Electronic TUBES

5751
TWIN TRIODE
Five-Star Tube
★ ★ ★ ★ ★

FOR GENERAL-PURPOSE VOLTAGE-AMPLIFIER APPLICATIONS

HIGH-MU
9-PIN MINIATURE
SHOCK, VIBRATION RATINGS
HEATER-CYCLING RATING
SEPARATE CATHODES

DESCRIPTION AND RATING

The 5751 is a miniature high-mu twin triode each section of which has an individual cathode connection. The tube is especially suited for use in resistance-coupled voltage amplifiers, phase inverters, multivibrators, and numerous industrial-control circuits where high voltage gain is desired.

The 5751 is a special-quality tube for use in critical industrial and military applications in which operational dependability is of primary importance. Features of the tube include a high degree of mechanical strength and a heater-cathode construction capable of withstanding many-thousand cycles of intermittent operation. When used in on-off control applications, the tube will maintain its emission capabilities after long periods of operation under cutoff conditions.

GENERAL

ELECTRICAL

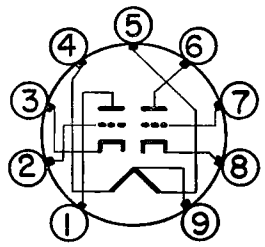
Cathode—Coated Unipotential	Series	Parallel	
Heater Voltage, AC or DC	12.6 ± 10%	6.3 ± 10%	Volts
Heater Current	0.175	0.35	Amperes
Direct Interelectrode Capacitances*			
Grid to Plate, Each Section		1.4	μμf
Input, Each Section		1.4	μμf
Output, Section 1		0.46	μμf
Output, Section 2		0.36	μμf

*Without external shield.

MECHANICAL

Mounting Position—Any
Envelope—T-6½, Glass
Base—E9-1, Small Button 9-Pin

BASING DIAGRAM

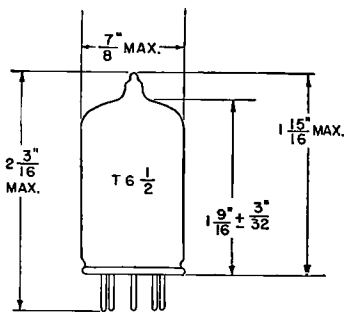


RETMA 9A

TERMINAL CONNECTIONS

Pin 1—Plate (Section 2)
Pin 2—Grid (Section 2)
Pin 3—Cathode (Section 2)
Pin 4—Heater
Pin 5—Heater
Pin 6—Plate (Section 1)
Pin 7—Grid (Section 1)
Pin 8—Cathode (Section 1)
Pin 9—Heater Center Tap

PHYSICAL DIMENSIONS



RETMA 6-2

GENERAL ELECTRIC

Supersedes ET-T1092 dated 8-54

MAXIMUM RATINGS

DESIGN-MAXIMUM VALUES, Each Section†

Plate Voltage	330	Volts
Positive DC Grid Voltage	0	Volts
Negative DC Grid Voltage	55	Volts
Plate Dissipation	0.8	Watts
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	Volts
Heater Negative with Respect to Cathode	100	Volts
Grid Circuit Resistance	0.5	Megohms
Bulb Temperature at Hottest Point	165	C

† Design-Maximum Ratings are the limiting values expressed with respect to bogie tubes at which satisfactory tube life can be expected to occur for the types of service for which the tube is rated. Therefore, the equipment designer must establish the circuit design so that initially and throughout equipment life no design-maximum value is exceeded with a bogie tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, and environmental conditions.

CHARACTERISTICS AND TYPICAL OPERATION

Plate Voltage	250	Volts
Grid Voltage	−3.0	Volts
Amplification Factor	70	
Plate Resistance, approximate	58,000	Ohms
Transconductance	1200	Micromhos
Plate Current	1.0	Milliamperes
Grid Voltage, approximate		
Ib = 10 Microamperes	−5	Volts

CLASS A RESISTANCE-COUPLED AMPLIFIER

EACH SECTION

LOW IMPEDANCE DRIVE (APPROXIMATELY 200 OHMS)

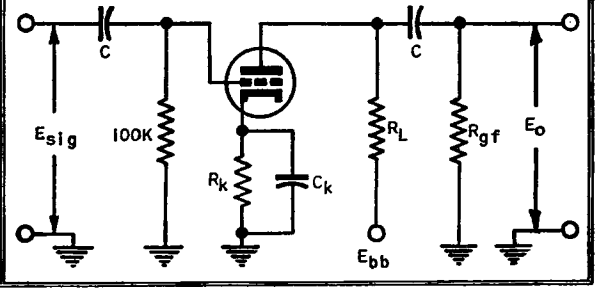
R_L	R_{gf}	Ebb = 90 Volts			Ebb = 180 Volts			Ebb = 300 Volts		
		R_k	E_o	Gain	R_k	E_o	Gain	R_k	E_o	Gain
0.10	0.10	1800	4.7	28	1100	15	35	960	31	36
0.10	0.24	2000	6.9	34	1500	21	40	1200	43	43
0.24	0.24	3800	6.5	36	2300	18	45	1900	38	47
0.24	0.51	4300	8.5	40	2700	24	47	2300	47	50
0.51	0.51	7400	7.2	40	4800	20	48	3700	38	51
0.51	1.0	8400	9.3	44	5600	25	50	4500	49	53

HIGH IMPEDANCE DRIVE (APPROXIMATELY 100K OHMS)

R_L	R_{gf}	Ebb = 90 Volts			Ebb = 180 Volts			Ebb = 300 Volts		
		R_k	E_o	Gain	R_k	E_o	Gain	R_k	E_o	Gain
0.10	0.10	2700	7.4	26	1600	18	33	1200	34	36
0.10	0.24	3100	9.7	31	1900	25	39	1500	47	42
0.24	0.24	5300	9.7	35	3200	24	43	2500	43	46
0.24	0.51	6100	12	38	3700	30	46	3000	54	49
0.51	0.51	10000	11	38	6000	26	46	4600	47	50
0.51	1.0	11000	13	42	6900	31	49	5400	59	53

Notes:

1. E_o is maximum RMS voltage output for approximately five percent total harmonic distortion.
2. Gain is measured for an output voltage of two volts RMS.
3. R_k is in ohms; R_L and R_{gf} are in megohms.
4. Coupling capacitors (C) should be selected to give desired frequency response. R_k should be adequately by-passed.



CHARACTERISTICS LIMITS

		Minimum	Maximum	
Heater Current				
Ef = 12.6 volts	Initial	160	190	Milliamperes
	500-Hr	160	190	Milliamperes
	1000-Hr	160	190	Milliamperes
Plate Current, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −3.0 volts	Initial	0.4	1.8	Milliamperes
Plate Current Difference between Sections				
Difference between plate currents for each section at Ef = 12.6 volts, Eb = 250 volts, Ec = −3.0 volts	Initial	...	0.6	Milliamperes
Transconductance (1), Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −3.0 volts	Initial	900	1600	Micromhos
Transconductance Change with Heater Voltage, Each Section				
Difference between Transconductance (1) and Transconductance at Ef = 11.4 volts (other conditions the same) expressed as a percentage of Transconductance (1)	Initial	...	15	Percent
Amplification Factor, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −3.0 volts	Initial	55	85	
Plate Current Cutoff, Each Section				
Ef = 12.6 volts, Ebb = 250 volts, Ec = −10.5 volts, R_L = 0.1 meg	Initial	...	10	Microamperes
AC Amplification, Each Section				
RMS Output Voltage from Fixed Input Signal				
Ef = 12.6 volts, Ebb = 100 volts, Ecc = 0 volts, R_L = 0.5 meg, Rg = 10 meg, Esig = 0.2 volts, RMS	Initial	7.5	...	Volts
AC Amplification Change with Operation, Each Section				
Difference between AC Amplification initially and after operation expressed as a percentage of initial value	500-Hr	...	15	Percent
	1000-Hr	...	20	Percent
Average AC Amplification Change with Operation, Each Section				
Average of values for "AC Amplification Change with Operation"	500-Hr	...	10	Percent
Interelectrode Capacitances				
Grid to Plate (g to p), Each Section	Initial	1.1	1.7	μμf
Input (g to k+h), Each Section	Initial	1.1	1.7	μμf
Output (p to k+h), Section 1	Initial	0.23	0.69	μμf
Output (p to k+h), Section 2	Initial	0.19	0.53	μμf
Measured without external shield.				
Negative Grid Current, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ecc = −3.0 volts, Rg = 0.5 meg	Initial	...	0.4	Microamperes
	500-Hr	...	0.4	Microamperes
	1000-Hr	...	0.4	Microamperes
Heater-Cathode Leakage Current				
Ef = 12.6 volts, Ehk = 100 volts				
Heater Positive with Respect to Cathode	Initial	...	7	Microamperes
	500-Hr	...	7	Microamperes
	1000-Hr	...	7	Microamperes
Heater Negative with Respect to Cathode	Initial	...	7	Microamperes
	500-Hr	...	7	Microamperes
	1000-Hr	...	7	Microamperes

CHARACTERISTICS LIMITS CONTINUED ON PAGE 4

CHARACTERISTICS LIMITS (Continued)

		Minimum	Maximum	
Interelectrode Leakage Resistance				
Ef = 12.6 volts, Polarity of applied d-c interelectrode voltage is such that no cathode emission results.				
Grid, Each Section, to All at 100 Volts DC	Initial	500	...	Megohms
	500-Hr	250	...	Megohms
Plate, Each Section, to All at 300 Volts DC	Initial	500	...	Megohms
	500-Hr	250	...	Megohms
Vibrational Noise Output Voltage, RMS				
Ef = 12.6 volts, Ebb = 250 volts, Ec = −3.0 volts, R_L = 2000 ohms, Vibrational acceleration = 2.5 G at 25 cps, Sections in parallel	Initial	...	100	Millivolts
Grid Emission Current, Each Section				
Ef = 15.0 volts, Eb = 250 volts, Ecc = −12.0 volts, Rg = 0.5 meg	Initial	...	0.6	Microamperes

The indicated 500-hour and 1000-hour values are life-test end points for the following conditions of operation for each section: Ef = 12.6 volts, Eb = 250 volts, Ecc = −2.0 volts, Ehk = 135 volts with heater positive with respect to cathode, and bulb temperature = 165 C minimum. The sections are connected in parallel, and a 0.5 megohm resistor is connected between the grids and grid-bias supply.

SPECIAL TESTS AND RATINGS

Stability Life Test
Statistical sample operated for one hour to evaluate and control initial variations in transconductance.

Survival Rate Life Test
Statistical sample operated for one hundred hours to evaluate and control early-life electrical and mechanical inoperatives.

Heater-Cycling Life Test
Statistical sample operated for 2000 cycles to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.5 volts (parallel-heater connection) cycled for one minute on and one minute off, Eb = Ec = 0 volts, and Ehk = 135 volts with heater positive with respect to cathode.

Shock Rating—600 G
Statistical sample subjected to five impact accelerations of 600 G in each of four different positions. The accelerating forces are applied by the Navy-type, High Impact (flyweight) Shock Machine for Electronic Devices or its equivalent.

Fatigue Rating—2.5 G
Statistical sample subjected to vibrational acceleration of 2.5 G for 32 hours minimum in each of three different positions. The sinusoidal vibration is applied at a fixed frequency between 25 and 60 cycles per second.

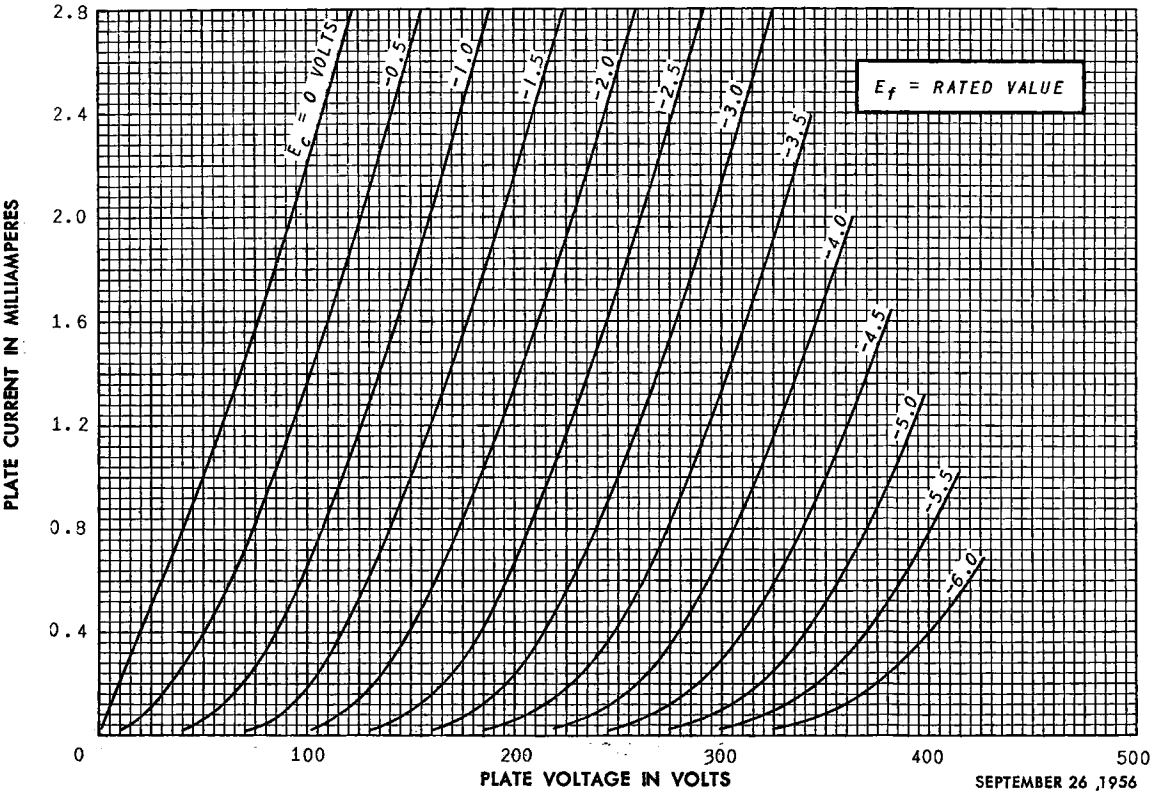
Altitude Rating—60,000 Feet
Statistical sample subjected to pressure of 55 millimeters of mercury to evaluate and control arcing and corona.

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.

In the design of military equipment employing this tube, reference should be made to the appropriate MIL-E-1C specification.

AVERAGE PLATE CHARACTERISTICS

EACH SECTION



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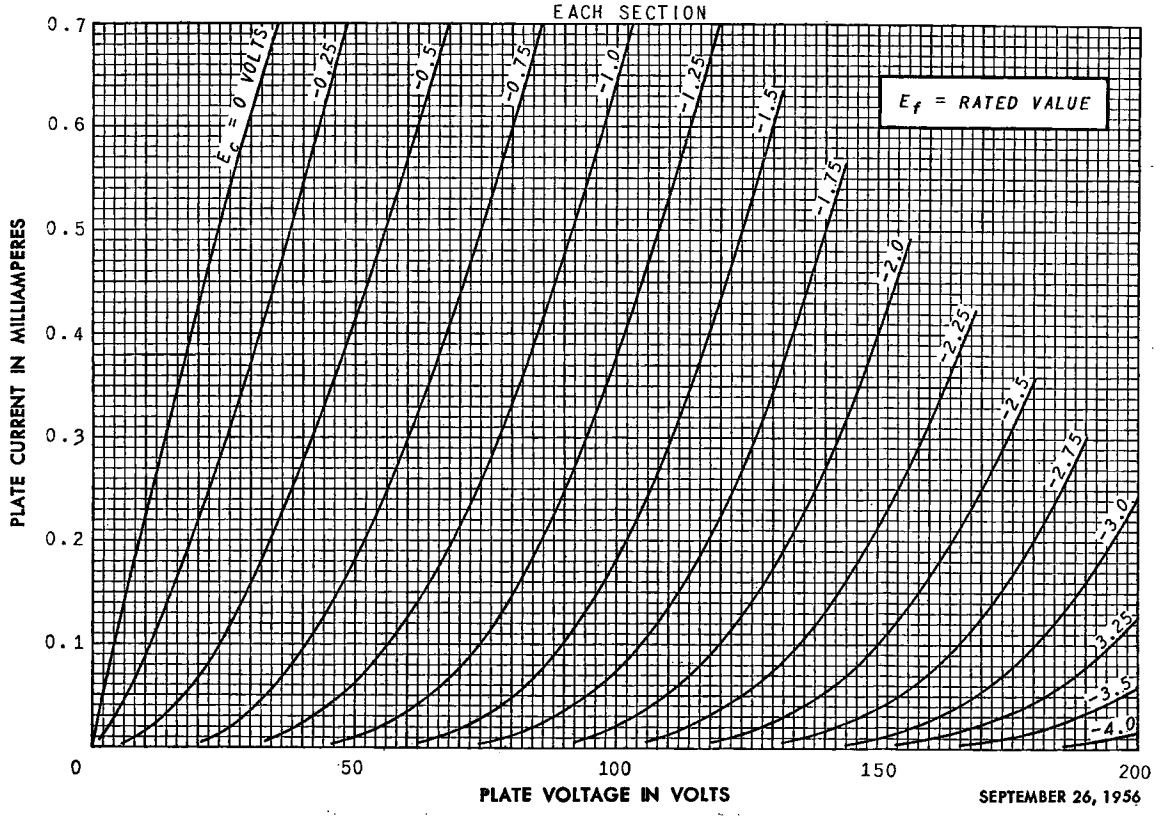
AVERAGE PLATE CHARACTERISTICS

EACH SECTION



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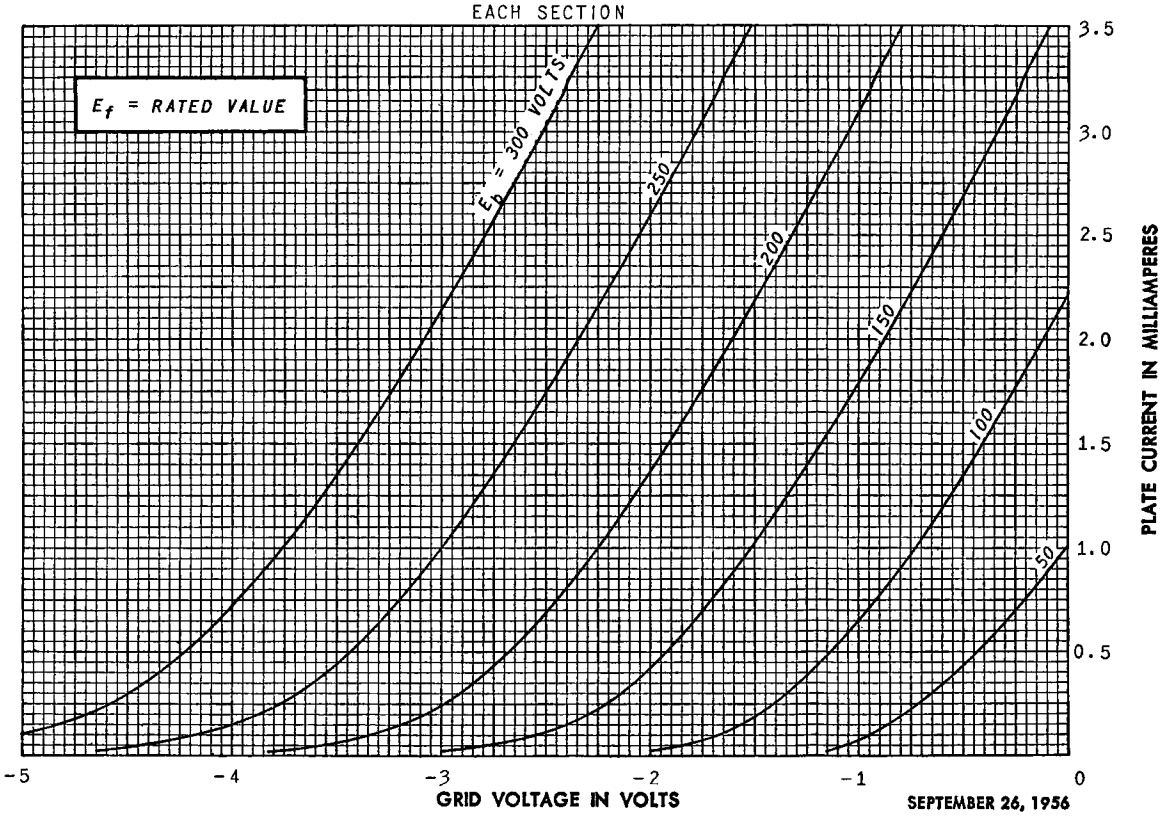
AVERAGE TRANSFER CHARACTERISTICS

EACH SECTION



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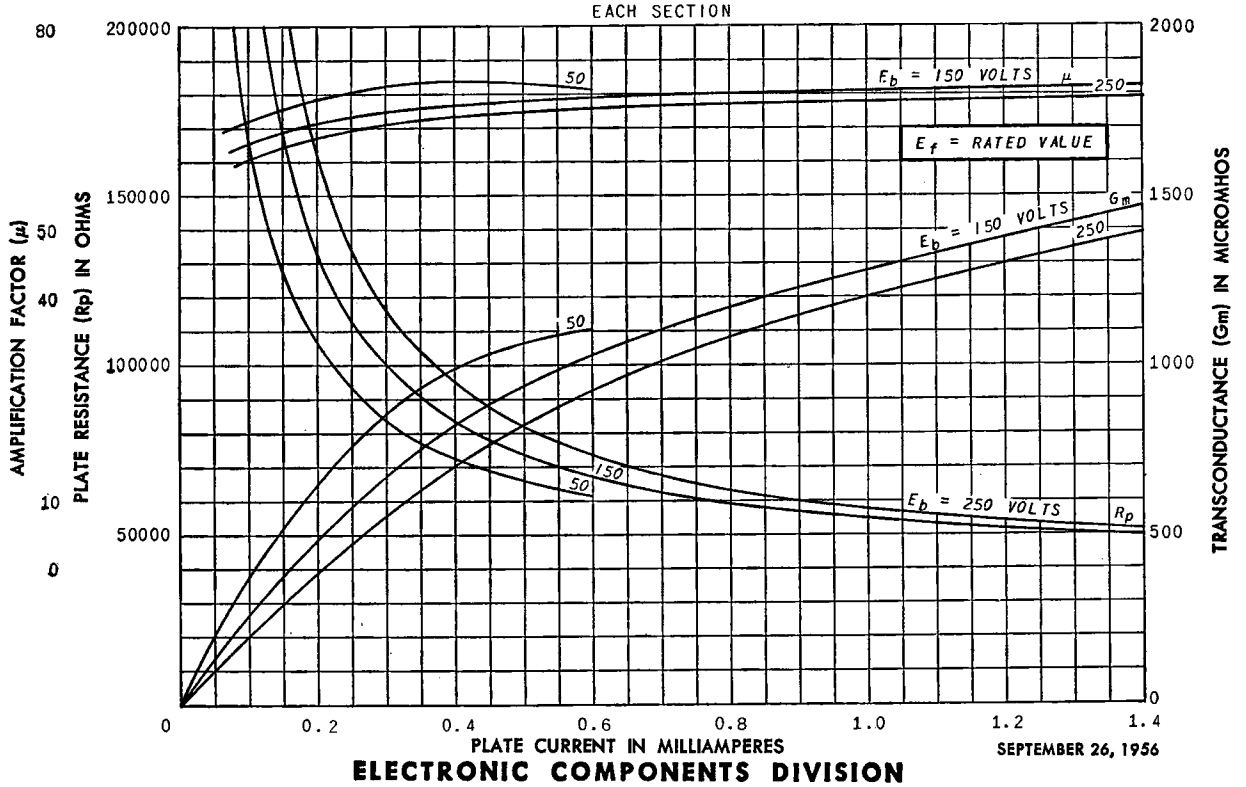
AVERAGE CHARACTERISTICS

EACH SECTION



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ELECTRONIC COMPONENTS DIVISION

GENERAL ELECTRIC

Schenectady 5, N. Y.