Beam Power Tube

CERMOLOX® **Full Input to 400 MHz**

20.0 Kilowatt Peak Sync. Output Through VHF-TV Band at 13 dB Gain

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type			
Voltage[a] (AC or DC)	9.5 10.0	typ. max.	V V
Current			
Typical value at 9.5 V	153		A
Maximum value for starting even momentarily	300		A
Cold resistance	0.01		Ω
Minimum heating time	15		s
Mu Factor[b] (Grid No.2 to Grid No.1)	12.5		
Direct Interelectrode Capacitances:			
Grid No.1 to plate[c]	0.4	max.	pF
Grid No.1 to filament	100		pF
Plate to filament[c,d]	0.15	max.	pF
Grid No.1 to grid No.2	85		pF
Grid No.2 to plate	20		pF
Grid No.2 to filament[d]	4.0	max.	pF

MECHANICAL

Operating Position	Vertical, either end up		
Overall Length	(180.3 mm)	7.100 max.	in
Greatest Diameter	(210.4 mm)	8.285 max.	in
Radiator	Integral part of tube		
Weight (Approx.)	(10.0 kg)	22	lb

THERMAL

Seal Temperature[e]	250	max.	°C
(Plate, grid No.2, grid No.1, cathode-filament, and filament)			
Plate Core Temperature[e]	250	max.	°C

RF Power Amplifier
Class B Television Service[f,p]

Synchronizing level conditions per tube unless otherwise specified.

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

DC Plate Voltage[g]	9,000 max.	V
DC Grid No.2 Voltage[h]	2,000 max.	V
DC Grid No.1 Voltage[i]	−600 max.	V
DC Plate Current	6.0 max.	A
Grid No.2 Input	450 max.	W
Grid No.1 Input	250 max.	W
Plate Dissipation	See Note m	

Calculated CCS Operation:

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.0 MHz[k]

DC Plate Voltage	6,580	V
DC Grid No.2 Voltage	1,000	V
DC Grid No.1 Voltage	−115	V
Zero Signal DC Plate Current	1.0	A
Effective RF Load Resistance	660	Ω
DC Plate Current:		
Synchronizing level	4.82	A
Blanking level	3.68	A
DC Grid No.2 Current:		
Synchronizing level	137	mA
Blanking level	33	mA
DC Grid No.1 Current:		
Synchronizing level	437	mA
Blanking level	131	mA
Input Circuit Efficiency (Approx.)	92.5	%
Driver Power Output:		
Synchronizing level	865	W
Blanking level	504	W
Output Circuit Efficiency (Approx.)	92.5	%
Useful Power Output:		
Synchronizing level	18.8	kW
Blanking level	10.6	kW

Linear RF Power Amplifier[f,p]
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 400 MHz		
DC Plate Voltage[g]	10,000	max.	V
DC Grid-No.2 Voltage[h]	2,000	max.	V
DC Plate Current at Peak of Envelope	6.0	max.	A
DC Grid-No.1 Current	500	max.	mA
Grid-No.2 Input	450	max.	W
Plate Dissipation	15	max.	kW

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance Under Any Conditions:

With fixed bias	5,000	max.	Ω
With fixed bias (In Class AB_1 operation).	25,000	max.	Ω
With cathode bias	Not recommended		
Grid-No.2 Circuit Impedance	See Note h		
Plate Circuit Impedance	See Note g		

Calculated Class AB_1 CCS Operation with "Two-Tone" Modulation

In a grid-drive circuit at 7 MHz

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage	−191	V
Zero-Signal DC Plate Current	1.0	A
Effective RF Load Resistance	978.5	Ω
DC Plate Current (At peak of envelope)	3.91	A
Average DC Plate Current	2.49	A
DC Grid-No.2 Current (At peak of envelope)	137	mA
Average DC Grid-No.2 Current	53	mA
Peak Envelope Drive Power	See Note n	
Output Circuit Efficiency (Approx.)	95	%
Useful Power Output (Approx.)		
Average	8,750	W
Peak envelope	17,500	W

Linear RF Power Amplifier[f,p]
Class AB or Class B Telephony

Carrier conditions for use with a maximum modulation factor of 1.0.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage[g]	10,000	max.	V
DC Grid-No.2 Voltage[h]	2,000	max.	V
DC Plate Current	3.0	max.	A
Grid-No.2 Input	300	max.	W
Plate Dissipation	See Note m		

Calculated CCS Operation

In a cathode drive circuit at 400 MHz.

DC Plate Voltage	8,000	V
DC Grid-No.2 Voltage	1,500	V
DC Grid-No.1 Voltage[r]	−235	V
DC Plate Current	2.47	A
DC Grid-No.1 Current	0	mA
DC Grid-No.2 Current	24	mA
Driver Power Output	500	W
Output Circuit Efficiency (Approx.)	80	%
Useful Power Output	5,000	W

a Measured at the tube terminals. The filament may be subjected to rf heating as the frequency of operation is increased. It is recommended that the filament power be regulated at the lowest value that will give stable performance. For those applications where hum is a critical consideration, dc filament operation or hum bucking circuits are recommended.

b For plate voltage = 2000 V, grid No.2 voltage = 1250 V, and plate current = 15 A.

c With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) in diameter. Shield is located in plane of the grid No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

d With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) in diameter. Shield is located in plane on the grid No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

e See Dimensional Outline for Temperature Measurement Points.

k The bandwidth of 6.0 MHz is calculated at the −1.0 dB power points of a double tuned output circuit using two times the tube capacity and a damping factor of $\sqrt{1.5}$.

m Permitted plate dissipation is a function of cooling. For specific ratings see Forced Air Cooling information.

n Driver power output represents circuit losses and is the actual power measured at the input to the grid No.1 circuit. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

p The maximum voltage and air flow rates must be modified to obtain adequate holdoff voltage and cooling at temperatures in excess of 35° C and altitudes above 7000 feet.

r Obtained from a fixed supply with an internal impedance of 695 ohms to provide necessary increase in bias at crest of modulating signal.

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

f See Section Class of Service.

g See Section Electrical Considerations - Power Supplies and Plate Voltage Supply.

h See Section Electrical Considerations - Grid-No.2 Voltage Supply.

j See Section Electrical Considerations - Grid-No.1 Voltage Supply.

DIMENSIONAL OUTLINE NOTES

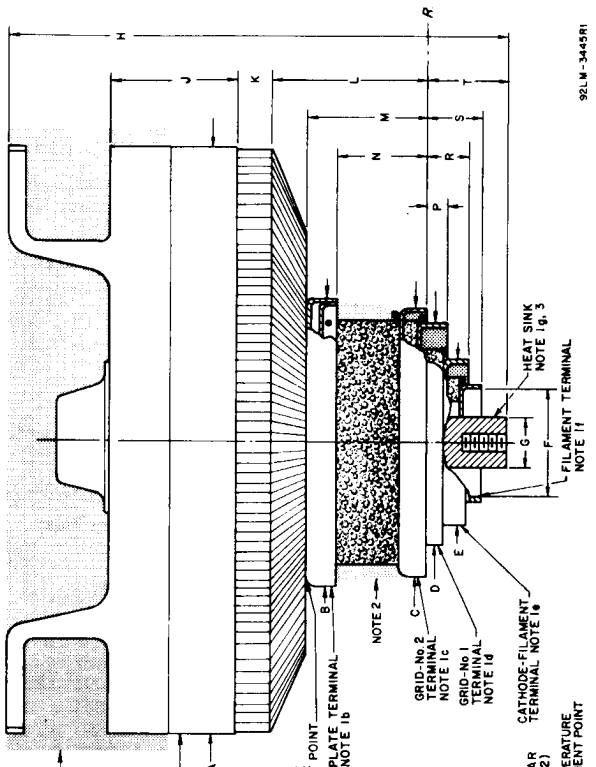
Note 1: The contact distance listed is the minimum, uniform, indicated length as measured from the edge of the terminal.

	Contact Distance inch (mm)
1a. Radiator	0.800 (20.32)
1b. Plate Terminal	0.265 (6.73)
1c. Grid No.2 Terminal	0.265 (6.73)
1d. Grid No.1 Terminal	0.265 (6.73)
1e. Cathode-Filament Terminal	0.250 (6.35)
1f. Filament Terminal	0.265 (6.73)
1g. Heat Sink (post)	0.450 (11.43)

Note 2: Keep all stippled regions clear. In general do not allow contacts to protrude into these annular regions. If special connectors are required which may intrude on these regions, contact RCA Power Tube Application Engineering, Lancaster, PA 17604.

Note 3: Tapped 1/4-20 NC x 0.5 in (12.7 mm) deep.

DIMENSIONAL OUTLINE



DIMENSIONAL OUTLINE

TABULATED DIMENSIONS

Dimensions	Value Inches	Value Millimeters
A Dia.	8.250 ± .035	(209.5 ± .9)
B Dia.	4.188 ± .020	(106.58 ± .51)
C Dia.	3.915 ± .015	(99.44 ± .38)
D Dia.	3.315 ± .015	(84.20 ± .38)
E Dia.	2.696 ± .015	(68.48 ± .38)
F Dia.	1.960 ± .015	(49.78 ± .38)
G Dia.	0.810 max.	(20.57 max.)
H	7.10 max.	(180.3 max.)
J	1.750 ± .030	(44.5 ± .8)
K	0.500 ref.	(12.7 ref.)
L	2.150 ± .050	(54.6 ± 1.3)
M	1.775 min.	(45.1 min.)
N	1.420 ± .030	(36.1 ± .8)
P	0.330 ± .030	(8.4 ± .8)
R	0.650 ± .038	(16.5 ± 1.0)
S	0.960 ± .050	(24.4 ± 1.3)
T	1.200 ref.	(30.5 ref.)

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 typical operation, the required air flow is as follows:

Plate Dissipation	Air Flow	Pressure Drop
Kilowatts	CFM	Inches H_2O
12.5	350	1.75
15.0	425	2.50
17.5	550	3.50

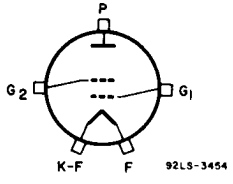
To Plate, Grid-No.2, Grid-No.1, Cathode-Filament, and Filament Terminals -- A sufficient quantity of air should be

allowed to flow past each of these terminals so that its temperature does not exceed the specified maximum value of 250° C.

During Standby Operation – Cooling air is required when only filament voltage is applied to the tube.

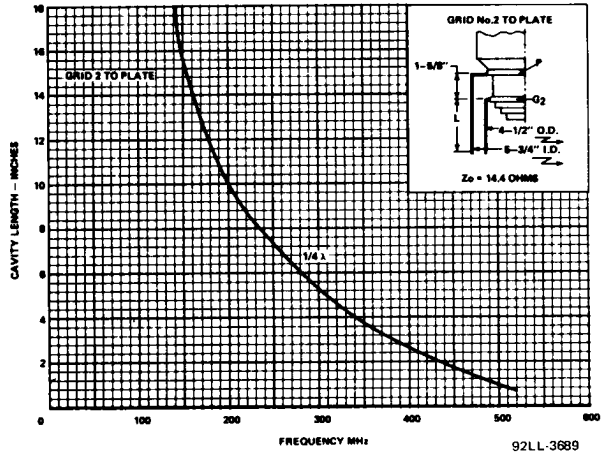
During Shutdown Operation – Air flow should continue for a few minutes after all electrode power is removed.

TERMINAL DIAGRAM

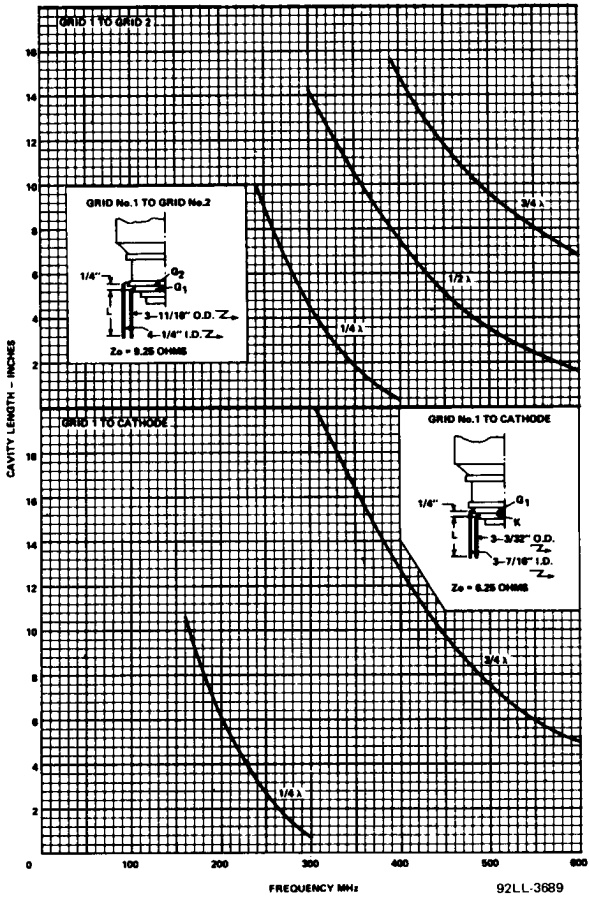


P – Plate Terminal
G_2 – Grid-No.2 Terminal
G_1 – Grid-No.1 Terminal
K-F – Cathode Filament Terminal
F – Filament Terminal

ELECTRODE CAVITY TUNING CHARACTERISTICS



ELECTRODE CAVITY TUNING CHARACTERISTICS (Cont'd.)



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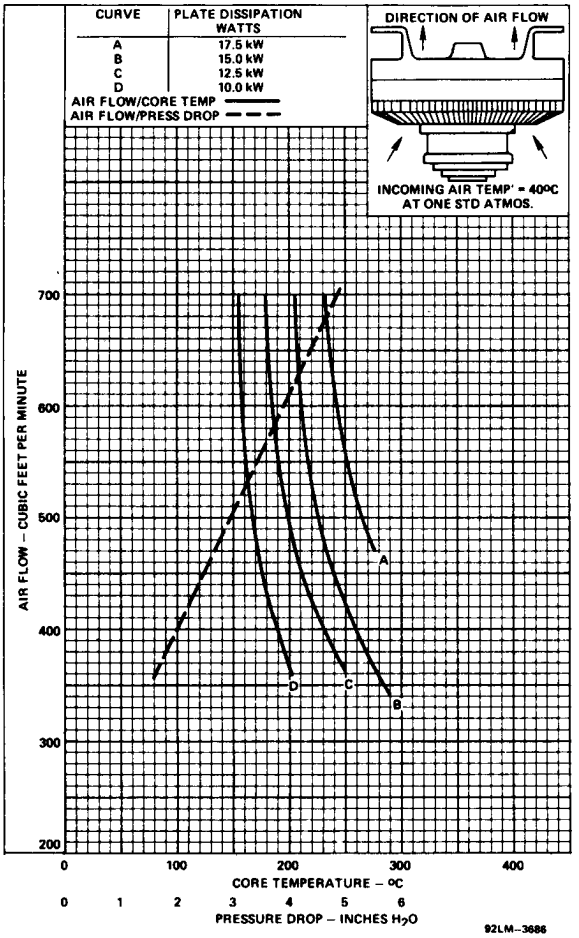
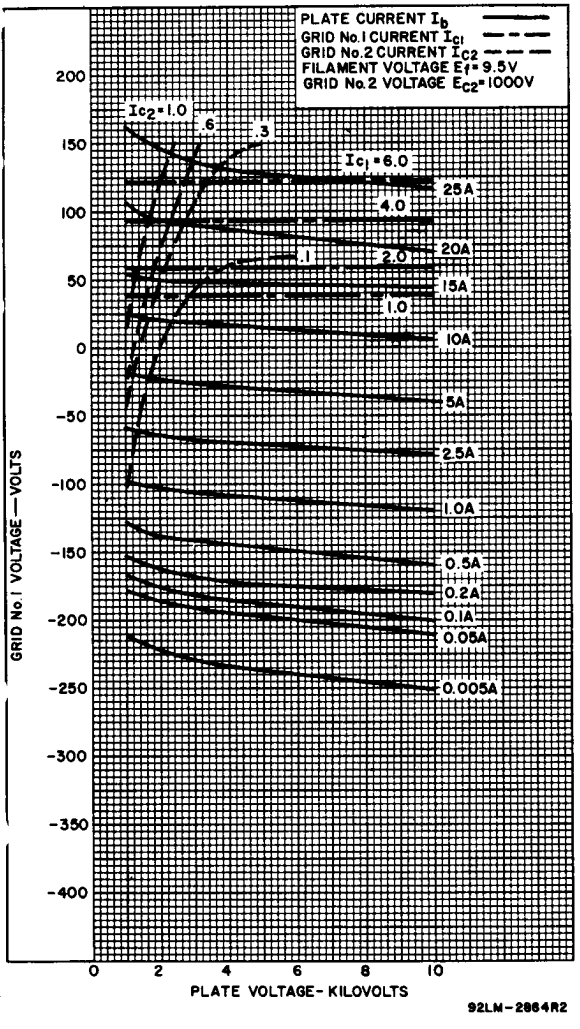
TYPICAL COOLING CHARACTERISTICS



TYPICAL CONSTANT CURRENT CHARACTERISTICS



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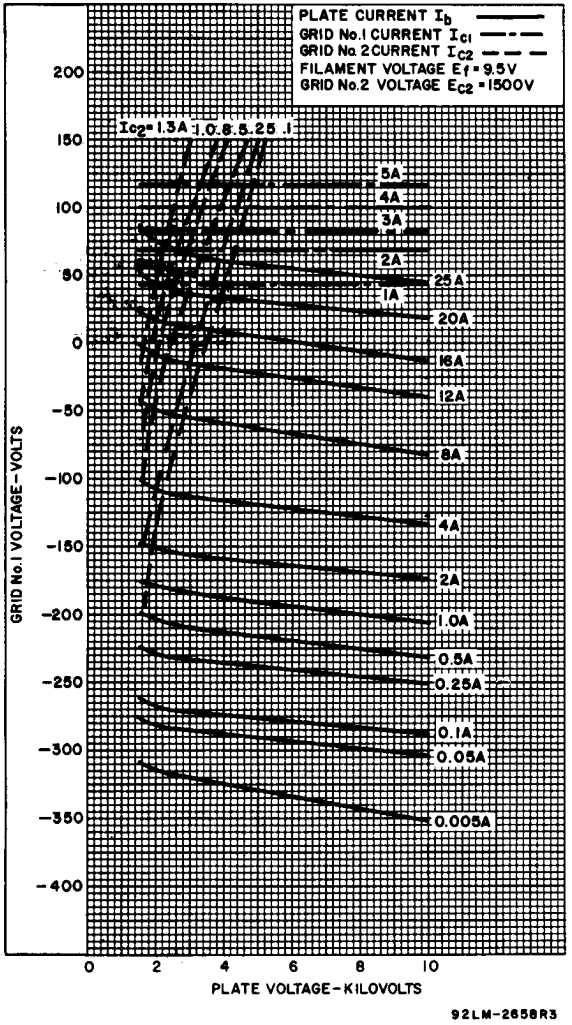

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