4662

UHF Power Amplifier

Ruggedized **Forced-Air Cooled**

300 W CW Output at 470 MHz
380 W PEP Output at 30 MHz

ELECTRICAL

Heater, for Unipotential Cathode:		
Voltage (AC or DC)[a]	13.5	V
Current at 13.5 volts	1.3	A
Minimum heating time	60	s
Mu-Factor, (Grid No.2 to Grid No.1)[b]	12	
Direct Interelectrode Capacitances:[c]		
Grid No.1 to plate	0.15 max.	pF
Grid No.1 to cathode	16	pF
Plate to cathode	0.01	pF
Grid No.1 to grid No.2	24	pF
Grid No.2 to plate	7.0	pF
Grid No.2 to cathode	2.7	pF
Cathode to heater	3.3	pF

MECHANICAL

Operating Position . . . . . Any

Maximum Overall Length . . . . . (57.40 mm) 2.26"

Seated Length . . . . . (48.8 ± 1.7 mm) 1.920" ± 0.065"

Greatest Diameter . . . . . (41.28 ± .38 mm) 1.625" ± 0.015"

Base . . . . . Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

Socket . . . . . Erie[d] No.9802-000 and 9804-000, Johnson[e] No.124-311-100 or equivalent

Grid No.2 Bypass Capacitor . . . . . Erie No.2943-002, Johnson No.124-121, or equivalent

Weight (Approx.) . . . . . 3.5 oz

THERMAL

Terminal Seal Temperature[g] (All Terminals)	250 max.	°C
Radiator Core Temperature[g]	250 max.	°C

Air Flow:

See *Typical Cooling Requirements curves and Forced-Air Cooling*

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service[h]

Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 500 MHz		
DC Plate Voltage	2200	max.	V
DC Grid-No.2 Voltage	400	max.	V
DC Grid-No.1 Voltage	-100	max.	V
DC Plate Current at Peak of Envelope	450[k]	max.	mA
DC Grid-No.1 Current	100	max.	mA
Plate Dissipation	400	max.	W
Grid-No.2 Dissipation	8	max.	W
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	150	max.	V
Heater positive with respect to cathode	150	max.	V

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance Under Any Condition:[m]			
With fixed bias	25000	max.	Ω
With fixed bias (in Class AB_1 operation)	100000	max.	Ω
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance[n]	1000	max.	Ω
Plate Circuit Impedance[j]	See Note p		

TYPICAL CCS OPERATION AT 30 MHz WITH "TWO-TONE MODULATION"

	AB_1	
DC Plate Voltage	2000	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-35	V
Zero-Signal DC Plate Current	100	mA
Effective RF Load Resistance	3050	Ω
DC Plate Current at Peak of Envelope	335	mA
Average DC Plate Current	250	mA
DC Grid-No.2 Current at Peak of Envelope	10	mA
Average DC Grid-No.2 Current	7	mA

DC Grid-No.1 Current at Peak of Envelope	0.05[r]	mA
Peak-Envelope Driver Power Output (Approx.)	0.3	W
Output-Circuit Efficiency (Approx.)	90	%
Distortion Products Level:		
Third order	29[s]	dB
Fifth order	32	dB
Useful Power Output (Approx.):		
Average	190	W
Peak envelope	380	W

RF POWER AMPLIFIER & OSCILLATOR – CLASS C TELEGRAPHY[h] AND RF POWER AMPLIFIER – CLASS C FM TELEPHONY[h]

MAXIMUM CCS RATINGS, *Absolute-Maximum Values:*

	Up to 500 MHz	
DC Plate Voltage	2200 max.	V
DC Grid-No.2 Voltage	400 max.	V
DC Grid-No.1 Voltage	-100 max.	V
DC Plate Current	300 max.	mA
DC Grid-No.1 Current	100 max.	mA
Grid-No.2 Dissipation	8 max.	W
Plate Dissipation	400 max.	W
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	150 max.	V
Heater positive with respect to cathode	150 max.	V

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance Under Any Condition:		
With fixed bias	25000 max.	Ω
Grid-No.2 Circuit Impedance	10000 max.	Ω
Plate Circuit Impedance	See Note **p**	

TYPICAL CCS OPERATION

In Grid-Drive Circuit at 50 MHz					
DC Plate Voltage	700	1000	1500	2000	V
DC Grid-No.2 Voltage	175	200	200	200	V
DC Grid-No.1 Voltage	-10	-30	-30	-30	V
DC Plate Current	300	300	300	300	mA
DC Grid-No.2 Current	25	20	20	20	mA

DC Grid-No.1 Current	50	40	40	30	mA
Driver Power Output (Approx.)	1.2	2	2	2	W
Useful Power Output	120	175	275	375	W
In Grid-Drive Circuit at 470 MHz					
DC Plate Voltage	700	1000	1500	2000	V
DC Grid-No.2 Voltage	200	200	200	200	V
DC Grid-No.1 Voltage	-30	-30	-30	-30	V
DC Plate Current	300	300	300	300	mA
DC Grid-No.2 Current	10	10	5	5	mA
DC Grid-No.1 Current	30	30	30	30	mA
Driver Power Output (Approx.)	5	5	5	5	W
Useful Power Output	100	165	235	300	W

PLATE-MODULATED RF POWER AMPLIFIER – CLASS C TELEPHONY[h]

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

MAXIMUM CCS RATINGS, *Absolute-Maximum Values:*

	Up to 500 MHz		
DC Plate Voltage	1800	max.	V
DC Grid-No.2 Voltage	400	max.	V
DC Grid-No.1 Voltage	-100	max.	V
DC Plate Current	250	max.	mA
DC Grid-No.1 Current	100	max.	mA
Grid-No.2 Input	5	max.	W
Plate Dissipation	280	max.	W

a Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz heater volts = 12.5 (approx.).

b For plate voltage = 450 V
Grid No.2 voltage = 325 V
Plate current = 1.2 A

c Measured with special shield adapter.

d Erie Technological Products, Inc., 645 West 12th Street, Erie, PA 16501

e E.F. Johnson Co., 1921 10th Ave., S.W. Waseca, MN 56093

g See Dimensional Outline for Temperature Measurement Points.

h See *RCA Transmitting Tube Operating Considerations - CLASSES OF SERVICE* given at the front of this section.

j The tube shall see an effective plate-supply impedance of no less than 750 ohms. A fault current limiting resistor of no less than 15 ohms is to be used between the output filter capacitance and the tube plate. The plate-supply-output-filter capacitance is to be no greater than 10 μF.

k The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

m A fault current limiting resistor of no less than 20 ohms is to be used between the bias supply output filter capacitance and the tube grid-No.1. The bias supply output filter capacitance is to be no greater than 150 μF.

n A fault current limiting resistor of no less than 320 ohms is to be used between the screen output filter capacitance and the tube screen. The screen supply output filter capacitance is to be no greater than 80 μF.

p The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

r This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

s The value of third order distortion product level shown may be improved by approximately 5 dB by utilizing an unbypassed, non-inductive 20-ohm resistor between the cathode and ground; a slight increase in drive power will be required.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
1. Heater Current	1	1.15	1.45	A
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	—	0.15	pF
Grid No.1 to cathode	2	14.6	18.0	pF
Plate to cathode	2	0.004	0.016	pF
Grid No.1 to grid No.2	2	20.0	26.5	pF
Grid No.2 to plate	2	6.3	7.7	pF

Grid No.2 to cathode	2	2.1	4.1	pF
Cathode to heater	2	2.5	4.1	pF
3. Grid-No.1 Voltage	1,3	-19	-10	V
4. Interelectrode Leakage Resistance	4	50	—	MΩ
5. Zero Bias Plate Current	1,5	1.0	1.8	A

Note 1: With 13.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will be no less than the valve specified.

Note 5: With dc plate voltage of 450 volts, dc grid No.2 voltage of 400 volts, dc grid No.1 voltage of -100 volts, grid drive voltage to zero. With pulse duration of 4500 to 5000 μs and pulse repetition frequency is 10 to 12 pps.

FORCED-AIR COOLING

AIR FLOW:

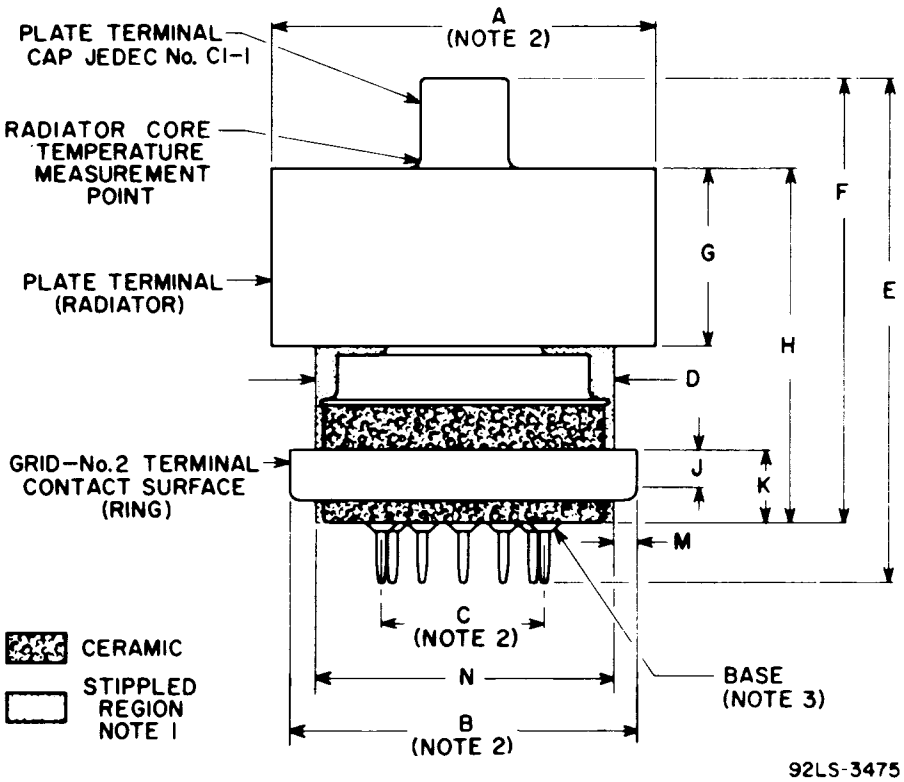
Through radiator — Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of filament, plate, grid-No.2, and grid No.1 voltages.

For a plate dissipation of 310 watts, approximately four and one half cubic feet of air per minute at an incoming temperature of 24° C is required in accordance with the air flow characteristics as shown in the chart.

During Shutdown Operation — Air flow should continue for a few minutes after all electrode power is removed.

For further information on forced-air cooling, see *RCA Transmitting Tube Operating Considerations at front of this section.*

DIMENSIONAL OUTLINE



TABULATED DIMENSIONS*

	Inches	Millimeters
A Dia.	1.625 ± .015	41.28 ± .38
B Dia.	1.426 ± .010	36.22 ± .25
C Dia.	0.687 ref.	17.45 ref.
D Dia.	1.25 max.	31.75 max.
E	2.26 max.	57.40 max.
F	1.920 ± .065	48.8 ± 1.7
G	0.750 ± .040	19.0 ± 1.0
H	1.515 ± .045	38.5 ± 1.1
J	0.150 min.	3.81 min.
K	0.300 ± .020	7.62 ± .51
M	0.080 min.	2.03 min.
N	1.200 max.	30.48 max.

*Basic dimensions are in inches. Metric dimensions are in millimeters and are derived from the inch dimensions (1 inch = 25.4 mm).

NOTES FOR DIMENSIONAL OUTLINE

Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

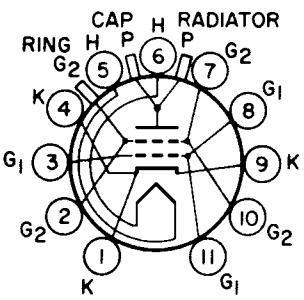
Note 2: The diameters of the radiator, grid-No.2 ring terminal contact, and pin circle shall be concentric within the following values of the maximum full indicator reading:

Radiator to Grid-No.2 Terminal Contact Surface	0.030" max.
Radiator to Pin Circle	0.040" max.
Grid-No.2 Terminal Contact Surface to Pin Circle	0.030" max.

The full indicator reading is the deviation of a surface when the tube is rotated about the center of the reference. It is a measure of the total effect of run-out and ellipticity.

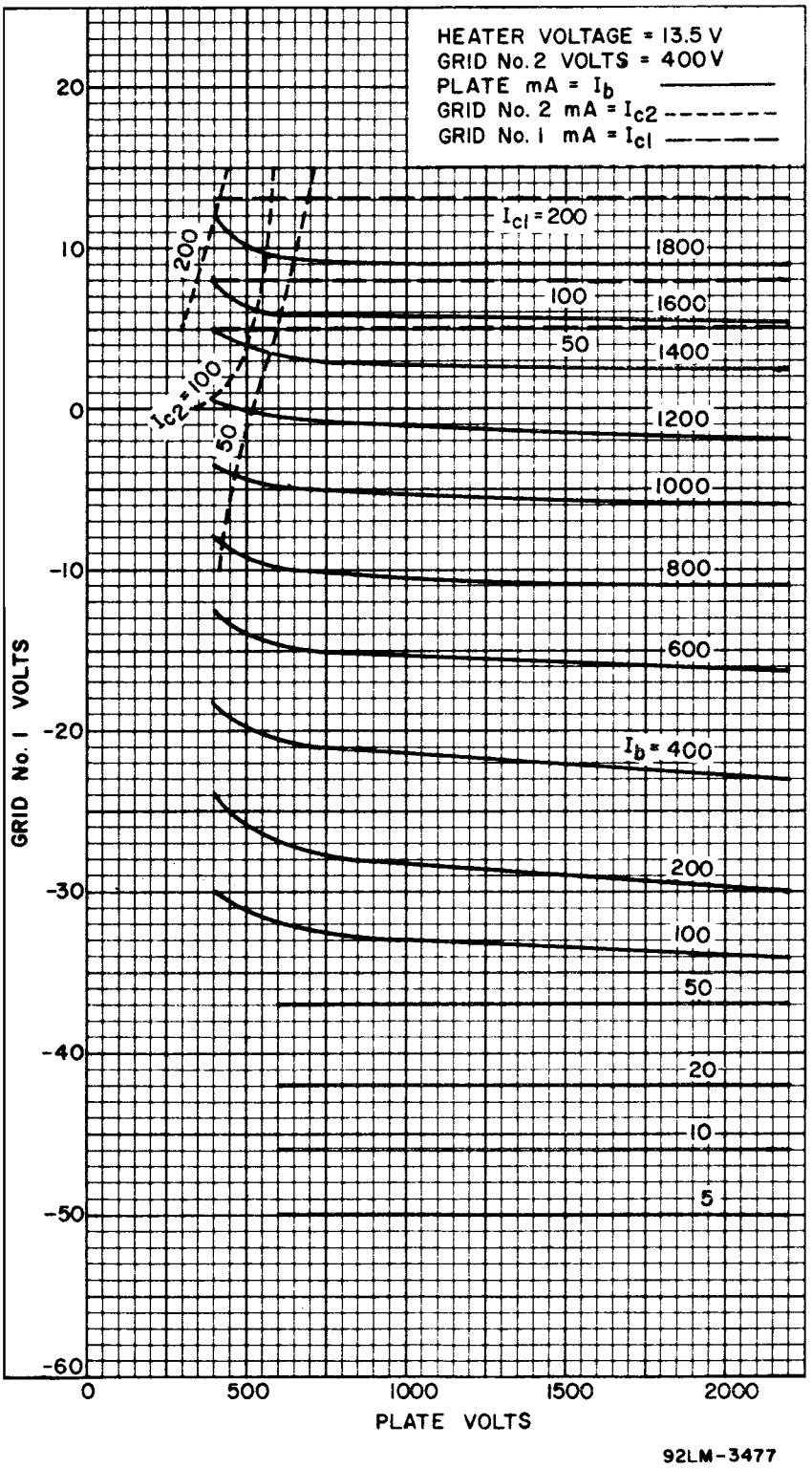
Note 3: Base conforms to specification of the Large Wafer, Elevenar, Eleven pin with ring Base No.JEDEC No.E11-81. It may be checked with Gauge JEDEC No.GE11-1.

TERMINAL DIAGRAM
(Bottom View)

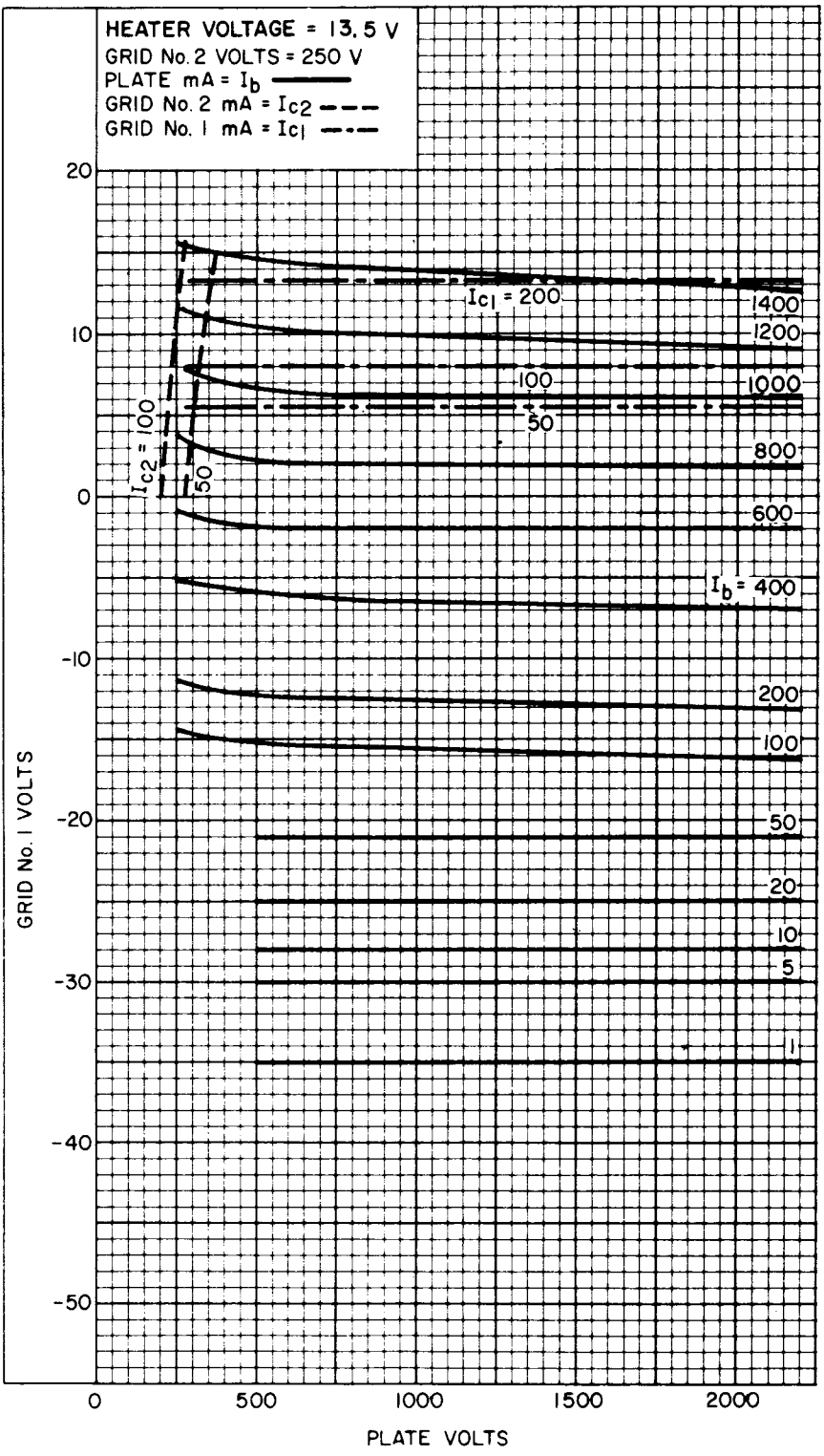


Pin 1: Cathode
Pin 2: Grid No.2
Pin 3: Grid No.1
Pin 4: Cathode
Pin 5: Heater
Pin 6: Heater
Pin 7: Grid No.2
Pin 8: Grid No.1
Pin 9: Cathode
Pin 10: Grid No.2
Pin 11: Grid No.1
Cap: Plate Terminal
Radiator: Plate Terminal
Ring: Grid-No.2 Terminal Contact Surface (For use at higher frequencies)

TYPICAL CONSTANT – CURRENT CHARACTERISTICS



TYPICAL CONSTANT – CURRENT CHARACTERISTICS



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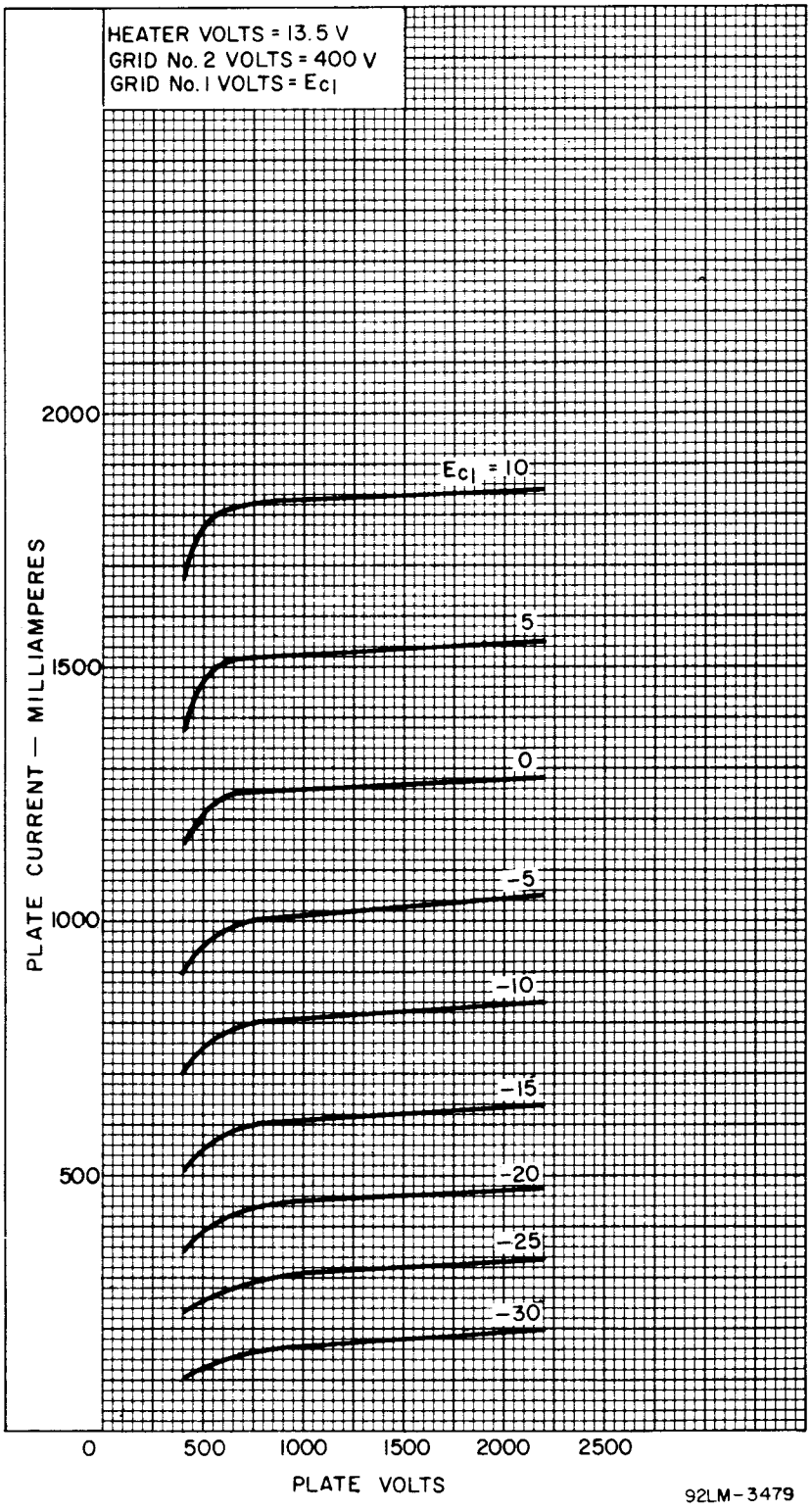
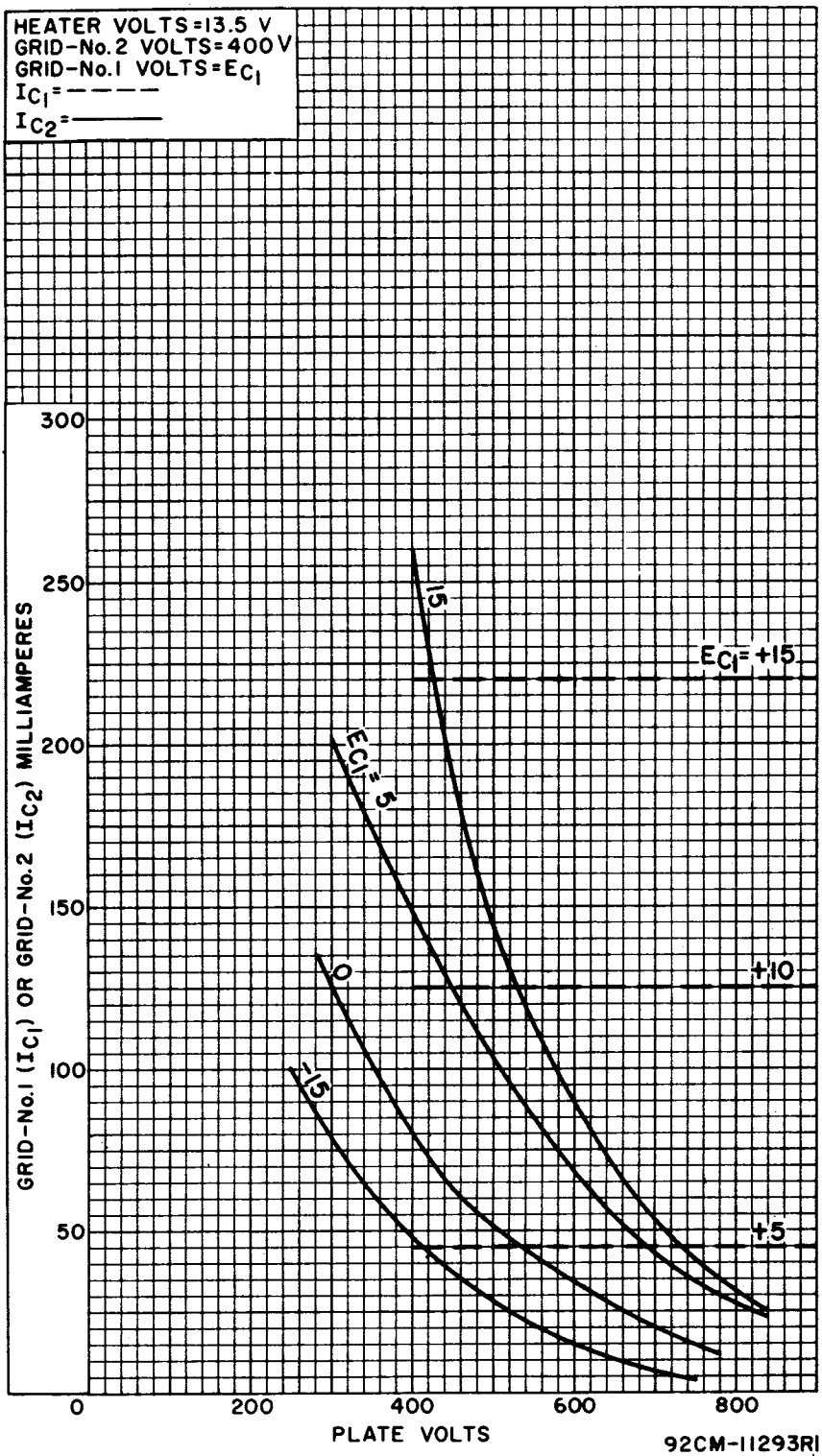
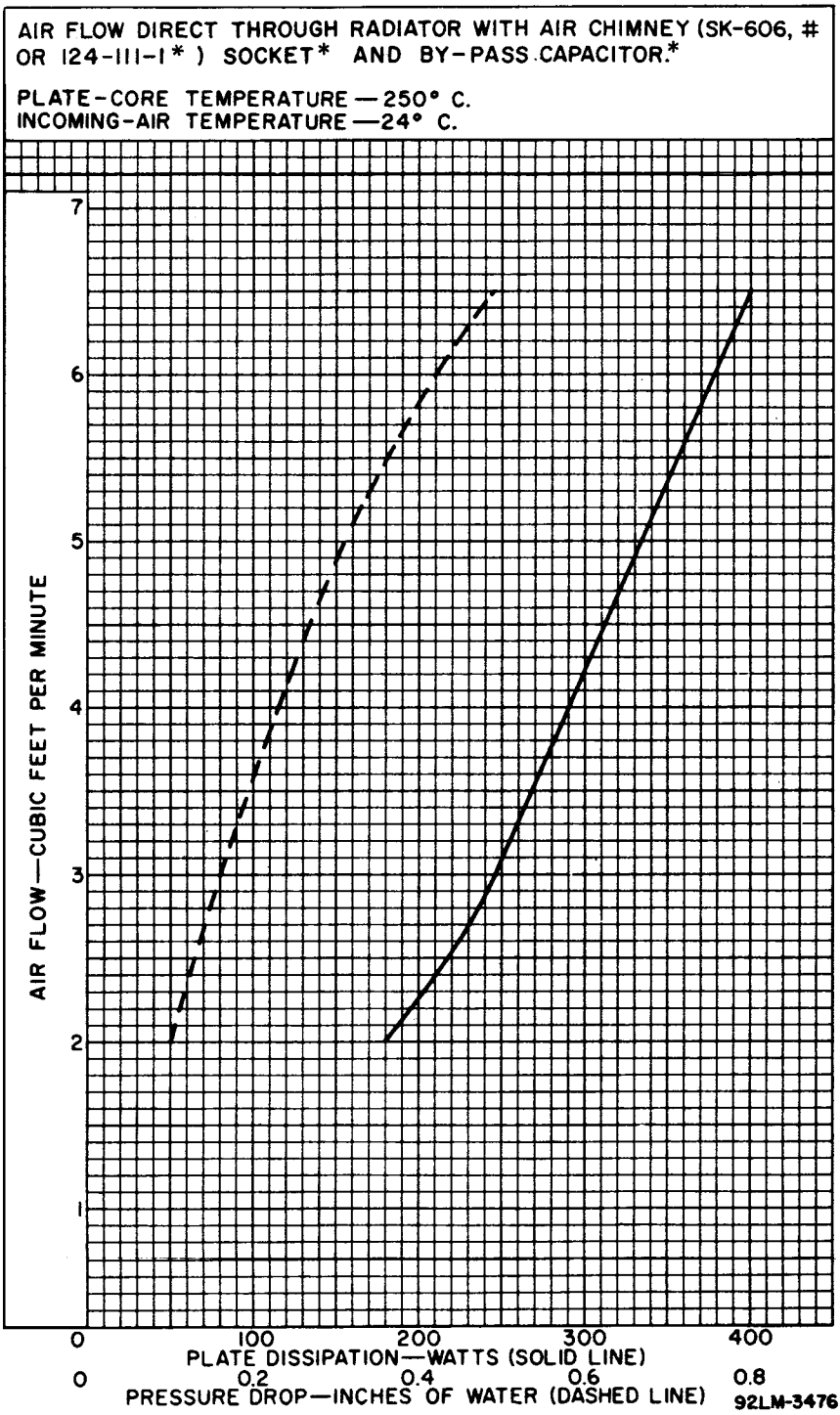
TYPICAL PLATE CHARACTERISTICS



TYPICAL GRID CHARACTERISTICS



TYPICAL COOLING REQUIREMENTS



#May be obtained through Eitel McCullough, Inc., San Carlos, CA 94070.

+May be obtained through EF Johnson, Co., 1921 10th Ave., SW, Waseca, MN 56093.