X-2159

Tentative Data

HIGH POWER
WATER COOLED
TETRODE

The EIMAC X-2159 tetrode is designed for very high powered MF or HF broadcast service, VLF communication in the megawatt power range, and for pulse modulator service where cathode current of up to 1000 amperes with anode supply voltage of up to 55,000 volts is required.

The EIMAC X-2159 has a two section thoriated tungsten cathode mounted on water cooled supports. The two sections may be excited in quadrature to reduce hum contributed by an ac power source. The maximum anode dissipation rating is 1,250,000 watts steady state.

In spite of these impressive electrical values, the external dimensions are:

Height	23 in;	58.4 cm
Anode Cooler Diameter	11¼ in;	28.6 cm
Mounting Base (Screen Terminal) Diameter	17 in;	43.2 cm

Provision is made for large diameter coaxial, terminals to the control grid and the three rf cathode terminals. Filament power and filament support cooling water connections are made through three special couplings with knurled and threaded clamping rings.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten, Two Section	
Voltage per section	18.0 ± .9 V
Current at 18.0 V per section	740 A
Amplication Factor (Average):	
Grid to Screen	4.5
Direct Interelectrode Capacitance (grounded cathode)	
Cin	2750 pF
Cout	450 pF
Cgp	7.5 pF
Frequency of Maximum Rating:	
CW	30 MHz

MECHANICAL

Net Weight	175 lbs; 80 kg
Operating Position	Vertical, base down
Cooling	Water and Forced Air
Recommended Anode Water Jacket (order separately)	X-2166

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The following typical operating conditions are calculated from the design characteristics of the X-2159 tetrode. Specific characteristics and maximum ratings are subject to change.

Radio Frequency Linear Amplifier

Grid Driven Class AB

Absolute Maximum Ratings:

DC Plate Voltage	20.0 kV
DC Screen Voltage	2.5 kV
DC Plate Current	125 A
Plate Dissipation	1250 kW
Screen Dissipation	15.0 kW
Grid Dissipation	4.0 kW

Typical Operation
Class AB_1, Peak Envelope Conditions

Plate Voltage	18.0 kV
Screen Voltage	1800 V
Grid Voltage	-400 V
Zero Signal Plate Current	20 A
Single Tone Plate Current	100.0 A
Single Tone Screen Current	2.0 A
Peak rf Grid Voltage	360.0 v
Plate Dissipation	670.0 kW
Plate Load Resistance	82 Ω
Plate Power Output	1180 kW

Radio Frequency Power Amplifier or Oscillator

Class C Telegraphy or FSK (Key-Down Conditions)

Absolute Maximum Ratings:

DC Plate Voltage	20.0 kV
DC Screen Current	2.5 kV
DC Plate Current	125 A
Plate Dissipation	1250 kW
Screen Dissipation	15.0 kW
Grid Dissipation	4.0 kW

Typical Operations

Plate Voltage	17.0 kV
Screen Voltage	800 V
Grid Voltage	-600 V
Plate Current	123.0 A
Screen Current	17.0 A
Grid Current	6.7 A
Calculated Driving Power	6.0 kW
Plate Dissipation	430 kW
Plate Load Resistance	68 Ω
Plate Output Power	1650.0 kW

Plate Modulated Radio Frequency Power Amplifier

Class C Telephony (Carrier Conditions)

Absolute Maximum Ratings:

DC Plate Voltage	17.5 kV
DC Screen Voltage	2.0 kV
DC Plate Current	100.0 A
Plate Dissipation	800.0 kW
Screen Dissipation	15.0 kW
Grid Dissipation	4.0 kW

Estimated Typical Operation (Carrier Condition)

DC Plate Voltage	15.0	17.5 kV
DC Screen Voltage	800	800 V
DC Grid Voltage	-800	-800 V
DC Plate Current	91	99 A
DC Screen Current	16	13.8 A
DC Grid Current	5.2	4.5 A
Peak Screen Voltage AC (100% mod.)	800	800 v
Peak rf Grid Voltage	1060	1060 v
Calculated Driving Power	5500	4700 W
Plate Dissipation	260	325 kW
Plate Load Resistance	82	82 Ω
Plate Output Power	1100	1375 kW

Audio Frequency Power Amplifier or Modulator

Class AB

Absolute Maximum Ratings:

DC Plate Voltage	20.0 kV
DC Screen Voltage	2.5 kV
DC Plate Current	125 A
Plate Dissipation	1250 kW
Screen Dissipation	15.0 kW
Grid Dissipation	4.0 kW

Typical Operation (two tubes)
Sinusoidal Signal

Plate Voltage	15.0	17.5 kV
Screen Voltage	1600	1800 V
Grid Voltage	-380	-400 V
Zero Signal Plate Current	10	10 A
Max. Signal Plate Current	142	156 A
Max. Signal Screen Current	8.3	5.5 A
Peak ac Grid Voltage	330	370 v
Max. Signal Plate Dissipation (per tube)	290	420 kW
Plate to Plate Load Resistance	220	222 Ω
Power Output	1540	1900* kW

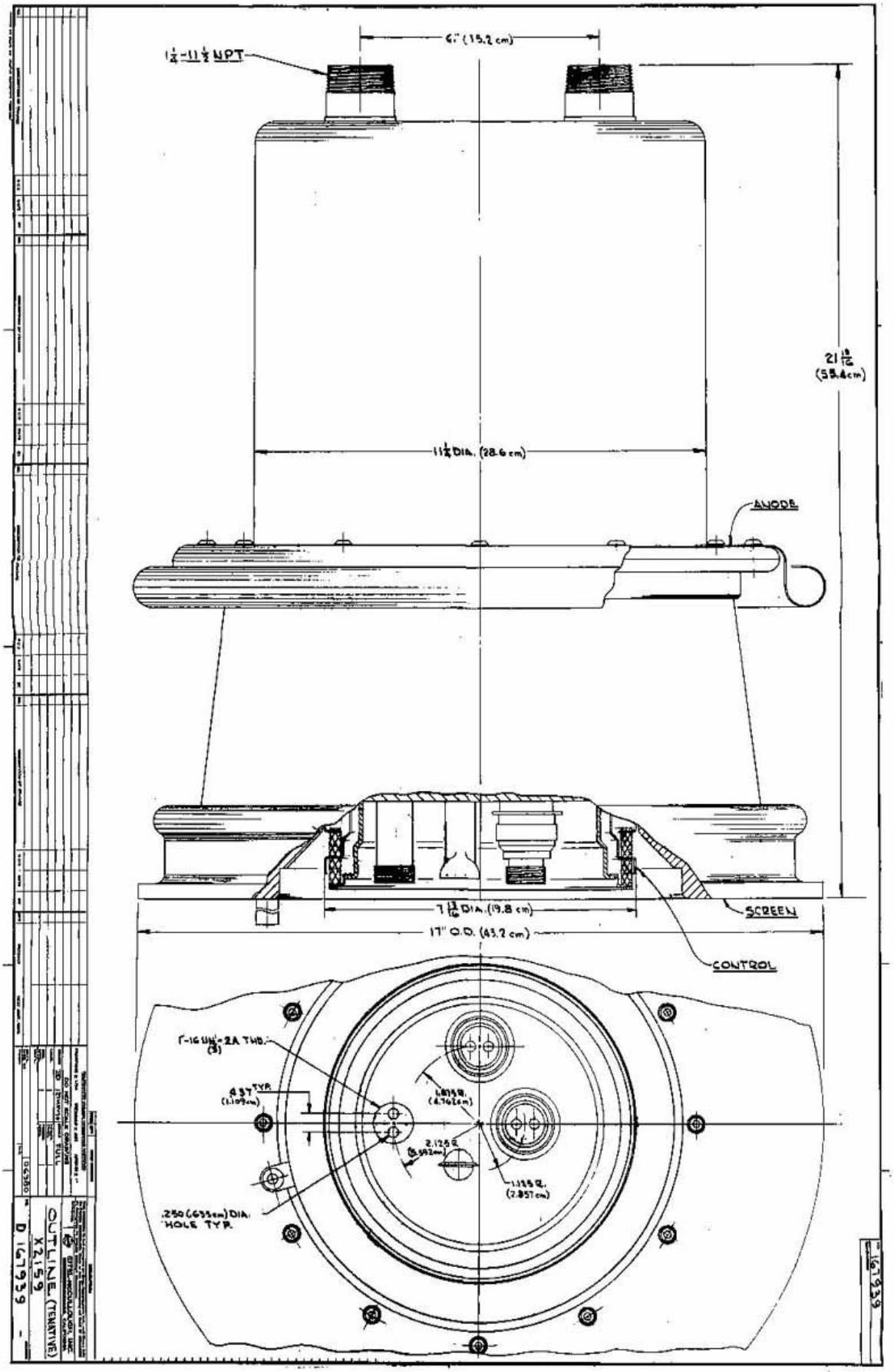
*suitable to modulate a carrier power of 2.5 MW

Pulse Modulator or Regulator

Absolute Maximum Ratings:

DC Plate Voltage	55 kV
DC Screen Voltage	2500 V
Pulse Plate Current (ib)	780 A
Plate Dissipation	1250 kW
Screen Dissipation	15.0 kW
Grid Dissipation	4.0 kW

NOTE: TYPICAL OPERATION data are obtained from direct measurement or by calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, screen and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid and screen current. The grid and screen currents which result when the desired plate current is obtained are incidental and vary from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. In the case of Class C Service, if grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.


1¼-11½ NPT
6" (15.2 cm)
21 15/16 (55.4 cm)
11¼ DIA. (28.6 cm)
ANODE
7 13/16 DIA. (19.8 cm)
SCREEN
17" O.D. (43.2 cm)
CONTROL
(3)
.437 TYP
(1.109 cm)
1.875 R.
(4.762 cm)
2.125 R.
(5.397 cm)
1.125 R.
(2.857 cm)
.250 (.635 cm) DIA.
HOLE TYP.
OUTLINE (TENTATIVE)
X2159
D167939