



MACHLETT

ML-893A-R

DESCRIPTION AND RATINGS

DESCRIPTION

The ML-893A-R 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 forced-air 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 25 mc/sec is permissible with voltage and input reduced to one-half maximum ratings.

The ML-893A-R 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 20 Volts		25.3		Amps
Filament Current at 20 Volts (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	29.8	34.0	38.8	uuf
Grid-Filament	39.5	48.0	56.5	uuf
Plate-Filament	2.6	3.5	4.4	uuf
Mechanical				
Mounting Position -- Vertical, Anode Down				
Type of Cooling -- Forced Air				
Maximum Incoming Air Temperature			45	°C
Required Air-Flow on Anode				
Plate Dissipation -- Per Cent of Rating	100	80	65	
Air Flow -- Cubic Feet per Minute	1800	1250	1000	
Static Pressure -- Inches Water	1.05	0.56	0.38	
Required Air Flow to Stem			2	cfm
Maximum Anode Temperature			230	°C
Maximum Glass Temperature			150	°C
Net Weight, approximate			230	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, approximate†	130	150	200	watts
Power Output, approximate	6000	7500	10000	watts

§ Averaged over any audio-frequency cycle of sine-wave form.
 † At crest of audio-frequency cycle with modulation factor of 1.0.

* 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, approximate	0.10	0.16	0.14	amps
Driving Power, approximate	120	210	210	watts
Power Output, approximate	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, approximate	0.26	0.25	0.21	amps
Driving Power, approximate	360	370	340	watts
Power Output, approximate	30000	40000	50000	watts

MAXIMUM FREQUENCY RATINGS

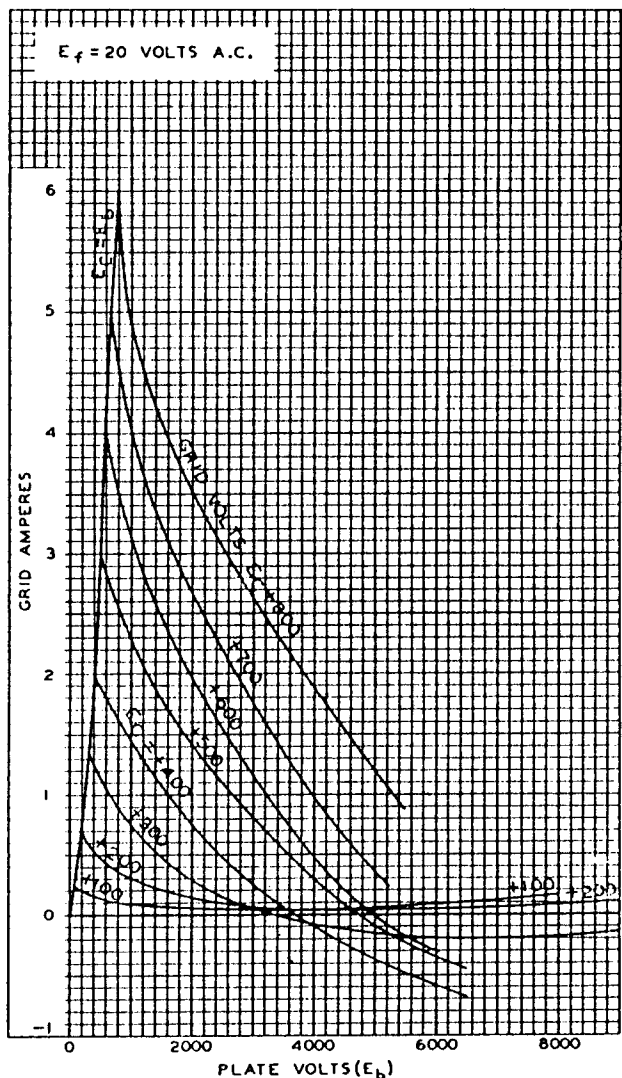
The ML-893A-R can be operated at full power at frequencies as high as 5 megacycles. It can be operated at higher frequencies provided the maximum values of plate voltage and plate input are reduced in accordance with table which shows the maximum permissible percentage of rated plate voltage and plate 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%
12	86%	86%	81%	81%	81%	75%
25	74%	74%	65%	65%	65%	50%

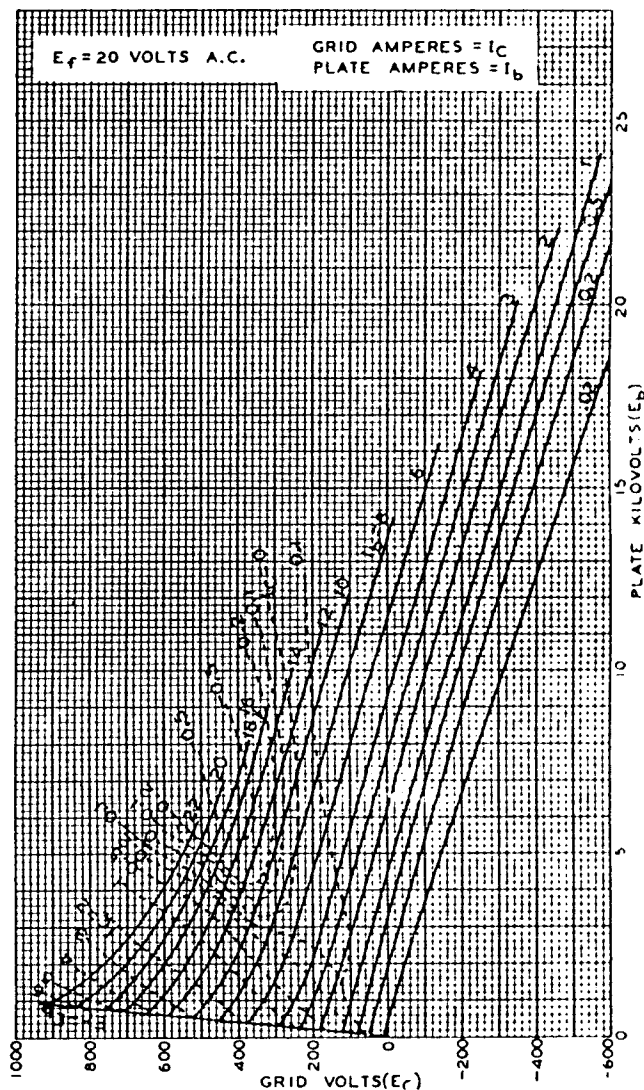
CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Characteristic	Conditions	Limits		
		Min.	Bogey	Max.
Grid Voltage	$i_b = 15.0$ amps; $e_b = 1500$ volts	e_g :	---	- 800 Volts
Grid Current	$i_b = 15.0$ amps; $e_b = 1500$ volts	i_g :	---	4.5 Amps
Plate Voltage	$I_b = 1.0$ Adc; $E_c = 0$	E_b :	3.0	5.0 kVdc
Plate Voltage	$I_b = 1.0$ Adc; $E_c = -200$ Vdc	E_b :	9.2	13.2 kVdc
Grid Voltage	$E_b = 20$ kVdc; $I_b = 0.020$ Adc	E_g :	- 530	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

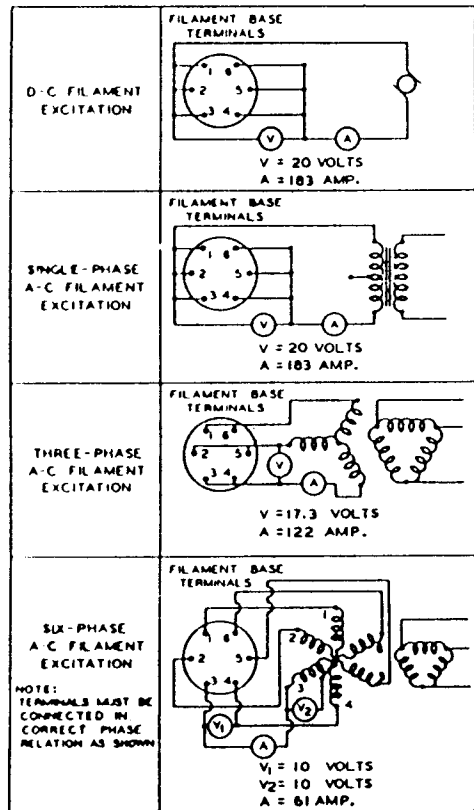
Note 1: Represents maximum usable cathode current for tube as plate current plus grid current for any condition of operation



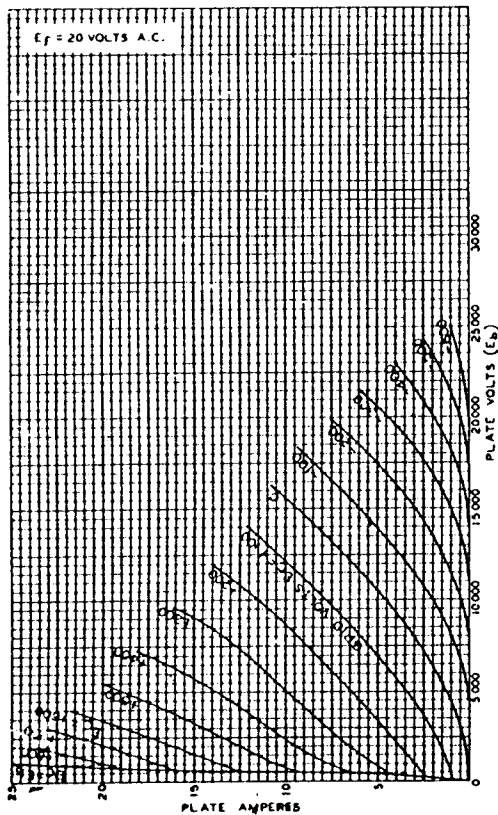
GRID-PLATE TRANSFER CHARACTERISTICS



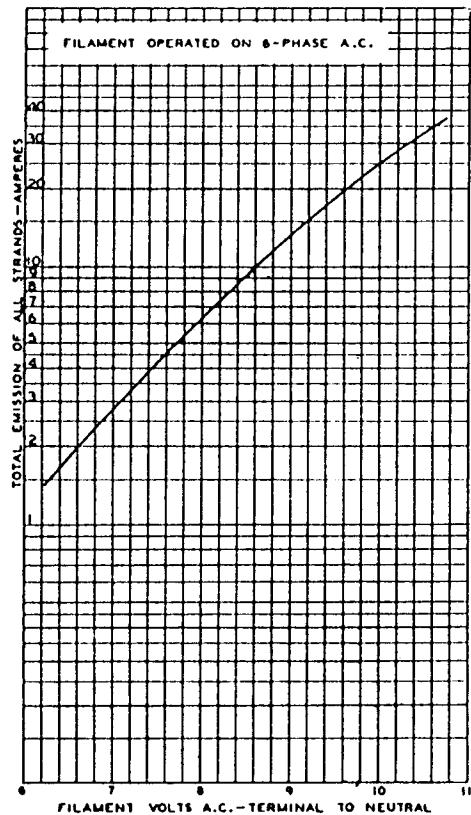
CONSTANT CURRENT CHARACTERISTICS



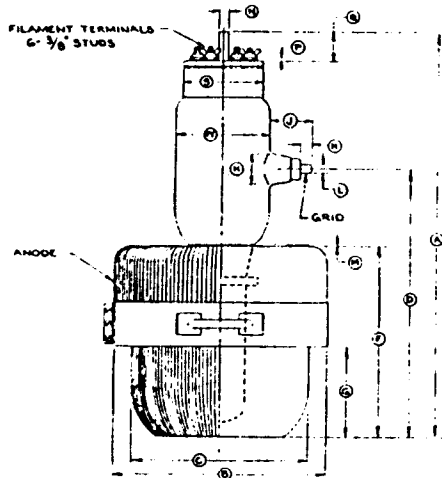
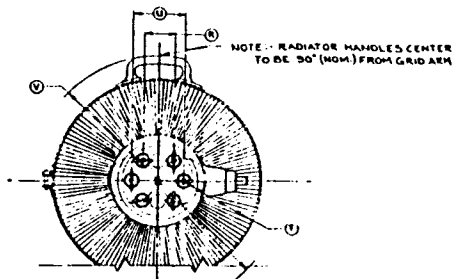
FILAMENT CONNECTIONS AND EXCITATION CIRCUITS



AVERAGE PLATE CHARACTERISTICS



AVERAGE FILAMENT-EMISSION CHARACTERISTICS



DIMENSIONS IN INCHES

	Min.	Max.
A—	25.750	28.000
B—	13.625	14.125
C—		12.000
D—		18.750
F—	12.812	
G—	5.937	6.063
H—		3.060
J—	2.625	3.375
K—	0.687	0.812
L—	0.559	0.573
M—		0.312
N—	0.590	0.660
P—	0.215	0.285
Q—	1.870	2.250
R—	1.965	2.035
S—	5.187	5.312
T—	1.165	1.535
U—	3.310	3.380
V—	16.500	17.000
W—	5.870	6.130

MACHLETT LABORATORIES, INC.

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