

Beam Power Tube

CERAMIC-METAL SEALS
 "ONE-PIECE" ELECTRODE DESIGN
 FORCED-AIR COOLED
 COAXIAL-ELECTRODE STRUCTURE
 INTEGRAL RADIATOR
 180 WATTS CW INPUT UP TO 1215 Mc/s
 MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use at Frequencies up to 2000 Mc/s
 under Severe Shock and Vibration

ELECTRICAL

Heater

For Matrix-Type, Oxide-Coated, Unipotential Cathode:

Voltage (AC or DC) ^a	6.3 ± 10%	V
Current at heater volts = 6.3	3.2	A
Minimum heating time	60	s

Mu-Factor (Grid No.2 to Grid No.1) 18

Plate volts = 250, grid-No.2 volts = 250,
 and plate mA = 100 .

Direct Interelectrode Capacitances^b

Grid No.1 to plate	0.065 max	pF
Grid No.1 to cathode & heater	14	pF
Plate to cathode & heater	0.019 max	pF
Grid No.1 to grid No.2	19	pF
Grid No.2 to plate	4.5	pF
Grid No.2 to cathode & heater	1.3 max	pF

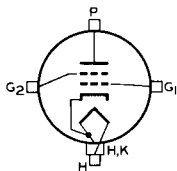
MECHANICAL

Operating Position	Any
Maximum Overall Length	1.930 in ←
Maximum Diameter (See <i>Dimensional Outline</i>)	1.265 in ←
Weight (Approx.)	2 oz
Radiator	Integral part of tube
Socket	

For frequencies up to about 400 Mc/s. Footnote c
 For use at higher frequencies . . . See *Mounting Arrangement*

Terminal Connections (See *Dimensional Outline*)

- G₁ - Grid-No.1-
 Terminal Contact Surface
 G₂ - Grid-No.2-
 Terminal Contact Surface
 H - Heater-
 Terminal Contact Surface
 H, K - Heater- & Cathode-
 Terminal Contact Surface
 P - Plate-
 Terminal Contact Surface



THERMAL

Plate, Grid No.2, Grid No.1, Cathode, and Heater Temperature	250 max	°C
Radiator-Core Temperature	250 max	°C

← Indicates a change.



Air Flow*

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 accompanying *Typical-Cooling-Requirements* curves.

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 may be met by use of the following blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent:

For 100% Plate Dissipation:

Blower Model No.	KS-2505	AS-2505	AXIMAX I	AXIMAX I
Motor Model No.	165AS	323JS	464YS	499JS
Phase (φ)	1	3	1	3
Frequency (c/s)	60	60	400	400
Voltage (V)	115	220	115	200

For 80% Plate Dissipation:

Blower Model No.	KS-202	AS-202	AXIMAX I	AXIMAX I
Motor Model No.	92AS	323JS	464YS	499JS
Phase (φ)	1	3	1	3
Frequency (c/s)	60	60	400	400
Voltage (V)	115	220	115	200

For 60% Plate Dissipation:

Blower Model No.	KS-1504	AS-1504	AXIMAX I	AXIMAX I
Motor Model No.	92AS	323JS	464YS	499JS
Phase (φ)	1	3	1	3
Frequency (c/s)	60	60	400	400
Voltage (V)	115	220	115	200

AF POWER AMPLIFIER & MODULATOR — CLASS AB₁^{d,y}

Maximum CCS^e Ratings, Absolute-Maximum Values

DC Plate Voltage	1000	V
DC Grid-No.2 (Screen-Grid) Voltage	300	V
Max.-Signal DC Plate Current ^f	180	mA
Max.-Signal Plate Input ^f	180	W
Max.-Signal Grid-No.2 Input ^f	4.5	W
Plate Dissipation ^f	115	W

Typical CCS Operation

Values are for 2 tubes

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage ^g	300	300	V
DC Grid-No.1 (Control-grid) Voltage	-15	-15	V
From fixed-bias source			
Peak AF Grid-No.1-to-Grid-No.1 Voltage ^h	30	30	V



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.	4330	7000	Ω
(Plate to plate)			
Max.-Signal Driving Power (Approx.)	0	0	W
Max.-Signal Power Output (Approx.)	50	80	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance

Under any condition:^j

For fixed-bias operation	30000	Ω
For cathode-bias operation	Not recommended	

AF POWER AMPLIFIER & MODULATOR — CLASS AB₂^{k, y}

Maximum CCS^e Ratings, Absolute-Maximum Values

DC Plate Voltage	1000	V
DC Grid-No.2 (Screen-Grid) Voltage	300	V
Max.-Signal DC Plate Current ^f	180	mA
Max.-Signal DC Grid-No.1 (Control-Grid) Current ^f	30	mA
Max.-Signal Plate Input ^f	180	W
Max.-Signal Grid-No.2 Input ^f	4.5	W
Plate Dissipation ^f	115	W

Typical CCS Operation

Values are for 2 tubes

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage ^g	300	300	V
DC Grid-No.1 Voltage	-15	-15	V
From fixed-bias source			
Peak AF Grid-No.1-to-Grid-No.1 Voltage	46	46	V
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.	2450	3960	Ω
(Plate to plate)			
Max.-Signal Driving Power (Approx.) ^m	0.3	0.3	W
Max.-Signal Power Output (Approx.)	85	140	W

LINEAR RF POWER AMPLIFIER — CLASS AB₁^y

SINGLE-SIDEBAND SUPPRESSED-CARRIER SERVICE

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

Maximum CCS^e Ratings, Absolute-Maximum Values

<i>Up to 1215 Mc/s</i>			
DC Plate Voltage	1000	V	
DC Grid-No.2 (Screen-Grid) Voltage	300	V	
Max.-Signal DC Plate Current	-100	mA	
DC Plate Current at Peak of Envelope	250 ⁿ	mA	



Up to 1215 Mc/s

Max.-Signal DC Grid-No.1 (Control-Grid) Current	30	mA
Max.-Signal Plate Input	180	W
Max.-Signal Grid-No.2 Input	4.5	W
Plate Dissipation	115	W

Typical CCS Class AB₁ "Single-Tone" Operation^P

Up to 60 Mc/s

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage ⁹	300	300	V
DC Grid-No.1 Voltage	-15	-15	V
Zero-Signal DC Plate Current	40	40	mA
Zero-Signal DC Grid-No.2 Current	0	0	mA
Effective RF Load Resistance	2165	3500	Ω
Max.-Signal DC Plate Current	100	100	mA
Max.-Signal DC Grid-No.2 Current	10	10	mA
Max.-Signal DC Grid-No.1 Current	0	0	mA
Max.-Signal Peak RF Grid-No.1 Voltage.	15	15	V
Max.-Signal Driving Power (Approx.).	0	0	W
Max.-Signal Power Output (Approx.)	25	40	W

Typical CCS Operation with "Two-Tone" Modulation

At 30 Mc/s

DC Plate Voltage	650	850	V
DC Grid-No.2 Voltage	300	300	V
DC Grid-No.1 Voltage	-18.5	-18.5	V
Zero-Signal DC Plate Current	40	40	mA
Effective RF Load Resistance	2200	3500	Ω
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	W
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	W
Peak envelope.	25	40	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance (Under any condition)		
For fixed bias	25000	Ω
For fixed-bias operation (Class AB ₁).	100000	Ω
For cathode-bias operation	Not recommended	

PLATE-MODULATED RF POWER AMPLIFIER — CLASS C TELEPHONY^Y

Carrier conditions per tube for use
with a maximum modulation factor of 1

Maximum CCS^e Ratings, Absolute-Maximum Values

Up to 1215 Mc/s

DC Plate Voltage	800	V
DC Grid-No.2 (Screen-Grid) Voltage	300	V



	Up to 1215 Mc/s		
DC Grid-No.1 (Control-Grid) Voltage. . .	-100		V
DC Plate Current	150		mA
DC Grid-No.1 Current	30		mA
Plate Input.	120		W
Grid-No.2 Input ^z	3		W
Plate Dissipation.	75		W

Typical CCS Operation

	At 400 Mc/s		
DC Plate Voltage	400	700	V
DC Grid-No.2 Voltage ^a	200	250	V
DC Grid-No.1 Voltage ^r	-20	-50	V
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.) ^s	2	3	W
Useful Power Output (Approx.)	16	45	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance	30000 ^t	Ω
Under any condition		

RF POWER AMPLIFIER & OSCILLATOR — CLASS C TELEGRAPHY^{u,y} and

RF POWER AMPLIFIER — CLASS C FM TELEPHONY^y

Maximum CCS^e Ratings, Absolute-Maximum Values

	Up to 1215 Mc/s		
DC Plate Voltage	1000		V
DC Grid-No.2 (Screen-Grid) Voltage	300		V
DC Grid-No.1 (Control-Grid) Voltage.	-100		V
DC Plate Current	180		mA
DC Grid-No.1 Current	30		mA
Plate Input.	180		W
Grid-No.2 Input.	4.5		W
Plate Dissipation.	115		W

Typical CCS Operation

	At 400 Mc/s		At 1215 Mc/s		
DC Plate Voltage	400	900	900		V
DC Grid-No.2 Voltage ^y	200	300	300		V
DC Grid-No.1 Voltage ^w	-35	-30	-22		V
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.) ^s	3	3	5		W
Useful Power Output (Approx.)	23	80	40		W

Maximum Circuit Values

Grid-No.1-Circuit Resistance	30000 ^r	Ω
Under any condition		

^a Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.



- b Measured with special shield adapter.
- c For socket to be used with the 7457, consult manufacturers such as J-V-M Microwave Company, 9300 West 47th Street, Brookfield, Illinois; E.F. Johnson Company, Waseca, Minnesota; and Collins Radio Company, 855 35th Street North, Cedar Rapids, Iowa.
- d Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
- e Continuous Commercial Service.
- f Averaged over any audio-frequency cycle of sine-wave form.
- g Preferably obtained from a fixed supply.
- h The driver stage should be capable of supplying the No.1 grids of the Class AB₁ stage with the specified driving voltage at low distortion.
- j The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer or impedance coupling devices are recommended.
- k Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
- m Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB₂ stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB₂ stage should be held to a low value. For this purpose, the use of transformer coupling is recommended.
- n 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. During short periods of Circuit Adjustment under "Single-Tone" conditions, the average plate current may be as high as 250 mA.
- p "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- q Obtained preferably from a separate source modulated along with the plate supply.
- r Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- s The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics and tube characteristics during life.
- t If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
- u Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
- v Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
- w Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.
- The following footnotes apply to the *RCA Transmitting Tube Operating Considerations* given at front of this section.
- x See *Cooling Considerations - Forced-Air Cooling*.
- y See *Classes of Service*.
- z See *Electrical Considerations-Grid-No.2 Voltage Supply*.

CHARACTERISTICS RANGE VALUES

Item No.		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



Item No.		Note	Min	Max	
	Grid No.2 to plate.	2	4	5.1	pF
	Grid No.2 cathode & heater . . .	2	-	1.30	pF
3.	Grid-No.1 Voltage.	1,3	-6	-18	V
4.	Reverse Grid-No.1 Current. . . .	1,3	-	-20	μ A
5.	Grid-No.2 Current.	1,3	-8	+2	mA
6.	Peak Emission.	1,4	-	400	peak V
7.	Inter electrode Leakage Resistance. .	5	1	-	M Ω
8.	Useful Power Output.	6	80	-	W

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

Note 2: Measured with special shield adapter.

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

Note 4: For conditions with heater volts = 6.3; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration (microseconds) = 2, pulse-repetition frequency (pps) = 60, and duty factor of 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 400 volts (peak).

Note 5: Under conditions with tube at 20^o to 30^oC 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 megohm, will be 1 megohm.

→ Note 6: In a single-tube, grid-driven coaxial-cavity class-C amplifier circuit at 400 Mc/s for conditions with 5.7 volts ac or dc on heater, dc plate volts = 1000, dc grid-No.2 volts = 300, dc plate mA = 180 maximum, dc grid-No.1 mA = 30 maximum, and driver power output (watts) = 3.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electronic Components and Devices to perform these tests may be obtained from RCA Commercial Engineering, Harrison, New Jersey, on request.

50 g, 11-Millisecond Shock Test

This test is performed on a sample lot of tubes from each production run 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 1, 3, 4, 7, and 8 under *Characteristics Range Values*.

500 g, Nominal 3/4-Millisecond Shock Test

This test is performed on sample lots 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 position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet the limits for items 1, 3, 4, 7, and 8 under *Characteristics Range Values*.

→ Indicates a change.



5-to-2000 c/s Variable Frequency and Cycling Vibration Test

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater volts = 6.3 ac or dc, dc plate supply volts = 300, dc grid-No.2 volts = 250, grid-No.1 voltage adjusted to give dc plate current of 10 mA., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

- a. 5-to-10 c/s with fixed double amplitude of 0.080 inch \pm 10%.
- b. 10-to-15 c/s at fixed acceleration of 0.41 g \pm 10%.
- c. 15-to-75 c/s with fixed double amplitude of 0.036 inch \pm 10%.
- d. 75-to-2000 c/s at fixed acceleration of 10 g \pm 10%.

During the above vibration test, tubes will not show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cycle range. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under *Characteristics Range Values*.

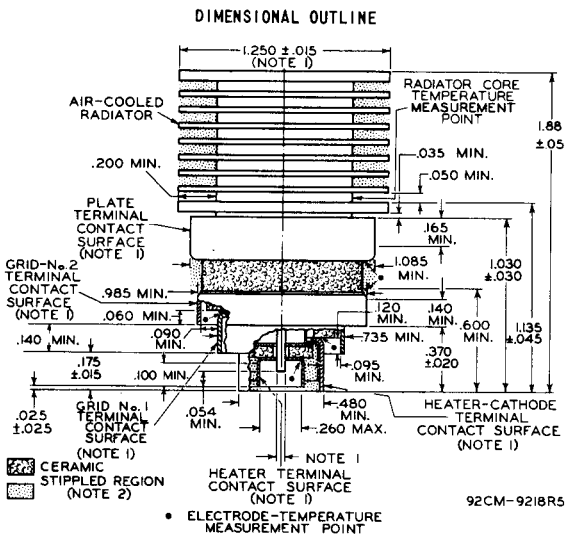
OPERATING CONSIDERATIONS

A suggested *mounting arrangement* for the 7457 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



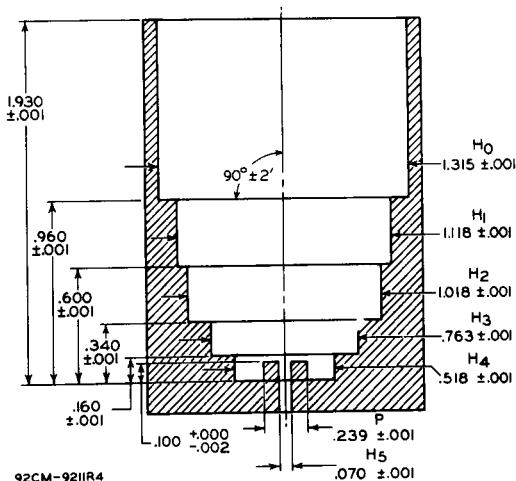


DIMENSIONS IN INCHES

Note 1: With the cylindrical surfaces of the plate terminal, grid-No. 2 terminal, grid-No. 1 terminal, heater-cathode terminal, and heater terminal clean, smooth, and free of burrs, the tube will enter a gauge as shown in sketch G1. The tube is properly seated in the gauge when a 0.010 inch-thickness gauge 1/8 inch wide will not enter between the heater-cathode terminal and the bottom surface of H4. The gauge is provided with a slot to permit making measurement of seating of heater-cathode terminal on bottom of hole H4.

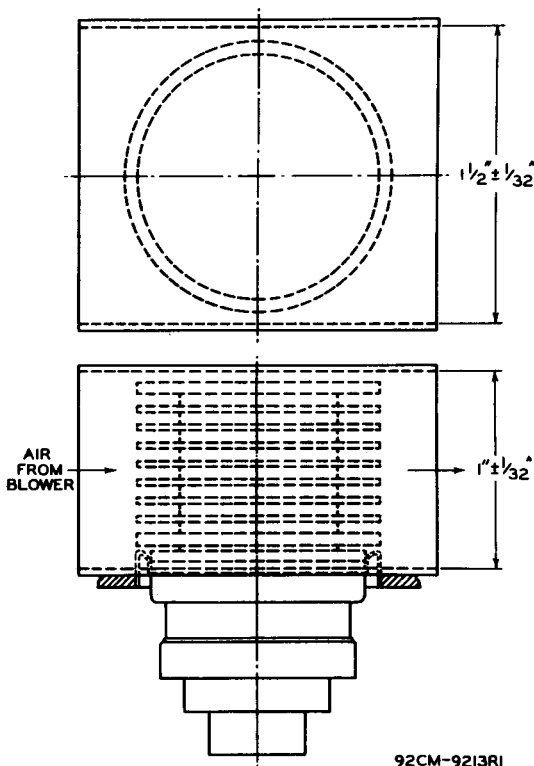
Note 2: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.



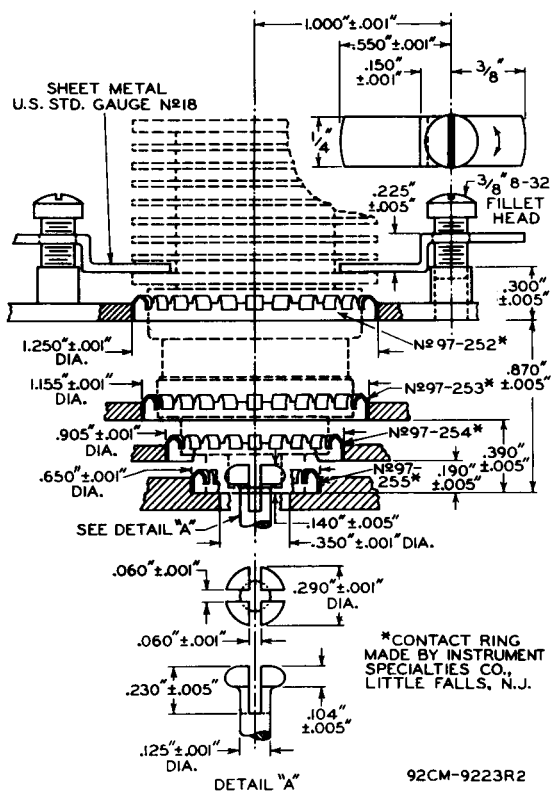
SKETCH G₁

The axes of the cylindrical holes H₀ through H₅ and the axes of post P are coincident within 0.001 inch.

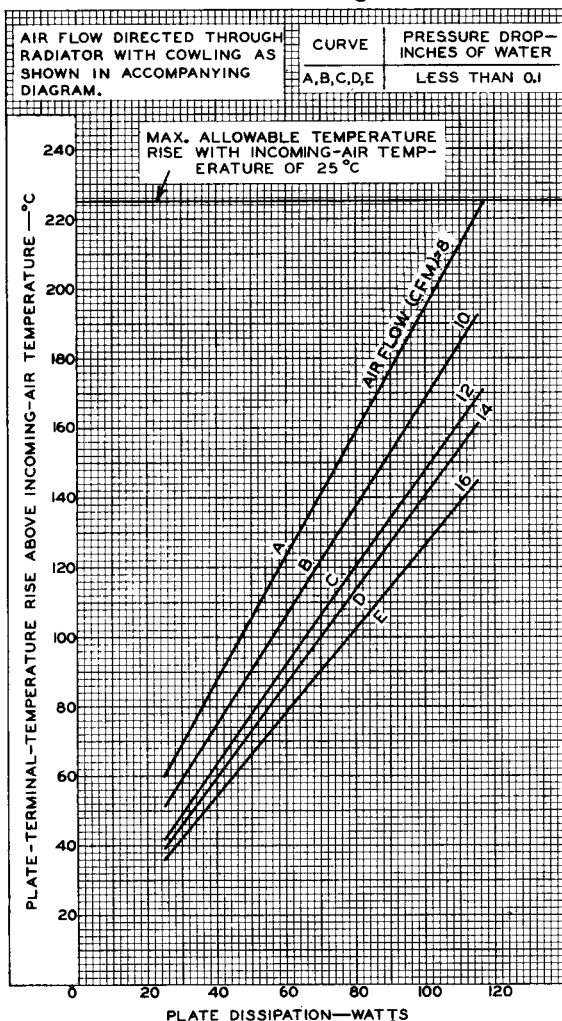
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RECOMMENDED COWLING
FOR DIRECTING AIR FLOW THROUGH RADIATOR

SUGGESTED MOUNTING ARRANGEMENT
& LAYOUT OF ASSOCIATED CONTACTS



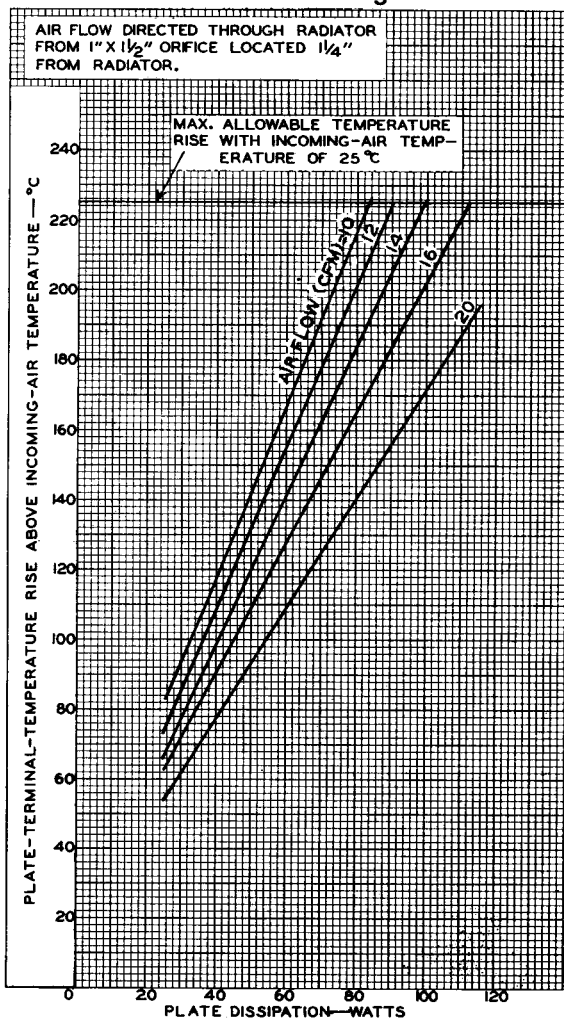
TYPICAL COOLING REQUIREMENTS With Cowling



92CM-9219RI



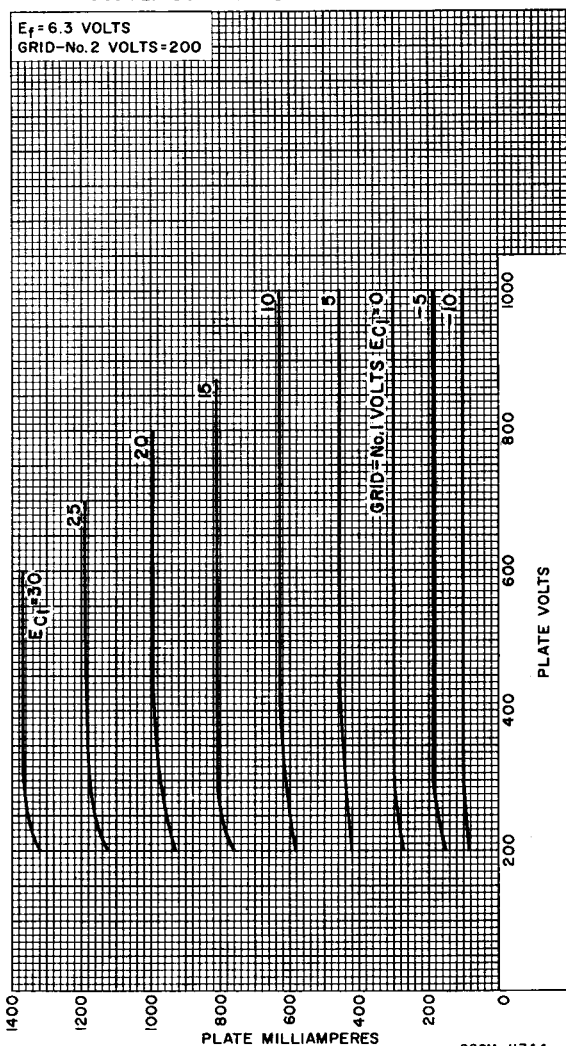
TYPICAL COOLING REQUIREMENTS Without Cowling



92CM-9220R1



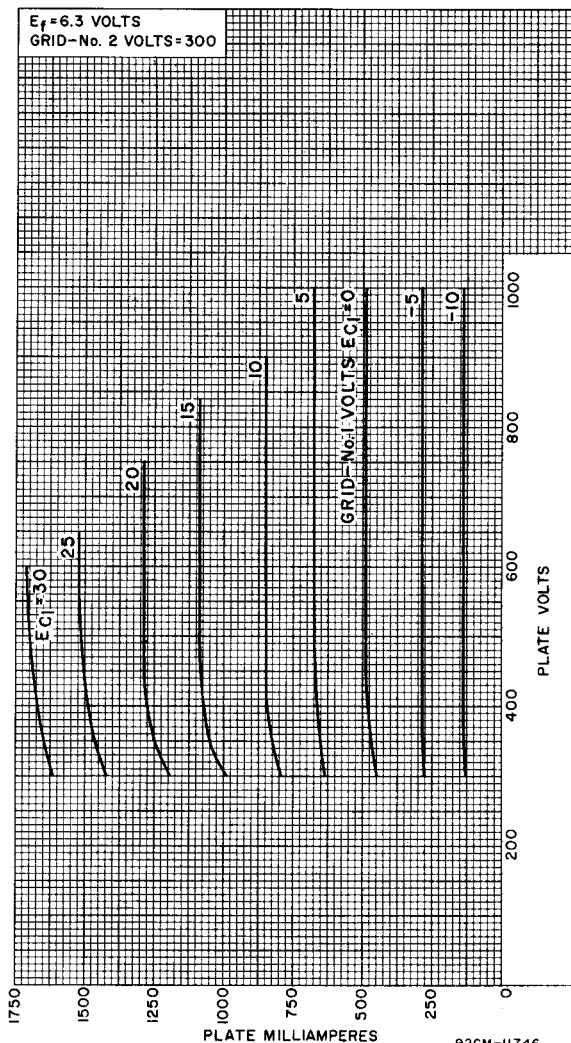
TYPICAL PLATE CHARACTERISTICS



92CM-11744



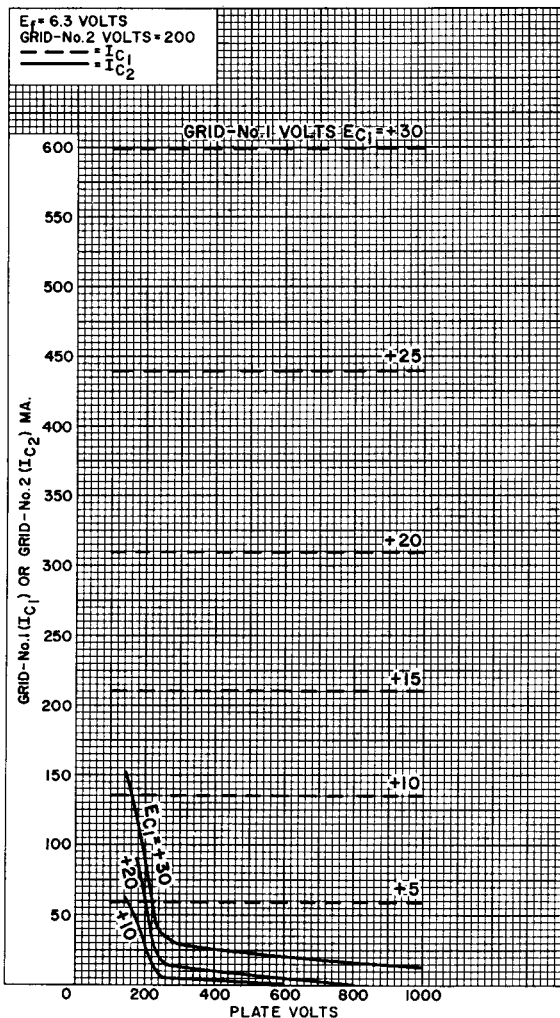
TYPICAL PLATE CHARACTERISTICS



92CM-11746



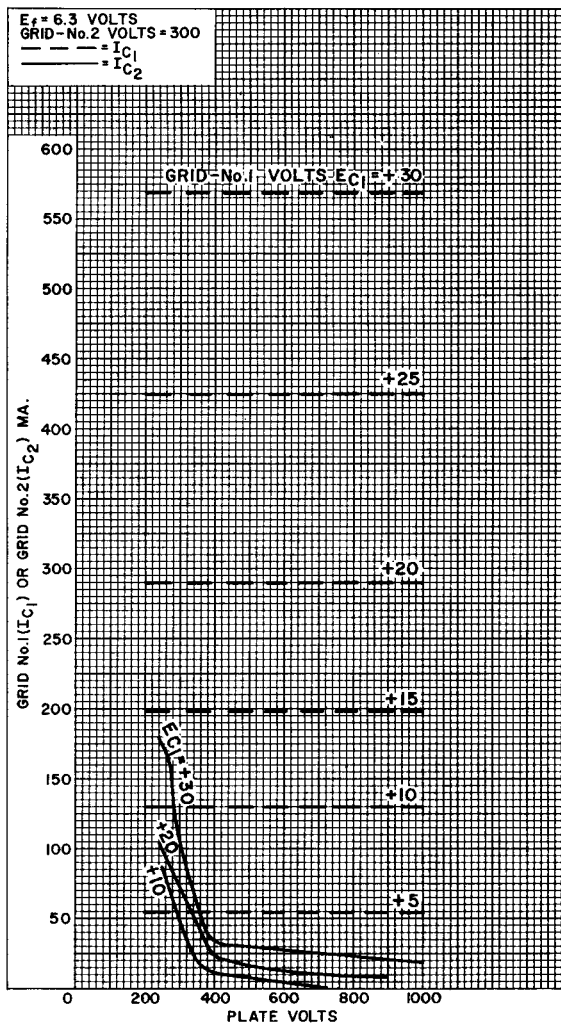
TYPICAL CHARACTERISTICS



92CM-11747



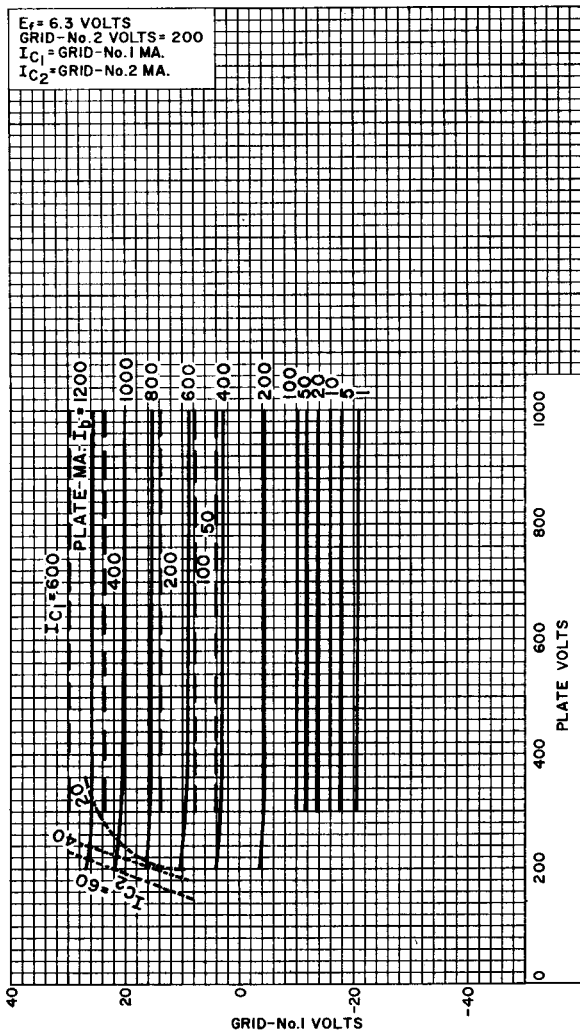
TYPICAL CHARACTERISTICS



92CM-11748



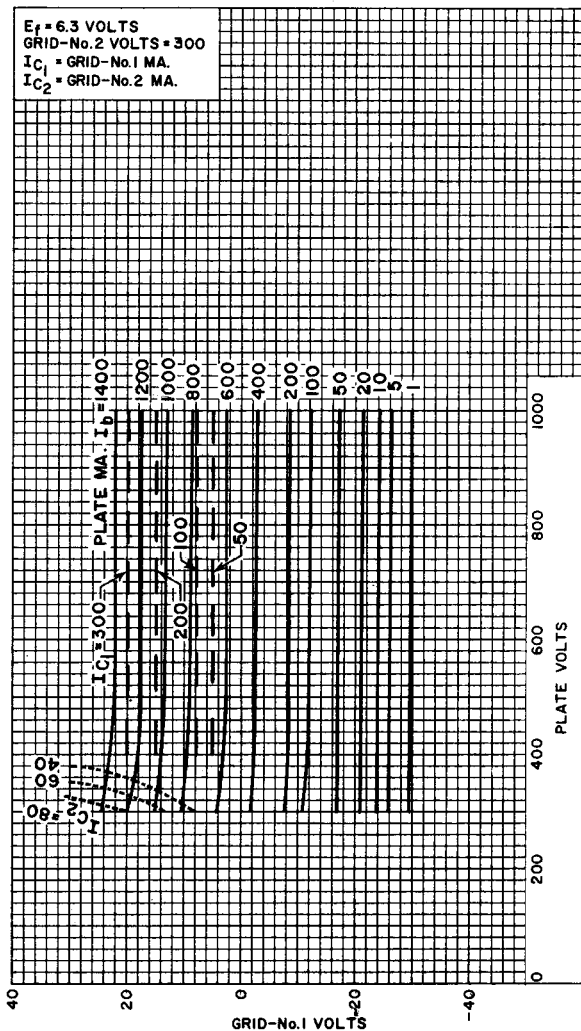
TYPICAL CONSTANT-CURRENT CHARACTERISTICS



92CM-11745

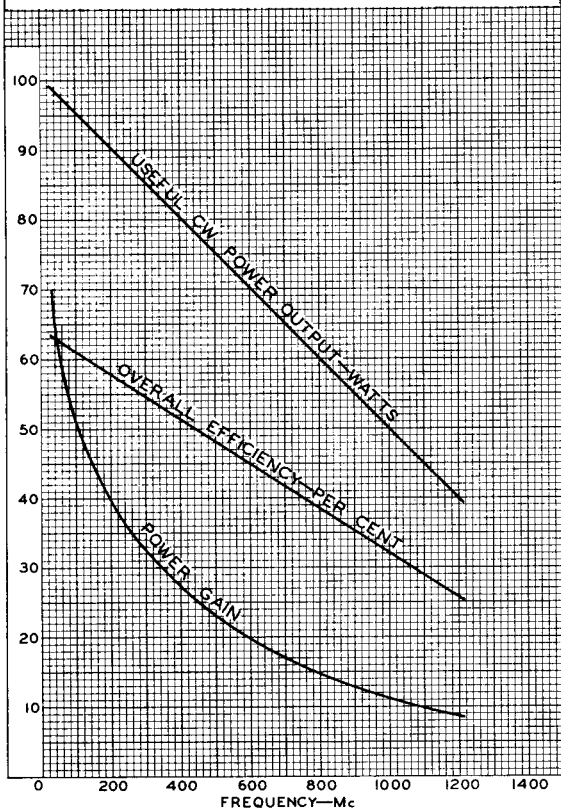


TYPICAL CONSTANT-CURRENT CHARACTERISTICS



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 - N*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



Beam Power Tube

Cermolox

Forced-Air Cooled

Ruggedized

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:⁹

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 AB₁ⁱ

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 AB₂ⁱ**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 Telephonyⁱ**

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

Maximum CCS Ratings, Absolute-Maximum Values

	<i>Up to 1215 MHz:</i>	
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:

	<i>At 400 MHz:</i>	
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
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**RF POWER AMPLIFIER & OSCILLATOR –
and Class C Telephonyⁱ**

RF POWER AMPLIFIER – Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values:

	<i>Up to 1215 MHz:</i>	
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,¹
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*.

50g, 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

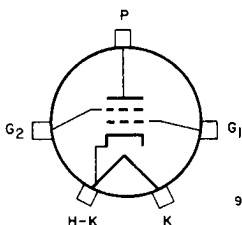
ohms. This tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

- a. 5-10 Hz with fixed double amplitude of 0.080 inch $\pm 10\%$.
- b. 10-15 Hz at fixed acceleration of $0.41\text{ g} \pm 10\%$.
- c. 15-75 Hz with fixed double amplitude of 0.036 inch $\pm 10\%$.
- d. 75-2000 Hz at fixed acceleration of $0\text{ g} \pm 10\%$.

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



92LS-2063

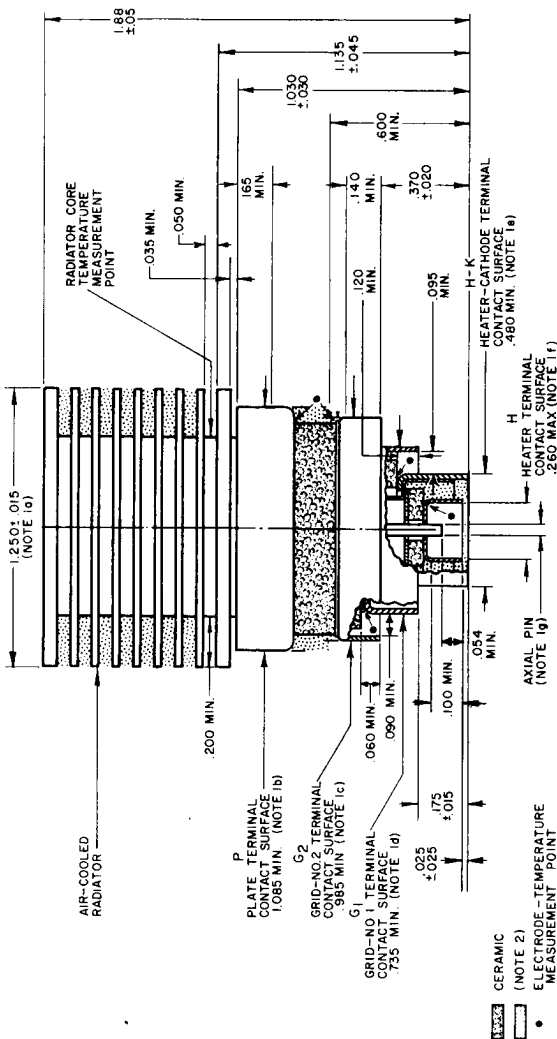
NOTES FOR DIMENSIONAL OUTLINE

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.

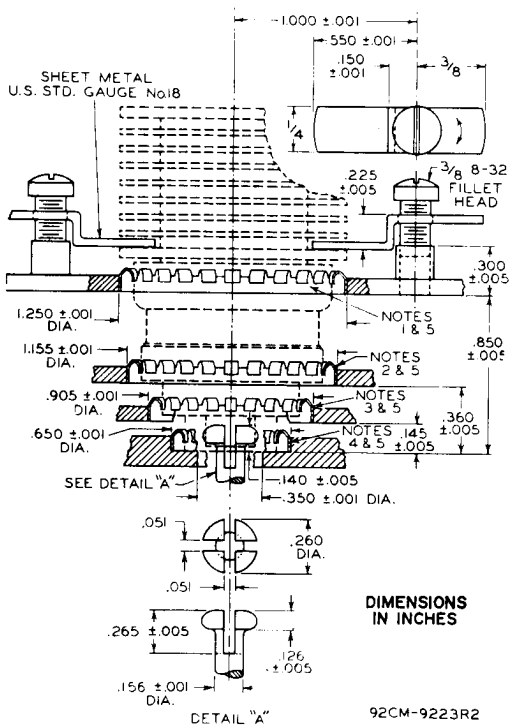
DIMENSIONAL OUTLINE



92LM-1591

DIMENSIONS IN INCHES

PREFERRED MOUNTING ARRANGEMENT



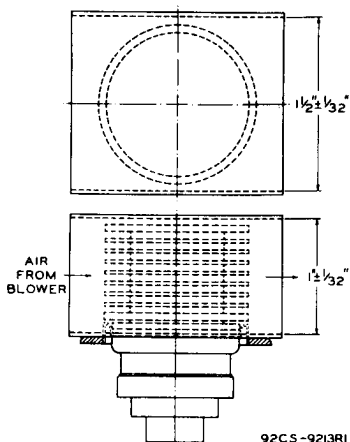
Note 1: Contact ring No.97-252 or finger stock No.97-380.

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

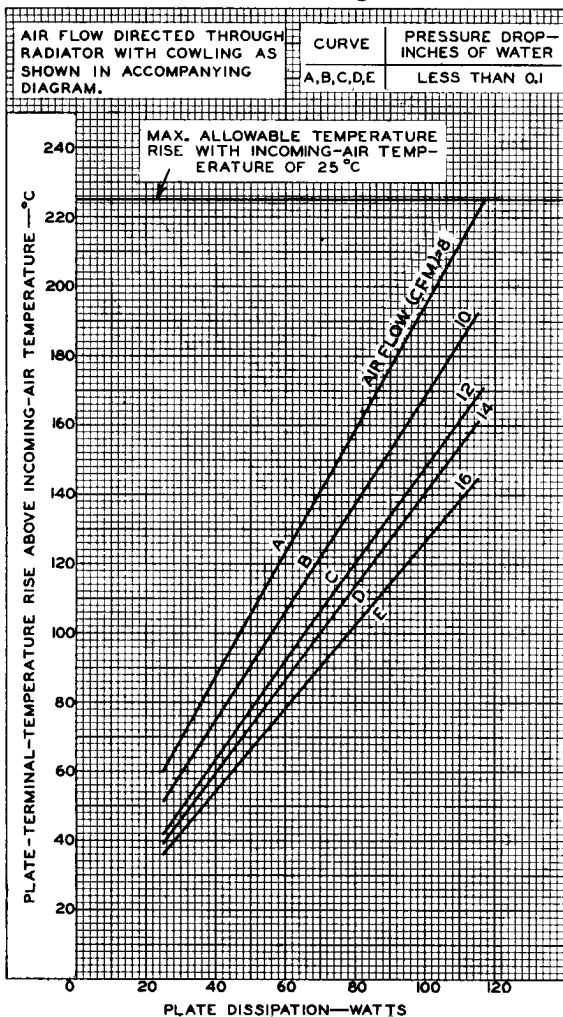
Note 3: Contact ring No.97-254 or finger stock No.97-380.

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



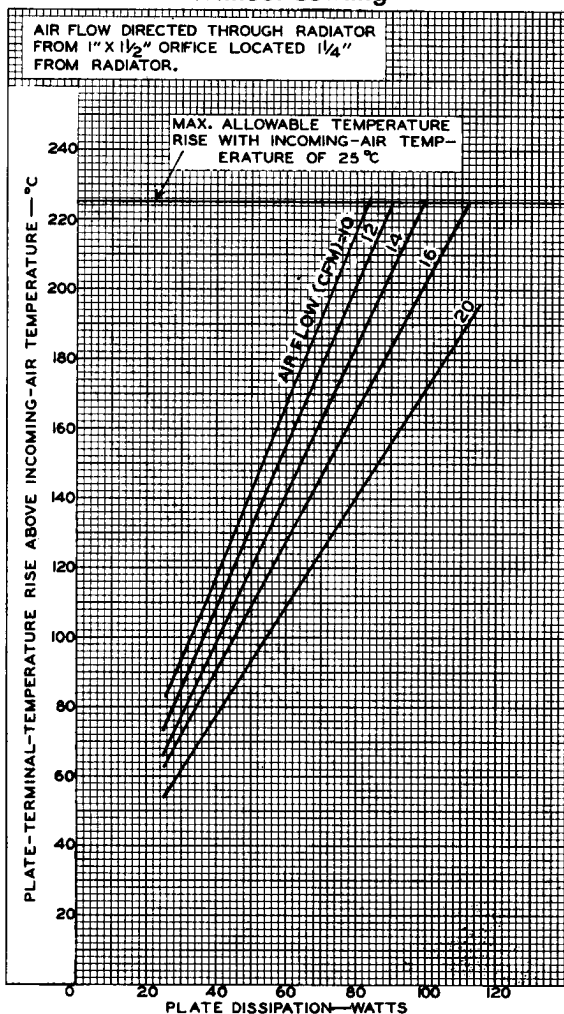
92CM-9219R1



RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 7
9-62

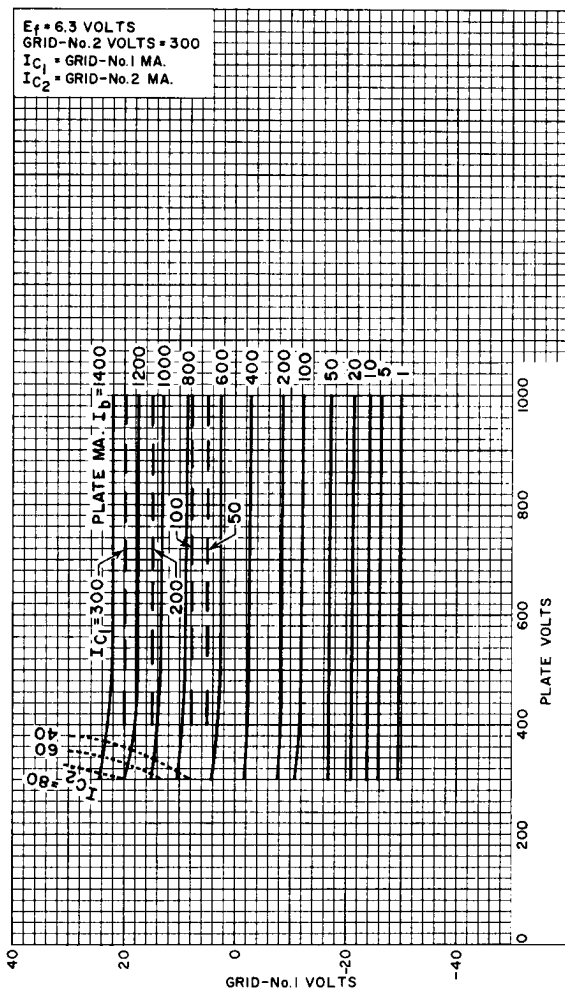
TYPICAL COOLING REQUIREMENTS Without Cowling



92CM-9220R1

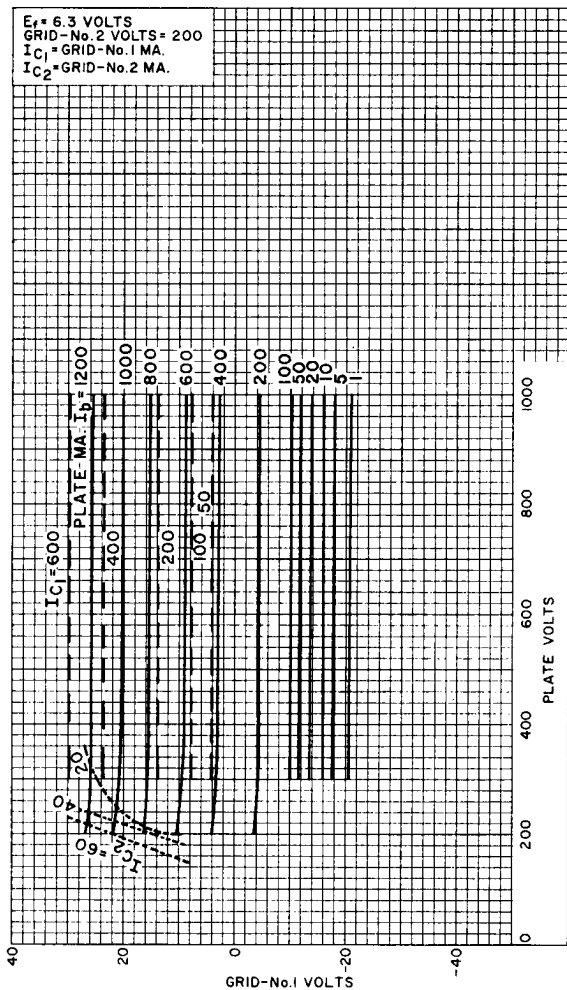


TYPICAL COOLING REQUIREMENTS



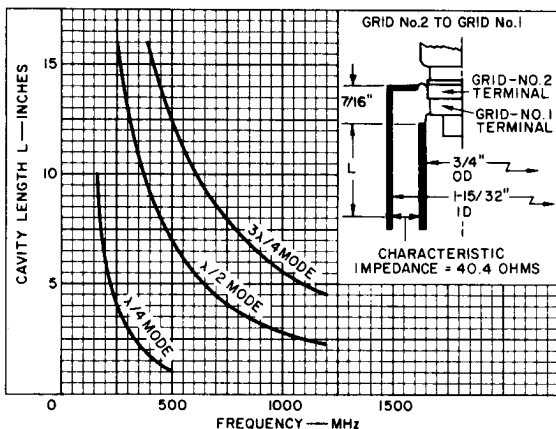
92CM-11749

TYPICAL COOLING REQUIREMENTS

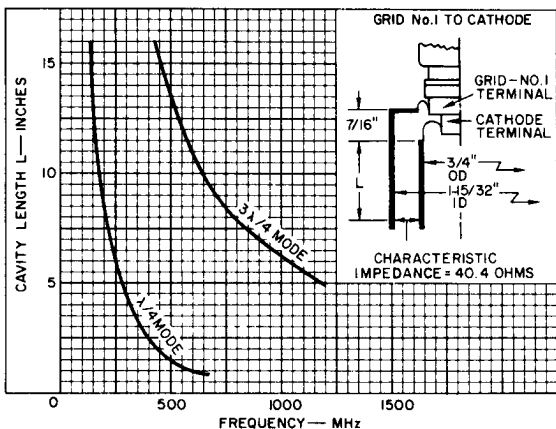


92CM-11745

TUNING CHARACTERISTICS

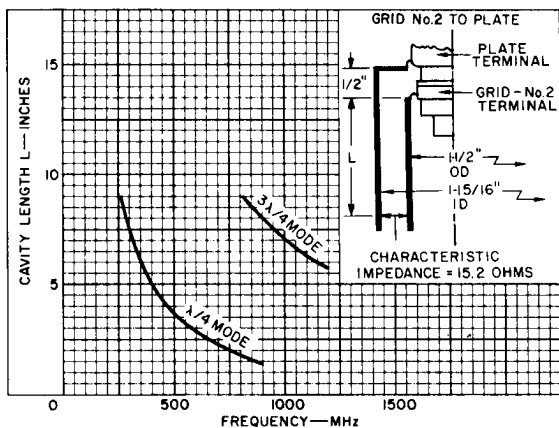


92CS-14833



92CS-14834

TUNING CHARACTERISTICS



92CS-14835