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# MULTIPLIER PHOTOTUBE

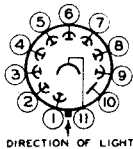
9-STAGE TYPE WITH S-8 RESPONSE

## DATA

### General:

Spectral Response . . . . .	S-8
Wavelength of Maximum Response . . . . .	4200 ± 500 angstroms
Cathode:	
Minimum Projected Length* . . . . .	15/16"
Minimum Projected Width* . . . . .	5/16"
Direct Interelectrode Capacitances:	
Anode to Dynode No. 9 . . . . .	4 μuf
Anode to All Other Electrodes . . . . .	6.5 μuf
Maximum Overall Length . . . . .	3-11/16"
Maximum Seated Length . . . . .	3-1/8"
Seated Length to Center of Cathode . . . . .	1-15/16" ± 3/32"
Maximum Diameter . . . . .	1-5/16"
Bulb . . . . .	T-9
Mounting Position . . . . .	Any
Base . . . . .	Small-Shell Submagnal 11-Pin, Non-Hygroscopic
Basing Designation for BOTTOM VIEW . . . . .	11K

- 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- Anode
- Pin 11- Cathode

### Maximum Ratings, Absolute Values:

ANODE-SUPPLY VOLTAGE (DC or Peak AC) <sup>□</sup> . . . . .	1250 max.	volts
SUPPLY VOLTAGE BETWEEN DYNODE No.9 and ANODE (DC or peak AC) . . . . .	250 max.	volts
PEAK ANODE CURRENT . . . . .	10 max.	ma
AVERAGE ANODE CURRENT <sup>○</sup> . . . . .	1 max.	ma
AMBIENT TEMPERATURE . . . . .	50 max.	°C

### Characteristics:

*With 100 volts per dynode stage and  
100 volts between dynode No.9 and anode\**

	<u>Min.</u>	<u>Av.</u>	<u>Max.</u>	
Anode Dark Current <sup>#</sup> . . . . .	-	-	0.25	μamp
Sensitivity:				
At 4200 Angstroms . . . . .	-	370	-	μamp/μwatt
Luminous <sup>▲</sup> . . . . .	0.115	0.6	50	amp/lumen
Current Amplification <sup>■</sup> . . . . .	-	200000	-	
Luminous Detectivity <sup>*</sup> . . . . .	1 x 10 <sup>-10</sup>	-	-	lumen

<sup>○</sup> The use of about 50 volts between dynode No.9 and anode will give improved operating stability without sacrifice in sensitivity as explained in note under Type 931-A.

\* On plane perpendicular to indicated direction of incident light.

<sup>□</sup> Referred to cathode.

○, #, ●, ▲, ■, \* : See next page.

← Indicates a change.

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→ Characteristics:

*With 75 volts per dynode stage  
and 50 volts between dynode No. 9 and anode*

Sensitivity:	<u>Av.</u>
At 4200 Angstroms. . . . .	55 $\mu$ amp/ $\mu$ watt
Luminous <sup>▲</sup> . . . . .	0.09 amp/lumen
Current Amplification <sup>■</sup> . . . . .	30000

- ° Averaged over any interval of 30 seconds maximum.
- ‡ Dark current due to thermionic emission and ion feedback may be reduced by the use of refrigerants.
- For maximum signal-to-noise ratio, operation below 1000 volts is recommended.
- ▲ Measured under conditions specified on sheet "PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS" at the front of this Section.
- Ratio of anode sensitivity to cathode sensitivity.
- \* Defined as the value where the rms output current is equal to the rms noise current determined under the following conditions: 100 volts per stage, 25°C tube temperature, bandwidth of 1 cycle per second, tungsten light source at 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. The output current is measured through a filter which passes only the fundamental frequency of the pulses.

OUTLINE DIMENSIONS for Type 1P22  
are the same as those for Type 931-A

SPECTRAL-SENSITIVITY CHARACTERISTIC  
of Phototube having S-8 Response  
is shown at the front of this Section

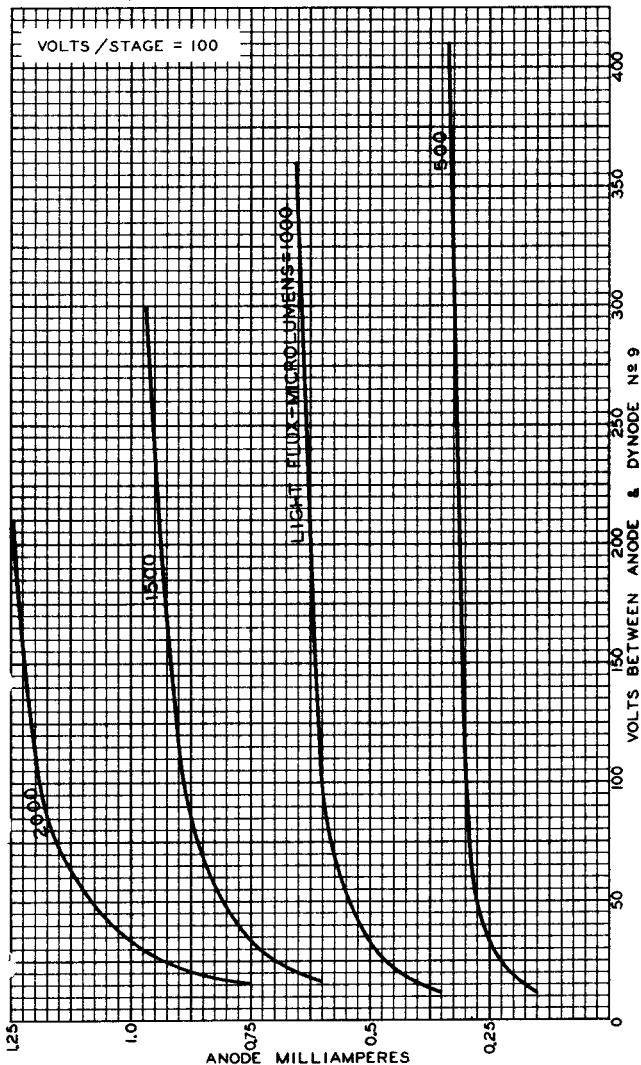
→ Indicates a change.



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### AVERAGE ANODE CHARACTERISTICS



MAR. 12, 1948

TUBE DEPARTMENT  
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

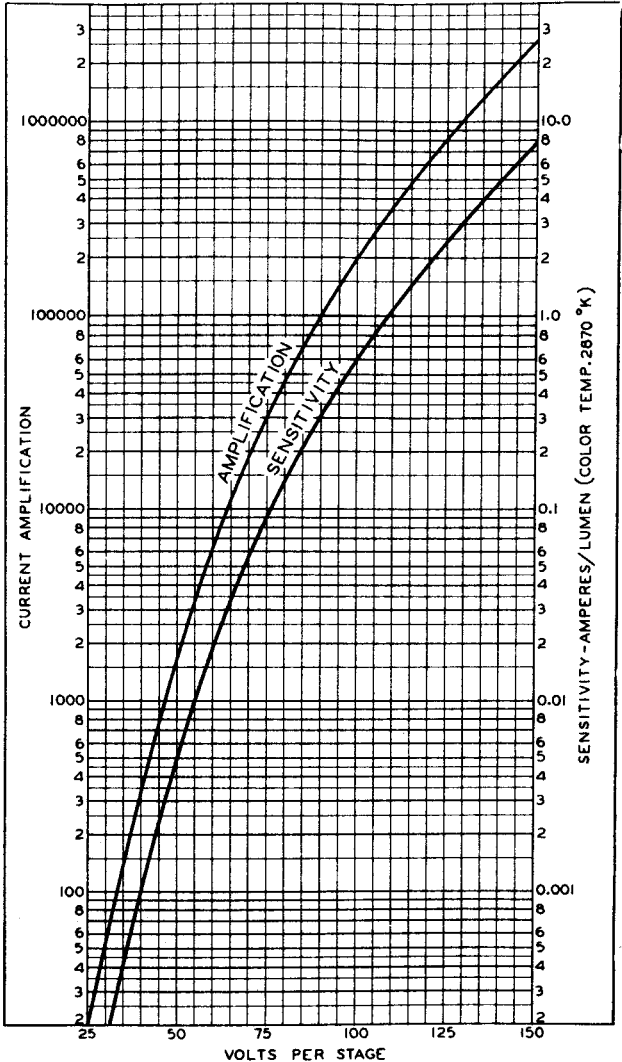
92CM-6585R1

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AVERAGE CHARACTERISTIC  
DC OPERATION



JUNE 15, 1945

TUBE DEPARTMENT  
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6586

## Multiplier Phototube

9-STAGE, SIDE-ON TYPE

S-8 RESPONSE

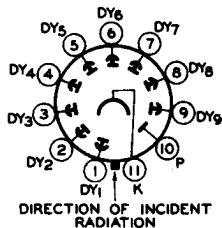
Especially Useful in Colorimetric and Spectroscopic Applications. High Sensitivity to Green-and-Blue Rich Light

**General:**

Spectral Response . . . . .	S-8
Wavelength of Maximum Response . . . . .	3650 ± 500 angstroms
Cathode, Opaque . . . . .	Cesium-Bismuth
Minimum projected length <sup>a</sup> . . . . .	15/16"
Minimum projected width <sup>a</sup> . . . . .	5/16"
Window . . . . .	Lime Glass <sup>b</sup>
Dynode Material . . . . .	Cesium-Antimony
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.9 . . . . .	4.4 pf
Anode to all other electrodes . . . . .	6.0 pf
Maximum Overall Length . . . . .	3-11/16"
Maximum Seated Length . . . . .	3-1/8"
Length from Base Seat to Center of Useful Cathode Area . . . . .	1-15/16" ± 3/32"
Maximum Diameter . . . . .	1-5/16"
Operating Position . . . . .	Any
Weight (Approx.) . . . . .	1.6 oz
Bulb . . . . .	T9
Socket . . . . .	Amphenol <sup>c</sup> No. 78S11T, or equivalent
Magnetic Shield . . . . .	Perfection Mica Co. <sup>d</sup> No. P-101-2, or equivalent
Base . . . . .	Small-Shell Submagnal 11-Pin (JEDEC Group 2, No. B11-88), Non-hygroscopic

Basing Designation for BOTTOM VIEW . . . . . **PK**

- 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 - Anode
- Pin 11 - Photocathode



**Maximum Ratings, Absolute-Maximum Values:**

Supply Voltage Between Anode and Cathode (DC or Peak AC) . . . . .	1250 max. volts
Supply Voltage Between Dynode No.9 and Anode (DC or Peak AC) . . . . .	250 max. volts
Supply Voltage Between Consecutive Dynodes (DC or Peak AC) . . . . .	250 max. volts
Supply Voltage Between Dynode No.1 and Cathode (DC or Peak AC) . . . . .	250 max. volts
Average Anode Current <sup>e</sup> . . . . .	1 max. ma
Ambient Temperature . . . . .	50 max. °C

← Indicates a change



## → Characteristics Range Values:

Under conditions with supply voltage (E) across a voltage divider providing 1/10 of E between cathode and dynode No.1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No.9 and anode

With E = 1000 volts (Except as noted)

	Min.	Typ.	Max.	
Sensitivity:				
Radiant, at 3650 angstroms. . . . .	-	750	-	a/w
Cathode radiant, at 3650 angstroms. . . . .	-	$2.3 \times 10^{-3}$	-	a/w
Luminous, at 0 cps <sup>f</sup> . . . . .	0.115	1	16	a/lm
Cathode luminous <sup>g</sup> . . . . .	$1.5 \times 10^{-6}$	$3 \times 10^{-6}$	-	a/lm
Current Amplification. . . . .	-	$3.3 \times 10^5$	-	
Equivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm <sup>h,j</sup> . . . . .	-	$7.5 \times 10^{-9}$	$3.75 \times 10^{-7}$	lm
Equivalent Noise Input <sup>k</sup> . . . . .	-	$7.5 \times 10^{-12}$	-	lm

With E = 750 volts (Except as noted)

	Min.	Typ.	Max.	
Sensitivity:				
Radiant, at 3650 angstroms. . . . .	-	110	-	a/w
Cathode radiant, at 3650 angstroms. . . . .	-	$2.3 \times 10^{-3}$	-	a/w
Luminous, at 0 cps <sup>f</sup> . . . . .	0.016	0.145	1.85	a/lm
Cathode luminous <sup>g</sup> . . . . .	$1.5 \times 10^{-6}$	$3 \times 10^{-6}$	-	a/lm
Current Amplification. . . . .	-	$4.8 \times 10^4$	-	

- <sup>a</sup> On plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube.
- <sup>b</sup> Corning No.0080, Corning Glass Works, Corning, New York, or equivalent.
- <sup>c</sup> Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, Illinois.
- <sup>d</sup> Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.
- <sup>e</sup> Averaged over any interval of 30 seconds maximum.
- <sup>f</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>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 100 volts are applied between cathode and all other electrodes connected as anode.
- <sup>h</sup> At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant.
- <sup>j</sup> For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- <sup>k</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.

→ Indicates a change.

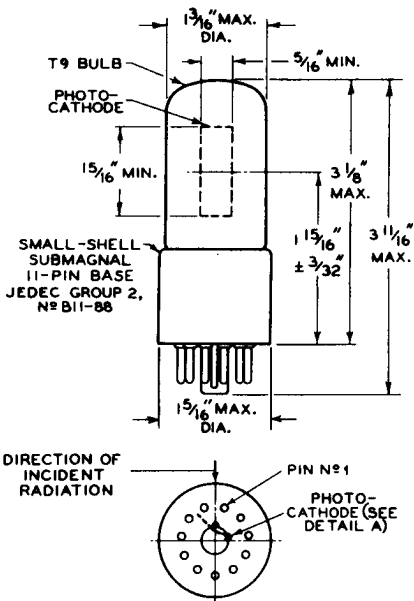




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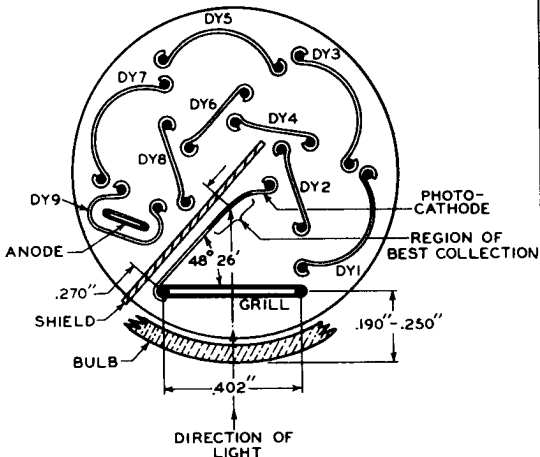
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## MULTIPLIER PHOTOTUBE

DETAIL A



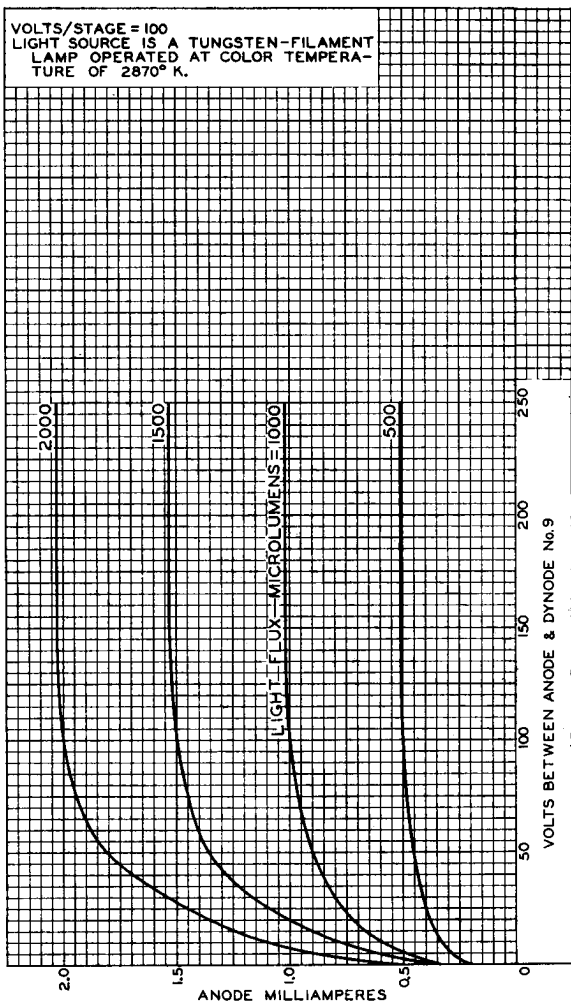
92CS-8674R1

**NOTE 1:** CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN  $2^{\circ}$  IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

**NOTE 2:** THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS I AND II AND THE PLANE OF THE GRILL WILL NOT EXCEED  $6^{\circ}$ .



## TYPICAL ANODE CHARACTERISTICS

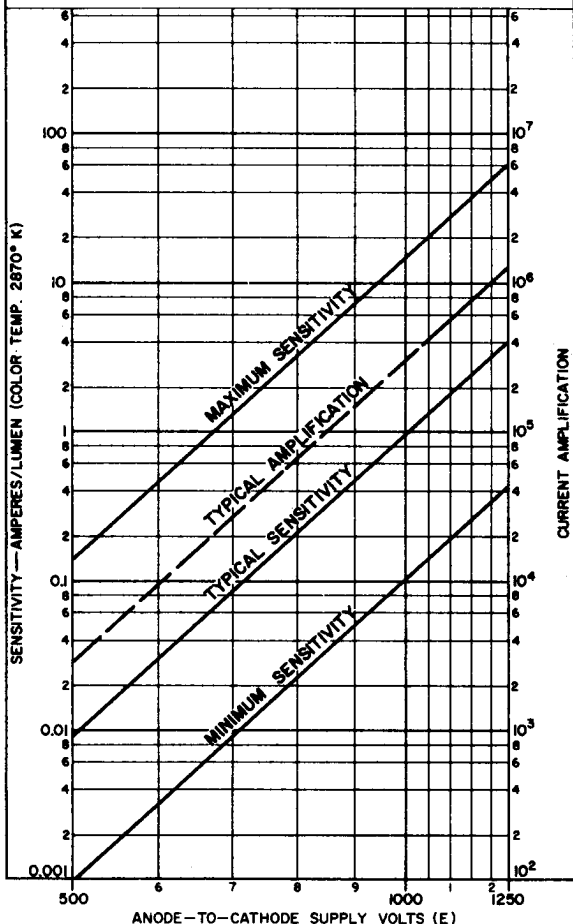


92CM-6585R1



## SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING 1/10 OF E BETWEEN CATHODE AND DYNODE No.1; 1/10 OF E FOR EACH SUCCEEDING DYNODE STAGE; AND 1/10 OF E BETWEEN DYNODE No. 9 AND ANODE.



92CM-9674R1

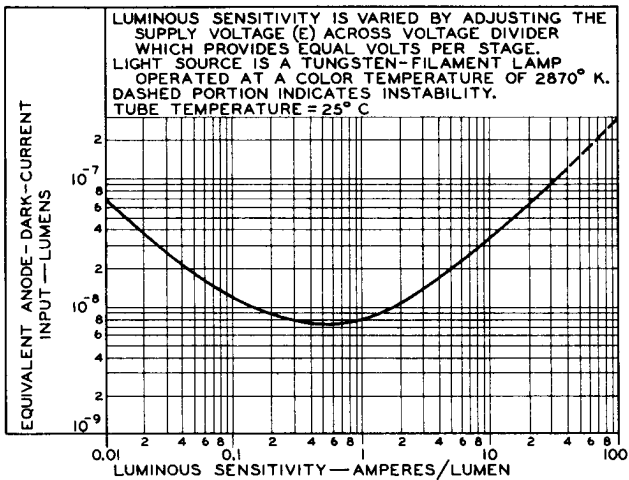




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### TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



92CS-9680