from JEDEC release #2602, Oct. 12, 1959

7558

BEAM POWER TUBE

20.5 Watts Output Class AB_1 Push-Pull AF Amplifier Service | **For Use in Fixed-Station Communications Equipment** | **24 Watts CW Input (ICAS) at 175 Mc.**

RCA-7558 is a beam power tube of the 9-pin miniature type designed for use primarily in fixed-station communications equipment. In such equipment, the 7558 is particularly useful in class C radio-frequency amplifier, oscillator, and frequency-multiplier service at frequencies up to 175 Mc. It may also be used in modulator and audio-frequency power amplifier applications.

Features which contribute to the efficient performance of the 7558 at high frequencies are low lead inductance, small interelectrode capacitances, and low rf losses. Low lead inductance for both cathode and grid No.2 is achieved by the use of two pin connections for each of these electrodes. The use of two cathode base pins provide two separate cathode returns thereby minimizing the possibility of degeneration. The two base-pin connections for grid No.2 facilitates rf bypassing. The low rf losses and high input resistance of the 7558 permit use of relatively high values of grid-No.1-circuit resistance, thus minimizing loading of the driver stage.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 5%	volts
Current	0.8	amp
Direct Interelectrode Capacitances (Without external shield):		
Grid No.1 to plate	0.15 max.	μμf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	10	μμf
Plate to cathode, grid No.3, grid No.2, and heater	5.5	μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid No.3 (Suppressor Grid)	Connected to cathode	
Grid-No.2 (Screen-Grid) Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage	-18	volts
Mu-Factor, Grid No.2 to Grid No.1	8.7	
Transconductance	5300	μmhos
Plate Current	40	ma
Grid-No.2 Current	3	ma

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter:	
Maximum	0.875"
Minimum	0.750"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

AF POWER AMPLIFIER & MODULATOR — Class AB_1♦

Maximum CCS● Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	300 max.	volts
GRID-No.3 VOLTAGE	0 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
MAX.-SIGNAL DC PLATE CURRENT□	70 max.	ma
MAX.-SIGNAL PLATE INPUT□	21 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT□	2 max.	watts
PLATE DISSIPATION□	10 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point)	225 max.	°C

Typical CCS● Operation:

Values are for 2 tubes

DC Plate Voltage	300	volts
Grid No.3	Connected to cathode	
DC Grid-No.2 Voltage§	250	volts
DC Grid-No.1 Voltage§	-21	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	40	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	125	ma
Zero-Signal DC Grid-No.2 Current	2	ma
Max.-Signal DC Grid-No.2 Current	14	ma
Effective Load Resistance (Plate to plate)	5000	ohms
Max.-Signal Driving Power	0	watts
Total Harmonic Distortion	5	per cent
Max.-Signal Power Output (Approx.)	20.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

RF POWER AMPLIFIER & OSC. — Class C Telegraphy† and RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values up to 175 Mc:*

	CCS●	*ICAS●●*	
DC PLATE VOLTAGE	300 max.	300 max.	volts
GRID No.3	Connected to cathode		
DC GRID-No.2 VOLTAGE	250 max.	250 max.	volts

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

7558 10-59
Printed in U.S.A.

	CCS●	ICAS●●	
DC GRID-No.1 VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	70 max.	80 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	21 max.	24 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point)	225 max.	225 max.	°C

Typical Operation as Amplifier at 175 Mc:

	CCS●		ICAS●●	
DC Plate Voltage	250	300	300	volts
Grid No.3	Connected to cathode			
DC Grid-No.2 Voltage□□	200	200	250	volts
DC Grid-No.1 Voltage⊕⊕	−40	−42	−55	volts
Peak RF Grid-No.1 Voltage	47	52	62	volts
DC Plate Current	60	70	80	ma
DC Grid-No.2 Current	3.7	3.7	5.1	ma
DC Grid-No.1 Current (Approx.)	1.5	2.1	1.6	ma
Driver Power Output (Approx.)▲▲	1	1	1.5	watts
Useful Power Output (Approx.)*	6.5	8.5	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum Ratings, *Absolute-Maximum Values Up to 175 Mc:*

	CCS●	ICAS●●	
DC PLATE VOLTAGE	250 max.	250 max.	volts
DC GRID-No.3 VOLTAGE	0 max.	0 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	250 max.	volts
DC GRID-No.1 VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	60 max.	70 max.	ma
DC GRID-No.2 CURRENT	10 max.	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17.5 max.	watts
GRID-No.2 INPUT	1.4 max.	1.4 max.	watts
PLATE DISSIPATION	7 max.	8 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point)	225 max.	225 max.	°C

Typical Operation at 175 Mc:

DC Plate Voltage	250	250	volts
Grid-No.3	Connected to cathode		
DC Grid-No.2 Voltage▲	250	250	volts
DC Grid-No.1 Voltage★	−70	−75	volts
From a grid resistor of	33000	33000	ohms
RF Grid-No 1 Voltage	75	80	volts
DC Plate Current	60	70	ma
DC Grid-No.2 Current	2.5	3.0	ma
DC Grid-No.1 Current (Approx.)	2.1	2.3	ma
Driving Power (Approx.)▲▲	1.0	1.0	watt
Useful Power Output*	6.5	7.5	watts

Maximum Circuit Values:	CCS●	ICAS●●	
Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

	CCS●	ICAS●●	
DC PLATE VOLTAGE	300 max.	300 max.	volts
DC GRID-No.3 VOLTAGE	0 max.	0 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	250 max.	volts
DC GRID-No.1 VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	50 max.	60 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	13 max.	15 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point)	225 max.	225 max.	°C

Typical Operation as Doubler to 175 Mc:

DC Plate Voltage	250	300	volts
DC Grid-No.3	Connected to cathode		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage⊕⊕	−53	−66	volts
From a grid resistor of	53000	44000	ohms
Peak RF Grid-No.1 Voltage	60	74	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.6	3.5	ma
DC Grid-No.1 Current (Approx.)	1.0	1.5	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	3.0	4.5	watts

Typical Operation as Tripler to 175 Mc:

DC Plate Voltage	200	250	volts
DC Grid-No.3	Connected to cathode		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage⊕⊕	−90	−120	volts
From a grid resistor of	50000	70000	ohms
Peak RF Grid-No.1 Voltage	105	130	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	3.0	3.9	ma
DC Grid-No.1 Current (Approx.)	1.85	1.7	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	1.4	2.3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

▲ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

● Continuous Commercial Service.

●● Intermittent Commercial and Amateur Service.

□ Averaged over any audio-frequency cycle of sine-wave form.

§ Obtained preferably from a fixed supply.

† Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

□□ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to

permit obtaining the desired operating plate current after initial tuning adjustments are completed.

⊕⊕ Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

▲▲ Driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

* Measured at load.

▲ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are made.

★ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.745	0.855	amp
Transconductance	1,2	4200	6400	μmhos
Plate Current	1,2	30	50	ma
Plate Current	1,3	–	50	μa
Grid-No.2 Current	1,2	–	7.5	ma
Reverse Grid-No.1 Current	1,4	–	2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,6	100	–	megohms
Between plate and all other electrodes tied together	1,7	100	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With plate voltage of 250 volts, grid-No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -18 volts.

Note 3: With plate voltage of 250 volts, grid-No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -48 volts.

Note 4: With plate voltage of 180 volts, grid-No.3 connected to cathode, grid-No.2 voltage of 250 volts, grid-No.1 resistor of 0.1 megohm, and cathode resistor of 170 ohms.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative.

Note 7: With plate 300 volts negative.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices:

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

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

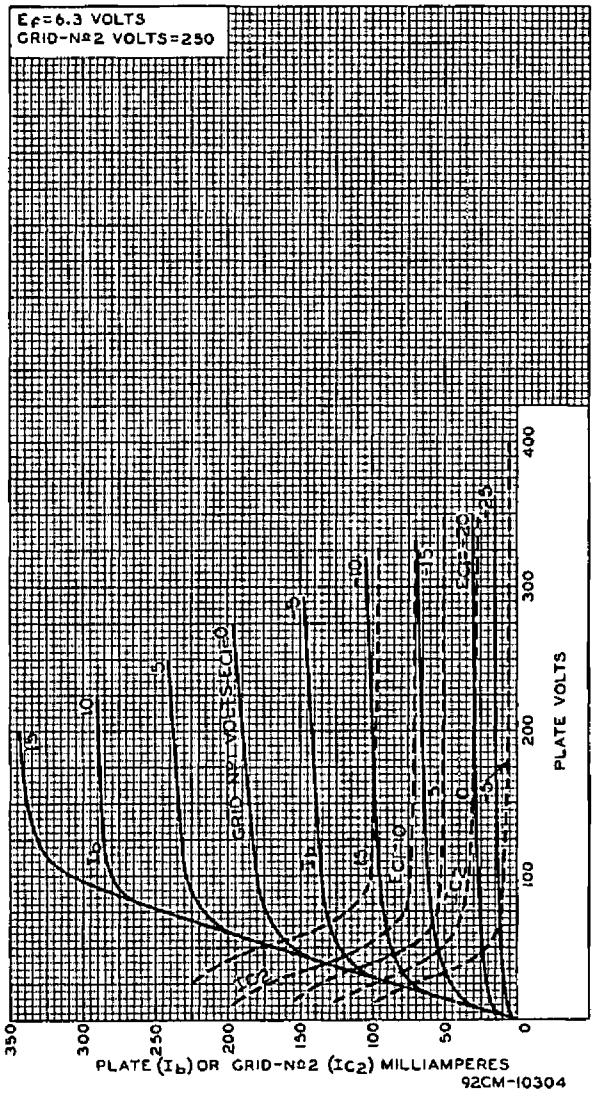
The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment,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

The *maximum bulb temperature* of 225° C is a tube rating and is to be observed in the same manner as other ratings. The temperature should be measured at the hottest point on the bulb with the tube operating in the completely assembled equipment with all covers in place, and delivering the maximum output under the highest ambient-temperature conditions and the most severe operating cycle for which the equipment is designed. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y. in the form of liquid and stick.

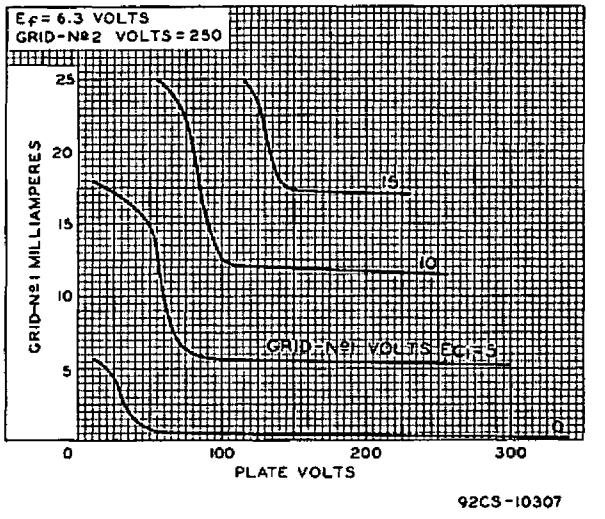
Shielding of the 7558 in "straight-through" rf amplifier service is required for stable operation. To minimize external feedback from the plate to grid No.1, a grounded shield crossing the terminal end of the tube socket through the space between pins 2 and 3 and the space between pins 8 and 9, is generally adequate for this purpose.

The heater may be effectively bypassed by grounding one heater pin at the tube socket and bypassing the other heater pin to ground with a low inductance capacitor. To reduce degeneration in the cathode circuit, two base-pin connections (pins 1 and 9) are provided. The cathode circuit should be arranged so that the input ac current flows through the cathode connection and the output ac current flows through the other. This circuit arrangement will reduce the effect of the cathode lead inductance. Both cathode circuit returns should be grounded through the shortest possible connection.

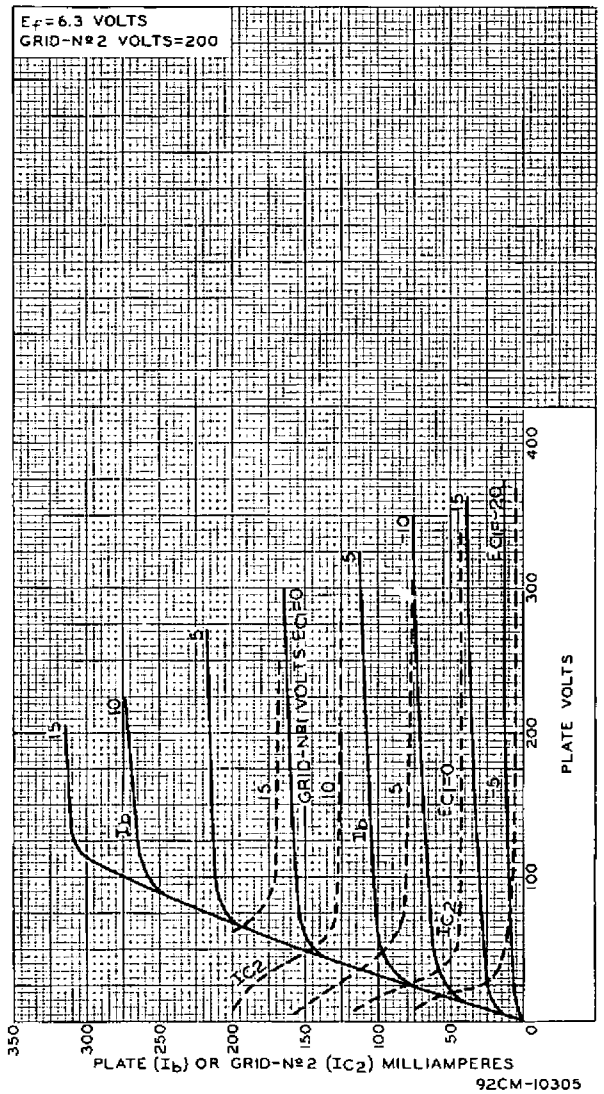
The *rf impedance between grid No.2 and the cathode* must be kept low, usually by means of a suitable bypass capacitor. In telephony service when grid No.2 is modulated, a smaller bypass capacitor than is used for telegraphy service may be required in order to avoid excessive af bypassing. However, if the capacitance value is too small, rf feedback may occur between plate and grid No.1, depending on the circuit layout, operating frequency, and power gain of the stage. AF bypassing difficulties can usually be eliminated if the grid-No.2 bypass capacitor is replaced by a series-resonant circuit which is tuned to resonate at the operating frequency. This circuit presents a high impedance to audio frequencies but a very low impedance to its resonant frequency.



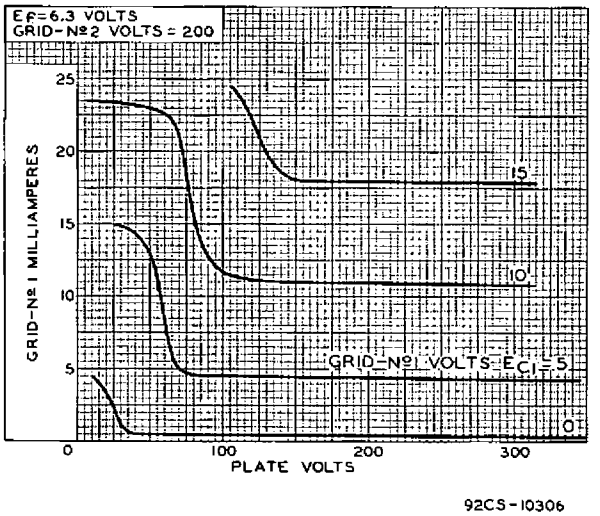
Average Characteristics of Type 7558.



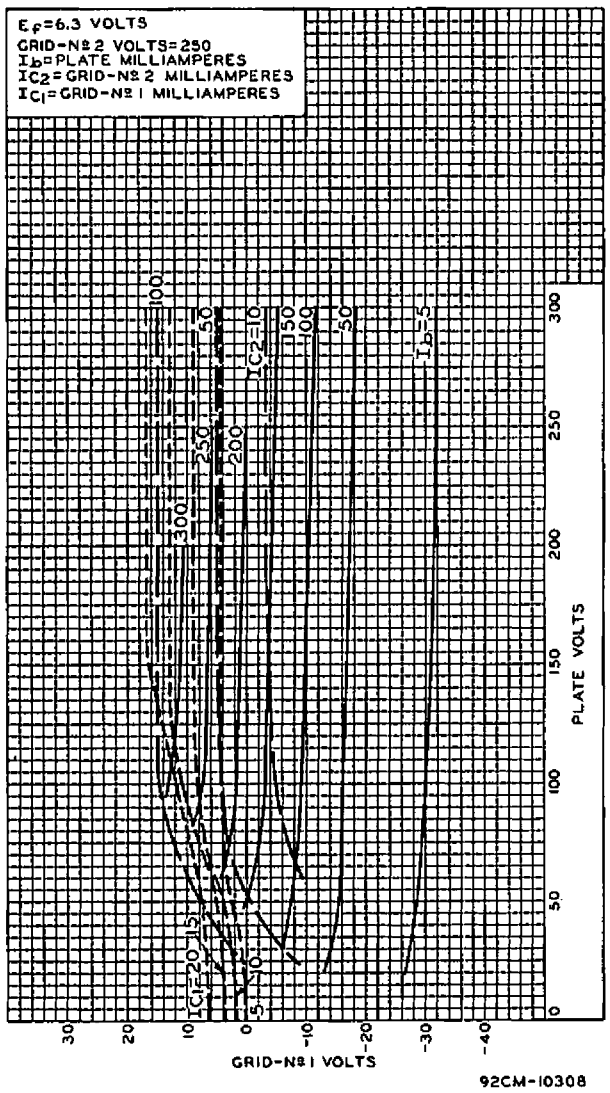
Average Characteristics of Type 7558.



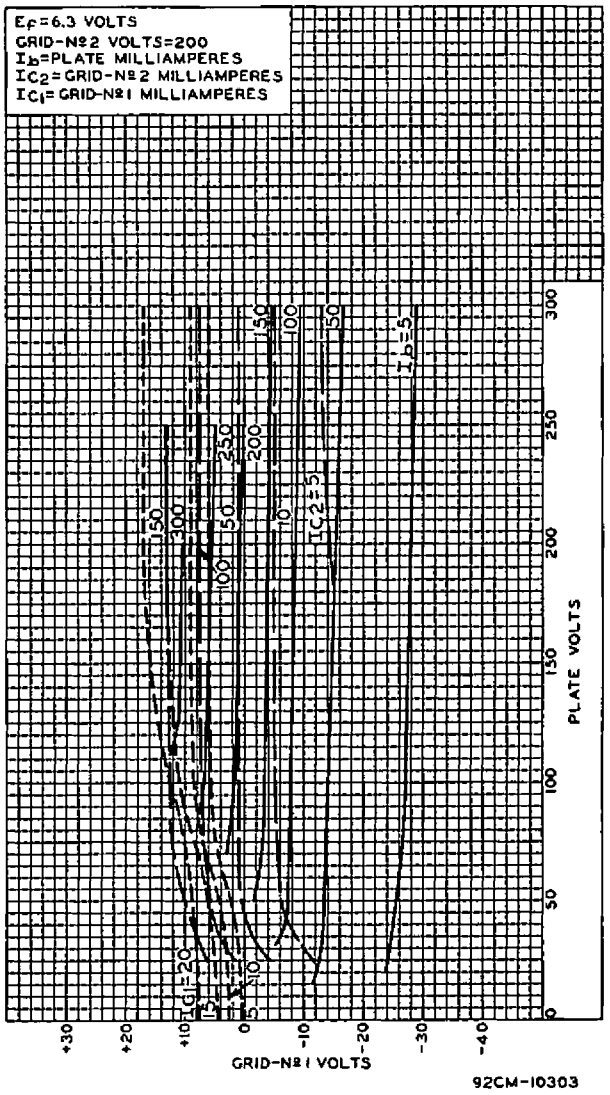
Average Characteristics of Type 7558.



Average Characteristics of Type 7558.

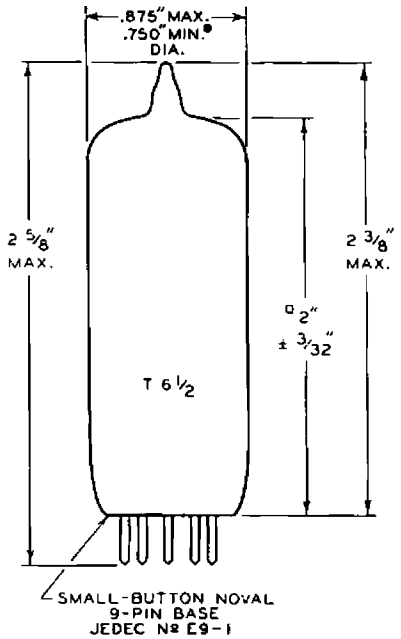


Average Constant-Current Characteristics of Type 7558.



Average Constant-Current Characteristics of Type 7558.

DIMENSIONAL OUTLINE

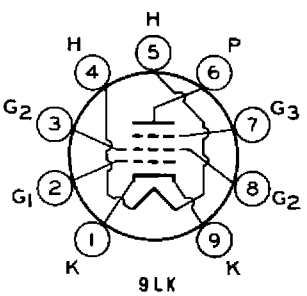


● APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.

□ MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY RING GAUGE OF 7/16" I.D.

SOCKET CONNECTIONS
Bottom View

PIN 1: CATHODE
PIN 2: GRID NO.1
PIN 3: GRID NO.2
PIN 4: HEATER
PIN 5: HEATER



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PIN 6: PLATE
PIN 7: GRID NO.3
PIN 8: GRID NO.2
PIN 9: CATHODE