Electronic TUBES

5636
PENTODE
Five-Star Tube
★★★★★

FOR GATED-AMPLIFIER AND MIXER APPLICATIONS

8-LEAD SUBMINIATURE
SHARP-CUTOFF CHARACTERISTICS

SHOCK, VIBRATION RATINGS
HEATER-CYCLING RATING

DESCRIPTION AND RATING

The 5636 is a subminiature dual-control pentode in which both grid-number 1 and grid-number 3 can be used as independent control electrodes. It is suitable for service as a gated or gain-controlled amplifier, or as a mixer at frequencies up to approximately 400 megacycles.

Intended for use in critical industrial and military applications in which operational dependability is of primary importance, the 5636 exhibits a high degree of mechanical strength and incorporates 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

Heater Voltage, AC or DC	6.3 ± 5%	Volts
Heater Current	0.15	Amperes

Direct Interelectrode Capacitances

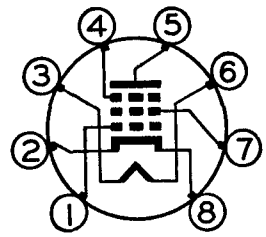
	With Shield*	Without Shield	
Grid-Number 1 to Plate, maximum	0.015	0.030	μμf
Grid-Number 3 to Plate, maximum	1.1	1.1	μμf
Grid-Number 1 to All	4.0	4.0	μμf
Grid-Number 3 to All	4.0	3.8	μμf
Plate to All	3.4	1.9	μμf
Grid-Number 1 to Grid-Number 3, maximum	0.15	0.17	μμf

* With external shield of 0.405-inch inside diameter connected to cathode.

MECHANICAL

Mounting Position—Any
Envelope—T-3, Glass
Base—E8-10, Subminiature

BASING DIAGRAM

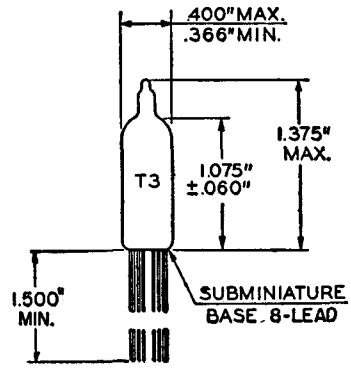


RETMA 8DC

TERMINAL CONNECTIONS

Lead 1—Grid Number 1
Lead 2—Cathode
Lead 3—Heater
Lead 4—Grid Number 3
Lead 5—Plate
Lead 6—Heater
Lead 7—Grid Number 2 (Screen)
Lead 8—Cathode

PHYSICAL DIMENSIONS



RETMA 3-1

GENERAL ELECTRIC

MAXIMUM RATINGS

DESIGN-MAXIMUM VALUES†

Plate Voltage	165	Volts
Screen Voltage	155	Volts
Positive DC Grid-Number 3 Voltage	30	Volts
Negative DC Grid-Number 1 Voltage	55	Volts
Plate Dissipation	0.55	Watts
Screen Dissipation	0.45	Watts
DC Cathode Current	16	Milliamperes
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	Volts
Heater Negative with Respect to Cathode	200	Volts
Bulb Temperature at Hottest Point	220	C
Grid-Number 1 Circuit Resistance	1.1	Megohms

† Design-Maximum Ratings are the limiting values expressed with respect to bogie tubes at which satisfactory tube life can be expected to occur. To obtain satisfactory circuit performance, therefore, the equipment designer must establish the circuit design so that 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

AVERAGE CHARACTERISTICS

Plate Voltage	100	100	Volts
Screen Voltage	100	100	Volts
Grid-Number 3 Voltage	−1	‡	Volts
Cathode-Bias Resistor	150	150	Ohms
Plate Resistance, approximate	....	0.11	Megohms
Grid-Number 1 Transconductance	....	3200	Micromhos
Grid-Number 3 Transconductance	950	....	Micromhos
Plate Current	....	5.3	Milliamperes
Screen Current	....	3.6	Milliamperes
Grid-Number 1 Voltage, approximate Ib = 10 Microamperes	....	−7.5	Volts
Grid-Number 3 Voltage, approximate Ib = 10 Microamperes	−8	....	Volts

‡ Grid-Number 3 connected to cathode at socket.

CHARACTERISTICS LIMITS

		Minimum	Maximum	
Heater Current				
Ef = 6.3 volts	Initial	140	160	Milliamperes
	500-Hr	138	164	Milliamperes
Plate Current				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed), g3 tied to k	Initial	3.7	6.9	Milliamperes
Screen Current				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed), g3 tied to k	Initial	2.8	5.4	Milliamperes
Grid-Number 1 Transconductance (1)				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed), g3 tied to k	Initial	2700	4000	Micromhos
Transconductance Change with Heater Voltage				
Difference between Grid-Number 1 Transconductance (1) and Grid-Number 1 Transconductance at Ef = 5.7 volts (other conditions the same) expressed as a percentage of Grid-Number 1 Transconductance (1)	Initial	....	15	Percent
	500-Hr	....	15	Percent
Transconductance Change with Operation				
Difference between Grid-Number 1 Transconductance (1) initially and after operation expressed as a percentage of initial value	500-Hr	....	20	Percent
Average Transconductance Change with Operation				
Average of Values for "Transconductance Change with Operation"	500-Hr	....	15	Percent
Grid-Number 3 Transconductance				
Ef = 6.3 volts, Eb = 100 volts, Ec3 = −1.0 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed)	Initial	500	1800	Micromhos
Plate Current Cutoff (1)				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Ec1 = −7.5 volts, g3 tied to k	Initial	....	100	Microamperes
Plate Current Cutoff (2)				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Ec1 = −4.5 volts, g3 tied to k	Initial	50	....	Microamperes
Plate Current Cutoff (3)				
Ef = 6.3 volts, Eb = 100 volts, Ec3 = −8.0 volts, Ec2 = 100 volts, Rk = 150 ohms	Initial	....	100	Microamperes
Plate Current Cutoff (4)				
Ef = 6.3 volts, Eb = 100 volts, Ec3 = −6.0 volts, Ec2 = 100 volts, Ec1 = −3.0 volts	Initial	5.0	....	Microamperes
Plate Current Cutoff (5)				
Ef = 6.3 volts, Eb = 100 volts, Ec3 = −15 volts, Ec2 = 100 volts, Ec1 = −2.0 volts	Initial	....	20	Microamperes

CHARACTERISTICS LIMITS CONTINUED ON PAGE 4

CHARACTERISTICS LIMITS (Cont'd)

		Minimum	Maximum	
Interelectrode Capacitances				
Grid-Number 1 to Plate (g1 to p)	Initial	....	0.015	μμf
Grid-Number 3 to Plate (g3 to p)	Initial	....	1.10	μμf
Grid-Number 1 to All (g1 to h, k, g2, g3, p)	Initial	3.5	4.5	μμf
Grid-Number 3 to All (g3 to h, k, g1, g2, p)	Initial	3.5	4.5	μμf
Output (p to h, k, g1, g2, g3)	Initial	2.9	3.9	μμf
Grid-Number 1 to Grid-Number 3 (g1 to g3)	Initial	....	0.15	μμf
Measured with external shield of 0.405-inch inside diameter connected to cathode.				
Negative Grid-Number 1 Current				
Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed), Rg1 = 1.0 meg, g3 tied to k	Initial	0	0.3	Microamperes
	500-Hr	0	0.9	Microamperes
Heater-Cathode Leakage Current				
Ef = 6.3 volts, Ehk = 100 volts				
Heater Positive with Respect to Cathode	Initial	0	5	Microamperes
	500-Hr	0	10	Microamperes
Heater Negative with Respect to Cathode	Initial	0	5	Microamperes
	500-Hr	0	10	Microamperes
Interelectrode Leakage Resistance				
Ef = 6.3 volts. Polarity of applied d-c interelectrode voltage is such that no cathode emission results.				
Grid-Number 1 to All at 100 Volts DC	Initial	100	....	Megohms
	500-Hr	50	....	Megohms
Plate to All at 300 Volts DC	Initial	100	....	Megohms
	500-Hr	50	....	Megohms
Vibrational Noise Output Voltage, RMS				
Ef = 6.3 volts, Ebb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms (by-passed), R_L = 10,000 ohms, g3 tied to k, vibrational acceleration = 15 G at 40 cps	Initial	....	60	Millivolts
Grid-Number 1 Emission Current				
Ef = 7.5 volts, Eb = 100 volts, Ec2 = 100 volts, Ec1 = −7.5 volts, Rg1 = 1.0 meg, g3 tied to k	Initial	0	0.5	Microamperes

The indicated 500-hour values are life-test end points for the following conditions of operation: Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 150 ohms, Rg1 = 1.0 meg, g3 tied to k, Ehk = 200 volts with heater positive with respect to cathode, and bulb temperature = 220 C minimum.

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 = 7.0 volts cycled for one minute on and four minutes off, Eb = Ec3 = Ec2 = Ec1 = 0 volts, and Ehk = 140 volts RMS.

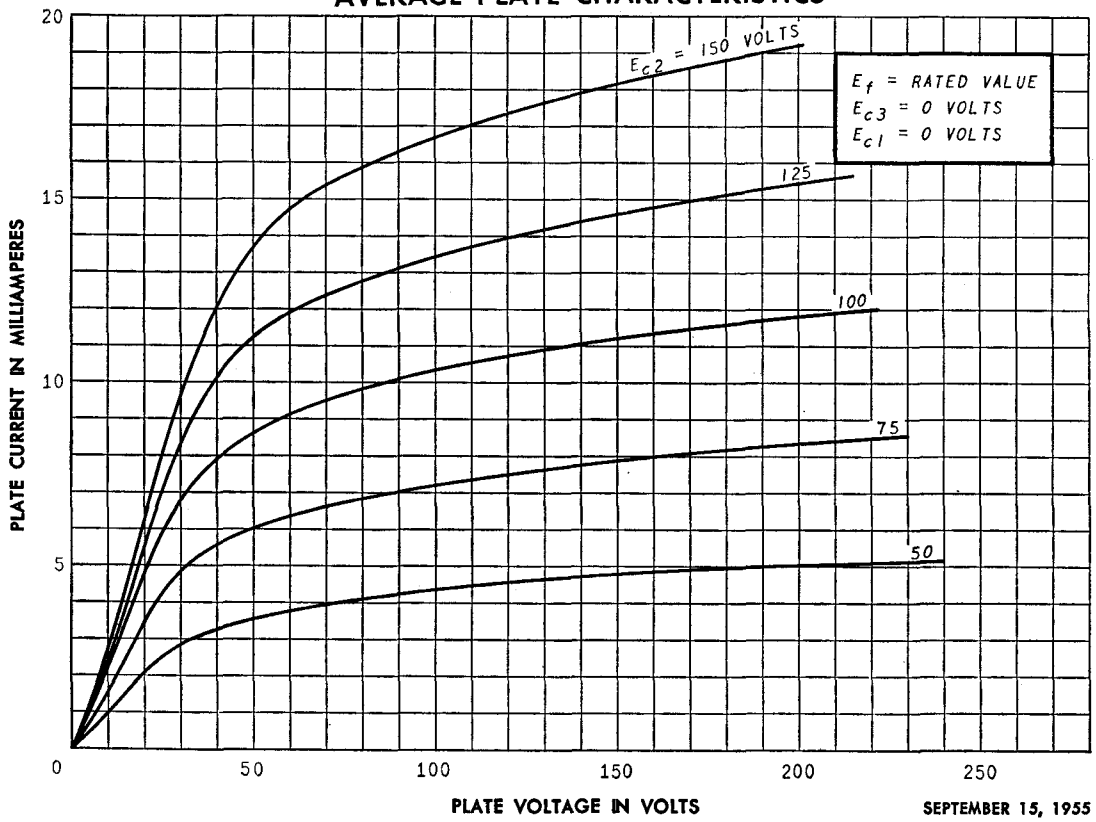
Shock Rating—450 G
Statistical sample subjected to five impact accelerations of 450 G in each of four different positions. The accelerating forces are applied by the Navy-type, High Impact (flyweight) Shock Machine for Electronic Devices or its equivalent.

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-1B specification.

AVERAGE PLATE CHARACTERISTICS



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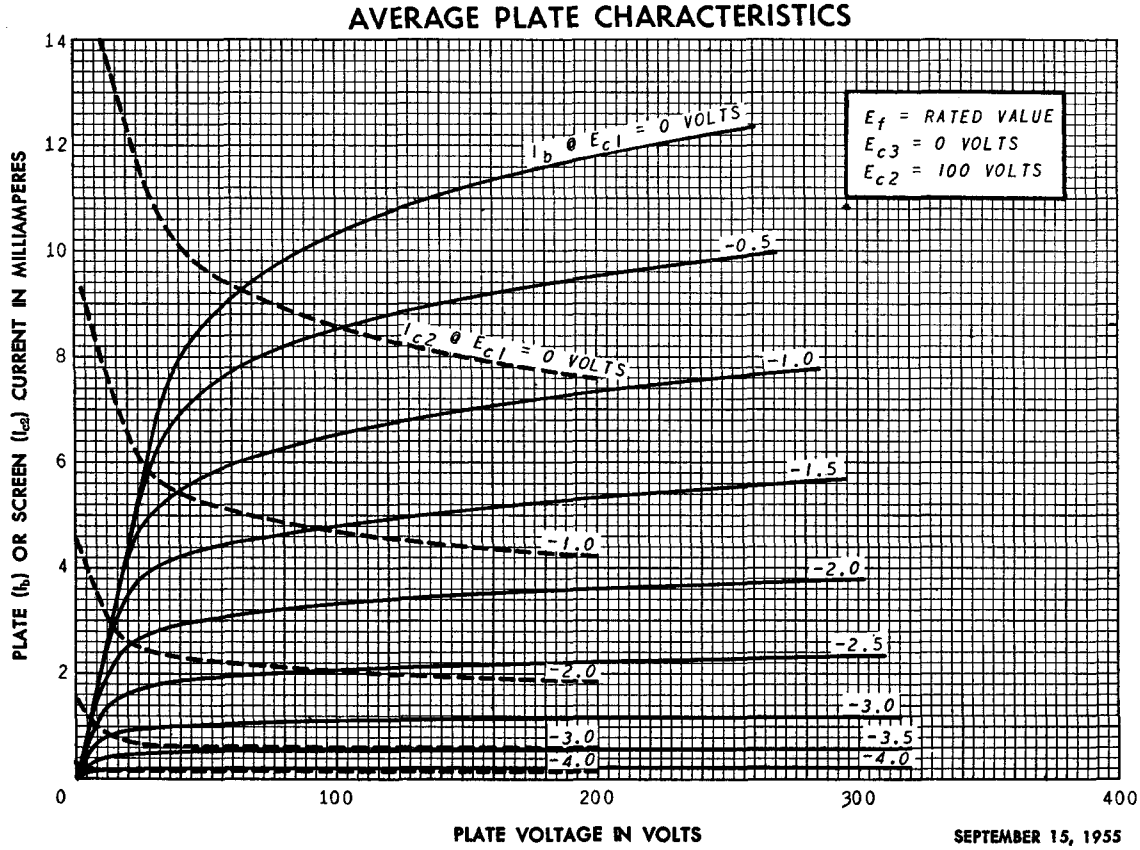

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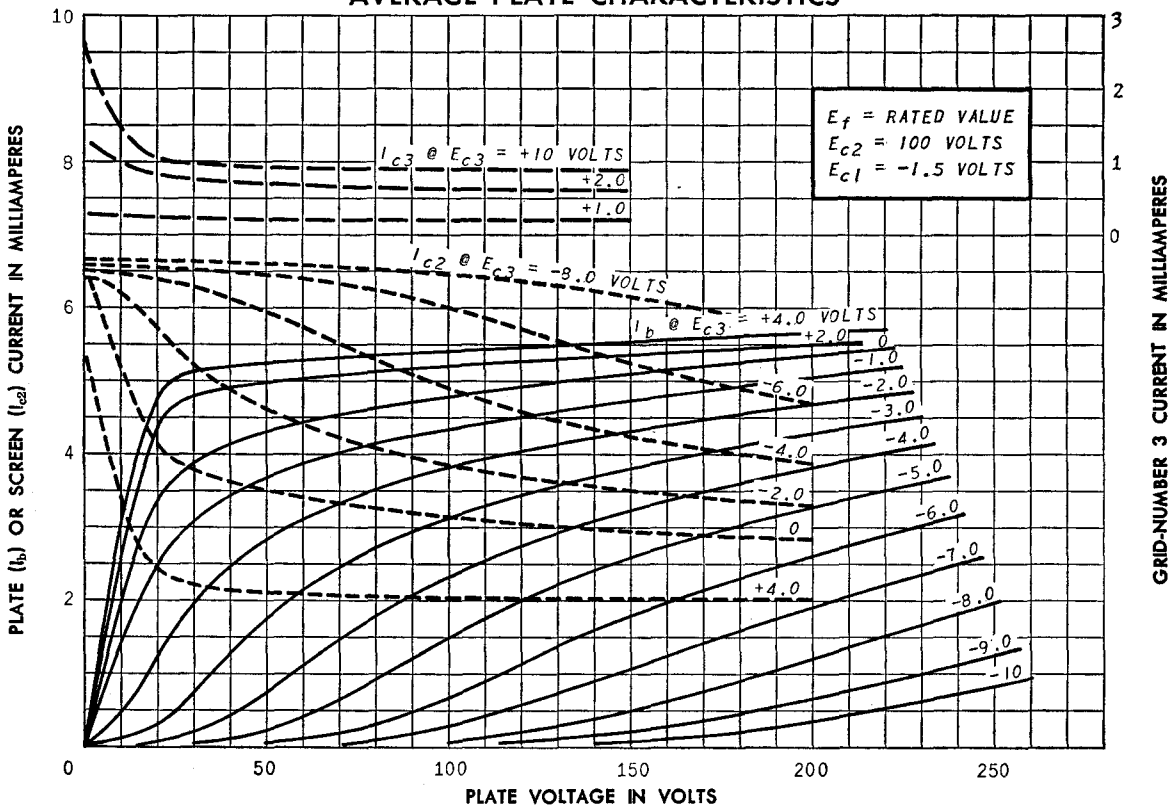

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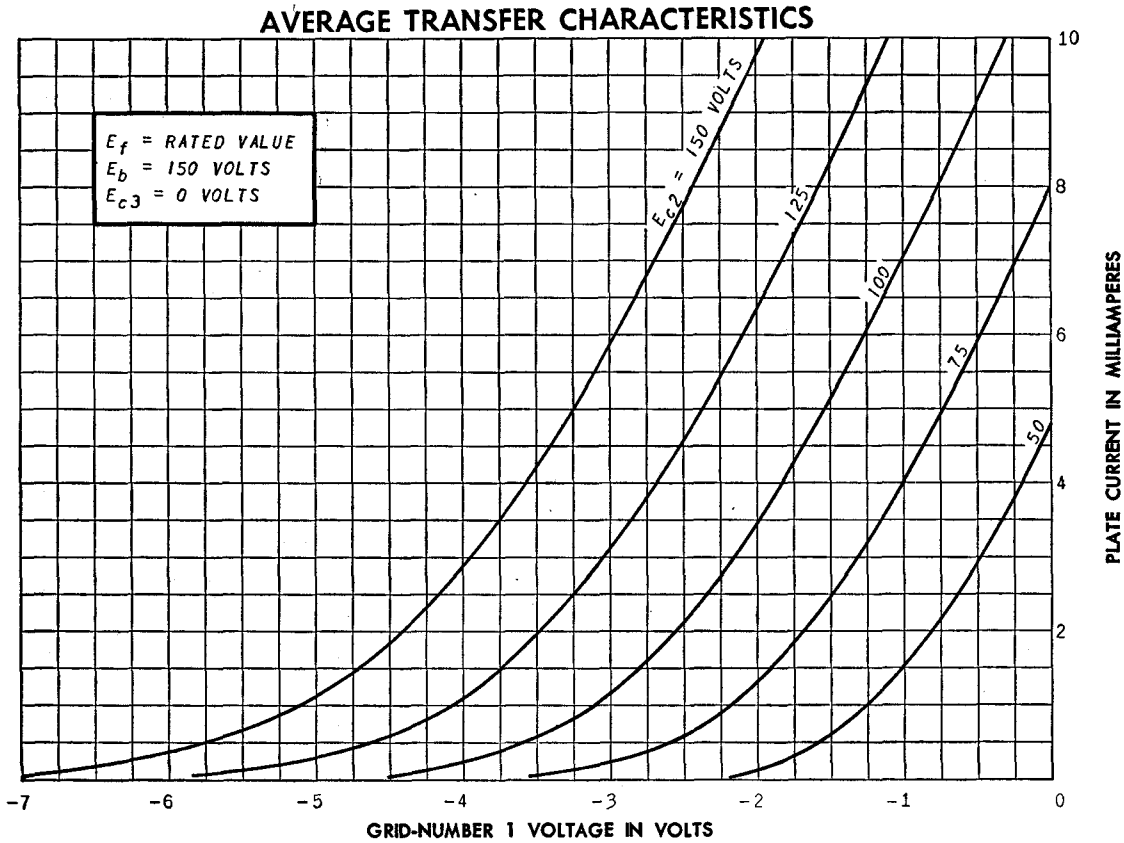
AVERAGE TRANSFER CHARACTERISTICS



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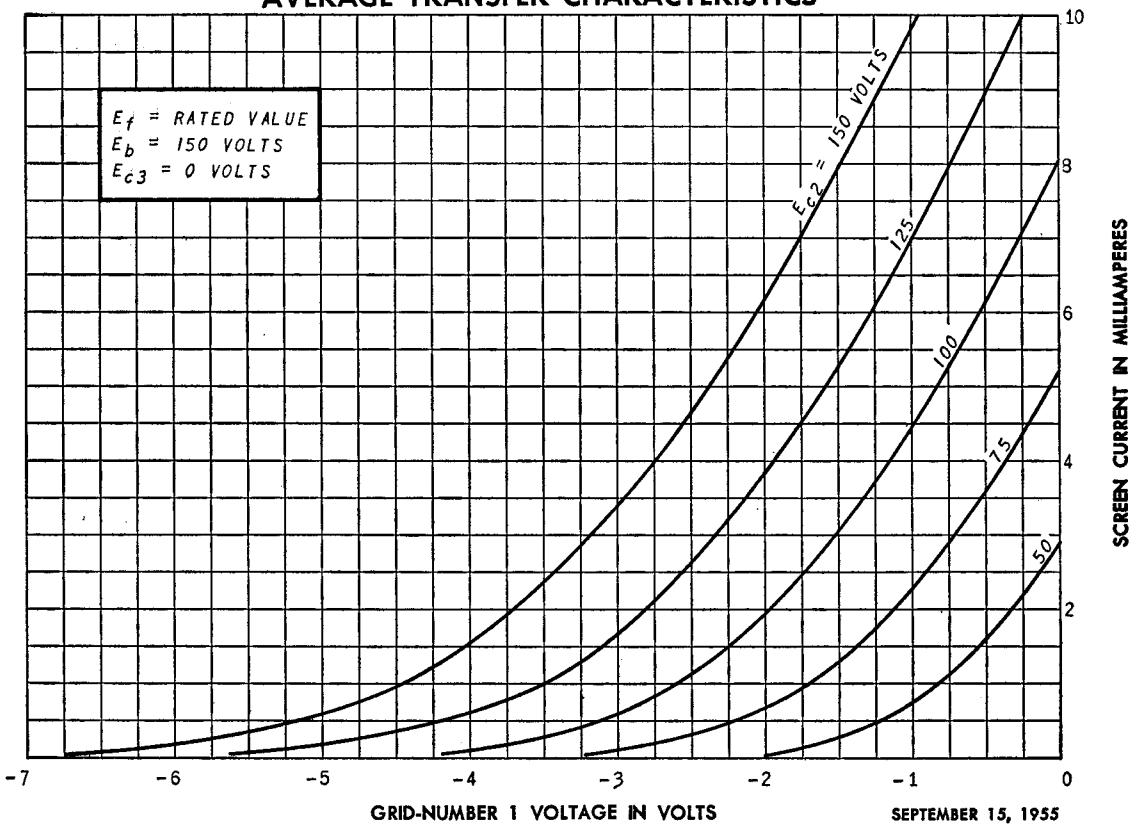

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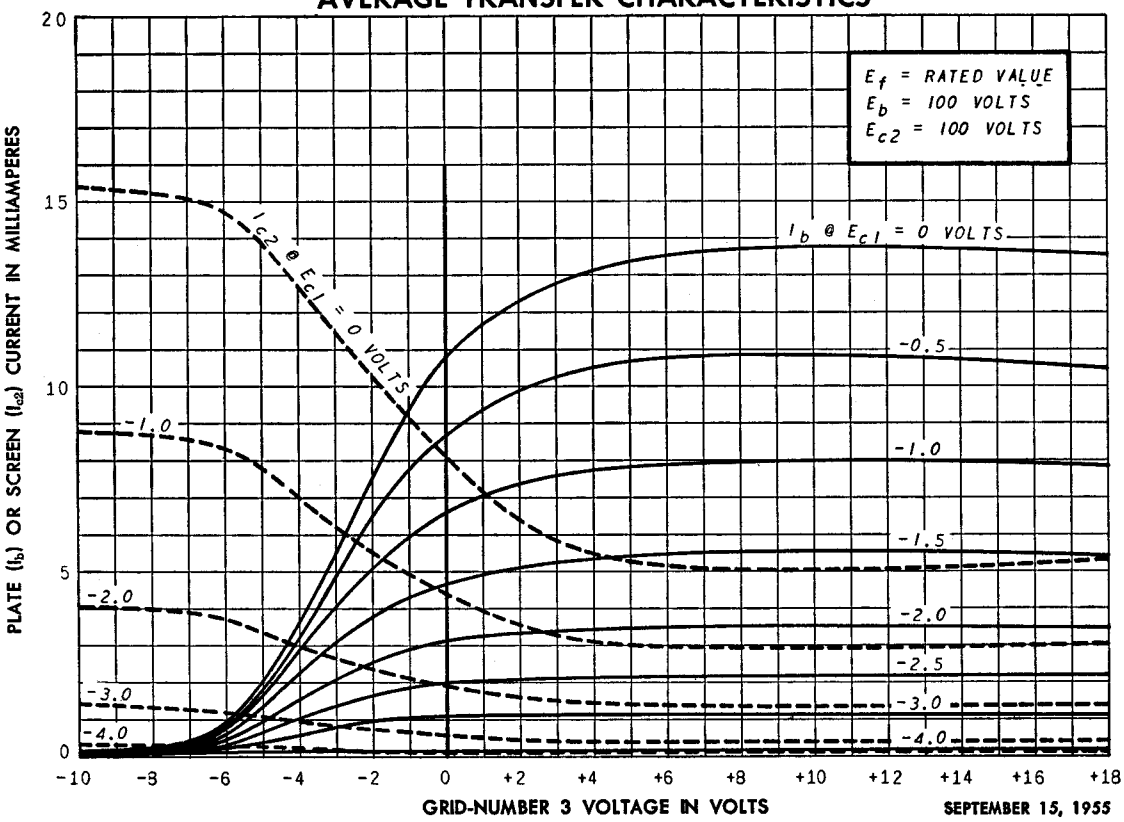

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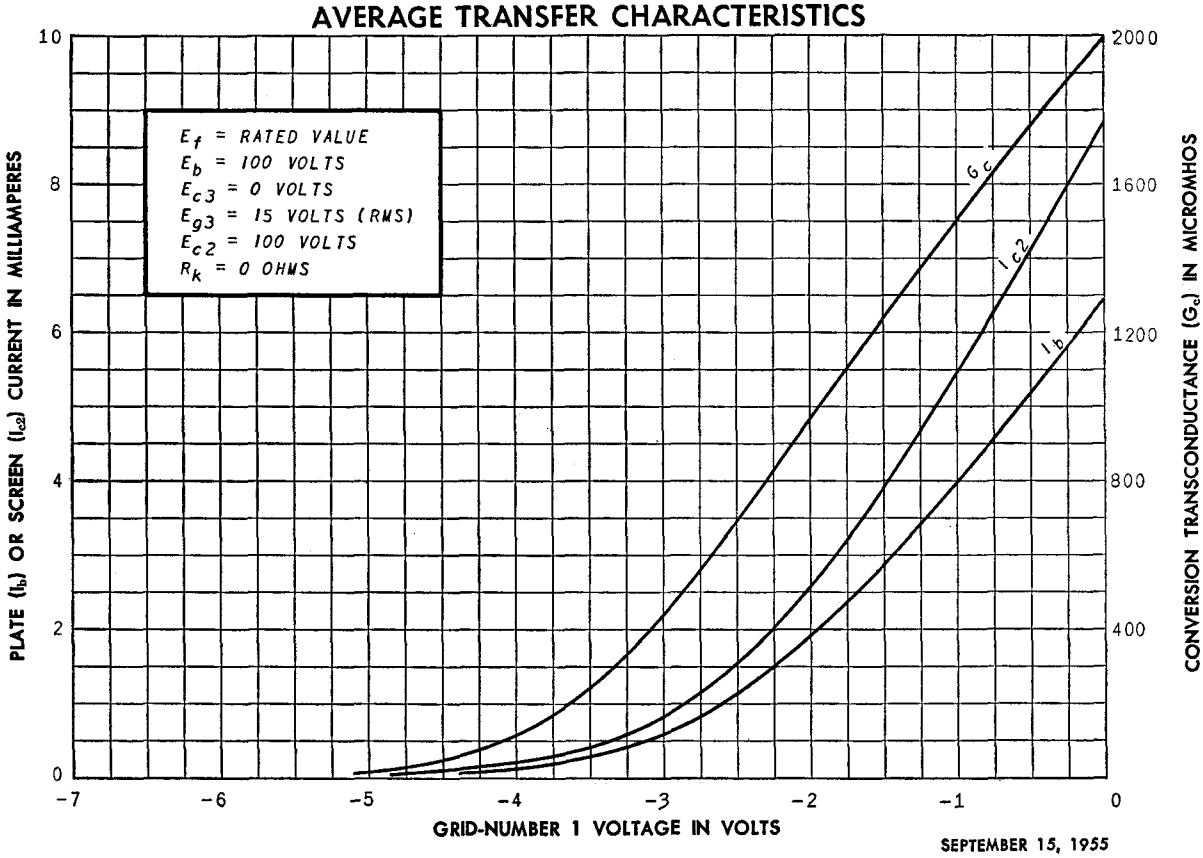

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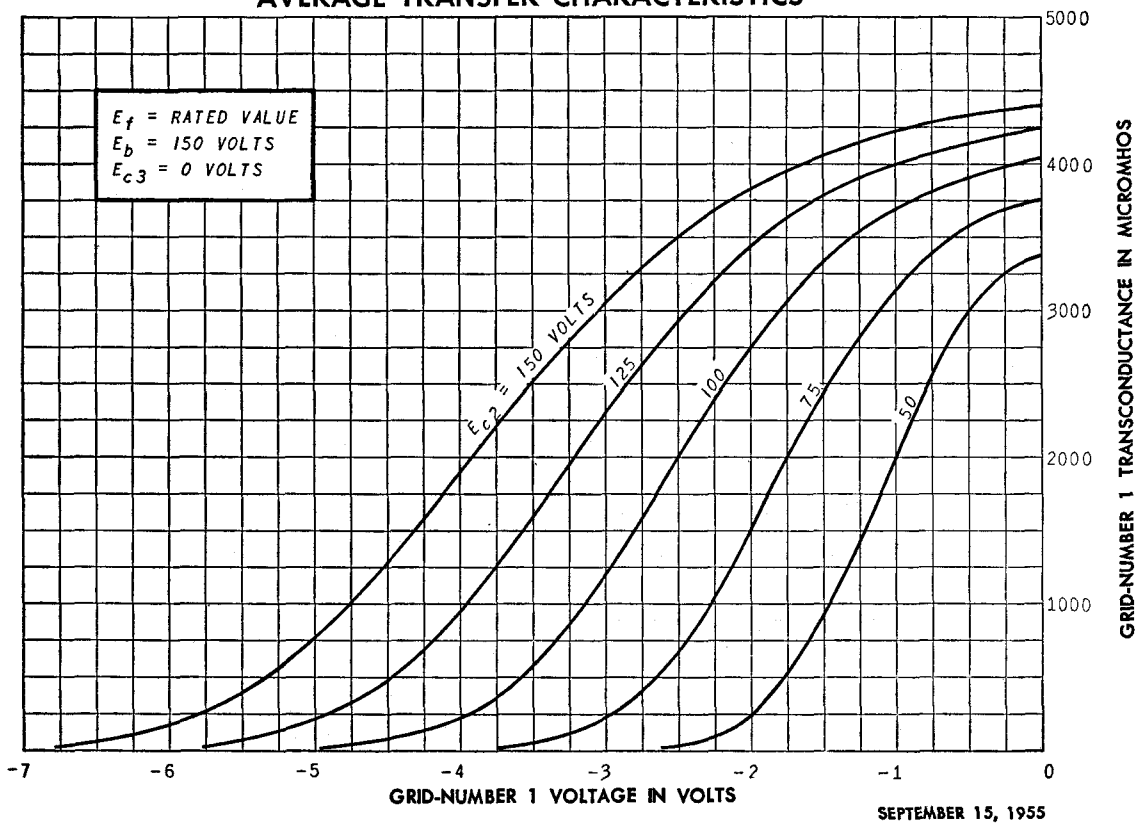

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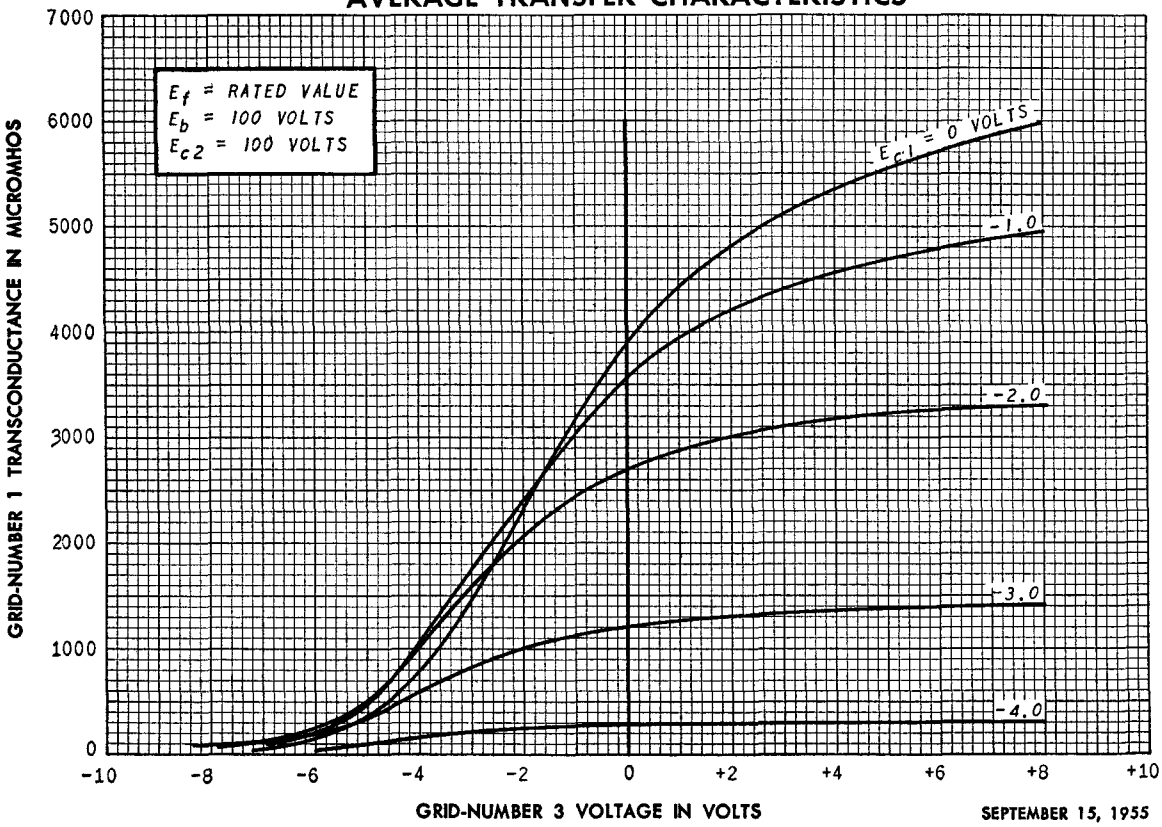

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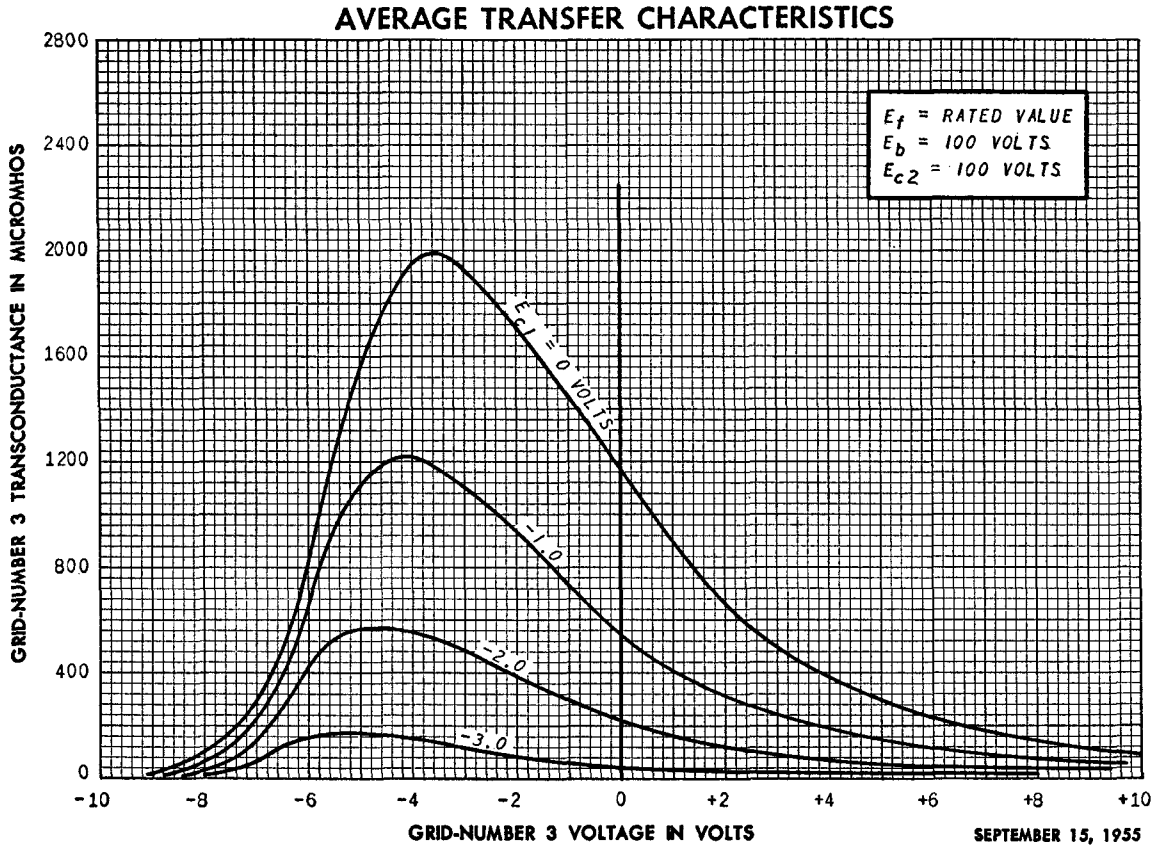

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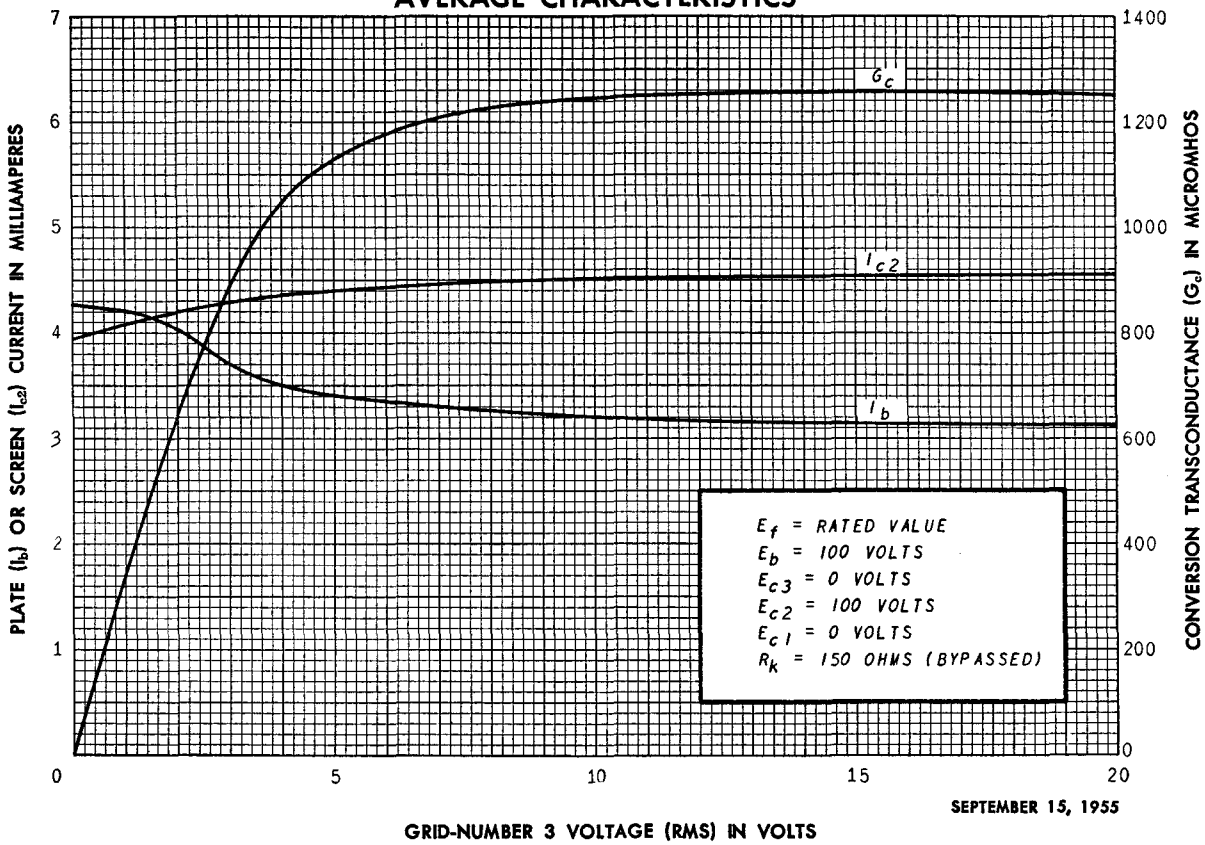

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