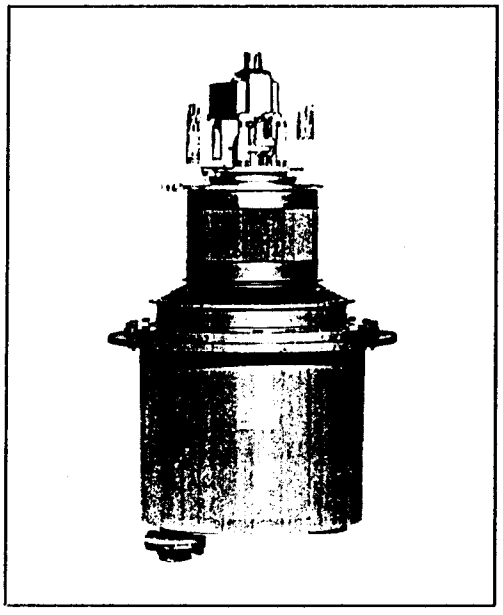
ISSUED 5-64



ML-8549

Super Power Triode

High Duty
Pulse Power
to 60 Mw

MACHLETT
ELECTRON TUBE SPECIALIST

DESCRIPTION

The ML-8549 is a super-power general-purpose water-cooled triode featuring extremely favorable plate-grid current division which results in minimum drive-power requirements. The cathode of this tube consists of sturdy self-supporting thoriated-tungsten filaments. The coaxial terminals have low inductance and high heat-dissipation capability. Insulating members are low-loss ceramic.

When used as a switch tube in hard-tube pulse modulators for radar or similar applications, it can deliver more than 60 Mw pulse output with pulse widths up to 10,000 microseconds at a duty factor of .06. When used as a pulsed rf amplifier operating at frequencies up to 30 Mc, the ML-8549 is capable of delivering 10 Mw, also at long pulse duration and high duty factors. When used as a pulsed modulator, a maximum plate voltage of 65 kVdc applies.

When operating as a Class C amplifier or oscillator at frequencies up to 30 Mc, the ML-8549 is capable of a continuous output in excess of 2.0 MW. The maximum CW plate-voltage rating of 25 kVdc applies at frequencies up to 30 Mc. Useful power output can be obtained at higher frequencies with reduced plate voltage and input.

The water-cooled anode of the ML-8549 is capable of dissipating up to 500 kW. The tube can be operated in air at maximum plate voltage ratings. The ML-8549 is supplied with an ion pump for maintaining a high vacuum during operation. This pump is normally mounted on the cathode end of the tube but can be mounted in a concealed position within the anode water jacket on special order.

Note: Data contained herein are based on initial design and test criteria. Before using these data in final equipment designs, consult Machlett for possible revisions.

GENERAL CHARACTERISTICS

Electrical		
Filament Voltage	7.6	V
Filament Current	1900	A
Amplification Factor	20	
Interelectrode Capacitances		
Grid-Plate	280	pf
Grid-Cathode	730	pf
Plate-Cathode	25	pf
Mechanical		
Mounting Position	Vertical	
Type of Cooling	Water and forced-air	
Water flow on anode for 500 kW dissipation	100	gpm†
Water jacket pressure for 100 gpm flow	30	psi
Maximum Ceramic Temperature	165	°C
Net Weight, approximate		
Tube	350	lb.
Water jacket and accessories	600	lb.

†Additional forced-air or forced-oil cooling of the grid and filament terminals will be required.

ACCESSORIES

Item	Part No.
Filament Connector	510269
Cathode Connector	510270
Grid Connector	510272
Water Jacket	510271
Ion Pump Connector with 14 ft. Polyethylene Cable	
With Cannon Connector	924-0022*
With unterminated supply end	924-0715*

*Part number of Varian Associates, Palo Alto, California.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Pulse Modulator or Pulse Amplifier

Maximum Ratings, Absolute Values		
DC Plate Voltage	65	kV▲
Peak Plate Voltage	70	kv▲
DC Grid Voltage	—5000	V
Peak Negative Grid Voltage	—6000	v
Pulse Cathode Current	1200	a
Grid Dissipation	9	kW
Plate Dissipation	500	kW
Pulse Duration	10	ms#
Duty Factor	.06	#
Typical Operation		
DC Plate Voltage	65	kV
DC Grid Voltage	—4000	V
Pulse Positive Grid Voltage	3000	v
Pulse Plate Current	1100	a
Pulse Grid Current	10	a
Pulse Driving Power	70	kw
Pulse Power Output	65	Mw
Pulse Plate Output Voltage	59	kv

Plate-Modulated RF Power Amplifier Class C Telephony

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

Maximum Ratings, Absolute Values			
DC Plate Voltage	16		kV
DC Grid Voltage	—4000		V
DC Plate Current	100		A
Plate Input	1.6		MW
Plate Dissipation	330		kW
Typical Operation	Cathode Drive	Grid Drive	
DC Plate Voltage	15	15	kV
DC Grid Voltage	—2000	—2000	V
Peak RF Plate Voltage	13	13	kv
Peak RF Grid Voltage	3500	3500	v
DC Plate Current	90	90	A
Peak RF Fundamental Plate Current	162	162	a
RF Load Resistance	102	78	ohms
Driving Power	300	4	kW
Plate Dissipation	300	300	kW
Power Output	1.3‡	1.1	MW

Plate-Pulsed RF Power Amplifier and Oscillator Class C

Maximum Ratings, Absolute Values			
Peak Plate Pulse Supply Voltage	40		kv▲
DC Grid Voltage	—4000		V
Pulse Cathode Current	1200		a
Grid Dissipation	9		kW
Plate Dissipation	500		kW
Pulse Duration	10		ms#
Duty Factor	.06		#
Typical Operation	Cathode Drive	Grid Drive	
Peak Plate Pulse Supply Voltage	38	38	kv
DC Grid Voltage	—2300	—2300	V
Peak RF Grid Voltage	5500	5500	v
Peak RF Plate Voltage	32	32	kv
Peak Plate Current from Pulse Supply	400	400	a
Peak RF Fundamental Plate Current	630	630	a
Peak Plate Dissipation	5.2	5.2	Mw
Plate Dissipation at .01 Duty	52	52	kW
Peak Driving Power	1750	33	kw
Peak Grid Dissipation	24	24	kw
RF Load Resistance	60	51	ohms
Peak Power Output	11.8‡	10	Mw

RF Power Amplifier and Oscillator Class C Telegraphy

Key-down conditions per tube without amplitude modulation.†

Maximum Ratings, Absolute Values				
DC Plate Voltage	25			kV
DC Grid Voltage	—4000			V
DC Plate Current	150			A
Plate Input	3.0			MW
Plate Dissipation	500			kW
Typical Operation	Cathode Drive	Grid Drive	Grid Drive	
DC Plate Voltage	20	20	25	kV
DC Grid Voltage	—2600	—2600	—3100	V
Peak RF Grid Voltage	4400	4400	4900	v
Peak RF Plate Voltage	18000	18000	23000	v
DC Plate Current	110	110	115	A
Peak RF Fundamental Plate Current	200	200	220	a
RF Load Resistance	112	90	107	ohms
Plate Dissipation	460	460	450	kW
Grid Driving Power	450	9	10	kW
Grid Dissipation	2500	2500	2500	W
Power Output	2.3‡	1.8	2.5	MW

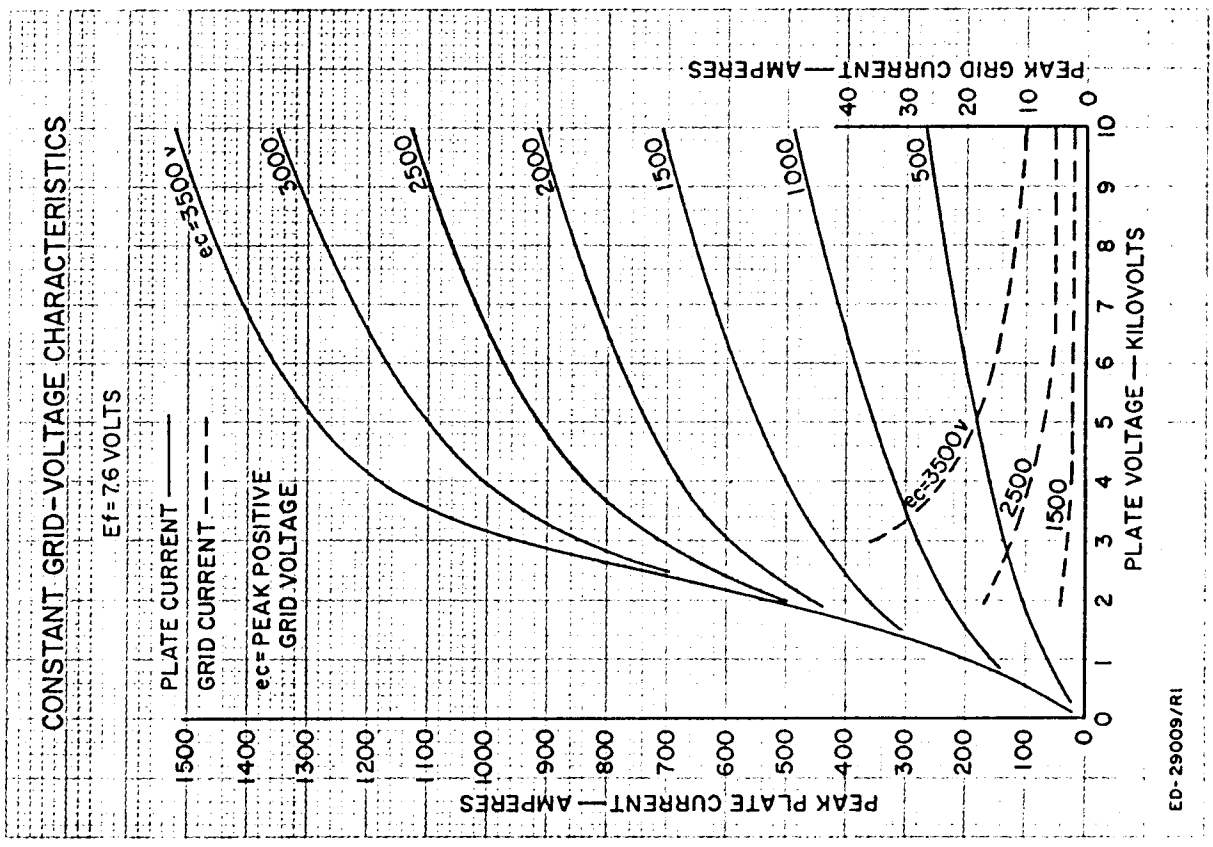
▲Maximum plate voltage ratings apply with the tube in air or immersed in oil.

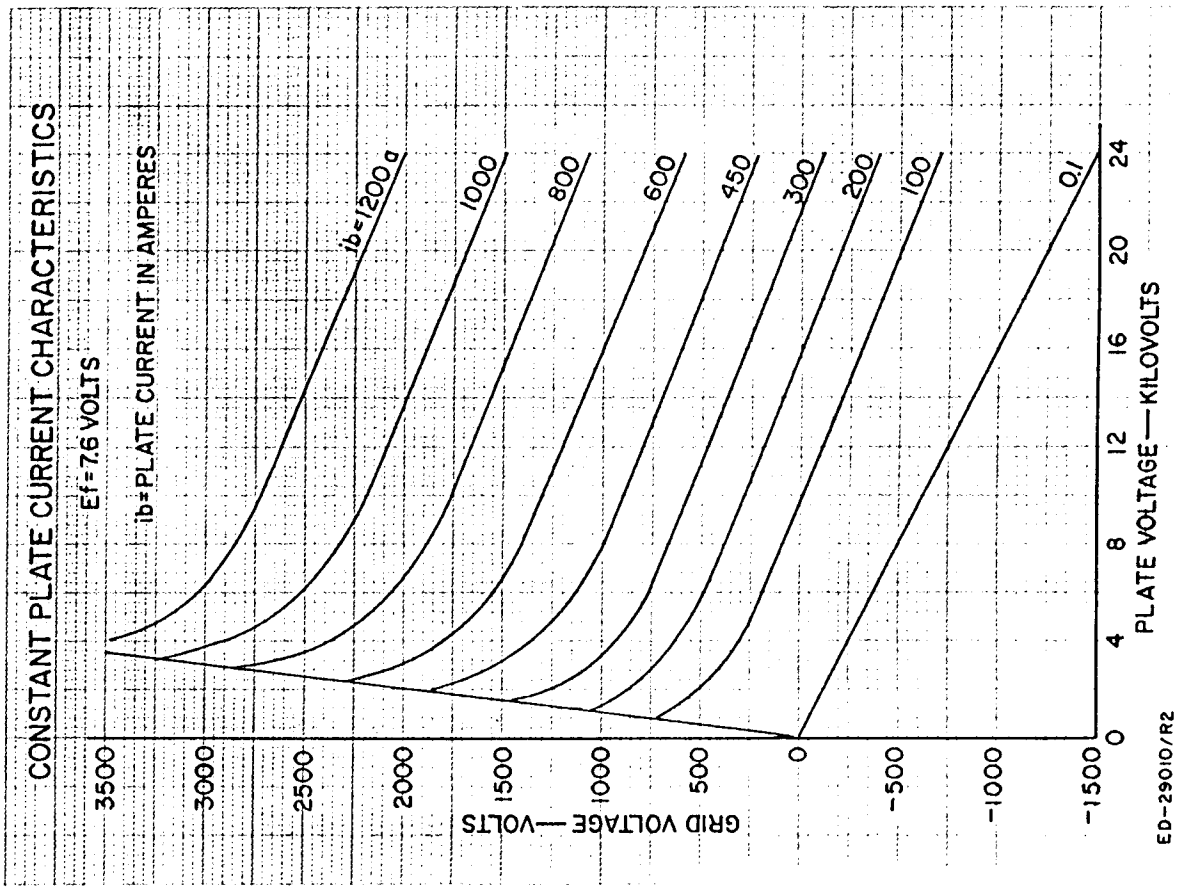
For applications requiring longer pulse duration or higher duty factors, consult the Machlett Engineering Department.

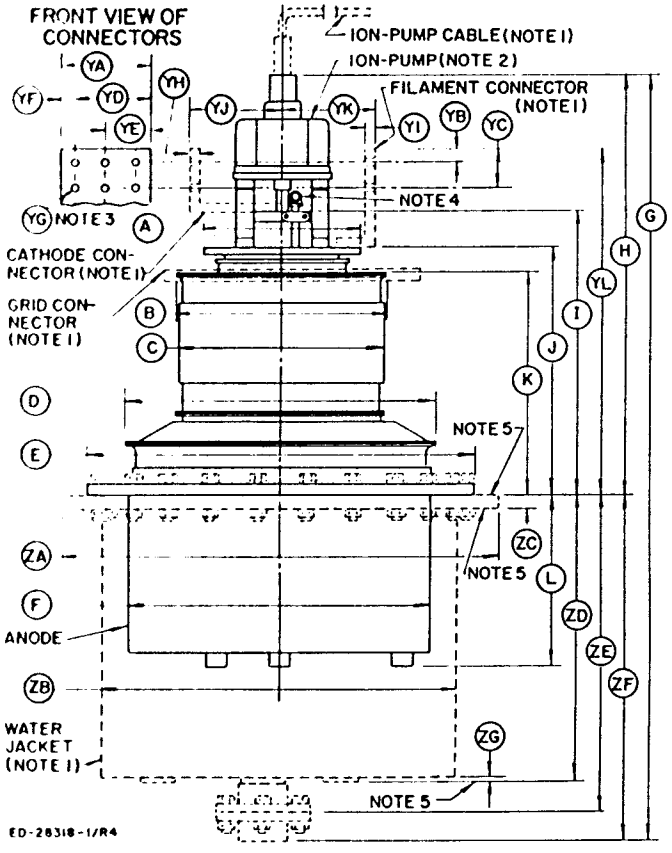
†Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115% of the carrier conditions.

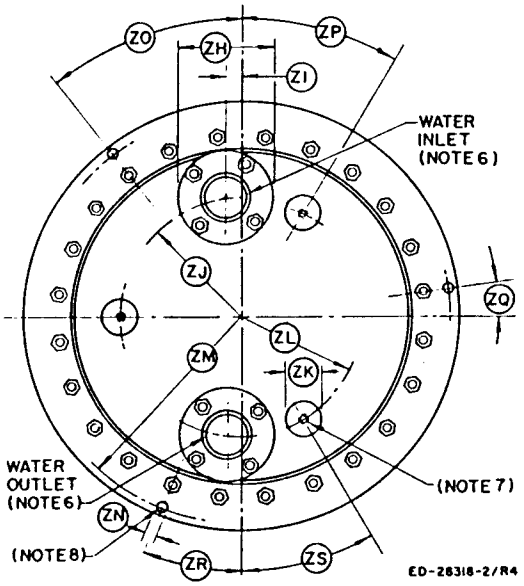
‡Includes power transferred from driver stage.

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


CONSTANT GRID-VOLTAGE CHARACTERISTICS
Ef=7.6 VOLTS
PLATE CURRENT ——
GRID CURRENT - - - -
ec=PEAK POSITIVE GRID VOLTAGE
ec=3500 v
3000
2500
2000
1500
1000
500
PEAK PLATE CURRENT — AMPERES
PEAK GRID CURRENT — AMPERES
PLATE VOLTAGE — KILOVOLTS
ED-29009/R1


CONSTANT PLATE CURRENT CHARACTERISTICS
Ef=7.6 VOLTS
ib=PLATE CURRENT IN AMPERES
ib=1200 a
1000
800
600
450
300
200
100
0.1
GRID VOLTAGE — VOLTS
PLATE VOLTAGE — KILOVOLTS
ED-29010/R2





BOTTOM VIEW OF WATER JACKET

DIMENSIONS FOR OUTLINE OF ML-8549

Ref.	Inches*			Notes
	Minimum	Nominal	Maximum	
A		9.63		
B		12.31		
C		12.0		
D		18.25		
E		22.88		
F		17.50		
G		45.75		
H		25.19		
I		17.03		
J		14.75		
K		13.44		
L		9.94		
YA		5.25		
YB		.88		
YC		2.38		
YD		4.38		
YE		2.63		
YF		.88		
YG		.44		3
YH		.50		
YI		.50		
YJ		5.38		
YK		5.38		
YL		20.78		
ZA		25.88		
ZB		20.25		
ZC		.75		
ZD		17.06		
ZE		18.88		
ZF		20.56		
ZG		.13		
ZH		5.56		
ZI		.94		
ZJ		7.19		6
ZK		2.00		
ZL		7.19		7
ZM		12.25		8
ZN		.81		8
ZO		37.5°		degrees
ZP		30.0°		degrees
ZQ		7.5°		degrees
ZR		22.5°		degrees
ZS		30.0°		degrees

NOTES:

1. Ion-pump cable, terminal connectors and water jacket not supplied with tube. Other terminal connectors can be designed on special order.
2. Five-liter-per-second ion pump. Ion pump can be mounted in a concealed position within the water jacket on special order.
3. Six holes, diameter (YG).
4. Connection for forced-oil or forced-air cooling of cathode re-entrant cavity, ⅜-inch male pipe thread.
5. Water jacket may be supported by upper or lower surface of flange or by three pads on bottom of jacket.
6. Water inlet and outlet are Anaconda No. 1740, 2½-inch copper tube flange unions, on circle radius (ZJ).
7. Three holes for mounting, ½"-13 ANC tap, on circle radius (ZL).
8. Three holes, diameter (ZN), on circle radius (ZM), for alternate mounting.

*Limits to be determined.

THE MACHLETT LABORATORIES, INC.
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