

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 Resistance017 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.

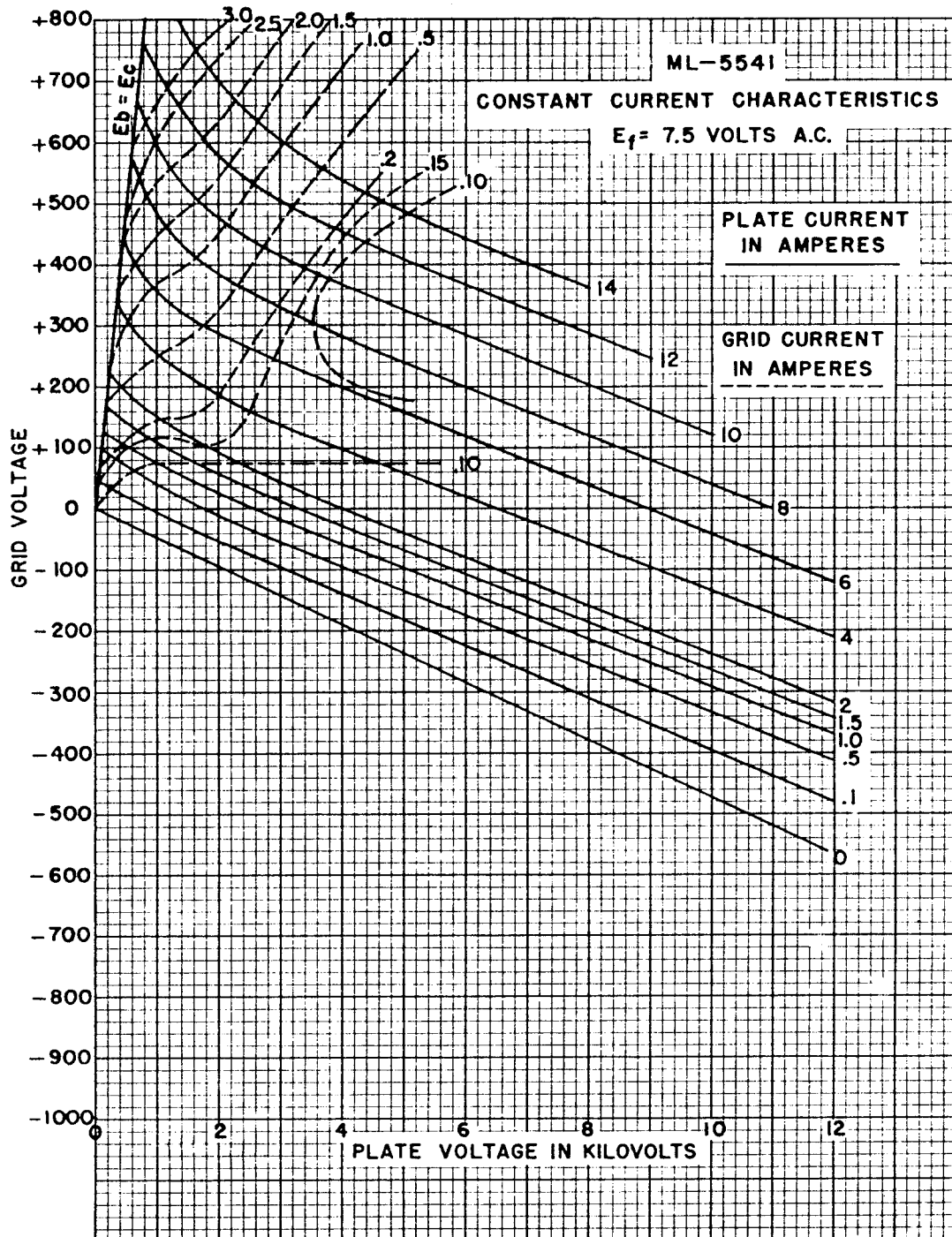
§ Includes power transferred from driver stage.

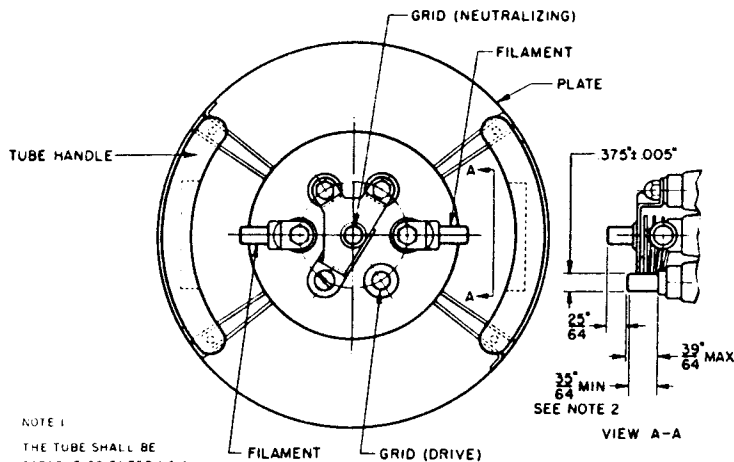
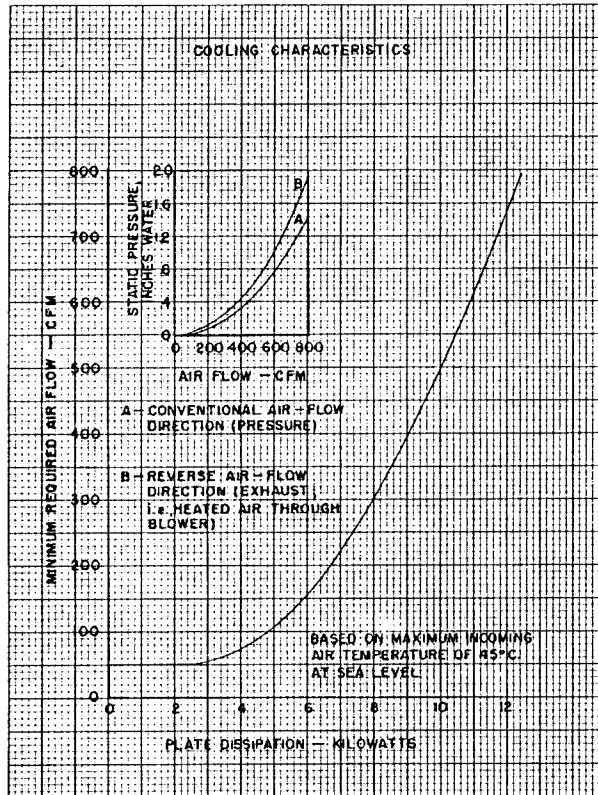
† Average value with modulation factor of 1.0.

‡ 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

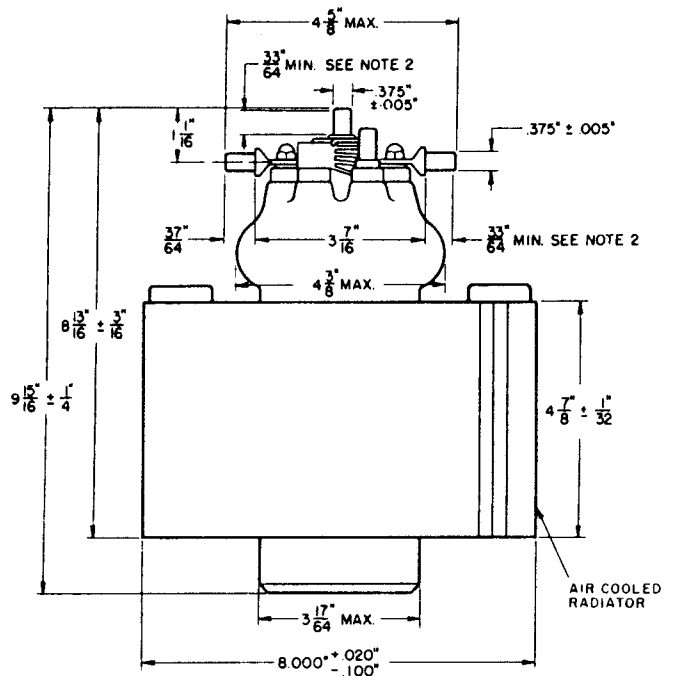
Characteristics	Conditions		Min.	Limits Bogey	Max.
Grid Voltage	$i_b = 10$ amps; $e_b = 1000$ v	e_c :	—	—	700 volts
Grid Current	$i_b = 10$ amps; $e_b = 1000$ v	i_c :	—	—	3.5 amps
Plate Voltage	$I_b = 1.0$ Adc; $E_c = 0$	E_b :	2.2	2.5	2.8 kV
Plate Voltage	$I_b = 1.0$ Adc; $E_c = -200$ Vdc	E_b :	7.2	7.7	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 $8 \frac{1}{16}$ " LONG AND THE SECOND $.500$ " DIA X $\frac{1}{2}$ " LONG

NOTE 2
LENGTH OF CONTACT SURFACE



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