

Photomultiplier Tube

10-Stage, Head-On Type Having S-11 Spectral Response

*For use in the detection and measurement of nuclear radiation
and other applications involving low-level light sources*

GENERAL

Spectral Response	S-11
Wavelength of Maximum Response	$4400 \pm 500 \text{ \AA}$
Cathode, Semitransparent	Cesium-Antimony
Minimum projected area	$2.2 \text{ in}^2 (14.1 \text{ cm}^2)$
Minimum diameter	1.69 in (4.3 cm)
Window	Corning ^a No.0080, or equivalent
Shape	Convexo-Concave
Index of refraction at 4360 angstroms	1.523

Dynodes:

Substrate	Nickel
Secondary-Emitting Surface	Cesium-Antimony
Structure	Circular-Cage, Electrostatic-Focus Type

Direct Interelectrode Capacitances (Approx.):

Anode to dynode No.10	4.2 pF
Anode to all other electrodes	6.5 pF
Maximum Overall Length	5.81 in (14.8 cm)
Seated Length	$4.88 \pm 0.19 \text{ in } (12.4 \pm 0.5 \text{ cm})$
Maximum Diameter	2.31 in (5.9 cm)
Bulb	T16
Base	Medium-Shell Diheptal 14-pin (JEDEC No.B14-38) Non-hygroscopic
Socket	Eby ^b No.9709-7, or equivalent
Magnetic Shield	JAN ^c No.S-2004, or equivalent
Operating Position	Any
Weight (Approx.)	5.2 oz (174 g)

MAXIMUM RATINGS, Absolute-Maximum Values:

DC Supply Voltage:

Between anode and cathode	1250 max.	V
Between anode and dynode No.10	250 max.	V
Between consecutive dynodes	250 max.	V
Between dynode No.1 and cathode	300 max.	V
Average Anode Current ^e	0.75 max.	mA
Ambient Temperature ^f	75 max.	°C

CHARACTERISTICS RANGE VALUES

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode.

With E = 1000 volts (Except as noted)

	Min.	Typical	Max.	
Anode Sensitivity:				
Radiant ^g at 4400 angstroms	—	8×10^4	—	A/W
Luminous ^h (2870° K)	10	100	300	A/lm
Cathode Sensitivity:				
Radiant ⁱ at 4400 angstroms	—	0.040	—	A/W
Luminous ^k (2870° K)	4×10^{-5}	5×10^{-5}	—	A/lm
Current with blue light source ^m (2870° K + C.S. No.5-58)	4×10^{-8}	—	—	A
Quantum Efficiency at 4200 angstroms .	—	11.5	—	%
Current Amplification	—	2×10^6	—	
Anode Dark Current ⁿ	—	6×10^{-9}	4×10^{-8}	A
Equivalent Anode Dark Current Input ⁿ	{	3×10^{-10}	2×10^{-9}	lm
		3.7×10^{-13p}	2.5×10^{-12p}	W
Equivalent Noise Input ^q	{	1.7×10^{-12}	—	lm
		2×10^{-15r}	—	W

^a Made by Corning Glass Works, Corning, NY 14830.

^b Made by Hugh H. Eby Company, 4701 Germantown Avenue, Philadelphia, PA 19144.

^c Made by JAN Hardware Mfg. Co., Inc., 47-27 36th Street, Long Island City, NY 11101.

^e Averaged over any interval of 30 seconds maximum.

^f Tube operation at room temperature or below is recommended.

^g This value is calculated from the typical anode luminous sensitivity rating using a conversion factor of 804 lumens per watt.

^h Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is

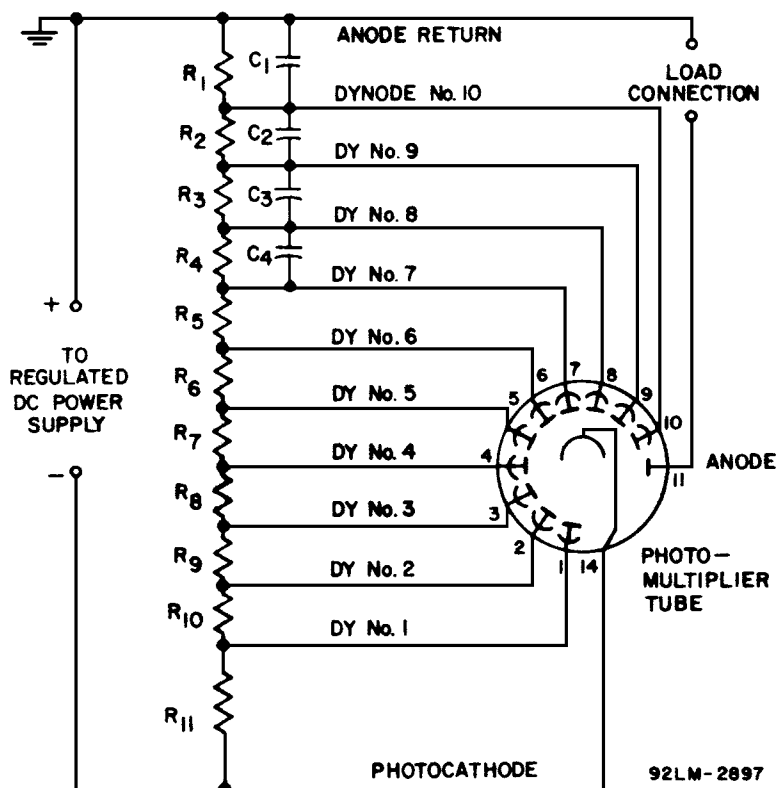
operated at a color temperature of 2870° K and a light input of 10 microlumens is used.

- i This value is calculated from the typical cathode luminous sensitivity rating using a conversion factor of 804 lumens per watt.
- k Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 2870° K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- m Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.5-58, polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, NY 14830) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux incident on the filter is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- n At a tube temperature of 22° C. With supply voltage adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission may be reduced by use of a refrigerant.
- p At 4400 angstroms. These values are calculated from the EADCI values in lumens using a conversion factor of 804 lumens per watt.
- q Under the following conditions: Tube temperature 22° C, external shield connected to cathode, bandwidth 1 Hz, tungsten-light source at a color temperature of 2870° K interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period.
- r At 4400 angstroms. This value is calculated from the ENI value in lumens using a conversion factor of 804 lumens per watt.

TERMINAL CONNECTIONS

The base pins of the 5819 fit a diheptal 14-contact socket, such as Eby No.9709-7, or equivalent. The socket should be made of high-grade, low-leakage material.

TYPICAL VOLTAGE-DIVIDER ARRANGEMENT



C_1 : 0.05 μF , 20%, 500 volts (dc working), ceramic disc

C_2 : 0.02 μF , 20%, 500 volts (dc working), ceramic disc

C_3 : 0.01 μF , 20%, 500 volts (dc working), ceramic disc

C_4 : 0.005 μF , 20%, 500 volts (dc working), ceramic disc

R_1 through R_{10} : 390,000 ohms, 5%, 1/2 watt

R_{11} : 910,000 ohms, 5%, 1/2 watt

Leads to all capacitors should be as short as possible to minimize inductance effects. The location and spacing of capacitors is critical and may require adjustment for optimum results.

TERMINAL DIAGRAM (Bottom View)

Pin 1: Dynode No.1

Pin 2: Dynode No.2

Pin 3: Dynode No.3

Pin 4: Dynode No.4

Pin 5: Dynode No.5

Pin 6: Dynode No.6

Pin 7: Dynode No.7

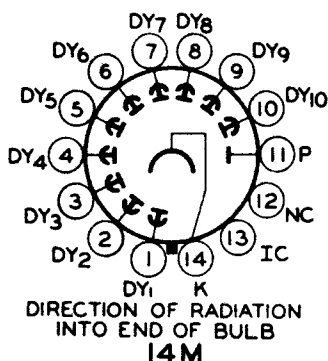
Pin 8: Dynode No.8

Pin 9: Dynode No.9

Pin 10: Dynode No.10

Pin 11: Anode

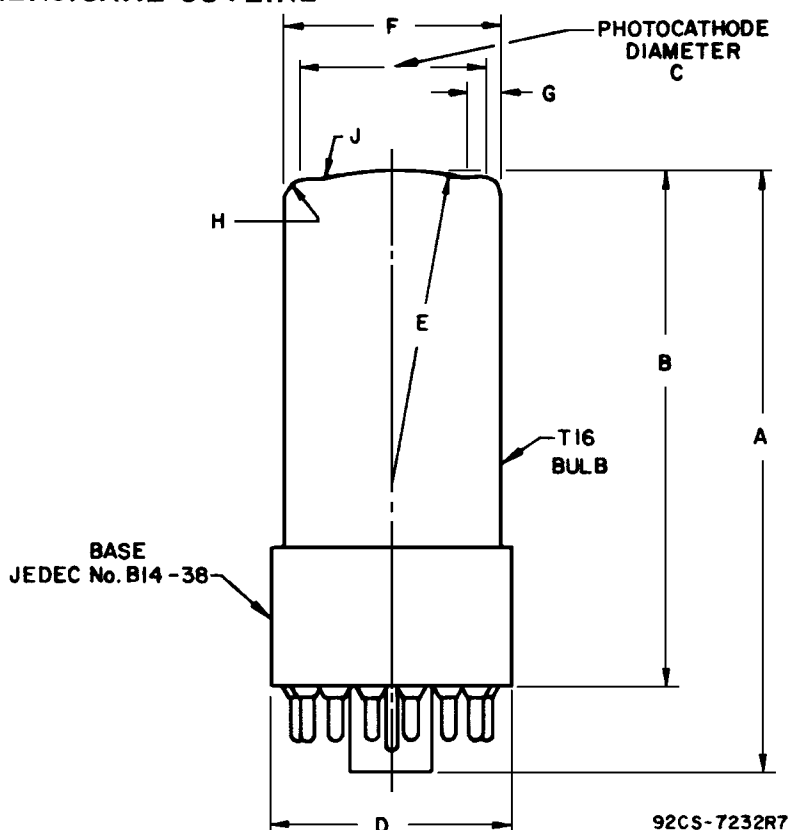
Pin 12: No Connection



Pin 13: Internal Connection - Do Not Use

Pin 14: Cathode

DIMENSIONAL OUTLINE

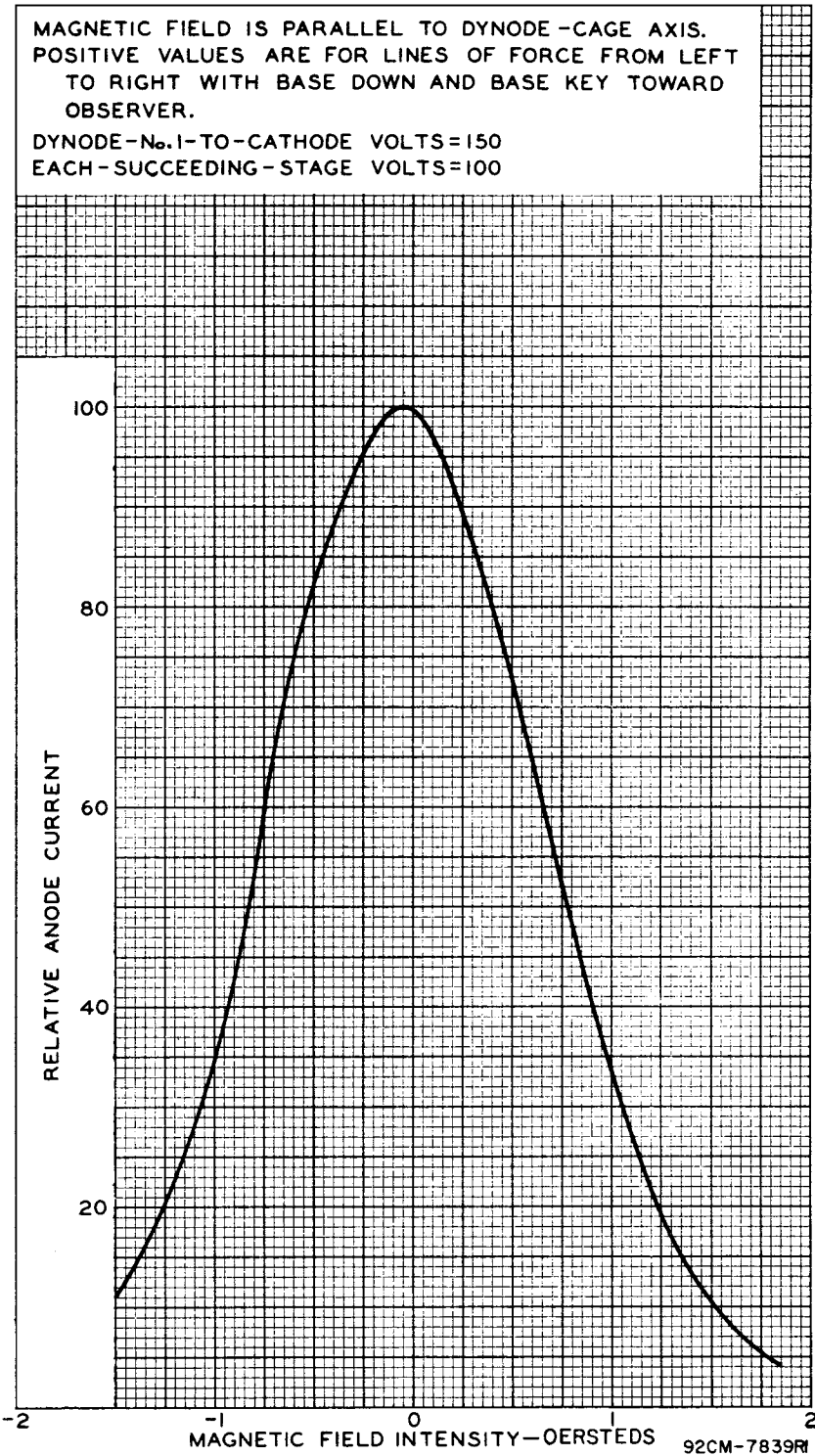


☑ of bulb will not deviate more than 2° in any direction from the perpendicular erected at the center of bottom of the base.

The dimensions in millimeters are derived from the basic inch dimensions (1 inch = 25.4 mm)

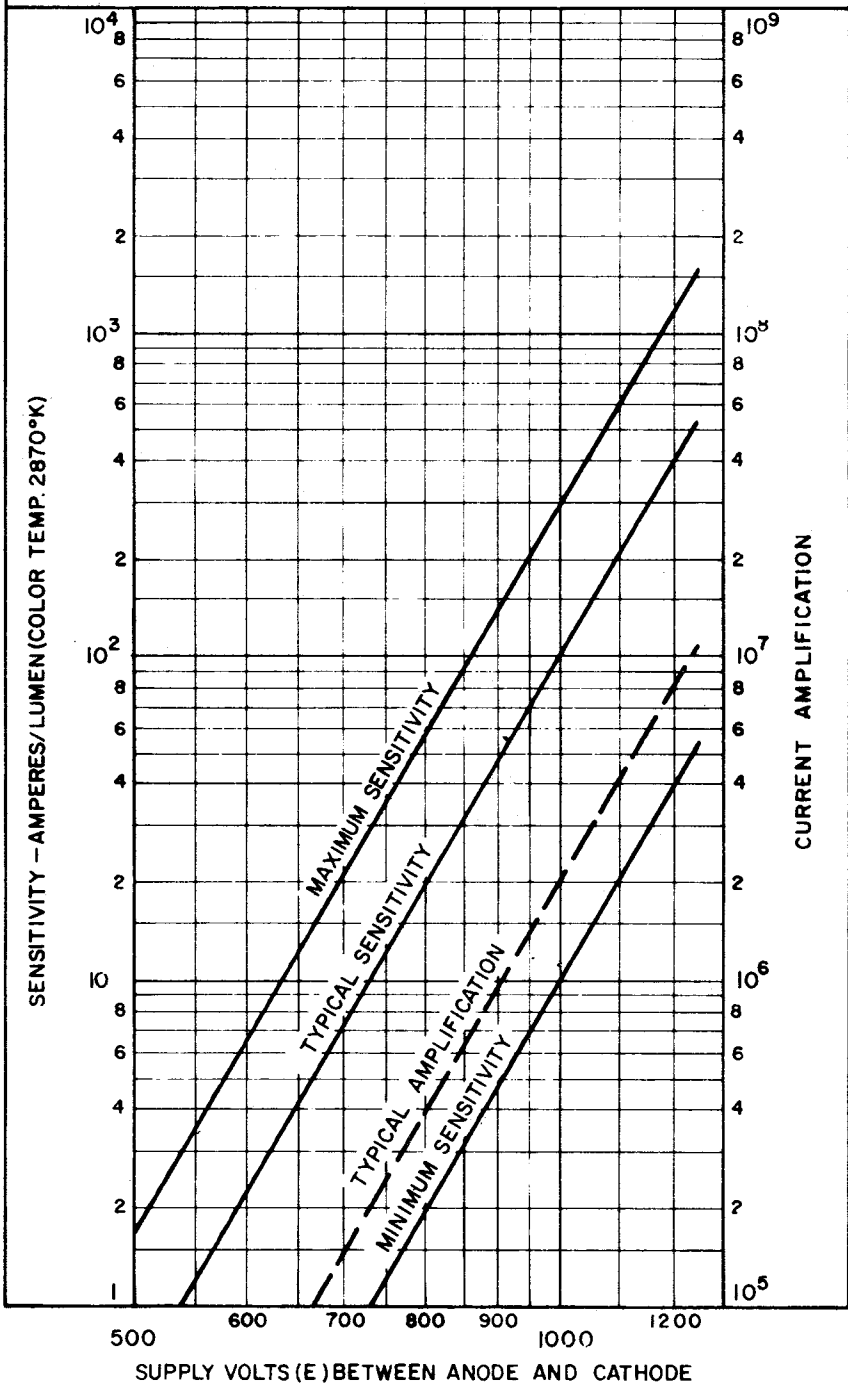
Dimensions	Inches	mm
A	5.81 max.	147.6 max.
B	$4.88 \pm .19$	123.9 ± 4.7
C	1.69 min. dia.	42.9 min. dia.
D	2.31 max. dia.	58.7 max. dia.
E	3.00 ± 1.00 R.	76.2 ± 25.4 R.
F	$2.00 \pm .06$ dia.	50.8 ± 1.5 dia.
G	.312	7.92
H	$.15 \pm .05$ R.	3.8 ± 1.2 R.
J	.50 R.	12.7 R.

TYPICAL EFFECT OF MAGNETIC FIELD
ON ANODE CURRENT



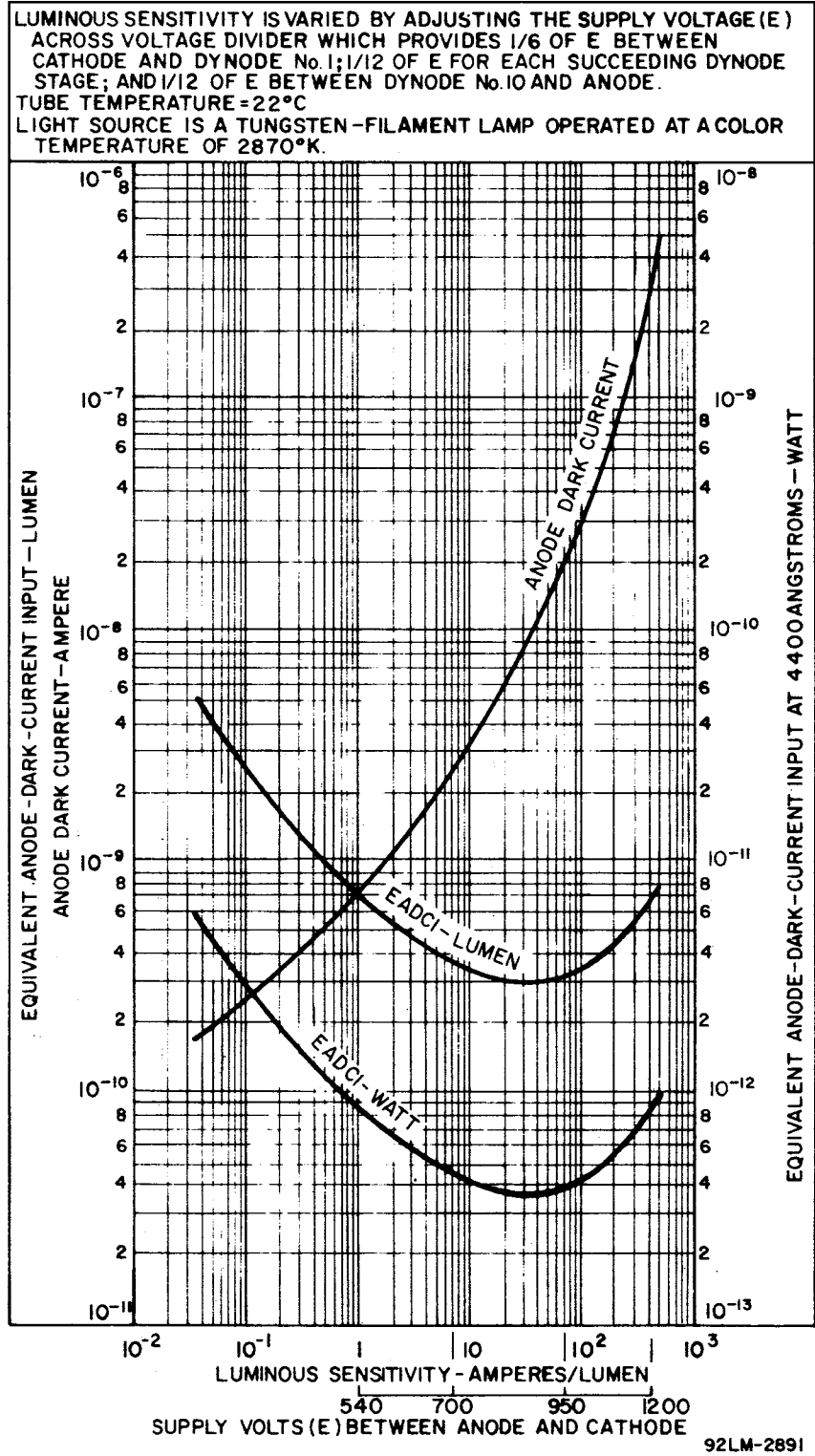
TYPICAL SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING 1/6 OF E BETWEEN CATHODE AND DYNODE No.1; 1/12 OF E FOR EACH SUCCEEDING DYNODE STAGE; AND 1/12 OF E BETWEEN DYNODE No.10 AND ANODE.

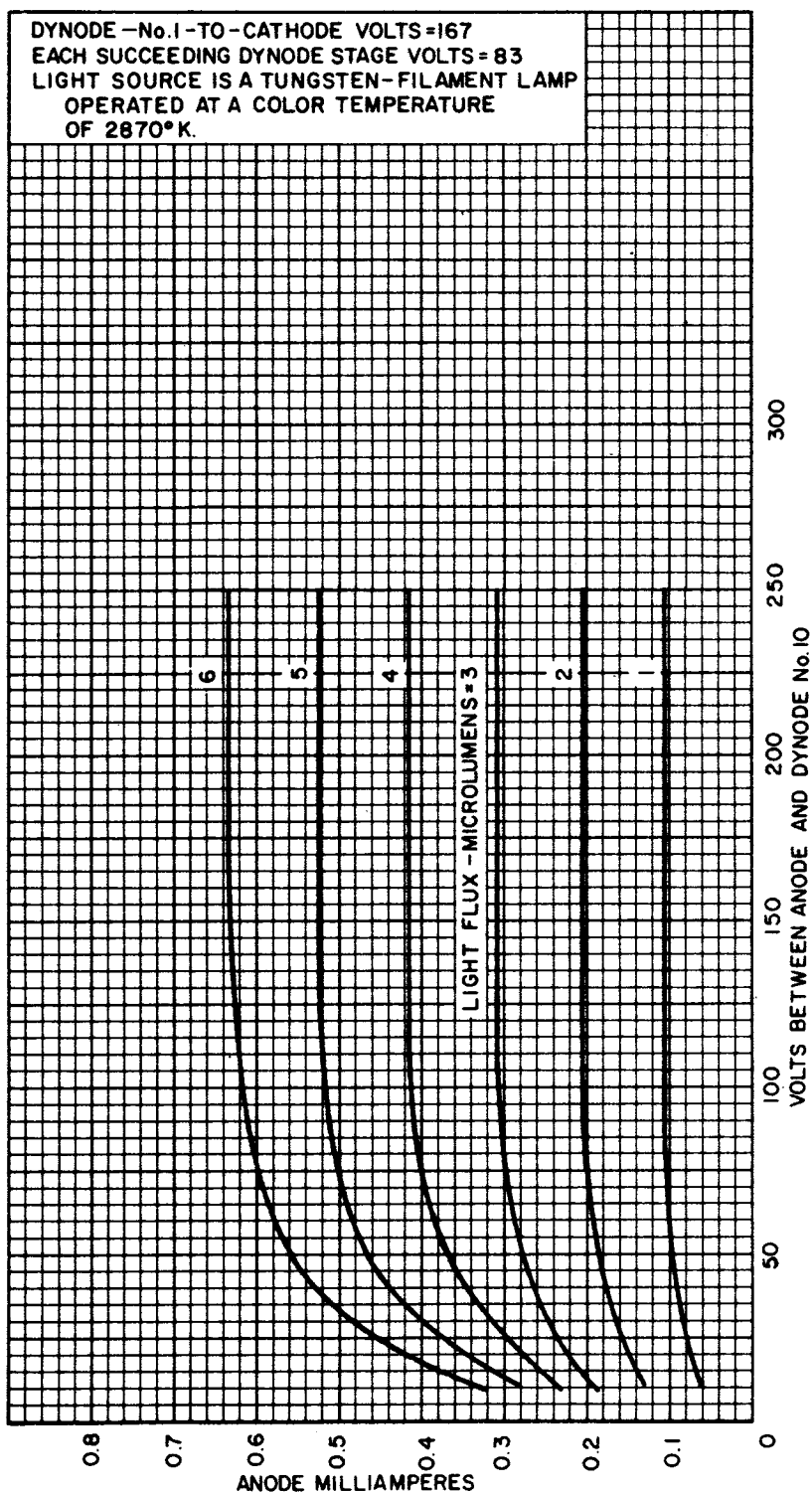


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TYPICAL DARK CURRENT AND EADCI CHARACTERISTICS



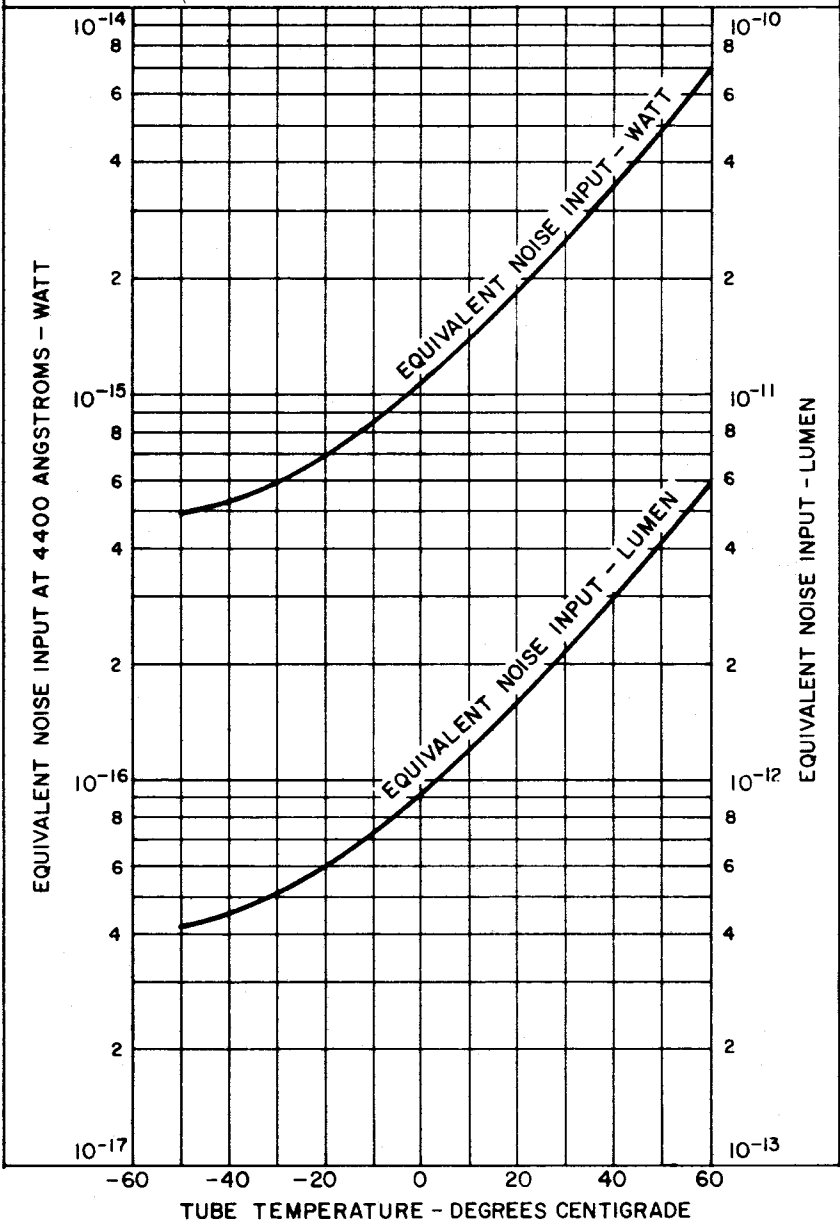
TYPICAL ANODE CHARACTERISTICS



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TYPICAL ENI CHARACTERISTICS

DYNODE-No.1- TO-CATHODE VOLTS = 167
 EACH-SUCCESSING-DYNODE-STAGE VOLTS = 83
 BANDWIDTH: 1 Hz
 LIGHT SOURCE: TUNGSTEN AT 2870°K INTERRUPTED AT 90 Hz TO
 PRODUCE PULSES ALTERNATING BETWEEN ZERO AND FLUX
 VALUE SHOWN FOR ANY GIVEN TUBE TEMPERATURE; "ON" PERIOD
 OF PULSE EQUAL TO "OFF" PERIOD: RMS SIGNAL CURRENT = RMS
 NOISE CURRENT.
 EXTERNAL SHIELD VOLTS RELATIVE TO ANODE VOLTS = -1000



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