

## Multiplier Phototube

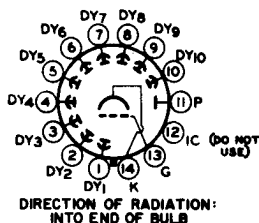
10-STAGE, HEAD-ON,  
FLAT-FACEPLATEELECTROSTATICALLY FOCUSED  
DYNODE STAGESFor Detection and Measurement of Nu-  
clear Radiation and other Low-Level  
Light Sources in Scintillation Counters

## DATA

## General:

Spectral Response . . . . .	S-11
Wavelength of Maximum Response . . . . .	4400 $\pm$ 500 angstroms
Cathode, Semitransparent . . . . .	Cesium-Antimony
Shape . . . . .	Curved, Circular
Minimum area . . . . .	2.2 sq. in.
Minimum diameter . . . . .	1.68 in.
Window . . . . .	Lime Glass (Corning <sup>a</sup> No.0080), or equivalent
Index of refraction . . . . .	1.51
Dynode Material . . . . .	Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.10 . . . . .	4.4 pf
Anode to all other electrodes . . . . .	7.0 pf
Maximum Overall Length . . . . .	5.81"
Seated Length . . . . .	4.87" $\pm$ 0.19"
Maximum Diameter . . . . .	2.31"
Operating Position . . . . .	Any
Weight (Approx.) . . . . .	5.2 oz
Bulb . . . . .	T16
Socket . . . . .	Loranger <sup>b</sup> No.2274, or equivalent
Magnetic Shield . . . . .	Millen <sup>c</sup> No.80802B, or equivalent
Base . . . . .	Medium-Shell Diheptal 14-Pin, (JEDEC Group 5, No.B14-38), Non-hygroscopic
Basing Designation for BOTTOM VIEW . . . . .	14AA

- 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 - Do Not Use
- Pin 13 - Focusing  
Electrode
- Pin 14 - Photocathode



# 6342A

## Maximum Ratings, Absolute-Maximum Values

SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC or Peak AC) . . . . .	1500 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE (DC or Peak AC) . . . . .	250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.1 AND CATHODE (DC or Peak AC) . . . . .	400 max.	volts
SUPPLY VOLTAGE BETWEEN FOCUSING ELECTRODE AND CATHODE (DC or Peak AC) . . . . .	400 max.	volts
AVERAGE ANODE CURRENT <sup>d</sup> . . . . .	2 max.	ma
AMBIENT TEMPERATURE . . . . .	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. Focusing-electrode voltage is adjusted to that value between 10 and 60 per cent of dynode No.1 potential (referred to cathode) which provides maximum anode current.

With E = 1250 volts (Except as noted)

	Min.	Typical	Max.	
Sensitivity:				
Radiant, at				
4400 angstroms. . . . .	-	$2.5 \times 10^4$	-	a/w
Cathode radiant at				
4400 angstroms. . . . .	-	0.064	-	a/w
Luminous:				
At 0 cps <sup>e</sup> . . . . .	15	31	200	a/lm
With dynode No.10 as output electrode <sup>f</sup> . . . . .	-	22	-	a/lm
Cathode Luminous:				
With tungsten light source <sup>g</sup> . . . . .	$5 \times 10^{-5}$	$8 \times 10^{-5}$	-	a/lm
With blue light source <sup>h, s</sup> . . . . .	$5 \times 10^{-8}$	-	-	a
Current Amplification . . . . .	-	$3.9 \times 10^5$	-	
Equivalent Anode-Dark-Current Input <sup>j</sup> . . . . .				
	{	$2 \times 10^{-10k}$	$2 \times 10^{-9k}$	lm
	{	$2.5 \times 10^{-13m}$	$2.5 \times 10^{-12m}$	w
Equivalent Noise Input <sup>n</sup> . . . . .				
	{	$7 \times 10^{-12}$	$1.7 \times 10^{-11}$	lm
	{	$8.7 \times 10^{-15p}$	$2.1 \times 10^{-14p}$	w
Anode-Pulse Rise Time <sup>q</sup> . . . . .	-	$3 \times 10^{-9}$	-	sec
Greatest Delay Between Anode Pulses:				
Due to position from which electrons are simultaneously released within a circle centered on tube face having a diameter of —				

→ Indicates a change.



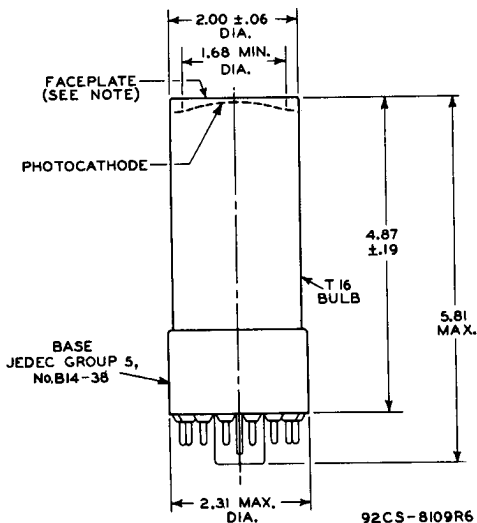
	Min.	Typical	Max.	
1-1/8" . . . . .	-	$1.3 \times 10^{-9} \text{ f}$	-	sec
1-9/16" . . . . .	-	$4 \times 10^{-9} \text{ f}$	-	sec

- <sup>a</sup> Made by Corning Glass Works, Corning, New York.
- <sup>b</sup> Made by Loranger Manufacturing Corporation, 36 Clark Street, Warren, Pennsylvania.
- <sup>c</sup> Made by James Millen Manufacturing Company, 150 Exchange Street, Malden 48, Massachusetts.
- <sup>d</sup> Averaged over any interval of 30 seconds maximum.
- <sup>e</sup> 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.
- <sup>f</sup> An output current of opposite polarity to that obtained at the anode may be provided by using dynode No.10 as the output electrode. With this arrangement, the load is connected in the dynode No.10 circuit and the anode serves only as a collector. The curves under *Typical Anode Characteristics* do not apply when dynode No.10 is used as the output electrode.
- <sup>g</sup> 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.
- <sup>h</sup> Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.5-58, Glass Code No.5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, New York) 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.
- <sup>j</sup> For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.
- <sup>k</sup> Measured at a tube temperature of 25° C and with a supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current may be reduced by use of a refrigerant.
- <sup>m</sup> Determined at 4400 angstroms.
- <sup>n</sup> Under the following conditions: Supply voltage (E) is as shown, 25° C tube temperature, external shield connected to cathode, bandwidth 1 cycle per second, 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.
- <sup>p</sup> Determined under the same conditions shown under (p) except that use is made of a monochromatic source having radiation at 4400 angstroms.
- <sup>q</sup> Measured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode-pulse rise time is primarily a function of transit-time variations in the multiplier stages and is measured under conditions with an incident-light spot approximately 1 millimeter in diameter centered on the photocathode.
- <sup>r</sup> These values also represent the difference in time of transit between the photocathode and dynode No.1 for electrons simultaneously released from the center and from the periphery of the specified areas.
- <sup>s</sup> See *Spectral Characteristic of 2870° K Light Source and Spectral Characteristic of Light from 2870° K Source after passing through Indicated Blue Filter* at front of this Section.

**SPECTRAL-SENSITIVITY CHARACTERISTIC  
OF PHOTSENSITIVE DEVICE HAVING S-II RESPONSE  
is shown at the front of this Section**



# 6342A

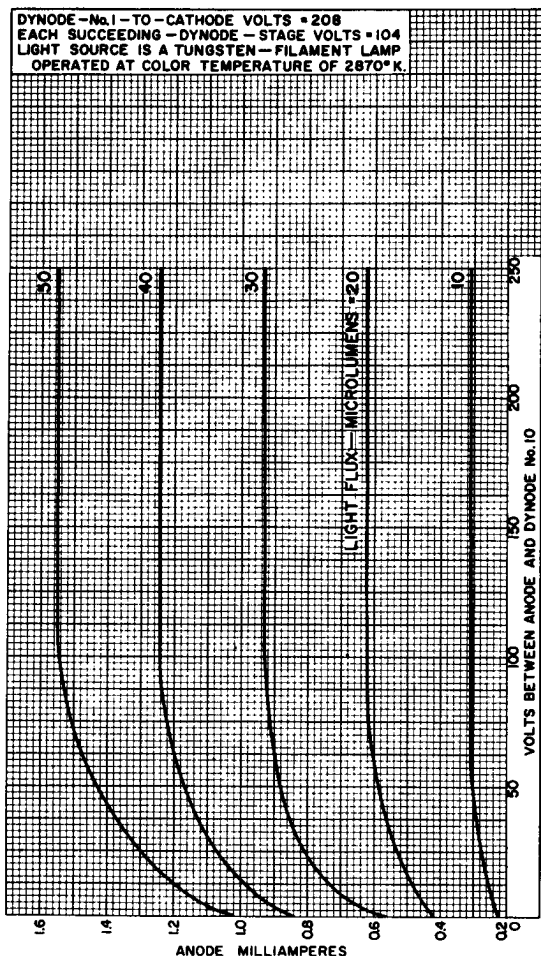


## ALL DIMENSIONS IN INCHES

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN  $2^{\circ}$  IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

**NOTE:** WITHIN 1.68" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

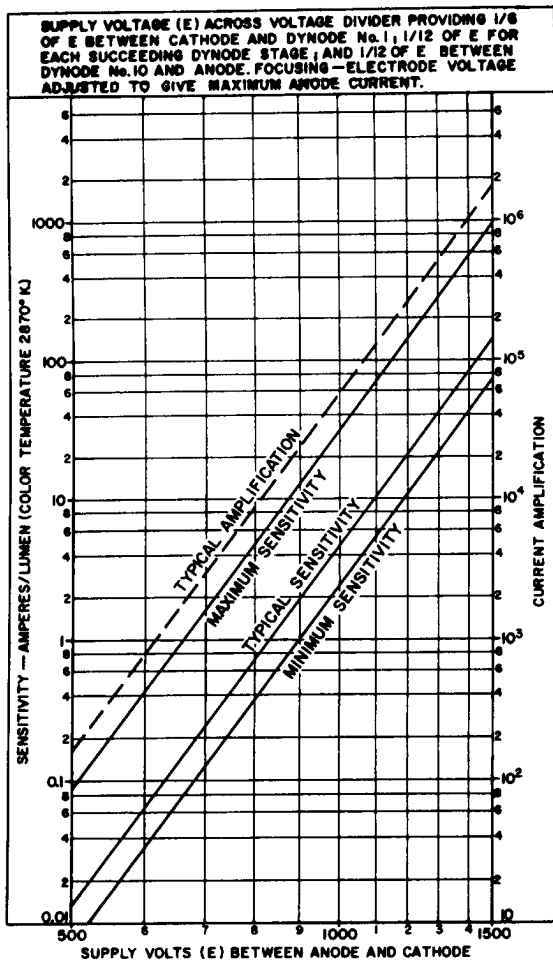
## TYPICAL ANODE CHARACTERISTICS



92CM-8125R4



## CHARACTERISTICS



92CM-6123R3



## TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

