

NATIONAL

CX-1159

DUETERIUM
THYRATRON (Tetrode)

ABRIDGED DATA

Deuterium Filled Tetrode Thyatron, featuring low jitter and low anode delay time drift. Suitable for use at high pulse repetition rates, in parallel for switching higher powers, or for switching long pulses. A reservoir operating from the cathode heater supply is incorporated.

Peak Forward Anode Voltage	33	kV Max
Peak Anode Current (See Page 2)	1000	A Max
Average Anode Current	1.25	A Max
Heating Factor	14x10 ⁹	V.A.p.p.s Max
Peak Output Power	16.5	MW Max



GENERAL

Electrical

Cathode (connected internally to mid-point of heater)	Oxide Coated	
Heater Voltage	6.3	V
Heater Current	21.5	A
Cathode Heating Time (Minimum)	5	minutes
Inter-electrode Capacitances (approximate):		
Anode to Grid 2 (grid 1 and cathode not connected)	13	pf
Anode to Grid 1 (grid 2 and cathode not connected)	7.5	pf
Anode to Cathode (grid 1 and grid 2 not connected)	26	pf

Mechanical

Overall Length	12.500 inches (317.5mm)	Max Max
Overall Diameter	3.312 inches (84.12mm)	Max Max
Net weight	1.5 lbs (0.7 kg)	Approx Approx
Mounting position (clamping is permissible by the base only)	Any	
Base	E.I.A. #A5-98 Metal shell with micalex or ceramic insert	
Top Cap	See outline	
Cooling	Air	

NATIONAL ELECTRONICS

A Division of Richardson Electronics, Ltd.

LaFox, IL 60147 (630) 208-2300

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<u>Anode</u>	<u>Min</u>	<u>Max</u>	
Peak Forward Anode Voltage (See note 1)	-	33	kV
Peak Inverse Anode Voltage (See Note 2)	-	25	kV
Peak Anode Current		1000	A
Peak Anode Current (pulse repetition rate limited to 60p.p.s. max)		2000	A
Average Anode Current		1.25	A
Rate of Rise of Anode Current (See note 3)	-	5000	A/usec
Heating Factor	-	14x10 ⁹	V.A.p.p.s.

Grid 2

Grid 2 Drive Pulse Amplitude	200	1000	V
Grid 2 Pulse Length	0.5	-	usec
Rate of Rise of Grid 2 Pulse (See note 3)	1.0	-	Kv/usec
Grid 2 Pulse Delay	0.5	3.0	usec
Peak Inverse Grid 2 Voltage	-	450	V
D.C. Potential of Grid 2 (See note 4)	-50	-120	V
Impedance of Grid 2 Drive Circuit	50	800	Ohms

Grid 1

Grid 1 Drive Pulse Amplitude	300	1000	V
Grid 1 Pulse Length	1.0	-	usec
Rate of Rise of Grid 1 Pulse (See note 3)	1.0	-	kV/usec
Peak Inverse Grid 1 Voltage	-	450	V
D.C. Potential of Grid 1 (See note 5)			
Peak Grid 1 Drive Current	0.3	1.0	A

Cathode

Heater Voltage	6.0	6.6	V
Cathode Heating Time	5.0	-	minutes

Environmental

Ambient Temperature	-50	+90	C
Altitude	-	10,000	ft
	-	3	km

CHARACTERISTICS

Anode Take-Over Voltage (See note 6)	2.0	-	kV
Anode Delay Time (See notes 6 and 7)	-	0.2	usec
Anode Delay Time Drift (See Notes 7,8 &9)	-	50	nsec
Jitter (See notes 6 and 7)	-	5.0	nsec
Heater Current (at 6.3V)	18	25	A

MAXIMUM RATINGS FOR SINGLE SHOT AND CROWBAR APPLICATIONS

Peak Forward Anode Voltage	30	kV Max
Peak Anode Current	30,000	A Max
Product of Peak Current and Pulse Length	0.6	A.sec Max
Repetition Frequency	1pulse per 10 seconds	Max.
D.C. Grid 1 Current (See note 10)	100	mA Max

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NOTES

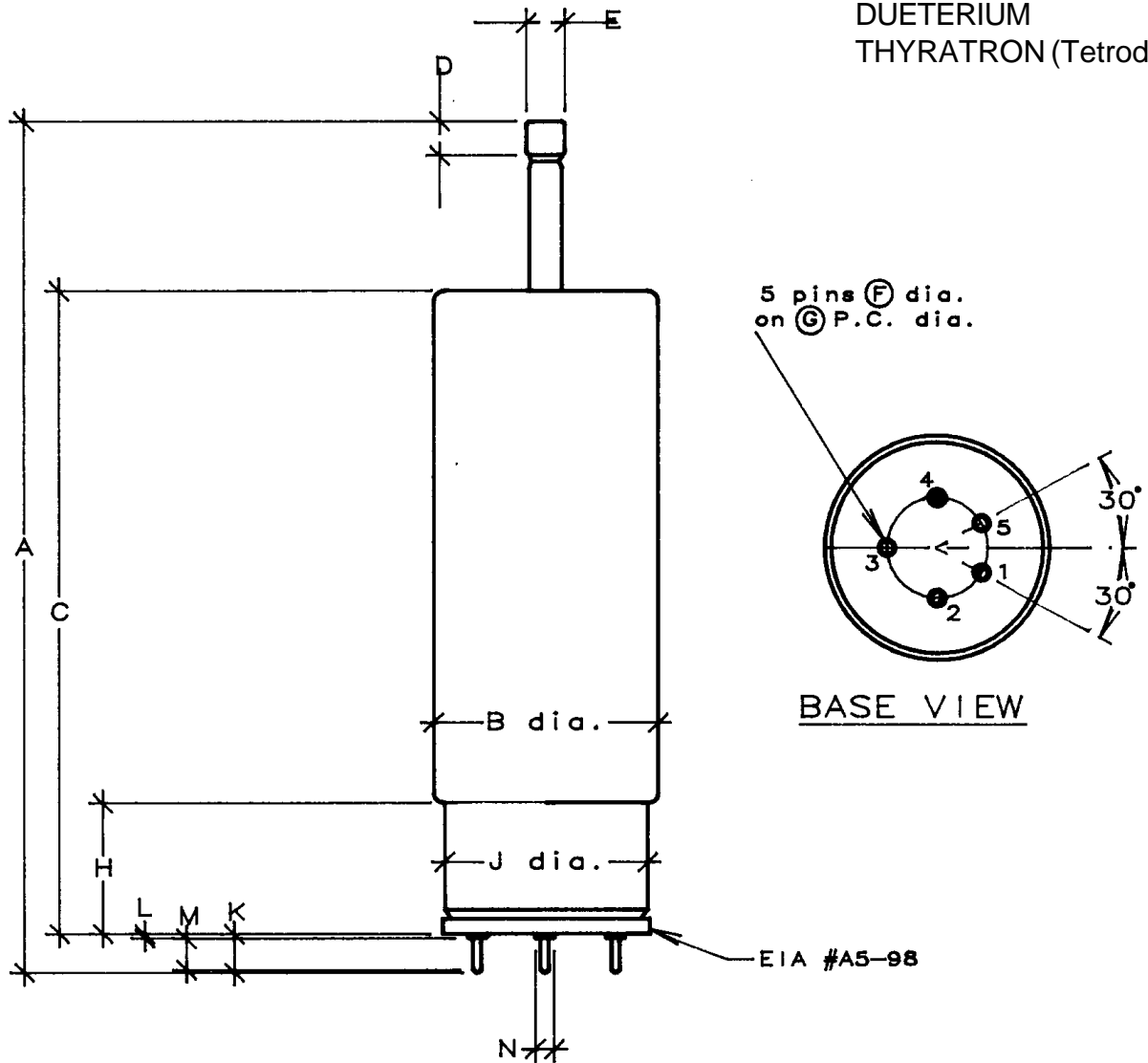
1. The maximum permissible peak forward voltage for instantaneous starting is 20kV and this must not be attained in less than 40 milliseconds.
2. The peak inverse voltage must not exceed 5.0kV for the first 25 microseconds after the anode pulse.
3. This rate of rise refers to that part of the leading edge of the pulse between 26% and 70.7% of the pulse amplitude.
4. The limits apply to the potential of the grid during the period between the completion of recovery and the commencement of the succeeding grid pulse.
5. External bias should not be applied to grid 1. During the period between the completion of recovery and the commencement of the succeeding grid pulse, the D.C. potential of grid 1 may be between -10 and +5V with respect to cathode potential.
6. These are test figures. Better values can be expected under normal triggering conditions.
7. The time interval between a point on the leading edge of the unloaded grid pulse at 26% of the pulse amplitude and the point where anode conduction takes place.
8. The drift in delay time over a period from 10 seconds to 10 minutes after reaching full voltage.
9. For equipment where jitter and anode delay time drift are not important, the tube may be triggered by applying a single pulse to Grid 2 and connecting Grid 1 to Grid 2 via a 100pf capacitor shunted by a 10 MOhm resistor.
10. The switching action of the tetrode thyatron is controlled completely by the second grid and it is therefore possible to maintain a continuous discharge between grid 1 and cathode, without affecting the peak hold-off voltage. A continuous D.C. grid 1 current of 100mA does not affect the life or performance of the valve and may be used as a simple monitor, e.g. for lighting an indicator bulb, to show that the crowbar is in a state of readiness.

X-RAY WARNING

X-Rays are emitted by the CX1159 from the region of the anode, but the radiation is usually reduced to a safe level by the metal panels of the equipment in which the tube operates.

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Ref.	Inches	Millimeters
A	12.000 \pm 0.500	304.8 \pm 12.7
B	3.312 mAX	84.12 Max
C	8.500 \pm 0.500	215.9 \pm 12.7
D	0.500 Min	12.70 Min
E	0.566 +0.007	14.38 \pm 0.18
F	0.187 \pm 0.003	4.750 \pm 0.076
G	1.250	31.75
H	1.937	49.20
J	3.062 \pm 0.062	77.77 \pm 1.57
K	0.770 Max	19.56 Max
L	0.073 Max	1.85 Max
M	0.575 Min	14.60 Min
N	0.260 Max	6.60 Max

PIN	Element
1	Heater
2	Cathode
3	Grid 2
4	Grid 1
5	Heater
Cap	Anode