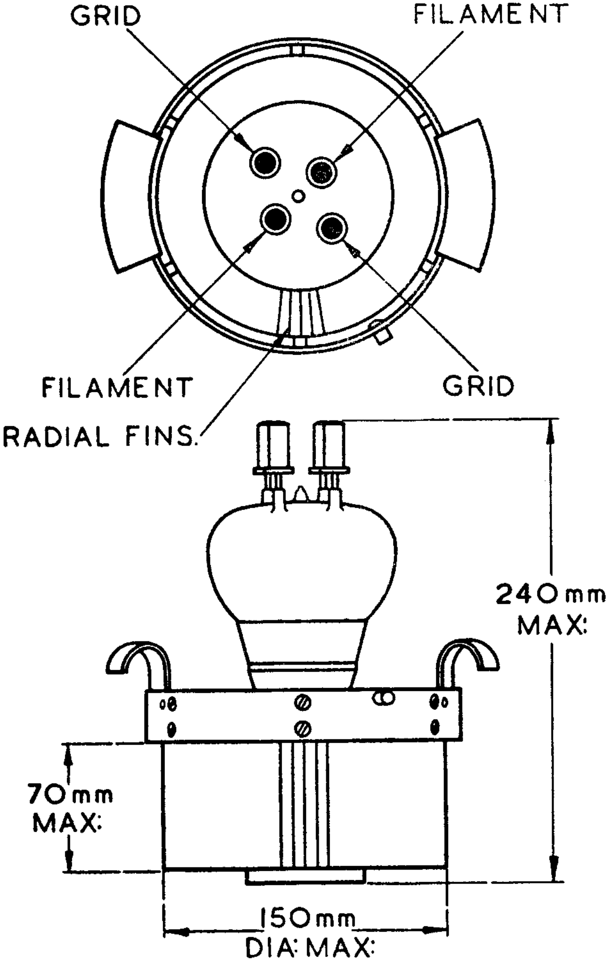
3J/192E



May 1947

Air-Blast-Cooled R.F. Triode

3J/192E



Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221E

CATHODE.

Tungsten filament		
Nominal (Actual voltage marked on bulb)	22	V
Nominal current	70	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va 12 kV, Ia 1.5 A	26	
Impedance		2,900	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	26	pF
Grid to filament	1.3	pF
Anode to filament	20.0	pF

AIR COOLING.

For anode dissipation of 20 kW.		
Volume of air at a pressure of 2in. of water	2,000	cu. ft./min.
Maximum temperature of core of cooler	150°	C.
Maximum ambient temperature	45°	C.

DIMENSIONS.

Maximum overall length	520	mm.
Maximum diameter over cooler	302	mm.
Net weight	8.15	kg.

MAXIMUM RATINGS.

Maximum direct anode voltage	17.5	kV.
Maximum direct anode current	2.5	A.
Maximum anode dissipation	20	kW.
Maximum grid dissipation	1.2	kW.
Maximum frequency for above ratings	22	Mc/s

Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221E

TYPICAL OPERATING CONDITIONS.

RADIO FREQUENCY.

Class B Telephony.

Modulated. Carrier applied to grid. (Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	15	kV.
Grid bias	—600	V
Direct anode current	2.0	A
Power Output	10	kW approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

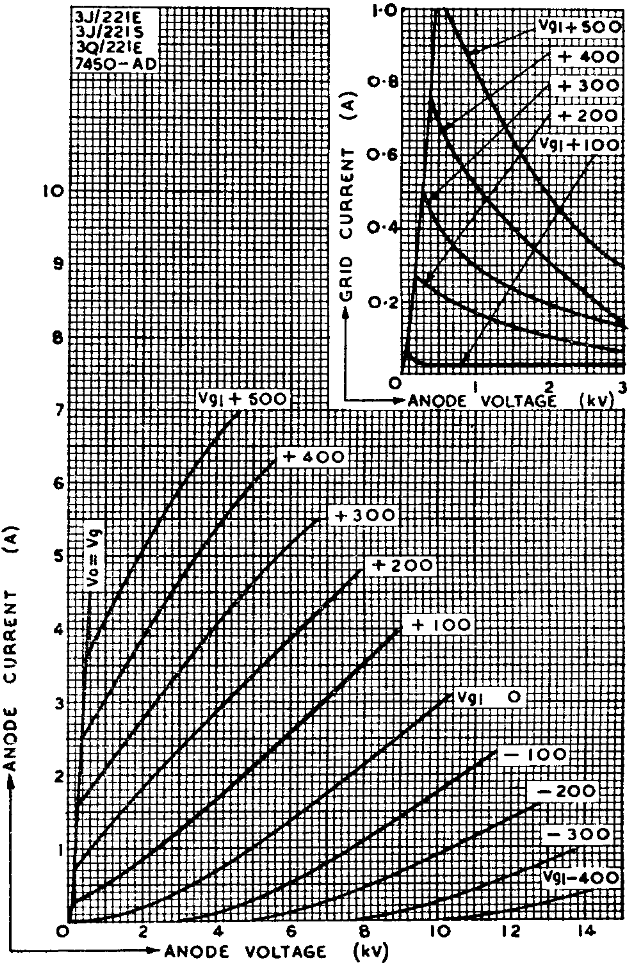
Direct anode voltage	15	kV
Grid bias	—2,000	V. approx.
Direct anode current	2	A
Power Output	20	kW. approx.

Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	17	kV.
Grid bias	—1,600	V. approx.
Direct anode current	2.5	A
Power Output	30	kW. approx.

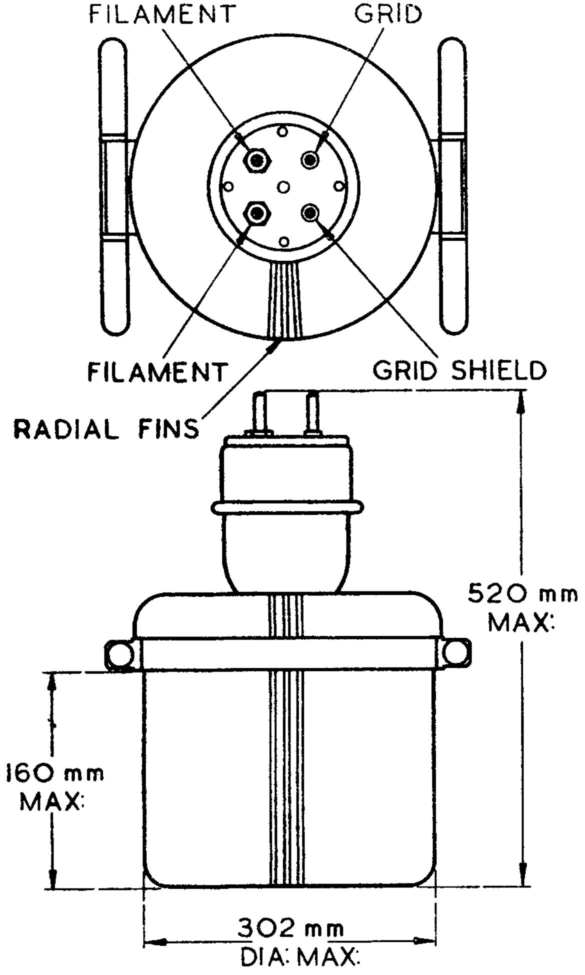
Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221E



Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221E



Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221S

CATHODE.

Tungsten filament		
Nominal (Actual voltage marked on bulb)	22	V
Nominal current	70	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va 12kV, Ia 1.5A	26	
Impedance		2,900	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	26	pF
Grid to filament	1.3	pF
Anode to filament	20.0	pF

AIR COOLING.

For dissipation of 10 kW		
Volume of air at a pressure of 3in. of water	475	cu. ft./min.
Maximum temperature of core of cooler	150°	C
Maximum ambient temperature	45°	C

DIMENSIONS.

Maximum overall length	506	mm.
Maximum diameter over cooler	172	mm.

MAXIMUM RATINGS.

Maximum direct anode voltage	17.5	kV
Maximum direct anode current	2.5	A
Maximum anode dissipation	10	kW
Maximum grid dissipation	1.2	kW
Maximum frequency for above ratings	22	Mc/s

Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221S

TYPICAL OPERATING CONDITIONS

RADIO FREQUENCY

Class B Telephony Modulated Carrier applied to Grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	15	kV
Grid bias	—600	V approx.
Direct anode current	1	A
Power output	5	kW approx.

Class C Power Amplifier Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

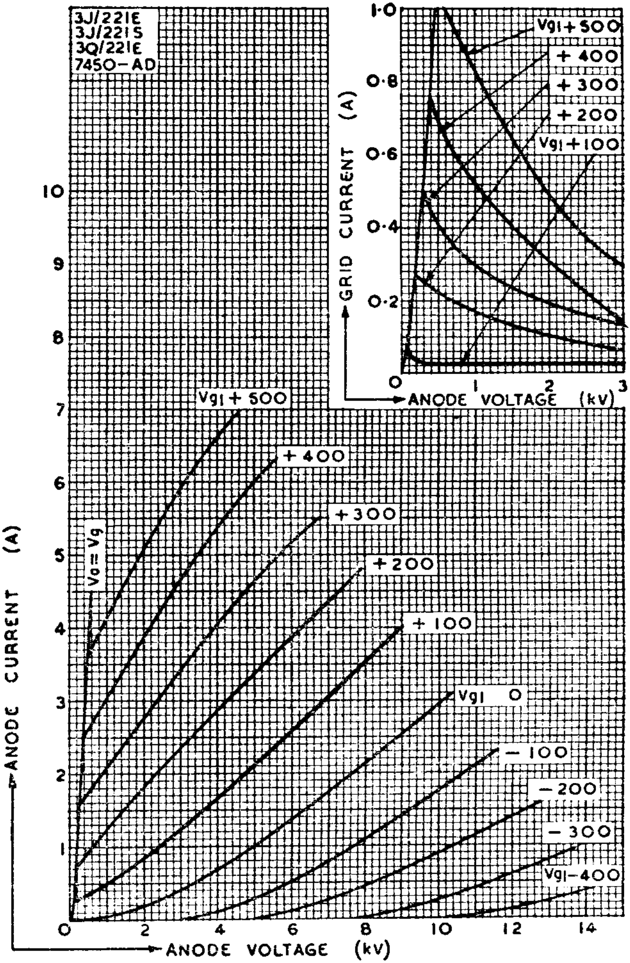
Direct anode voltage	12	kV
Grid bias	—2000	V approx.
Direct anode current	1.25	A
Power output	12	kW approx.

Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	17.5	kV
Grid bias	—1,500	V approx.
Direct anode current	2	A
Power output	25	kW approx.

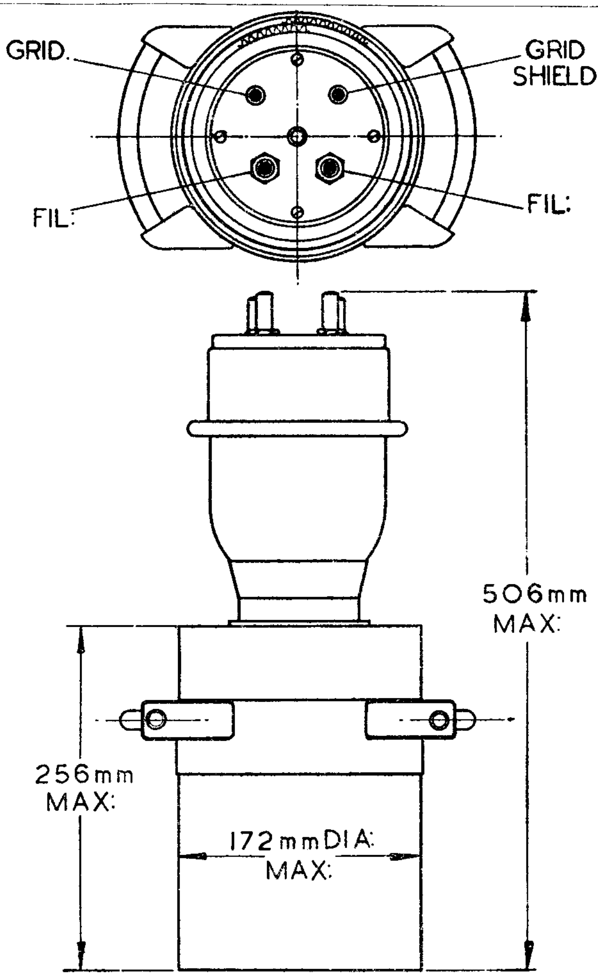
Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221S



Air-Blast-Cooled R.F. Power Amplifier Triode

3J/221S



Water Cooled Triode

4228A

CATHODE.

Tungsten filament		
Voltage (operating voltage marked on bulb)	22	V
Nominal current	41	A
Peak emission	6	A

RATING.

Amplification factor	Measured at Va 5 kV Ia 0.75 A	18	
Impedance		2,200	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	24	pF
Grid to filament	25	pF
Anode to filament	3.1	pF

WATER FLOW.

Water jacket type	235/LU2A	
Nominal water flow	5	galls./min.

DIMENSIONS.

Maximum overall length	475	mm.
Maximum bulb diameter	95	mm.
Net weight	1.2	kg.

MAXIMUM RATINGS.

Maximum direct anode voltage	6	kV
Maximum direct anode voltage for anode modulation	4	kV
Maximum direct anode current	1.5	A
Maximum anode dissipation	5	kW
Maximum grid dissipation	100	W
Maximum frequency for above ratings	3	Mc/s
Maximum direct anode voltage for frequency of 6 Mc/s	3	kV

Water Cooled Triode

4228A

TYPICAL OPERATING CONDITIONS.
AUDIO FREQUENCY.

Class B Power Amplifier.
(For balanced 2-valve circuit).

Direct anode voltage	5	kV
Grid bias	—265	V
Direct anode current per valve—zero signal	0.15	A
Direct anode current per valve—maximum signal	0.6	A
Load resistance—anode to anode	8,400	Ω
Power output 2 valves	3.75	kW

RADIO FREQUENCY.

Class B Telephony. Modulated Carrier applied to Grid.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	5	kV
Grid bias	—325	V
Direct anode current	0.65	A
Carrier output	1.1	kW approx.

Class C Power Amplifier. Anode subject to modulation.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	4,000	V
Grid bias	—500	V
Direct anode current	1.25	A
Carrier output	2.5	kW

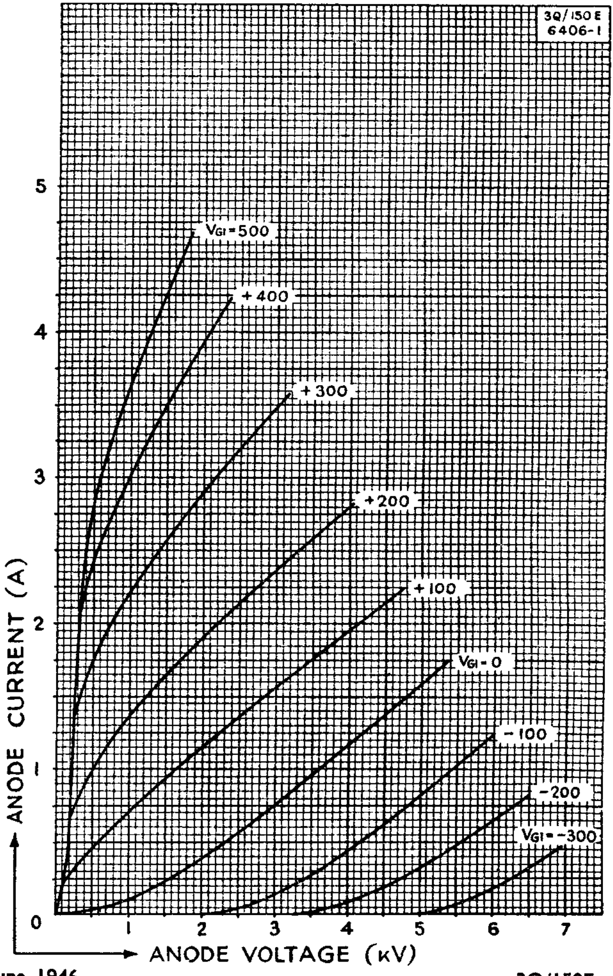
Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	6	kV
Grid bias	—750	V
Direct anode current	1.25	A
Power output	3.4	kW approx.

3Q/150E
(4228A)

Water Cooled Triode

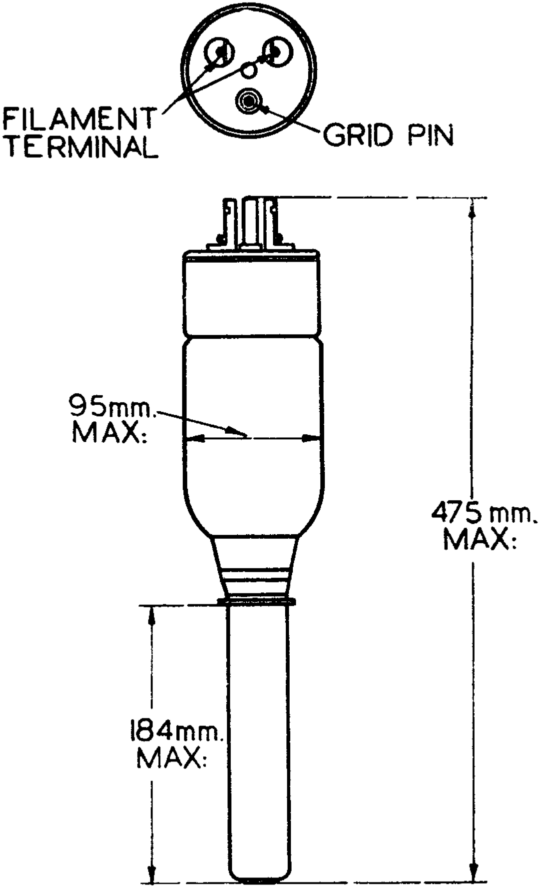
4228A



June 1946

Water Cooled Triode

4228A



Water-Cooled R.F. Triode

3Q/191E

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	33	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va 5kV, Ia 0.8A	26	
Impedance		3,450	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	12	pF
Grid to filament	11.5	pF
Anode to filament	1.5	pF

WATER COOLING.

Water jacket type 235/LU3		
Normal water flow	3	galls/min.

DIMENSIONS.

Maximum overall length	355	mm.
Maximum width	149	mm.
Net weight	905	g

MAXIMUM RATINGS.

Maximum direct anode voltage	10	kV
Maximum direct anode current	2	A
Maximum direct grid current	0.25	A
Maximum anode dissipation	5	kW

Water-Cooled R.F. Triode

3Q/191E

TYPICAL OPERATING CONDITIONS

RADIO FREQUENCY

Class B Telephony. Modulated carrier applied to grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	8	kV
Grid bias	—480	V
Direct anode current	0.8	A
Peak R.F. grid voltage	700	V
*Direct grid current	20	mA approx.
Output	2	kW approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	8	kV
Grid bias	—1,000	V
Direct anode current	0.8	A
Peak R.F. grid voltage	1,700	V
* Direct grid current	120	mA approx.
Output	4.5	kW approx.

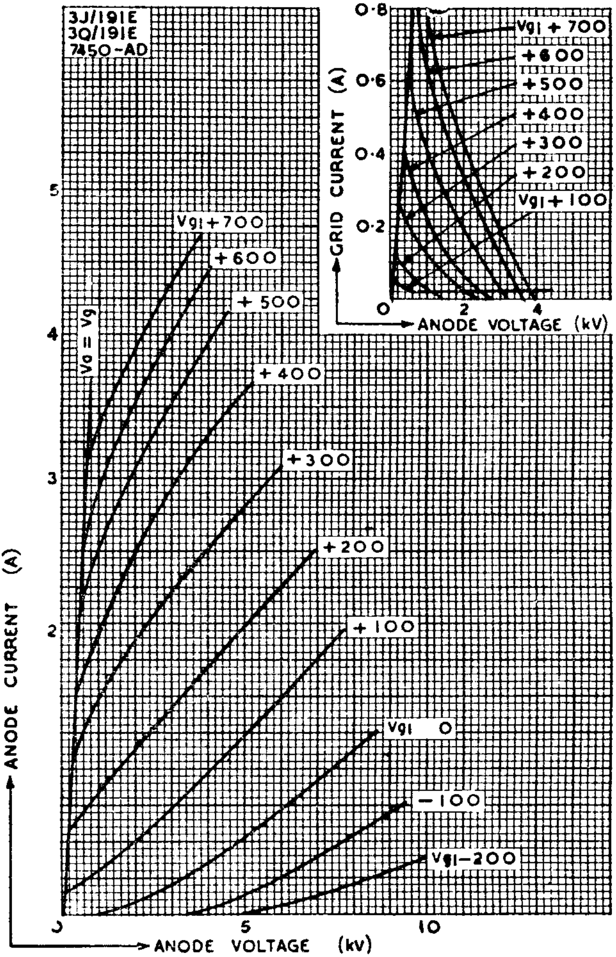
Class C Power Amplifier or Oscillator—unmodulated.

Direct anode voltage	10	kV
Grid bias	—800	V
Direct anode current	1	A
Peak R.F. grid voltage	1,500	V
* Direct grid current	120	mA approx.
Output	7.3	kW approx.

* Subject to wide variation depending upon the impedance of the load circuit.

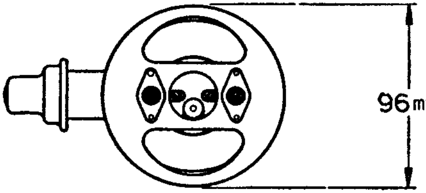
Water-Cooled R.F. Triode

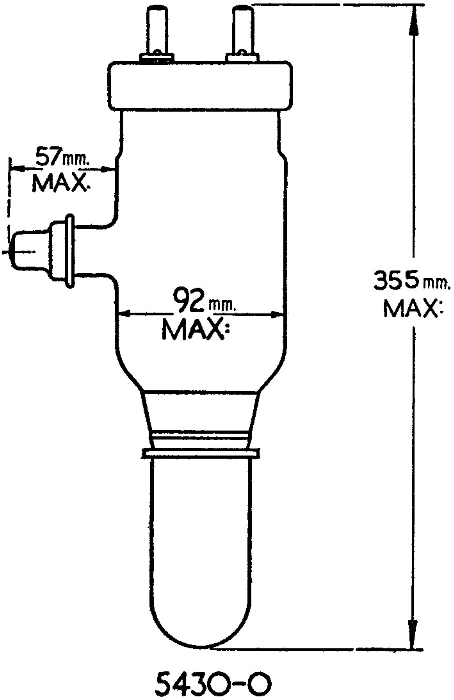
3Q/191E



Water-Cooled R.F. Triode

3Q/191E





5430-O

Single-ended Water-cooled R.F. Power Amplifier Triode

3Q/221E

CATHODE.

Tungsten filament		
Nominal voltage (Actual voltage marked on bulb)	22	V
Nominal current	70	A
Peak emission	12	A

RATING.

Amplification factor	Measured at Va 12kV Ia 1.5A	26	
Impedance		2,900	Ω

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	17	pF
Grid to filament	29	pF
Anode to filament	1	pF

WATER FLOW

Water Jacket type 3005A	
Normal water flow	11 gal. per min.
Pressure drop for normal flow	14 lb. per sq. in.
Maximum water pressure	50 lb. per sq. in.

DIMENSIONS.

Maximum overall length	520	mm.
Net weight	3.6	kg.

MAXIMUM RATINGS.

Maximum direct anode voltage	17,500	V
Maximum direct anode current	2.5	A
Maximum anode dissipation	20	kW
Maximum grid dissipation	1.2	kW

Single-ended Water-cooled R.F. Power Amplifier Triode

3Q/221E

TYPICAL OPERATING CONDITIONS

RADIO FREQUENCY

Class B Telephony. Modulated. Carrier applied to grid.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	15	kV
Grid bias	—600	V
Direct anode current	2.0	A
Power output	10	kW approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

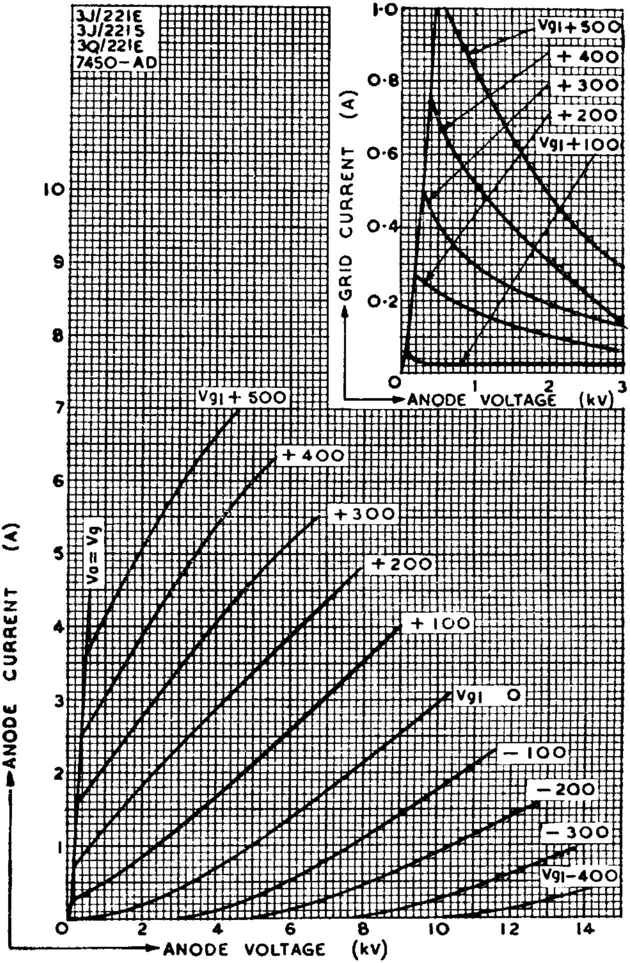
Direct anode voltage	15	kV
Grid bias	—2,000	V approx.
Direct anode current	2	A
Power output	20	kW approx.

Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	17	kV
Grid bias	—1,600	V approx.
Direct anode current	2.5	A
Power output	30	kW approx.

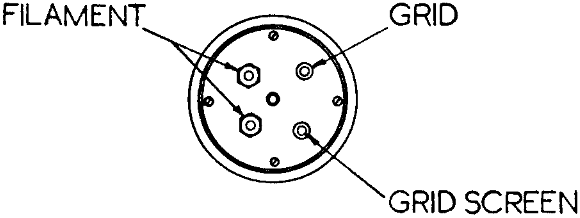
Single-ended Water-cooled R.F. Power Amplifier Triode

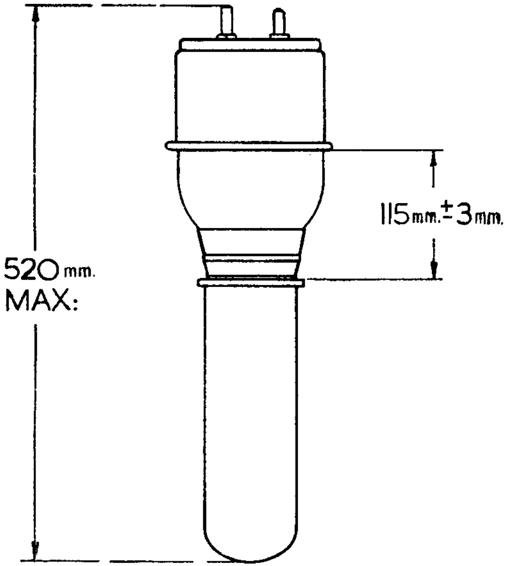
3Q/221E



Single-ended Water-cooled R.F. Power Amplifier Triode

3Q/221E





Double Ended Water Cooled Triode

4030C

CATHODE.

Tungsten filament		
Nominal voltage (actual voltage marked on bulb)	25	V
Nominal current	248	A
Peak emission	45	A

RATINGS.

Amplification factor	Measured at Va 17.5kV Ia 5A	36	
Impedance		1800	Ω

DIRECT INTER-ELECTRODE CAPACITANCIES

Grid to anode	61	pF
Grid to filament	45	pF
Anode to filament	15	pF

COOLING

(Water Jacket is integral part of the valve)

Nominal water flow	22 gal. per minute
Pressure drop at nominal flow	9 lb. per sq. in.
Maximum water pressure in jacket	35 lb. per sq. in.

DIMENSIONS.

Maximum overall length	1346	mm.
Net weight	16	kg.

MAXIMUM RATINGS.

Maximum direct anode voltage	17.5	kV
Maximum direct anode current	11	A
Maximum anode dissipation	80	kV
Maximum grid dissipation	1.5	kW
Maximum frequency for above ratings	2	Mc/s
Maximum anode voltage for frequency of 22 Mc/s	15	kV

Double Ended Water Cooled Triode

4030C

TYPICAL OPERATING CONDITIONS
AUDIO FREQUENCY

Class B Power Amplifier or Modulator (for balanced 2 valve circuit)

Direct anode voltage	14	kV
Grid bias	–150	V
Direct anode current per valve zero signal	1.3	A
Direct anode current per valve maximum signal	6.5	A
Anode dissipation	41	kW
Load resistance anode to anode	1900	Ω
Maximum output 2 valves	100	kW

RADIO FREQUENCY

Class B Telephony, Modulated Carrier applied to Grid (Carrier conditions per valve for use with 100% modulation)

Direct anode voltage	17.5	15	12	10	kV
Direct anode current	4.8	4.8	4.8	4.8	A
Grid bias	–400	–300	–250	–150	V
Power output	25	22	17	12	kW
Anode dissipation	59	50	40	36	kW
Frequency	2	12	19	22	Mc/s

Class C Power Amplifier, Anode Subject to Modulation (Carrier conditions per valve for use with 100% modulation)

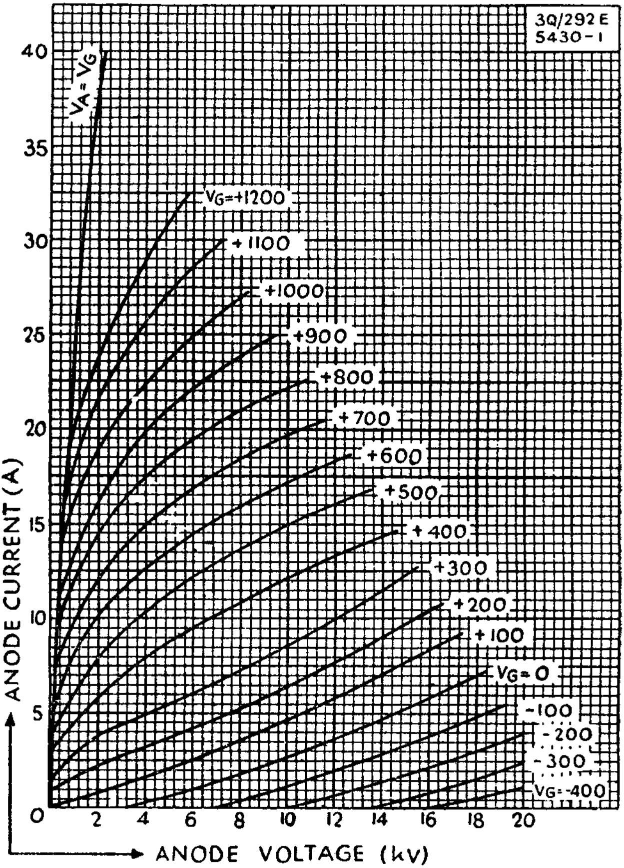
Direct anode voltage	12	11	10	9	kV
Direct anode current	5	5	5	5	A
Grid bias	–600	–500	–450	–400	V
Power output	40	35	30	20	kW
Anode dissipation	20	20	20	25	kW
Frequency	2	12	19	22	Mc/s

Class C Power Amplifier or Oscillator, Unmodulated

Direct anode voltage	17.5	15	12	10	kV
Direct anode current	9.6	9.6	9.6	9.6	A
Grid bias	–600	–500	–450	–400	V
	–700	–600	–500	–400	V
Power output	100	88	68	48	kW
Anode dissipation	68	56	47	48	kW
Frequency	2	12	19	22	Mc/s

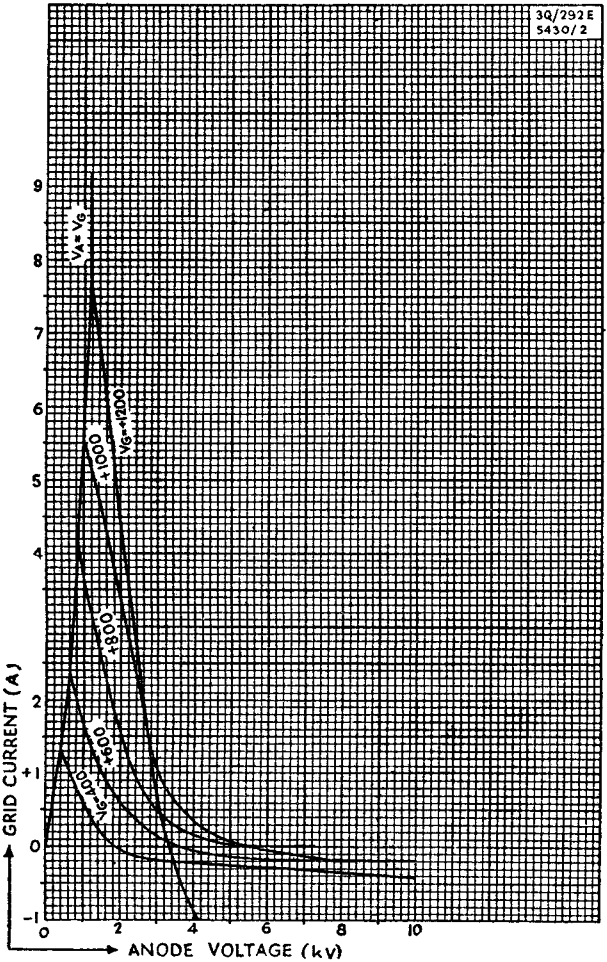
Double Ended Water Cooled Triode

4030C



Double Ended Water Cooled Triode

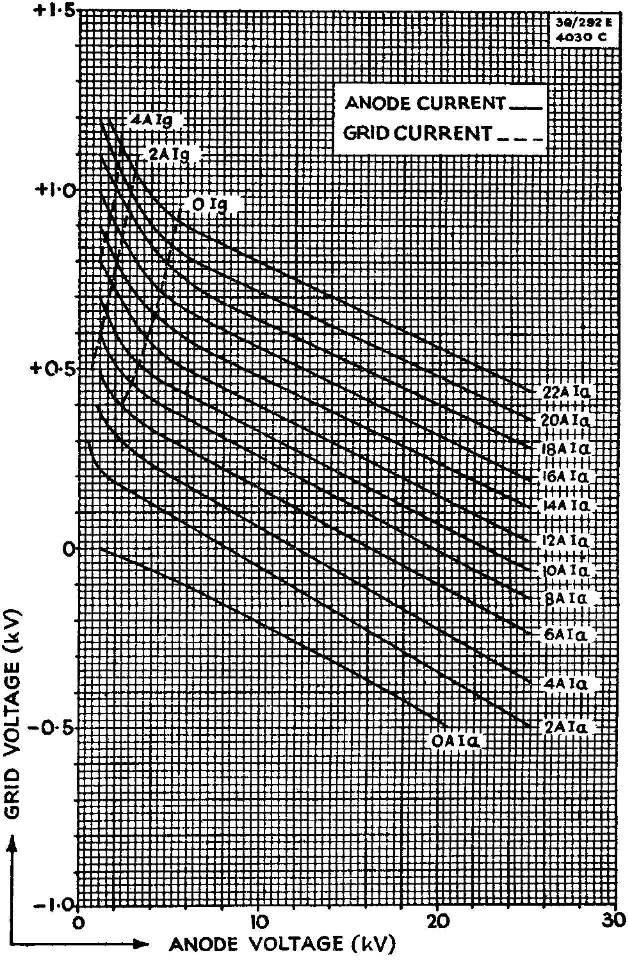
4030C



August 1945

Double Ended Water Cooled Triode

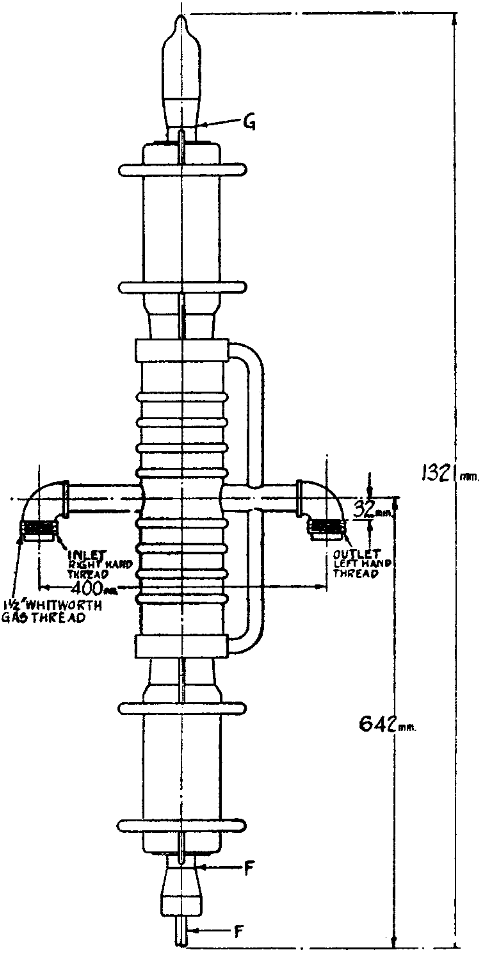
4030C



August 1945

Double Ended Water Cooled Triode

4030C



Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator 3Q/331E

CATHODE.

Tungsten filament		
Voltage (operating voltage marked on bulb)	27.5	V
Nominal current	600	A
Peak emission	100	A

RATING.

Amplification factor	Measured at Va 16 kV V_{g_1} —100V	46	
Impedance		750	

DIRECT INTER-ELECTRODE CAPACITIES.

Grid to anode	98	pF
Grid to filament	145	pF
Anode to filament	7	pF

COOLING.

Water Jacket type	PL125,549/8459	
Normal water flow	50	galls/min.
Pressure drop across the jacket at normal flow	15	lbs/sq. in.
Maximum water pressure	50	lbs/sq. in.
Air cooling for filament and grid seals at a pressure of 7in. SWG	5	cu. ft./min.

DIMENSIONS.

Maximum overall length	104	cms.
Net weight	35	kgms.

MAXIMUM RATINGS.

Maximum direct anode voltage	17.5	kV
Maximum anode dissipation	160	kW
Maximum grid dissipation	3	kW
Maximum direct anode current	16	A
Maximum frequency for above ratings	22	Mc/s

Tentative data
May 1947

Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator 3Q/331E

TYPICAL OPERATING CONDITIONS.

Class B Audio Frequency Amplifier or modulator for balanced 2 valve operation.

Direct anode voltage	12,500	V
Grid bias	—150	V
Direct anode current	12.4	A
Load resistance	1,080	Ω
Power output	185	kW

RADIO FREQUENCY.

Class B Telephony. Modulated carrier applied to grid. (Carrier conditions for use with 100% modulation.)

Direct anode voltage	17,000	V
Grid bias	—325	V
Direct anode current	11	A
Power output	65	kW

Class C Power Amplifier. Anode subjected to modulation. (Carrier conditions for use with 100% modulation.)

Direct anode voltage	12,000	V
Grid bias	—1,300	V
Direct anode current	11	A
Power output	90	kW

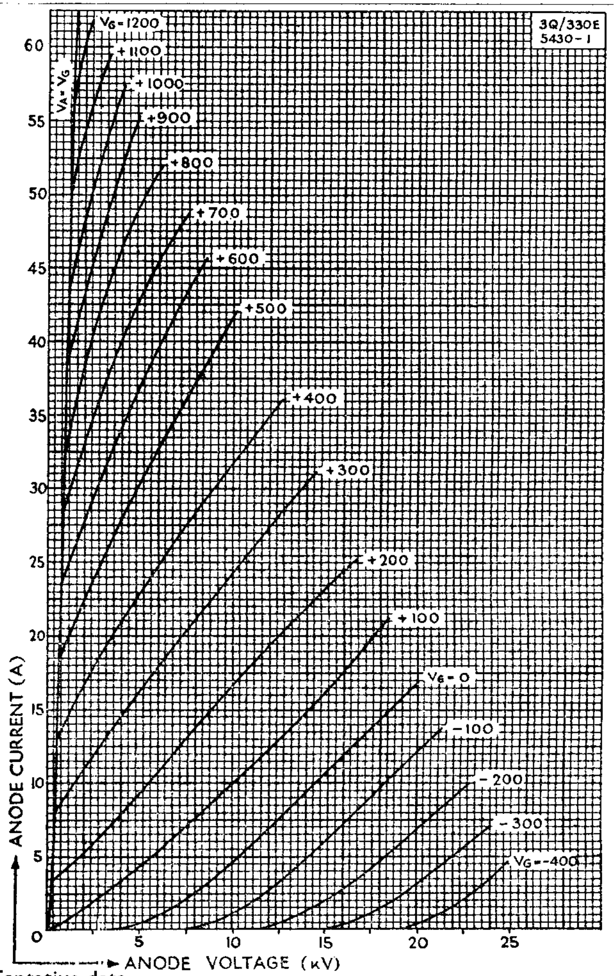
Class C. Amplifier or Oscillator, unmodulated.

Direct anode voltage	12,000	17,000	V
Grid bias	—800	—1,000	V
Direct anode current	11	15	A
Power output	95	180	kW

Tentative data
May 1947

Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator

3Q/331E



Tentative data
May 1947

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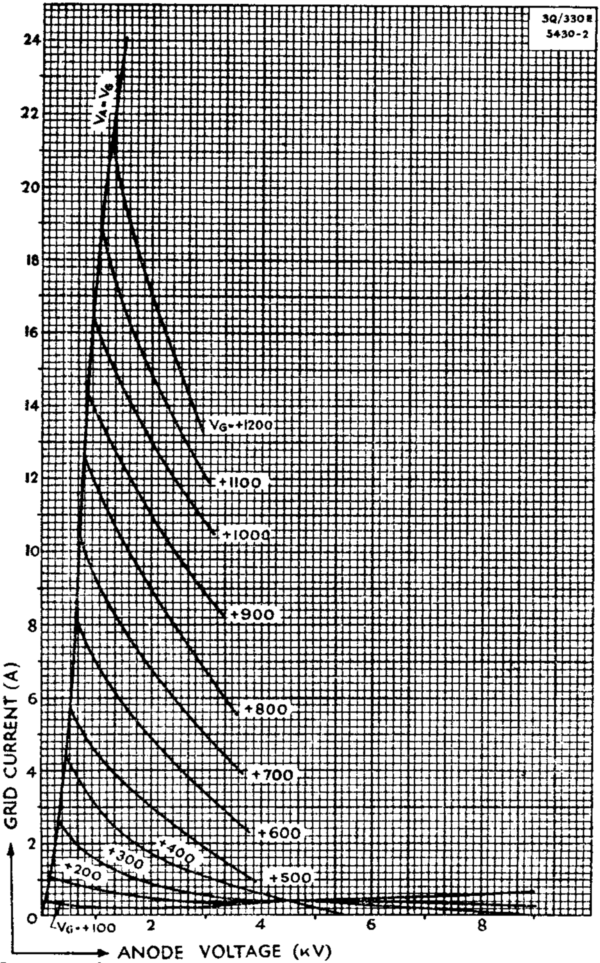
Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator

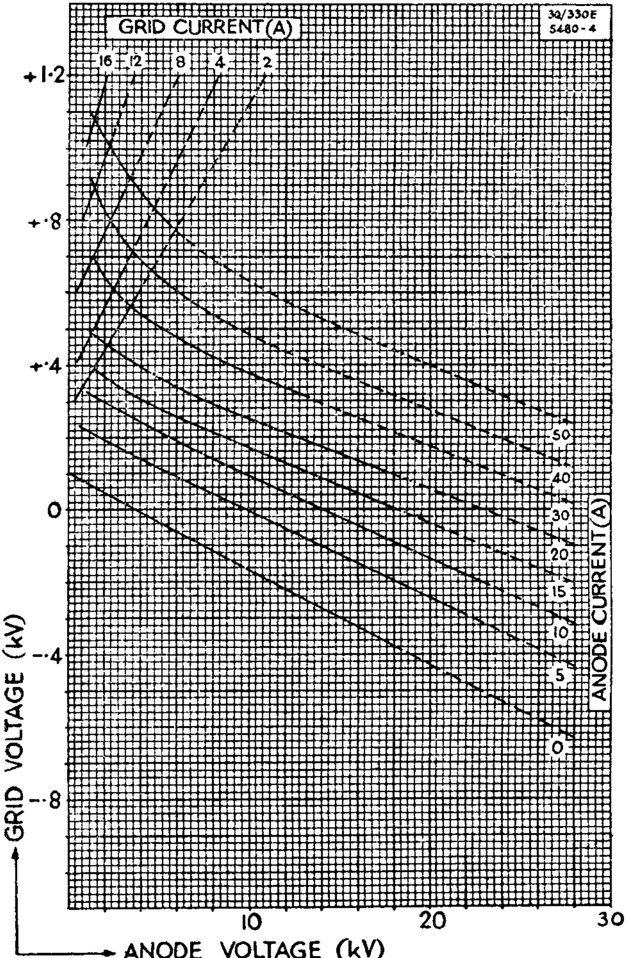
3Q/331E



Tentative data

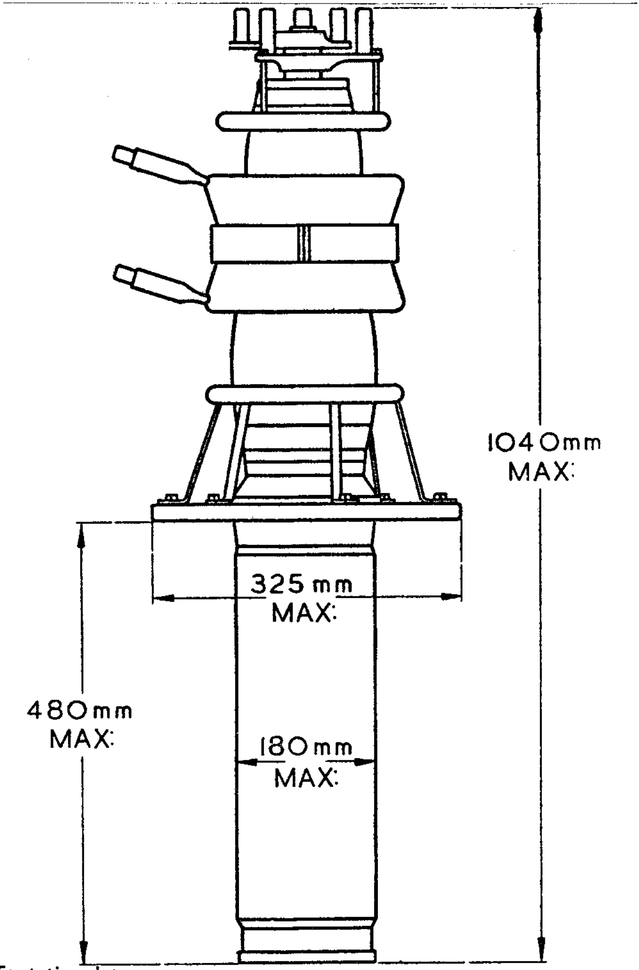
May 1947

Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator
3Q/331E



Tentative data
May 1947

Single-ended Water-Cooled Triode High Power RF Amplifier and Oscillator 3Q/331E



Tentative data
May 1947

Hot Cathode Mercury Vapour Thyratron

3V/340B

CATHODE.

Oxide-coated filament		
Voltage	2.5	V
Nominal current	5	A

DIMENSIONS.

Maximum overall length	168	mm.
Maximum bulb diameter	60	mm.
Base	Standard British 4-pin	
Net weight	90	gm.

MAXIMUM RATINGS.

Maximum peak inverse voltage	1,500	V
Maximum peak anode current at 25 c/s and above	2	A
Maximum average anode current	0.5	A
Maximum peak grid current	0.1	A
Condensed mercury temperature range	15°C. to 40°C.	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	up to 35°C.	35°C. to 40°C.
Peak inverse voltage	1,500V	1,000V

Tentative data
May 1946

Hot Cathode Mercury Vapour Thyratron

3V/340B

TYPICAL OPERATING CONDITIONS.

	No. of Valves	Maximum D.C. Output voltage	Maximum D.C. Output current
Bi-phase half wave	2	500V	1.0 A
Full wave	4	1000V	1.0 A

THYRATRON OPERATION.

With a condensed mercury temperature of 35°C. the minimum value of grid blocking voltage required to prevent ignition will be :

Anode voltage	Grid voltage (approx.)
200 V	—3
500 V	—4

For positive operation it is recommended that for a given anode voltage the grid should be biased back beyond the value required to prevent ignition and a pulse of 20 to 30 volts positive applied.

The pulse should have a leading edge as near vertical as possible and the pulse circuit should be of high impedance in order to limit the grid current.

The control of the output may be effected by varying the phase of the grid pulse relative to the phase of the applied anode voltage.

This thyratron being directly heated it is recommended that the output circuit be connected to the midpoint of the filament transformer secondary.

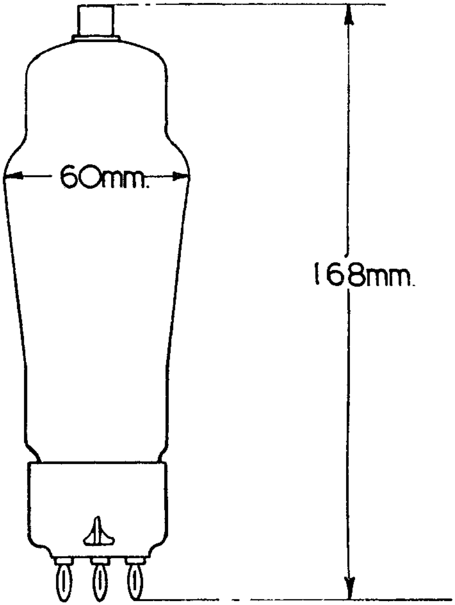
CATHODE HEATING TIME.

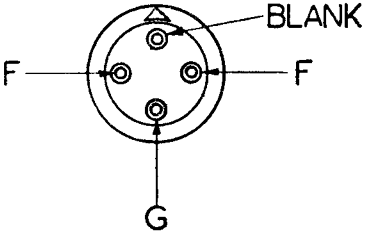
Minimum cathode heating time 30 seconds. After shipment or transit the valve must be pre-heated for not less than 15 minutes before any anode voltage is applied so that the mercury may be distributed correctly.

Tentative data
May 1946

Hot Cathode Mercury Vapour Thyratron

3V/340B





Tentative data
May 1946

Hot Cathode Mercury Vapour Thyratron

3V/420B

CATHODE.

Indirectly-heated oxide-coated		
Voltage	5	V
Nominal current	5.5	A

DIMENSIONS.

Maximum overall length	225	mm.
Maximum bulb diameter	64	mm.
Base	Standard British 5-pin	
Net weight	167	gm.

MAXIMUM RATINGS.

Maximum peak inverse voltage	1,500	V
Maximum peak anode current at 25 c/s and above	12.5	A
Maximum average anode current	2.5	A
Maximum peak grid current	0.1	A
Condensed mercury temperature range	25°C. to 50°C.	

The above ratings apply to operation with a choke-input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	up to 35°C.	35°C. to 40°C.
Peak inverse voltage	1,500V	1,000V

Tentative data
June 1946

Hot Cathode Mercury Vapour Thyratron

3V/420B

TYPICAL OPERATING CONDITIONS.

	No. of Valves	Maximum D.C. Output voltage	Maximum D.C. Output current
Bi-phase half wave	2	500V	5.0 A
Full wave	4	1000V	5.0 A

THYRATRON OPERATION.

With a condensed mercury temperature of 35°C. the minimum value of grid blocking voltage required to prevent ignition will be :

Anode voltage	Grid voltage (approx.)
200 V	—10
500 V	—12

For positive operation it is recommended that for a given anode voltage the grid should be biased back beyond the value required to prevent ignition and a pulse of 20 to 30 volts positive applied.

The pulse should have a leading edge as near vertical as possible and the pulse-circuit should be of high impedance in order to limit the grid current.

The control of the output may be effected by varying the phase of the grid pulse relative to the phase of the applied anode voltage.

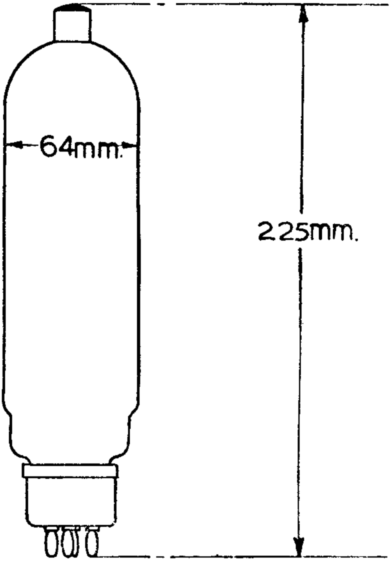
CATHODE HEATING TIME.

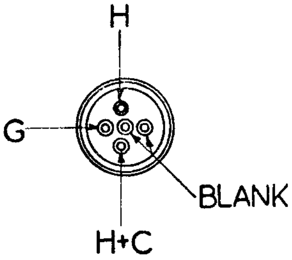
Minimum cathode heating time 5 minutes. After shipment or transit the valve must be pre-heated for not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly.

Tentative data
June 1946

Hot Cathode Mercury Vapour Thyratron

3V/420B





Tentative data
June 1946

Hot Cathode Mercury Vapour Thyratron

4049GD

CATHODE.

Oxide-coated filament, Shielded		
Voltage	4	V
Nominal current	11	A

DIMENSIONS.

Maximum overall length	280	mm.
Maximum bulb diameter	62	mm.
Base, Large American 4 pin.		
Net weight.		

MAXIMUM RATINGS.

Maximum peak inverse voltage	20	kV
Maximum peak anode current	5	A
Maximum average anode current	1.25	A
Condensed mercury temperature range with forced ventilation	20°C—65°C	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	20°C—55°C	20°C—40°C.
Forced Ventilation	20°—65°	20°C—55°C.
Peak Inverse Voltage	Less than 10 kV.	10 kV. to 20 kV.

3V/500A
(4049GD) Hot Cathode Mercury Vapour Thyratron

4049GD

TYPICAL OPERATING CONDITIONS
(for ideal choke-input filter)

Circuit No.	No. of Valves	Maximum D.C. output Volts	Maximum D.C. output current
2	2	6,400V	2.5A
3	4	13,000V	2.5A
4	3	9,500V	3.75A
5	6	9,500V	7.5A
6	6	18,500V	3.75A

THYRATRON OPERATION.
With a condensed mercury temperature of 35°C the minimum values of grid blocking voltages to prevent ignition are

GRID VOLTAGE (approx).	ANODE VOLTAGE
—4V	15,000V
—3V	11,000V
—2V	9,000V
—1V	5,000V
—0V	3,000V

To strike the valve the grid should be pulsed positive. The pulse should have a leading edge as near vertical as possible. The control of the output is made by variation of the phase of the applied grid pulse relative to that of the anode voltage.

This thyratron being directly heated, it is recommended the output circuit be connected to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

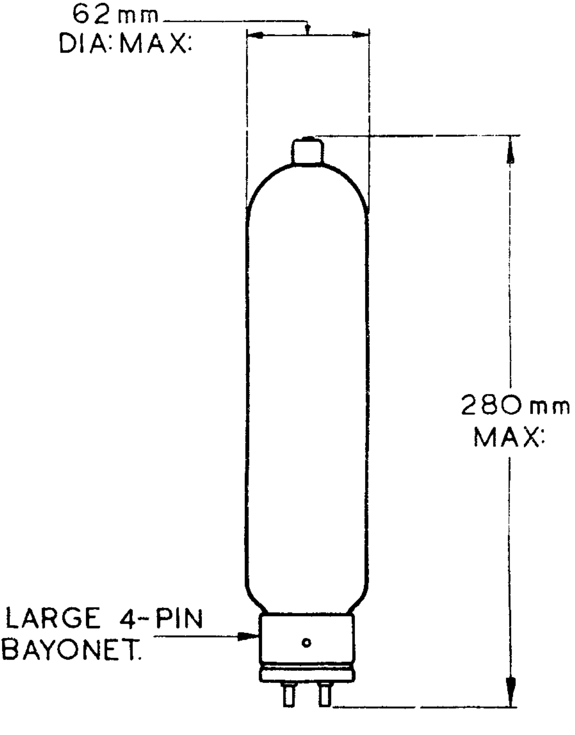
Ambient temperature	20° to 30°	30° to 65°
Min. pre-heating period	15 mins.	5 mins.

After shipment or transit, the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly. Temperature limits under "Natural Ventilation" are only valid for unrestricted natural ventilation, forced air blast cooling being required for operation up to the maximum condensed mercury temperature limit.

Note.—Before putting a valve of this type into service, it is recommended that reference be made to the General Information Sheet K.

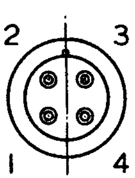
Hot Cathode Mercury Vapour Thyratron

4049GD



BASING.

1 GRID.
2 FILAMENT.
3 BLANK.
4 FILAMENT.



3V/500A
(4049GD)

Hot Cathode Mercury Vapour Thyratron

4049GD

Circuit No.

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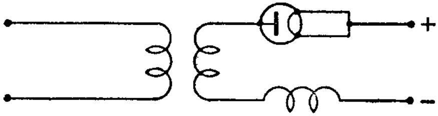

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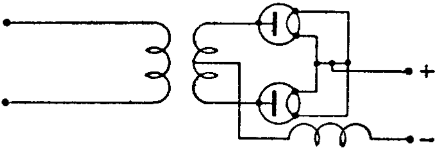

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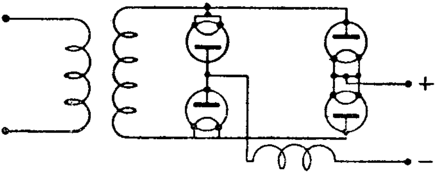

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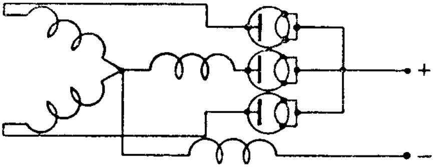

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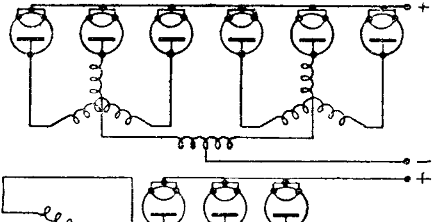

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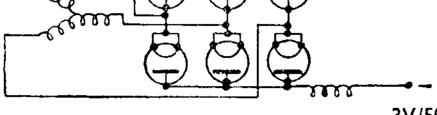


Hot Cathode Mercury Vapour Thyratron

4078GA

CATHODE.

Oxide-coated shielded filament		
Voltage	5	V
Nominal current	20	A

DIMENSIONS.

Maximum overall length		435	mm.
Maximum bulb diameter		158	mm.
Net weight		925	g.
Base.	Special 3 pin.	See Drawing.	
Top cap.	Special.	See Drawing.	

MAXIMUM RATINGS.

Maximum peak inverse voltage	20,000	V
Maximum peak anode current	10	A
Maximum average anode current	2.5	A
Condensed mercury temperature range with forced ventilation	15° C. to 65° C. maximum	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15° C. to 50° C.	15° C. to 40° C.	—	—
Forced Ventilation	15° C. to 65° C.	15° C. to 55° C.	15° C. to 45° C.	15° C. to 40° C.
Peak inverse voltage	Less than 7,000 V	7,500 to 10,000 V	10,000 to 12,500 V	Greater than 12,500 V

(4078GA) Hot Cathode Mercury Vapour Thyratron

4078GA

TYPICAL OPERATING CONDITIONS

Circuit No.	No. of Valves	Maximum D.C. Output volts	Maximum D.C. Output Amps
2	2	6,400 V	6 A
3	4	13,000 V	6 A
4	3	9,500 V	8 A
5	6	9,500 V	15 A
6	6	18,500 V	8 A

THYRATRON OPERATION.

With a condensed mercury temperature of 35° C. the minimum values of grid blocking voltages to prevent ignition are :

Grid voltage (approximately)	Anode voltage
—0.5 V	2 kV
—15 V	16 kV

To strike the valve the grid should be pulsed positive.
The pulse should have a leading edge as near vertical as possible. The control of the output is made by variation in phase of the grid pulse relative to the phase of the applied anode voltage.

This thyratron being directly heated, the output circuit must be connected to the mid-point of the filament transformer secondary.

Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

CATHODE HEATING TIME.

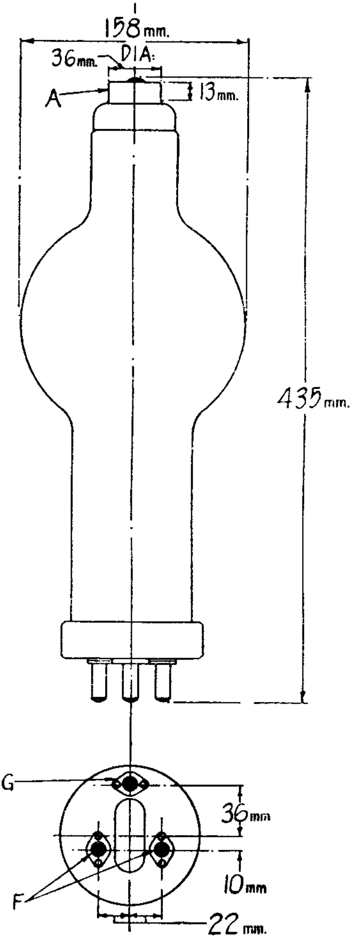
Ambient Temperature	10° C. to 15° C.	15° C. to 20° C.	20° C. and above
Minimum pre-heating period	30 minutes	15 minutes	5 minutes

After shipment or transit the valve must be pre-heated not less than 30 mins. before any voltage is applied so that the mercury may be distributed correctly.

NOTE.—Before putting a valve of this type into service it is recommended that reference be made to the General Information sheet K.

Hot Cathode Mercury Vapour Thyratron

4078GA



August 1945

Hot Cathode Mercury Vapour Thyratron

4078GA

Circuit No.

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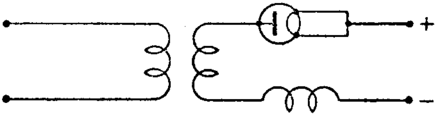

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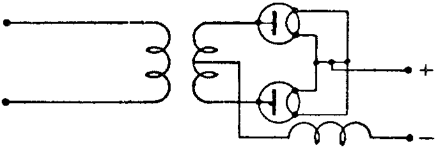

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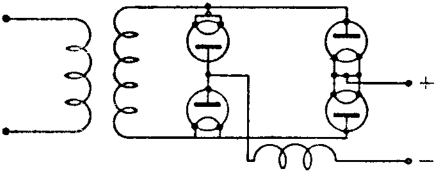

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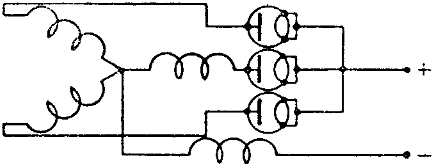

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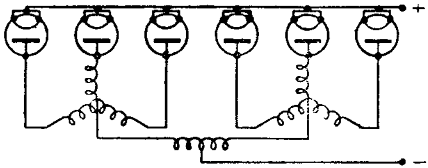

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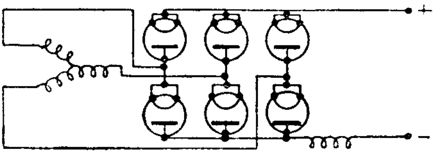


Hot Cathode Mercury Vapour Thyratron

4079GA

CATHODE.

Oxide-coated shielded filament.

Voltage	5	V
Nominal current	38	A

DIMENSIONS.

Maximum overall length	544	mm.
Maximum bulb diameter	196	mm.
Net weight	1.9	kg.
Base. Special 3 pin. See drawing.		
Top cap. Special. See drawing.		

MAXIMUM RATINGS.

Maximum peak inverse voltage	20,000	V
Maximum peak anode current	20	A
Maximum average anode current	7.5	A
Condensed mercury temperature range with forced ventilation	15° C. to 65° C. maximum	

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15° C. to 45° C.	15° C. to 35° C.	—	—
Forced Ventilation	15° C. to 60° C.	15° C. to 50° C.	15° C. to 40° C.	15° C. to 35° C.
Peak inverse voltage	Less than 7,000 V	7,500 to 10,000 V	10,000 to 12,500 V	Greater than 12,500 V

Hot Cathode Mercury Vapour Thyratron

4079GA

TYPICAL OPERATING CONDITIONS
(for ideal choke-input filter).

Circuit No.	No. of Valves	Maximum D.C. Output volts	Maximum D.C. Output Current
2	2	6,400 V	12.5 A
3	4	13,000 V	12.5 A
4	3	9,500 V	16 A
5	6	9,500 V	30 A
6	6	18,500 V	16 A

THYRATRON OPERATION.

With a condensed mercury temperature of 35° C. the minimum values of grid blocking voltages to prevent ignition are :

Grid voltage (approximately)	Anode voltage
—1	2 kV
—20	16 kV

To strike the valve the grid should be pulsed positive.
The pulse should have a leading edge as near vertical as possible. The control of the output is made by variation of the phase of the grid pulse relative to the phase of the applied anode voltage.

This thyratron being directly heated, the output circuit must be connected to the mid-point of the filament transformer secondary.

CATHODE HEATING TIME.

Ambient temperature	10° C. to 15° C.	15° C. to 20° C.	20° C. and above
Minimum pre-heating time	30 minutes	15 minutes	5 minutes

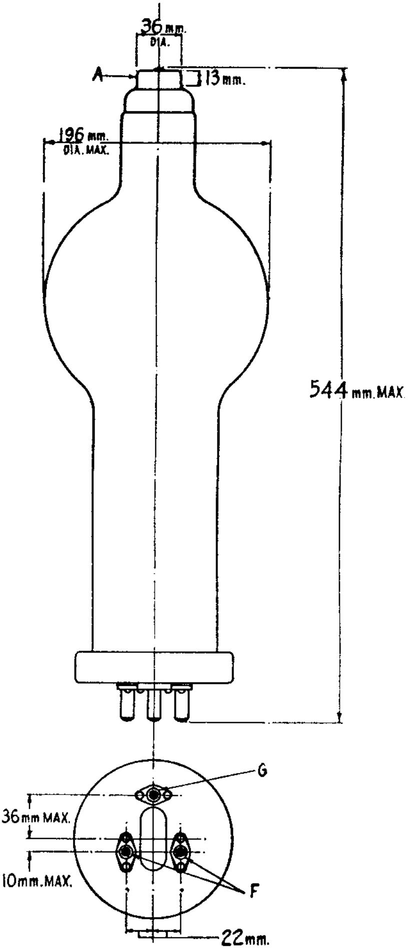
After shipment or transit the valve must be pre-heated not less than 30 minutes before any anode voltage is applied so that the mercury may be distributed correctly.

Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

NOTE.—Before putting a valve of this type into service it is recommended that reference be made to the General Information sheet K.

Hot Cathode Mercury Vapour Thyratron

4079GA



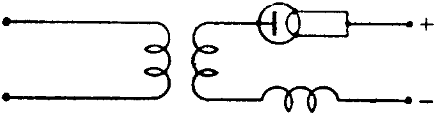
August 1945

Hot Cathode Mercury Vapour Thyratron

4079GA

Circuit No.

1



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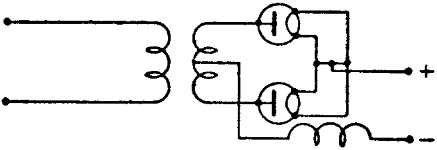

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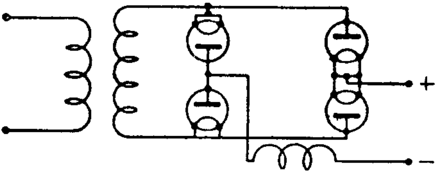

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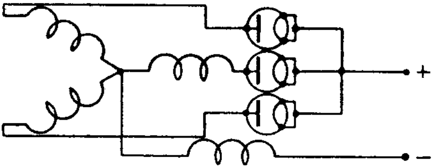

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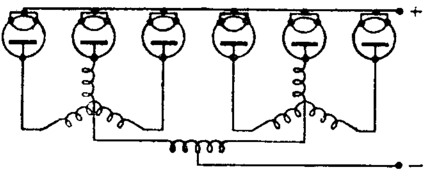

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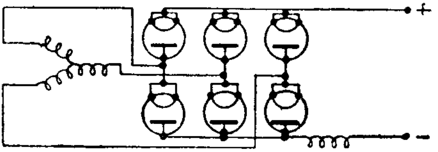


Hot Cathode Mercury Vapour Thyratron

4080GA

CATHODE.

Oxide coated shielded filament.

Voltage	5	V
Nominal current	100	A

DIMENSIONS.

Maximum overall length	685	mm.
Maximum bulb diameter	266	mm.
Net weight	4	kg.
Base. Special 3 pin.	See drawing.	
Top cap. Special.	See drawing.	

MAXIMUM RATINGS.

Maximum peak inverse voltage	16,000	V
Maximum peak anode current	50	A
Maximum average anode current	20	A

Condensed mercury temperature range with forced air cooling — 15° C. to 60° C. maximum

The above ratings apply to operation with a choke input filter and a supply frequency of 50 c/s.

MAXIMUM PEAK INVERSE VOLTAGE RATINGS.

Natural Ventilation	15° C. to 45° C.	15° C. to 35° C.	—	—
Forced Ventilation	15° C. to 60° C.	15° C. to 50° C.	15° C. to 40° C.	15° C. to 35° C.
Peak inverse voltage	Less than 7,500 V	7,500 to 10,000 V	10,000 to 12,500 V	Greater than 12,500 V

Hot Cathode Mercury Vapour Thyratron

4080GA

TYPICAL OPERATING CONDITIONS.
(for ideal choke-input filter).

Circuit No.	No. of Valves	Maximum D.C. Output volts	Maximum D.C. Output current
2	2	5,000 V	31 A
3	4	10,000 V	31 A
4	3	7,500 V	38 A
5	6	7,500 V	76 A
6	6	15,000 V	47 A

THYRATRON OPERATION.

With a condensed mercury temperature of 35° C. the minimum values of grid blocking voltages to prevent ignition are :

Grid voltage (approximately)	Anode volts
—1	1 kV
—20 V	16 kV

To strike the valve the grid should be pulsed positive.
The pulse should have a leading edge as near vertical as possible.
The control of the output is made by variation of the phase of the grid pulse relative to the phase of the applied grid voltage.

This thyratron being directly heated, the output circuit must be connected to the mid-point of the filament transformer secondary

CATHODE HEATING TIME.

Ambient Temperature	15° to 20° C.	20° C. and above
Min. Pre-heating period	30 min.	10 min.

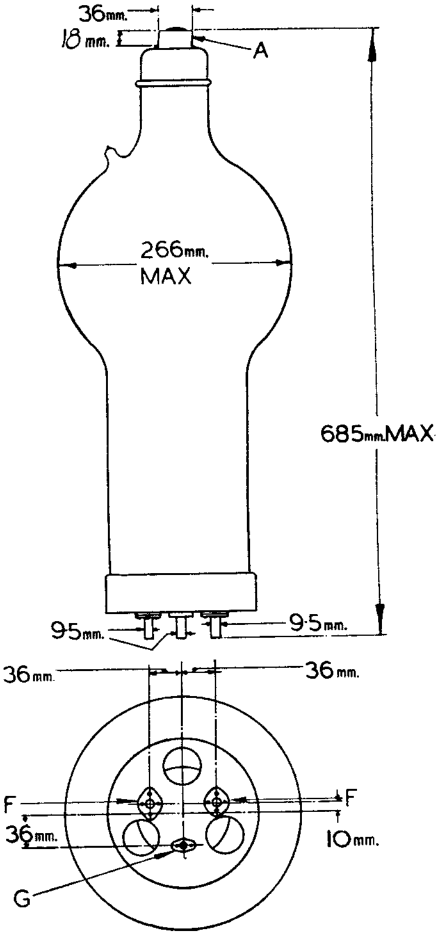
After shipment or transit the valve must be preheated not less than 30 min. before any anode voltage is applied so that the mercury may be distributed correctly.

Temperature limits given under " Natural Ventilation " are only valid for unrestricted natural ventilation, forced air blast being required for operation up to the maximum condensed mercury temperature limit.

NOTE.—Before putting a valve of this type into service it is recommended that reference be made to the General Information Sheet K.

Hot Cathode Mercury Vapour Thyratron

4080GA



August 1945

3V/590E
(4080 GA)

Hot Cathode Mercury Vapour Thyratron

4080GA

Circuit No.

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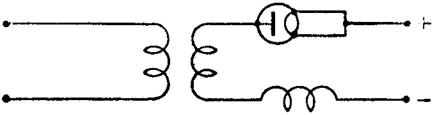

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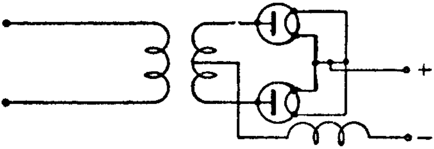

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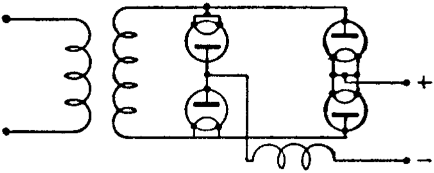

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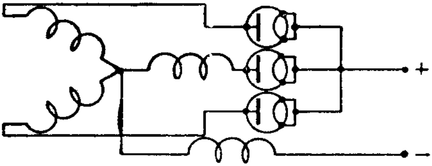

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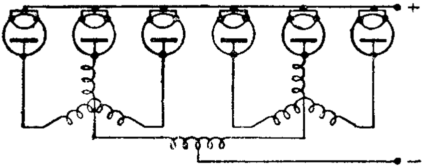

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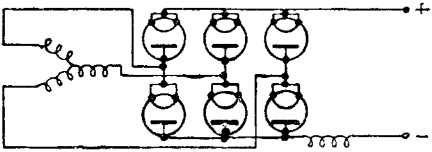


Coplanar-Grid Tetrode

4045A

CATHODE.

Oxide-coated filament		
Voltage	5	V
Nominal current	1.6	A

RATING.

Amplification factor	Measured at Va 145V Vg_2 70V Vg_1—60V	5.3	
Impedance		3,600	Ω

INTER-ELECTRODE CAPACITIES.

Grid to anode	3.8	pF
Input	18	pF
Output	9.4	pF

DIMENSIONS.

Maximum overall length	165	mm.
Maximum bulb diameter	63	mm.
Base	Standard British 5-pin	
Net weight	100	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	250	V
Maximum direct anode current	45	mA
Maximum potential difference between screen and control grids	150	V
Maximum control grid potential on positive swing of input voltage	10	V

It is recommended that the valve be operated in a vertical position. When operated horizontally the plane of the filament must be vertical.

Coplanar-Grid Tetrode

4045A

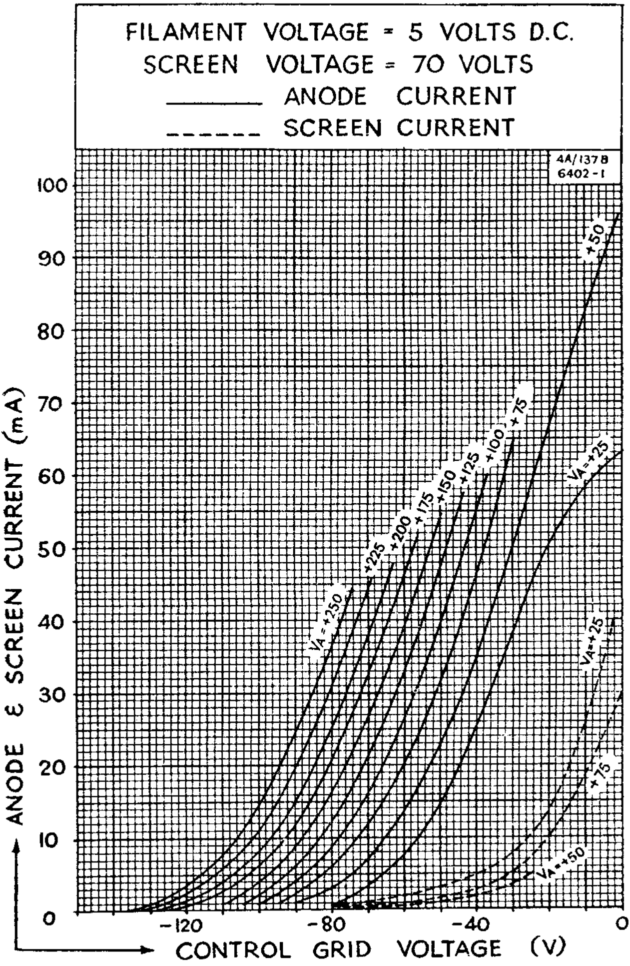
TYPICAL OPERATING CONDITIONS.

Anode voltage (volts)	130	130	130	130	130	180	180	*250
Control grid voltage (volts)	–40	–60	–40	–60	–40	–50	–65	–70
Positive grid voltage (volts)	43	63	53	72	59	55	70	65
Anode current (mA)	25	25	35	35	45	40	40	45
Positive grid current (mA)	0.2	0.4	0.4	0.7	0.9	0.3	0.4	0.2
Amplification factor	5.1	5.0	5.0	5.0	5.1	5.2	5.2	5.2
Anode resistance (ohms)	3,700	4,000	3,200	3,400	2,900	3,400	3,600	3,600
Load resistance (ohms)	5,000	3,000	4,000	2,000	2,800	5,000	3,500	5,000
Input peak volts	40	60	40	60	40	50	65	70
Fundamental power output (watts)	1.1	2.0	1.2	2.2	1.4	2.1	3.3	4.2
2nd harmonic (db)	29	21	33	21	30	30	26	26

* Maximum operating condition.

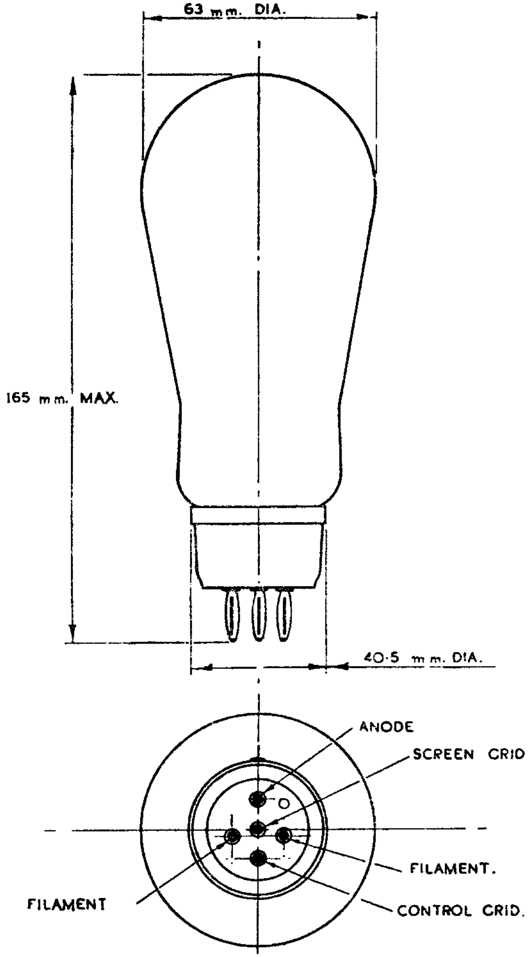
Coplanar-Grid Tetrode

4045A



Coplanar-Grid Tetrode

4045A



February 1946

Output Pentode

5A/102A and D

(5A/102A is for replacement purposes only)

CATHODE.

Indirectly-heated Oxide-coated		
Current	0.85	A
Nominal voltage	7.5	V

RATING.

Mutual conductance (Measured at Va 180V, Vg_2 150V Vg_1 —18V)	2.5	ma/V

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.5	pF
Input	6.8	pF
Output	9	pF

DIMENSIONS.

	5A/102A	5A/102D
Maximum overall length	134 mm.	134 mm.
Maximum bulb diameter	46 mm.	46 mm.
Net weight	50 g.	55 g.
Base	Am 6 pin.	Int. Octal

MAXIMUM RATINGS.

Maximum direct anode voltage	180	V
Maximum direct anode current	50	mA
Maximum direct screen voltage	150	V
Maximum direct screen current	10	mA
Maximum control grid resistance (using auto-bias)	500	k Ω

Output Pentode

5A/102A and D

(5A/102A is for replacement purposes only)

TYPICAL OPERATING CONDITIONS.

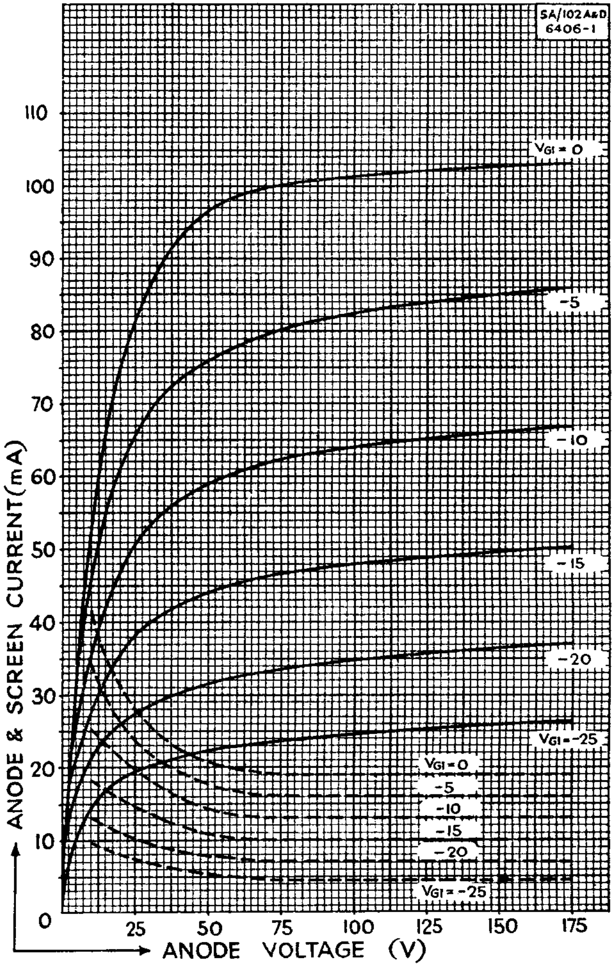
Anode voltage	180 volts					
Control grid voltage	—18 volts					
Screen voltage	150 volts					
Suppressor voltage	0 volts					
Load resistance	4,000 ohms					
Output mW	50	100	250	500	750	1,000
Total harmonics, db below fundamental	34	31	28	26	25	24

Output Pentode

5A/102A
5A/102D

5A/102A and D

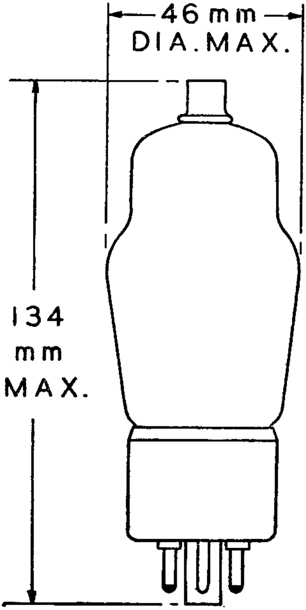
(5A/102A is for replacement purposes only)



Output Pentode

5A/102A and D

(5A/102A is for replacement purposes only)

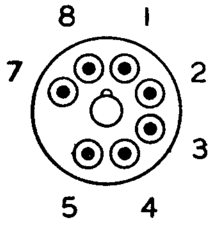


5A/102A BASING

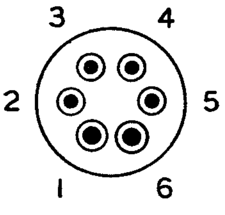
1 HEATER
2 ANODE
3 GRID 2
4 GRID 3
5 CATHODE
6 HEATER

5A/102 D BASING

1 BLANK
2 HEATER
3 ANODE
4 GRID 2
5 GRID 3
7 HEATER
8 CATHODE



5A/102 D



5A/102 A

R.F. Pentode

4046A

CATHODE.

Indirectly-heated oxide-coated.		
Voltage	4	V
Nominal current	1	A

RATING.

Mutual conductance {Measured at Va 200V, Vg_2 100V Vg_1 —2V}	3	mA/V

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.007	pF
Input	10.7	pF
Output	8	pF

DIMENSIONS.

Maximum overall length	137	mm.
Maximum bulb diameter	39	mm.
Base : Standard British 5-pin		
Net weight	60	g.

MAXIMUM RATINGS.

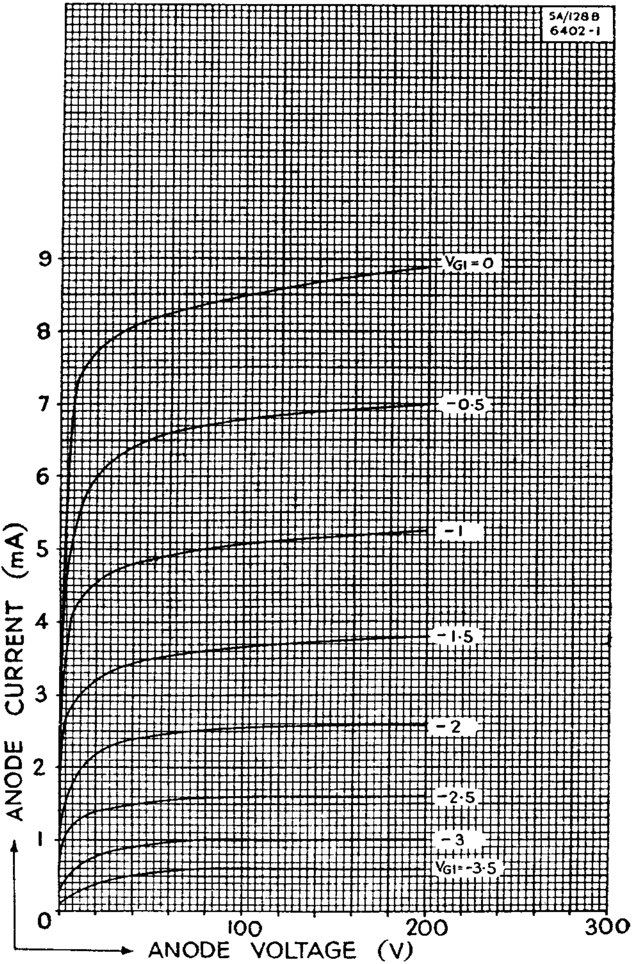
Maximum direct anode voltage	250	V
Maximum direct screen voltage	100	V
Maximum direct anode current	9	mA

TYPICAL OPERATING CONDITIONS.

Anode voltage ...	250	200	150	volts
Control grid bias ...	—1.5	—1.5	—1.5	volts
Screen grid voltage...	100	100	100	volts
Anode current ...	3.9	3.8	3.7	mA
Anode resistance ...	800,000	800,000	800,000	ohms
Load	50,000	46,000	30,000	ohms
Output	0.315	0.258	0.175	watts
2nd harmonic—% ...	8.6	8.75	11.5	
—db	21.3	20.7	19	

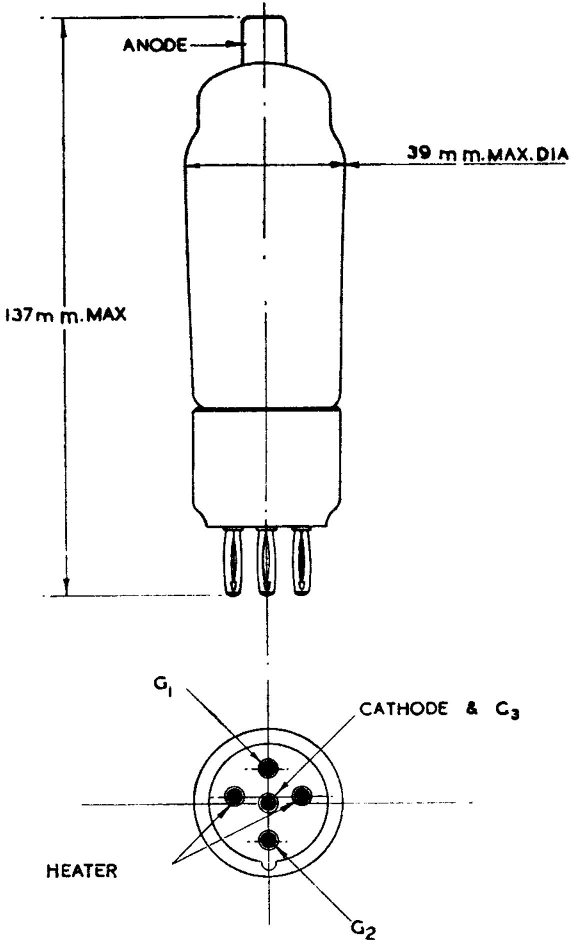
R.F. Pentode

4046A



R.F. Pentode

4046A



Carrier Pentode

4328A and D

(4328A is for replacement purposes only)

5A/136A (4328A)
5A/136D (4328D)

CATHODE.

Indirectly heated Oxide-coated.

Current	0.425	A
Nominal voltage.	7.5	V

RATING.

Mutual conductance	measured at Va250V Vg_2 180V $Vg_3$0 Vg_1—5.5V	2	mA/V
Screen grid μ		19	

INTER-ELECTRODE CAPACITIES.

Grid to Anode	0.03	pF
Input	6	pF
Output	14	pF

DIMENSIONS.

	4328A	4328D
Maximum overall length	125 mm.	125 mm.
Maximum bulb diameter	40 mm.	40 mm.
Base	Small American 6 pin	International Octal
Net weight	50 g.	45 g.

MAXIMUM RATINGS.

Maximum direct anode voltage	250	V
Maximum direct anode current	7.5	mA
Maximum direct screen voltage	180	V
Maximum direct screen current	2.5	mA

NOTE.—When this valve is used in series with other valves of a different type, protection should be provided for the heaters at the moment of switching on.

5A/136A (4328A) 5A/136D (4328D)

Carrier Pentode

4328A and D

(4328A is for replacement purposes only)

TYPICAL OPERATING CONDITIONS.

Anode voltage ...	135	135	135	135	135	135	180	180	225	225	*250	250	250	250	volts
Screen grid voltage ...	135	135	135	135	135	135	135	135	135	135	135	135	135	135	volts
Control grid bias ...	—3	—3	—3	—3	—3	—3	—3	—3	—3	—3	—3	—3	—3	—3	volts
Suppressor grid voltage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	volts
Anode current ...	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.5	5.5	5.5	5.5	5.5	mA
Load resistance ...	20000	60000	60000	60000	100000	100000	40000	100000	60000	100000	60000	60000	100000	100000	ohms
Input voltage	3.00	1.60	0.95	1.15	0.57	0.40	2.70	1.50	2.70	1.80	2.70	1.20	2.10	1.50	peak volts
Output voltage ...	—	—	—	100	75	50	—	175	—	220	—	—	250	200	peak volts
Output power ...	250	130	60	—	—	—	340	—	425	—	480	110	—	—	mW
Second harmonic ...	22	26	35	33	35	40	26	26	27	27	26	30	26	30	db
Third harmonic ...	30	28	45	39	50	55	28	30	27	31	30	55	29	43	db

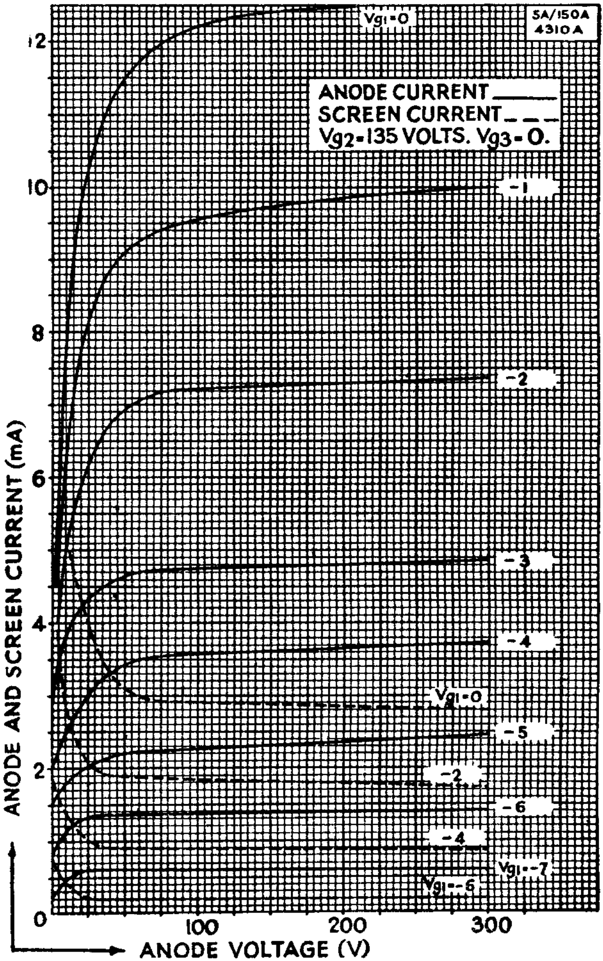
* Maximum operating conditions

Carrier Pentode

4328A and D

5A/136A
(4328A)
5A/136D
(4328D)

(4328A is for replacement purposes only)

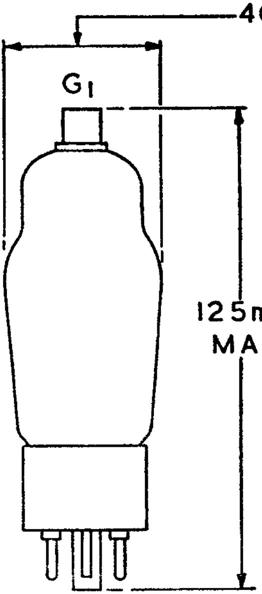


5A/136A
(4328A)
5A/136D
(4328D)

Carrier Pentode

4328A, and D

(4328A is for replacement purposes only)



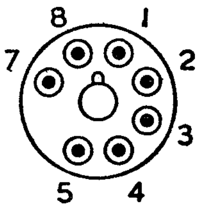
BASING 4328A

1 HEATER
2 ANODE
3 GRID 2
4 GRID 3
5 CATHODE
6 HEATER

BASING 4328D

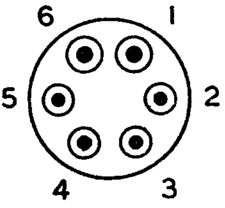
1 BLANK
2 HEATER
3 ANODE
4 GRID 2
5 GRID 3
7 HEATER
8 CATHODE

4328D



SMALL SHELL OCTAL

4328A



AMERICAN SMALL SHELL

Carrier Pentode

4310A

CATHODE.

Indirectly heated oxide-coated		
Voltage	10	V
Nominal current	0.32	A

RATING.

Mutual conductance	Measured at $Va = Vg_2 = 135$ Vg_3 0 Vg_1—3	2.0	mA/V
Screen grid μ		19	

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.03	pF
Input	6	pF
Output	14	pF

DIMENSIONS.

Maximum overall length	130	mm.
Maximum bulb diameter	40	mm.
Base—Small American six pin		
Net weight	50	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	250	V
Maximum direct screen voltage	180	V
Maximum direct cathode current	10	mA
Maximum direct screen current	2.5	mA

Tentative data
July 1946

5A/150A
(4310A)

Carrier Pentode

4310A

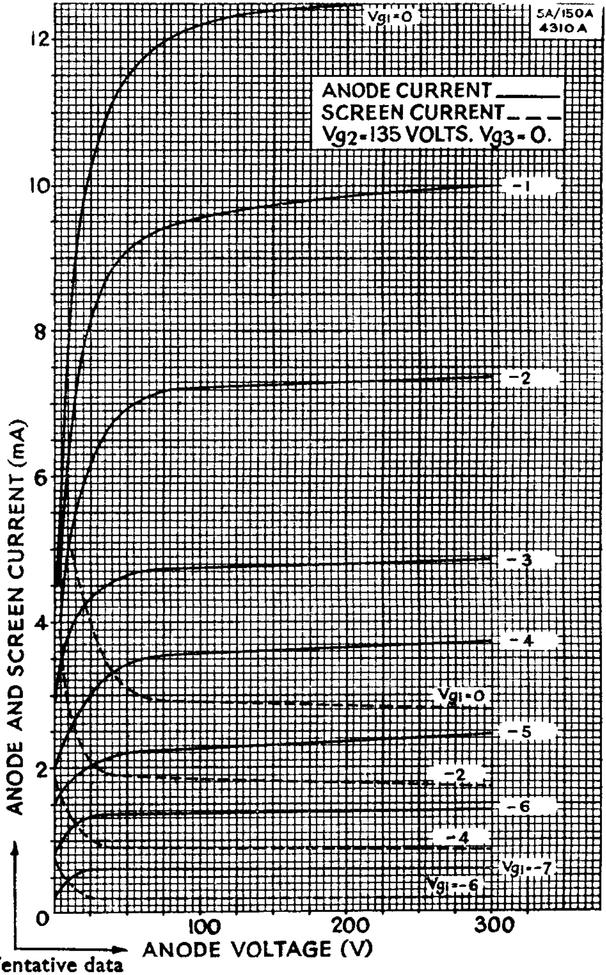
TYPICAL OPERATING CONDITIONS

Anode Voltage	Screen Gr. Voltage	Control Grid Bias	Suppressor Grid Volt	Anode Current	Load resistance	Input Voltage	Output Voltage	Output Power	Second Harmonic	Third Harmonic
Volts	Volts	Volts	Volts	Milli-amperes	Ohms	Peak Volts	Peak Volts	Milli-watts	db	db
135	135	—3	0	5.4	20,000	3.00	—	250	22	30
					60,000	1.60	—	130	26	28
					60,000	0.95	—	60	35	45
					60,000	1.15	100	—	33	39
					100,000	0.57	75		35	50
					100,000	0.40	50	—	40	55
100	135	—3	0	5.4	40,000	2.70	—	340	26	28
					100,000	1.50	175	—	26	30
225	135	—3	0	5.5	60,000	2.70	—	425	27	27
					100,000	1.80	220	—	27	31
250	135	—3	0	5.5	60,000	2.70	—	480	26	30
					60,000	1.20	—	110	30	55
					100,000	2.10	250	—	26	29
					100,000	1.50	200	—	30	43

Tentative data
July 1946

Carrier Pentode

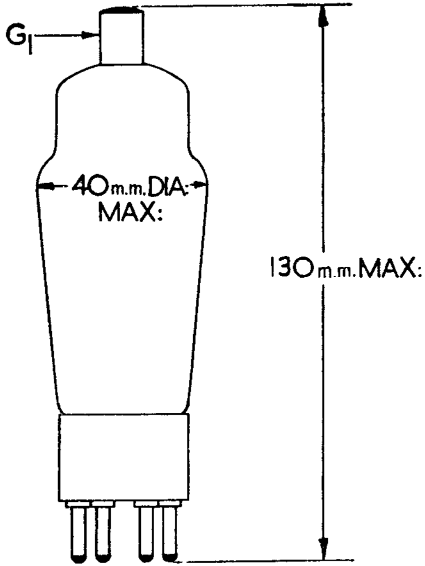
4310A

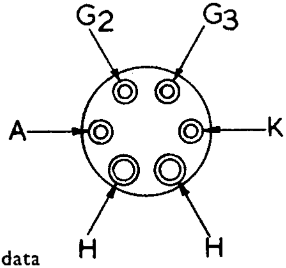


Tentative data
July 1946

Carrier Pentode

4310A





Tentative data
July 1946

Coaxial Repeater Pentode

5A/152M

CATHODE.

Indirectly heated Oxide coated		
Voltage	6.3	V
Nominal current	0.47	A

RATING.

Mutual conductance (at Ia 10mA)	7.5	mA/V

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.018	pF
Input	10	pF
Output	5	pF

DIMENSIONS.

Maximum overall length	80.2	mm.
Maximum seated height	66.7	mm.
Maximum diameter	30.15	mm.
Net weight	28.5	grms.

MAXIMUM RATINGS.

Maximum direct anode voltage	250	V
Maximum direct screen voltage	150	V
Maximum direct screen current	5	mA
Maximum anode dissipation	5	W
Equivalent noise resistance	670	Ω

Coaxial Repeater Pentode

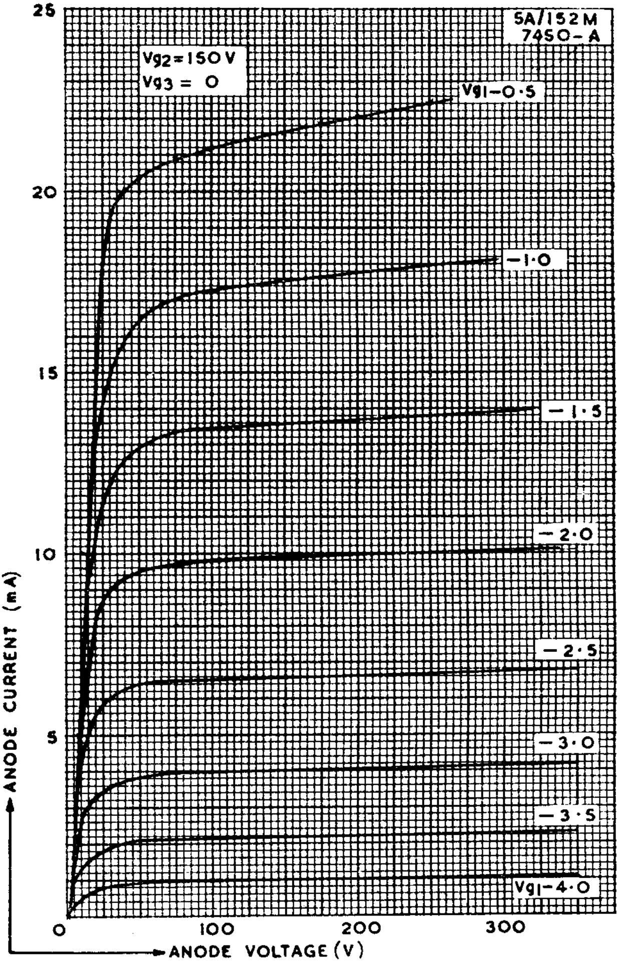
5A/152M

TYPICAL OPERATING CONDITIONS.

Direct anode voltage	250	V
Direct anode current	10	mA
Direct screen voltage	150	V
Direct screen current	2	mA
Direct suppressor voltage	0	V
Load impedance	6,000	Ω
Power output	50	mW
Distortion	<5	%

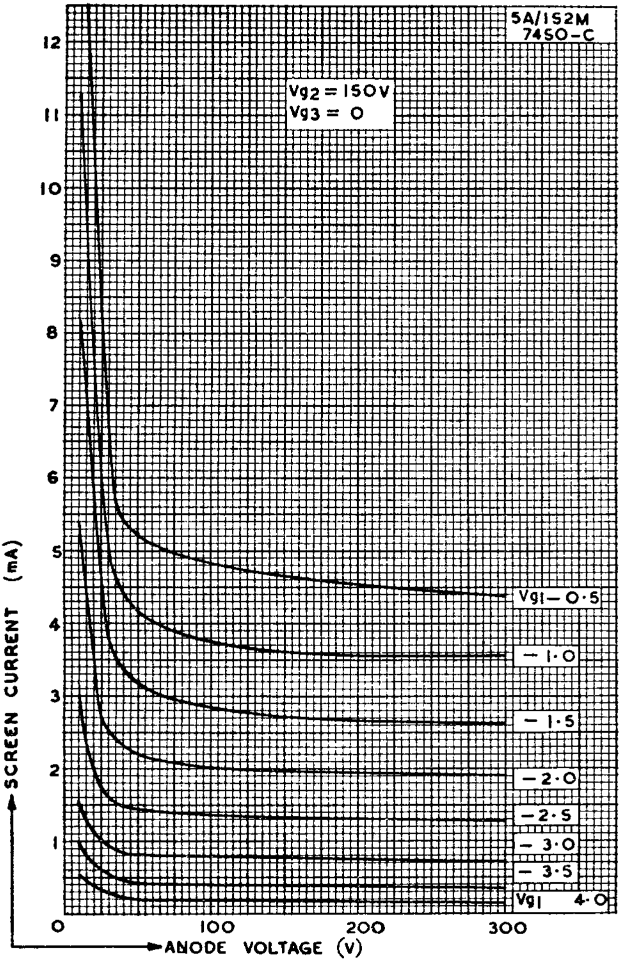
Coaxial Repeater Pentode

5A/152M



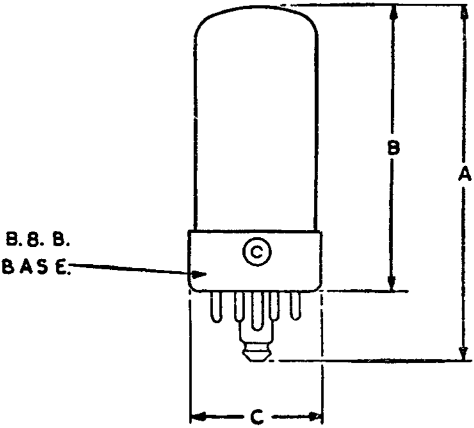
Coaxial Repeater Pentode

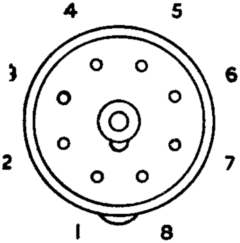
5A/152M



Coaxial Repeater Pentode

5A/152M





BASING

1	HEATER
2	ANODE
3	GRID 2
4	GRID 3
5	SHIELDS
6	GRID 1
7	CATHODE
8	HEATER

DIM	MILLIMETRES	INCHES
A	80·2 MAX	3 5/32 MAX
B	66·7 MAX	2 5/8 MAX
C	30·15 MAX	1 3/16 MAX

NOTE. BASIC FIGURES ARE INCHES

Coaxial Repeater Pentode

5B/110M

CATHODE.

Indirectly-heated oxide-coated

Voltage	6.3	V
Nominal current	0.8	A

RATING.

Mutual conductance	Measured at Va 250V	6.5	ma/V

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.035	pF
Input	11	pF
Output	6	pF

DIMENSIONS.

Maximum overall length	80.2	mm.
Maximum seated height	66.7	mm.
Maximum diameter	30.15	mm.
Net weight	30	grms.

MAXIMUM RATINGS.

Maximum direct anode voltage	250	V
Maximum direct screen voltage	150	V
Maximum direct screen current	11	mA
Maximum direct anode dissipation	11	W

May 1947

Coaxial Repeater Pentode

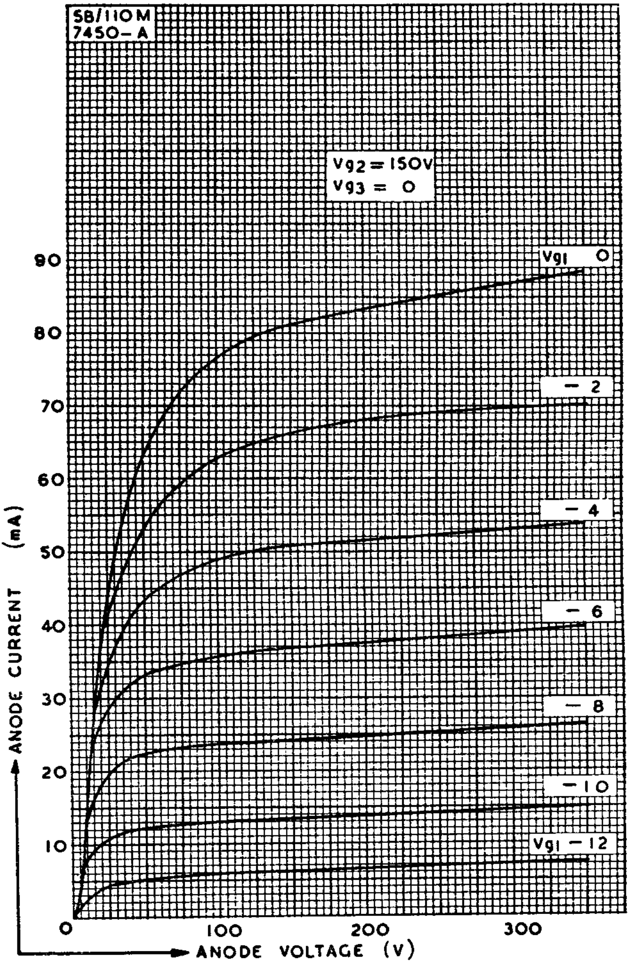
5B/110M

TYPICAL OPERATING CONDITIONS.

Direct anode voltage	250	V
Direct anode current	38	mA
Direct screen voltage	150	V
Direct screen current	8	mA
Direct suppressor voltage	0	V
Load Impedance	5,000	Ω
Power output	2	W
Distortion	<5	%

Coaxial Repeater Pentode

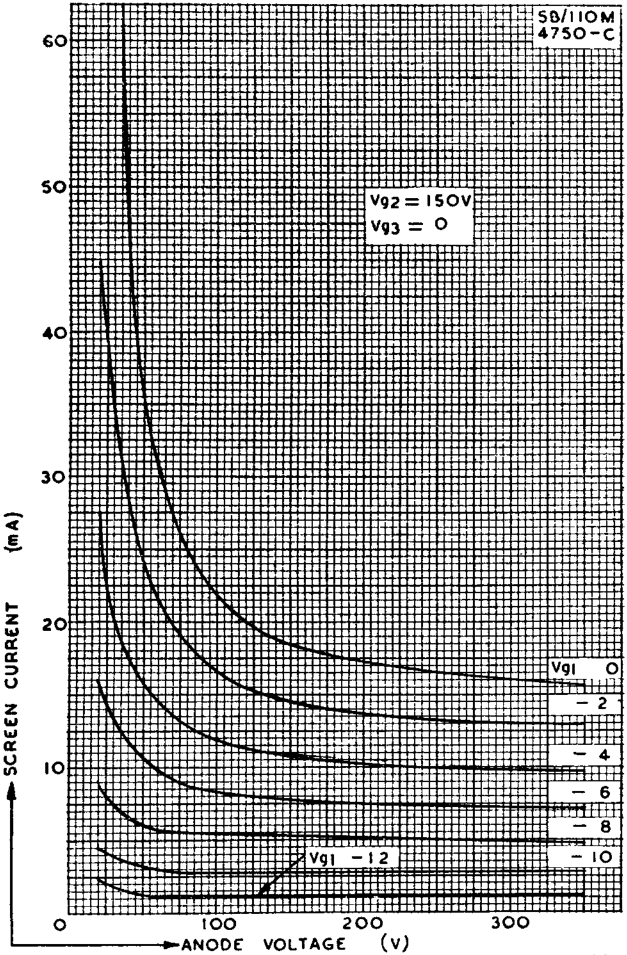
5B/110M



May 1947

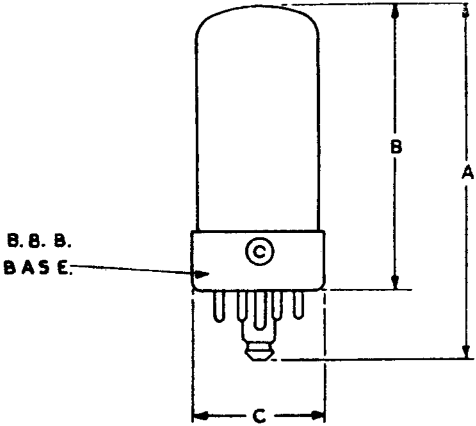
Coaxial Repeater Pentode

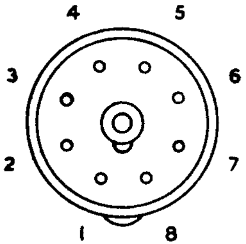
5B/110M



Coaxial Repeater Pentode

5B/110M





BASING

1 HEATER
2 ANODE
3 GRID 2
4 GRID 3
5 SHIELDS
6 GRID 1
7 CATHODE
8 HEATER

DIM	MILLIMETRES	INCHES
A	80·2 MAX	3 5/32 MAX
B	66·7 MAX	2 5/8 MAX
C	30·15 MAX	1 3/16 MAX

NOTE. BASIC FIGURES ARE INCHES.

Beam Power Amplifier

5B/250A

CATHODE.

Indirectly heated oxide coated.

Heater voltage	6.3	V
Nominal current	0.9	A

RATING.

Screen Grid μ	Measured at V_a 500 V, V_{g2} 250 V, $I_a = 72$ mA	9	
Mutual conductance		6.0	mA/V

INTER-ELECTRODE CAPACITIES

Grid to anode	0.2	pF
Input capacity	11	pF
Output capacity	7	pF

DIMENSIONS.

Maximum overall length	150	mm.
Maximum diameter	53	mm.
Base—American medium 5-pin ceramic.		
Net weight	72	g.

MAXIMUM RATINGS

Maximum direct anode voltage	600	V
Maximum direct screen voltage	300	V
Maximum direct anode current	120	mA
Maximum anode dissipation	25	W
Maximum screen input	3.5	W
Maximum frequency for above ratings	60	Mc/s
Maximum anode voltage for frequency of 125 Mc/s	300	V

Beam Power Amplifier

5B/250A

TYPICAL OPERATING CONDITIONS

AUDIO FREQUENCY

Class B Power Amplifier or Modulator.
(For balanced 2-valve circuit.)

Direct anode voltage	400	600 V
Direct screen voltage	300	300 V
Grid bias	—25	—30 V
Anode current per valve—zero signal	50	30 mA
Anode current per valve—maximum signal	115	100 mA
Load resistance anode to anode	3,800	6,660 ohms
Maximum signal direct screen current	10	10 mA
Maximum signal power output	60	80 W
Peak A.F. grid-to-grid voltage	80	80 V

RADIO FREQUENCY

Class B Telephony Modulated Carrier applied to Grid. (Carrier conditions per valve for use with 100%) modulation.)

Direct anode voltage	400	600 V
Direct screen voltage	250	250 V
Grid bias	—25	—25 V
Direct anode current	75	62.5 mA
Direct screen current	4	3 mA
*Direct grid current	0	0 mA
Peak R.F. grid voltage	30	20 V
Power output	9	12.5 W

Class C Power Amplifier Anode subject to modulation. (Carrier conditions per valve for use with 100%) modulation.)

Direct anode voltage	325	475 V
Direct screen voltage	225	225 V
Grid bias	—45	—50 V
Peak R.F. grid voltage	70	70 V
Direct anode current	80	83 mA
Direct screen current	9	9 mA
*Direct grid current	3	2 mA
Power output	15	24 W

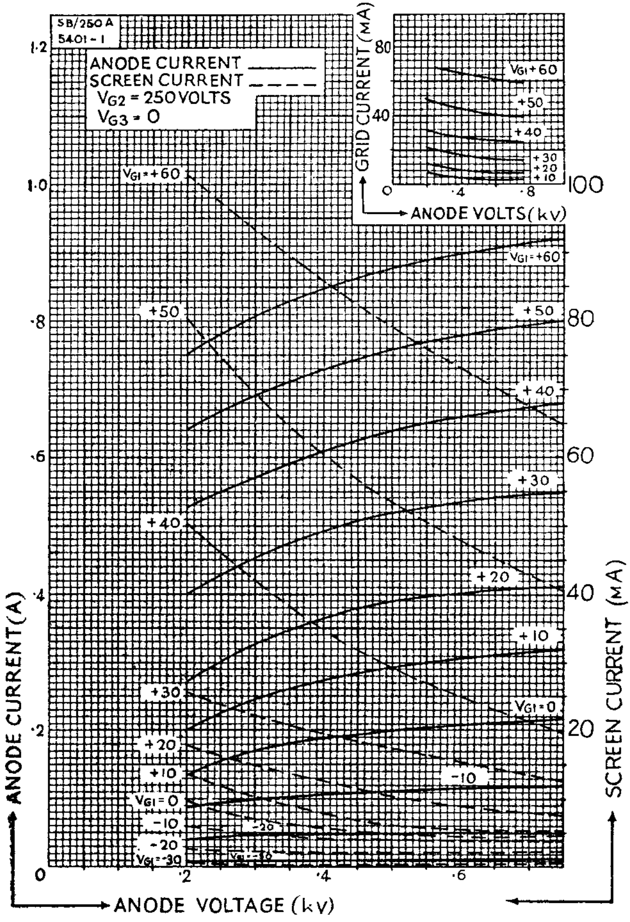
Class C Power Amplifier or Oscillator unmodulated.

Direct anode voltage	400	600 V
Direct screen voltage	250	250 V
Grid bias	—50	—50 V
Peak R.F. grid voltage	80	80 V
Direct anode current	95	100 mA
Direct screen current	9	9 mA
*Direct grid current	2.5	3 mA
Power output	25	37.5 W

*Subject to wide variation depending upon the impedance of the load circuit.

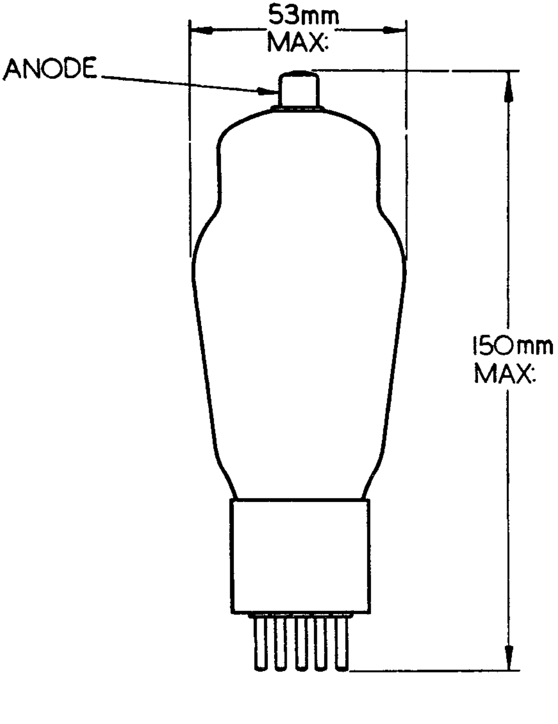
Beam Power Amplifier

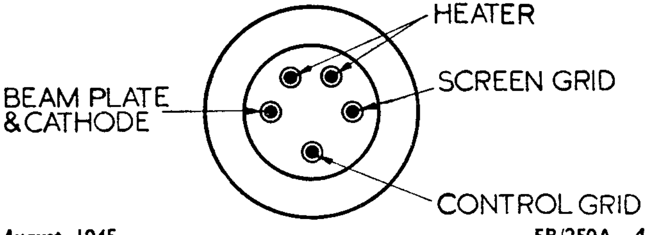
5B/250A



Beam Power Amplifier

5B/250A





R.F. Beam Power Amplifier

5C/100A

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	5	A
Peak emission	2.25	A

RATING.

Mutual conductance	Measured at Va 2kV, Vg_2 400V, Ia 50 mA	3.3	mA/V
Screen grid μ	Va=Vg_2 400V, Ia 50 mA	10	

INTER-ELECTRODE CAPACITIES.

Anode to grid	0.2	pF
Input	17.0	pF
Output	14	pF

DIMENSIONS.

Maximum overall length	191	mm.
Maximum bulb diameter	66	mm.
Base : Large American 7-pin bayonet		
Net weight	240	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	2.0	kV
Maximum direct anode current	200	mA
Maximum anode dissipation	100	W
Maximum direct screen voltage	400	V
Maximum screen dissipation	15	W
Maximum Freq. for above Ratings	30	Mc/s

R.F. Beam Power Amplifier

5C/100A

TYPICAL OPERATING CONDITIONS.

RADIO FREQUENCY.

Class B Power Amplifier Telephony.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1.5	2.0	kV
Grid bias	—60	—75	V
Direct anode current	100	75	mA
Direct screen voltage	400	400	V
Direct screen current	4	3	mA
Peak RF grid voltage	70	80	V
Power output	50	50	W approx.

Class C Power Amplifier. Anode subject to modulation.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	1.25	1.6	kV
Grid bias	—120	—130	V
Direct anode current	150	150	mA
Direct screen voltage	400	400	V
Direct screen current	16	20	mA
Peak RF grid voltage	195	210	V
*Direct grid current	4	6	mA approx.
Power output	135	175	W approx.

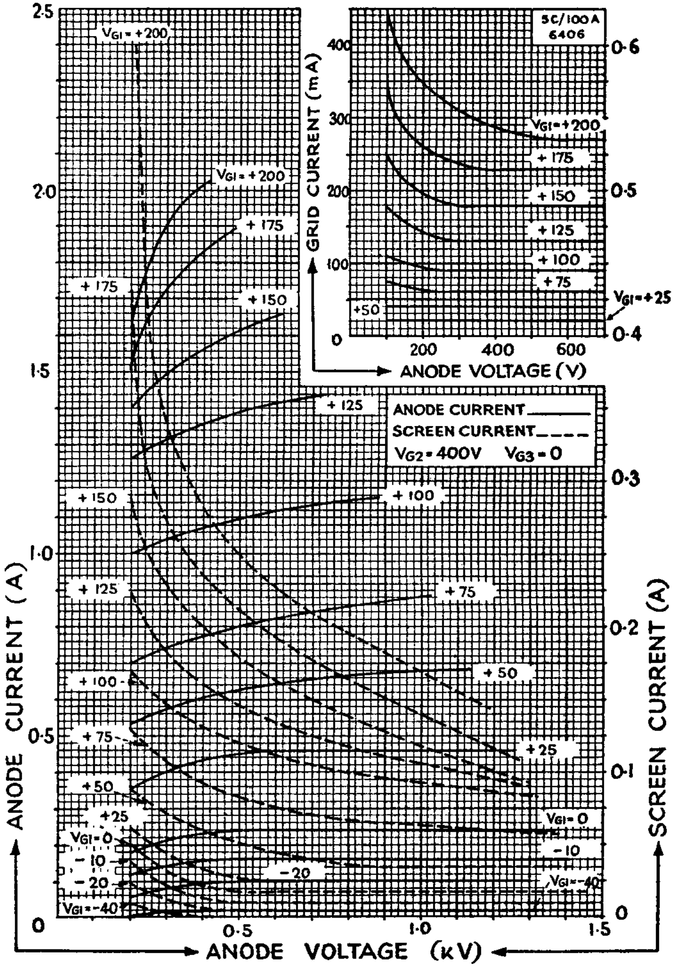
Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	2.0	kV
Grid bias	—90	V
Direct anode current	180	mA
Direct screen voltage	400	V
Direct screen current	15	mA
Peak RF grid voltage	160	V
*Direct grid current	3	mA approx.
Power output	260	W approx.

*Subject to wide variation depending upon the impedance of the load circuit.

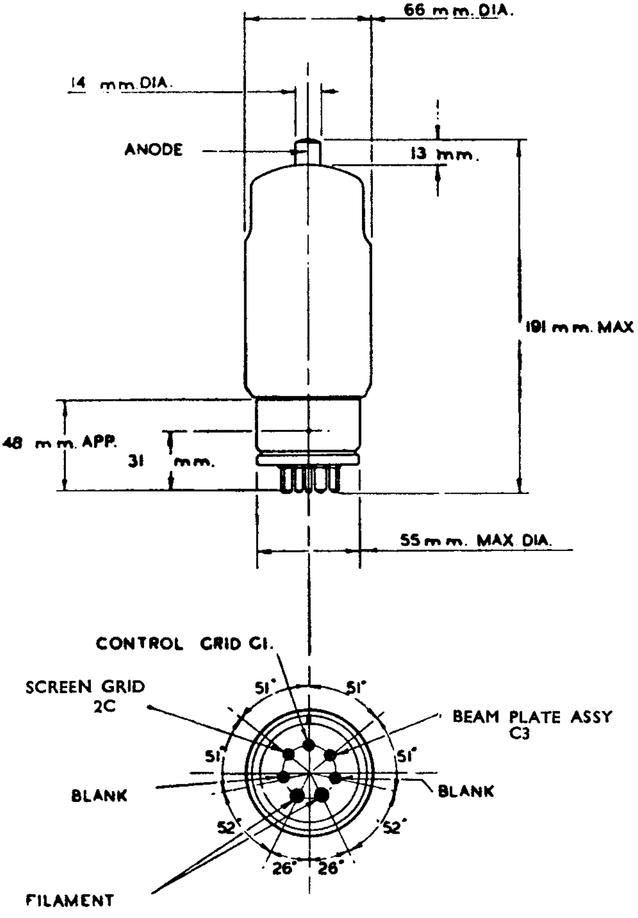
R.F. Beam Power Amplifier

5C/100A



R.F. Beam Power Amplifier

5C/100A



Pentode

4069A

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	5.4	A
Peak emission	3	A

RATING.

Mutual conductance {Measured at Va 2 kV, Vg_2 400V, Vg_1—20V}	5	mA/V
Screen grid μ Va=Vg_2=400V. Vg_1—20	11	

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.1	pF
Input capacity	18	pF
Output capacity	13.0	pF

DIMENSIONS.

Maximum overall length	249	mm.
Maximum bulb diameter	66	mm.
Base : Large American 5 pin		
Net weight	300	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	2	kV
Maximum direct screen voltage	400	V
Maximum direct suppressor voltage	45	V
Maximum direct anode dissipation	100	W
Maximum direct screen dissipation	35	W
Maximum direct control grid current	25	mA
Maximum RF control grid current	8	A
Maximum frequency at above ratings	30	Mc/s

Pentode

4069A

TYPICAL OPERATING CONDITIONS.

RADIO FREQUENCY.

Class C Power Amplifier. Control grid modulated.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	2	kV
Grid bias	—140	V
Direct anode current	85	mA
Direct screen voltage	400	V
Direct screen current	20	mA
Direct suppressor voltage	0	V
Peak RF grid voltage	170	V
*Direct grid current	3	mA approx.
Power output	70	W approx.

Class C Power Amplifier. Suppressor modulated.

(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	2	kV
Grid bias	—100	V
Direct anode current	80	mA
Direct screen voltage	400	V
Direct screen current	85	mA
Direct suppressor voltage	—50	V
Peak RF grid voltage	180	V
*Direct grid current	11	mA approx.
Power output	60	W approx.

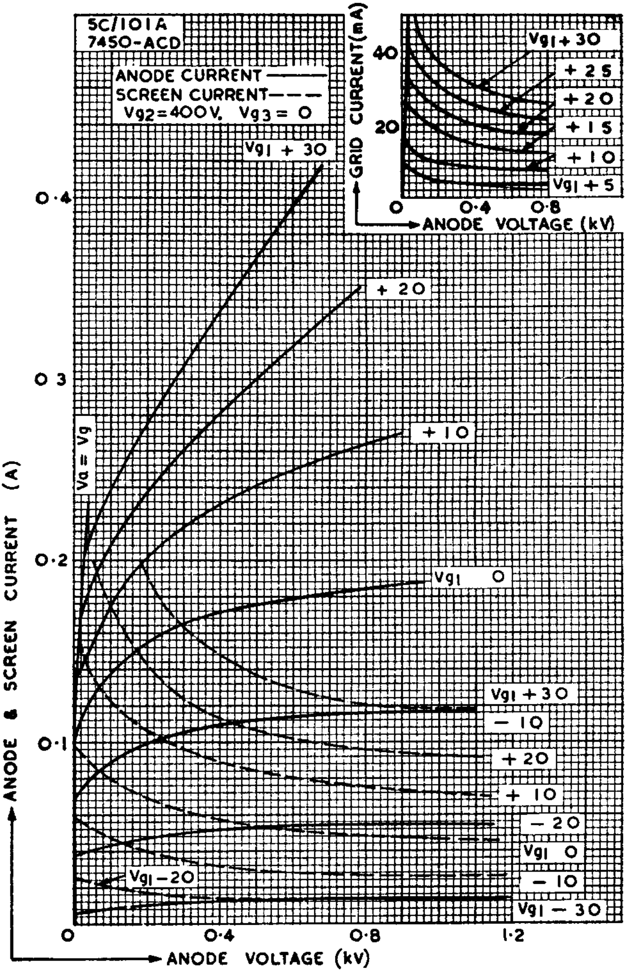
Class C Power Amplifier or Oscillator, unmodulated.

Direct anode voltage	2	kV
Grid bias	—100	V
Direct anode current	120	mA
Direct screen voltage	400	V
Direct screen current	75	mA
Direct suppressor voltage	0	V
Peak RF grid voltage	180	V
*Direct grid current	10	mA approx.
Power output	160	W approx.

* Subject to wide variation depending upon the impedance of the load circuit.

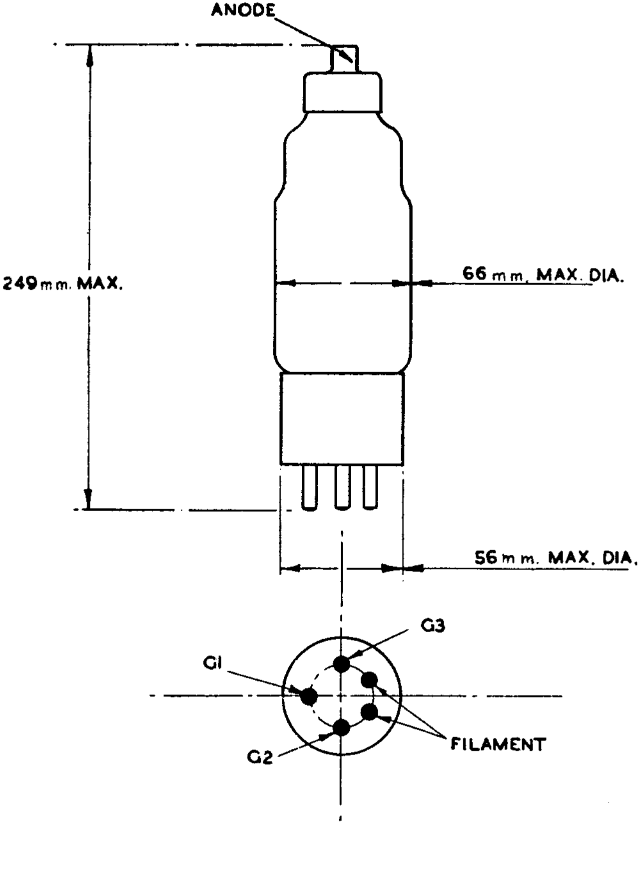
Pentode

4069A



Pentode

4069A



R.F. Suppressor Modulated Pentode

5C/450A

CATHODE.

Thoriated tungsten filament

Voltage	10	V
Nominal current	12.5	A
Peak emission	7	A

RATING.

Mutual conductance	Measured at Va 2.5 kV Vg_2 0.6 kV Vg_3 0V Vg_1—90V	4.5	mA/V
Screen grid μ		5	

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.2	pF
Input	45	pF
Output	27	pF

DIMENSIONS.

Maximum overall length	330	mm.
Maximum bulb diameter	108	mm.
Base—Special, see sketch		
Net weight	800	g.

MAXIMUM RATINGS.

Maximum direct anode voltage	3	kV
Maximum direct anode current	0.7	A
Maximum anode dissipation	450	W
Maximum direct screen voltage	850	V
Maximum screen dissipation	100	W
Maximum frequency for above ratings	10	Mc/s.
Maximum anode voltage for frequency for 20 Mc/s.	2.25	kV

NOTE.—It is recommended that the valve be operated in a vertical position. When operated horizontally the plane of the filament should be vertical. Free circulation of air around the bulb is essential. When operated in a confined space circulation of air by means of a fan is recommended.

R.F. Suppressor Modulated Pentode

5C/450A

TYPICAL OPERATING CONDITIONS
RADIO FREQUENCY.

Class C Power Amplifier. Suppressor Grid Modulated.
(Carrier conditions per valve for use with 100% modulation)

Direct anode voltage	2.5	kV
Grid bias	–165	V
Direct anode current	0.3	A
Screen voltage	530	V
Screen resistor	2500	Ω
Direct screen current	110	mA
Direct suppressor voltage	–90	V
Direct grid current *	19	mA approx.
Carrier output	300	W approx.

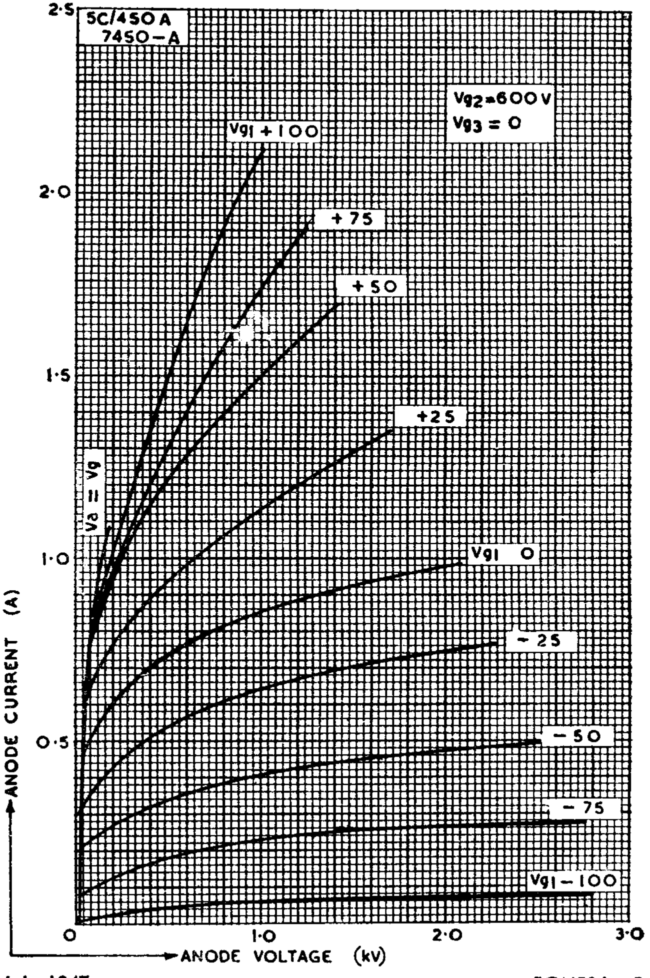
Class C Power Amplifier or Oscillator Unmodulated

Direct anode voltage	2.5	kV
Grid bias	–165	V
Direct anode current	590	mA
Direct screen voltage	600	mA
Direct screen current	80	mA
Direct suppressor voltage	100	V
Direct grid current	*19	mA approx.
Power output	1	kW approx.

* Subject to wide variation depending upon the impedance of the load circuit.

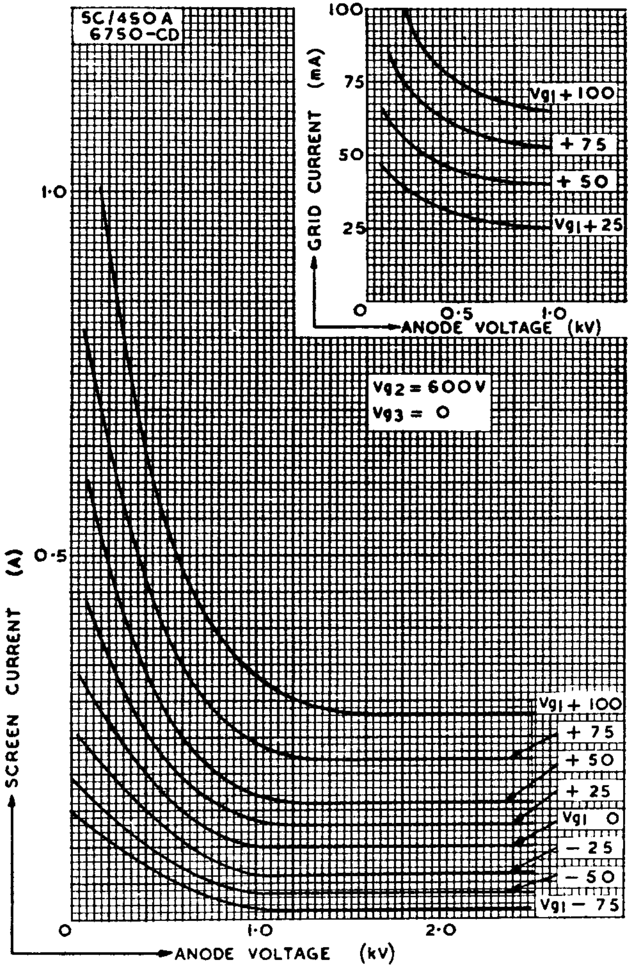
R.F. Suppressor Modulated Pentode

5C/450A



R.F. Suppressor Modulated Pentode

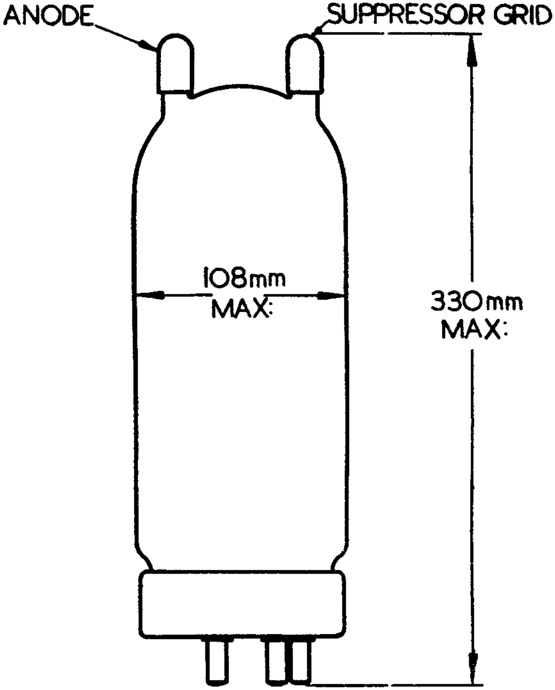
5C/450A

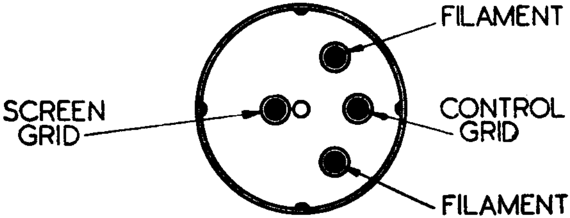


July 1947

R.F. Suppressor Modulated Pentode

5C/450A





July 1946

Air Blast Cooled Pentode

5J/180E

CATHODE.

Thoriated tungsten filament		
Voltage	10	V
Nominal current	28	A
Peak emission	12	A

RATING.

Mutual conductance	Measured at Va 6kV Vg_2 1.5kV Ia 0.5A	5	mA/V
Screen grid μ	Va 1.5kV Vg_2 1.5kV Ia 0.5A	6	

INTER-ELECTRODE CAPACITIES.

Grid to anode	0.6	pF
Input	32	pF
Output	21	pF

AIR BLAST.

For an anode dissipation of 3.5kW		
Volume of air	220	cu. ft./min.
Velocity of air	2,300	ft./min.
		at a pressure of 1in. SWG.

DIMENSIONS.

Maximum overall length	245	mm.
Maximum diameter over cooler	155	mm.
Net weight	6.8	kg.

MAXIMUM RATINGS.

Maximum direct anode voltage	6	kV
Maximum direct anode current	1.5	A
Maximum anode dissipation	3.5	kW
Maximum direct screen voltage	1.5	kV
Maximum direct screen current	0.25	A
Maximum freq. for above ratings	25	Mc/s

Tentative data.

June 1946

Air Blast Cooled Pentode

5J/180E

TYPICAL OPERATING CONDITIONS.
RADIO FREQUENCY.

Class B Power Amplifier. Modulated carrier applied to grid.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	6	kV
Grid bias	—250	V
Direct anode current	0.8	A
Direct screen voltage	1,500	V
Peak RF grid voltage	750	V
Peak RF grid current	0.33	A
*Direct grid current	25	mA approx.
Power output	1.4	kW approx.

Class C Power Amplifier. Anode subject to modulation.
(Carrier conditions per valve for use with 100% modulation).

Direct anode voltage	5	kV
Grid bias	—1,000	V
Direct anode current	1.2	A
Direct screen voltage	1.5	kV
Peak RF grid voltage	1.5	kV
Peak RF grid current	0.36	A
*Direct grid current	46	mA
Power output	3.8	kW approx.

Class C Power Amplifier or Oscillator unmodulated. For operation up to 25 Mc/s.

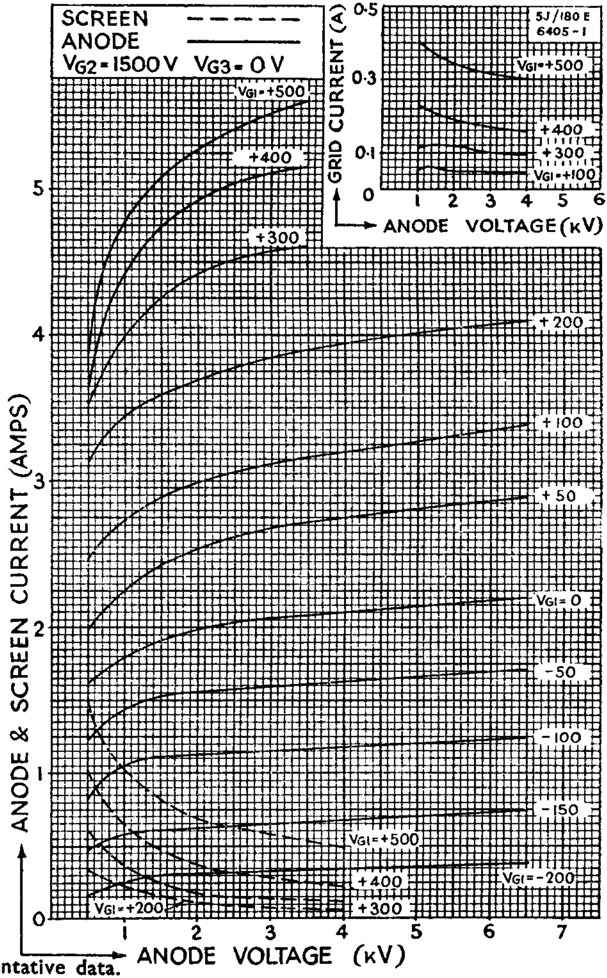
Direct anode voltage	6	kV
Grid bias	—500	V
Direct anode current	1.15	A
Direct screen voltage	1,400	V
Direct screen current	0.2	A
Direct suppressor voltage	200	V
Peak RF grid voltage	1	kV
*Direct grid current	90	mA approx.
Power output	5	kW approx.

* Subject to wide variation depending upon the impedance of the load circuit.

Tentative data.
June 1946

Air Blast Cooled Pentode

5J/180E



Tentative data.
June 1946

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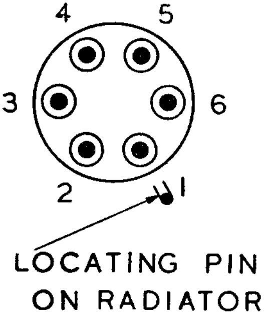
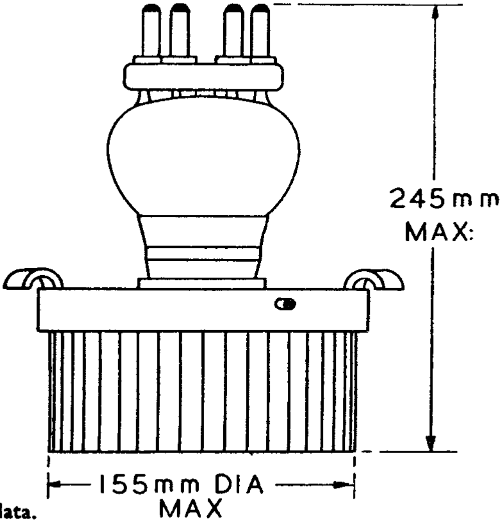
Air Blast Cooled Pentode

5J/180E



BASING

1 GRID 3
2 FILAMENT
3 GRID 2
4 FILAMENT
5 GRID 3
6 GRID 1



Tentative data.
June 1946

Monitor Cathode Ray Tube

VLS492AB (Blue Screen) **VLS492AG (Green Screen)**

CATHODE.

Indirectly-heated oxide-coated

Voltage	2	V
Nominal current	1.8	A

INTER-ELECTRODE CAPACITIES.

X_1 to X_2	0.8	pF
Y_1 to Y_2	4.3	pF
X_1 to all	6.6	pF
Y to all	6.0	pF
Grid to all	8.5	pF

CONSTANTS.

Second anode voltage	250 to 1,000	V
First anode voltage	130 to 500	V
Sensitivity where Va_2 = 2nd anode voltage	X plates $\frac{110}{Va_2}$	mm./V
	Y plates $\frac{120}{Va_2}$	mm./V

DIMENSIONS.

Maximum overall length	181	mm.
Maximum bulb diameter	40	mm.
Base	Medium shell Octal	
Net weight	100	g.

TYPICAL OPERATION.

Second anode voltage	500	1,000	V
First anode voltage	100	200	V
Grid bias	0 to —5	—5 to —10	V

NOTES ON OPERATION.

1. The life of the tube will be materially increased by keeping the negative grid bias as high as is consistent with the brilliance required.
2. Earthing the second anode increases the stability of the trace.

Monitor Cathode Ray Tube

VLS492AB (Blue Screen) **VLS492AG** (Green Screen)

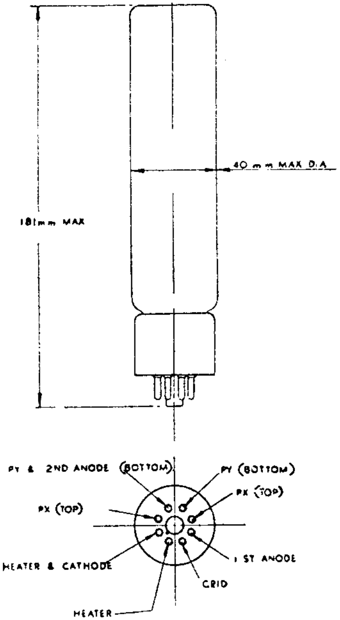
NOTES ON OPERATION—(continued)

3. Provision should be made for a path from the deflector-plates to the anode, e.g. by resistance of 1 to 5 M Ω. The plate Y is strapped to the second anode internally.

4. The tube operates more effectively at the higher anode voltages.

5. Focusing is effected by the variation of the first anode voltage for a fixed value of second anode voltage.

6. The key-way is 45° to the plane of the deflector plates.



High Vacuum Cathode Ray Tube

C10SS/1B (4096AB)

C10SS/1G (4096AG)

4096AB (C10SS/1B) Blue Trace

4096AG (C10SS/1G) Green Trace

CATHODE.

Indirectly-heated oxide-coated		
Voltage	2	V
Nominal heater current	1.7	A

DIRECT INTER-ELECTRODE CAPACITIES.

X_1 to X_2	0.8	pF
Y_1 to Y_2	4.3	pF
X_1 to all other electrodes	6.6	pF
Y_1 to all other electrodes	6.0	pF
Control electrode to all others	8.5	pF

CONSTANTS.

Second anode voltage	800—2,000	V
First anode voltage	$\frac{1}{8}$th of 2nd anode	V approx.
Control electrode bias	0 to —25	V
Cut off voltage at Va_2 2,000V	—35 to —45	V
Maximum current to Va_1	300	μA
Sensitivity at Va_2 2,000V	Sx 0.13	mm./V
	Sy 0.135	mm./V
Sensitivity at Va_2 1,000V	Sx 0.26	mm./V
	Sy 0.27	mm./V
Screen diameter	2.5	in.

DIMENSIONS.

Maximum overall length	273	mm.
Maximum diameter	79	mm.
Base	International octal	
Net weight	215	g.

TYPICAL OPERATION.

Second anode voltage	2,000	1,000 V
First anode voltage	240	120 V
Grid bias	—15 to —25	0 to —10 V

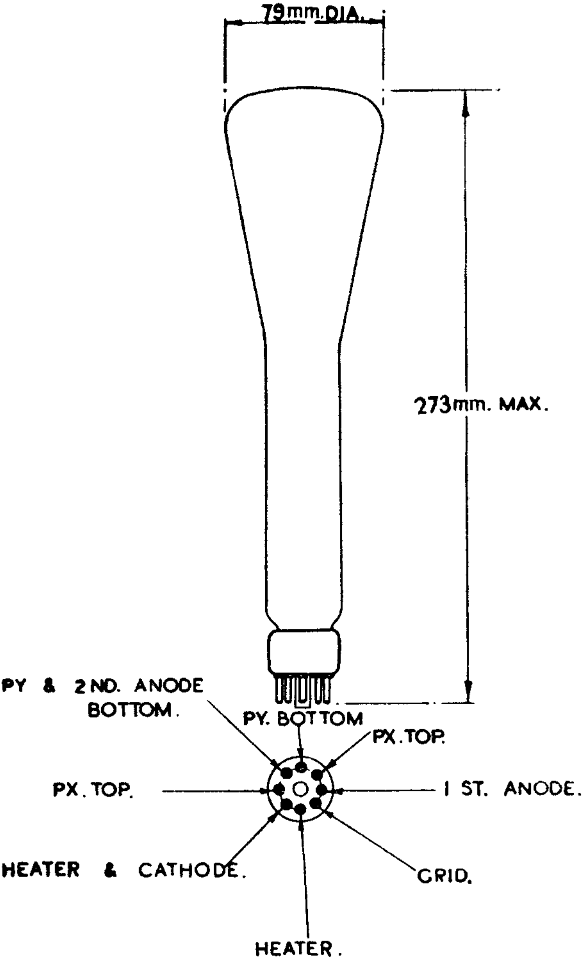
C10SS/1B
4096 AB)

C10SS/1G
(4096AG)

High Vacuum Cathode Ray Tube

4096AB
(C10SS/1B)
Blue Trace

4096AG
(C10SS/1G)
Green Trace



Gas Focused Cathode Ray Tube

C16GS/2B (4050AB)
C16GS/2D (4050AD)
C16GS/2G (4050AG)

4050AB	4050AD	4050AG
(Blue Screen)	(Delay Screen)	(Green Screen)

CATHODE.

Oxide-coated filament		
*Current	0.7 to 1.1	A
Nominal voltage	0.75	V

INTER-ELECTRODE CAPACITIES.

Between either pair of deflecting plates	7.0	pF
Anode to X plates	1.2	pF
Anode to Y plates	2.3	pF

RATING.

Anode voltage	350 to 1,500	V
Normal anode voltage	500	V
Shield voltage	0 to +50	V
Sensitivity (V = anode voltage)	$\frac{370}{V}$	mm./V
Effective screen diameter	4	in.

DIMENSIONS.

Maximum overall length	340	mm.
Maximum bulb diameter	118	mm.
Base	Standard British 9-pin	
Net weight	285	g.

* For maximum life the tube should be operated with just sufficient filament current to produce a satisfactory trace. Filament current will rise with life.

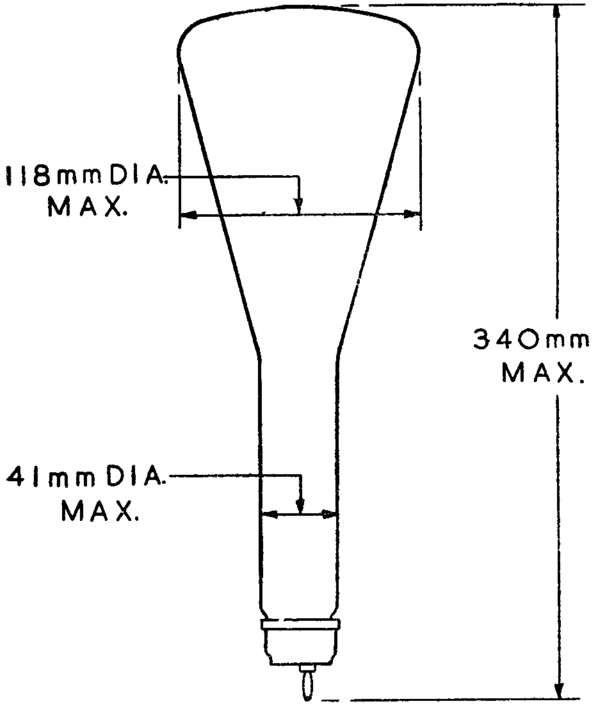
The P.x. plates produce horizontal deflection when the tube is mounted with filament pins at the bottom.

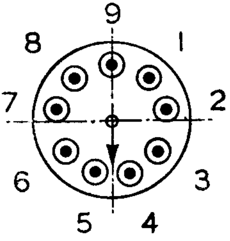
It is recommended that a 2,000 ohm protective resistance should be included in the shield circuit as well as in the anode circuit.

C16GS/2B
(4050AB)
C16GS/2D
(4050AD)
C16GS/2G
(4050AG)

Gas Focused Cathode Ray Tube

4050AB	4050AD	4050AG
(Blue Screen)	(Delay Screen)	(Green Screen)





BASING

1 PY.
2 PX.
3 BLANK.
4 F +.
5 F −.
6 S.
7 PX.
8 PY.
9 ANODE.

High Vacuum Cathode Ray Tube

C22SS/1B (4063AB) C22SS/2B (4063YB)

4063AB (Blue Screen)

4063YB (Blue Screen Y plates terminated through side of bulb)

CATHODE.

Indirectly-heated oxide-coated		
Voltage	2	V
Nominal heater current	1.9	A

DIRECT INTER-ELECTRODE CAPACITIES.

	4063AB	4063YB	
X_1 plate to X_2 plate	2	2	pF
X_1 or X_2 plate to earth	16	16	pF
Y_1 plate to Y_2 plate	1.1	1.2	pF
Y_1 or Y_2 plate to earth	10	3.5	pF
Grid to earth	18	18	pF

RATINGS.

Maximum anode voltage	5	kV
Approximate sensitivity where V = final anode voltage		
X plates	$\frac{600}{V}$	mm./V
Y plates	$\frac{700}{V}$	mm./V
Conductance of any plate pair	less than 0.1	μMho.
Maximum input power to screen	0.01	W/sq. cm.

OPERATING CONDITIONS.

Third anode voltage	5	kV
Second anode voltage (adjust for focus)	$0.27 \times Va_3$	V approx.
First anode voltage	150	V
Grid bias for maximum brilliancy	0 to —5	V
Grid bias for cut off	—30	V approx.
Grid base for modulation	30	V

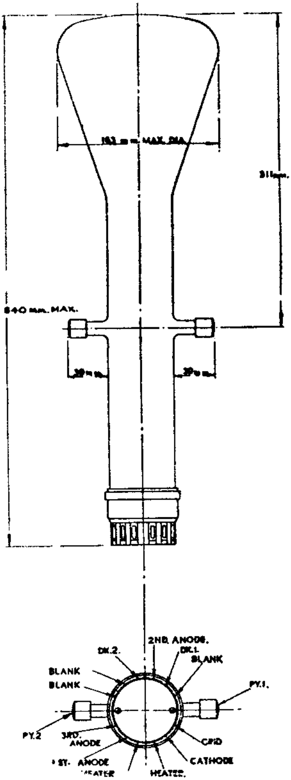
C22SS/1B (4063AB) C22SS/2B (4063YB)

High Vacuum Cathode Ray Tube

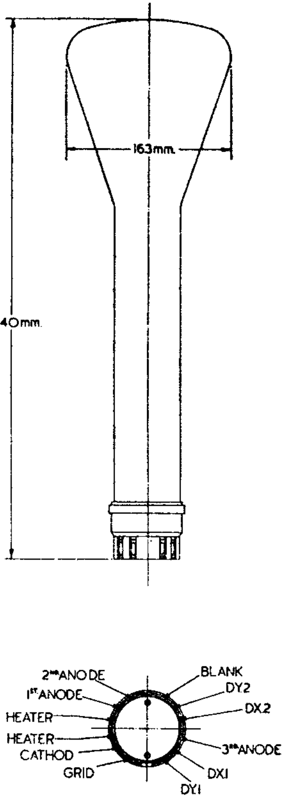
4063AB
(Blue Screen)

4063YB
(Blue Screen
Y plates terminated
through side of bulb)

4063 YB



4063 AB



Gas Focused Cathode Ray Tube

C28GS/1B (4050BB)
C28GS/1G (4050BG)
C28GS/1D (4050BD)

4050BB (Blue Screen)	4050BG (Green Screen)	4050BD (Delay Screen)

CATHODE.

Oxide-coated filament		
*Current	0.7 to 1.1	A
Nominal voltage	0.75	V

INTER-ELECTRODE CAPACITIES.

Between either pair of deflecting plates	7.0	pF
Anode to X plates	1.2	pF
Anode to Y plates	2.3	pF

RATINGS.

Anode voltage	350 to 1,500	V
Normal anode voltage	500	V
Shield voltage	0 to +50	V
Sensitivity (V= anode voltage)	$\frac{580}{V}$	mm./V
Effective screen diameter	$6\frac{1}{2}$	in.

DIMENSIONS.

Maximum overall length	476	mm.
Maximum bulb diameter	185	mm.
Base	Standard British 9-pin	
Net weight	790	g.

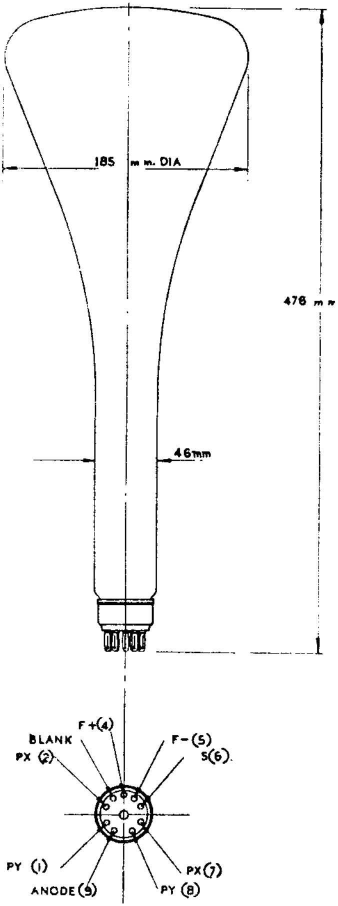
*For maximum life the tube should be operated with just sufficient filament current to produce a satisfactory trace. Filament current will rise with life. The Px plates produce horizontal deflection when the tube is mounted with pins 4 and 5 at the bottom.

It is recommended that a 2,000 ohms protective resistance should be included in the shield circuit as well as in the anode circuit.

C28GS/1B (4050BB)
C28GS/1G (4050BG)
C28GS/1D (4050BD)

Gas Focused Cathode Ray Tube

4050BB (Blue Screen)	4050BG (Green Screen)	4050BD (Delay Screen)



Cold Cathode Stabiliser Valve

G120/1B

This valve is a two-electrode gas-filled stabiliser especially developed for application where a high degree of stability and performance is essential. Its outstanding characteristics are its low voltage drop (55 volts) and close regulation over a wide current range.

DIMENSIONS.

Maximum overall length	102	mm.
Maximum bulb diameter	34	mm.
Standard 4 pin British Base		
Net weight	30	g.

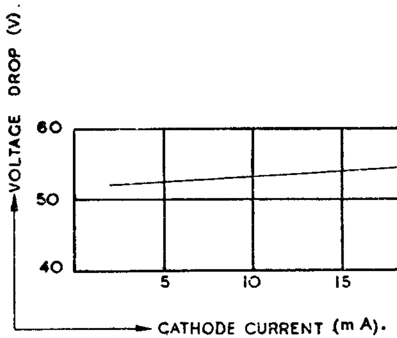
CHARACTERISTICS.

Nominal breakdown voltage	100	V
Nominal maintaining voltage	55	V
D.C. operating current continuous	2 to 30	mA
Regulation 2 mA to 30 mA	3	V

MAXIMUM RATINGS.

Maximum peak cathode current (averaged over 1 sec.)	50	mA
Maximum direct cathode current	30	mA

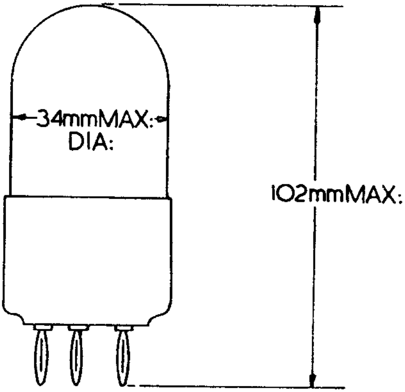
The valve will normally regulate satisfactorily at 1 mA but operation below 2 mA is not recommended as the valve tends to be erratic. The maximum average anode current must not be exceeded or the life will be shortened.

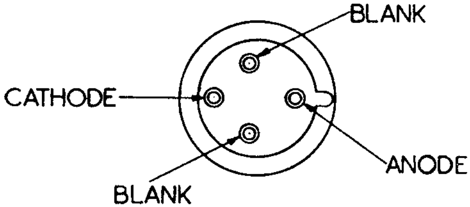


Tentative data
November 1945

Cold Cathode Stabiliser Valve

G120/1B





Tentative data
November 1945

Cold Cathode Gas-Filled Relay

4313C

Double gap cold cathode gas-filled valve for use as a relay or voltage regulator in special circuits.

DIMENSIONS.

Maximum overall length	88	mm.
Maximum overall diameter	30	mm.
Net weight	30	g.

CHARACTERISTICS.

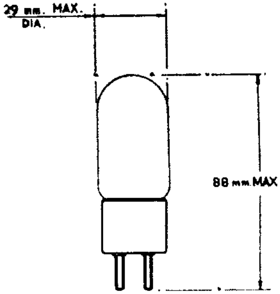
Nominal control gap breakdown voltage	70	V
Nominal control gap maintaining voltage	60	V
Minimum main gap breakdown voltage	150	V
Nominal main gap maintaining voltage	75	V
Transfer current	5	μA (max.)

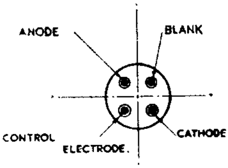
NOMINAL DEIONIZATION TIME.

Main gap	10 milliseconds
Control gap	3 milliseconds

MAXIMUM RATINGS.

Maximum peak control electrode current	30	mA
Maximum average control electrode current (averaged over 1 second)	10	mA
Maximum peak reverse current in main gap	5	mA





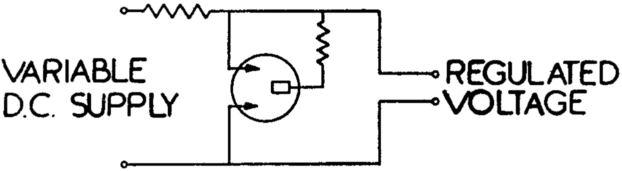
Cold Cathode Gas-Filled Relay

4313C

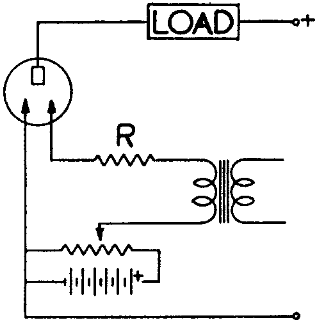
TYPICAL OPERATION.

Circuit A shows a circuit using the control gap of the valve as a voltage regulator.

Circuit B shows a circuit using the valve as a relay. The anode voltage should be intermediate between the main gap breakdown and maintaining voltage. The resistance R in the control circuit should be of the order of 100,000 ohms. This circuit possesses a " lock-in " feature, since the anode potential must be removed momentarily to restore the valve to a non-conducting condition. When supplied from an A.C. source this feature only occurs if the frequency of the supply voltage is such that the deionization time is not exceeded.



CIRCUIT A



CIRCUIT B

Cold Cathode Gas-Filled Relay

G150/2D

Cold cathode, 3 electrode, gas-filled valve for use as a relay. This valve has similar electrical characteristics to the 4313C (G150/1A) but has non-interchangeable trigger and cathode electrodes.

DIMENSIONS.

Maximum overall length	87	mm.
Maximum bulb diameter	30	mm.
Base International Octal		

CHARACTERISTICS.

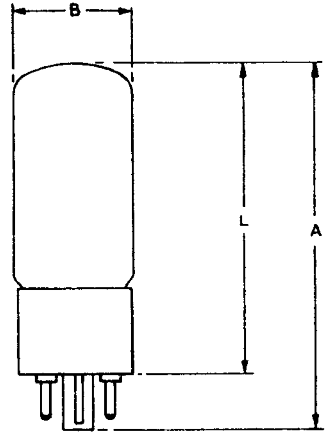
Nominal control gap breakdown voltage	70	V
Nominal control gap maintaining voltage	60	V
Minimum main gap breakdown voltage	150	V
Nominal main gap maintaining voltage	75	V
Transfer current at Va 130V	5	μA
Optimum operating current	20	mA

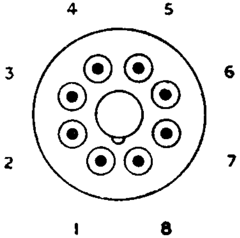
MAXIMUM RATINGS.

Maximum peak cathode current	50	mA
Maximum direct cathode current	30	mA

Cold Cathode Gas-Filled Relay

G150/2D





BASING

1	BLANK
2	BLANK
3	ANODE
4	BLANK
5	TRIGGER
6	BLANK
7	BLANK
8	CATHODE

DIM	MILLIMETRES	INCHES
A	87 MAX.	3 7/16 MAX.
B	30 MAX.	1 3/16 MAX.
L	73 MAX.	2 7/8 MAX

NOTE. BASIC FIGURES ARE INCHES

Cold Cathode Gas-Filled Relay

G240/2D

Cold cathode, 3 electrode, gas filled valve for use as a relay or rectifier in applications where a higher power is needed in the anode circuit than that obtainable with a G150/1A (4313C) valve.

It is characterised by its long life cathode and the non-interchangeability of trigger and cathode electrodes.

DIMENSIONS.

Maximum overall length	102	m.m.
Maximum bulb diameter	30	m.m.
Base International Octal		
Net weight	34	g.

CHARACTERISTICS.

Nominal control gap breakdown voltage	75	V
Nominal control gap maintaining voltage	65	V
Minimum main gap breakdown voltage	240	V
Nominal main gap maintaining voltage	90	V
Optimum operating current	20	mA
Transfer current at Va 200V	10	μA

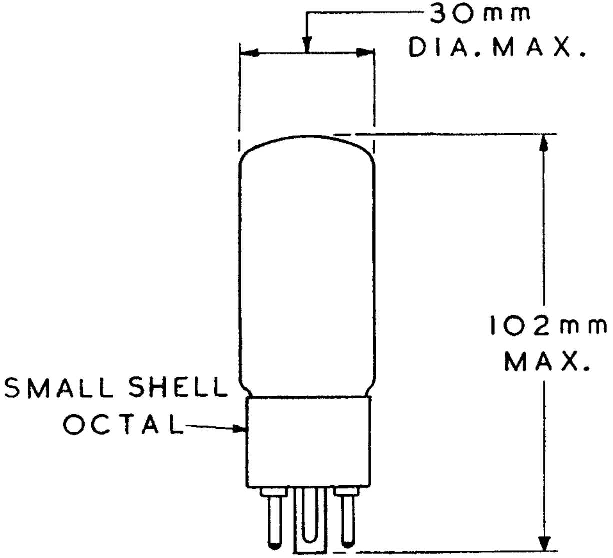
MAXIMUM RATINGS.

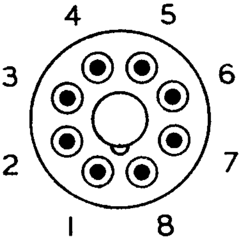
Maximum direct cathode current	30	mA
Maximum peak cathode current	50	mA

Tentative data
March 1945

Cold Cathode Gas-Filled Relay

G240/2D





BASING

1 BLANK
2 BLANK
3 ANODE
4 BLANK
5 TRIGGER
6 } INTERNALLY
7 } STRAPPED
8 CATHODE

Tentative data
March 1945

Vacuum Condenser

K12/2L

This condenser is suitable for wiring direct on to the tank circuit of Radio transmitters.

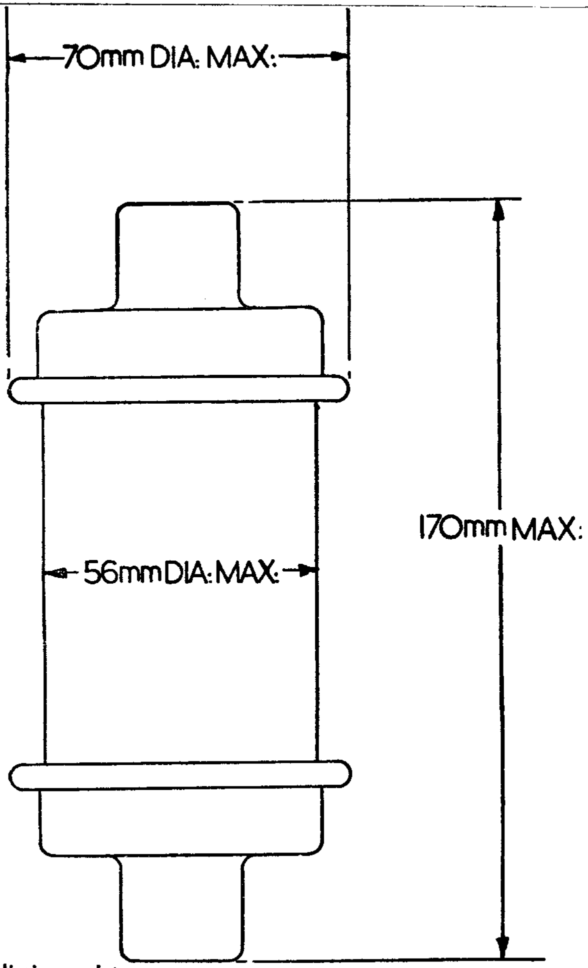
The physical size of each unit is small and four separate tank circuits need not occupy more space than a single open plate condenser.

CAPACITY.	12 ± 10%	pF
DIMENSIONS.		
Maximum overall length	170	mm.
Maximum bulb diameter	56	mm.
Maximum overall diameter	70	mm.
MAXIMUM RATING.		
Maximum peak RF voltage	32	kV
Maximum RF current	12	A
Maximum frequency of operation	20	Mc/s

Preliminary data.
October 1946

Vacuum Condenser

K12/2L



Preliminary data.
October 1946

Vacuum Condenser

K25/2L

This condenser is suitable for wiring direct on to the tank circuit of Radio transmitters.

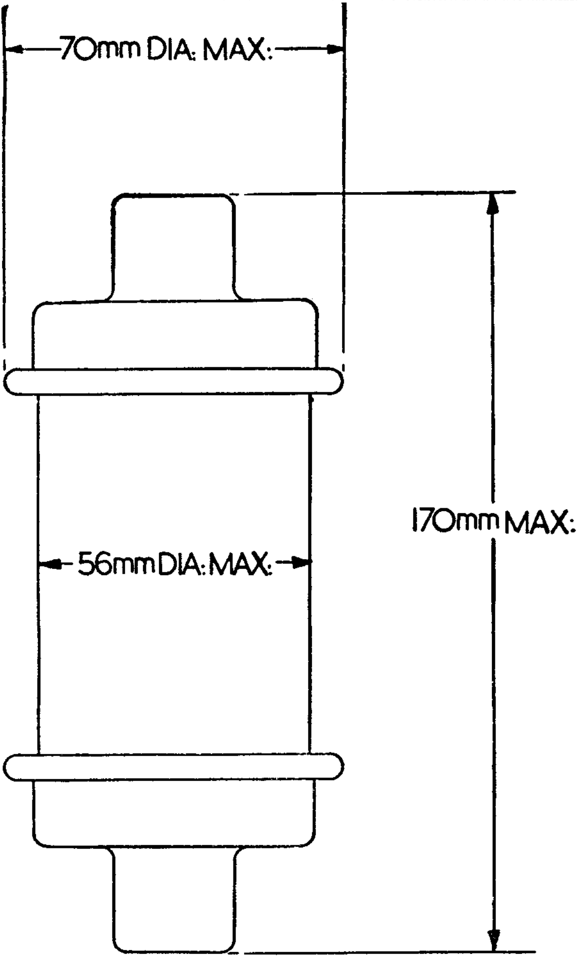
The physical size of each unit is small and four separate tank circuits need not occupy more space than a single open plate condenser.

CAPACITY.	25 ± 10%	pF
DIMENSIONS.		
Maximum overall length	170	mm.
Maximum bulb diameter	56	mm.
Maximum overall diameter	70	mm.
MAXIMUM RATING.		
Maximum peak RF voltage	32	kV
Maximum RF current	12	A
Maximum frequency of operation	20	Mc/s.

Preliminary data.
October 1946

Vacuum Condenser

K25/2L



Preliminary data.
October 1946

Vacuum Condenser

K50/2L

This condenser is suitable for wiring direct on to the tank circuit of Radio transmitters.

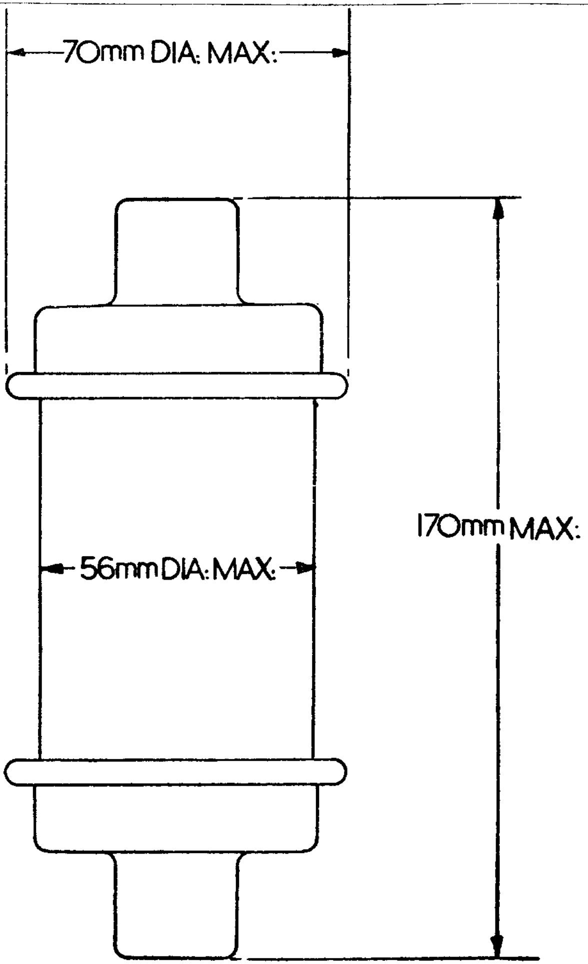
The physical size of each unit is small and four separate tank circuits need not occupy more space than a single open plate condenser.

CAPACITY.	50 ± 10%	pF
DIMENSIONS.		
Maximum overall length	170	mm.
Maximum bulb diameter	56	mm.
Maximum overall diameter	70	mm.
MAXIMUM RATING.		
Maximum peak RF voltage	32	kV
Maximum RF current	12	A
Maximum frequency of operation	20	Mc/s.

Preliminary data.
October 1946

Vacuum Condenser

K50/2L



Preliminary data.
October 1946

Tetrode Pulse Modulator

P535/1E & P552/1E

CATHODE.

Indirectly-heated, oxide-coated

Voltage	26	V
Nominal current	2	A

INTER-ELECTRODE CAPACITIES.

Grid-anode	1.2	pF
Input	35.0	pF
Output	7.0	pF

DIMENSIONS.

Maximum overall length	149	mm.
Maximum bulb diameter	65.2	mm.
Base—see sketch		
Net weight	194	g.

MAXIMUM RATINGS.

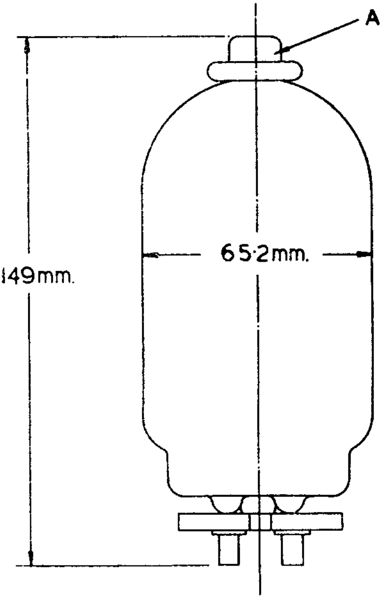
	P535/1E	P552/1E
Maximum direct anode voltage	15,000 V	20,000 V
Maximum direct screen voltage	1,250 V	1,250 V
Maximum average anode current	30 mA	30mA
Maximum peak anode current with duty cycle of 1/1,000 or less	15 A	15 A
Maximum anode dissipation	60 W	60 W
Maximum screen dissipation	8 W	8 W
Maximum peak positive control grid	250 V	250 V
Maximum grid bias	—1,000 V	—1,000 V

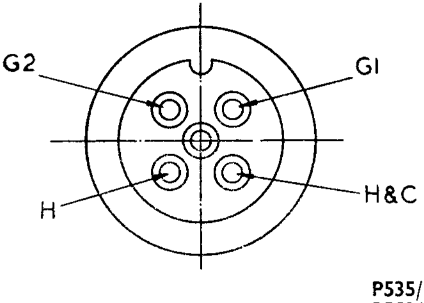
Note.—Product of pulse duration in seconds and pulse recurrence frequency in c/s $<\cdot 001$. In any 100 μsec. interval the tube shall not be operated longer than 5 μsec.

Tentative data
June 1946

Tetrode Pulse Modulator

P535/1E & P552/1E





Tentative data
June 1946

Velocity Modulated Oscillator

V230A/1K (CV234)

This is a velocity modulated oscillator of the coaxial line type for CW operation within the wave range 8.9 cm. to 11 cm. and 8 cm. to 16 cm.

CATHODE.

Indirectly-heated oxide-coated.		
Voltage	6.3	V
Nominal current (AC frequencies above 60 c/s must not be used)	0.3	A

DIMENSIONS.

Maximum overall length	81	mm.
Maximum bulb diameter	20.1	mm.
Base Miniature 7 pin button		
Net weight	22½	g.

MAXIMUM RATINGS.

The mean input power to all electrodes other than the heater must not exceed	15	W
The maximum direct cathode current	65	mA
Maximum direct screen voltage	200	V

Tentative data
November, 1945

Velocity Modulated Oscillator

V230A/1K (CV234)

OPERATING CONDITIONS.

Oscillator 8.9 to 11 cm. See Fig. 1.

Grid voltage Vg_1	0 to 200 V negative with respect to cathode
Resonator voltage Vr	At 9.1 cm. 250V $\pm$ 5%. For other wavelengths the Vr is approximately proportional to the square of the frequency
Screen voltage Vg_2	0 to Vr
Anode voltage Va	Vr plus 10 to 20 V
Output power	Not less than 0.3 W at the ends of the band with 15 W input

The output may be controlled by either Vg_1 or Vg_2. It is usually desirable to set Vg_1 to zero voltage and adjust Vg_2 by means of a potentiometer across the resonator supply.

Oscillator over at least an octave, approximately 8-16 cm.

See Fig. 2.

Grid voltage Vg_1	0 to 200 V negative with respect to cathode
Resonator voltage Vr	At 15 cm. 100V $\pm$ 5%. For other wavelengths the Vr is approximately proportional to the square of the frequency
Screen voltage Vg_2	0 to Vr
Anode voltage Va	Vr plus 10 to 20 V
Output power	Not less than 0.4 W in the middle of the band

The output may be controlled by either Vg_1 or Vg_2 as for 8.9 to 11 cm. operation.

Tentative data
November, 1945

Velocity Modulated Oscillator

V230A/1K (CV234)

PULSE OPERATION.

The valve may be operated with 10% duty cycle giving peak power output of the same values as for CW operation. The delay time for optimum voltage will be approximately 1 microsecond.

MAGNET AND MAGNET ALIGNMENT.

The magnet recommended is Jessops type 10512 but any magnet giving a uniform field of about 1200 oersteds over a 22 mm. gap may be used. The valve must be accurately aligned in the magnetic field so that as much of the current as possible reaches the anode. Once aligned no further adjustment will be necessary when replacing valves.

CIRCUITS.

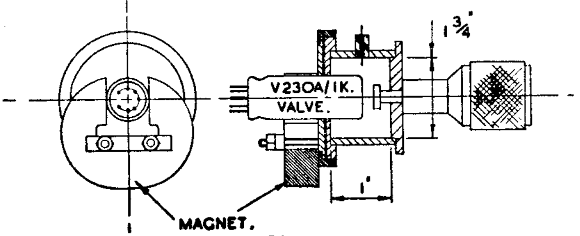
Two circuits suitable for use with this valve are shown in Fig. 1 and 2. The position of the output probe is of importance.

Circuit Fig. 1 is a rhumbatron cavity with micrometer screw for wavelength adjustment. Wavelength 8.9 to 11 cm.

Circuit Fig. 2 is a non-contact octave rhumbatron.

Further information may be obtained on application to the Chief Valve Engineer, Standard Telephones and Cables Ltd., Connaught House, Aldwych, London, W.C.2.

FIG. 1.



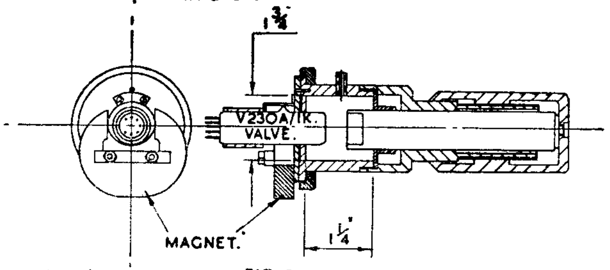
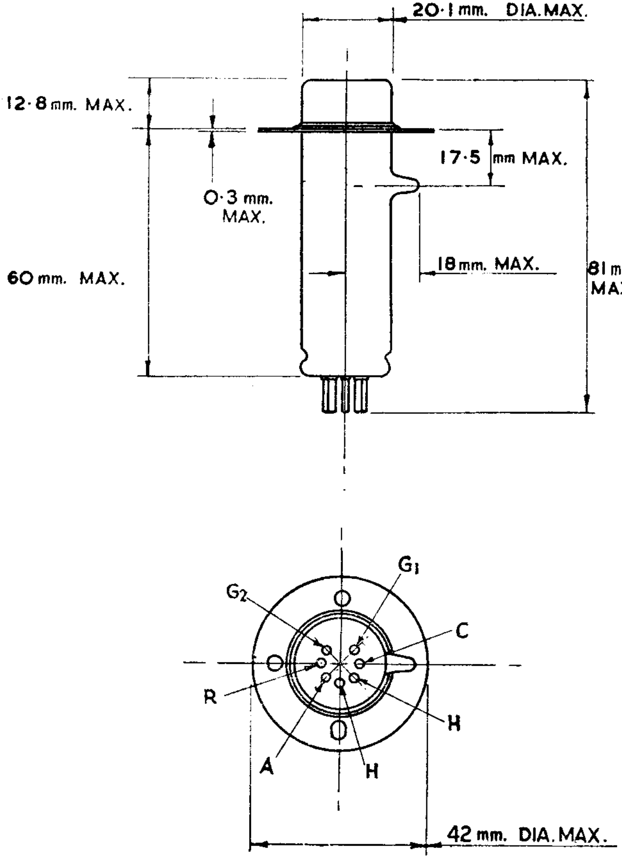


FIG. 2.

Tentative data
November, 1945

Velocity Modulated Oscillator

V230A/1K (CV234)



Tentative data
November, 1945

Velocity Modulated Oscillator

V246A/1K (CV.228)

The V246A/1K is a velocity modulated oscillator of the coaxial line type for pulsed or CW operation over the band 6 to 7 cm.

The low voltage operation is made possible by the use of a magnetic field to focus the electron stream through the resonator system of the valve.

CATHODE.

Indirectly-heated oxide-coated.		
Voltage	6.3	V
Nominal current (AC frequencies above 60 c/s must not be used)	0.3	A

DIMENSIONS.

Maximum overall length	90	mm.
Maximum bulb diameter	20.1	mm.
Base miniature 7 pin button		
Net weight	22½	g.

MAXIMUM RATINGS.

The mean input power to all electrodes other than the heater must not exceed	15	W
The peak cathode current must not exceed	0.5	A

Tentative data.

August 1947

Velocity Modulated Oscillator

V246A/IK (CV.228)

OPERATING CONDITIONS.

CW BEATING OSCILLATOR 6 to 7 cm.

Grid voltage Vg_1	0 to 200 V negative with respect to cathode.
Resonator voltage Vr	At 6.45 cm. 220 V $\pm$5%. For other wavelengths the Vr is approximately proportional to the square of the frequency
Screen voltage Vg_2	0 to Vr
Anode voltage Va	Vr plus 10 to 20 V
Output power Wo	Not less than 0.5 W with 15 W input at 6.45 cm.

The output may be controlled by either Vg_1 or Vg_2. It is usually desirable to set Vg_1 to say—15 V and adjust Vg_2 by means of a potentiometer across the resonator supply.

PULSE OPERATION with less than 10% duty cycle. Suitable as a transmitter. Subject to a delay time of 1 μ sec. approximately.

Grid voltage Vg_1	0 to 200 V negative to the cathode
Screen voltage Vg_2	0 to Vr
Resonator voltage Vr	At 6.45 cm. 800 V $\pm$5%. For other wavelengths the Vr is approximately proportional to the square of the frequency.
Anode voltage Va	Vr plus 10 to 20 V
Output power Wo	Up to 20 W

The output may be controlled by either Vg_1 or Vg_2 as for CW operation.

MAGNET AND MAGNET ALIGNMENT.

The magnet recommended is Jessops type 10512 but any magnet giving a uniform field of about 1200 oersteds over a 22 mm. gap may be used. The valve must be very accurately aligned in the magnetic field so that as much of the current as possible reaches the anode. Once aligned no further adjustment is necessary when changing valves.

Velocity Modulated Oscillator

V246A/1K (CV.228)

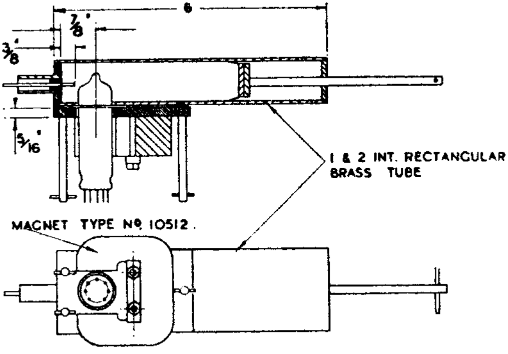
CIRCUITS.

Two circuits suitable for use with this valve are shown below. The position of the output probe is of importance. In circuit A the valve excites a rectangular wave guide which is tunable over the range 6 to 7 cm. by a feathered plunger.

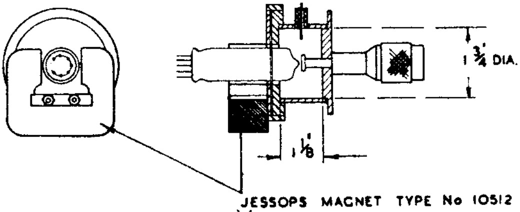
Circuit B is a cavity resonator with a micrometer screw for wavelength adjustment. Wavelength range of this circuit is 6.3 cm. ± 0.2 cm.

The mean wavelength is determined by the diameter of the cavity.

Further information may be obtained on application to the Chief Valve Engineer, Standard Telephones and Cables Ltd., Connaught House, Aldwych, London, W.C.2.



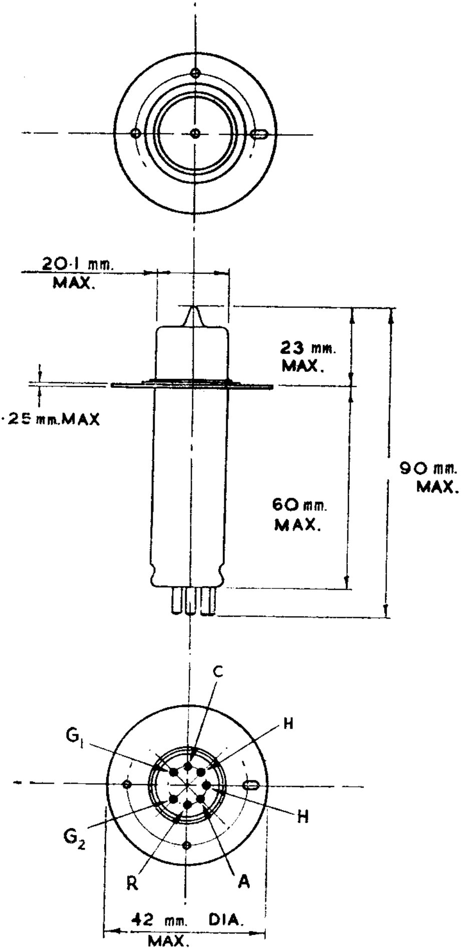
CIRCUIT 'A'.



CIRCUIT 'B'.

Velocity Modulated Oscillator

V246A/IK (CV.228)



Thermal Delay Switch

VLS 631 (CV342)

Miniature thermal delay switch suitable for applying the anode voltage to an indirectly heated valve after the cathode has warmed up.

RATINGS.

Heater voltage	6.3	V
Nominal heater current	0.5	A
Nominal delay at 20°C.	50—60	secs.
Ambient temperature range	—35°C. to —85°C.	
Time delay is not less than 50 sec. and not more than 90 secs. over the ambient temperature range.		
Max. O/C voltage between contacts	220	V.DC
Max. contact current on make	1.0	A
,, surge current on make	5.0	A
,, current on break	100mA at 50VDC	

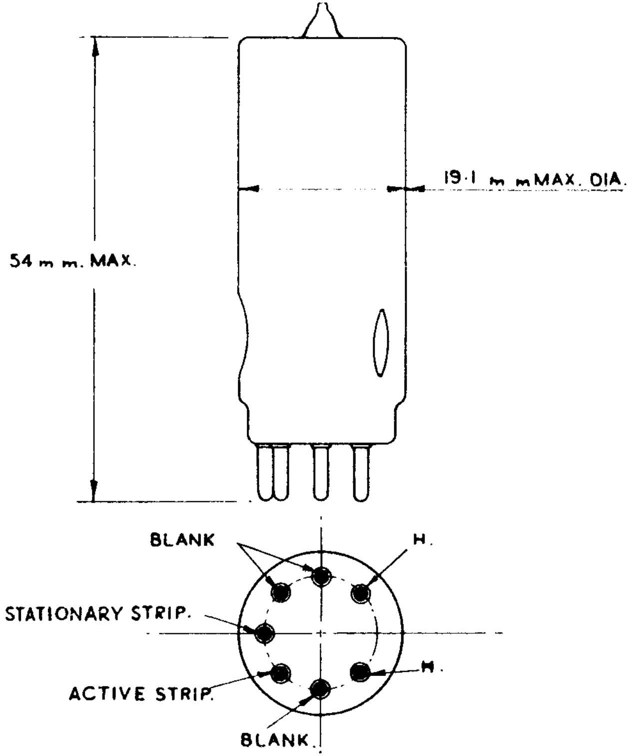
DIMENSIONS.

Maximum overall length	54	mm.
Maximum overall diameter	19.1	mm.

Tentative data
June 1946

Thermal Delay Switch

VLS 631 (CV.342)



Tentative data
June 1946

X-RAY TUBE

4072A

CATHODE.

(*a*) **For operation on 10 mA only.**
Filament voltage 3.4 volts maximum, 2.6 volts minimum.
Filament current 2.4 amps. maximum, 1.7 amps minimum.

(*b*) **For operation on any emission between 2 mA and 10 mA.**
Filament voltage 3.4 volts maximum, 2.0 volts minimum.
Filament current 2.4 amps maximum, 1.5 amps minimum.

DIMENSIONS.

Maximum overall length	121	mm.
Maximum diameter	38	mm.
Net weight	110	g.

MOUNTING.

The tube is intended for mounting by means of a 2 B.A. screw fitting the tapped hole in the anode and a locating slot as shown on the drawing. No metal parts should approach within ½″ of the glass at any point, except in the immediate vicinity of the anode.

FOCUS.

Effective focal spot is 1.5 mm. × 1.5 mm.

COVERING POWER.

The diameter of the cone of X-rays emerging from the tube is 16″ (min.) at 30 inches target distance and the intensity is effectively constant over this area.

OPERATION.

The tube is only to be operated when wholly immersed in Grade A transformer oil. It is most important that the electrical connections to the tube shall be thoroughly sound.

The tube is self-rectifying and is intended to be run directly across the poles of a high tension transformer which delivers 10 mA mean rectified current at a peak voltage, during the active half cycle, of 63 kilovolts. The regulation of the transformer secondary circuit should be such that the peak voltage does not rise above 75 kV when the tube is removed and yet such that the maximum current which the transformer will deliver on short circuit is less than 120 mA. The high tension should be applied by means of a switch in the primary circuit which momentarily inserts a resistance of at least 0.06 ohm per volt of mains voltage.

X63C/I
(4072A)

X-RAY TUBE

4072A

PROTECTION.

This tube is not self-protected and therefore external X-ray protection equivalent to I mm. of lead should be provided.

MAXIMUM RATING.

The tube may be run continuously at 63 kV peak 10 mA for a period depending upon the design of the tube container. Provision must be made for perfectly free circulation of oil round the tube, especially the anode, in order to prevent excessive local rise in temperature. The temperature of the body of the oil must not be permitted to rise above 60°C.

MAINS FLUCTUATION.

While the tube is intended to be run at 10 mA, small changes in tube current due to voltage variations of the mains will not damage the tube, but it is important to ensure that the tube current never exceeds 12 mA. It is therefore advisable when starting to reduce the filament current slightly, in case the mains voltage has risen considerably since the tube was last used.