AMPEREX TUBE TYPE 5923

The 5923 is a water cooled three-electrode tube designed for use as power amplifier, oscillator and modulator in television and AM/FM transmitters and for industrial applications. Maximum ratings apply up to 75 Mc. At reduced ratings it may be operated up to 220 Mc.

GENERAL CHARACTERISTICS

ELECTRICAL DATA

	Min.	Bogey	Max.	
Filament Voltage	12.0	12.6	13.2	volts
Filament Current at Bogey Voltage	30	33	36	amps
Amplification Factor (Ib=1 amp, Eb=4000 volts)	26	32	38	
Peak Cathode Current[1]			10	amps
Direct Interelectrode Capacitances				
Grid to Plate	9.5	11	12.5	μμf
Grid to Filament	13	16	19	μμf
Plate to Filament	0.2	0.3	0.4	μμf

MECHANICAL DATA

Mounting Position . . . . . vertical with plate down

Max. Temperature of Seals . . . . . 180° C

COOLING : Water and low velocity air flow

COOLING CHARACTERISTICS (See Curves)

Plate Dissipation (kilowatts)	Inlet Water Temperature (° C)	Min. Water Flow (gpm)	Inlet Water Pressure (lbs./sq. inch)
1	20	0.66	1.18
	50	0.79	1.47
2	20	0.66	1.18
	50	1.32	4.41
4	20	1.06	2.65
	50	2.38	13.2
6	20	1.58	5.9
	50	3.70	36.8

Max. Inlet Water Temperature . . . . 50° C

ACCESSORIES

Water Jacket . . . . . Amperex Type #S3737

Filament Connector . . . . . Amperex Type #S3707

Grid Connector . . . . . Amperex Type #S3706

WEIGHT

Tube — Net Weight (approx.) . . . . . 14 ounces

Water Jacket — Net Weight (approx.) . . 21 ounces

[1]Represents max. usable cathode current for any condition of operation.

[2]At frequencies above 30 Mc it is necessary to direct a low velocity air flow to plate and grid seals.

Radio-Frequency Power Amplifier—Class B

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

Maximum Ratings, Absolute Values

	CCS	
D.C. Plate Voltage	6000	volts max.
D.C. Plate Current	1.1	amps max.
Plate Input	6600	watts max.
Plate Dissipation	6000	watts max.

Typical Operation

	CCS	CCS	
D.C. Plate Voltage	6	5	kilovolts
D.C. Grid Voltage	—180	—145	volts
Peak R.F. Grid Voltage	250	225	volts
D.C. Plate Current	0.99	0.9	amp
Driving Power, approximate[2]	140	120	watts
Power Output, approximate	1.9	1.45	kilowatts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[2]	Up to 220 Mc[2]	
D.C. Plate Voltage	6000	5000	4000	volts
D.C. Plate Current	1.1	1.1	0.9	amps
Plate Input	6600	5500	3600	watts

Grid-Modulated R.F. Power Amplifier Class C—Television Service

Negative Modulation, Positive Synchronization

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	5000	volts max.
D.C. Grid No. 1 Voltage—White Level	—1000	volts max.
Plate Current (at crest of modulation)	1.9	amps max.
Plate Input (sync)	9.5	kilowatts max.
Plate Dissipation (sync)	6	kilowatts max.
Grid No. 1 Dissipation (sync)	120	watts max.

Typical Operation in Television Service at 75 Mc and Bandwidth of 5.25 Mc at 85% Antenna Current and 8 Mc at 70% Antenna Current

	2 tubes—push pull	
D.C. Plate Voltage	5000	volts
D.C. Grid No. 1 Voltage		
Synchronizing Level	—200	volts
Pedestal Level	—300	volts
White Level	—550	volts
R.F. Grid No. 1 Voltage Peak to Peak Synchronization Level	1000	volts
D.C. Plate Current		
Synchronization Level	3.8	amps
Pedestal Level	2.6	amps
D.C. Grid Current, approximate		
Synchronization Level	0.5	amp
Pedestal Level	0.35	amp
Driving Power at Synchronization Level, approximate	5.35	kilowatts
Power Output, approximate		
Synchronization Level	9	kilowatts
Pedestal Level	250	watts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[2]	Up to 220 Mc[2]	
Plate Input (Sync.)	6000	5000	4500	volts
D.C. Plate Voltage	1.9	1.9	1.9	amps
Plate Current (Sync.)	11.4	9.5	8.5	kw

Radio-Frequency Amplifier—Class B for Television Service

Negative Modulation and Positive Synchronization

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	5000	volts max.
D.C. Grid Voltage	—1000	volts max.
D.C. Plate Current (at crest of modulation)	1.9	amps max.
Plate Input	9500	watts max.
Plate Dissipation	6000	watts max.
Grid Dissipation	120	watts max.

Typical Operation in Television Service at 75 Mc and Bandwidth of 5.25 Mc at 85% Antenna Current and 8 Mc at 70% Antenna Current

	2 tubes—push pull	
D.C. Plate Voltage	5000	volts
D.C. Grid Voltage	—200	volts
R.F. Grid Voltage Peak to Peak Synchronization Level	1000	volts
Pedestal Level	800	volts
White Level	0	volt
D.C. Plate Current		
Synchronizing Level	3.8	amps
Pedestal Level	3	amps
White Level	0.2	amp
D.C. Grid Current		
Synchronizing Level	0.5	amp
Pedestal Level	0.22	amp
White Level	0	amp
Driving Power at Synchronization Level, approximate	250	watts
Power Output, approximate		
Synchronizing Level	9	kilowatts
Pedestal Level	5.35	kilowatts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[2]	Up to 220 Mc[2]	
D.C. Plate Voltage	6000	5000	4500	volts
D.C. Plate Current (Sync.)	1.9	1.9	1.9	amps
Plate Input (Sync.)	11.4	9.5	8.5	kw

from RTMA release #1237, Sept. 18, 1953

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TENTATIVE DATA

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Audio-Frequency Power Amplifier and Modulator—Class B

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	6000	volts max.
Maximum Signal D.C. Plate Current[1]	1.5	amps max.
Maximum Signal Plate Input[1]	9000	watts max.
Plate Dissipation[1]	6000	watts max.
Grid Resistor	15,000	ohms max.

Typical Operation

Unless otherwise specified, values are for two tubes

	CCS	CCS	CCS	CCS	CCS	CCS	
D.C. Plate Voltage	6000	5000	4500	4000	3500	3000	volts
D.C. Grid Voltage	—165	—138	—125	—112	—100	—80	volts
Peak A-F Grid to Grid Voltage	910	661	655	632	618	570	volts
Zero Signal D.C. Plate Current	250	220	200	200	150	130	milliamps
Maximum Signal D.C. Plate Current	3000	1920	1840	1880	1900	1600	milliamps
Effective Load Resistance, Plate to Plate	4800	5400	6100	4900	4200	4400	ohms
Maximum Signal Driving Power, approx.	230	84	54	108	100	104	watts
Maximum Signal Power Output, approx.	13.3	6.6	6.0	5.3	4.6	3.3	kilowatts

Plate-Modulated Radio-Frequency Power Amplifier—Class C—Telephony

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

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	5000	volts max.
D.C. Grid Voltage	—1000	volts max.
D.C. Plate Current	1.3	amps max.
D.C. Grid Current	0.35	amp max.
Plate Input	6.5	kilowatts max.
Plate Dissipation	4	kilowatts max.

Typical Operation

	CCS	CCS	CCS	CCS	CCS	
D.C. Plate Voltage	5	4.5	4	3.5	3	kilovolts
D.C. Grid Voltage[2]	—400	—350	—300	—300	—250	volts
Peak R.F Grid Voltage	690	650	600	600	510	volts
D.C. Plate Current	1.2	1.2	1.2	1.2	1.0	amps
D.C. Grid Current, approx.	0.3	0.3	0.3	0.3	0.3	amp
Driving Power, approx.	190	180	165	165	140	watts
Power Output, approx.	4.7	4.1	3.5	3.0	2.2	kilowatts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[3]	Up to 220 Mc[3]	
D.C. Plate Voltage	5000	4000	3200	volts
D. C. Plate Current	1.3	1.3	1.1	amps
Plate Input	6.5	5.2	3.5	kw

Radio-Frequency Power Amplifier and Oscillator—Class C—Telegraphy

Key-down conditions per tube without amplitude modulation[4]

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	6000	volts max.
D.C. Grid Voltage	—1000	volts max.
D.C. Plate Current	1.5	amps max.
D.C. Grid Current	0.35	amp max.
Plate Input	9000	watts max.
Plate Dissipation	6000	watts max.

Typical Operation, Grounded-Filament Circuit

	CCS	CCS	CCS	
Frequency	75	75	75	megacycles
D.C. Plate Voltage	6	5	4	kilovolts
D.C. Grid Voltage	—400	—300	—200	volts
Peak R.F Grid Voltage	740	640	500	volts
D.C. Plate Current	1.5	1.5	1.37	amps
D.C. Grid Current, approximate	0.31	0.33	0.35	amps
Driving Power	210	190	160	watts
Power Output, approx.	6.9	5.6	4.0	kilowatts

Typical Operation, Grounded-Grid Circuit, Two Tubes

	CCS	CCS	CCS	CCS	
Frequency[3]	75	110	110	220	megacycles
D.C. Plate Voltage	6	5	4	4	kilovolts
D.C. Grid Voltage	400	300	200	200	volts
Peak R.F Grid Voltage	740	640	500	450	volts
D.C. Plate Current	3	3	2.75	2.5	amps
D.C. Grid Current, approx.	0.62	0.66	0.70	0.40	amp
Driving Power	2240	1840	1350	760	watts
Power Output, approx.[5]	15.6	12.1	8.8	5.6	kilowatts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[3]	Up to 220 Mc[3]	
D.C. Plate Voltage	6000	5000	4000	volts
D.C. Plate Current	1.5	1.5	1.25	amps
Plate Input	9000	7500	5000	watts

Oscillator—Class C

With Rectified, unfiltered, single-phase, full-wave plate supply

Maximum Ratings, Absolute Values (per tube)

	CCS	
D.C. Plate Voltage	5400	volts max.
D.C. Grid Voltage	—900	volts max.
D.C. Plate Current	1.35	amps max.
D.C. Grid Current	0.31	amp max.
Plate Input[7]	9000	watts max.
Plate Dissipation	6000	watts max.
Grid Dissipation	120	watts max.

Typical Operation

Transformer Voltage	6000[8]	5100[9]	volts rms
D.C. Plate Voltage	5.4	4.6	kilovolts
D.C. Plate Current	1.35	1.15	amps
D.C. Grid Current	0.31	0.27	amp
Grid Resistor	1300	1100	ohms
Plate Input	9	6.5	kilowatts
Plate Dissipation	2.3	1.84	kilowatts
Driving Power of Tube, approximate	210	160	watts
Power Output, approximate	6.5	4.5	kilowatts

Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[3]	Up to 220 Mc[3]	
D.C. Plate Voltage	5400	4500	3600	volts
D.C. Plate Current	1.35	1.35	1.1	amps
Plate Input[7]	9000	7500	5000	watts

Self-Rectifying Oscillator—Class C §

Maximum Ratings, Absolute Values (per tube)

	CCS	
A.C. Plate Voltage (RMS)	6800	volts max.
D.C. Grid No. 1 Voltage	—640	volts max.
D.C. Plate Current	0.8	amp max.
D.C. Grid Current	0.19	amp max.
Plate Input[10]	9000	watts max.
Plate Dissipation	6000	watts max.
Grid Dissipation	120	watts max.

Typical Operation

	CCS	CCS	
A.C. Plate Voltage (RMS)	6800[8]	5900[9]	volts
D.C. Plate Current	0.8	0.7	amp
D.C. Grid Current	0.19	0.165	amp
Grid Resistor	1050	1050	ohms
Power Output, approximate	4.55	3.38	kilowatts

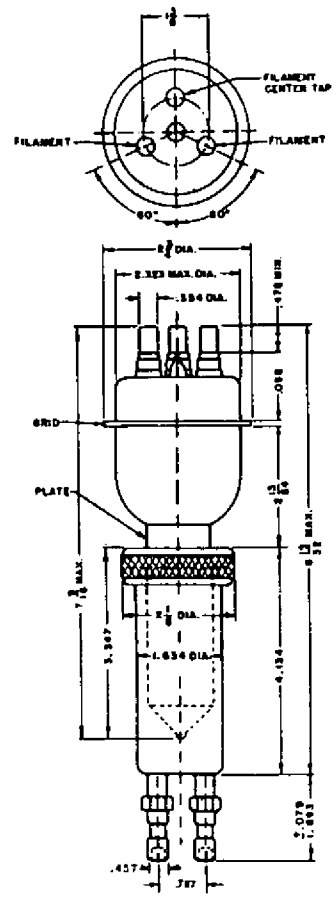
Max. Ratings (per Tube)	Up to 75 Mc	Up to 110 Mc[3]	Up to 220 Mc[3]	
A.C. Plate Voltage (RMS)	6800	5700	4500	volts
D.C. Plate Current	0.8	0.8	0.66	amps
Plate Input	9000	7500	5000	watts

Electrical Data and Limits

Characteristic	Conditions	Limits Min.	Bogey	Max.	
Grid Voltage[11]	Eb=1000 volts Ib=6 amps	Ec:	—	—	420 volts
Grid Current[11]	Eb=1000 volts Ib=6 amps	Ic:	—	—	2.5 amps
Plate Current	Eb=6000 volts Ec=—180 volts	Ib:	—	—	130 milliamps
Grid Current	Eb=6000 volts Ib=0.85 amp	Ic:	—	—	40 microamps
Grid Voltage	Eb=6000 volts Ib=0.85 amp	Ec:	67	94	121 volts
Power Output	Eb=6000 volts Ib=1.5 amps Ec=—400 volts Ic=0.31 amp f=75 megacycles	Po:	6	—	— kilowatts

[1]Averaged over any audio-frequency cycle of sine-wave form.

[2]Grid bias partially obtained by the grid resistor.



[3]When using the tube above 110 megacycles, particular attention must be given to a careful design of the installation, otherwise the tube may be damaged. Therefore, guarantee for tubes operating above 110 mc can only be given after approval of the prototype circuit.

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

[5]Power transferred from driving stage included.

[6]At crest of audio-frequency cycle with modulation factor of 1.0.

[7]Plate input is 1.23 times the product of D.C. Plate Voltage and D.C. Plate Current.

[8]Care must be taken that under these operating conditions the absolute limiting values are not exceeded by variation of the supply voltage or the load or by tolerances in the circuit elements.

[9]Under these conditions normal deviations of voltages and load are permissible. The absolute limiting values of the tube must, however, not be exceeded.

[10]Plate input is 1.11 times the product of A.C. Plate Voltage (RMS) and D.C. Plate Current.

[11]This data is given only for design purposes; not for measurements.

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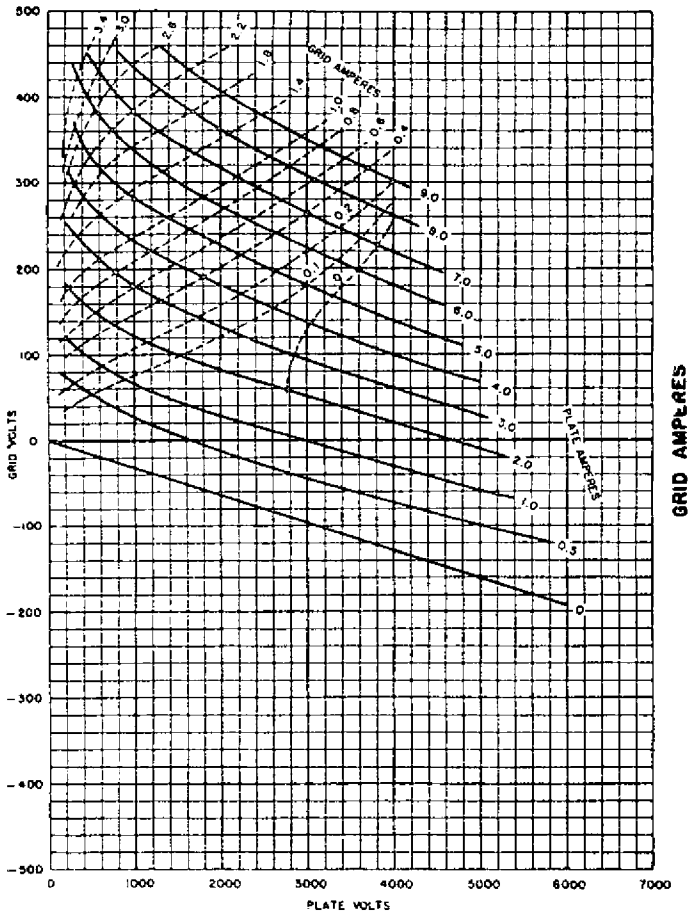
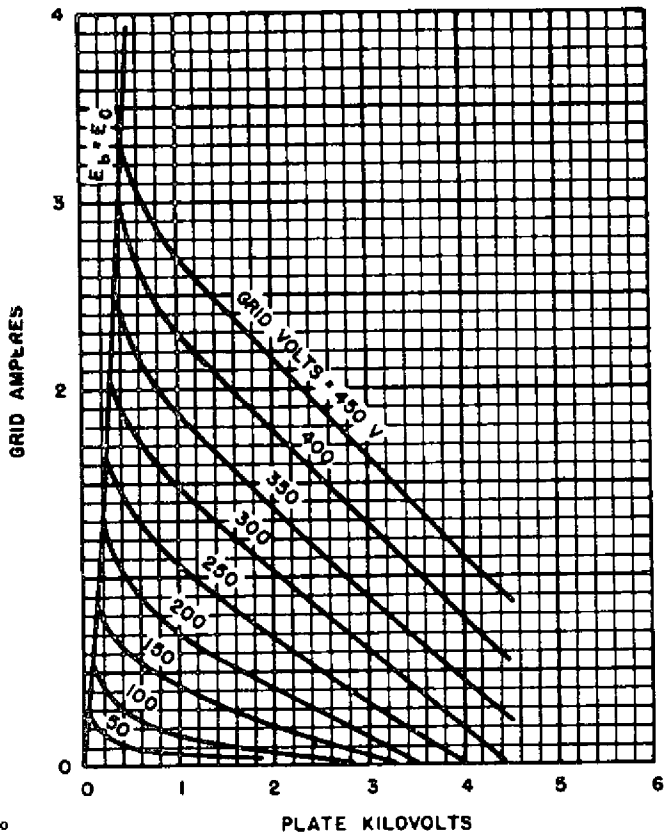

GRID VOLTS
PLATE VOLTS
GRID AMPERES
PLATE AMPERES


GRID AMPERES
PLATE KILOVOLTS
Eb = Ec
GRID VOLTS = 450 V
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350
300
250
200
150
100
50
0

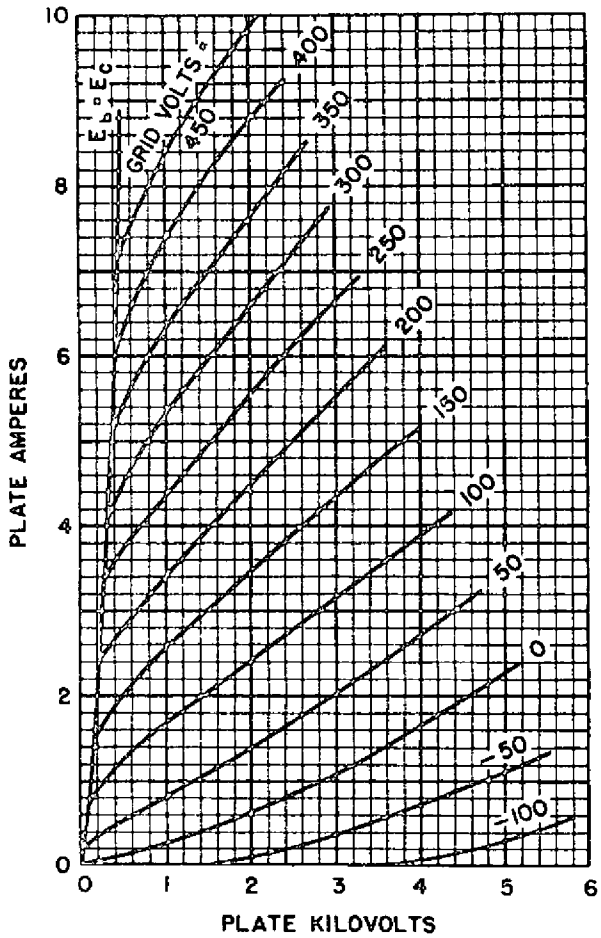
PLATE AMPERES
PLATE KILOVOLTS
Eb = Ec
GRID VOLTS
450
400
350
300
250
200
150
100
50
0
-50
-100

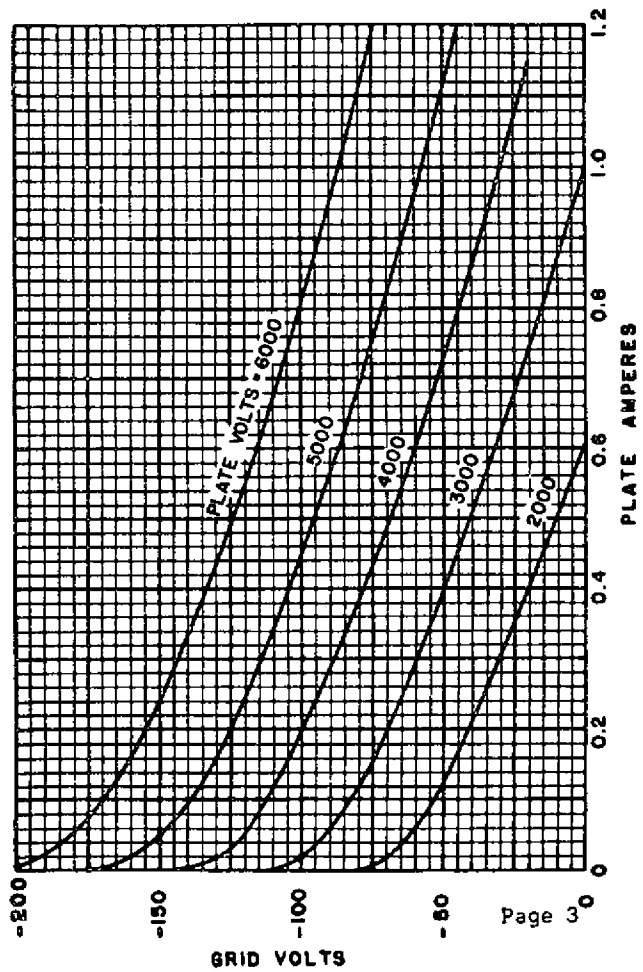
PLATE AMPERES
GRID VOLTS
PLATE VOLTS = 6000
5000
4000
3000
2000

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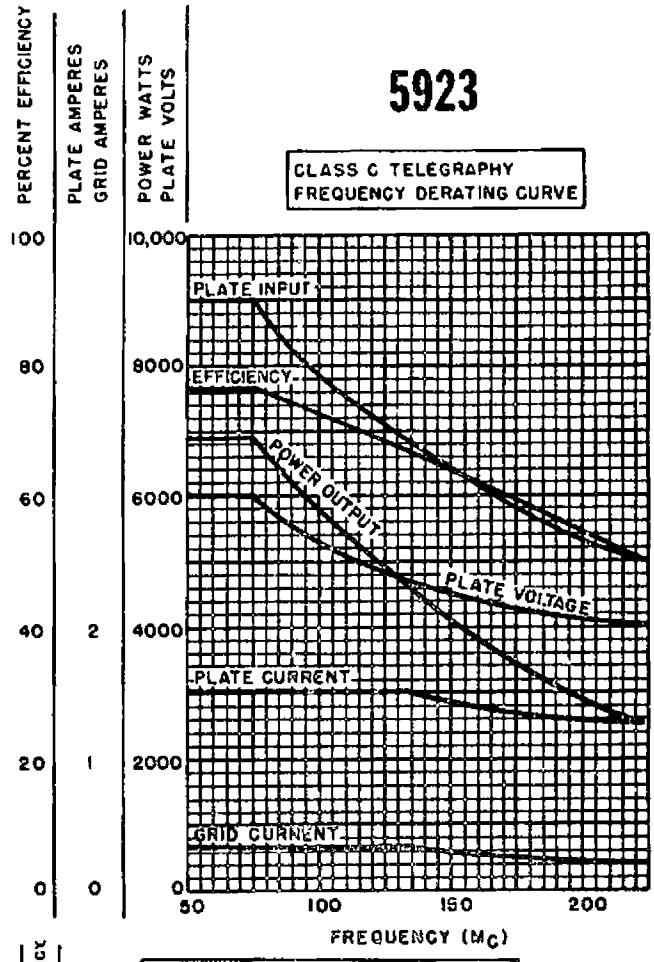
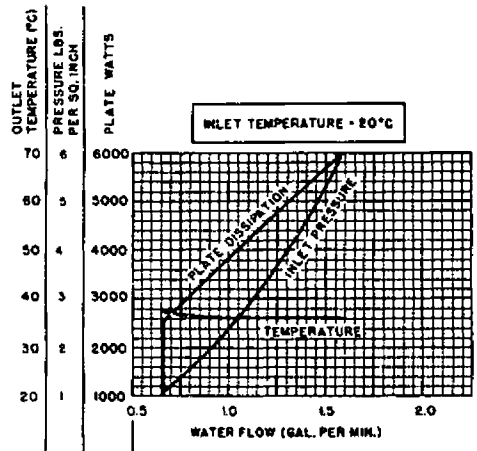
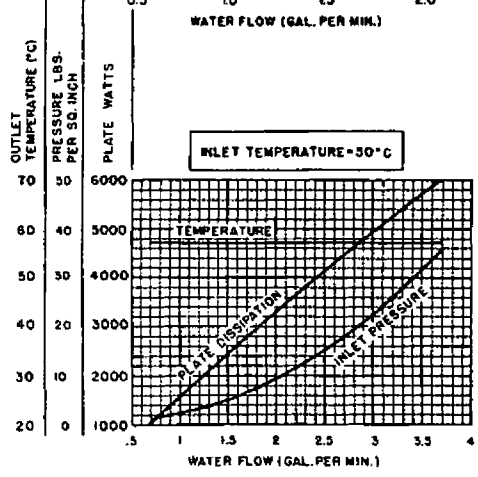
CLASS C TELEGRAPHY
FREQUENCY DERATING CURVE

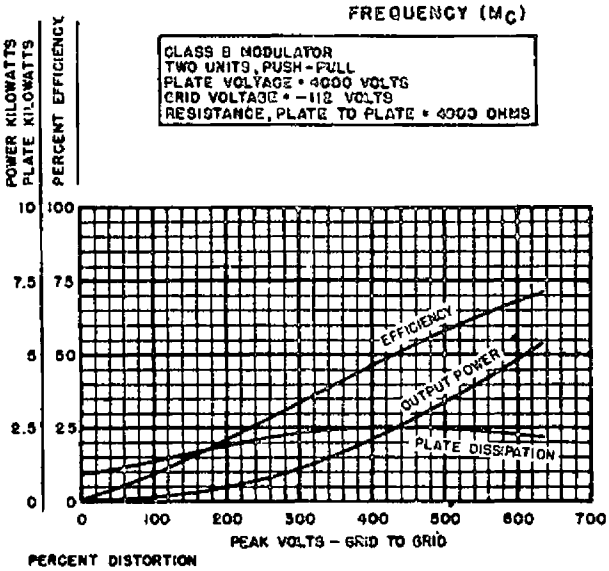






NOTE:
AT INLET TEMPERATURES BETWEEN 20°C AND 50°C, THE REQUIRED WATER FLOW CAN BE FOUND BY PROPORTIONAL INTERPOLATION.

CLASS B MODULATOR
TWO UNITS, PUSH-PULL
PLATE VOLTAGE = 4000 VOLTS
GRID VOLTAGE = −112 VOLTS
RESISTANCE, PLATE TO PLATE = 4000 OHMS



CLASS B TELEPHONY
WAVE LENGTH = 75 MC/SEC
PLATE VOLTAGE = 5000 VOLTS
GRID BIAS = −145 VOLTS