

JOINT ELECTRON DEVICE ENGINEERING COUNCILS

JEDEC Electron Tube Council

JEDEC Semiconductor Device Council



EIA Building
2001 Eye Street, N. W.
Washington, D. C. 20006



Announcement
of
Electron Device Type Reregistration
Release No. 2220B (Final)
July 11, 1966

The Joint Electron Device Engineering Council announced the proposed reregistration of the following electron device designation

6655A

on May 23, 1966.

This letter is notice that the proposed reregistration covered by Release No. 2220B, dated May 23, 1966, may be considered "FINAL."

JOINT ELECTRON DEVICE ENGINEERING COUNCILS

JEDEC Electron Tube Council

JEDEC Semiconductor Device Council



EIA Building
2001 Eye Street, N. W.
Washington, D. C. 20006

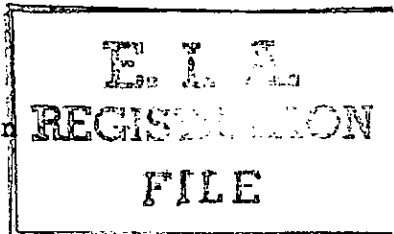
Announcement

of

Electron Device Type Reregistration

Release No. 2220B (Tentative)*

May 23, 1966



The Joint Electron Device Engineering Council announced the registration of the following electron device designation

6655A

on June 16, 1958, Release No. 2220, under the sponsorship of Radio Corporation of America, Harrison, New Jersey.

The sponsor now proposes reregistration based on the attached data sheets.

*Unless valid objection to this reregistration is lodged with the EIA Engineering Office, 2001 Eye Street, N.W., Washington, D.C. 20006, prior to June 23, 1966, this reregistration will be made and this information will be considered "FINAL".

JOINT ELECTRON DEVICE ENGINEERING COUNCIL
REREGISTRATION DATA
PHOTOMULTIPLIER TUBE

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. 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 = 1000 volts (Except as noted)

	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>		
Sensitivity:					
Radiant ^g at 4400 angstroms	-	9.6x10 ⁴	-	A/W	←
Cathode radiant ^h at 4400 angstroms.	-	0.061	-	A/W	←
Luminous ^j	10	120	300	A/lm	←
Cathode luminous:					
With tungsten light source ^k	4x10 ⁻⁵	7.6x10 ⁻⁵	-	A/lm	←
With blue light source ^m	4x10 ⁻⁸	-	-	A	←
Quantum Efficiency at 4200 angstroms	-	17	-	%	←
Current Amplification.	-	1.6x10 ⁶	-		
Equivalent Anode-Dark-Current Input ⁿ	{ -	3.0x10 ^{-10p}	2x10 ^{-9p}	lm	←
	{ -	3.7x10 ^{-13q}	2.5x10 ^{-12q}	W	←
Anode Dark Current ^{n,p}	-	6x10 ⁻⁹	-	A	←
Equivalent Noise Input ^r	{ -	8x10 ⁻¹³	2.7x10 ⁻¹¹	lm	←
	{ -	1x10 ^{-15q}	3.4x10 ^{-14q}	W	←
Anode-Pulse Rise Time ^s	-	3.4x10 ⁻⁹	-	sec	←
Electron Transit Time ^t	-	3.4x10 ⁻⁸	-	sec	←

Recommended.

^g This value is calculated from the typical value for luminous sensitivity using a conversion factor of 804 lumens per watt.

^h This value is calculated from the typical value for cathode luminous sensitivity using a conversion factor of 804 lumens per watt.

^j 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.

→ Indicates a change or an addition.

- k 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.
- m 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.
- n Measured at a tube temperature of 22 °C. Dark current may be reduced by use of a refrigerant.
- p Measured with supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current is measured with no incident light.
- q At 4400 angstroms. This value is calculated from the rating in lumen using a conversion factor of 804 lumens/watt.

- r Under the following conditions: Supply voltage (E) is as shown, 22 °C tube temperature, external shield connected to cathode, bandwidth 1 Hz, 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.
- s 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 variation and is measured under conditions with the incident light fully illuminating the photocathode.
- t The electron transit time is the time interval between the arrival of a delta function light pulse at the entrance window of the tube and the time at which the output pulse at the anode terminal reaches peak amplitude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.

DATA DELETIONS

Sensitivity:	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>
Luminous:			
With dynode			
No.10 as out-			
put electrode -		36	- A/lm

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"	-	1.5	- milliysec
1-9/16"	-	4.5	- milliysec

FOOTNOTE DELETIONS

- (*) 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.
- (†) 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.

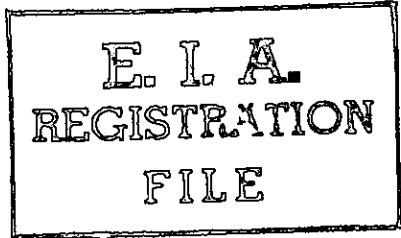
FOOTNOTE DELETIONS CONT'D

- (#) 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.
- (o) For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- (**) Under the following conditions: Supply voltage (E) is 1000 volts, 25° C tube temperature, external shield potential of -1000 volts with respect to anode, ac-amplifier 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.
- (□) 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 and with an incident light spot approximately 1 millimeter in diameter centered on the photocathode.
- (~~2~~) 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.

JOINT ELECTRON DEVICE ENGINEERING COUNCIL



JEDEC Type Administration Section
Electronic Industries Association
32 Green Street
Newark 2, New Jersey



Announcement
of
Electron Device Type Reregistration

Release No. 2220A (Tentative) *

October 21, 1963

The Joint Electron Device Engineering Council announced the registration of the following electron device designation

6655A

on June 16, 1958, Release No. 2220, under the sponsorship of Radio Corporation of America, Harrison, New Jersey.

The sponsor now proposes reregistration based on the following data:

<u>ITEM</u>	<u>AS REGISTERED</u>			<u>AS PROPOSED</u>		
<u>Under Characteristics Range Values for Equipment Design:</u>						
<u>With E = 1000 volts (Except as noted)</u>						
Sensitivity:	<u>Min.</u>	<u>Median</u>	<u>Max.</u>	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>
Radiant, at 4400 angstroms.	-	40000	-	-	7.2×10^4	- a/w
Luminous: †						
At 0 cps	10	50	300	10	90	300 a/lm
With dynode No.10 as output electrode †.	-	36	-	-	65	- a/lm
Current Amplification. .	-	900000	-	-	1.6×10^6	-
Equivalent Anode-Dark-Current Input#*	-	8.5×10^{-10}	2×10^{-9}	-	5×10^{-10}	2×10^{-9} lm

* Unless valid objection to this reregistration is lodged with the EIA Engineering Office, 32 Green Street, prior to November 21, 1963, this reregistration will be made and this information will be considered "FINAL" WITHOUT FURTHER NOTICE!

JOINT ELECTRON TUBE ENGINEERING COUNCIL



650 SALMON TOWER
11 WEST FORTY-SECOND STREET
NEW YORK 36, N. Y.
TELEPHONE: LONGACRE 5-3450

Announcement
of
Electron Device Type Registration

Release No. 2220

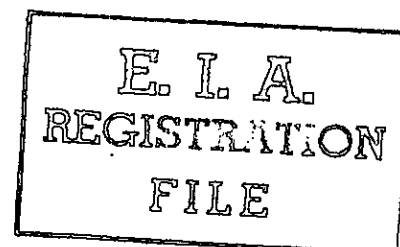
June 16, 1958

The Joint Electron Tube Engineering Council announces the registration of the following electron device designation

6655A

according to the ratings and characteristics found on the attached data sheets on the application of

Radio Corporation of America
Harrison, New Jersey





6655-A

MULTIPLIER PHOTOTUBE

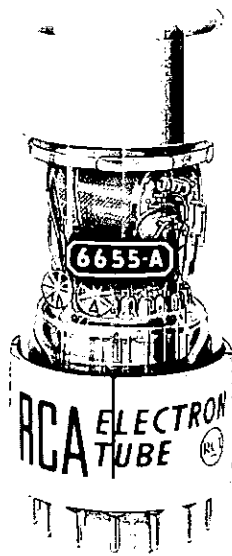
1.68" Dia. Curved
Circular Semitrans-
parent Photocathode

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

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

TENTATIVE DATA

RCA-6655-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 6655-A include dynodes with high-secondary-emission properties, 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 6655-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 9 per cent. The curved surface together with the electrode configuration employed in the 6655-A minimizes variation in electron-transit time between the photocathode and dynode No.1.

The spectral response of the 6655-A covers the range from about 3000 to 6500 angstroms, as shown in Fig.2. Maximum response occurs at approximately 4400 angstroms. The 6655-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 μmf
Anode to all other electrodes	7.0 μmf
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.814-38), Non-hygroscopic
Operating Position	Any
Weight (Approx.)	5.2 oz

Maximum Ratings, Absolute Values:

SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC or Peak AC)	1250 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)	300 max. volts
FOCUSING-ELECTRODE SUPPLY VOLTAGE (DC or Peak AC)	300 max. volts
AVERAGE ANODE CURRENT	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 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 = 1000 volts (except as noted) and Focusing-Electrode* Voltage Adjusted to Give Maximum Anode Current

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400 angstroms	-	40000	-	μa/μw
Cathode Radiant, at 4400 angstroms	-	0.044	-	μa/μw
Luminous:▲				
At 0 cps	10	50	300	amp/lumen
With dynode No.10 as output electrode†	-	36	-	amp/lumen
Cathode Luminous:				
With tungsten light source▲	40	55	-	μa/lumen
With blue light source®	0.04	-	-	μa

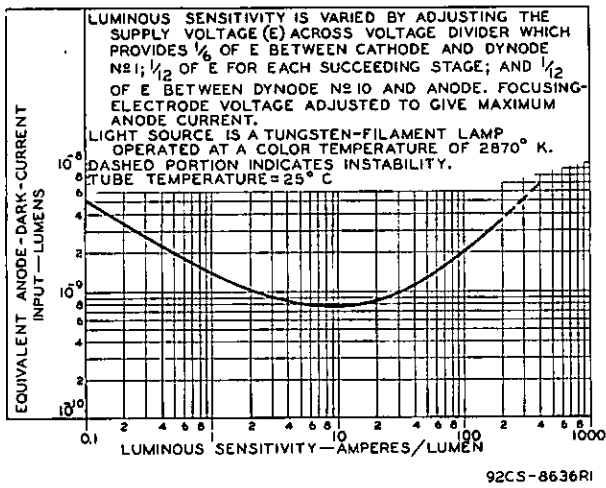
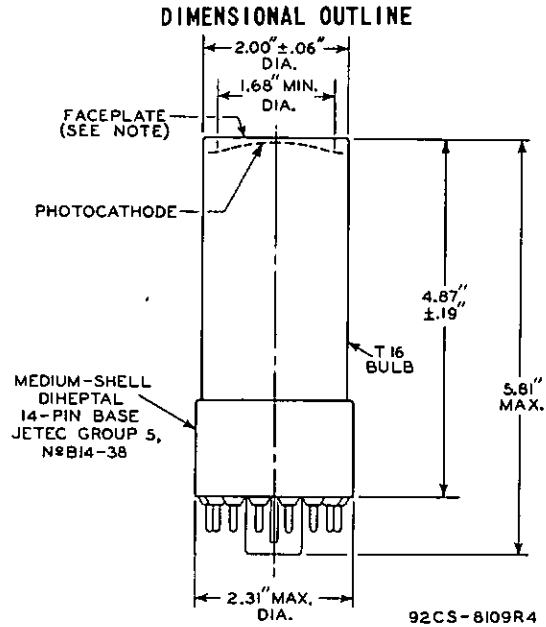


Fig. 4 - Typical Anode-Dark-Current Characteristic of Type 6655-A.



∠ 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.

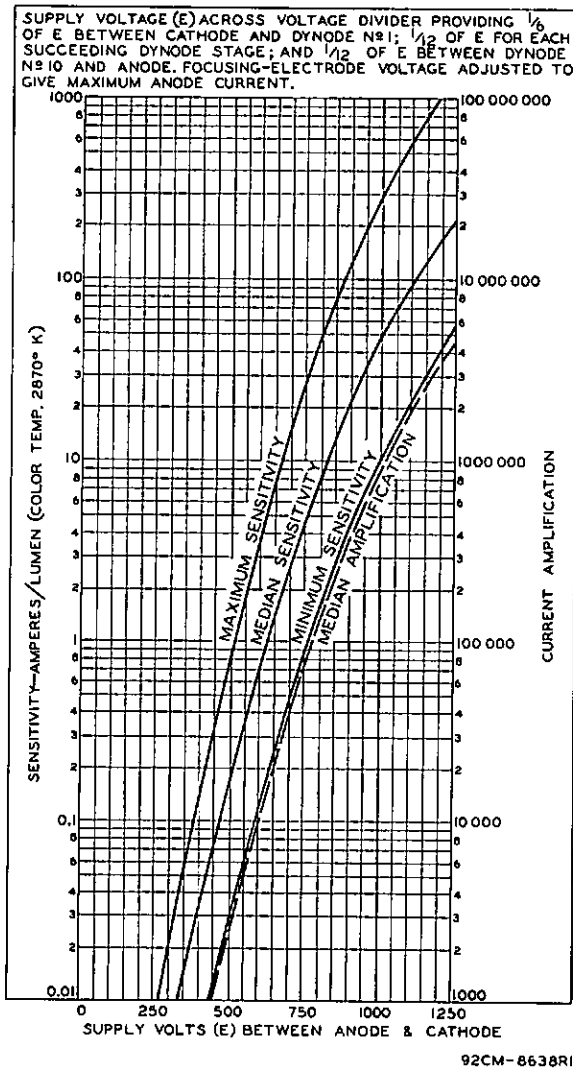
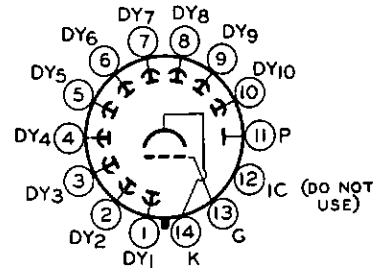


Fig. 5 - Characteristics of Type 6655-A.

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

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES
LANGASTER, PENNSYLVANIA 17045



2220 B
MAY 23 / 66

May 6, 1966

Mr. C. E. Coon
Electronic Industries Association
Engineering Department
2001 Eye Street, N. W.
Washington, D. C., 20006

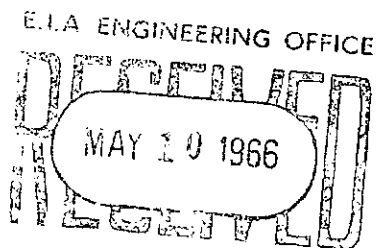
Dear Mr. Coon:

Releases No. 2220 and 2220A cover registration and reregistration of tube type 6655A. We are now proposing modification of the registered data as per the attached sheets.

Very truly yours,

John F. Wilhelm, Manager
Industrial Products and Picture Tubes
Commercial Engineering Activity

/jah
Att.



THE MOST TRUSTED NAME IN ELECTRONICS

JOINT ELECTRON DEVICE ENGINEERING COUNCIL
REREGISTRATION DATA
PHOTOMULTIPLIER TUBE

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. 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 = 1000 volts (Except as noted)

	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>		
Sensitivity:					
Radiant ^g at 4400 angstroms . . .	-	9.6x10 ⁴	-	A/W	←
Cathode radiant ^h at 4400 angstroms	-	0.061	-	A/W	←
Luminous ^j	10	120	300	A/lm	←
Cathode luminous:					
With tungsten light source ^k	4x10 ⁻⁵	7.6x10 ⁻⁵	-	A/lm	←
With blue light source ^m	4x10 ⁻⁸	-	-	A	
Quantum Efficiency at 4200 angstroms	-	17	-	%	←
Current Amplification	-	1.6x10 ⁶	-		
Equivalent Anode-Dark-Current Input ⁿ	{ -	3.0x10 ⁻¹⁰ p	2x10 ⁻⁹ p	lm	←
Anode Dark Current ^{n,p}	{ -	3.7x10 ⁻¹³ q	2.5x10 ⁻¹² q	W	←
Equivalent Noise Input ^r	{ -	6x10 ⁻⁹	-	A	←
	{ -	8x10 ⁻¹³	2.7x10 ⁻¹¹	lm	←
	{ -	1x10 ⁻¹⁵ q	3.4x10 ⁻¹⁴ q	W	←
Anode-Pulse Rise Time ^s	-	3.4x10 ⁻⁹	-	sec	←
Electron Transit Time ^t	-	3.4x10 ⁻⁸	-	sec	←

^g This value is calculated from the typical value for luminous sensitivity using a conversion factor of 804 lumens per watt.

^h This value is calculated from the typical value for cathode luminous sensitivity using a conversion factor of 804 lumens per watt.

^j 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.

→ Indicates a change or an addition.

- ^k 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.
- ^m 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.
- ⁿ Measured at a tube temperature of 22 °C. Dark current may be reduced by use of a refrigerant.
- ^p Measured with supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current is measured with no incident light.
- ^q At 4400 angstroms. This value is calculated from the rating in lumen using a conversion factor of 804 lumens/watt.
- ^r Under the following conditions: Supply voltage (E) is as shown, 22 °C tube temperature, external shield connected to cathode, bandwidth 1 Hz, tungsten-light source at a color temperature of 2370 °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.
- ^s 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 variation and is measured under conditions with the incident light fully illuminating the photocathode.
- ^t The electron transit time is the time interval between the arrival of a delta function light pulse at the entrance window of the tube and the time at which the output pulse at the anode terminal reaches peak amplitude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.

DATA DELETIONS

Sensitivity:	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>
Luminous:			
With dynode			
No.10 as out-			
put electrode	-	36	- A/lm

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"	-	1.5	- milliysec
1-9/16"	-	4.5	- milliysec

FOOTNOTE DELETIONS

- (*) 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.
- (†) 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.

FOOTNOTE DELETIONS CONT'D

- (#) 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.
- (o) For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- (**) Under the following conditions: Supply voltage (E) is 1000 volts, 25° C tube temperature, external shield potential of -1000 volts with respect to anode, ac-amplifier 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.
- (□) 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 and 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.