6342-A

MULTIPLIER PHOTOTUBE

1.68" Dia. Curved Circular Semitransparent Photocathode

10-Stage, Head-On Type, Flat Faceplate
S-11 Response
High-Current Dynodes

2.31" Max. Diameter
5.81" Max. Length
Diheptal 14-Pin Base

TENTATIVE DATA

RCA-6342-A is a head-on type of multiplier phototube intended for use in scintillation counters for the detection and measurement of nuclear radiation, and in other applications involving low-level light sources.

Design features of the 6342-A include dynodes with stable high-current capability, a focusing electrode with external connection for shaping the field which directs photoelectrons from the photocathode onto the first dynode, and a semitransparent photocathode on the curved inner surface of the face end of the bulb.

The focusing electrode permits optimizing the magnitude, uniformity, or speed of the response in critical applications.

The curved photocathode surface of the 6342-A assures very good collection by dynode No.1 of electrons from all parts of the useful photocathode area to give a typical pulse-height resolution of about 8 per cent. The curved surface together with the electrode configuration employed in the 6342-A minimizes variation in electron-transit time between the photocathode and dynode No.1.

The spectral response of the 6342-A covers the range from about 3000 to 6500 angstroms, as shown in Fig.2. Maximum response occurs at approximately 4400 angstroms. The 6342-A, therefore, has high sensitivity to blue-rich light and negligible sensitivity to red radiation.

DATA

General:

Spectral Response	S-11
Wavelength of Maximum Response	4400 ± 500 angstroms
Cathode, Semitransparent:	
Shape	Curved Circular
Window:	
Area	2.2 sq. in.
Minimum diameter	1.68 in.
Index of refraction	1.51
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.10	4.4 μμf
Anode to all other electrodes	7.0 μμf
Maximum Overall Length	5.81"
Seated Length	4.87" ± 0.19"
Maximum Diameter	2.31"
Bulb	T-16
Base	Medium-Shell Diheptal 14-Pin (JETEC Group 5, No.B14-38), Non-hygroscopic
Operating Position	Any
Weight (Approx.)	5.2 oz

Maximum Ratings, *Absolute Values:*

SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC or Peak AC)	1500 max.	volts
SUPPLY VOLTAGE BETWEEN ANODE AND DYNODE No.10 (DC or Peak AC)	250 max.	volts
DYNODE-No.1 SUPPLY VOLTAGE (DC or Peak AC)	400 max.	volts
FOCUSING-ELECTRODE SUPPLY VOLTAGE (DC or Peak AC)	400 max.	volts
AVERAGE ANODE CURRENT■	2 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 dynode No.1 and cathode; 1/12 of E for each succeeding dynode stage; and 1/12 of E between anode and dynode No.10.

With E = 1250 volts (except as noted) and Focusing-Electrode* Voltage Adjusted to Give Maximum Anode Current

	Min.	*Median*	*Max.*	
Sensitivity:				
Radiant, at 4400 angstroms	–	11000	–	μa/μw
Cathode Radiant, at 4400 angstroms	–	0.064	–	μa/μw
Luminous:●				
At 0 cps	4	14	120	amp/lumen
With dynode No.10 as output electrode†	–	10	–	amp/lumen
Cathode Luminous:				
With tungsten light source▲	50	80	–	μa/lumen
With blue light source⊕	0.05	–	–	μa

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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Printed in U.S.A.

	Min.	Median	Max.	
Current Amplification	-	175000	-	
Equivalent Anode-Dark-Current Input#●	-	5×10^{-10}	2×10^{-9}	lumen
Equivalent Noise Input**	-	7×10^{-12}	1.7×10^{-11}	lumen
Anode-Pulse Rise Time□	-	3	-	millimicrosec
Greatest Delay Between Anode Pulses:				
Due to position from which electrons are simultaneously released within a circle centered on tube face and having a diameter of—				
1-1/8"	-	1.3✠	-	millimicrosec
1-9/16"	-	4✠	-	millimicrosec

■ Averaged over any interval of 30 seconds maximum.

* The focusing electrode should be connected to the adjustable arm of a potentiometer between cathode and dynode No.1 in the voltage divider, and operated at an optimum potential within the range of 10 to 60 per cent of the dynode No.1 potential.

● For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

† 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.

▲ For conditions the same as shown under (●) except that the value of light flux is 0.01 lumen and 200 volts are applied between the cathode and all other electrodes connected together as anode.

⊕ Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux on the filter is 0.01 lumen. The load resistor has a value of 0.01 megohm, and 200 volts are applied between cathode and all other electrodes connected together as anode.

\# Measured at a tube temperature of 25° C and with the supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.

● For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.

** Under the following conditions: Supply voltage (E) is 1250 volts, 25° C tube temperature, external shield potential -1250 volts with respect to anode, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870° K interrupted at 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.

□ Measured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode pulse rise time is determined by transit-time variations in the multiplier stages only with an incident light spot approximately 1 millimeter in diameter centered on the photocathode.

✠ 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.

DEFINITIONS

Radiant Sensitivity. The quotient of output current by incident radiant power of a given wavelength, at constant electrode voltages.

Cathode Radiant Sensitivity. The quotient of current leaving the photocathode by incident radiant power of a given wavelength.

Luminous Sensitivity. The quotient of output current by incident luminous flux, at constant electrode voltages.

Current Amplification. Ratio of the output current to the photocathode current, at constant electrode voltages.

Equivalent Anode-Dark-Current Input. The quotient of the anode dark current by the luminous sensitivity.

Equivalent Noise Input. That value of incident luminous flux which when modulated in a stated manner produces an rms output current equal to the rms noise current within a specified bandwidth.

Pulse Rise Time. The time required for the instantaneous amplitude of the pulse to go from 10 per cent to 90 per cent of the peak value.

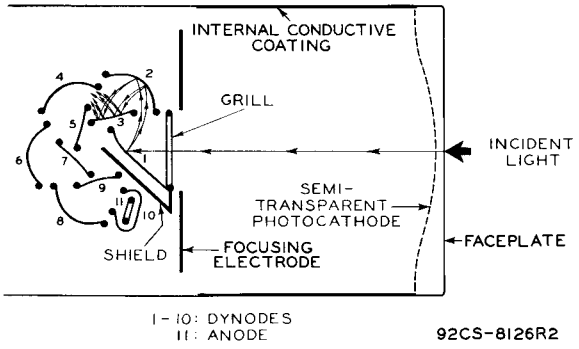


Fig. 1 - Schematic Arrangement of Type 6342-A Structure.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

The use of an *average anode current* well below the maximum rated value of 2 milliamperes is recommended when stability of operation is important.

Electrostatic and/or magnetic shielding of the 6342-A may be necessary. When a shield is used it should be connected to a potential near that of the cathode.

The high voltages at which the 6342-A is operated are very dangerous. Before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitors grounded.

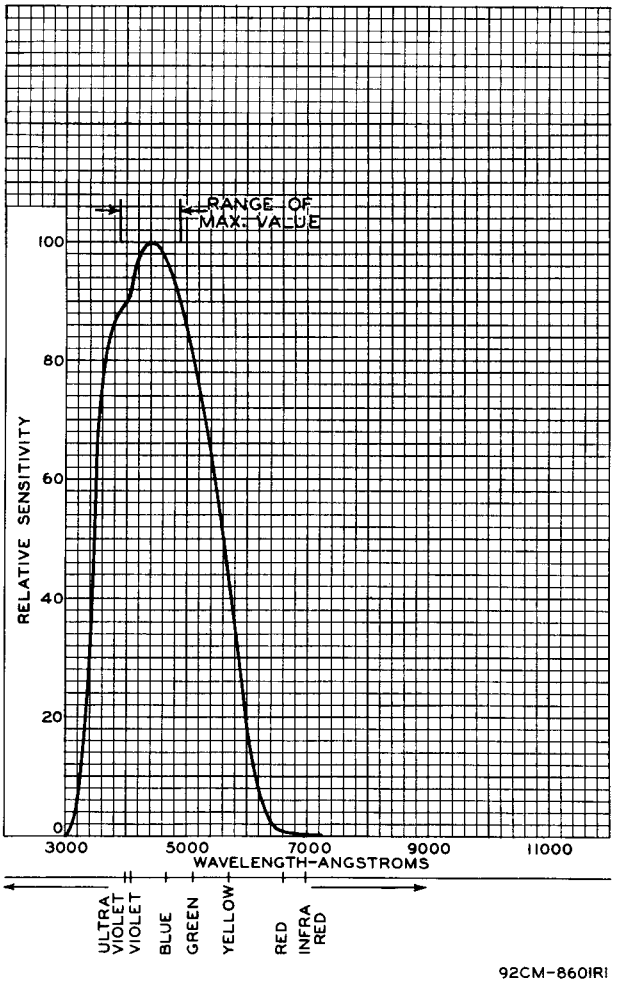


Fig. 2 - Spectral Sensitivity Characteristic of Type 6342-A which has S-11 Response. Curve is shown for Equal Values of Radiant Power at All Wavelengths.

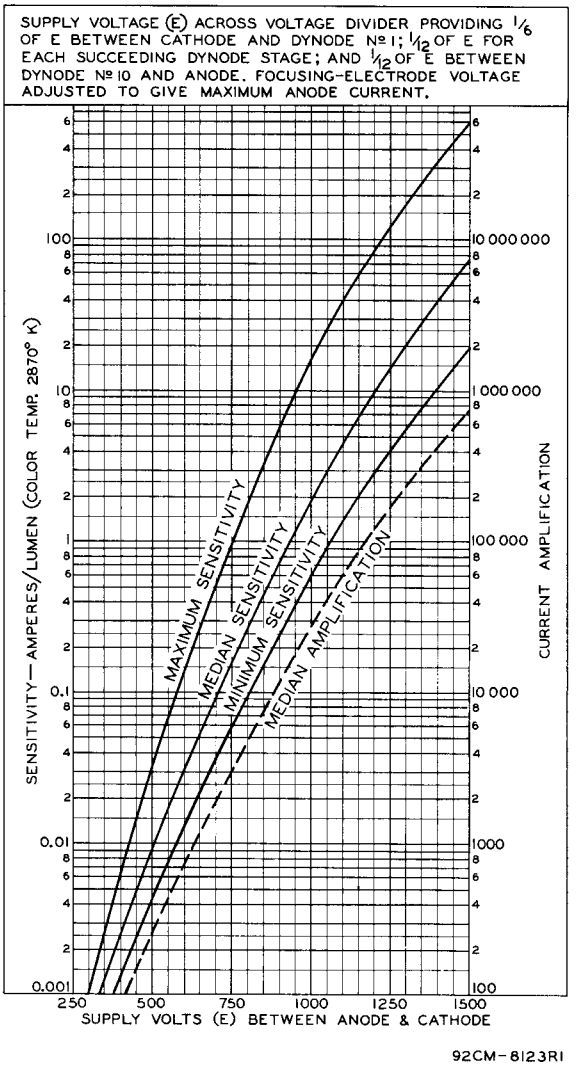


Fig. 3 - Characteristics of Type 6342-A.

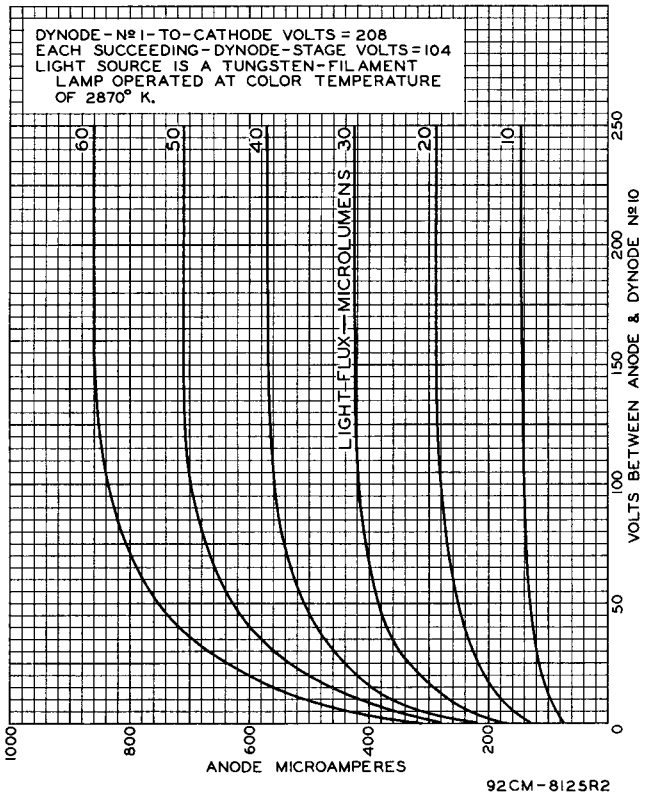


Fig. 4 - Average Anode Characteristics of Type 6342-A.

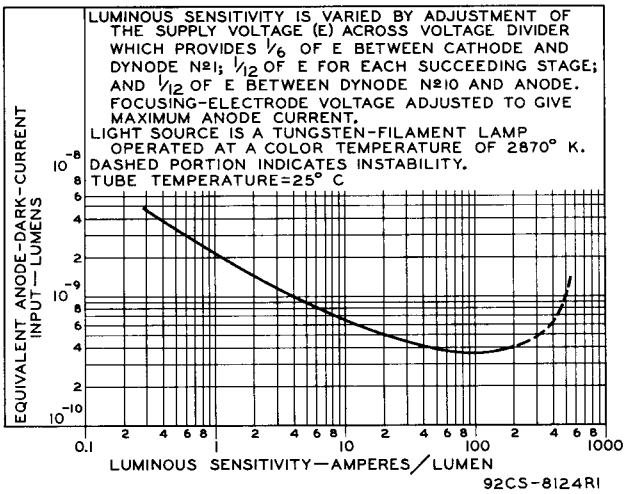
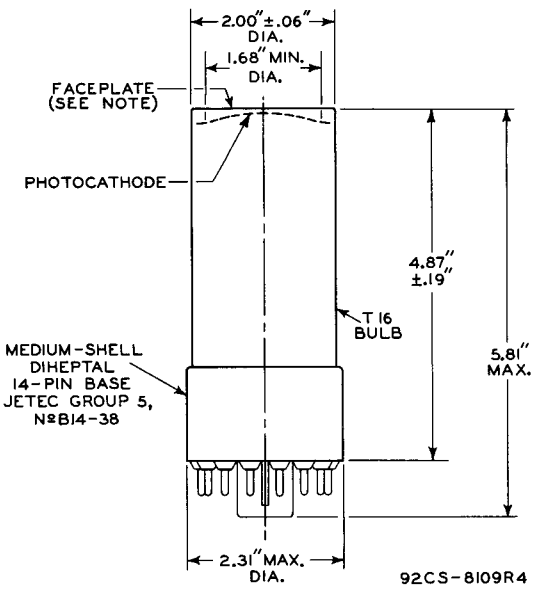


Fig. 5 - Typical Anode-Dark-Current Characteristic of Type 6342-A.

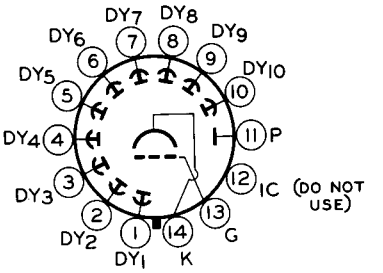
DIMENSIONAL OUTLINE



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

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

SOCKET CONNECTIONS
Bottom View



DIRECTION OF LIGHT:
INTO END OF BULB

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: INTERNAL CONNECTION—DO NOT USE
PIN 13: FOCUSING ELECTRODE
PIN 14: CATHODE