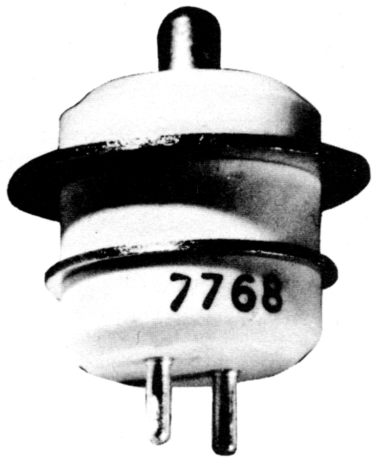
ELECTRONIC INNOVATIONS IN ACTION

TUBES

7768



METAL-CERAMIC TRIODE

DESCRIPTION AND RATING

FOR BROADBAND RADIO-FREQUENCY AMPLIFIER APPLICATIONS

The 7768 is a high-mu triode of ceramic-and-metal planar construction primarily intended for use as a broadband radio-frequency amplifier. The 7768 is especially suited for use where unfavorable conditions of mechanical shock, mechanical vibration, and nuclear radiation are encountered.

GENERAL

ELECTRICAL

Cathode—Coated Unipotential

Heater Characteristics and Ratings

Heater Voltage, AC or DC*	6.3 ± 0.3	Volts
Heater Current†	0.4	Amperes
Direct Interelectrode Capacitances‡		
Grid to Plate: (g to p)	1.7	pf
Input: g to (h+k)	6.0	pf
Output: p to (h+k)	0.018	pf
Heater to Cathode: (h to k)	2.4	pf

MECHANICAL

Mounting Position—Any

See Outline Drawing on page 3 for dimensions and electrical connections

MAXIMUM RATINGS

ABSOLUTE-MAXIMUM VALUES

Plate Voltage	330	Volts
Positive DC Grid 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 Cathode Bias	0.01	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
Grid Voltage	+6.0	Volts
Cathode-Bias Resistor	270	Ohms
Amplification Factor	225	
Plate Resistance, approximate	4500	Ohms
Transconductance	50000	Micromhos
Plate Current	24	Milliamperes
Grid Voltage, approximate Ib = 100 Microamperes	−3	Volts

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 Ef = 6.3 volts.

‡ Without external shield.

§ Operation below the rated maximum envelope temperature is recommended for applications requiring the longest possible tube life.

INITIAL CHARACTERISTICS LIMITS

	Min.	Bogey	Max.	
Heater Current				
Ef = 6.3 volts	370	400	430	Milliamperes
Plate Current				
Ef = 6.3 volts, Eb = 200 volts, Rk = 22 ohms (bypassed)	14	22	30	Milliamperes
Transconductance				
Ef = 6.3 volts, Eb = 200 volts, Rk = 22 ohms (bypassed)	40000	50000	60000	Micromhos
Amplification Factor				
Ef = 6.3 volts, Eb = 200 volts, Rk = 22 ohms (bypassed)	170	225	280	
Grid Voltage Cutoff				
Ef = 6.3 volts, Eb = 200 volts, Ib = 100 μa	.....	−3.0	−5.0	Volts
Noise Figure				
Ef = 6.3 volts, Ebb = 280 volts, R_L = 3300 ohms, Rk = 22 ohms (bypassed), F = 200 MC ± 10 mc	.....	3.0	4.8	Decibels
Interelectrode Capacitances				
Grid to Plate: (g to p)	1.3	1.7	2.1	pf
Input: g to (h+k)	4.5	6.0	7.5	pf
Output: p to (h+k)	0.01	0.018	0.026	pf
Heater to Cathode: (h to k)	1.5	2.4	3.3	pf
Negative Grid Current				
Ef = 6.3 volts, Eb = 200 volts, Ecc = −1.0 volts, Rk = 22 ohms (bypassed), Rg = 0.1 meg	.....	.....	0.5	Microamperes
Heater-Cathode Leakage Current				
Ef = 6.3 volts, Ehk = 100 volts				
Heater Positive with Respect to Cathode	.....	.....	20	Microamperes
Heater Negative with Respect to Cathode	.....	.....	20	Microamperes
Interelectrode Leakage Resistance				
Ef = 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				
Ef = 7.0 volts, Eb = 200 volts, Ecc = −15 volts, Rg = 0.1 meg	.....	.....	2.0	Microamperes

SPECIAL PERFORMANCE TESTS

	Min.	Bogey	Max.	
Grid Recovery				
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 7768 tubes the effect is negligible, but to eliminate the few in which it may be excessive, tubes are tested under the following conditions: Ef = 6.3 volts, Ebb = 250 volts, R_L = 0.01 meg. Ec is adjusted for Ib = 10 ma.

Upon application to the grid of a 3 volt positive pulse (prr = 60 pps, duty factor = 0.0012) 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.

	Min.	Bogey	Max.	
Low Frequency Vibrational Output	.....	.....	50	Millivolts RMS

Statistical sample is subjected to vibration in each of two planes at 40 cps, with peak acceleration 15G. Tube is operated with Ef = 6.3 volts, Ebb = 250 volts, Rk = 68 ohms (bypassed), $R_L \doteq 2000$ ohms

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.

OUTLINE DRAWING

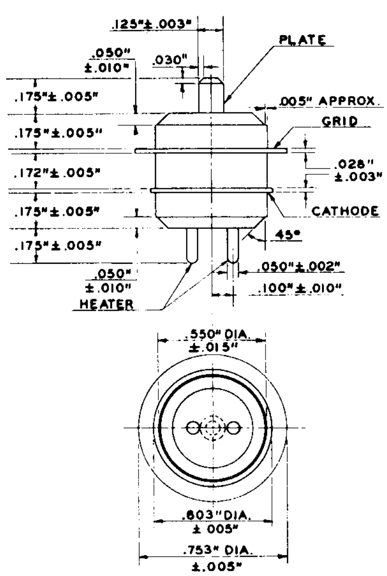
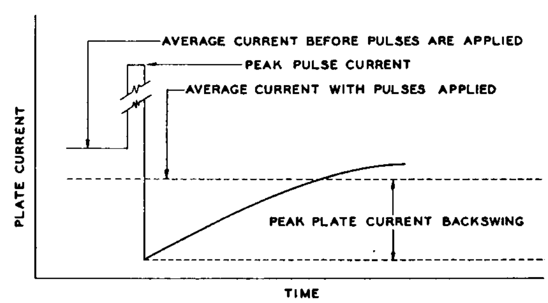


PLATE CURRENT VS. TIME —GRID RECOVERY TEST



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 10G. 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 Ef = 6.3 volts, Eb = 250 volts, and Rk = 68 ohms. Following the test, tubes are evaluated for low frequency vibrational output, heater-cathode leakage, heater current, and transconductance.

Shock

Statistical sample subjected to 5 impact accelerations of approximately 450G 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 operated during the test with Ef = 6.3 volts, Eb = 250 volts, Ehk = +100 volts, and Rk = 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 zero-bias 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 for 1000 hours under the following conditions: Ef = 6.3 volts (cycled—on 1¾ hours, off ¼ hour), Eb = 200 volts, Ecc = +7 volts, Ehk = −70 volts d-c, Rk = 270 ohms, and Rg = 0.01 meg. Tubes are evaluated, following 500 and 1000 hours of life test, for shorted or open elements, heater current, grid current, transconductance, noise figure, heater-cathode leakage, and interelectrode leakage resistance.

Interface Life Test

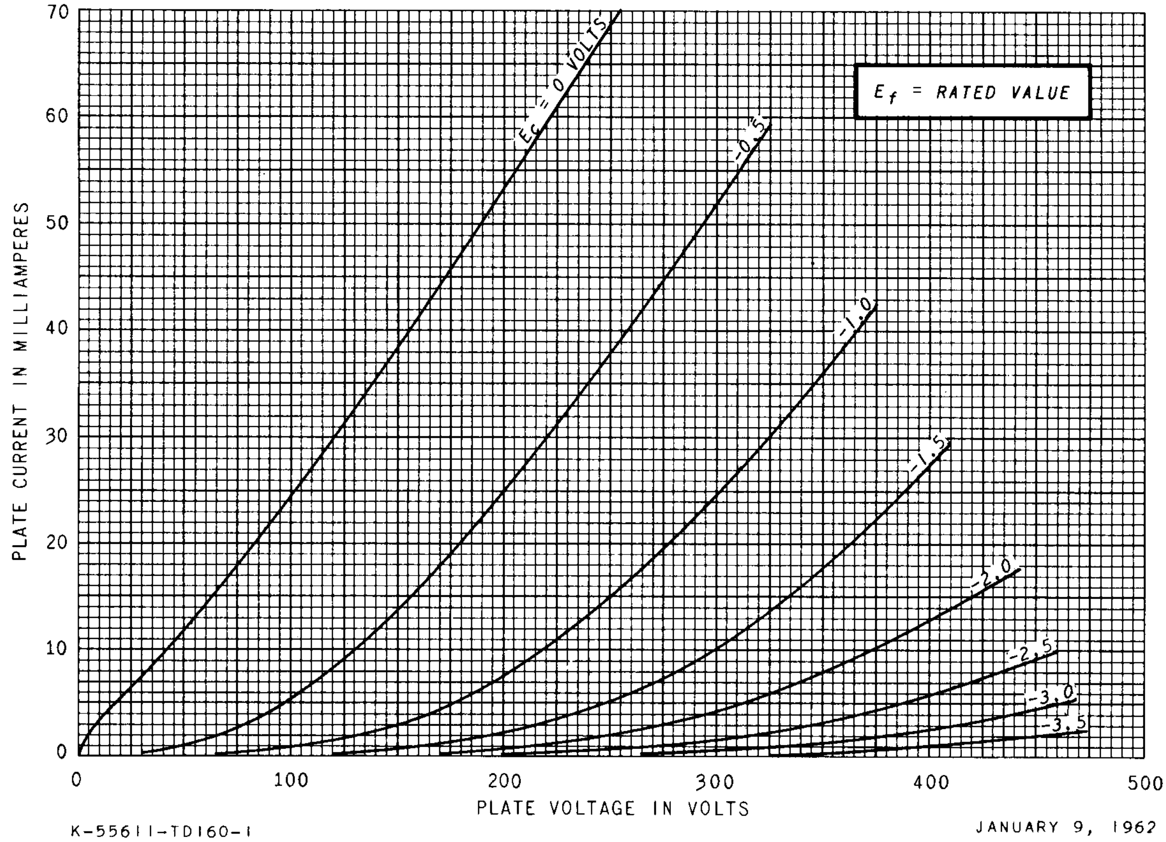
Statistical sample operated for 1000 hours with Ef = 6.6 volts, no other voltages applied, and evaluated for cathode interface resistance following the life test.

Heater-Cycling Life Test

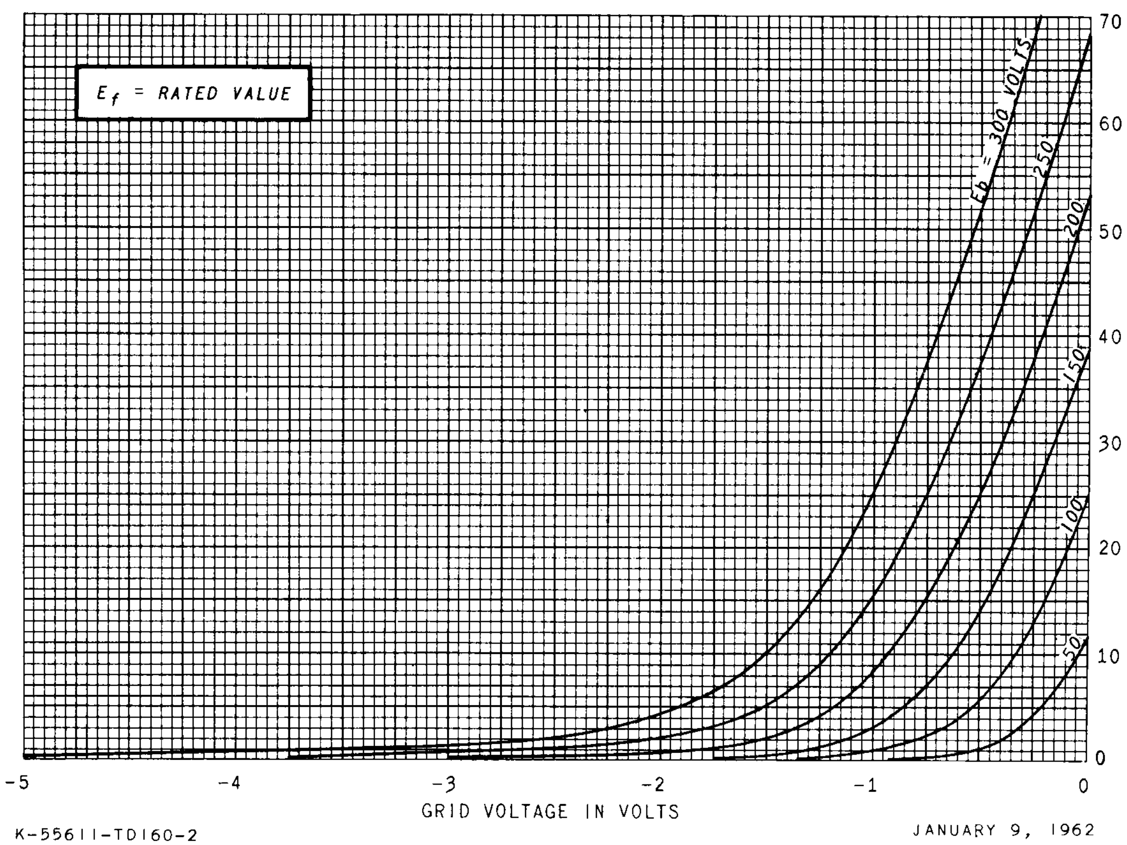
Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.5 volts cycled for one minute on and one minute off, Eb = Ec = 0 volts, and Ehk = 70 volts with heater positive with respect to cathode. Following this test, tubes are evaluated for open heaters, heater-cathode shorts, and heater-cathode leakage current.

Note: The conditions for some of the indicated tests have deliberately been selected to aggravate tube failures for test and evaluation purposes. In no sense should these conditions be interpreted as suitable circuit operating conditions.

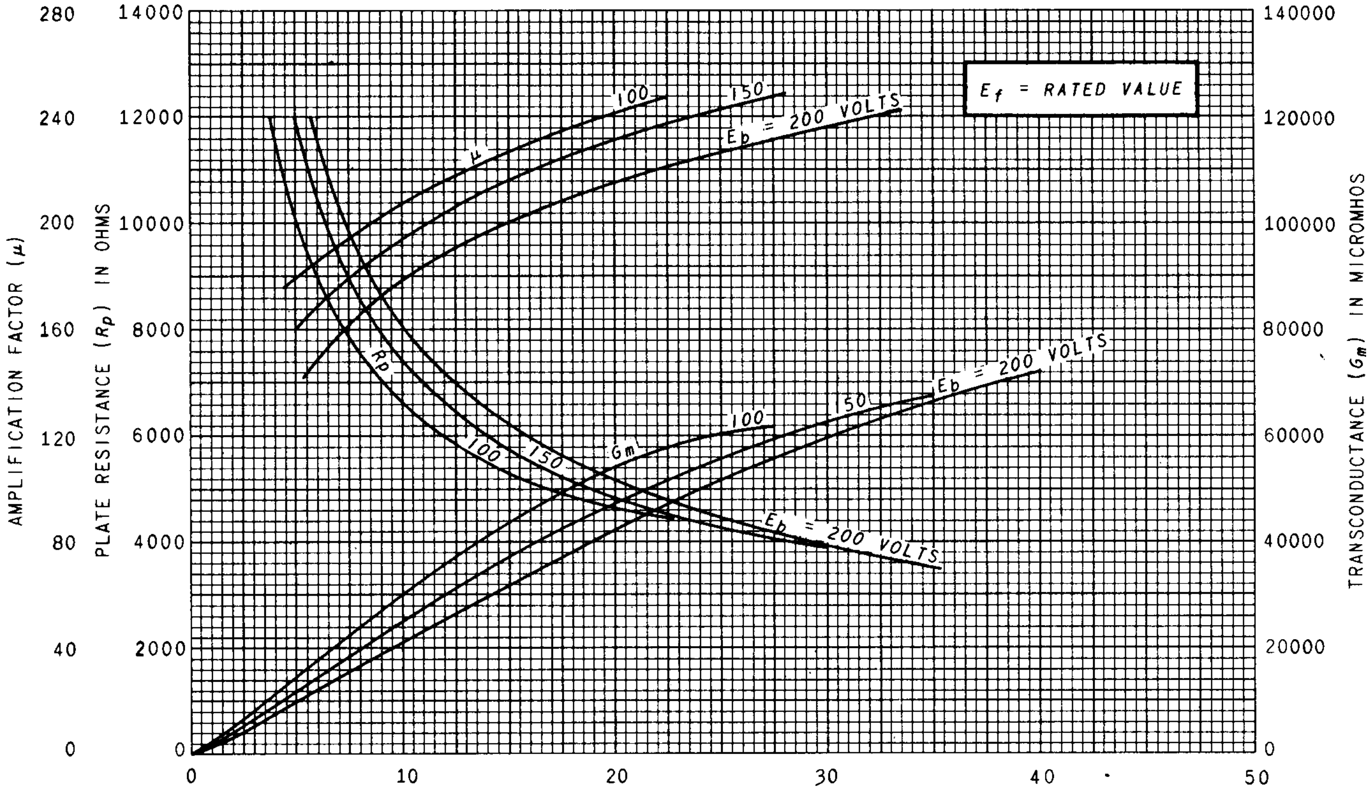
AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



AVERAGE CHARACTERISTICS



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JANUARY 9, 1962

RECEIVING TUBE DEPARTMENT

GENERAL ELECTRIC

Owensboro, Kentucky