ELECTRONICS

5749

PENTODE

Five-Star Tube

★★★★★

FOR RF AND IF AMPLIFIER APPLICATIONS

REMOTE-CUTOFF CHARACTERISTIC
7-PIN MINIATURE
SHOCK, VIBRATION RATINGS
HEATER-CYCLING RATING
HIGH TRANSCONDUCTANCE

DESCRIPTION AND RATING

The 5749 is a miniature remote-cutoff pentode intended for use as a high-gain radio-frequency or intermediate-frequency amplifier. Its remote-cutoff characteristic makes it especially suitable for use in circuits to which it is desired to apply automatic-gain-control. Features include low grid-plate capacitance and relatively high transconductance.

The 5749 is a special-quality tube intended 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

Heater Characteristics and Ratings

Heater Voltage, AC or DC* . . .	6.3±0.6	Volts
Heater Current‡.	0.3	Amperes

Direct Interelectrode Capacitances

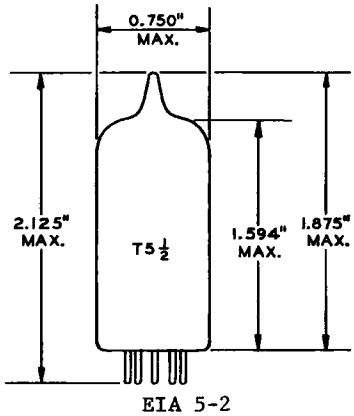
	With Shield§	Without Shield	
Grid-Number 1 to Plate: (g1 to p), maximum. .	0.0035	0.0035	pf
Input: g1 to (h + k + g2 + g3 + i.s.)	5.5	5.5	pf
Output: p to (h + k + g2 + g3 + i.s.)	5.5	5.0	pf

MECHANICAL

Operating Position - Any
Envelope - T-5 1/2, Glass
Base - E7-1, Miniature Button 7-Pin
Outline Drawing - EIA 5-2

Maximum Diameter	0.750	Inches
Maximum Over-all Length . . .	2.125	Inches
Maximum Seated Height. . . .	1.875	Inches

PHYSICAL DIMENSIONS

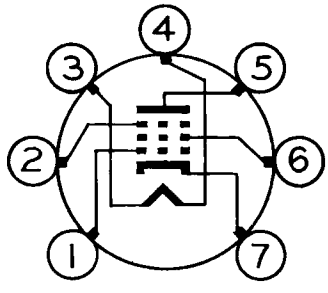


EIA 5-2

TERMINAL CONNECTIONS

Pin 1 - Grid Number 1
Pin 2 - Grid Number 3 (Suppressor) and Internal Shield
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid Number 2 (Screen)
Pin 7 - Cathode

BASING DIAGRAM



EIA 7BK

GENERAL ELECTRIC

Supersedes ET-T1090 dated 8-54

MAXIMUM RATINGS

ABSOLUTE-MAXIMUM VALUES

Plate Voltage	300	Volts
Screen-Supply Voltage	300	Volts
Screen Voltage - See Screen Rating Chart		
Positive DC Grid-Number 1 Voltage	0	Volts
Negative DC Grid-Number 1 Voltage	55	Volts
Plate Dissipation	3.3	Watts
Screen Dissipation	0.7	Watts
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	Volts
Heater Negative with Respect to Cathode	100	Volts
Grid-Number 1 Circuit Resistance	1.0	Megohms
Bulb Temperature at Hottest Point	165	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	250	Volts
Suppressor Voltage	0	Volts
Screen Voltage	100	Volts
Cathode-Bias Resistor	68	Ohms
Plate Resistance, approximate	1.0	Megohms
Transconductance	4400	Micromhos
Plate Current	11	Milliamperes
Screen Current	4.2	Milliamperes
Grid-Number 1 Voltage, approximate		
Gm = 40 Micromhos	-20	Volts

NOTES

* 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.

§ With external shield (EIA 316) connected to pin 7.

CHARACTERISTICS LIMITS

		Minimum	Bogey	Maximum	
Heater Current					
Ef = 6.3 volts	Initial	275	300	325	Milliamperes
	500-Hr	275	---	330	Milliamperes
	1000-Hr	275	---	333	Milliamperes
Plate Current					
Ef = 6.3 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Rk = 68 ohms.	Initial	8.5	11	13.5	Milliamperes
Screen Current					
Ef = 6.3 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Rk = 68 ohms.	Initial	---	4.2	5.6	Milliamperes
Transconductance					
Ef = 6.3 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Rk = 68 ohms (bypassed)	Initial	3600	4400	5200	Micromhos
Transconductance Change with Heater Voltage					
Difference between transconductance measured at Ef = 6.3 volts and transconductance at Ef = 5.7 volts (other conditions the same) expressed as a percentage of transconductance at Ef = 6.3 volts	Initial	---	---	15	Percent
	500-Hr	---	---	15	Percent
	1000-Hr	---	---	20	Percent
Transconductance Change with Operation					
Difference between transconductance measured initially and after operation expressed as a percentage of the initial value	500-Hr	---	---	20	Percent
	1000-Hr	---	---	25	Percent
Average Transconductance Change with Operation					
Average of values for "Transconductance Change with Operation"	500-Hr	---	---	15	Percent
Transconductance Cutoff					
Ef = 6.3 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Ec1 = -20 volts	Initial	5	40	100	Micromhos
Interelectrode Capacitances					
Grid-Number 1 to Plate: (g1 to p).	Initial	---	---	0.0035	Picofarads
Input: g1 to (h + k + g2 + g3 + i.s.)	Initial	4.4	5.5	6.6	Picofarads
Output: p to (h + k + g2 + g3 + i.s.)	Initial	3.5	5.0	6.5	Picofarads
Measured without external shield.					
Negative Grid-Number 1 Current					
Ef = 6.3 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 120 volts, Ecc1 = -1.0 volts, Rg1 = 0.25 meg.	Initial	---	---	1.0	Microamperes
	500-Hr	---	---	1.0	Microamperes
	1000-Hr	---	---	1.0	Microamperes
Heater-Cathode Leakage Current					
Ef = 6.3 volts, Ehk = 100 volts					
Heater Positive with Respect to Cathode.	Initial	---	---	10	Microamperes
	500-Hr	---	---	10	Microamperes
	1000-Hr	---	---	20	Microamperes
Heater Negative with Respect to Cathode.	Initial	---	---	10	Microamperes
	500-Hr	---	---	10	Microamperes
	1000-Hr	---	---	20	Microamperes

CHARACTERISTICS LIMITS (Cont'd)

		Minimum	Bogey	Maximum	
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	60	---	---	Megohms
	1000-Hr	50	---	---	Megohms
Plate to All at 300 volts DC	Initial	100	---	---	Megohms
	500-Hr	60	---	---	Megohms
	1000-Hr	50	---	---	Megohms
Grid-Number 1 Emission Current					
Ef = 7.5 volts, Eb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Ecc1 = -25 volts, Rg1 = 1.0 meg.	Initial	---	---	1.0	Microamperes

SPECIAL PERFORMANCE TESTS

Low Frequency Vibrational Output		---	---	300	Millivolts, RMS

Statistical sample is subjected to vibration in each of two planes at 40 cps, with peak acceleration 10G. Tube is operated with Ef = 6.3 volts, Ebb = 250 volts, Ec3 = 0 volts, Ec2 = 100 volts, Rk = 68 ohms (bypassed), R_L = 2000 ohms.

Low Pressure Voltage Breakdown Test

Statistical sample tested for voltage breakdown at a pressure of 21 millimeters Hg, to simulate an altitude of 80000 feet. Tubes shall not give visual evidence of flashover or corona when 500 volts RMS, 60 cps, is applied between the plate pin and adjacent pins.

DEGRADATION RATE TESTS

Fatigue

Statistical sample vibrated for a total of 96 hours, 32 hours in each of 3 planes, at a peak acceleration of 2.5G. Frequency is 25 cps. Tubes are operated during the test with Ef = 6.3 volts (no other voltages applied). Following the test, tubes are evaluated for low-frequency vibrational output, heater-cathode leakage, transconductance, and negative grid-number 1 current.

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, Ec3 = 0 volts, Ec2 = 100 volts, Ehk = +100 volts, Rk = 68 ohms, and Rg1 = 0.1 megohms. Following the test, tubes are evaluated for low-frequency vibrational output, heater-cathode leakage, transconductance, and negative grid-number 1 current.

Stability Life Test

Statistical sample operated under the following conditions: Ef = 6.3 volts (cycled - on 1 3/4 hours, off 1/4 hour), Eb = 300 volts, Ec3 = 0 volts, Ec2 = 150 volts, Rk = 230 ohms, Rg1 = 1.0 megohms, Ehk = 135 volts with heater positive with respect to cathode, and temperature = room temperature. Tubes are evaluated, following 2 hours and 20 hours of life test, for percent change in transconductance of individual tubes.

Survival Rate Life Test

Statistical sample operated under Stability Life Test conditions 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 1 3/4 hours, off 1/4 hour), Eb = 300 volts, Ec3 = 0 volts, Ec2 = 150 volts, Rk = 230 ohms, Rg1 = 1.0 megohms, Ehk = 135 volts with heater positive with respect to cathode and bulb temperature = 165 C minimum. Tubes are evaluated, following 500 and 1000 hours of life test, for shorted or open elements, heater current, transconductance, negative grid-number 1 current, heater-cathode leakage, and interelectrode leakage resistance. Life test end points are given in "Characteristics Limits" section.

DEGRADATION RATE TESTS (Cont'd)

Interface Life Test

Statistical sample operated for 500 hours with Ef = 6.9 volts, no other voltages applied, and evaluated for cathode interface resistance following the life test.

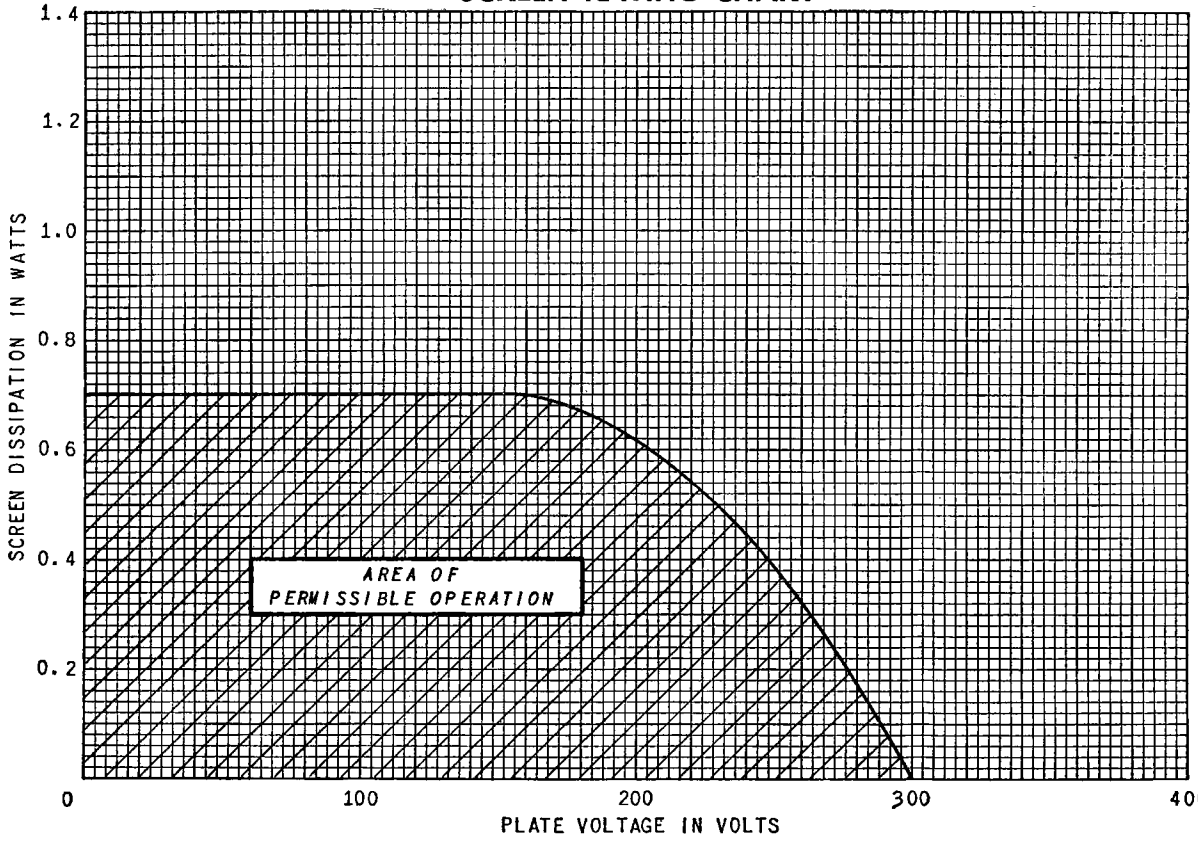
Heater-Cycling Life Test

Statistical sample operated for 2000 cycles minimum to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.5 volts (cycled - on 1 minute, off 1 minute), Eb = Ec3 = Ec2 = Ec1 = 0 volts, and Ehk = +135 volts. Following this test, tubes are evaluated for open heaters, heater-cathode shorts, and heater-cathode leakage current.

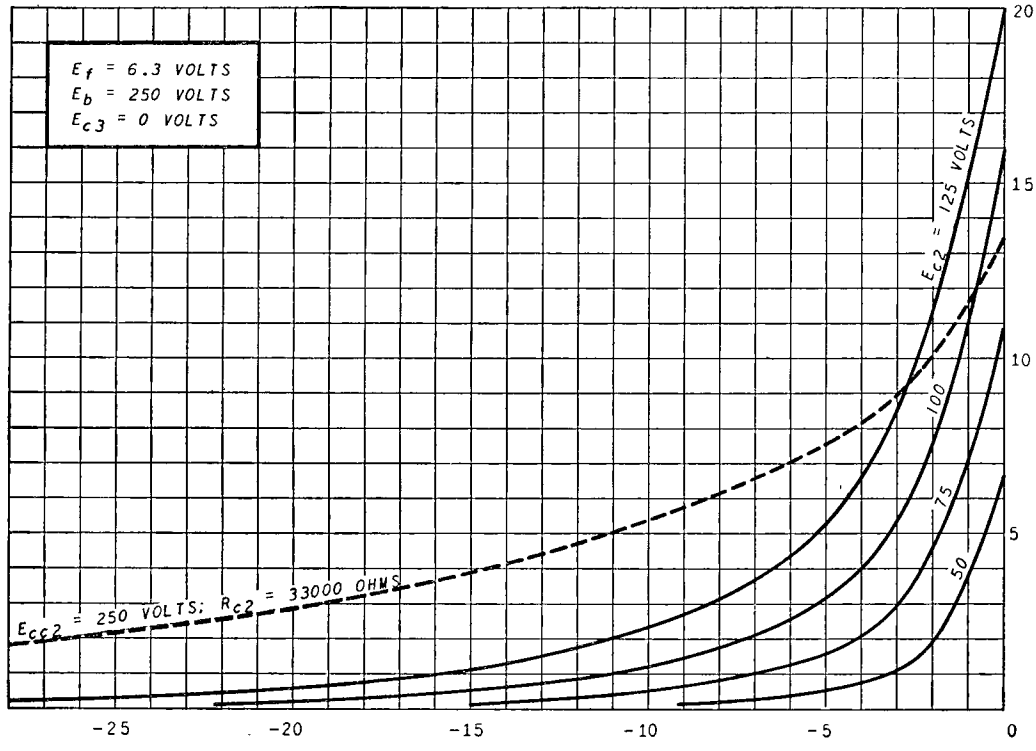
Note: The conditions for some of the indicated tests have deliberately been selected to aggravate tube failures for test and evaluation purposes. In no sense should these conditions be interpreted as suitable circuit operating conditions.

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

SCREEN RATING CHART



AVERAGE TRANSFER CHARACTERISTICS



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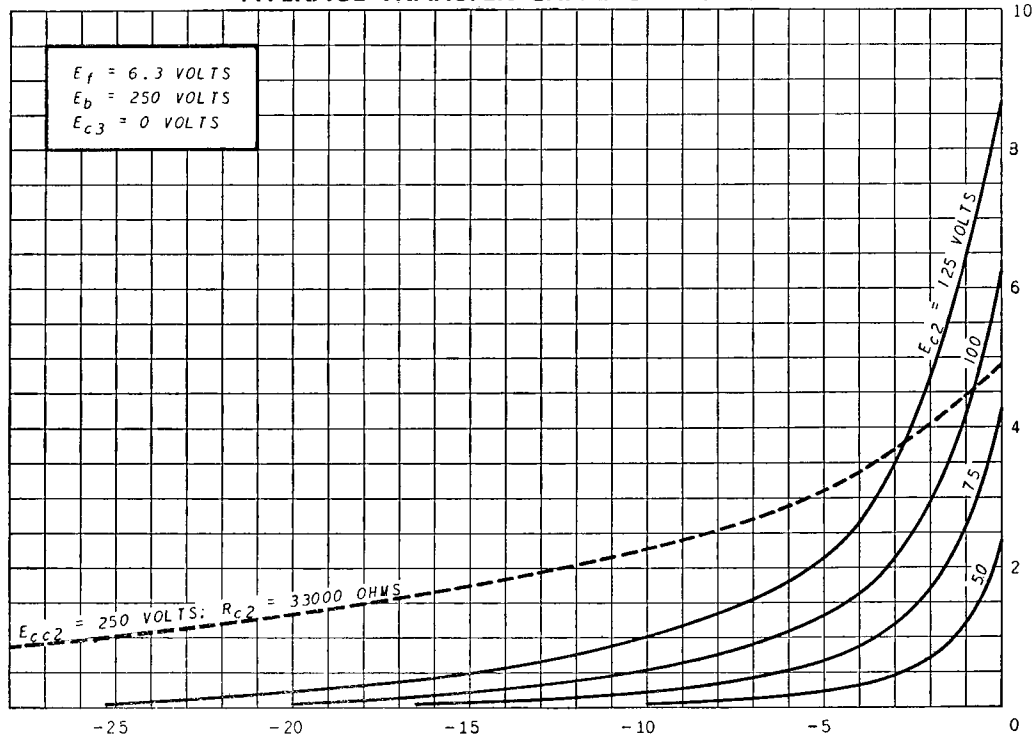
AVERAGE TRANSFER CHARACTERISTICS



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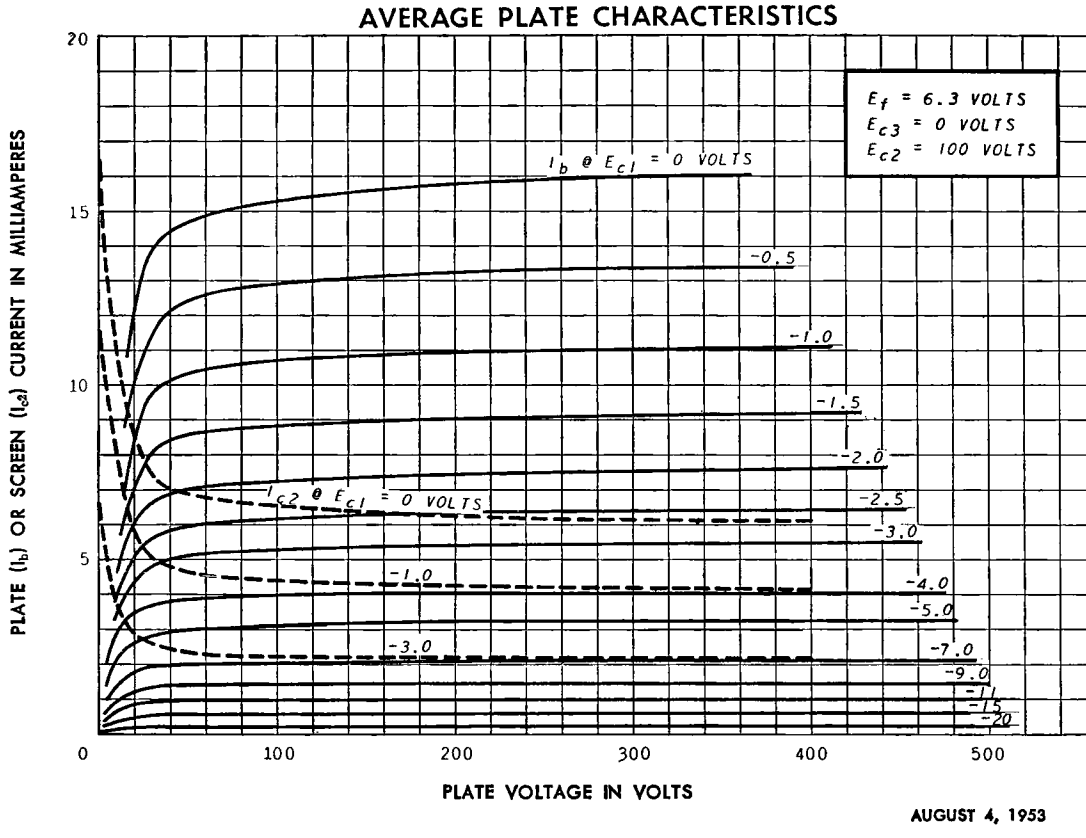
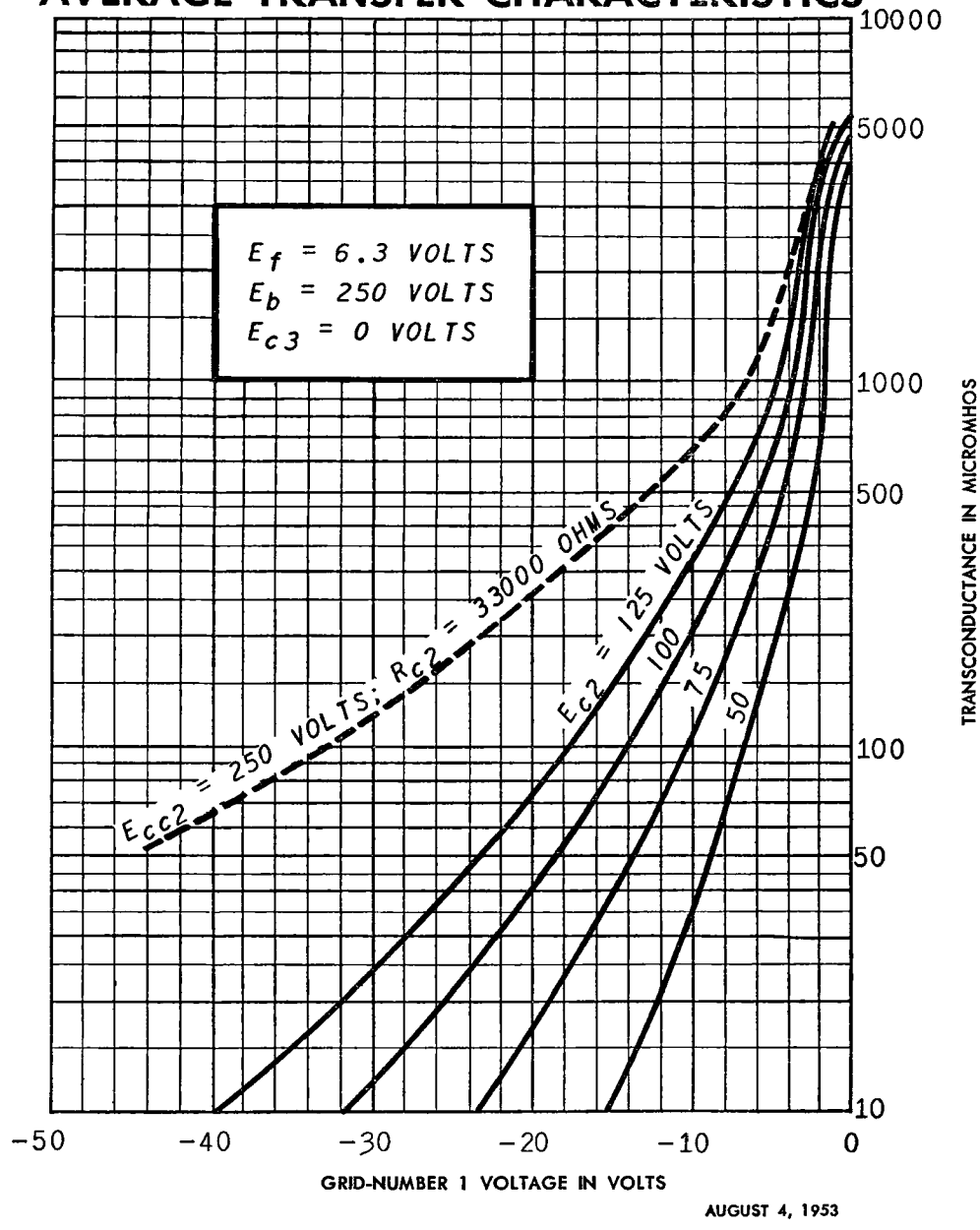

AVERAGE PLATE CHARACTERISTICS
E_f = 6.3 VOLTS
E_{c3} = 0 VOLTS
E_{c2} = 100 VOLTS
I_b @ E_{c1} = 0 VOLTS
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-4.0
-5.0
-7.0
-9.0
-11
-15
-20
I_{c2} @ E_{c1} = 0 VOLTS
-1.0
-3.0
PLATE (I_b) OR SCREEN (I_{c2}) CURRENT IN MILLIAMPERES
PLATE VOLTAGE IN VOLTS
0
5
10
15
20
100
200
300
400
500
AUGUST 4, 1953

AVERAGE TRANSFER CHARACTERISTICS



AUGUST 4, 1953

TUBE DEPARTMENT

GENERAL ELECTRIC

Owensboro, Kentucky