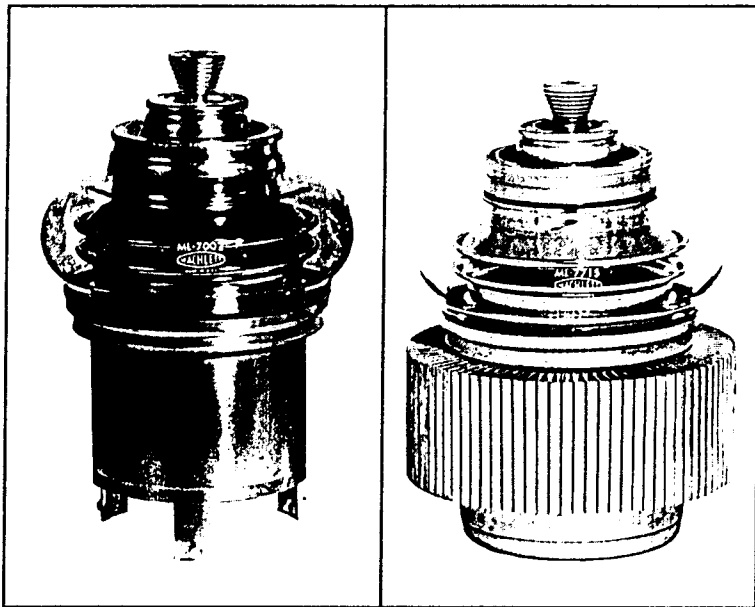


# ML-7002 ML-7715

**Shielded  
Grid Triodes**  
Pulse Power  
to 3.5 Mw



ELECTRON TUBE SPECIALIST



## DESCRIPTION

The ML-7002 and ML-7715 are shielded-grid triodes designed primarily to operate as switch tubes in hard-tube pulse modulators, for radar and similar applications. In this service they can deliver more than three megawatts pulse power output with less than 10 kilowatts driving power.

Each of these types has sturdy electrodes arranged to form a cylindrical array of electron-optical systems, featuring a shield electrode connected internally to the cathode by direct, low-impedance paths. This design permits operation with low grid current and it results in favorably low grid-plate capacitance. The presence of the ground-potential

shield adjacent to the anode, furthermore, protects the cathode and grid from damage by transient arcs.

The cathode of each type is unipotential, oxide-coated. The anode of the ML-7002 is designed to be cooled by a forced flow of oil or other dielectric liquid.† The ML-7715 anode is cooled by forced-air or dielectric gas. When cooled by forced air the anode is capable of dissipating 3 kW with 150 cfm air flow. The maximum ratings of 65 kVdc and 70 kv peak apply when the tubes are completely immersed in a suitable dielectric fluid. This fluid is typically mineral oil for the ML-7002, and a gas such as sulfur hexafluoride for the ML-7715.

## GENERAL CHARACTERISTICS

### Electrical

Heater Voltage .....	6.0 ± 5%	Volts
Heater Current .....	60	Amps
Heater Starting Current, maximum .....	300	Amps
Cathode Warmup Time .....	10	Minutes*
Amplification Factor .....	400	
Interelectrode Capacitances		
Grid-Plate .....	2.0	μμf
Grid-Cathode .....	250	μμf
Plate-Cathode .....	25	μμf

### Mechanical

Mounting Position (support tube by anode or anode radiator only)	Any
Type of Cooling — ML-7002 .....	Circulating oil†
Type of Cooling — ML-7715 .....	Forced-air‡
Air flow on anode, minimum for 3 kW dissipation .....	150 cfm at 0.3" water
Air flow on grid .....	50 cfm
Maximum incoming air temperature .....	65 °C
Maximum Glass Temperature .....	175 °C‡
Net Weight, approximate	
ML-7002 .....	18 lbs.
ML-7715 .....	28 lbs.

†For details on cooling requirements for ML-7002, consult the Machlett Engineering Department.

\*For accelerated cathode warmup, the filament may be energized at 7.0 volts for 5 minutes and then reduced to 6.0 volts for high-voltage operation. If a filament standby voltage of 5.0 volts is used, the minimum cathode warmup time is 1 minute at 6.0 volts.

‡Sufficient coolant flow must be provided to maintain glass temperatures at less than 175°C under all conditions of operation.

**MAXIMUM RATINGS  
AND TYPICAL OPERATING CONDITIONS**  
VALUES APPLY TO BOTH TYPES

**Pulse Modulator or Pulse Amplifier**

Maximum Ratings, Absolute Values

D-C Plate Voltage .....	65	kV*
Peak Plate Voltage .....	70	kv*
D-C Grid Voltage .....	-600	volts
Peak Positive Grid Voltage .....	+1.5	kv
Peak Negative Grid Voltage .....	-1500	volts
Pulse Cathode Current .....	90	amp
D-C Plate Current .....	250	mA
Grid Dissipation .....	75	watts
Plate Dissipation .....	3.0	kW
Pulse Duration† .....	25	μsec
Duty Factor† .....	0.03	

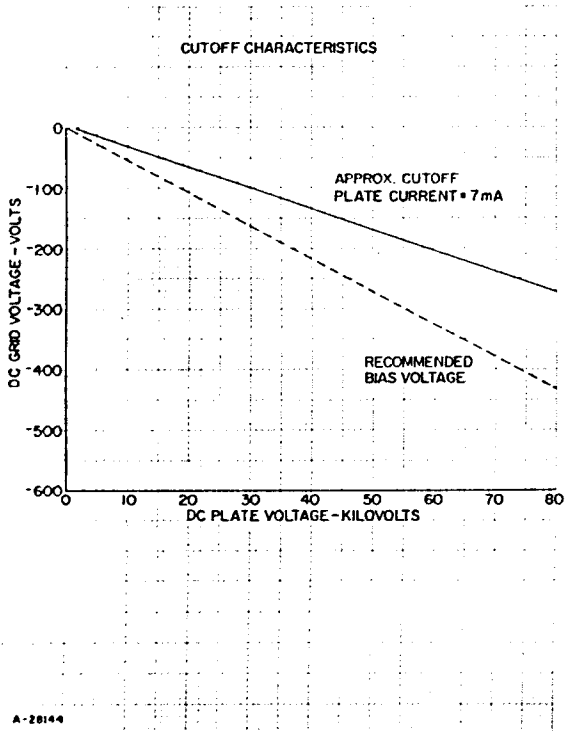
Typical Operation

D-C Plate Voltage .....	60	65	kV*
D-C Grid Voltage .....	-350	-350	volts
Pulse Positive Grid Voltage .....	+0.6	+1.2	kv
Pulse Plate Current .....	25	65	amp
Pulse Grid Current .....	2	4	amp
Pulse Driving Power .....	1.9	6.2	kw
Pulse Power Output .....	1.3	3.5	Mw
Plate Output Voltage .....	55	55	kv
Duty Factor .....	.01	.003	

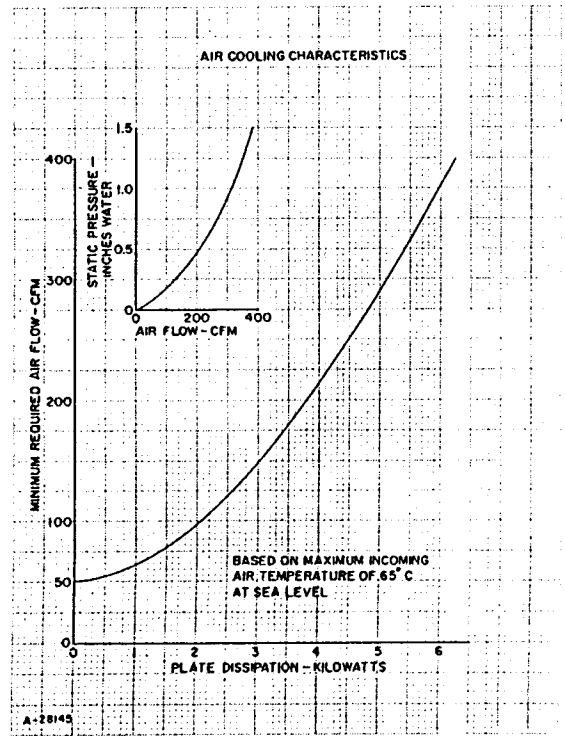
†For applications requiring longer pulse duration or higher duty factors, consult the Machlett Engineering Department.

\*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 plate voltage ratings are 45 kVdc and 50 kv peak.

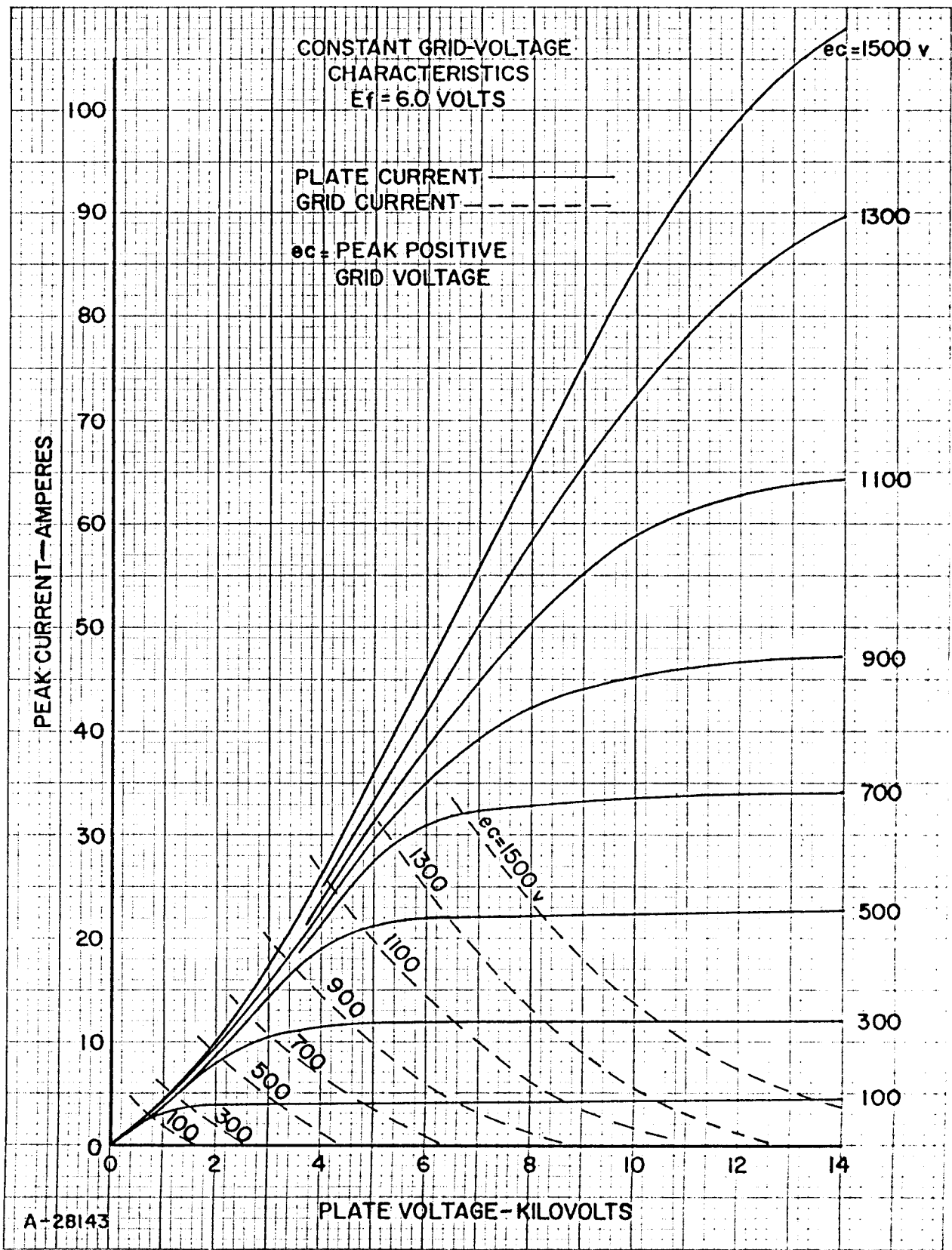
**WARNING:** Operation of this tube may produce x-rays. Adequate rayproof shielding must therefore be provided in the equipment.



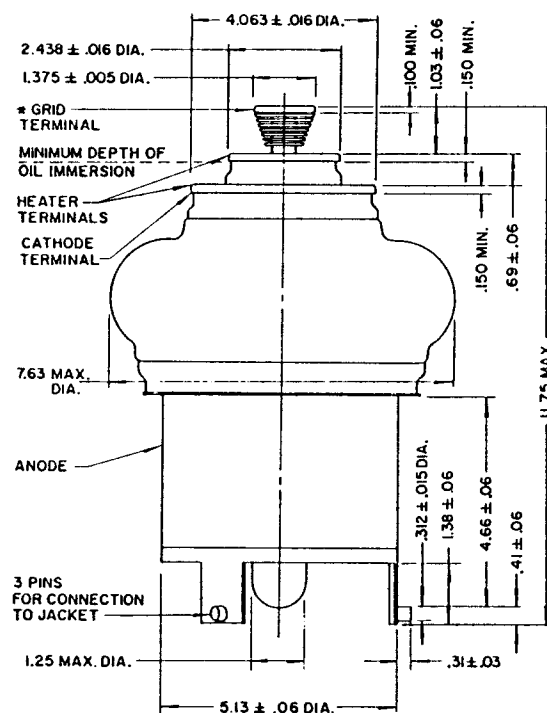
CUT-OFF CHARACTERISTICS  
ML-7002 & ML-7715



AIR COOLING CHARACTERISTICS  
ML-7715



CONSTANT GRID VOLTAGE CHARACTERISTICS—ML-7002 & ML-7715

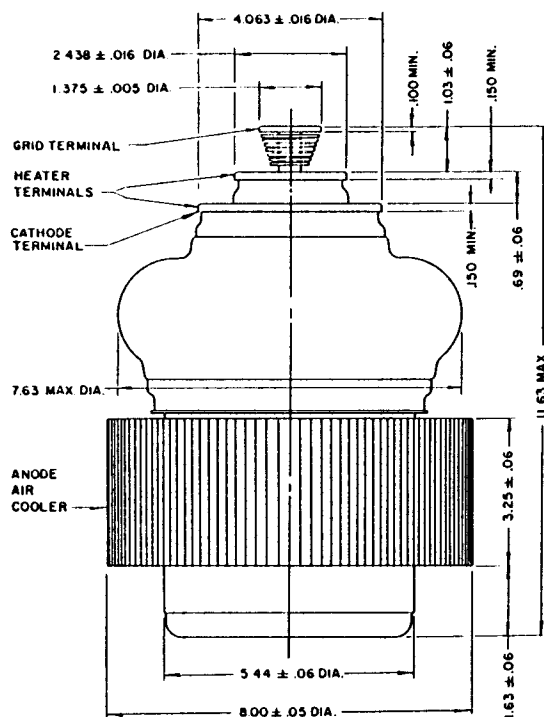


ALL DIMENSIONS IN INCHES

\* IF TUBE IS NOT COMPLETELY IMMERSSED IN OIL, AIR FLOW OF 25 CFM IS REQUIRED ON GRID TERMINAL

ED-28349

DIMENSIONS — ML-7002



ALL DIMENSIONS IN INCHES

ED-28348

DIMENSIONS — ML-7715

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