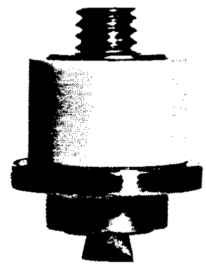
The Machlett Laboratories, Inc.
1063 Hope Street • Stamford, Conn. 06907
Tel. 203-348-7511 • TWX 710-474-1744



ISSUED 9-66

ML-8741

MACHLETT

Miniature UHF Planar Triodes

CW, Plate or Grid Pulsed
Low Grid-Plate Capacitance
Phormat Cathode
High Cathode-Current Capability

DESCRIPTION

The ML-8741 is a ruggedized, high-mu planar triode of ceramic-and-metal construction, designed for use as a grid-pulsed, plate-pulsed or CW oscillator, frequency multiplier, or amplifier in radio transmitting service from low frequency to 3 GHz. With its low grid-plate capacitance, the tube is especially suitable for use in wide-band amplifiers.

Distinguishing characteristics of this tube are its miniaturization, high cathode-current capability, high transconductance and high mu. Also, the tube employs a Phormat type cathode, which consists of an indirectly heated disc with an oxide coating impregnated in a nickel matrix. This construction, in combination with proper plate series impedance, reduces to a minimum failures of the cathode due to voltage surges.

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

Heater Voltage (AC or DC)	6.3	V
Heater Current at 6.3 Volts	1.30	A
Cathode Heating Time, minimum	60	sec
Amplification Factor	80	
Transconductance ($Jk = 200 mA/cm^2$)	38000	μmhos
Interelectrode Capacitance, without Heater Voltage		
Gride-Plate	1.7	pf
Gride-Cathode	9.5	pf
Plate-Cathode, maximum	.065	pf

Mechanical

Mounting Position	Optional	
Type of Cooling		
With radiator	Forced Air	
Without radiator	Conduction & Convection	
Envelope Temperature, maximum	250	°C
Net Weight		
With radiator	45	g
Without radiator	20	g

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

CW RF Power Oscillator and Amplifier Class C

Maximum Ratings, Absolute Values		
DC Plate Voltage	2500	V
DC Grid Voltage	−150	V
Instantaneous Peak Grid-Cathode Voltage		
Grid negative to cathode	−400	v
Grid positive to cathode	30	v
DC Plate Current	250	mA
DC Grid Current	45	mA
Plate Dissipation		
Forced-air cooling with radiator	150	W
Conduction and convection	10	W†
Grid Dissipation	1.5	W
Frequency	2.5	GHz
Typical Operation, Power Amplifier		
Frequency	500	MHz
Filament Voltage	6.0	V
DC Plate Voltage	900	V
DC Grid Voltage	−30	V
DC Plate Current	140	mA
DC Grid Current, approximate	40	mA
Driving power, approximate	9	W
Useful Power Output	65	W

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

Maximum Ratings, Absolute Values		
Plate Voltage		
Grid-pulsed, DC	2500	V
Plate-pulsed, peak pulse supply	3500	v
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	16	mA
Average Grid Current	6	mA
Pulse Plate Current	5	a
Average Plate Dissipation		
Forced-air cooling with radiator	60	W
Conduction and convection	10	W†
Average Grid Dissipation	1.5	W
Pulse Duration	6	μs††
Duty Factor	.0033	††
Frequency	3	GHz
Typical Operation, Grid-Pulsed RF Amplifier		
Frequency	1.1	GHz
Filament Voltage	6.3	V
Pulse Duration	3.5	μs
Duty Factor	.001	
DC Plate Voltage	2000	V
DC Grid Voltage	−70	V
Peak Plate Current from DC Supply	3.0	a
Peak Grid Current from Pulse Supply	1.0	a
Driving Power During Pulse, approximate	400	W
Useful Peak Power Output, approximate	2.5	kw

Pulse Modulator or Pulse Amplifier

Maximum Ratings, Absolute Values		
DC Plate Voltage	3500	V
Peak Plate Voltage	5000	v
DC Grid Voltage	−150	V
Instantaneous Peak Grid-Cathode Voltage		
Grid negative to cathode	−750	v
Grid positive to cathode	110	v
DC Plate Current	150	mA
Pulse Cathode Current	7.5	a
Average Plate Dissipation		
Forced-air cooling with radiator	150	W
Conduction and convection	10	W†
Average Grid Dissipation	1.5	W
Pulse Duration	6	μs††
Duty Factor	.0033	††

†Greater plate dissipation will be possible with the ML-8741 when the tube is used with an appropriately designed heat sink.

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

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Filament Current at 6.3 V (Note 1)	1.20	1.40	A
Cut-Off Bias (Note 2)	—	−30	Vdc
Grid-Plate Capacitance (Note 3)	1.55	1.85	pf
Grid-Cathode Capacitance (Note 3)	8.50	10.50	pf
Plate-Cathode Capacitance (Note 3)	—	.065	pf

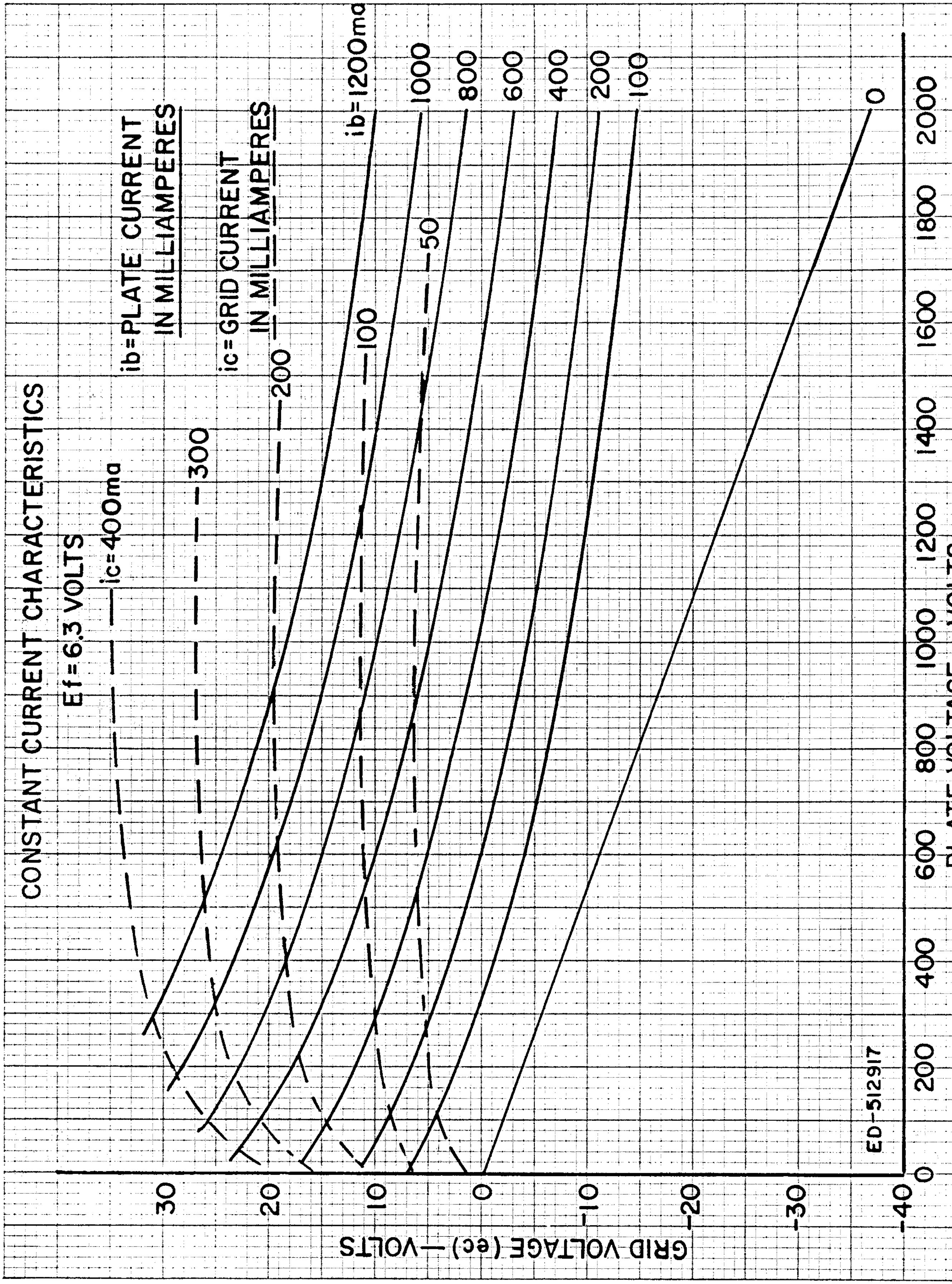
Note 1 — For reduced filament voltage see "Heater Voltage" section in *Application Notes*.

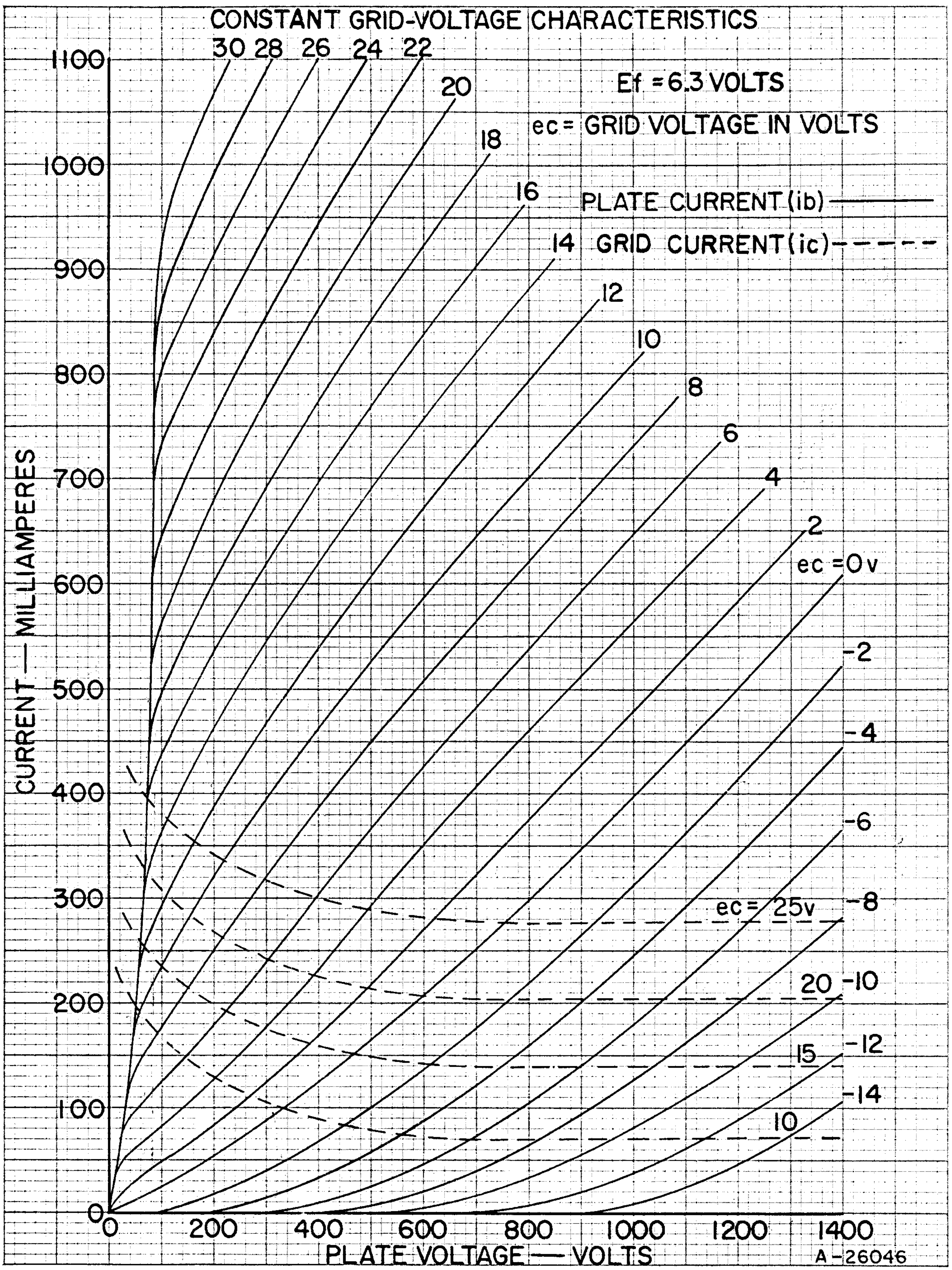
Note 2 — Measured with 1 mA plate current and a plate voltage of 1000 Vdc.

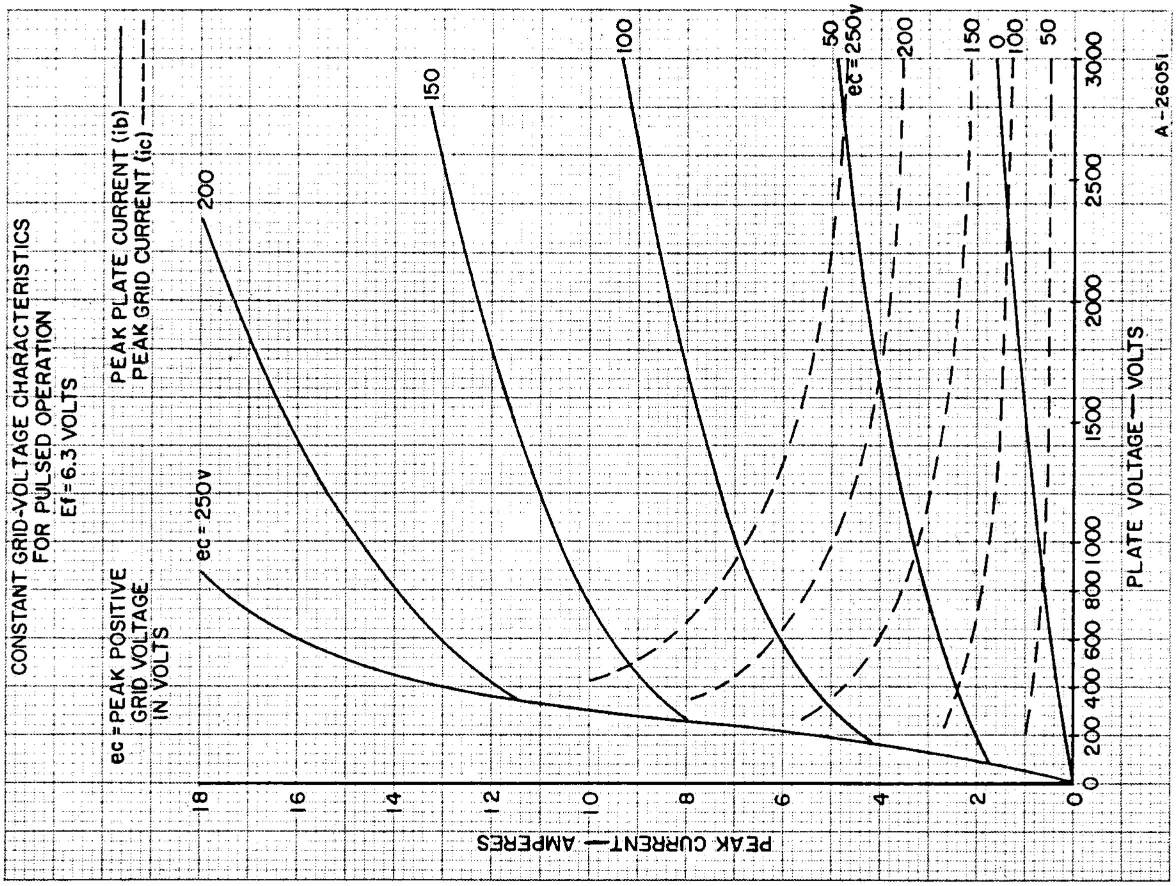
Note 3 — Capacitance values are given for a cold tube. When the filament is heated to its proper temperature, the grid-cathode capacitance will increase by approximately 1 pf due to thermal expansion of the cathode.

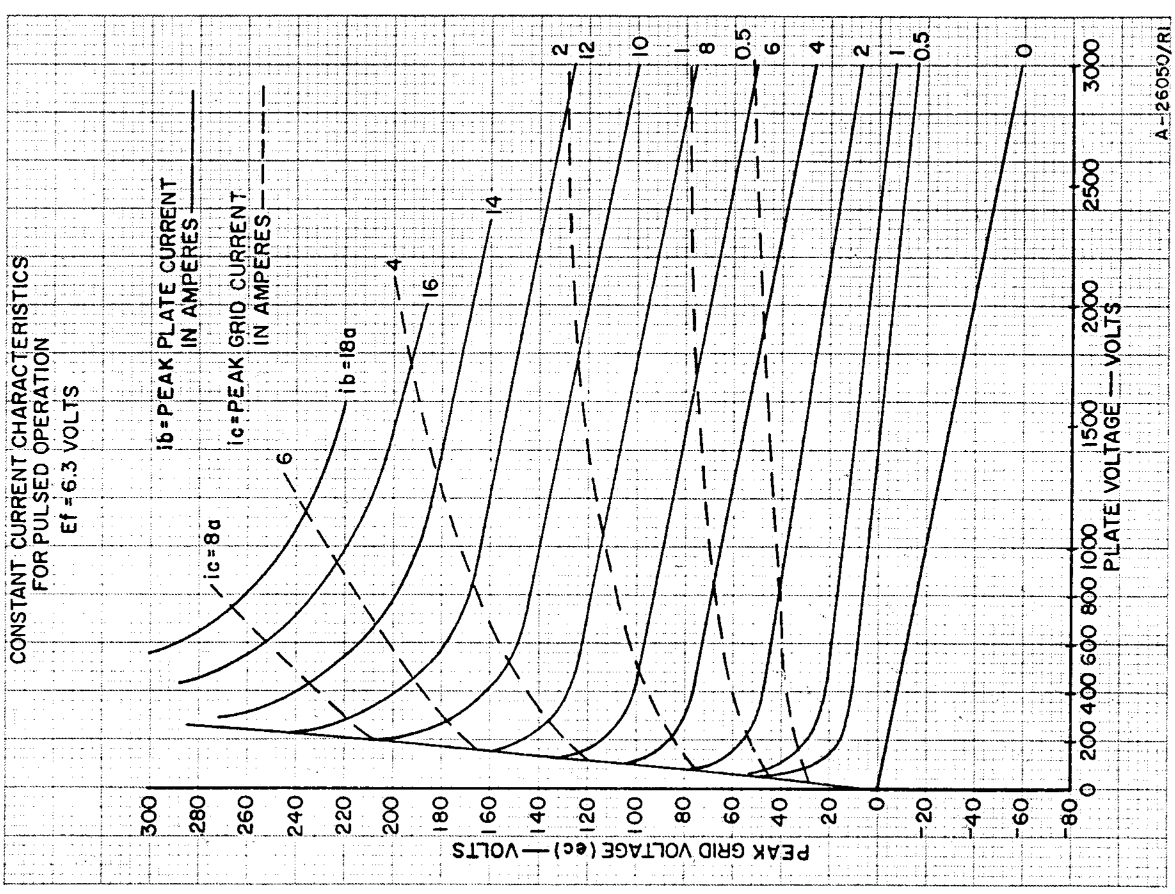
APPLICATION NOTES

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 CURRENT CHARACTERISTICS
Ef = 6.3 VOLTS
ib=PLATE CURRENT IN MILLIAMPERES
ic=GRID CURRENT IN MILLIAMPERES
ib=1200ma
1000
800
600
400
200
100
0
ic=400ma
300
200
100
50
ED-512917
PLATE VOLTAGE — VOLTS
0
200
400
600
800
1000
1200
1400
1600
1800
2000
GRID VOLTAGE (ec) — VOLTS
30
20
10
0
-10
-20
-30
-40


CONSTANT GRID-VOLTAGE CHARACTERISTICS
Ef = 6.3 VOLTS
ec = GRID VOLTAGE IN VOLTS
PLATE CURRENT (ib)
GRID CURRENT (ic)
30 28 26 24 22
20
18
16
14
12
10
8
6
4
2
ec = 0 v
-2
-4
-6
-8
-10
-12
-14
ec = 25 v
20
15
10
CURRENT — MILLIAMPERES
1100
1000
900
800
700
600
500
400
300
200
100
0
0
200
400
600
800
1000
1200
1400
PLATE VOLTAGE — VOLTS
A-26046

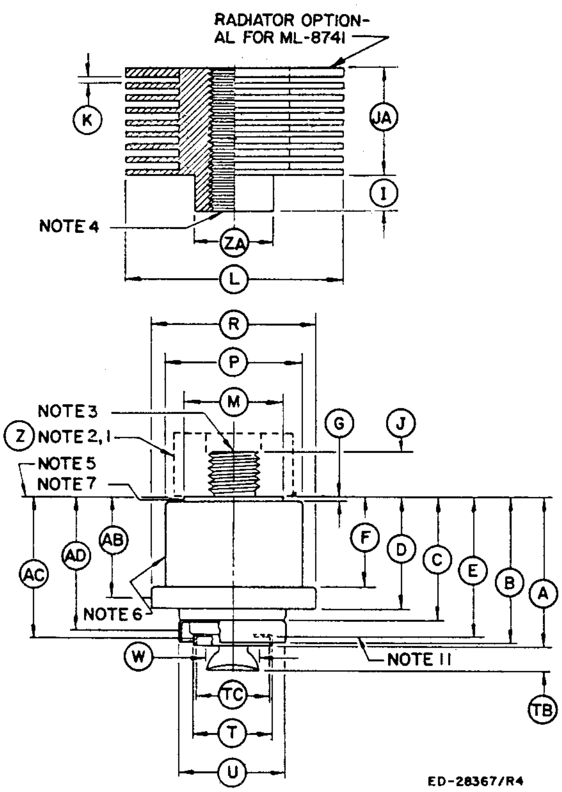

CONSTANT GRID-VOLTAGE CHARACTERISTICS
FOR PULSED OPERATION
Ef = 6.3 VOLTS
PEAK PLATE CURRENT (ib)
PEAK GRID CURRENT (ic)
ec = PEAK POSITIVE GRID VOLTAGE IN VOLTS
ec = 250v
200
150
100
50
ec = 250v
200
150
0
100
50
PEAK CURRENT — AMPERES
0
2
4
6
8
10
12
14
16
18
PLATE VOLTAGE — VOLTS
0
200
400
600
800
1000
1500
2000
2500
3000
A-26051


CONSTANT CURRENT CHARACTERISTICS
FOR PULSED OPERATION
Ef = 6.3 VOLTS
ib = PEAK PLATE CURRENT IN AMPERES
ic = PEAK GRID CURRENT IN AMPERES
ic = 8a
6
4
ib = 18a
16
14
2
12
10
1
8
0.5
6
4
2
1
0.5
0
PEAK GRID VOLTAGE (ec) — VOLTS
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
PLATE VOLTAGE — VOLTS
0
200
400
600
800
1000
1500
2000
2500
3000
A-26050/R1

DIMENSIONS FOR OUTLINE OF ML-8741

The millimeter dimensions are derived from the original inch dimensions.

Ref	Inches			Millimeters			Notes
	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	
A	.845		.909	21.46		23.09	
AB	.559	.598	.637	14.20	15.19	16.18	1, 8
AC	.795	.815	.835	20.19	20.70	21.21	1, 10
AD	.738	.778	.818	18.75	19.76	20.78	1, 9
B	.825		.875	20.96		22.22	
C	.702		.740	17.83		18.80	
D	.640		.669	16.26		16.99	
E	.782		.837	19.86		21.26	
F	.520		.537	13.21		13.64	
G	.022		.040	.56		1.02	
I	.192		.208	4.88		5.28	
J	.240		.275	6.10		6.98	
JA	.585		.635	14.86		16.13	
K	.028		.045	.71		1.14	
L	1.235		1.265	31.37		32.13	
M	.565		.580	14.35		14.73	
P	.775		.785	19.68		19.94	
R	.935		.950	23.75		24.13	1, 8
T	.440		.460	11.18		11.68	1, 10
TB			.250			6.35	
TC	.410		.425	10.41		10.80	
U	.595		.607	15.11		15.42	1, 9
W			.313			7.95	
Z			.015			.38	1
ZA	.440		.460	11.18		11.68	



ED-28367/R4

NOTES:

1. The total indicated runout of the grid-contact surface (Note 8), the cathode-contact surface (Note 9) and the heater-contact surface (Note 10) will not exceed (Z). This measurement is made with the gage (Note 2) screwed on the anode thread (Note 3) so that the face of the gage makes full contact with the reference surface (Note 5). Runout is then measured with the gage chucked on the measurement reference axis.
2. See outline. Machlett gage No. S-L5. Details will be supplied upon request.
3. See outline. Anode, 5/16 — 24 UNF-2A thread.
4. See outline. 5/16 — 24 UNF-2B thread. Use 5/16-24 bolt in this hole for tube extraction.
5. See outline. Reference surface. The tube shall be stopped only by this surface when screwed in the socket.
6. See outline. Insulating envelope. Do not clamp or locate on this surface.
7. See outline. Measure anode temperature on this surface.
8. Grid-contact surface and reference dimension for eccentricity measurement, defined by dimensions (R) and (AB).
9. Cathode- or heater-contact surface and reference dimension for eccentricity measurement, defined by dimensions (U) and (AD).
10. Heater-contact surface and reference dimension for eccentricity measurement, defined by dimensions (T) and (AC). See also Note 11.
11. See outline. Alternate heater-contact surface. Heater contact can be made to the bottom of the heater terminal-cup by means of a coil spring having a maximum coil OD of .390 inch and a minimum coil ID of .320 inch, or some similar device.

RAYTHEON
THE MACHLETT LABORATORIES, INC.
A SUBSIDIARY OF RAYTHEON COMPANY

Printed in U.S.A.
ST-2294 2.5M 9-66