TECHNICAL DATA

7815
7815R

PLANAR TRIODES

7815 7815R

The EIMAC 7815 and 7815R are rugged ceramic/metal planar triodes designed for use in CW, grid- or plate-pulsed oscillator, amplifier or frequency multiplier service up to 3 GHz. The tubes may also be used in pulse modulator or voltage regulator service. The 7815R is normally supplied with an air cooled radiator for forced air cooling, while the 7815 is supplied without radiator and is intended for conduction-convection cooling as found in many pulsed type applications. Except for the plate dissipation ratings and outline, the characteristics of both tube types are identical.

The 7815 and 7815R feature high mu, high transconductance, great mechanical strength and low interelectrode capacitances, as well as high current capability and increased grid-anode insulator length. Both tubes have an arc-resistant, extended interface cathode, well proven in airline applications, assuring reliable and long life operation under adverse conditions.

Note: This data sheet also covers the 3CPN10A5 (same as 7815) and 3CPX100A5 (same as 7815R).

GENERAL CHARACTERISTICS[1]

ELECTRICAL

Cathode: Oxide Coated, Unipotential		
Heater: Voltage	6.0 ± 0.3	V
Current, at 6.0 volts	1.00	A
Transconductance (Average):		
I_b = 70 mAdc, (E_b = 600 Vdc)	25	mmhos
Amplification Factor (Average)	100	
Direct Interelectrode Capacitance (grounded cathode)[2], without heater voltage:		
Cin	6.3	pF
Cgp	1.98	pF
Cout	0.035	pF
Cut-off Bias[3] (maximum)	-25	V

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.
2. Capacitance values are for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.
3. Measured with one milliampere plate current and a plate voltage of 1 kVdc.

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MECHANICAL

Maximum Overall Dimensions:	
Length	2.701 in; 68.60 mm
Diameter (7815)	1.195 in; 30.35 mm
Diameter (7815R)	1.264 in; 32.11 mm
Net Weight (7815)	1.8 oz; 48 gm
Net Weight (7815R)	2.2 oz; 63 gm
Operating Position	Any
Maximum Operating Temperature:	
Ceramic/Metal Seals	250°C
Anode Core	250°C
Cooling (7815)	Conduction and Convection
Cooling (7815R)	Forced Air
Terminals	Coaxial, special

ENVIRONMENTAL

Shock, 11 ms, non-operating	60 G
Vibration, operating, all axes 55 to 500 Hz	10 G
Altitude, max (in a suitably designed circuit)	70,000 ft.

CW RF POWER AMPLIFIER OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE	2500 VOLTS
DC GRID VOLTAGE	-150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE	
Grid negative to cathode	-400 VOLTS
Grid positive to cathode	30 VOLTS
DC PLATE CURRENT	100 MILLIAMPERES
DC GRID CURRENT	50 MILLIAMPERES
AVERAGE PLATE DISSIPATION	
Conduction and Convection (7815)	10 WATTS
Forced Air Cooling (7815R)	100 WATTS
GRID DISSIPATION (Average)	2 WATTS
FREQUENCY	2.5 GHz

OPERATING CONDITIONS FOR 7815 AND 7815R IN REPRESENTATIVE APPLICATION

Grounded Grid CW Power Amplifier

Frequency	500 MHz
Heater Voltage	6.0 V
DC Plate Voltage	900 Vdc
DC Grid Voltage (approx)	-40 Vdc
DC Cathode Current	90 mAdc
DC Grid Current	25 mAdc
Drive Power (approx)	6 W
Useful CW Power Output	40 W

Grounded Grid CW Oscillator

Frequency	2.5 GHz
Heater Voltage	5.0 V
DC Plate Voltage	900 Vdc
DC Grid Voltage (approx)	-20 Vdc
DC Plate Current	90 mAdc
DC Grid Current	10 mAdc
Useful CW Power Output	17 W

GRID PULSED OR PLATE PULSED AMPLIFIER OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE (GRID PULSED)	2500 VOLTS
PEAK PULSE PLATE VOLTAGE (PLATE PULSED)	3500 VOLTS
DC GRID VOLTAGE	-150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE	
Grid negative to cathode	-700 VOLTS
Grid positive to cathode	250 VOLTS
PULSE PLATE CURRENT	3.0 AMPERES
PULSE GRID CURRENT	1.8 AMPERES
AVERAGE PLATE DISSIPATION	
Conduction and Convection (7815)	10 WATTS
Forced Air Cooling (7815R)	100 WATTS
GRID DISSIPATION (Average)	2 WATTS
FREQUENCY	3.0 GHz
PULSE DURATION[1]	6 μs
DUTY FACTOR[1]	.0033

OPERATING CONDITIONS FOR 7815 AND 7815R IN REPRESENTATIVE APPLICATION

Grid Pulsed Amplifier

Frequency	1.1	GHz
Heater Voltage	6.0	V
DC Plate Voltage	2200	Vdc
DC Grid Voltage	-45	Vdc
Peak Video Plate Current	1.9	a
Peak Video Grid Current	1.1	a
Pulse Drive Power (approx)	400	w
Useful Power Output (approx)	2000	w
Pulse Duration	3	μs
Duty Factor	.002	

Plate Pulsed Oscillator

Frequency	3.0	GHz
Heater Voltage	5.8	V
Peak Plate Voltage	3500	v
Peak Video Plate Current	3.0	a
Peak Video Grid Current	1.8	a
Useful Power Output (approx)	1600	w
Pulse Duration	3	μs
Duty Factor	.0025	

1. For application requiring longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Device Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

PULSE MODULATOR OR PULSE AMPLIFIER SERVICE

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE	2500	VOLTS
PEAK PLATE VOLTAGE	3500	VOLTS
DC GRID VOLTAGE	-150	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-700	VOLTS
Grid positive to cathode	150	VOLTS
PULSE CATHODE CURRENT	4.8	AMPERES
DC PLATE CURRENT	100	MILLIAMPERES
AVERAGE PLATE DISSIPATION		
Conduction and Convection (7815)	10	WATTS
Forced Air Cooling (7815R)	100	WATTS
GRID DISSIPATION (Average)	2	WATTS
PULSE DURATION [1]	6	μs
DUTY FACTOR [1]	.0033	
CUT-OFF MU	70	

1. For application requiring long pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Device Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

RANGE VALUES FOR EQUIPMENT DESIGN

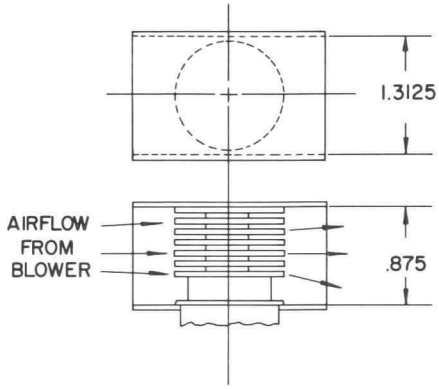
	Min.	Max.	
Heater: Current at 6.0 volts	0.90	1.05	A
Cathode Heating Time	60	---	sec.
Interelectrode Capacitances[1] (grounded cathode connection)			
Cin	5.60	7.00	pF
Cout	---	0.035	pF
Cgp	1.85	2.10	pF

1. Capacitance values for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.

APPLICATION

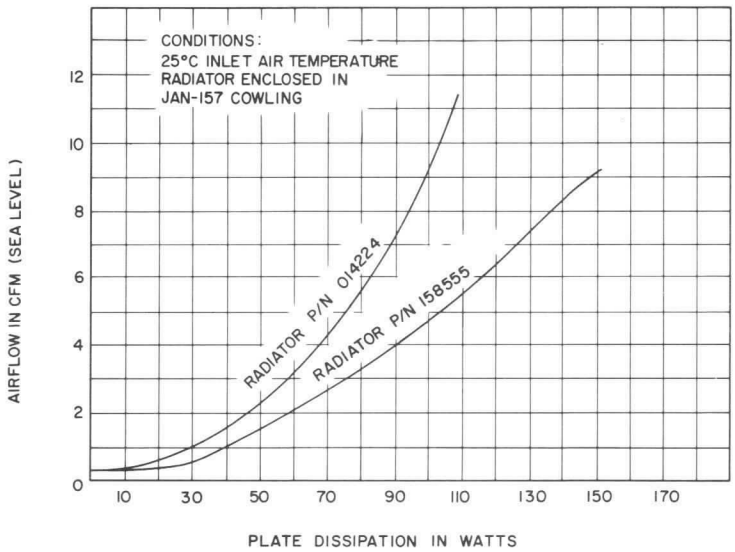
For general application information please refer to the Planar Triode Operating Instruction Sheet. The operating instructions should be consulted prior to the designing of new requirements around the above tube types. Plate dissipation of up to 150 watts is possible with the 7815/7815R tube type when using radiator P/N 158555. If this is required the tube order should include a reference the different radiator part number. For unusual and special application consult the nearest Varian Electron Tube and Device Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake, City, Utah.

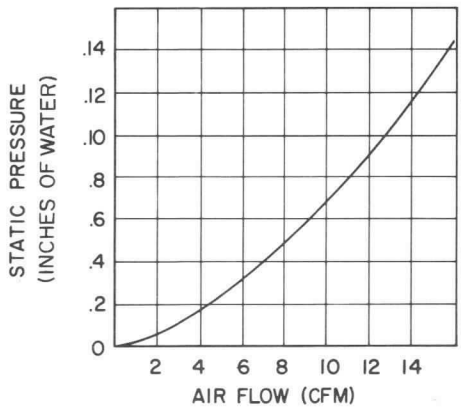
AIRFLOW vs STATIC PRESSURE WITH STANDARD COWLING JAN-157



-STANDARD COWLING-

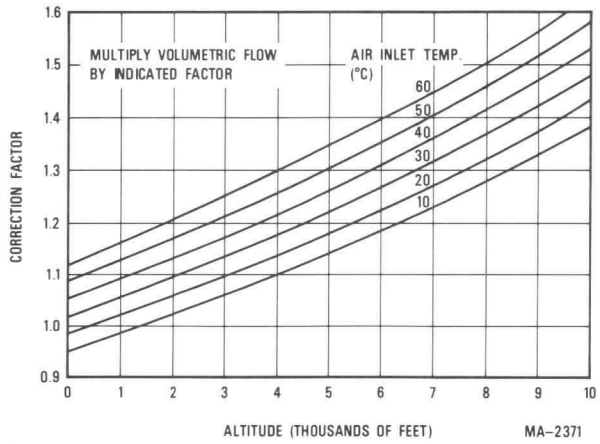
MAXIMUM PLATE DISSIPATION vs COOLING AIRFLOW

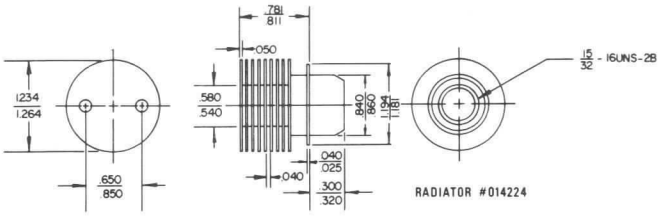




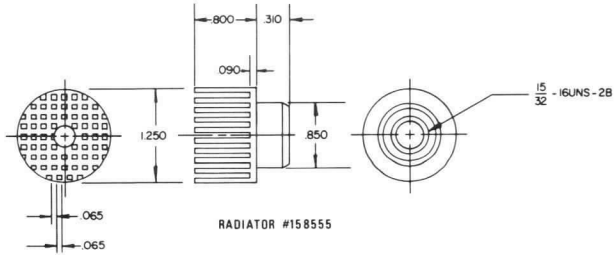
COMBINED CORRECTION FACTORS FOR INLET AIR TEMPERATURE AND ALTITUDE

(RELATIVE TO 25°C AND SEA LEVEL)

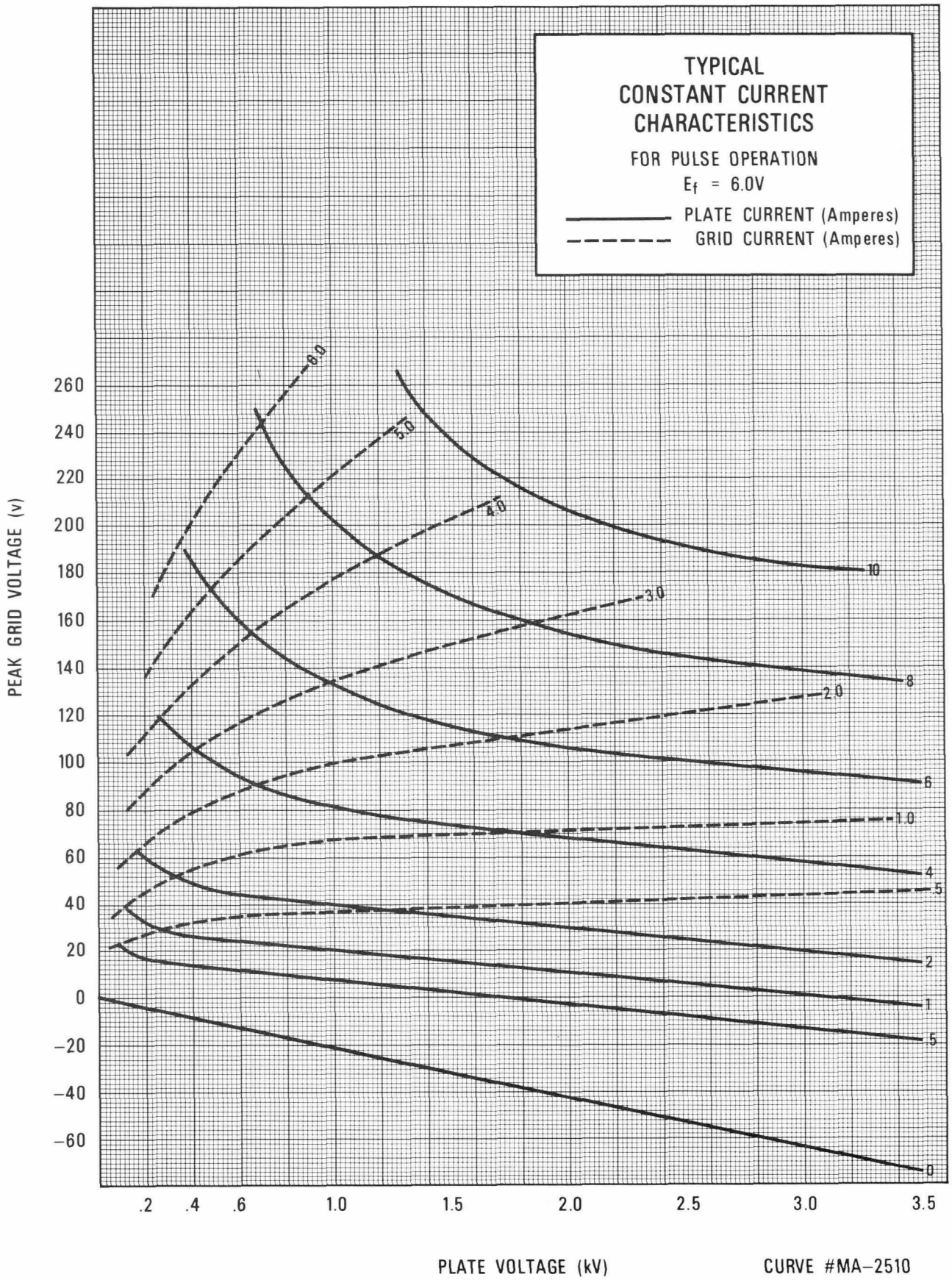




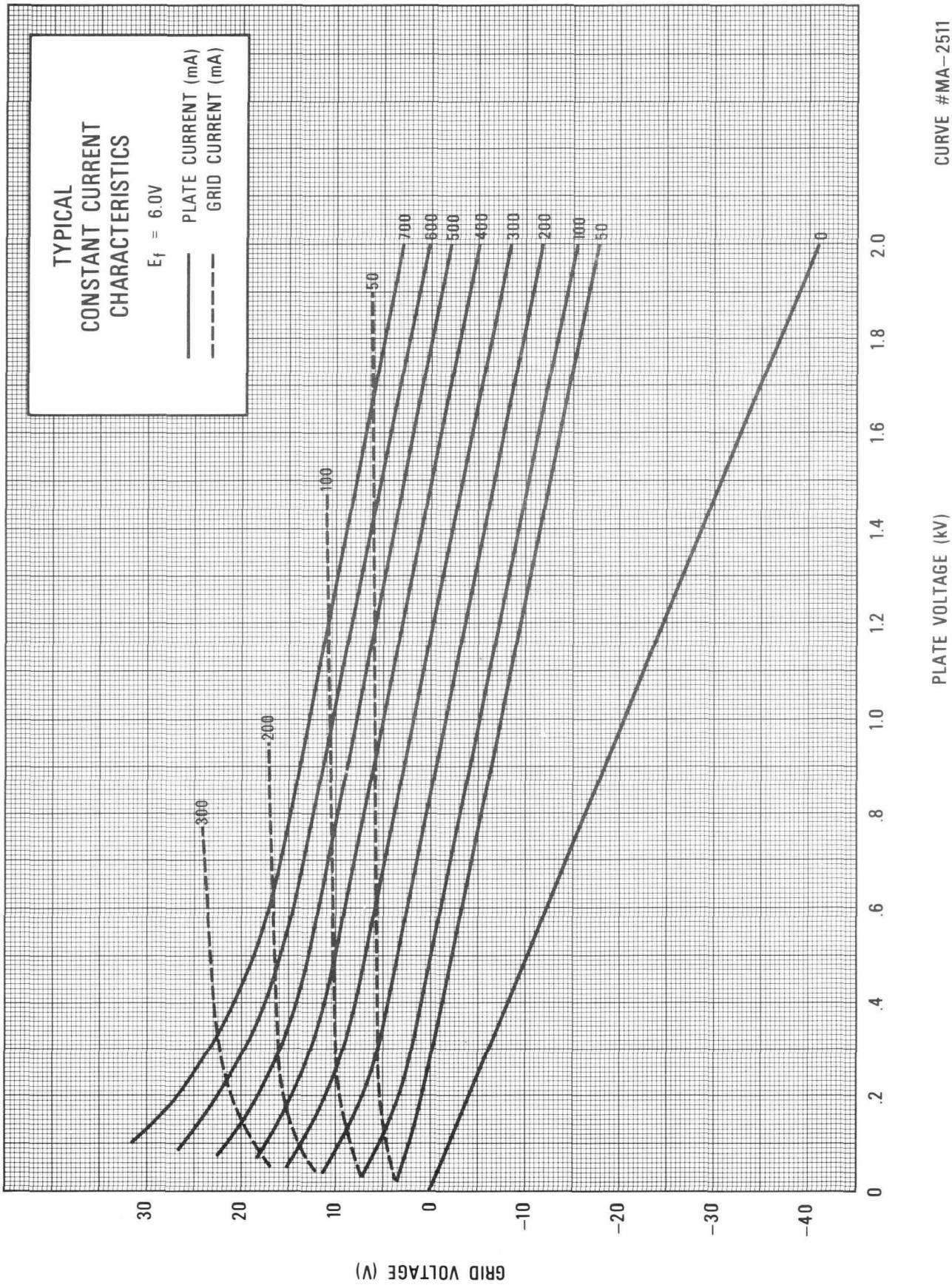
RADIATOR #014224



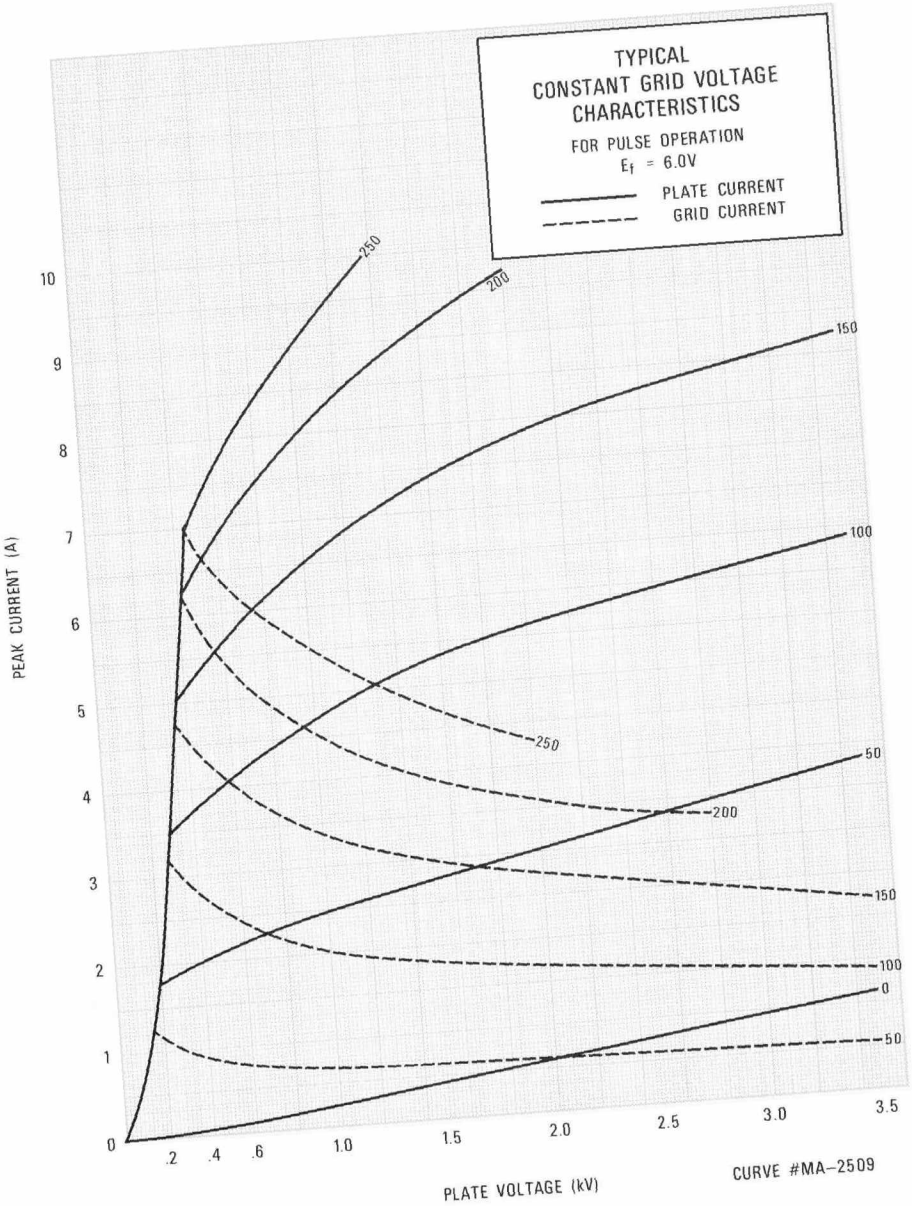
RADIATOR #158555

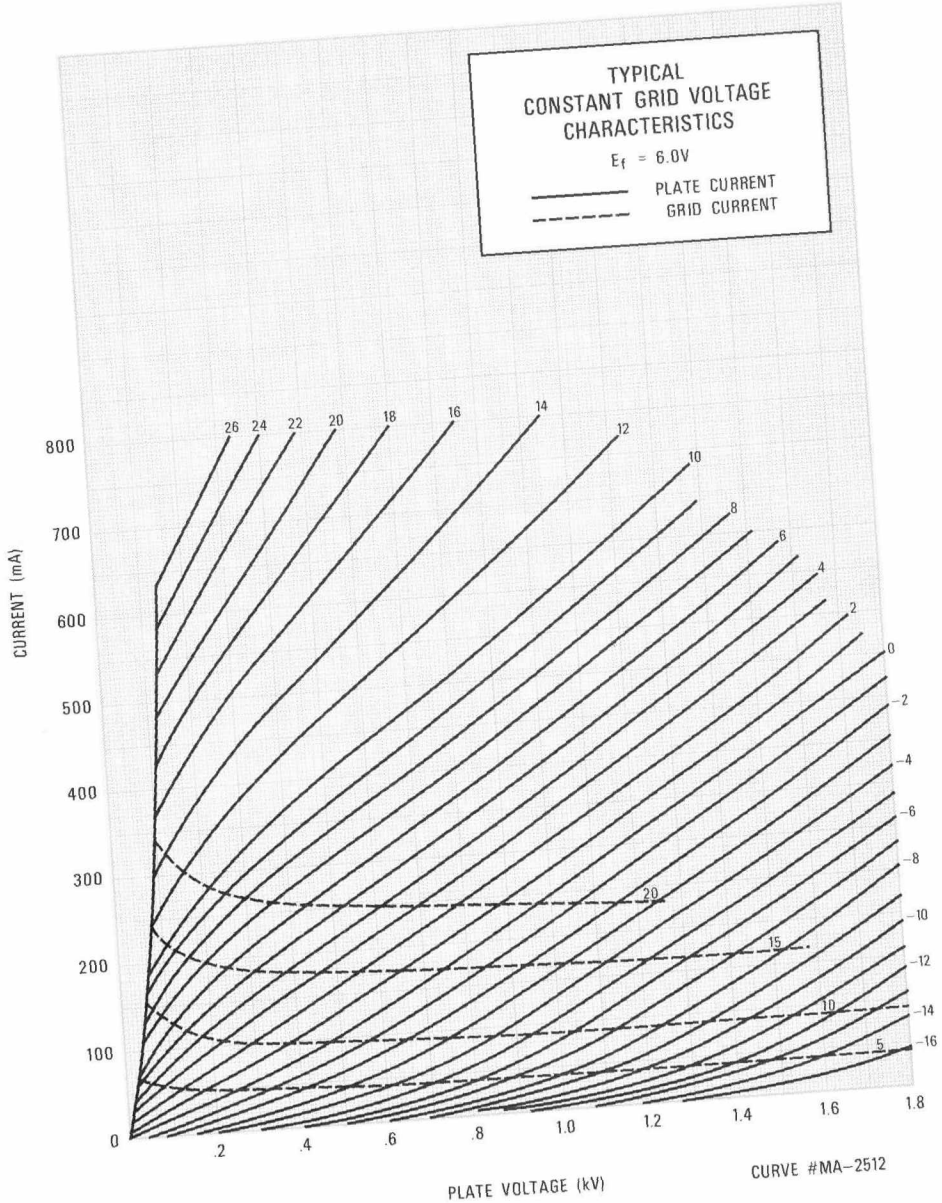


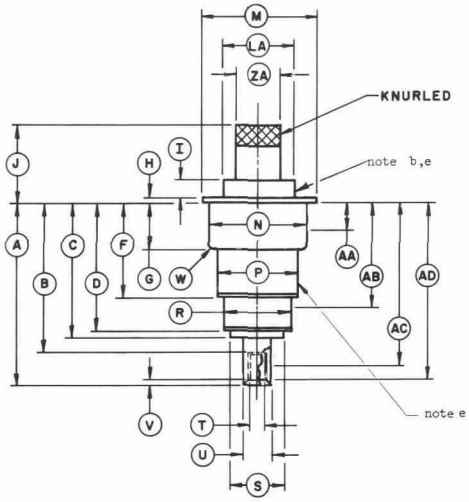
CURVE #MA-2510



CURVE #MA-2511


TYPICAL
CONSTANT GRID VOLTAGE
CHARACTERISTICS
FOR PULSE OPERATION
E_f = 6.0V
PLATE CURRENT
GRID CURRENT
PEAK CURRENT (A)
PLATE VOLTAGE (kV)
CURVE #MA-2509
250
200
150
100
50
0
250
200
150
100
50


TYPICAL
CONSTANT GRID VOLTAGE
CHARACTERISTICS
E_f = 6.0V
PLATE CURRENT
GRID CURRENT
CURRENT (mA)
PLATE VOLTAGE (kV)
CURVE #MA-2512
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
20
15
10
5



7815

ELECTRODE CONTACT AREA (see note a,f)				
DIM.	MIN.	MAX.	MIN.	MAX.
AA	.035	.361	.89	9.17
AB	1.185	1.265	30.10	32.14
AC	1.534	1.728	38.96	43.89
AD	1.475	1.815	37.47	46.10
	DIM. IN INCHES		DIM. IN MILLIMETERS	

DIMENSION DATA (Note a)					
DIM. IN INCHES		DIM. IN MILLIMETERS			
MIN.	MAX.	DIM.	MIN.	MAX.	NOTES
1.815	1.875	A	46.10	47.62	
	1.534	B		38.96	
	1.475	C		37.46	
1.289	1.329	D	32.74	33.76	
.970	1.010	F	24.64	25.65	
.462	.477	G	11.73	12.12	
	.040	H		1.02	
	.185	I		4.70	
.766	.826	J	19.46	20.98	
1.180	1.195	M	29.97	30.35	
1.025	1.035	N	26.04	26.29	d
.752	.792	P	19.10	20.12	
.655	.665	R	16.64	16.89	d
	.545	S		13.84	
.213	.223	T	5.41	5.66	d
.315	.325	U	8.00	8.26	d
	.086	V		2.18	
	.100	W		2.54	
.840	.860	LA	21.34	21.84	
.427	.447	ZA	10.85	11.35	

NOTES:

a.. Metric equivalents, to the nearest .01 mm, are given for general information only & are based on 1 inch = 25.4 mm.

b. This surface shall be used to measure Anode Shank temperature.

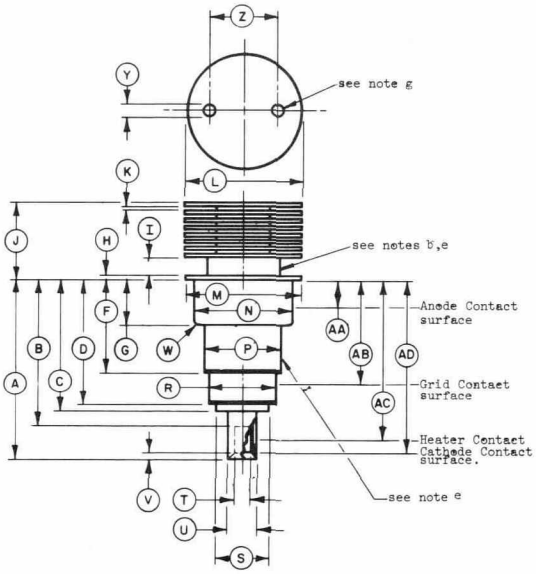
c. Eccentricity of contact surfaces shall be gaged from center line of reference & shall be as follows; note 2 shall apply:

Contact Surface	TIR Max.	Reference
Anode	.020	Cathode
Grid	.020	Cathode
Heater	.012	Cathode

d. Dias. N,R,T,U shall apply throughout entire contact area as defined by dims. AA,AB, AC,AD respectively.

e. This surface shall not be used for clamping or locating.

f. Electrode Contact Dims. are given for socket design purposes & are not intended for inspection purposes.



7815R

ELECTRODE CONTACT AREA (Note a,f)				
Dim. in Inches			Dim. in Millimeter	
Dim.	Min.	Max.	Min.	Max.
AA	.035	.361	.89	9.17
AB	1.185	1.265	30.10	32.14
AC	1.534	1.728	38.96	43.89
AD	1.475	1.815	37.47	46.10

DIMENSION DATA (Note a)					
Dim. in Inches		Dim. in Millimeters.			
Min.	Max	Dim.	MIN.	MAX.	Notes
1.815	1.875	A	46.10	47.62	
	1.534	B		38.96	
	1.475	C		37.46	
1.289	1.329	D	32.74	33.76	
.970	1.010	F	24.64	25.65	
.462	.477	G	11.73	12.12	
	.040	H		1.02	
.125	.185	I	3.18	4.70	
.766	.826	J	19.46	20.98	
.025	.040	K	.64	1.17	
1.234	1.264	L	31.34	32.11	
1.180	1.195	M	29.97	30.35	
1.025	1.035	N	26.04	26.29	e,d
.752	.792	P	19.20	20.12	
.655	.665	R	16.64	16.89	e,d
	.545	S		13.84	
.213	.223	T	5.41	5.66	e,d
.315	.325	U	8.00	8.26	e,d
	.086	V		2.18	
	.100	W		2.54	
.105	.145	Y	2.67	3.68	
.650	.850	Z	16.51	21.59	

Notes:

a. Metric equivalents to the nearest .01 mm, are given for general information only & are based on 1 inch= 25.4 mm.

b. This surface shall be used to measure anode shank temp.

c. Eccentricity of contact surfaces shall be gaged from center line of reference & shall be as follows:

Contact Surface	TIR Max.	Reference
Anode	.020	Cathode
Grid	.020	Cathode
Heater	.012	Cathode

d. Dias. N,R,T & U shall apply throughout entire lenght as defined be dims. AA,AB,AC & AD respectively.

e. This surface shall not be used for clamping or locating.

f. Electrode Contact dims. are given for socket design purposes & are not intended for inspection purposes.

g. Holes for Tube Extractor thru top fin only.