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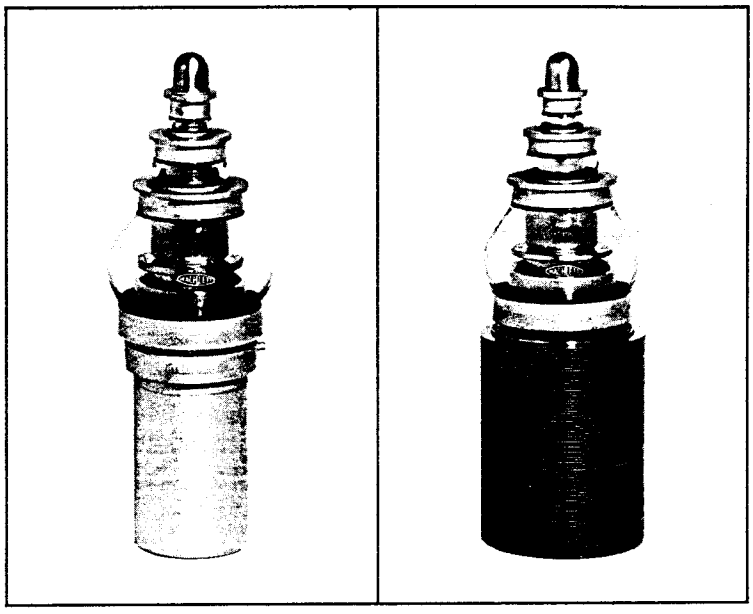


ISSUED 3-70

ML-6426
ML-6427

MACHLETT

General Purpose Triodes
55 kW CW
2.1 Mw Pulse Power

DESCRIPTION

The ML-6426 and ML-6427 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-6426 has a water-cooled, heavy-wall anode capable of dissipating 40 kW. The ML-6427 has a forced-air-cooled, heavy-wall anode with high-efficiency disc fins capable of dissipating 20 kW.

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 MHz. Useful power output can be obtained at frequencies up to 70 MHz with reduced ratings. In a typical pulse modulator application these tubes are capable of switching 2.1 Mw.

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	50	pf
Plate-Filament	1.8	pf

Mechanical

Mounting Position	Vertical, anode down	
Type of Cooling — ML-6426	Water and forced-air†	
Water flow on anode, minimum for 40 kW dissipation	20	gpm
Maximum outgoing water temperature	70	°C
Type of Cooling — ML-6427	Forced-air	
Air flow on anode, minimum for 20 kW dissipation*	Pressure: 1000 cfm at 7.7" water Exhaust: 1150 cfm at 8.4" water	
Maximum incoming air temperature	50	°C
Maximum Envelope Temperature	165	°C†
Net Weight, approximate		
ML-6426	13	lbs.
ML-6427	30	lbs.

*When used with Machlett ML-6427 Air Distributor, F-17798.

†At frequencies up to 15 MHz, normal cabinet ventilation should be sufficient to cool glass portions of tube. At higher frequencies or high ambient temperatures, auxiliary air flow of 50-150 cfm may be required and should be distributed

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

(Continuous Commercial Service)

VALUES APPLY TO BOTH TYPES UNLESS OTHERWISE SPECIFIED

Audio-Frequency Power Amplifier and Modulator Class B

Maximum Ratings, Absolute Values	*ML-6426*	*ML-6427*	
D-C Plate Voltage	12500	12500	volts
Max.-Signal D-C Plate Current*	8.0	7.0	amps
Max.-Signal Plate Input*	80	60	kW
Plate Dissipation*	40	20	kW

Typical Operation (Values are for two tubes)	*ML-6426*			
D-C Plate Voltage	8500	10000	12000	volts
D-C Grid 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	*ML-6426*	*ML-6427*	
D-C Plate Voltage	12500	12500	volts
D-C Plate Current	6.0	6.0	amps
Plate Input	60	32	kW
Plate Dissipation	40	20	kW

Typical Operation	*ML-6426*			
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	*ML-6426*	*ML-6427*	
D-C Plate Voltage	9000	9000	volts
D-C Grid Voltage	-2000	-2000	volts
D-C Plate Current	6.0	5.5	amps
D-C Grid Current	1.0	1.0	amp
Plate Input	53	53	kW
Plate Dissipation	26	13	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 Telegraphy

Key-down conditions per tube without amplitude modulation‡

Maximum Ratings, Absolute Values	*ML-6426*		*ML-6427*		
D-C Plate Voltage	7500	12500	7500	12500	volts
D-C Grid Voltage	-2000	-2000	-2000	-2000	volts
D-C Plate Current	8.0	8.0	8.0	8.0	amps
D-C Grid Current	0.8	1.0	0.8	1.0	amp
Plate Input	48	80	48	80	kW
Grid Dissipation	750	750	750	750	watts
Plate Dissipation	40	40	20	20	kW
Frequency	70	30	70	30	MHz

Typical Operation	*Cathode-Drive Circuitry*	*Grid-Drive Circuitry*			
				ML-6426	
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.

Note: The Maximum Plate Input Ratings are based on operating efficiencies high enough to insure that the Maximum Plate Dissipation Ratings are not exceeded.

Pulse Modulator or Pulse Amplifier‡

Maximum Ratings, Absolute Values

D-C Plate Voltage	35	kV
Peak Plate Voltage	40	kv
Peak Negative Grid Voltage	−5000	volts
Pulse Cathode Current	85	amps
Grid Dissipation	750	watts
Plate Dissipation	20	kW
Pulse Duration, approximate*	1000	μsec
Duty Factor*	0.03	

Typical Operation

D-C Plate Voltage	35	kV
D-C Grid Voltage	−3500	volts
Pulse Positive Grid Voltage	1300	volts
Pulse Plate Current	70	amps
Pulse Grid Current	8	amps
Pulse Driving Power	40	kw
Pulse Power Output	2.1	Mw
Plate Output Voltage	30	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.

CAUTION, X-RAYS: This device may produce x-rays when energized. Operating personnel must be protected by appropriate shielding. X-ray warning signs or labels should be permanently attached to equipment directing operating personnel never to operate this device without x-ray shielding in place.

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

MAXIMUM FREQUENCY RATINGS

Maximum ratings apply at frequencies up to 30 MHz 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 MHz
Percent Maximum Rated Plate Voltage and Plate Input			
Class B	100	90	70
Class C	100	75	60

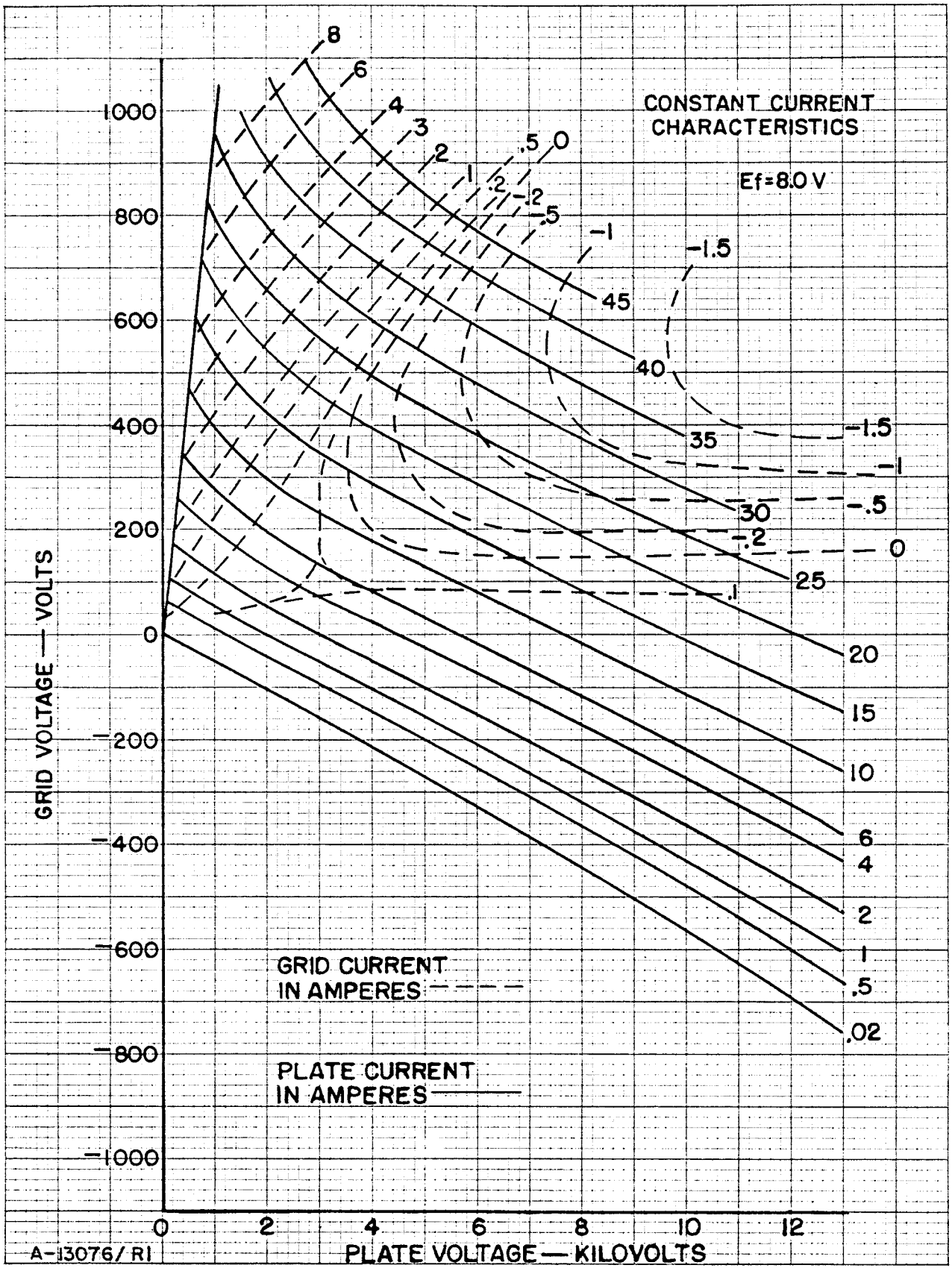
ACCESSORIES

Item	Part No.
Small Filament Connector	F-17487
Large Filament Connector	F-17488
Grid Connector	F-17489
Water Jacket for ML-6426	F-17292
O-Ring Gasket for ML-6426 Water Jacket	P-17494
Mounting Clamp for ML-6426 Water Jacket	P-15198
Mounting Plate for ML-6426 Mounting Clamp	F-15196
Air Distributor for ML-6427	F-17798
Spring Clips for ML-6427 Air Distributor	P-21113
Tube Support for ML-6427	F-17795

NOTE: For additional information on accessories, refer to Accessory Data Sheet No. ST-1295.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Characteristics	Conditions		Limits Minimum	Limits Bogey	Limits 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	4.3	kVdc
Plate Voltage	E_c = −200 Vdc; I_b = 3.0 Adc	E_b:	7.2	7.8	8.4	kVdc
Grid Voltage	E_b = 12.0 kVdc; I_b = 0.02 Adc	E_c:	−570	−670	−800	Vdc
Plate Power Output	E_b = 12.0 kVdc; E_c = −1200 Vdc; I_b = 5.4 Adc; I_c = 0.30 Adc	P_o:	40	———	———	kW


CONSTANT CURRENT CHARACTERISTICS
Ef=8.0 V
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — KILOVOLTS
GRID CURRENT IN AMPERES
PLATE CURRENT IN AMPERES
1000
800
600
400
200
0
−200
−400
−600
−800
−1000
0
2
4
6
8
10
12
8
6
4
3
2
1
.5
0
.2
−.2
−.5
−1
−1.5
45
40
35
30
25
20
15
10
6
4
2
1
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−.5
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0
.1
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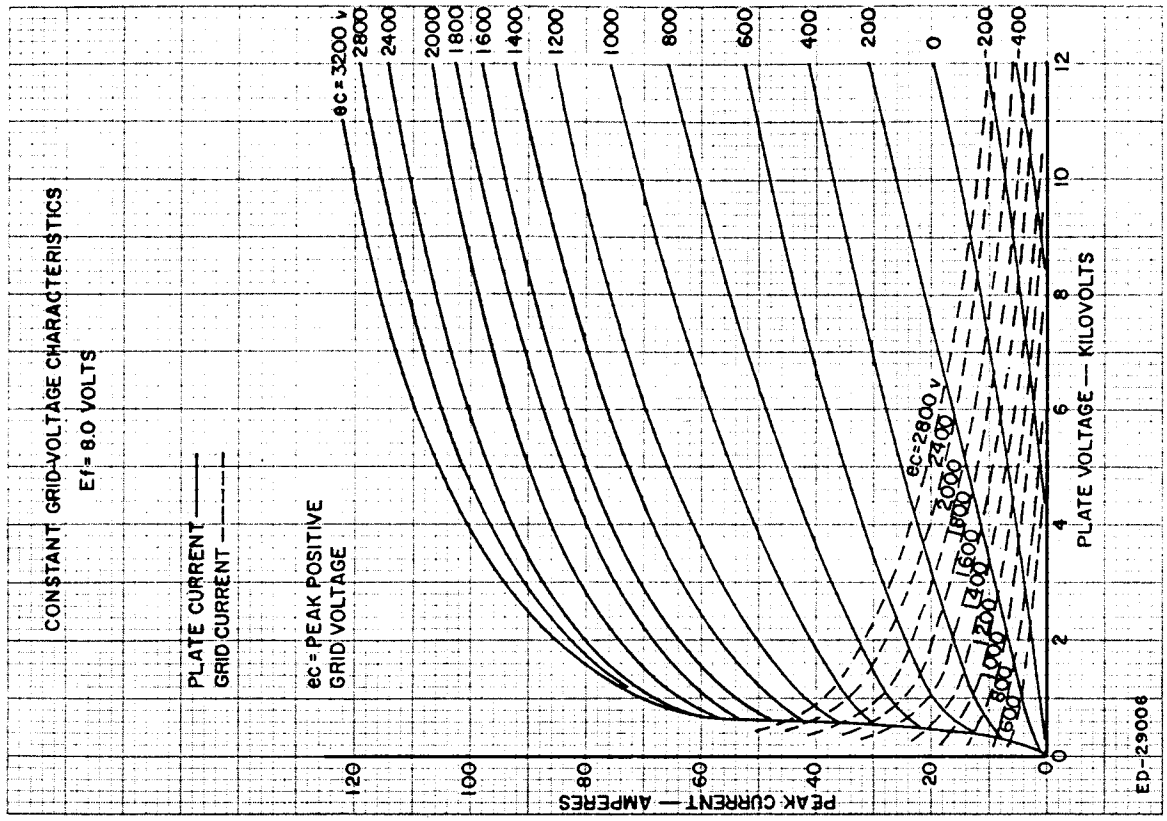
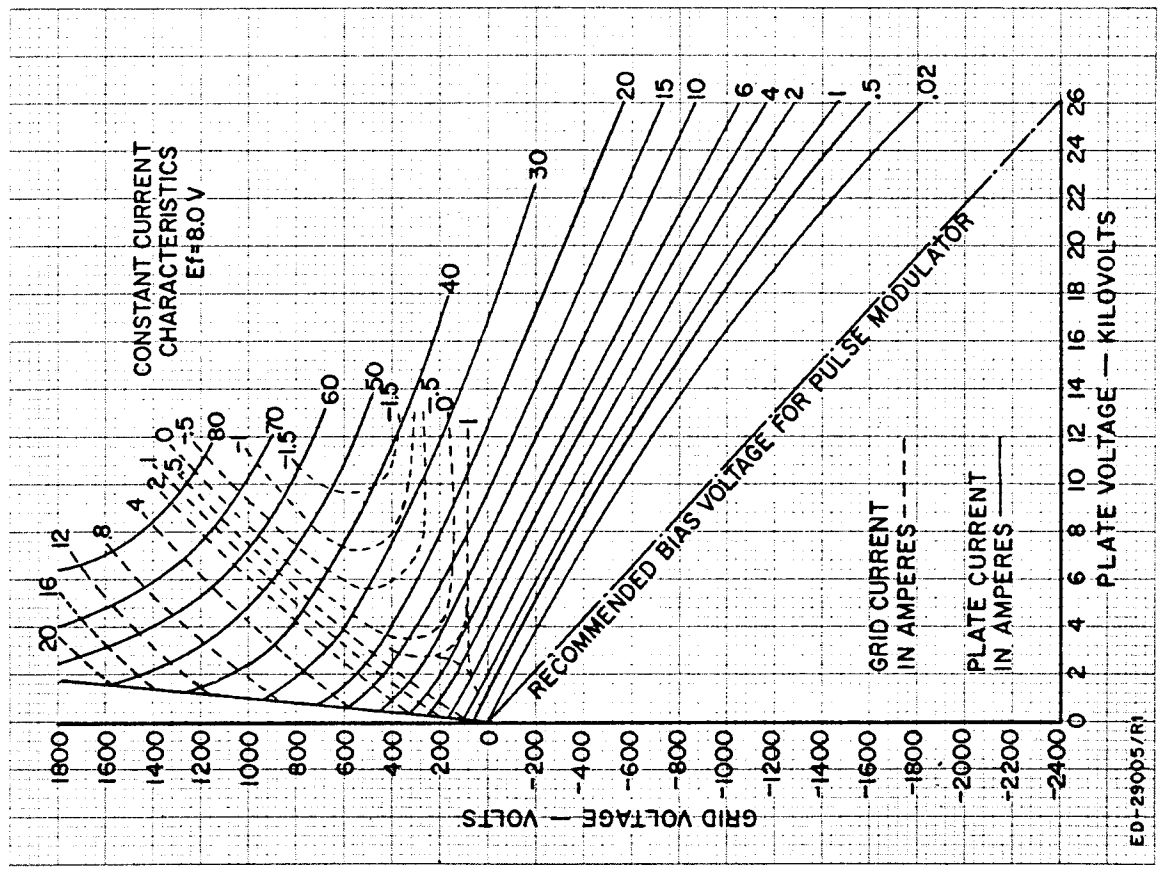
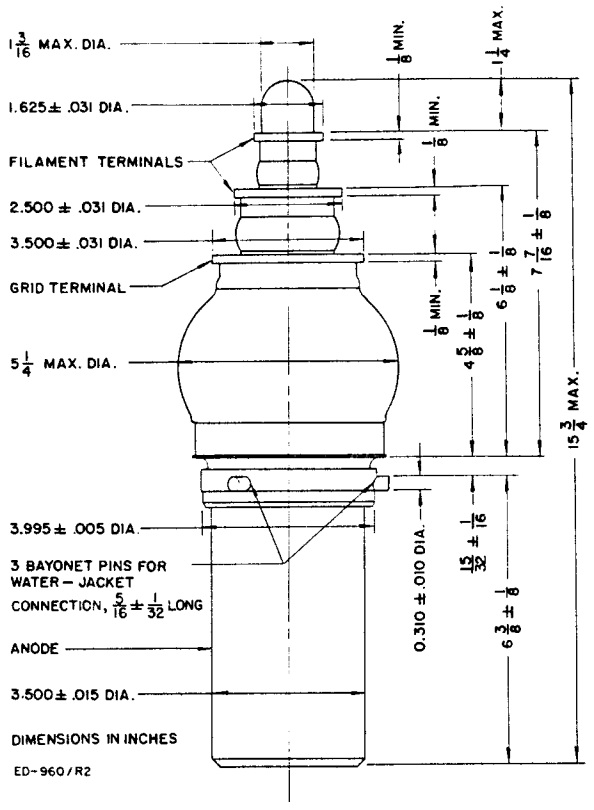
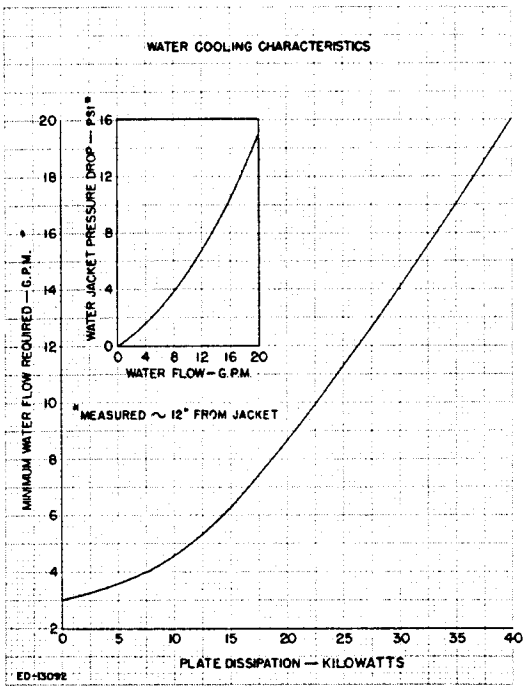
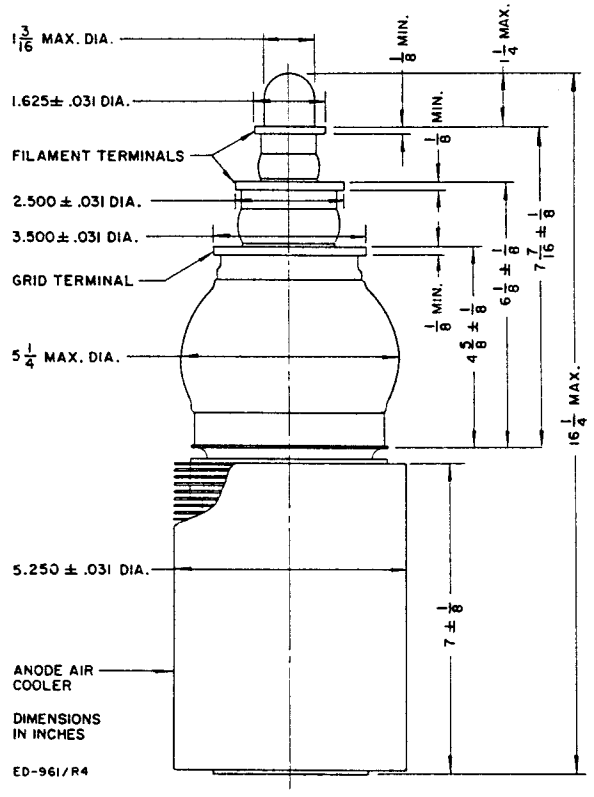

CONSTANT GRID-VOLTAGE CHARACTERISTICS
Ef = 8.0 VOLTS
PLATE CURRENT
GRID CURRENT
ec = PEAK POSITIVE GRID VOLTAGE
ec = 3200 v
2800
2400
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
-400
ec=2800 v
2400
2000
1800
1600
1400
1200
1000
800
600
400
200
PEAK CURRENT — AMPERES
PLATE VOLTAGE — KILOVOLTS
ED-29006


CONSTANT CURRENT CHARACTERISTICS
Ef=8.0 V
20
16
12
8
4
2.5
2.1
.5
0
-.5
80
-1
70
-1.5
60
50
-1.5
-.5
0
-.5
-1
40
30
20
15
10
6
4
2
1
.5
.02
RECOMMENDED BIAS VOLTAGE FOR PULSE MODULATOR
GRID CURRENT IN AMPERES
PLATE CURRENT IN AMPERES
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — KILOVOLTS
ED-29005/R1



DIMENSIONS — ML-6426





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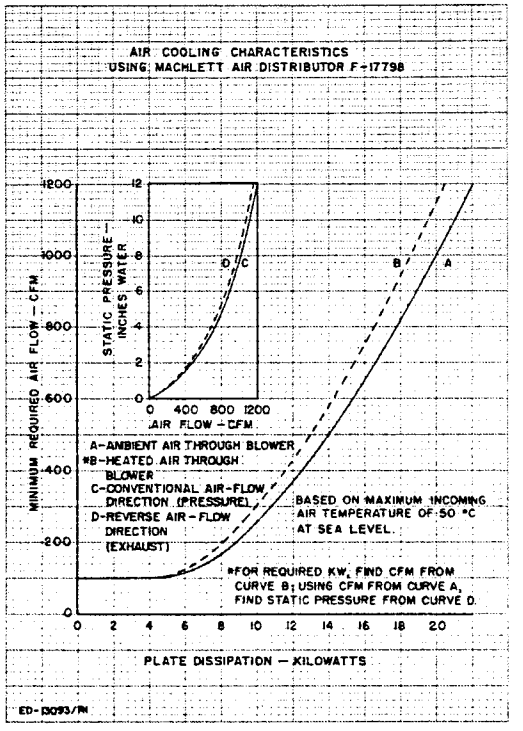

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