

ML-7479

DESCRIPTION & RATINGS

DESCRIPTION

The ML-7479 is a general-purpose vapor-cooled triode conservatively designed for 40-50 kW industrial heating and AM broadcast service.

The anode is designed to dissipate 50 kilowatts, and substantially higher power during momentary overloads or intermittent operation. It features greater mass than usual, with thick external ribs or protrusions. Efficient cooling is accomplished by vaporization of water in a boiler* and transport of the vapor to a secondary cooling circuit at a temperature of about 100°C. Sturdy coaxial grid and cath-

ode mounting structures provide low-inductance, high-dissipation r-f terminals. The cathode itself is a sturdy, self-supporting, stress-free, thoriated-tungsten filament. Envelope insulation members are strong, low-loss, ceramic cylinders.

Maximum ratings of 12.5 kVdc plate voltage and 90 kW plate input apply at frequencies up to 30 Mc. Useful power output can be obtained at frequencies up to 70 Mc at reduced plate voltage and plate input.

GENERAL CHARACTERISTICS**Electrical**

Filament Voltage	8.0	Volts
Filament Current	200	Amps
Filament Starting Current, maximum	800	Amps
Filament Cold Resistance	0.0051	Ohms
Amplification Factor	20	
Interelectrode Capacitances:		
Grid-Plate	38	pf
Grid-Filament	58	pf
Plate-Filament	1.8	pf

Mechanical

Mounting Position	Vertical, Anode Down
Type of Cooling, Anode	Vaporization of water
Air Flow on Bulb and Seals, approximate	100 cfm
Maximum Ceramic Temperature	165 °C
Net Weight, approximate	38 lb.

* For information on boiler and application details, consult the Machlett Laboratories Engineering Department.

* At frequencies up to 15 Mc, air flow should be directed primarily on filament seals and the main ceramic bulb; at higher frequencies or high ambient temperatures, additional air flow may be required on the grid seals. Air flow should be distributed to maintain uniform temperature, not greater than 165°C, around the circumference of the seals.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

(Continuous Commercial Service)

Audio-Frequency Power Amplifier and Modulator
Class B

Maximum Ratings, Absolute Values

D-C Plate Voltage	12500	volts
Max.-Signal D-C Plate Current*	7.0	amps
Max.-Signal Plate Input*	90	kW
Plate Dissipation*	50	kW

Typical Operation (Values are for two tubes)

D-C Grid Voltage	8500	10000	12000	volts
D-C Plate Voltage	-400	-500	-550	volts
Peak A-F Grid-to-Grid Voltage ..	1600	1940	2120	volts
Peak A-F Plate-to-Plate Voltage ..	14000	16000	19000	volts
Zero-Signal D-C Plate Current ..	1.3	1.2	2.4	amps
Max.-Signal D-C Plate Current ..	7.8	10.0	12.4	amps
Effective Load Resistance, Plate-to-Plate	2300	2000	1950	ohms
Max.-Signal Driving Power, approximate	200	200	170	watts
Max.-Signal Power Output, approximate	42	63	93	kW

* Averaged over any audio-frequency cycle of sine-wave form.

Radio-Frequency Power Amplifier
Class B

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum Ratings, Absolute Values

D-C Plate Voltage	12500	volts
D-C Plate Current	6.0	amps
Plate Input	75	kW
Plate Dissipation	50	kW

Typical Operation

D-C Plate Voltage	12000	10000	12000	volts
D-C Grid Voltage	-550	-450	-550	volts
Peak R-F Grid Voltage	550	580	600	volts
Peak R-F Plate Voltage	5400	4200	5300	volts
D-C Plate Current	2.6	3.6	3.2	amps
D-C Grid Current	0	0	0	mA
R-F Load Resistance	1330	730	1040	ohms
Driving Power, approximate** ..	350	550	480	watts
Power Output, approximate	11	12	13.5	kW

** At crest of audio-frequency cycle with modulation factor of 1.0.

Plate-Modulated R-F Power Amplifier
Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum Ratings, Absolute Values

D-C Plate Voltage	9000	volts
D-C Grid Voltage	-2000	volts
D-C Plate Current	6.0	amps
D-C Grid Current	1.0	amp
Plate Input	60	kW
Plate Dissipation	32	kW

Typical Operation

D-C Plate Voltage	8500	volts
D-C Grid Voltage	-1400	volts
Peak R-F Grid Voltage	2140	volts
Peak R-F Plate Voltage	7000	volts
D-C Plate Current	4.8	amps
D-C Grid Current	0.50	amp
R-F Load Resistance	800	ohms
Driving Power, approximate	1.1	kW
Power Output, approximate	30.7	kW

R-F Power Amplifier and Oscillator
Class C Telephony

Key-down conditions per tube without amplitude modulation†

Maximum Ratings, Absolute Values

D-C Plate Voltage	7500	12500	volts
D-C Grid Voltage	-2000	-2000	volts
D-C Plate Current	8.0	8.0	amps
D-C Grid Current	0.8	1.0	amp
Plate Input	54	90	kW
Plate Dissipation	50	50	kW
Frequency	70	30	Mc

Typical Operation

	Cathode-Drive Circuitry		Grid-Drive Circuitry		
D-C Plate Voltage	7500	10000	12000	12000	volts
D-C Grid Voltage	-850	-1100	-1200	-1200	volts
Peak R-F Grid Voltage	1500	1880	1880	1940	volts
Peak R-F Plate Voltage	5600	8000	10000	9800	volts
D-C Plate Current	5.3	6.5	5.4	6.4	amps
D-C Grid Current	0.35	0.48	0.30	0.35	amp
R-F Load Resistance	750	700	550	870	ohms
Driving Power, approx.	7500	900	550	670	watts
Power Output, approx.	33§	46.4	48.5	55.4	kW

† Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115% of the carrier conditions.

§ Includes power transferred from driver stage.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Characteristics	Conditions	Minimum	Limits Bogey	Maximum
Grid Voltage	$e_b = 1500$ volts; $i_b = 28$ amps	e_c :	—	1000 volts
Grid Current	$e_b = 1500$ volts; $i_b = 28$ amps	i_c :	—	8.5 amps
Plate Voltage	$E_c = 0$ Vdc; $I_b = 3.0$ Adc	E_b :	3.3	3.8 kVdc
Plate Voltage	$E_c = -200$ Vdc; $I_b = 3.0$ Adc	E_b :	7.2	7.8 kVdc
Grid Voltage	$E_b = 10.0$ kVdc; $I_b = 0.02$ Adc	E_c :	-480	-560 Vdc
Plate Power Output	$E_b = 12.0$ Adc; $E_c = -1200$ Vdc	P_o :	40	— kW
	$I_b = 5.4$ Adc; $I_c = 0.30$ Adc			

MAXIMUM FREQUENCY RATINGS

Maximum ratings apply at frequencies up to 30 Mc except as noted. The tube may be operated at higher frequencies provided the maximum values of plate voltage and plate input are reduced according to the tabulation below (other maximum ratings are the same as shown above). Special attention should be given to adequate ventilation of the bulb at the higher frequencies.

Frequency	30	50	70 Mc
Percent Maximum Rated Plate Voltage and Plate Input			
Class B	100	90	70
Class C	100	75	60

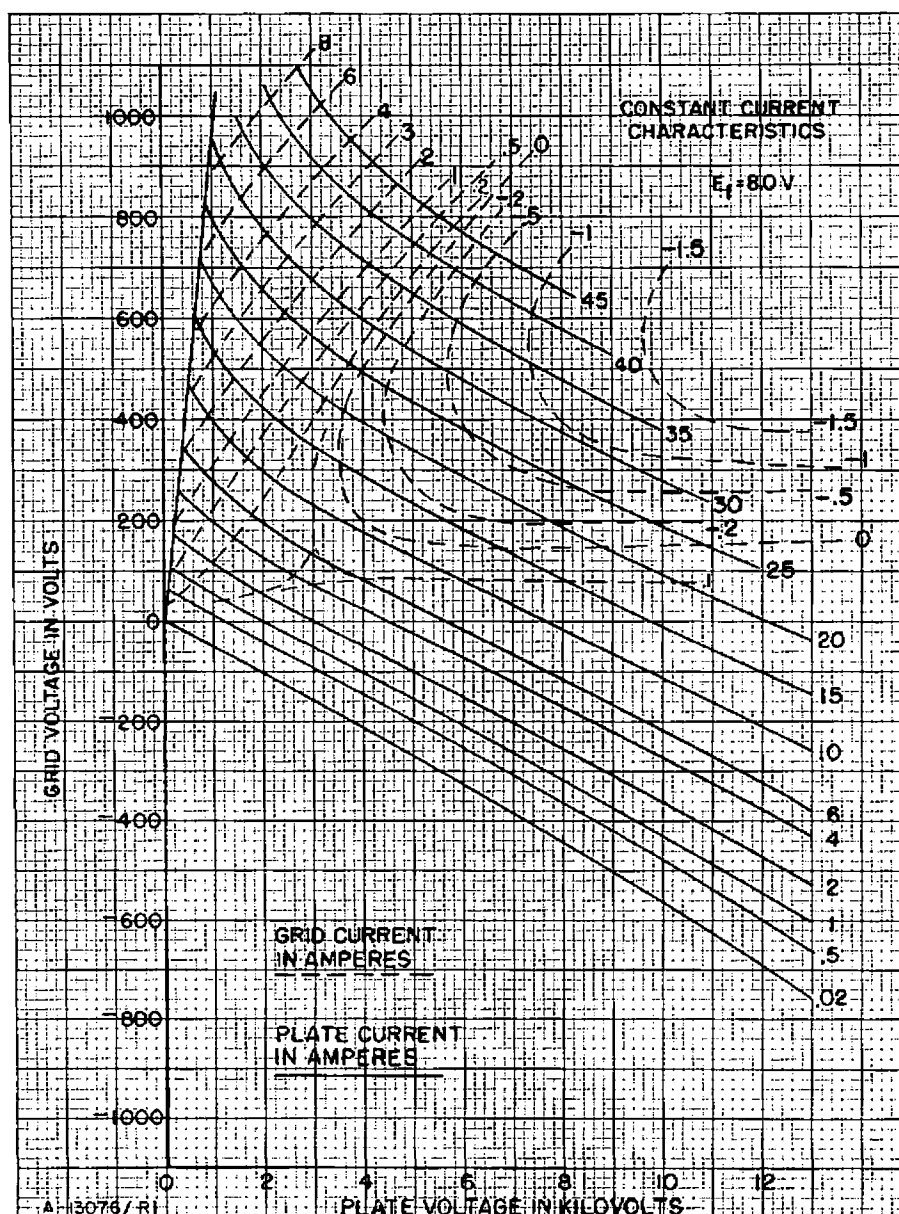
APPLICATION NOTES

The handling of high power requires particular attention

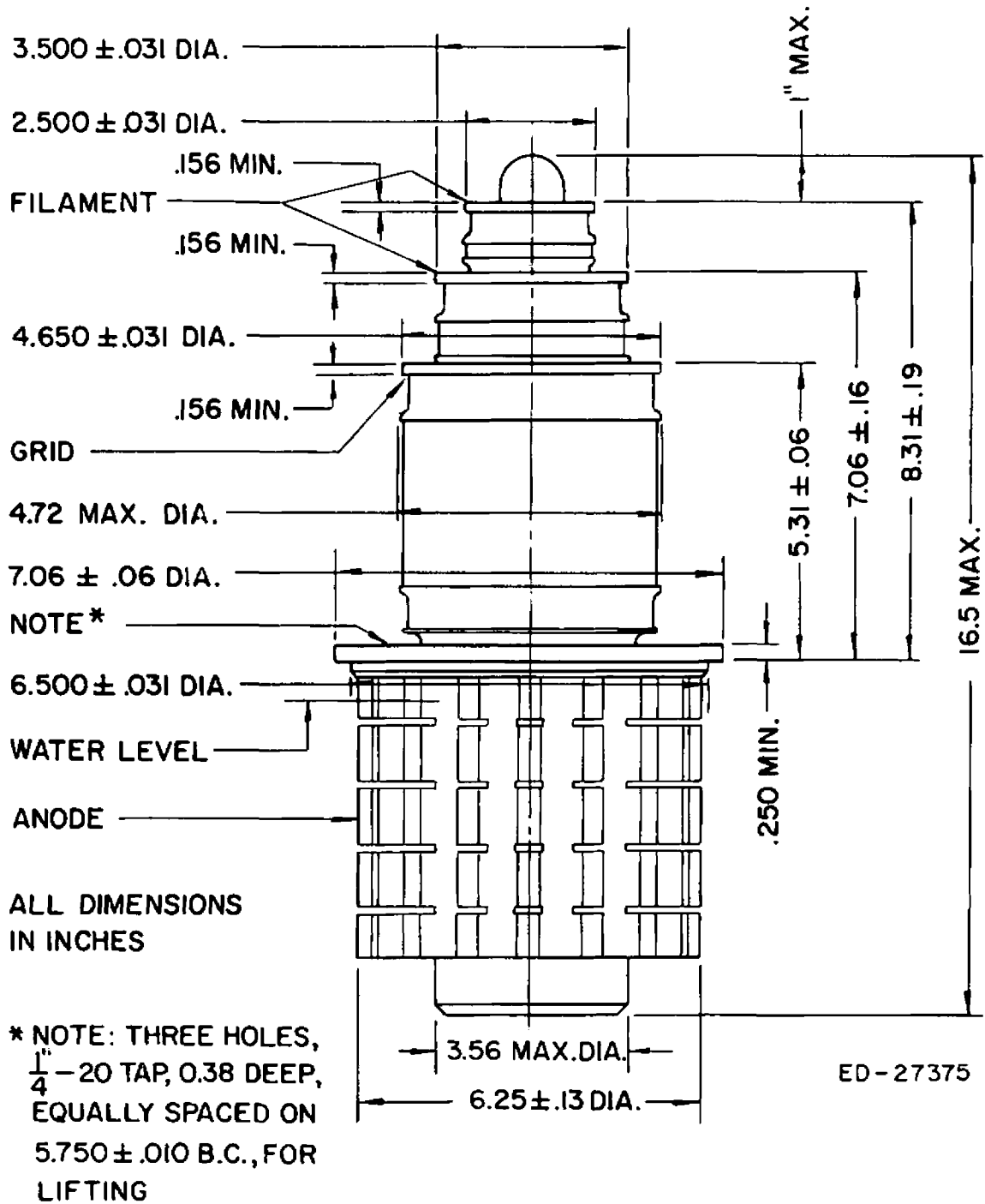
to the removal of power under fault conditions, since the large amount of energy involved can severely damage the electron tube if not properly controlled. Therefore the ground leads of the plate and grid circuits should be equipped with individual quick-acting overload relays which will remove power from these circuits within 1/10 second.

Additional protection is recommended and may be obtained by connecting a resistor in series with the plate lead of each tube for protection of the tube during the time required for the plate overload relay to act. The criterion is the total energy to which the tube can be subjected. The minimum value of resistance which will give adequate protection with reasonably low power loss is as follows:

Maximum Power Output				
of Rectifier	80	160	320	640 kW
Series Resistor	15	25	40	60 ohms



CONSTANT CURRENT CHARACTERISTICS — ML-7479



DIMENSIONS — ML-7479

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