

Multiplier Phototube

S-11 RESPONSE

"RUGGEDIZED", 10-STAGE, HEAD-ON, ELECTROSTATICALLY FOCUSED
FLAT-FACEPLATE TYPE DYNODE STAGES

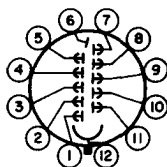
For Detection and Measurement of Nuclear Ra-
diation and Other Low-Level Light Sources in
Industrial, Military, and Missile Applications

DATA

General:

Spectral Response	S-11
Wavelength of Maximum Response.	4400 $\pm$ 500 angstroms
Cathode, Semitransparent.	Cesium-Antimony
Shape	Flat, Circular
Minimum Area.	1.2 sq. in.
Minimum diameter.	1.24"
Window.	Lime Glass (Corning ^a No.0080), or equivalent
Index of refraction	1.51
Dynode Material	Cesium-Antimony
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.10	4 pf
Anode to all other electrodes	7 pf
Maximum Overall Length.	4.12"
Seated Length	3.50" $\pm$ 0.12"
Maximum Diameter.	1.56"
Operating Position.	Any
Weight (Approx.).	2.2 oz
Bulb.	T12
Socket.	Amphenol ^b No.59-402, or equivalent
Magnetic Shield	Millen ^c No.80802C, or equivalent
Base.	Ultrasort Small-Shell Duodecal 12-Pin, (JEDEC Group 4, No.B12-186), Non-hygroscopic
Basing Designation for BOTTOM VIEW.	12AE

- Pin 1 - Dynode No.1
- Pin 2 - Dynode No.3
- Pin 3 - Dynode No.5
- Pin 4 - Dynode No.7
- Pin 5 - Dynode No.9
- Pin 6 - Anode
- Pin 7 - Dynode No.10
- Pin 8 - Dynode No.8
- Pin 9 - Dynode No.6
- Pin 10 - Dynode No.4
- Pin 11 - Dynode No.2
- Pin 12 - Photocathode



DIRECTION OF RADIATION:
INTO END OF BULB

Maximum Ratings, Absolute-Maximum Values:

DC SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE	1250 max. volts
DC SUPPLY VOLTAGE BETWEEN DYNODE No.10 AND ANODE	250 max. volts
DC SUPPLY VOLTAGE BETWEEN CONSECUTIVE DYNODES	200 max. volts



DC SUPPLY VOLTAGE BETWEEN DYNODE No.1

AND CATHODE 300 max. volts
 AVERAGE ANODE CURRENT^d 0.75 max. ma
 AMBIENT TEMPERATURE 75 max. °C

Characteristics Range Values for Equipment Design:

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.	Typ.	Max.	
Sensitivity:				
Radiant, at 4400 angstroms. . . .	-	2.2×10^4	-	a/w
Cathode radiant, at 4400 angstroms. . . .	-	0.036	-	a/w
Luminous:				
At 0 cps ^e	10	27	300	a/lm
With dynode No.10 as output electrode ^f . .	-	16	-	a/lm
Cathode luminous:				
With tungsten light source ^g . . .	3×10^{-5}	4.5×10^{-5}	-	a/lm
With blue light source ^{h,n} . . .	2.8×10^{-8}	-	-	a
Current Amplification Equivalent Anode-Dark-Current Input at a luminous sensitivity of 20 a/lm ^{j,k} . . .	-	6×10^{-5}	-	
Equivalent noise Input ^m	-	8×10^{-10}	2.5×10^{-9}	lm
Dark Current to Any Electrode Except Anode at 25° C . .	-	4×10^{-12}	1.7×10^{-11}	lm
	-	-	7.5×10^{-7}	a

With E = 750 volts (Except as noted)

	Min.	Typ.	Max.	
Sensitivity:				
Radiant, at 4400 angstroms. . . .	-	2.2×10^3	-	a/w
Cathode radiant, at 4400 angstroms. . . .	-	0.036	-	a/w
Luminous:				
At 0 cps ^e	-	2.7	-	a/lm
With dynode No.10 as output electrode ^f . .	-	1.6	-	a/lm

	Min.	Typ.	Max.	
Cathode luminous:				
With tungsten				
light source ^g . . .	3×10^{-5}	4.5×10^{-5}	-	a/lm
With blue light				
source ^{h,n}	2.8×10^{-8}	-	-	a
Current Amplification. .	-	6×10^4	-	

^a Made by Corning Glass Works, Corning, New York.

^b Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, Illinois.

^c Made by James Millen Manufacturing Company, 150 Exchange Street, Malden 48, Massachusetts.

^d Averaged over any interval of 30 seconds maximum.

^e 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.

^f 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 collector. The curves shown in the accompanying *Typical Anode Characteristics* curve do not apply when dynode No. 10 is used as the output electrode.

^g 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.

^h 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.

^j At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant.

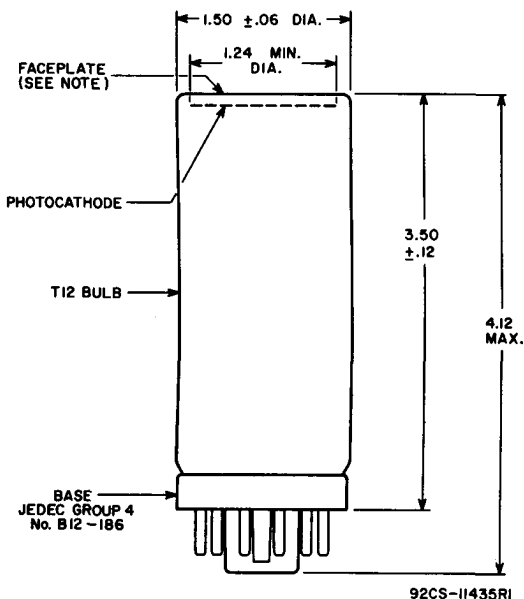
^k For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.

^m 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.

ⁿ 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-11 RESPONSE
is shown at the front of this Section





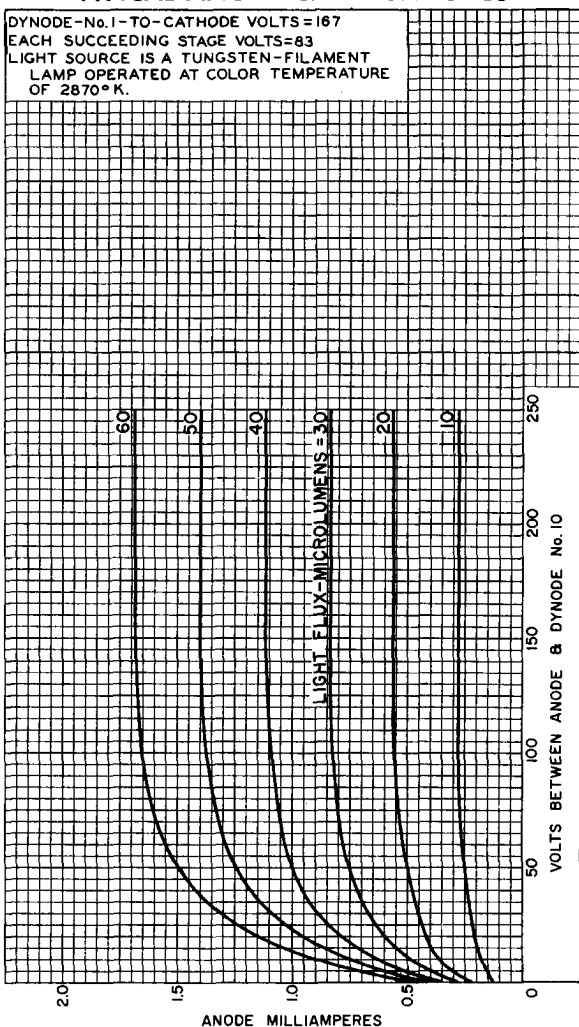
DIMENSIONS IN INCHES

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN 1.24 INCH DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010 INCH FROM PEAK TO VALLEY.

TYPICAL ANODE CHARACTERISTICS

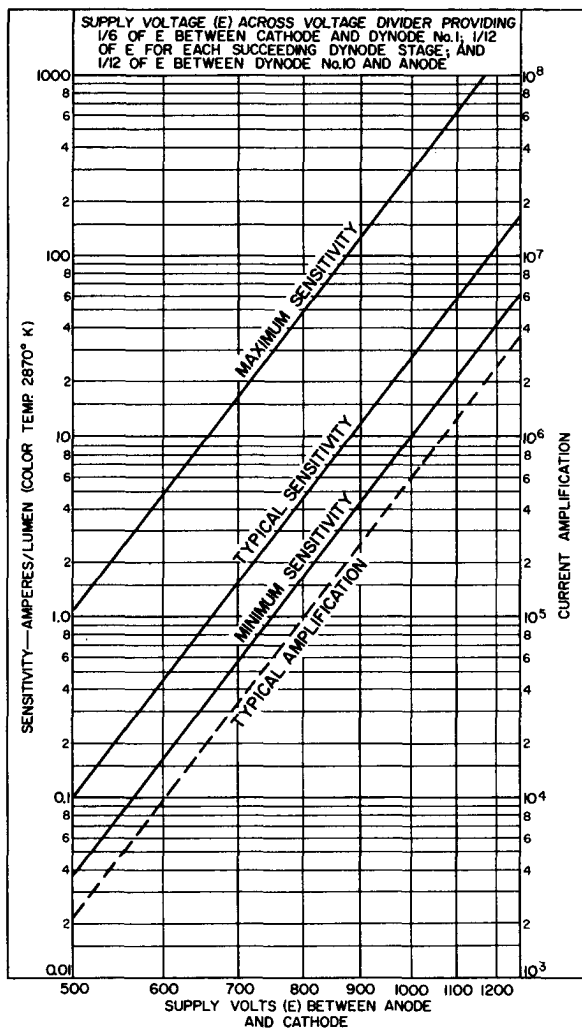
DYNODE-NO. 1-TO-CATHODE VOLTS = 167
 EACH SUCCEEDING STAGE VOLTS = 83
 LIGHT SOURCE IS A TUNGSTEN-FILAMENT
 LAMP OPERATED AT COLOR TEMPERATURE
 OF 2870° K.



92CM-7255R6



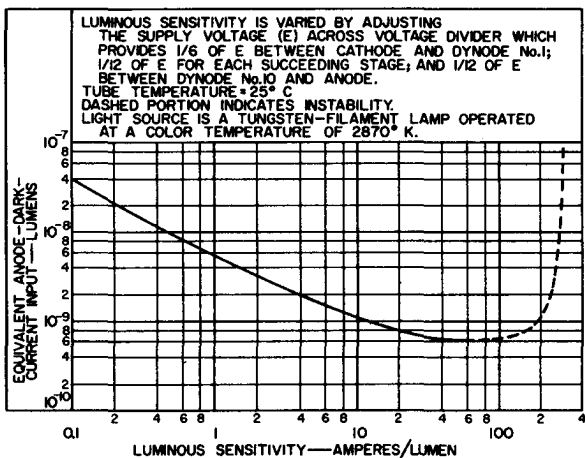
TYPICAL CHARACTERISTICS



92CM-11439R1



TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



92CS-11436

