

ML-6424
ML-6425
ML-6425F

General Purpose Triodes

30 kW CW

900 kw Pulse Power



ELECTRON TUBE SPECIALIST

DESCRIPTION

The ML-6424 and ML-6425 are general-purpose triodes suitable for industrial heating, AM broadcasting and pulse modulation. These tubes feature coaxial mounting structures providing high-dissipation, low-inductance rf electrode terminals. The cathode of each type consists of sturdy, self-supporting, stress-free, thoriated-tungsten filaments.

The ML-6424 has a water-cooled, heavy-wall anode capable of dissipating 20 kW. The ML-6425 has a forced-air-cooled, heavy-wall anode with high-efficiency disc fins.

The ML-6425-F has an anode fin construction which fits tube supports used with the type 5604.

These tubes will operate with plate voltages up to 12.5 kV in CW operation or 35 kV in pulse modulator service. Maximum ratings apply at frequencies up to 30 Mc. Useful power output can be obtained at frequencies up to 70 Mc with reduced ratings. In a typical pulse modulator application these tubes are capable of switching 900 kW.

GENERAL CHARACTERISTICS

Electrical

Filament Voltage	7.0	volts
Filament Current	120	amps
Filament Starting Current, maximum	550	amps
Filament Cold Resistance	0.0070	ohms
Amplification Factor	20	

Interelectrode Capacitances

	ML-6424	ML-6425	ML-6425-F
Grid-Plate	27	34	28 $\mu\mu\text{f}$
Grid-Filament	34	34	34 $\mu\mu\text{f}$
Plate-Filament	2.0	2.2	2.2 $\mu\mu\text{f}$

Mechanical

Mounting Position	Vertical, anode down
Type of Cooling ML-6424	Water and forced-air†
Water flow on anode, minimum for 20 kW dissipation	7 gpm
Maximum outgoing water temperature	70 °C
Type of Cooling ML-6425 & ML-6425-F	Forced-air
Air flow on anode:	
ML-6425, minimum for 12.5 kW dissipation	Pressure: 710 cfm at 4.7" water*
ML-6425-F, minimum for 11 kW dissipation	Exhaust: 815 cfm at 5.1" water*
Maximum incoming air temperature	870 cfm
Maximum Glass Temperature	50 °C
Net Weight, approximately	165 °C†
ML-6424	10 lbs.
ML-6425	15 lbs.
ML-6425-F	50 lbs.

*When used with Machlett ML-6425 Air Distributor F-17797.

†At frequencies up to 15 Mc, normal cabinet ventilation should be sufficient to cool glass portion of tube. At higher frequencies or high ambient temperature, auxiliary air flow of 25-50 cfm may be required and should be distributed to maintain uniform glass temperature, not greater than 165°C, around the circumference of the seals.

ML-6424
ML-6425
ML-6425-F

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS
(Continuous Commercial Service)
VALUES APPLY TO ALL THREE TYPES UNLESS OTHERWISE SPECIFIED

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Audio-Frequency Power Amplifier and Modulator
Class B

Maximum Ratings, Absolute Values

D-C Plate Voltage	12500	volts
Max.-Signal D-C Plate Current*	3.5	amps
Max.-Signal Plate Input*	40	amps
Plate Dissipation*		
ML-6424	20	kW
ML-6425	12.5	kW
ML-6425-F	11	kW

Typical Operation (Values are for two tubes) **ML-6424**

D-C Plate Voltage	8500	12000	volts
D-C Grid Voltage	-380	-560	volts
Peak A-F Grid-to-Grid Voltage	2020	2260	volts
Peak A-F Plate-to-Plate Voltage	14000	20400	volts
Zero-Signal D-C Plate Current	0.4	0.6	amp
Max.-Signal D-C Plate Current	6.9	6.5	amps
Effective Load Resistance, Plate-to-Plate	2550	3900	ohms
Max.-Signal Driving Power, approx.	400	260	watts
Max.-Signal Power Output, approx.	38	53	kW

* Averaged over any a-f cycle of sine-wave form.

Radio-Frequency Power Amplifier
Class B

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

Maximum Ratings, Absolute Values

D-C Plate Voltage	12500	volts
D-C Plate Current		
ML-6424	2.8	amps
ML-6425 & ML-6425-F	2.5	amps
Plate Input		
ML-6424	30.0	kW
ML-6425	19.0	kW
ML-6425-F	16.5	kW
Plate Dissipation		
ML-6424	20	kW
ML-6425	12.5	kW
ML-6425-F	11	kW

Typical Operation **ML-6424**

D-C Plate Voltage	10000	10000	volts
D-C Grid Voltage	-420	-420	volts
Peak R-F Grid Voltage	510	540	volts
Peak R-F Plate Voltage	4200	4200	volts
D-C Plate Current	1.65	1.80	amps
D-C Grid Current	0	0	mA
R-F Load Resistance	1600	1500	ohms
Driving Power, approx.§	170	200	watts
Power Output, approx.	5.5	6.0	kW

§At crest of a-f cycle with modulation factor of 1.0.

Plate-Modulated R-F Power Amplifier
Class C Telephony

Carrier conditions per tube for use with 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	2.5	amps
D-C Grid Current	0.50	amp
Plate Input	22	kW
Plate Dissipation		
ML-6424	13	kW
ML-6425	8	kW
ML-6425-F	7.5	kW

Typical Operation

D-C Plate Voltage	8500	volts
D-C Grid Voltage	-1400	volts
Peak R-F Grid Voltage	2000	volts
Peak R-F Plate Voltage	7300	volts
D-C Plate Current	1.8	amps
D-C Grid Current	0.17	amp
R-F Load Resistance	2200	ohms
Driving Power, approx.	330	watts
Power Output, approx.	12.1	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	12500	volts
D-C Grid Voltage	-2000	volts
D-C Plate Current	3.5	amps
D-C Grid Current	0.50	amps
Plate Input	40	kW
Plate Dissipation		
ML-6424	20	kW
ML-6425	12.5	kW
ML-6425-F	11	kW

Typical Operation

D-C Plate Voltage	10000	12000	12000	volts
D-C Grid Voltage	-1000	-1000	-1000	volts
Peak R-F Grid Voltage	1750	1620	1740	volts
Peak R-F Plate Voltage	8400	10500	10500	volts
D-C Plate Current	3.3	2.6	3.3	amps
D-C Grid Current	0.25	0.15	0.25	amp
R-F Load Resistance	1450	2300	1800	ohms
Driving Power, approx.	430	250	430	watts
Power Output, approx.	24.4	24.2	30.6	kW

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

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Characteristics	Conditions	Limits		
		Minimum	Bogey	Maximum
Grid Voltage	$e_b = 1500$ volts; $i_b = 14$ amps	e_c :	—	950 volts
Grid Current	$e_b = 1500$ volts; $i_b = 14$ amps	i_c :	—	4.0 amps
Plate Voltage	$E_c = 0$ Vdc; $I_b = 1.5$ Adc	E_b :	2.8	3.2
Plate Voltage	$E_c = -200$ Vdc; $I_b = 1.5$ Adc	E_b :	6.4	7.2
Grid Voltage	$E_b = 10.0$ kVdc; $I_b = 0.02$ Adc	E_c :	-470	-560
Plate Power Output	$E_b = 12.0$ kVdc; $E_c = -1000$ Vdc;	P_o :	25	—
ML-6424, ML-6425	$I_b = 3.3$ Adc; $I_c = 0.25$ Adc			kW
Plate Power Output	$E_b = 12.0$ kVdc; $E_c = -1000$ Vdc;	P_o :	21	—
ML-6425-F	$I_b = 2.6$ Adc; $I_c = 0.15$ Adc			kW

MAXIMUM FREQUENCY RATINGS

Maximum ratings apply up to 30 Mc except as noted. The tube may be operated at higher frequencies provided the maximum values of plate voltage and power input are reduced according to the tabulation on the right (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

COOLING CHARACTERISTICS — ML-6424

Pulse Modulator or Pulse Amplifier ‡

Maximum Ratings, Absolute Values

D-C Plate Voltage	35 kV
Peak Plate Voltage	35 kv
Peak Positive Grid Voltage	-4800 volts
Pulse Cathode Current	45 amps
Grid Dissipation	400 watts
Plate Dissipation	12.5 kW
Pulse Duration, approximate*	1000 μsec
Duty Factor*	0.03

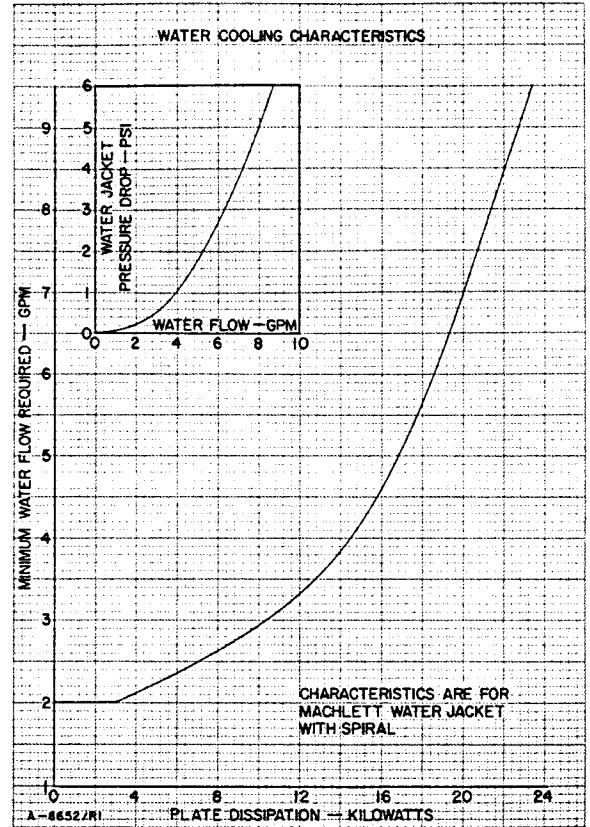
Typical Operation

D-C Plate Voltage	30 kV
D-C Grid Voltage	-2000 volts
Pulse Positive Grid Voltage	1500 volts
Pulse Plate Current	36 amps
Pulse Grid Current	4 amps
Pulse Driving Power	16 kw
Pulse Power Output	900 kw
Plate Output Voltage	25 kv

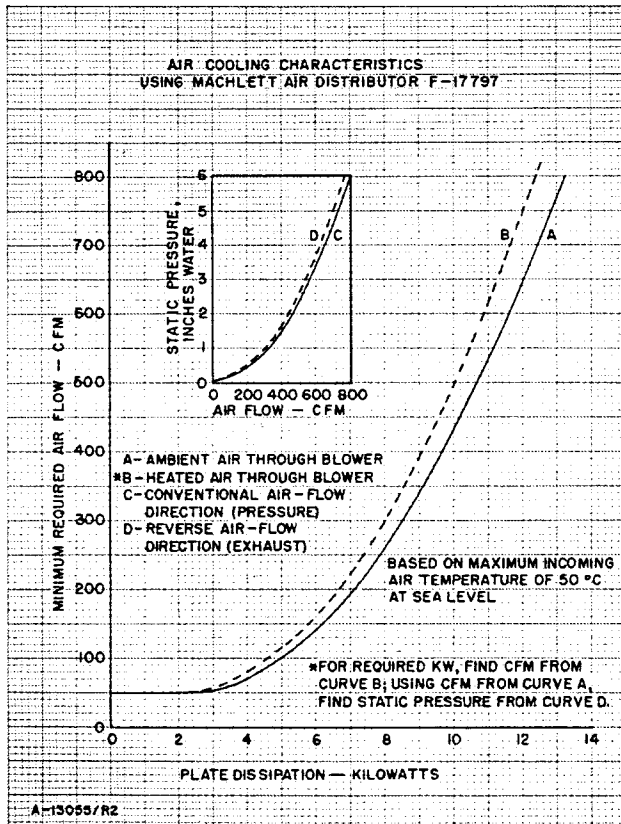
‡When ordering for this application add the suffix "P" to the Machlett tube number.

*For applications requiring longer pulse duration or higher duty factors, consult the Machlett Engineering Department.

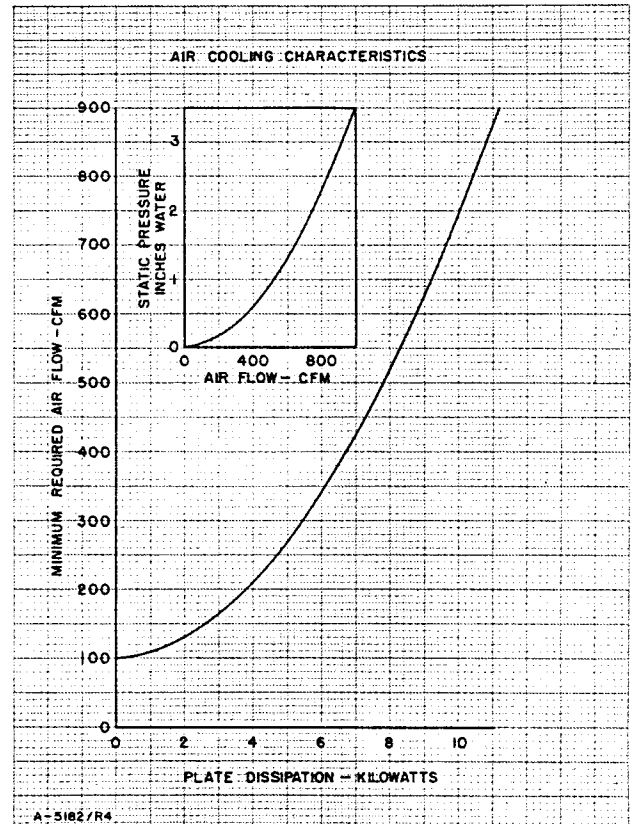
WARNING: Operation of this tube may produce x-rays. Adequate rayproof shielding must therefore be provided in the equipment.

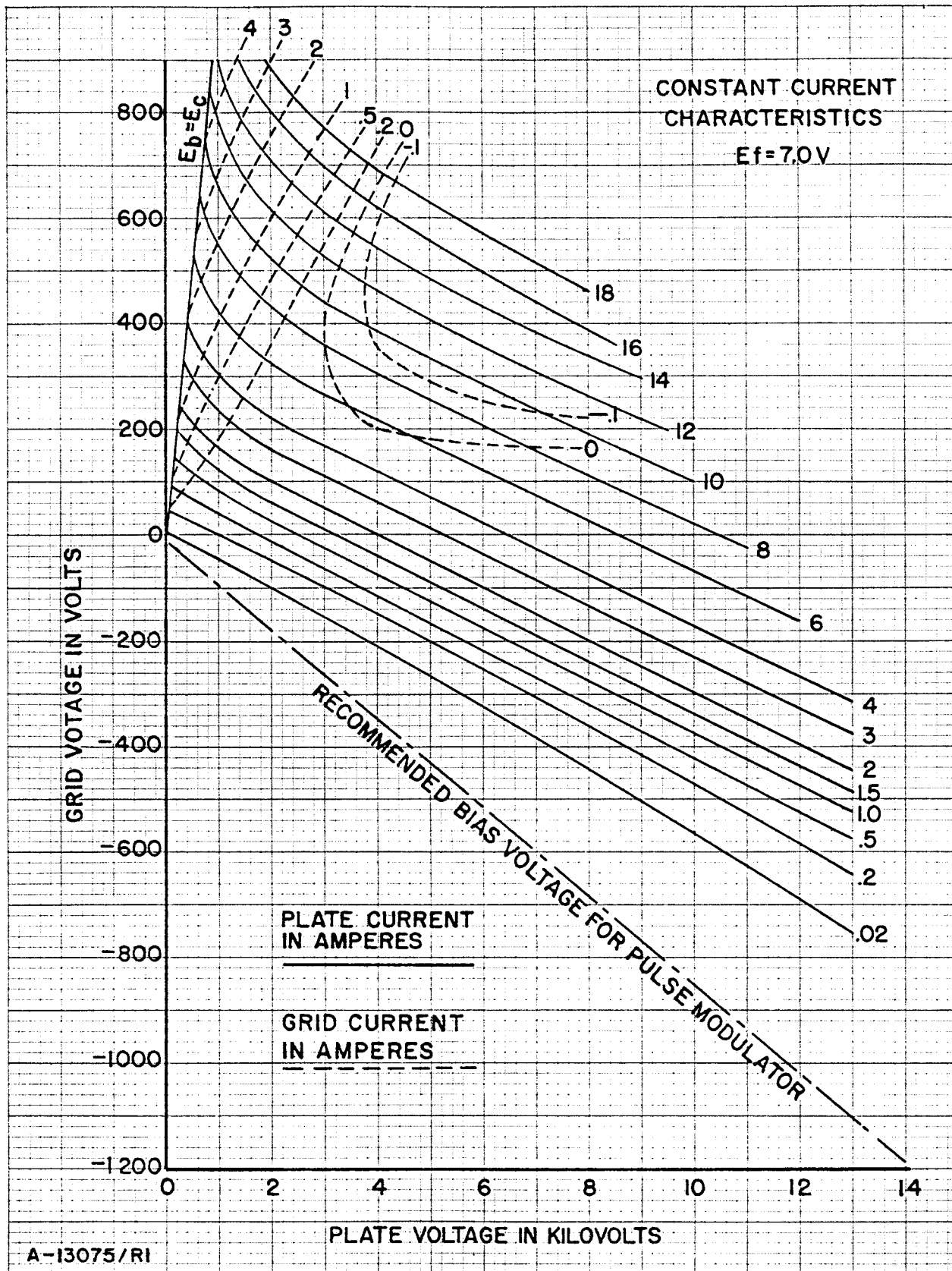


COOLING CHARACTERISTICS — ML-6425



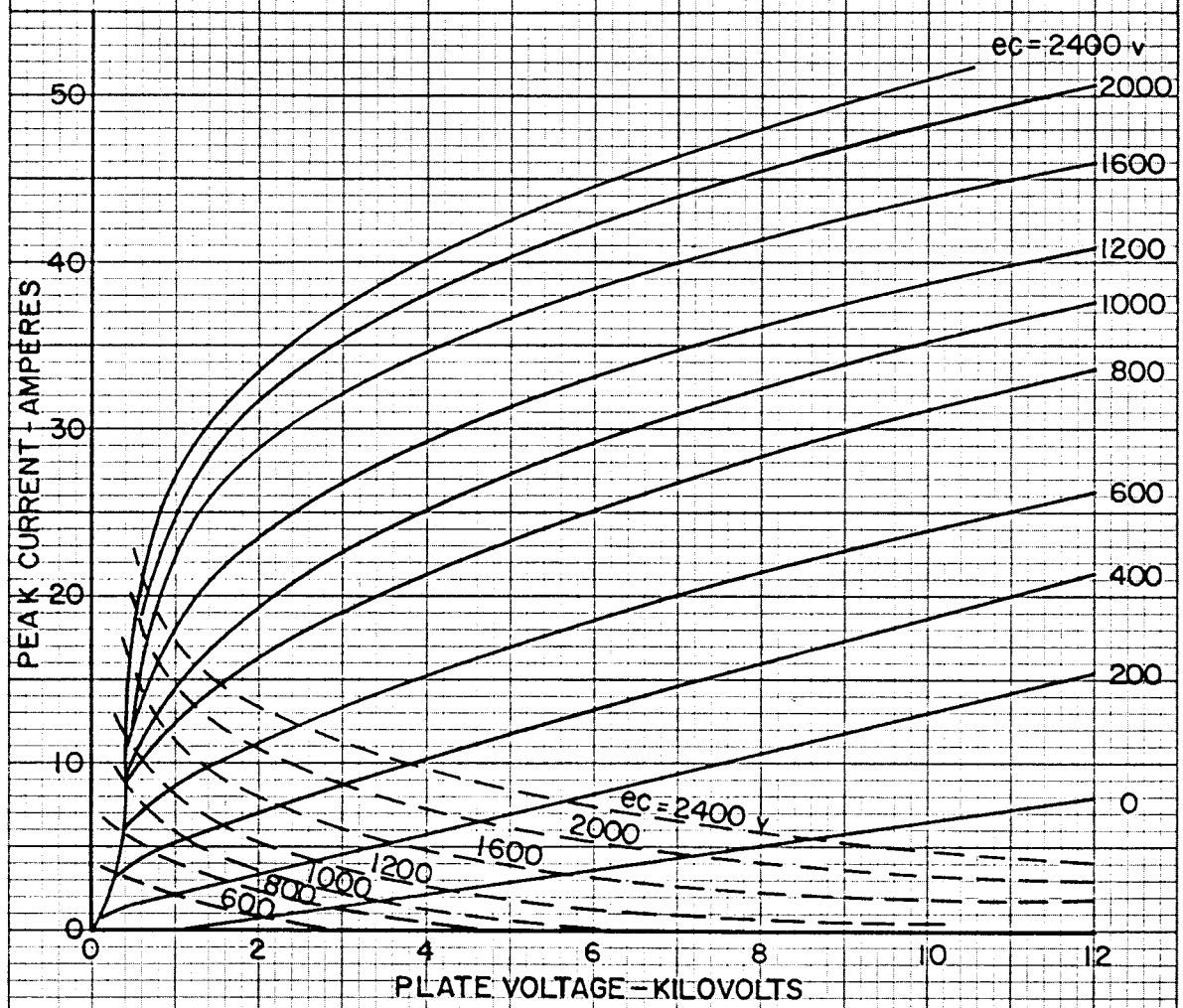
COOLING CHARACTERISTICS — ML-6425-F

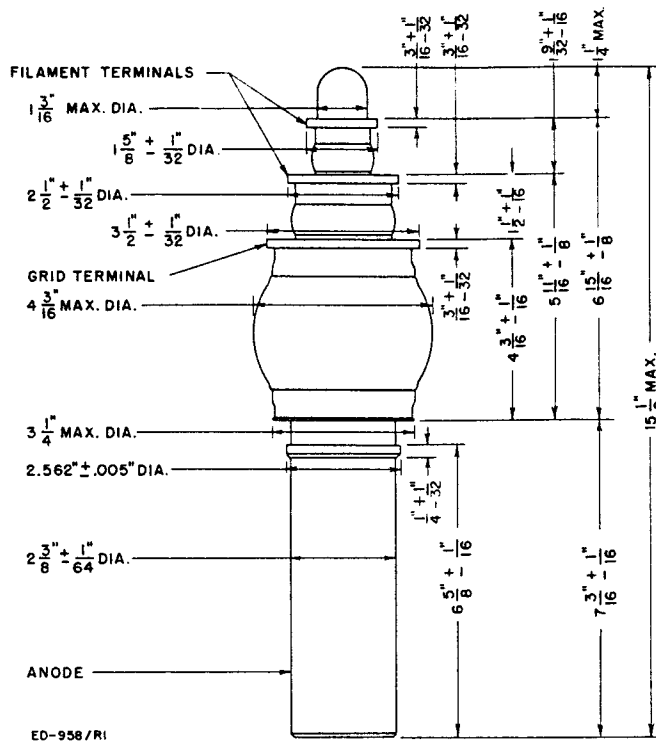




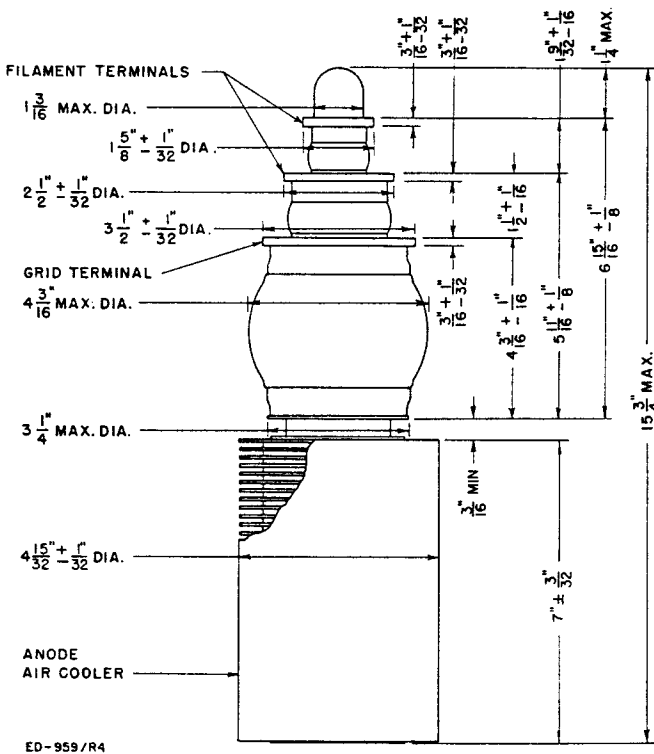
CONSTANT GRID-VOLTAGE CHARACTERISTICS
 $E_f = 7.0$ VOLTS

PLATE CURRENT ———
GRID CURRENT - - - - -
 $e_c =$ PEAK POSITIVE
GRID VOLTAGE

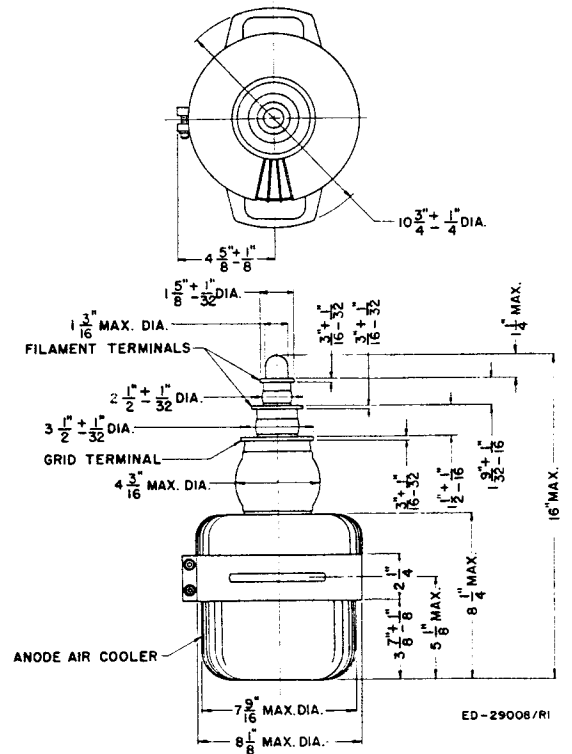




DIMENSIONS — ML-6424



DIMENSIONS — ML-6425



DIMENSIONS — ML-6425-F

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