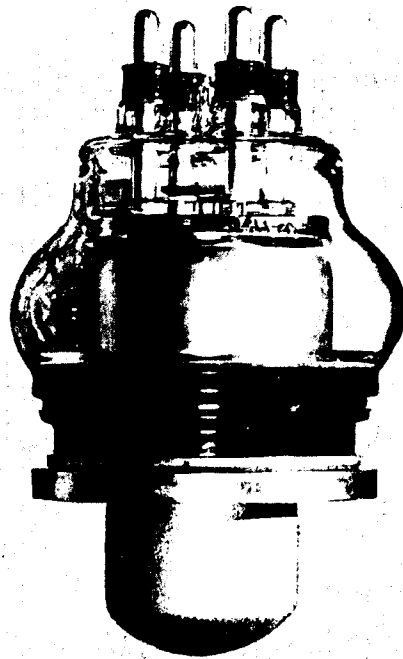




ML-5658 ML-880

DESCRIPTION & RATINGS

DESCRIPTION

The ML-5658 is a three-electrode tube designed specifically for radio-frequency heating service, replacing the type 880 in industrial applications without equipment modification. The anode is water cooled and is capable of dissipating 20 kilowatts. The cathode is a stress-free, pure-tungsten filament. The tube incorporates rigidly supported grid and filament assemblies, glass surfaces shielded against electron bombardment and filament radiation, and sturdy kovar anode, grid, and filament seals.

The ML-880 is a three-electrode tube designed specifically for use as a modulator, amplifier, or oscillator in radio transmitting service, featuring low lead inductances and low

interelectrode capacitances.

All of the structural improvements of the ML-5658 have been incorporated in the ML-880 so that these two types are now physically identical. With filament voltage at 12.6 volts, the ML-5658 is electrically identical to the ML-880 at the same filament voltage setting and will replace it directly.

Maximum ratings of 12.5 kVdc plate voltage and 60 kW plate input apply to the ML-5658 at frequencies up to 15 Mc; maximum ratings of 10.5 kVdc plate voltage and 60 kW plate input apply to both types at frequencies up to 25 Mc. Operation at higher frequencies is permissible with voltage and input reduced according to the table on p. 2.

GENERAL CHARACTERISTICS

Electrical

Filament Voltage	12.0	12.6	Volts
Filament Emission	28	35	Amps
Filament Current at Bogey Voltage	310	315	Amps
Filament Starting Current, maximum	450	450	Amps
Filament Cold Resistance	0.003	0.003	Ohms
Amplification Factor			
$I_b = 2.0 \text{ Adc}$, $E_c = -100 \text{ Vdc}$	20	20	
Interelectrode Capacitances			
Grid-Plate	24	24	$\mu\mu\text{f}$
Grid-Filament	35	35	$\mu\mu\text{f}$
Plate-Filament	2	2	$\mu\mu\text{f}$

ML-5658

ML-880

Mechanical

Mounting Position	Vertical, Anode Down
Type of Cooling	Water and forced-air
Water flow on anode, minimum for 20 kW dissipation	10.4 gpm
Maximum outgoing water temperature	70 °C
Air flow on dish from 3" nozzle	50 cfm*
Maximum Glass Temperature	160 °C
Net Weight, approximate	7 lbs.

*At frequencies above 10 Mc special attention should be given to adequate ventilation of the dish and seals to keep the temperature at the hottest point below 160°C. Heat radiating connectors for grid and filament posts are recommended when tube operation is at frequencies greater than 10 Mc.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

VALUES APPLY TO BOTH TYPES UNLESS OTHERWISE SPECIFIED

R-F C-W Oscillator (ML-5658)

Maximum Ratings, Absolute Values

D-C Plate Voltage	12500	volts
D-C Grid Voltage	-1600	volts
D-C Plate Current	5.0	amps
D-C Grid Current	0.8	amp
Plate Input	60	kW
Plate Dissipation	20	kW
Frequency	15	Mc

Typical Operation

Filament Voltage	12.0	12.0	12.0	volts
D-C Plate Voltage	8000	10000	12000	volts
Filament Voltage	11.6	11.8	12.0	volts
D-C Grid Voltage	-800	-900	-1000	volts
Peak R-F Grid Voltage	1320	1510	1680	volts
D-C Plate Current	3.1	4.0	4.5	amps
D-C Grid Current, approx.	.40	.45	.50	amp
Power Output, approx.	17	27	38	kW

A-F Power Amplifier and Modulator
Class B

Maximum Ratings, Absolute Values

D-C Plate Voltage	10500	volts
Signal D-C Plate Current*	5.0	amps
Signal Plate Input*	40	kW
Plate Dissipation*	15	kW

Typical Operation (Values are for 2 Tubes)

Filament Voltage	12.6	12.6	volts
D-C Plate Voltage	7500	10000	volts
Zero Signal D-C Plate Current	1.0	1.0	amp
Max. Signal D-C Plate Current	6.7	7.0	amps
D-C Grid Voltage	-340	-450	volts
Peak A-F Grid-to-Grid Voltage	1450	1680	volts
Effective Load (plate to plate)	2300	3100	ohms
Max. Signal Driving Power	490	540	watts
Max. Signal Power Output	31	46	kW

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

R-F 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	10500	volts
D-C Plate Current	4.0	amps
Plate Input	32	kW
Plate Dissipation	20	kW

Typical Operation

Filament Voltage	12.6	12.6	volts
D-C Plate Voltage	7500	10000	volts
D-C Plate Current	3.3	2.75	amps
D-C Grid Voltage	-340	-460	volts
D-C Grid Current, approximate	0.013	0.009	amp
Peak R-F Grid Voltage	570	595	volts
Driving Power†	1250	900	watts
Power Output	8	9	kW

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

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	10500	volts
D-C Plate Current	3.6	amps
D-C Grid Current	0.8	amp
D-C Grid Voltage	-1200	volts
Plate Input	36	kW
Plate Dissipation	12	kW

Typical Operation

Filament Voltage	12.6	12.6	volts
D-C Plate Voltage	7500	10000	volts
D-C Plate Current	3.0	3.6	amps
D-C Grid Voltage	-1000	-1200	volts
Peak R-F Grid Voltage	1560	1840	volts
D-C Grid Current	0.57	0.64	amp
Driving Power	850	1100	watts
Power Output	16	27	kW

R-F Power Amplifier and Oscillator
Class C Telegraphy

Key-down conditions per tube without modulation†

Maximum Ratings, Absolute Values

D-C Plate Voltage	10500	volts
D-C Plate Current	6.0	amps
D-C Grid Current	0.8	amp
D-C Grid Voltage	-1200	volts
Plate Input	60	kW
Plate Dissipation	20	kW

Typical Operation

Filament Voltage	12.6	12.6	12.6	volts
D-C Plate Voltage	7500	10000	10000	volts
D-C Plate Current	4.8	4.5	6.0	amps
D-C Grid Voltage	-600	-800	-1000	volts
Peak R-F Grid Voltage	1250	1460	1830	volts
D-C Grid Current	0.79	0.78	0.8	amp
Driving Power	920	1000	1500	watts
Power Output	24	33	40	kW

†Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

MAXIMUM FREQUENCY RATINGS

Maximum ratings apply at frequencies up to 25 Mc. Both types may be operated at higher frequencies provided the maximum values of plate voltage and plate input are reduced according to the table below (other maximum ratings are the same as shown on page 2). For R-F C-W Oscillator operation, the ML-5658 may be operated up to 15 Mc with the plate voltage increased to 120 per cent of the maximum rating for 25 Mc. Special attention should be given to adequate ventilation of the dish and seals at the higher frequencies.

Percentage of Maximum Rated Plate Voltage and Input

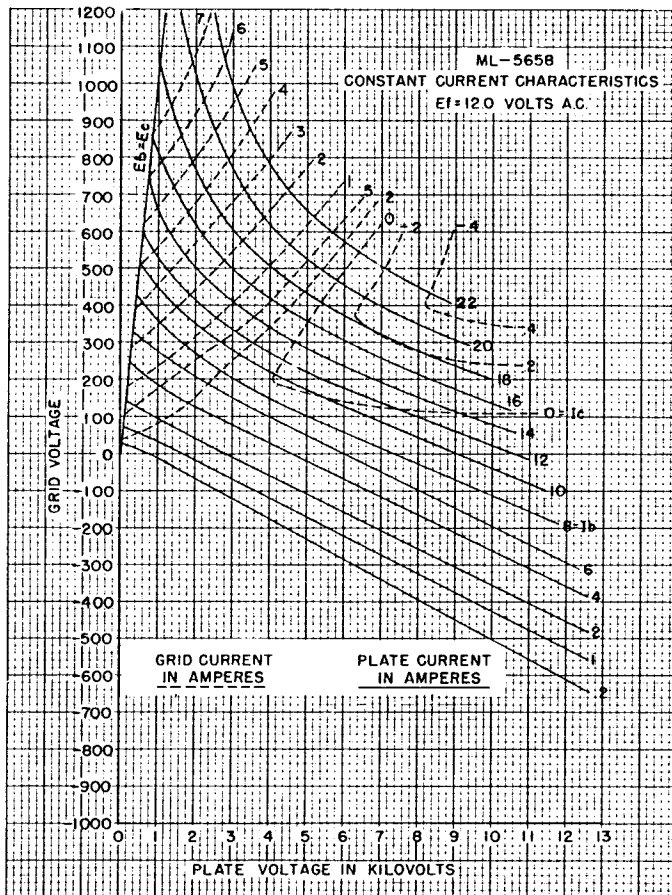
Mc	Class B		Class C Telephony	Class C Telegraphy
	Volts	Watts		
25	100	100	100	100
50	80	94	72	75
75	68	85	56	62
100	60	75	45	50

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

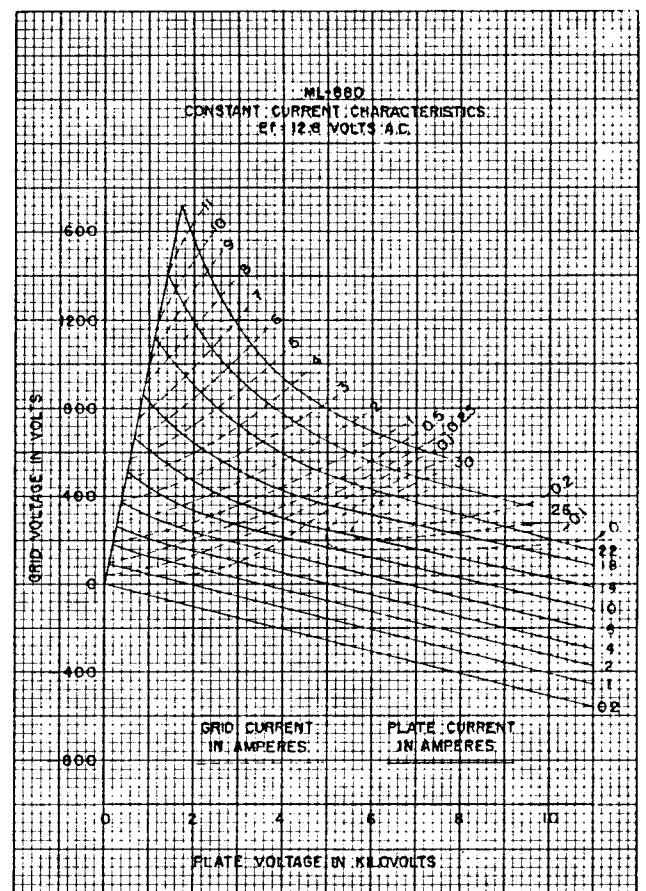
Characteristics	Conditions ($E_f = 12.6$ Volts)	Limits		
		Minimum	Bogey	Maximum
Grid Voltage	$e_b = 2000$ volts; $i_b = 25$ amps	e_c :	—	1300 Volts
Grid Current	$e_b = 2000$ volts; $i_b = 25$ amps	i_c :	—	10.0 Amps
Plate Voltage	$E_c = 0$ Vdc; $I_b = 2.0$ Adc	E_b :	2.8 3.2	3.6 kVdc
Plate Voltage	$E_c = -200$ Vdc; $I_b = 2.0$ Adc	E_b :	6.5 7.3	8.1 kVdc
Grid Voltage	$E_b = 10.0$ kVc; $I_b = 0.02$ Adc	E_c :	-460 -525	-690 Vdc
Peak Cathode Current	Note 1	i_k :	35	— Amps
Power Output	$E_b = 10.0$ kVdc; $I_b = 4.5$ Adc	P_o :	28	— kW
	$E_c = -1000$ Vdc; $I_c = 0.80$ Adc			

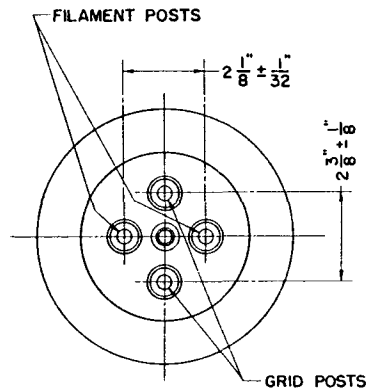
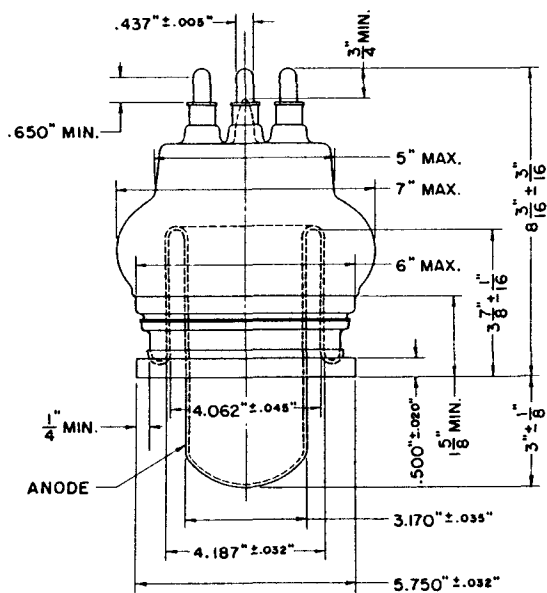
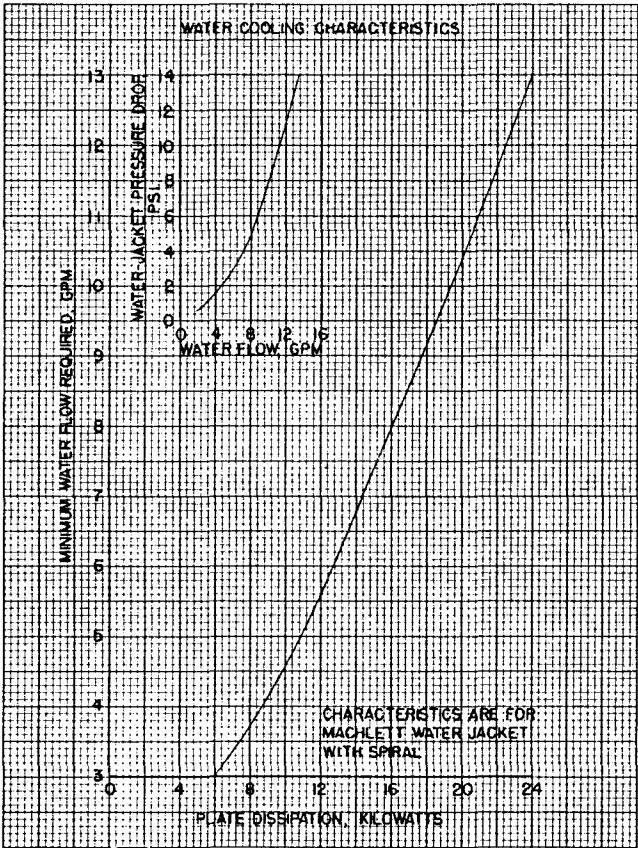
Note 1: Represents maximum plate current plus grid current for any condition of operation.

ML-5658



ML-880





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