

DESCRIPTION AND RATING

The 7588 is a high- μ triode of ceramic-and-metal planar construction. The tube is intended for use as a broadband radio-frequency amplifier at frequencies up to 500 megacycles.

GENERAL

ELECTRICAL

Cathode—Coated Unipotential

Heater Characteristics and Ratings

Heater Voltage, AC or DC*.....6.3 $\pm$ 0.3 Volts

Heater Current†.....0.4 Amperes

Direct Interelectrode Capacitances‡

Grid to Plate: (g to p).....2.8 pf

Input: g to (h+k).....6.5 pf

Output: p to (h+k).....0.075 pf

Heater to Cathode: (h to k).....2.6 pf

MECHANICAL

Mounting Position—Any§

See Physical Dimensions on page 4 for dimensions and electrical connections.

MAXIMUM RATINGS

ABSOLUTE-MAXIMUM VALUES

Plate Voltage.....300 Volts

Positive DC Grid-to-Cathode Voltage.....0 Volts

Negative DC Grid Voltage.....50 Volts

Plate Dissipation.....5.5 Watts

DC Cathode Current.....30 Milliamperes

Heater-Cathode Voltage

Heater Positive with Respect to Cathode.....50 Volts

Heater Negative with Respect to Cathode.....50 Volts

Grid Circuit Resistance

With Fixed Bias.....0.025 Megohms

With Cathode Bias.....0.1 Megohms

Envelope Temperature at Hottest Point.....250 C

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making no allowance for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration and of

all other electron devices in the equipment.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of the tube under consideration and of all other electron devices in the equipment.

CHARACTERISTICS AND TYPICAL OPERATION

AVERAGE CHARACTERISTICS

Plate Voltage.....200 Volts

Positive Grid Voltage.....6.0 Volts

Cathode-Bias Resistor.....270 Ohms

Amplification Factor.....175

Plate Resistance, approximate.....3900 Ohms

Transconductance.....45000 Micromhos

Plate Current.....24 Milliamperes

Grid Voltage, approximate

Ib = 100 Microamperes.....—5 Volts

Noise Figure¶.....3.0 Decibels

FOOTNOTES

* The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.

† Heater current of a bogey tube at $E_f = 6.3$ volts.

‡ Without external shield.

§ One method of mounting the 7588 is to use a stainless-steel "T" bolt (see drawing) to attach the mounting base of the tube to a chassis or circuit board. The "T" bolt should be inserted in the slot in the base of the tube, turned 90 degrees, and attached to the chassis or circuit board with a 4-40 nut and lock washer. Torque used to tighten the nut should not exceed 3 inch-pounds.

¶ Measured at 200 megacycles in a grounded-grid amplifier and corrected for second-stage noise figure and diode temperature.

The tubes and arrangements disclosed herein may be covered by patents of General Electric Company or others. Neither the disclosure of any information herein nor the sale of tubes by General Electric Company conveys any license under patent claims covering combinations of tubes with other devices or

elements. In the absence of an express written agreement to the contrary, General Electric Company assumes no liability for patent infringement arising out of any use of the tubes with other devices or elements by any purchaser of tubes or others.

INITIAL CHARACTERISTICS LIMITS

	Min.	Bogey	Max.	
Heater Current				
$E_f = 6.3$ volts	370	400	430	Milliamperes
Plate Current				
$E_f = 6.3$ volts, $E_b = 200$ volts, $R_k = 22$ ohms	17	25	33	Milliamperes
Transconductance				
$E_f = 6.3$ volts, $E_b = 200$ volts, $E_c = +6$ volts, $R_k = 270$ ohms (bypassed)	35000	45000	55000	Micromhos
Amplification Factor				
$E_f = 6.3$ volts, $E_b = 200$ volts, $E_c = +6$ volts, $R_k = 270$ Ohms (bypassed)	140	175	210	
Transconductance Change with Heater Voltage				
Difference between transconductance at $E_f = 6.3$ volts and transconductance at $E_f = 5.7$ volts (other conditions the same) expressed as a percentage of transconductance at $E_f = 6.3$ volts			20	Percent
Grid Voltage Cutoff				
$E_f = 6.3$ volts, $E_b = 200$ volts, $I_b = 100$ μ a		-5.0	-8.0	Volts
Noise Figure				
$E_f = 6.3$ volts, $E_{bb} = 265$ volts, $E_c = 0$ volts, $R_L = 3300$ ohms, (bypassed), $R_k = 22$ ohms, $F = 200 \pm 10$ MC		3.0	4.8	Decibels
Interelectrode Capacitances				
Grid to Plate: (g to p)	2.1	2.8	3.5	pf
Input: g to (h + k)	5.1	6.7	8.3	pf
Output: p to (h + k)	0.05	0.075	0.1	pf
Heater to Cathode: (h to k)	1.9	2.6	3.3	pf
Negative Grid Current				
$E_f = 6.3$ volts, $E_b = 200$ volts, $E_{cc} = -1.0$ volts, $R_k = 22$ ohms (bypassed), $R_g = 0.1$ meg			0.5	Microamperes
Heater-Cathode Leakage Current				
$E_f = 6.3$ volts, $E_{hk} = 100$ volts				
Heater Positive with Respect to Cathode			20	Microamperes
Heater Negative with Respect to Cathode			20	Microamperes
Interelectrode Leakage Resistance				
$E_f = 6.3$ volts. Polarity of applied d-c interelectrode voltage is such that no cathode emission results.				
Grid to All at 100 volts d-c	50			Megohms
Plate to All at 300 volts d-c	50			Megohms
Grid Emission Current				
$E_f = 7.0$ volts, $E_b = 200$ volts, $E_{cc} = -15$ volts, $R_g = 0.1$ meg			2.0	Microamperes

SPECIAL PERFORMANCE TESTS

Grid Recovery

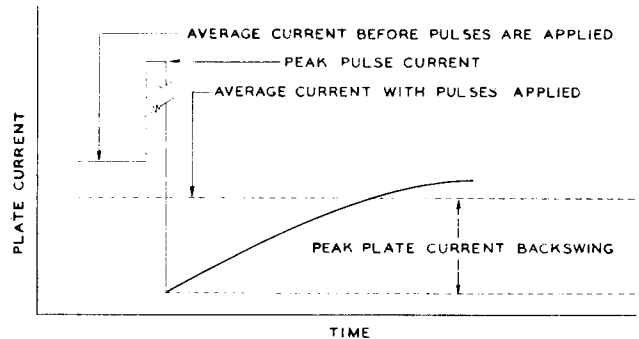
Min. Bogey Max.

Change in Average Plate Current.....	1.0	Milliamperes
Peak Plate Current Backswing.....	2.0	Milliamperes

Tubes with poor grid recovery affect circuit operation when the grid is driven positive by a pulse of signal or noise, somewhat as if a parallel RC circuit were in series with the grid. This effect may occur in tubes of any type but is unimportant in many applications. In the majority of 7588 tubes the effect is negligible, but to eliminate the few in which it may be excessive, tubes are tested under the following conditions: $E_f = 6.3$ volts, $E_{bb} = 250$ volts, $R_L = 0.01$ meg. EC is adjusted for $I_b = 10$ ma.

Upon application to the grid of a pulse driving it 3 volts positive with respect to cathode ($prr = 60$ pps, duty cycle = 0.12%) the change in average plate current is noted, and the peak plate current backswing is measured. The following diagram shows qualitatively the plate current-time relationship for a tube (with poor grid recovery) subjected to this test:

**PLATE CURRENT VS TIME
—GRID RECOVERY TEST**



Min. Bogey Max.

Low Frequency Vibrational Output

Statistical sample is subjected to vibration in each of two planes at 40 cps, with peak acceleration 15G. Tube is operated with $E_f = 6.3$ volts, $E_{bb} = 250$ volts, $R_k = 68$ ohms (bypassed), $R_L = 2000$ ohms.....

25 Millivolts
RMS

Variable Frequency Vibrational Output

Statistical sample is subjected to vibration according to the procedure given below. Tube is operated with $E_f = 6.3$ volts, $E_{bb} = 250$ volts, $R_k = 68$ ohms (bypassed), $R_L = 2000$ ohms.....

75 Millivolts
RMS

The variable-frequency vibration test shall be performed as follows:

1. The frequency shall be increased from 100 to 2000 cps with approximately logarithmic progression in 3 ± 1 minutes. The return sweep (2000 to 100 cps) is not required.
2. The tube shall be vibrated with simple harmonic motion in each of two planes: first, parallel to the cylindrical axis; second, perpendicular to the cylindrical axis and parallel to a line through the major axis of a terminal lug. At all frequencies from 100 to 2000 cps, the total harmonic distortion of the acceleration wave form shall be less than 5%.
3. The peak acceleration shall be maintained at 10 ± 1.0 G throughout the test.
4. The value of the alternating voltage produced across the load resistor (R_L), as a result of the vibration, shall be measured with a suitable device having a response to the RMS value of the voltage to within ± 0.5 db of the response at 400 cps for the frequency range of 100 to 3000 cps, and having a band-pass filter with an attenuation rate of 24 db per octave below the low frequency cutoff point of 50 cps and above the high frequency cutoff point of 5000 cps. The meter shall have a dynamic response characteristic equivalent to or faster than a VU meter (operated in accordance with ASA Standard No. C16.5-1954).

Low Pressure Voltage Breakdown Test

Statistical sample tested for voltage breakdown at a pressure of 8mm Hg, to simulate an altitude of 100,000 feet. Tubes shall not give visual evidence of flashover or corona when 300 volts RMS, 60 cps, is applied between the plate and grid terminals.

DEGRADATION RATE TESTS

Fatigue

Statistical sample vibrated for a total of six hours, three hours in each of two planes, at a peak acceleration of 10 G. Frequency is continuously varied from 30 cps to 2000 cps and back to 30 cps, with a period of ten minutes. Tubes are operated during the test with $E_f = 6.3$ volts, $E_b = 250$ volts, and $R_k = 68$ ohms. Following the test, tubes are evaluated for low frequency vibrational output, heater-cathode leakage, heater current, and transconductance.

DEGRADATION RATE TESTS (Continued)

Shock

Statistical sample subjected to 5 impact accelerations of approximately 450 G in each of four positions. The accelerating forces are applied by the Navy-type, High Impact (flyweight) Shock Machine using a 30° hammer angle. Tubes are mounted by T-bolt with 3 inch-pounds torque, and operated during the test with $E_f = 6.3$ volts, $E_b = 250$ volts, $E_{hk} = +100$ volts, $R_g = 0.1$ meg, and $R_k = 68$ ohms. Following the test, tubes are evaluated for low frequency vibrational output, heater-cathode leakage, heater current, and transconductance.

Stability Life Test

The statistical sample subjected to the Intermittent Life Test is evaluated for percent change in transconductance of individual tubes, from the initial reading to readings following 2 hours and 20 hours of the life test.

Survival Rate Life Test

The statistical sample subjected to the Intermittent Life Test is evaluated for shorted and open elements, and transconductance, following approximately 100 hours of life test.

Intermittent Life Test

Statistical sample operated 1000 hours under the following conditions: $E_f = 6.3$ volts, $E_b = 200$ volts, $E_{cc} = +6$ volts, $E_{hk} = -70$ volts, $R_k = 270$ ohms, $R_g = 0.1$ meg. Heater voltage is cycled (on $1\frac{3}{4}$ hours, off $\frac{1}{4}$ hour). Tubes are evaluated, following 500 and 1000 hours of life test, for shorted or open elements, heater current, transconductance, negative grid current, noise figure, heater-cathode leakage, and interelectrode leakage resistance.

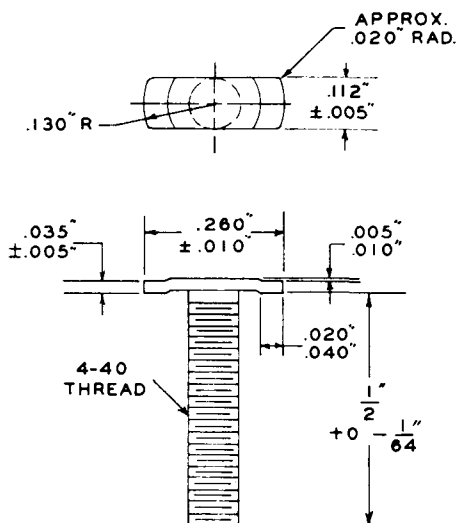
Interface Life Test

Statistical sample operated for 1000 hours with $E_f = 6.6$ volts, no other voltages applied, and evaluated for cathode interface resistance following the life test.

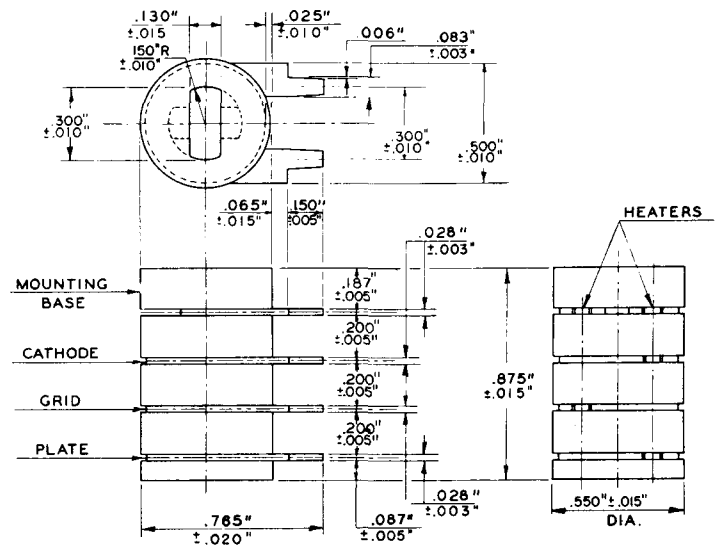
Heater-Cycling Life Test

Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Conditions of test include $E_f = 7.5$ volts cycled for one minute on and one minute off, $E_b = E_c = 0$ volts, and $E_{hk} = 70$ volts with heater positive with respect to cathode. Following this test, tubes are evaluated for open heaters, heater-cathode shorts, and heater-cathode leakage current.

MOUNTING BOLT

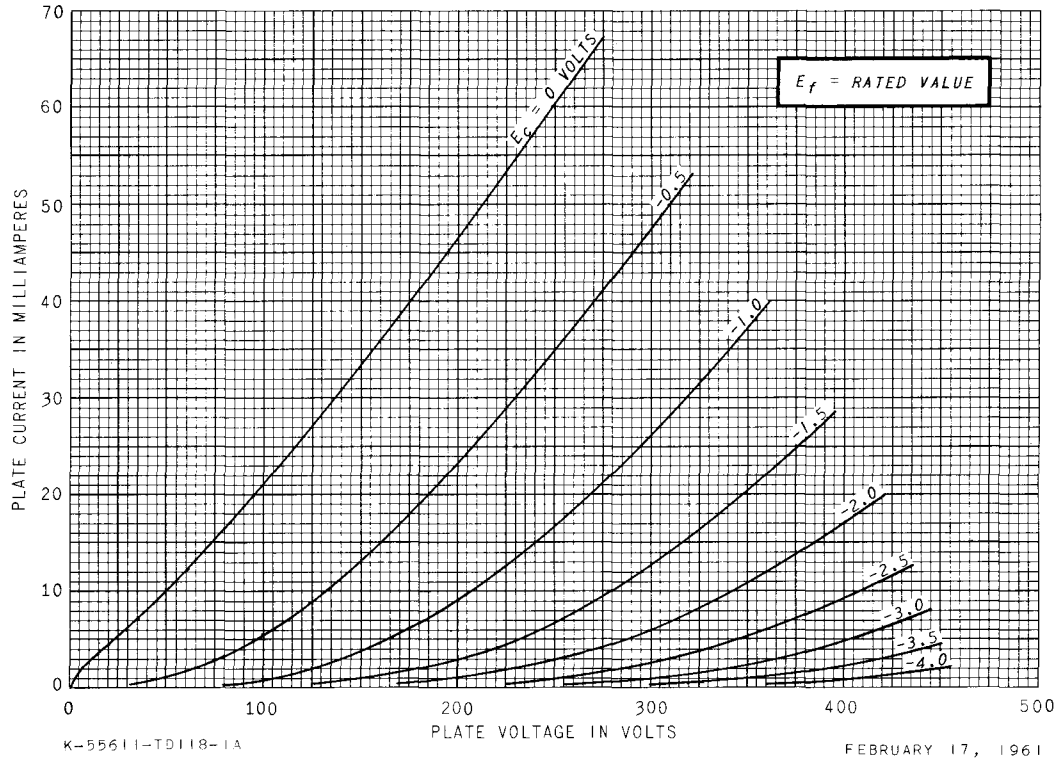


PHYSICAL DIMENSIONS

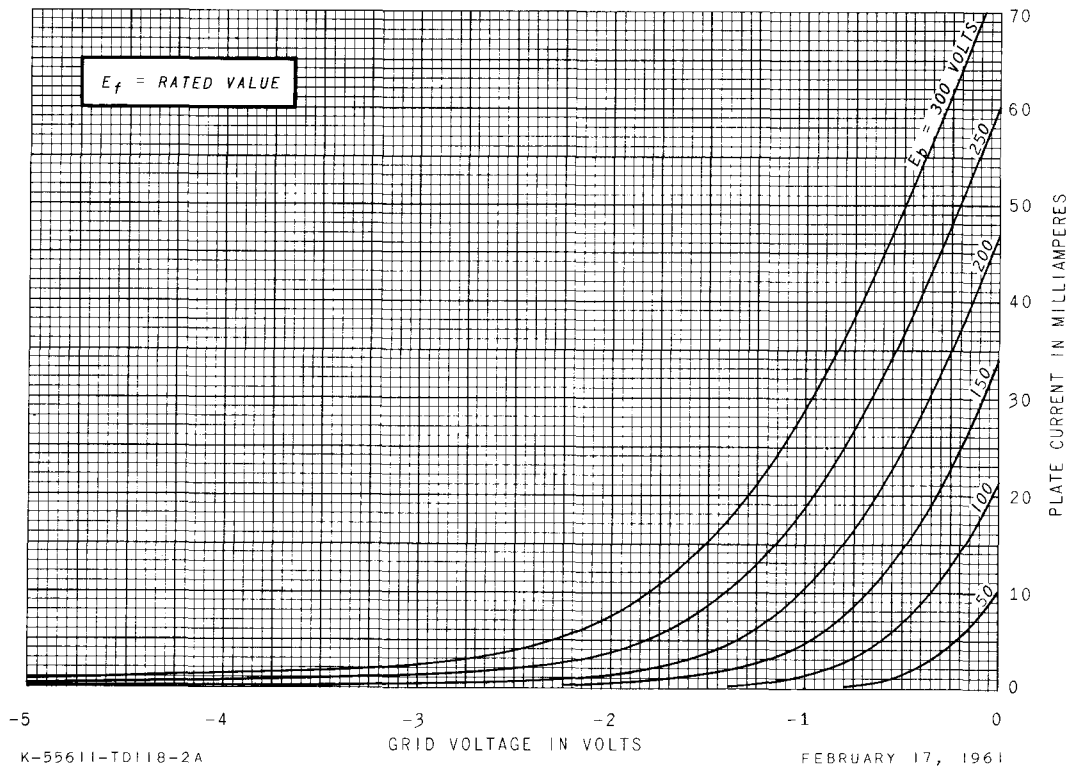


Maximum eccentricity of insulators 0.015 in. from center line.

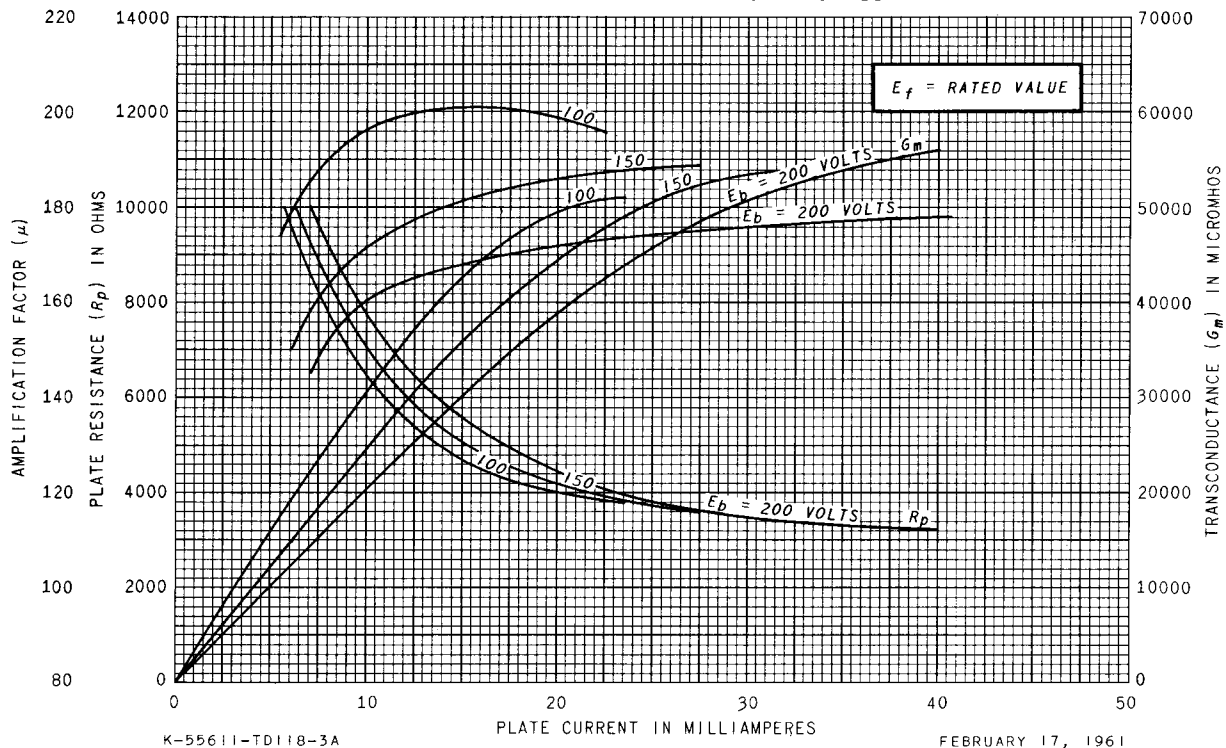
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



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