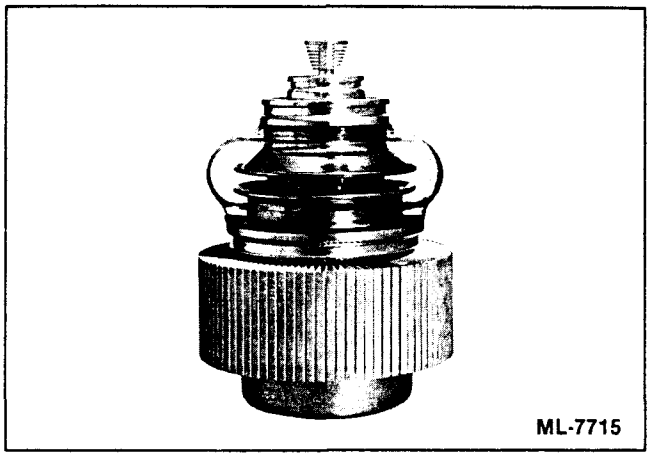
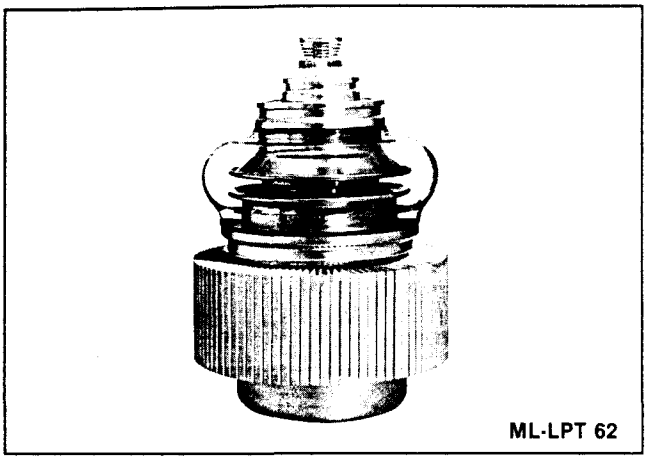
MACHLETT

PRODUCT DATA

ML-7715, ML-LPT 62



ML-7715



ML-LPT 62

APPLICATION

The ML-7715 and its ruggedized version, the ML-LPT-62, are shielded-grid triodes designed primarily for use as switch tubes in hard-tube pulse modulators for radar applications. They can deliver a peak pulse power output of 3.5 megawatts with less than 7 kilowatts driving power. The maximum ratings of 65 kVdc and 70 kV peak apply when the tube is completely immersed in a suitable dielectric fluid such as sulfur hexafluoride or a mineral oil.

CONSTRUCTION

These tubes incorporate a beamed electrode structure to minimize driving power. This design avoids the fine-wire grids usually used in tetrodes and provides a rugged structure. The shield grid is strapped to the cathode internally and protects the cathode from transient arcs. These features provide a tube which operates much more stably at high voltages than hard-tube modulators of earlier design. The high amplification factor coupled with low grid current results in unusually low driving power requirements. Additionally, the input and output circuits are isolated so that feedback capacitance is small. The cathode is a unipotential oxide-coated type. When cooled by forced air, the anode is capable of dissipating 3 kW with 200 cfm air flow. When cooled by oil forced through the radiator, the anode can dissipate 3 kW at 2 gal./min. (7.6 L/min.) oil flow.

WARNING

When operating at peak voltage in excess of 15 kV, this electron tube may give off x-rays which can be harmful unless adequately shielded by the enclosure within which the tube is used. Instructions for protective installation are given in National Bureau of Standards Handbook 114, "Safety Standard for Non-Medical X-Ray and Sealed Gamma Ray Sources." Additional information is available in National Council on Radiation Protection and Measurements Report No. 33, "Medical X-Ray and Gamma Ray Protection for Energies up to 10 MeV." Periodic checks of shielding effectiveness are also required since x-ray radiation levels may increase with the operating life of the tube.

ORDERING NOTES

Refer to **Machlett** price list. When ordering specify:

- tube type
- accessories - (both types except as noted)
  - —heater connector (small) F-21989
  - —cathode/heater connector (large) F-21991
  - —grid connector F-21987
  - —tube support (ML-7715) P-16893

SPECIFICATION

ELECTRICAL CHARACTERISTICS

	ML-7715	ML-LPT 62
Heater Voltage:	6.0 ± 5% volts	6.3 ± 5% volts
Heater Current:	60 amps	62 amps
Heater Starting Current, maximum:	300 amps	300 amps
Cathode Warmup Time:	10 Minutes*	15 Minutes*
Amplification Factor:	400	400
Interelectrode Capacitances:		
Grid-Plate:	2.0 pf	1.2 pf
Grid-Cathode:	250 pf	275 pf
Plate-Cathode:	20 pf	20 pf

MECHANICAL CHARACTERISTICS:

	ML-7715 & ML-LPT 62
Mounting Position (support tube by anode radiator only):	Any
Forced-Air Cooling†	
Air Flow Thru Anode Radiator, Minimum for 3 kW Dissipation:	200 cfm
Air Flow on Grid Radiator, Minimum:	25 cfm
Maximum Incoming Air Temperature:	75 °C (167 °F)

Forced-Oil Cooling†	
Oil Flow Thru Anode Radiator, Minimum for 3 kW Dissipation:	2 gal./min. (7.6 L/min.)
Oil Flow on Grid Radiator:	(convection)‡
Maximum Bulk Oil Temperature:	75 °C (167 °F)
Maximum Glass Temperature:	175 °C (347 °F)
Net Weight, approximate:	28 lbs. (12.7 kg)

* For accelerated cathode warmup, the heater may be energized at 7.0 volts (7.5 volts for LPT 62) for 5 minutes and then reduced to rated value for high voltage operation. If a heater standby voltage of 5.0 volts is used (5.25 volts for LPT 62), the minimum cathode warmup time is one minute at rated voltage.

† Sufficient coolant flow must be provided to maintain glass temperatures at less than 175 °C (347 °F) under all conditions of operation.

‡ If the tube is mounted with the terminal end down, an additional oil flow of about ⅓ gpm must be directed into the grid-heater well.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Pulse Modulator or Pulse Amplifier

Maximum Ratings, Absolute Values*	ML-7715 & ML-LPT 62	
DC Plate Voltage	65	kV‡
Peak Plate Voltage	70	kv‡
DC Grid Voltage	−600	volts
Peak Positive Grid Voltage	+1.5	kv
Peak Negative Grid Voltage	−1500	volts
Pulse Cathode Current	90	amp‡‡
DC Plate Current	600	mA
Grid Dissipation	25	watts
Plate Dissipation	3.0	kW
Pulse Duration	10	*μsec*#
Duty Factor	0.03	#

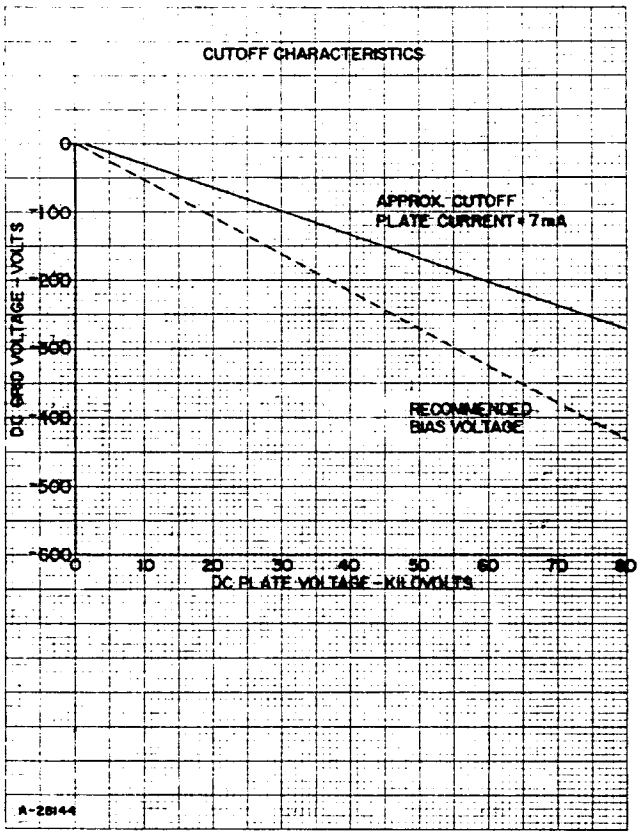
Typical Operation	ML-7715 & ML-LPT 62			
DC Plate Voltage	60	kV‡	65	kV‡
DC Grid Voltage	−350	volts	−350	volts
Pulse Positive Grid Voltage	+0.6	kv	+1.2	kv
Pulse Plate Current	25	amp	65	amp
Pulse Grid Current	2	amp	4	amp
Pulse Driving Power	1.9	kw	6.2	kw
Pulse Power Output	1.3	Mw	3.5	Mw
Plate Output Voltage	55	kv	55	kv
Duty Factor	.01		.003	

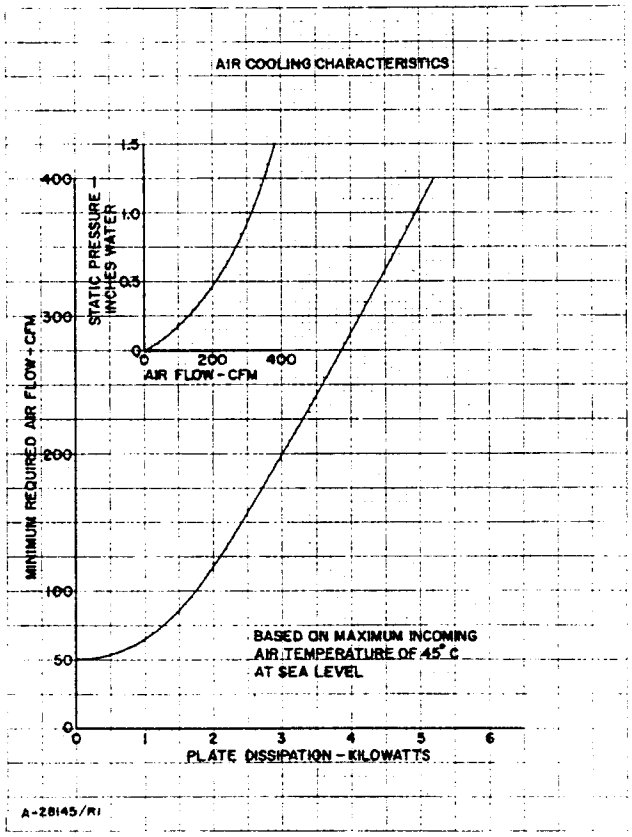
* All given maximum ratings may not apply simultaneously. Due to the possibility of instantaneous overheating of electrodes during the pulse, it may be necessary to restrict some of the parameters, e.g., peak plate current, tube drop, pulse duration, duty or average dissipation, in order not to adversely affect the performance of the tube. Because of the many possible combinations of operating conditions, all restrictions cannot be delineated here, and it is suggested to review new applications with the Machlett Engineering Department.

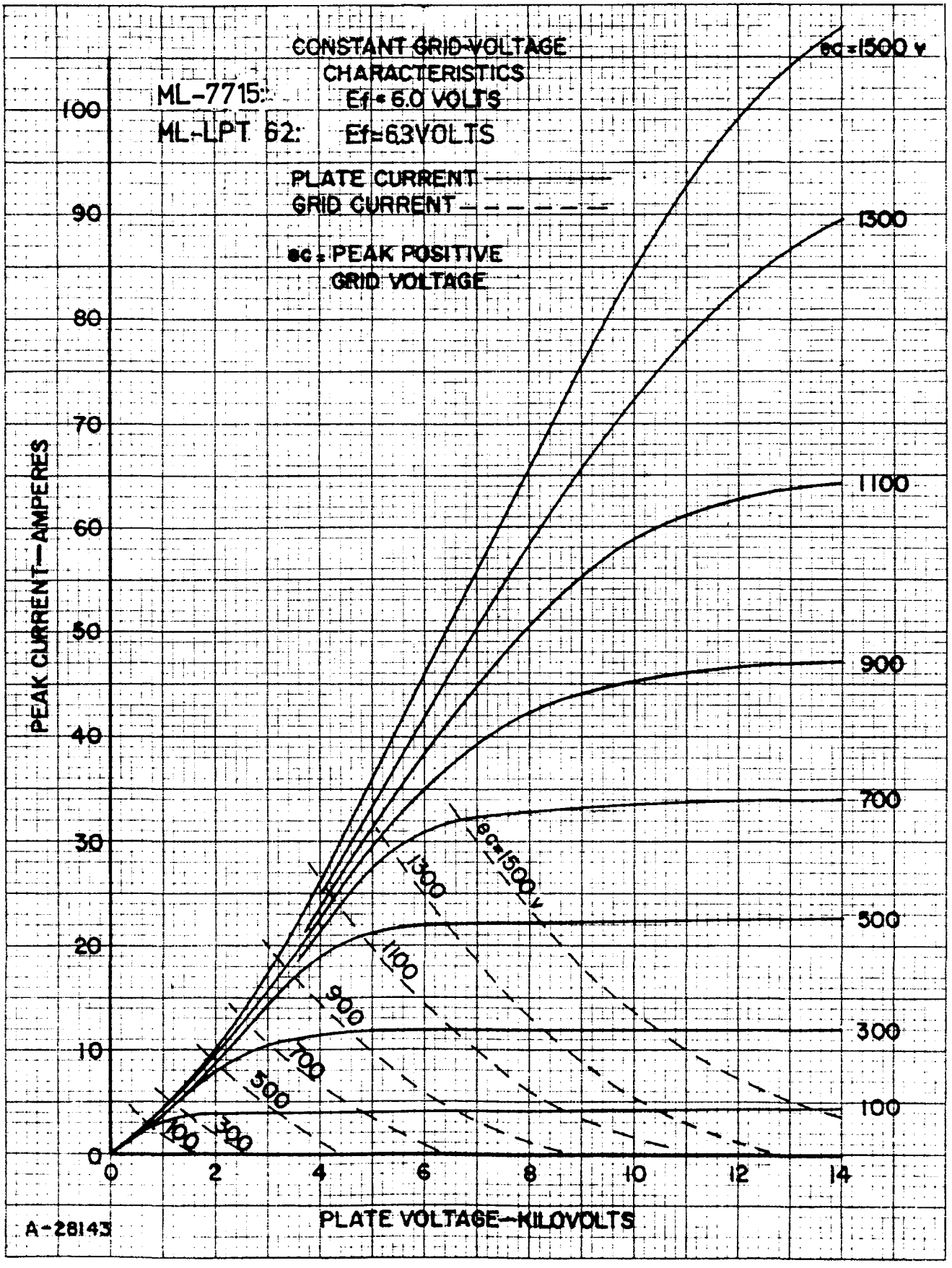
‡ This voltage may be applied only when the tubes are in a suitable dielectric liquid or gas. When the insulating medium is air at atmospheric pressure, the maximum ratings are 45 kV dc and 50 kv peak.

‡‡ For pulse cathode currents above 60 amperes, minimum heater voltage for the LPT 62 is 6.3 V.

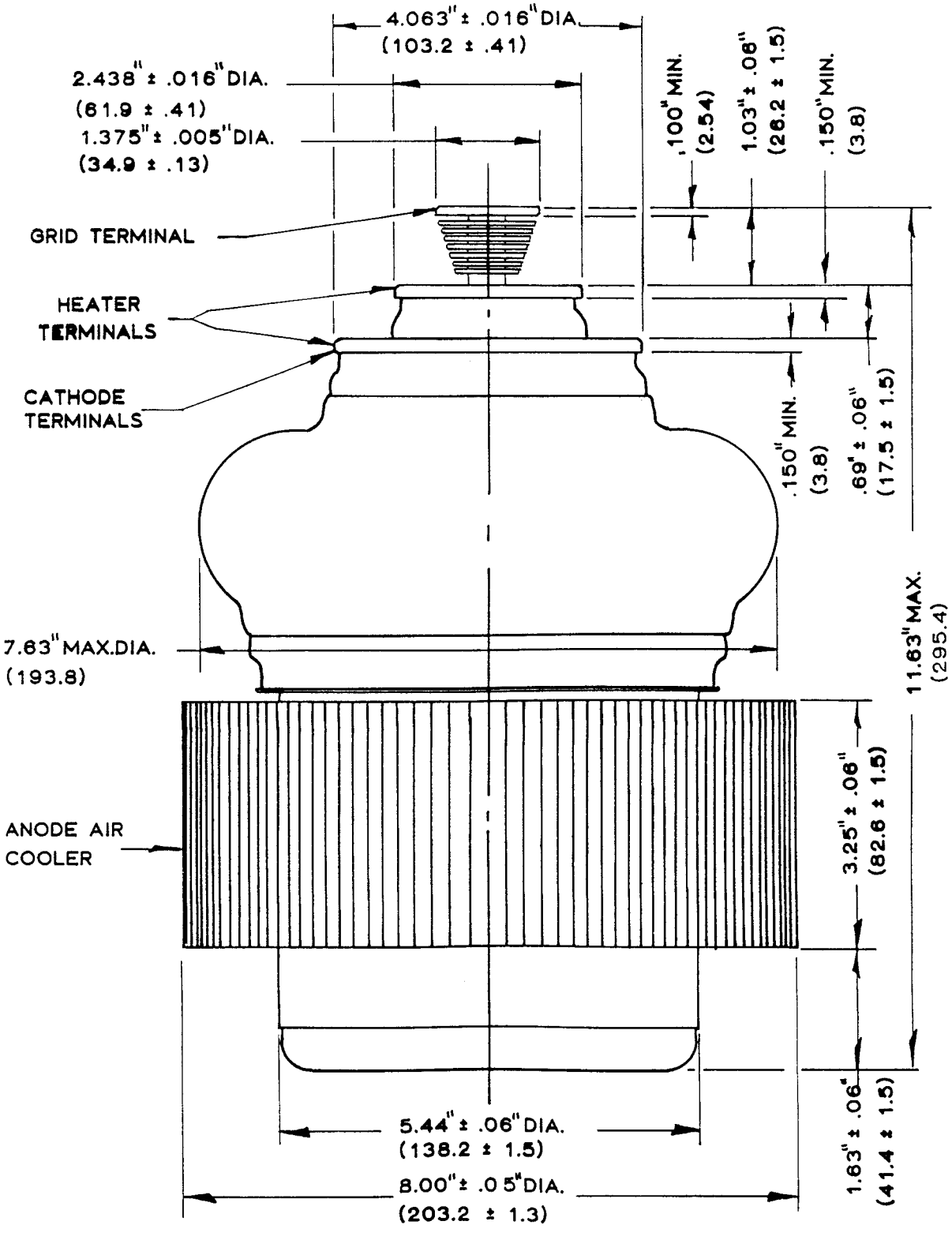
\# For applications requiring longer pulse duration or higher duty factors, consult the Machlett Engineering Department.






CONSTANT GRID-VOLTAGE CHARACTERISTICS
ML-7715: Ef = 6.0 VOLTS
ML-LPT 62: Ef=6.3VOLTS
PLATE CURRENT
GRID CURRENT
ec = PEAK POSITIVE GRID VOLTAGE
ec=1500 V
1300
1100
900
700
500
300
100
PEAK CURRENT—AMPERES
PLATE VOLTAGE—KILOVOLTS
0
2
4
6
8
10
12
14
10
20
30
40
50
60
70
80
90
100
A-28143

ML-7715 & ML-LPT 62 † OUTLINE DATA



ALL DIMENSIONS IN INCHES (MM) ED-28348/R1

† The LPT 62 has a teflon re-inforcing spider mounted under the grid radiator.

SPO882
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ST-3763