



ML-893A

DESCRIPTION AND RATINGS

DESCRIPTION

The ML-893A is a three-electrode tube designed specifically for use as a modulator, amplifier, or oscillator in radio transmitting service. The cathode is a pure-tungsten filament and can be operated from single, three, or six-phase power supply; it has been designed for maximum strength to minimize the possibility of grid to filament shorts. The anode is water-cooled and is capable of dissipating 20 kilowatts. Maximum ratings

of 20 kVdc plate voltage and 70 kW plate input apply at frequencies up to 5 mc/sec; operation at 40 mc/sec is permissible with voltage and input reduced to one-half maximum ratings.

The ML-893A embodies the highest standards for this tube type. All types are thoroughly processed by special Machlett techniques to assure efficient operation and long life.

GENERAL CHARACTERISTICS

Electrical	Minimum	Bogey	Maximum
Filament Voltage (Notes 1 and 2)	—	20	— Volts
Filament Emission at Bogey Voltage	—	25.3	— Amps
Filament Current at Bogey Voltage (Notes 1 and 2)	175	183	190 Amps
Filament Starting Current (Note 1)	—	—	275 Amps
Filament Cold Resistance	—	.0093	— Ohms
Amplification Factor			
$I_b = 1.0$ Adc, $E_c = -100$ Vdc	28	34.5	41
Interelectrode Capacitances			
Grid-Plate	28.5	33	37.5 uuf
Grid-Filament	39.5	48	56.5 uuf
Plate-Filament	2.0	3	4.0 uuf
Mechanical			
Mounting Position — Vertical, Anode Down			
Type of Cooling — Water and Forced Air			
Water Flow on Anode			15 gpm
Maximum Outgoing Water Temperature			70 °C
Air Flow to Stem (Note 3)			2 cfm
Maximum Glass Temperature			150 °C
Net Weight, approximate			12 lbs.

Note 1: Single-Phase Excitation.

Note 2: See Diagrams of Filament Connections and Excitation Circuits.

Note 3: Air flow to be directed into stem through tubing in center of base.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

A-F Power Amplifier and Modulator — Class B

Maximum Ratings, Absolute Values

D-C Plate Voltage	20000 volts
Max. Signal D-C Plate Current*	4.0 amps
Max. Signal Plate Input*	60000 watts
Plate Dissipation*	20000 watts

Typical Operation*

D-C Plate Voltage	12000	15000	18000 volts
Zero Signal D-C Plate Current	0.8	0.8	0.8 amps
Max. Signal D-C Plate Current	7	6	5.5 amps
D-C Grid Voltage	-260	-350	-450 volts
Peak A-F Grid-to-Grid Voltage	1480	1560	1720 volts
Effective Load Resistance (plate to plate)	4000	6000	8000 ohms
Max. Signal Driving Power	220	190	140 watts
Max. Signal Power Output, approximate	52000	60000	70000 watts

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	20000 volts
D-C Plate Current	2.0 amps
Plate Input	32000 watts
Plate Dissipation	20000 watts

Typical Operation

D-C Plate Voltage	12000	15000	15000 volts
D-C Plate Current	1.5	1.5	2.0 amps
D-C Grid Voltage	-250	-340	-340 volts
D-C Grid Current, approximate	35	30	50 ma
Peak R-F Grid Voltage	350	395	450 volts
Driving Power	130	150	200 watts
Power Output	6000	7500	10000 watts

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

* Unless otherwise specified, values are for 2 tubes.

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

Plate-Modulated R-F Power Amplifier — Class C

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

Maximum Ratings, Absolute Values

D-C Plate Voltage	12000 volts
D-C Plate Current	2 amps
D-C Grid Voltage	-3000 volts
D-C Grid Current	0.4 amps
Plate Input	24000 watts
Plate Dissipation	12000 watts

Typical Operation

D-C Plate Voltage	10000	10000	12000 volts
D-C Plate Current	1.5	2	2 amps
D-C Grid Voltage	-800	-800	-1000 volts
Peak R-F Grid Voltage	1200	1280	1500 volts
D-C Grid Current	0.1	0.16	0.14 amps
Driving Power	120	210	210 watts
Power Output	11000	15000	18000 watts

R-F Power Amplifier and Oscillator — Class C

Key-down conditions per tube without modulation**

Maximum Ratings, Absolute Values

D-C Plate Voltage	20000 volts
D-C Plate Current	4 amps
D-C Grid Voltage	-3000 volts
D-C Grid Current	0.4 amps
Plate Input	70000 watts
Plate Dissipation	20000 watts

Typical Operation

D-C Plate Voltage	12000	15000	18000 volts
D-C Plate Current	3.5	3.6	3.6 amps
D-C Grid Voltage	-800	-900	-1000 volts
Peak R-F Grid Voltage	1430	1520	1630 volts
D-C Grid Current	0.26	0.25	0.21 amps
Driving Power	360	370	340 watts
Power Output	30000	40000	50000 watts

MAXIMUM FREQUENCY RATINGS

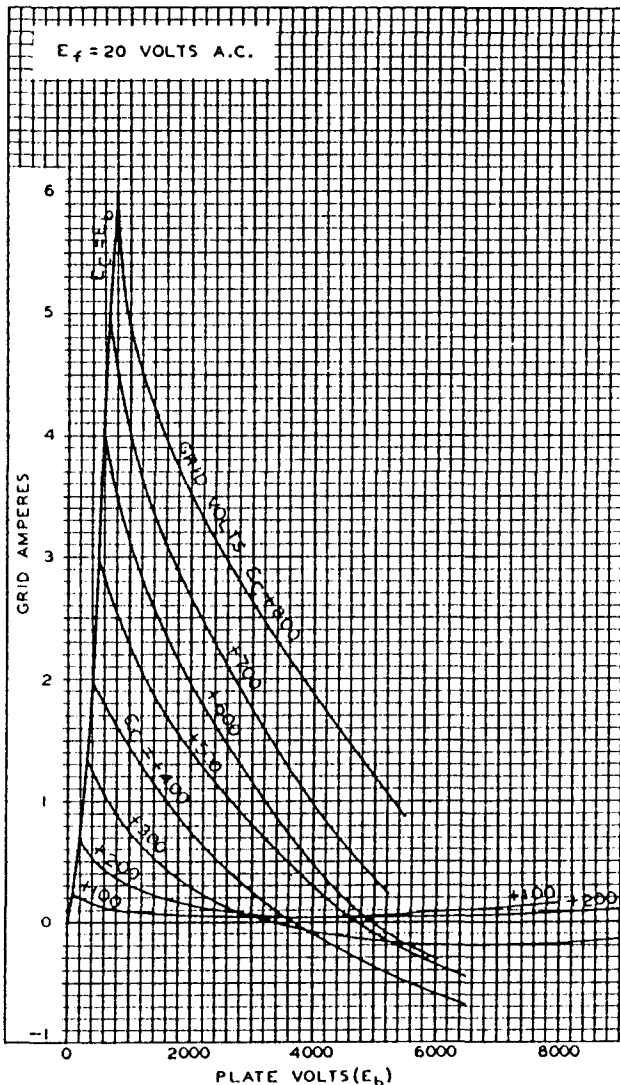
The ML-893A can be operated at full power at frequencies as high as 5 megacycles. It can be operated at higher frequencies provided the maximum values of plate voltage and plate input are reduced in accordance with table which shows the maximum permissible percentage of rated plate voltage and plate input for various frequencies above 5 megacycles.

Mc	Class B		Class C Plate Modulated		Class C	
	Volts	Watts	Volts	Watts	Volts	Watts
5	100%	100%	100%	100%	100%	100%
20	85%	82%	80%	75%	80%	66%
40	65%	73%	64%	64%	60%	50%

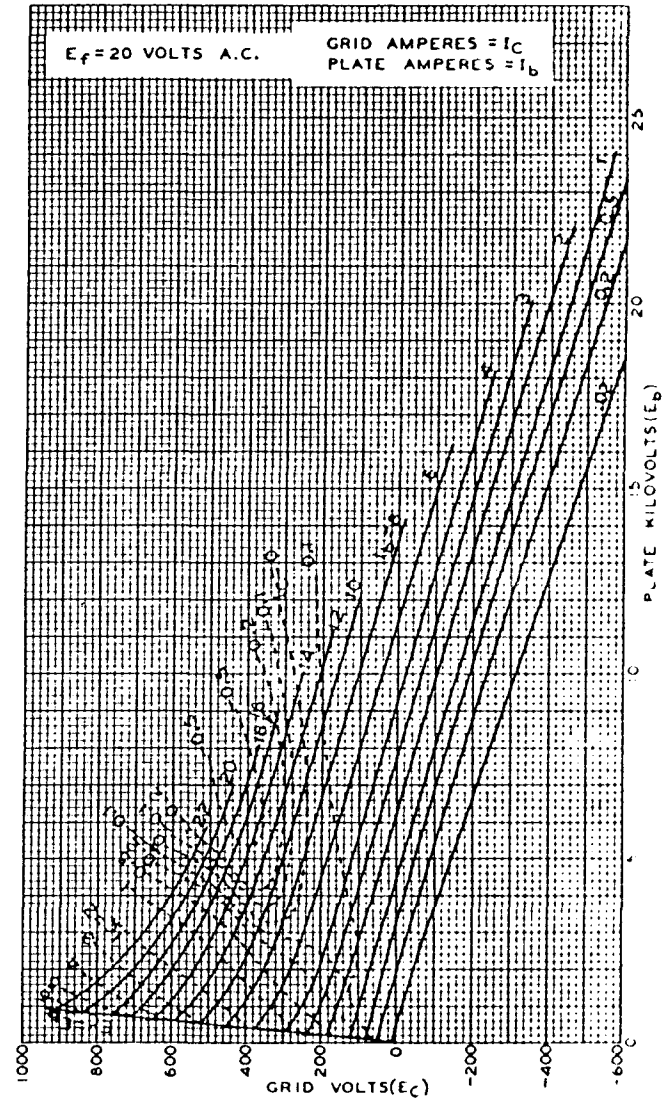
CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Characteristic	Conditions	Limits		
		Min.	Bogey	Max.
Grid Voltage	$i_b = 15.0$ amps; $e_b = 1500$ volts	e_c : —	—	800 Volts
Grid Current	$i_b = 15.0$ amps; $e_b = 1500$ volts	i_c : —	—	4.5 Amps
Plate Voltage	$I_b = 1.0$ Adc; $E_c = 0$	E_b : 3.0	4.0	5.0 kVdc
Plate Voltage	$I_b = 1.0$ Adc; $E_c = -200$ Vdc	E_b : 9.2	11.2	13.2 kVdc
Grid Voltage	$E_b = 20$ kVdc; $I_b = 0.020$ Adc	E_c : -530	600	770 Vdc
Peak Cathode Current	Note 1	i_k : 20	—	— Amps
Power Output	$E_b = 18.0$ kVdc; $I_b = 3.6$ Adc $I_c = 0.36$ Adc; $E_c = -1800$ Vdc	P_o : 45	—	— kW

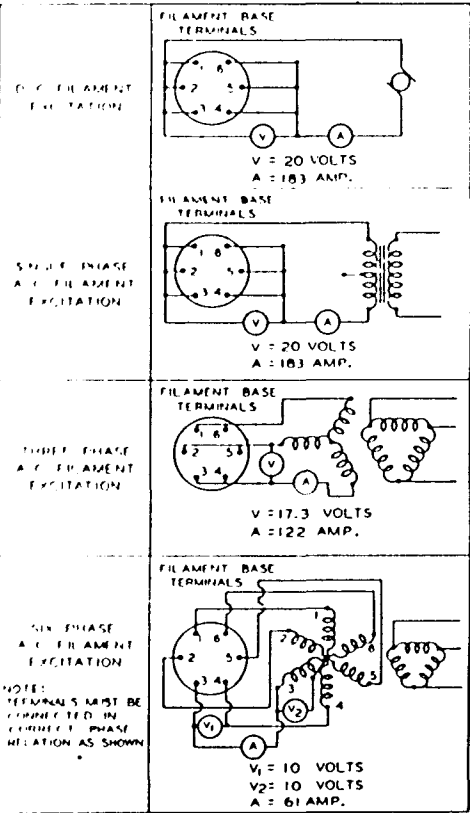
Note 1: Represents maximum usable cathode current for tube as plate current plus grid current for any condition of operation.



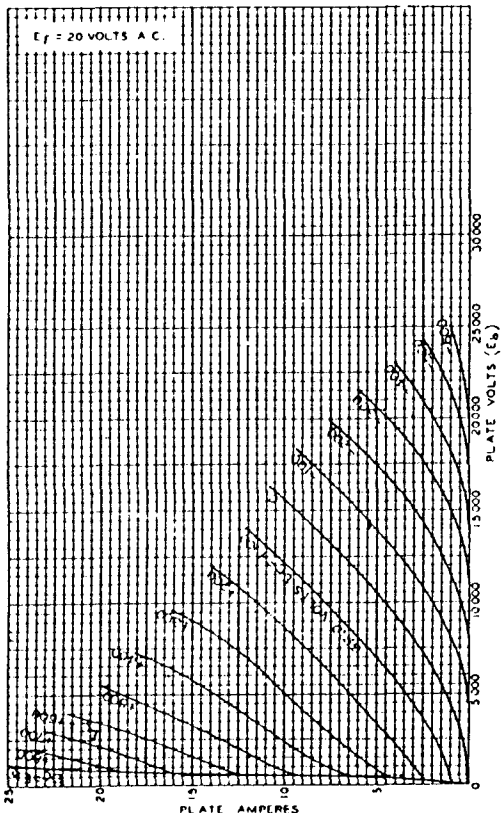
GRID-PLATE TRANSFER CHARACTERISTICS



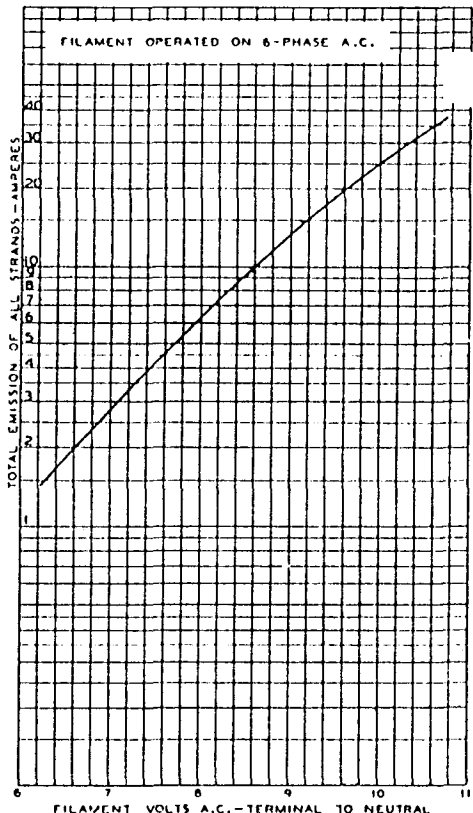
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



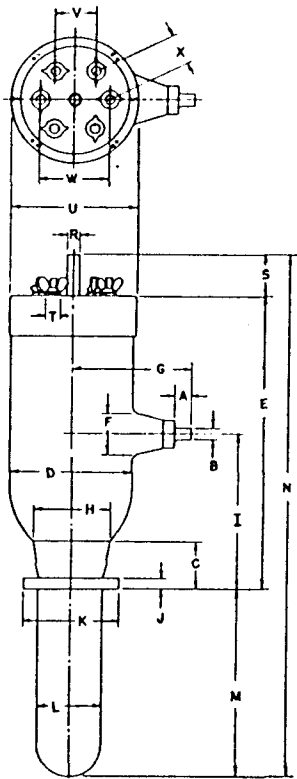
FILAMENT CONNECTIONS AND EXCITATION CIRCUITS



AVERAGE PLATE CHARACTERISTICS



AVERAGE FILAMENT-EMISSION CHARACTERISTIC



DIMENSIONS IN INCHES

Min.	Max.
A— 0.687	0.812
B— 0.561	0.571
C— 2.00	2.75
D— 5.87	6.13
E— 14.00	15.00
F— 1.50	3.06
G— 5.00	6.50
H— 3.81	4.312
I— 7.375	8.125
J— 0.480	0.520
K— 4.667	4.707
L— 3.125	3.250
M— 9.00	9.50
N— 24.50	26.75
R— 0.590	0.660
S— 1.875	2.250
T— 0.215	0.285
U— 6.250	6.375
V— 1.965	2.035
W— 3.310	3.375
X— 1.465	1.535

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