

# ML-5541

## DESCRIPTION AND RATINGS

### DESCRIPTION

The ML-5541 is a three-electrode tube designed for high-frequency dielectric-heating service, and for AM and FM broadcasting at frequencies up to 110 megacycles. The tube has been designed for grounded-plate use, but it is also suitable for grounded-grid applications. Circuit inductance has been kept at a minimum in the grid as well as in all other internal connections. The filament is oriented with respect to the grid structure to minimize the required r-f driving power. The cathode is a thoriated-tungsten filament, whose

self-supporting structure employs no sliding contacts, insulators, or tension springs. Rugged grid support rods provide great mechanical strength as well as low electrical loss. Kovar is used for the glass-to-metal seals. The plate fin structure is designed to provide 10 kilowatts dissipation with a forced-air flow of 500 cfm. Maximum ratings of 8.5 kVdc plate voltage and 23 kW plate input apply at frequencies up to 110 Mc.

### GENERAL CHARACTERISTICS

#### Electrical

Filament Voltage .....	7.5 Volts
Filament Current at 7.5 Volts .....	57 Amps
Filament Starting Current, maximum .....	250 Amps
Filament Cold Resistance .....	.017 Ohms
Amplification Factor .....	26
Grid Plate Transconductance at $E_b = 3.6$ kV; $I_b = 2.75$ amps .....	21000 umhos
Interelectrode Capacitances	
Grid-Plate .....	25 uuf
Grid-Filament .....	20 uuf
Plate-Filament .....	1.5 uuf

#### Mechanical

Mounting Position .....	Vertical, anode down
Type of Cooling .....	Forced-air
Air flow on anode, minimum for 10kW dissipation .....	500 cfm at 0.55" water
Air flow on glass and seals .....	See Note
Maximum incoming air temperature .....	45 °C
Maximum Glass Temperature .....	160 °C
Net Weight, approximate .....	30 lbs.

Note: At frequencies above 40 Mc, or at high ambient temperatures, auxiliary air flow may be required and should be distributed to maintain uniform glass temperature, not greater than 160°C. Auxiliary cooling may be obtained from separate blower or by reversing the direction of air flow through radiator (exhaust).

**MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS**

(Continuous Commercial Service)

**Audio-Frequency Power Amplifier and Modulator  
Class B**

Maximum Ratings, Absolute Values

D-C Plate Voltage .....	8500 volts
Maximum Signal D-C Plate Current* .....	2.5 amps
Maximum Signal Plate Input* .....	21 kW
Plate Dissipation* .....	10 kW

Typical Operation (Values are for two tubes)

D-C Plate Voltage .....	7500 volts
D-C Grid Voltage .....	-250 volts
Peak A-F Grid-to-Grid Voltage .....	1280 volts
Peak A-F Plate-to-Plate Voltage .....	13000 volts
Zero Signal D-C Plate Current .....	0.8 amp
Maximum Signal D-C Plate Current .....	4.2 amps
Effective Load Resistance, plate-to-plate .....	4000 ohms
Maximum Signal Driving Power, approx. ....	210 watts
Maximum Signal Power Output, approx. ....	21 kW

**Radio-Frequency Power Amplifier  
Class B**

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

Maximum Ratings, Absolute Values

D-C Plate Voltage .....	8500 volts
D-C Plate Current .....	1.75 amps
Plate Input .....	15 kW
Plate Dissipation .....	10 kW

Typical Operation

D-C Plate Voltage .....	7500 volts
D-C Grid Voltage .....	-250 volts
Peak R-F Grid Voltage .....	370 volts
D-C Plate Current .....	1.4 amps
D-C Grid Current, approx. ....	0.025 amp
Driving Power, approx.** .....	200 watts
Power Output, approx. ....	3.5 kW

**High-Efficiency Grid-Modulated Amplifier**

Carrier conditions per tube, unless otherwise specified, for use with a maximum modulation factor of 1.0.

Maximum Ratings, Absolute Values

	Carrier Tube	Peak Tube
D-C Plate Voltage .....	8500	8500 volts
D-C Grid Voltage .....	-1500	-1500 volts
D-C Plate Current .....	2.2	1.5†amps
Plate Input .....	18	12†kW
Plate Dissipation .....	10	10 kW

Typical Operation

D-C Plate Voltage .....	7500	7500 volts
D-C Grid Voltage .....	-920	-920 volts
D-C Plate Current		
Carrier .....	1.1	0.11 amps
Modulated† .....	1.1	0.66 amps
Driving Power, approx. ....	450	— watts
Power Output, approx. ....	5.5	— kW

**Plate-Modulated R-F Power Amplifier  
Class C Telephony**

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

Maximum Ratings, Absolute Values

D-C Plate Voltage .....	6500 volts
D-C Grid Voltage .....	-1500 volts
D-C Plate Current .....	2.3 amps
D-C Grid Current .....	0.30 amp
Plate Input .....	15 kW
Plate Dissipation .....	7 kW

Typical Operation

D-C Plate Voltage .....	6000 volts
D-C Grid Voltage .....	-800 volts
Peak R-F Grid Voltage .....	1150 volts
Peak R-F Plate Voltage .....	5000 volts
D-C Plate Current .....	1.1 amps
D-C Grid Current .....	0.12 amp
Driving Power, approx. ....	135 watts
Power Output, approx. ....	5.2 kW

**Radio-Frequency Power Amplifier and Oscillator  
Class C**

Key-down conditions per tube without amplitude modulation.‡

Maximum Ratings, Absolute Values

D-C Plate Voltage .....	8500 volts
D-C Grid Voltage .....	-1500 volts
D-C Plate Current .....	2.75 amps
D-C Grid Current .....	0.30 amp
Plate Input .....	23 kW
Plate Dissipation .....	10 kW

Typical Operation

	Grounded-Grid	Grounded-Filament	
D-C Plate Voltage .....	7500	5000	7500 volts
D-C Grid Voltage .....	-650	-400	-650 volts
Peak R-F Grid Voltage .....	1135	825	1135 volts
Peak R-F Plate Voltage .....	5400	4300	5400 volts
D-C Plate Current .....	2.4	2.0	2.4 amps
D-C Grid Current, approx. ....	0.16	0.16	0.16 amp
Driving Power, approx. ....	2550	135	170 watts
Power Output, approx. ....	13.8§	6	11.5 kW

\* Averaged over any audio-frequency cycle of sine-wave form.

\*\* At crest of audio-frequency cycle with modulation factor of 1.0.

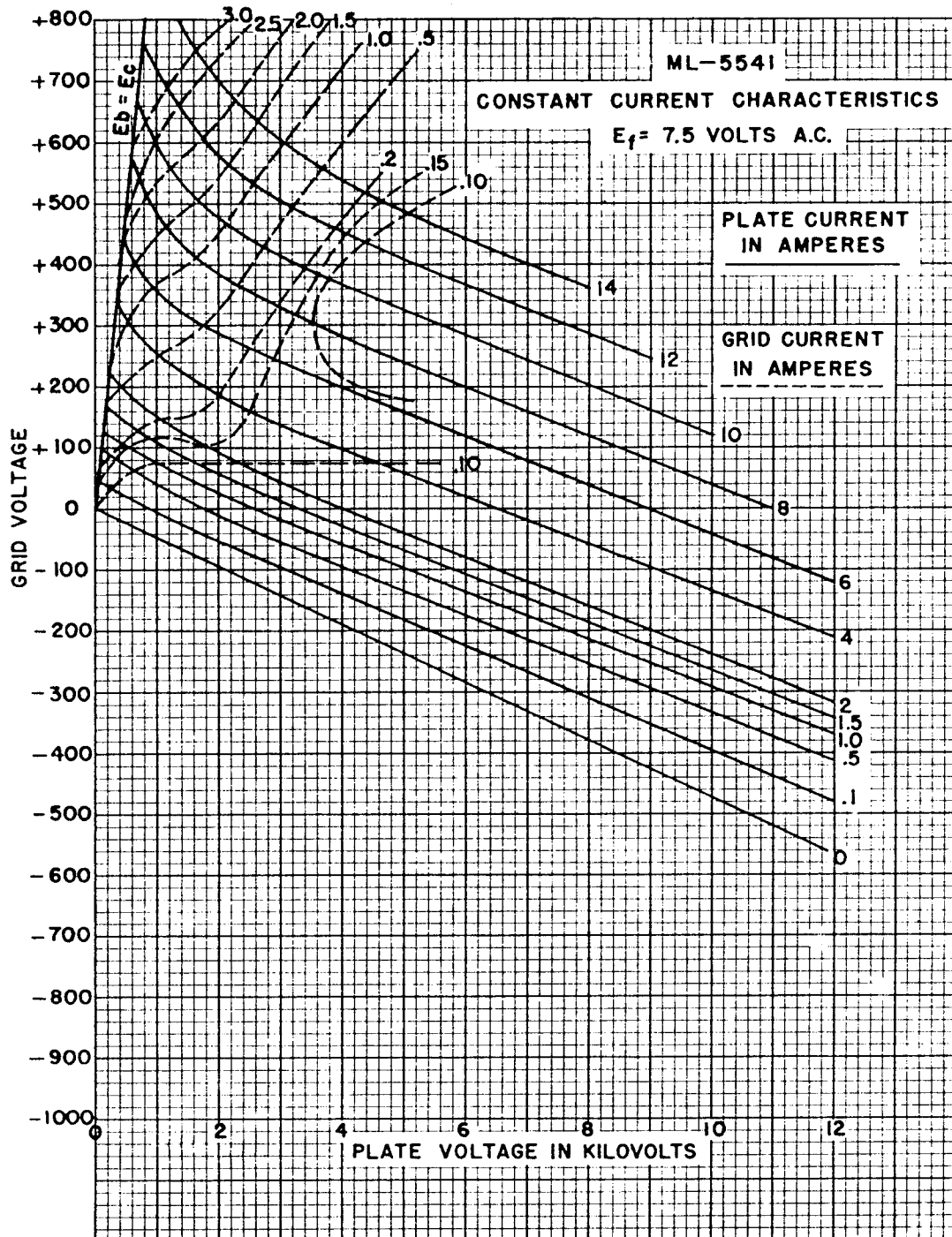
§ Includes power transferred from driver stage.

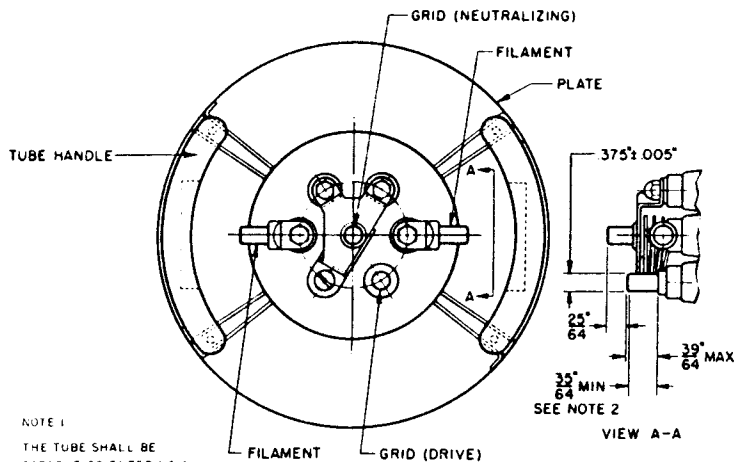
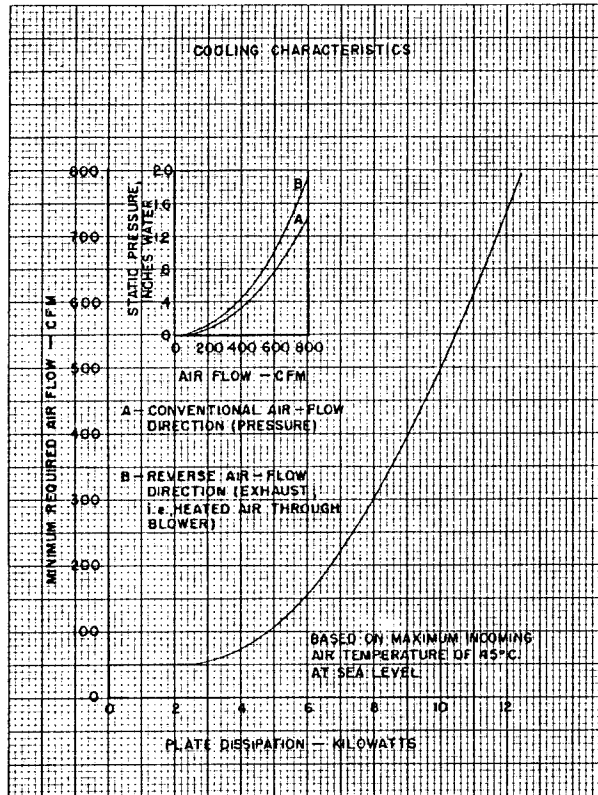
† Average value with modulation factor of 1.0.

‡ Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

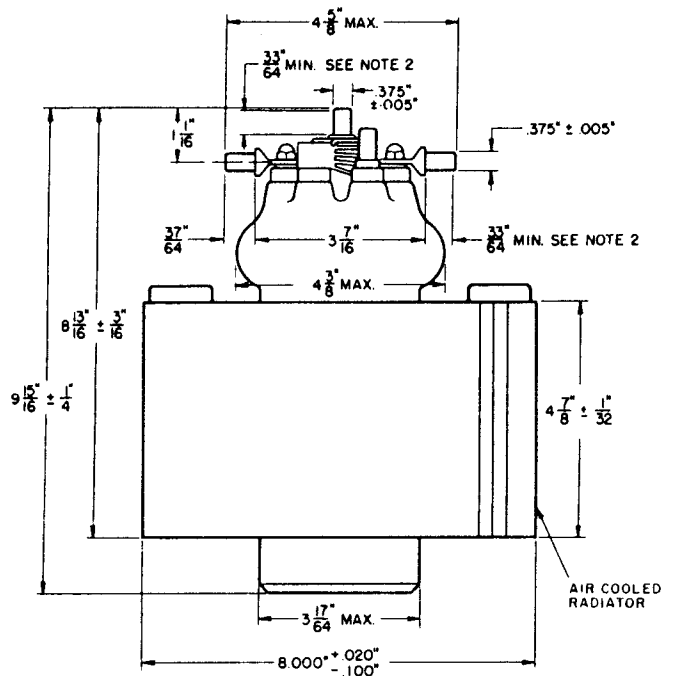
Characteristics	Conditions		Min.	Limits Bogey	Max.
Grid Voltage	$i_b = 10$ amps; $e_b = 1000$ v	$e_c$ :	—	—	700 volts
Grid Current	$i_b = 10$ amps; $e_b = 1000$ v	$i_c$ :	—	—	3.5 amps
Plate Voltage	$I_b = 1.0$ Adc; $E_c = 0$	$E_b$ :	2.2	2.5	2.8 kV
Plate Voltage	$I_b = 1.0$ Adc; $E_c = -200$ Vdc	$E_b$ :	7.2	7.7	8.2 kV
Grid Voltage	$I_b = 0.05$ Adc; $E_b = 8.5$ kV	$E_c$ :	-350	-400	-450 Volts
Plate Power Output	$E_b = 7.5$ kV; $E_c = -650$ Vdc; $I_b = 2.4$ Adc; $I_c = 0.16$ Adc	$P_o$ :	9.8	—	— kW





NOTE 1  
THE TUBE SHALL BE CAPABLE OF ENTERING A GAUGE CONSISTING OF TWO COAXIAL CYLINDERS: THE FIRST  $8.020$ " DIA X  $8 \frac{1}{8}$ " LONG AND THE SECOND  $.500$ " DIA X  $\frac{1}{2}$ " LONG

NOTE 2  
LENGTH OF CONTACT SURFACE



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