7457

Beam Power Tube

Cermolox **Ruggedized**
Forced-Air Cooled **Integral Radiator**

80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

For Applications in Which Dependable Performance Under Severe Shock and Vibration is Essential

ELECTRICAL

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:[g]		
Voltage (ac or dc)	6.3 ± 10%	V
Current at 6.3 volts	3.2	A
Minimum heating time	1	minute
Mu-Factor, Grid No.2 to Grid No.1	18	
Direct Interelectrode Capacitances[a]:		
Grid No.1 to plate	0.065 max.	pF
Grid No.1 to cathode & heater	14	pF
Plate to cathode & heater	0.019	pF
Grid No.1 to grid No.2	19	pF
Grid No.2 to plate	4.5	pF
Grid No.2 to cathode & heater	1.30	pF

MECHANICAL

Operating Position . . . . . Any
Overall Length . . . . . 1.880" ± .050"
Greatest Diameter . . . . . 1.265" max.
Terminal Connections . . . . . See *Dimensional Outline*

For operation up to 400 MHz

Socket, including Grid-No.2 Bypass Capacitor . . . . . Erie[b] 2948-000, E.F. Johnson[c] DN124-152-1, Jettron[d] 89-001, or equivalent

Grid-No.2 Bypass Capacitor . . . . . Erie[b] 2926-000, 2929-001, or equivalent

For operation at high frequencies

See Accompanying Preferred Mounting Arrangement
Radiator . . . . . Integral part of tube
Weight (Approx.) . . . . . 2 oz.

THERMAL

Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater)	250 max.	°C
Plate-Core Temperature	250 max.	°C

Air Flow:[h]

Through radiator — Adequate air flow to limit the radiator core temperature to 250° C should be delivered by a blower across the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed across the radiator versus plate dissipation are shown in two graphs under *Typical Cooling Requirements*.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals — A sufficient quantity of air should flow across each of these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is not normally required when only heater voltage is applied to the tube.

Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

At sea level cooling requirements with air flow directed across the radiator with cowling as indicated may be met by use of blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent.

AF POWER AMPLIFIER & MODULATOR — Class AB_1[i]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
Max.-Signal DC Plate Current	180 max.	mA
Max.-Signal Plate Input	180 max.	watts
Max.-Signal Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

	Values are for 2 tubes		
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage:			
From fixed-bias source	−15	−15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30	30	volts

Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	200	200	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	20	20	mA
Effective Load Resistance (Plate to plate)	4330	7000	ohms
Max.-Signal Driving Power (Approx.)	0	0	watt
Max.-Signal Power Output (Approx.)	50	80	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition:

With fixed bias	30,000 max. ohms
With cathode bias	Not recommended

AF POWER AMPLIFIER & MODULATOR – Class AB_2 [i]

Maximum CCS Ratings, *Absolute-Maximum Values:*

DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
Max.-Signal DC Plate Current	180 max.	mA
Max.-Signal DC Grid-No.1 Current	30 max.	mA
Max.-Signal Plate Input	180 max.	watts
Max.-Signal Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage: From fixed-bias source	−15	−15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	46	46	volts
Zero-Signal DC Plate Current	80	80	mA
Max.-Signal DC Plate Current	355	355	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Max.-Signal DC Grid-No.2 Current	25	25	mA
Max.-Signal DC Grid-No.1 Current	15	15	mA
Effective Load Resistance (Plate to plate)	2450	3960	ohms
Max.-Signal Driving Power (Approx.)	0.3	0.3	watt
Max.-Signal Power Output (Approx.)	85	140	watts

PLATE-MODULATED RF POWER AMPLIFIER – Class C Telephony[i]

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

Maximum CCS Ratings, *Absolute-Maximum Values*

	Up to 1215 MHz:	
DC Plate Voltage	800 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
DC Grid-No.1 Voltage	–100 max.	volts
DC Plate Current	150 max.	mA
DC Grid-No.1 Current	30 max.	mA
Plate Input	120 max.	watts
Grid-No.2 Input	3 max.	watts
Plate Dissipation	75 max.	watts

Typical CCS Operation:

	At 400 MHz:		
DC Plate Voltage	400	700	volts
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage	–20	–50	volts
DC Plate Current	100	130	mA
DC Grid-No.2 Current	5	10	mA
DC Grid-No.1 Current	5	10	mA
Driver Power Output (Approx.)	2	3	watts
Useful Power Output (Approx.)	16	45	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under Any Condition	30,000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR – Class C Telegraphy[i]

and

RF POWER AMPLIFIER – Class C FM Telephony

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 1215 MHz:	
DC Plate Voltage	1000 max.	volts
DC Grid-No.2 Voltage	300 max.	volts
DC Grid-No.1 Voltage	–100 max.	volts
DC Plate Current	180 max.	mA
DC Grid-No.1 Current	30[c] max.	mA
Plate Input	180 max.	watts
Grid-No.2 Input	4.5 max.	watts
Plate Dissipation	115 max.	watts

Typical CCS Operation:

	At 400 MHz		*At 1215 MHz*	
DC Plate Voltage	400	900	900	volts
DC Grid-No.2 Voltage	200	300	300	volts
DC Grid-No.1 Voltage	−35	−30	−22	volts
DC Plate Current	150	170	170	mA
DC Grid-No.2 Current	5	1	1	mA
DC Grid-No.1 Current	3	10	4	mA
Driver Power Output (Approx.)	3	3	5	watts
Useful Power Output (Approx.)	23	80	40	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance
under Any Condition . . . . . 30,000 max. ohms

LINEAR RF POWER AMPLIFIER,[i]
Single-Sideband Suppressed-Carrier Service

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

Maximum CCS Ratings, *Absolute-Maximum Values:*

	Up to 1215 MHz		
DC Plate Voltage	1000	max.	volts
DC Grid-No.2 Voltage	300	max.	volts
DC Grid-No.1 Voltage	−100	max.	volts
DC Plate Current at Peak of Envelope	250[c]	max.	mA
DC Grid-No.1 Current	30	max.	mA
Plate Input	180	max.	watts
Grid-No.2 Input	4.5	max.	watts
Plate Dissipation	115	max.	watts

Typical CCS Operation with "Two-Tone" Modulation:

	At 30 MHz		
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage	300	300	volts
DC Grid-No.1 Voltage	−18.5	−18.5	volts
Zero-Signal DC Plate Current	40	40	mA
Effective RF Load Resistance	2200	3500	ohms
DC Plate Current at Peak of Envelope	100	100	mA
Average DC Plate Current	75	75	mA
DC Grid-No.2 Current at Peak of Envelope	8.2	4.2	mA
Average DC Grid-No.2 Current	3.6	1.7	mA
Peak-Envelope Driver Power Output (Approx.)	0.5	0.5	watt

Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:			
Third Order	35	30	dB
Fifth Order	40	36	dB
Useful Power Output (Approx.):			
Average	12.5	20	watts
Peak envelope	25	40	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance			
Under Any Condition:			
With fixed bias	25000	max.	ohms
With fixed bias (In Class AB_1 operation)	100000	max.	ohms
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance [k]	10000	max.	ohms

[a] Measured with special shield adapter.

[b] Erie Technological Products, Inc., 2206 West 15th Street, Erie, Pennsylvania

[c] E.F. Johnson Co., 299 10th Ave., S.W., Waseca, Minn.

[d] Jettron Products, Inc., 56 Rt. 10, Hanover, N.J.

[e] The maximum dc plate current at peak of envelope is 250 mA dc for a signal having a minimum peak-to-average power ratio of 2. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 250 mA. 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 180 mA.

[f] In applications where the frequency is less than 80 MHz and the bias is less than –50 volts, the maximum value is 40 mA.

The following footnotes apply to the RCA *Transmitting Tube Operating Considerations* given at front of this section.

[g] See *Electrical Considerations*—Filament or Heater.

[h] See *Cooling Considerations*—Forced Air Cooling.

[i] See *Classes of Service*.

[k] See *Electrical Considerations*—Grid No.2 Voltage Supply.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
1. Heater Current	1	2.90	3.55	A
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	—	0.065	pF
Grid No.1 to cathode & heater	2	11.8	15.2	pF
Plate to cathode & heater	2	—	0.019	pF
Grid No.1 to grid No.2	2	17.3	21.9	pF
Grid No.2 to plate	2	4	5.1	pF
Grid No.2 to cathode & heater	2	—	1.30	pF
3. Grid-No.1 Voltage	1,3	−6	−18	volts
4. Reverse Grid-No.1 Current	1,3	—	−20	μA
5. Grid-No.2 Current	1,3	−8	+2.0	mA
6. Peak Emission	1,4	—	300	peak volts
7. Interelectrode Leakage Resistance	5	1.0	—	megohm
8. Useful Power Output	6	85	—	watts

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 mA.

Note 4: With grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed the value specified.

Note 5: 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 adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will exceed the value specified.

Note 6: In a single-tube, grid-driven coaxial-tuned amplifier circuit at 400 MHz and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 voltage adjustable for dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3 watts maximum.

SPECIAL TESTS AND PERFORMANCE DATA

The environmental conditions shown for the tests below are those applied directly to the tube. Extreme care must be used in the design of the mountings to minimize mounting resonances.

50g, 11-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a medium impact shock machine and are subjected to three blows in each position.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values*.

500g, Nominal 3/4-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a high-impact shock machine and are subjected to five blows in each positions.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values*.

5-2000 Hz Variable Frequency Vibration Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 mA, and plate load resistor of 2000

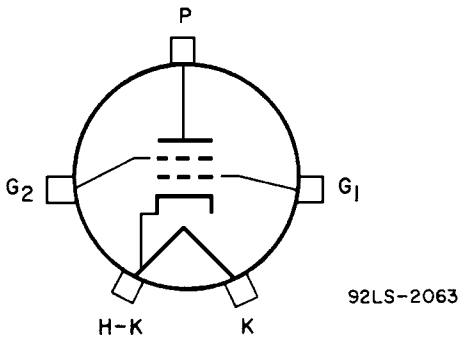
ohms. This tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

a. 5-10 Hz with fixed double amplitude of 0.080 inch ±10%.
b. 10-15 Hz at fixed acceleration of 0.41 g ± 10%.
c. 15-75 Hz with fixed double amplitude of 0.036 inch ±10%.
d. 75-2000 Hz at fixed acceleration of 0 g ± 10%.

During the above vibration tests, tubes will show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-2000 hertz range.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under *Characteristics Range Values.*

TERMINAL DIAGRAM



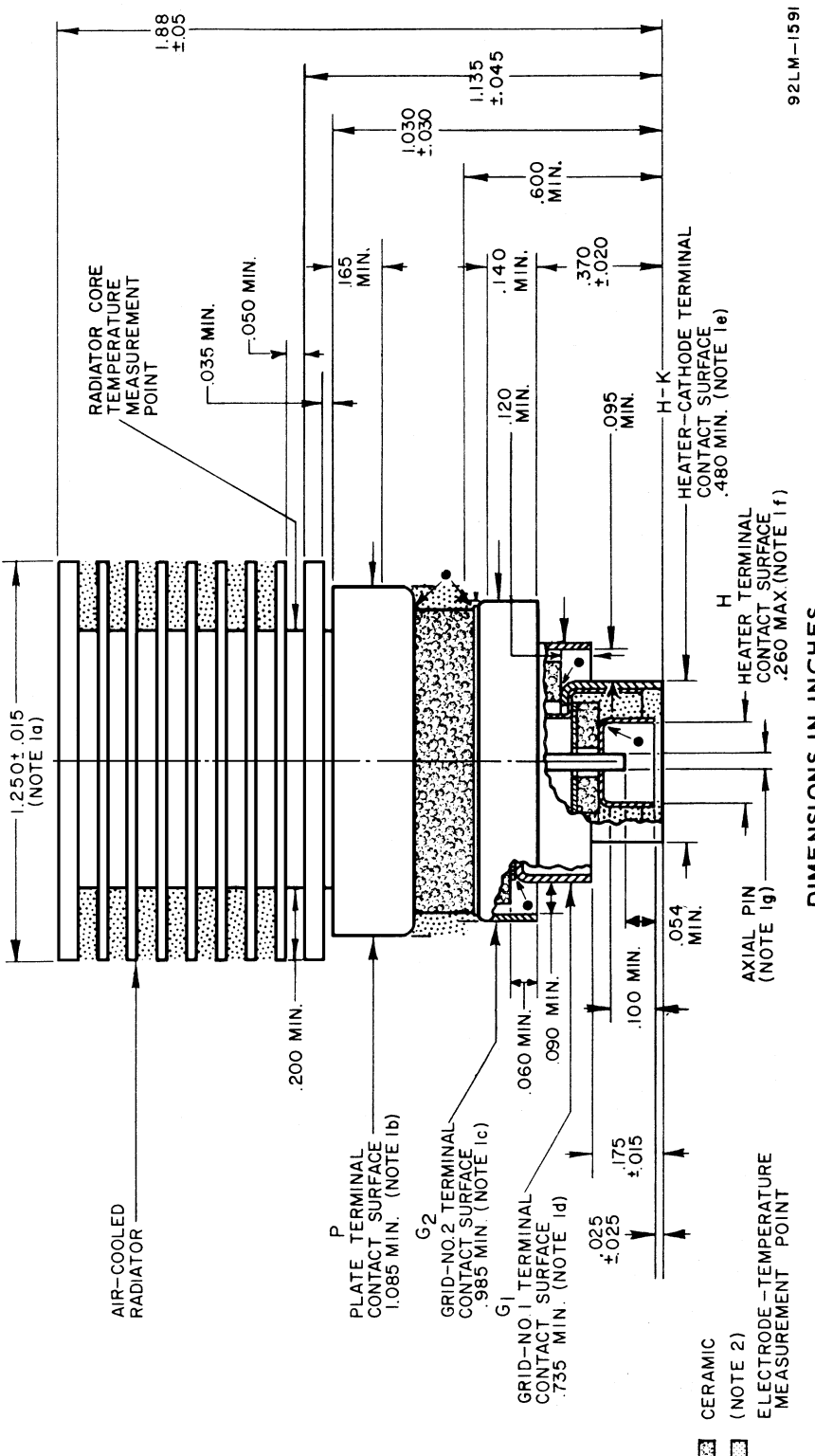
NOTES FOR DIMENSIONAL OUTLINE

Note 1: The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator fins, axial pin, and each electrode terminal:

a. Radiator Band – 1.316"
b. Plate Terminal – 1.120"
c. Grid-No.2 Terminal – 1.020"
d. Grid-No.1 Terminal – 0.765"
e. Heater-Cathode Terminal – 0.520"
f. Heater Terminal – 0.240"
g. Axial Pin – 0.072"

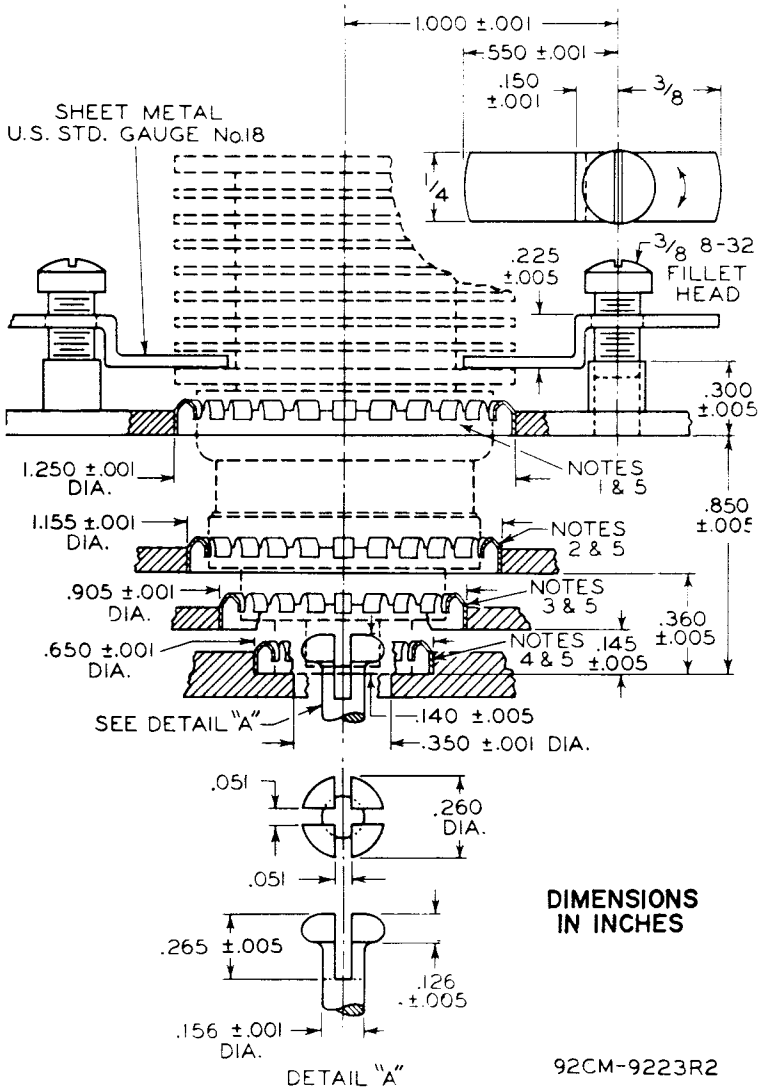
Note 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

PREFERRED MOUNTING ARRANGEMENT



Note 1: Contact ring No.97-252 or finger stock No.97-380.

Note 2: Contact ring No.97-253 or finger stock No.97-380.

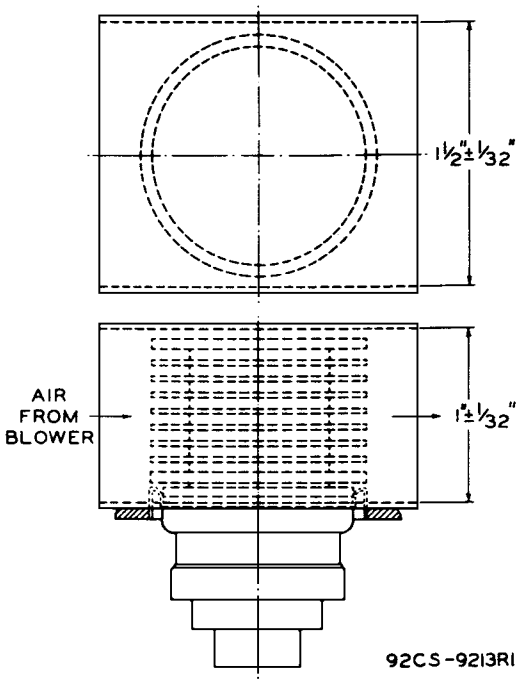
Note 3: Contact ring No.97-254 or finger stock No.97-380.

Note 4: Contact ring No.97-255 or finger stock No.97-380.

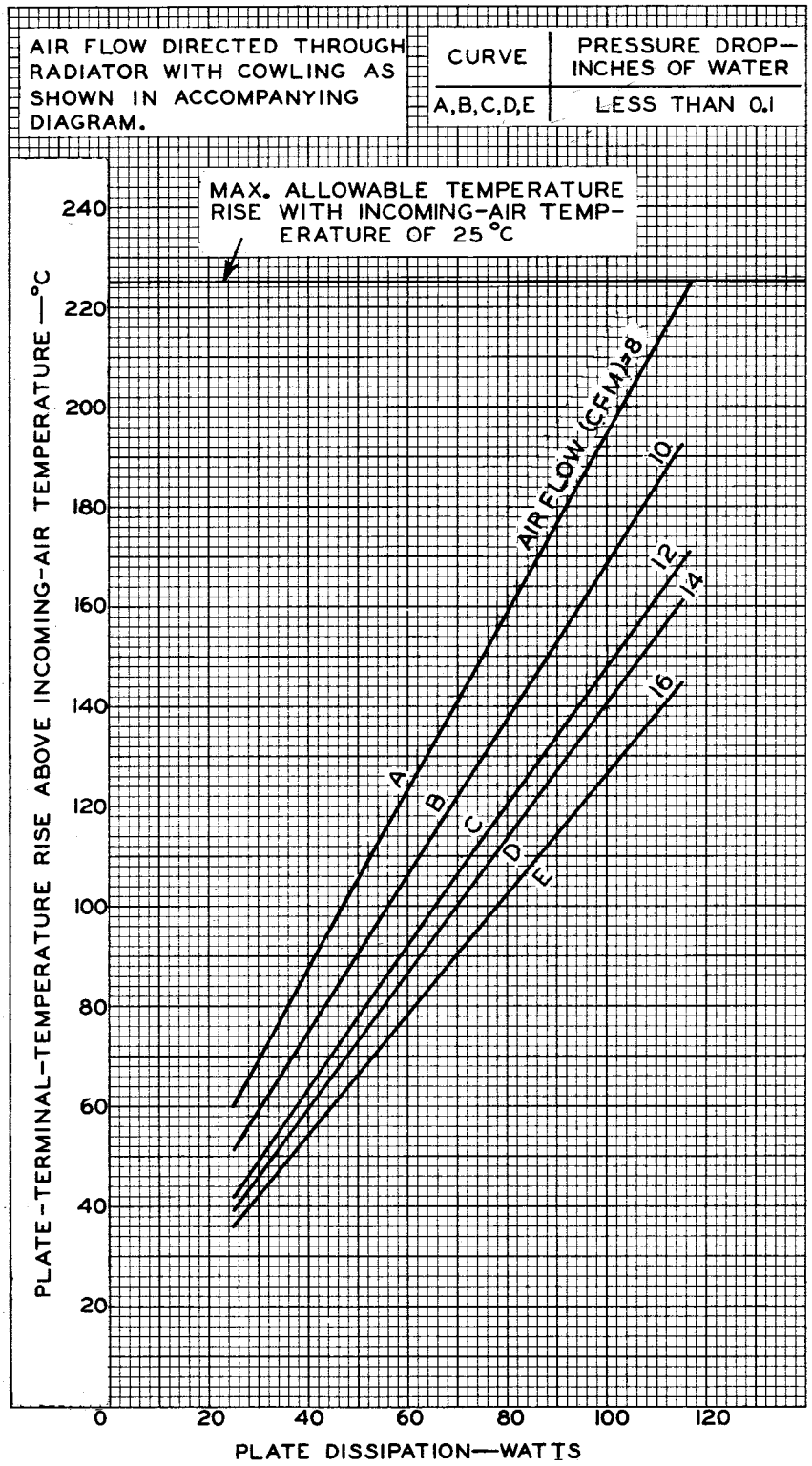
Note 5: The specified contact ring of preformed finger stock and finger stock No.97-380 provide adequate electrical contact, but the finger stock No.97-380 is less susceptible to breakage than the specified contact ring. Both types are made by Instruments Specialties Co., Little Falls, N.J.

RECOMMENDED COWLING

For Directing Air Flow Through Radiator

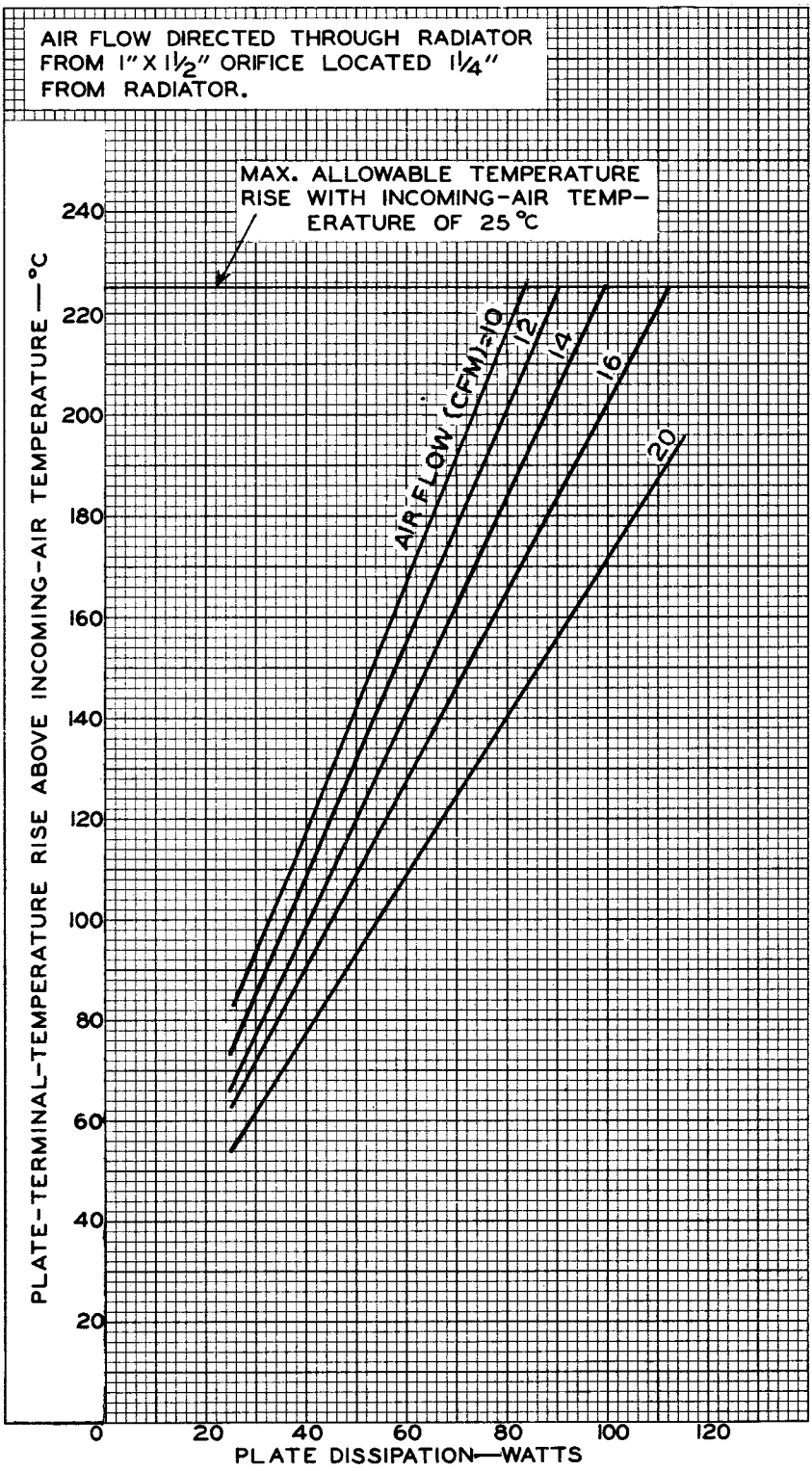


TYPICAL COOLING REQUIREMENTS
With Cowling



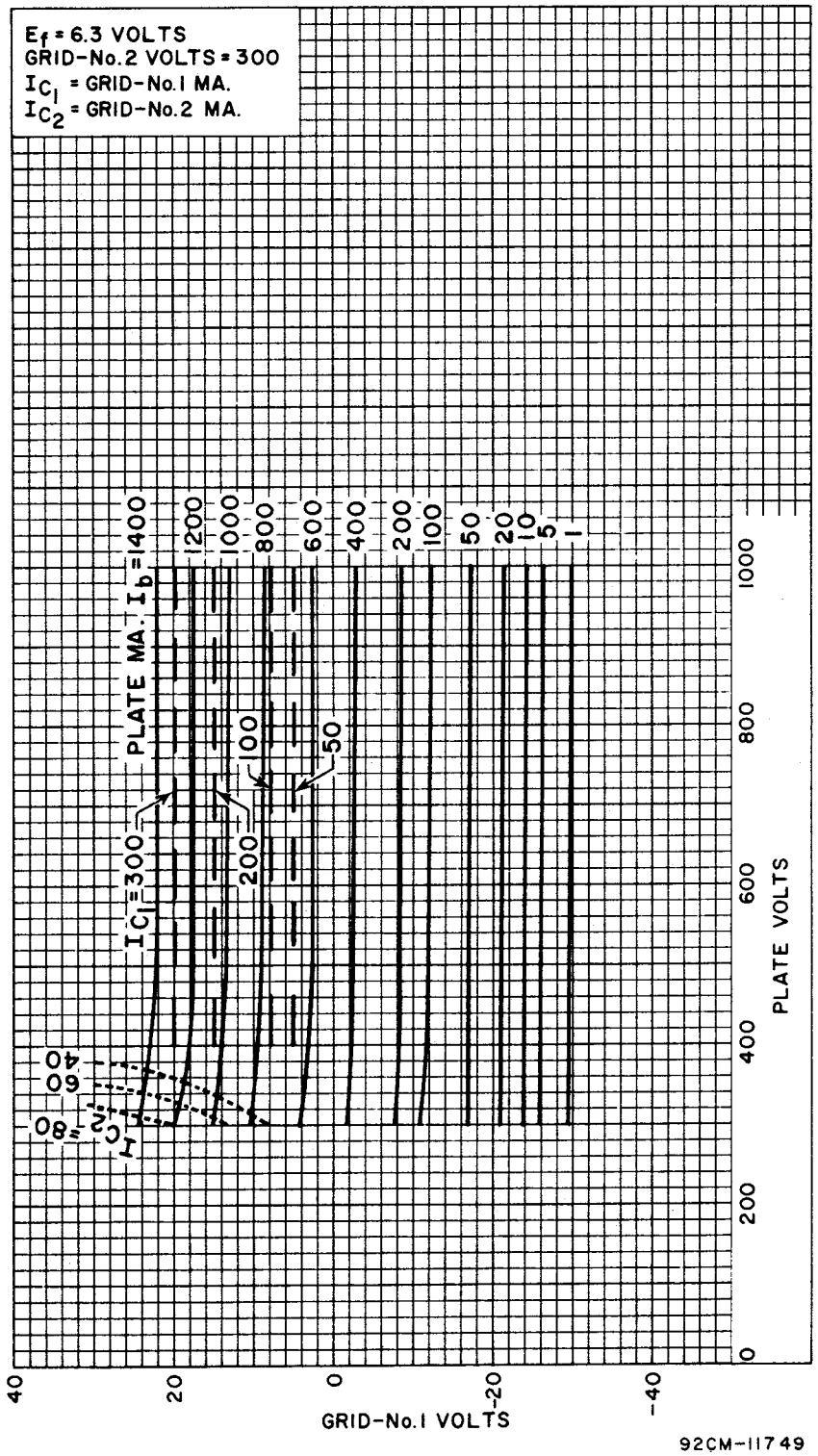
92CM-9219RI

TYPICAL COOLING REQUIREMENTS
Without Cowling



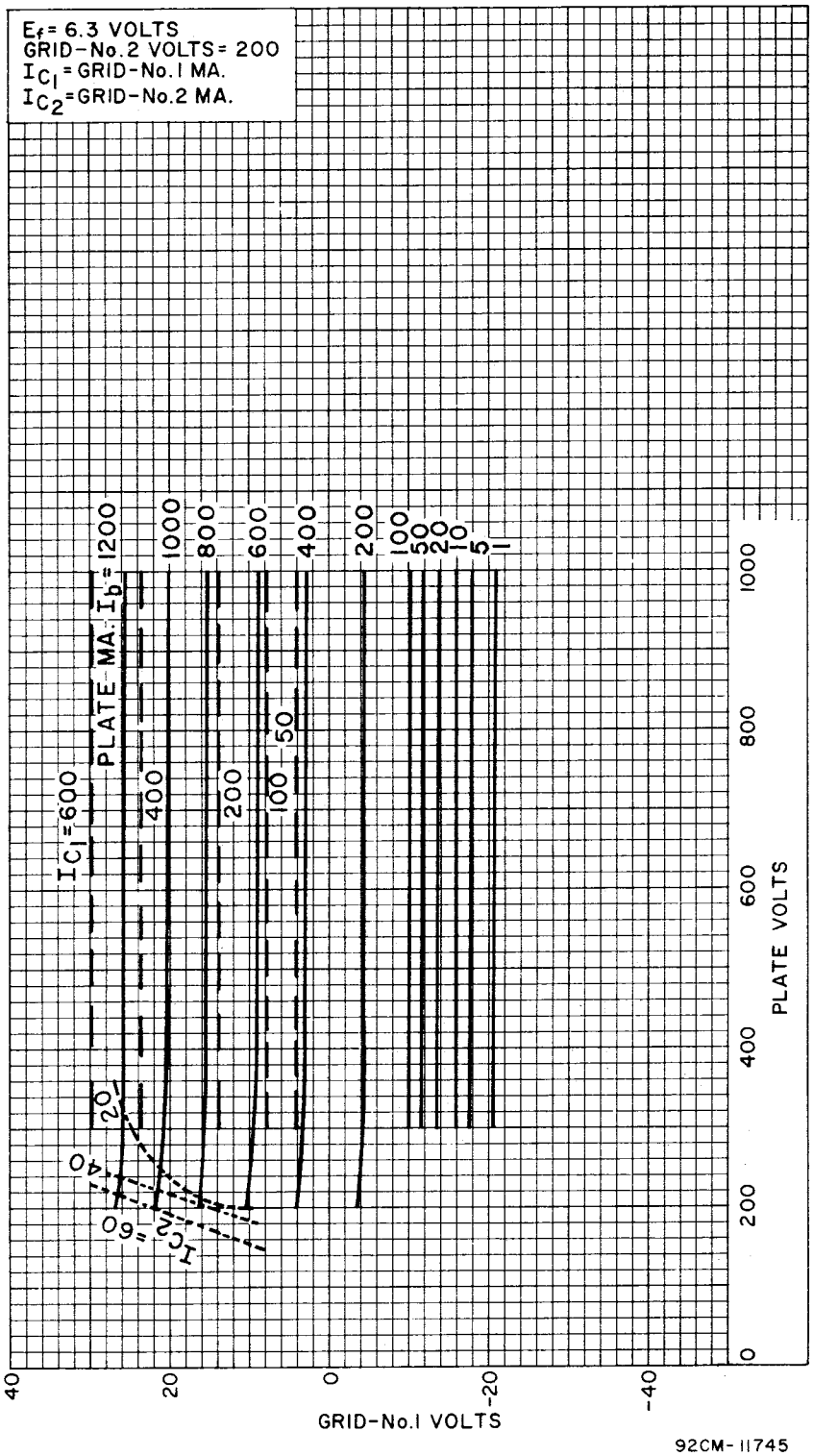
92CM-9220R1

TYPICAL CONSTANT-CURRENT CHARACTERISTICS

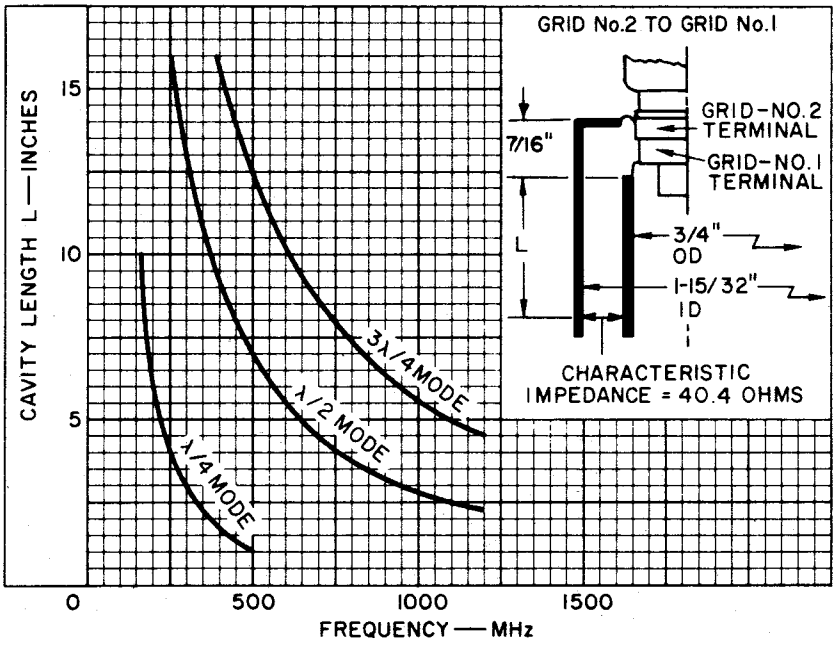


92CM-11749

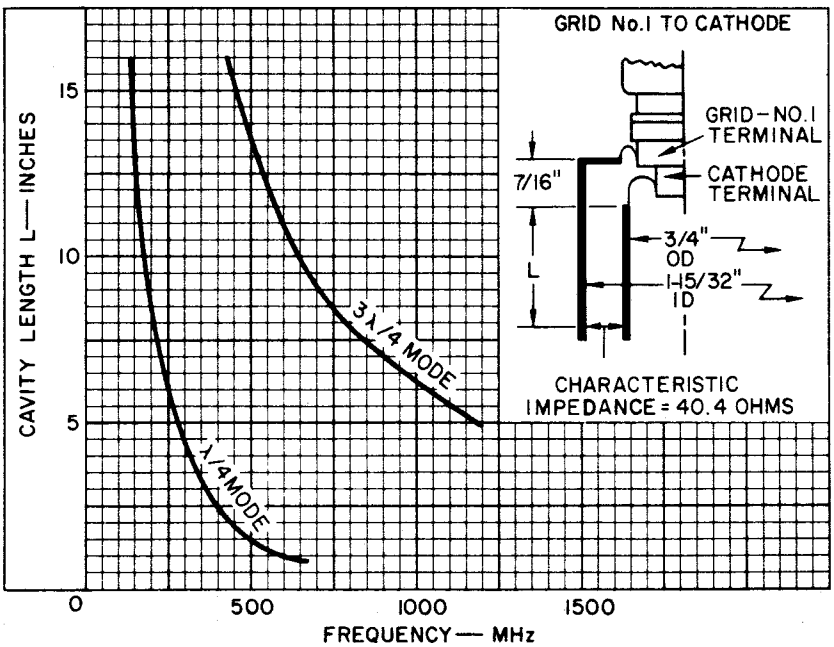
TYPICAL CONSTANT-CURRENT CHARACTERISTICS



TUNING CHARACTERISTICS

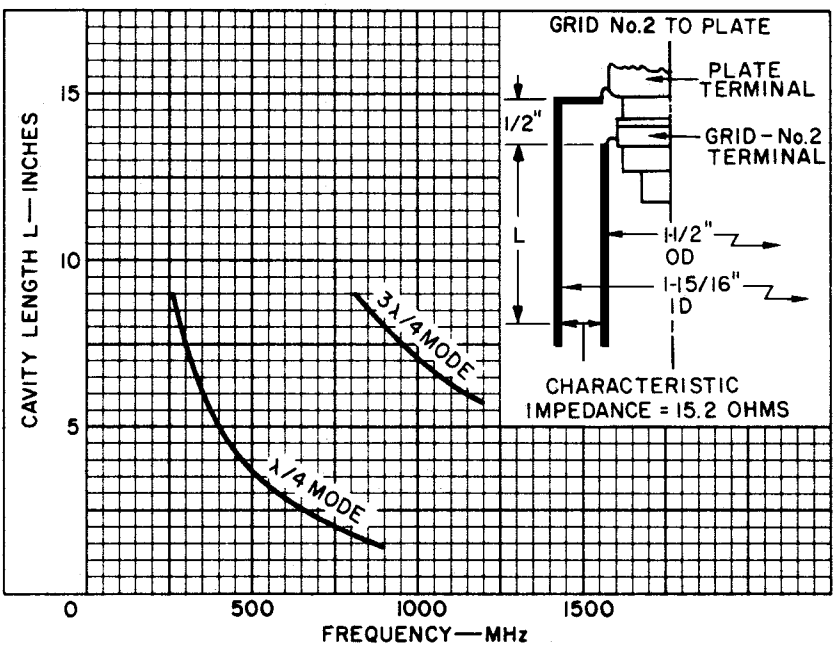


92CS-14833



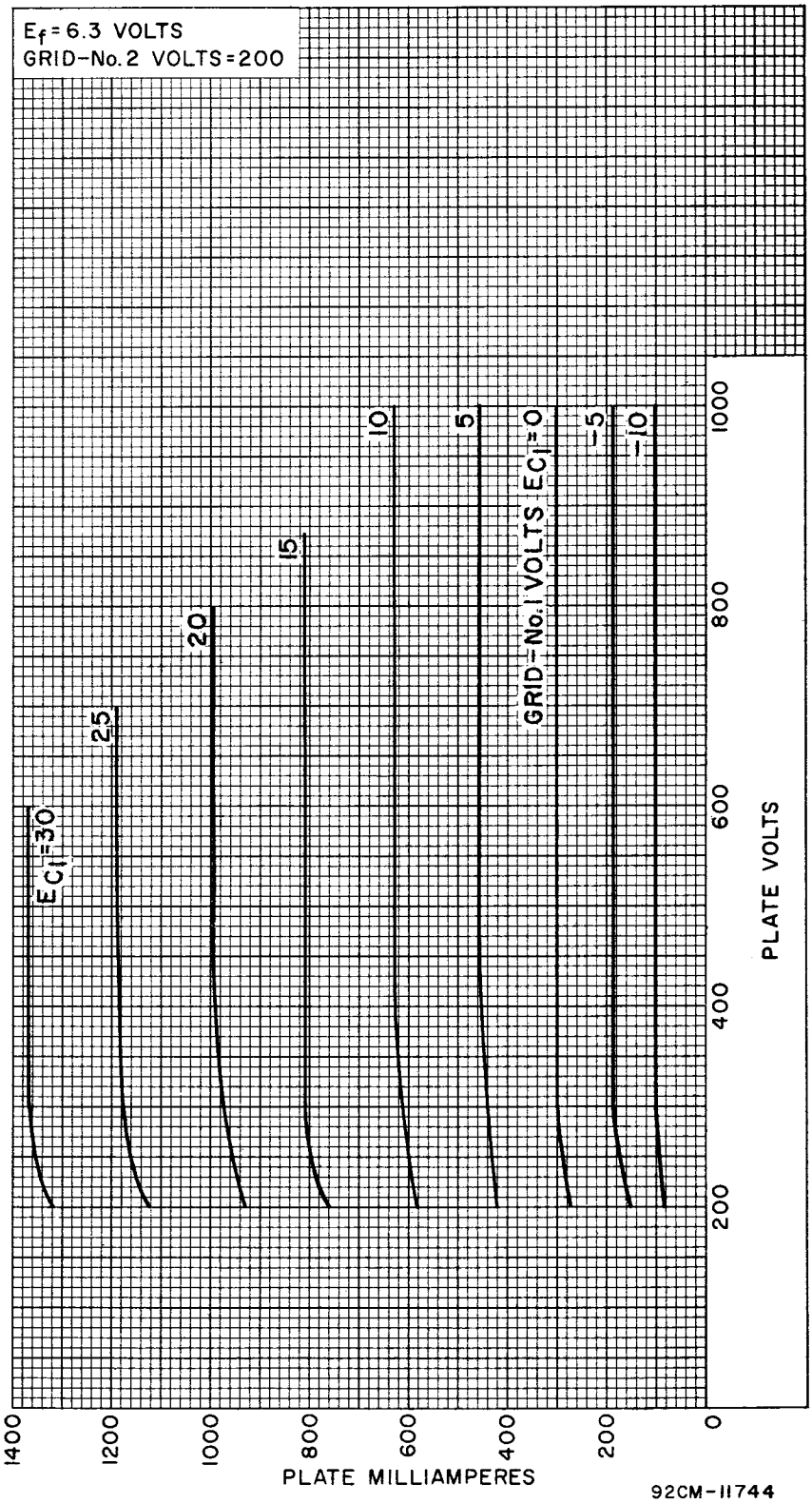
92CS-14834

TUNING CHARACTERISTICS

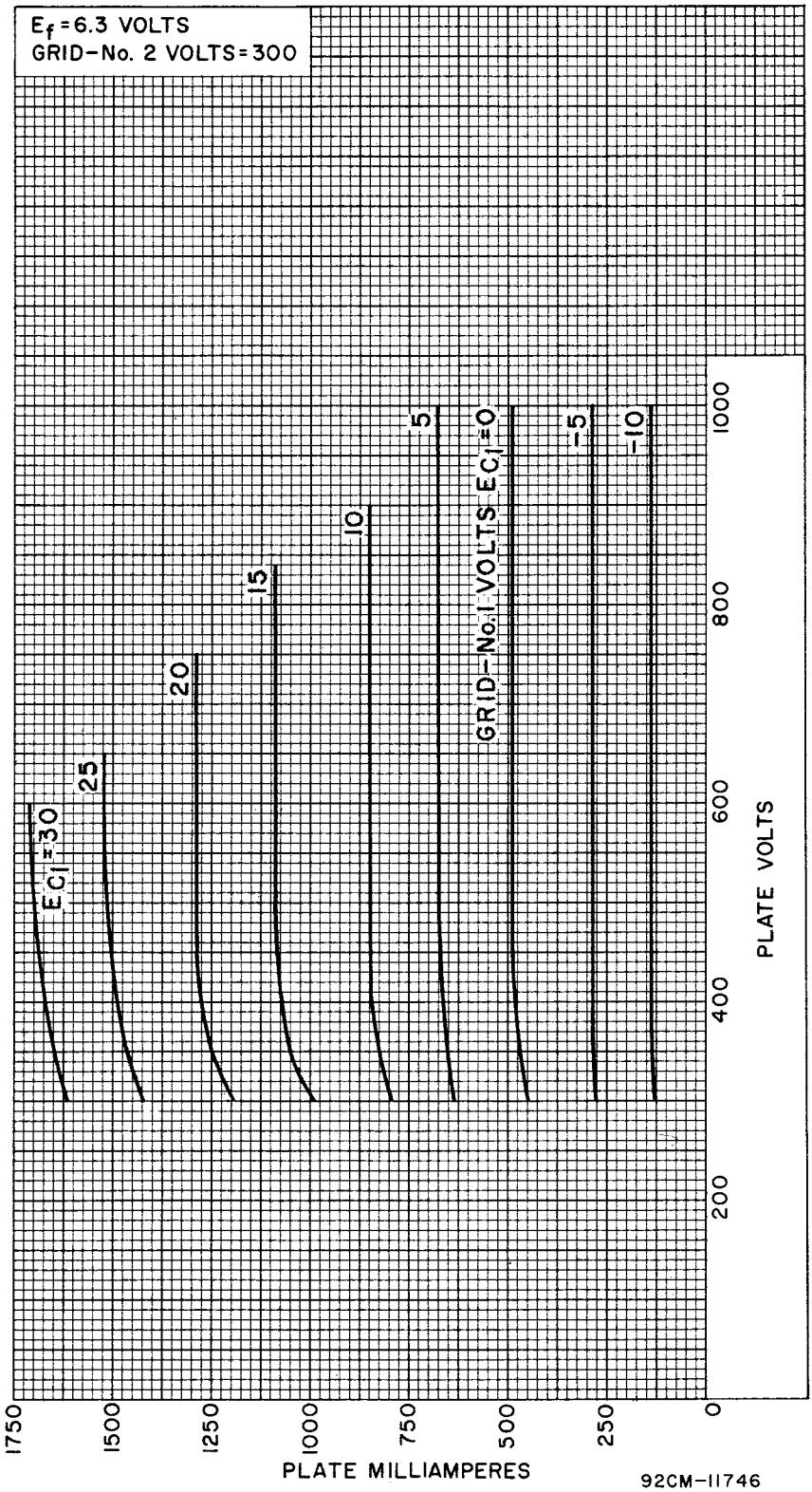


92CS-14835

TYPICAL PLATE CHARACTERISTICS

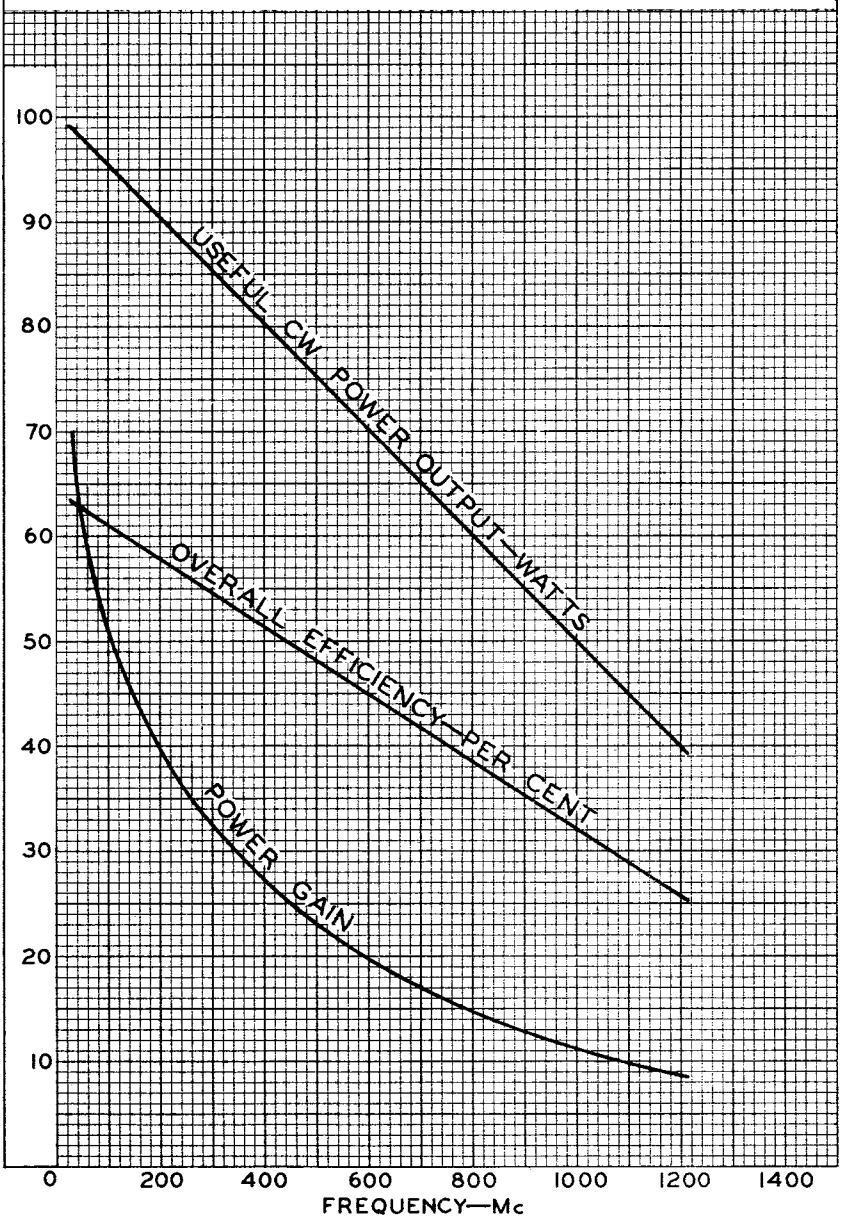


TYPICAL PLATE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS
In Class C Telegraphy or Class C FM Telephony Amplifier Service

E_f = ADJUSTED TO SIMULATE NORMAL OPERATING CONDITIONS OF HEATER IN UHF SERVICE
PLATE VOLTS = 900
GRID-Nº 2 VOLTS = 300
PLATE AMPERES = 0.170
OVERALL EFFICIENCY = USEFUL POWER OUTPUT IN LOAD DIVIDED BY DC PLATE INPUT
POWER GAIN = USEFUL POWER OUTPUT IN LOAD DIVIDED BY DRIVER POWER OUTPUT



92CM-9221