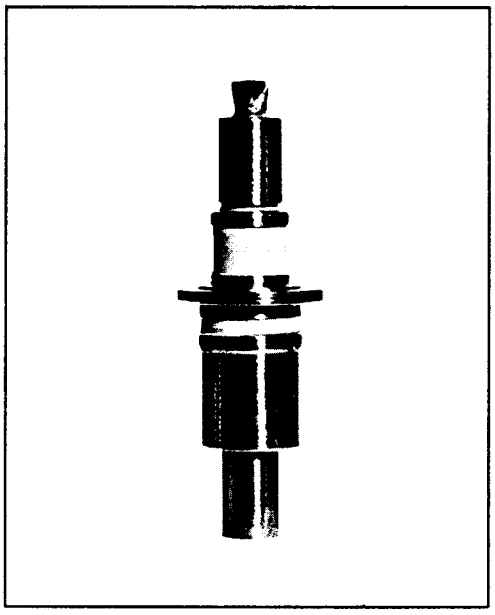


ISSUED 11-64

ML-6442

UHF Planar Triode

Plate Pulsed or CW
to 5 Gc

MACHLETT
ELECTRON TUBE SPECIALIST

DESCRIPTION

The ML-6442 is a metal-ceramic envelope, medium-mu triode of the planar-electrode type designed specifically for use as a plate-pulsed oscillator and amplifier at frequencies up to about 5000 Mc. It can also be used as a c-w oscillator, r-f power amplifier or frequency multiplier at frequencies up to 2500 Mc. Features include short electron transit time, low inter-electrode capacitances and high transconductance. Lead inductances and r-f losses are minimized by a compact, rugged metal-ceramic construction with ring type seals, 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 heater is insulated from the cathode permitting this tube to be used in series-string circuitry. The anode is cooled by conduction and convection and is capable of dissipating 8 watts.

GENERAL CHARACTERISTICS

Electrical

Cathode	Indirectly Heated	
Heater Voltage, Optimum, AC or DC*		
CW Operation	4.5 to 5.7	volts
Pulsed Operation	5.7 to 6.3	volts
Heater Current at 6.3 Volts	0.9	Amp
Cathode Heating Time for Pulse Operation, minimum	60	Seconds
Amplification Factor	50	
Direct Interelectrode Capacitances, approximate		
Grid-Plate	2.3	$\mu\mu f$
Grid-Cathode, Eh = 0	5.10	$\mu\mu f$
Plate-Cathode, maximum, Eh = 0	0.045	$\mu\mu f$

Mechanical

Mounting Position	Optional	
Type of Cooling	Conduction and convection	
Envelope Temperature, maximum	175	°C
Net Weight, approximate	1	ounce

*The optimum heater voltage is dependent upon the back-heating or transit-time effect and is a function of frequency, grid current, grid bias, plate current, duty cycle and circuit design and adjustment. However, once dynamic operation of the tube begins, the heater voltage must be maintained within ±5% of the established optimum value. Selection of heater voltage depends on stability of the supply. For specific applications above 500 Mc, consult the Machlett Engineering Department for optimum heater voltage values.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Plate-Pulsed Amplifier and Oscillator — Class C

Maximum Ratings, Absolute Values

For a Maximum Conducting Period of 5 Microseconds in any 5000 Microsecond Interval.*

The tube shall not be grid pulsed beyond the Class C Telegraphy ratings.

Peak Positive-Pulse Plate-Supply Voltage	3000	volts
Peak Negative-Pulse Grid-Bias Voltage	100	volts
Peak Plate Current from Pulse Supply†	2.5	amps
Peak Rectified Grid Current	1.25	amps
DC Plate Current	2.5	mA
DC Grid Current	1.25	mA
Plate Input	7.5	Watts
Plate Dissipation	7.5	Watts
Pulse Duration	2.0	μsec
Cathode Heating Time	60	Seconds
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	90	volts
Heater Positive with Respect to Cathode	90	volts
Frequency	5000	Mc
Duty Factor*	0.001	

Typical Operation — With Rectangular Wave Shape

Plate Pulsed Self-Excited Oscillator at 3500 Mc

Duty Factor	0.001	
Peak Positive-Pulse Plate-Supply Voltage	3000	volts
Peak Negative-Pulse Grid Bias Voltage, approx.	75	volts
Grid Bias Resistor, approximate	50	ohms
Peak Current from Pulse Supply	2.5	amps
Peak Rectified Grid Current	1.25	amps
DC Plate Current	2.5	mA
DC Grid Current	1.25	mA
Useful Power Output at Peak of Pulse, approx.	2.0	kW
Pulse Duration	1.0	μsec
Pulse Repetition Rate	1000	pps
Heater Voltage	6.0	Volts

* For applications above a duty factor of 0.001, contact the Machlett Engineering Department for recommendations.

† The regulation and/or series plate supply impedance shall be such as to limit the instantaneous peak current, with the tube considered as a short circuit, to a maximum of 10 times the specified maximum current rating.

Radio-Frequency Power Amplifier and Oscillator— Class C Telephony

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

Maximum Ratings, Absolute Values

DC Plate Voltage	275	Volts
DC Grid Voltage	−50	Volts
DC Plate Current	35	mA
DC Grid Current	15	mA
Plate Input	9.5	Watts
Plate Dissipation	6.0	Watts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	90	volts
Heater Positive with Respect to Cathode	90	volts
Frequency	2500	Mc

Radio-Frequency Power Amplifier and Oscillator— Class C Telegraphy

Key-down conditions per tube without amplitude modulation‡

Maximum Ratings, Absolute Values

DC Plate Voltage	350	Volts
DC Grid Voltage	−50	Volts
DC Plate Current	35	mA
DC Grid Current	15	mA
Plate Power Input	12	Watts
Plate Dissipation	8	Watts
Peak Heater-Cathode Voltage		
Heater Negative with Respect to Cathode	90	volts
Heater Positive with Respect to Cathode	90	volts
Frequency	2500	Mc

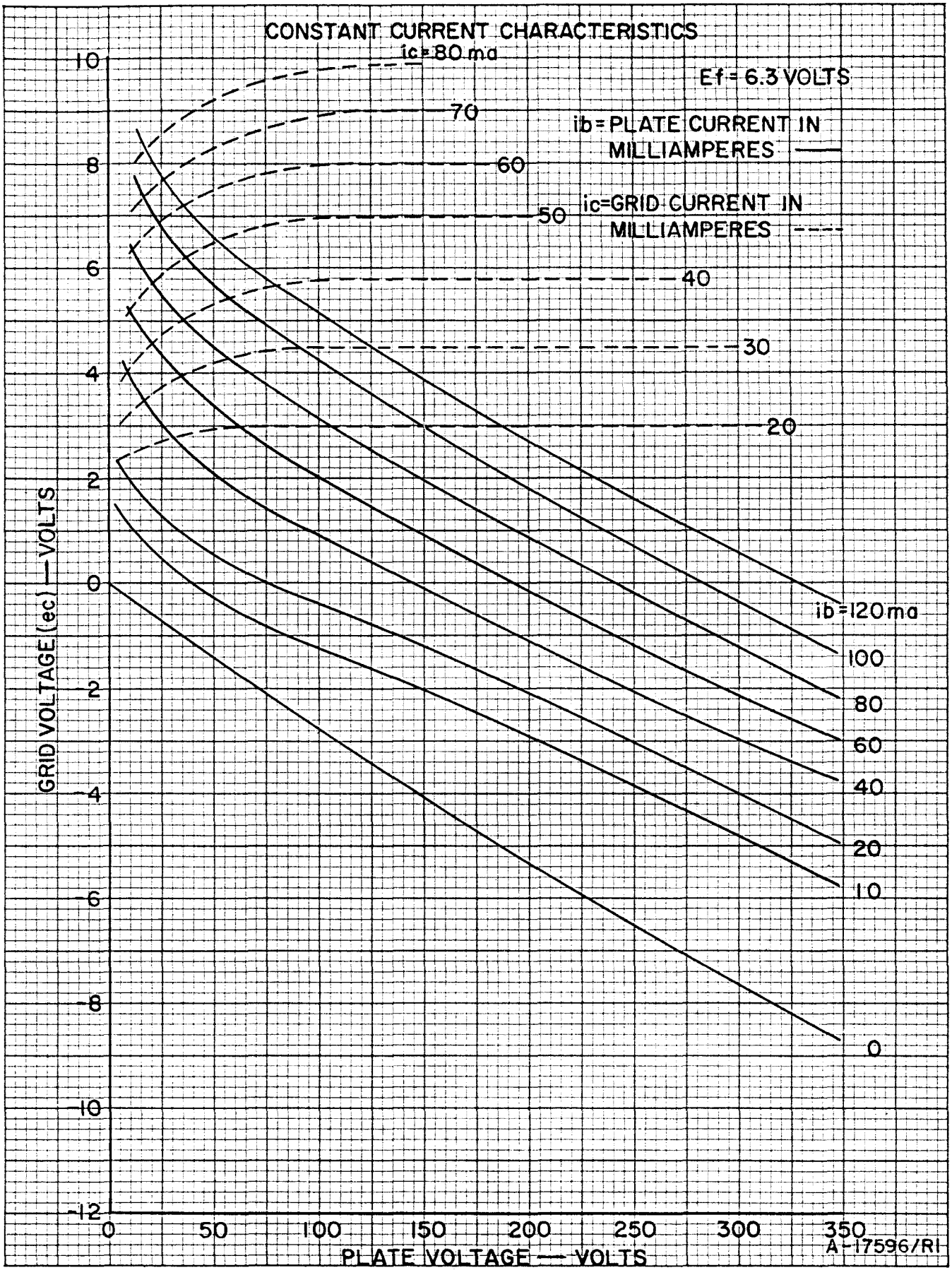
‡ Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 percent of the carrier conditions.

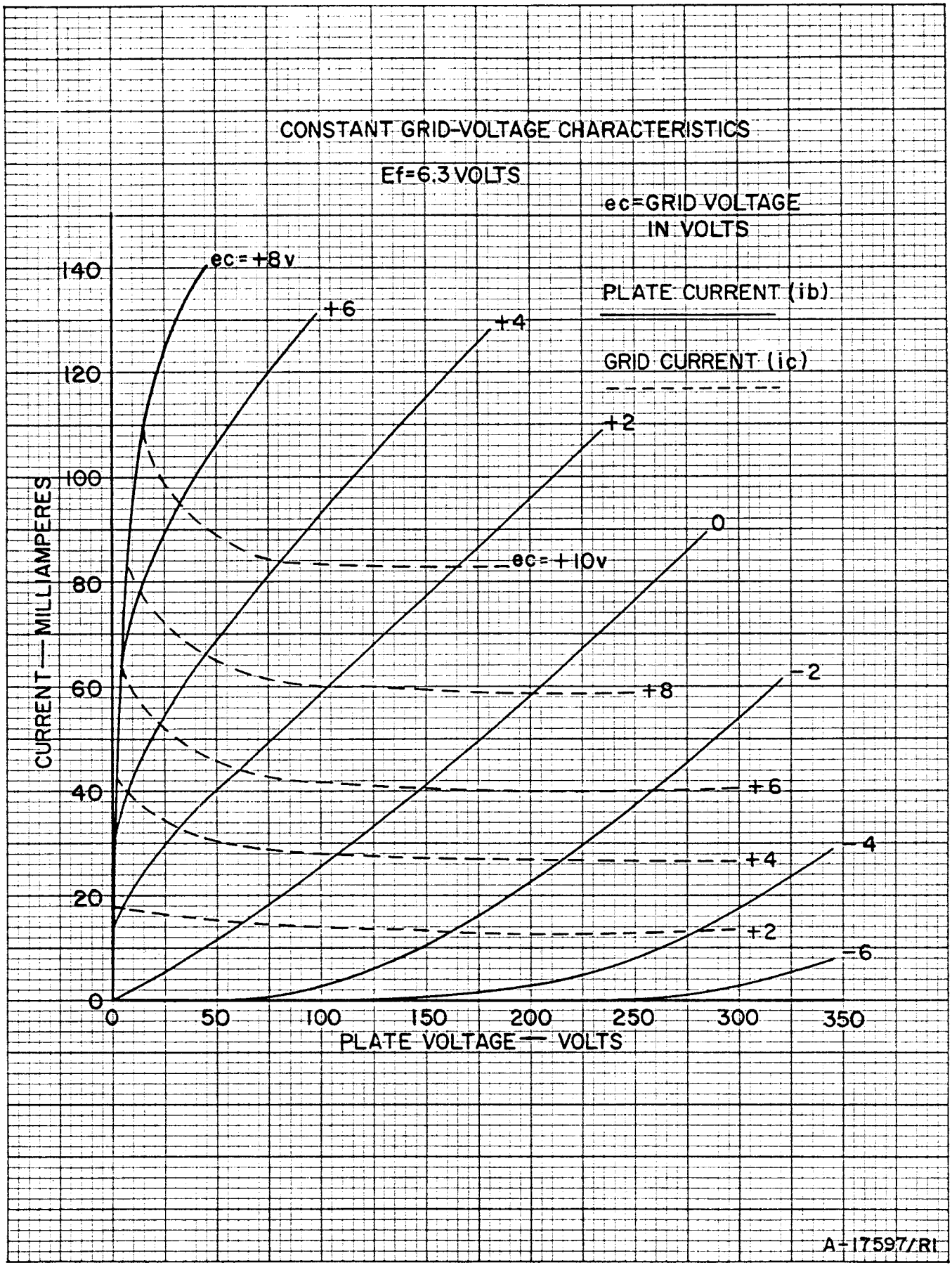
CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

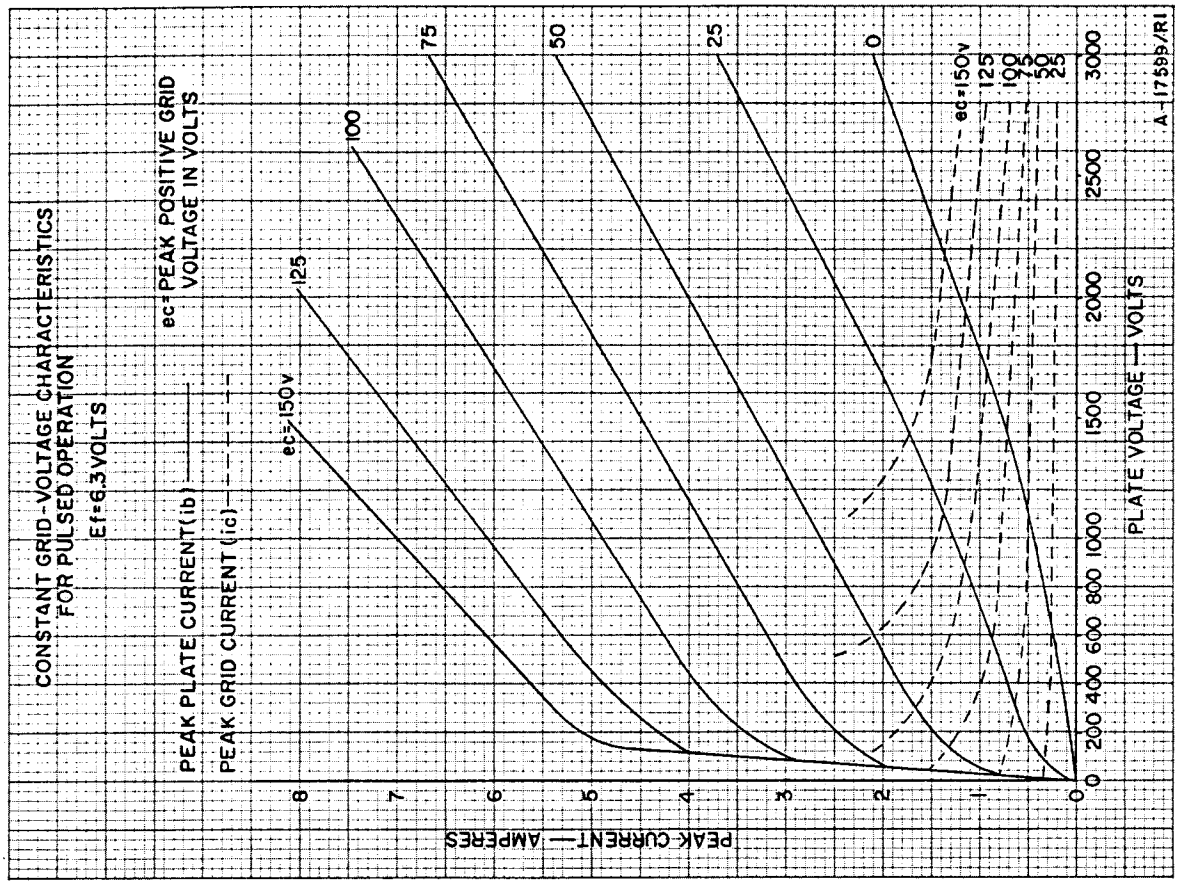
Class A_1 Amplifier	Min.	Max.	
Plate Voltage	——	350	Volts
DC Grid Bias, approximate	−2.5	−5.75	Vdc
Amplification Factor, approximate, Ec/Ib = 35 mAdc	35	65	
Transconductance	13500	19000	μmhos
Plate Current	——	35	mAdc
Grid-Plate Capacitance	2.10	2.45	μμf
Grid-Cathode Capacitance, Eh = 0	4.60	5.45	μμf
Plate-Cathode Capacitance, Eh = 0	——	0.045	μμf

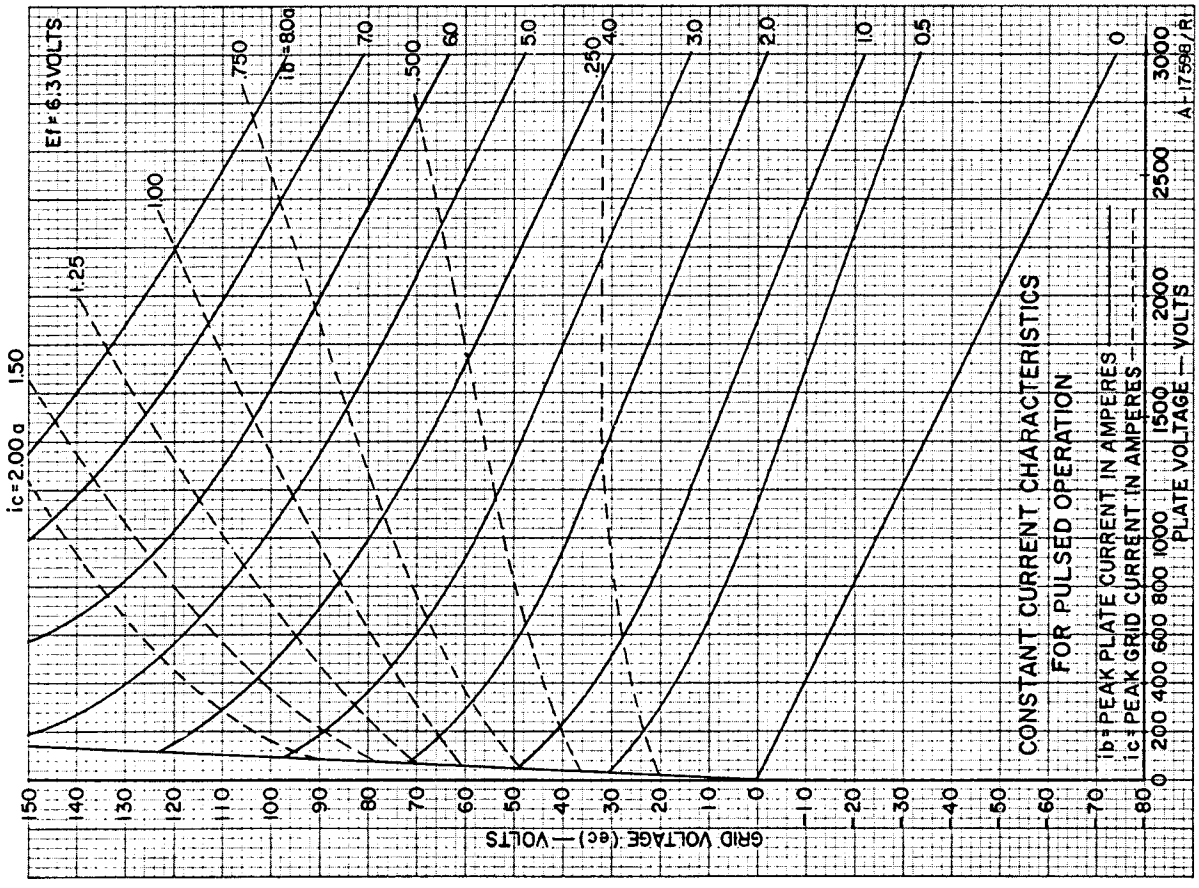
APPLICATION NOTES

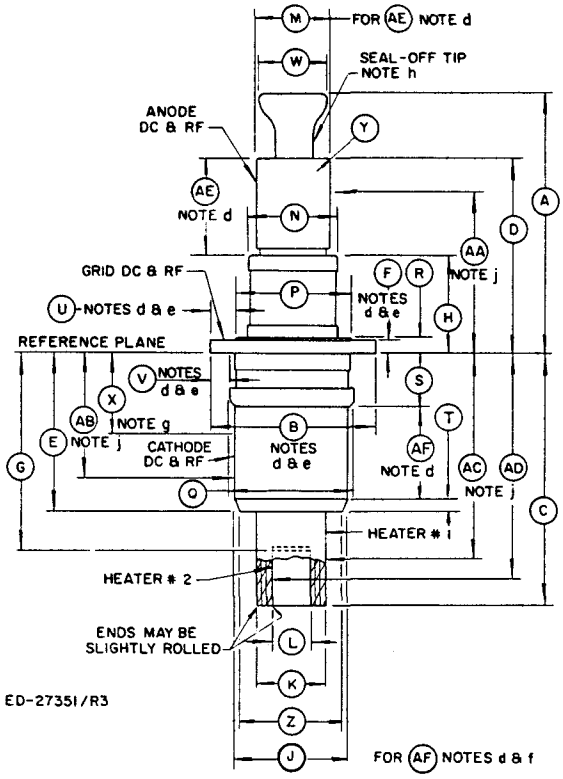
Before designing equipment for use with these tubes and before installing tubes in equipment, refer to the general information given in the Machlett publication entitled *Application Notes, UHF Tubes — General.*


CONSTANT CURRENT CHARACTERISTICS
ic=80 ma
70
60
50
40
30
20
Ef = 6.3 VOLTS
ib = PLATE CURRENT IN MILLIAMPERES
ic=GRID CURRENT IN MILLIAMPERES
ib=120 ma
100
80
60
40
20
10
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
GRID VOLTAGE (ec) — VOLTS
0
50
100
150
200
250
300
350
PLATE VOLTAGE — VOLTS
A-17596/R1


CONSTANT GRID-VOLTAGE CHARACTERISTICS
Ef=6.3 VOLTS
ec=GRID VOLTAGE IN VOLTS
PLATE CURRENT (ib)
GRID CURRENT (ic)
ec=+8v
+6
+4
+2
0
ec=+10v
+8
+6
+4
+2
-2
-4
-6
CURRENT — MILLIAMPERES
0
20
40
60
80
100
120
140
0
50
100
150
200
250
300
350
PLATE VOLTAGE — VOLTS
A-17597/R1


CONSTANT GRID-VOLTAGE CHARACTERISTICS
FOR PULSED OPERATION
Ef=6.3VOLTS
ec=PEAK POSITIVE GRID VOLTAGE IN VOLTS
PEAK PLATE CURRENT (ib)
PEAK GRID CURRENT (ic)
ec=150v
125
100
75
50
25
0
PEAK CURRENT — AMPERES
PLATE VOLTAGE — VOLTS
A-17599/R1


Ef=6.3VOLTS
ic=2.00a
1.50
1.25
1.00
.750
ib=80a
.70
.500
.60
.50
.250
.40
.30
.20
.10
.05
0
CONSTANT CURRENT CHARACTERISTICS
FOR PULSED OPERATION
ib=PEAK PLATE CURRENT IN AMPERES
ic=PEAK GRID CURRENT IN AMPERES
GRID VOLTAGE (ec) — VOLTS
PLATE VOLTAGE — VOLTS
A-17598/R1



NOTES

d. Contact surfaces shall be confined to this area.

e. Only these surfaces shall be used for tube stops or clamping.

f. Maximum diameter is not increased by solder.

g. Tube marking is confined to this area.

h. Exhaust tubulation must not be subjected to any mechanical stress.

j. Eccentricity (one-half total indicated runout) is gaged at points designated and falls within the following limits:

Contact	Max. Eccentricity Inches	Max. Eccentricity mm	Reference
Anode	.010	.25	Grid Contact
Cathode	.010	.25	Grid Contact
Heater No. 1	.015	.38	Grid Contact
Heater No. 2	.015	.38	Grid Contact

DIMENSIONS FOR OUTLINE

The millimeter dimensions are derived from the original inch dimensions.

Ref.	Inches			Millimeters			Notes
	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	
A			1.328			33.73	
B	.810		.818	20.57		20.77	dia.
C	1.219		1.281	30.96		32.53	
D	.953		.984	24.21		24.99	
E	.750		.813	19.05		20.65	
F	.070		.078	1.78		1.98	
G			1.016			25.80	
H			.515			13.08	
J	.539		.549	13.69		13.94	dia.
K	.318		.328	8.08		8.33	dia.
L	.180		.190	4.57		4.82	dia.
M	.365		.371	9.27		9.42	dia.
N			.453			11.50	dia.
P	.560		.570	14.22		14.47	dia.
Q			.609			15.46	dia.
R	.077		.097	1.96		2.46	
S			.266			6.75	
T	.015		.090	.38		2.28	
U		.094			2.39		
V		.094			2.39		
W			.313			7.95	
X			.375			9.52	
Y		.016			.41		rad.
Z	.490		.520	12.45		13.20	
AA		.750			19.05		
AB		.547			13.89		
AC		1.000			25.40		
AD		1.109			28.17		
AE		.438			11.13		
AF		.453			11.51		

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