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

DIRECTION OF LIGHT

Maximum Ratings, Absolute Values:
ANODE-SUPPLY VOLTAGE (DC or Peak AC) ... 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 ... 1 max. ma
AMBIENT TEMPERATURE ... 50 max. °C

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

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anode Dark Current*</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 4200 Angstroms</td>
<td>370</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luminous*</td>
<td>0.115</td>
<td>0.6</td>
<td>50</td>
</tr>
<tr>
<td>Current Amplification*</td>
<td>200000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luminous Detectivity*</td>
<td>1 x 10^{-10}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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.
* Referred to cathode.
O, #, *, : See next page.

MAR. 15, 1948
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
MULTIPLIER PHOTOTUBE

Characteristics:

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

Sensitivity:

- At 4200 Angstroms: \( 55 \mu \text{amp/\mu watt} \)
- Luminous: \( 0.09 \text{ amp/lumen} \)
- Current Amplification: \( 30000 \)

* 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 2870K 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-B Response
is shown at the front of this Section

- Indicates a change.

MAR. 15, 1948

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
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: 3650 ± 500 angstroms
Wavelength of Maximum Response: 3650 ± 500 angstroms
Cathode, Opaque: Cesium-Bismuth
Minimum projected length: 15/16"
Minimum projected width: 5/16"
Window: Lime Glass
Dynode Material: Cesium-Antimony
Direct Interelectode 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 No.78S11T, or equivalent
Magnetic Shield: Perfection Mica Co. No. P-101-2, or equivalent
Base: Small-Shell Submagnal 11-Pin (JEDEC Group 2, No. B11-88), Non-hygrosopic

Basing Designation for BOTTOM VIEW: PAK

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: 1 max. ma
Ambient Temperature: 50 max. °C

Indicates a change in data.
### Characteristics Range Values:

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

With $E = 1000$ volts (Except as noted)

<table>
<thead>
<tr>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiant, at 3650 angstroms</td>
<td>-</td>
<td>750</td>
</tr>
<tr>
<td>Cathode radiant, at 3650 angstroms</td>
<td>-</td>
<td>2.3x10^-3</td>
</tr>
<tr>
<td>Luminous, at 0 cps</td>
<td>0.115</td>
<td>1</td>
</tr>
<tr>
<td>Cathode luminous</td>
<td>1.5x10^-6</td>
<td>3x10^-6</td>
</tr>
<tr>
<td>Current Amplification</td>
<td>-</td>
<td>3.3x10^5</td>
</tr>
</tbody>
</table>

Equivalent Anode–Dark–Current

Input at a luminous sensitivity of 0.4 a/lm, j

<table>
<thead>
<tr>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5x10^-9</td>
<td>3.75x10^-7</td>
<td>lm</td>
</tr>
</tbody>
</table>

Equivalent Noise Input

<table>
<thead>
<tr>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5x10^-12</td>
<td>-</td>
<td>lm</td>
</tr>
</tbody>
</table>

With $E = 750$ volts (Except as noted)

<table>
<thead>
<tr>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiant, at 3650 angstroms</td>
<td>-</td>
<td>110</td>
</tr>
<tr>
<td>Cathode radiant, at 3650 angstroms</td>
<td>-</td>
<td>2.3x10^-3</td>
</tr>
<tr>
<td>Luminous, at 0 cps</td>
<td>0.016</td>
<td>0.145</td>
</tr>
<tr>
<td>Cathode luminous</td>
<td>1.5x10^-6</td>
<td>3x10^-6</td>
</tr>
<tr>
<td>Current Amplification</td>
<td>-</td>
<td>4.8x10^4</td>
</tr>
</tbody>
</table>

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*a* On plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube.  
*b* Corning No. 0000, Corning Glass Works, Corning, New York, or equivalent.  
*c* Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 34, Illinois.  
*d* Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.  
*e* Averaged over any interval of 30 seconds maximum.  
*f* 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 microcandelas is used.  
*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 100 volts are applied between cathode and all other electrodes connected as anode.  
*h* At a tube temperature of 250° C. Dark current may be reduced by use of a refrigerant.  
*i* For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.  
*j* Under the following conditions: Supply voltage (E) is as shown, 250° 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.

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Indicates a change.
NOTE 1: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS

SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER PROVIDING 1/10 OF E BETWEEN CATHODE AND DINODE NO. 1; 1/10 OF E FOR EACH SUCCESSING DINODE STAGE; AND 1/10 OF E BETWEEN DINODE NO. 9 AND ANODE.

SENSITIVITY — AMPERES/LUMEN (COLOR TEMP: 2870° K)

ANODE—TO—CATHODE SUPPLY VOLTS (E)
TYPICAL ANODE–DARK–CURRENT CHARACTERISTIC

LUMINOUS SENSITIVITY IS VARIED BY ADJUSTING THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES EQUAL VOLTS PER STAGE. LIGHT SOURCE IS A TUNGSTEN–FILAMENT LAMP OPERATED AT A COLOR TEMPERATURE OF 2870° K. DASHED PORTION INDICATES INSTABILITY. TUBE TEMPERATURE = 25° C

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