



RADIAL BEAM POWER TETRODE

DESCRIPTION

The F-7213 is a metal and ceramic forced-air-cooled tetrode designed for use as a CW rf amplifier at frequencies up to 1215 MHz. Its uses include operation in compact aircraft, mobile and stationary equipment. It may be used as a linear rf power amplifier in single sideband suppressed carrier service, as a plate-modulated rf power amplifier in Class C telephony service, as an rf power amplifier and oscillator Class C telegraphy service and as an rf power amplifier in Class C FM telephony service. The unipotential cathode is of the oxide coated matrix type and the anode radiator assembly features integral brazed construction. Processing is especially rigorous and includes a double vacuum exhaust procedure that permits higher temperature degassing of internal elements.

Electrical Characteristics	Min.	Nom.	Max.
Heater Voltage (1)		5.5	6.0 Volts
Heater Current at 5.5 Volts	16.3		18.2 Amp
Heater Starting Current			55 Amp
Cathode Warm Up Time	5		Minutes
Grid Voltage (Ib=.020A Eb=3000V Ec2=1000V)			— 140 Volts
Screen Current (Ib=.6A Eb=2500V Ec2=500V)	— .028		+ .012 Amp
Amplification Factor (Grid-Screen) (Ib=.60A Eb=2500V Ec2=600V)	8		24
Useful Power Output (2)	1000		Watts
Direct Interelectrode Capacitances			
Grid to Plate (3)			17 pf
Grid to Cathode-Heater	37		46 pf
Plate to Cathode-Heater (3 & 4)			.017 pf
Grid to Screen	46		62 pf
Screen to Plate	14.6		17.8 pf
Screen to Cathode-Heater (4)			1.4 pf

Mechanical Characteristics

Mounting Position	Any
Type of Cooling	Forced Air
Maximum Plate Core and Seal Temperature (5)	250 C
Net Weight (approx.)	2 lbs.
Vibration: Low Frequency (6)	500 mv max.
High Frequency (7)	

Note 1. Under high frequency operating conditions, transit time effects will affect cathode temperature, the heater may be operated at the lowest voltage that will give stable performance.

Note 2. Cathode driven CW amplifier under the following conditions: 600 MHz, D-C Plate Voltage 2,500 Volts, D-C Screen Voltage 700 Volts and D-C Grid Voltage adjusted for 1.0 ampere plate current.

Note 3. Measured with an 8" OD, 3" ID flat metal shield located in the plane of and connected to the screen terminal.

Note 4. Measured with an 8" OD, 2 3/8" ID flat metal shield located in the plane of and connected to the grid terminal.

Note 5. A temperature sensitive lacquer is convenient for this measurement.

Note 6. Per MIL-E-1E test method 1031
Ebb=450V Ec2=300V Ec/Ib=.010A Rp=2000ohms

Note 7. Per MIL-E-1E test method 1031

F-7213

RADIO FREQUENCY LINEAR AMPLIFIER CLASS AB₁

Single-sideband suppressed-carrier service (Peak envelope conditions for a signal having a minimum peak to average power ratio of 2)

	up to 1215 MHz
Maximum CCS Ratings (8)	
D-C Voltage	3,000 Volts
D-C Screen Voltage	1,000 Volts
D-C Plate Current	1.0 Amp
D-C Grid Current	.2 Amp
Plate Input	2,500 Watts
Screen Input	50 Watts
Plate Dissipation	1,500 Watts

Typical CCS Operation — Class AB₁ single tone

	up to 60 MHz	up to 1215 MHz
D-C Plate Voltage	2,250	2,500 Volts
D-C Screen Voltage	700	700 Volts
D-C Grid Voltage	-50	-50 Volts
Max. Signal Plate Current	.9	1.0 Amp
Zero Signal Plate Current	.2	.2 Amp
Max. Signal Screen Current	.045	.045 Amp
Zero Signal Screen Current	0	0 Amp
Max. Signal Grid Current	0	0 Amp
Max. Signal Peak RF Grid Voltage	50	50 Volts
Max. Signal Driving Power (approx.)	0	0 Watts
Max. Signal Power Out (approx.)	1,000	1,250 Watts
Effective RF Load Resistance	1,100	1,100 ohms

Maximum Circuit Values — Grid circuit resistance under any condition.

Fixed Bias	5,000 Max. ohms
Fixed Bias (Class AB ₁)	Not Recommended
Cathode Bias	Not Recommended
Screen Circuit Impedance	Note 9
Plate Circuit Impedance	Note 10

Maximum Circuit Values

Grid Circuit Resistance under any condition:

With Fixed Bias	5000 Max. Ohms
With Fixed Bias (Class AB ₁)	Not Recommended
With Cathode Bias	Not Recommended
Screen Circuit Impedance	Note 9
Plate Circuit Impedance	Note 10

PLATE MODULATED RADIO FREQUENCY POWER AMPLIFIER

Class C telephony (carrier conditions with maximum modulation factor of 1)

	up to 1215 MHz
Maximum CCS Ratings (8)	
D-C Plate Voltage	2,500 Volts
D-C Screen Voltage	1,000 Volts
D-C Grid Voltage	-300 Volts
D-C Plate Current	.85 Amp
D-C Grid Current	.2 Amp
Plate Input	1,700 Watts
Screen Input	35 Watts
Plate Dissipation	1,000 Watts

Typical CCS Operation — Grid drive circuit at 600 MHz

D-C Plate Voltage	1,800	2,000 Volts
D-C Screen Voltage	500	500 Volts
D-C Grid Voltage	-75	-75 Volts
D-C Plate Current	.75	.83 Amp
D-C Screen Current	.015	.015 Amp
D-C Grid Current (approx.)	.04	.04 Amp
Driver Power Output (approx.)	50	55 Watts
Useful Power Output (approx.)	650	800 Watts

Maximum Circuit Values

Grid circuit resistance under any condition	5,000 ohms
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RADIO FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class C telegraphy

RADIO FREQUENCY POWER AMPLIFIER

Class C FM telephony

	up to 1215 MHz
Maximum CCS Ratings (8)	
D-C Plate Voltage	3,000 Volts
D-C Screen Voltage	1,000 Volts
D-C Grid Voltage	-300 Volts
D-C Plate Current	1.0 Amp
D-C Grid Current	0.2 Amp
Plate Input	2,500 Watts
Screen Input	50 Watts
Plate Dissipation	1,500 Watts

Typical CCS Operation — Grid drive circuit at 600 MHz

D-C Plate Voltage	2,250	2,500 Volts
D-C Screen Voltage	500	500 Volts
D-C Grid Voltage	-75	-75 Volts
D-C Plate Current	0.9	1.0 Amp
D-C Screen Current	.02	.02 Amp
D-C Grid Current (approx.)	.07	.07 Amp
Output Circuit Efficiency (approx.)	90	90 %
Driver Power Output (approx.)	70	75 Watts
Useful Power Output (approx.)	1,050	1,350 Watts

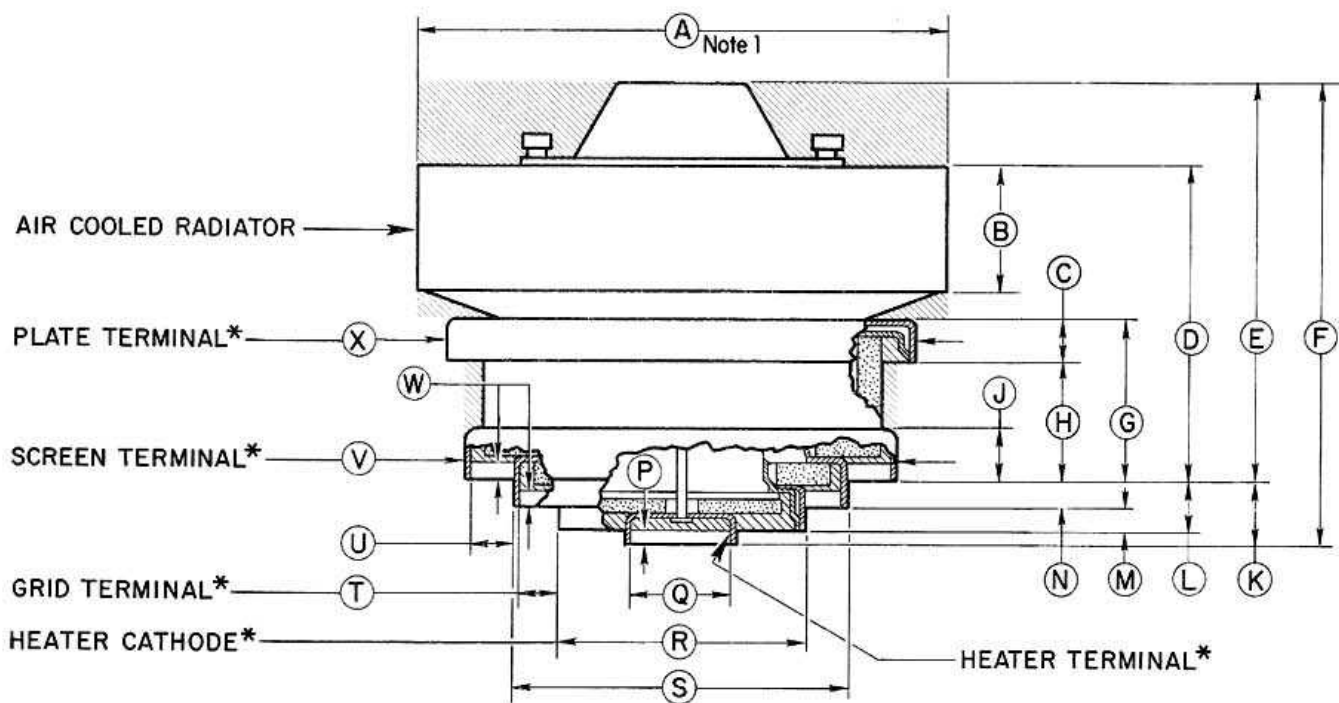
Maximum Circuit Values

Grid circuit resistance under any condition	5,000 ohms
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Maximum ratings are limiting values above which the serviceability of the tube may be impaired with respect to life and satisfactory performance and should not be exceeded under the worst probable conditions.

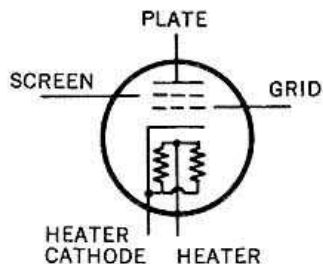
Note 9. The screen to ground impedance must be low enough to prevent build-up of screen voltage under negative current conditions.

Note 10. A plate impedance which will provide a plate-voltage-supply regulation of no better than 10% is recommended.



**DIMENSIONAL DATA
(IN INCHES)**

DIM.	MIN.	MAX.
A Dia.	3.69	3.75
B	.850	
C	.22	
D	2.15	2.23
E	2.71	2.85
F	3.14	3.34
G	1.160	1.165
H	.79	.85
J	.22	
K	.43	.49
L	.34	.40
M	.115	
N	.175	.225
P	.135	
Q Dia.		.725
R Dia.	1.710	
S Dia.	2.307	
T	.200	
U	.250	
V Dia.	3.010	
W	.105	
X Dia.	3.210	



Accessories
Socket..... 57282

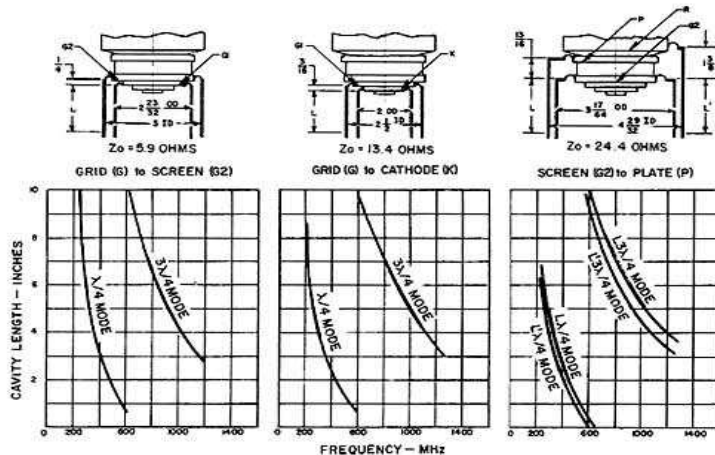
 **HATCHED REGION
NOTE 2**

 **CERAMIC INSULATOR**

Note 1. Concentricity between the various diameters is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

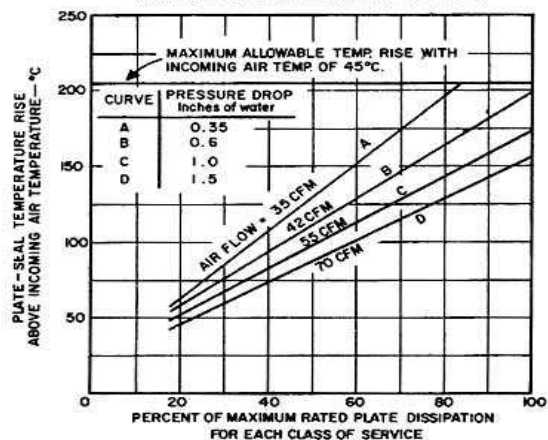
A. Radiator Band	3.7805
B. Plate Terminal	3.2605
C. Screen Terminal	3.0605
D. Grid Terminal	2.3375
E. Heater-Cathode Terminal	1.7445
F. Heater Terminal	0.6945

Note 2. Keep all hatched regions clear. Do not allow contacts or circuit components to protrude into these annular volumes. Diameters of hatched areas above Air-Cooled Radiator, Plate Terminal Contact Surface, and Screen Terminal Contact Surface shall not be greater than its associated diameter.



TYPICAL COOLING CHARACTERISTICS

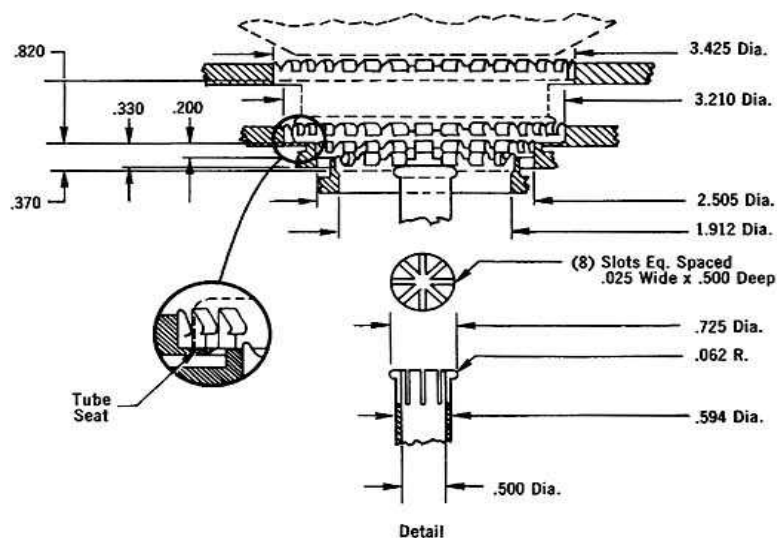
AIR FLOW THROUGH RADIATOR IN EITHER DIRECTION
MAXIMUM PLATE-SEAL TEMPERATURE = 250°C.



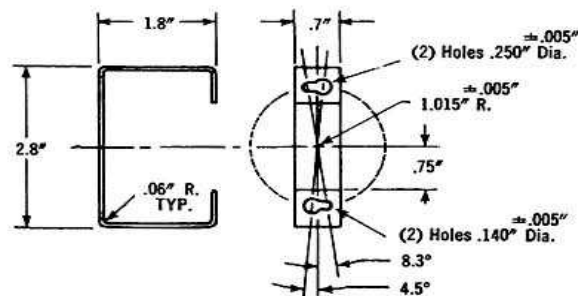
Standby Operation: Cooling Air is required when only heater voltage is applied to the tube.

Shutdown Operation: Air flow should continue for several minutes after all power to the tube is removed.

PREFERRED MOUNTING ARRANGEMENT



TUBE EXTRACTOR



NOTES:

1. Material — 1/16" thk. Cold Rolled Steel
2. Slot Between Holes
3. Round All Edges

CONSTANT CURRENT CHARACTERISTICS

$E_f = 5.5$ VOLTS, SCREEN VOLTS = 500

PLATE AMPERES = I_b _____

GRID AMPERES = I_{c1} -----

SCREEN AMPERES = I_{c2} -----

GRID VOLTS

50
40
30
20
10
0
-10
-20
-30
-40

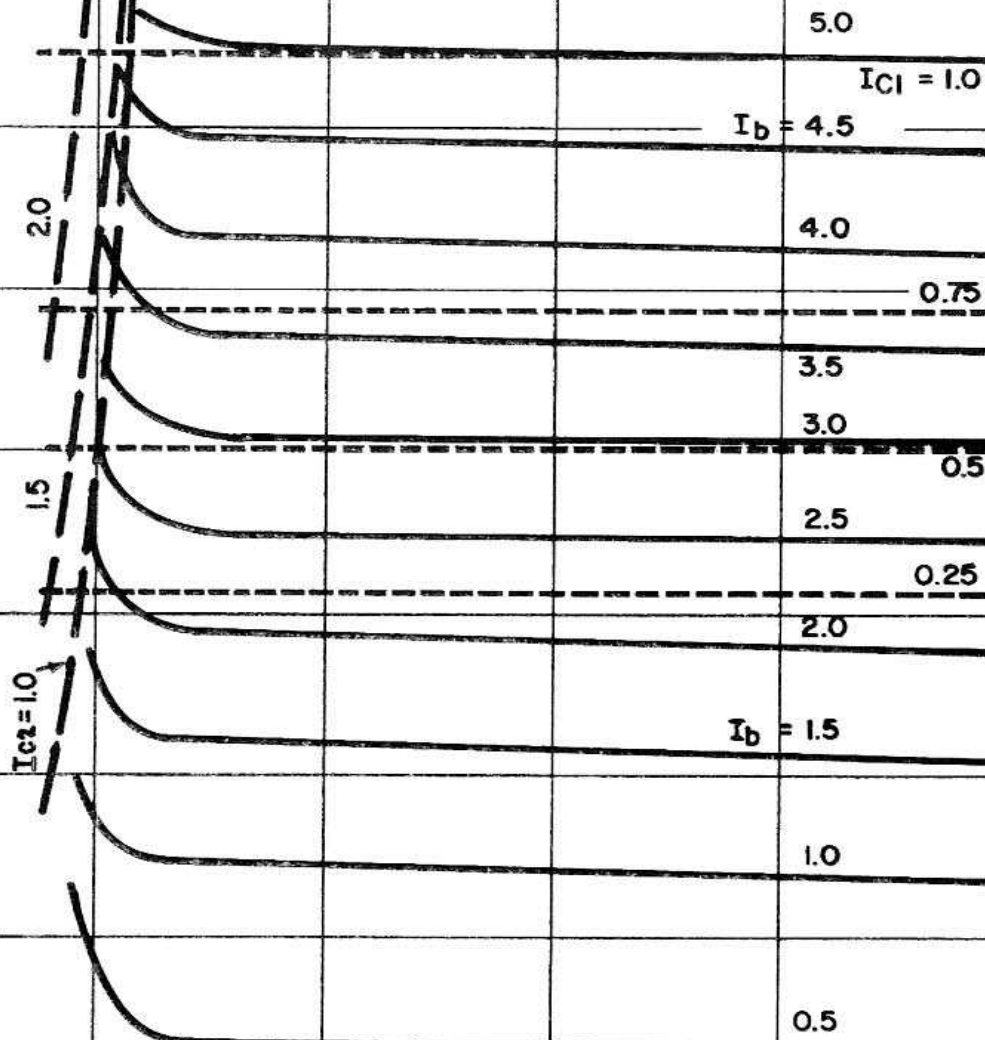


PLATE VOLTS

0 500 1000 1500 2000 2500

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