NATIONAL

4PR400A
POWER TETRODE

Radiation and forced air cooled power tetrode for pulse-modulator and pulsed R.F. amplifier or oscillator service with frequencies up to 100 MHz.

Quick Reference Data:

Anode votlage	Va	20	kV
Anode Current (peak)	Ia	4.0	$A_{1)}$
Anode Dissipation (Average)	Wa	400	W

HEATING: direct; thoriated tungsten filament

Filament Voltage	Vf	5	V
Filament Current	If	14.1	A

The filament is designed to accept temporary fluctuations of +/- 5%

CAPACITANCE

Grid 1 to all other elements except anode	Cg1	12.7	pF
Anode to all other elements except grid 1	Ca	4.9	pF
Anode to grid 1	Cag1	0.12	pF

TYPICAL CHARACTERISTICS

Anode Voltage	Va	2500	V
Grid 2 Voltage	Vg2	500	V
Anode Current	Ia	100	mA
Mutual Conductance	S	4.0	mA/V
Amplification factor of grid 2 with respect to grid 1	μ g2g1	5.1	

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COOLING: Radiation and forced air

At anode dissipations up to 250 W a low-velocity air flow directed on the anode seal and the base generally will provide sufficient cooling. At higher dissipations the glass chimney should be used for circulating forced air along the bulb. At 400 W anode dissipation at least 0.4 m^3/min air should be passed through the chimney. For this purpose the static pressure below the chassis should be min. 50 Pa if cooling as arranged in the recommended way.

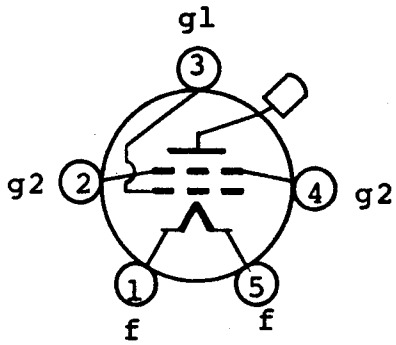
TEMPERATURE LIMITS

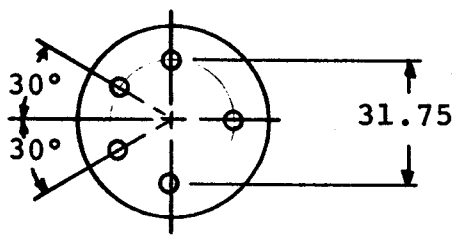
Absolute Maximum Rating System

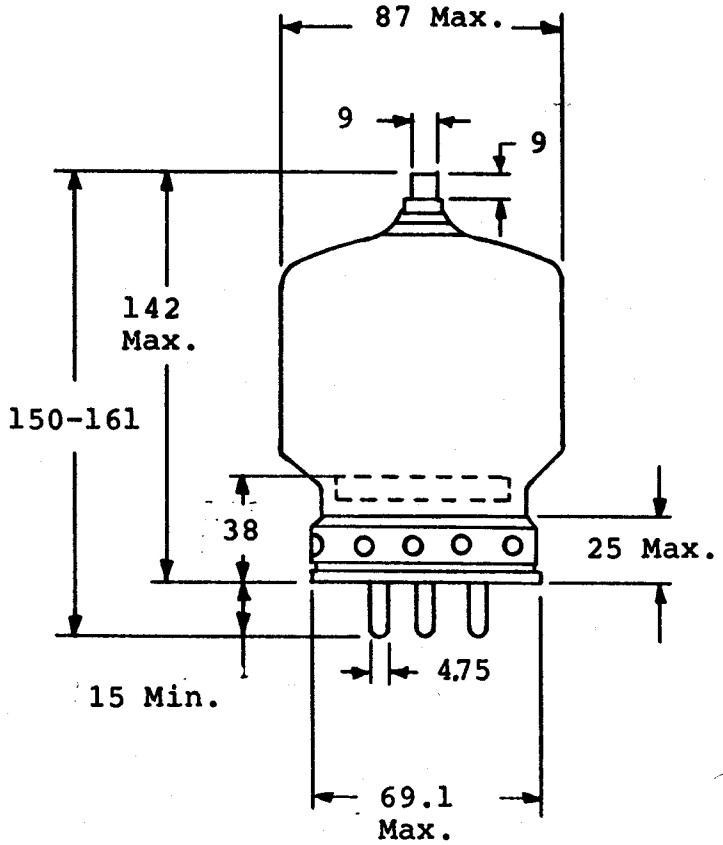
Bulb Temperature	Max. 350 °C
Temperature of anode seal	Max. 220 °C
Temperature of Pin Seals	Max. 180 °C

MECHANICAL DATA

Base metal-shell	giant .5 pin
Socket	2422 S12 01001
Anode Connector	40712
Chimney	40666
Net Mass	275 g.







All dimensions in mm

PULSE MODULATOR SERVICE

Limiting values (absolute maximum rating system)

Anode Voltage	Va	20	kV
Grid 2 Voltage	Vg2	2.5	kV
Grid 1 Voltage	-Vg1	1.0	kV
Anode Current (Peak)	Ia	4.0	A [1)]
Anode Dissipation (Average)	Wa	400	W
Grid 2 Dissipation (Average)	Wg2	35	W
Grid 1 Dissipation (Average)	Wg1	10	W

Operating Conditions

No power in Load:

Anode Voltage	Va	10	15	20	Kv
Grid 2 Voltage	Vg2	1.5	1.5	1.5	kV
Grid 1 Voltage	Vg1	-450	-490	-525	V

Power in Load (Pulse):

Anode Voltage	Va	1.75	1.75	1.75	kV
Load Voltage	Vℓ	8.25	13.25	18.25	kV
Anode Current	Ia	3.5	3.5	3.5	A
Grid 2 Current	Ig2	0.40	0.40	0.40	A
Grid 1 Current	Ig1	0.06	0.06	0.06	A
Grid 1 Voltage	Vg1	60	60	60	V
Power in Load	Wℓ	28.88	46.38	63.88	kW
Driving Power	Wdr	31	33	35	W
Anode Disissipation (Average)	Wa	337	337	337	W
Duty Factory	δ	5.5	5.5	5.5	%

R.F. ANODE - AND SCREEN GRID - PULSED AMPLIFIER AND OSCILLATOR.

Limiting values (absolute maximum rating system)

Frequency	f	110	MHz	
Anode Voltage (Peak)	Va	15	kV	
Grid 2 Voltage	Vg2	2.5	kV	
Grid 1 Voltage	-Vg1	1.0	kV	3)
Cathode Current (Peak)	Ikp	5.4	A	
Anode Dissipation (Average)	Wa	400	W	
Grid 2 Dissipation (Average)	Wg2	35	W	
Grid 1 Dissipation (Average)	Wg1	10	W	2)

Operating Conditions:

Grid 1 Voltage	Vg1	-725	-750	-785	V	
Anode Voltage(Pulse)	Va	10	12.5	15	kV	
Grid 2 Voltage(Pulse)	Vg2	1.5	1.5	1.5	kV	
Anode Current(pulse)	Ia	0.87	0.87	0.87	A	3)
Grid 2 Current(Pulse)	Ig2	70	70	70	mA	
Grid 1 Voltage (Peak R.F.)	Vgp	845	870	905	V	
Driving Power(Pulse)	Wdr	8.5	8.7	9.0	W	2)
Anode Input Power (Pulse)	Wia	8.7	11.0	13.0	kW	
Anode Output Power (Pulse)	Wo	6.8	8.8	10.5	kW	
Anode Dissipation (Average)	Wa	380	396	400	W	
Duty Factory	δ	20	18	16	%	

R.F. GRID 1 - PULSED AMPLIFIER AND OSCILLATOR

Limiting values (absolute maximum rating system)

Frequency	f	110	mHz
Anode Voltage	Va	10	kV
Grid 2 Voltage	Vg2	2.5	kV
Grid 1 Voltage	-Vg1	1.0	kV 3)
Cathode Current (Peak)	Ikp	5.4	A
Anode Dissipation (Average)	Wa	400	W
Grid 2 Dissipation (Average)	Wg2	35	W
Grid 1 Dissipation (Average)	Wg1	10	W

Operating Conditions:

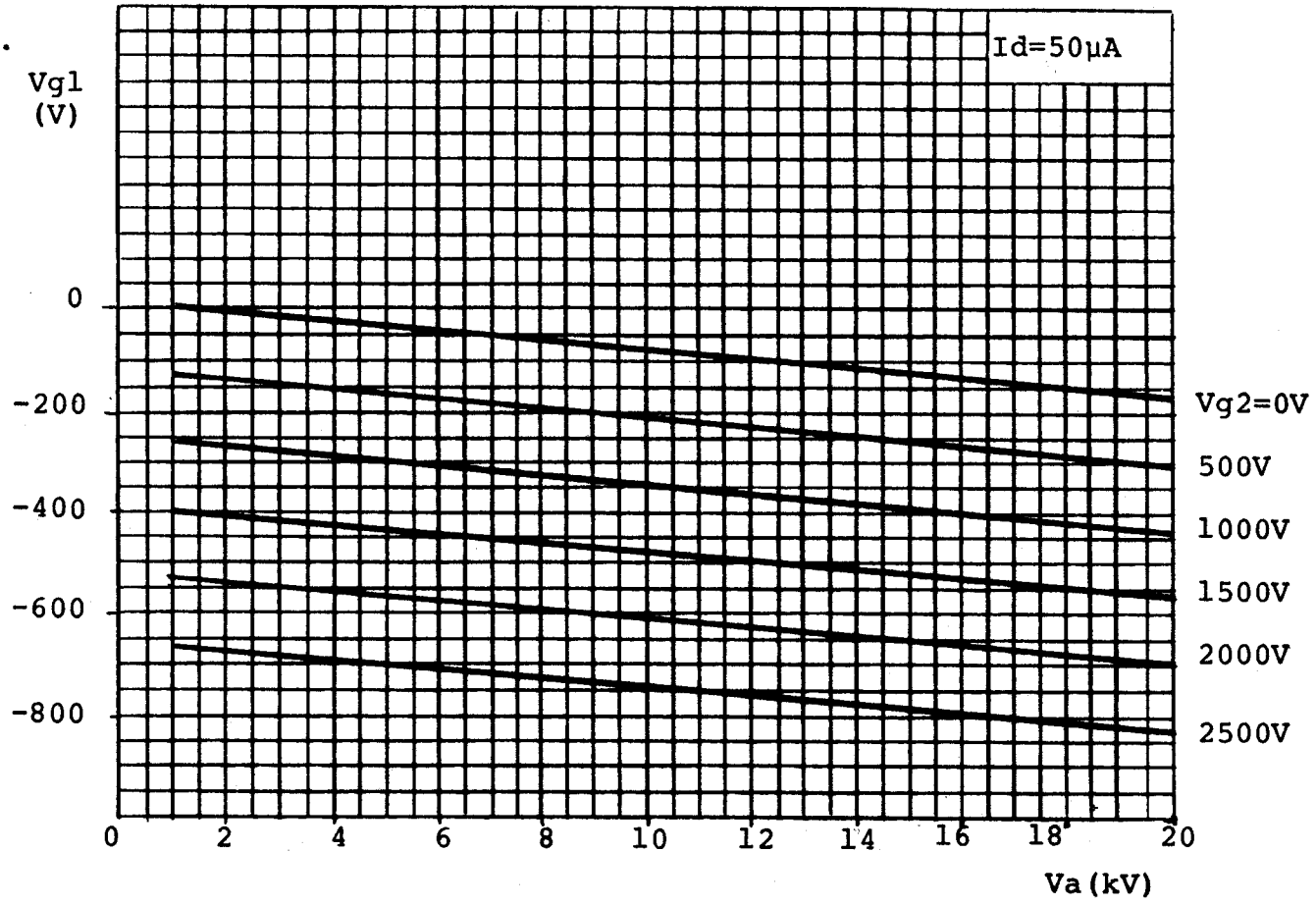
Anode Voltage	Va	5	7.5	10	kV
Grid 2 Voltage	Vg2	1.5	1.5	1.5	kV
Grid 1 Voltage	Vg1	-680	-700	-725	V 3)
Anode Current(Pulse)	Ia	0.87	0.87	0.87	A
Grid 2 Current(Pulse)	Ig2	70	70	70	mA
Grid 1 Current(Pulse)	Ig1	10	10	10	mA
Grid 1 Voltage (Peak R.F.)	Vgp	800	820	845	V
Driving Power(Pulse)	Wdr	8.0	8.2	8.5	W
Anode Input Power (Pulse)	Wia	4.3	6.5	8.7	kW
Anode Output Power (Pulse)	Wo	2.7	4.7	6.6	kW
Anode Dissipation (Average)	Wa	400	396	399	W
Duty Factory	δ	25	22	19	%

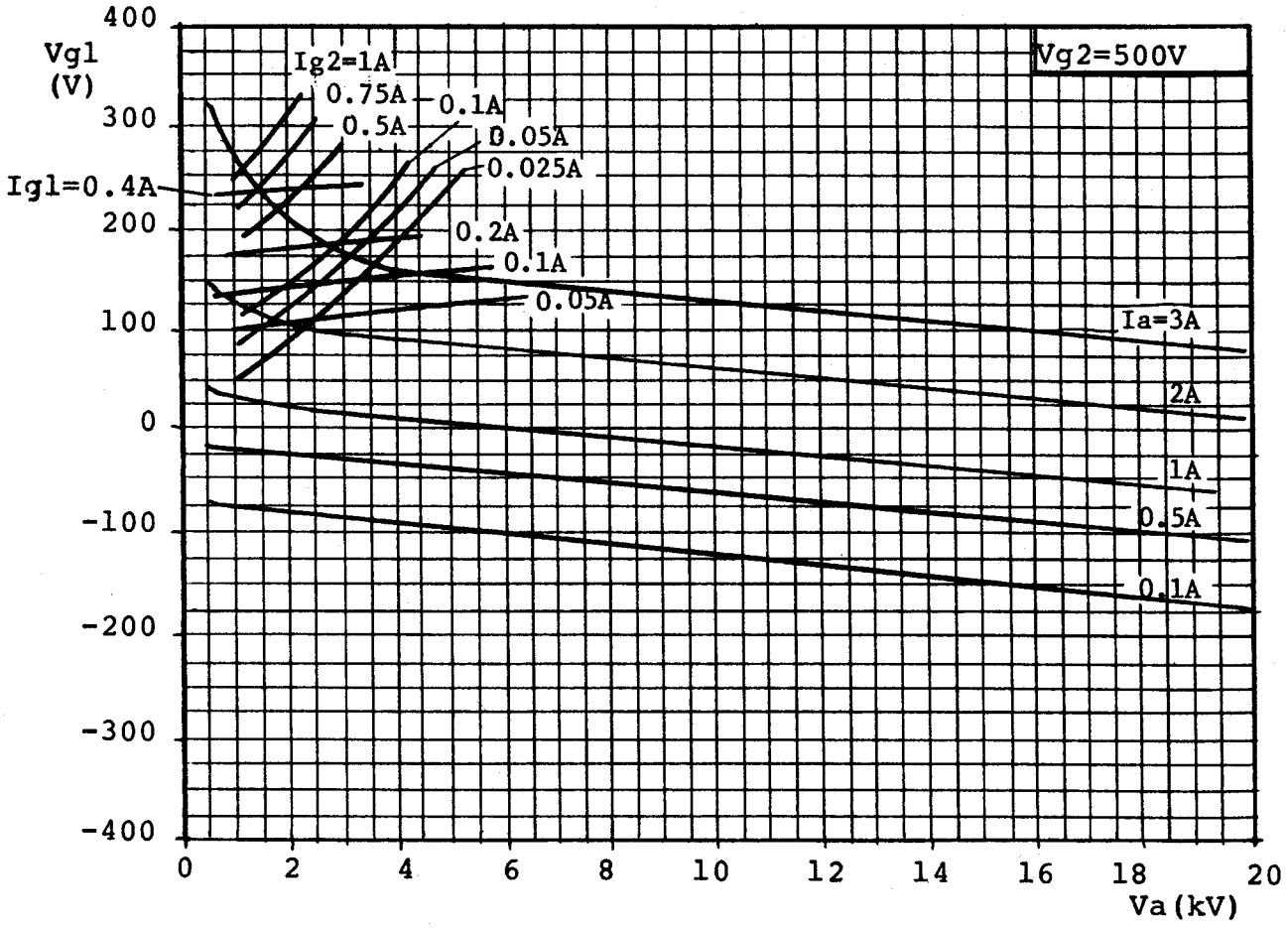
NOTES:

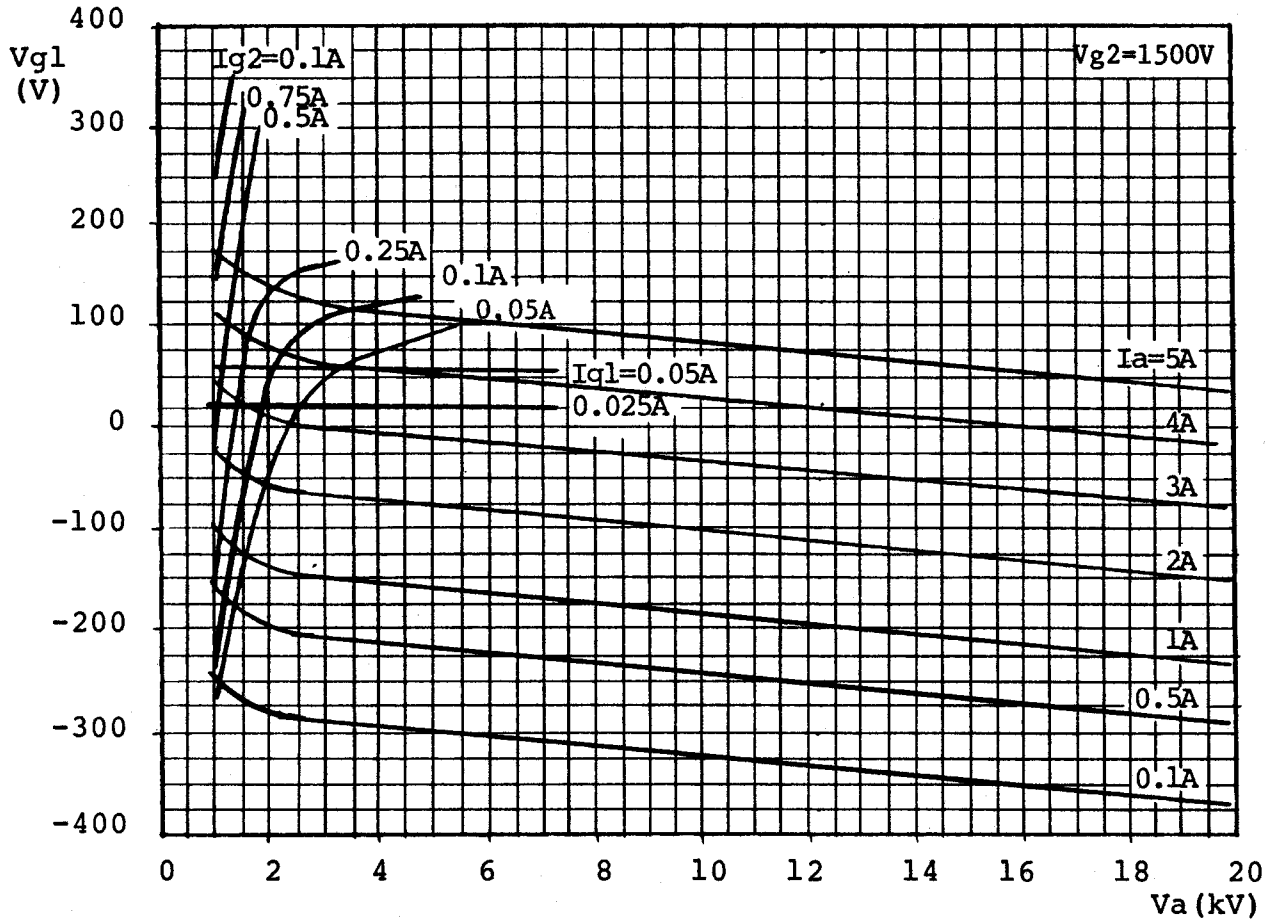
1. In "Pulse Modulator Service" a range of voltages may appear across the tetrode, depending on the power supplied to the load and the need to retain non-oscillating conditions in the circuit. This may make necessary the use of sophisticated averaging of anode dissipation, or alternatively the use of conservative ratings.

2. When used as a R.F. Anode - and screen grid-pulsed amplifier the grid drive must also be pulsed to avoid over-heating grid 1 during the inter-pulse periods.

3. The maximum peak cathode current rating refers to the instantaneous peak cathode current available. The pulse anode current data given under the "Operating Conditions" refer to the D.C. anode current during the pulse.


Id=50μA
Vg1
(V)
0
-200
-400
-600
-800
Vg2=0V
500V
1000V
1500V
2000V
2500V
0
2
4
6
8
10
12
14
16
18
20
Va (kV)


Vg2=500V
Vg1
(V)
400
300
200
100
0
-100
-200
-300
-400
Ig2=1A
0.75A
0.5A
0.1A
0.05A
0.025A
Ig1=0.4A
0.2A
0.1A
0.05A
Ia=3A
2A
1A
0.5A
0.1A
0
2
4
6
8
10
12
14
16
18
20
Va (kV)


Vg1
(V)
400
300
200
100
0
-100
-200
-300
-400
Ig2=0.1A
0.75A
0.5A
0.25A
0.1A
0.05A
Ig1=0.05A
0.025A
Vg2=1500V
Ia=5A
4A
3A
2A
1A
0.5A
0.1A
0
2
4
6
8
10
12
14
16
18
20
Va (kV)