C1149A

PULSE AMPLIFIER TETRODES

ABRIDGED DATA

C1149/1 is a high vacuum, radial beam tetrode designed primarily for the output stage in power amplifier pulse modulators. It is of rugged construction and is a development of the C1149, being identical electrically but having a modified envelope design to give improved mechanical characteristics.

The C1149/1 may be used as a replacement for type 4PR60B, having equivalent electrical characteristics, and it also replaces types 715C, 5D21 and CV427 with a generous margin of safety.

C1149A is a version of C1149/1 with improved X-ray shielding.

Anode voltage	20	kV max
Pulse anode current	18	A max
Duty cycle (at 18 A peak anode current)	0.001	
Typical pulse output power	330	kW

GENERAL

Electrical

Cathode	indirectly heated, oxide coated	
Heater voltage	26	V
Heater current	2.15	A
Cathode pre-heating time (minimum)	3.0	min
Inter-electrode capacitances:		
grid to anode	0.36	pF
input	43	pF
output	6.5	pF

Mechanical

Overall length	6.000 inches (152.4 mm) max
Overall diameter	3.062 inches (77.77 mm) max
Net weight	9 ounces (255 g) approx
Base	B.S.448-B4A
Top cap	see note 1
Mounting position	any
Cooling (see note 1)	natural

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PULSE MODULATOR SERVICE

MAXIMUM RATINGS (Absolute values)

Duty cycle		see note 2
Anode voltage (see note 3)	20	kV max
Screen voltage (see notes 3 and 4)	1.5	kV max
Grid voltage (see note 5)	−1.0	kV max
Peak positive grid voltage	300	V max
Pulse anode current (see notes 2 and 6)	18	A max
Peak anode voltage	25	kV max
Anode dissipation	60	W max
Screen dissipation	8.0	W max
Seal temperature (see note 1)	200	°C max
Vibration		see note 7

TYPICAL OPERATING CONDITIONS

Duty cycle (see note 2)	0.001	
Pulse length	2.0	μs
Anode voltage	20	kV
Screen voltage	1.25	kV
Grid voltage	−600	V
Pulse positive grid voltage	150	V
Pulse anode current	18	A
Pulse screen current (approx)	1.7	A
Pulse grid current (approx)	0.3	A
Pulse input power	360	kW
Pulse output power	330	kW

NOTES

1. To keep the anode seal at a safe temperature, it is necessary to use an anode connector with good heat dissipation characteristics. The use of a spring type anode connector is recommended; where a connector using grub screw clamping is employed, care must be taken to avoid overtightening the screw or applying excessive side thrust to the top cap.

2. For the pulse current given under maximum ratings, the duty cycle must not exceed 0.001. At higher duty cycles the pulse current must be reduced in proportion. For pulse currents exceeding 5.0 A, the product of pulse current in amperes and pulse duration in microseconds must not exceed 40 and the tube must not be operated for longer than 5 microseconds in any 100 microsecond interval. For pulse currents of less than 5.0 A, the anode dissipation of 60 W determines the permissible pulse length.

3. Occasional internal discharges may occur during operational life. The power in such discharges should be limited and it is recommended that a series resistor should be included in the anode circuit to limit the short circuit current to 500 mA or less. A resistor of about 100 ohms value should be connected in series with the screen as close to the pin of the tube as possible. A 0.5 μF by-pass capacitor should be connected between the supply side of the 100 ohm resistor and earth.

4. The screen decoupling resistance must not be less than 20 kΩ.

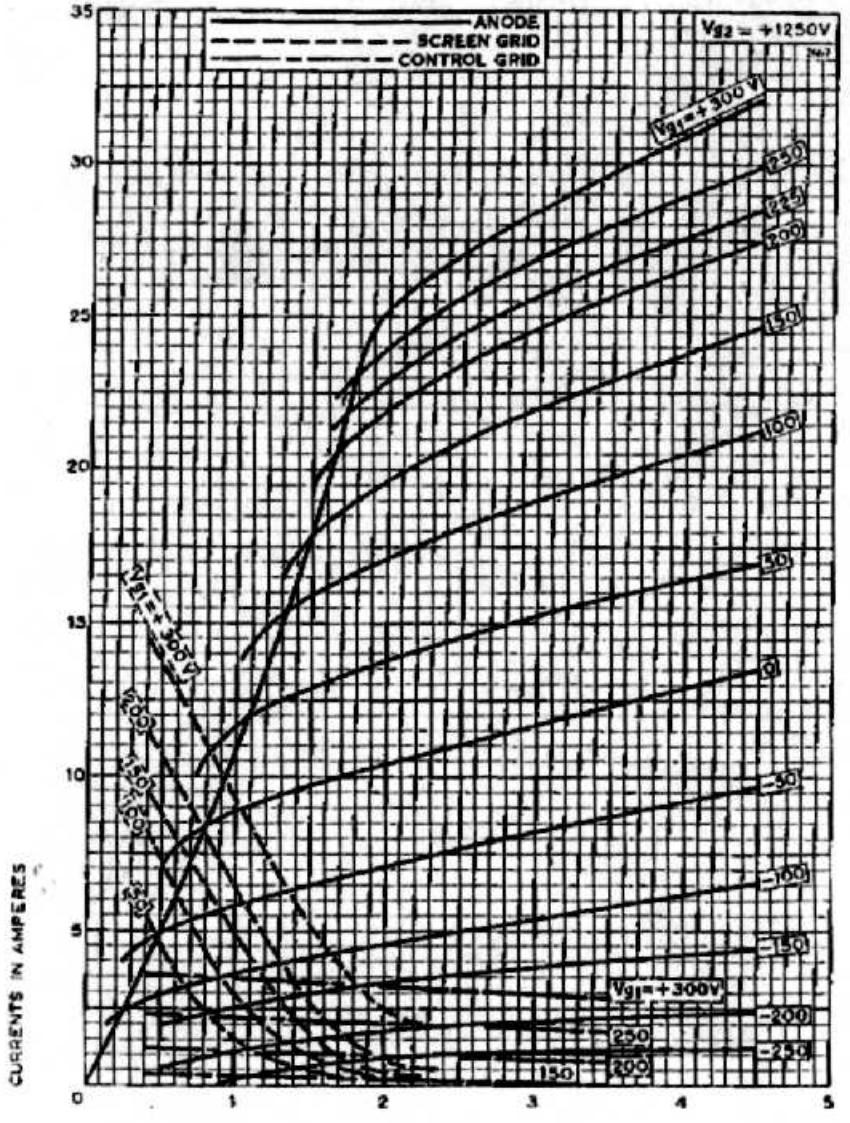
5. The total resistance of the grid circuit must not exceed 0.1 MΩ.

6. The rating specified for pulse anode current refers to the maximum amplitude of the flat portion of the pulse following an initial spike on the leading edge which must not exceed 25 A.

7. The tube will withstand vibration at 5 g from 30 to 1500 Hz for short periods but it should not be operated continuously under these conditions.

8. In the inter-pulse period the anode voltage gives rise to focusing effects which concentrate the anode dissipation in small areas of the anode. Consequently the published anode dissipation must not be used as a criterion for the permissible inter-pulse anode current, which must be cut-off by the provision of ample negative bias (see page 6).

TYPICAL ANODE AND GRID CHARACTERISTICS



HEALTH AND SAFETY HAZARDS

EEV electronic devices are safe to handle and operate, provided that the precautions stated are observed. English Electric Valve Company does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating EEV devices and in operating manuals.

High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and stored energy in the electronic devices before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

X-Ray Radiation

This device, when operating at voltages above 5 kV, produces progressively more dangerous X-rays as the voltage is increased; the radiation varies greatly during life. The device envelope provides only limited protection and further shielding may be required. A metal equipment cabinet with overlapping joints will usually provide sufficient shielding, but if there is any doubt an expert in this field should perform an X-ray survey of the equipment.

Operation of high-voltage equipment with interlock switches 'cheated' and cabinet doors open to help locate an equipment malfunction can result in serious X-ray exposure.

Implosion

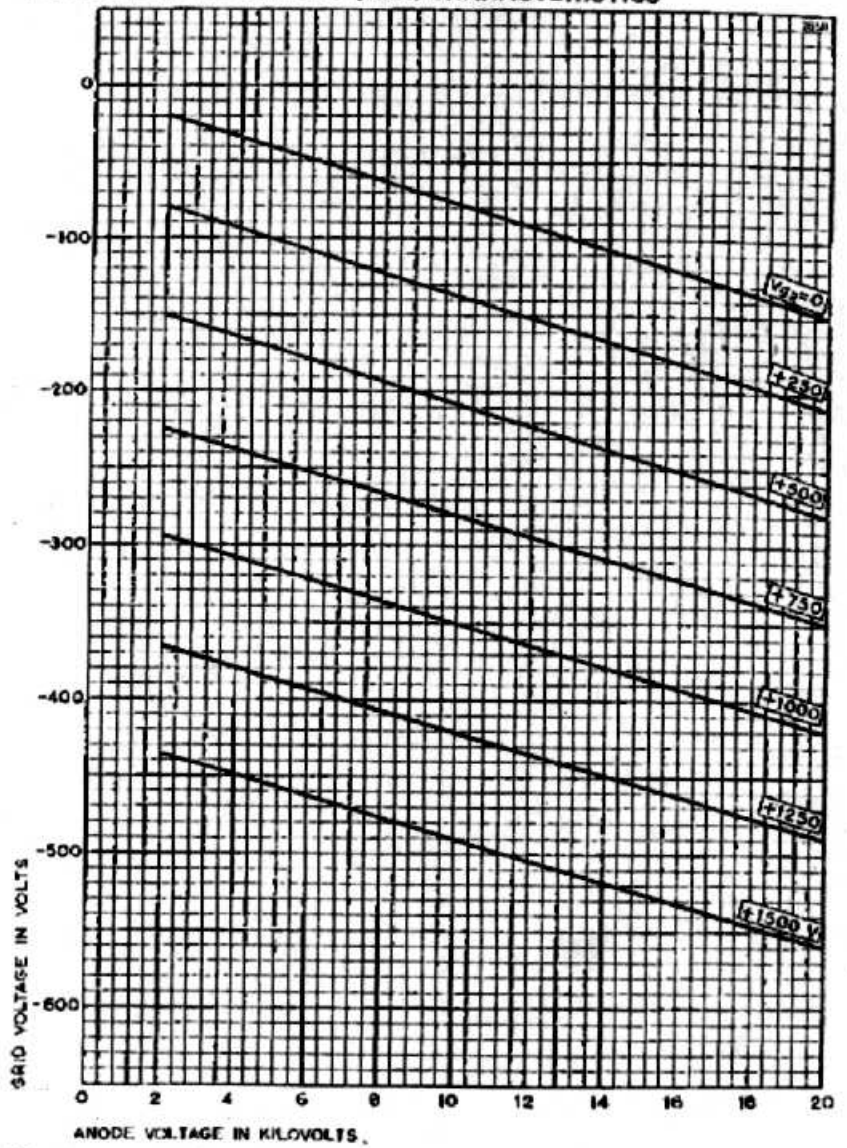
This tube stores potential energy by virtue of its vacuum. The energy level is low, but there is some hazard from flying fragments if the tube is dropped or subjected to violent impact.

The tube must be stored and transported in its approved puck. During installation or replacement the tube must not be scratched or damaged in any way likely to reduce the strength of the glass envelope.

References

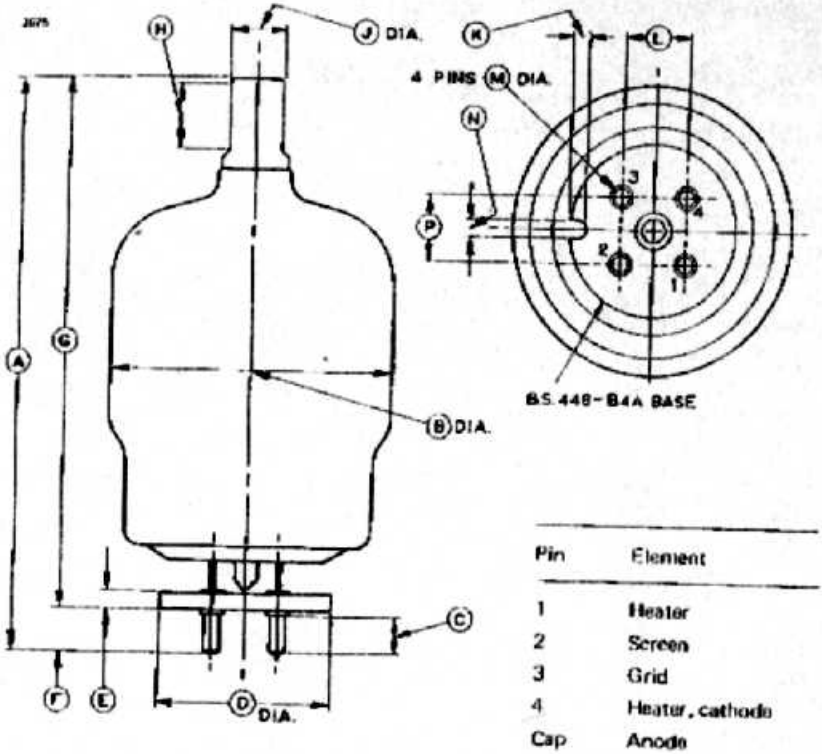
1. BS 3192. Specification for safety requirements for radio (including television) transmitting apparatus.
2. JEDEC Publication no. 81. Recommended practice on X-radiation detection and measurements for high power tubes.

ANODE CURRENT CUT-OFF (1mA) CHARACTERISTICS



The above graph is for an average tube. To allow for variations between tubes and to cover changes during life the working bias voltage shown on the graph should be exceeded by at least 20% (see note 8 on page 3).

OUTLINE (All dimensions without limits are nominal)



Pin	Element
1	Heater
2	Screen
3	Grid
4	Heater, cathode
Cap	Anode

Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	5.875 ± 0.125	149.23 ± 3.18	H	0.437 min	11.10 min
B	3.062 max	77.77 max	J	0.567	14.40
C	0.328 min	8.33 min	K	0.187	4.75
D	1.813 max	46.05 max	L	0.687	17.45
E	0.187	4.75	M	0.187 ± 0.004	4.750 ± 0.102
F	0.500 max	12.70 max	N	0.187	4.75
G	5.419 ± 0.125	137.6 ± 3.18	P	0.687	17.45

Millimetre dimensions have been derived from inches.

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