4600A

Beam Power Tube

FORCED-AIR COOLED
CERAMIC-METAL CONSTRUCTION "ONE-PIECE" ELECTRODE DESIGN
COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Voltage-Regulator Applications

GENERAL DATA

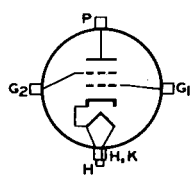
Electrical:

Heater, for Matrix-Type Oxide-Coated Unipotential Cathode:		
Voltage (AC or DC)	{ 5.5 typical { 6.0 max.	volts volts
Current at heater volts = 5.5	17.3	amp
Minimum heating time at heater volts = 5.5	5	minutes
Mu-Factor, Grid No.2 to Grid No.1, for plate volts = 2500, grid No.2 volts = 600, and plate ma. = 600.	17	

Mechanical:

Operating Position	Any
Overall Length	3.25"
Diameter	3.725" ± 0.035"
Radiator	Integral part of tube
Weight (Approx.)	2 lbs

Terminal Connections (See *Dimensional Outline*):



G_1 – Grid No.1
G_2 – Grid No.2
H – Heater
K – Cathode
P – Plate

Thermal:

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

Air Flow:

Through radiator—Adequate air flow to limit the plate-terminal temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid No.2, and grid No.1 voltages. Typical values of air flow directed through the radiator versus plate dissipation are shown in accompanying *Typical-Cooling-Requirements* curve. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

To grid No.2, grid No.1, cathode, and heater terminals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these

terminals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.

VOLTAGE REGULATOR

Maximum CCS[a] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	3500 max.	volts
DC GRID-No.2 VOLTAGE	1000 max.	volts
DC PLATE CURRENT	1 max.	amp
GRID-No.2 INPUT	50 max.	watts
PLATE DISSIPATION	1750 max.	watts

CHARACTERISTICS RANGE VALUES

	Min.	*Max.*	
1. Heater Current	16.3	18.2	amp
2. Direct Interelectrode Capacitances:			
Grid No.1 to cathode	37	46	μμf
Grid No.1 to grid No.2	46	62	μμf
Grid No.1 to plate[b]	–	0.17	μμf
Grid No.2 to cathode[c]	–	1.40	μμf
Grid No.2 to plate	14.6	17.8	μμf
Plate to cathode[b,c]	–	0.017	μμf
3. Grid-No.1 Voltage[d] (1)	5	30	volts
4. Grid-No.1 Voltage[e] (2)	5	30	volts
5. Grid-No.2 Current[d] (1)	-15	0	ma
6. Grid-No.2 Current[e] (2)	-30	0	ma
7. Pulse Emission Voltage[f]	–	650	volts

[a] Continuous Commercial Service.

[b] With external, flat, metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

[c] With external, flat, metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

[d] With dc plate voltage 3500 volts, dc grid-No.2 voltage of 400 volts, grid-No.1-circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.25 ampere.

[e] With dc plate voltage of 600 volts, dc grid-No.2 voltage of 400 volts, grid-No.1-circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.5 ampere.

[f] With grid No.1, grid No.2, and plate tied together; and a pulse-voltage source connected between plate and cathode. The half-sinusoid (Approx.) pulse is 2 microseconds between the two points on the pulse at which the instantaneous value is 50% of the peak value, pulse-repetition frequency is 60 cps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 90 amperes is obtained. After 2 minutes at this value, the voltage-pulse amplitude will not exceed 650 volts peak.

SPECIAL TEST

5-to-400 cps 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 voltage of 5.5 volts ac, dc plate supply

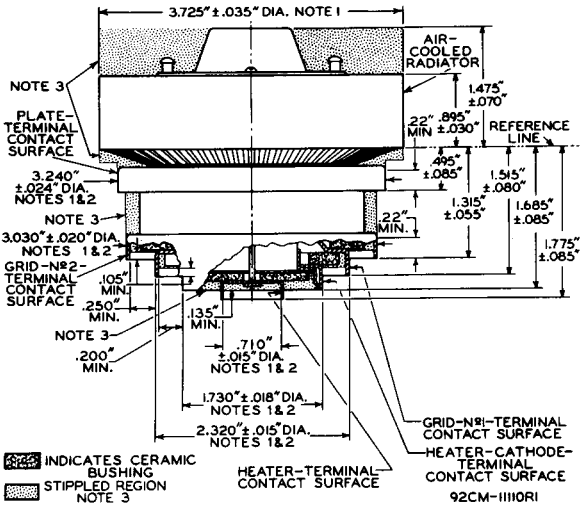
voltage of 450 volts, dc grid-No.2 supply voltage of 300 volts, and grid-No.1 supply voltage adjusted to give dc plate current of 10 ma. Plate load resistor = 2000 ohms, grid-No.2 resistor = 1000 ohms, and grid-No.1 resistor = 30 ohms. The tube is vibrated along each of three mutually perpendicular axes over a 6-minute sweep consisting of:

(a) 5 to 22 cps with a fixed double amplitude of 0.240 inch ±10%.
(b) 22 to 200 cps at a fixed acceleration of 10 g ± 10%.
(c) 200 to 400 cps at a fixed acceleration of 3 g ± 10%.

At the end of this test, the tubes are required to meet the limits of items 1,3,4,5,6, and 7 under *Characteristics Range Values.*

OPERATING CONSIDERATIONS

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. 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 cannot 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.

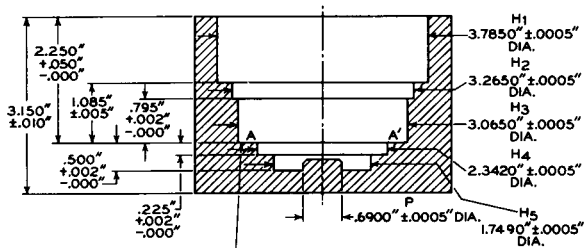


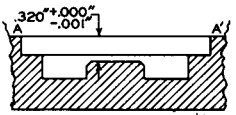
NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

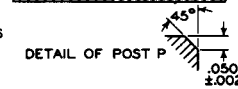
SKETCH G_1





* THIS SURFACE IS FLAT WITHIN .0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN .00025".

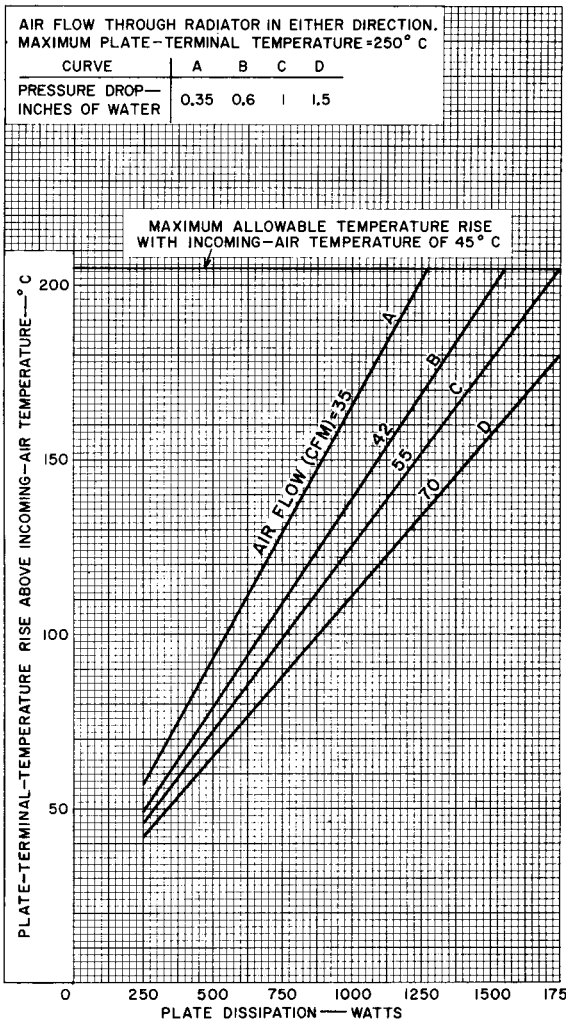
THE AXES OF THE CYLINDRICAL HOLES H_1 THROUGH H_5 AND THE AXIS OF POST P ARE COINCIDENT WITHIN .001".



DETAIL OF POST P

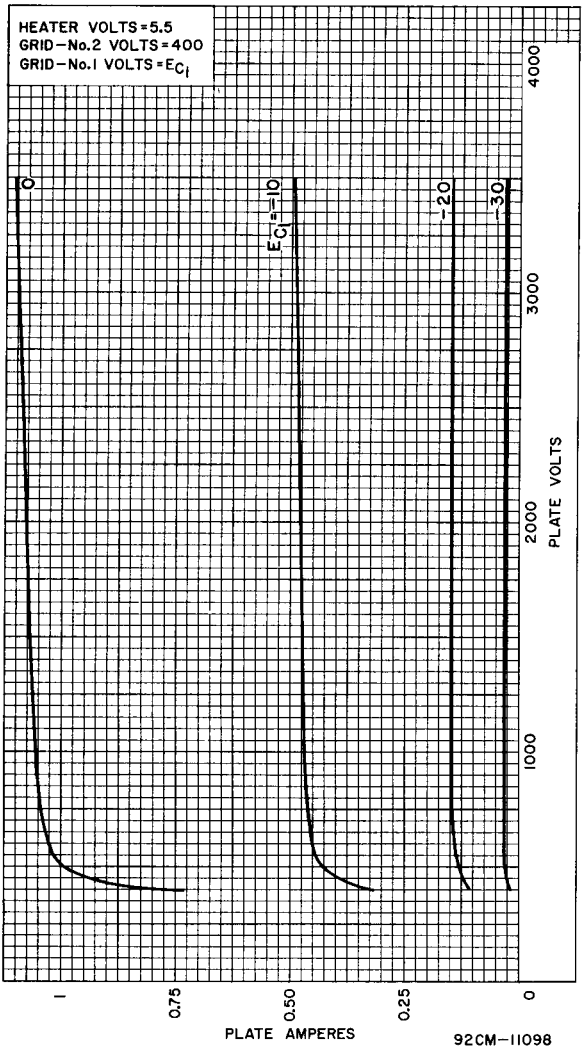
92CM-11109

TYPICAL COOLING REQUIREMENTS



92CM-11100

TYPICAL PLATE CHARACTERISTICS



TYPICAL CHARACTERISTICS