8437

Beam Power Tube

CERMOLOX®

FORCED-AIR COOLED
INTEGRAL RADIATOR
THORIATED-TUNGSTEN MESH FILAMENT

HIGH GAIN-BANDWIDTH PRODUCTS
10000 WATTS CW POWER OUTPUT
AT 400 Mc

For Compact Aircraft, Mobile, and Stationary Equipment Applications in the UHF Frequency Range

Electrical:

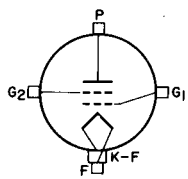
Filamentary Cathode, Thoriated-Tungsten Cylindrical-Mesh Type:		
Voltage (AC or DC)	8.5 typ. / 9.0 max.	volts / volts
Current:		
Typical value at 8.5 volts	88	amp
Maximum value for starting, even momentarily	300	amp
Minimum heating time	15	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 7000, grid-No.2 volts = 1350, and plate ma. = 500	30	
Direct Interelectrode Capacitances:		
Grid No.1 to plate[a]	0.4 max.	pf
Grid No.1 to filament	86	pf
Plate to filament[a]	0.07 max.	pf
Grid No.1 to grid No.2	88	pf
Grid No.2 to plate	20	pf
Grid No.2 to filament[a]	1.5 max.	pf

Mechanical:

Operating Position	Any
Maximum Overall Length	6.188"
Maximum Diameter (See *Dimensional Outline*)	6.170"
Weight (Approx.)	12 lbs.
Radiator	Integral part of tube

Terminal Connections (See *Dimensional Outline*):

G_1 - Grid-No.1-Terminal Contact Surface
G_2 - Grid-No.2-Terminal Contact Surface
F - Filament-Terminal Contact Surface



K-F - Cathode-Filament Terminal Contact Surface
P - Plate-Terminal Contact Surface

Thermal:

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

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. Typical values of air flow directed through the radiator are shown in accompanying *Typical-Cooling-Requirements* curve as a function of plate dissipation.

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 their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required to the Cathode-Filament and Filament Terminals 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.

At Sea Level — Cooling requirements as shown in accompanying *Typical-Cooling-Requirements* curve, 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.	AS-704	KS-704	-	PS-606
Motor Model No.	255JS	452AS	-	209JS
Phase (ϕ)	3	1	-	3
Frequency (cps)	60	60	-	400
Voltage (v)	208	115	-	115
For 80% Plate Dissipation:				
Blower Model No.	AS-601	KS-601	PS-4502	PS-4502
Motor Model No.	266JS	413AS	358AS	209JS
Phase (ϕ)	3	1	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	208	115	115	115
For 60% Plate Dissipation:				
Blower Model No.	AS-4506	KS-4506	PS-3503	NS-301
Motor Model No.	139JS	364AS	450AS	587JS
Phase (ϕ)	3	1	1	3
Frequency (cps)	60	60	400	400
Voltage (v)	208	115	115	115

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

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

For frequencies up to 500 Mc

DC Plate Voltage.	7000 max.	volts
DC Grid-No.2 Voltage.	1500 max.	volts

DC Grid-No.1 Voltage	−150 max.	volts
DC Plate Current	4 max.	amp
DC Grid-No.1 Current	1.2 max.	amp
Grid-No.1 Input[c]	150 max.	watts
Grid-No.2 Input[c]	300 max.	watts
Plate Dissipation	10000 max.	watts

Typical CCS Operation:

In Cathode-Drive Circuit at 400 Mc

DC Plate Voltage	6500	volts
DC Grid-No.2 Voltage[d]	1200	volts
DC Grid-No.1 Voltage[e]	−30	volts
DC Plate Current	3.5	amp
DC Grid-No.2 Current	0.05	amp
DC Grid-No.1 Current	0.53	amp
Driver Power Output[f] (Approx.)	600	watts
Output-Circuit Efficiency	78	%
Useful Power Output	10000	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	5000 max.	ohms
Grid-No.2-Circuit Impedance	[g]	
Plate-Circuit Impedance	[h]	

[a] See *Characteristics Range Values, Test No.2.*

[b] Continuous Commercial Service.

[c] Grid input represents the power dissipated in the grid electrode. The grid input is not necessarily the product of the dc grid voltage and the "metered" grid current. For example, see *Grid No.2* under *Operating Considerations.*

[d] Obtained from a fixed supply.

[e] Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[f] 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.

[g] See *Grid No.2* under *Operating Considerations.*

[h] See *Plate* under *Operating Considerations.*

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min.*	*Max.*	
1. Filament Current	1	84	92	amp
2. Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	–	0.4	pf
Grid No.1 to filament	–	78	94	pf
Plate to filament	2,3	–	0.07	pf
Grid No.1 to grid No.2	–	80	96	pf
Grid No.2 to plate	–	18	22	pf
Grid No.2 to filament	3	–	1.5	pf
3. Peak Grid-No.1 Voltage	1,4	–	125	volts

Note 1: With 8.5 ac volts on filament.

Note 2: With external flat metal shield 8" in diameter having a center hole 4" 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.

Note 3: With external flat metal shield 8" in diameter having a center hole 3-3/8" in diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1.

Note 4: With dc plate voltage of 1750 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 10 amperes.

OPERATING CONSIDERATIONS

Filament

The rated filament voltage of 8.5 volts should be applied for 15 seconds to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can then be conserved by adjusting to the lowest nominal filament supply voltage which will give the desired performance. Good regulation of the filament supply voltage about this value is, in general, economically advantageous from the view-point of tube life. The supply regulation should not exceed ± 5%. This recommendation is particularly applicable at the higher operating frequencies.

Temperature

The maximum plate core or terminal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. This paint is manufactured in the form of liquid or stick by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y.

Grid No.2

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary-emission phenomena. Because it is the net result of these component currents which is read on a meter in the grid-No.2 circuit, grid-No.2 dissipation can not be accurately determined. Operation similar to conditions given under *Typical Operation* in in the tabulated data section will minimize the possibility of exceeding maximum grid-No.2 input rating.

The grid-No.2 circuit must be capable of maintaining the proper grid-No.2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No.2-to-ground impedance that is low enough to prevent gradual build-up of grid-No.2 voltage and/or catastrophic build-up (runaway) under negative-current conditions, and a current-overload relay to protect the grid No.2 against positive or negative currents of the order of one-tenth the required plate current.

Plate

In beam power tubes with closely spaced electrodes, such as the 8437, extremely high voltage gradients occur even with moderate tube operating voltages. Any arc-over between elec-

trodes may be destructive. A series impedance in the plate lead is recommended. The resultant plate impedance giving a plate-voltage-supply regulation of no better than 10% is usually sufficient.

Standby Operation

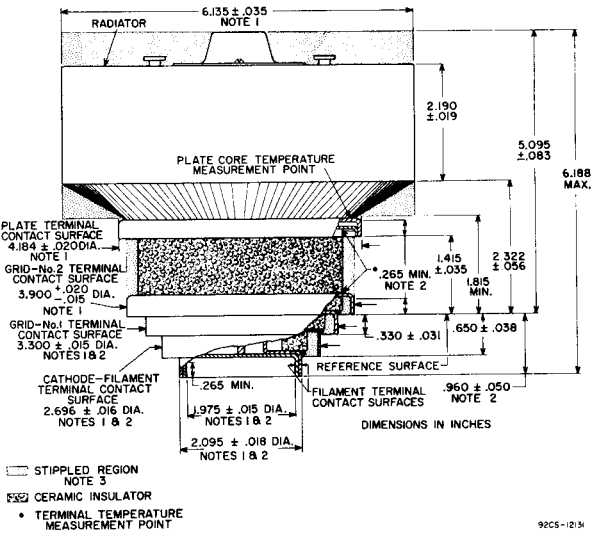
During long or frequent standby periods, the 8437 may be operated at decreased filament voltage to conserve life. It is recommended that the filament voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the filament voltage should be turned off.

Precautions

Protective devices should be used to protect the plate and grid No.2 against overload. Excessive plate-current flow and resultant over-heating of the tube can be prevented by connection of the common ground lead of the plate circuit in series with the coil of an instantaneous overload relay. This relay should be adjusted to remove the dc plate voltage and dc grid-No.2 voltage when the average value of plate current reaches a value slightly higher than normal plate current. A protective device in the grid-No.2 supply should remove the grid-No.2 voltage when the dc grid-No.2 current reaches a value slightly higher than normal.

The 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 can not possibly come in contact with any high-potential point in the electrical system. The interlock device should function to break the primary circuit of the high-voltage supplies when any gate or door of the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

8437

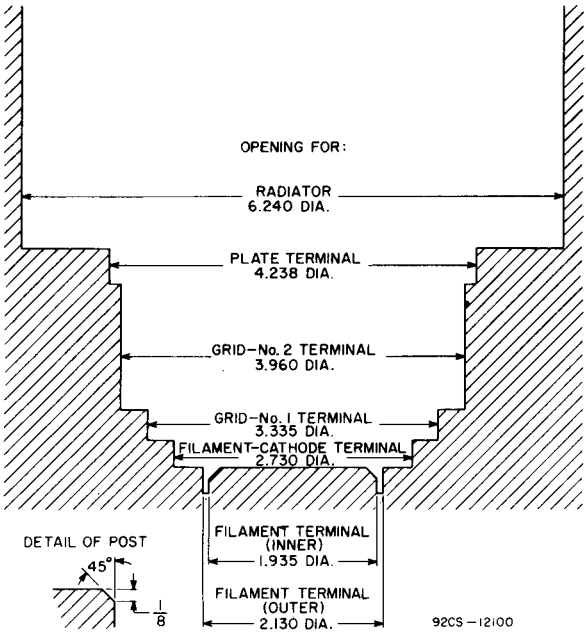


NOTE 1: SEE *SKETCH G1* FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8437 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE FILAMENT, CATHODE-FILAMENT, AND GRID-No.1 TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

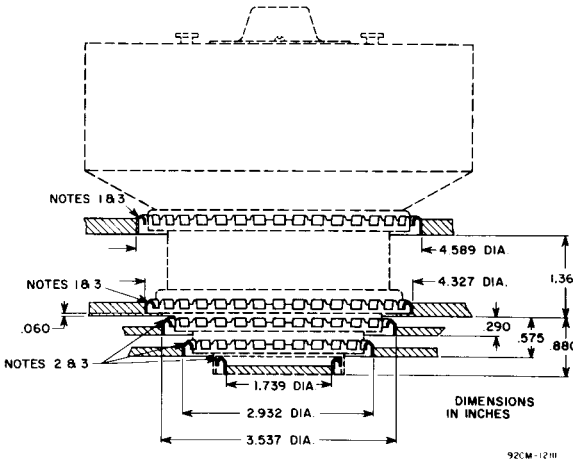
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS.

SKETCH G1



DIMENSIONS IN INCHES

PREFERRED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

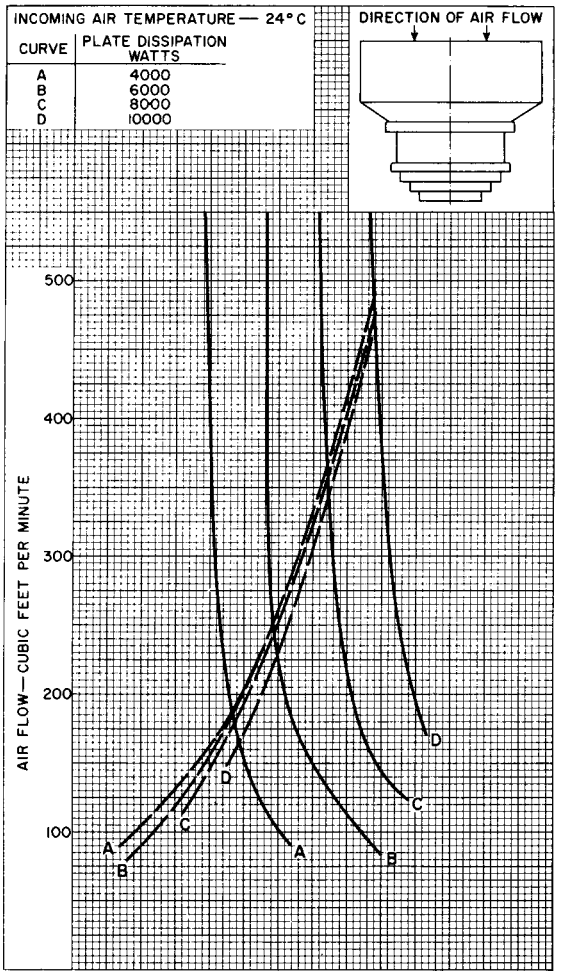


NOTE 1: FINGER STOCK No.97-310.

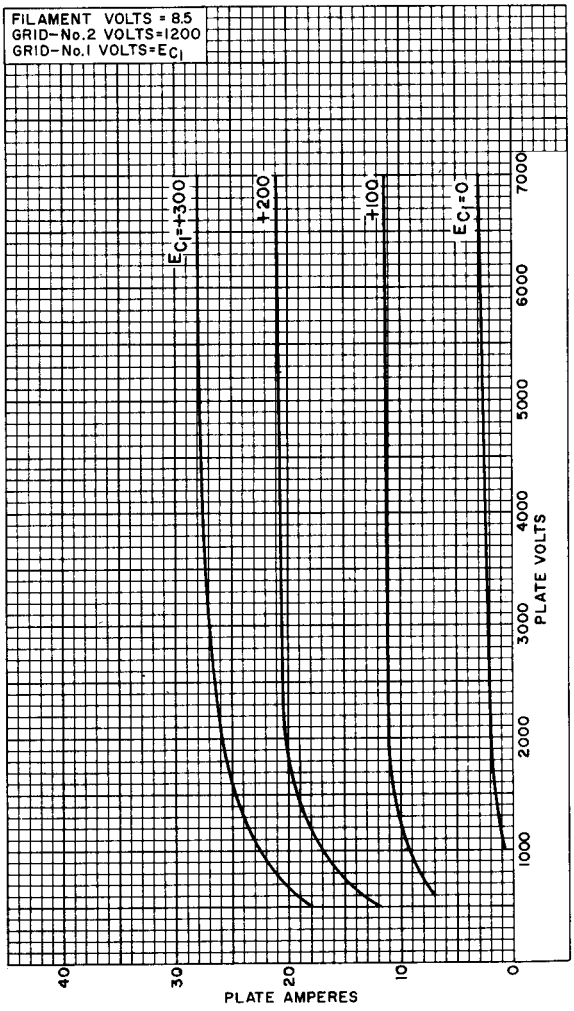
NOTE 2: FINGER STOCK No.97-139.

NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALTIES CO., LITTLE FALLS, N.J.

TYPICAL COOLING REQUIREMENTS



TYPICAL PLATE CHARACTERISTICS



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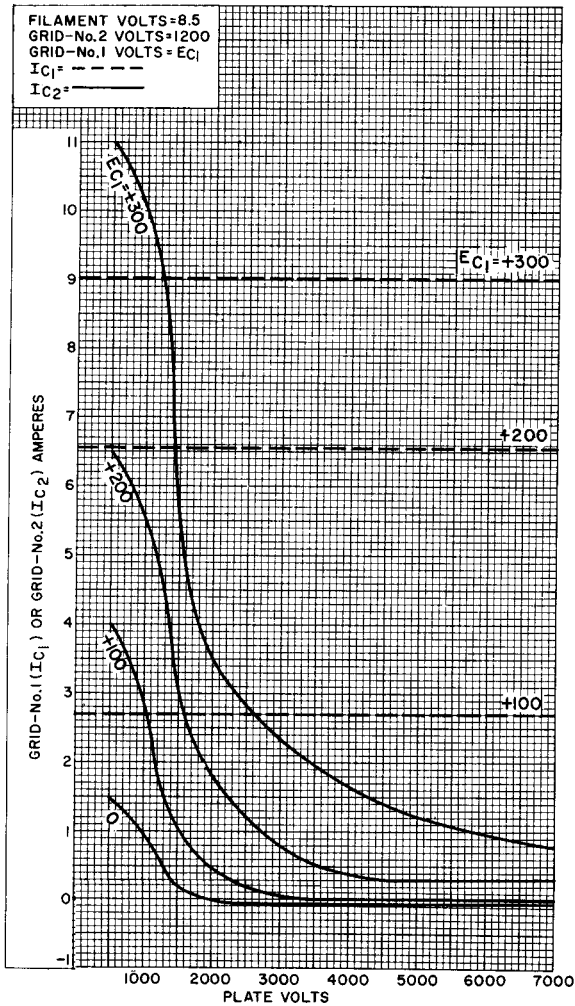
TYPICAL CHARACTERISTICS



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TYPICAL CONSTANT-CURRENT CHARACTERISTICS