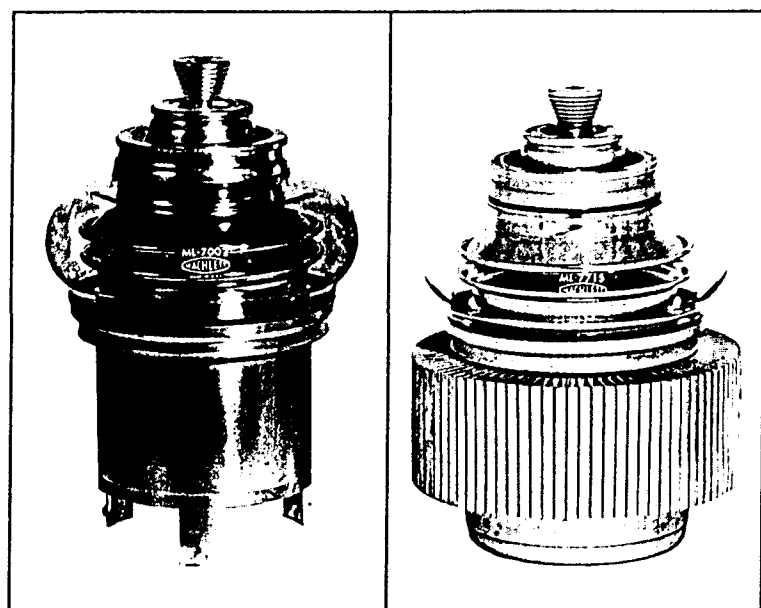


ML-7002 ML-7715

**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	μf
Grid-Cathode	250	μf
Plate-Cathode	25	μf

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

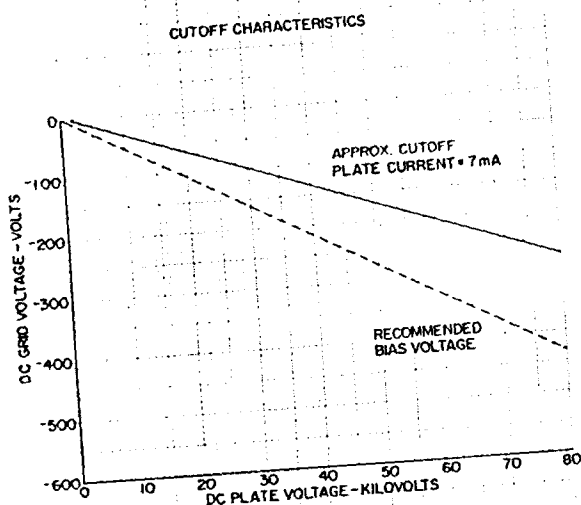
Maximum Ratings, Absolute Values	
D-C Plate Voltage	65 kV*
Peak Plate Voltage	70 kv*
D-C Grid Voltage	-600 volts
Peak Positive Grid Voltage	+1.5 kv
Peak Negative Grid Voltage	-1500 volts
Pulse Cathode Current	90 amp
D-C Plate Current	250 mA
Grid Dissipation	75 watts
Plate Dissipation	3.0 kW
Pulse Duration†	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.

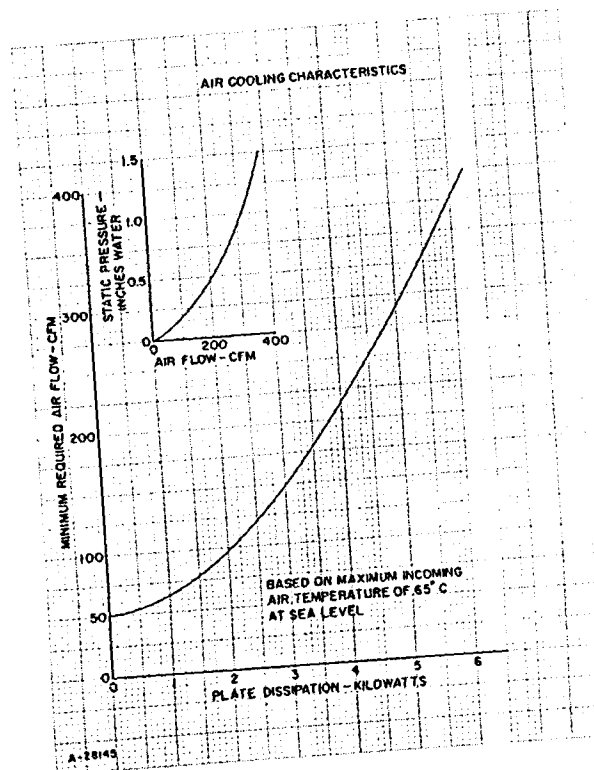
*This voltage may be applied only when the tubes are in a suitable dielectric liquid or gas. When the insulating medium is air at atmospheric pressure, the maximum plate voltage ratings are 45 kVdc and 50 kv peak.

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



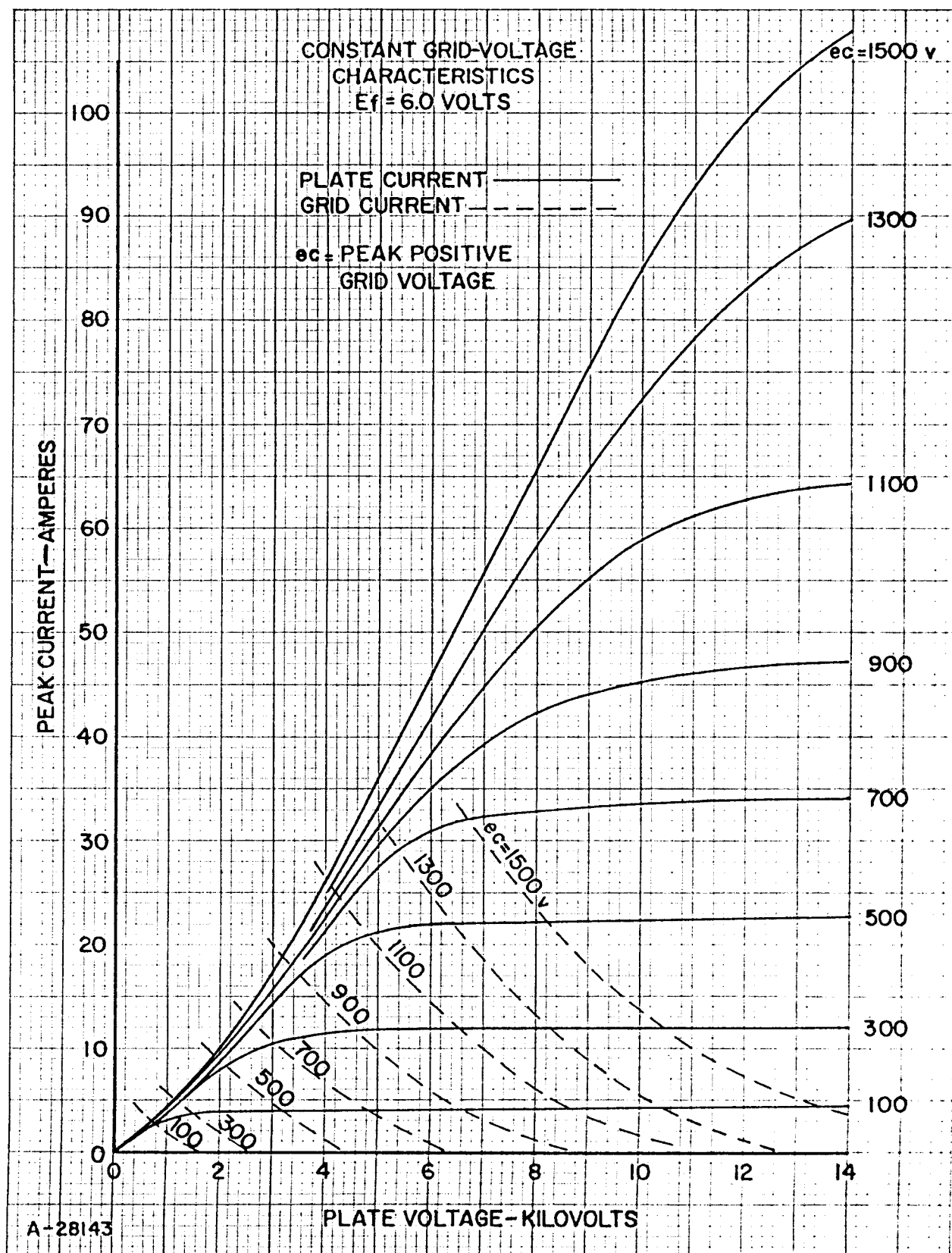
A-28144

CUT-OFF CHARACTERISTICS
ML-7002 & ML-7715



A-28145

AIR COOLING CHARACTERISTICS
ML-7715



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



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

ED-28349

Technical drawing of a vacuum tube assembly, showing dimensions and labels. The drawing includes a cross-section of the tube and a side view of the anode air cooler.

Labels:

- GRID TERMINAL
- HEATER TERMINALS
- CATHODE TERMINAL
- ANODE AIR COOLER

Dimensions:

- Top diameter: $4.063 \pm .016$ DIA.
- Second diameter from top: $2.438 \pm .016$ DIA.
- Third diameter from top: $1.375 \pm .005$ DIA.
- Distance from top to heater terminals: $.100$ MIN.
- Distance from heater terminals to cathode terminal: $1.03 \pm .06$
- Distance from cathode terminal to base: $.150$ MIN.
- Base diameter: $.69 \pm .06$
- Maximum diameter of the main body: 7.63 MAX DIA.
- Length of the anode air cooler: $3.25 \pm .06$
- Inner diameter of the anode air cooler: $5.44 \pm .06$ DIA.
- Outer diameter of the anode air cooler: $8.00 \pm .05$ DIA.
- Maximum diameter of the anode air cooler: 11.63 MAX DIA.

ALL DIMENSIONS IN INCHES

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