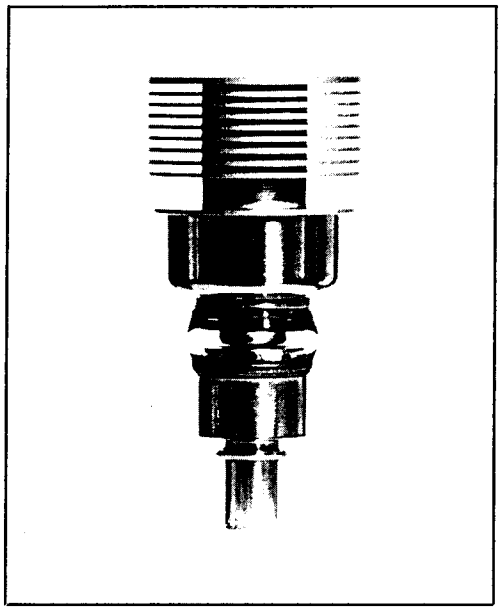


ISSUED 12-64

ML-7209

UHF Planar Triode

4.5 kw Pulse Power

2.2 kw RF Pulse Power

MACHLETT

ELECTRON TUBE SPECIALIST

DESCRIPTION

The ML-7209 is a high-mu triode of the planar-electrode type designed for use as a grid- or plate-pulsed oscillator, switch tube, or frequency multiplier at frequencies up to 3 Gc. Features include low interelectrode capacitances, high transconductance and great mechanical strength. Lead inductances and rf losses are minimized by a compact, rugged coaxial construction, making the tube ideally suited to cavity type circuits as well as for parallel line operation. The cathode is an indirectly-heated, oxide-coated disc. The anode is forced-air cooled. The ML-7209 is a direct replacement for the ML-381 but is constructed to withstand more severe conditions of shock and vibration.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage, AC or DC (See "Application Notes")	6.0± 5 %	V
Heater Current at 6.0 Volts	1.0	A
Heater Heating Time, minimum	60	sec
Amplification Factor, Cutoff	60	
Amplification Factor, Dynamic	100	
Transconductance (Ib=70 mA, Eb=600 V)	25000	μmhos
Interelectrode Capacitances, without Heater Voltage		
Grid-Plate	2.01	pf
Grid-Cathode	6.60	pf
Plate-Cathode, maximum	.035	pf

Mechanical

Mounting Position	Optional	
Type of Cooling	Forced-air	
Maximum Anode Temperature	200	°C
Net Weight	2¼	oz

MAXIMUM RATINGS
AND TYPICAL OPERATING CONDITIONS

Grid-Pulsed or Plate-Pulsed RF Oscillator and Amplifier — Class C

Maximum Ratings, Absolute Values		
Frequency	3	Gc
Plate Voltage		
Grid-Pulsed, DC	1.5	kV
Plate-Pulsed, Peak Pulse Supply	3.5	kv
DC Grid Voltage	−150	V
Instantaneous Peak Grid-Cathode Voltage		
Grid negative to cathode	−750	v
Grid positive to cathode	250	v
Average Plate Current	10	mA
Average Grid Current	5	mA
Peak Plate Current	3	a
Average Plate Dissipation (Forced-Air Cooling)	35	W
Average Grid Dissipation	2	W
Pulse Duration	5	μs†
Duty Factor	.0033	†

Typical Operation, Plate-Pulsed RF Oscillator		
Frequency	2.5	Gc
Filament Voltage	5.8	V
Pulse Duration	5	μs
Duty Factor	.0030	
Pulse Repetition Rate	660	pps
Peak Plate Pulse Supply Voltage	3.5	kv
DC Grid Voltage	−100	V
Peak RF Plate Voltage	2.5	kv
Peak RF Grid Voltage	340	v
Peak Plate Current from Pulse Supply	3	a
Average Plate Current	9	mA
Average Grid Current	3	mA
Driving Power During Pulse, approximate	450	w
Useful Peak Power Output, approximate	2.2	kw

Pulse Modulator or Pulse Amplifier

Maximum Ratings, Absolute Values		
DC Plate Voltage	1.5	kV
Peak Plate Voltage	1.8	kv
DC Grid Voltage	−150	V
Instantaneous Peak Grid-Cathode Voltage		
Grid negative to cathode	−750	v
Grid positive to cathode	250	v
DC Plate Current	100	mA
Pulse Cathode Current	4.8	a
Average Plate Dissipation (Forced-Air Cooling)	100	W
Average Grid Dissipation	1.5	W
Pulse Duration	5	μs†
Duty Factor	.0033	†

Frequency Doubler — Class C Telegraphy

Maximum Ratings, Absolute Values		
Frequency	3	Gc
Peak Plate Pulse Supply Voltage	3.5	kv
Grid Bias Voltage (from cathode resistor)	−200	v
Instantaneous Peak Grid-Cathode Voltage		
Grid negative to cathode	−750	v
Grid positive to cathode	250	v
Peak Cathode Current	3	a
Average Plate Current	6.5	mA
Average Grid Current	2	mA
Average Plate Input	25	W
Average Plate Dissipation (Forced-Air Cooling)	25	W
Average Grid Dissipation	1	W
Pulse Duration	5	μs†
Duty Factor	.0033	†

Typical Operation, Frequency Doubler		
Frequency	.6 to 1.2	Gc
Filament Voltage	5.5	V
Pulse Duration	3	μs
Duty Factor	.0030	
Peak Plate Pulse Supply Voltage	3.5	kv
Grid Bias Voltage (from cathode resistor)	−190	V
Cathode Resistor	160	ohms
Peak Plate Current	1.2	a
Average Plate Dissipation	9	W
Driving Power During Pulse, approximate	600	w
Useful Power Output at Peak of Pulse, approx.	1.2	kw

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

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Filament Current at 6.0 volts (Note 1)	0.90	1.05	A
Plate Current (Note 2)	60	95	mAdc
Cut-off Bias (Note 3)	—	−15	Vdc
Transconductance	20,000	30,000	μmhos
Grid-Plate Capacitance (Note 4)	1.86	2.16	pf
Grid-Cathode Capacitance (Note 4)	5.60	7.00	pf
Plate-Cathode Capacitance (Note 4)	—	.035	pf
Plate Tuning Range (Note 5)	1.98	2.02	Gc

Note 1 — For reduced filament voltage see "Heater Voltage" section under "Application Notes".

Note 2 — Measure at a plate voltage of 600 volts and a cathode-bias resistor of 30 ohms.

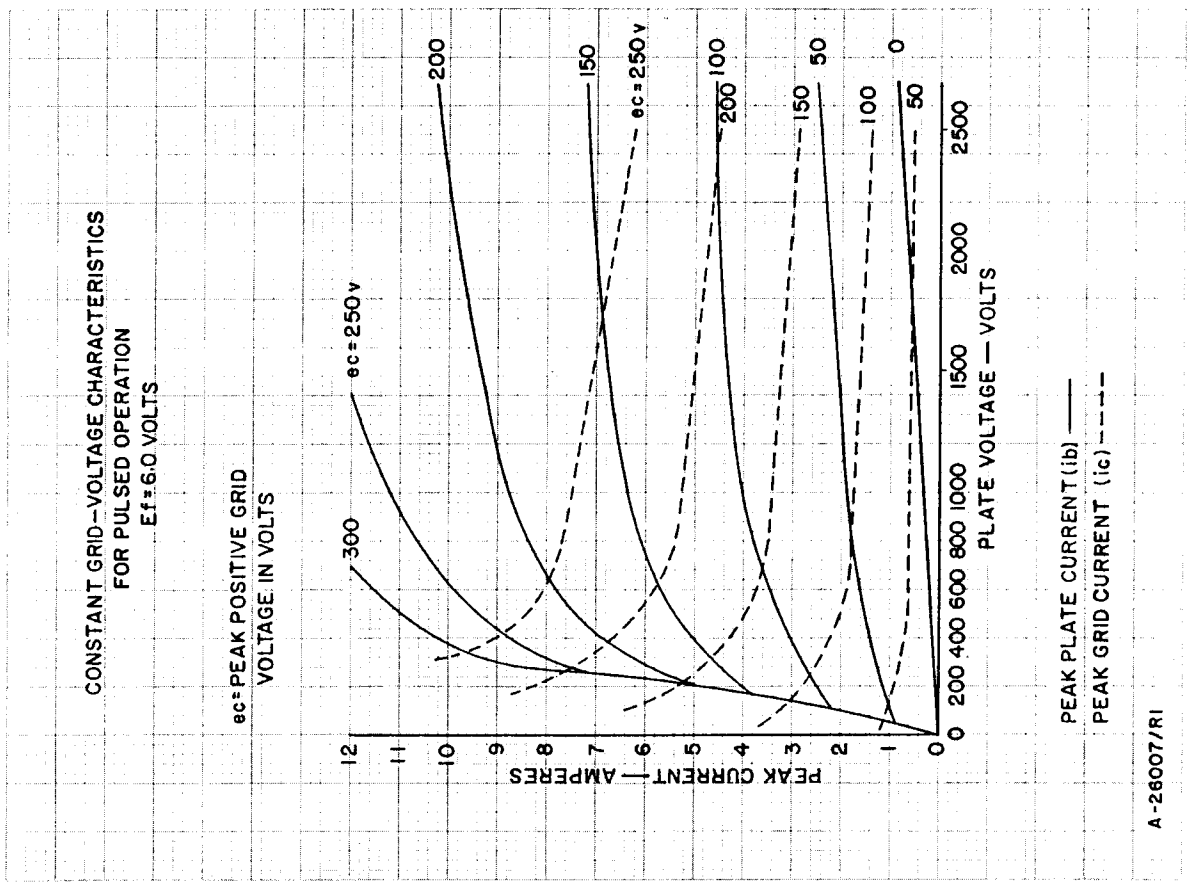
Note 3 — Measured at 1 mA of plate current and a plate voltage of 600 volts.

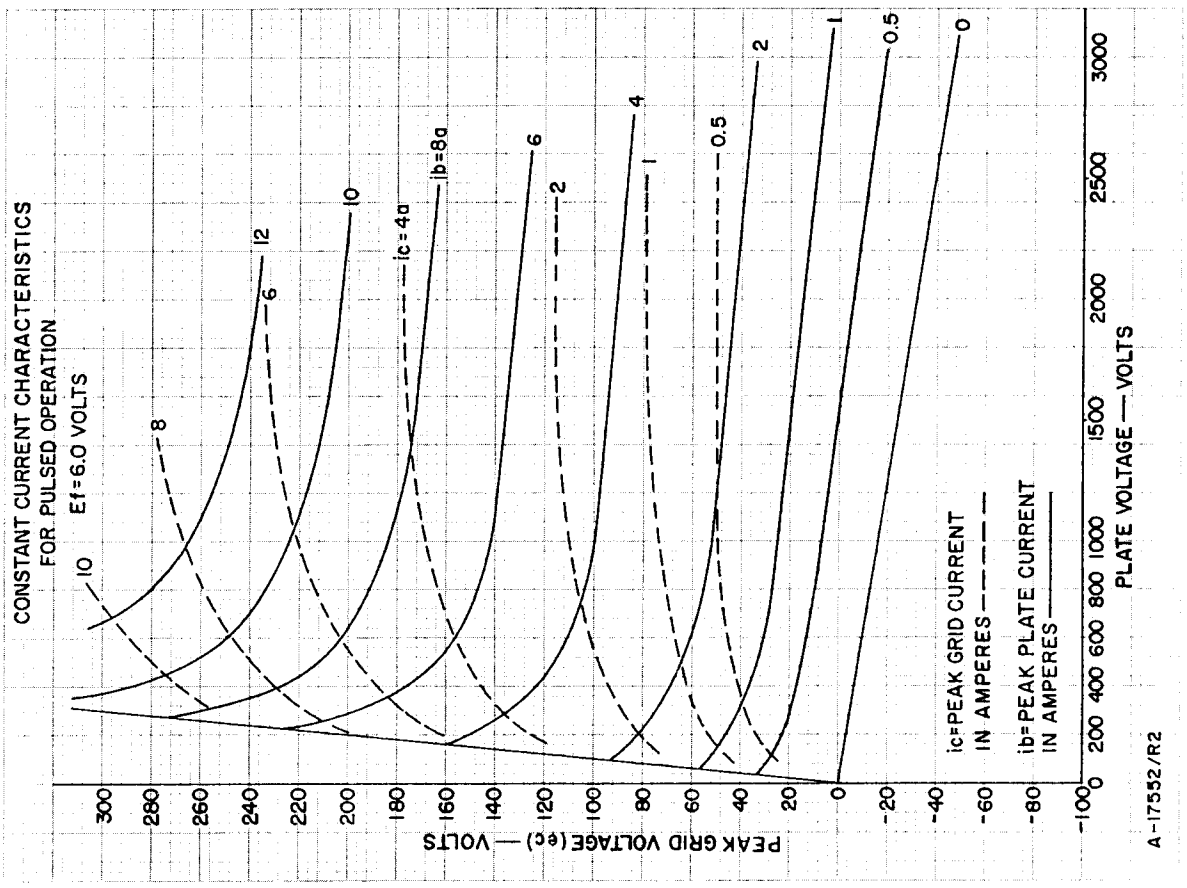
Note 4 — Capacitance measurements are with the tube cold. When the filament is heated to proper operating temperature the grid-cathode capacitance will increase by about 1 pf due to thermal expansion of the cathode.

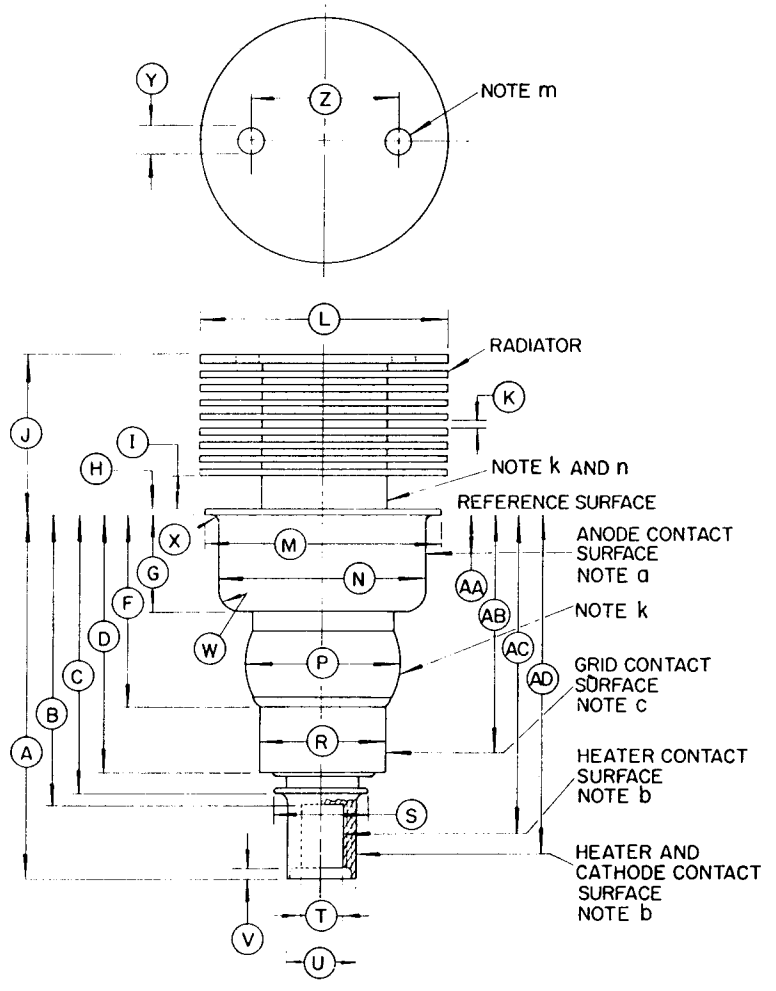
Note 5 — With a plate-grid coaxial cavity of fixed dimensions, all tubes will resonate within the specified frequency range.

APPLICATION NOTES

Before designing equipment for use with these tubes and before installing tubes in equipment, refer to the general information given in the Machlett publication entitled *Application Notes, UHF Tubes — General.*


CONSTANT GRID-VOLTAGE CHARACTERISTICS
FOR PULSED OPERATION
Ef=6.0 VOLTS
ec=PEAK POSITIVE GRID
VOLTAGE IN VOLTS
ec=250v
300
200
150
ec=250v
200
100
150
50
100
0
50
PEAK CURRENT — AMPERES
PLATE VOLTAGE — VOLTS
PEAK PLATE CURRENT (ib) ——
PEAK GRID CURRENT (ic) - - - -
A-26007/R1


CONSTANT CURRENT CHARACTERISTICS
FOR PULSED OPERATION
Ef=6.0 VOLTS
10
8
12
6
10
ic=4a
ib=8a
6
2
4
1
0.5
2
1
0.5
0
PEAK GRID VOLTAGE (ec) — VOLTS
ic=PEAK GRID CURRENT
IN AMPERES - - - - -
ib=PEAK PLATE CURRENT
IN AMPERES ——
PLATE VOLTAGE — VOLTS
A-17552/R2



DIMENSIONS FOR OUTLINE (INCHES)

Ref.	Minimum	Maximum
A	1.815	1.875
B	—	1.534
C	—	1.475
D	1.289	1.329
F	—	.980
G	.462	.477
H	—	.040
I	.125	.185
J	.766	.826
K	.025	.046
L	1.234	1.264
M	1.180	1.195
N	1.025	1.035
P	—	.812
R	.655	.665
S	—	.545
T	.213	.223
U	.315	.325
V	—	.086
W	—	.100
X	—	.035
Y	.105	.145
Z	.650	.850

NOTES

a. The total indicated runout of the anode contact surface with respect to the cathode contact surface will not exceed .020 inch.
b. The total indicated runout of the cathode contact surface with respect to the heater contact surface will not exceed .012 inch.
c. The total indicated runout of the grid contact surface with respect to the cathode contact surface will not exceed .020 inch.
k. Do not clamp or locate on this surface.
m. Hole provided for tube extractor through top fin only.
n. Measure anode shank temperature here.

DIMENSIONS FOR ELECTRODE CONTACT AREA (INCHES)

Ref.	Dimensions	Contact
AA	0.198 ± 0.163	Anode
AB	1.225 ± .040	Grid
AC	1.631 ± .097	Heater
AD	1.645 ± .170	Cathode

DIMENSIONS—ML-7209

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