RCA TUBE Handbook HB-3



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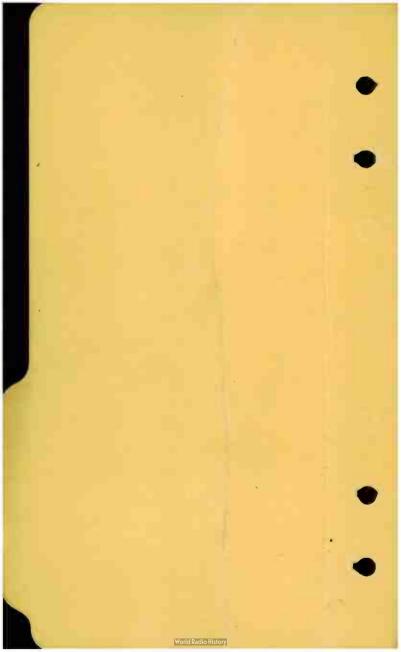
SEPARATOR

PHOTOSENSITIVE DEVICE SECTION

This Section contains data on pho otubes of the single-unit, twin-unit, and multiplier types; photocells; television camera tubes such as image orthicons, iconoscopes, and vidicons; and other devices employing photosensitive materials.

For further Technical Information, write to Commercial Engineering, Tube Division, Rodio Corporation of America, Harrison, N. J.

2-57



RCA PHOTOSENSITIVE DEVICES

IMAGE-CONVERTER TUBES

CAMERA TUBES

Image	Image Orthicons										
Tube	Recor	mmended Servi	ice								
Diameter	Live lelevision Pickup Milit										
inches	Black & White	Color	and Industrial								
3	4401V1 5820A 7293A 8093A	4415, 4416a 7513 7513/V1 b	7198								
4-1/2	7295A 7389A										

Saucharal	Rec	commended	Service
Spectral Response	Infrared	Ultra- violet	Photographic Shutter
S-1	6032A 6381 6914 6914A 6929		
S-11			4449
S-21		7404	

All types utilize a P20 phosphor screen except type 4449 which has a P11 phosphor screer.

> For photocell data. see foldout sheet-RCA PHOTOCELL DATA TABLES

	Vidicons									
1	Tuba	Recommended Service								
	Tube Diameter inches	Broedcast Studio Film Pickup	Live Television and Industrial	Special Military and Industrial						
	1/2			4427 4429						
	1	6326 7038	7262A 7697 7735A 8134	2048A 7263A						
	1-1/2	8051		8051						

- ^a Supplied as a set of two 4415's and one 4416 having matched characteristics.
- ^b Set of three 7513's having matched characteristics.

PHOTOSENSITIVE DEVICES

DEVICES

PHOTOSENSITIVE

World Radio History

SELECTION GUIDE PHOTOSENSITIVE DEVICES 4-63

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.





MULTIPLIER PHOTOTUBES

Numi o Sta	f	6	9		10	12	14
Dyne Mater		Cu-Be	Cs-Sb	Cu-Be	Cs-Sb - Ag-Mg*	Cu-Be	Cu-Be - Ag-Mg*
	S-1				7102*		
	S-4		1P21 931A 6328 6472 7117				
	S-5		1P28				
	S-8		1P22				
	S-10				6217		
Spec- tral Re- sponse	S-11	7764		2020 6342A 7746 7767 8053 8054 8055	2067 4438 4439 4440 4441 5819 6199 6655A	7850	6810A 7264*
	S-11a						7046*
	S-13				6903		
	S-17				7029		
	S-19	(ni	7200				
	S-20				7326*		7265

VACUUM AND GAS PHOTOTUBES

Spectral	Single	Single-Unit		Composite Anode- Cathode
Response	Vacuum	Gas	Gas	Vacuum
S-1	917 919 922 925 6570	1P40 1P41 868 918 921 923 927 928 930 6405/ 1640 6953	920	
S-3	926	1P29		
S-4	1P39 929 934 5653 7043	1P37 4409 5581 5582 5583	5584	5652
S5	935			
S-9	1P42			

^a Extended Spectral Response.



World Radio History

RCA PHOTOCELLS

RCA PHOTOCELLS

RCA PHOTOCELLS

Data Tables

JUNCTION	PHOTOCELLS	_
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		MAXI	MAXIMUM RATINGS					
RCA Type	Spectral Response	Volt. bet Term.	Power Dissi- pation ^p	Ambient Temp. Range	Dia. of Sensi- tive Surface			
		dc volts	watt	°C	inch			
SQ2516	S-14	50	0.03	-40 to +50	0.045			

JUNCTION PHOTOVOLTAIC CELLS -

RCA Type	Spectral Response	Ambient Temp. Range	Sensi Are (Av	ar	
1,1,00		Range	sq. in.	sq. cm	
SL2205	q	-100 to	0.278	1.795	
SL2206	q	+125	0.586	3.783	

- ^a The maximum ambient operating temperature range for these cells is -75°C to +75°C.
- The maximum ambient operating temperature range for these cells is -40°C to +75°C.
- ^C With sensitive surface of cell fully illuminated. These dissipation ratings apply up to a temperature of +40°C from which point the cells are derated linearly to 0 watts at +75°C.
- ^a The demand rating is a dissipation rating to which the cell may be exposed in outdoor applications. The rating may be utilized twice every 24 hours for a period of 20 minutes each time provided the interval between demand periods is not less than 4 hours.
- e For conditions where light flux from a tungsten-filament lamp operated at 2870°K is transmitted through a filter (Corning C.S. No.1-62 which has an effective transmission of luminous flux of 13.3%) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. The sensitive surface of the cell is fully f illuminated.
- This characteristic determined after the cell has been exposed for a period of 16 to 24 hours to 500 footcandle illumination (white fluorescent light).
- 9 Measured 10 seconds after removal of incident-illumination level.

Í		Germanium P-N Allo								
		CHARACTERISTICS AT 25°C								
ļ		TY								
	Voltage Between Terminals dc volts	als instion luminous LE mismon		1.5 microns	Max. Dark Current ^{µa}					
	45	0.3 min. 0.7 typ.	0.014	0.52	35					
			0:1:		D. T					

Silicon N on P Types

	CHARACTERISTICS AT 270 ± 1°C								
	Min.	Min.		vity(Typ.					
Min. Current ma	Power Output mw	Effic- iency %	Illumi- nation µa●/fc	Luminous ma⊕/lm	Radiant © 8600 A° a●/w				
48	48 17.9 10.0		14.5 7.13		0.58				
101.5	37.8	10.0	29	7.13	0.58				

- For renewal use only. Not for new equipment design. The maximum ambient operating temperature range for these cells is -75°C to +60°C.
- [•] The maximum ambient operating temperature range for $_{\rm I}$ these cells is -40°C to +60°C.
- In continuous service with sensitive surface of cell fully illuminated. The power dissipation rating applies up to the maximum rated ambient operating temperature.
- ^m For conditions where the light source is a tungstenfilament lamp operated at a color temperature of 2870°K.
- ⁿ This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 50 to
- p 100 footcandle illumination (white fluorescent light). These ratings apply up to maximum rated ambient temp-
- , erature.
- ⁹ Wavelength of maximum response is 8600 ± 750 angstroms.
- Including metallic grid lines but excluding negative contact terminal.
- Refer to SPECTRAL-SENSITIVITY CHARACTERISTIC CHART of PHOTOCONDUCTIVE CELL HAVING S-15 RESPONSE at front of Photosensitive Device Section.
- * Additional technical data for this type are given on individual data sheets in this section.
- Short-circuit current.



RCA PHOTOCELLS

Data Tables

PHOTOCONDUCTIVE CELLS - Cadmium-Sulfide Types

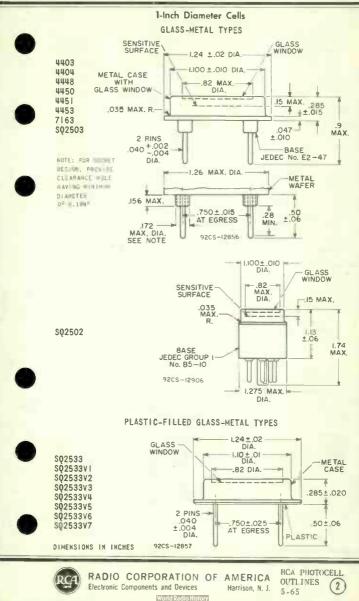
RCA	TYPES		١	MAXIMUM RAT	INGS		CHARACTERISTICS AT 25°C					
Glass- Metal	Glass-	Filled	Spectral Response	Voltage Between Terminals	Power Diss wat		Photo-	Voltage Between	Illumi- nation ^e	Photoc	urrent ^f na	Max. Decay
Typesa			DC or Peak AC Continuous Demand volts Service Serviced ma	Terminals ac volts	1001-	Min.	Max.	Current9 µa				
				I-inch Dia	ameter Bro	oad-Area						
4451	SQ2533	S-15	600	0.75	1.0	50	50	35	2	3.5	40	
4450	SQ2533V1	S-15	600	0.75	1.0	50	50	3.5	2	3.5	40	
SQ2503	SQ2533V2	S-15	600	0.75	1.0	50	50	1	0.8	1.7	40	
7163*	SQ2533V3	S-15	600	0.75	1.0	50	50	1	1	3	40	
4448	SQ2533V4	S-15	600	0.75	1.0	50	50	1	1.5	4	40	
4404 SQ2502h	SQ2533V5	S-15	600	0.75	1.0	50	50	1	2.5	5	40	
4453	SQ2533V6	S-15	600	0.75	1.0	50	50	1	3	7	40	
4403	SQ2533V7	S-15	250	0.75	1.0	50	50	1	8	16	78	

RCA TYPES		ES		MAXIMU	M RATINGS	3	CHARACTERISTICS AT 25°C				
Glass- Metal	All- Glass	Plastic- Filled Glass- Metal	Spectral Response	Voltage Between Terminals DC or Peak AC	Power Dissi- pation	Photo- current	Voltage Between Terminals	lllumi- nation ^m	Photoc		Max. Decay
TypesJ	TypesJ	Typesk		volts	watt	ma	volts	foot- candles	Min.	Max.	Current9 µa
_				1/2-inch	Diameter	Broad-Are	a				
SQ2525	SQ25 00	SQ2532	S-15	250	0.2	20	12 (dc)	1	0.24n	0.8n	6
SQ2521	4423	SQ2532V1	S-15	250	0.2	20	50 (ac)	le	1.5 ^f	4 ^f	40
SQ2526	SQ2523	SQ2532V2	S-15	110	0.2	50	12 (dc)	1	lu	3n	80
SQ2527	SQ2524	SQ2532V3	S-15	110	0.2	50	12 (dc)	1	2 n	6 n	80
SQ2520	4425	SQ2532V4	S-15	110	0.2	50	12 (dc)	1	3.6 ⁿ	14.5 ⁿ	80
				I/4-inch	Diameter	Broad-Are	a				
SQ2529	SQ2528	SQ2531	S-15	300	0.05	5	12	1	0.004f	0.012	0.1
-	-	SQ2531V1	S-15	200	0.05	5	12	1	0.04 ^f	0.12 ^f	1
SQ2508	7412*	SQ2531V2	S-15	200	0.05	5	12	1	0.065f	0.275	
-	4413	SQ2531V3	S-15	110	0.05	5	12	10	1.4	2.75f	12
SQ2519	4402	SQ2531V4	S-15	300	0.05	5	12	10	1.6 ⁿ	-	12
-	-	SQ2531V5	S-15	110	0.05	7	12	1	1	3f	15
-	-	SQ2531V6	S-15	110	0.05	7	12	1	1.6 ^f	4.8 ^f	15



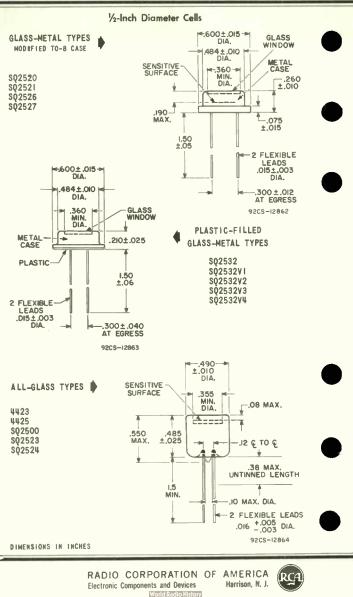
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

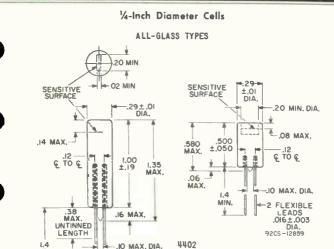
RCA PHOTOCELLS Dimensional Outlines



RCA PHOTOCELLS

Dimensional Outlines





4402 4413 S02528

FLEXIBLE

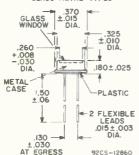
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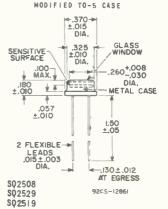
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MIN.

PLASTIC-FILLED **GLASS-METAL TYPES**



SQ2531 SQ2531V1 S02531V2 S02531V3 S02531V4 S02531V5 S02531V6



GLASS-METAL TYPES

DIMENSIONS IN INCHES

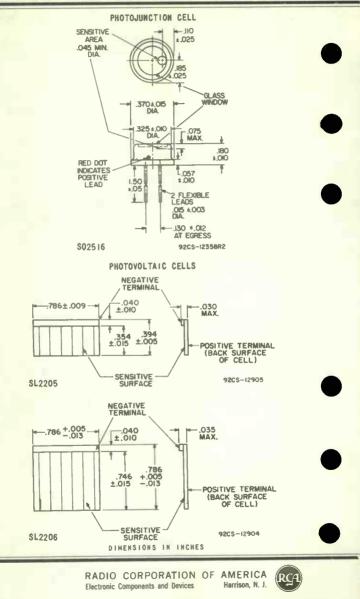
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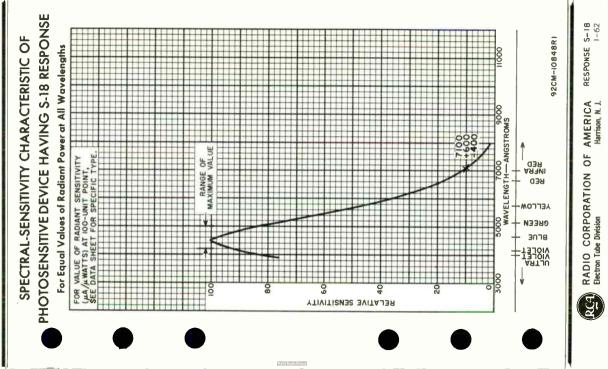
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RCA PHOTOCELL OUTLINES 3 5-65

RCA PHOTOCELLS Dimensional Outlines





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PHOTOTUBE SENSITIVITY AND SENSITIVITY MEASUREMENTS

GENERAL CONSIDERATIONS

The range of luminous-sensitivity limits given for a phototube on the data sheets of this Section is that which the tube will display when operated under low-current conditions.

If the tube s to be operated under conditions approaching its maximum-current rating, the equipment design should provide for a wider sensitivity range having a minimum value equal to one-half of that shown for low-current operation. The sensitivity of a phototube under such high-current conditions is dependent upon the tube type, as follows:

- I. Single-Unit and Twin Phototubes
 - a. Gas Types: For high-current operation, and particularly in applications in which the type is subjected to these higher values continuously, a drop in sensitivity below the values for low-current operation may be expected, the extent of the drop being affected by the severity of the operating conditions. After a period of idleness, a gas phototube usually recovers most of its initial sensitivity.
 - b. Vacuum Types: Unlike gas phototubes, this class of phototubes shows negligible drop in sensitivity values for different degrees of illumination and over long periods of use. The output current of a vacuum phototube is a linear function of the exciting illumination under normal operating conditions. The frequency response is flat up to frequencies at which transit-time effects become the limiting factor.

2. Multiplier Phototubes

Although RCA Multiplier Phototubes are vacuum types, a drop in sensitivity is to be expected from this class of phototubes when operated at high anode-current values. The extent of the drop is affected by the nature and severity of the operating conditions to which the tube is subjected. After aperiod of idleness, the multiplier phototube usually recovers a substantial percentage of this loss of sensitivity.

Multiplier-phototube-sensitivity values are dependent on the respective amplification of each dynode stage. Hence, large variations insensitivity can be expected between individual tubes of a given type. The overall amplification of a multiplier phototube is equal to the average amplification per stage raised to the nth power, where n is the number of stages. Thus, very small variations in amplification per stage produce very large changes in overall tube amplification.

Because these overall changes are very large, it is advisable for designers to provide adequate adjustment of the supply vo tage per stage so as to be able to adjust the amplification of individual tubes to the desired design value. It is suggested that an overall voltage-adjustment (continued on next page)

TUBE DEPARTMENT

PHOTOTUBE SEN. & RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY MEASUREMENTS











PHOTOTUBE SENSITIVITY SENSITIVITY MEASUREMENTS

range of at least 2 to 1 be provided. When the output current can be controlled by change in the illumination of the photocathode of the multiplier phototube, the required range of adjustment in the voltage per stage can be reduced.

SENSITIVITY MEASUREMENTS

The luminous-sensitivity values shown on the data pages of this Section are measured according to the following procedures:

I. Single-Unit and Twin Phototubes

- a. Gas Types: The light source consists of a tungsten lamp operating at a filament color temperature of 2870^{bK}. For the 0-cycle measurements, a light input of 0.1 iumen is used, unless otherwise specified. For the 5000- and 10000 cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean. For all measurements, adc anode-supply voltage of 90 volts and a 1.0-megohm load resistor are employed. Under these conditions, the effect of tube capacitance is negligible.
- b. Vacuum TyPes: The light source consists of a tungsten lamp operating at a filament color temperature of 2870°K. A steady light input of 0.1 lumen is used, unless otherwise specified, together with a dc anode-supply voltage of 250 volts and a 1-megohm load resistor.

2. Multiplier Phototubes

The light source consists of a tungsten lamp operating at a filament color temperature of 2870° K. A light flux of 10 microlumens from a rectangular aperture approximately 0.8" long and 0.2" wide is projected normal to the cathode in the direction noted on the basing diagram and out line. The load resistor has a value of 0.01 megohm. The applied voltages are specified on the individual data sheets.

World Radio History



DEFINITIONS

of Photosensitive-Device Terms

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

Radiant Intensity Sensitivity. The quotient of output current by incident radiant power per unit area, 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.

Luminous Intensity Sensitivity. The quotient of the putput current by the incident luminous intensity, at constant electrode voltages.

Cathode Luminous Sensitivity. The quotient of current leaving the photocathode by the incident luminous flux.

Illumination Sensitivity. The quotient of output current by the incident illumination, at constant electrode voltages.

Dynamic Sensitivity. The quotient of the modulated component of the electrical output by the modulated component of the incident radiation.

Current Amplification. Ratio of the putput 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 Naise Input. That value of incident luminous flux which when modulated in a stated manner produces an rms putput current equal to the rms noise current within a specified bandwidth.

Electrode Dark Current. The electrode current which flows when there is no radiant flux incident on the photocathode.

Transit-Time Spread. The increase in width of the output pulse over that of the input pulse. Pulse width is measured at 50 per cent of the pulse height.

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.

Median. That value in a series such that half of the devices in the series are on one side of it, and half on the other.







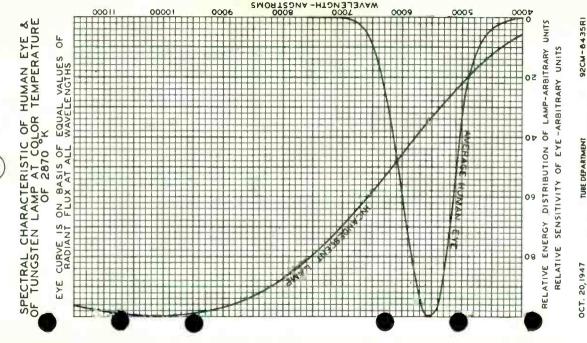


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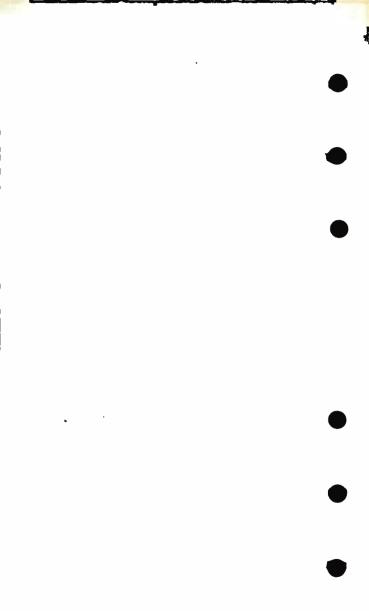
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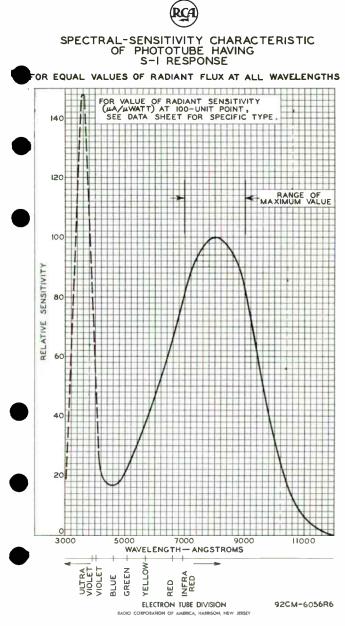
World Radio History



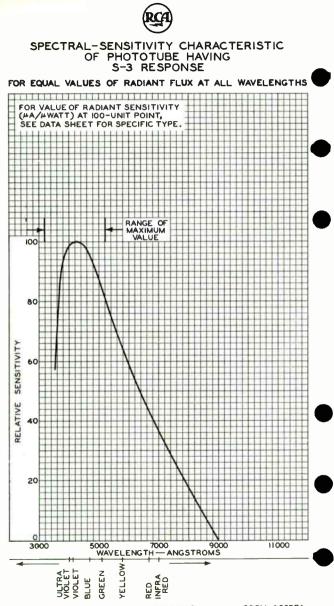
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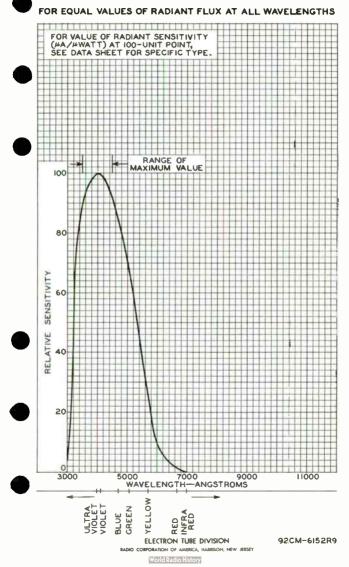
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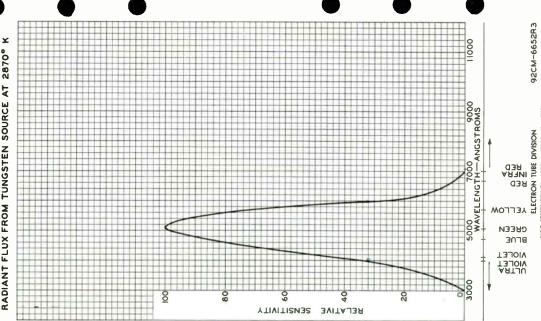
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-4 RESPONSE

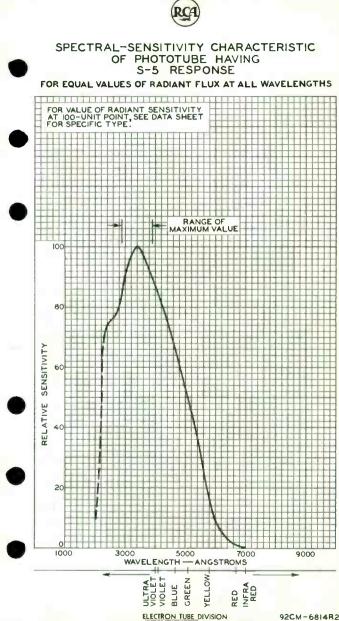




SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-4 RESPONSE







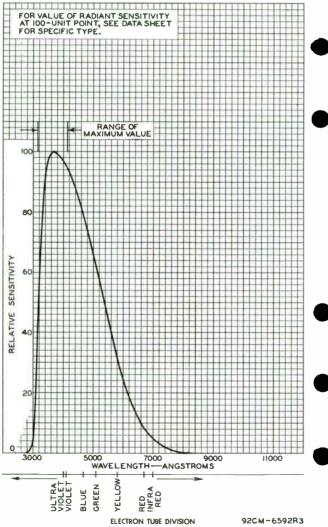
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SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-8 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS

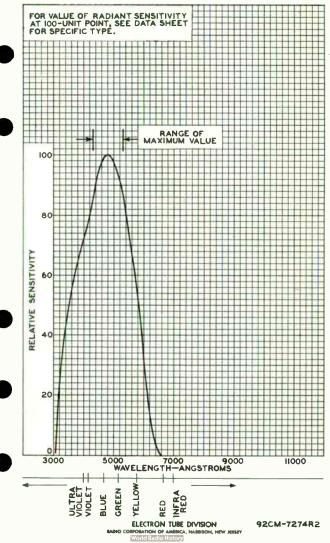


RADIO CORPORATION OF AMERICA, MARTISON, NEW JERSEY



SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-9 RESPONSE

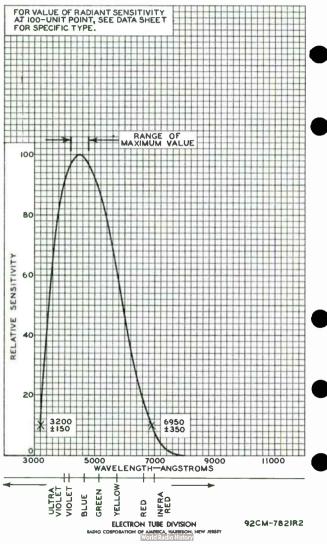


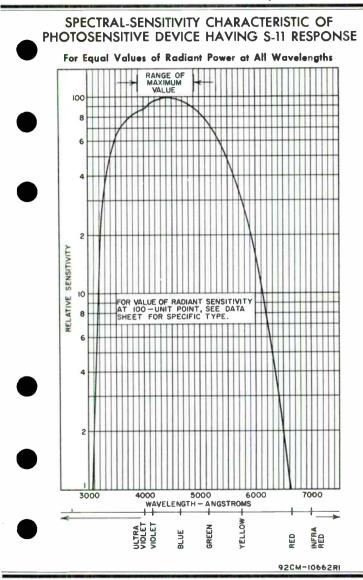




SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS







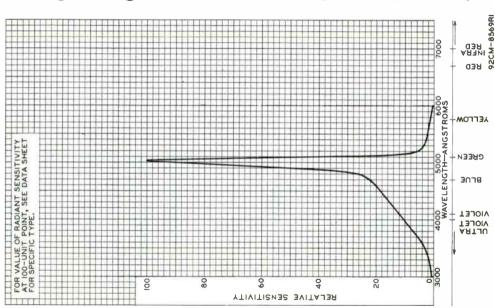
RADIO CORPORATION OF AME Electron Tube Division World Radio History Harrise

AMERICA Harrison, N. J. RESPONSE S-11 7-63

Response S-12

STIC OF RESPONSE CHARACTERISTIC -12 ல் **UNIVAH** -SENSITIVITY DEVICE **PHOTOSENSITIVE** Å SPECTR.





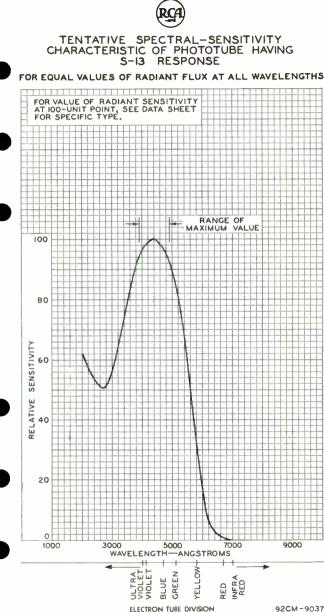
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CORPORATION

RADIO CORPI Electron Tube Division



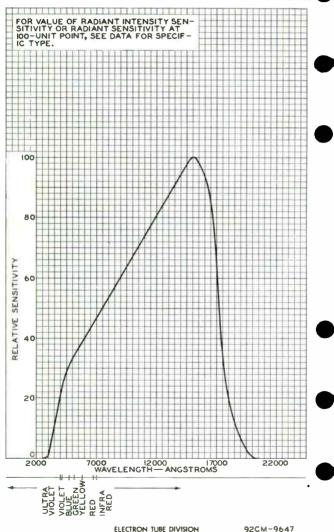
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TENTATIVE SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOJUNCTION CELL HAVING S-14 RESPONSE

FOR EQUAL VALUES OF RADIANT FLUX AT ALL WAVELENGTHS

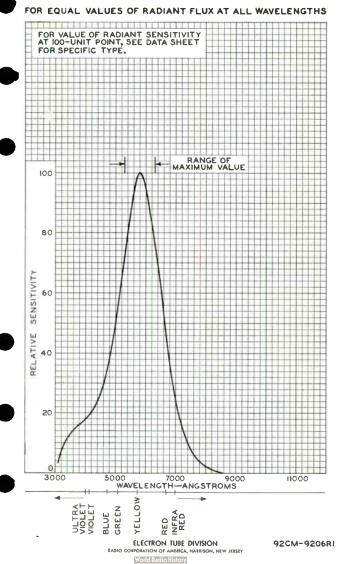


RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

World Radio History



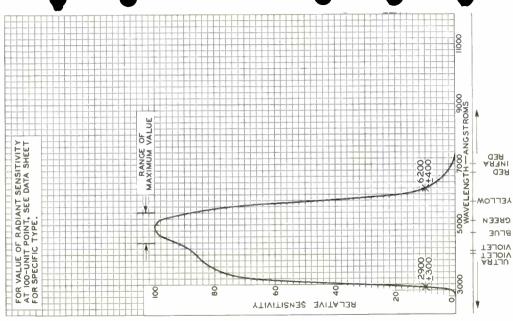
TENTATIVE SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOCONDUCTIVE CELL HAVING S-15 RESPONSE





TENTATIVE SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-17 RESPONSE

WAVELENGTHS ALL AT FLUX RADIANT Р VALUES EQUAL FOR



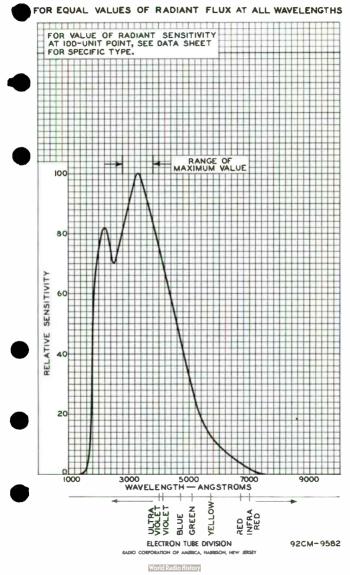
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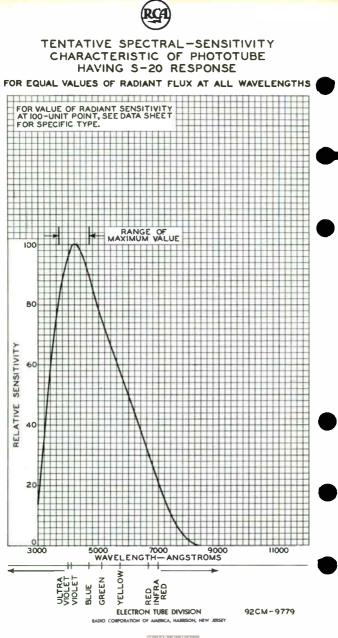
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ELECTRON TUBE

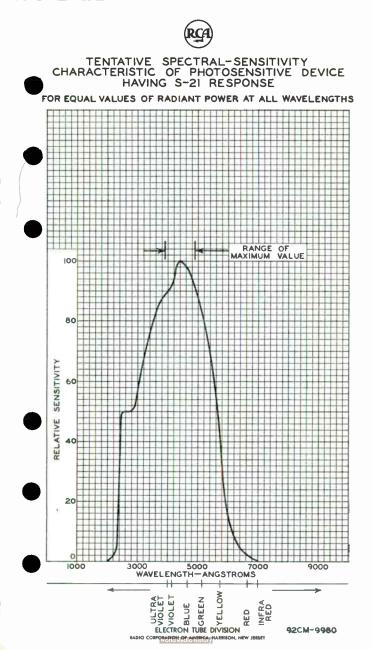


TENTATIVE SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-19 RESPONSE

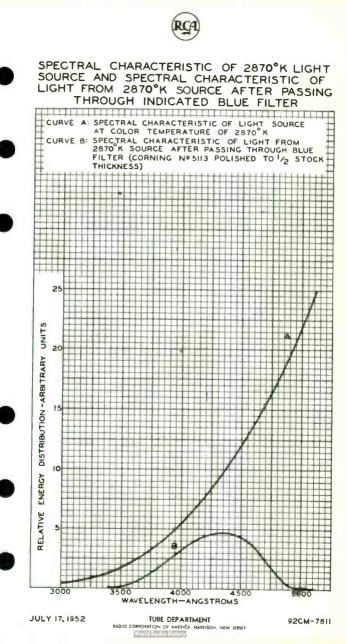




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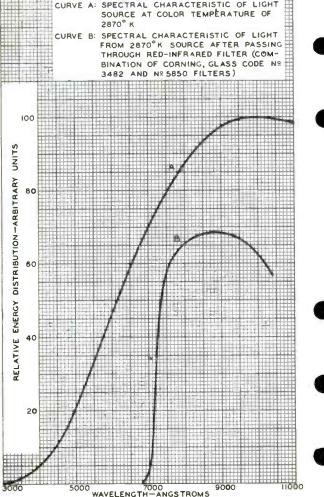


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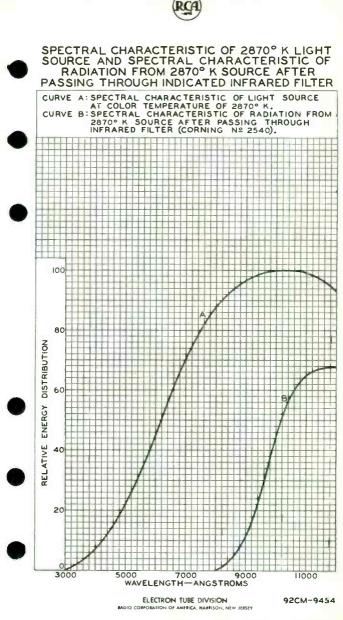
SPECTRAL CHARACTERISTIC OF 2870°K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870°K SOURCE AFTER PASSING THROUGH INDICATED RED-INFRARED FILTER



SEPT. 3, 1952

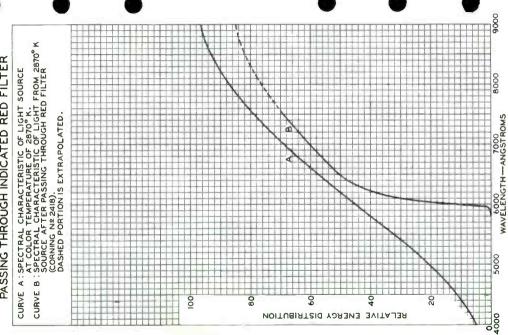
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2870° K LIGHT CTERISTIC OF TER LTER ⊒ ٩ Ŀ, RED SOURCE ATED RED ίυ ▼ CHARACTERISTIC OF ID SPECTRAL CHAR. FROM 2870° K THROUGH INDIC SPECTRAL CH SOURCE AND LIGHT



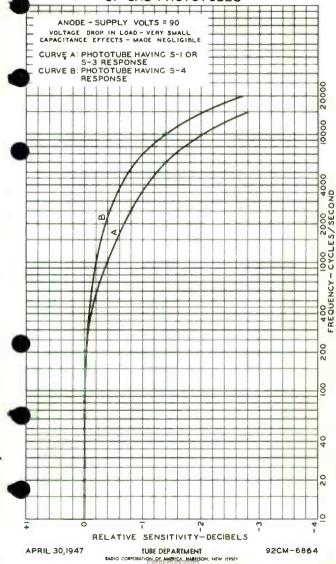
ELECTRON TUBE DIVISION

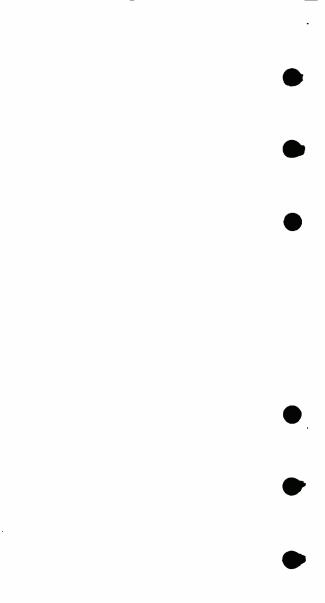
6889

92CM-



FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES





Multiplier Phototube

9-STAGE, SIDE-ON TYPE For Detection and Measuremen		S-4 RESPONSE ight Levels
General:		+
Spectral Response	e 4000 ± 5 	ium-Antimony 15/16" 5/16" Lime Glassb ium-Antimony 4.4 pf 6.0 pf 3-11/16" 3-1/8" 5/15" ± 3/32"
Operating Position Weight (Approx.) Bulb Socket Am Magnetic Shield. Perfection Mi Base Small-Shell Basing Designation for BOTT	bhenol¢ №.78S11T, o caCo.ª, №.P-101-1.c Submagnal 11-Pin (JEI No.Bil-88). Non	Any 1.6 oz 1.6 oz 79 r equivalent or equivalent DEC Group 2, -hygroscopic
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	DY3 DY4 DY3 DY3 DY2 DY2 DY1 K DIRECTION OF IN RADIATION	
Maximum Ratings, Absolute-Naxi For operation at alti		←
Supply Voltage Between Anode and Cathode [®] (DC or Peak AC) Supply Voltage Between Dynode	1250 m	
and Anode (DC or Peak AC) Supply Voltage Between Consecu	250 m	ax. volts
Dynodes (DC or Peak.AC) Supply Voltage Between Dynode		ax. volts
and Cathode (DC or Peak AC). Average Anode Current [†] Ambient Temperature	0.1 m	ax. ma ax. ^o C
	🔶 Indica	tes a change.

RADIO CORPORATION OF AMERICA

Electronic Components and Devices



Harrison, N. J.

DATA I 10~63

- Characteristics Range Values:

Under conditions with dc supply voltage (E) across a voltage divider providing I/IC f 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)

Sensitivity:	Min.	Typ.	Max.
Eadiant, at 4000 angstroms Cath dr radi nt, at	-	7.8×104	– 1/w
4000 angstroms			
Cathode luminous ^h	2×10-5	4×10-5	- a/lm
Current Amplification Equivalent Anode-Dark-Current	_	ZX100	-
Input at a luminous sen- sitivity of 20 a/lmj.k	_	_	5x10-10 lm
Equivalent Noi e Input"		5×10-13	1.3x10-1 1m

With E = 750 volts (Except as noted)

0 1.1 1.	2.0.11.1	194.4	1704 20 .	
Sensitivity: Radi nt, at 4000 undetroms Cathode radiunt, at	-	1.2×10 ⁴	-	w/w
4(00 angstroms		0.04	_	a/w
Luminous, at (cp 9		12	10 0	A/Im
Cathod lutinoush	-		-	3/]m
Current Amplification	-	3×10	-	

Typ

On plane perpendicular to the indicated direction of incident light and passing through the major axis of tube.

b Corning No.0080, Corning Glass Works. Corning, New York, or equivalent. Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 50, Illinois.

Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.

Operation with a supply voltage [L] of less than 500 volts dc is usually net recommended. If such a supply voltage is used, illumination must be limited to such a value that the cathode photocurrent does not exceed approximately 1 x 10^{-6} ampere. A

Averaged over any interval of 30 seconds maximum.

Under the following conditions: The light source is a tungsten-filament 1 mm having a lime-glass envelope. It is operated at a color temperature α 1 amp having a time-glass envelope. It is operated at a co of 28700 K and a light input of 10 microlumens is used. ь

Under the following conditions: The light source is a tungsten-filament lump 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.

- At a tube temperature of 25°C. Dark current may be reduced by a refrigerant.
- k For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- m Supply voltage (E) is as shown, 25° C Under the following conditions: The formation of the state of

- Indicates a change.

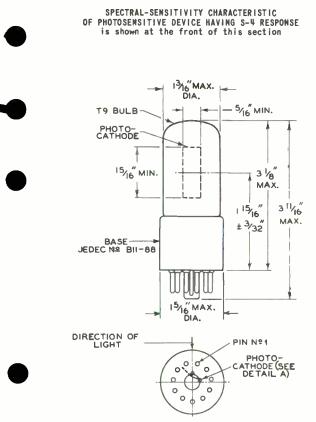






RADIO CORPORATION OF AMERICA Electronic Components and Devices



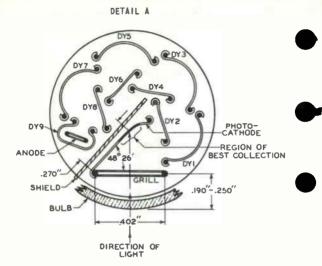


92CM-6264R8

CENTER LINE OF BULL WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the perpendicular erected at center of bottom of base.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 2 3-62



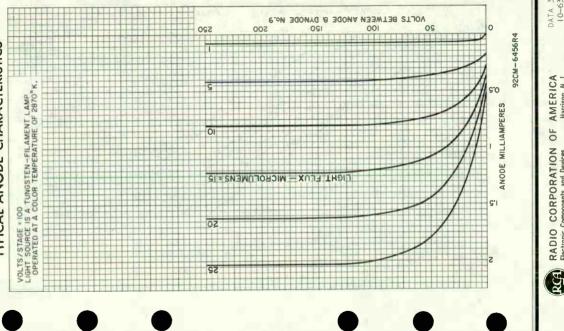
92CS-8674RI





IP21





HC.

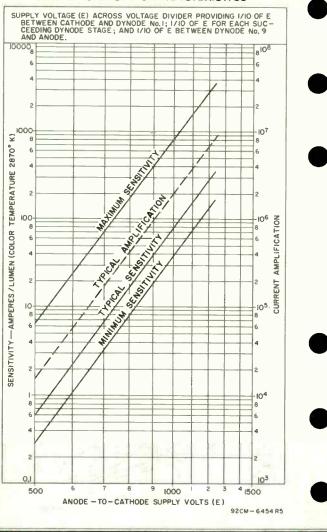
AMERICA Harrison, N. J.

G

CORPORATION Components and Devices

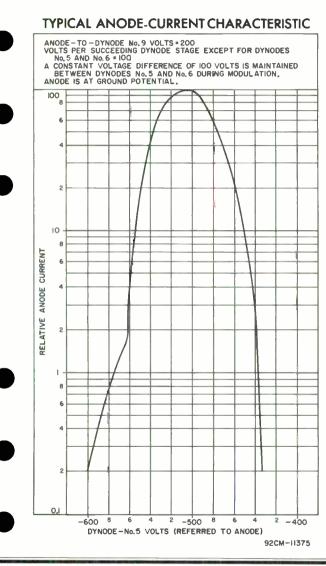
RADIO Electronic (

TYPICAL SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS



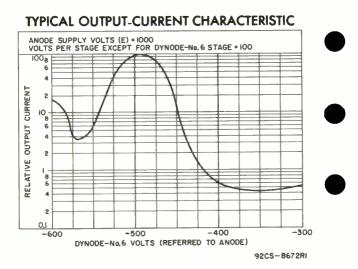
RADIO CORPORATION OF AMERICA Electronic Components and Devices World Devices Harrison, N. J.

RCA

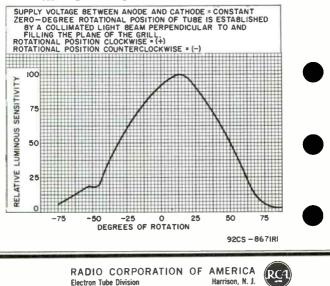


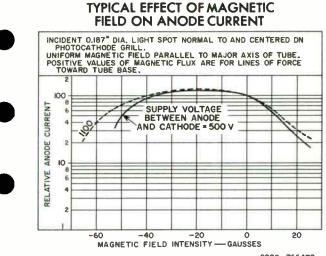


RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 4 3-62



VARIATION IN LUMINOUS SENSITIVITY





92CS-7664R2



RADIO CORPORATION OF AMERICA Electron Tube Division Karrison, N. J. DATA 5 3-62

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
Wavelength of Maximum Response 3650 ± 500 angstroms
Cathode, Opaque Cesium-Bismuth
Minimum projected length ^a
Minimum projected width ^a
Window Lime Glass ^b
Dynode Material
Dynode Material Cesium-Antimony Direct Interelectrode Capacitances (Approx.):
Approx. /:
Anode to dynode No.9 4.4 pf
Anode to all other electrodes 6.0 pf
Maximum Overall Length
Maximum Seated Length
Length from Base Seat to Center
of Useful Cathode Area 1-15/16" ± 3/32"
Maximum Diameter
Operating Position
Weight (Approx.) 1.6 oz
Bulb
Socket
Magnetic Shield. Perfection Mica Co. 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 . . .



F

PPP

P

P

P

P

Pin	1 – Dynode	No.1
'in	2 – Dynode	No.2
'ni	3 – Dynode	
'in	4 – Dynode	
lin	5 – Cynode	
'in	6 – Dynode	
in	7 - Dynode	No.7
in.	B – Dynode	
in	9 - Dynode	
in	10 – Anode	
	11 - Photoca	t hode



Maximum Ratings, Absolute-Maximum Values:

Supply Voltage Between Anode and		
Cathode (DC or Peak AC)	0 max.	volts
Supply Voltage Between Dynode No.9		
and Anode (DC or Peak AC)	0 max.	volts
Supply Voltage Between Consecutive		
Dynodes (DC or Peak AC)	0 max.	volts
Supply Voltage Between Dynode No.1		
and Cathode (DC or Peak AC)) max.	volts
Average Anode Current ^e	1 max.	ma
Ambient Temperature) max.	°C
- Indi	cates a	



RADIO CORPORATION OF AMERICA Electronic Components and Detrices in History Harrison, N. J. DATA I

11K

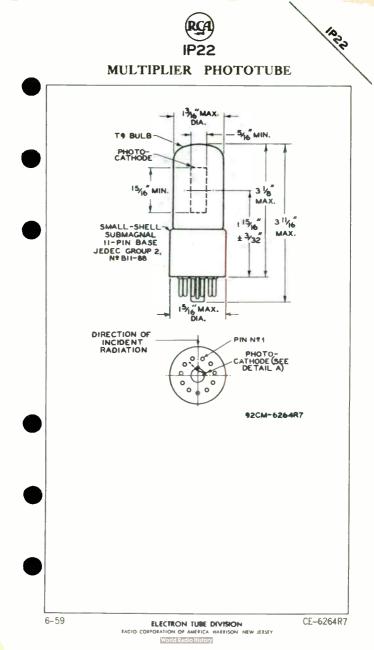
<pre>Under conditions with supply voltage (E) across a voltage divider providing 1/10 of E between cathode stage; and 1/10 of E between dynode No.9 and anode With E = 1000 volts (Except as noted) Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms 750 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps⁷ 0.115 1 16 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3.10⁻⁶ - a/lm Current Anplification 3.3x10⁵ - Ecuivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm^{h.j} 7.5x10⁻⁹ 3.75x10⁻⁷ lm Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Unrent Anplification 7.5x10⁻⁹ 3.75x10⁻⁷ lm fauivalent Noise Input^k 7.5x10⁻⁹ 3.75x10⁻⁷ lm fauivalent Noise Input^k 7.5x10⁻⁹ 3.75x10⁻⁷ lm fauivalent to lose first as noted) Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps⁷ 0.016 0.145 1.85 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Carrent Amplification 4.8x10⁴ - ^a on plane perpendicular to the indicated direction of incident light and pasing through the major axis of the tube. ^b torning No.0000. Corning Glass Works. Corning. New York, or equivalent. ^c waraged over any interval of 30 seconds maximu. ^c Under the following conditions: The light source is a tungsten-filament at 2800 K and a light input of 10 microlumens is used. ^c Under the following conditions: The light source is a tungsten-filament at 2800 K and a light input of 10 microlumens as used. ^c Under the following conditions: The light source is a tungsten-filament at 2800 K in a light input of 10 microlumens as used. ^c Under the following conditions: The light source is a tungsten-filament at 2800 K in the ad light input of 10 microluments is used. ^c Under the following conditions: The light source is a tacofor temperature of 2800 K in the rune of 250 C. Dark current ma</pre>	+ Chara	acterist	ics Rang	e Value	s:					-
<pre>Sensitivity: Radiant, at 3650 angstroms 750 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps¹ 0.115 1 16 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Current Amplification 3.3x10⁵ - Ecuivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm^h, 7.5x10⁻⁹ 3.75x10⁻⁷ ln fauivalent Noise Input^k 7.5x10⁻⁹ 3.75x10⁻⁷ ln With E = 750 volts (Except as noted) Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps¹ 0.016 0.145 1.85 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Carrent Amplification 4.8x10⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. b Corning No.0080. Corning Glass Works. Corning, New York, or equivalent. Made by Amphenol Electronics Corporation. 1830 South 5%th Avenue, Chicago 5%, 1110ois. Made by Magnetic Snield Division, Perfection Mica Co., 1829 Civic Opera 8ldg., 20 Morth Macker Drive, Chicago 6, 111inois. Made by Magnetic Snield Division, Perfection Mica Co., 1829 Civic Opera 8ldg., 20 Morth Macker Drive, Chicago 6, 111inois. Made by Magnetic Snield Division, Perfection Mica Co., 1829 Civic Opera 8ldg., 20 Morth Macker Drive, Chicago 6, 111inois. Made by Magnetic Snield Division, Perfection Mica Co., 1829 Civic Opera 8ldg., 20 Morth Macker Drive, Chicago 6, 111inois. Made by Magnetic Snield Division, Thelight source is a lungsten-filament lamp having alime-glass envelope. It is operated at a color temperature of 2870° K. The value of 11ght flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected as anode. At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. Photom 1000 volts is renommended.</pre>	With	voltage and dyn stage;	divider ode No.	provid ; 1/10) of E t	ing I/ ofE fo petween as no	10 of reach n dyno ted)	E between succeeding de No.9 ar	cathode g dynode nd anode	(
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Luminous, at 0 cps ⁷ 0.115 1 16 a/lm Cathode luminous ⁹ 1.5×10 ⁻⁶ 3×10 ⁻⁶ - a/lm Current Amplification 3.3×10 ⁵ - Ecuivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm ^{h,j} 7.5×10 ⁻⁹ 3.75×10 ⁻⁷ lm fauivalent Noise Input ^k 7.5×10 ⁻¹² - lm With E = 750 volts (Except as noted) Min. Typ. Nax. Sensitivity: Radiant, at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3×10 ⁻³ - a/w Luminous, at 0 cps ⁷ 0.016 0.145 1.85 a/lm Cathode luminous ⁹ 1.5×10 ⁻⁶ 3×10 ⁻⁶ - a/lm Carrent Amplification 4.8×10 ⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the lube. Coring No.0080. Corning Glass Works, Corning, New York, or equivalent. Made by Amphenol Electronics Corporation, 1830 South 5%th Avenue, Chicago 5%, 111inois. Made by Amphenol Electronics Corporation, 1830 South 5%th Avenue, Chicago 5%, 111inois. Made by Amphenol Electronics The light source is a Lungsten-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 anolor Muder the following conditions: The light source is a lungsten-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. At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant.	Ra Ca	diant, a thode ra	t <mark>36</mark> 50 a di <mark>ant</mark> ,	5		_			(
Cathode İuminous ⁹ 1.5x10 ⁻⁶ 3x10 ⁻⁶ - a/lm Current Amplification 3.3x10 ⁵ - Equivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm ^h , J 7.5x10 ⁻⁹ 3.75x10 ⁻⁷ ln fouivalent Noise Input ^k 7.5x10 ⁻¹² - ln With E = 750 volts (Except as noted) Min. Typ. Max. Sensitivity: Radiant,at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10 ⁻³ - a/w Luminous, at 0 cps ⁴ 0.016 0.145 1.85 a/lm Carrent Amplification 4.8x10 ⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. Coring Wo,0080, Corning Glass Works, Corning, New York, or equivalent. ^c Made by Amphenol Electronics Corporation. 1830 South 54th Avenue, Chicago 54, 1110015. ^d Morth Wacker Drive, Chicago 6, 1111015. ^d Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 Morth Wacker Drive, Chicago 6, 1111015. ^d Muder the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 28700 K and a light imput of 10 microlumen 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 28700 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 25° C. Dark current may be reduced by use of a refrigerant.						115		16		_
Current Amplification 3.3x10 ⁵ - Ecuivalent Anode-Dark-Current Input at a luminous sensi- tivity of 0.4 a/lm ^h , j 7.5x10 ⁻⁹ 3.75x10 ⁻⁷ ln Fauivalent Noise Input ^k 7.5x10 ⁻¹² - In With E = 750 volts (Except as noted) Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10 ⁻³ - a/w Luminous, at 0 cps ⁷ 0.016 0.145 1.85 a/lm Cathode luminous ⁹ 1.5x10 ⁻⁶ 3x10 ⁻⁶ - a/lw Current Amplification 4.8x10 ⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. ^b Corning No.0080, Corning Glass Works, Corning, New York, or equivalent. ^c Made by Maphenol Electronics Corporation. 1830 South 5%th Avenue, Chicago 5%, 111 inois. ^d Made by Maphenol Electronics The light source is a tungsten-filament lamp having alime-glass envelope. It is operated at a color temperature of 2870° K and a light input of 10 microlumens is used. ^g Under the following conditions: The light source is a tungsten-filament lamp having alime-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 25° C. Dark current may be reduced by use of a refrigerant.								-		
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Min. Typ. Max. Sensitivity: Radiant, at 3650 angstroms. - 110 - a/w Cathode radiant, at 3650 angstroms. - 2.3x10 ⁻³ - a/w Luminous, at 0 cpsf. . 0.016 0.145 1.85 a/lm Cathode luminous ⁹ . . 1.5x10 ⁻⁶ 3x10 ⁻⁶ - a/w Current Amplification. - - 4.8x10 ⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the lube. Coring No.0080, Corning Glass Works, Corning, New York, or equivalent. Chicago 54, 111nois. Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, 111nois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bildg., 20 Worth Wacker Drive, Chicago 6, 111inois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bildg., 20 Worth Wacker Drive, Chicago 6, 111inois. Muder the following conditions: The light source is a lungsten-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. Under the following conditions: The light source is a lor 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.	ti	vityofC).4 a/lm	h,j _.		-	7.5x10-9 7.5x10-12	3.75×10-		
Min. Typ. Max. Sensitivity: Radiant,at 3650 angstroms. - 110 - a/w Cathode radiant, at 3650 angstroms. - 2.3x10 ⁻³ - a/w Luminous, at 0 cpsf. . 0.016 0.145 1.85 a/lm Cathode luminous ⁹ . . 0.016 0.145 1.85 a/lm Cathode luminous ⁹ . . 1.5x10 ⁻⁶ 3x10 ⁻⁶ - a/m Corrent Amplification. - - 4.8x10 ⁴ - - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. Coring No.0080. Corning Class Works. Corning, New York, or equivalent. Chade by Amphenol Electronics Corporation. 1830 South 5 ^{su} th Avenue. Chicago 5 ^{su} , 111nois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bidg., 20 Worth Wacker Drive, Chicago 6, 111inois. 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. 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 25° C. Dark current may be reduced by use of a refrigerant.<	With	E = 750	volts (Except	as not	ed)				
 Radiant, át 3650 angstroms 110 - a/w Cathode radiant, at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps⁷ 0.016 0.145 1.85 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Carrent Amplification 4.8x10⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. ^b Corning No.0080. Corning Glass Works. Corning, New York, or equivalent. ^c Made by Maphenol Electronics Corporation. 1830 South 5%th Avenue, Chicago 5%, 111 mois. ^d Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera 81dg., 20 Worth Wacker Drive, Chicago 6, 111 mois. ^d Waraged over any interval of 30 seconds maximum. ^f Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass evelope. It is operated at a color temperature of 28700 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 25° C. Dark current may be reduced by use of a refrigerant. ^j For maximum signal-to-noise ratio, operation with a supply voltage (1) 							Typ.	Max.		
 at 3650 angstroms 2.3x10⁻³ - a/w Luminous, at 0 cps⁴ 0.016 0.145 1.85 a/lm Cathode luminous⁹ 1.5x10⁻⁶ 3x10⁻⁶ - a/lm Carrent Amplification 4.8x10⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. ^b Corning No.0080, Corning Glass Works, Corning, New York, or equivalent. ^c Made by Amphenol Electronics Corporation, 1830 South 5st th Avenue, Chicago 5st, 111nois. ^d Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera aldg., 20 North Wacker Drive, Chicago 6, 111inois. ^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 28700 K. The value of 10 microlumens 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 28700 K. The value of 10 microlumens is used. ^g Under the toplowing conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 28700 K. The value of a 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. ^h For maximum signal-to-moise ratio, operation with a supply voltage (t) below 1000 volts is recommended. 	Ra	diant, át	3650 an	gstroms		_	110	-	a/w	
 Cathode luminous⁹1.5x10⁻⁶ 3x10⁻⁶ - a/lm Carrent Amplification 4.8x10⁴ - ^a Dn plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube. Corning Wo.0080, Corning Glass Works, Corning, New York, or equivalent. Chade by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, 111inois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bildg., 20 Worth Wacker Drive, Chicago 6, 111inois. 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. The value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected as anode. A t a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. For maximum signal-to-noise ratio, operation with a supply voltage (t) below 		at 36 50	angstro		•••	-		-		
 Current Amplification								1.85		
 and passing through the major axis of the lube. Corning No.0080, Corning Glass Works, Corning, New York, or equivalent. No.0080, Corning Glass Works, Corning, New York, or equivalent. Nade by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, 111inois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera aldg., 20 North Wacker Drive, Chicago 6, 111inois. Averaged over any interval of 30 seconds maximum. Under the following conditions: The light source is a lungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 28700 K and a light input of 10 microlumens is used. 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 28700 K. The value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected as anode. A ta tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. For maximum signal-to-noise ratio, operation with a supply voltage (1) below 1000 wolts is recommended. 					• 1.	-		-	a7 m	
 C Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, 111inois. Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 Worth Wacker Drive, Chicago 6, 111inois. 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 28700 K and a light input of 10 microlumens is used. 9 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 28700 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. J For maximum signal-to-noise ratio, operation with a supply voltage (t) helow 1000 wolts is recommended. 	ê Din and	plane per passing	pendicula through t	ar to the he major	indica axis of	ted di the tu	rection of be.	incident 1	ight	
 d Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bidg., 20 North Wacker Drive, Chicago 6, Illinois. 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 microlumens 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 25° C. Dark current may be reduced by use of a refrigerant. J For maximum signal-to-noise ratio, operation with a supply voltage (1) below 										
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 Averaged over any interval of 30 seconds maximum. 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 28700 K and a light input of 10 microlumens is used. 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 28700 K. The value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected as anode. At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. For maximum signal-to-noise ratio, operation with a supply voltage (t) below. 	d _{Mad} ≋ld	le by Magne ig., 20 No	tic Shiel rth Wacke	d Divisio r Drive,	n, Perf Chicago	ection 6, Ill	Mica Co., 18 inois.	829 Civic	Opera	
⁹ 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 25° C. Dark current may be reduced by use of a refrigerant. ^J For maximum signal-to-noise ratio, operation with a supply voltage (I) below 1000 volts is recommended.	e Ave	raged ove	r any int	erval of	30 seco	nds max	imum.			_
<pre>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. A t a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. For maximum signal-to-noise ratio, operation with a supply voltage (1) below 1000 volts is recommended.</pre>	TUnd lam of	ler the fo up having a 2870° K a	llowing c lime-gla nd a ligh	onditions ss envelo t input o	: Thel pe. It of 10 mi	ight so is oper crolume	urce is a tu ated at a co ens is used.	ngsten~fil. lor temper:	ament ature	
 At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. For maximum signal-to-noise ratio, operation with a supply voltage (I) below 1000 volts is recommended. 	lam ⊸of	р having a 2870 ⁰ к,	alime-gla The valu	ss envelo e of lig!	pe. It ht flux	is oper is 0.01	ated at a co 1 lumen and	lor temper- 100 volts	ature are	
For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.	h At	a tube te	mperature							
berow for our for the commended. k 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.				-noise ra	tio, op	eration	with a sup	ply voltag	e (£)	
tupe temperature, external shield connected to callode, ballwordth i cycle per second, tungsten-light source at a color temperature of 2070° 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.	k Und	ler the fo	llowing c	onditions	Supp	ly volt	age (E) is	as shown,	250 C	
	cy 28 rat °or	cle per s 70° K int diation pu n° period	econd, t econd, t errupted ilses alto of the pu	at a lo at a lo ernating lse is ec	light s w audio between qual to	freque zero a the "of	at a color ency to pro and the valu 'f" period.	temperatu oduce inci ue stated.	re of dent The	
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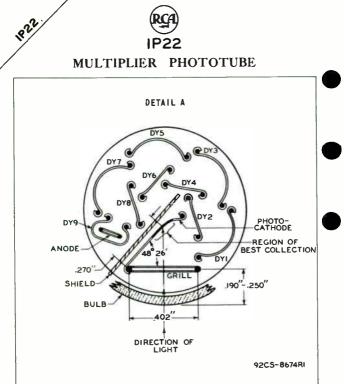








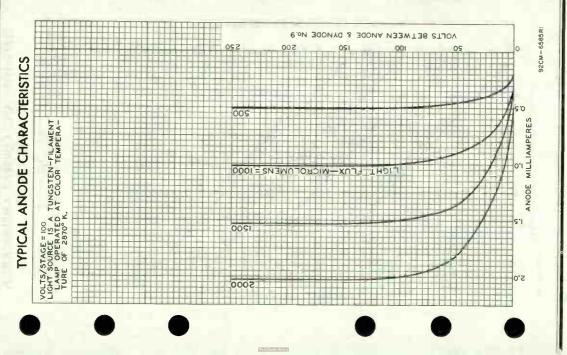




NOTE I: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the perpendicular erected at center of bottom of base.

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

IP22

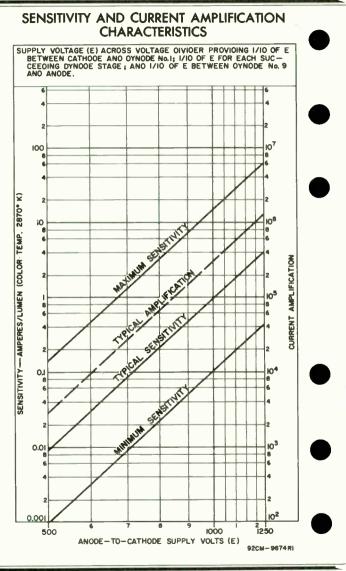


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> AMERICA Harrison, N. J.

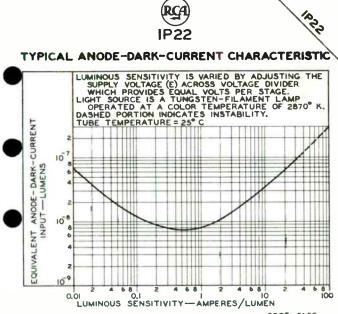
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RADIO CORPORATION Electronic Components and Devices



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.





9205-9680

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44

Multiplier Phototube



9-STAGE, SIDE-ON TYPE

S-5 RESPONSE

For Detection and Measurement of Ultraviolet and Visible Radiation

General:

I	Spectral Response
	Window Ultraviolet-Transmitting Glass ^b
	Dynode Material Cesium-Antimony
	Direct Interelectrode Capacitances (Approx.):
	Anode to dynode No.9
	Anode to all other electrodes 6.0 pf
	Maximum Overall Length
	Maximum Seated Length
	Length from Base Seat to Center
	of Useful Cathode Area 1-15/16" ± 3/32"
	Maximum Diameter
	Operating Position
	Weight (Approx.)
	Bulb
	Socket Amphenol ^c Na.78S11T, or equivalent
	Magnetic Shield Perfection Wica Co., d No.P-101-3,
	or equivalent
	Base Small-Shell Submagnal 11-Pin (JEDEC Group 2, No.B11-88), Non-hygroscopic
	Basing Designation for BOTTOM VIEW.



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	
١.	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	
		-Indicatés a change.	



RADIO CORPORATION OF AMERICA Electronic Components and Devices to History Harrison, N. J.

Average Anode Current ^e . 1			0.5 max.	ma:
Ambient Temperature			75 max.	°C
Characteristics Range Value Under conditions with voltage divider provi and dynode No.1; 1/10 stage; and 1/10 of E With E = 1000 volts (Exception)	ding l ding l of E f betwe	/10 of E betw or each succes en dynode No.	ween cathode eding dynode	e e
	Nin.	Typ.	Max.	
Sensitivity:		- / /		
Radiant. at 3400		6.18×10^4	_	a/w
angstroms Dathode radiant, at		0.10 × 10		0.7.11
3400 angstroms Luminous:	-	0.05	-	a/w
At O cps ^f With dynode No.9 as	17.5	50	300	a/lm
output electrode	_	30	_	a/lm
Cathode luminoush	_	4×10^{-5}	-	a/lm
Current Amplification		1.25 x 10 ⁶	-	
Equivalent Anode-Dark-				
Current Input at a				
luminous sensitivity of				
20 a/lm:j.k				
With anode as output electrode		—	1.25×10^{-9}	łm
With dynode No.9 as			1.20 × 10	
output electrode .	-	_	2×10^{-9}	lm
Equivalent Noise Input:				
Luminous [®]	_	7.5×10^{-13}	-	lm
Ultraviolet ⁿ	-	8.5×10^{-16}	-	W
With E = 750 volts (Except	tasn	oted)		
··· ·· · · ·	Nin.	Typ.	Max.	
Semsitivity:				
Fadiant, at 3400		7 0 403		- 1-1-
angstroms.		7.9×10^{5}	_	a/w
Cathode radiant, at		0.05	_	a/w
3400 angstroms Luminous, at 0 cps ^f	_	6, 4		a/lm
Cathode luminous ^h .		4×10^{-5}	_	a/lm
Current Amplification.	_	1.6 × 10 ⁵	_	
 Cn plane perpendicular to the passing through the major ab passing through the major ab contraining No.9741, Corning Gla Su, 111 inois. Made by Magnetic Shield Divit Bidg., 20 North Wacker Drive Averaged over any interval of under the following condition lamp haying a lime-glass enviced 2070 K and a light input sourcet of opposit be provided by using dynode rangement, the load is connection. 	ass Work Corpora sion, Pe e, Chica of 30 se ns: The elope. t of 10	is, Corning, New Ation, 1830 South erfection Mica (1960, 111 inois, conds maximum, e light source i ti soperated ; microlumens is ity to that obta the output elek the dynode-Ko.9	v York, or equi 54th Avenue, Co., 1829 Civi sa tungsten-f atacolor temp used.	valent. Chicago c Opera Vilament berature tode may this ar- ne anode
0.010	0000	DATION OF	AMEDICA	

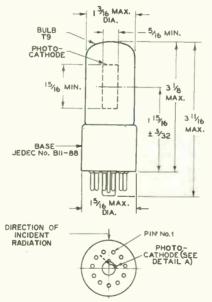
RADIO CORPORATION OF AMERICA Electronic Components and Regices Harrison, N. J. Electronic Components and Davices

RCA

serves only as collector. The curves shown in $2\gamma pical$ Anode Characteristics do not apply when dynode No.9 is used at the output electrode.

- h Under the following conditions: The light source is a tungsten-filamentlamp having a lime-glass envelope. It is operated at acolor temperature of 2870° K. The value of light flux is 0.01 lumen and 100 volts are aplied between _athode and all other electrodes connected as anode.
-] At a tube temperature of $25^{\rm O}$ C. Dark current may be reduced by use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- Under the following conditions: supply voltage (f) is as shown, 250 Cube temperature, external shield connected to cathrode, bandwidth 1 cycle per second, tungsten-light source at a color temperature of 2870 K interrupted at low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The "Dn" period of the pulse is equal to the "off" period.
- n Under the same conditions as shown under (m) except that use is made of a monochromatic source having radiation at 2537 angstroms.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-5 RESPONSE is shown at the front of this Section



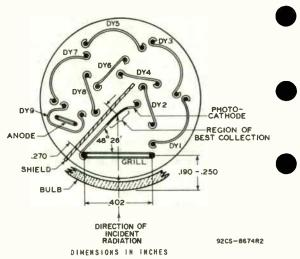
92CM-6264R9

DIMENSIONS IN INCHES

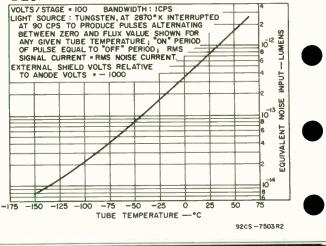
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2⁰ IN ANY DIRECTION FROM THE PERPEN-DICULAR ERECTED AT CENTER OF BOTTOM OF BASE.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DETAIL A



EQUIVALENT-NOISE-INPUT CHARACTERISTIC



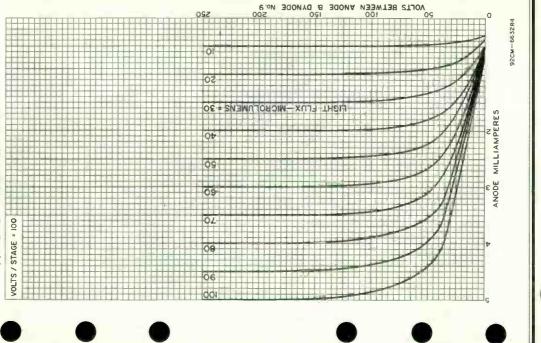
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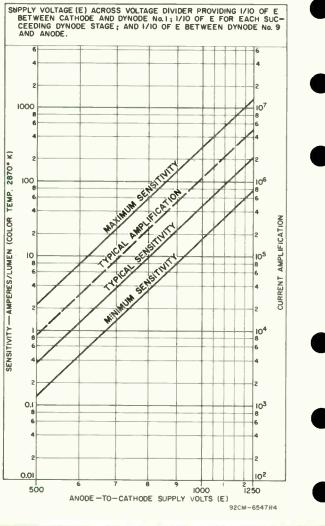
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Components and Devices

SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Particulation

Gas Phototube

SIDE-ON TYPE HAVING S-3 RESPONSE

DATA

0.00	-	- 1
Gen		

Spectral Response
Shape
Vinimum projected width ^a
Maximum Overal Length 4-1/8" Maximum Seated Length 3-1/2" Seated Length to Center of Cathode 2-1/8" ± 3/32"
Maximum Diameter
Weight (Aporox.)
Socket Amphenol No.77-MIP-4-T, or equivalent Base Dwarf-Shell Smail 4-Pin (JEDEC No.A4-26) Basing Designation for BOTTOM VIEW
Pin 1-No Connection Pin 2-Anode Pin 4-Photocathode
Pin 1 - No Connection Pin 2 - Anode Pin 2 - Anode Pin 4 - Photocathode

DIRECTION OF LIGHT

Maximum Ratings, Absolute-Nazimum Values:

Rating I Rating II

ANODE-SUPPLY VOLTAGE (DC or Peak AC)		80 max.	100	max.	volts
AVERAGE CATHODE-CURRENT DENSITY ^b . AVERAGE CATHODE CURRENT ^b . AMBIENT TEMPERATURE		10 max.	5	max.	µa/sq. in. µa °C

Characteristics:

With an anode-supply voltage of go volts unless otherwise specified

Min. Median Max.

Sensitivity: Radiant, at 4200 angstroms – Luminous:°	0.011	-	amp/watt
At 0 cps	40	70	µa/l ume n
At 5000 cps	35	_	µa/lumen
At 10000 cps	31	-	µa/lumen
Gas Amplification Factor ^d –	_	9	
Anode Darĸ Current at 25º C —	-	0.10	μa

History

-Inditates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.

Minimum Circuit Values:

With an anode-supply voltage of 80 or less 100 volts DC Load Resistance: For dc currents above 5 µa. . . 0.1 min. megohm For dc currents below 5 $\mu a.$. 0 min. megohms For dc currents above 3 $\mu a.$. 2.5 min. _ megohms For dc currents below 3 µa. . . 0.1 min. megohm

a on plane perpendicular to indicated direction of incident light.

b Averaged over any interval of 30 seconds maximum.

- C For conditions where the light source is a tungsten-filament lamp oper-ated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohn load resistor are used. For the 0-cycle meas-urement, a light input of 0.1 lumen is used. For the 5000- and 10.000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.
- d The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 28740 x, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-3 RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

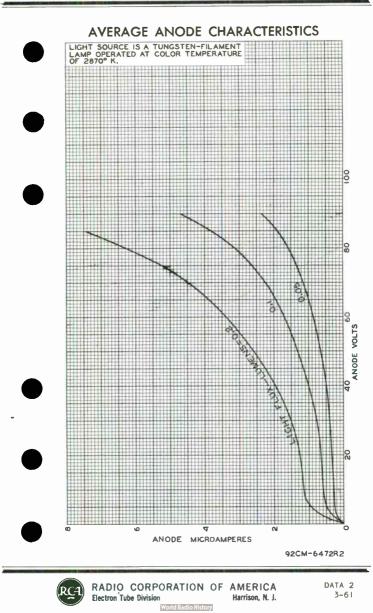
are shown at the front of this section

DIMENSIONAL OUTLINE shown under Type 1P37 also applies to the 1P29

Electron Tube Division







Gas Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

General:

Spectral Response						
Shape						
Direct Interelectrode Capacitance (Approx.) 3 µµf						
Maximum Overall Length						
Maximum Seated Length 3-1/2" Seated Length to Center of Cathode 2-1/8" ± 3/32"						
Maximum Diameter						
Cperating Position						
Weight (Approx.)						
Bulb						
Base						
Basing Designation for BOTTOM VIEW 2K						
Pin 1 - No Connection Pin 2 - Anode DIRECTION OF LIGHT						
Maximum Ratings, Absolute-Maximum Values:						
Rating I Rating II						

ANODE-SUPPLY VOLTAGE (DC or Peak AC) AVERAGE CATHODE-CURRENT	•	80 max.	100 max	. volts
DENSITY ^b . AVERAGE CATHODE CURRENT ^b . AMBIENT TEMPERATURE	•	10 max.	5 max	. μa/sq.in. μa οC

Characteristics:

With an anode-supply voltage of 90 volts unless otherwise specified

Min. Hedian Max.

Sensitivity: Radiant, at 4000 angstroms.	_	0.13	_	µа/µм	
Luminous: ^c At O cps	75	135		µa/lumen	
At 5000 cps	-	124	-	µa/lumen	
At 10000 cps	-	108	-	µa/lumen	
Gas Amplification Factor	-	-	5.5		
Anode Dark Current at 25° C .	-	-	0.05	μa	

🛥 Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 1 3-61

Minimum Circuit Values:

With an anode-supply voltage of 80 or less 100 volts DC Load Resistance: For dc currents above 5 µa . . 0.1 min. megohm _ For dc currents below 5 μa . . 0 min. megohms

For dc currents above 3 µa . . 2.5 min. megohms For dc currents below 3 µa . . 0.1 min. megohm

On plane perpendicular to indicated direction of incident light.

Averaged over any interval of 30 seconds maximum.

- Averaged over any interval of yesuches maximum.
 C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10,000-cycle measurements, the light input is varied sinusoidal value of 0.015 lumen from zero to a maximum of twice the tungsten. mean value.
- The ratio of luminous sensitivity at an anode supply voltage of 90 valts to luminous sensitivity at an anode supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS **OF GAS PHOTOTUBES**

are shown at the front of this section

AVERAGE-ANODE-CHARACTERISTICS CURVE shown under Type 5581 also applies to the 1937

> RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. World Radio History

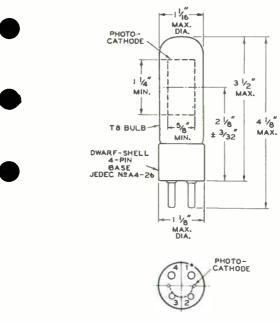












92CM-470R5



RADIO CORPORATION OF AMERICA Electron Tube Division

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World Radio History

وجيدي فانبع تيمؤهم بمروان بالمتجا بمناهده والم



VACUUM PHOTOTUBE

WITH S-4 RESPONSE For applications critical as to leakage under high-humidity conditions

The 1P39 is like the 929, except that the 1P39 has a maximum dark current of 0.005 μ a at 250 volts, and has a nonhygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity.

e-Indicates a change.



GAS PHOTOTUBE

For applications critical as to leakage under high-humidity conditions



The 1P40 is like the 930, except that the 1P40 has a maximum dark current of 0.005 μa at 90 volts, and has a non-hygroscopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse service conditions of high humidity.

. Indicates a change.





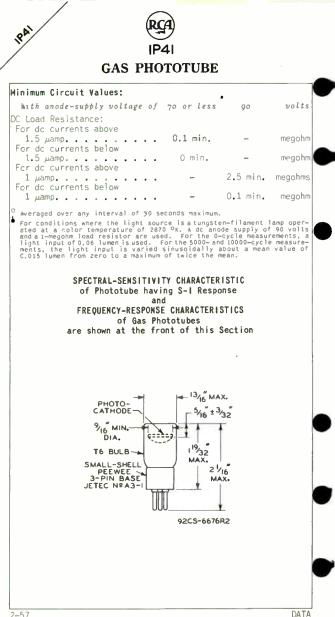
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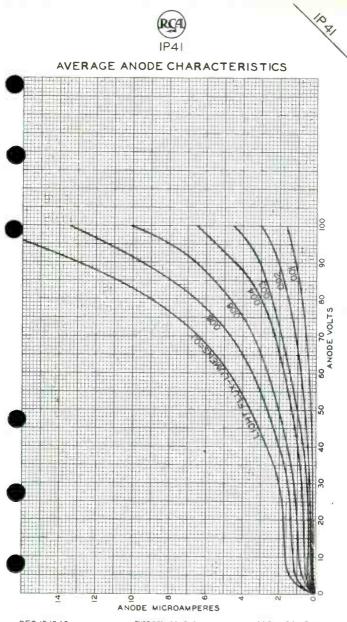
GAS PHOTOTUBE

HEAD-ON TYPE WITH S-I RESPONSE

DATA

General:					S 1
Spectral Response Wawelength of Maximum Cathode:	Respo	nse.	80	00 ± 10	00 angstroms
Shape					Circular
Minimum diameter Oirect Interelectrode	Canac	· · ·	••••	••••	
Maximum Overall Lengt	h				2-1/16"
Maximum Seated Length Axial Distance from B		• • •	• • • •	• • • •	. 1–19/32"
Periphery of Cathode	e Area	,	• • • • •	5	/16" ± 3/32"
Maximum Olameter					13/16"
Mounting Position Weight (Approx.)					
Bulb					T6
Base.					
Basing Designation	tor BU		ILW	• • • •	• • • • ZAR
Pin 1 - No Connec-		2	< l>	Pin	2 – Anode
tion	1	\perp			3 - Cathode
		Y			
	3	C	6		
	DIRECT	END OF	LIGHT: BULB		
Maximum Ratings, Abso	lute V	alues:			
		Rat	ng I Ra	ting II	
ANODE-SUPPLY VOLTAGE		-			
(DC or Peak AC)	• • •	. 70	max. 9	0 max.	volts
CURRENT DENSITYº		. 40	max. 2	0 max.	µamp/sq.in.
AVERAGE CATHODE CURRENTO		2	max. 1.	5 max.	шато
AMBIENT TEMPERATURE		. 100		0 max.	paginp C
Characteristics, With	oo Vo	lts on	Anode:		
		Min.		Nax.	
Sensitivity:					
Radiant, at 8000 angstroms.			0.008	_	µamp/µwatt
Luminous:	•••				
At 0 cps	•••	50	90 77	145	µamp/lumen µamp/lumen
At 5000 cps At 10000 cps		_	67	-	µamp/lumen
Gas Amplification Fac		-	-	8.5	, ,
Anode Oark Current at 25 °C		_	_	0.1	µamp
at 20 °C	• • •	_	_	0.1	parantip
°,∳: See next page.				🗕 India	ates a change.
0.03					0ATA
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Vacuum Phototube

HEAD-ON TYPE WITH S-9 RESPONSE

DATA

General:	
Spectral Response	
Window: Area	
Terminal Diagram (See Dimensional Outline)	
Small End: Anode Large End: Cathode	
INTO END OF BULB	
Maximum Ratings, Absolute-Maximum Values:	
Maximum Ratings, Absolute-Maximum Values:	

AVERAGE CATHODE-CURRENT DENSITY 25 max. µa/sq. in.	
LJ max. Harsu. III.	
AVERAGE CATHODE CURRENT 0.4 max. µa	
AMBIENT TEMPERATURE	

Characteristics:

With an anode-supply voltage of 180 volts unless otherwise specified

Nin. Nedian Nax.

Sensitivity:				
Radiant, "at 4800 angstroms	-	0.025	-	μa/µ₩
Luminous [#]	20	37	70	µa/lumen
node Dark Current at 25° C.	-	-	0.005	щa

- Averaged over any interval of 30 seconds maximum.
- For conditions where the light source is a tungsten-filament lamp operated a color temperature of 2870° K. The supply voltage is 180 volts, the load resistor is 1 megohm, and the light input is 0.015 lumen.



Electron Tube Division

-Indicates a change.

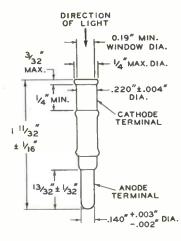


OPERATING CONSIDERATIONS

Exposure to intense illumination, such as direct sunlight, may decrease the sensitivity of the IP42 even though no voltage is applied to the tube. The magnitude and duration of the decrease depend on the length of the exposure.

Shielding of the IP42 and its leads to the amplifier is recommended when amplifier gain is high or when the phototube load resistance is high. Whenever frequency response is important in a phototube circuit, the leads from the phototube to the amplifier should be made short so as to minimize capacitance shunting of the phototube load. It is important that insulation of associated circuit parts and wiring be adequate.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-9 Response is shown at front of this Section



NOTE: WHEN TUBE IS ROTATED ABOUT THE LONGITUDINAL AXIS OF ITS CATHODE TERMINAL, NO PART OF THE ANODE TERMINAL WILL FALL OUTSIDE OF A 0.241"-DIAMETER CIRCLE CONCENTRIC WITH THE LONGITUDINAL AXIS OF THE CATHODE TERMINAL.

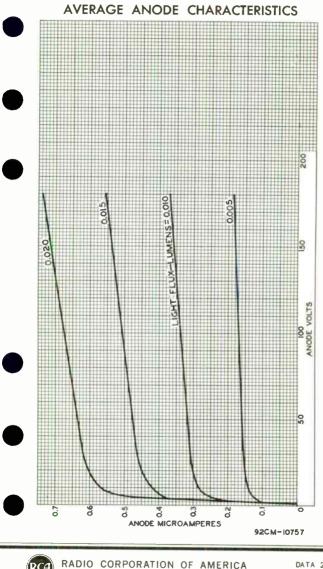
92CS~679IR2



-- Indicates a change.



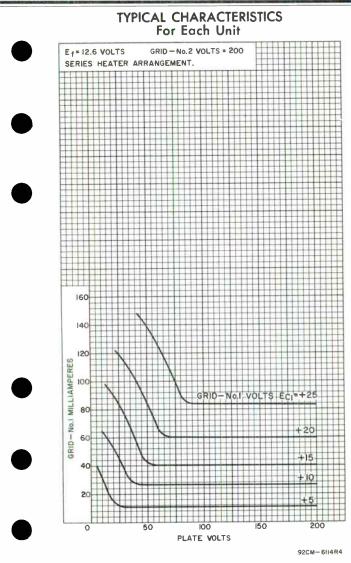
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World Radio History

Electron Tube Division

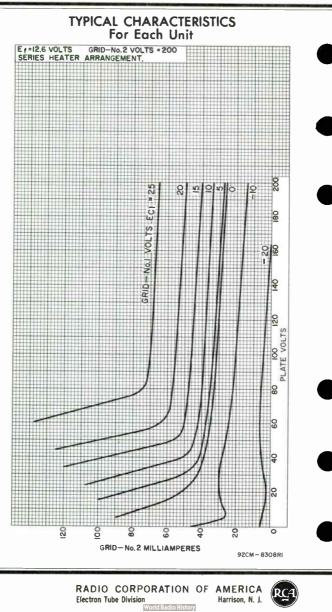
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Gas Phototube

SIDE-ON TYPE HAVING S-I RESPONSE

DATA

General:

	Spectral Response Wavelength of Maximum Res Cathode:	pons	 e		S-1 0 angstroms
)	Shape	¦h≞. ∖≞			1–1/4" 5/8"
	Maximum Overall Length . Maximum Seated Length Seated Length to Center c Maximum Diameter	of Ca	thode		. 4-1/8" . 3-1/2" /8" ± 3/32" . 1-1/8"
	Operating Position Weight (Approx) Bulb Socket A Base Dwar Basing Designation for	 mpher	nol No.77- ell Small	-MIP-4-T, or 4-Pin (JEDE	. 1.1 oz -
	Ріл 1— No Connection Pin 2— Anode DMR			Pin 3-No C Pin 4-Phot	
	Maximum Ratings, Absolute	-Nax	imum Valu	es:	*
	ANODE-SUPPLY VOLTAGE		Rating r	Rating 11	
	(DC or Peak AC)	• •	80 max.	100 max.	volts
			10 max.	25 max. 5 max. 100 max.	μa/sq. in. μa ο _C
	Characteristics:				+

With an anode-supply voltage of go volts unless otherwise specified

> Nin. Nedian Nax.

Sensitivity: Radiant, at 8000 angstroms Luminous: ^c			-	0.0084	-	amp/watt
At 0 cps				90 77	145 _	μa/lumen μa/l umen
At 10000 cps			_	67	-	µa/lumen
Gas Amplification Factor ^d			_	-	8	
Anade Dark Current at 25 ⁰ C.	•	•	-	-	0.1	μa

- Indicates a change.



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Minimum Circuit Values:

With an anode-supp	bly								
voltage of						80 or less	100	volts	
DC Load Resistance For dc currents									
5 μa						0.1 min	_	megohm	
For dc currents		•	•	•	•	0.1 1000.		megonia	
5 μa						0 min.	_	megohms	
For dc currents	above							0	
_ 3 μa		•	•	•	•	-	2.5 min.	megohms	1
For dc currents									
3 μa		٠				-	0.1 min.	megohm	

- On plane perpendicular to indicated direction of incident radiation. b
- Averaged over any interval of 30 seconds maximum. c
- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10,000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value
- The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts, in each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm. ы

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-I RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS **OF GAS PHOTOTUBES**

are shown at the front of this section

DIMENSIONAL OUTLINE shown under Type IP37 also applies to the 868

AVERAGE-ANODE-CHARACTERISTICS CURVE shown under Type IP41 also applies to the 868

Electron Tube Division World Radio History



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VACUUM PHOTOTUBE

WITH ANODE-TERMINAL CAP AND S-I RESPONSE

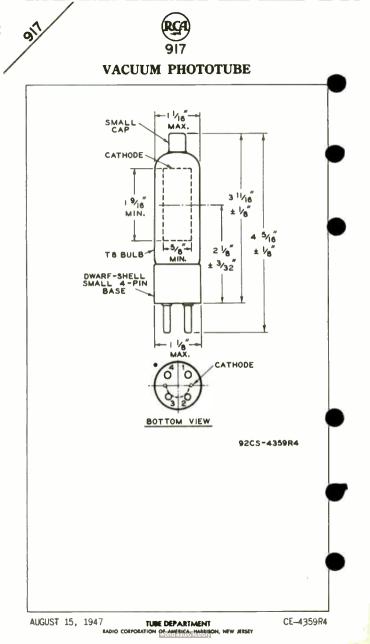
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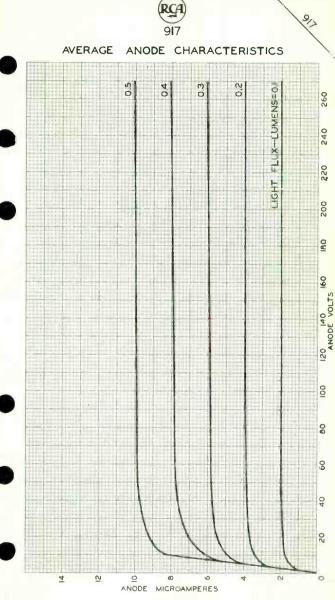
0414	1
General:	←
Spectral Response	
Wavelength of Maximum Response 8000 ± 1000 Angstroms	
Cathcde:	
Shape Semi-Cylinorical Minimum Projected Width* 1-9/16" Minimum Projected Width* 5/8" Direct Interelectrode Capacitance 2.2 µµ Overall Length 4-5/16" ± 1/8" Seated Length 3-11/16" ± 1/8" Seated Length to Center of Cathode 2-1/8" ± 3/32" Maximum Diameter 1-1/8" Bulb T-8 Mounting Position Small Base Small 4-Pin BOTTOM VIEW BOTTOM VIEW	
Pin 1-No Cannection Pin 2-No Connection OURECTION OF LIGHT. Pin 3-No Connection Pin 4-Cathode Cap - Anode	
Maximum Ratings, Absolute Values:	-
ANODE-SUPPLY VOLTAGE (DC or Peak AC) PEAK CATHODE CURRENT	
Characteristics:	*
	1
Sensitivity	
At 8000 Angstroms 0.002 - μamp/μwatt Luminous	
• On plane perpendicular to indicated direction of incident light. • Averaged over any interval of 30 seconds maximum.	
SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-1 Response is shown at the beginning of this Section	
<- Indicates a change.	
	General: Spectral Response

AUGUST 15, 1947

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TUBE DIVISION

92CM-4360R2

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Gas Phototube

SIDE-ON TYPE HAVING S-I RESPONSE

DATA

General:
Spectral Response
Shape.
Pin 1 - No Connection Pin 2 - Anode DRECTION OF RADIATION
Maximum Ratings, Absolute-Maximum Values:
Rating 1 Rating 11
ANODE-SUPPLY VOLTAGE (DC or Peak AC)
AVERAGE CATHODE CURRENT ^b . 10 max. 5 max. AMBLENT TEMPERATURE 100 max. 100 max. ^O C
Characteristics:
volts unless otherwise specified
Nin. Nedian Max.
Sensitivity: Radiant, at 8000 angstroms 0.014 - amp/watt Luminous:¢
At 0 cps
At 10000 cps 105 - μa/lumen Gas Amplification Factor ^d 10.5 Anode Dark Current at 25 ^o C 0.1 μa

Generals

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Minimum Circuit Values:

With an anode-supply voltage of DC Load Resistance: For dc currents above	70 or less	90	volts
5 μa	0.1 min.	shafe	megohm
5 μa	0 min.	-	megohms
β μa	-	2.5 min.	megohms
3 μa	-	0.1 min.	megohm

. On plane perpendicular to indicated direction of incident radiation. ь

Averaged over any interval of 30 seconds maximum. с

For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10.000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value. đ

The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts. In each case, sensitivity is botained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-1 RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS **OF GAS PHOTOTUBES**

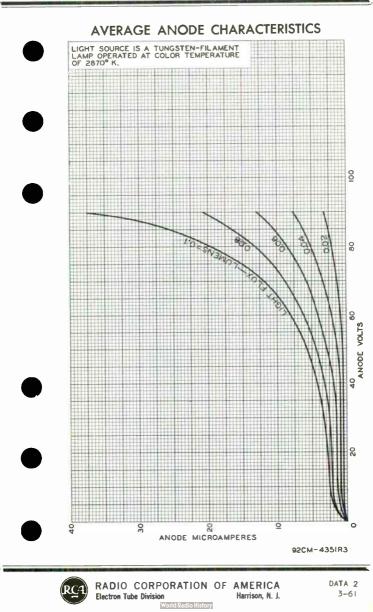
are shown at the front of this section

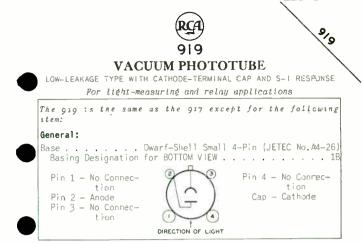
DIMENSIONAL OUTLINE shown under Type 1P37 also applies to the 918



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Gas Phototube

SIDE-ON, TWIN-UNIT TYPE HAVING S-I RESPONSE

DATA

General:

	Spectral Response
ł	Shape
	Cathode to cathode ⁶ 1.8 $\mu\mu$ f Cathode to anode ⁶ 1.6 $\mu\mu$ f Anode to anode ⁴ 0.4 $\mu\mu$ f Maximum Overall Length
	Maximum Seated Length
	Weight (Åpprox.). 1.1 oz - Bult
	Pin 1 - Photo- catnode of Unit No.2 Pin 2 - Anode of Unit No.2
	DIRECTION OF RADIATION
)	Maximum Ratings, Absclute-Naximum Values:
	Values are for Each Unit
	Rating I Rating II ANOBE-SUPPLY VOLTAGE (DC or Peak AC) 70 max. 90 max. volts

AVERAGE CATHODE-CURRENT						
DENSITY ^e			30 ma	ax. 15	max.	µa/sq.in.
					max.	μa
AMBIENT TEMPERATURE		•	100 ma	ax. 100	max.	μa oC
	AVERAGE CATHODE CURRENT®.	DENSITY®	DENSITY®	DENSITY®	DENSITY ^e	DENSITY ^e

RCA

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- Indicates a change.

DATA I 3-62

920

-+ Characteristics:

Values are for each unit with an anode-supply voltage of 90 volts unless otherwise specified

Nin, Nedian Max.

Sensitivity: Radiant, at 8000 angstroms Luminous: ^f	_	0.0094	_	amp/watt
At 0 cps	50	100	175	µa/lumen
	00			
At 5000 cps	-	85	-	µa/lumen
At 10000 cps		74	-	µa/lumen
Ratio of Luminous Sensitivities				
(Unit No.1 to Unit No.2)	0.5	1.15	2.0	
Gas Amplification Factor	-	-	0	
Anode Dark Current at 25° C	-	-	0.1	μа

Minimum Circuit Values:

Values are for Each Unit

With an anode-supply valtage of	70 or less	90	volts
DC Load Resistance: For dc currents above 2 μ a For dc currents below 2 μ a For dc currents above 1 μ a For dc currents below 1 μ a	0 min. _	2.5 min. 0.1 min.	megohm megohm megohms megohm

on plane perpendicular to indicated direction of incident radiation.

b with anodes grounded.

C Each unit, with other unit grounded.

d With cathodes grounded.

Averaged over any interval of 30 seconds maximum.

- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply of 90 volts and a >-megohn load resistor are used. For the 0-cycle measurement, a light input of 0.0% lumen is used. For the 5000- and 10000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.
- The ratio of luminous sensitivity at an anode-supply voltage of 90 volts to luminous sensitivity at an anode-supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lampoperated at a color temperature of 2870 K, the light inputis 0.04 lumen, and the load resistor has a value of 1 megoha.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-I RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

are shown at the front of this section

DIMENSIONAL OUTLINE shown under Type 5584 also applies to the 920



- Indicates a change.

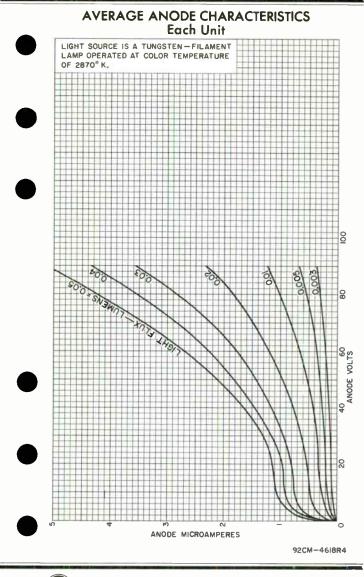














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World Radio History

DATA 2 3-62





GAS PHOTOTUBE

CARTRIDGE TYPE WITH S-I RESPONSE

DATA General: . . S-1 8000 ± 1000 Angstroms Cathode: Semi-Cylindrical 7/8" Minimum Projected Width*.... 1/2" Direct Interelectrode Capacitance . . . 1.0 µµf 1-21/32" ± 1/16" 1-13/32" ± 1/32" Overall Length. Seated Length Length, Cathode Center to plane A-A' (see outline) 11/16" ± 1/16" 0.890" Mounting Position Anv See Outline Terminal Caps BOTTOM VIEW RECESSED Recessed Protruding Anode Cathode Terminal Terminal BOTBUDING DIRECTION OF LIGHT INTO CONCAVE SIDE OF CATHODE Maximum Ratings, Absolute Values: ANODE-SUPPLY VOLTAGE (DC or Peak AC) 90 max. . . . volts PEAK CATHODE CURRENT. 10 max. . . . µamp I PEAK CATHODE-CURRENT DENSITY. . 100 max. *µ*amp/sg.in. AVERAGE CATHODE CURRENTO. 3 max. . . . µатр 00 AMBIENT TEMPERATURE 100 max. . . . Characteristics: Nin. Nax. Av. 0.1 . . . Dark Current at 90 Volts. . Jamp Sensitivity: At 8000 Angstroms . . . 0.0135 - •µamp/µwatt 1.00 Luminous: * At O Cycles 75 135 205 µamc/lumen At 5000 Cycles. . . . 119 uamp/lumen -_ At 10000 Cycles . . . µamp/lumen 108 Gas Amplification Factor. . _ 10 On plane perpendicular to indicated direction of incident light. O Averaged over any interval of 30 seconds maximum. Average current may be drubled wher anode-supply voltage is limited to 70 volts. Measured under conditions specified on sheet "PHOTOTUBE SENSITEVITY and SENSITIVITY MEASUREMENTS", at the front of this Section.

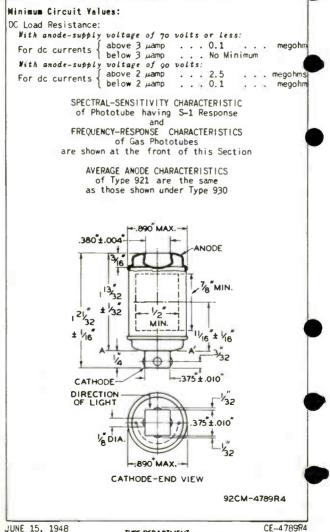
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JUNE 15, 1948

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921



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VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-I FESPONSE

For relay applications

DATA

	DATA			
General:				
Spectral Response . Wavelength of Maximu Cathode:	um Response.	800	0 ± 1000 a	S−1 ngstroms
Shape Minimum projected Direct Intere ectror Overall Length Length from Center of	length [*] width [*] de Capacitance of Useful Cath	1-21/3 node Area	2" + 1/32" 1-13/32"	. 5/8" . 1/2" 1 μμf - 1/16" ± 1/32"
to Plane A-A' (See Maximum Diameter.			. 11/16"	± 1/16" 0.890"
Mounting Position . Weight (Approx.)		· · · · ·	· · · · · ·	0.4 oz
Terminals:			15750	
Recessed cap Protruding cap Basing Designation.	•••••	••••	JETEC	
basing besignation.	RECESSED	• • • • •	• • • • •	ZMŲ
Recessed } Anode			ruding}C	athode
Maximum Ratings, Ab		E SIDE DE		
ANODE-SUPPLY VOLTAGE AVERAGE CATHODE-CURE AVERAGE CATHODE CURE AMBIENT TEMPERATURE	RENT DENSITYO.	· · 30	max. μam; max. μam; max. max.	volts p/sq.in. µamp oc
Characteristics, At	250 Volts on	Anode:		
	Min.	Nedian N	ax.	
Sensitivity: Radiant, at		0.0010		
8000 angstroms. Luminous Anode Dark Current	. 10	0.0018 20		np/µwatt np/lumen
at 25 ⁰ C	–	- 0	.005	μamp
 On plane perpendicula Averaged over any int For conditions where ated at a color tempe a 1-megohm load resis 	erval of 30 seco	nds maximum.		1
			+.(ndicates	a change.

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922

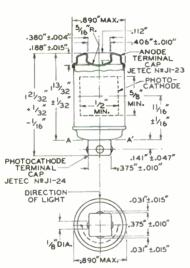
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VACUUM PHOTOTUBE

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-1 Response is shown at the front of this Section

AVERAGE ANODE CHARACTERISTICS for Type 922 are the same as those shown for Type 917



A-A'=PLANE PERPENDICULAR TO AXIS OF TUBE

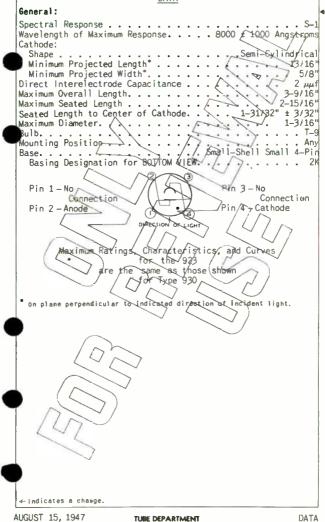
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922



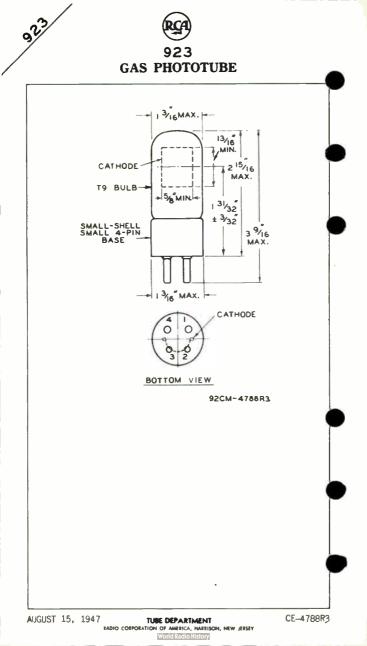
WITH S-I RESPONSE

DATA



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923



Vacuum Phototube

SIDE-ON TYPE HAVING S-I RESPONSE

DATA

General:

Spectral Response
Wavelength of Maximum Response 8000 ± 1000 angstroms
Cathode:
Shape
Minimum projected length ^a
Minimum projected width ^a
Direct Interelectrode Capacitance (Approx.) 1.6 µµf
Maximum Overall Length
Maximum Seated Length
Seated Length to Center of Cathode 1-13/32" ± 3/32" +
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Socket
Base Intermediate-Shell Octal 5-Pin, Arrangement 1
(JEDEC Group 1, No.B5-10)
Basing Designation for BOTTOM VIEW
DIRECTION OF RADIATION

Pin 1-No Internal Connection Pin 2-No Internal €onnection



Pin 4 - Anooe Pin 6-No Internal Connection Pin 8 - Photocathode



Maximum Ratings, Absolute-Maximum Values: ANODE-SUPPLY VOLTAGE (DC or Feak AC). 250 max. volts AVERAGE CATHODE-CURRENT DENSITY 30 max. µa/sq.in. AVERAGE CATHODE CURRENT^b . . 5 max. <u>µ</u>а 00 AMBIENT TEMPERATURE. 100 max.

Characteristics:

With an anode-supply voltage of 250 volts

Min. Median Max.

Sensitivity:				
Radiant, at 8000 angstroms.	-	0.0019	-	amp/watt
Luminous ^c	12	20	40	µa/lumen
Anode Dark Current at 25° C.		-	0.0125	μa



-Indicates a change.

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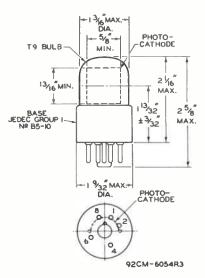
Harrison, N. J.

DATA 1-62

925

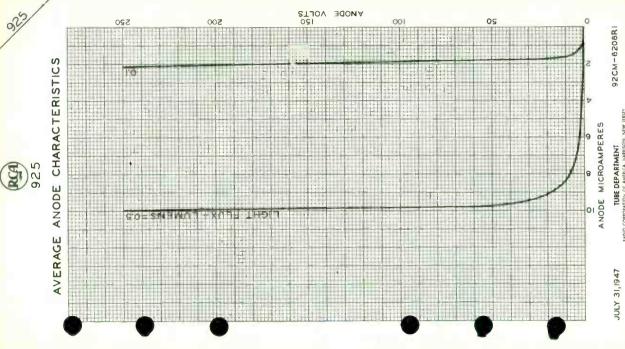
- ^a On plane perpendicular to indicated direction of radiation.
- b Averaged over any interval of 30 seconds maximum.
- $^{\rm C}$ For conditions where the light source is a tungsten-filament lamp operated as a color temperature of 2870° K. A 1-megohm load resistor and a light input of 0.1 lume are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-I RESPONSE is shown at the front of this section



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VACUUM PHOTOTUBE

CARTRIDGE TYPE WITH S-3 RESPONSE For colorimetric applications

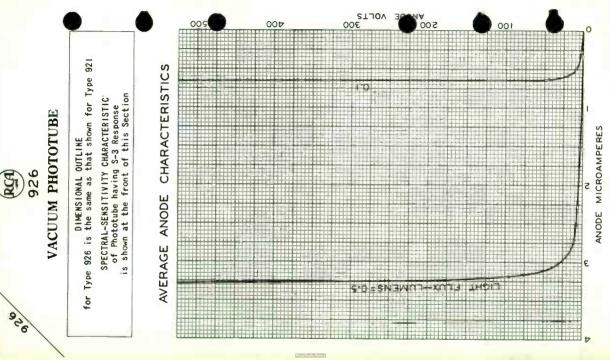
DATA

DATA	
General:	
Spectral Response	
Wavelength of Maximum Response	. 4200 ± 1000 angstroms
Cathode:	
Shape	Semicy indrical
Minimum projected length*	
Minimum projected width*	1/2"
Direct Interelectrode Capacitance	
Overall Length	1-21/32" ± 1/16"
Seated Length	1-13/32" ± 1/32"
Length from Center of Useful Cathode	
to Plane A-A' (See Dimensional Outl	
Maximum Diameter	0 : 1
Weight (Approx.)	
Mounting Position	· · · · · · · · · · · · · · · · Any
Recessed cap	JETEC Na. J1-23
Protruding cap	
Basing Designation	
basing besignation	
Recessed Anode	Protruding Cathode
Cap { Anode ()	Cap f athode
DIRECTION OF LIGH	17:
DIRECTION OF LIGH INTO CONCAVE SID OF CATHODE	DE
Maximum Ratings, Absolute Values:	
ANODE-SUPPLY VOLTAGE (DC or Peak AC)	500 max. volts
AVERAGE CATHODE-CURRENT DENSITYO	30 max. µampisq. in.
AVERAGE CATHCOE CURRENTO	5 max. µamo
AMBIENT TEMPERATURE	100 max. °C
Characteristics, At 250 Volts on Ano	de :
	Nedian Max.
Sensitivity:	neuron next
Radiant, at	
	0.0018 - µamp/µvatt
Luminous 4	6.5 15 μamp/μwatt
Anode Dark Current	oro zo pampritunen
at 25°C	- 0.005 µamp
on plane perpendicular to indicated direc	
O Averaged over any interval of 30 seconds	
For conditions where the light source is a ated at a color temperature of 2870°K. A a 1-megohm load resistor, and a light inp	a tungsten-filament lamp oper- dc anode supply of 250 volts, but of 0.1 lumen are used.
	1
	- Indicates a change.

TUBE DIVISION

926

BADIO CORPORATION OF AMERICA MARRISON NEW JERSEY



92CM - 6209RI

TUBE DIVISION

MDIO

Gas Phototube

SIDE-ON TYPE HAVING S-I RESPONSE

DATA

	Spectral Response
	Shape Semicylindrical Minimum projected length ^a 11/16" Minimum projected width ^a 7/16" Direct Interelectrode Capacitance (Approx.) 2 μμf
	Maximum Overall Length
	Maximum Diameter. 0.669" Operating Position. Any Weight (Approx.). 0.3 oz Bulb.
	Socket
	DIRECTION OF RADIATION
	Pin 1-No Internal Connection 1 3 Pin 2-Anode Pin 3-Photocathode
	Maximum Ratings, Absolute-Naximum Values:
	Rating I Rating II
-	ANODE-SUPPLY VOLTAGE {DC or Peak AC} 70 max. 90 max. volts AVERAGE CATHODE-CURRENT
	DENSITY ^b
	Characteristics:
	With an anode-supply voltage of go volts unless otherwise specified
	Nin. Nedian Naz.
	Sensitivity: Radiant, at 80D0 angstroms
	indicate: a change.



General:

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

DATA I 3-62

World Radio History

	11	11 0 00 0 000		
Luninous: ^c At 0 cps At 5000 cps At 10000 cps Gas Amplification Factor ^d Anode Dark Current at 25 ^o C.	75 - - -	125 110 100 -	185 - 10 0.1	μa/lumen μa/lumen μa/lumen μa
Minimum Circuit Values:				
With an anode-supply voltage of	70 or	less	90	volts
DC Load Resistance: For dc currents above 2 μ a. For dc currents below 2 μ a. For dc currents above 1 μ a. For dc currents below 1 μ a.	0.1 m 0 m 	nin.	_ 2.5 min. 0.1 min.	megohm megohm megohms megohm

Min. Median Nax.

8 On plane perpendicular to indicated direction of radiation.

b Averaged over any interval of 30 seconds maximum.

- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10400-cycle measurements, the light input is varied sinusoidally about a mean value of 0.0151umen from zero to amaximum of twice the mean value. с
- The ratio of luminous sensitivity at an anode-supply voltage of 90 volts to luminous sensitivity at an anode-supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm. đ

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-1 RESPONSE

and

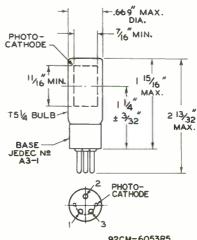
FREQUENCY-RESPONSE CHARACTERISTICS **OF GAS PHOTOTUBES**

are shown at the front of this section





RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. <u>d Radio H</u>istory



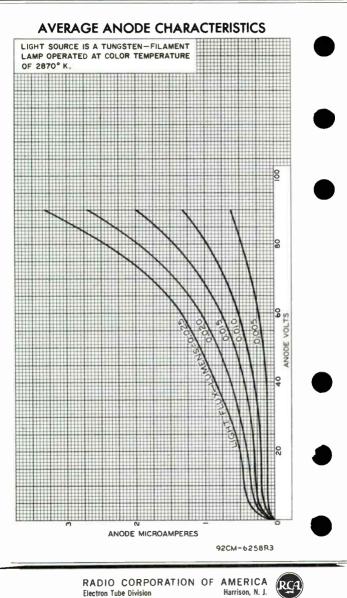




2

RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. World Radio History

DATA 2 3-62



World Radio History

Vacuum Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

General:	
Spectral Response	S-4 a⊓gstroms
Shape. Shape. Shape. Semic; Minimum projected width ^a Semic; Direct Interelectrode Capacitance (Approx.) Semic; Maximum Overall Length Semic; Maximum Seated Length Semic; Maximum Diameter Semic; Operating Position Semic; Weight (Approx.) Socket Bulb Cinch No.8 JM-1, or of Base Intermediate-Shell Octal 5-Pin, Arra (JEDEC Group 1, Basing Designation for BOTTOM VIEW	
DIRECTION OF LIGHT	
Pin 1 - No Internal Connection Pin 2 - No Internal Connection Pin 8 - Cath	Internal
Maximum Ratings, Absolute-Naximum Values:	
ANODE-SUPPLY VOLTAGE (DC or Peak AC)	volts سa/sq.in. مر
Characteristics:	0
	-
With an anode-supply voltage of 250 volts	
Nin. Nedian Nax.	

Sensitivity: Radiant, at 4000			
angstroms Luminous ^c Anode Dark Current	 - 0.044 25 45	+ – 70	amp/watt µa/lumen
25° C		0.0125	μа

-Indicates a change.

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

DATA I 1-62

World Radio History

929

- ⁴ On plane perpendicular to indicated direction of radiation.
- b Averaged over any interval of 30 seconds maximum.
- C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A 1-megohm load resistor and a light input of 0,1 lumen are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE is shown at the front of this section

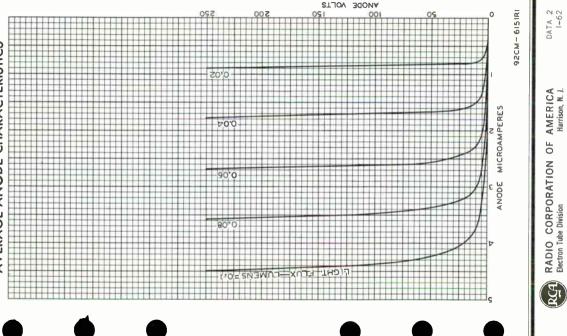
DIMENSIONAL OUTLINE shown under Type 5581 also applies to the 929











World Radio History

Gas Phototube

SIDE-ON TYPE HAVING S-I RESPONSE

DATA

General:	
	S-1
Wavelength of Maximum Response	e 8000 ± 1000 angstroms
Cathode:	i i i i i i i i i i i i i i i i i i i
	Semicylindrical
Minimum projected length ^a .	13/16"
Minimum projected width ^a .	
Direct Interelectrode Capacit	ance (Approx.) 2.4 µµf
Maximum Overall Length	3-1/16"
Maximum Seated Length	
Seated Length to Center of Ca	athode
Weight (Approx.).	
Bulb	
Socket	Cinch No.8JM-1, or equivalent -
8ase	Intermediate-Shell Octal 5-Pin
	Arrangement 1, (JEDEC No.85-10)
	TOM VIEW 3J
DIRECTIO	N OF RADIATION
(
/	
Pin 1 - No Connection	⊥ Pin 6-No Connection
Pin 2 - No Connection	Y. Pin 8-Photocathode
Pin 4 – Anode	\searrow
(
Maximum Ratings, Absolute-Na.	rimum Values:
Harrison Harrigoy Hospitato Ha	Rating I Rating II
ANODE CUDDLY VOLTAGE	Rating 1 Rating 11
ANODE-SUPPLY VOLTAGE	70 max. 90 max. volts
AVERAGE CATHODE-CURRENT	10 max. 50 max. Volts
DENSITY ^b	60 max. 30 max. μa/sq.in.
AVERAGE CATHODE CURRENT ^b .	6 max. 3 max. µa
AMBIENT TEMPERATURE	100 max. 100 max. 'OC
Characteristics:	
	upply voltage of go
	therwise specified
	Nin. Nedian Nax.
Sensitivity:	Ain, Action Aoxi
Radiant, at 8000	
angstroms	0.013 - amp/watt-
ungottono i titi i i i i	





RADIO CORPORATION OF AMERICA Electron Tube Division World Racio History (

Lumi noun (

Nin. Nedian Nax.

Luminous:*						
At 0 cps			90	135	205	µa/lumen µ
At 5000 cps			-	111	_	µa/lumen
At 10000 cps				101	_	µa/lumen
Gas Amplification Factor®			-	-	10	
Anode Dark Current at 25°	С			-	0.1	uЯ

Minimum Circuit Values:

With an anode-supply voltage of	70 or less	90	volts
DC Load Resistance:			
For dc currents above 3 $\mu a.$	0.1 min.	_	megohm
For dc currents below 3 $\mu a.$.	0 min.	-	megohms
For dc currents above 2 $\mu a.$.	-	2.5 min.	megohms
For dc currents below 2 μa .	-	1 min.	megohm

a Om plane perpendicular to indicated direction of incident radiation.

b Averaged over any interval of 30 seconds maximum.

- C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10,000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.
- d The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870 K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-I RESPONSE

and

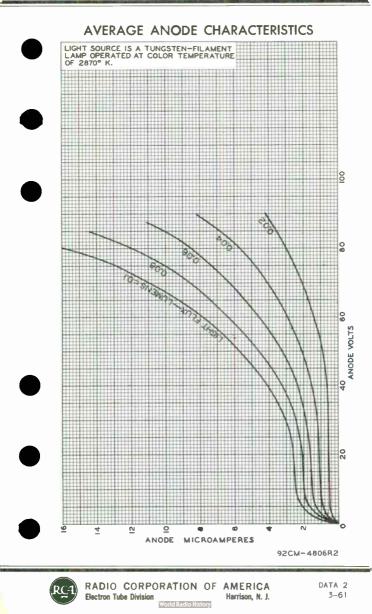
FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

are shown at the front of this section

DIMENSIONAL OUTLINE shown under Type 5581 also applies to the 930



RADIO CORPORATION OF AMERICA Electron Tupe Division World Radio History



World Radio History

Multiplier Phototube



9-STAGE, SIDE-ON TYPE

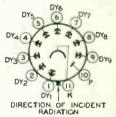
S-4 RESPONSE

For General Use in Applications Having Low Light Levels Such as Light-Operated Relays, X-Ray Exposure Control, and Facsimile Transmission

General:

Spectral Response
Wavelength of Maximum Response 4000 ± 500 angstroms
Cathode, Opaque Cestum-Antimony
Minimum projected length ^a
Minimum projected width ^a
WindowLimw Glass ^b
Dynod Material Cerium-Antimony
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No. J
Anode to all other electrodes
Maximum Overall Length
Maximum Seated Length
Length from Base Seat to Center
of Useful Cathode Area 1-15/16" ± 3.32"
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Socket Amphenol ^c No.78S11T, pr equivalent
Magnetic Shield Perfection Mica Co.d, No.P-101-4,
er equivalent
Base Small-Shell Submagnal 11-Pin, (JEDEC Group 2,
No. B11-88), Non-hydroscopic

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



Maximum Ratings, Absolute-Naximum Values:

Supply Voltage Between Anode and Catnode (DC or Peak AC)				1250	max.	volts
Supply Voltage Between Dynode No.9 and Anode (DC or Peak AC)		•	•	250	max.	volts
Juoply Voltage Between Consecutive Dynodes (DC or Peak AC)				250	max.	vo't <mark>s</mark>

🛶 Indicates a change.



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History DATA I

Supply Voltage Between Dynu and Cethode (DC or Peak A Average Anode Current ^e Ambient Temperature	AC)	2	50 max. 1 max. 75 max.	volts ma oc	•
Characteristics Range Value	es:				
Under conditions with voltage divider provid and dynode No.1; 1/10 stage; and 1/10 of E With E = 1000 volts (Except	ding I/ of E for between	10 of E betw each succe dynode No.	veen cathoo eding dynoo	le le	-
With E = 1000 voites (Except	Min.	Typ.	Max.		
Sensitivity:	H & /1 -	iyp.	Hux.		
Radiant, at 4000					
angstroms	-	2.4×104	-	a/w	
Cathode radiant, at 4000 angstroms		0.03		a/w	
Luminous:		0.05	_	d1/ W	
At O cpsf	4.5	24	300	a/lm	
Cathode luminous9 Current Amplification	-	3×10 ⁻⁵ 8×10 ⁵	-	a/lm	
Equivalent Anode-Dark-	_	DX10-			
Current Input at a					
lumirous sensitivity of			0 5 40-0		
Equivalent Noise Inputk.		9.5×10-13	2.5×10 ⁻⁹	ի Մա	
With E = 750 volts (Except a	ar natad			110	
area 5 - 150 vores (Except a	Min.		Max.		
Sensit'vity:	nın.	Tyþ.	A 62 .	•	
Radiant, at 4000					
angstroms	-	3.3×10 ³	_	a/w	
Cathode radiant, at					
4000 angstroms Luminous:		0.03		a/w	
At 0 cpsf		3.3		a/lm	
Cathode luminous ⁹	-	3×10-5		a/lm	-
Current Amplification		1.1×10 ⁵	-	a/1m	

On plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube.

Corning No.0080, Corning Glass Works, Corning, New York, or equivalent. c Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54. Illinois.

Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illingis.

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 $28700~{\rm K}$ and a light input of 10 microlumens is used.

Under the following conditions: The light source is a tungsten-fila-ment 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.

Electronic Components and Devices



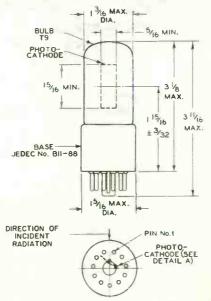
Harrison, N. J.



RADIO CORPORATION OF AMERICA

- At a lube temperature of 250 C. Dark carrent may be reduced by use of a refrigerant.
- J For maximum signal-to-noise ratio, operation with a supply voltage (E) below 500C volts is recommended.
- k Under the following conditions: Supply voltage (E) is as shown, 25^G C tube temperature, external shield connected to cathode, bandwidth 1 cycle per second, tungsten-light source at a color temperature of 28700 m 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.





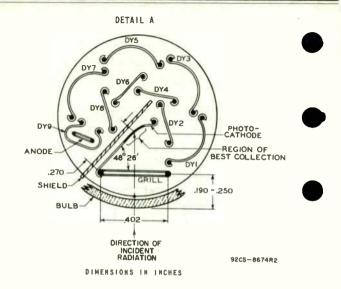
92CM-6264R3

DIMENSIONS IN INCHES

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2^O IN ANY DIRECTION FROM THE PERPEN-DICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

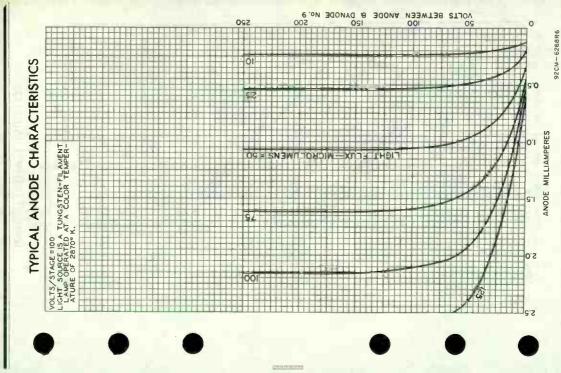


RADIO CORPORATION OF AMERICA Electronic Components and Devices World References Harrison, N. J. DATA 2 10-63



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History





DATA 3 10-63

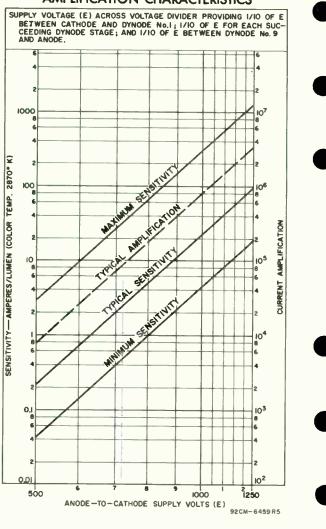
AMERICA Harrison, N. J.

OF

CORPORATION Components and Devices

R A D IO

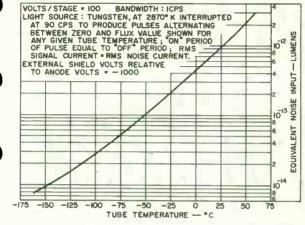
SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History

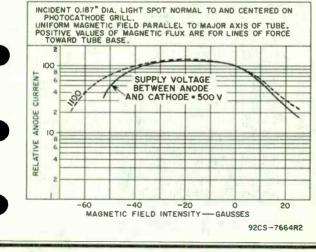






92CS-7505R2

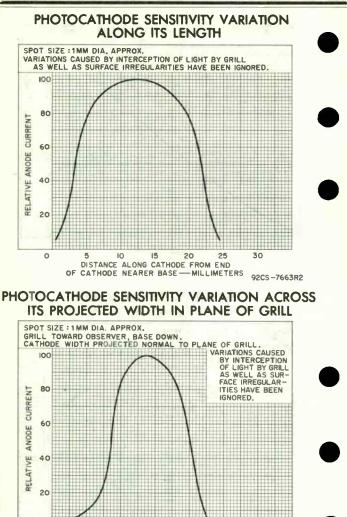
TYPICAL EFFECT OF MAGNETIC FIELD ON ANODE CURRENT





RADIO CORPORATION OF AMERICA Electronic Components and Devices Work Dariability of Harrison, N. J. DATA 4 10-63

ò



2 10 12 DISTANCE ALONG PLANE OF GRILL FROM LEFT TO RIGHT - MILLIMETERS 92CS-7667R2

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.

Vacuum Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

General: Constant

Spectral Response	••••••••••••••••••••••••••••••••••••••
Wavelength of Maximum Response	e 4000 ± 500 angstroms
Cathode:	
	Semicylindrical
Minimum projected width*	
Direct Interelectrode Capacita	ance (Approx.) 1.5 µµf
Maximum Overall Length	
	hode 1-1/4" ± 3/32"
	0.669"
	••••••••••••••••••••••••••••••••••••••
Weight (Approx.)	0.4 oz-
Bulb	
Socket	phenol No.78S3S-T, or equivalent.
Base	ell Feewee 3-Pin (JEDEC No.A3-1)
	DM VIEW
DIRECTIO	N OF LIGHT

Pin 1-Nc Internal Connection



Pin 2 - Anoce Pin 3 - Photocathode

Maximum Ratings, Absolute-Naxin	num	Va	lues	2			
ANODE-SUPPLY VOLTAGE (DC or Peak AC)				250	max.	V	olts
AVERAGE CATHODE-CURRENT DENSITY	/b.			30	max.		
AVERAGE CATHODE CURRENT ^D			• •	4	max.		μa °C
AMBIENT TEMPERATURE							oC
Characteristics:							-
∦rith an anode-supply	vol	lta	ge o	f 25	o volt	5	
	Ma	п.	Me	dıan	Max.		
Sensitivity:							
Radiant, at 4000 angstroms.			0	. 029	_	amp/r	watt

Luminous^c 19 30 75 μa/lumen Anode Dark Current at 25^o C . . - - 0.005 μa



- Indicates a change.

RADIO CORPORATION OF AMERICA **Electron Tube Division**

DATA I 3-62

World Radio History

Harrison, N. J.

934

- On plane perpendicular to indicated direction of incident light.
- Averaged over any interval of 30 seconds maximum.
- C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 28700 K. A i-megohm load resistor and a light input of 0.1 lumen are used.

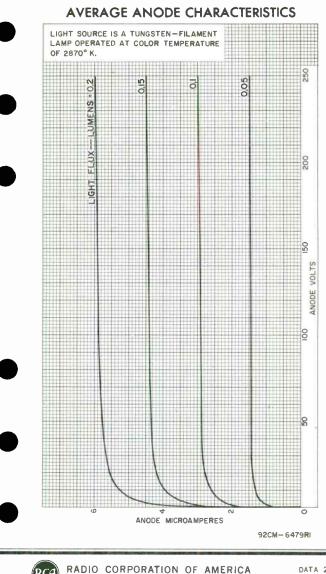
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE is shown at the front of this section

DIMENSIONAL OUTLINE shown under Type 927 also applies to the 934





World Radio History



World Radio History

Electron Tube Division

Harrison, N. J.

DATA 2 3~62

World Radio History

Vacuum Phototube

SIDE-ON TYPE HAVING S-5 RESPONSE

DATA

2616
General:
Spectral Response
Shape.
DIRECTION OF RADIATION
Pin 1-No Internal Connection Pin 2-No Internal Connection Pin 4-No Internal Connection
Maximum Ratings, Absolute-Naximum Values:
ANODE-SUPPLY VOLTAGE
(DC or Peak AC)
AVERAGE CATHODE CURRENT ^b
AMBIENT TEMPERATURE
Characteristics:
With an anode-supply voltage of 250 volts
Min. Nedian Nax.
Sensitivity: Radiant, at 3400 angstroms 0.043 - amp/watt Luminous ^c
Anode Dark Current at 25° C 0.0005 µa
🖛 Indicates a change.

RCA

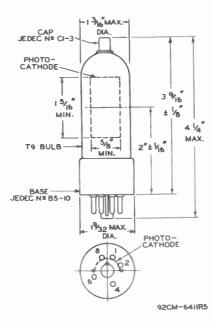
RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J.

DATA 5-62

935

- ^a On plane perpendicular to indicated direction of radiation.
- ^b Averaged over any interval of 30 seconds maximum.
- ^C For conditions where the light Source is a tungsten-filament lamp operated at a color temperature of 2870[°] K. A 1-megohm load resistor and a light input of 0.1 jume are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-5 RESPONSE is shown at the front of this section









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FOR PICKUP FROM MOTION-PICTURE FILM OR SLIDES

DATA

	DATA	
	General:	
	Heater, for Unipotential Cathode: Voltage 6.3 \pm 10% ac or dc volts Current 0.6 amp Direct Interelectrode Capacitances (Approx.): Grio No.1 to All Other Electrodes 6.5 $\mu\mu$ f Signal Electrode to Grid No.4 ^o 10 $\mu\mu$ f Mosaic, Photosensitive:	
	Response	*
	Height of Mounted Tube 10-3/15" ± 3/4" Depth of Mounted Tube 12-13/16" ± 3/4" Mounting Position 12-13/16" ± 3/4" Mainimum Deflecting-Coil Inside Diameter 1-1/2" Maximum Deflecting-Coil Length 2-1/4" Caps (Two) 1000000000000000000000000000000000000	+ +
6	Pin 1 - Heater Pin 2 - Grid No.2 Pin 3 - Grid No.3 Pin 4 - Grid No.1 Pin 5 - Cathode Pin 6 - Heater Pin 6 - Heater Pin 8 - Grid No.1 Pin 9 - Cathode Pin 9 - Grid No.1 Pin 9 - Cathode Pin 9 - Heater Pin 9 - Grid No.1 Pin 9 - Cathode Pin 9 - Grid No.1 Pin 9 - Cathode Pin 9 - Heater Pin 9 - Grid No.1 Pin 9 - Cathode Pin 9 - Grid No.1 Pin 9 - Cathode Pin 9 - Heater Pin 9 - Heater	
-	1	
	Maximum Ratings, Absolute Values: AVERAGE MOSAIC ILLUMINATION [®]	-
l	OPERATING TEMPERATURE OF BULB AT LARGE END OF TUBE 40 max. °C SIGNAL-ELECTRODE VOLTAGE	*
1	GRID-No.1 VOLTAGE: Negative bias value	
	Heater positive with respect to cathode. 10 max, volts GRID-No.4 CURRENT0.5 max. µamp ⁰ with external shield. • Averaged over any interval of 1 sec. max. →- ndicates 2 change.	
1	MAY 1, 1951 TUBE DEPARTMENT DATA	

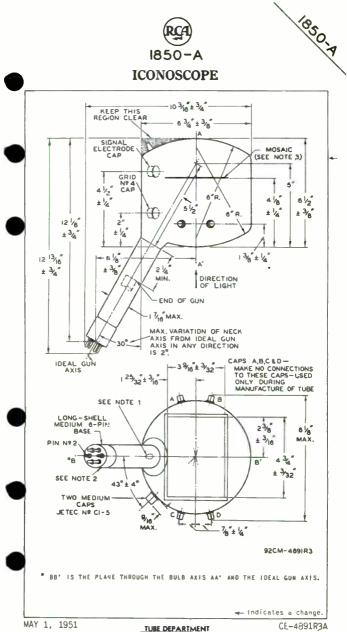
TUBE DEPARTMENT RADIO CORPORATION DE MARRISON, NEW JERSEY

I850-A ICONOSCOPE

1850-1

	Typical Operation and Characteristics:			,
	Signal-Electrode Voltage	1000	volts	
	Grid-No.4 Voltage	1000	volts	
	Grid-No.3 Voltage (Beam Focus)			
	24% to 36% of Grid-No.4 Voltage	240 to 360	volts	
	Grid-No.2 Voltage	1000	volts	-
-	Max. Grid—No.1 Voltage for Pattern			,
	Cutoff 7% of Grid-No.4 Voltage	-70	volts	
-	Grid-No.4 Current			
	(With no illumination on mosaic)*.		μ amp	
	External Load Resistance	0.1	megohm	
->	Illumination on Mosaic:			
	Steady Highlight Value for Slides	4 to 6	.ft-c	
	Average Pulsed Highlight Value	40.4. 00	ft-c	
	for Mction-Picture Film	10 to 20	11-0	
	Ratio of Peak-to-Peak Highlight			
	Video-Signal Current to RMS Noise	100		
	Current (Approx.).	100 20	volts	
+	Minimum Peak-to-Peak Blanking Voltage.	20	VUILS	
*	Deflecting-Coil Current (Approx.):	600	ma	
	Horizontal (Peak to peak)	140	ma	
	∀ertical (Peak to peak)	140	ma	
	Maximum Circuit Values:			
	Grid-No.1-Circuit Resistance	1.0 max.	megohm	
	Grig-Mo.1-Cricori Resistance · · · · ·	2.0 10271	-32.00	
	* Allowance should be made for leakage currents.			
	** For RCA Deflecting Yoke No. 201076.			

DATA



RADIO CORPORATION OF IMERICAL HARRISON, NEW JERSEY

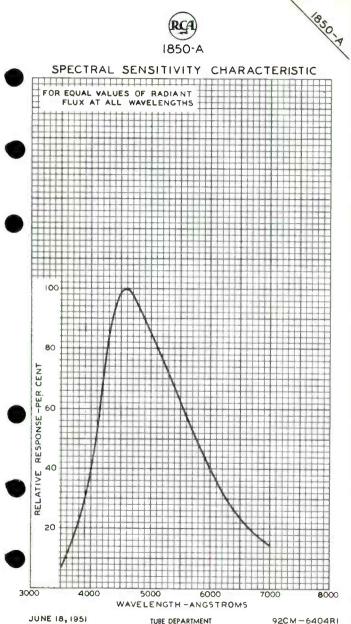




DOTE I: VARIATION OF TIP CENTER FROM PLANE BB' IS 1/2". NOTE 2: MAXIMUM ROTATION OF LINE THROUGH PINS 2 AND 5 ABOUT IDEAL GUN AXIS IS ± 10°, MEASURED FROM PLANE BB'.

BOTE 3: DEVIATION OF PLANE OF MOSAIC FROM PLANE PERPEN-DICULAR TO THE BULB AXIS AA' IS 2.5° MAX. ROTATION OF MOSAIC ABOUT THE BULB AXIS AA' WITH RESPECT TO A LINE OF INTERSECTION FORMED BY MOSAIC PLANE AND PLANE BB' IS 2.5° MAX.

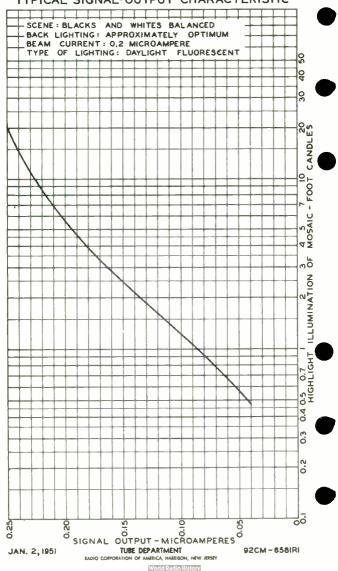




RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY



TYPICAL SIGNAL-OUTPUT CHARACTERISTIC



Multiplier Phototube



10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING S-II RESPONSE

1.5" Minimum Diameter Flat Photocathode With High-Conductivity Grating. For Use as a Scintillation Radiation Detector. Especially Useful in Measuring Transients of Short Duration Involving High Peak Photocathode Currents.

-	

General:

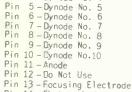
Spectral Response	11
Cithole, Semitransparent Cesium-Antimony wi	mn + L
High-Conductivit' Grati	na.
Shape	ar
Minimum area including grating 1.8 g. i	n.
Minimum diameter	n.
Mindow	sa
Index of retraction	51
Dynode Material Copper-Servili	um
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.10 4.4	
Anode to all other electrodes 7.0	pf
Maximum Overall Length	5″
Seated Length	5"
Maximum Diameter	D
Operating Position	пy
Weight (Approx.)	16
Socket Ebyb No.9709-7, or equivalen	10
Magnetic Shield Perfection Mica Co., C No.P-100-	2
or equivale	
Base Medium-Shell Diheptal 14-Pir	n
(JEDEC Group 5, No. P14-38) Non-hydroscop	ic
Basing Designation for BOTTOM VIEW	AA



Pin

Pin





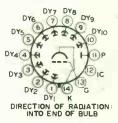
1 - Dynode No. 1

2 - Dynode No. 2

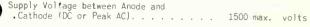
Pin 3-Dynode No. 3

Pin 4-Dynode No. 4

Pin 14 - Fhotocathode



Maximum Ratings, Absolute-Maximum Values:



- Indicates a change.



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Supply Voltage between Dynode No.10 and Anode (DC or Peak AC)	250	max.	volts
Supply Voltage between Dynode No.1 and Cathode (DC or Peak AC)	400	may	volts
Supply Voltage between Focusing Elec-			
trode and Cathode (DC or Peak AC)			volts
Average Anode Current ^a			ma
Cathode Irradiation			lm
Ambient Temperature	/5	max.	°C

Characteristics Range Values:

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of E between cathode and dynode No.1; i/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 = 1500 volts (Except as noted)

with E - 1300 voits (Except as no	ceu/			
	Nin.	Typ.	Nax.	
Sensitivity:				
Radiant at 4400 angstroms	-	2.2×10 ⁴	_	a/w
Cathode radiant, at 4400 angstroms Luminous:	-	0.04	-	a/w
At O cps ^f	-	28	-	a/lm
output electrode ⁹ Cathode luminous:	-	17	-	a/lm
With tungsten light source ^h	3×10-5	5×10-5	_	a/lm
With blue light source ¹ Current Amplification	3x10-8	5.6x10 ⁵	-	а
With $E = 1250$ volts (Except as no	ted)			
		Typ.	Nax.	
		Typ.	Nax.	
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400			Nax.	
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms		<i>Typ</i> . 4.8×10 ³	Hax.	a/w
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms Cathode radiant, at 4400 angstroms			Нах. _ _	a/w a/w
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms Cathode radiant, at 4400 angstroms Luminous: At 0 cps ^f		4.8×10 ³	Нах. - - 75	
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms Cathode radiant, at 4400 angstroms Luminous: At 0 cpsf With dynode No.10 as output electrode ⁹	Nin. - -	4.8×10 ³ 0.04	-	a/₩
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms Cathode radiant, at 4400 angstroms Luminous: At 0 cpsf With dynode No.10 as output electrode ⁹ Cathode luminous: With tungsten light	<i>№1п.</i> - 2.5 -	4.8×10 ³ 0.04 6 3.6	- 75 -	a/w a/lm a/lm
With E = 1250 volts (Except as no Sensitivity: Raciant at 4400 angstroms Cathode radiant, at 4400 angstroms Luminous: At 0 cpsf With dynode No.10 as output electrode ⁹ Cathode luminous:	Nin. - -	4.8×10 ³ 0.04 6 3.6	- 75 -	a/w a/lm

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--- Indicates a change.

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lm lm

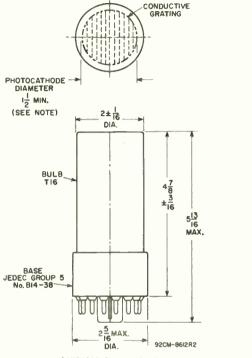
	Min.	Typ.	Max.
Current Amplification	-	1.2×10 ⁵	_
Equivalent Anode-Dark-			
Current Input at a			
luminous sensitivity of			
20 a/1mk.m	-	2.5×10-10	2.25×10-9
Equivalent Noise Input ⁿ		7x10-12	1.7×10-11

- a Corning No.0080 made by Corning Glass Works, Corning, New York, or equivalent.
- ^b Made by Hugh H. Eby Company, #701 Germantowr Avenue, Philadelphia #4, Pennsylvania.
- ^C Made by Agnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Macker Drive, Chicage 6, Illinois.
- d Averaged over any interval of 30 seconds maximum. For best stability, the average anode current value should not exceed 250 microamperes.
- the average and/e current value should not exceed 200 microampers. Above this value of cathode illumination, serious loss in linearity between light input and and/e current will becaused by the restivity of the cathode. For gontinuous light input of 0.1 lumen from tungsten light source at 2870 K incident on cathode area having diameter in linearity will not exceed 30 per cent depending on the magnitude of the cathode current. At 0.1 lumen, the corresponding continuous cathode current is approximately 5 microamperes, regardless of the Spectral distribution of the exciting illumination.
- ^f Under the following conditions: The light source is a tungstwn-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.
- ^g 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-Ko.10 circuit and the anode serves only as collector. The curves shown in fypical Anode Characteristics do not apply when dynode No.10 is used as the output electrode.
- ¹⁰ Under the following conditions: The light source is at ungstenfilament lamp having a lime-glass envelope. It is operated at a color temperature of 28700 K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- as and/us. Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. Mc.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 lump operated at a color remperature of 2870 K. The value of light flux inciden: on the filter is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- k At a tube temperature of 25⁰ C. Dark current may be reduced by use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.
- Under the "ollowing 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.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at front of this Section



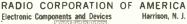
RADIO CORPORATION OF AMERICA Electronic Components and Devices World Padio History DATA 2 10-63



DIMENSIONS IN INCHES

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

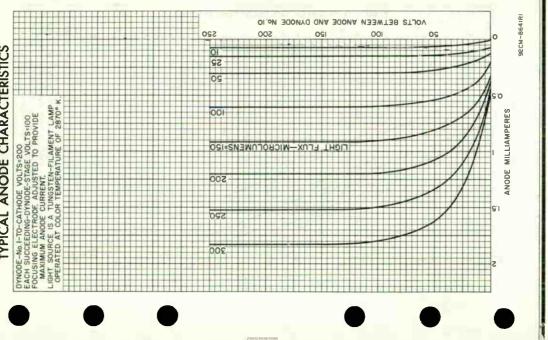
NOTE: WITHIN 1-1/2 INCH DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010 INCH FROM PEAK TO VALLEY.





Electronic Components and Devices

CHARACTERISTICS ANODE TYPICAL



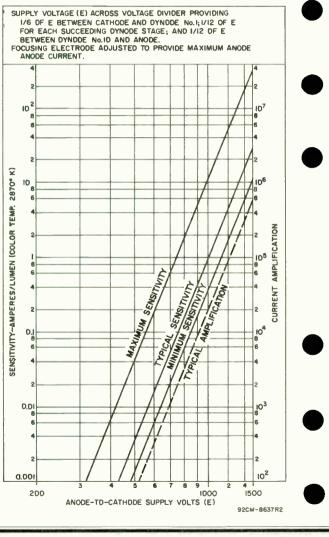
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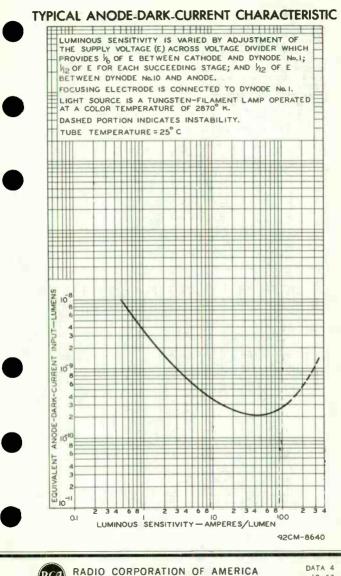
SENSITIVITY AND CURRENT AMPLIFICATION **CHARACTERISTICS**



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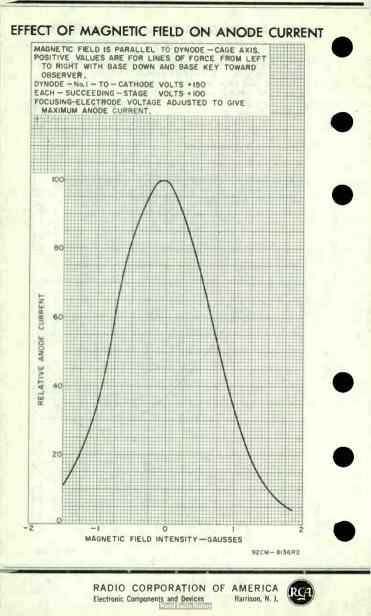
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Electronic Components and Devices Harrison, N. J. World Radio History

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Photomultiplier Tube

S-II RESPONSE IO-STAGE, HEAD-ON, FLAT-FACEPLATE

ELECTROSTATICALLY FOCUSED DYNODE STAGES

For Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources in Scintillation Counters

The 2061 is electrically similar to type 6342A except for the following performance characteristic and that the anode luminous sensitivity and equivalent noise input ratings shown for the 6342A do not apply for type 2061.

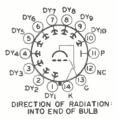
The 2061 is supplied with a medium-shell diheptal base attached to flexible leads to facilitate testing. After testing, the attached base of the 2061 should be removed prior to installing the tube in a given system.

PERFORMANCE CHARACTERISTIC

Pulse height is defined as the amplitude of the anode pulse voltage (referred to anode) measured across a 100 ± 5%-kilohm resistor and a total capacitance of 92 ± 3% pFinparallel. An anode-to-cathode voltage of 130 volta is applied across a voltage-divider network having a 1.5 ± 5% megoha resistor between cathode and dynode No.1, 450 ± 3%-kilohm resistors between each succeding stage including dynode No.10 ± 00% of dynode No.1 potential (referred to sathode) which will provide maximum anode current. The 662-KeV photon from an isotope of cesium having an etomic mass of 137 (18.37) and a cylindrical 2 inch x 2 inch thallium-activated sodium-iodide scintillator [Ne1/Ti] type 8D8, or equivalent are used. The scintillator is manufactured by the Harshaw Chemical Corporation, 1945 East 97th Street, Cleveland 6, Ohio. The (Sat) is in direct contact with the metal end of the scintillator fue faceplate end of the crystal is coupled to the 2061 by a coupling fluid south as Dow Corning Corp., Midland, Michigan, or equivalent.

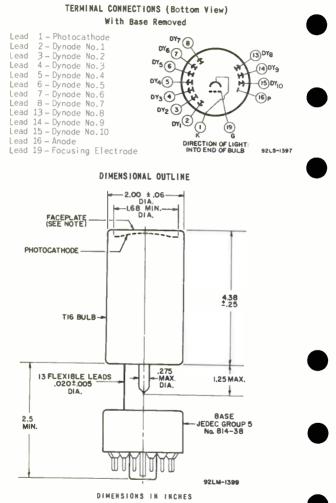
BASING DIAGRAM (Bottom View) With Base Attached

- 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.7 Pin 8 - Dynode No.9 Pin 10 - Dynode No.9 Pin 11 - Arode Pin 12 - No Connection
- Pin 13 Focusing Electrode
- Pin 14 Photocathode





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 6-66



Note: Within 1.68-inch diameter, deviation from flatness of external surface of faceplate will not exceed 0.010 inch from peak to valley.

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Photomultiplier Tube

IO-STAGE, HEAD-ON FLAT-FACEPLACE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 1.68-INCH MINIMUM-DIAMETER, FLAT, CIR-CULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

For Use in Scintillation Counting Applications

The 2063 is electrically similar to type 8053 except for the following performance characteristics and that the anode luminous sensitivity and equivalent noise input ratings shown for the 8053 do not apply for type 2063.

The 2063 is supplied with a medium-shell diheptal base attached to flexible leads to facilitate testing. After testing, the attached base of the 2063 should be removed prior to installing the tube in a given system.

PERFORMANCE CHARACTERISTICS

Under cond tions 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 Ebetween dynode No. 10 and anode. The forusing electrode is adjusted to that value between 50% and ICO% of dynode No. | potential (referred to cathode) which will provide maximum anode current.

Maximum	Anode	Dark Cur	rent	a.							0.05	
Minimum	Pulse	Height ^b .						÷	÷	1	0.13	

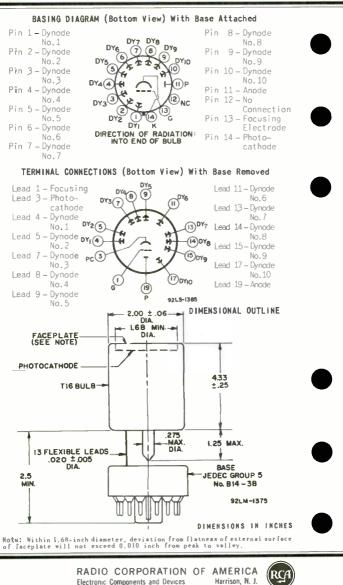
- Measured under the following conditions: Light incident on the photo-cathode is transmitted through a blue filter Corning C.S. No. 5-58, polished to 1/2 vicot thickness-Manufactured by the Corning Giana Works, Corning, New York) from a tungsten-filmert famp operated at a color temperature of 2870 K. The light flux incident on the filter is 10 microlumens. The supply voltage is adjusted to obtain an annude current of 9 μ A. Dark current is measured with the light source removed.
- microiumena. The supply torings is adjusted to the anode pulse work of 9 µA. Dark wurrent is measured with the light source removed.
 Pulse height is defined as the asplitude of the anode pulse work and a total capacitance of 92 ± 3% pF in parallel. An anodes resistor and a total capacitance of 92 ± 3% pF in parallel. An anodes resistor and a second source of a seco



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DATA I 6-66



Photomultiplier Tube

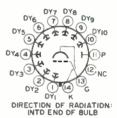
IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 2.59-INCH MINIMUM-DIAMETER, FLAT, CIR-CULAR, SEMITRANSPARENT PHOTOCATHODE AND S-11 RESPONSE

For Use in Scintillation Counting Applications

The 2064 is identical to type 8054 in all respects except that it is supplied with a medium-shell diheptal base attached to flexible leads to facilitate testing. After testing, the attached base should be removed prior to installing the 2064 in a given system.

> BASING DIAGRAM (Bottom View) With Base Attached

- Pin 1 - Dynode No.1 Pin 2 - Dynode No.2 3 - Dynode No. Pin Pin 4 - Dynode No. 4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.6 Pin 7 - Dynode No.7 8 - Dynode No.8 Pin Pin 9 - Dvnode No.9 Pin 10 - Dynode No. 10 Pin 11 - Anode Pin 12-No Connection
- Pin 13 Focusing Electrode
- Pin 14 Photocathoce



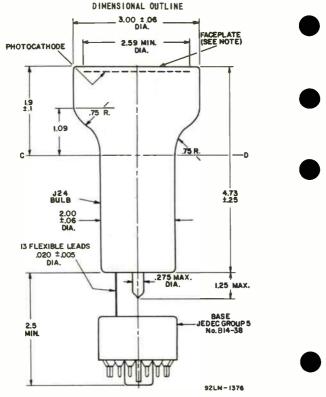
TERMINAL CONNECTIONS (Bottom View) With Base Removed



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DIMENSIONS IN INCHES

Note: Within 2.59-inch diameter, deviation from flatness of external surface of faceplate will not exceed 0.010 inch from peak to valley.



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Photomultiplier Tube

IO-STAGE, HEAO-ON, FLAT-FACEPLACE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 2.59-INCH MINIMUM-DIAMETER, FLAT, CIR-CULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

For Use in Scintillation Counting Applications

The 2064B is electrically similar to type 8054 except for the following performance characteristics and that the anode luminous sensitivity and equivalent noise input ratings shown for the 8054 do not apply for type 2064B.

The 2064B is supplied with a medium-shell diheptal base attached to flexible leads to facilitate testing. After testing, the attached base of the 2064B should be removed prior to installing the tube in a given system.

PERFORMANCE CHARACTERISTICS

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of E between cathode and dynode No.1; I/12 of E for each succeeding dynode stage; and I/12 of E between dynode No.10 and anode. The focusing electrode is adjusted to that value between 50% and 100% of dynode-Nc.1 potential (referred to cathode) which will provide maximum anode current.

Maximum	Anode	Dark Cur	rei	۱té	а.						0.05	щA
Minimum	Pulse	Height ^b .									0.18	

- Measured under the following conditions: Light incident on the photo-cathode is transmitted through a blue filter (Corning C.S. No.5-58, pointed tal/sect thickness-Manufactured by the Corning (Tasaw Works, pointing New 2000 a Tungsten-filment lamp operated at a color temperature of 28700 cm. The light flux incident on the filter is 10 microlumens. The supply voltage is adjusted to obtain an anode current of $9 \ \mu$ A. Park current is measured with the light source removed.
- of 9 μ A. Dark current is measured with the light source removed. Pulse height is defined as the amplitude of the anode pulse voltage (referred to anode) measured across a 100 ± 5%-kilohm resister and at total capacitance of 92 ± 3% pF in parallel. An anode-to-cathode volt-age of 1130 volts is applied across a voltage-divider network having a 1.5 ± 5%-megohm resistor between cathode and dynode No. 1, 450 ± 5%-kil-om de. The footeness act aucceeding stage including dynode No. 10 ± 5%-kil-om de. The footeness act aucceeding stage including dynode No. 10 ± 5%-kil-om de. The footeness act aucceeding stage including dynode No. 10 ± 5%-kil-om de. The footeness act aucceeding stage including dynode No. 10 ± 5%-med 100% of dynode No. 1 estrode is adjusted to that value between 50% and including the stage of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a common isotope of cessium having an atomic mass of 137 (Cal37) and a complete the the declass of the complete complete of the 2064 by coupleted by the manufactured by the Bow Corning Corp., Midland, Michigan, or equivalent.



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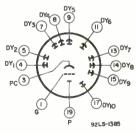
BASING DIAGRAM (Bottom View) With Base Attached

1 – Dynode No.1
2 - Dynode No.2
3 - Dynode No.3
4 - Dynode No.4
5 - Dynode No.5
6 – Dynode No.6
7 - Dynode No.7
8 – Dynode No.8
9 - Dynode No.9
10 - Dynode No.10
11 - Anode
12 - No Connection
13 - Focusing Electrode
14 - Photocathode



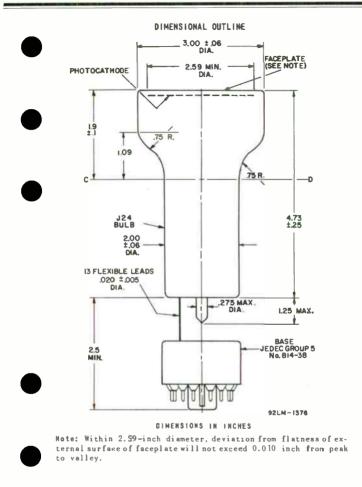
TERMINAL CONNECTIONS (Bottom View) With base Removed

Lead	1 - Focusing Electrode
Lead	3 – Photocathode
Lead	4 - Dynode No.1
Lead	5 – Dynode No.2
Lead	7 – Dynode No.3
Lead	8 – Dynode No.4
	9 – Dynode No.5
Lead	11 – Dynode No.6
Lead	13 – Dynode No.7
	14 - Dynode No.8
Lead	15 - Dynode No.9
	17 - Dynode No.10
Lead	19 – Anode





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World Radio History

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Photomultiplier Tube

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 4.38-INCH MINIMUM DIAMETER. FLAT, CIRCULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

For Use in Scintillation Counting Applications

The 2065 is electrically similar to type 8055 except for the following performance characteristics and that the anode luminous sensitivity and equivalent noise input ratings shown for the 8055 do not apply for type 2065.

The 2065 is supplied with a medium-shell diheptal base attached to flexible leads to facilitate testing. After testing, the attached base of the 2065 should be removed prior to installing the tube in a given system.

PERFORMANCE CHARACTERISTICS

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. The focusing electrode is adjusted to that value between 50% and 100% of dynode-No.1 potential (referred to cathode) which will provide maximum anode current.

Maximum Anode	Dark Current ^a .						0.05	μA
Minimum Pulse	Height ^D						0.13	١V.

- a Messured under the following conditions: Light incident on the photocathode in transmitted through a blue filter (Corning C.S. No.5-58, 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 light flux incident on the litter is 10 microlumens. The supply voltage is adjusted to obtain an anode current of 9 AA. Dark current is measured with the light source removed.
- 10 microluments in compertant is measured with the light source removeu, pent of 9 µÅ. Dark current is measured with the light source removeu, pulse height is defined as the amplitude of the mode pulse voltage (referred to anode) measured across a 100 ± 55-kilohn resistor and a total capacitance of 92 ± 3% pF in parallel. An anode-to-cath.de voltage of 130 volts is applied across a voltage-divider network having a 1.5 ± 5%-megoha resistor between cathode and dynode No.1, 450 ± 55%hom resistors between cath succeeding stage includang dwinde No.80 to anode. The facusing electrode is adjusted to that value between 50% and 100% of dynode No.1 potential (referred to cathode) which will provide muximum anode current. The 662-kgV photon from an inctope of cesium having an atonic mass of 137 (Cal¹⁴⁷) and a cylindrica' 3 inch 3 inch thalliam-activated sodium-iodide acintillator is man fatured by Warshaw Chemical Corporation, 1945 East 9; th Street, Clevelando, Oho. The fac27 is in direct contact with the metal end of the scintillator. The fac27 is in direct contact with the metal end of the scintillator. The fac27 is in direct contact with the metal end of the scintillator. The fac27 is in down for provide is completed to the 2065 br a coupling fluid suck as Dav Corning Corp.. Type DC206 (Viscosity of 100 centipoise) manufactured by the Dos Corning Corp., Midland, Michigan, or equivalent.

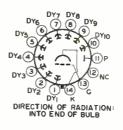


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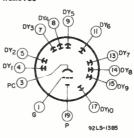
BASING DIAGRAM (Bottom View) With Base Attached

PIN	I - Uynode No.1
Pin	2 - Dynode No.2
Pin	3 - Dynode No.3
Pin	4 - Dynode No.4
Pin	5 - Dynode No.5
Fin	6 - Dynode No.6
Pin	7 - Dynode No.7
Fin	8 – Dynode No.8
Pin	9 - Dynode No.9
Pin	10 - Dynode No. 10
Pîn	11 – Anode
Pin	12-No Connection
Pin	13-Focusing Electrode
Pin	14 - Photocathode



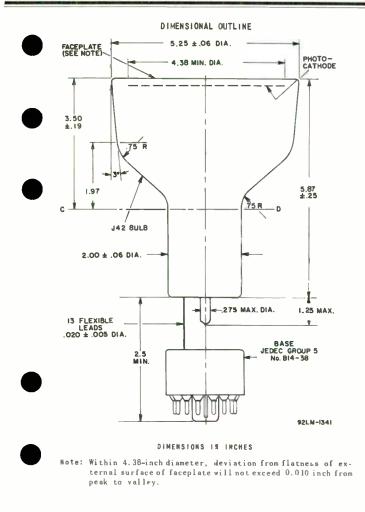
TERMINAL CONNECTIONS (Bottom View) With Base Removed

Lead	1 - Focusin	g Electrode
Lead	3 – Photoca	thode
Lead	4 – Dynode	No.1
Lead	5 – Dynode	No.2
Lead	7 – Dynode	No.3
Lead	8 – Dynode	No.4
Lead	9 – Dynode	No.5
Lead	11 - Dynode	No.6
Lead	13 – Dynode	No.7
Lead	14 - Dynode	No.8
Léad	15 - Dynode	No.9
Lead	17 – Dynode	No.10
Lead	19 – Anode	





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Harrison, N. J.

DATA 2 6-66

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Image Orthicon

MAGNETIC FOCUS

MAGNETIC DEFLECTION

The 4401 is Unilat-For Low-Light-Level Color Pickup. erally Interchangeable with Types 5820, 6474, and 7513.

DATA

General:

Heater, for Unipotential Cathode: Voltage (AC or DC)
Guillenc ac ory forcat i i i i i i i i i i i i i i i i i i i
Direct Interelectrode Capacitance:
Anode to all other electrodes 12 ##f
Spectral Response
Spectral Response
Photocathooe, Semitransparent:
Rectangular image (4 x 3 aspect ratio):
Useful size of 1.8" max. diagonal
Note: The size of the optical image focused on the
photocathode should be adjusted so that its maximum
diagonal does not exceed the specified value. The
corresponding electron image on the target should
have a size such that the corners of the rectangle
just touch the target ring.
Orientation of Proper orientation is obtained when the
vertical scan is essentially parallel to
the plane passing through center of face-
plate and pin 7 of the shoulder base.
Focusing Method
Overall Length
Greatest Diameter of Bulb
Minimum Deflecting-Coil Inside Diameter
Minimum Deflecting-Coll Inside Diameter
Deflecting-Coil Length
Focusing-Coil Length
Alignment-Coil Length
Photocathode Distance Inside End of Focusing Coil 1/2"
Operating Position See Operating Considerations
Weight (Approx.).
Weight (Approx.)
Pin 1-Grid No.6 Pin 5-Grid No.5

Pin 2 - Photocathode	
	Pin 6 - Target
Pin 3-Internal Connec- tion-Do Not Use	Fin o = larget
	Pin 7 - Internal Connec-
Pin 4 - Internal Connec-	tion-Do Not Use
tion-Do Not Use	tion-bo Not use

See basing diagram on next page.

Electron Tube Division

RADIO CORPORATION OF AMERICA Harrison, N. J. World Radio History

DATA I 10-60

End Base Small-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-45) BOTTOM VIEW	
BOTTOM VIEW Pin 1 - Heater Pin 2 - Grid No.4 Pin 3 - Grid No.3 Pin 4 - Internal Connec- tion-Do Not Use Pin 12- Grid No.1 Pin 12- Grid No.1 Pin 12- Grid No.1 Pin 14- Heater BOTTOM VIEW DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE 0 0 0 0 0 0 0 0 0 0 0 0 0	•
Merchanne and Minimum Detterner the second second	

Maximum and Minimum Ratings, Absolute-Haxi	mum Value	s :
PHOTOCATHODE :		
Voltage	-550 max	volts
Illumination	50 max	
OPERATING TEMPERATURE:		
Of any part of bulb	50 max	°C
Of bulb at large end of tube		
(Target section)	35 min	•C
TEMPERATURE DIFFERENCE:		
Between target section and any part		
of bulb hotter than target section	5 max	•C
GRID-No.6 VOLTAGE	-550 max	. volts
TARGET VOLTAGE:		
Positive value	10 max	 volts
Negative value	10 max	. volts
GRID-No.5 VOLTAGE	150 max	• volts
GRID-No.4 VOLTAGE	300 max	• volts
GRID-No.3 VOLTAGE	400 max	• volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	350 max	• volts
GRID-Nc.1 VOLTAGE:		
Negative-bias value	125 max	 volts
Positive-bias value	0 max	. volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	125 max	
Heater positive with respect to cathode .	10 max	
ANODE SUPPLY VOLTAGE	1500 max	
VOLTAGE PER MULTIPLIER STAGE	500 max	 volts

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. World Radio History



Typical Operation and Characteristics:

Photocathode Voltage (Image Focus)	-400 to -540	volts
Grid-No.6 Voltage (Accelerator)		
Approx. 75% of photocathode voltage .	-300 to -405	volts
Target-Cutoff Voltage*	-3 to +1	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam Focus)	140 to 180	volts
Grid-No.3 Voltage [®]	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff	–45 to –115	volts
Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Minimum Peak-to-Peak Blanking Voltage	5	volts
Field Strength at Çenter		
of Focusing Coil	75	gausses
Field Strength of Alignment Coil	0 to 3	gausses

Performance Oata:

With conditions shown under Typical Operation and with picture highlights at the "knee" of the accompanying Basic-Light-Transfer-Characteristic Curve

		Min.	Average	Max.	
Cathode Radiant Sensitivity at 4500 angstroms Anode Current (DC)		-	0.03	-	µа/µw µа
Signal-Output Current (Peak-tc-peak) Ratio of Peak-to-Peak High- light Video-Signal Current to RMS Noise Current for	•	10.	25	50	μа
Bandwidth of 4.5 Mc Photocathode Illumination at 2870° K Required to Reach "Knee" of Light-	•	35:1	45:1	60×	
Transfer Characteristic Peak-to-Peak Response to Square-Wave Test Pattern at 400 TV Lines per Picture Height (Per cent of large-	•	φe.	0.007	0.01	fc
area black to large-area white)		28	35	-	%

- Ratio of dynode voltages is shown urder Typical Operation.
- Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- Adjust to give the most uniformly shaded picture near maximum signal. Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coll.
- Measured with amplifier having flat frequency response.

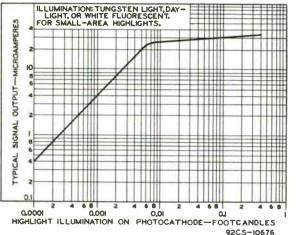


OPERATING CONSIDERATIONS

The operating position of the 4401 should preferably be such that any loose particles in the neck of the tube will not fall down and strike or become lodged on the target. Therefore, it is recommended that the tube never be operated in a vertical position with the Diheptal-base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20° with the vertical.

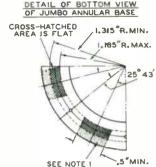
> SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device having S-10 Response is shown at the front of this Section

BASIC LIGHT-TRANSFER CHARACTERISTIC





RADIO CORPORATION OF AMERICA Electron Tube Division Liferid Radio History Harrison, N. J.

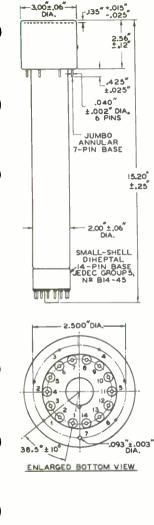


NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY D. OGD" MAX.

ANNULAR-BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- а. SIX HOLES HAVING DIAMETER QF D.065" ± 0.0DI" AND ONE HOLE HAVING DIAMETER OF D. 150" ± D. DOI". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIK 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51026' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- SEVEN STOPS HAVING HEIGHT b. OF 0.187" ± 0.001", CEN-TERED BETWEEN PIN HOLES TO BEAR AGAINST FLAT AREAS OF BASE.
- RIM EXTENDING OUT A MINIMUM ċ. OF 0,125" FROM 2.812" DIAMETER AND HAVING HEIGHT OF 0.126" ± 0.001".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



3.00°±.06″-

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DATA 3 10-60

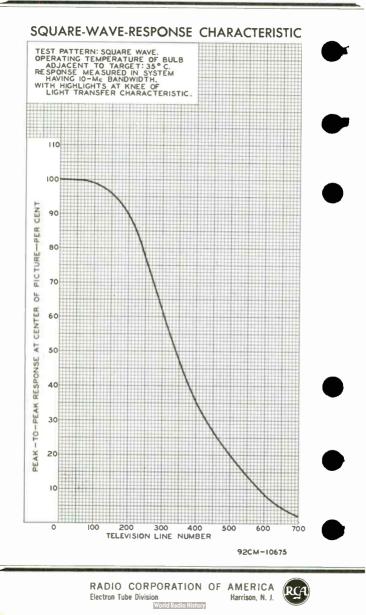


Image Orthicon



See basing diagram on next page.



RADIO CORPORATION OF AMERICA Electronic Computents and Devices World Racio History DATA I 3-64

4401V1

End Base
BOTTOM VIEW
Pin 1 - Heater Pin 2 - Grid No.4 Pin 3 - Grid No.3 Pin 4 - Do Not Use Pin 8 - Dynode No.5 Pin 9 - Dynode No.5 Pin 9 - Dynode No.5 Pin 10 - Dynode No.1, Grid No.1 Pin 12 - Grid No.1 Pin 14 - Heater
(7) IC
WHITE INDEX LINE ON FACE
Maximum and Minimum Ratings, Absolute-Maximum Values:
Photocathode:
Voltage

Voltage	
Of any part of bulb	oC
(Target section)	oC
Between target section any any part of bulb hotter than target section 5 max. Grid-No.6 Voltage	o _C olts
Target Voltage: Positive value	
Grid-Ne.5 Voltage	olts
Grid-Nc.2 & Dynode-No.1 Voltage	olts
Negative-bias value	olts
Heater negative with respect to cathode 125 max. vv Heater positive with respect to cathode 10 max. vv Anode Supply Voltage ^a	olts

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



Typical Operation and Characteristics:

Photocathode Valtage (Image Focus) Grid-No.6 Voltage (Accelerator)	-400 to -54C	volts
Approx. 75% cf photocathode voltage	-300 to -40 p	volts
Target-Cutoff Voltage ^b	-3 to +1	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam Focus)	140 to 1 3 0	volts
Grid-No.3 Voltage ^c	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutcff	–45 to –115	
Dynode-No.2 Voltage	60C	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Minimum Peak-to-Peak Blanking Voltage	5	volts
Field Strength at Center	30	
of Focusing Coild		gausses
Field Strength of Alignment Coil	0 ta 3	gausses

Performance Data:

With conditions shown under Typical Operation and with dicture highlights at the "knee" of the accompanying Basic-Light-Transfer-Characteristic Curve

	A_1n .	lyp.	Max.	
Cathede Radiant Sensitivity at 4500 angstroms Anode Current (DC)	_	0.03		a/w μa
Signal-Output Current (Peak-tc-peak) Ratio of Feak-to-Peak High- light Video-Signal Current	 10	15	35	μа
to RMS Noise Current for Bandwidth of 4.5 Mc Photocathode Illumination at 2570 ^c K Required to	 35:1	40:1	-	
Reach "⊧nee" of Light- Transfer Characteristic Peak-to-Peak Response to Square-Wave Test Pattern at 400 TV Lines per Picture	 -	0.005	0.008	fc
Height (Per cent of large- area black to large-area white) ^e	35	60	_	%

Ratio of dynede voltages is shown under Typical Operation.
 Normal setting of target voltage is to volts from target cutoff. The target supply voltage should be adjustable from -3 to to volts.

Adjust to give the most uniformly shaded picture near maximum signal.

d Direction of current should be such that a north-serking pole is attracted to the image end of the Tocusing coil, with the indicator located outside of and at the image end of the focusing coil.

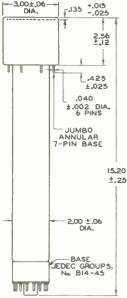
Measured with amplifier having flat frequency response.

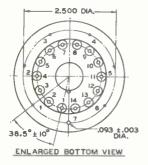
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this Section



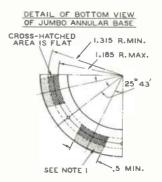
RADIO CORPORATION OF AMERICA Electronic Components and Devices

4401V1





DINENSIONS IN INCHES



Note 1: Ootted area is flat or extends toward diheptalbase end of tube by 0.060" max.

ANNULAR-BASE GAUGE

Angular variations between pins as well as eccentricity of neck cylinder with respect to photocathode cylinder are held to tolerances such that pins and neck cylinder will fit flat-plate gauge with:

- а. Six holes having diameter of 0.065" ± 0.001" and one hole having diameter of 0.150" ± 0.001". All holes have depth of 0.265" ± 0.001". The six 0.065" holes are enlarged by 45° taper to depth of 0.047". All holes are spaced at angles of 51°26 ± 51 on circles diameter of 2.500" ± 0.001".
- b . Seven stops having height of 0.187" ± 0.001", centered between pin holes to bear against flat areas of base.
- Rim extending out a minimum с. of 0.125" from 2.812" diameter and having height of 0.126" ± 0.001".
- d Neck-cylinder clearance hole having diameter of 2.200" ± 0.001".

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RADIO CORPORATION OF AMERICA **Electronic Components and Devices** Harrison, N. J.



Image Orthicon

MAGNETIC FOCUS

MAGNETIC DEFLECTION

HIGH SENSITIVITY For Outdoor and Studio Pickup. The 4414/7611 is Unilaterally Interchangeable with Types 5820,5820A, and 7611ª.

DATA

General:
He₄ter, for Unipotential Cathode: ∀oltage (AC or DC)
Direct Interelectrode Capacitance: Anode to all other electrodes 12 pf
Spectral Response
Wavelength of Maximum Response 4500 ± 300 angstroms
Photocathode, Semitransparent:
Rectangular image (4 x 3 aspect ratio): Useful size of
Note: The size of the optical image focused on the pho-
tocathode should be adjusted so that its maximum diag-
onal does not exceed the specified value. The corres-
pending electron image on the target should have a size
such that the corners of the rectangle just touch the target ring.
Orientation of Proper orientation is obtained when the
vertical scan is essentially parallel to
the plane passing through center of face-
plate and pin 7 of the showlder base. Focusing Method
Deflection Method
Overall Length
Greatest Diameter of Bulb
Minimum Deflecting-Coil Inside Diameter
Frecusing-Coil Length
A ¹ ianment-Coil Length
Photocathode Distance Inside End of Focusing Coil 1/2"
Operating Position The tube should never be operated in a
vertical position with the diheptal-base endup nor in any other position where the axis of the tube with
the base up makes an angle of less than 20° with the
vertical.
Weight (Approx.)
Shoulder Base Keyed Jumbo Annular 7-Pin BOTTOM VIEW
Pin 1-Grid No.6 Pin 5-Grid No.5
Pin 2 – Phorocathode Pin 6 – Target Pin 3 – Do Not Use Pin 7 – Do Not Use
Pin 3 - Do Not Use Pin 7 - Do Not Use

See basing diagram on next page.

Electron Tube Division



RADIO CORPORATION OF AMERICA Harrison, N. J.

4414/7611

End Base Small-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-45) BOTTOM VIEW	
Pin 1-Heater Pin 2-Grid No.4 Pin 3-Grid No.3 Pin 4-Do Not Use Pin 5-Dynode No.2 Pin 6-Dynode No.4 Pin 7-Anode Pin 8-Dynode No.5 Pin 9-Dynode No.3 Pin 10-Dynode No.1, Grid No.2 Pin 11-Do Not Use Pin 12-Grid No.1 Pin 12-Grid No.1 Pin 12-Grid No.1 Pin 14-Heater WHTE INDEX LINE ON FACE	•
Maximum and Minimum Ratings, Absolute-Maximum Values: PHOTOCATHODE:	
Voltage	
Of any part of bulb 50 max. °C	

Of any part of bulb	°C
Of bulb at large end of tube	0.0
(Target section)	°C
Between target section and any part of bulb hotter than target section 5 max.	°C
OF build hotter than target section 5 max.	-
GRID-No.6 VOLTAGE	volts
Pasitive value	
Positive value 10 max.	volts
Negative value 10 max.	volts
GRID-No.5 VOLTAGE	volts
GRID-No.4 VOLTAGE	volts
GRID-No.3 VOLTAGE	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE 350 max.	volts
GRID-No.1 VOLTAGE:	
Negative-bias value	volts
Positive-bias value 0 max.	volts
VOLTAGE PER MULTIPLIER STAGE	volts
ANODE SUPPLY VOLTAGE [®]	volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode 125 max.	volts
Heater positive with respect to cathode 10 max.	volts
Typical Operating Values:	00103
Photocathode Voltage (Image Focus)400 to -540	volts
Grid-No.6 Voltage (Accelerator)	

Approx. 75% of photocathode voltage . . -300 to-405 volts

o<mark>rld R</mark>adio History

RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.



4414/7611

)	Target Cutoff Voltage ^C -3 to1 Grid-No.5 Voltage (Decelerator) 0 to 125 Grid-No.4 Voltage (Beam Focus) 140 to 180 Grid-No.3 Voltage ^d 225 to 330 Grid-No.2 & Dynode-No.1 Voltage 300 ⁻	volts volts volts volts volts
	Grid-No.1 Voltage for Picture Cutoff45 to -115	
	Dynode-No.2 Voitage	volts
	Dynode-No.3 Voltage	volts
	Dynode-No.4 Vo'tage	volts
	Dynode-No.5 Voltage	volts
	Anode Voltage	volts
	Minimum Peak-to-Peak Blanking Voltage 5	volts
	Field Strength at Center	
		gausses
	Field Strength of Alignment Coil 0 to 3	gausses

Performance Data; f

With conditions shown under Typical Operating Values and with camera lens set to bring the picture highlights one stop above the "knee" of the accompanying Basic Light-Transfer-Characteristic Curve

	Min.	Average	Max.	
Cathode Radiant Sensitivity at 4500 angstroms	_	0.030	-	a/w
Luminous Sensitivity		60 30	-	μa/lm μa
Signal-Output Current (Peak-to-Peak)	3	В	2≮	μа
Ratio of Peak-to-Peak High- light Video-Signal Current				
to RMS Noise Current for Bandwidth of 4,5 Mc Photocathode Illumination	35:1	-	-	
at 2870 ⁰ K Required to Bring Picture Highlights				
One Stop Above "Knee" of Light Transfer				
Characteristic	-	0.02	0.04	fc
Square-Wave Test Pattern at 400 TV Lines per Picture				
Height (Per cent of large- area black to large-area				
white) ⁹	. 35	-	-	%
Ratio of Shading (Back- ground) Signal to High-				
light Signal Variation of Highlight Signal (Per cent of	-	0,12	0.15	
maximum highlight signal) ^h	. –	20	25	%

RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. DATA 2 6-63

World Radio History

4414/7611

- The 4414/7611 when operated within the temperature range of 35^{0} to 45^{0} C is unilaterally interchangeable with types 5820,5820A, and 7611. a
- h Dymode-voltage values are shown under Typical Operating Values.
- Normal setting of target voltage.is+2 volts from target cutoff. get supply voltage should be adjustable from -3 to 5 volts. c The tard
- Adjust to give the most uniformly shaded picture near maximum signal.
- . Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coll, with the indicator located out-side of and at the image end of the focusing coll.
- f with 4414/7611 operated in properly adjusted RCA TK-31 camera.
- ^g Measured with amplifier having flat frequency response.

Electron Tube Division

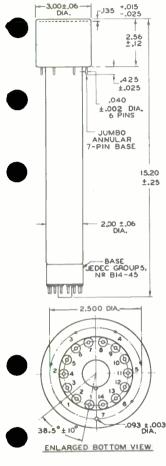
Variation of response over scanned area.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this Section



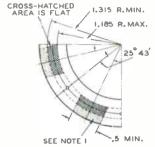


4414/7611



ALL DIMENSIONS IN INCHES

DETAIL OF BOTTOM VIEW JUMBO ANNULAR BASE OF



NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD CIHEPTAL-BASE END OF TUBE BY 0.D60" MAX.

ANNULAR-BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTO-CATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- a. SIX HOLES HAVING DIAMETER DF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF D.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± THE SIX D.065" D.0C!". HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF C.047". ALL HOLES ARE SPACED AT ANGLES OF 510261 ± 51 ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES TO BEAR AGAINST FLAT AREAS OF BASE.
- C. RIM EXTENDING OUT A MINIMUM OF D. 125" FROM 2.812" DIAM-ETER AND HAVING HEIGHT OF 0.126" ± 0.0D1".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER DF 2.200" ± 0.001".

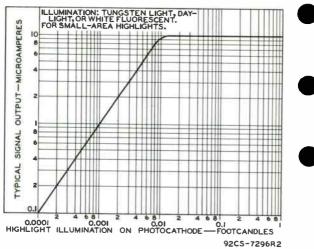


92CM-8293R3

RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

Harrison, N. J.





RADIO CORPORATION OF AMERICA Electrón Tube Division World Radio History



Image Orthicons

MAGNETIC DEFLECTION

For Color Pickup at Light Levels of Studios Equipped for Black-and-White Pickup. Two 4415's for the Red and Green Channels and One 4416 for the Blue Channel are Supplied as a Specially Selected Set having High Sensitivity for Simultaneous-Pickup Color TV Cameras.

DATA

General

MAGNETIC FOCUS

General:
Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 ± 10% volts
Current at 6.3 volts 0.6 amp
Direct Interelectrode Capacitance:
Anode to all other electrodes 12 µµf Maximum Target-to-Mesh Spacing 0.0008 inch
Maximum Target-to-Mesh Spacing 0.0008 inch Photocathode, Semitransparent:
Response:
Type 4415
Type 4416
Wavelength of maximum response:
Type 4415
Type 4416 \ldots \ldots \ldots \ldots \ldots 4400 ± 500 angstroms
Rectangular image (4 x 3 aspect ratio):
Useful size of 1.8" max. diagonal
Note: The size of the optical image focused on the
photocathode should be adjusted so that its maximum
diagonal does not exceed the specified value. The
corresponding electron image on the target should
have a size such that the corners of the rectangle
just touch the target ring.
Orientation of Proper orientation is obtained when the
vertical scan is essentially parallel to the plane
passing through center of faceplate and pin 7 of the
shoulder base. The horizontal and vertical scan should
start at the corner of the raster nearest pin 6 of
the shoulder base.
Focusing Method
Deflection Method
Createst Dispeter of Bulb 2.00" + 0.00"
Greatest Diameter of Bulb
Deflecting-Coil Length
Focusing-Coil Length

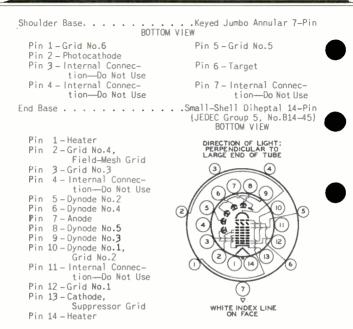
Alignment Coil: Length. . . . 15/16" Position on neck. .Centerline of coil located 8.5" from the flat area of the jumbo annular base Photocathode Distance Inside End of Focusing Coil . . . 1/2" Operating Position. See Operating Considerations Weight (Ăpprox.). 1 lb 6 oz



RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.

4415, 4416



NOTE: In the tube symbol, the suppressor grid connected to the cathode, and the field-mesh grid connected to grid No.4, are intentionally without numbers to avoid upsetting industry practice of associating functional camera control knobs with specific grid numbers. For example, beam-focus control is generally associated with knob identified as G_{μ} (grid No.4).

Maximum and Minimum Ratings, Absolute-Maximum Values:

PHOTOCATHODE:						
Voltage		 			-550 max.	volts
Illumination		 			50 max.	fc
OPERATING TEMP						
Of any part				•	50 max.	°C
Of bulb at l						
	ction)	 • •	• •	•	35 min.	°C
TEMPERATURE DI						
Between imag					_	0.0
of bulb hot					5 max.	°C
GRID-No.6 VOLT		 • •	• •	•	-550 max.	volts
TARGET VOLTAGE						
Positive val					10 max.	volts
Negative val					10 max.	volts 👝
GRID-No.5 VOLT					150 max.	volts
GRID-No.4 VOLT					300 max.	volts
GRID-No.3 VOLT	FAGE	 • •	• •	•	400 max.	volts

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



4415, 4416

GRID-No.2 & DYNODE-No.1 VOLTAGE GRID-No.1 VOLTAGE:	350 max.	volts
Negative-bias value	125 max.	volts
Positive-bias value PEAK HEATER-CATHODE VOLTAGE:	0 max.	volts
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	10 max.	volts
ANODE-SUPPLY VOLTAGE *	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE	350 max.	volts
Typical Operating Values:		
Photocathode Voltage (Image focus) ^b Grid-No.6 Voltage (Accelerator)—	-400 to -540	volts
Approx. 65% of photocathode voltage	-260 to -350	volts
Target-Cutoff Voltage ^c	-3 to +1	volts
Grid-No.5 Voltage (Decelerator)	0 to 125	volts
Grid-No.4 Voltage (Beam focus) ^b Grid-No.3 Voltage ^d	140 to 180 225 to 330	volts volts
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for picture cutoff	-45 to -115	volts
Dynode-No.2 Voltage	600	volts
Dynode-No.3 Voltage	800	volts
Dynode-No.4 Voltage	1000	volts
Dynode-No.5 Voltage	1200	volts
Anode Voltage	1250	volts
Target-Temperature Range	35 to 45	°C
Minimum Peak-to-Peak Blanking Voltage	5	volts
Field Strength at Center of Focusing Coil*.	75	gausses
Field Strength of Alignment Coil (Approx.)	0 to 3	
	0105	gausses
Performance Data:		
With conditions shown under Typi		
Values and with picture highl		
"knee" of the light-transfer ch		
Nin.	Average Hax	•
Type 4415:		
Cathode Radiant Sensitivity		
at 4500 angstroms	0.028 -	μa/μw
Signal-Output Current	20	
(Peak-to-Peak) 4 Ratio of Peak-to-Peak Highlight	- 30	μa
Video-Signal Current to RMS Noise		
Current for Bandwidth of 4.5 Mc 30:1	37:1 -	
ourrent for building the web Met		

Type 4416:

Cathode Radiant Sensitivity at 4400 angstroms. . . . 0.04 µa/µw Signal-Output Current 30 4 μa light Video-Signal Current to RMS Noise Current for 37:1



RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

DATA 2 5-61

4415, 4416

- ^a Ratio of dynode voltages is shown under Typical Operating Values.
- b within this range, the actual focusing-voltage value will not differ by more than 2% from that for any other tube when all other operating conditions are held constant, i.e., when different tubes are operated in the same camera with the same deflecting yoke, with fixed focusingfield current, with grid-No.6 voltage at a fixed percentage of the photocathode voltage, and with all other voltages held constant.
- C Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- d Adjust to give the most uniformly shaded picture near maximum signal.
- Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

The operating position of these types should preferably be such that any loose particles in the neck of the tubes will not fall down and strike or become lodged on the target. Therefore, it is recommended that these tubes neverbe operated in a vertical position with the Diheptal-base end up nor in any other position where the axis of the tubes with base up makes an angle of less than 20° with the vertical.

PERFORMANCE CHARACTERISTICS

Because of the high sensitivity of the 4416 in the blue channel, cameras employing the 4415-4416 set will have greatly increased overall sensitivity. Color reproduction will also be excellent. With a lens opening of f/B, the set is capable of producing high-quality color pictures when scenes illuminated by incandescent light provide scene-luminance levels of approximately 100 footlamberts.

INSTALLATION PRECAUTION

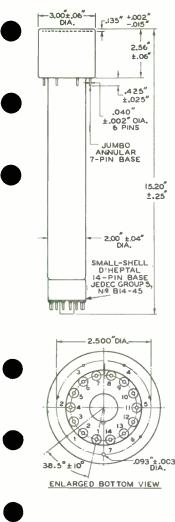
The 4416 has S-II response and is specifically intended for use in the blue channel. Its sensitivity to blue light is nearly twice that of the 4415's. However, its low green response and negligible red response restrict its use to this channel only. Either of the 4415's, which have the panchromatic S-I0 response, may be used in the green or red channels. Improved performance is obtained, however, if the most sensitive of the 4415's is placed in the least sensitive of these two channels.

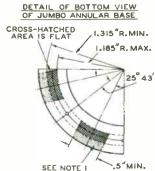
If a replacement tube is desired for any given set of tub#s, reference should be made in the replacement order to the serial numbers of the remaining tubes in the set.

SPECTRAL-SENSITIVITY CHARACTERISTICS OF PHOTOSENSITIVE DEVICES HAVING S-10 OR S-11 RESPONSE are shown at front of this Section









NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEFTAL-BASE END OF TUBE BY 0.060" MAX.

ANNULAR-BASE GAUGE

ANNULAE VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

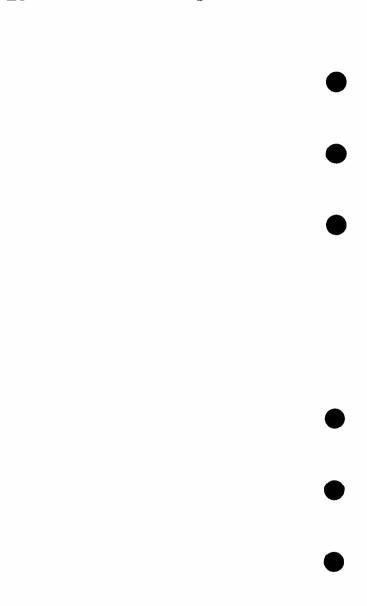
- SIX HOLES HAVING DIAMETER а OF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265"±0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51°26' ± 5' ON CIRCLE DIAM-ETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES. TO BEAR AGAINST FLAT AREAS OF BASE.
- c. RIM EXTENDING OUT A MINIMUM OF 0.125" FROM 2.812" DIAM-ETER AND HAVING HEIGHT OF 0.126" ± 0.001".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



92CM-10154RI

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.



World Radio History

Multiplier Phototube

S-II RESPONSE

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

> For Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources in Industrial, Military, and Missile Applications DATA

General:

Spectral Response S-11 Wavelength of Maximum Response 4400 ± 500 angstroms Cathode, Semitransparent Cesium—Attimony Shape Minimum area. Minimum diameter. Window. Index of refraction Dynode Material Anode to dynode No.10 Anode to all other electrodes Maximum Overall Length (Excluding flexibleleads) Maximum Diameter. Maximum Diameter. Maximum Diameter. Maximum Diameter. Maximum Diameter. Masheld Base. Lead 1 - Dynode No.1 Lead 1 - Dynode No.5 Lead 3 - Dynode No.5 Lead 4 - Dynode No.7 Lead 4 - Dynode No.7
Lead 5 - Dynode No.10
Lead 8 - Dynode No.8 Lead 9 - Dynode No.6 Lead 10 - Dynode No.4
Lead 11 – Dynode No. 2 Lead 11 – Dynode No. 2 Lead 13 – Photocathode INTO END OF BULB
Maximum Ratings, Absolute-Maximum Values: DC SUPPLY VOLTAGE BETWEEN ANODE
CATHODE
AND ANODE
DYNODES
AND CATHODE



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AVERAGE ANODE CURRENT ^C						
Characteristics Range	Values for	r Equipment D	esian:			
Urder conditions wit age divider providin Ng.1; 1/12 of E for of E between dynode 1	h dc suppl g 1/6 of 1 each succ No.10 and	y voltage (E) E between cat eeding dynode anode.	across a vo hode and dyn	ode	•	
With E = 1000 volts (E	,					
	Mın.	Typ.	Nax.			
Sensitivity: Radiant, at 4400 angstroms Cathode radiant,	_	2.2×10^4	_	a/w	•	
at 4400 angstroms	-	0.036	-	a/w		
Luminous: At O cps ^d ∛ith dynode No.10 as output	10	27	300	a/lm		
electrode ^e Cathode luminous: With tungsten	-	16	-uti	a/]m		
light source ^f . With blue	3 × 10 ⁻¹	⁵ 4.5 × 10 ⁻⁵	-	a/lm		
light source ^{9,m} Current Amplification	2.8 × 10	-8 _ 6 × 10 ⁵	_	а		
Equivalent Anode- Dark-Current Input at a luminous sensitivity of						
20 a/lm:h,j Equivalent Noise	-	8 × 10-10	2.5×10^{-9}	lm		
Input ^k	-	4 × 10 ⁻¹²	1.7 × 10 ⁻¹¹	lm		
Ancde at 25° C	_	-	7.5×10^{-7}	а		
With E = 750 volts (Exc	cept as no	oted)				
	Nin.	Typ.	Max.			
Sensitivity: Radiant, at 4400 angstroms Cathode radiant,	_	2.2 × 10 ³	_	a/w		
at 4400 angstroms	_	0.036	_	a/w		
Luminous: At O cps ^d With dynode	-	2.7	_	a/lm		
No.10 as output electrode ^e	-	1.6	-	a/lm		

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

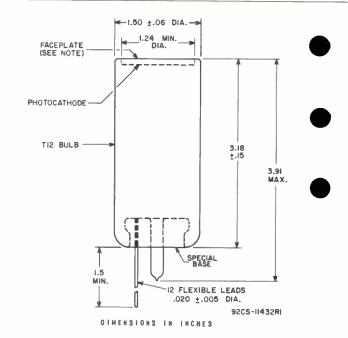
RCA

	Min.	Typ.	Max.	
Cathode Luminous: With tungsten	_	_		
light source!	3 x 10 ⁻⁵	4.5 × 10 ⁻⁵		a/lm
Withblue				
light source ^{9+#} .	2.8 × 10 ⁻⁸	_	-	a
Current Amplification	-	6×10^{4}	-	

- a Made by Corring Glass Works, Corning, New York.
- b Magnetic shielding material in the form of foil or tape as available from The Magnetic Shield Division, Perfection Mira Company, 1829 Civic Opera Building, 20 North Wacker Drive, Chicago 6, Illinois, or equivalent.
- C Averaged over any interval of 30 seconds maximum.
- d Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope, ft is operated at a color temperature of 287% K and a light input of 10 microlumens is used.
- 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 fypical Anode Characteristics curve, do not apply when dynode No.10 is used as the output electrode.
- ⁶ Under the following conditions: The light source is atungsten-filament lamp having a lime-glass envelope. It is operated at a co'or temperature of 2870⁰ K. The value of light flux is 0,01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- 9 Under the fallowing conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No. 5-58, Glass Cod# No. 5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filament lampoperated at a color temperature of 2870⁶ *. The value of light flux incident on the "ilter is 0.01 lumen and 200 volts are applied between cathode and aliother electrodes connected as anode.
- h At a tube t∞mperature of 25⁰ C. Dark current may be reduced by use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- ^K Under the following conditions: Supply voltage (E) is as shown, 25^o C tube temperature, external shield connect-d to cathode, bardwidth 1 cycle per second, tungsten-light source at a color temperature of 2870° interrupted at a low audio frequency to prodwce incident radiation pulses alternating between zero and the value stated. The "on" period of the pulse is equal to the "off" period.
- See Spectral Characteristic of 2870° K Light Source and Spectral Characteristic of Light from 2870° K Source after fassing through Indicated Blue Filter at front of this Section.

SPECTRAL-SENSITIVITY CMARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this Section





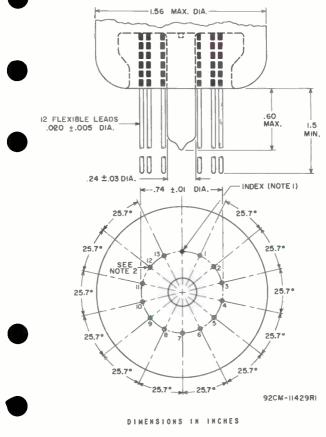
NOTE: WITHIN 1.24 INCH DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010 INCH FROM PEAK TO VALLEY.





RADIO CORPORATION OF AMERICA Electronic Components and Devices

SPECIAL BASE Pin Dimensions and Orientation and Index Guide



12-Lead Base 1,2,3,4,5,6,7,8,9,10,11,13

NOTE 1: LEAD IS OUT OFF WITHIN 0.04 INCH OF THE GLASS BUTTON FOR INDEXING.

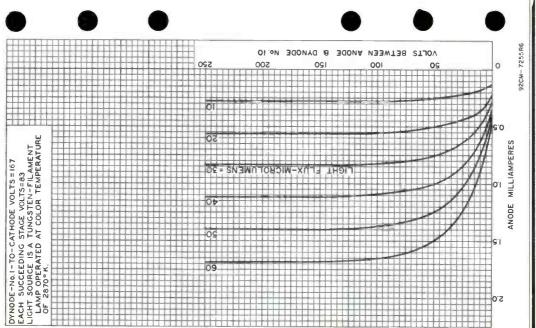
NOTE 2: LEAD NO.12 IS CUT OFF WITHIN 0.04 INCH OF THE GLASS BUTTON.



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CHARACTERISTICS ANODE TYPICAL

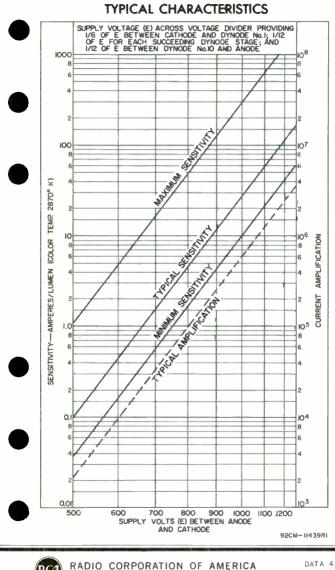


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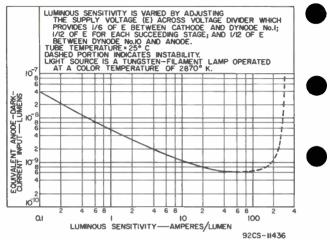
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TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



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Multiplier Phototube



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

For Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources in Industrial and Military Applications

The 4439 is the same as the 4438 except for the following: The 4439 is supplied with a small-shell duodecal base

attached to the flexible leads to facilitate testing. After testing, and prior to installing the 4439 in a given system, the attached base should be removed.

DATA

General:

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 - Arode 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 - Photo-cathode

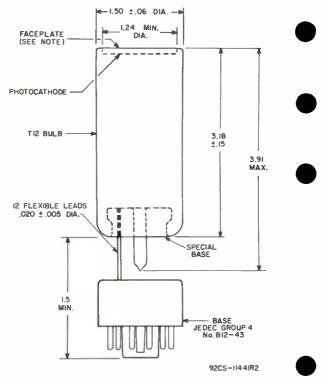


DIRECTION OF RADIATION : INTO END OF BULB

Base (With JEDEC No.812-43 removed from flexible leads) Special Terminal Diagram. Same as for type 4438



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DIMENSIONS IN INCHES

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



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Multiplier Phototube

S-11 RESPONSE

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

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

General:

Cathode, Semitransparent. Shape Minimum Area Minimum diameter Undex of refraction Dynode Material Direct Interelectrode Car Anode to dynode No.10. Anode to all other elec Maximum Overall Length Seated Length Operating Position Weight (Approx.) Bulb Socket Magnetic Shield Base	
Pin 1 - Dynode No.1 Pin 3 - 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.2 Pin 11 - Dynode No.2	6 7 8 9 7 8 9 7 8 9 9 9 9 9 10 10 10 10 10 10 10 10 10 10

Maximum Ratings, Absolute-Naximum Values:

DC SUPPLY VOLTAGE	BETWEEN	ANODE		
AND CATHODE			1250 max.	volts
DC SUPPLY VOLTAGE			250 max.	welte
AND ANODE			250 max.	VOITS
DC SUPPLY VOLTAGE			200 max.	volte
DYNODES			ZUU Max.	10113



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DC SUPPLY VOLTAGE BETWEEN DYNODE No.1 AND CATHODE							
Characteristics Range V	alues for	Equipment D	esign:				
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 (Ex.							
0	Min.	Ty¢.	Nax.				
Sensitivity: Radiant, at 4400 angstroms Cathode radiant, at 4400	_	2.2 × 10 ⁴	-	a/w			
angstroms Luminous:	-	0.036	-	a/w			
At O cps ^e With dynode No.10 as output	10	27	300	a/lm			
electrode ^f Cathode luminous; With tungsten	-	16		a/lm			
light source ⁹ . With blue light	3 × 10 ⁻⁵	4.5×10 ⁻⁵	-	a/lm			
source ^{h,n} ; Current Amplification Equivalent Anode- Dark-Current In- put at a luminous	2.8 × 10 ⁻⁸ -	6 × 10 ⁻⁵	_	a			
sensitivity of 20 a/lmj.k Equivalent noise	-	8 × 10 ⁻¹⁰	2.5×10 ⁻⁹	lm			
Input [®]	-	4 × 10 ⁻¹²	1.7×10-11	lm 🌑			
Anode at 25° C	-	-	7.5×10-7	a			
With E = 750 volts (Exce	pt as not	ed)					
	Min.	Ty⊅.	Nax.				
Sensitivity: Radiant, at 4400 angstroms Cathode radiant, at 4400	_	2.2 × 10 ³	-	a/w			
argstroms	-	0.036	-	a/w			
At O cps ^e With dynode No.10 as output	-	2.7	-	a/lm			
electrode [†]		1.6	-	a/lm			

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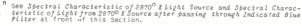


		Min.	Typ.	Max.
Сі	Cathode luminous: With tungster Light source ⁹ With blue light source ¹ * ⁿ urrent Amplification	3×10 ⁻⁵ 4 2.8×10 ⁻⁸ - 6		- a/lm - a -
a b c d e	Made by Corning Giass works, Cor Made by Amphenol ÷lectronics Cor 54, Illinois. Made by James Mill+n Manufacturin 40, Massachusetts. Averaged over any interval of 30 Under the followina conditions: Jamp haging a lime-glass envelope	poration, 1830 g Company, 150 seconds maxin The light source	South 54th Ave D Exchange St hum. rce is a tungsi	re⊬t, Malden
f	of 2070° K'ard a light input of An output current of opposite pol be provided by using dynade No.10 rangement, the load is connected in serves only as collector. The cu Anode Characteristics curve do no output electrode. Under the following conditions:	arity to that as the output of the dynode—Mo rves shown in t apply wher o The light soul	obtained at th electrode. I b.10 circuit a the accompany dynode No.10 i	with this ar- nc the anode ving Typical sused as the
h	lamp haying a lime-glass envelope of 2870° K. The value of light f plied between cathode and all ot Under the following conditions: mitted through a blue filter (Corn ished to 1/2 stock thickness-Manu ing, New York) from a tungsten-fi ature of 2870° K. The value of I lumen and 200 volts are applied b connected as anode.	 It is operat lux is 0.01 Tur her electrodes Light incident ing C.S. No.5-5 Tactured by the lament lamp og ight flux inci 	ted at a color men and 200 vo s connected as t on the cathoo 8, Glass Code I Corning Glass perated at a co dent on the f	temperature)Its are ap- s anode. de is trans- Ic.5113 pol- Works,Corn-)Tor temper-)Iter is 0 01

j At a tube temperature of 25⁰ C. Dark current may be reduced by use of a refrigerant.

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

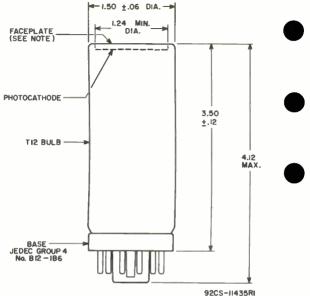
Under the following conditions: Supply voltage (E) is as shown, 25° C tube temperature, external shield connected to cathode, bandwidth 1 crcle per second, tungsten-light source at a color temperature of 2870% tinterrupted at a low audio requency to produce inciden: radiation pulses witernating between zero and the value stated. The "on" period of the rulse is equal to the "off" period.



SPECTRAL-SENSITIVITY CHARACTERISTIC of PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this Section



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DIMENSIONS IN INCHES

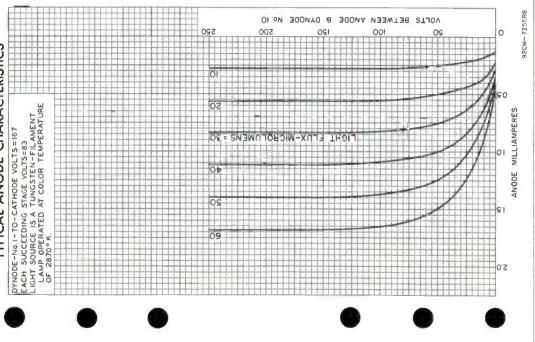
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

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



RADIO CORPORATION OF AMERICA **Electronic Components and Devices**





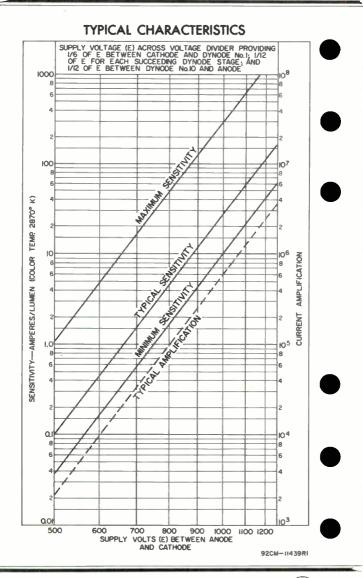
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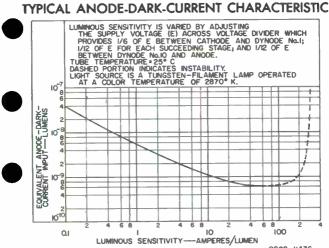
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Multiplier Phototube

S-II RESPONSE

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

DATA

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

General:

Spectral Response Wavelength of Maximum Resp Cathode, Semitransparent . Shape Minimum diameter Window Lime Glas Index of refraction Dynode Mater al Direct Interelectrode Capa Anode to dynode No. 10 . Anode to dynode No. 10 . Anode to al other elect Maximum Diameter Operating Position Weight (Approx.) Bulb Magnetic Shield Base Terminal Diagram: B	onse	00 ± 500 angstroms . Cesium-Antimony . Flat, Circular 1.2 sq. in. 1.24" 80), or equivalent 1.51 . Cesium-Antimony
Lead 1 & Metal Flange- Photocathode Lead 2 - Dynode No.1 Lead 3 - Dynode No.3 Lead 4 - Dynode No.5 Lead 5 - Dynode No.9 Lead 7 - Anode Lead 8 - Dynode No.10 Lead 9 - Dynode No.6 Lead 10 - Dynode No.6 Lead 11 - Dynode No.4 Lead 12 - Dynode No.2	6 6 3 2 1 DIRECTION	METAL FLANGE OF RADIATION: ND OF BULB
Maximum Ratings, Absolute- DC SUPPLY VOLTAGE BETWEEN	ANODE AND	
CATHODE DC SUPPLY VOLTAGE BETWEEN	DYNODE No. 10 AND	1250 max. volts
ANODE		250 max. volts
DYNODES	CONDECUTIVE	200 may volts



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison N I DATA I 8-63

AND CATHODE	-			
Characteristic 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 x 10 ⁴ - a/ Cathode radiant,	w			
at 4400 angstroms 0.036 - a/	w 🦱 👘			
Luminous: At 0 cps ⁴ 10 27 300 a/1 With dynode No.10 as out-	m			
put electrode ^e 16 - a/l	n			
€athode luminous: With tungsten light				
source [¥] 3×10 ⁻⁵ 4.5×10 ⁻⁵ − a/l With blue light	n			
source ^{9, .} 2.8 x 10 ⁻⁸	3			
Current Amplification - 6 x 10 ⁵ - Equivalent Anode-Dark- Current Input at a iuminous sensitivity				
	n			
Dark Current to Any Electrode Except	n			
	a 🌰 -			
With E = 750 volts (Except as noted)				
Nin. Typ. Nax. Sensitivity:				
Radiant, at 4400 angstroms 2.2 x 10 ³ - a/	v			
Cathode radiant, at 4400 angstroms. – 0.036 – a/				
Luminous:				
At O cps ^d 2.7 - a/l With dynode No.10 as	n			
output electrode ^e - 1.6 - a/l Cathode luminous:	n			
 With tungsten light source[†]3×10⁻⁵ 4.5×10⁻⁵ – a/li With blue light 				

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

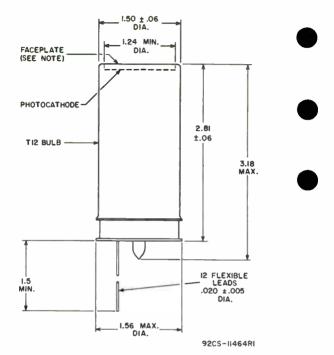
RCA

- ^a Made by Corning Glass Works, Corning, New York.
- b Magnetic shielding material in the form of foil or tape as available from the Magnetic Shield Division. Perfection Mica Company. 1829 Civic Opera Building, 2D North Wacker Drive, Chicago 6, 111 inols, or equivalent.
- c Averaged over any interval of 30 seconds maximum.
- d Under the following conditions: The light source is a tungsten-f'lament lamp haying a lime-glass envelope. It is operated at a color t+mmp+rature of 2870° K and a light input of 10 microlumens is used.
- e An output current of opposite polarity to that obtained at the anude 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 accommanying fypical Anode Characteristics curve do not apply when dynode Nm.10 is used as the output electrode.
- ^T Under the following conditions: The light source is a tungsten-filament lamp haying a lime-glass envelope. It is operated at a color temperature of 2870° K. The value of light flux is 0.01 lume and 200 volts are applied between cathode and all other electrodes connected as mode.
- piled between tathole and an other citeriote control to the cathole is transmitted through a blue filter (corning C.S. No.5-58. Glass Code No.5.113 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 2870⁶ 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.
- h At a tube temperature of 25 $^{\rm O}$ C. Dark current may be reduced by use of _ a refrigerant.
- j For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- ^k Under the following conditions: Supply voltage (£) is as shown. 25^o C tube temperature, external shield connected to cathode. bandwidtb L cycle per second, tungsten-light source at a color temperature of 2870^o 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.
- See Spectra: Characteristic of 2870° X 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 PHOTOSENSITIVE OEVICE HAVING S-11 RESPONSE is shown at the front of this Section



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 B-63



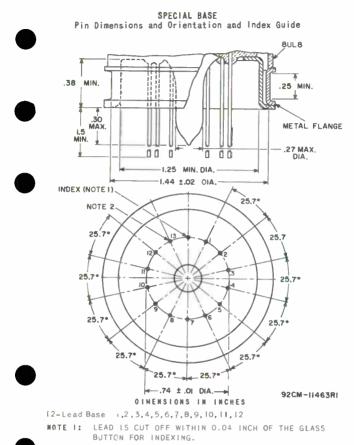
DIMENSIONS IN INCHES

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 FLANGE.

NOTE: DEVIATION FROM FLATNESS WITHIN THE 1.24 INCH DIAM-ETER AREA WILL NOT EXCEED 0.010 INCH FROM PEAK TO VALLEY.



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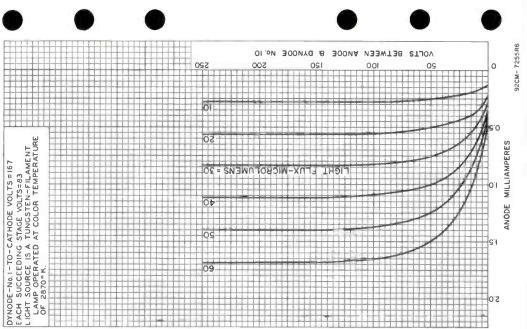
NOTE 2: LEAD NO.13 IS CUT OFF WITHIN 0.04 INCH DF THE GLASS BUTTON.



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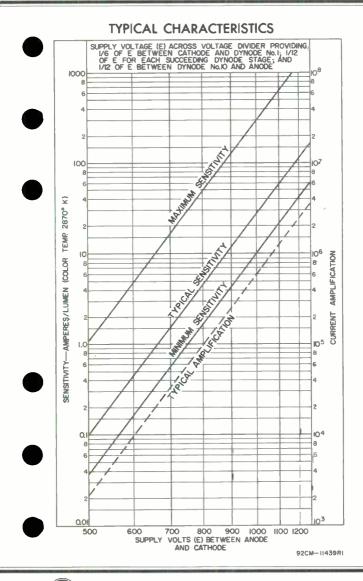
CHARACTERISTICS ANODE TYPICAL



QF

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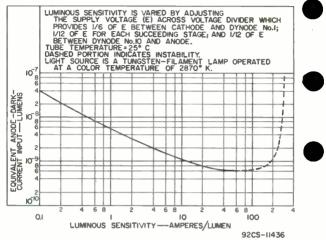
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Harrison, N. J.

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC





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Multiplier Phototube

RUGGED VIBRATION-RESISTANT STRUCTURE S-II RESPONSE ELECTROSTATICALLY FOCUSED 10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE DYNODE STAGES

For Detection and Measurement of Nuclear Radiation and other Low-Level Light Sources. Especially Useful in Missile and Rocket Service and other Industrial and Military Applications where Severe Environmental Conditions may be Encountered.

The 4441A is the same as the 4441 except for the fallowing:

Characteristics Range Values for Equipment Design:

With E = 1000 volts

Min. Typ. Nax. Anode-Pulse Rise Time^a. . . - 2.3×10^{-9} sec. With E = 750 valts Equivalent Anoce-Dark-Current Input at a luminous sensitivity - 8×10-10 2.5×10-9 of 20 a/lm^{b, c} lm

ENVIRONMENTAL TESTS:

The 4441A is designed to withstand environmental tests equivalent to those specified in MIL-E-5272C* for equipment mounted on the structures of missiles propelled or launched by high-thrust rocket engines. The accelerations specified in these tests are applied directly to the tubes.

One-Hundred Per-Cent Shock and Vibration Testing:

Shock. These tests are performed first, per method of MIL-E-5272C*, Par. 4.15.5.1, Proc. V. on apparatus which provides a half-wave sinusoidal shock pulse. One-hundred percent testing of all 4441A's is performed. Each 444.A (nonoperating) is subjected to three impact shocks in each direction of the three orthogonal axes. Each impact shock has a peak acceleration of 30 ± 3 g's and a time duration of 11 ± 1 milliseconds. Each tube is subjected to a total o" 18 impact shocks

Vibration. These tests are performed next, on apparatus which applies a variable-sinusoidal frequency vibration to the tube in accordance with MIE-E-5272C*, par.4.7.14 and par. 4.7. 14.1, except for the cycle duration. This test is performed on all 4441A tube types. Each 4441A (Operating under the conditions specified under Tube Rejection Criterion) is vibrated in each of the three orthogonal axes and as specified in the following schedule. A vibration cycle has a duration of 5 minutes per axis in which time the frequency is varied logarithmically from 20 to 2000 and back to 20 cycles per second. One vibration cycle is performed for each axis and the total test period for each tube is 15 minutes.



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Double Amplitude inches	Accelera- tion g's	Fre- quency cps	Cycle Duration Per Axis minutes
0.050 ± 0.005 - 0.050 ± 0.005	20 20	20–87 87–2000 2000–87 87–20	} 5

Tube Rejection Criterion. After completion of the shock tests, tubes are operated at an anode-to-cathode voltage of 1000 volts with the light level incident on the tube adjusted to provide an anode current of 8 microamperes. Electrical and/or mechanical tube failures due to shock or vibration are observed during the vibration test when the specified anode current is monitored. Tube rejection criterion for both tests is that the anode current of 8 microamperes will not change more than \pm 20 per cent at any time during the vibration test for each axis.

Design Tests:

Vibration. These tests are performed under conditions equivalent to those described in MIL-E-5272C^{*}, par.4.7.14 and par.4.7.14.1. The vibration cycle has a duration of one hour and two cycles are performed for each of the three orthogonal axes. The total test period for each tube is six hours.

Acceleration. These tests are performed in a centrifuge providing unidirectional acceleration by a method equivalent to that specified in MLL- $E-5272C^*$, par.4.16.3, Proc.111 except that tubes are subjected for one minute to an increased acceleration test level of 100 ± 10 g's in both directions of the three orthogonal axes and the tubes are non-operating.

Milltary Specification MIL-E-5272C (ASG), 13 April 1959; and Amendment 1, 5 January 1960.



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4449A

Image-Converter Tube

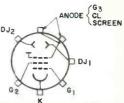
S-II RESPONSE

For Use as a High-Speed Light Shutter in Extremely-High-Speed Photography

General:
Spectral Response
Spectral Response
Photocathode, Semitransparent:
Shape
Window:
Area 9.52 sq.cm (1.48 sq.in.)
Minimum diameter
Index of refraction
Fluorescent Screen:
Shape
Phosphor
Fluorescence
Phosphorescence
Persistence ^a
Window:
Useful deflection
area (Approx.)
Minimum diameter
Index of refraction
Direct Interelectrode Capacitances (Approx.):
Grid No.1 to all other electrodes
Deflecting electrode DJ1 to
deflecting electrode DJ2
Deflecting electrode DJ1 to
all other electrodes
Deflecting electrode DJ2 to
all other electrodes
Focusing Method
Deflection Method
Overall Length
Diameter
Operating Position
Weight (Approx.)
Terminal Connections (See Dimensional Outline):

 $\begin{array}{c} G_1 = Gr \ d \ \text{No.1} \\ G_2 = Gr \ d \ \text{No.2} \\ \text{DJ1} = \text{Deflecting} \end{array}$ Electrode No.1 DJ2 K - Photocathode DJ2 - Deflecting Electrode No.2 Anode - (Grid No.3, Collector. Screen)

DIRECTION OF LIGHT -PERPENDICULAR TO PHOTOCATHODE END OF TUBE





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4449A

Maximum Ratings, Absolute-Naximum Values:
DC Anode Voltage ^b
DJ1 and DJ2 ^e
Typical Operating Values:
Anode Voltage ^b
Operating (Minimum) ^f 110 to 170 volts Cutoff (Maximum)
Characteristics:
With conditions shown under Typical Operating
Values and at an ambient temperature of 25°C
Hin. Typical Max.
Photocathode Sensitivity: Radiant, at 4400 angstroms
Luminous,at 0 cps9 2 × 10 ⁻⁵ 5 × 10 ⁻⁵ – amp/lumen Paraxial Image
Magnification (Cmx) ^{h,j} . 0.69 - 0.78
Distortion ^{h, k}
Edge Resolution ^{b,m,n} 15 line-pairs/mm
Radiant Power Gain, P. 9 50
Equivalent Background Screen Brightness Input ^r 5 x 10 ⁻¹² watts/sq.cm
Screen Uniformity Factor ^s . – – 1.3
Alignment t

For P11 Spectral-Energy Emission Characteristic curve, see front.of Cathode-Rayfube, Storage-Lube, & Nonoscope Section. See also accompanying Operating Considerations.

b Referred to photocathode.

C Referred to anode.

d Over an interval not exceeding 1 microsecond.

Averaged over any interval of 8 minutes maximum.

Adjusted to minimize shadowing effects in the displayed image caused by the wires of grid No.1.

- 9 For conditions where the light source is a tungsten-filament lamp having a Time glass envelope (corning Glass Code No.0080, or equivalent). The lamp is operated at a color temperature of 2870° K. A light input of 0.01 lumen is used to irradiate a centered 1/2-inch diameter of the phetocathode.
- h Defined as the ratio of the separation of two diametrically opposite image points on the screen to the separation of the corresponding image points on the photocathode.



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Electronic Components and Devices

- Determined as follows: The image incident on the photocathode is perpendicular to the grid-No.1 wires and consists of 2 parallel lines on a bright background approximately 0.16° in length and separated by a distance of 0.160° ± 0.002°. The image on the photocathode is focused and positioned so that the separation between the image kines is an equal distance on both sides of the geometric senter of the photocathode. The line spacing on the screen is measured adjacent to the "aint image of the center grid-No.1 wire.
- k A second magnification value (Emx) is measured under the conditions established in (j) except that the lines are separated by a distance of 1.00° ± 0.01°. Distortion (D) is defined by the equation:

$$D = \frac{Emx}{Cmx} - 1$$

- Determined with a resolution pattern consisting of horizontal and vertical bars. The limiting resolution value is measured adjacent to the faint image of the center grid-No.1 wire and applies to both vertical and horizontal resolution.
- Measured at the edge of a 1-inch diameter circle positioned concentric with the geometric centerof the photocathode under the same conditions established in (m).
- 9 Under the following conditions: Light inc&dent on the photocathode is transmitted through a blue filter (corning C. S. No.5-58 'ilter from Melt No.5113 polished to 1/2 stock thickness—Manufactured by the corning Glass works, corning, New York) from a tungsten-filament lamp maying a lime glass envelope. The lamp is operated at a color temperature of 2870° K. A 1/2-inch diameter of the photocathode is irradia&ed and the value of light flux incident on the filter is 0.1 lumen. A calibrated receiver having S-11 spectral response and masked to have a 1/2-inch-diameter experter is no the screen of the sume receiver is then positioned to receiver the radiant flux originally incident on the spectre of the sume receiver is then positioned and its output current (12) is noted. Radiant power gain (G) is defined by the equation:

$$G = 2000 \times \frac{I_1}{I_2}$$

The coefficient 2000 is derived by assuming that the integrated light radiated by the screen is 79 per cent of that value that would be obtained if the light emitted by the screen has a cosine distribution.

- 9 See Spectral Characteristic of 28700 I Light Source and Spectral Characteristic of Light from 2870 I Source after passing through Indicated Blue Pilter al front of this Section.
- Pefined as that value of incident radiation required to cause an increase in screen brightness equal to the screen background prightness.
- The ratio of the luminance values of the brightest area to the darkest area of the screen with the entire photocathode uniformly illuminated. The value of incident illumination on the photocathode is 1 footcandle and the light spot on the screen has a diameter of 0.10" to .C1".
- A trace produced on the screen, when the center of the photocathode is irradiated with a 0.025-inch diameter light spot and an ac voltage is applied to the deflecting electrodes, will not deviate more than 4 from the plane passing through the center of the recessed ball cap of grid Wo.1 and the major axis of the tube. The angle produced by the trace and the faint images of the grid wires, that are observed when the photocathode is uniformly illuminated, will be 90° ± 3°.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at front of this Section

OPERATING CONSIDERATIONS

Magnetic shielding of the 4449A 's required to minimize the effects of extraneous fields on tube performance; ac magnetic fields are particularly objectionable in that they seriously impairtube resolution. If an irpor steel case is used, care should be taken in its construction to insure that the case is completely demagnetized.



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4449A

The P-11 phosphor screen employed by the 4449A emits highintensity actinic blue fluorescence and has a persistence characteristic, within the range of IO microseconds to I millisecond, that is dependent on the current density employed.

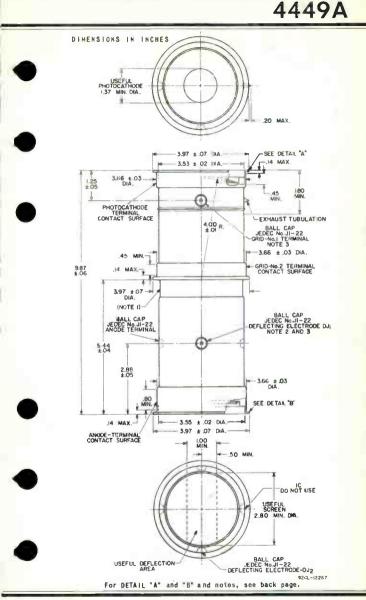
To prevent degradation in the resolution of deflected images care must be taken to assure that the deflecting voltage is free of ac ripple and that shielded semiflexible leads are used for making connection to the deflecting electrode terminals. Balanced deflection with respect to anode should be used.

Exposure Time. In practice, the shutter speeds attainable with the 4449A are limited by the ability of the external circuitry to supply to grid No.1 good rectangular-wave pulses of sufficiently short duration. With perfect pulse-forming circuits, the minimum exposure time of the 4449A is limited by electron transit time which, for an anode voltage of 15 kilovolts, is in the order of 10^{-9} seconds. Electrons are defocused if they are not beyond the influence of the gating (control) grid when its voltage returns to cutoff value at the end of the gating pulse.

The high voltage at which the 4449A is operated may be very dangereous. Great care should be taken in the design of apparatus to prevent the user from coming in contact with the high voltage. Precautions must include safeguards which eliminate all hazards to operating personnel. In the use of high-voltage tubes, such as the 4449A, it should always be remembered that high voltage may appear at normally lowpotential points in the circuit because of capacitor breakdown or incorrect circuit connections. Before any part of the circuit is touched, the voltage-supply switch should be turned off and both terminals of any capacitors grounded.









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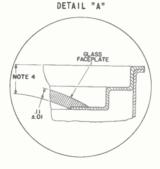
DATA 3 6-64

NOTES FOR OINENSIONAL OUTLINE

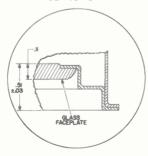
Note I: Not to be used for mechanical support or electrical connection.

Note 2: The plane passing through the center of the recessed ball cap DJ2 and the major axis of the tube will not deviate more than 3° from the plane passing through the center of the recessed ball cap DJI and the major axis of the tube. Note 3: The plane passing through the center of the recessed ball cap DJI and the major axis of the tube will not deviate more than 5° from the plane passing through the center of the recessed ball cap for grid No.1 and the major axis of the tube.

Note 4: This distance on the major axis of the tube is .33 ± .03.



DETAIL "B"



DIMENSIONS IN INCHES



Harrison, N. J.



Multiplier Phototube

	12-STAGE, HEAD-ON S-20 RESPONSE ENCLOSED, IN-LINE SPHERICAL-FACEPLATE TYPE DYNODE STRUCTURE HIGH CURRENT AMPLIFICATION EXTREMELY SHORT RISE TIME For Near-Infrared Ruby-Laser Detector Systems, Flying- Spot Scanning, Photometry, and Scintillation Counters Requiring Low-Dark Current and High Sensitivity over the Visible and Near-Infrared Regions of the Spectrum.
ŀ	General: Spectral Response. S-20 Wavelength of Maximum Response 4200 ± 50C angstroms Cathode, Semitransparent Spherical, Circular Minimum area 2.2 sq.in. Minimum diameter 1.68 in. Window 1.68 in. Dynode Materia'. Borosilicate Glass ^a Index of refraction 1.48 Dynode Materia'. Copper-Beryllium Direct Interelectrode Capacitances (Approx.): 3.8 pf Anode to all other electrodes. 5.7 pf Dynode No.12 to all other electrodes. 6.31" Seated Length 6.31" Maximum Dizmeter 2.06" Operating Position Any Weight (Approx.) T16 Socket Small-Shell Bidecal 20-Pin (JEDEC No.620-I02), Non-hygroscopic Basing Designation for BOTTOM VIEW
	Pin 1 - No Internal Connection Pin 2 - Dynode No.1 Pin 3 - Synode No.3 Pin 4 - Dynode No.5 Pin 5 - Dynode No.7 Pin 6 - Dynode No.9 Pin 7 - Dynode No.11 Pin 8 - Anode Pin 9 - Same as Pin 1 Pin 12 - Dynode No.12 Pin 13 - Dynode No.12 Pin 15 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.2 Pin 19 - (Focusing Electrode) Pin 20 - Phofocathode



RADIO CORPORATION OF AMERICA Electronic Components and Devices Wond Rector History DATA I 6-64 Maximum Ratings, Absolute-Maximum Values: DC Cumplu Vala

DC Supply Voltage:				
Between anode and cathode			2800 max. volts	5
Between anode and dynode No.12 .				
Between consecutive dynodes			400 max. volts	5
Between dynode No.1 and cathode.			600 max. volts	5
Between focusing electrode				
and cathode				
Average Anode Current ^d				
Ambient-Temperature Range			-200 to +85 °C	2

Characteristics Range Values:

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table 1. Focusing electrode is connected to arm of a potentionmeter between cathode and dynode No.I and its voltage is adjusted to that value which provides maximum anode current.

With E = 2300 volts (Except as noted)

	Hin.	Ty⊅.	Hax.	
Sensitivity: Radiant, at 4200				
angstroms Cathode radiant, at 4200	- 19	4.3×10 ⁵		a/w
angstroms Luminous.	-	0.064	-	a/w
at 0,cps ^e Cathode luminous: With tungsten	250	1000	12000	a/lm
light source ^f With blue light	1.1×10^{-4}	1.5×10^{-4}	-	a/lm
source ^{g,h} With red light	5.5×10^{-8}	-	-	а
Sourcej,k Current Amplifi-	3×10^{-7}	5×10^{-7}	-	а
cation Equivalent Anode- Dark-Current Input at a luminous sensi- tivity of	-	6.6×10 ⁶	-	
300 a/lmª Anode-Pulse Rise	-	1×10^{-10}	1.3×10^{-9}	lm
Time [®] Greatest Delay Between Anode Pulses: Due to position from which elec- trons are simul- taneously released within a circle centered on tube	-	2 × 10 ⁻⁹	-	Sec

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	Nin.	Tvþ.	Nax.	
face having a diameter of—				
1.4"	-	3 x 10-10p	-	sec
	-	D 11 2.0	-	sec
With E = 1800 volts (E	Except as no	ted)		
	Min.	Typ.	Max.	
Sensitivity:				
Radiant, at 4200				
angstroms	-	4.3×10^{4}	-	a/w
Cathode radiant, at				
4200 angstroms.	-	0.064	-	a/w
Luminous, at O cps ^e .	-	100	-	a/lm
Cathode luminous:				
With tungsten light sourcef.	1 1 1 10-4	1.5×10^{-4}		a/lm
With blue light	1.1 × 10	1.0 × 10	-	a/ ///
source ^{9+h}	5.5 × 10 ⁻⁸		_	а
With red light	010 / 20	_		
sourcej,k	3 x 10 ⁻⁷	5×10^{-7}		a
Current Amplification	_	6.6×10 ⁵	-	
Equivalent Anode-				
Dark-Current				
Input at a				
luminous sensi- tivity of				
300 a/lm ^m	_	1 × 10-10	1.3 x 10-9	lm
Equivalent Noise	_	1 × 10	1.) X _0 -	110
Input ⁴	-	1.1×10^{-12}	2.4×10^{-12}	lm

- Corning No. 7056, made by Corning Glass Works, Corning. New York, or equivalent.
- Made by Cinch Nanufacturing Company, 1026 South Homan Avenue, Chicago 24, Illinois. c
- Magnetic shielding material in the form of foil or tape as available from the Magnetic Shield Division, Perfection Nica Company, 1829 [vic Opera Bldg., 20 Worth Wacker Drive, Chicago 6, Illinois, or equivalent.
- Averaged over any interval of 30 seconds maximum.
- Under the fellowing conditions: The light source is a tungsten-filament lamp having a limme-glaas envelope. It is operated at a color temperature of 2870° K and a light input of 0.1 microlumen is used.
- Under the following conditions: The light source is a tungsten-filament lamp having a limm-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.
- upder the following conditions: Light incident on the cathode is trans-mitted through a blue filter (corning C.S. No.5-58, polished to 1/2 slock thickness--Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filament lamp operated at a color temperature of 28700 K. The value of light flux incident on the filter is 0.31 lumen and 200 yotts are applied between cathodr and all other electrodes connected as anode.
- see Spectral Characteristic of 2870⁰ K Light Source and Spectral Char-acteristic of Light from 28700 K Source after passing through Indicated Blue Filter at Tront of this Section.
- i Under the following conditions: Light incident on the cathode is trans-Under the following convisions: Light including to the convoers trans-milted through a red filter (Corning C.S. No.2-62--Maufactured by the Corning Glass works, Corning, New York; from a tungsten-filament lamp operated at a color temperature of 2870° A. 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.



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DATA 2 6-64



- k see Spectral Characteristic of 28700 K Light Source and Spectral Characteristic of Light from 28700 K Source after passing through Indicated Red Filter at front of this Section.
- At a tube temperature of 25 $^{\circ}$ C. Dark current may be reduced by use of a refrigerant.
- Neasured 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.
- P 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.
- 9 under the following conditions: Supply voltage (E) is as shown. 25° C tube temperature, external shield connected to cathode. bandwidth is yrice per second, lungsten-light source at a color temperature of 200° 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.

Between	6.95% of Supply Voltage (E) multiplied by
Cathode and Dynode No.1	2
Dynode No.1 and Dynode No.2	1.4
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Dynode No.11	1
Dynode No.11 and Dynode No.12	1
Dynode No.12 and Anode	1
Anode and Cathode	14.4

TABLE I

Focusing electrode is connected to arm of potentiometer between cathode and dynode No.1. The focusingelectrode voltage is varied to give maximum anode current.

OPERATING CONSIDERATIONS

The operating stability of the 4459 is dependent on the magn tude of the anode current and its duration. When the 4459 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends of the severity of the operating conditions. After a period of idleness, the 4459 usually recovers a substantial percentage of such loss in sensitivity.

It is recommended that the average anode current be well below the maximum-rated value of 1 milliampere when stability of operation is important. When maximum stability is required, the average anode current should not exceed 10 microamperes.





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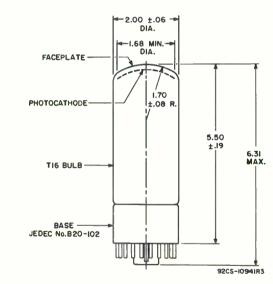


Electrostatic and/or magnetic shielding of the 4459 may be necessary.

Adequate *light shielding* should be provided to prevent extraneous light from reaching any part of the 4459.

The high voltages at which the 1450 is operated are very dangerous. Care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Precautions should include the exclosure of high-potential terminals and the use of interlock switches to break the primary circuit of the high-voltage power supply when access to the apparatus is required.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 RESPONSE is shown at the front of this Section



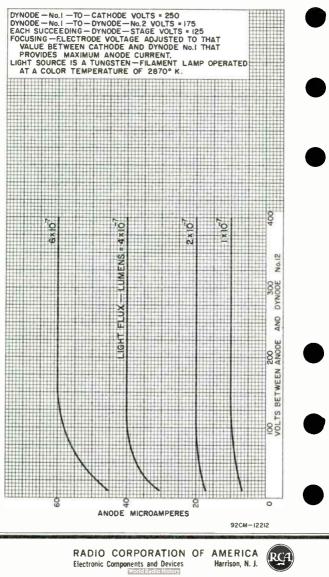
DIMENSIONS IN INCHES

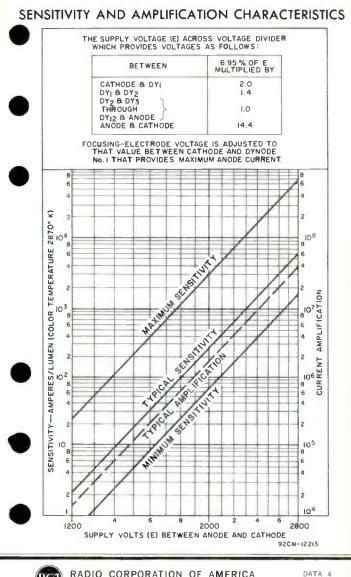
Center line of bulb will not deviate more than 2° in any direction from the perpendicular erected at the center of bottom of the base.



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TYPICAL ANODE CHARACTERISTICS



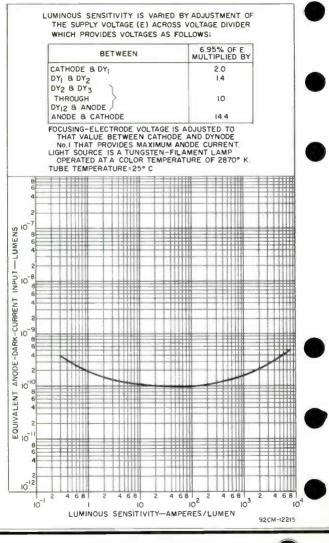


Electronic Components and Devices

6-64

Harrison, N. J.

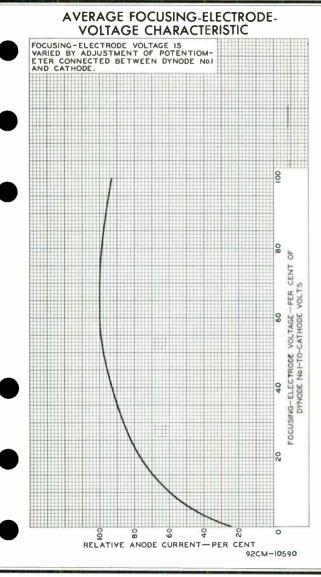
TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.



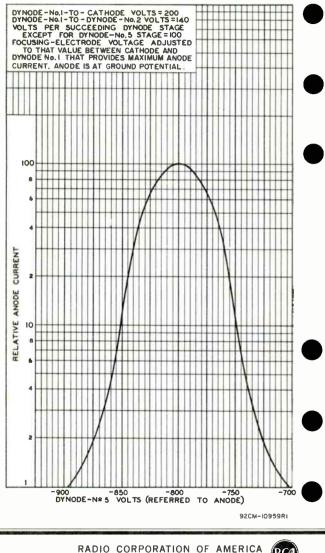


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RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

DATA 5 6-64

TYPICAL ANODE-CURRENT CHARACTERISTIC



Electronic Components and Devices World Radio History Harrison, N. J.

Multiplier Phototube

S-II RESPONSE

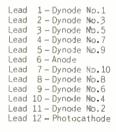
"RUGGEDIZED", IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE

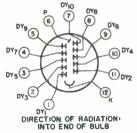
ELECTROSTATICALLY FOCUSED

For Detection and Measurement of Nuclear-Radiation and Low-Level Light in Compact Industrial and Military Equipment

General:

Spectral Response. 5-11 Wavelength of Maximum Response 4400 ± 500 angstroms Cathode, Semitransparent Cesium-Antimony Minimum area 0.2 sq. in. Minimum diameter 0.5 in. Window Lme Glass (Corning ^a No.D080), or equivalent Shape Plano-Concave Index of refract on at 5893 angstroms. 1.51 Dynode Waterial Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):
Anode to dynede No.102.4 pf Anode to all other electrodes3.2 pf Maximum Overall Length
(Excluding semiflexible leads)
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Magnet'c Shield Perfection Mica Co. ^b , or equivalent
Base Small-Button Thirteenar 12-Semiflexible Lead.
(JEDEC No.E12-72), and Protective Shell
Pacing Decisesting for POTTON VIEW





Maximum Ratings, Absolute-Naximum Values:

Supply Voltage (DC or Peak AC):		
Between Anode and Cathode	1500 max.	volts
Between Anode and Dynode No.10	300 max.	valts
Between Consecutive Dynodes	250 max.	volts
Between Dynode No.1 and Cathode		
Average Anode Current ^c		
Ambient Temperature	75 max.	°C



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Characteristics Range Values:

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of Ebetween 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 = 1250 volts (Except as noted)

-		<i>m</i> (
a	Min.	Туþ.	Max.	
Sensitivity:				
Radiant, at 4400		_		-
angstroms	. –	6×10^{3}	-	a/w
Cathode radiant.				
at 4400 angstroms.		0.048	_	a/w
Luminous.	•	0.070		0.0 11
At 0 cpsd	. 3	7.5	60	a/'m
	• >	1.0	00	0.7 11
Cathode luminous:				
With tungsten light				
source	. 4 × 10⁻⊃	6 × 10 ⁻⁵	-	a/im/
With blue light				
sourcef.g.	4×10^{-8}	6×10^{-8}	-	а
Current Amplification		1.25×10^{5}	_	
Equivalent Anode-Dark-	•			
Current Input at a				
luminous sensitivity of		0 10 10	0 40-0	
7.5 a/lm ^h		8 × 10-10		lm
Equivalent Noise InputJ.		3×10^{-12}) m
Anode-Pulse Rise Time ^k .		2.1×10^{-9}		sec
Electron Transit Time ^m .		2.3×10^{-8}	_	sec
Quantum Efficiency at				
4300 angstroms	_	14	_	%
	•	±-7		10

Made by Corning Glass Works, Corning, New York.

Magnetic shielding in the form of foil or tape as available from the Magnetic shield Division, Perfection Mica Company, 1322 North Ellston, Chicago 24, Illinois, or equivalent. C.

Averaged over any interval of 30 seconds maximum.

d Under the following conditions: The light source is a tungsten-filamert 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.

- Under the following conditions: The light-source is a tungsten-filament Under the following conditions: the fight-source is a sungstein-filament lamp having a lime-glass envelope. It is operated at a color temperature of 24700 K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.
- ŧ. Under the following conditions: Light incident on the cathode is trans-mitted through ablue filter (Corning C.S. No.5-58, polished to1/2 stock thickness-Manufactured by the Corning Glass works, Corning, New York) from a tungsten-filament lamp operated at a color temperature of 28700 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 #S anode.
- 9 See Spectral Characteristic of 2870° K Light Source and Spectral Charac-teristic of Light from 2870° K Source after passing through Indicated Blue Filter at front of this Section.
- At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant such as dry ice.
- Under the following conditions: Supply voltage (E) is as shown, 25^oC tube temperature, external shield connected to cathode, bandwidth 1 Cyclo per second, tungsten-light source at a color temperature of radiation pulses allernation audio frequency to produce incident radiation pulses allernations and the new off the value stated. The large control of the suite is a within the off the value stated. "on" period of the pulse is equal to the "off" period.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. World Radio History



k Weasured between 10 per cent and 90 per cent of maximum anode-pulse height. This antde-pulse rise time is primarily a function of transittime variation and is measured under conditions with the incident light fully illuminating the photocathode.

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 reach-s peak amplitude. The transit time is measured under conditions with the incident light "ully illuminating the photocathede.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this Section

ENVIRONMENTAL TESTS-

The 4460 is designed to withstand the snock, vibration, and acceleration tests shown below which are equivalent to those specified in ML'_E-5272C* for equipment mounted on the structures of missiles propelled or launched by high-thrust rocket engines. The accelerations specified in these tests are applied directly to the tubes.

One-Hundred Per-Cent Shock and Vibration Testing:

Each 4460 is subjected in sequence to shock and then to vibration as specified below with the tube non-operating.

Shock. These tests are performed rirst, per method of MIL-E-5272C*, Paragraph 4.15.5.1, Procedure V, on apparatus which provides a half-wave sinusoidal shock pulse. One-hundred per-cent testing of all 4460', is performed. Each 4460 is subjected to three impact shocks in each direction of the three orthogonal axes shown in the accomparying Orthogonal Axes Used During Environmental Tests drawing. The peak acce'eration of the impact shocks. Each tube is subjected to a total of 18 impact shocks.

Vibration. These tests are performed next, on apparatus which applies variable-sinusoidal frequency vibration to the tube, per method of MIL-E-5272C^{*}, paragraph 4.7.14 and paragraph 4.7.14.1. One-hundred per-cent testing or all 4460's is performed. Each 4460 is vibrated in each of the three orthogonal axes shown in the accompanying Orthogonal Axes Used During Environmental Tests drawing and as specified in the schedu e below. A vibration cycle has a duration of 5 minutes per axis in which time the frequency is varied logarithmical y from 20 to 2000 and back to 20 cycles per second. One vibration cycle is performed for each axis and the total test period for each tube is 15 minutes.

Double Amplitude Inches	Acceleration g's	Frequency Cps	Cycle Duration per axis minutes
0.050 ± 0.005 - ~	- 20 ± 2 20 ± 2	20 - 87 87 - 2000 2000 - 87	5
0.050 ± 0.005	-	87 – 20	J



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.







Tube Rejection Criterion. Upon completion of the One-Hundred Per-Cent Shock and Vibration Testing each tube is tested at a anode-to-cathode voltage of 1250 volts under the conditions shown under Characteristics Range Values for Equipment Design and will meet the specified values.

Design Tests:

Vibration. These tests are performed under conditions equivalent to those described in ML_{E} -5272C^{*}, paragraph 4.7.14 and paragraph 4.7.14.1. The vibration cycle has a duration of one hour and two cycles are performed for each of the three orthogonal axes shown in the accompanying *Orthogonal Axes Used During Environmental Tests* drawing. The total test period for each tube is six hours. Tubes are operating during the test.

Acceleration. These tests are performed in a centrifuge providing unidirectional acceleration by a method equivalent to that specified in MIL-E-5272C*, paragraph 4.16.3, Procedure III, except that tubes are subjected for one minute to an increased acceleration test level of 100 ± 10 g's in both directions of the three orthogonal axes shown in the accompanying Orthogonal Axes Used During Environmental Tests drawing and the tubes are non-operating.

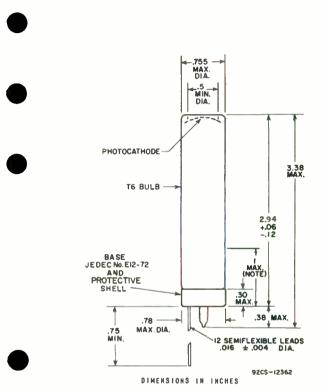
* Military Specification MIL-E-5272C (ASG), 13 April 1959; and Amendment 1,5 January 1960.







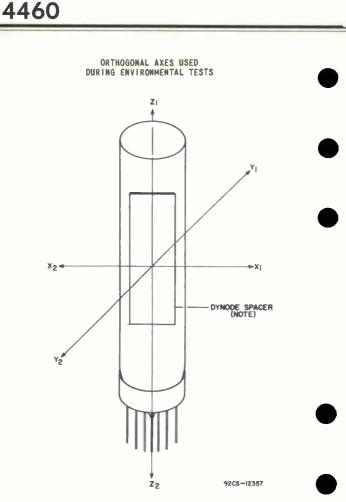




Note: Within this length, maximum diameter of tube is 0.78".



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History DATA 3 6-64

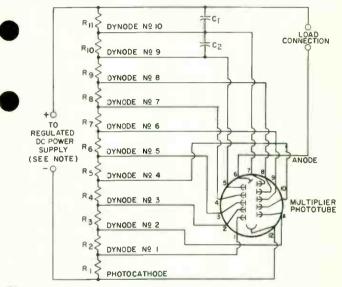


Note: The plane of each dynode spacer is parallel to the X-Z plane. The Z-axis is the major axis of the tube.

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TYPICAL VOLTAGE-DIVIDER ARRANGEMENT



92CS-10656RI

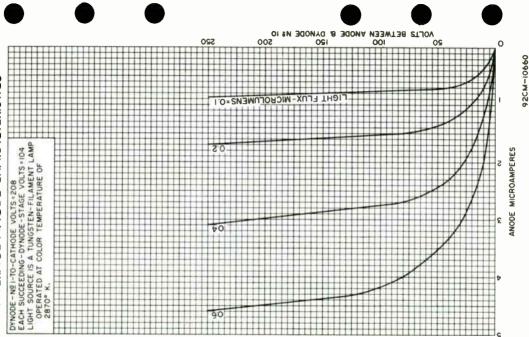
Note: Adjustable between approximately 500 and 1500 volts DC.



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CHARACTERISTICS ANODE AVERAGE



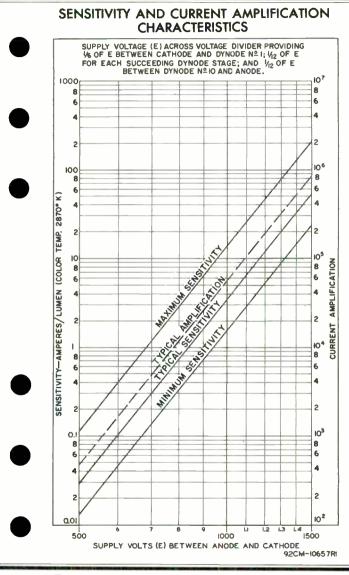
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CORPORATION Components and Devices

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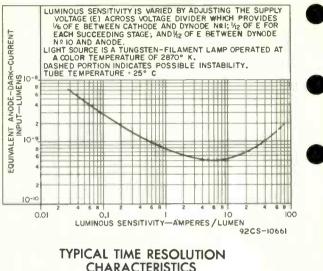
Electronic

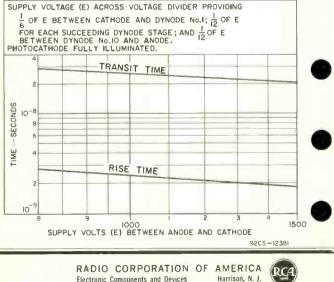


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TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC





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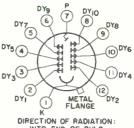
Photomultiplier Tube⁴

RUGGED VIBRATION-RESISTANT STRUCTURE S-11 RESPONSE ELECTROSTATICALLY FOCUSED **IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE** DYNODE STAGES For Detection and Measurement of Nuclear Radiation and other Low-Level Light Sources. Especially Useful in Missile and Rocket Service and other Industrial and Military Applications where Severe Environmental Conditions may be Encountered.

General:

Spectral Response
Minimum area
Window Lime Glass (Cornir.g ^a No.0080), or equivalent
Shape
Index of refraction at 5893 angstroms 1.51
Dynode Material Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.10
Anode to all other electroges
Maximum Overall Length (Excluding semif'exible leads) 3.18"
Maximum Diameter
Operating Position
Weight (Åpprox.)
Bulb
Magnetic Shield Millen Co. ^b , or equivalent
Base
Terminal Diagram: BOTTOM VIFW

Lead 1 & Metal	Flange-
	cathode
Lead 2 - Eynode	No.1
Lead 3 – Dynode	No.3
Lead 4 - Dynode	No.5
Lead 5 - Dynode	No. 7
Lead 6 - Dynode	No.9
Lead 7 - Anode	
Lead 8 - Dynode	No.10
Lead 9 - Dynode	No.8
Lead 10 - Dynode	No.6
Lead 11 - Dynode	No.4
Lead 12 - Dynode	No.2



INTO END OF BULS

Maximum Ratings, Absolute-Naximum Values:

DC Supply Voltage:		
Between anode and cathode	1500	volts
Between anode and dynode No.10	250	volts
Between consecutive dynodes	200	volts
Between dynode No.1 and cathode	400	volts
Average Anode Current ^e	_	та
Average Cathode Current¢, d	2	μa
Ambient Temperature	75	µа °C

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Characteristics Range Values:

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 anode and dynode No.10 and anode.

With E = 1250 volts (Except as noted)

	Min.	$Ty\phi$.	Max.	
Sensitivity: Radiant, at 4400 angstroms Cathode radiant, at 4400		8 × 10 ⁻³	şush	a/w
angstroms	- 3	0.048 10	90	a/w a/lm
With dynode No.10 as output electrode ^f Cathode luminous:		6	-	a/lm
With tungsten light source ⁹ 4 With blue light	× 10 ⁻⁵	6×10^{-5}		a/lm
source ^h 4 Current Amplification .	× 10 ⁻⁸ -	6 × 10 ⁻⁸ 1.7 × 10 ⁻⁵	_	а
Equivalent Anode- Dark-Current Input at aluminous sensitivity of 10 a/lm ^j		5 × 10 ⁻¹⁰	2 4 10-9	łm
Equivalent Noise Input ^k , m Anode-Pulse Rise Time ⁿ .	-	2.8×10^{-12} 1 2.4 × 10 ⁻⁹	.8 × 10-1	1 lm sec
Electron Transit Time [®] Quantum Efficiency at 43CO angstroms	-	2.9 × 10 ⁻⁸		sec %
With E = 750 volts (Except	as noted			<i></i>
	Min.	Ty⊅.	Max.	
Sensitivity: Radiant, at 4400 angstroms Cathode radiant, at 4400	-	1.8 × 10 ⁻²	_	a/w
angstroms	_	0.048 0.22	_	a/w a/lm
With tungsten light source ⁹ Withbluelight	4 × 10 ⁻⁵	$5 6 \times 10^{-5}$	-	a/lm
source" Current Amplification Equivalent Anode-Dark-	4 × 10 ⁻⁸ -	⁸ 6 × 10 ⁻⁸ 3.7 × 10 ⁻³	_	а
Current Input at a luminous sensitivity of 10 a/lm ^J Anod:-Pulse Rise Time ^k Electron Transit Time ^P		5 × 10 ⁻¹⁰ 3.1 × 10 ⁻⁹ 3.8 × 10 ⁻⁸		9 lm sec sec

Made by Corning Glass Works, Corning, New York.

b Magnetic shielding in the form of foil or tape as available from the James Millen Manufacturing Company, 150 Exchange Street, Malden 48, Massachusetts, or equivalent.

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e Averaged over any interval of 30 seconds maximum.

d For a uniformly illuminated area of 0.5 square inches minimum.

⁶ Under the following conditions: The light source is a tungsten-filement lamp haying a lime-glass envelope. It is operated at a color temperature of 2870° K and at a light input of 10 microlumens.

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 a collector. The curves under fyrical Anode Characteristics do not apply when dynode No.10 is used as the output electrode.

- ^g Under the following conditions: The light source is a tungst+n-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 vClts are applied between cathode and all other electrodes connected as anode.
- h Under the following conditions: Light incident on the cathod- is transmitted through ablue filter (Corning C.S. No.5-58, polished to 1/2 stock thickness—Hanufactured by the Corning Glass Works, Corning, New York) from a Lungsten-filament lamp operated at a color temperature of 2870° k. The value of light flux incident on the filter is 0.01 lumen aud 200 volts are applied between cathode and all other electrodes connect-das anode.
-] at a tube temperature of $25^{\rm O}$ 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 1250 volts is recommended.
- Winder the following conditions: Supply voltage (E) is as shiwn, 25° C tube temperature, external shield connected to cathode, bandwidth 1 cyclepersecond, 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.
- A 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 variations and is measured under conditions with an incident-light fully illuminating the photocathode.
- P 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 reachespeak amplitude. The transit time is measured under conditions with the incident light fully ill uminating the photocathode.
- Alternate designation for Multiplier Phototube.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this Section

ENVIRONMENTAL TESTS:

The 4461 is designed to withstand the shock, vibration, and acceleration tests shown below which are equivalent to those specified in MLL-E-5272C* for equipment mounted on the structures of missiles propelled or launched by high-thrust rocket engines. The accelerations specified in these tests are applied directly to the tubes.

One-Hundred Per-Cent Shock and Vibration Testing:

Each 4461 is subjected in sequence to shock and then to vibration as specified below with the tube non-operating.

Shock. These tests are performed first, per method of MIL-E-5272C°, Paragraph 4.15-5.1, Procedure V, on apparatus which provides a half-wave sinusoidal shock pulse. One-hundred per-cent testing of all 4461's is performed. Each 4461 (non-operating) is subjected to three impact shocks in each direction of the three orthogonal axes. The peak acceler-



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 5-65 ation of the impact shock is 30 ± 3 g's and the time duration is 11 \pm 1 milliseconds. Each tube is subjected to a total of 18 impact shocks.

Vibration. These tests are performed next, on apparatus which applies variable-sinusoidal frequency vibration to the tobe, permethod of MIL-E-5272C^{*}, paragraph 4.7.14 and paragraph 4.7.14.1. One hundred per-cent testing of all 4461's is performed. Each 4461 is vibrated in each of the three orthogonal axes as specified in the schedule below. A vibration cycle has a duration of 5 minutes per axis in which time the frequency is varied logarithmically from 20 to 2000 and back to 20 cycles per second. One vibration cycle is performed for each axis and the total test period for each tube is 15 minutes.

Double Amplitude Inches	Acceleration g's	Frequency	Cycle Duration Per Axis minutes
0.050 ± 0.005 - 0.050 ± 0.005	20 ± 2 20 ± 2 	20 - 87 87 - 2000 2000 - 87 87 - 20	5

Tube Rejection Criterion. Upon completion of the Shock and Vibration Testing each tube is tested at a anode-to-cathode voltage of 1250 volts with the light level incident on the tube adjusted to provide an anode current of approximately 8 microamperes. Electrical and/or mechanical tube failures due to shock or vibration will be observed during the vibration test when the specified anode current is monitored. Tube rejection criterion for both tests is that the anode current of 8 microamperes will not change more than ±20 per cent upon completion of the vibration test for each axis.

Design Tests:

Vibration. These tests are performed under conditions equivalent to those described in MIL-E-5272C[#], paragraph 4.7.14 and paragraph 4.7.14.1. The vibration cycle has a duration of one hour and two cycles are performed for each of the three orthogonal axes. The total test period for each tube is six hours.

Acceleration. These tests are performed in a centrifuge providing unidirectional acceleration by a method equivalent to that specified in MIL- $E-5272C^*$, paragraph 4.16.3, Procedure III, except that tubes are subjected for one minute to an increased acceleration test level of 100 \pm 10 g's in both directions of the three orthogonal axes. The tubes are non-operating during the test.

⁸ M'litary Specification HIL-E-5272C (ASG), 13 April 1959; and Amendment 1, 5 January 1960.

Electronic Components and Devices

RADIO CORPORATION OF AMERICA



Harrison, N. J.

DATA 2

OPERATING CONSIDERATIONS

The operating stability of the 4451 is dependent on the magnitude of the anode current and its duration. When operating athigh average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 4461 usually recovers a substantial percentage of such loss in sensitivity.

It is recommended that the average anode current be well below the maximum rated value of 1 milliampere when stability of operation is important. When maximum stability is required, the average ancde current should not exceed 10 microamperes.

Electrostatic and/or magnetic shielding of the 4461 may be necessary.

Adequate shielding should be provided to prevent extraneous radiation from reaching any part of the 4461.

The high voltages at which the 4451 is operated are very dangerous. Before any part of the circuit is touched, the power supply switch should beturned off and both terminals of any capacitors grounded.

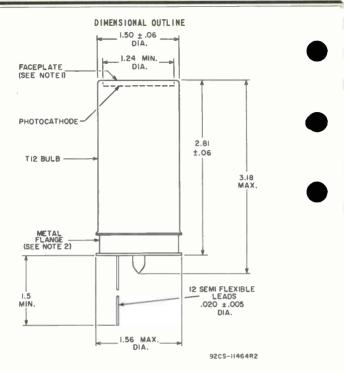
Accompanying Typical Voltage-Divider Arrangement is recommended for use with the 4461. Resistance values for the voltage-divider arrangement range from 10,000 ohms perstage to 1,000,000 ohms per stage. The choice of resistance values for the voltage-divider network is usually a compromise. If low values of resistance per stage are utilized, the power drawn from the regulated power supply and the required wattage rating of the resistors increase. Phototube noise may also increase due to heating if the divider network is near the photocathode. The use of resistance values near 1 megohm per stage may cause deviation from linearity if the voltage-divider current is mot maintained at a value several times that of the maximum value of anode current, and may limit anode-current response to pulsed light. The latter effect may be recuced by connecting capacitors between the leads for dynodes No.7 and No.8, dynodes No.8 and No.9, dynodes No.9 and No.10, and between dynode No.10 and anode return. In addition to non-linearity and pulse-limiting effects, the use of resistance values exceeding I megahm per stage make the 4461 more susceptible to leakage effects between terminals with possible resulting deviation in interstage voltage leading to a loss of current amplification.



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DIMENSIONS IN INCHES

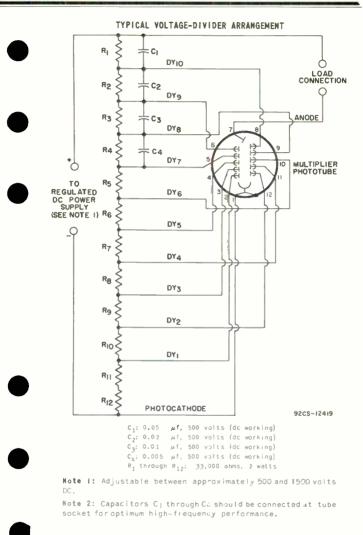
Center line of bulb will not deviate more than 20 in any direction from the perpendicular erected at the center of bottom of the base flange.

Note I: Deviation from flatness within the 1.24 inch diaeter area will not exceed 0.010 inch from peak to valley. Note 2: The metal flange should never be employed for mechanical mounting purposes.



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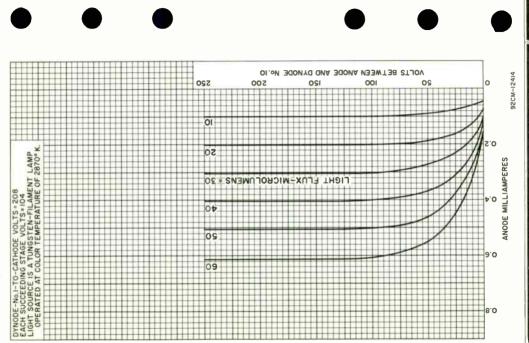




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4 DATA

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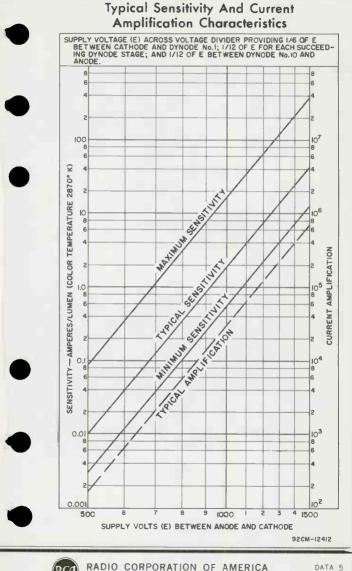
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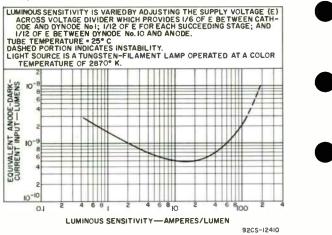
5-65

World Radio Histor

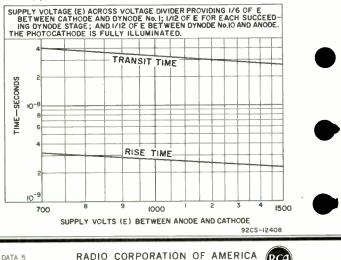
Electronic Components and Devices

Harrison, N. J.

Typical Anode-Dark-Current Characteristic



Typical Time Resolution Characteristics



World Radio History

Harrison, N. J.

Electronic Components and Devices

Multiplier Phototube

S-20 RESPONSE

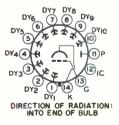
10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE VENETIAN-BLIND-TYPE DYNODE STRUCTURE

For Photometry, Flying-Spot Scanning, and Scintillation-Counter Equipment Requiring Low-Dark Current and High Sensitivity Over a Wide Spectrum (Blue through Near-Infrared).

General:

Spectral Response
Minimum area
Dynode Material Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No. 10
Anode to all other electrodes
Maximum Overall Length
Seated Length
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Socket
Magnetic Shield JAN ^c No.S-2004, or equivalent
Base Medium-Shell Diheptal 14-Pin
(JEDEC Group 5, No.B14-38), Non-hygroscopic
Basing Designation for BOTTOM VIEW
Pin 1- Dynode No.1 Pin 2 Dynode No.2

- Pin 2-Dynode No. 2 3 - Dynode No. 3 Pin 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-Do Not Use Pin 13-Focusing Electrode
- Pin 14 Photocathode





RADIO. CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 6-64

Maximum Ratings, Absolute-Maximum Values: 00.0

DC Supply													
	anode a												volts
Between	anode a	ind dy	node	No.	10		•	•	•	•	300	max.	volts
	consecu										300	max.	volts
	dynode										600	max.	volts
	focusin											max.	volts
Average A													ma
Ambient T	emperatu	re				•	•	•	•	•	85	max.	°C

Characteristics Range Values:

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 anode and dynode No.10. Focusing-electrode voltage is adjusted to that value between 50 and 100 per cent of dynode-No.1 potential (referred to cathode) which provides maximum anode current,

With E = 2000 volts (Except as noted)

		Min.	Ty⊅.	Max.	
Sensitivity:					
Radiant, at 4200					
angstroms	•	-	1.1×10^{4}	-	a/w
Cathode radiant,			C 0 10-2		- 1
at 4200 angstroms. Luminous, at 0 cps ^e .		12	6.8 x 10 ⁻² 25	240	a/w a/lm
Cathode luminous:	•	12	20	240	a/ 1m
With tungsten					
light source ^f .	• 1.	2×10^{-4}	1.6×10^{-4}	_	a/lm
With blue light					
source ^{g, h}	• 5	× 10-8	-	-	а
With red light	0	40-7			
source ^{j,k}	• 3	x 10-7	1 6 10 5	-	а
Current Amplification Equivalent Anode-	•	-	1.0 × 10 -	_	
Dark-Current Input					
ataluminous sensi-					
tivity of 12 a/lm ^m .		-	4 × 10 ⁻¹⁰	1×10^{-9}	lm
Equivalent Noise Input		-	-	3.8 × 10 ⁻¹²	lm
Anode-Pulse Rise Time"		-	9.8×10^{-9}	-	sec
Electron Transit Time ^P	•	-	5.2×10 ⁻⁸	-	sec
With E = 1500 volts ()	Exce‡	ot as no	ted)		
		Min.	Typ.	Max.	
Sensitivity:					
Radiant, at 4200					
angstroms	•	-	2.1×10^{3}	-	a/w
Cathode radiant,					
at 4200 angstroms		-	6.8 × 10 ⁻²	-	a/w
Luminous, at 0 cps ^e .	•	-	5	-	a/lm

RADIO CORPORATION OF AMERICA Electronic Components and Devices





	Mın.	Typ.	Max.	
Cathode luminous:				
With tungsten				
light sourcef .	1.2×10^{-4}	1.6×10^{-4}	-	a/lm
With blue light				
	5 × 10 ⁻⁸	_		5
With red light source ^{j,k}				
source ^{j,k}	3 × 10 ⁻⁷	_	-	a
Current Amplification	_	3.1×10 ⁴	-	
Equivalent Anode-Dark				
Current Irput at a				
luminous sensitivity				
of 12 a/ln ^m	-	4 × 10 ⁻¹⁰	1×10^{-9}	l m
a Corning No. 1056 made by	Corning Glass	Works, Corni	Do New York	0.0

Corning No.1056 made by Corning Glass Wor%s, Corning, New York, or equivalent.

- b Made by Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago 24, 11)inois.
- G Made by JAN Hardware Manufacturing Company, 38-01 Queens Blvd., Long Island City 1, New York.
- Averaged over any interval of 30 seconds makimum.
- Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temoerature of 2870° K and a light input of 1 microfumer is used.
- f Under the following conditions: The light sources, a trensten-filament lamp having a lime-plass envelope. It is operated is a color temperature of 28700 K. The value of light flux is 0.01 lumen and 20c whits are applied between cathode and all other electrodes connected as anoda.
- Under the following conditions: Light incident on the Eathode is transmitted through a blue filter (Corning C.S. No.5-58 pol.shed to 1/2 stock thickness—manufactured by the Carning Glass Works, Corning. New York) from a Lungsten-filament lamp operated at a color temperature of 20700 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.
- h See Spectrul Characteristic of 2870" I Light Source and Spectral Characteristic of Light from 2870" I Source after passing through Indicated Biue Filter at front of this Section.
- Inder the following conditions: Light incident on the cathode is transmitted through a red filter (corning C.S. No.2-62, manufactured by the corning Glass Works, Corning, New York) from a tungsten-filament lamp operated at a color temperature of 2k70° 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.
- k See Spectral Characteristic of 2070° I Light Source and Spectral Characteri: tic of Light from 2070° I Source after passing through Indicated Red Piller at from of this iscition.
- At a tube temperature of 25⁰ C. Dark surrent may be reduced by use of a refrigerant.
- Measured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode-pulse rise time is trimurily a function of transittime variation and is measured under conditions with the incident light fully illuminating the photocathode.
- P 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 anod + terminal reaches peak amplitude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.



OPERATING CONSIDERATIONS

The operating stability of the 4463 is dependent on the magnitude of the anode current and its duration. When the 4463 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 4463 usually recovers a substantial percentage of such loss in sensitivity.

It is recommended that the average anode current be well below the maximum-rated value of 1 milliampere when stability of operation is important. When maximum stability is required, the average anode current should not exceed 10 microamperes.

Electrostatic and/or magnetic shielding of the 4463 may be necessary.

Adequate shielding should be provided to prevent extraneous radiation from reaching any part of the 4463.

The high voltages at which the 4463 is operated are very dangerous. Care should be taken in the design of apparatus to prevent the operator from coming incontact with these high voltages. Precautions should include the enclosure of highpotential terminals and the use of interlock switches to break the primary circuit of the high-voltage power supply when access to the apparatus is required.

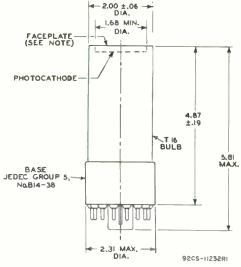
> SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 RESPONSE is shown at the front of this Section



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Harrison, N. J.





DIMENSIONS IN INCHES

Center line of bulb will not deviate more than 2⁰ in any direction from the perpendicular erected at the center of bottom of the base.

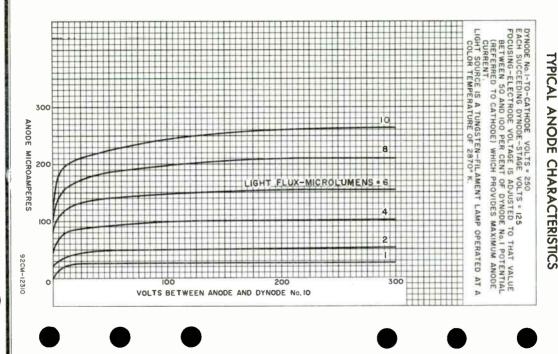
Note: Within 1.68" diameter, deviation from flatness of external surface of faceplate will not exceed 0.010" from pEak to valley.



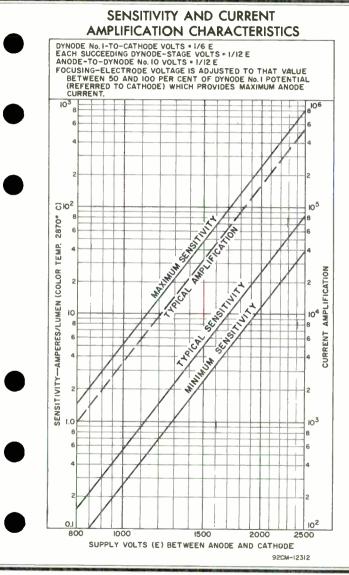
RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History Harrison, N. J. DATA 3 6-64

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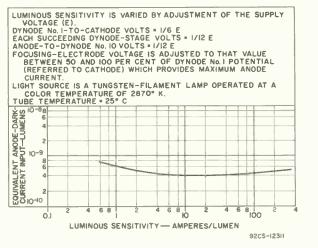




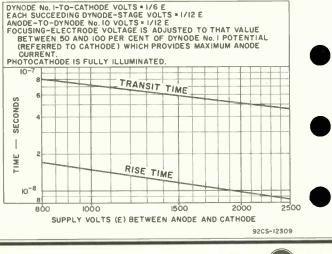
RADIO CORPORATION OF AMERICA Electronic Components and Devices

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TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



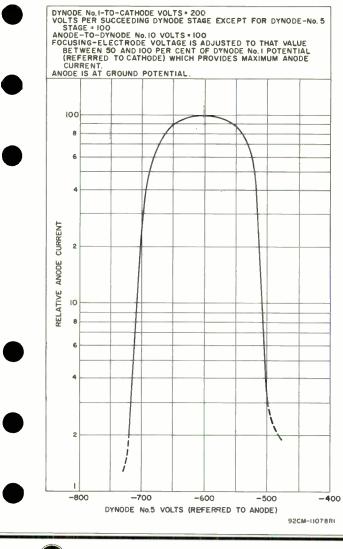
TYPICAL TIME RESOLUTION CHARACTERISTICS



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

RCA

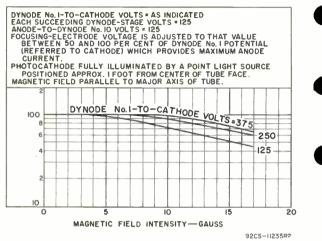
TYPICAL ANODE-CURRENT CHARACTERISTIC





RADIO CORPORATION OF AMERICA Harrison, N. J. DATA 5 6-64

TYPICAL ANODE-CURRENT CHARACTERISTICS



DYNODE No. 1-TO-CATHODE VOLTS = AS INDICATED EACH SUCCEEDING DYNODE-STAGE VOLTS = 125 ANODE-TO-DYNODE No. 10 VOLTS = 125 FOCUSING-ELECTRODE VOLTAGE IS ADJUSTED TO THAT VALUE BETWEEN 50 AND 100 PER CENT OF DYNODE No. 1 POTENTIAL (REFERRED TO CATHODE) WHICH PROVIDES MAXIMUM ANODE CURRENT PHOTOCATHODE FULLY ILLUMINATED BY A POINT LIGHT SOURCE POSITIONED APPROX. I FOOT FROM CENTER OF TUBE FACE. MAGNETIC FIELD PERPENDICULAR TO MAJOR AXIS OF TUBE. Z 100 CURRE 6 DYNODE 4 ANODE No 1- TO-CATHODE VOLTS=125 10 ATIVE R 6 4 SEL 2 20 15 MAGNETIC FIELD INTENSITY - GAUSS 92CS-11236R2

> RADIO CORPORATION OF AMERICA Electronic Components and Devices World Racio History



Multiplier Phototube

S-20 RESPONSE

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE

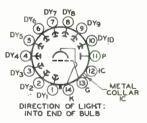
VENETIAN-8LIND-TYPE DYNODE STRUCTURE

For Photometry, Flying-Spot Scanning, and Scintillation-Counter Equipment Requiring Low-Dark Current and High Sensitivity Over a Wide Spectrum (Blue through Near-Infrared).

General:

Spectral Response
Index of refraction at 5893 angstroms 1.51
Dynode Materiai Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):
Anode to dynode No.10
Anode to all other electrodes
Maximum Overall Length 6.31"
Seated Length
Maximum Diamotor
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Socket
Magnetic Shield Perfection Mica Co. c, or equivalent
Base Medium-Shell Diheptal 14-Pin
(JEDEC Group 5, No.B14-45) Non-hygroscopic

Pin 1 - Dynode No.1 Pin 2 - Dynode No. 2 Pin 3-Eynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.5 Pin 7 - Eynode No.7 Pin 8 - Dynode No.8 Pin 9-Dynode No.9 Pin 10 - Cynode No.10 Pin 11 - Anode Pin 12-Do Not Use Pin 13-Focusing Electrode Pin 14 - Photocathode Metal Collar-Do Net Use





RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History

Maximum Ratings, Absolute-Naximum Values:

DC Supply Voltage:			
Between anode and cathode	00	max.	volts
Between anode and dynode No.10 30	00	max.	volts
Between consecutive dynodes			volts
			volts
			volts
			ma
Ambient Temperature	35	may.	00
		110.4/5 #	0

Characteristics Range Values:

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 anode and dynode No.10. Focusing-electrode voltage is adjusted to that value between 50 and 100 per cent of dynode-No.1 potential (referred to cathode) which provides maximum anode current.

With E = 2000 volts (Except as noted)

	Hin.	Typ.	Max.	
Sensitivity:				
Radiant, at 4200				
angstroms	. –	1.1×10^{4}	_	a/w
Cathode radiant,				
at 4200 angstroms.	. –	6.8×10^{-2}	_	a/w
Luminous, at 0 cps ^e .	. 12	25	240	a/lm
Cathode luminous:				
With tungsten				
light source ^f	1.2×10^{-4}	1.6×10^{-4}	_	a/lm
With blue light				
source ^{g, h} .	$.5 \times 10^{-8}$	-	-	а
With red light	7			
source ^{j,k}		-	_	а
Current Amplification.	• -	1.6×10^{5}	-	
Equivalent Anode-				
Dark-Current Input				
at a luminous sensi-		4.0-10		
tivity of 12 a/lm ^m . Equivalent Noise Input		4 × 10 ⁻¹⁰	1 x 10 ⁻⁹	, lm
Anode-Pulse Rise Time"		1.16 × 10 ⁻⁸ ³	.8 × 10-14	- lm
Electron Transit Time		5.8×10^{-8}		
			-	sec
With $E = 1500$ volts (E:	xceptasno	ted)		
	Nin.	Typ.	Nox.	
Sensitivity:				
Radiant, at 4200				
angstroms		2.1×10^{3}	_	a/w
Cathode radiant,				0.7 11
at 4200 angstroms.		6.8×10^{-2}		a/w
Luminous, at 0 cps ^e .	. –	5	-	a/lm

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



	M.n.	Typ.	Max.	
Cathode luminous:				
With tungsten				
	1.2×10^{-4}	1.6×10^{-4}	-	a/lm
With blue light				
source ^{g, h}	5×10^{-8}	-	-	а
With red light source ^{j,k}	2.10-7			_
Current Amplification	3×10^{-7}	3.1×10^{4}	-	а
Equivalent Anode-Dark	-	2.1 X 10	-	
Current Input at a				
luminous sensitivity				
of 12 a/lm ^m		4 × 10-10	1×10^{-9}	lm
a corping No 0080 made by corpin				
Corning No.0080 made by Cornin equivalent.		-		
Made by Cinch Manufacturing Com 24, Illingis.	pany, 1025	South Homan A	venue, C	hicago
C Magnetic shielding material in	the form of	foil or tap	e as ava	ilable
C Magnetic "hielding material in from the Magnetic Shield Divisio Ellston, Chicago 24, Illinois, o	on, Perfecti or equivalen	on Mica Compa	апу, 1322	North
d Averaged over any interval of 30) seconds ma	ximum.		
e Under the following conditions:	The light s	ource is a tur	nasten-fi	lament
of 2870° K and a light input of	 It is ope microlume 	rated at a col n is used.	or tempe	rature
Hoder the fellewise conditions.	When 1 to both in			
of 2870 ⁰ K. The value of light applied between cathode and all	flux is 0. other elec	Ol Jumen and trodes conne	or tempe 200 vol cted as	ts are anode.
⁹ Under the following condition: transmitted through a blue fil 1/2 stock thickness manufacture	s: Lghti	ncident on t	he cath	ode is
1/2 stock thickness-manufacture	d by the Co	rning Glass W	iorks, Co	neu to
New York) from a tungsten-filamer of 2870° k. The value of ligh lumen and 200 volts are applied to	it lam⇒ oper t flux in⊳i	ated at a col	or tempe	rature
lumen and 200 volts are applied t	etweem cath	ode and all ot	her elec	trodes
	PROO & Link	t Source and	Stort	(h
h See Spectrul Characteristic of 2 acteristic of Light from 2870° K Blue Pilter at Tront of this Sec.	Source afte	τ passing the	orectrai	icated
junder the following condition	:tinn. 		• -	
J Under the following condition: transmitted through a red filter the Cornin J Glass Works, Cornin lamp operated at a color temper flux incident on the filter is between cathode ano all other ell	Corning e.	S. No.2-62, n	he cathu narufactu	red by
lamp operated at a color temper	ig, Nes York ature of 28) from a tun	gsten-fi	lament
flux incident on the filter is	0.01 Jumen	and 200 volt	ts are a	pplied
k See Sheetral Characteristic of	ectroces co	nnected as an	ode.	
K See Spectral Characteristic of 2 acteristic of Light from 2870° K Red Pilter at front of this Sect	Source afte	t Source and r passing thr	Spectral ough Ind	Char- icated
" At a tube temperature of 25° c.		nt may be red		
a refrigerænt.				
height. This anode-pulse rise t	nd 90 per co ime is orim	ent of max mu arily a function	im anode-	-pulse
Peasured brtween 10 per cent an height. This anode-pulse rise t time variation and is measured or fully illuminating the photocath	der conditi	ons with the	incident	light
P The electron transit time is an		val between	the arri	val of
time at which the output nulse at th	ne entrance	window of th	e tube a	nd the
		ons with the	incident	light
fully illuminating the photocati	noue.			-
OPERATING C	ONSIDERAT	IONS		
It is recommended that th	ne average	anode cur	rent be	well
below the maximum-rated value	of I mit	liampere wh	en stab	ility
of operation is important. Wh	en maximum	n stability	is requ	ired
the average anode current sho	ould not e	xceed i0 m	icroamp	eres.
Electrostatic and/or magn	etic shie	lding of th	е 4464 п	av be

necessary.



9

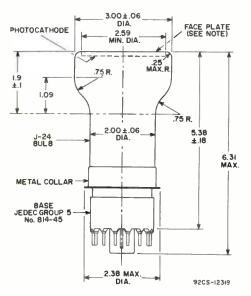
RADIO CORPORATION OF AMERICA Electronic Components and Devices Monte Participation History

Adequate shielding should be provided to prevent extraneous radiation from reaching any part of 4464.

The operating stability of the 4464 is dependent on the magnitude of the anode current and its duration. When the 4464 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 4464 usually recovers a substantial percentage of such loss in sensitivity.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 RESPONSE is shown at the front of this Section

TYPICAL VOLTAGE-DIVIDER ARRANGEMENT shown under Type 4463 also applies to Type 4464



DIMENSIONS IN INCHES

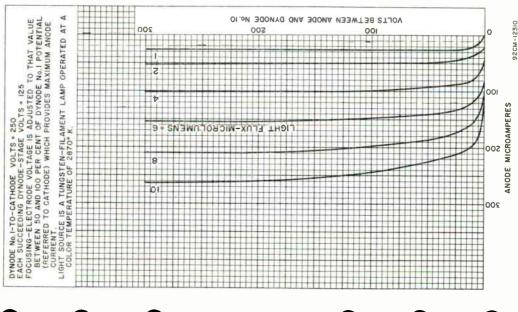
Center line of bulb will not deviate more than 2⁰ in any direction from the perpendicular erected at the center of bottom of the base.

NOTE: Within 2.59" diameter, deviation from flatness of external surface of faceplate will not exceed 0.010"from peak to valley.



RADIO CORPORATION OF AMERICA Electronic Components and Devices, Harrison, N. J.

CHARACTERISTICS ANODE **IVPICAL**



DATA 3 8-64

AMERICA Harrison, N. J.

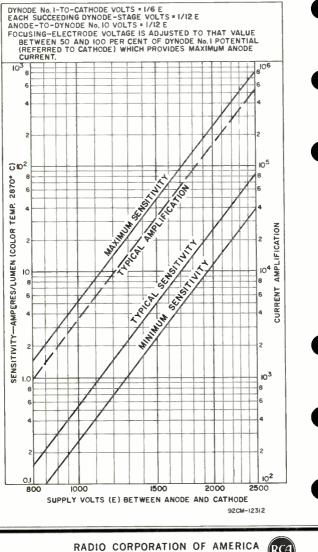
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CORPORATION Components and Devices

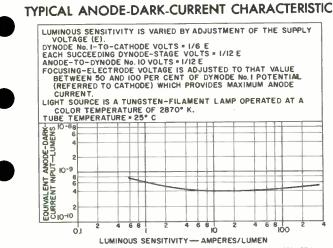
Electronic 1

RADIO

SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS

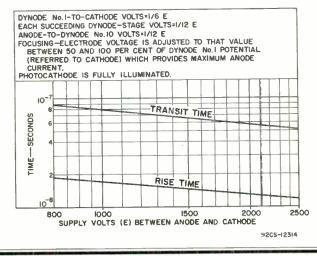


Electronic Components and Devices Harrison, N. J.



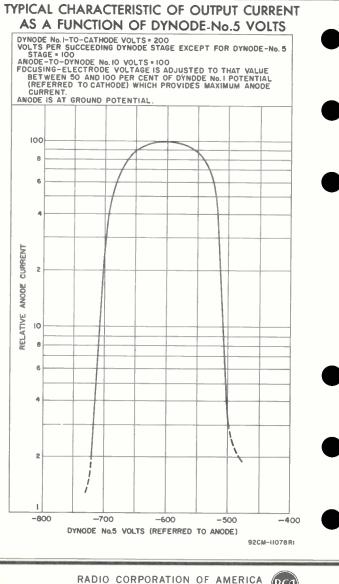
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TYPICAL TIME RESOLUTION CHARACTERISTICS



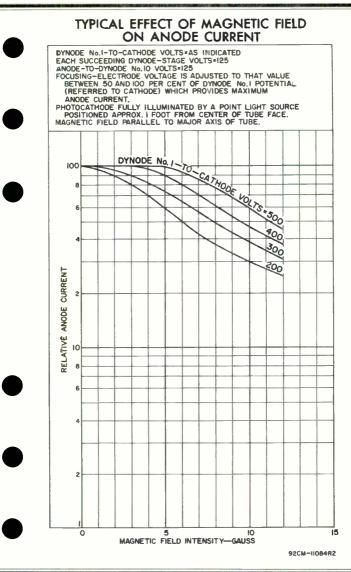


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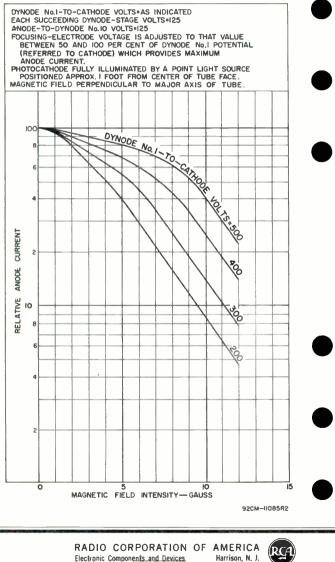
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TYPICAL EFFECT OF MAGNETIC FIELD ON ANODE CURRENT



Multiplier Phototube

S-20 RESPONSE

IO-STAGE, HEAD-ON FLAT-FACEPLATE TYPE VENETIAN-BLIND-TYPE DYNODE STRUCTURE

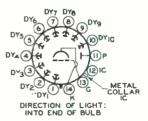
For Photometry, Flying-Spot Scanning, and Scintillation-Counter Equipment Requiring Low-Dark Current and High Sensitivity Over a Wide Spectrum (Blue Visible Well into Near Infrared).

General:

Spectral Response	S-20
Wavelength of Maximum Response 4200	± 500 angstroms
Cathode, Semitransparent K-Na-Cs-	Sb (Multialkalı)
Shape	. Flat, Circular
Minimum area	15.1 sq.in.
Minimum diameter	••••••••••••••••••••••••••••••••••••••
Window	Lime Glass ^a
Index of refraction at 5893 angstroms	1.51
Dynode Material	Copper-Beryllium
Direct Interelectrode Capacitances (Approx.):	
Anode to dynoce No.10	7 pf
Anode to all other electrodes	8.5 pf
Maximum Overall Length	7.69"
Seated Length.	. 6./5" ± 0.19"
Maximum Diameter	5.31"
Operating Position	Any
Weight (Approx.)	1 lb 7 oz
Bulb	J42
Socket Cinch [®] No.3N	114,or equivalent
Magnetic Shield Perfection Mica Co	o.≌,or ∈quivalent
Base	Diheptal 14-Pin
(JEDEC Group 5, Mo.B14-45),	Non-hygroscopic
Basing Designation for BOTTOM VIEW	14AM

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 - Do Not Use Pin 13 - Focusing Electrode Pin 14 - Phototathode Metal Collar- Do Not Use





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Maximum Ratings, Absolute-Naximum Values:

DC Supply										
	anode and									
Between	anode and	dynoo	de No	b.10			300	max.	volts	
	consecut i						300	max.	volts	
	dynode No						600	max.	volts	
	focusing						600	max.	volts	
Average Ar	ode Curre	ntª.					1	max.	ma	
Ambient Te	emperature				• •		85	max.	°C	

Characteristics Range Values:

Under conditions with dc aupply 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. Focusingelectrode voltage is adjusted to that value between 50 and 100 per cent of dynode-No.1 potential (referred to cuthode) which provides maximum anode current.

With E = 2000 volts (Except as noted)

		Min.	Typ.	Max.	
Sensitivity:					
Radiant, at 4200 angstroms Cathode radiant,		-	1.1×10^{4}	-	a/w
at 4200 angstroms.		_	6.8×10^{-2}	_	a/w
Luminous, at 0 cps ^e . Cathode luminous:	•	12	25	240	a/lm
With tungsten light source ^f With blue light	•	1.2×10^{-4}	1.6×10^{-4}	-	a/lm
source ^{g,h} ₩ith red_light	•	5×10^{-8}	-	-	а
source ^{j, k}		3 × 10 ⁻⁷			a
Current Amplification.		-	1.6×10^{5}		
Equivalent Anode-Dark- Current Input at a luminous sensitivity			10		
of 12 a/lm ^m Equivalent Noise Input		_	4 × 10 ⁻¹⁰	1×10^{-9}	lm
Anode-Pulse Rise Time"		_	1.65 × 10 ⁻⁸	- UX 10	lm sec
Electron Transit Time ^P		_	9.3×10 ⁻⁸	_	sec
With E = 1500 volts (E:	cc e	pt as noted	Ð		
		Nin.	Typ.	Max.	
Sensitivity: Radiant, at 4200				_	
angstroms Cathode radiant.	•	• –	2.1×10	.3 _	a/w
at 4200 angstroms. Luminous, at 0 cps ^e .			6.8 × 10 ⁻ 5	-2 _	a/w a/lm
			-		

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



Max.

Cathode luminous:	
With tungsten light source ^f 1.2×10 ⁻⁴ 1.6×10 ⁻⁴ -	a/lm
With blue light source ^{9, h}	а
With red light source ^{],k} 3×10 ⁻⁷	а
Current Amplification 3.1 × 10 ⁴ -	
Equivalent Anode-Dark-	
Current Irput at a	
luminous sensitivity	
of $12 a/lm^{-10} 1 \times 10^{-10}$	-9 lm

Min. Typ.

- Corning No.0080 made by Corning Glass Works, Corning, New York, or equivalent.
- Made by Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago 24, Illinois-
- Magnetic shielding material in the form of foil or tape as available from the Magnetic shield Division, Perfection Mica Company, 1322 Worth Ellston, Chicago 24, Illinois, or equivalent. ~
- Averaged over any interval of 30 seconds maximum.
- Under the following conditions: The light spurce is a tungsten-filament lamp haying a lime-glass envelope. It is operated at a color temperature of 2870 K and a light input of 1 microlumen is used. .
- Under the fallowing 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.
- upder the following conditions: Light incident on the cathode is transmitted through a blue filter (corning C.S. No.5-58 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 20706 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. g
- See Spectral Characteristic of 2870⁰ I Light Source and Spectral Char-acteristic of Light from 2870⁰ I Source after passing through Indicated Blue Pilter at front of this Section.
- Under the following conditions: Light incident on the cathode is transmitted through a red filter (Corning C.S. No.2-62, 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.
- k See Spectral Characteristic of 2870° X Light Source and Spectral Characteristic of Light from 2870° K Source after passing through Indicated Red Piliter at front of this Section.
- At a tube temperature of 25⁰ C. Dark current may be reduced by use of a refrigerant.
- Measured between 10 per cent and 90 per cent of maximum ampde-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.
- The electrom transit time is the time irterval between the arrival of a delta function light pulse at the entrance window of she tube and the time at which the output pulse at the anode terminal reaches peak amplitude. The transit time is measwred under conditions with the incident light fully illuminating the photocathode. 0

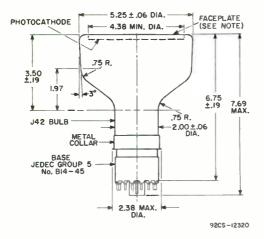
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 RESPONSE is shown at the front of this Section

TYPICAL VOLTAGE-DIVIDER ARRANGEMENT shown under Type 4463 also applies to Type 4465

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DATA 2 8-64





DIMENSIONS IN INCHES

Center line of bulb will not deviate more than 20 in any direction from the perpendicular erected at the center of bottom of the base.

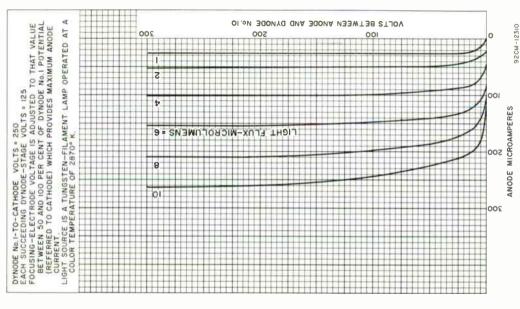
NOTE: Within 4.38" diameter, deviation from flatness of external surface of faceplate will not exceed 0.010" from peak to valley.



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CHARACTERISTICS ANODE **TYPICAL**



A 3 DATA 8-6

∢

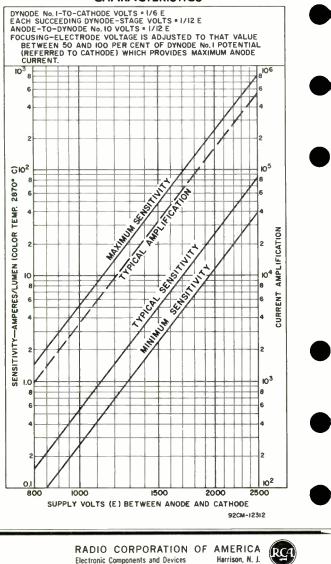
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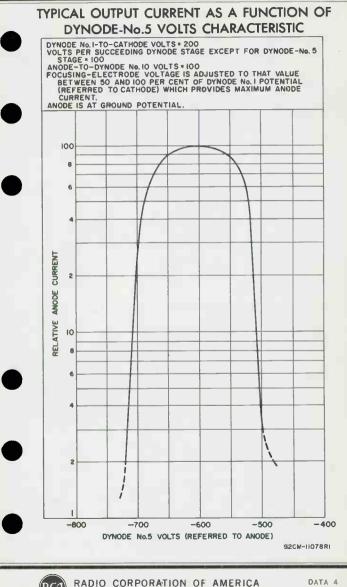
AMERIC. Harrison, 1 LL. ō CORPORATION and Devices Components



RADIO Electronic

SENSITIVITY AND CURRENT AMPLIFICATION CHARACTERISTICS



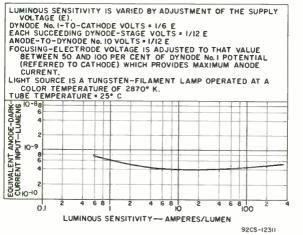


DATA 4 8-64

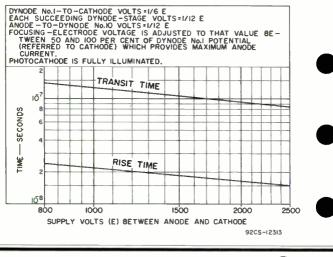
Electronic Components and Devices

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TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



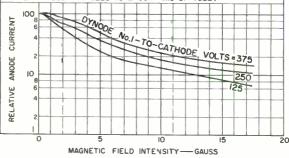
TYPICAL TIME RESOLUTION CHARACTERISTICS



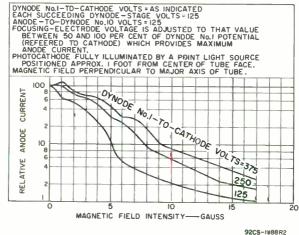
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TYPICAL EFFECT OF MAGNETIC FIELD ON ANODE CURRENT CHARACTERISTIC

BETWEEN 50 AND 00 PER CENT OF DYNODE NAL PDTENTIAL (REFERED TO CATHODE) WHICH PROVDES MAXIMUM ANODE CURRENT. PHOTOCATHODE FULLY ILLUMINATED BY A PDINT LIGHT SOURCE POSITIONED APPROX.IFOOT FROM CENTER OF TUBE FACE. MAGNETIC FIELD PARALLEL TO MAJOR AXIS OF TUBE.



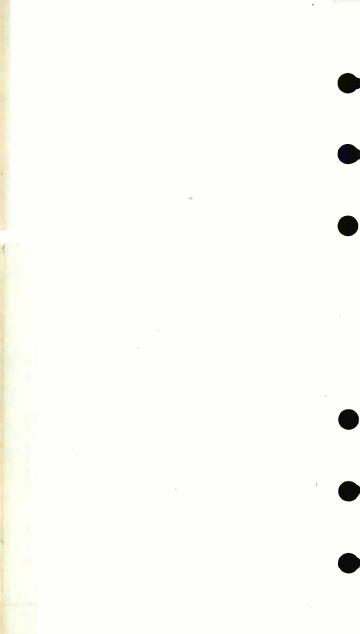
92C5-1187R2





RADIO CORPORATION OF AMERICA Electronic Components and Devices World Partice History 263-1866 82

DATA 5 8-64



World Radio History

Image-Intensifier	Orthicon
COMBINED IMAGE-CONVERTER & IMAGE ORTHICON THIN FILM SEMICONDUCTIVE TARGET	SECTIONS
For Extremely Low-Light Level Television	Cameras
GENERAL	
Maximum Overall Length	5.Cl6 in operated in a up nor in any th the base up ical.
Spectral Response	500 angstroms s max diagonal
Focusing-Coil Length	0.6 A Magnetic Magnetic or equivalent . 2-3/8 in Part No.0Y-1, ^b or equivalent 5 in Part No.0F-2, ^b or equivalent 10 in Part No.0A-3, ^b or equivalent
Shoulder Base: Keyed	24
Jumbo Annular 7-Pin Pin 1 - Gr.d No.6 Pin 2 - second Photocathode Pin 3 - Do Not Use Pin 4 - Do Not Use Pin 5 - Grid No.5 Pin 6 - Target Pir 7 - Do Not Use Direction of Light:	
to Large End	ofTube
RADIO CORPORATION OF AMERICA Electronic Components and Petrickinstory Harrison, N. J.	FATA 1 7-65

End Base: Small-Shell Diheptal 14-Pin (JEDEC No.B14-4	5)	
Pin 1 - HeaterPin 8 - Dynode No.5Pin 2 - Grid No.4Pin 9 - Dynode No.3Pin 3 - Grid No.3Pin 10 - Dynode No.1, GridPin 4 - Do Not UsePin 11 - Do Not UsePin 5 - Dynode No.2Pin 12 - Gri3 No.1Pin 6 - Dynode No.4Pin 13 - CathodePin 7 - AnodePin 14 - Heater	No.2	
MAXIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES		
Maximum Continuous Operating Photocathode Illumination Ix 10 ⁻⁶ Storage-Temperature Range 0 to 50 Image-Conterter Section	fc °C	
Supply Voltage ^d	000 V	
Image-Orthicon Section		
Second Photocathode Voltage	v v	
Fositive Value 10 Megative Value 10 Grid-No.5 Voltage 150 Grid-No.4 Voltage 300 Grid-No.3 Voltage 400 Grid-No.2 & Dynode-No.1 Voltage 350	A A A A A	
Grid-No.I Voltage legative bias value	V V	
Peak Heater-Cathode Voltage I25 Heater negative with respect to cathode. I0 Anode-Supply Voltage®. I350 Voltage Per Multiplier Stage. 350	V V V	
Operating Temperature 50 Of any part of bulb	n °C	
Between target section and any part hotter than image—orthicon target section	°C	
TYPICAL OPERATING VALUES		
Image-Converter Section	-	
Supply Voltage ⁴	000 V 🔴	
Second Photocathode Voltage		

DATA I

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Dynode-No.2 Voltage	600	· V
Dynode-No.3 Voltage	800	V
Dynode-No.4 Voltage	1000	V
Dynode-No.5 Voltage	1200	٧
Anode Voltage	1250	V
Target-Temperature Range	35 to 45	°c
Minimum Peak-to-Peak Blanking Voltage	5	V
Field Strength at Center of Focusing Coilh	75	G
Field Strength of Alignment Coil	0 to 3	G

- ^a Made by Cinch Manufacturing Co., 1026 Nouth Homan Ave., Chicago 24, Illinois.
- b Made by Cleveland Electronics Inc., 1974 East 61st Street, Cleveland, Ohio.
- C Image-Converter Power-Supply Connector Asiembly (Three Leads)- 1. Short Red Lead — To ground of image-orthicon-section power supply. 2. Long Black Lead — To negative high-voltage treminal of image-convertersection power supply and fitted with Alden Part No.8111W or equivalent. 3. Long Red Lead — To positive (ground) high-voltage terminal of image-connector-section power supply and fitted with Alden Part No.8111M, or equivalent.
- d An optimum value of image-converter-section supply voltage is supplied with each individual 4470.
- Consider voltage values are shown under Typical Operating Values.
- f Normal setting of target voltage is +2 V from target cutoff. The target supply voltage should be adjustable from -3 to +5 V.
- 9 Adjust to give the most uniformly shaded picture near maximus signal. h Direction of current should be such that a rorth-seeking pole is attracted to the image end of the focusing coil, with indicator located outside of and at the image end of the focusing coil.

OPERATING CONSIDERATIONS

When the beam current is adjusted to just dircharge the highlights of the scene being televised, the amount of signal current produced is nearly directly proportional to the light level intensity. Noise, on the other hand, varies as the square root of the scanning-beam current employed. The 4470, therefore, maybe operated over a wide range of signal current, or scene illumination levels, without a change in signal-tonoise ratio of the video signal that is in direct proportion. However, attention must be paid to those parameters affecting the amount of beam current used during tube operation.

When the 4470 is used in image-orthicon cameras the following instructions and camera modifications should be followed:

1. The camera should be of good velectrical and mechanical design.

2. A high-voltage source must be provided to supply the necessary voltage for the image-converter section of the 4470. The positive terminal of this voltage supply should be grounded and be adjustable from -4kV to -20kV for optimum operation of the tube. The image-converter section presents a load of approximately 20,000 megohns to the power supply.

3. A spherical corrective lens system, such as "Super-Farron F/0.87", - manufactured by the Farrand Optical Co., Inc., Bronx Blvd., and East 238th St., New York 70, N.Y. - or equivalent, should be employed with the first photo-catFode (image-converter section) to minimize "pin cushioning" effects.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. 4. The video signal should be passed through a 2 megacycle low-pass filter to obtain optimum signal-to-noise ratio at threshold light levels.

5. Support for the image-converter section of the 4470 must be provided. Such support may be provided by any convenient method that does not introduce undue pressure to the "potting" material and thereby reduces its voltage-isolation properties. In addition, the mounting arrangement should not introduce torsion or forces that are perpendicular to the major axis of the tube. Any tube retaining plug or lens housing placed at the image-converter section (front end) of tube should be made of high-grade insulating material.

SET-UP PROCEDURE

Follow carefully the set-up procedure to obtain optimum performance from the 4470. Care must be exercised at all times to prevent the inducrient exposure of the 4470 to direct illumination from the sun or other bright light sources. The maximum first photocathode illumination level should not exceed $1 \ge 10^{-6}$ footcandle.

Insert the 4470 in its socket with all camera voltages in the "off" position. Before applying the heater voltage make sure that no light is incident on the photocathode. i.e., make sure that all camera doors and light shields are closed and that the camera lens is capped. Allow warm-up for 2 minutes with only heater voltage applied.

Check the camera lens system for the proper combination of neutral-density filter and lens aperture that limits the illumiwation on the first photocathode to 1×10^{-6} footcandle from a test chart or set-up scene. After the lens system has been so adjusted, uncap the lens. Apply specified image-converter voltage to that section.

Apply scanning and image-orthicon-section voltage as indicated under Typical Operating Values. The image-orthicon beam control (grid No.1) should be in its most negative position and that the target-voltage control adjusted to -3 volts, or its most negative position. Adjust deflecting circuits for maximum output to assure overscanning of the target.

Grid No.5 is used to control the beam landing on the target and consequently the uniformity of signal output. Adjust grid-No.5 voltage control to produce a picture that has most uniform shading from center to edge with the lens iris adjusted to permit operation at the highest light level involved in the application. Grid-No.5 voltage should be as high as possible consistent with uniform shading. Grid No.3 facilitates a more complete collection by dynode No.2 of the secondaries from dynode No.1. Adjust grid-No.3 voltage control to produce maximum signal output and uniformity.

With a test pattern consisting of a straight line centered on the face of the 4470, adjust grid-No.6 and photocathode voltage to produce a sharply focused straight line on the monitor. Improper adjustment of the grid-No.6 voltage control will result in the straight-line pattern having a slight S-shape.





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Scanning may be adjusted until the target just fills the monitor picture.

The above adjustments constitute a rough setup of the 4470. Final adjustments include realignment of the beam with the lens capped. Beam alignment is necessary after each change of the grid-No.5 voltage control and sometimes after each adjustment of the grid-No.3 voltage control.

With the camera operating at the desired illumination level, slowly decrease the beam current by adjusting the grid-No.l voltage control to the point where the beam is just sufficient to discharge the highlights of the picture. Each change of scene illumination should be accompanized by appropriate changes in the beam current and amplifier gain to obtain the best contrast and signal-to-noise ratio for each new scene condition.

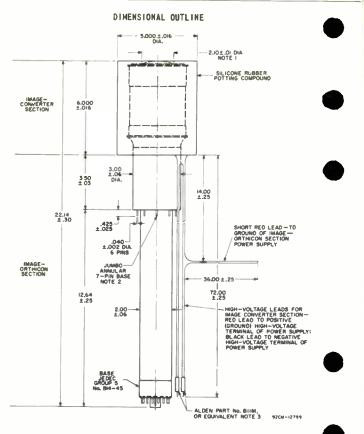
For s*and-by operation, adjust scanning for over-scan, cap camera lens, turn off image-converter voltage, #nd keep the beam and target voltage on.

To turn the 4470 off, put the camera in the standby operation described above, set the target voltage to -2 volts, or its most negative position, turn the beam control 'grid No.1) to its most negative position and immediately thereafter turn off all other image-orthicon voltages. To turn tube on again, repeat the set-up procedure.

> SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 RESPONSE

> > is shown at front of this section





DIMENSIONS IN INCHES

Note 1: The window area of the first photocathode is concentric with the image-converter section cylinder, and the image-orthicon section cylinders within 0.100" of the major axis of the tube.

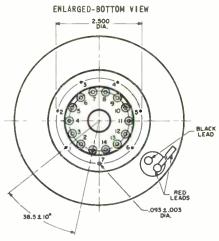
Note 2: The index of the annular base and the key of the diheptal base are aligned within ± 7° with reference to the annular index pin.

Note 3: Alden Products Company, 9140 North Main Street, Brockton 64, Mass.



RADIO CORPORATION OF AMERICA

Electronic Components and Devices solution Harrison, N. J.

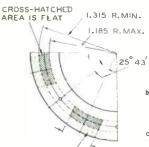


DIMENSIONS IN INCHES

ANNULAR-BASE GAUGE

Annular variations between pins as well as eccentricity of neck cylinder with respect to photocathode cylinder are held to tolerances such that pins and neck cylinder will fit flat-plate gauge

Detail of Bottom View of Jimbo Annular Base



SEE NOTE + .5 MIN.

DIMENSIONS IN INCHES

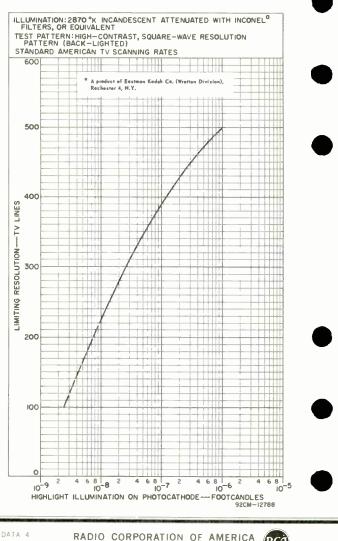
Note 1: Dotted area is flat or extends toward diheptal-base end of tube by 0.060" max. with:

- a. Six holes having drameter of 0.065" ± 0.001" and one hole naving drameter of 0.150" ± 0.001". All holes have depth of 0.265" ± 0.001". The six 0.065" holes are en'arged by 15° taper to depth of 0.047".
 5 All holes are spaced at angles of 51°26' ± 5' on circle drameter of 2.500" ± 0.001".
- b. Seven stops having 'eight of 0.187" ± 0.001", centered between pin holes, to bear against flat areas of base.
- c. Rim extending out aminimum of 0.125" from 2.812" diameter and having height of 0.126" ± 0.001".
- d. Neck-cylinder clearance hole having diameter of 2.200" ± r 0.001".



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 4 7-65

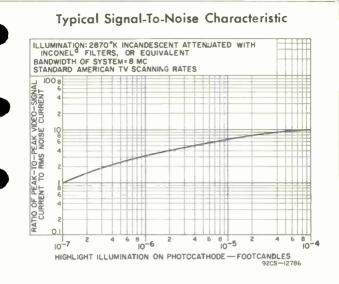
Typical Limiting Resolution Characteristic



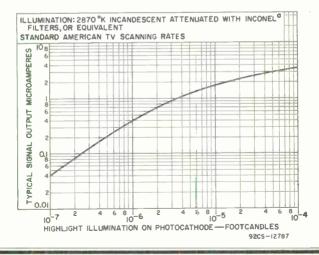
Electronic Components and Devices

World Radio History

Harrison, N. J.



Typical Light Transfer Characteristic





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World Radio History

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4471, 4472

Photomultiplier Tubes^a

9-STAGE, SIDE-ON TYPES

S-4 RESPONSE

CONTROLLED SENSITIVITY ABOVE WAVELENGTH OF 5800Å

The 4471 and 4472 are the same as the $931\mathbb{A}$ except for the following items:

Characteristics Range Values:

With E = 1000 volts

Sensitivity:								Min.	$Ty\phi$.	Max.	
Luminous, at "Red-to-White"	C cps ^b . Ratio:		•	•	•	-		10	100	600	a/1m
4471		 :	-	:	:	:	:	5 7		_	% %

Alternat- designation for Multiplier Pho otube.

^b Under the following conditions: The light source is a tungstem-filament lamp having a lime-glass envelope. It is operated at a color temperature of .870 × and a light imput of 10 microlumens is used.

OPERATING CONSIDERATIONS

The luminous-sensitivity ratings of the 4471 and 4472 are higher, and their sensitivities above the wavelength of 5800 angstroms are controlled. This control is important in applications where a high level of sensitivity in the red region of the spectral-response characteristic is required. The degree of this controlled sensitivity in the red region is specified by a "red-to-white" ratio of anode currents. Anode current is measured first using atungsten-lamp source, and then measured with a red filter interposed between the light source and the phototube. The "red-to-white" ratio is greater than 5% for the 4471, and greater than 7% for the 4472.

The auode current comprising the "white" portion of this ratio is measured with a light input of 10 microlemens. The light source is a tungsten-filam⊬nt lamp having a lime-glass envelope. It is operated at a color t⊭mperature of 2870⁵ K.

The anode current comprising the "red" portion of the ratio is measured under conditions identical with the "white" measurement except tHat the light input of 10 microlumens is transmitted through a red filter (Corning C.S. No.2-112--manufactured by the Corning Glass Works, Corning, N.Y., or equivalent) whick has the following character:stics: the transmittance of all wavelergths from 3000 to 579C angstroms is less than 0.5%; the 37% transmittance point lies between 603D and 6070 angstroms; the transmittance from 64C0 to 7000 angstroms is greater than 80%; and the difference between the wavelengths where transmittance is 15% and 60% is not greater than 150 angs-roms.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

DATA 5-65

Photomultiplier Tube^a

17

Tub No



9-STAGE, SIDE-ON TYPE

S-4 RESPONSE

CONTROLLED SENSITIVITY ABOVE WAVELENGTH OF 5800Å

The 4473 is the set the 1921 would for the following items:

Characteristics Range Values:

With E = 1000 volts

	aren. The	7 66
Sen itivity:		
Luminous, at cps ^b	40 100	8.0: a/lm
"Red-to-White" Fitio	7 –	- 5

Alt rn t delignat on for Multiplier Piototube.

Under the following conditions: The light source is a tunisten-film of limp having glime glass envelope. It is perated at a covor smorthure of 28 no K and a light imput of 10 \pm is out does is used.

OPERATING CONSIDERATIONS

Sensitivity of the 4473 above the wavelength of 5000 angstroms is controlled. This control is important in applications where a high-level of sensitivity in the red region of the spectral-response characteristic is required. The degree of this controlled sensitivity in the red region is specified by a "red-to-white" ratio of anode currents. Anode current is measured first using a tungsten-lamp source, and them measured with a red filter interposed between the light source and phototube. The "red-to-white" ratio is greater than 7% for the 4473.

The anode current comprising the "white" portion of this ratio is measured with a light input of 10 microlumens. The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 2370° K.

The anode current comprising the "rwd" portion of the ratio is measured under conditions identical with the "white' measurement except that the light input of 10 microlumens is transmitted through a red filter (Corning C.S. to. 2-112--manufactured by the Corning Glass Works, Corning, N.Y., or equivalent) which has the following characteristics: the transmittance of all wavelengths from 3000 to 5790 angstroms is 'ess than 0.55; the 37% transmittance point lies between 603C and 6070 angstroms; the transmittance from 6400 to 7000 angstroms is greater than 80%; and the difference between the wavel ngths where transmittance is 1.5 and 60% is not greater than 150 angstroms.



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DATA 5-65

World Radio History

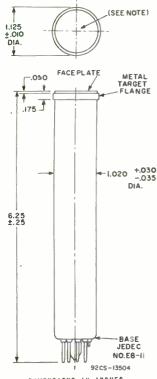
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Vidicons

For Televising L and Other Clos Broadcast-Quali	ed-Circuit T	V Applic	itions W	here
The 4478 and 4488 a fallowing items:	re the same as GENERAL	the 773	5Bexcept	for
Photoconductive Layer Maximum useful dia image (4x3 aspect	gonal of rectar	igular		
J P 1	OPERATION AND PE	ERFORMANCI	DATA	
		<u>478</u>	4488	
Grid-No.1 Voltage fo Cutoff ^b Limiting Resolution ^c	45	to-110 -	45 to-100)
of Picture Typical value Minimum value		700 600	700 625	TV 11 TV 11
Average-sensitivit	y operation — 1	. O footca	dle on fac	eplat
	<u>_</u>	1478	4488	
Faceplate Illuminati (Highlight) Target Voltage ^{d,e} .	10	1.0 to 70 .035	1.0 12 to 53 0.030	
Dark Current [∓] Signal-Output Curren	t9	.005		
Signal-Output Curren Typical	t ^g 	.265	0.270	
Signal-Output Curren Typical Minimum ^a Orientation of quality the horizontal scanis the tube axis and shor	t9 	.265 .240	0.270 0.250	ained ng thr
Signal-Output Curren Typical Minimum Orientation of quality the horizontal scan is the tube sxis and shor With no blanking volte Amplitude response val type 7735B.	t9 0 rectangle - Prop easentially para t pin. ge on grid No.1.	265 240 Der prienta llel to the	0.270 0.250 tion is obt	ng thr
Signal-Output Curren Typical Minimum a Orientation of quality the horizontal scanin the tube axis and shor b With no blanking volta G Amplitude response val type 77358. The target voltage for	t ⁹ rectangle — Prop essentially paral t pin. ige on grid No.1. ues will be corr r each tube must	2.265 2.240 Der prienta Liel to the respondingl	0.270 0.250 tion is obt plane passi	ng thr n thos
Signal-Output Curren Typical Minimum Orientation of quality the horizontal scanias the tube axias and ahor With no blanking volta Capiltude response val type 77359. The target voltage foo gives the desired open	t9 0 rectangle Prop easentially parel t pin. ige on grid No.1. ues will be corr r each tube must ating aigenal curr	2.265 0.240 Der prienta Liel to the respondingi be adjusted rent.	0.270 0.250 tion is obt plane passi y lower that to that y	ng thr n thos alue w
Signal-Output Curren Typical Minimum a Orientation of quality the horizontal scanin the tube axis and shor b With no blanking volta G Amplitude response val type 77358. The target voltage for	t ^g 	265 240 ver prienta lel to the espondingl be adjusted rent. se serves o / encounter tremely li t signal i ning veloci	0.270 0.250 tion is obt plane passi y lower that to that y hly to illu ed. proportio ty produce	ng thr n thos alue w strate ng for nal to s + bl.

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 10-65

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

Note: Type 4488 has portion of face masked similar to type 7735B.

SPURIOUS SIGNAL TEST

4478

For scanned area of 1/2" x 3/8"

Equivalent Number of Raster Lines	Zone Allowed Spots	Zone 2 Allowed Spots
over 6	0	0
6 but not including 4	0	2
4 but not including 1	3	4
1 or less	footnote	footnote
	h	h

4488

For scanned area of 1/2" x 3/8"

Equivalent Number of Raster Lines	Zone Allowed Spots	Zone 2 Allowed Spots
over 4	0	0
4 but not including 3	0	1
3 but not including 1	2	3
1 or less	footnote h	footnote h

Minimum separation between any 2 spots greater than 1 raster line is limited to 16 raster lines.

^h Spots of this size are allowed unless concentration causes a smudged appearance.



DATA I 3-61

Gas Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

General:	
Spectral Response	
Wavelength of Maximum Response	
Cathode:	
Shape	Semicylindrical
Minimum projected length*	
Minimum projected width ^a	
Direct Interelectrode Capacitan	ce(Approx.) 2.6 µµf
Maximum Overall Length	
Maximum Seated Length	
Seated Length to Center of Cath	ode 1-5/8" ± 3/32"
Maximum Diameter	· · · · · · · · · · · · · · · 1–9/32" *
Operating Position	Any
Weight (Approx.)	· · · · · · · · · · · · 0.9 oz -
Bulb	.Cinch No.8JM-1, or equivalent -
Rase Intermediate_Sh	ell Octal 5-Pin Arrangement 1, -
base	(JEDEC No. B5-10)
Basing Designation for BOTTOM	
DIRECTION	
DIRECTION	OF LIGHT
Pin 1-No Connection	Pin 6 - No Connection
Pin 2-No Connection	Pin 8 - Photocathode
Pin 4 – Anode	- Printo-Photocathode
a	· . /
0	(0)
Maximum Ratings, Absolute-Naxim	v Faluest
ANODE-SUPPLY VOLTAGE	ating 1 Rating 11
	0 max. 100 max. volts
AVERAGE CATHODE-CURRENT	VOIDA. 100 Max. VOILS
the second se	0 max. 30 max. μa/sq.in.
AVERAGE CATHODE CURRENT ^b	6 max. 3 max. μα
AMBIENT TEMPERATURE	'5 max. 75 max. °C
Characteristics:	
	+
With an anode-supp	ly voltage of go
volts unless othe	
Constatuteur	Nin. Nedian Nax.
Sensitivity:	
Radiant, at 4000 angstroms.	0.12
Luminous: C	- 0.13 - amp/watt
At 0 cps	75 135 205 ua/lumen
At 5000 cps	$-124 - \mu a/lumen$
	$-$ 124 $ \mu a/lumen$ $-$ 108 $ \mu a/lumen$
At 5000 cps	$-124 - \mu a/lumen$

RADIO CORPORATION OF AMERICA

Harrison, N. J.

Electron Tube Division

Gas Amplification Factor ^d Anode Dark Current	Nin. Ned: 	ian Nax. 5.5 0.05	μа
Minimum Circuit Values: With an anode-supply voltage of DC Load Resistance: For dc currents above	80 or less	100	volts
3 µa	0.1 min.	-105	megohm
3 µa	0 min.	-	megohms
1 μa	-	2.5 min.	megohms
1 μa	-	0.1 min.	megohm

On plane perpendicular to indicated direction of incident light.

Averaged over any interval of 30 seconds maximum.

- Averaged user any interval of your sections maximum. C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000 and 10.000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.
- Value. d The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts, in each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 28700 K. the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE

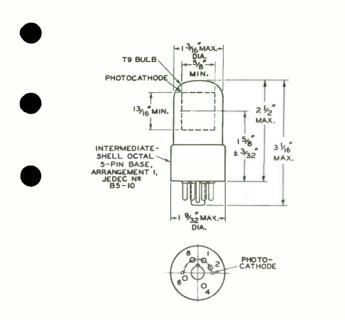
and

FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

are shown at the front of this section



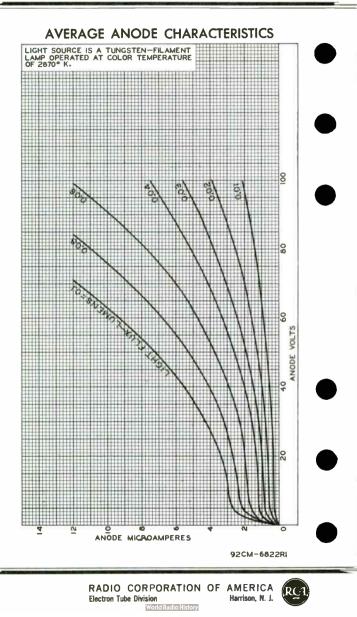
RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



92CM-6137R3



RADIO CORPORATION OF AMERICA Electron Tube Division Herrison, N, J. DATA 2 3-61





SBEE

GAS PHOTOTUBE

CARTRIDGE TYPE WITH S-4 RESPONSE

For sound reproduction involving a dye-image sound track in conjunction with an incandescent light source

h	4.7	7 4
υ	A I	IA.

	General:		
	Spectral Response		
	Wavelength of Maximum Response 4000 + 50	00 arastroms	
	Cathode:	,	
	Shape	icvlindrical	
		5/8"	
	Minimum projected width	1/2"	
	Direct Interelectrode Capacitance.		
	Overall Length	/30H = 1/16H	
	Seated Length.	1201 + 1/201	-
	Length from Center of Useful Cathode Area		
	to Plane A-A' (See Dimensional Outline) 11.	1101 1 1 1101	
1		0.890"	
	Weight (Approx.)		+
	Mounting Position	Any	
	Terminals:	FF	-
	Recessed cap JE		
į	Protruding cap JE		
	Basing Designation	2AQ	-
	-		
	Recessed Protruding	. 1	
	Recessed Anode	Cathode	
	Cap J Cap	1	
	$\langle \uparrow \bullet \rangle$		
	DIRECTION OF LIGHT: INTO CONCAVE SIDE		
	INTO CONCAVE SIDE OF CATHODE		
	Maximum Ratings, Absolute Values;		
	(ANODE-SUPPLY VOLTAGE (DC or Peak AC) . 100 max.	volts	
		µamp/sq.in.	+
	AVERAGE CATHODE CURRENT ^O 2 max.	μamp	
	AMBIENT TEMPERATURE	°d	
	Characteristics, At go Volts on Anode:		
	Nin. Nedian Nax.		
	Sensitivity:		
	Radiant, at		
	4000 angstroms – 0.12 –	µamp/µwatt	-
	Luminous:		
	At O cps 80 120 175	µamp/lumen	
	At 5000 cps 110 -	_µamp/lumen	
	At 10000 cps 96 -	µamp/lumen	
	Gas Amplification Factor 5.5		
	Anode Dark Current		
	at 25 ^o C	µалпр	
	* On plane perpendicular to indicated directior of incident	Licht	
		ates a change.	
l			
	12-56 TUBE DIVISION	DATA	

TUBE DIVISION

5582 5582 GAS PHOTOTUBE Minimum Circuit Values: With anode-supply voltage of 80 or less 100 volts DC Load Resistance: For do currents above 0.1 min. megohm 3 µато.... For dc currents below 0 min. $3 \mu \text{amp} \dots$ megohm For dc currents above 2.5 min. megohms 1 µamp For dc currents below 0.1 min. meaohm 1 μamp . . Averaged over any interval of 30 seconds maximum. This doubled when anode-supply voltage is limited to 80 volts. This value may be For conditions where the light source is a tungsten-filament lamp oper-ated at a color temperature of 28700k. A dc anode supply of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurements, a light input of 0.1 lumen is used. For the 5000-and 10000-cycle measure-ments, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean. SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response and FREQUENCY-RESPONSE CHARACTERISTICS of Gas Phototubes are shown at the front of this Section -1890 MAX-5/16 R. -112" .380"±.004 406"±.010" .188"±.015" ANODE TERMINAL CAP 1 HOTO-13/32 5/8 121/32 ± 1/32 MIN. 1/16 ± 1/16 м ł ±1/16 ×ŧ

> A-A'=PLANE PERPENDICULAR TO AXIS OF TUBE 92CM-4818R3

J41" ±.047"

.03(*±.015"

.031" ±.015

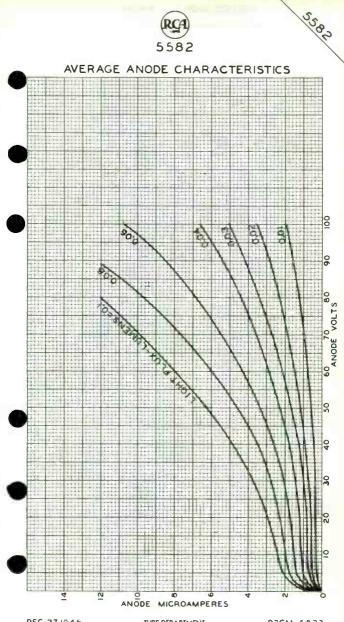
375"±.010"

-,890"MAX-+

PHOTOCATHODE

CAP JETEC NºJI-24 DIRECTION OF LIGHT

14 DIA



DEC.27,1946

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA HARRISON, NEW MERSEY 92CM-6823

Gas Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

General:

	Spectral Response
)	Cathode: ShapeSemicylindrical
	Minimum projected length ^a
	Direct Interelectrode Capacitance (Approx.)
	Maximum Overall Length
	Seated Length to Center of Cathode 1-1/4" ± 3/32"
	Maximum Diameter
	Weight (Approx.)
	Socket Amphenol No.78S3S-T, or equivalent -
	Base Small-Shell Peewee 3-Pin (JEDEC No.A3-1) → Basing Designation for BOTTOM VIEW
	DIRECTION OF LIGHT
	Ś
	Pin 1 - No Consection Pin 2 Photosethods

tocathode

Maximum Ratings, Absolute-Naximum Values:

Rating I Rating II

ANODE-SUPPLY VOLTAGE (DC or Peak AC) AVERAGE CATHODE-CURRENT	80	max.	100	max.	volts
DENSITY A AVERAGE CATHODE CURRENT AMBIENT TEMPERATURE.	4	max. max. max.	2	max. max. max.	μa

Characteristics:

Pin 2 - Anode

With an anode-supply voltage of 90 valts unless otherwise specified

Nin. Median Max.

Sensitivity: Radiant, at 4000 angstroms Luminous: ^c	-	0.13	-	amp/watt
At 0 cps	-	135 124 108	205 -	µa/lumen µa/lumen µa/lumen

-Indicates a change.



RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

	Min.	Median	n Max.		
Gas Amplification Factord	-	-	5.5		_
Anode Dark Current at 25° C	-	-	0.05	μa	
Minimum Circuit Values: With an anode-supply					
voltage of	80 or	less	100	volts	
DC Load Resistance: For dc currents above					
β μa	0.1 m	nin.	-	megohm	
3 μa	0 п	nin.	-	megohms	<u> </u>
For dc currents above 1 µa For dc currents below	-	;	2.5 min.	megohms	
1 μa	-	(0.1 min.	megohm	

^a On plane perpendicular to indicated direction of incident light.

Averaged over any interval of 30 seconds maximum.

For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000 and 9,000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.

The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts. In each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE

and

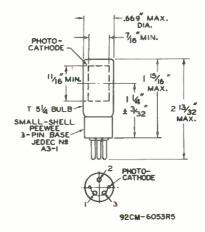
FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

are shown at the front of this section

AVERAGE-ANODE-CHARACTERISTICS CURVE shown under Type 5581 also applies to the 5583



RADIO CORPORATION OF AMERICA Electron Tube Division Marrison, N. J.





RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 2 3-61

Vacuum Phototube

COMPOSITE-ANDDE-CATHODE, SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

DATA	
General:	
Spectral Response	
Wavelength of Maximum Response 4000 ± 5CO angstroms	
Cathode:	
Shape	
Minimum projected length ^a	
Minimum projected width ^a	
Direct Interelectrode Capacitances (Approx.): Between base pins 4 and 8 (C ₁)	
Balancing capacitance $(C_2)^b$	
Capacitance Difference between C_1 and C_2 C_3 max. $\mu\mu$ f	
Maximum Overail Length	
Maximum Seated Length	
Seated Length to Center of Cathode 1-5/8" ± 3/32"	
Maximum D'ameter	
Operating Position	
Weight (Approx.)	-
Bulb	
Base Intermediate-She'l Octal 5-Pin, Arrangement 1	
(JEDEC Group 1, No.85-10) Non-hygroscopic	
Basing Designation for BOTTOM VIEW	
DIRECTION OF LIGHT	
Pin 1 – No Internal	
Connection Connection	
Pin 2 - Balancing	
Capacitance C. Photocathode	
Pin 4 – Anode or Photo-	
Cathode Cathode	
Maximum Ratings, Absolute-Naximum Values:	-
ANODE-SUPPLY VOLTAGE (DC or Peak AC) 250 max. volts	
AVERAGE CATHCDE-CURRENT DENSITYC 30 max. µa/sq.in.	
AVERAGE CATHODE CURRENT ^c	
AMBIENT TEMPERATURE	
Characteristics:	-
With an anode-supply voltage of 250 volts	
Nin. Nedian Nac.	
Sensitivity:	
Radiant, at 4400 angstroms 0.044 - amp/watt	
Luminous ^d	
Ratio of Cathode Luminous Sensitivities	
Anode Dark Current at 25° C 0.01 µa	
→Indicates a change,	

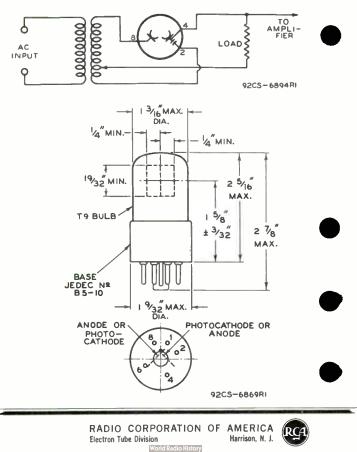
RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 3-62

- On plane perpendicular to indicated direction of incident light.
- b Measured between pins 2 and 4.
- c Averaged over any interval of 30 seconds maximum.

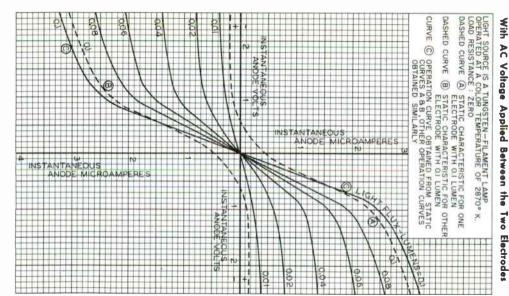
d For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A 1-megohm load resistor and a light input of 0.02 lumen are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE is shown at the front of this section

TYPICAL CIRCUIT

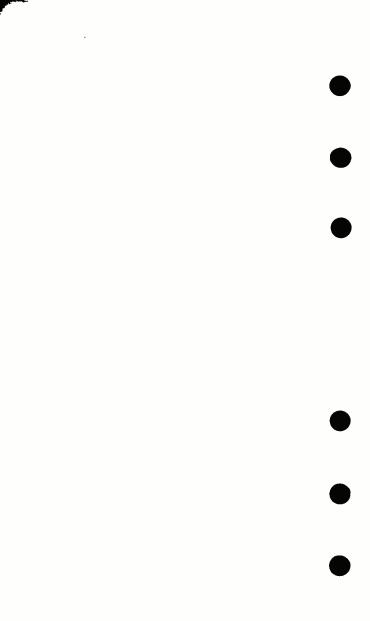


PIC AC Voltage ≥ Q ĔRA Applied OILO Between ž CHAR 7 > -10 ¥0 H ERISTICS Electrodes



92CM~ 6895R





Vacuum Phototube

SIDE-ON TYPE HAVING S-4 RESPONSE

DATA

	General:
	Spectral Response
)	Shape
	Minimum projected width ^a
	Maximum Overall Length
	Maximum Seated Length
	Seated Length to Center of Cathode 1-5/8" ± 3/32"
	Maximum Dianeter
	Weight (Approx.).
	Bulb,
	Socket Cinch No.8JM-1. or equivalent 🖛
	Base Intermediate-Shell Octal 5-Pir, Arrangement 1
	(J£DEC Group 1, No.B5-10) Basing Designation for BOTTOM VIEW
	DIRECTION OF LIGHT
	Pin 1 - No Internal Connection Pin 2 - No Internal Connection 2
	(1) = (8)

Maximum Ratings, Absolute-Maximum Values:

ANODE-SUPPLY VOLTAGE		
(DC or Peak AC)		volts
AVERAGE CATHODE-CURRENT DENSITY"		µa/sq. in.
AVERAGE CATHODE CURRENT ^b	5 max.	μa °C
AMBIENT TEMPERATURE	/5 max.	C

Characteristics:

With an anode-supply voltage of 250 volts

Nin.	Median	Nax.
<i>n</i> + <i>n</i> +	neulun	nax.

Sensitivity:				
Radiant, at 4000 angstroms.	_	D.044	_	amp/watt
Luminous ^e		45	100	µa/lumen
Anode Dark Current at 25° C .	-	-	0.25	μā



-Indicates a change.

- a or plane perpendicular to indicated direction of incident light.
- ^b Averaged over any interval of 30 seconds maximum.
- For conditions where the light source is a lungsten-filament lamp operated at a color temperature of 2870° K. A 1-megohm load resistor and a light input of 0.1 lumen are used.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE is shown at front of this section

DIMENSIONAL OUTLINE shown under Type 5581 also applies to the 5653

AVERAGE-ANODE-CHARACTERISTICS CURVE shown under Type 929 also applies to the 5653

> RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History



Multiplier Phototube



10-STAGE, HEAD-ON, CURVED-FACEPLATE TYPE S-11 RESPONSE 1-11/16" Minimum Diameter Curved Photocathode, For Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources in Scintillation Counters.

General:

Spectral Response
Cathode, Semitransparent Cesium-Antimony
Shape
Minimum area
Minimum diameter
Window
Index of refraction
Dupode Material
Dynode Material
Direct Interelectrode Capacitances (Approx.):
Anode to dynade No.10
Anode to all other electrodes 6.5 pf
Maximum Overall Length
Seated Length
Maximum Diameter
Approximation Position
Operating Posit on
Weight (Approx.)
Bulb
Socket Ety ^b No.9709-7, orequivalent
Magnetic Shield Perfection Mica Co., No. P-100-3, or equivalent
Base Medium-Shell Diheptal 14-Pin,
(JEDEC Group 5, No.B14-38), Non-hygroscopic
Basing Designation for BOTTOM VIEW
Dasing Designetion for DULLOW VIEW

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-No Internal Connection Pin 13-Do Not Use Pin 14 - Photocathode



Maximum Ratings, Absolute-Maximum Vulues:

	Supply Voltage Between Anode and				1050	
	Cathode (DC or Peak AC) Supply Voltace Between Dynode No.10	•	٠	٠	1250 max.	volts
)	and Anode (DC or Peak AC)				250 max.	volts

Indicates a change.



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	Supply Voltage Between Dync and Cathode (DC or Peak A Average Anode Current ^d Ambient Temperature.	C).).75 max.	volts ma °C					
Characteristics Range Values:											
	Under conditions with a voltagedivider provi and dynode No. 1; 1/120j stage; and 1/12 of Ebet	ding Ej ween	g 1/6 oreac n dyno	of Ebetwee h succeedi de No.10 d	n cathode ng dynode						
	With E = 1000 volts (Except										
			Min.	Tyþ.	Nax.						
	Sensitivity: Radiant, at 4400 angstroms Cathode radiant,		-	8 x 10 ⁴	-	a/w					
	at 4400 angstroms Luminous:		-	0.04	-	a/w					
	At O cps ^e		10	100	300	a/lm	-				
	output electrode [†]		-	60	-	a/lm					
	Cathode luminous: With tungsten light source ⁹ With blue light source ^h	. 4 >		-	-	a/lm a					
	Current Amplification Equivalent Anode-Dark- Current Input at a luminous sensitivity of 20 a/lm ^{1, k} Equivalent Noise Input ^m Dark Current to Any Electro Except Anode at 25 ^o C	de		2 × 10 ⁶ 3 × 10 ⁻¹⁰ 7 × 10 ⁻¹²	2 × 10 ⁻⁹ 2.6 × 10 ⁻¹¹ 7.5 × 10 ⁻⁷	lm lm a					
	With E = 750 volts (Except	as	noted)								
			Min.	Typ.	Nax.						
	Sensitivity: Radiant, at 4400 angstroms		_	8 × 10 ³	_	a/w					
	Cathode radiant,										
	at 4400 angstroms Luminous:		-	0.04	-	a/w					
	At O cps ^e		-	10	-	a/lm					
	output electrode ^f Cathode luminous:		-	6	-	a/lm					
	With tungsten light source ⁹				-	a/lm					
	source ^h · · · · ·		x 10 ⁻⁸		_	а					
	Current Amplification		-	2 ×10 ⁵	-		•				

🛥 Indicates a change,

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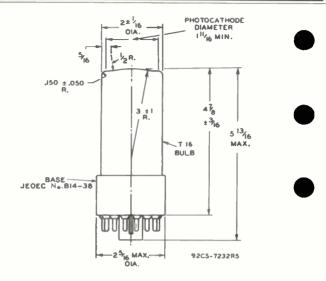


- a Corning No.0080 made by Corning Glass Works, Corning, New York, of equivalent. ь
- Made by Hugh H. Eby Company, #701 Germantown Avenue, Philadelphia 44, Pennsylvania. C.
- Perfection Mica Co., 1829 Divic Opera Made by Magnetic Shield Division, Perfection Mica C Bldg., 20 North Wacker Drive, Chicago 6, [Tlinois.
- Averaged over any interval of 30 seconds maximum. For best stability. the average anode current value should not exceed 100 microamperation
- Under the following conditions: The light source is a tungsten-filament lamo having a lime-glass envelope. It isoperated at a color temperature lamp having a lime-glass envelope. It is operated at a c of 2870°K and a light input of 10 microlumens is used.
- 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 Nc.10 circuit and the ande serves only as collector. The curves shown in *Typical Anode* the anode serves only as collector. The curves shown in Typical anode Characteristics do not apply when dynode No.10 is used as the output electrode.
- Under the following conditions: The light source is a tungsfen-filament, lamp haying a lime-glass envelope. It is operated at a color temperature of 28700 K. The value of light flux is 0.01 iumen and 167 volts are applied between cathode and all other electrodes connected as anode.
- Under the following conditions: Light incident on the cathodw is trans-mitted through a blue filter (Corning C. S. No.5-58, Glass Cude No.5113 polished to 1/2 stock thickness- Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filament lamp operated at color temperature of 2870° K. The value of light flux incluent on the filter is 0.01 umen and 65 volts are applied between cathode and all other electrodes connected as anode.
- j At a tube temperature of 25 $^{\rm O}$ C. Dark current may be reduced by use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (f) below 1000 volts is recommended.
- Under the following conditions: Supply voltage (E) is as shown, 25° C tube temperature, external shield connected to cathode, bandwidth i cycle per ascond, tungsten-light source at a color temperature of 2010 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.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device Having S-II Response is shown at the front of this Section



- Indicates a change.



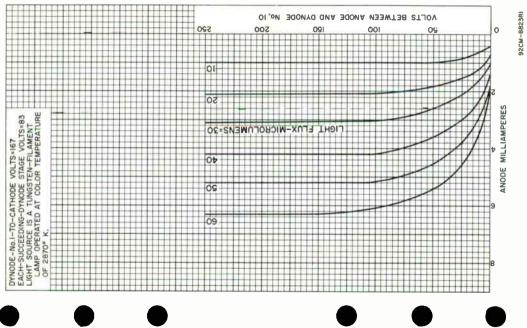
DIMENSIONS IN INCHES

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the perpendicular erected at the center of bottom of the base.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

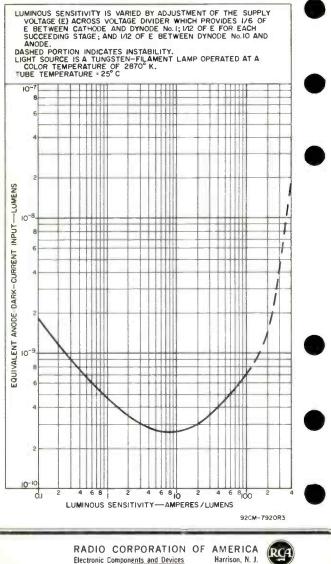
CHARACTERISTICS ANODE TYPICAL

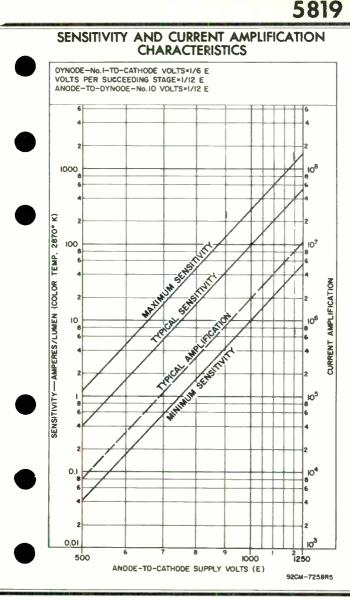


DATA 3 2-64

AMERICA Harrison, I عا ō CORPORATION Devices Components and RADIO Electronic (

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

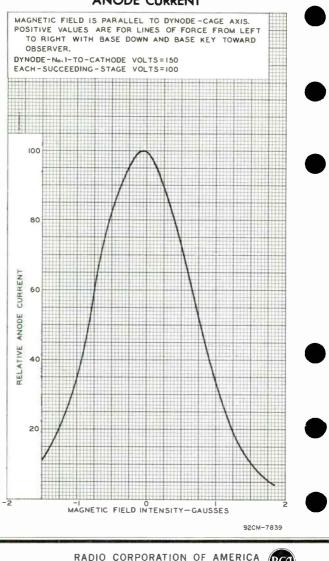






RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 4 2-64

EFFECT OF MAGNETIC FIELD ON ANODE CURRENT



Electronic Components and Devices

Harrison, N. J.

Image Orthicon

MAGNETIC DEFLECTION

For Outdoor and Studio Pickup. The 5820A is Unilaterally Interchangeable with Type 5820.

DATA

General:

MAGNETIC FOCUS

	Heater, for Unipotential Cathode: Voltage (AC or DC)
	Current at 6.3 volts 0.6 amp
	Direct Interelectrode Capacitance:
	Anode to all other electrodes 12 $\mu\mu f$
	Spectral Response
	Photocathode, Semitransparent:
	Rectangular image (4 x 3 aspect ratio):
	Useful size of 1.8" max. diagonal
	Note: The size of the optical image focused on the
	photocathode should be adjusted so that its maximum diagonal does not exceed the specified value. The
	corresponding electron image on the target should
	have a size such that the corners of the rectangle
	just touch the target ring.
	Orientation of Proper orientation is obtained when the
	vertical scan is essentially parallel to the plane passing through center of face-
	plate and pin 7 of the shoulder base.
	Eccusing Method
	Deflection Method
	$\begin{array}{c} \text{Overall Length} & \dots & $
	Minimum Deflecting-Coil Inside Diameter
	Deflecting-Coil Length
	Focusing-Coil Length
	Alignment-Coil Length
)	Operating Position The tube should never be operated in a
	vertical position with the Diheptal-base end up
	nor in any other posit on where the axis of the
	tube with the base up makes an angle of $$ ess than $20^{ m O}$ with the vertical.
	Weight (Approx.). 1 lb 6 oz
	Shoulder Base Keyed Jumbo Annular 7-Pin
,	BOTTOM VIEW"
	Pin 1-Grid No.6 Pin 5-Grid No.5
	Pin 2 - Photocathode
	Pin 3 - Internal Connec- Pin 6 - Target tion-Do Not Use
	Pin 4 – Internal Connec– Pin 7 – Internal Connec–
1	tion—Do Not Use tion—Do Not Use
,	

^a See basing diagram on next page.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 5-61

5820A

End Base	
Pin 1 - Heater Pin 2 - Grid No.4 Pin 3 - Grid No.3 Pin 4 - Internal Connec- tion-Do Not Use Pin 5 - Dynode No.2 Pin 6 - Dynode No.4 Pin 7 - Anode Pin 8 - Dynode No.5 Pin 9 - Dynode No.5 Pin 10 - Dynode No.1, Grid No.2 Pin 11 - Internal Connec- tion-Do Not Use Pin 12 - Grid No.1 Pin 13 - Cathode Pin 14 - Heater WHITE INDEX LINE ON FACE	
Maximum and Minimum Ratings, Absolute-Naximum Values:	
PHOTOCATHODE: Veltage	volts
lilumination 50 max. OPERATING TEMPERATURE:	fc
Of any part of bulb 50 max. Of bulb at large end of tube	°C
(Target section)	°C
Between target section and any part of bulb hotter than target section 5 max.	°C
GRID-No.6 VOLTAGE	volts
Positive value 10 max.	volts
Negative value 10 max.	volts
GRID-No.5 VOLTAGE	volts 🔍
GRID-No.4 VOLTAGE	volts
GRID-No.3 VOLTAGE	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE 350 max. GRID-No.1 VOLTAGE:	volts
Negative-bias value	volts
Positive-bias value 0 max. PEAK HEATER-CATHODE VOLTAGE:	volts
Heater negative with respect to cathode. 125 max.	volts
Heater positive with respect to cathode. 10 max.	volts
ANODE SUPPLY VOLTAGE ^b	volts
VOLTAGE PER MULTIPLIER STAGE	volts
Typical Operation:	
Photocathode Voltage (Image Focus)400 to -540	volts
Grid-No.6 Voltage (Accelerator)— Approx. 75% of photocathode voltage300 to -405	volts.

RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

5820A

volts

volts

volts

volts volts volts

volts volts

volts volts

volts volts

	Target-Cutoff Voltage ^c			-3 to +1
	Grid-No.5 Voltage (Decelerator)			0 to 125
	Grid-No.4 Voltage (Beam Focus)			140 to 180
	Grid-No.3 Veltaged			225 to 330
	Grid-No.2 & Dynode-No.1 Voltage			300
	Grid-No.1 Veltage for Picture Cutoff.			-45 to -115
	Dynode-No.2 Voltage			600
	Dynode-No.3 Voltage			800
	Dynode-No.4 Voltage			1000
-	Dynode-No.5 Voltage			1200
	Anode Voltage			1250
	Minimum Peak-to-Peak Blanking Voltage			5
	Field Strength at Certer	-	-	-
	of Focusing Coil®			75

of Focusing Coil® . . gausses 75 Field Strength of Alignment Coil. 0 to 3 gausses . . .

Performance Data: f

With conditions shown under Typical Operation and with camera lens set to bring the picture highlights one stop above the "knee" of the light transfer characteristic Min Annua Mari

		Min.	Average	Max.	
	athode Radiant Sensitivity at 4500 angstroms uminous Sensitivity		0.03	-	μa/μw μa/lumen
	node Current (DC)	-	30	-	μa
	(Peak-to-peak) itio of Peak-to-Peak High- light Video-Signal Current to RMS Noise Current for	3	8	24	μа
Pł	Bandwidth of 4.5 Mc notocathode Illumination at 2870° K Required to Bring Picture Highlights One Stop Above "Knee"	35:1	40:1	-	
Pe	of Light Transfer Characteristic sak-to-Peak Response to Square-Wave Test Pattern at 400 TV Lines per Picture Height (Per cent of large- area black to large-area	-	0.02	0.04	fc
Ur	white)9	35	45	_	%
	Jight Signal	_	0.12 20	0.15 25	%
b	Dynode-voltage values are shown und	er Typi			<i>"</i>

Normal setting of target voltage is +2 volts from target cutoff. target supply voltage should be adjustable from -3 to +5 volts. The

d Adjust to give the most uniformly shaded picture near maximum signal.



RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. DATA 2 5-61

5820A

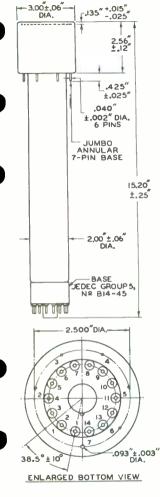
- . Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coll, with the indicator located outside of and at the image end of the focusing coll.
- f With 5820A operated in properly adjusted RCA TK-31 camera.
- 9 Measured with amplifier having flat frequency response.
- h Variation of response over scanned area.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this Section

RADIO CORPORATION OF AMERICA Electron Tube Division Radio History







92CM-8293R3

DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE CROSS-HATCHED 1.315"R.MIN. AREA IS FLAT 1.185"R. MAX. 25°43'

> "MIN. 5 SEE NOTE I

OOTTED AREA IS FLAT NOTE 1: OR EXTENOS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

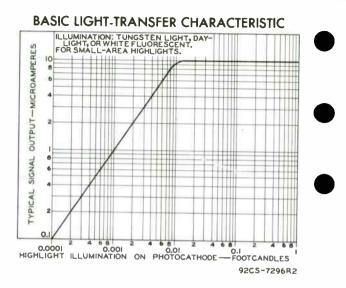
ANNULAR-BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTO-CATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- a. SIX HOLES HAVING DIAMETER OF 0.065" ± 0.001 AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIK 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 510261 ± 51 ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES TO BEAR AGAINST FLAT AREAS OF BASE.
- c. RIM EXTENDING OUT A MINIMUM OF 0.125" FROM 2.812" 01AM-ETER AND HAVING HEIGHT OF 0.126" ± 0.001".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. <u>Vorld Radio</u> History



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



Image Orthicon

LONG-LIFE NON-DETERIORATING TARGET

MAGNETIC FOCUS

MAGNETIC DEFLECTION

For Outdoor and Studio Pickup with Black-and-White TV Cameras. The 5820A/L is Directly Interchangeable with the 5820 and 5820A in All Cameras.

The 5820AlL is the same as the 5820A except it utilizes a longer-life non-deteriorating glass target.

The sturdy, long-life, non-deteriorating, glass target of type 5820A/L is cnaracterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electronic rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as secondary emission and resistivity, are essentially constant and sensitivity of the 5820A/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "sticking picture" and raster "burn-in" due to underscanning are significantly reduced. The resistance of the 582CA/L to image "burn-in" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS

Dos and Don'ts on Use of RCA-5820A/L

Dos

- 1. Allow the 5820A/L to warm up prior to operation.
- 2. Hold temperature of the 5820A/L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- 4. Adjust beam-focus control for best usable resolution.
- Condition spare 5820A/L's by operating several hours once each month.
- Determine proper operating point with target voltage adjusted to exactly 2 volts above target cutoff.
- 7. Cap lens during standby operation.

Don'ts

- 1. Don't force the 5820A/L into its shoulder socket.
- 2. Don't operate the 5820A/L without scanning.
- 3. Don't operate a 5820A/L having an ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turm off beam while voltages are applied to photocathode, grid No.6, target, dynodes, and anode during warmup or standby operation.



World Radio History

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IMAGE-CONVERTER TUBE

For use, in combination with suitable optical systems, in viewing a scene with infrared radiation

DATA

Spectral Response		General:	
Minimum window area		Wavelength of Maximum Response 8000 ± 1000 argstroms	
Phosphor (For Curves, see front of Catrode-Ray Tube Section. See also Operating Considerations)	,	Shape Circular Minimum windcw area. 1 sq. in. Minimum windcw diameter. 1-1/8"	1
See also Operating Considerations). Pluorescence. Phosphorescence. Persistence. Persistence. Shape. Shape. Shape. Circular Minimum diameter Maximum diameter Maximum Diameter Maximum Diameter Curcular Maximum Diameter Maximum Diameter Coverall Length. Maximum Diameter Coverall Length. Coverall Leng			ł
Fluorescence . Yellow-Green Phosphorescerce. Yellow-Green Persistence. Yellow-Green Persistence. Yellow-Green Persistence. Yellow-Green Procusing Methoc. Yellow-Green Minimum diameter . Yellow-Green Fluorescent Screen: Shape Medium-Short Fluorescent Screen: Shape			
Phosphorescerce. Ye:lcw-Green Persistence. Medium-Short Fluorescent Screen: Shape			
Fluorescent Screen: Shape		Phosphorescence Yellow-Green	
Shape			ł
Minimum diameter			
Focusing Methoc			
Maximum Diameter		Focusing Methoc	
Weight (Approx.)		Overall Length	
Operating Position		Maximum Diameter	
Terminal Connections (See Dimensional Outline): DIRECTION OF LGHT: PERMENDICULAR TO: LARGE END OF TUBE CL-Collector G ₁ -Grid No.1 Maximum Ratings, Absolute Values: GRID-No.2* VOLTAGE (DC or Peak AC) ^D . 20000 max. volts GRID-No.1 VOLTAGE (DC or Peak AC) ^D . 20000 max. volts GRID-No.1 VOLTAGE (DC or Peak AC) ^D . 20000 max. volts AVERAGE PHOTOCATHODE CURRENT (Continuous Operation)			
CL - Collector $G_2 - Grid Nc.2$ $G_1 - Grid No.1$ $G_1 - Grid No.1$ Maximum Ratings, Absolute Values: GRID-No.2* VOLTAGE (DC or Peak AC) ^D . 2700 max. volts 2700 max. volts AVERAGE PHOTOCATHODE CURRENT (Continucus Operation) Continucus Operation) Characteristics: Grid-No.2* Voltage. Characteristics: Grid-No.1 (Focusing- Electrode) Voltage. 10.75% tc 13.25% of grid-No.1 Current 0.4Grid-No.2* Voltage. Characteristics: Grid-No.2 voltage. Continucus Operation)16000 20000 20000Grid-No.2* Voltage. Characteristics: Grid-No.1 (Focusing- Electrode) Voltage. Continucus Operation)16000 20000 20000Grid-No.2* Voltage. Characteristics: Characteristi			ł
GRID-No.2* VOLTAGE (DC or Peak AC) ^D . 20000 max. volts GRID-No.1 VOLTAGE ^D . 2700 max. volts AVERAGE PHOTOCATHODE CURRENT (Continucuus Operation)		CL-Collector G2-Grid Nc.2	
GRID-No.1 VOLTAGE ^D		Maximum Ratings, Absolute Values:	ł
AVERAGE PHOTOCATHODE CURRENT (Continuous Operation)		GRID-No.2* VOLTAGE (DC or Peak AC) ^D 20000 max. volts	
(Continuous Operation)			
AMBIENT TEMPERATURE. 75 max. %C Characteristics: 6000 20000 volts Grid-No.2* Voltage 16000 20000 volts Grid-No.1 (Focusing- Electrode) Voltage- 10.75% tc 13.25% of grid-No.2 voltage. 1720 tc 2120 2150 to 2650 volts Maximum Grid-No.1 Current 0.4 0.5 μa *, □: see next page. *. *. *. *.			l
Grid-No.2* Voltage 16000 20000 volts Grid-No.1 (Focusing- Electrode) Voltage 10.75% tc 13.25% of grid-No.2 voltage 1720 tc 2120 2150 to 2650 volts Maximum Grid-No.1 Current 0.4 0.5 μa *, ^D : see next page.			
Grid-No.2* Voltage 16000 20000 volts Grid-No.1 (Focusing- Electrode) Voltage 10.75% tc 13.25% of grid-No.2 voltage 1720 tc 2120 2150 to 2650 volts Maximum Grid-No.1 Current 0.4 0.5 μa *, ^D : see next page.		Characteristics:	l
grid-No.2 voltage 1720 tc 2120 2150 to 2650 volts Maximum Grid-No.1 Current 0.4 0.5 μα *,□: see next page.		Grid-No.2* Voltage 16000 20000 volts Grid-No.1 (Focusing- Electrode) Voltage-	
MaximumGrid-No.1Current 0.4 0.5 µa *,0: See next page.			
		Maximum Grid-No.1 Current 0.4 0.5 µa	Т
			J

7-58

ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY



IMAGE-CONVERTER TUBE

Paraxial Magnification Factor	•	0.5	0.5	
Sensitivity: Radiant, at 8000 angstroms .			0.0038	μa/μwatt
Infrared [®]		5 8	5 10	µa/lumen
Minimum Resolution (In central area of photocathode)		18	18	line-pairs
				per mm

- Grid No.2 serves the dual function of high-voltage electrode for accelerating the electron beam and of collector through which the the electrons leave the tube after their energy has been transformed within the tube.
- ^D Referred to photocathode.

b032

- urder the following conditions: 2870° K tungsten light source; light flux of 0.1 lumen incident on Corning No.2540 Infrared Filter (Mell 1615, 2.61-mm thick, or equivalent); irradiated area of photo-cathode is 3/4* in diameter.
- ↑ Ratio of light flux from fluorescent screen to the product of the light flux incident on the infrared filter multiplied by the filter factor.
- The resolution, both horizontally and vertically in a 0.3"-diameter cTrcle centered on the photocathode is determined with a pattern con-sisting of alternate black and white lines of equal width. Any two adjacent lines are designated as a "line-pair."
- Magnification is defined as the ratio of the distance from the tube axis of an image point on the fluorescent screen to the distance from the tube axis of an object point on the photocathode. Paraxial magnification is the magnification observed along the tube axis.

OPERATING CONSIDERATIONS

The curves giving the spectral-energy emission characteristic and the persistence characteristics of phosphor P20 are located in the front of the Cathode-Ray Tube Section. Only persistence-characteristic curve A applies to the 6032.

Subjecting the 6032 to intense incident-radiation levels may temporarily decrease the tube's sensitivity even though there is no voltage applied. The magnitude and duration of this decrease depend on the length of exposure. Permanent damage to the tube may result if it is exposed to radiant energy so great as to cause excessive heating of the photocathode.

The sensitivity values for the 6032 are average values. The average values are representative of this type when operated with low values of photocathode current. At high values of photocathode current, a drop in sensitivity below the values shown may be expected. The extent of the drop is affected by the nature and severity of the operating conditions to which the 6032 is subjected. After a period of idleness, the 6032 usually recovers a substantial percentage of such loss in sensitivity.

Support for the 6032 may be provided at the photocathode end by a cushioned arrangement and at the screen end by a suitable fixture which will exert adequate but not excessive pressure to hold the tube firmly against the cushioned arrangement.



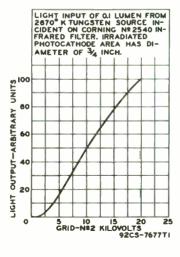
IMAGE-CONVERTER TUBE

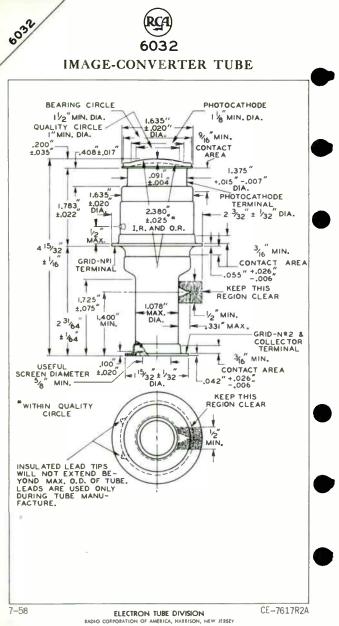
Shielding of the 6032 is required taminimize the effects of extraneous fields on tube performance. If an iron or steel case is used, care should be taken in its construction to insure that the case is completely demagnetized. The shielding case may be designed, if desired, to include an annular end piece to position the tube properly in the optical system. The circular opening of the end piece should have a diameter less than $1-1/2^m$ in order to bear on the rim of the tube face (See Dimensional Outline).

Connections to the respective terminals of the tube, Indicated on the *Dimensional Outline*, should not be soldered to the terminals. They should be made by flexible metal bands fastened firmly around the tube in the contact areas shown on the *Dimensional Outline*. The bands should be fastened only tight enough to insure good contact. If the bands are too tight, the metal-glass, seals may be damaged.

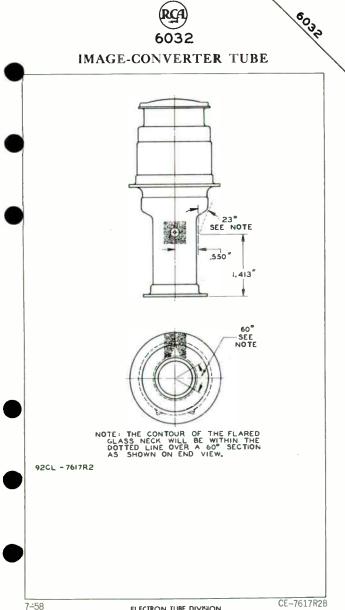
> The curve showing the Spectral-Sensitivity Characteristic of Phototube having S-1 Response located at the front of this Section also applies to the 6032

AVERAGE CHARACTERISTIC





World Radio History





AVERAGE CHARACTERISTICS

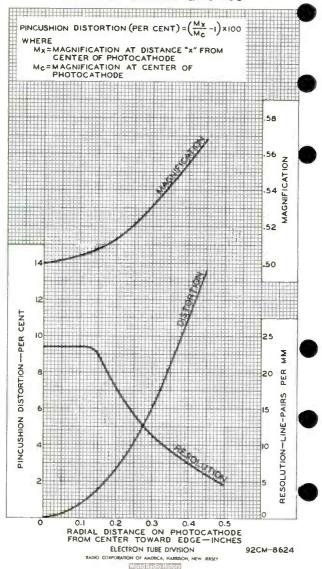




IMAGE-CONVERTER TUBE

For use, in combination with suitable optical systems, in viewing a scene with infrared radiation

The 6032-A is unilaterally interchangeable with the 6032.

The 6032-A is like the 6032 except that it is processed and tested to meet the following special-performance test: Maximum luminous equivalent of infrared radiation for threshold visibility*. 4.1 \times 10⁻¹¹ lumen

Radiation from a tungsten lamp operating at a color temperature of 2870° K is passed through a Corning No.2530 [Higrared Filter and focused to a point on the photocathode. The resulting image on the fluorescent screen is viewed by a dark-adapted eye through a 10-power ocular. The amount of infrared radiation for threshold visibility is determined by reducing the incluent radiation or threshold visibility is determined by be discerned. The luminous equivalent of this amount of infrared radiation is the value of luminous flux from a 2870° K source which produces a response equal to that produced by the infrared radiation when both are measured with a receiver having S-1 spectral response.

60321R

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Photomultiplier Tube

10-STAGE. HEAD-ON, FLAT-FACEPLATE TYPE HAVING S-11 RESPONSE 1.24" MINIMUM DIAMETER FLAT PHOTOCATHODE

For Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources in Portable Scintillation Counters

GENERAL

Spectral Response									
Cathode, Semitransparent									
Window Lime Glass, Corning ^a No.0080, or equivalent—									
Index of refraction. I.51 Direct Interelectrode Capacitances (Approx.) Anode to dyrode No.10. 4.0 pF Anode to all other electrodes. 7.0 pF Maximum Overall Length 4.57 in Seated Length 3.88 ± 0.19 in Maximum Diameter 6.56 in Operating Position 4.72 Any Weight (Approx.) 2.2 oz									
Envelope									
Non-hygroscopic Socket Eby ^b No.9058, or equivalent↔ Magnetic Shield Perfection Mica Co.,⊂ No.P-104-1,↔ or equivalent BASING DIAGRAM									
Basing Designation for Bottom View Pin 1 - Dynade No.1 Pin 3 - Dynade No.5 Pin 4 - Dynade No.7 Pin 5 - Dynade No.7 Pin 6 - Anace Pin 7 - Dynade No.10 Pin 8 - Dynade No.6 Pin 9 - Dynade No.6 Pin 10 - Dynade No.2 Pin 12 - Photocathode Pin 12 - Photocathode									
ABSOLUTE-MAXIMUM RATINGS									
Supply Voltage (DC or Peak AC) Between Anode and Cathode									



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 10-65

- Indicates a change.

CHARACTERISTICS RANGE VALUES

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 V (except as noted)

	Min	Тур	Max	
Sensitivity Radiant at 4400 angstroms .	-	2.2x104	-	A/W
Cathode radiant at 4400 _angstroms	-	0.036	-	A/W
Luminous: At 0 c/s ^e	10	27	300	A/1m
With dynode No.10 as output electrode ^f Cathode luminous:	-	16	-	A/lm
With tungsten light source ^g With blue light source ^h	3x10-5 2.8x10-8	4.5×10-5	-	A/1m A
Current Amplification	-	6x10 ⁵	-	
Equivalent Anode-Dark-Current Input	-	8x10-10	2.5×10-9	lm
2C A/lm ^{j,k} → Equivalent Noise Input ^m Dark Current to any Electrode. At 25°C and does not include anode	-	4x10-12 -	1.7x10 ⁻¹¹ 7.5x10 ⁻⁷	lm A
With E = 750 V (except as not	ed)			
	Min	Тур	Max	
Sensitivity Radiant at 4400 angstroms	-	2.2x10 ³	-	A/W
Cathode radiant at 4400 angstroms	-	0.036	-	A/W
Luminous: At 0 c/s ^e	-	2.7	-	A/1m
With dynode No.10 as output electrode Cathode luminous:	-	1.6	-	A/lm
Vith tungsten light	3x10-5	4.5×10-5	-	A/lm

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

^b Made by Hugh H. Eby Company, 4701 Germantown Avenue, Philadelphia 44, Pennsylvania.

^C Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.

d Averaged over any interval of 30 seconds maximum. For best stability, the average anode current value should not exceed 100 microamperes.

• Under the following conditions: The light source is a tungsten-filament lamp having a line-glass envelope. It is operated at a color temperature of 2870% and a light input of 10 microlumens is used.

- Indicates a change.

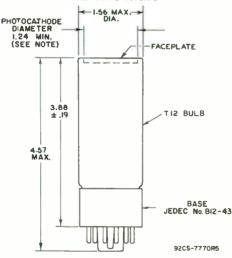


RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. World Radio History



- An output current of opposite polarity to that obtained at the amode 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 shewn in fypical Arcde Charac-teristics do not apply when dynode No. 10 is used as the output electrode.
- 9 Under the following conditions: The light source is a tungsten-filament lamphaving a lime-glass envelope. It is operated at a color temperature of 2870°K. The value of light flux is 0.011 unmen and 167 volts are applied between cathode and all other electrodes connected as anode.
- between cathode and all other electroues connected as anost. h Under the following conditions: Light incident on the cathode is trans-mitted through a blue filter (Corning C.S. No.5-58, Glass Code No.5113 palished to 1/2 stock thickness-Manufactured by the Corning Glass Works, Carning, New York) from a tungsten-filament lamp operated at a color tempera-ture of 2870°K. The value of light flux incident on the filter is 0.01 lumen and 167 volts are applied between cathode and all other electrodes connected as anode.
- $^{
 m j}$ At a tube tempersture of 25°C. Dark current may be reduced by use of a refrigerant.
- 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, 2%^oC tube temperature, external shield connected to cathode, bandwidth I cycle per content of the statement of the state second, ungsten-light source at a color temperature of 2870% knterrupted at a low audio frequency to produce incident radiation pulses alternating between term and the value stated. The "on" period of the pulse is equal to the "off" period.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCLES

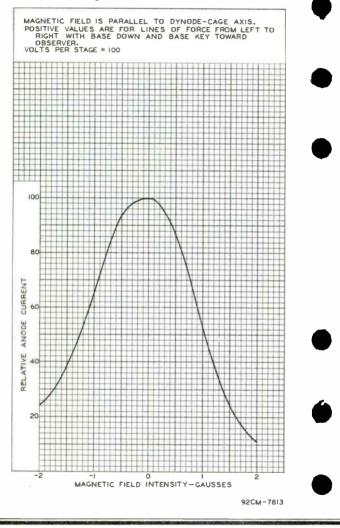
Note: Deviation from flatness within 1.24"-diameter area will not exceed 0.010" from peak to valley.

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.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Hanrison, N. J. DATA 2 0-65

Effect of Magnetic Field on Anode Current



DATA 2

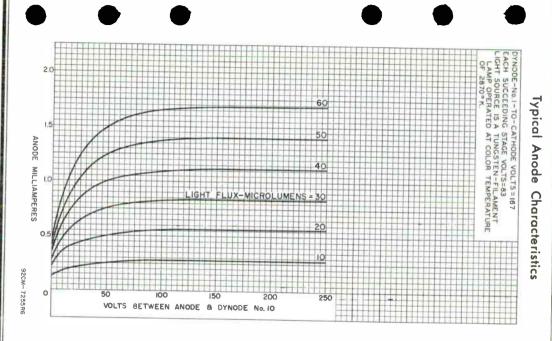
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. World Radio History

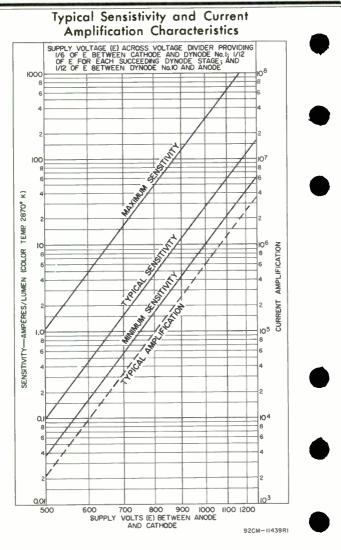






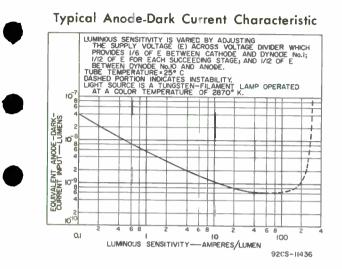






RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

RCA





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 4

Photomultiplier Tube

IO-STAGE, CURVED-FACEPLATE TYPE HAVING S-IO RESPONSE 1-11/16 INCH MINIMUM DIAMETER CURVED PHOTOCATHODE

GENERAL

Spectral	Re	spo	nse	з.																			S-	-10	()
Waveleng	gth.	of	Max	ciπ	nun	i I	Re	spo	on	se						4!	500	±	3	00	ar	ngs	tr	oms	
Cathode	, Se	mit	rar	isp	ar	er	١t														Aq-	-Bi	-0	-Cs	;
Shape.																		Cu	r v	ed	í. í	ΣĪr	cu	lar	-
Minim	um a	area	ι.																		2.2	2 s	a	in	
Minim	um c	i an	iete	er.													•				-	117	16	in	
Window .				Li	me	E (G 1 a	355	5	(0	orr	ιin	۱a ²	a j	10.	0	080	i.	Ċ	r	ear	. i v	al	ent	-
Index	of	ref	rad	:ti	on	١.												. '					ĩ	.51	-
Dynode N	late	əria	d														÷						Cs.	-Sb	-
Direct	Inte	erel	ect	tro	de	. (Cai	oad	ci	ta	nce	es	11	1 D I	ord	١x.	1	-	-	-					
Anode	to	dyn	ode	e N	10.	10)										1					ш	2	n F	
Anode	to	all	01	the	er.	el	le	ct i	ro	de	s.			÷			÷.				•	6	Ē	DE	
Maximum	0ve	eral	1.1	.er	at	h																5	εĭ.	in	
Seated I	.en g	ith.							÷		÷.				÷				Ъц	่ค	· 7 +	0	ïa.	in	
Maximum	Dia	met	er										÷			÷					· ±	2	31	in	
uperatir	ig P	'0SI	tic	n																				Ånv.	
mergnt (арр	rox	.)																		-	- 5	. 2	07	
Enverope	3																					ED F	c `	TIG	
Base . N	led i	um–	She	:11	D	it	nep	ta	1	14	-P	in	()	IEC)EC	: (iro	u D	5.	. N	0. P	14	-3	R١	
																		N	on	-h	var	0.5	col	nic	
Socket .											. E	bv	b	No	. 9	70)9-	7.	0	r	, a.	iv	a 1 a	ent	+
Magnetic	: Sh	iel	d.							÷		AN	c	No	5. S	1	00	u.			edu	1.	alı	ent.	_
-						-	-	-	-									• •	~ ~		~ 40		14 U U	an r	-

ABSOLUTE-MAXIMUM RATINGS

DC or Peak AC Supply Voltage

Between anode and cathode	250	v
Between dynode No.10 and anode	250	ý
Between dyrode No.1 and cathode.	300	v -
Average Anode Current ^o	.75	mÅ
Ambient Temperature	75	°c

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Dynede No.1 Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynede No.5 Pin 6 - Dynode No.6 Pin 7 - Dynode No.7 Pin 8 - Dyncde No.8 Pin 9 - Dynede No.9 Pin10-Dynode No.10 Pin11-Anode Pin 12-No Connection Pin 13-Do Not Use Pin 14-Photocathode



-Indicates a change.

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.

DATA 1 2-66

CHARACTERISTICS RANGE VALUES

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 V (Except as noted)

	Min	Тур	Max	
Sensitivity				
Radiant, at 4500 angstroms	-	5.1 x 10 ⁴	-	A/W
Cathode radiant, at				
4500 angstroms,	-	0.02	-	A/W
Luminous, at O c/s ^e	10	100	300	A/1m
Catnode luminous				
With tungsten	_	_		
light source ^f	2x10-5	4×10-5	-	A/1m
With red-infrared				
light source ⁹	5x10-8	-	-	A
Current Amplification	-	2.5×10^{6}	-	
Equivalent Anode-Dark-				
Current Input ^h	-	1.4x10-9	2.5×10^{-8}	lm
At a luminous sensitivity				
of 20 A/1m				
Equivalent Noise Input ^j .	-	4 x 10 ⁻¹¹	1.7×10 ⁻¹⁰	1 m
Dark Current	-	-	7.5×10^{-7}	Α
To any electrode except				
anode at 25 °C				
With E = 750 V (Except as n	oted)			

		- 7 -		
Sensitivity Raciant, at 4500 angstroms Cathode radiant, at 4500	-	5, ×10 ³	-	A/W
angstroms	-	0.02 10	-	A/W A/1m
Cathode luminous ⊮ith tungsten light source ^f . With red-infrared light	2 x 10 ⁻⁵	4 × 10 ⁻⁵	-	A/1m
source ^g	5 x 10-8	2.5×10 ⁵	-	A

Min Typ Max

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

b Made by Hugh H. Eby Company, 4701 Germantown Avenue, Philadelphia 44, Pa.

C Made by JAN Hardware Manufacturing Company, 38.01 Queens Blvd, Long Island City 1, New York.

d Averaged over any interval of 30 seconds maximum. For best stability, the average anode current value should not exceed 100 microamperes.

Under the following conditions: The light source is a tungsten-filsment lamp having a lime-glass envelope. It is operated at a color temperature of 2070% and a light input of 10 microlumens is used.

^f Under the following conditions: The light source is a tungaten-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 167 volts are applied between cathode and all other electrodes connected as anode.

9 Under the following conditions: Light incident on the cathode is transmitted through a red-infrared filter (Combination of Corning C.S. Nos. 3-67 and 7-59, Glass Code No. 3482 and 3850, respectively-Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filsment lamp operated at a color temperature of 2870 M. The value of light flux



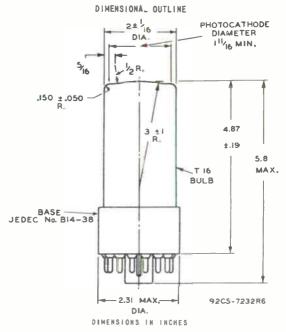
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

RCA

- Indicates a change,

incident on the filter is 0.Dl lumen and 167 volts are applied between cathode and all other electrodes connected at anode.

- At a tube temperature of 25^{9} C. Prior to measurement, tube is stored in dark for a period of 30 minutes. Dark current may be reduced by use of a refrigerant. ь
- Under the following conditions: Supply v+ltage (E) is as showr, 25°C tube temperature, external shield connected to cathode, bandwidth 1 cycle per second, tungaten-light source at a coor temperature of 287°C interrupted at a low audio frequency to produce incident radiation pulses alternating between zere and the value stated. The "on" period of the pulse is equal to the "off" period.



Center line of bulb will not deviate more than 2° in any direction from perpendicular erected at the center of bottom of the base.

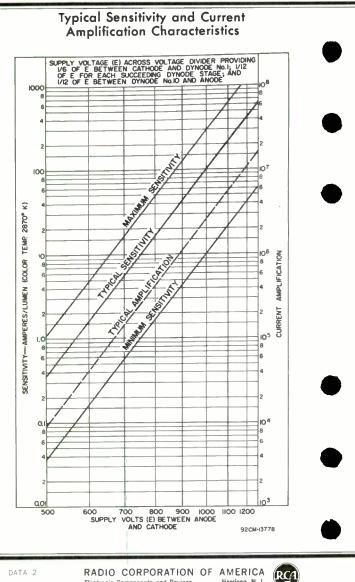
> SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-10 Response is shown at the front of this Section

TYPICAL ANODE CHARACTERISTICS are the same as those shown for Type 6199



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DATA 2



World Radio History

Electronic Components and Devices

Harrison, N. J.





MULTIPLIER PHOTOTUBE

9-STAGE TYPE WITH S-4 RESPONSE For Headlight-Control Service

The	6323	1 S	the	same	as	the	6328	except	for	the	following
stem	IS /						1				

	General:
	Direct Interelectroot Capacitances/(Approx.): Anode to dynode Mo. 9 4.4 μμf
	Anode to all other electrodes
	Length from Bake Seat to Center of Useful Cathode Area
	Weight (Apgrox.).
	Base Small-Shell Submarial 11-Pin (JETEC No.B11-88), Non-hygroscopic
	T9 BULB
	CATHODE
	3 / 3 / 3 / 3
1	SMALL-SHELL
	SUBMAGNAL II-PIN BASE
· · · · ·	JETEC Nº BII-88
•	
	OF LIGHT
	O CATHODE
	$\left(\circ \right) $
	92CM-6264R3
	BOTTOM VIEW
	(OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.
-	NOTE: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE
	THROUGH PINS NO.1 AND NO.14 AND THE PLANE OF THE GRILL WILL NOT EXCEED 6°.
	SEPT. 1, 1955 TUBE DIVISION + DATA
	EARLY CONTRACTOR OF AMERICA, INTELANT, INTELANT, INTELANT,



6 3 Po

600-LINE RESOLUTION

For film pickup

with color or black-and-white TV cameras

DATA

General: Heater, for Unipotential Cathode: Current 0.6 amo Direct Interelectrode Capacitance: Target (Signal electrode) to all other electrodes. 4.5 μµf Spectral ResponseSee curves Photoconductive Layer: Maximum useful diagonal of rectanoular image (4 x 3 aspect ratio). 0.62" Orientation of quality rectangle-Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin. Focusing Method . . . Magnetic Deflection Method . .MagneticMagnetic 6.25" ± 0.25" Overall Length. Greatest Diameter (Excluding side tip). . . 1.125" ± 0.010" Maximum Radius (Including side tip) 0.805" Weight (Approx.). . . . 2 oz Operating Position. . . Approx. horizontal, or faceplate up T8 Base Connector.Cinch No.54A18088, or equivalent Base.Small-Button Ditetrar 8-Pin (JETEC No.E8-11) Basing Designation for BOTTOM VIEW. . . . 8HL . . . Pin 7 - Cathode Pin 1 - Heater Pin 2-Grid No.1 Pin 8-Heater Pin 3-Grid No.3 Flange - Target (Signal Electrode) Pin 4 - Internal 3 Short Index Pin-Connection-Do Not Use Interna. (2 Pin 5-Grid No.2 Connection-Pin 6-Grid No.4. Do Not Use Grid No.5 DIRECTION OF LIGHT: INTO FACE END OF TUI THRE Maximum Ratings, Absolute Values: For scanned area of 1/2" x 7/8" GRID-No.5 & GRID-No.4 VOLTAGE . . 350 max. volts GRID-No.3 VOLTAGE 350 max. volts GRID-No.2 VOLTAGE . . . 350 max. volts See next page. 🕳 Indicates a change, 7-58 DATA 1 ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



GR D-No.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	. 0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathoo		
Heater positive with respect to cathod		
DARK CURRENT	. 0.025 max.	
FACEPLATE:	. 0.5 max.	μa
Illumination	. 1000 max.	ft-c
Temperature	. 60 max	
Typical Operation:		
Grid No.3 connected to grids No.4 and N	lo.5. scanned a	rea of
1/2" x 3/8"; faceplate temperature		
Faceplate Illumination:		
Average highlight ⁴ , for pickup		
from film.	50 to 300	ft-c
Constant highlight, for pickup		
from live scenes	20	ft-c
Maximum Target (Signal-Electrode)		
Voltage required to produce dark current of 0.02 μ a in		
any tube*	100	volts
Target (Signal-Electrode) Voltage:	100	VUILS
For pickup from film	20 to 40	volts
For pickup from live scenes	40 to 70	volts
Grid-No.5 (Decelerator) and		
Grids-No.4 & No.3 (Beam-	_	
Focus-Electrodes) Voltage	250° to 300	volts
Grid-No.2 (Accelerator) Voltage.	300	volts
Grid-No.1 Voltage for picture cutoff	-45 to -100	volts
Signai-Output Current:* Peak	0.3 to 0.4	
Average.	0.1 to 0.2	μa
Dark Current:	0.1 10 0.2	μa
For pickup from film	0.004	μa
For pickup from live scenes	0.02	μa
Average "Gamma" of Transfer		· ·
Characteristic for signal-		
output current between 0.02 μa		
and 0.2 µa	0.65	
Visual Equivalent Signal-to-Noise	200.1	
Ratio (Approx.) ^o Minimum Peak-to-Peak Blanking Voltage;	300:1	
When applied to grid No.1	40	volts
When applied to cathode	10	volts
Field Strength at Center of		
Focusing Coil (Approx.).	40	gausses
Field Strength of Adjustable		
Alignment Coil ⁿ	0 to 4	gausses
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ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1

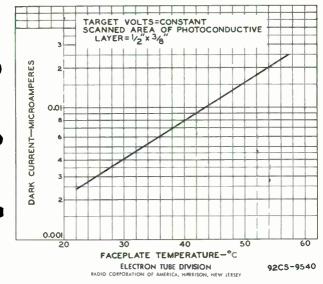


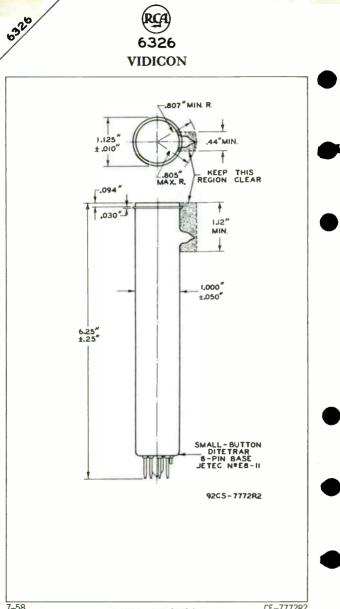
- This capacitance, which effectively is the output impedance of the 6326, is increased when the tube is mounted in the deflacting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.
- Averaged over the time of one TV frame.
- ** The target (signal-electrode) voltage for each 6326 must be adjusted to that value which gives the desired operating dark current.
- Indicated range for each type of service serves only to illustrate the operating target- (signal-electrode-) voltage range normally encountered.
- Beam focus is obtained by combined effect of grids-Mo.4 & Mo.4 voltage which should be adjustable over indicate# range, and a fucu..ing coil having an average field strength of 40 gausses. If desired, yrid No.3 may be operated separately to permit vernier control of focus. Under such conditions, the instantaneous grid-Mo.3 voltage must always be equal to or greater than the grid-Mo.4 voltage.
- Definition, focus uniformity, and picture quality decrease with decreasing grids-Ko.5 & No.4 & No.3 voltage. In general, grids No.5 & No.4 No.3 voltage. In general, grids No.5 & No.4 No.3 volta.
- With no blanking voltage on grid No.1.
- Defined as the component of the target (signal-electrcde) current after the dark-current component has been subtracted.
- ^O Measured with high-gain, low-noise, cascode-type amplifier having bandwidthof5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-te-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.
- The alignment coil should be located on the tube so that .ts center is at a distance of 3-11/16 inches from the face of the tube, and be position-d so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.

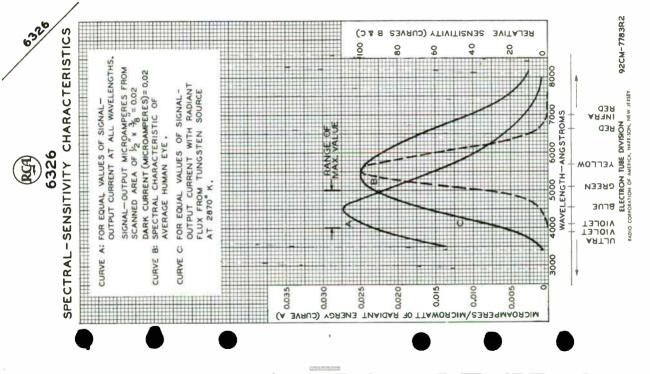
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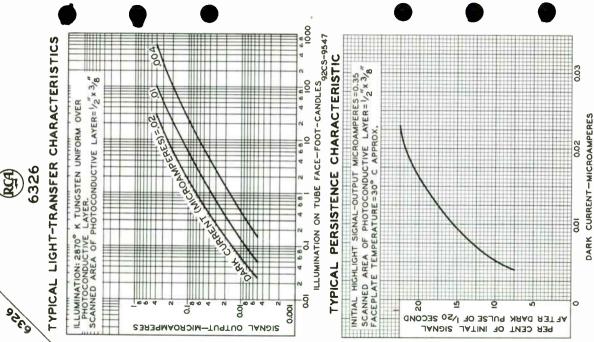
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TYPICAL CHARACTERISTIC









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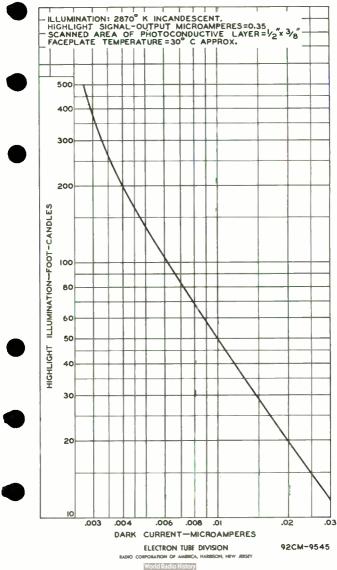
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DIVISION ..

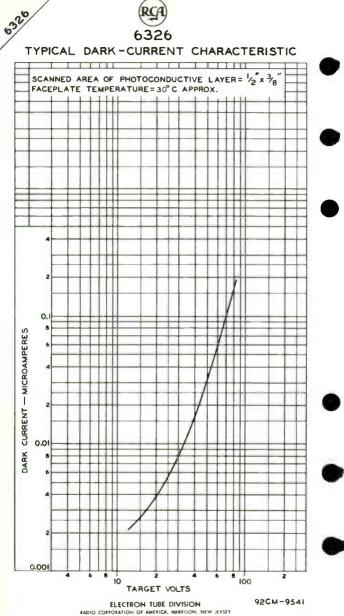
ELECTRON TUBE RADIO CORPORATION OF AMERICA,



TYPICAL CHARACTERISTIC

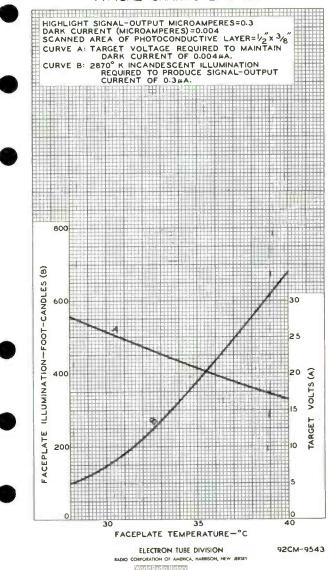


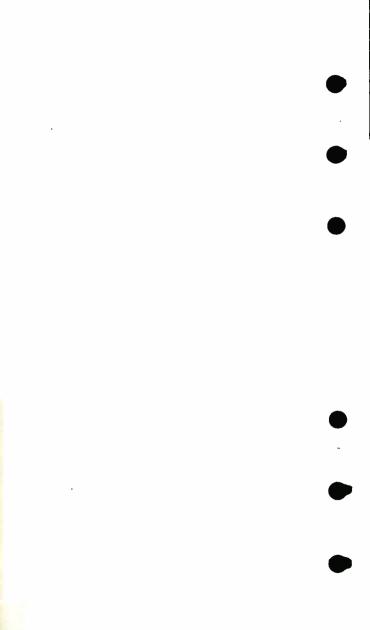






TYPICAL CHARACTERISTICS





Photomultiplier Tube

9-STAGE, SIDE-ON TYPE HAVING S-4 RESPONSE

For AC-Operated Control Applications Such as Automobile-Headlight Control

GENERAL

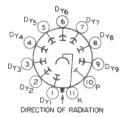
Spectral Response	S-4
Wavelength of Maximum Response 4000	= 500 angstroms
Cathode Onaque	Ce-Sh
Minimum projected length ^a	0.93 in
Minimum projected width	0.31 in
Window Lime Glass, (Corning ¹ No.0080)	, or equivalent 🕶
Dynode Material	Cs-Sb
Direct Interelectrode Capacitances (Approx.)	
Anode to dynade No.9	4.2 pF
Anode to all other electrodes	5.5 pF
Maximum Overall Length	3.12 in
Maximum Seated Length	2.69 in
Length	1.56 ± 0.09 in
From base seat to center of useful cathode a	rea
Maximum Diameter	1.31 in
Operating Position	Any
Weight (Approx.)	1.6 oz
Envelope	JEDEC T9
BaseSmall-Shell Neosubmagnal II-Pin (JED	EC No. 811-104),
	Non-bygroscopic
Socket Amphenol ^C No.78SIIT	or equivalent +
Magnetic Shield Millen ^d No.80801B.	or equivalent -
	,

ABSOLUTE-MAXIMUM RATINGS

Peak AC Supply Voltage	
Between anode and cathode	1400 V 🔶
Between dynode No.9 and anode	250 V 🛶
Between consecutive dynodes	250 V 🛨
Between dynode No.1 and cathode	250 V 🛨
Average Anode Current ^e	O.I mA
Ambient-Temperature	75 °C

TERMINAL DIAGRAM (Bottom View)

Pin	1 – Dynode No.1	
Pin	2 - Dynode No.2	
Pin	3 - Dynoce No.3	
Pin	4 - Dynoce No.4	
Pin	5 - Dynoce No.5	
Pin	6 - Dynode No.6	
Pin	7 - Dynoce No.7	
Pin	8 – Dynode No.8	
Pin	9 - Dynode No.9	
Pin	10 – Anode	
Din	11 Photosathoda	



-Indicates a change.



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DATA I 2-65

CHARACTERISTICS	RANG	E VALUES			
Under conditions with dc supply divicer providing 1/10 of E bet 1/ 0 of E for each succeeding between dynode No	ween dynod	cathode a e stage;	ind dynode	No.l;	
With E = 1000 V dc					
	Min	Тур	Max		
Sensitivity Radiant, at 4000 angstroms Luminous, at 0 c/s ^T Dark Current to Any Electrode At 25°C		3.4×10 ⁴ 35 -	- 7.5 × 10 ⁻⁷	A/W A/1m A	
With E = Adjustable 60 c/s ac V	oltad	e			
Anode-to-Cathode Voltage ⁹ RMS values Anode Dark Current ^h At 25°C		Min 525 	Тур Маз 750 990 - I x 10) V	•
 On plane perpendicular to the indication passing through the major axis of the Made by Corning Glass Works, Corning Made by Amphenol Electronics Corporal 11 linois. Made by James Millen Manufacturing (48, Massachusetts. Averaged over any interval of 30 as 1 line planes Millen Manufacturing (520% and a light input of 10 millions). Under the following conditions: Limitted through a filter (Corning Coming Conditions). Limitted through a filter (Corning Coming Glass Works, Corning, New operated at acolor temperature of 28 dent on the filter is 10 microlumens give an anode current of 8 microam of 20 microlumens 	company company econds e ligh Itis crolum S. No. inous f York) 70°K. . Sup	<pre>x York. 830 South 54 x, 150 Exch maximum. x source is operated a ident on th 2-62, Glass from a tun The value</pre>	ange Street, atungsten-fi t a color temp code No.2411 Manufactured gsten-filamet of light flu	Malden ilament erature trans- which by the nt lamp ici-	

h For conditions same as (g) except no radiant flux on photocathode.



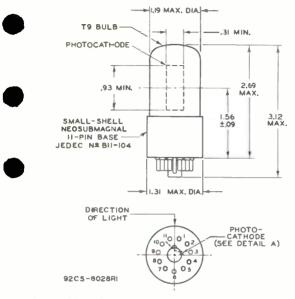
- Indicates a change.

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DIMENSIONAL OUTLINE



Center line of hulb will not deviate more than 2° in any direction from the perpendicular erected at the center of bottom of the base.

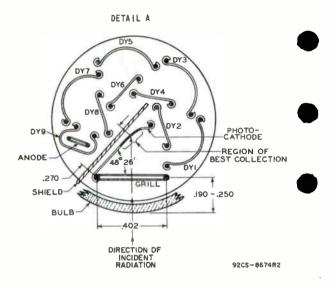
Note: The maximum angular variation between the planes through pins l and ll and the plane of the grill will not exceed 6°.

DIMENSIONS IN INCHES



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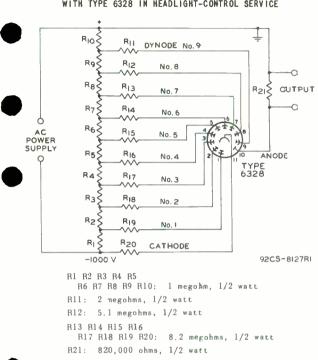
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World Radio History

DATA 2

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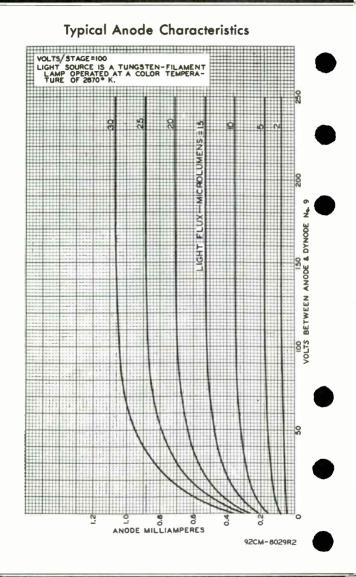




RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE WITH TYPE 6328 IN HEADLIGHT-CONTROL SERVICE



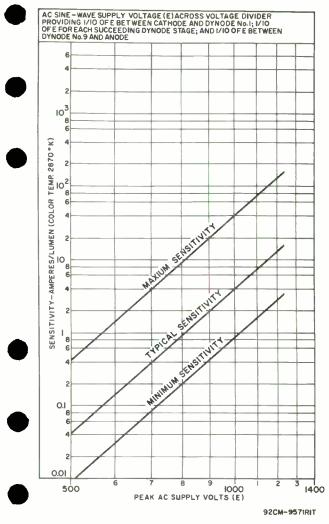
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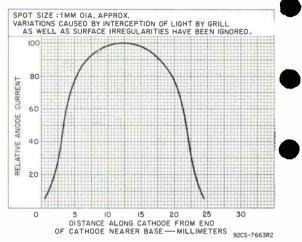




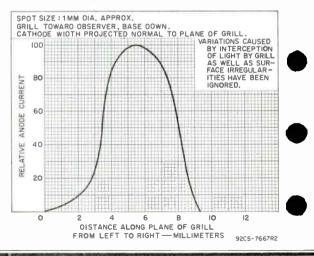


RCA

RADIO CORPORATION OF AMERICA Electronic Components and Perior Recipitations N. J. 



Variation in Photocathode Sensitivity Across Its Projected Width in Plane of Grill



RADIO CORPORATION OF AMERICA Electronic Complimentacianal Elevinces Harrison, N. J.



Multiplier Phototube

ELECTROSTATICALLY FOCUSED DYNODE STAGES

For Detection and Measurement of Nuclear Radiation and other Low-Level Light Sources in Scintillation Counters

IO-STAGE, HEAD-ON,

FLAT-FACEPLATE

DATA

General:
Spectral Response. S-11 Wavelength of Maximum Response 4400 ± 500 angstroms Cathode, Semitransparent Cesium-Antimony Shape Curved, Circular Minimum area 2.2 sq. in. Minimum diameter 1.68 in. Window Lime Glass (Corning® No.0080), or equivalent
Index of refraction
Anode to dynode No.10
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.5 Pin 7 - Dynode No.7 Pin 8 - Dynode No.7 Pin 8 - Dynode No.9 Pin 10 - Dynode No.9 Pin 11 - Anode Pin 12 - Do Not Use Pin 12 - Focusing Electrode Pin 14 - Photocathode



RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

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DATA I 6-66

Maximum Ratings, Absolute-Maximum Values

SUPPLY VOLTAGE BETWEEN ANODE AND			
CATHODE (DC or Peak AC)	1500	max.	volts
SUPFLY VOLTAGE BETWEEN DYNODE No.10			
AND ANODE (DC or Peak AC)	250	max.	volts
SUPFLY VOLTAGE BETWEEN DYNODE No.1			
AND CATHODE (DC or Peak AC)	400	max.	volts
SUPPLY VOLTAGE BETWEEN FDCUSING			
ELECTRODE AND CATHODE			
(DC or Peak AC)	400	max.	volts
AVERAGE ANODE CURRENT [®]	2	max.	ma
AMBIENT TEMPERATURE	75	max.	оС

Characteristics Range Values:

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 foreach 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 = 1250 volts (Except as noted)

	Min.	Typıcal	Max.	
		2.5×10^4	_	a/w
				G(7 9)
·	-	0.064	-	a/w
	15	31	200	a/lm
		22		
•	-	22	_	a/lm
. 5	x 10 ⁻⁵	8×10^{-5}	-	a/lm
5	× 10-8	_		2
:	-	3.9×10^{5}	_	а
ſ	_	2 × 10-10 ^k	2 × 10-9 ^k	լա
1	-	2.5 x 10-13	2.5 x 10-1	2 m w
ſ		7 10 12		
·{	_	8 7 v 10-15	1./ × 10 ⁻¹⁴	i Im
C.		3 0 10-9	2.1 × 10	• W
•) X 10	-	sec
d				
:0				
		+	Indicates a	change.
	• • 5 • 5 • •{ •{	• - • 15 • - • 5×10^{-5} • 5×10^{-8} • - • $\{$ - - • $\{$ - - • $\{$ - - • $\{$ - -	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

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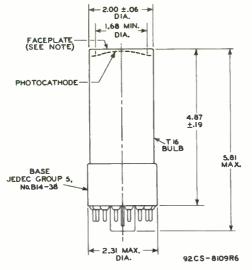
AMERICA Harrison, N. J.

					Min.	Typical	Max.	
1-1/8".						1.3×10-9 4×10-9	-	sec
1-9/16"	•		٠		-	4×10^{-9}	-	Sec

- ^a Made by Corning Glass Works, Corning, New York.
- b Made by Loranger Manufacturing Corporation, 36 Clark Street, Warren, Pennsylvania.
- ^C Made by James Willen 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 haying a lime-glass envelope. It is operated at a color temperature of 2870 K and a light input of 10 microlumens is used.
- 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 a collector. The curves under Typical Anode Characteristics do not apply when dynode No.10 is used as the output electrode.
- 9 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 201 volts are applied between cathode and all nther electrodes connected as anode.
- Applied between calloce and an interference in the cathooe 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 is poperated 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 For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1250 volts is recommended.
- k Measured at a tube temperature of 25° c and with a supply voltage (ε) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current may be reduced by use of a refrigerant.
- Determined at 4400 angstroms.
- ⁶ Under the following conditions: Supply voltage (E) is as shown, 25^o C tube temperature, external shield consected to cathode, transwidth 1 cycleper second, tungsten-light source et 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.
- P Determined under the same conditions shown under (p) except that use is made of a monochromatic source having radiation at 4400 angstrowns.
- 9 Measured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode-pulse rise time is primarily a function of transittime variations in the multipiler stages and is measured under coaditions 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.
- See Spectral Characteristic of 2870° K Light Source and Spectral Characteristic of Light from 2870° K Source after passing through Indicated Blue Filter al front of this Section.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this Section





ALL DIMENSIONS IN INCHES

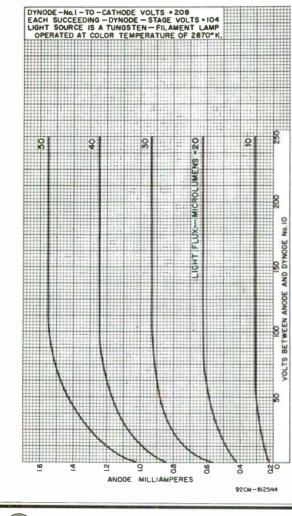
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

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



RADIO CORPORATION OF AMERICA Electron Tube Division of America History Harrison, N. J.



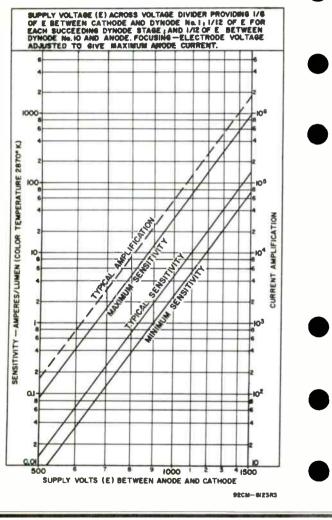


Electronic Components and Devices

RADIO CORPORATION OF AMERICA Harrison, N. J. World Radio History

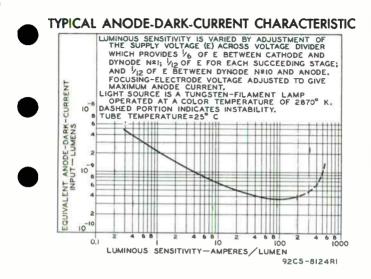
DATA 3 6-66

CHARACTERISTICS



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History







RADIO CORPORATION OF AMERICA Electron Tube Division World Recicibilistory Harrison, N. J. DATA 4 7-63

Gas Phototube

SIDE-ON TYPE

S-I RESPONSE

For Industrial Applications Critical as to Microphonics and Sensitivity Gradient

DATA

General:

Spectral Response
Wavelength of Maximum Response 8000 ± 1000 angstroms
Cathode:
Shape
Minimum projected length ^a
Minimum projected width [*]
Direct Interclectred Conneitones Acarey 1
Direct Interelectrode Capacitance Approx.) 2.6 pf
Maximum Overali Length
Maximum Seated Length
Seated Length to Center of Cathode 2-1/8" ± 3/32"
Maximum Diameter
Operating Position
Weight (Anney)
Weight (Approx.)
Bulb
Socket Amphenol No.77-MIP-4-T, or equivalent
Base
Non-hygroscopic
Basing Designation for BOTTOM VIEW.

Basing Designation for BOTTOM VIEW.

Pin 1-No Internal Connection Pin 2-Anode



Pin 3-No Internal Connection Pin 4 - Photocathode

DIRECTION OF RADIATION



Maximum Ratings, Absolute-Maximum Values;

Rating I Rating II

ANODE SUPPLY VOLTAGE (DC or Peak AC) AVERAGE CATHODE-CURRENT	•		70 max.	90	max.	volts
DENSITY ^b AVERAGE CATHODE CURRENT ^b . AMBIENT TEMPERATURE			10 max.	5	max.	μа

Characteristics:

With an anode-supply voltage of 50 volts unless otherwise specified

Min. Typical Max.



Sensitivity: Radiant, at 8000 angstroms. . . 0.0033

- Indicates a change.



RADIO CORPORATION OF AMERICA **Electronic Components and Devices** Harrison, N. J.

DATA 8-63

a/w 🛥

Min. Typical Max. Luminous: ° At O cps. . . . µa/lumen At 5000 cps . . . 30 µa/lumen At 10000 cps. . . . 26 µa/lumen Sensitivity Difference between highest value and lowest value along cathode length^d . µa/lumen Gas emolification Factor ". . . Anode Dark Current at 25° C μa Minimum Circuit Values: With an anode-supply voitage of 70 or less volts 00 DC Load Resistance: For dc currents above 0.1 min. 5 μa. megohm For dc currents below 0 min. 5 да. megohm For dc currents above 3 да. 2.5 min. meaohms For dc currents below 3 µa. 0.1 min. meanhm

- a On plane perpendicular to indicated direction of incident radiation.
- Averaged over any interval of 30 seconds maximum.
- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K. A dc anode supply of 50 volts and a 1-megohn load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.
- d Measured under the same conditions as indicated under *C* with light input Df0,1 lumen and a rectangular light spot having a width of0,315 inch and a length sufficient to cover the length of the cathode.
- The ratio of luminous sensitivity at an anode-supply voltage of 50 volts to luminous sensitivity at an anode-supply voltage of 25 volts. case, sensitivity sobtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K, the light input is 0,1 umen, and the load resistor has avalue of 1 megohn.

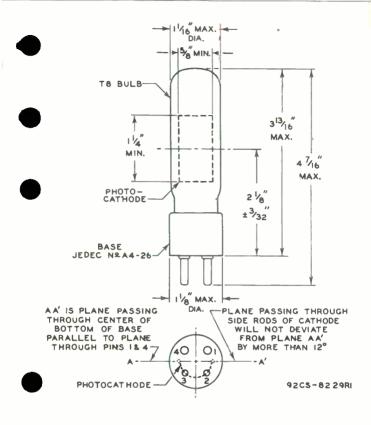
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE OEVICE HAVING S-1 RESPONSE

and

FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES are shown at the front of this section

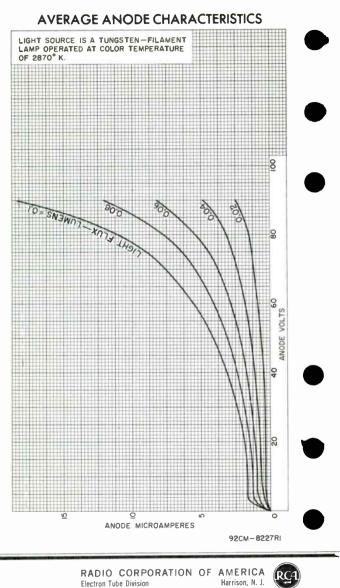


RADIO CORPORATION OF AMERICA Electronic Components and Oevices World Recipitistopy





RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2 3-62



Photomultiplier Tube

S-4 RESPONSE

FLEXIBLE LEADS

SIDE-ON, 9-STAGE TYPE

For AC- or DC-Operated Control Applications Which Require High Luminous Sensitivity

GENERAL

Spectral Response S-4 Wavelength of Maximum Response 4000 ± 500 angstroms Cathode, Opaque S-4 Minimum projected lengtha S-50 = Minimum projected widtha S/16 in Window Lime Glass, (Corningth No.0080), or equivalent = Dynode Material S/16 in Direct Interelectrode Cappacitances (Approx.) Anode to all other electrodes Anode to all other electrodes 4.8 pF Maximum Overall Length 2-3/4 in Excluding semiflexible leads Maximum Envelope Length Maximum Dipectes seal to center of useful cathode aree Maximum Diameter
Cathode, Upaque
Dynode Material
Window. Line Glass, (Lorning* No.0080), or equivalent - Dynode Material
Dynode Material
Dynode Material
Direct Interelectrode Cappacitances (Approx.) Anode-to-dyrode No.9. Anode to all other electrodes Maximum Overall Length. Length. Lingth. Length. Length.
Anode-to-dyrode No.9
<pre>Maximum Overall Length</pre>
<pre>Maximum Overall Length</pre>
Maximum Envelope Length
Maximum Envelope Length
Excluding tip Length
From envelope seal to center of useful cathode area
From envelope seal to center of useful cathode area
Maximum Diameter
Operating Position
Weight (Approx.)
Envelope
Magnetic Shield Perfection Mica Co., C No.P-107,
or equivalent
TERMINAL DIAGRAM (Bottom View)
Lead 1 - Photocathode DYs
Lead 2 - Dynode No.1 DY4 6 DY6
Lead 3-Dynode No.2
Lead 4 - Dynode No.3
Lead 5-Dynode No.4
Lead 6 - Dynode No.5 DY23 H DY28
Lead 7 - Dynode No.6
Lead 8 – Dynode No. 7 Dyn® V 100 Dyg
Lead 9 - Dynode No.8
Lead 10 - Dynode No.9
Lead 10 - Dynode No.9

DIRECTION OF LIGHT

ABSOLUTE-MAXIMUM RATINGS

DC or Peak AC Supply Volta	age													
Between anode and cathod	de .	• •										1250	٧	
Between anode and dynode	e No.	9.										250	v	
Between consecutive dyna	odes											250	V 🕳	
Between dynode No.1 and	cath	node	•	*	• •		٠	•	•	•		250	۷ 🗕	
Average Anode Current ^d .	• •	• •	•		• •		•	•	•	٠	٠	0.1	mA	
Ambient Temperature	• •	• •	٠	-	• •	*	•	•	•		٠	75	°C +	

- Indicates a change.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. -

OURING LEVIOLIDO	MANUE	TREDEO		
Under conditions with supply vol vider providing 1/10 of E between of E for each succeeding dynode dynode No.9 and anode.	cathoo	le and dy	node No.l;	1710
With $E = 1000 V dc$				
	Min	Тур	Max	
Sensitivity Rediant, at 4000 angstroms Luminous, at 0 c/s ^e Dark Current to any Electrode . At 25°C	- 5 -	3.4×10 ⁴ 35 -	250 7.5x10-7	A/W A/Im
With E = Adjustable 60 c/s ac vo	ltage			
	Min	Тур	Max	
- Anode-to-Cathode Voltage ^f RMS Values	535	775	1000 2.5×10 ⁻⁷	¥.
 a On plane perpendicular to the indica passing through the major axis of the Made by Corning Glass Works, Corning C Made by Magnetic Shield Division, Per Bldg., 20 North Wacker Drive, Chicag Averaged over any interval of 30 sec 6 Under the following conditions: The lamp having a lime-glass envelope. ture of 2870 K and a light input of Under the following conditions: The 	te tube, s, New) fection so 6, 11 conds ma ight so It is o f 10 min	(ork. h Mica Co., llinois. aximum. purce is a poperated a crolumens	tungsten-fi t a color ter is used.	Opera lament npera-

CHARACTERISTICS RANGE VALUES

¹ Under the following conditions: The light source is a tungsten filament lawp having a lime-glass envelope. It is operated at a color temperature of 2870¹⁰ K and a light input of 1 microlumen is used. Supply Voltage (E) is adjusted to give an anode current of 7.5 microamperes.

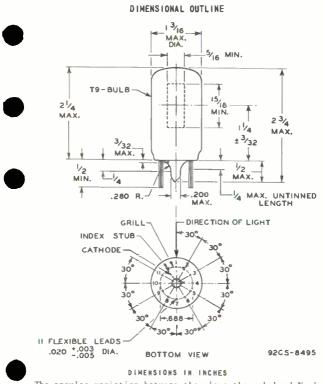
9 For conditions same as (f) except no radiant flux on photocathode.



- Indicates a change.



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History



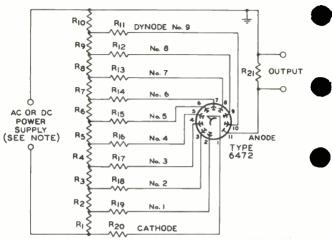
The angular variation between the plane through Lead No.1 and tube axis and the plane perpendicular to the plane of the grill will mot exceed 20°.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at front of this section



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redo History Harrison, N. J.

RECOMMENDED VOLTAGE-DIVIDER NETWORK FOR USE WITH TYPE 6472 IN HEADLIGHT-DIMMING SERVICE



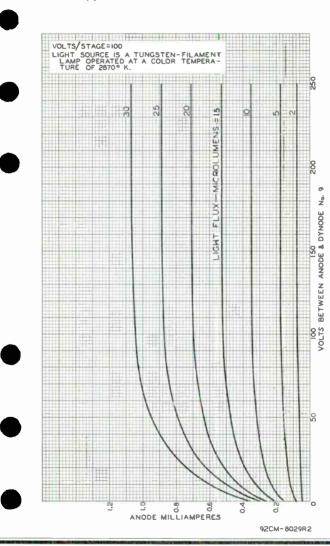
9205-8526

B1 B2 B3 B4 B5 R6 R7 R8 R9 R10: 1 megohm, 1/2 watt R11: 2 megohms, 1/2 watt R12: 5.1 megohms, 1/2 watt R13 R14 R15 R16 R17 R18 R19 R20: 8.2 megohms, 1/2 watt R21: 820,000 ohms, 1/2 watt

Note: Adjustable between approximately 500 and 1000 volts dc or peak ac.



Harrison, N. J.



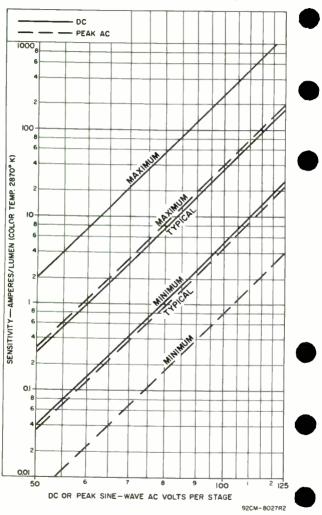
Typical Anode Characteristics

RC

RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

DATA 3 12-65



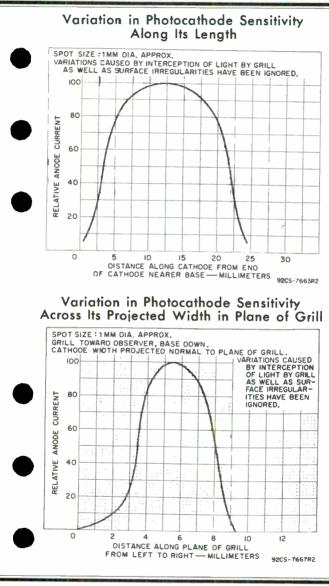
Range of Luminous Sensitivity

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6472





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DATA 4

World Radio History

1



IMAGE ORTHICON

FOR SIMULTANEOUS COLOR PICKUP

MAGNETIC FOCUS

MAGNETIC DEFLECTION

6×1×

DATA

General:	VATA		
Heater, for Unipotential			
Voltage			
Current			
Direct Interelectrode Cap			
Anode to all other elec			
Photocathode, Semitranspa			
Response See acc	companying Spectral Sensitivity curve		
Rectangular image (4 x	3 aspect ratio):		
Useful size of	1.6" max. Diagonal		
Orientation of	Proper orientation is obtained when		
	the vertical scan is essentially		
	parallel to the plane passing		
	through center of faceplate and		
	pin No.7 of the shoulder base.		
	Magnetic		
	Magnetic		
Overall Length	15-3/16" ± 1/4"		
Greatest Diameter of Bulb			
Minimum Deflecting-Coil L	nside Diameter 2-3/8"		
Deflecting-Coil Length	· · · · · · · · · · · · · · · · · · ·		
Eccusing_Coil Length			
Alignmont_Coil Longth	15/16"		
Photocathodo Distance Ins	ide End of Focusing Coil 15/16"		
Consting Pacition: Any of	xcept with diheptal base up and tube		
operating Position, any e	at angle of less than 20 ⁰ from vertical		
Waight (Anoroy)			
Find Base	1 lb 6 oz . Small-Sheli Diheptal 14-Pin Base		
	(JETEC No.814-45)		
	BOTTOM VIEW		
Pin 1-Heater			
Pin 2-Grid No.4	DIRECTION OF LIGHT: PERPENDICULAR TO		
Pin 3-Grid No.3	LARGE END OF TUBE		
Pin 4 - Internal Connec	-		
tion-Do Not Us	e 3 0		
Pin 5-Dynode No.2	DY4 7 8 DY3		
Pin 6-Dynode No.4			
Pin 7-Anode	6 G2 G2		
Pin 8-Dynode No.5	20Y2 5 F TODYIS		
Pin 9-Dynode No.3	ICA & STATE MIC		
Pin 10 - Dynode No.1.	Jer Here		
Grid No.2	GOLD A XOC.		
Pin 11- Internal Conrec	- 2 (3)		
tion-Do Not Us			
Pin 12-Grid No.1	H H TARGET		
Pin 13 - Cathode	0		
Pin 14 - Heater	K		
	WHITE INDEX LINE		
(Continued on next page) ON FACE			
(Con	conver on next page)		

JUNE 14, 1954

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



IMAGE ORTHICON

Shculder Base Keyed	d Jumbo Anni	ular 7-Pin
Pin 1-Grid No.6 Pin	5-Grid No.	5
Pin 2 - Photocathode	_	1
	6 – Target	
tion-Do Not Use		~
Pin 4 – Internal Connec– Pin tion—Do Not Use	7 - Internal tion-Do	
tion-Do Not Use	000	NUCUSE
Maximum Ratings, Absolute Values:		
		ſ
PHOTOCATHODE:	550 m	ax. volts
Voltage	. 50 m	
OPERATING TEMPERATURE:	• • • • •	
Of any part of bulb		ax. °C
Of bulb at large end of tube		
(target section)		in. °C
TEMPERATURE DIFFERENCE:	-	
Between target section and any part		
of bulb hotter than target section		
GRID-No.6 VOLTAGE	••• –550 m	ax. volts
TARGET VOLTAGE:		
Positive value		
Negative value		
GRID-No.5 VOLTAGE		
GRID-No.4 VOLTAGE		ax. volts ax. volts
GRID-No.3 VOLTAGE		
GRID-No.2 & DYNODE-No.1 VOLTAGE	••• >>> //	ax. voits
GRID-No.1 VOLTAGE: Negative bias value	125 m	ax. volts
Positive bias value	•••	
PEAK HEATER-CATHODE VOLTAGE:	•••	
Heater negative with respect to cathod	e. 125 m	ax, volts
Heater positive with respect to cathod	e. 10 m	ax. volts
ANODE-SUPPLY VOLTAGE"	1350 m	ax. volts
VOLTAGE PER MULTIPLIER STAGE		ax. volts
	F	
Typical Operation and Characteristics:		
Photocathode Voltage (Image Focus)	-300 to -5	00 volts
Grid-No.6 Voltage (Accelerator)	005 4 0	75
75% of photocathode voltage	-225 to -3	
Target Voltage ⁰	0 to 3 0 to 12	
Grid-No.5 Voltage (Decelerator) Grid-No.4 Voltage (Beam Focus)	160 to 22	
Grid—No.4 Voltage (beam rocus) Grid—No.3 Voltage#	225 to 33	
Grid-No.2 & Dynode-No.1 Voltage	300	volts
Grid-No.1 Voltage for Picture Cutoff	-45 to -1	
Ratio of dynode voltages is shown under Typica	l Operation.	
O Adjustable from -3 to +5 volts with blanking v	oltage off.	
Adjust to give the most uniformly shaded pictu	re near maxim	um signal.

JUNE 14, 1954

6474

TENTATIVE DATA 1





IMAGE ORTHICON

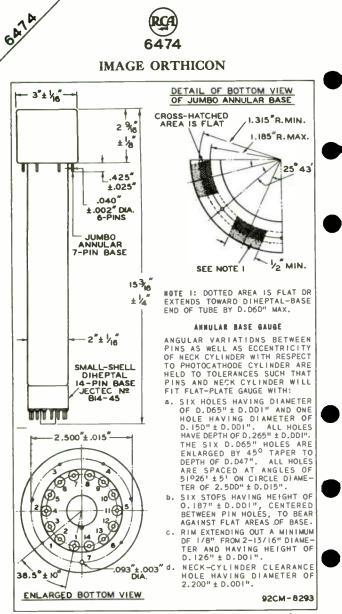
	Oynode-No.2 Voltage	600	volts	
	Uynode-No.3 Voltage	800	volts	
	Oynode-No.4 Voltage	1000	volts	
	Oynode-No.5 Voltage	1200	volts	
	Anode Voltage	1250	volts	
	Anode Current (DC)	30	µamp	
,		3 to 20	µamp	
	Target Temperature Range	35 to 45	' °ċ l	
	Ratio of Peak-to-Peak Highlight Video-	· · · ·		
	Signal Current to RMS Noise Current			
	(Approx.)	60		
	Minimum Peak-to-Peak Blanking Voltage	5	volts	
	Field Strength at Center of Focusing Coil*	75	qausses	
	Field Strength of Alignment Coil (Approx.)	0 to 3	gausses	
	I tota ottotigen of thirdinene coll (rippi ovit)	0.00	3	

Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coll, with the indicator located outside of and at the image end of the focusing coll.

OPERATING CONSIDERATIONS

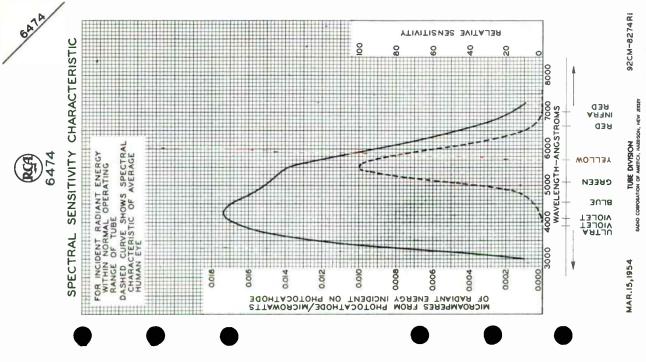
When the equipment design or operating conditions are such that the maximum temperature rating or maximum temperature difference as given under Maximum Ratings will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflectingcoil assembly and its extension. Any attempt to effect cooling of the tube by circulating even a large amount of air around the focusing coll will do little good, but a small amount of air directly in contact with the bulb surface will effectively drop the bulb temperature. For this purpose, a small blower is satisfactory, but it should be run at low speed to prevent vibration of the 6474 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur.

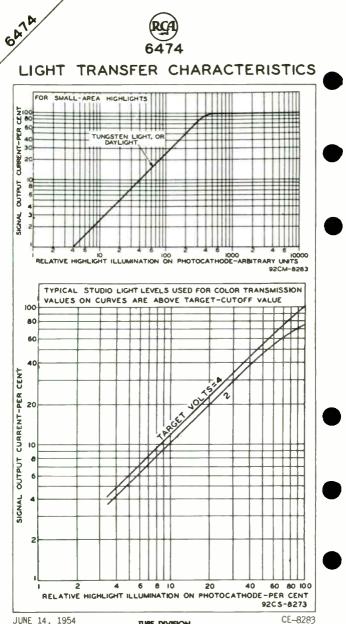
To keep the operating temperature of the large end of the tube from falling below $35^{\circ}C$, some form of controlled heating should be employed. Drdinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. If, in special cases, a target heater is required, it should fit between the focusing coil and the bulb near the shoulder of the tube, and be non-inductively wound.



JUNE 14, 1954

CE-8293





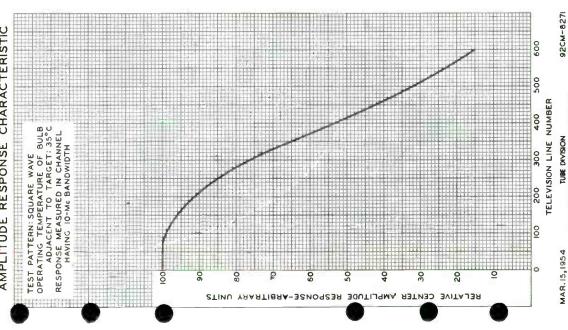
TUBE DIVISION

-8273



6474



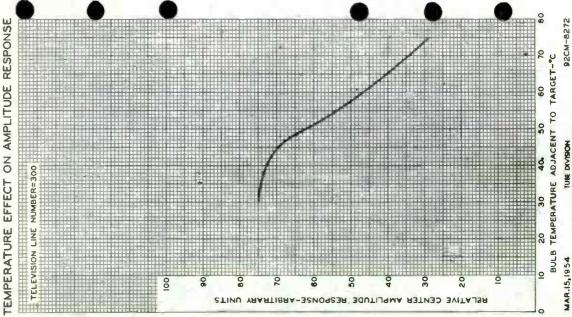


92CM-827



AL49

TUDE AMPL Z EFFECT URE TEMPERAT





010

VACUUM PHOTOTUBE

1

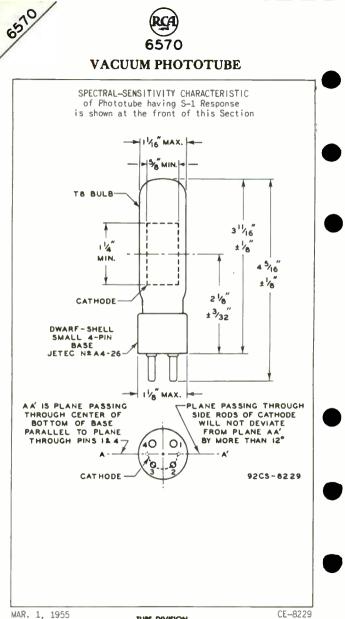
χ.,

LOW-MICROPHONIC TYPE WITH S-I RESPONSE

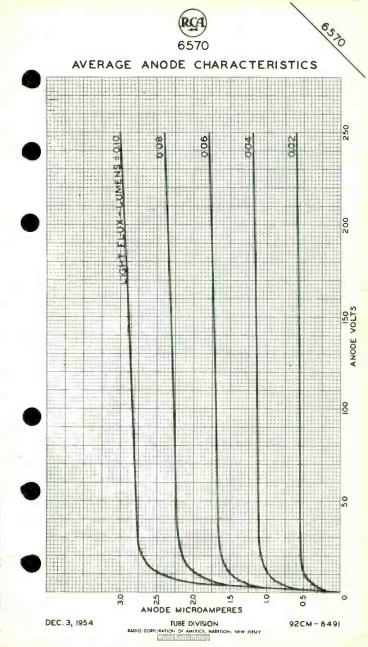
DATA

General:			
Spectral Response Wavelength of Maximum Re Cathode:		8000 ± 100	S—1 O angstroms
Shape Minimum projected leng Minimum projected widt Direct Interelectrode <i>Ge</i> Overall Length.	h*	· · · · · ·	cylindrical . 1-1/4" . 5/8" . 3 µµf 5/16" ± 1/8"
Seated Length Seated Length to Center Maximum Diameter Mounting Position	of Cathode	3-1	1/16" ± 1/8" 1/8" ± 3/32" 1-1/8" Any
Weight (Approx.) Bulb Base Dwa	arf-Shell Small 4		. 1.3 oz T-8 C Na.A4-26), hygroscopic
	BOTTOM VIEW		
Pin 1-No Connection Pin 2-Anode		Pin 3-No C Pin 4-Ca	onnection
	DIRECTION OF LIGHT		
Maulmum Dahlana di i			
Maximum Ratings, Absolut ANODE-SUPPLY VGLTAGE (DC or Peak AC) AVERAGE CATHODE-CURRENT AVERAGE CATHODE CURRENT AMBIENT TEMPERATURE	DENSITYO	500'max. 25 max. 5 max. 100 max.	volts µamp/sq.in. µamp oc
Characteristics at 250 N	Volts on Anode:		
Sensitivity:	Hin. A	v. Hax.	
Radiant at 8000 angstr Luminous [#] Sensitivity Difference Be Hiddest Value and Lowe	20 etween	0027 – 30 40	µamp/µwatt µamp/lumen
		- 4.5	"amp/lurren
Value Along Cathode Len Anode Dark Current at 25		- 0.013	µamp
Anode Dark Current at 25 • On plane perpendicular to	50C	- 0.013 of incident	μamp
Anode Dark Current at 25 On plane perpendicular to O Averaged over any interval For conditions where the 1 ated at a color temperature a 1-megohm load resistor,	OC — indicated direction of 30 seconds maxi ight source is a tu e of 2870°K, A dc and a light input o	- 0.013 of incident mum. ngsten-filame anode supply f 0.1 lumen a	µamp igst. of 250 volts. ire used.
Anode Dark Current at 25 • On plane perpendicular to • Averaged over any interval	OC — indicated direction of 30 seconds maxi ight source is a tu e of 2870°K, A dc and a light input o	- 0.013 of incident mum. ngsten-filame anode supply f 0.1 lumen a	µamp igst. of 250 volts. ire used.
Anode Dark Current at 25 On plane perpendicular to O Averaged over any interval For conditions where the 1 ated at a color temperature a 1-megohm load resistor,	OC — indicated direction of 30 seconds maxi ight source is a tu e of 2870°K, A dc and a light input o	 0.013 of incident mum. ngsten-filame anode supply f 0.1 lumen a d under (#) diameter. 	µamp igst. of 250 volts. ire used.

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History



TUBE DIVISION EADIO COEPOEATION OF AMERICA, HARRISON, NEW JERSEY



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Photomultiplier Tube



IO-STAGE. HEAD-ON, FLAT-FACEPLATE TYPE HAVING S-II RESPONSE 1.68 INCH MINIMUM DIAMETER CURVED PHOTOCATHODE

For Use in Scintillation Counters for the Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources

GENERAL

Spectral	Respons	ie											. S.	-11
Wavelengt	h of Ma	ximum	Res	spon	se				LUN) + I	500	i an		
Cathode.	Semitra	nspar	ent			• •	•	•••	1100	· -	500	0.0	yati	DIII S
Shane				• •	•	•••	•	• •	• •		•			- 20 -
Shape.		•••	• •	• •	•	• •	•	• •	• •	Cur	ved		Ircu	lar
Minimum	area	• •	• •	• •		• •	٠	• •	• •	• •		2.2	sq	in
MINIMUM	diariet	er.	• •	• •	. •		• •	• •					1.68	in
Minimum Window .	• • • •	Lime	Gla	155	(Co	rni	ng"	No	.0080)).	or	ean	ival	ent 🕳
Index 0	i rena	LION												51
Dynode Mar	terial.						•	•••	•••	•••	•	• •		101
Direct In	terelec	trode	 Can	iaci.	+		1.	• •		• •	•	• •	65.	- 20 -
Anode to	a dynad	a No	10	aci	Lan	ces	(A	ppro	5x. j					
Anode to	a all a	then.	10.	÷*	.*	• •	•	• •	• •	• •		•	4.4	pF
Anode to		ther	erec	tro	aes	• •	•	• •	• •				7.0	pF
HOAT MOIN OF	verarr	Lengt	n .										5 81	i.
Seared Lei	ngtn									<u>ц</u>	87	A 6	0 10	i -
Maximum D	ameter												2 31	in
Operating Weight (Ar	Positi	00					-	•••	•••	•••	•	• •		
Weight (År	nroy)		•••	•••	•	•••	•	• •	• •	• •	•	• •		Any
Weight (År	·p· 0/.)	•••	• •	• •	•	• •	• •	• •	• •	• •		•	5.2	oz
Base . Mec	31um-5n	eiiDi	hept	taï	4-	Pin	(JI	EDEC) Gro	up 5	5. N	o. B	4-38	11.
Socket					Lo	rand	ier ^l	No	227	н.				
Magnetic S	shield.			. Pr	ar fa	acti	0.0	Mile		"'c	M.	equi	vare	<u>πτ</u> 🗕
_			•		. 10	SULI	on	mic	a 10					
											or (equ i	vale	nt 🛨
		180	01.111	E E - A	AV.	A 41 1A 4	0.0	T 1 14	~ ~					

ABSOLUTE-MAXIMUM RATINGS

DC or Peak AC Supply Voltage

Between anode and cathode.	1050
Between dynade No. 10 and anothe	1250 V
Between dynade No.10 and anode .	250 V
Average Anode Currentd	300 V
Average Anode Current ^d	0.75 mA
Ambient Temperature	75 °C
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

TERMINAL DIAGRAM (Sottom View)

Pin 1 - Dynode No.1 Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.5 Pin 6 - Dynode No.5 Pin 6 - Dynode No.6 Pin 7 - Dynode No.7 Pin 8 - Dynode No.9 Pin 10 - Dynode No.10 Pin 11 - Anode Pin 12 - Do Not Upo	DY6 DY7 DY8 DY9 DY5 S F 2 2 3 10 DY4 4 H H P DY3 3 C F 4 C H L P DY3 3 C F 4 C H L P DY3 3 C F 4 C H L P DY2 C F 10 C F 10 L P DY2 DY1 K DIRECTION OF RADIATION:
Pin 12 - Do Not Use	INTO END OF BULB
Pin 13 - Focusing Electrode Pin 14 - Photocathode	IVAA
and an invested though	-Indicates a change:



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 2-66

CHARACTER					
Under conditions with de divider providing 1/6 of 1/12 of E for each succ between d	E be eedin	tween g dyna	cathode and	dynode No	e D
With $E = 1000 V dc$	h	lin	Тур	Max	
Sensitivity Radiant, at 4400 angstrom	ns	-	7.2x10 ⁴	-	A/W
Cathode radiant, at 4400 angstroms	•	-	0.044	-	A/W
Luminous: At O c/s ^e		10	90	300	A/lm
With dynode No.10 as output electrode Cathode luminous:	•	-	65	-	A/1m
With tungsten light source ⁹	. 4x	10-5	5.5 x 10 ⁻⁵	-	A/lm
With blue light source ^h	. 4x	10 ⁻⁸	1.6x10 ⁶	- -	A
Equivalent Anode-Dark- Current Input At a luminous sensitivi		-	5x10 ⁻¹⁰	2 x 10 ⁻⁹	lm
of 20 A/lm],k Equivalent Noise Input ^m . Anode-Pulse Rise Time ⁿ . Greatest Delay Between	•	-	7×10 ⁻¹² 3×10 ⁻⁹	2.7×10-11 -	Ìm s
Anode Pulses, due to posi from which electrons are simultaneously released within a circle centered tube face having: Diameter of 1-1/8 in . Diameter of 1-9/16 in.	e don	-	1.5×10-9 ^p 4.5×10 ^{-9p}	-	5 5
And the standard heads	Corr	ing N	law York.		

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

^b Made by Loranger Manufacturing Corp., 36 Clark St., Warren, Pa.

C Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bl4g., 20 North Wacker Drive, Chicago 6, Illinois.

Averaged over any interval of 30 seconds maximum.

⁶ Under the following conditions: The light source is a tungsten-filament lamphaying a lime-glass envelope. It is operated at a color temperature of 2870°K and a light input of 10 microlumena is used.

- 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 curres shown in fysical Anode Chaoter(stics do not sppl) when dynode No.10 is used as the output electrode.
- ⁹ 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 eathode and all other electrodes connected as mode.
- ^b 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 (Jass Works, Corning, New York) from a tungsten-filament lamp operated at a cubr temperature of 2870 K. The value of light flux incident on the filter is0.01 lumen and 200 volts are applied between cathode and all other electrodes connected as anode.

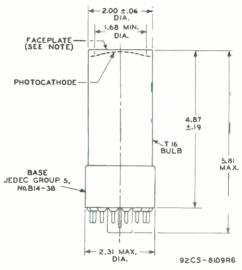
- Indicates a change.

DATA I

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



- j At a tube temperature of $25^{\circ}\text{C}.$ 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.
- Delow 1909 volts is recommence. Winder the following conditions: Supply voltage (E) is as shown, 25°C tybe temperature, external shield connected to cathode, bandwidt; 1 cycle pr ascond, turgsten-light source at a color temperature of 2670°K interrwpted at a low mudio frequency to produce incident radiation pulses alternuting between zero and the value stated. The "on" period of the pulse it equal to the "off" period.
- M. saured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode-pulse rise time is primarily a function of transi-time wariations in the multiplier atages and is measured under conditions with an i.c.ident-light apot approximately 1 millimeter in diameter centered on the photocathode.
- P Πiese values also represent the difference is time of transit besween the piotocathede and dynode No.1 for electrons simultaneoualy released from the center and from the periphery of the specified areas.



DIMENSIONAL OUTLINE

DIMENSIONS IN INCHES

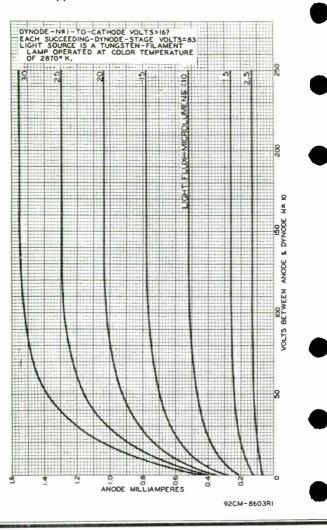
Center lime of bulb will not deviate more than 2° in any direction from the perpendicular erected at the center of bottom of the base.

Note: within 1.68 inch diameter, deviation from Flatness of external surface of faceplate will not exceed 0.010 inch from peak to valley.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 2-66

Typical Anode Characteristics

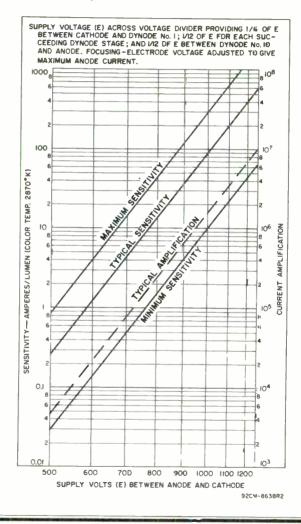


DATA 2

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

RCA

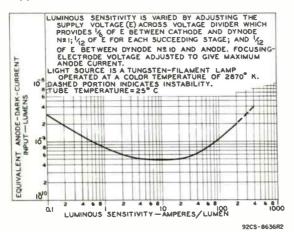
Typical Sensitivity and Current Amplification Characteristics





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 3

Typical Anode-Dark-Current Characteristic





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

DATA 3

Photomultiplier Tube



14-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING S-II RESPONSE

1.68-INCH MINIMUM DIAMETER CURVED PHOTOCATHODE

Particularly Useful in Fast Scintillation Counters, in the Detection and Measurement of Nuclear Radiation and Other Low-Level Light Sources

GENERAL

Spectral Response	S-11
Wavelength of Maximum Response	
Cathode, Semitransparent	Cs-Sb 🖛
Shape	
Minimum area	
	1.68 in
Window Lime Glass, Corr	
lodov er refrection	ing Ho.0000, or equivalent-
Index or refraction	
Dynode Material	Cu-Be
Direct Interelectrode Capacitances	s (Approx.)
Anode to dynode No.14	
Anode to all other electrodes.	6.0 pF
Maximum Overall Langth	••••••••••••••• 7.5 in
Seated Length	6.69 ± 0.19 in
Maximum Diameter	
Operating Position	Any
Weight (Approx.)	8.07
Envelope	IEDEC TIG
Envelope 8aseSmall-Shell Bidecal	20-Pin (JEDEC No 820-102)
	Non-huaraaaania
Socket Cir	ichb No 20-PM or ganingloot
Magnetic Shield Mille	No 2020 PM, or equivalent
TERMINAL DIAGRAM (Bottom View)
Pin 1-No Connection	
Pin 2-Dynode No.1	P DYI4
Pin 3-Dynode No.3	G2 (D) (I) DYI2
Pin 4 - Dynode No. 5	
Pin 5 - Dynode No.7	
Die C Die Hole D	
The provide No 9	
Pin 6 - Dynode No.9 DY	
Pin 7 - Dynode No.11	
Pin 7 - Dynod∉ No.11 Pin 8 - Dynod∉ No.13 DYg(
Pin 7 - Dynod∉ No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler-	
Pin 7-Dynode No.11 DYg(Pin 8-Dynode No.13 DYg(Pin 9-Grid No.2 (Acceler- ating Electrode) DYr(
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 10 - Anode	
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14	
Pin 7-Dynode No.11 DYg(Pin 8-Dynode No.13 DYg(Pin 9-Grid No.2 (Acceler- ating Electrode) DYr(Pin 10 - Anode Pin 11 - Dynode No.14 DY	
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.10 Pin 13 - Dynode No.10	
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.12 Pin 13 - Dynode No.10 Pin 14 - Dynode No.8	
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.12 Pin 13 - Dynode No.10 Pin 14 - Dynode No.6	6 6 6 6 6 6 6 6 6 6 6 6 6 6
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.12 Pin 13 - Dynode No.10 Pin 14 - Dynode No.6 Pin 15 - Dynode No.6 Pin 16 - Dynode No.4	
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 12 - Dynode No.14 Pin 12 - Dynode No.10 Pin 13 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.8 Pin 15 - Dynode No.4 Pin 17 - Dynode No.2	6 6 6 6 6 6 6 6 6 6 6 6 6 6
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.10 Pin 13 - Dynode No.8 Pin 15 - Dynode No.6 Pin 16 - Dynode No.6 Pin 16 - Dynode No.2 Pin 18 - No Connection	birto END of Bulls
Pin 7-Dynode No.11 Pin 8-Dynode No.13 Pin 9-Grid No.2 (Acceler- ating Electrode) Pin 10-Anode Pin 11-Dynode No.14 Pin 12-Dynode No.12 Pin 13-Dynode No.10 Pin 14-Dynode No.8 Pin 15-Dynode No.6 Pin 16-Dynode No.4 Pin 17-Dynode No.2 Pin 18-No Connection Pin 19-Grid No.1 (Focusing Election)	by a constraint on the second
Pin 7-Dynode No.11 Pin 8-Dynode No.13 Pin 9-Grid No.2 (Acceler- ating Electrode) Pin 10-Anode Pin 11-Dynode No.14 Pin 12-Dynode No.12 Pin 13-Dynode No.10 Pin 14-Dynode No.8 Pin 15-Dynode No.6 Pin 16-Dynode No.4 Pin 17-Dynode No.2 Pin 18-No Connection Pin 19-Grid No.1 (Focusing Election)	by a constraint on the second
Pin 7 - Dynode No.11 Pin 8 - Dynode No.13 Pin 9 - Grid No.2 (Acceler- ating Electrode) Pin 10 - Anode Pin 11 - Dynode No.14 Pin 12 - Dynode No.10 Pin 13 - Dynode No.8 Pin 15 - Dynode No.6 Pin 16 - Dynode No.6 Pin 16 - Dynode No.2 Pin 18 - No Connection	6 6 6 6 6 6 6 6 6 6 6 6 6 6



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 12-65

L

VERY-LOW-LIGHT-LEVEL, LOW-NOISE, HIGH-GAIN SERVICE								
Absolute-Maximum Ratings								
Under conditions with dc voltage divider providi in Table I - Column A, accelerating-electrode v values which provide	supply v ngelect The foc voltages	oltage (E) rode voltag using-elect are adjuste	es shown rode and d to those					
DC Supply Voltage Between Anode and Cathode. Between Dynode No.14 and An → Between Consecutive Dynodes Between Dynode No.1 and Cat Eetween Focusing Electrode Between Accelerating Electro Average Anode Current ^d Ambient Temperature.	hode hode and Catl	node vnode No.13	. 40 . 40 . ±50)			
Characterist With E = 2000 V (except as no	-	e Values)			
With E = 2000 V (except as ho		-		-				
Sensitivity	Min	Тур	Max					
Radiant at 4400 angstroms Cathode radiant at 4400	-	2.4×10 ⁶	-	A/W				
angstroms	-	0.056	-	A/W				
At O c/s ^e . With dynode No.14 as	480	3050	2×10 ⁴	A/lm				
output electrode ^f Cathode luminous; With tungsten light	-	2.1x10 ³	-	A/1m				
source ^g	5×10 ⁻⁵ 5×10 ⁻⁸	7 × 10 ⁻⁵	-	A/1m A				
Current Amplification	-	4.3x10 ⁷	-	<u> </u>				
Equivalent Anode-Dark- Current Input At luminous sensitivity of 2000 A/lm ^j , ^K	-	5×10 ⁻¹⁰	1.5 x 10 ⁻⁹	lm				
Equivalent Noise Input ^m	-	3.3×10-12	5×10-11	Im				
Greatest Delay Between Anode	Pulses ⁿ							
Due to position from which leased within a circle cen	electror	ns are simul	taneousl	y re-				
Diameter of 1.12 in .	-	1 x 10 ⁻⁹	naving:	s				
Diameter of 1.56 in .	-	3 x 10 ⁻⁹	-	s 👝				
HIGH-OUTPUT	-PULSE S	ERVICE			1			
Absolute-Ma	aximum R	atings						
Absolute-Maximum Ratings Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table I - Column B. The focusing-electrode and accelerating-electrode voltages are adjusted to those values which provide maximum anode current. DC Supply Voltage Between Anode and Cathode								
DATA I RADIO CORP Electronic Component			ERICA son, N. J.	RCA				

	Ambient Temperature	V V V V V V V C
	With E = 2400 V (except as noted)	
	Min Typ Max	
	<pre>Sensitivity Radiant at 4400 angstroms 2.4x10⁶ - A Cathode radiant at 4400</pre>	/₩
		/₩
	At c/s ^e 3050 - A/ With dynode No.14 as output	1 m
	electrode ¹	lm
	With blue light source ⁰ . 5×10^{-5} 7 $\times 10^{-5}$ - A/ With blue light source ⁰ . 5×10^{-8} Current Amplification	lm A
	Equivalent Anode-Dark-Current	
	Input	lm
		lm
•	 ^a Made by Coruing Glass Works, Corning, New York. ^b Made by Cinch Manufacturing Company, 1626 South Homan Avenue. Chicago 24 Illinois. ^c Made by James Millen Manufacturing Company, 150 Exchange Street, Malden 46 Massachusetts. ^d Averaged over any interval of 30 seconds maximum. ^e Under the fallowing conditions: The light source is a tungsten-filamer lamphaving a lime-glas.envelope. It is operated at a color temperatur of 2870 K and a light input of 0.1 microlumen is used. ^f An output current of opposite polarity othat obtained at the anode me be provided by using dynode No.14 as the output electrode. With this arrangement, the load is connected in the dynode-No.14 circuit and the anode serves only as collector. The curves shown under 729ical Anod Characteriifics do not apply when drnodr No.14 is used as the output of 2870° K. The value of light flux is 0.01 lumen and 200 volts ar anode. ^e Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-Mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang C.S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 for K and a sub stress of light flux incident on the cathode is transmitted through a blue filter (Corning C.S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-mang S. No S-58. Glass Code No.511 poliahed to 1/2 atock thickness-m), ite ise le it ite ise
	j At a tube temperature of 25° C. Dark current may be reduced by use of a refrigerant. K For maximum signal-tempine ratio, or eration with a supply related 15 K.	
	below 2000 volts is recommended. → Indicates a change	



Harrison, N. J.

- ^m Under the following conditions: Supply voltage (E) is as shown, 25° C tube temperaturesexternal shield connected to cathode, bandwidth 1 crgim per second, tungsten-light source at a color temperature of 287° K interrupted st 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 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.
- P For maximum signal-to-noise ratio, operation with a supply voltage (E) below 2300 volts is recommended.
- G Focusing-electrode voltage is adjusted to that value which provides maximum anode current.

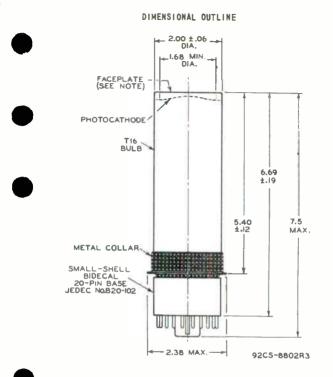
TABI	FI		[
VOLTAGE TO BE PROVIDED BY DIVIDER									
COLUMN A COLUMN B									
Between	5.4% of Supply Voltage (E)								
Cathode and	See footnote ^q	See footnote ^q	1						
Focusing Electrode Cathode and Dynode No.1	2	2							
Focusing Electrode and Dynode No.I	I	1							
Dynode No. 1 and Dynode No. 2		I							
Dynode No.2 and Dynode No.3 Dynode No.3 and Dynode No.4									
Dynode No.4 and Dynode No.5									
Oynode No.5 and Dynode No.6	i i	i							
Dynode No.6 and Dynode No.7	1	1.2							
Dynode No.7 and Dynode No.8 Dynode No.8 and Dynode No.9		1.5							
Dynode No.9 and Dynode No.9		2.4							
Dynode No. 10 and Dynode No. 11	i i	3.0							
Dynode No. 11 and Dynode No. 12	1.25	3.8							
Dynode No. 12 and Dynode No. 13	1.5	4.8							
Dynode No.13 and Dynode No.14 Dynode No.14 and Anode	1.75	6.0 4.8							
Anode and Cathode	18.5	36.4							

OPERATING CONSIDERATIONS

An increase in current amplification may be obtained under conditions with a dc supply voltage (E) across a voltage divider providing 1/8 of E between cathode and dynode No.1; 1/16 of E for each succeeding dynode stage, and 1/16 of E between dynode No.14 and anode.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



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.

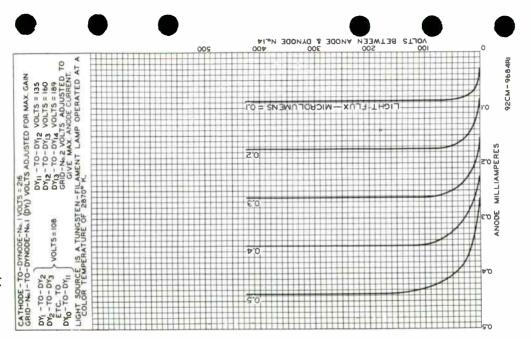
Note: Within 1.68" diameter, deviation from flatness of external surface of faceplate will not exceed 0.005" from peak to valley.



RADIO CORPORATION OF AMERICA Electronic Components and Devices History Harrison, N. J.



Characteristics Anode Typical



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Harrison,

Devices

and

Components

RADIO Electronic

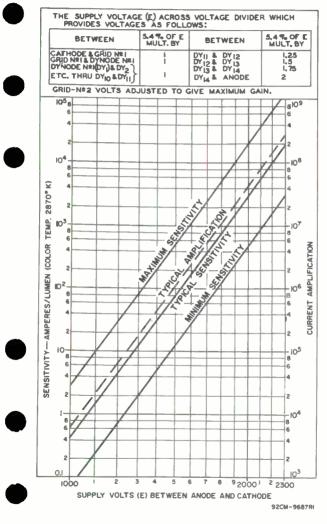
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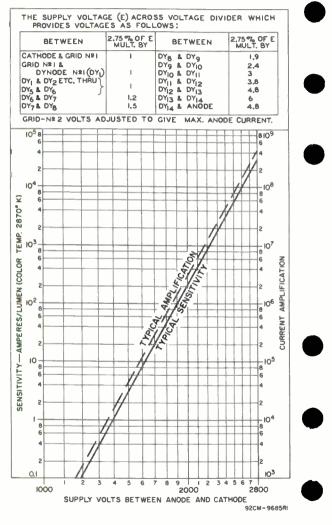


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Harrison, N. J.

Sensitivity and Current Amplification Characteristics

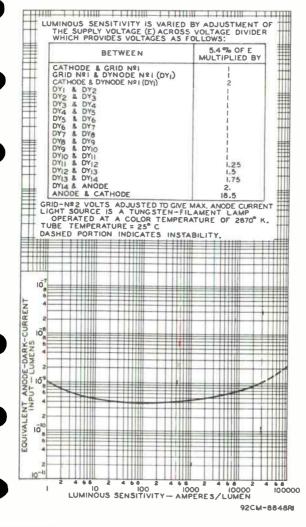






Typical Anode-Dark-Current Characteristic

VERY-LOW-LIGHT-LEVEL, LOW-NOISE, HIGH-GAIN SERVICE

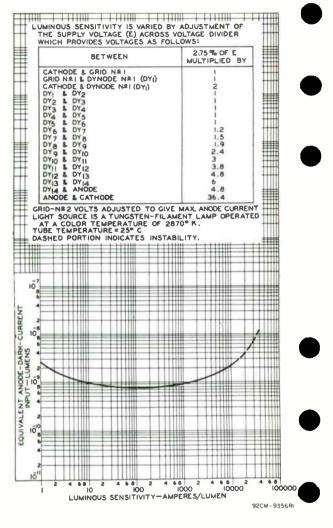




RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Typical-Anode-Dark-Current Characteristic

HIGH-OUTPUT-PULSE SERVICE



DATA 5

RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.



Photomultiplier Tube

S-13 RESPONSE

10-STAGE, HEAD-ON, FLAT-FACEPLATE

ELECTROSTATICALLY FOCUSED DYNODE STAGES

For Detection and Measurement of Ultraviolet Radiation and Other Low-Level Radiation Sources

GENERAL

Spectral																		
Waveleng	th of	Maxi	mum	Re	spo	onse	۶.					44(00	±	500	ar	igstr	oms
Cathode,	Semit	trans	par	ent										Ce	siu	m-/	intin	iony
Shape														. F	lat	, 0	ircu	lar
Minimur	n area	a															2 sq	in
Minimu	m diar	-etei	·													1	-5/8	in
Window.															.Fu	sec	1 Sil	ica
Maximu																		
Index	of re	ract	tion	at	20	000	ar	ng s	tr	c-ms	Ξ.						. 1	.51
Dynode M	ateria	al.												Ce	siu	m-/	\ntim	iony
Direct I	ntere	lecti	rode	Ca	pac	cita	and	es:	(App	ro	х.)					
Anode	tc dy	node	No.	10					•				•				4.4	pF
Anode	to al	l oth	her	ele	cti	rode	es										7.0) pF
Maximum	Overa	11 Le	engt	h.												6.	-9/16	i în
Seated L	ength													5-	5/8	±	3/16	i n
Maximum	Diame	ler.														2.	-5/16	i n
Operating																		
Weight ()	Approx	x.).															5.8	oz
Bulb																		
Socket.																		
Magnetic																		
Base																		
			(JE	DEC	G	rou	p 5	5,	No	• B I	4-	-38),	No	n-h	yg	rosco	pic
Basing D	esigna	ation	1 fo	r B	OTI	ГОМ	V I	E١								,	. 1	444

Pin	1 – Dynode	No.1
Pin	2 - Dynode	No.2
Pin	3 – Dyncde	No.3
Pin	4 – Dynode	No.4
Pin	5 – Dync de	No.5
Pin	6 – Dynode	No.6
Pin	7 – Dyncde	No.7
Pin	8 – Øynode	No.8
Pin	9 - Dyncde	No.9
Pin	10 - Dynode	No.10
Pin	11 – Anode	
Pin	12-Do Not	Use
Pin	13 - Focusir	ig Elect
D: _	14 Oheene	a la la sel s





RADIO CORPORATION OF AMERICA Electronic Components Value Devicesistory Harrison, N. J.

MAXIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

DC or Peak AC Supply Voltage

Between anode and cathode	1250	٧
Between dynode No.10 and anode	250	۷
Between dynode No.1 and cathode	300	
Between focusing electrode and cathode.		
Average Anode Current ^d		
Ambient Temperature	75	°C

CHARACTERISTICS RANGE VALUES

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)

	Min	Тур	Max	
Sensitivity				
Radiant, at 4400 angstroms	-	7.2×10 ⁴	-	A/W
Cathode radiant, at				
4400 angstroms	-	0.047	-	A/W
Luminous:				
At 0 c/s ^e	10	90	300	A/lm
With dynode No.10 as				,,, ,,,,
output electrode ^f	_	52	-	A/1m
Cathode luminous:		02		147 110
Waith tungsten light				
source ⁹	1×10-5	6×10 ⁻⁵	-	A/lm
With blue light		0.10		147 110
source ^h	4×10-8	-	-	Α
Current Amplification		1.5x10 ⁶	-	
Equivalent Anode-Dark-			k	
Current Input ⁹	-	5×10-10k	2x10-9 k	lm
L L	-	6.3×10 ^{-12^m}	2.5×10-12 ^m	W
Equivalent Noise Input				
Luminous ⁿ	-	6.7×10-12	2.7×10-11	lm
Radiant ^p	-	8.4x10-15	-	W
Dark Current to any				
Electrode Except Anode			_	
at 25 ⁰ C	-	-	7.5×10-7	A
With E = 750 volts (Except a	s note	4.)		
atta 2 + 750 botto (Baccht a			14	
	Min	Тур	Max	
Sensitivity				
Radiant, at 4400 angstroms	-	6.3×10 ³	-	A/W
Cathode radiant, at				
4400 angstroms	-	0.047	-	A/W

🛥 Indicates a change.

DATA I

RADIO CORPORATION OF AMERICA Electronic Components, and Devices of Harrison, N. J.

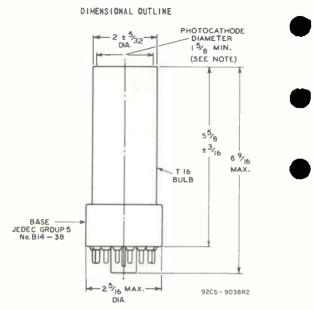


	Min	Тур	Max	
Luminous: At C c/s ^e With dynode No.10 as	-	7.9	-	A/1m
output electrode ^f Cathode luminous:	-	4.6	-	A/1m
With tungsten light source ⁹ With blue light	4x10-5	6x 0 ⁻⁵	-	A/1m
source ^h		- 1.3×10 ⁵	-	A

- ^a Alternate designation for Multiplier Phototube.
- b Made by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, Illinois.
- ^C Made by Magnetic Shield Division, Perfection Mica Co., 1829 Civic Opera Bldg., 20 North Wacker Drive, Chicago 6, Illinois.
- d Averaged over any interval of 30 seconds maximum.
- ⁶ Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a colortemperature 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 curve shown in fypical Anode Charact.ristics does 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.
- nected as anoae. Hunder the following conditions: Light incident on the cethode is transmitted through a blue filter (Corning C.S. No.5-58, Glass Code No.5113 pelished 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 zlectrodes connected as anode.
- J For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1000 volts is recommended.
- k Messured at a tube temperature of 25° C and with supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen. Dark current may be reduced by use of a refrigerant.
- ^m Determined at 4400 angstroms.
- Determined at 9400 angettoms: Supply voltage (E) is as shown, 25° C tube temperature, external shield "onnected to cathode, bandwidth l cycle per second, tungsten-light...ource 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.
- P Under the same conditions as shown under (n) except that use is made of a monochromatic source having radiation at 2537 angstroms.
- 9 See Spectral Characteristic of 2800° I 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 PHOTOSENSITIVE DEVICE HAVING S-13 RESPONSE is shown at the front of this section





OIMENSIONS IN INCHES

Center line of bulb will not deviate more than 3° in any direction from the perpendicular erected at the center of bottom of the base.

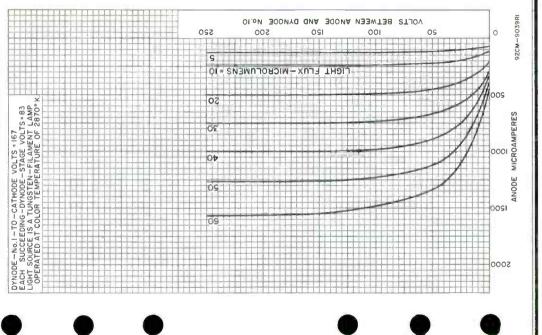
Note: Within minimum diameter, deviation from flatness will not exceed 0.010" from peak to valley.



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History



CHARACTERISTICS ANODE TYPICAL



DATA 3 7-63

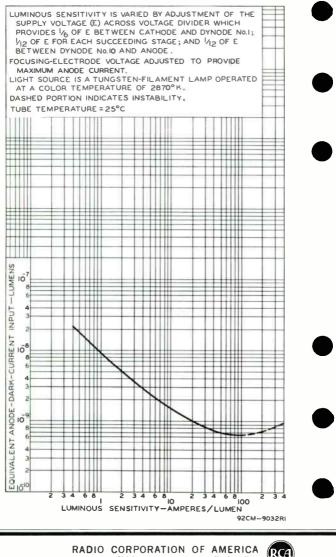
AMERICA Harrison, N. J.

9

CORPORATION

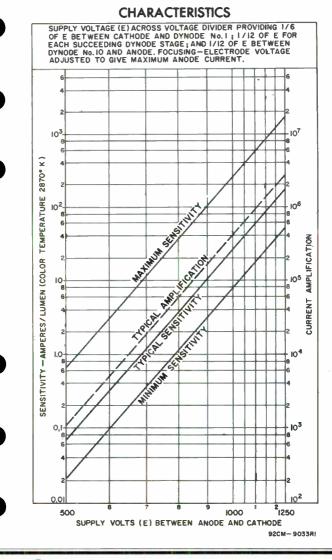
RADIO CORPC Electron Tube Division

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



Electron Tube Division

Harrison, N. J.





RADIO CORPORATION OF AMERICA Harrison, N. J.

6903

TYPICAL EFFECT OF MAGNETIC FIELD ON ANODE CURRENT

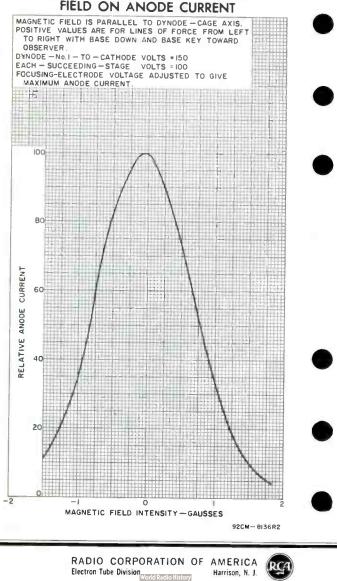




IMAGE-CONVERTER TUBE

MONOVOLTAGE TYPE HAVING S-I RESPONSE

For use, in combination with suitable optical systems, in viewing a scene irradiated with near-infrared radiation

DATA

	General:					
;	Spectral Response	5				
	Shape					
	Fluorescent Screen: Shape Circular Minimum useful diameter 0.86" Phosphor 1.08" Phosphorscence Yellow-Greer Presistence Yellow-Greer Persistence Medium-Short Focusing Method (Self-focusing) Electrostatic Overall Length 2.92" ± 0.05" Greatest Diameter (Excluding side tip) 1.88" ± 0.03" Maximum Radius (Including side tip) 1.08" Weight (Approx.) 3.000 Operating Position 3.000 Terminal Connections (See Dimensional Outline):					
	DIRECTION OF INCIDENT RADIATION: PERPENDICULAR TO PHOTOCATHODE END OF TUBE CL - Collector G ₁ - Grid No.1 (Focusing Electrode) K - Photocathode					
	Maximum Ratings, Absolute-Naximum Values:					
	FLUORESCENT-SCREEN VOLTAGE: P Peak instantaneous. 17000 max. volts Average (DC). 16500 max. volts AVERAGE PHOTOCATHODE CURRENT (Continuous operation)* 0.35 max. µz AMBIENT TEMPERATURE 75 max. 000000000000000000000000000000000000	s				
	Characteristics:					
	At Ambient Temperature of 25° C					
	Fluorescent-Screen Voltage (DC) ^D 16000 volts Median Paraxial Magnification Factor [©] . 0.76 Minimum Conversion Index ¹ 15 Winimum Resolution [©]	5				
		E				

World Radio History

69/4

IMAGE-CONVERTER TUBE

Maximum Quotient** of Screen Backaround by Conversion Index. 0.25 µlumen/sa.cm.

- For Curves, see front of Cathode-Ray Tube, Storage Tube, & Nonoscope Section. See also Operating Considerations. n
- Referred to photocathode.

6914

- Averaged over any interval of 10 seconds maximum.
- Defined as the ratio of the linear size of the image on the fluores-cent screen to the linear size of the image on the photocathode. The image on the photocathode consists of two parallel lines 0.08° long, each located 0.08° from the tube axis. Size of the image on the fluorescent screen is determined by measuring the spacing between the two parallel lines. ŧ
- Ratio of luminous flux from fluorescent screen to the product of the luminous flux incident on Corning No. 2540 infrared Filter (Melt No.1613, 2.61-mm thick), or equivalent, and the filter factor of 11.6 per cent. The light source is a tungsten-filament lamp operated at a color temperature of 28700 k.
- The resolution, both horizontally and vertically in a 0.15-inch-diam-eter circle centered on the photocathode, is determined with a pattern consisting of alternate black and white lines of equal width. Any two adjacent lines are designated as a "line-pair",
- The value of this quotient for any individual tube multiplied by the square of the magnification factor of the tube gives that value of the incident illumination from a 2870° K source required to produce an increase in screen brightness equal to the screen background.

OPERATING CONSIDERATIONS

The curves giving the spectral-energy emission characteristic and the persistence characteristics of phosphor P20 are located in the front of the Cathode-Ray Tube, Storage Tube, & Monoscope Section. Only persistence-characteristic curve A applies to the 6914.

Subjecting the 6914 to intense incident-radiation levels may temporarily decrease the tube's sensitivity even though there is no voltage applied. The magnitude and duration of this decrease depend on the length of exposure. Permanent damage to the tube may result if it is exposed to radiant energy so great as to cause excessive heating of the photocathode.

Support for the 6914 may be provided at the photocathode end by a cushioned arrangement and at the screen end by a suitable fixture which will exert adequate but not excessive pressure to hold the tube firmly against the cushion.

Connections to the two terminals of the tube, indicated on the Dimensional Outline, should not be soldered to the terminals. They may be made by spring fingers engaging the rim or the straight side of each terminal.

Magnetic shielding of the 6914 is required to minimize the effects of extraneous fields on tube performance. It is to be noted that ac magnetic fields are particularly objectionable in that they seriously impair tube resolution. If an iron or steel case is used, care should be taken in its construction to insure that the case is completely demagnetized.

The high voltage at which the 6914 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the user from coming in contact with



IMAGE-CONVERTER TUBE

the high voltage. Precautions must include safeguards which eliminate all hazards to operating personnel. In the use of high-voltage tubes, such as the 6914, it should always be remembered that high voltage may appear at normally owpotential points in the circuit because of capacitor breakdown or incorrect circuit connections. Before any part of the circuit is touched, the voltage-supply switch should be turned off and both terminals of any capacitors connected to ground.

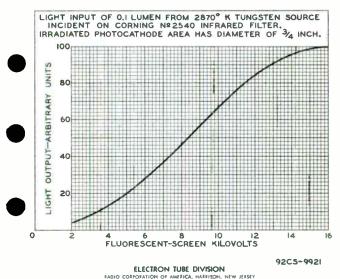
The curve showing the Spectral-Sensitivity Characteristic of Phototube having S-1 Response located at the front of this Section also applies to the 6914

8-59

DATA 2

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AVERAGE CHARACTERISTIC



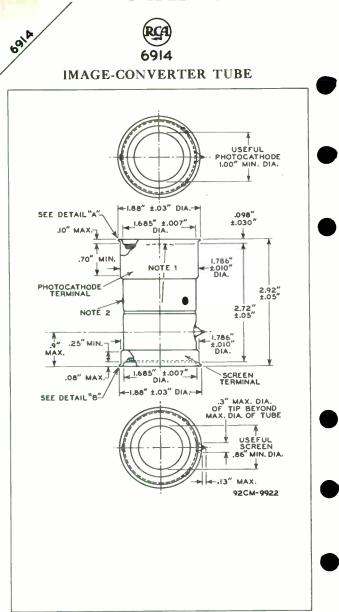
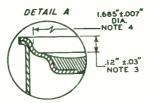
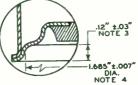




IMAGE-CONVERTER TUBE





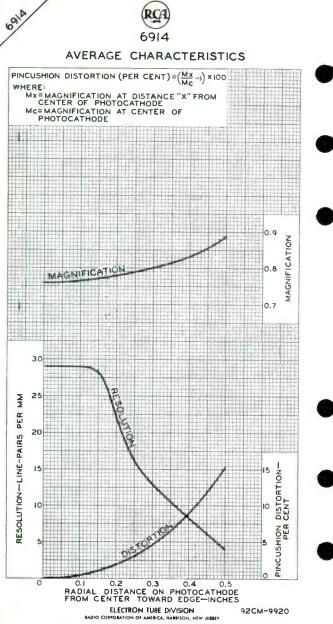


NOTE I: RADIUS OF CURVATURE OF FACEPLATE IS $2.380" \pm 0.005"$; FACEPLATE THICKNESS AT CENTER IS $0.065" \pm 0.004"$. NOTE 2: THREE INSULATED LEAD TIPS WILL NOT EXTEND BEYOND MAXIMUM OUTSIDE DIAMETER OF TUBE. LEADS ARE USED ONLY DURING TUBE MANUFACTURE.

NOTE 3: DEPTH IS MEASURED TO TANGENT OF THE TWO RADII. NOTE 4: DIAMETER IS MEASURED TO TANGENT OF THE TWO RADII.

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World Radio Histo



IMAGE-CONVERTER TUBE

MONOVOLTAGE TYPE HAVING S-I RESPONSE

For use, in combination with suitable optical systems, in viewing a scene irradiated with near-infrared radiation

The 6914-A is unilaterally interchangeable with the 6914.

The 6914-A is like the 6914 except that it is processed and tested to meet the following special-performance test: Maximum luminous equivalent of infrared radiation for threshold visibility^{*}. 4.1 x 10^{-11} lumen

Radiation from a tungsten lamp operating 4t a color temperature of 2870° K is passed through a Corning No.2580 Infrared Filter and focused to a point on the photocathode. The resulting image on the fluorescent screen is viewed by a dark-adapted eye through a 10-power ocular. The amount of infrared radiation for threshold visibility is determined by reducing the incident radiation until the image on the screen can just be discerned. The luminous equivalent of this amount of sinfrared radiation is the value of luminous flux from a 2870° K source which produces a tesponse equal to that produced by the infrared radiation when both are measured with a receiver having S-1 spectral response.

6918 A

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World Radio History

Image-Converter Tube

SELF-FOCUSING, MONOVOLTAGE TYPE HAVING S-1 RESPONSE

For Use, in Combination with Suitable Optical Systems, in Viewing a Scene Irradiated with Near-Infrared Radiation

GENERAL

	Spectral Response							S-1
	Wavelength of Maximum Response	•		•		80	00	± 1000 angstroms
	Photocathode, Semitransparent							
)	Shape	•	•	•	•	• •	٠	Convexo-Concave
	Flourescent Screen	•	•	•	٠	• •	•	· · · · 0.75 In
	Shape							Plano-Plano
	Minimum useful diameter							0.57 in
	Phosphor							P20 ^a , Aluminized
	Fluorescence					• •		Yellow-Green
	Phosphorescence	•			•			Yellow-Green
	Persistence							Medium-Short
	Focusing Method.	•	•	•	•	• •		. Electrostatic
	Overall Length	•	•	•	•	• •		2.285 ± 0.050 in
	Greatest Diameter	•	•	•	*	• •		1.350 ± 0.025 in
	Operating Position	•	•	•	•	• •	•	Any Any
	Weight (Approx.)							
	TERMINAL DIAGRAM (See	D	l m	° R	\$ 2 0	onal	0	•
	CL - Collector							
	$G_1 - Grid No.1$						-	
	(Focusing Electrode)						6	
	G2-Grid No.2 (Focusing &					1	L_	
	Accelerating Electrode)						Γ.	}
	K - Photocathode					$\langle \rangle$	1	γ
							-	
		DIE	FC	ти	061	OF	IM	LIK,GI CIOENT RADIATION
					PE	RPE	NDI	CULAR TO
			PH	от	oc.	ATH	DDE	END OF TUBE
	MAXIMUM RATINGS, A8S	DLI	JT	E-1	(A)	(I MU	M 1	ALUES
	Fluxer and a second b							



Fluorescent-Screen Voltageb Peak instantaneous . . 13000

Average (DC)	٧
Continuous operation ⁶ 0.35 Ambient Temperature 75	^µ A د
CHARACTERISTICS	
At Ambient Temperature = 25° C	
Fluorescent-Screen Voltage (DC) ^b	V

Median Paraxial Magnification Factor ^d .	0.75	V
Minimum Conversion Index ^e Minimum Resolution ^f	10	line-pairs/mm
Maximum Quotient ⁹ of Screen Back- ground by Conversion Index		μlm/sq cm
	🛨 Ind	icates a change.



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Harrison, N. J.

- For curves, see front of Cathode-Ray Tube, Storage Tube, & Monoscope Section. See also Operating Considerations.
- b Beferred to photocathode.
- C Averaged over any interval of 10 seconds maximum.
- Defined as the ratio of the linear size of the image on the fluorescent screen to the linear size of the image on the photocathode. The image on the photocathode consists of two parallel lines 0.08 inch long, each located 0.08 inch from the tube axis. Size of the image on the fluorescent screen is determined by measuring the spacing between the two parallel lines.
- e Ratio of luminous flux from fluorescent screen to the product of the luminous flux incident on Corning No.2540 Infrared Filter (Melt No.1613, 2.61-mm, thick), or equivalent, and the filter factor of 11.6 per cent. The light source is a tungsten filament lamp operated at a color temperature of 2870° K.
- The resolution, both horizontally and vertically in a 0.15-inch-diameter circle centered on the photocathode, is determined with a pattern consisting of alternate black and white lines of equal width. Any two adjacent lines are designated as a "line-pair".
- The value of this quotient for any individual tube multiplied by the square of the magnification factor of the tube gives that value of the incident illumination from a 2870° K source required to produce an increase in screen brightness equal to the screen background.

OPERATING CONSIDERATIONS

The curves giving the spectral-energy emission characteristic and the persistence characteristics of phosphor P20 are located in the front of the Cathode-Ray Tube, Storage Tube, & Monoscope Section. Only persistence-characteristic curve A applies to the 6929.

Subjecting the 6929 to intense incident-radiation levels may temporarily decrease the tube's sensitivity even though there is no voltage applied. The magnitude and duration of this decrease depend on the length of exposure. Permanent damage to the tube may result if it is exposed to radiant energy so great as to cause excessive heating of the photocathode.

Support for the 6929 may be provided at the photocathode end by a cushioned arrangement and at the screen end by a suitable fixture which will exert adequate but not excessive pressure to hold the tube firmly against the cushion.

Connections to the two terminals of the tube, indicated on the Dimensional Outline, should not be soldered to the terminals. They may be made by spring fingers engaging the rim or the straight side of each terminal.

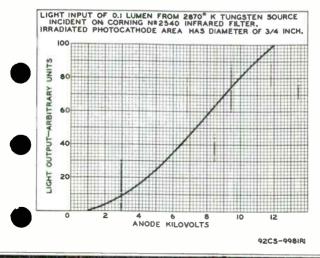
Magnetic shielding of the 6929 is required to minimize the effects of extraneous fields on tube performance. It is to be noted that ac magnetic fields are particularly objectionable in that they seriously impair tube resolution. If an iron or steel case is used, care should be taken in its construction to insure that the case is completely demagnetized.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. The high voltage at which the 6929 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the user from coming in contact. with the high voltage. Precautions must include safeguards which eliminate all hazards o operating personnel. In the use of high-voltage tubes, such as the 6929, it should always be remembered that high voltage may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections. Before any part of the circuit is touched, the voltage-supply switch should be turned off and both terminals of any capacitor onnected to ground.

> The curve showing the Spectral-Sensitivity Characteristic of Phototube having S-1 Response located at the front of this section also applies to the 6929

Average Characteristic

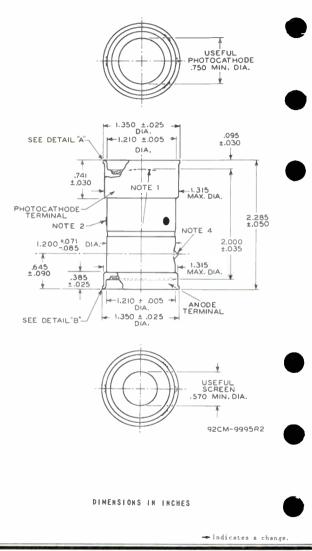




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DATA 2

DIMENSIONAL OUTLINE

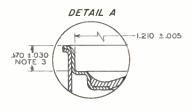


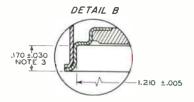
DATA 2

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Electronic Components and Devices World Radio History





DIMENSIONS IN INCHES

Note 1: Radius of curvature of faceplate is $1,230" \pm 0.005"$; faceplate thickness at center is $0,060" \pm 0.004"$.

Note 2: Three insulated lead tips will not extend beyond maximum outside diameter of tube. Leads are used only during tube manufacture.

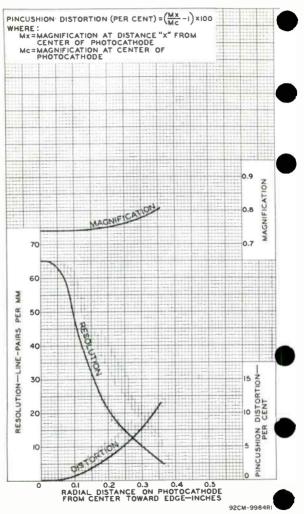
Note 3: Depth is measured to tangent of the two radii.

Note 4: Tip will not extend beyond maximum outside diameter of tube.



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Harrison, N. J.

Gas Phototube

SIDE-ON TYPE HAVING UNOBSTRUCTED PHOTOCATHODE AREA AND S-I RESPONSE

DATA

General:	
Spectral Response	. S-1 stroms
Shape. Semicylise Minimum urobstructed projected length* Minimum urobstructed projected width* Direct Interelectrode Capacitance (Approx.). Maximum Overall Length 3 Maximum Seated Length. 5 Seated Length to Center of Cathode 1-5/8" ± Maximum Diameter 1 Operating Position 1	23/32" 9/16" 3 μμf -1/16" 2-1/2" 3/32" -9/32" . Any 0.9 oz
Socket	ent 1,
Basing Designation for BOTTOM VIEW	3Ú
Pin 1-No Connection Pin 2-No Connection 2 No C	
Maximum Ratings, Absolute-Maximum Values:	
Rating 1 Rating 11	
AVERAGE CATHODE-CURRENT	volts
DENSITY ^b	q. in. μa °C
Characteristics:	+
With an anode-supply voltage of go volts unless otherwise specified	
<i>Hin. Median Max.</i> Sensitivity: Radiant, at 8000 angstroms	p/watt





RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 3-61

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1				Min.	Nedia	n Max.		
Luminous: ^c At 0 cps At 5000 cps At 10000 cps Gas Amplification Factor ^d Anode Dark Current at 25 ^o	•	•	•	140 - - - -	200 165 150 -	330 - 10 0.1	μa/lumen μa/lumen μa/lumen μa	
Minimum Circuit Values:								
With an anode-supply voltage of DC Load Resistance: For dc currents above				70 or	less	90	volts	
3 μa	•	•	•	0.1 m	in.	-	megohm	
3 μa	•	•	•	0 m	in.	-	megohms	
2 μa	•	•	•	-	2	.5 min.	megohms	
2 μa				_		1 min.	megohm	-

On plane perpendicular to indicated direction of incident radiation.

b Averaged over any interval of 30 seconds maximum.

C For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870⁵ K. A dc anode supply voltage of 90 volts and a 1-megohm load resistor are used. For the 0-cycle measurement, a light input of 0.1 lumen is used. For the 5000- and 10,000-cycle measurements, the light input is varied sinusoidally about a mean value of 0.015 lumen from zero to a maximum of twice the mean value.

d The ratio of luminous sensitivity at an anode supply voltage of 90 volts to luminous sensitivity at an anode supply voltage of 25 volts, in each case, sensitivity is obtained under conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870 K, the light input is 0.1 lumen, and the load resistor has a value of 1 megohm.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-1 RESPONSE

and

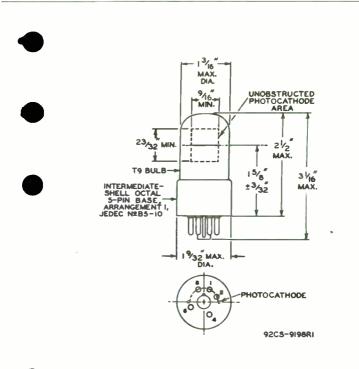
FREQUENCY-RESPONSE CHARACTERISTICS OF GAS PHOTOTUBES

are shown at the front of this section



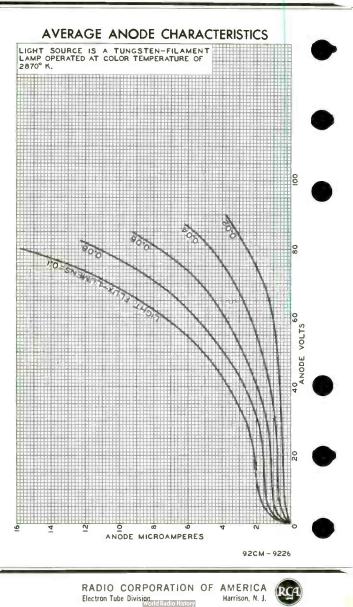


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RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J. DATA 2 3-61



Vidicon

AGNETIC FOCUS

I" Diameter MAGNETIC DEFLECTION

For Live and Film Pickup With Color or Black-and-White TV Cameras

General:

Heater, for Unipotential Cathode: Voltage (AC or DC)6.3 ± 10% volts Current at heater volts = 6.3 0.6 amp irect Interelectrode Capacitance: Target to all other electrodes 4.6 pf Spectral Response See Accompanying Curves Photoconductive Laver:
Maximum useful diagonal of rectangular image (4 x 3 aspect ratio) ^b
Deflecting Yoke Cleveland Electronics ^{6-d} No.VY-111-3, or equivalent
Alignment Coil Cleveland Electronics ^{C, d} No.VA-118, or equivalent
Socket
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Do Not Use Pin 4 - Dc Not Use Pin 5 - Grid No.2 Pin 6 - Grid No.3 & No.4 Pin 7 - Cathode Pin 8 - Heater Flange - Target Short Pin - Do Not Use Pin 4 - Dc Not Use Pin 5 - Grid No.2 Pin 5 - Grid No.2 Pin 5 - Grid No.2 Pin 5 - Grid No.2 Pin 6 - Grid No.2 Pin 7 - Cathode Pin 8 - Heater Flange - Target Short Pin - Do Not Use Pin 5 - Grid No.2 Pin 7 - Cathode Pin 8 - Heater Flange - Target Short Pin - Do Not Use

DIRECTION OF LIGHT: INTO FACE END OF TUBE

Maximum Ratings, Absolute-Naximum Values:

For scanned area of 1/2" x 3/8"		
Grid-No.3 & Grid-No.4 Voltage	750 max.	volts
Grid-No.2 Voltage	750 max.	volts
Crid-No.1 Voltage:		
Negative-bias value	300 max.	volts 🖛
Positive-bias value	0 max.	volts
+	Indicates a	change.



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Peak Heater-Cathode Voltage: Heater negative with respect to cathode. 125 max. Heater positive with respect to cathode. 10 max. 10 max. Dark Current. 0.25 max. 0.55 max. Peak Target Current . 0.55 max. 1000 max. Faceplate: 110unination . 1000 max. Temperature. 71 max. 1000 max.	volts µa µa
Typical Operation:	
For scanned area of $1/2^n \times 3/8^n$ and	
faceplate temperature of 30° to 35° C Grid-No.4 (Decelerator) & Grid-No.3	-
(Beam-Focus Electrode ^f) Voltage	volts volts
cutoff	volts
teristic for signal-output current between 0.02 µa and 0.2 µa 0.65 Visual Equivalent Signal-to-Noise	
Ratio (Approx.)j Minimum Peak-to-Peak Blanking Voltage:	
When applied to grid No.1	volts volts
Coil (Approx.). 40 Field Strength of Adjustable	gauss
Alignment Coil ^k 0 to 4	gauss
Naximum-Sensitivity Operation for Live-Scene Picku	ι¢
Faceplate Illumination (Highlight) 2 Maximum Target Voltage required to produce dark current of 0.2 μa	fc
in any tube [®]	volts
Dark Current ^p 0.2	μa 🔍
Target Current (Highlight) ⁹ 0.4 to 0.5 Signal-Putput Current:	μа
Peak. . . . 0.2 to 0.3 Average . . . 0.08 to 0.1	µа µа
Average-Sensitivity Operation for Live-Scene Pickup	
Faceplate Illumination (Highlight) 15 Maximum Target Voltage required to produce dark current of 0.02 μa	fc
in any tube ^m	volts
Target Voltage	volts
Target Current (Highlight) ^a 0.3 to 0.4 Signal-Output Current:	μа μа
Peak. 0.3 to 0.4 Average 0.1 to 0.2	μа μа
→ Indicates a	

RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

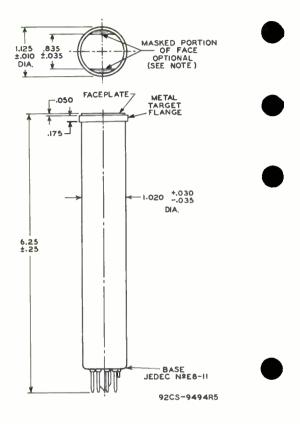


		Ninimum-Lag Operation for Film Pickup
		aceplate Illumination (Highlight) 100 fc aximum Target Voltage required to produce dar< current of 0.004 μa
	Da Ta	in any tube ^m
	Si	ignal-Output Current: ^Γ Peak
	a	This capacitance, which effectively is the output impedance of the 7038, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 mecohns.
		Proper orientation of quality rectangle is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plame passing through the tube axis and short pin. The masking is for orientation only and does not define the proper scansed area of photoconductive layer.
	d	Cleveland Electronics Inc., 1974 East 61st St., Cleveland,Ohio. These components are chosen to provide tube operation with minimum beam-landing error.
	e f	
	g	Oefinition, focus uniformity, and picture quality decrease with de- creasing grid-Mo.4 and grid-Mo.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.
		With no blanking voltage on grid No.1. Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal- to-noise ratio is taken as the ratio of highlight video-signal current to rms noise current, multiplied by a factor of 3.
_	ĸ	The alignment coil should be located on the tube so that its center is at a distance of $3-11/16$ inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing chil.
	1	The target voltage for each 7038 must be adjusted to that value which

- gives the desired operating dark current.
- Indicated rauge for each type of service .erves only to illustrate the operating target-voltage range normally encountered.
- P The deflecting circuits must provide extremely linear scawning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.
- q video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion. Defined as the component of the target ${\tt curr}{\succ}{\tt nt}$ after the dark-current component has been substracted.







DIMENSIONS IN INCHES

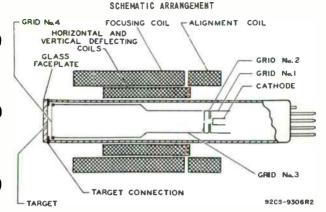
Note: Straight sides of masked portions are parallel to the plate passing through tube axis and short pin.



🕳 Indicates a change.

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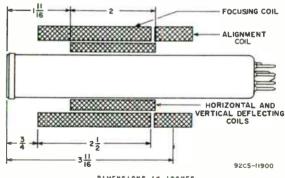


Alignment of the beam is accomplished by a transverse magnetic field produced by external coils located at the base end of the focusing coil.

Deflection of the beam is accomplished by transverse magnetic fields produced by external deflecting coils.

RECOMMENDED LOCATION AND LENGTH OF DEFLECT-ING, FOCUSING, AND ALIGNMENT COMPONENTS

For Minimum Beam-Landing Error



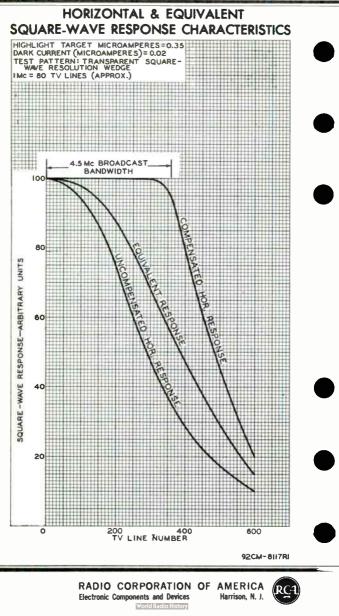
DIMENSIONS IN INCHES

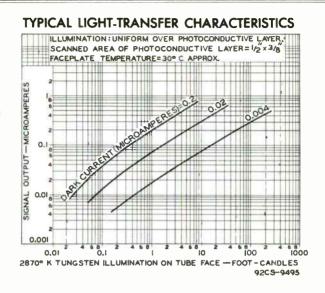
The deflecting yoke and focusing coil used with the 703B are designed to cause the scanning beam to land perpendicularly to the target at all points of the scanned area with minimum beam-landing error and resultant superior uniformity of sensitivity and focus over the scanned area.



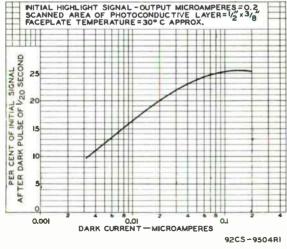
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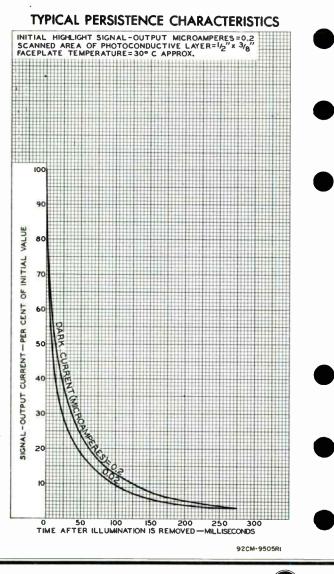


TYPICAL PERSISTENCE CHARACTERISTIC



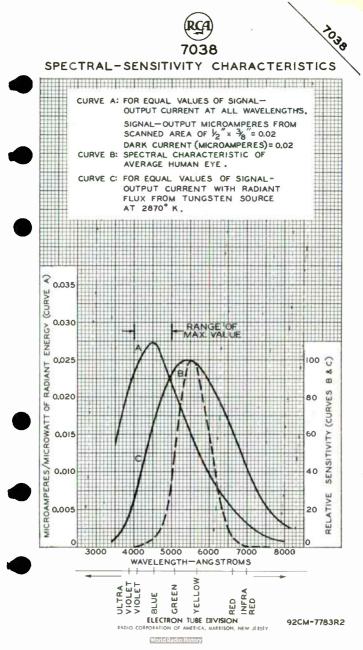
RADIO CORPORATION OF AMERICA Electronic Components and Devices

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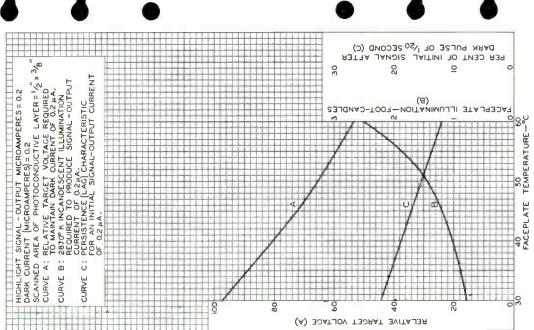
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TYPICAL CHARACTERISTICS



92CM

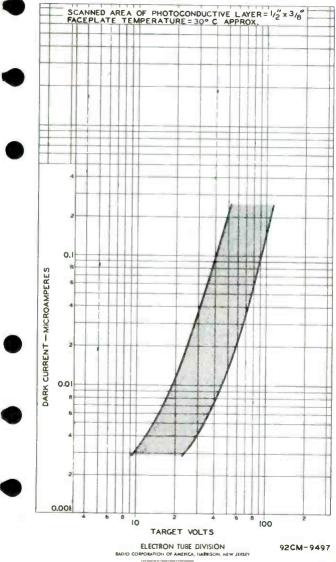
DIVISI

TUBE

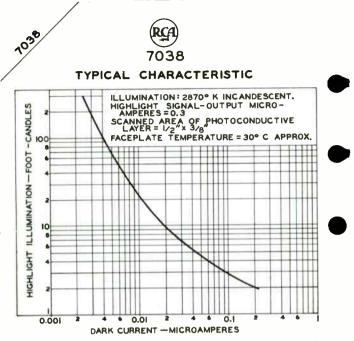
ELECTRON



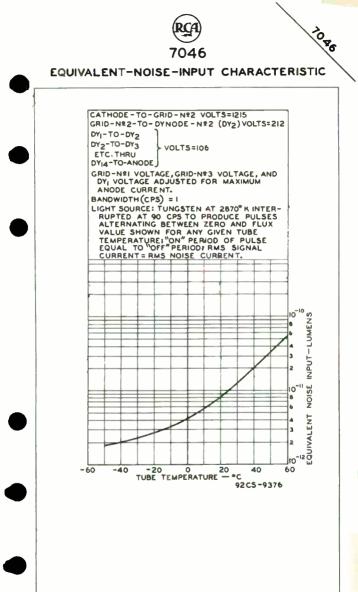
DARK-CURRENT RANGE

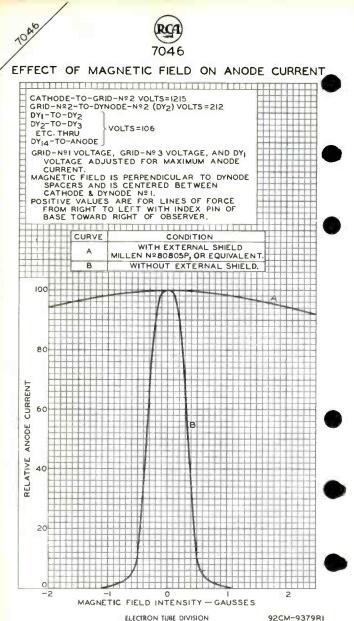


World Radio History



92CS-9493





RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9379RI



TOP

MULTIPLIER PHOTOTUBE

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE WITH I.24"-DIAMETER FLAT, SEMITRANSPARENT CATHODE AND S-! RESPONSE CAPABLE OF VERY SHORT TIME-RESOLUTION

DATA

	General:	
	Spectral Response	. S-1 astroms
)	Cathode, Semitransparent: ShapeFlat C	
	Window: 1.2 Minimum diameter 1.24	sq. in. in.
	Index of refraction. 1.51 Direct Interelectrode Capacitances (Approx.): Anode to dynode No.10.	4 <u>سر</u> 1
	Anode to all other electrodes	7 µµf 4.57"
	Seated Length	± 0.19" 1.56"
	Operating Position	
	Bulb. Socket. BaseSmall-Shell Duodecal 12-Pin (JETEC No.8	ivalent
	Basing Designation for BOTTOM VIEW	oscopic
	Pin 1 – Dynode No.1 Pin 7 – Dynode	No.10
	Pin 2 - Dynode No.3 Pin 8 - Dynode	
	Pin 3-Dynode No.5 Pin 9-Dynode	
	Pin 4 - Dynode No.7 3 Pin 10 - Dynode	
	Pin 5-Dynode No.9 2 Pin 11-Dynode	No.2
)	Pin 6 - Anode Pin 12 - Cathode DIRECTION OF INCIDENT RADIATION: INTO END OF BULLBAT	
	Maximum Ratings, Absolute Values:	
	ANODE-SUPPLY VOLTAGE (DC or Peak AC)	volts
)	ANODE (DC or Peak AC)	
	DYNODE No.1 (DC or Peak AC) 400 max.	
	AMBIENT TEMPERATURE	μa oC
)		
	• See part page	

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World Radio History



MULTIPLIER PHOTOTUBE

Characteristics Range Values for Equipment Design: Under conditions with supply voltage (E) across 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 = 1250 volts (except as noted) Nin. Nedian Max. Sensitivity: Radiant, at 8000 angstroms . . 400 µa/µw Cathode radiant, at 8000 angstroms . . 0.0027 ua/uw Luminous: At 0 cps . . . 30 amp/lumen 1 4.5 With dynode No.10 as output electrode* amo/lumen . . . 2.7 Catnode luminous: With tunasten light source▲. . 10 30 ua/lumen With infrared source®.... 0.012 0.036 μa Currert Amplification. 150000 Equivalent Anode- 3×10^{-7} 5 x 10-6 lumen Dark-Current Input[®]. 3.3 × 10-9† 5.5 × 10-8† watt Equivalent Noise 1.5 × 10-10 7.5 × 10-10 lumen Input* 1.7 × 10-12 8.4 × 10-12 watt With E = 1500 volts (except as noted) Nin. Nedian Nax. Sensitivity: Radiant, at 8000 angstroms . . 1250 µa/ LON Cathode radiant, at 8000 angstroms . . 0.0027 µa/µw Luminous: At 0 cps 14 amp/lumen With dynode No.10 as output electrode* amp/lumen 8.4 Cathode Luminous: With tungsten light source▲. . 10 30 µa/lumen With infrared source®... 0.012 0.036 μa Current Amplification. 465000 Averaged over any interval of 30 seconds maximum, .*,▲,⊕,♦,♥,★,†: See next page. 4-58 TENTATIVE DATA 1 ELECTRON TUBE DIVISION

World Radio History

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

- 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 resistance has a value of 0.01 megoham.
- 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 150 volts are applied between cathode and all other electrodes connected together as anode.
- Under the following conditions: 2870° K tungsten light source; light flux of 0.01 lumen incident on Corning No.2540 infrared Filter (Welt 1613, 2.61 mm thick, or equivalent); irradiated area of photocathode is 1.24 inch in diameter.
- ♦ For spectral characteristic of this source, see sheet SPECTRAL CHAR-ACTERISTIC OF 2870[°] K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870[°] K SOURCE AFTER PASSING THROUGH INDICATED INFRARED FILTER at front of this section.
- Measured at a tube temperature of 25⁰ C and with the supply voltage (E) adjusted to give a luminous sensitivity of 4 amperes per lumen. Dark current caused by thermionic emission and ion feedback may be reduced by the use of a refrigerant.
- Under the following conditions: Supply voltage (E) 1250 volts, 25° c type temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten ight source at color temperature of 2870° K interrupted at a low audio frequencies of produce incident radiation pulses alternating between condities 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 at 8000 angstroms.

OPERATING CONSIDERATIONS

The 7102 is capable of very short time-resolution. For an input pulse having a duration of 1 millimicrosecond or less, the time spread of the pulse at the anode is about 5 millimicroseconds measured at 50 per cent of the maximum pulse height. This time spread corresponds to an electron transit-time spread of about 4 millimicroseconds. The transit-time spread can be reduced to about 2 millimicroseconds by irradiating only a small central area of the photocathode.

When stability of operation is important, the use of an average anode current well below the maximum rated value of 10 microamperes is recommended. This maximum rating should never be exceeded because operation at higher average output currents may cause a permanent decrease in infrared sensitivity and a consequent decrease in tube life.

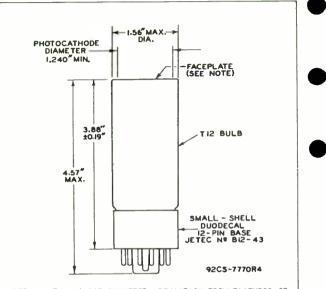
A small temporary loss of infrared sensitivity may be observed after long periods of operation. The sensitivity recovers during idle periods but only very slowly at temperatures below 25° C.

Electrostatic and/or magnetic shielding of the 7102 may be necessary.

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



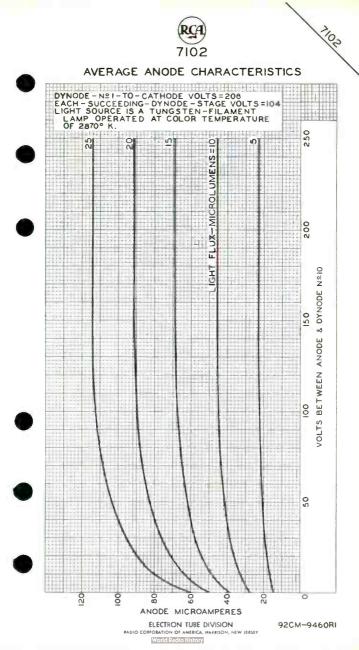
MULTIPLIER PHOTOTUBE



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

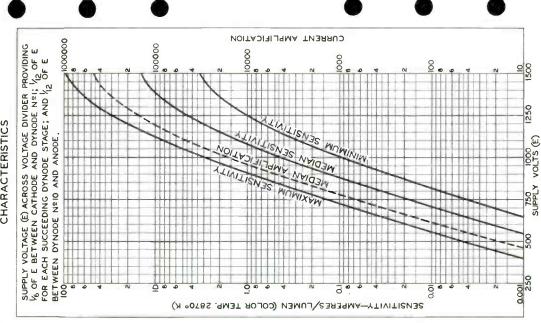
 $\mbox{$\xi$}$ OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

1102







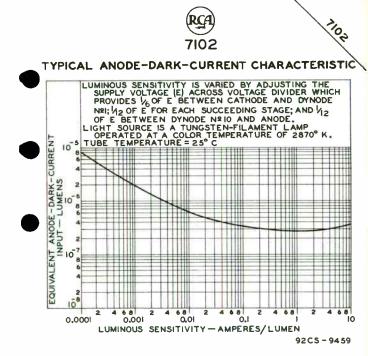


9455

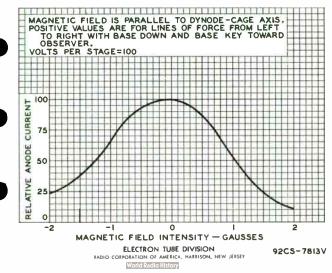
92CL

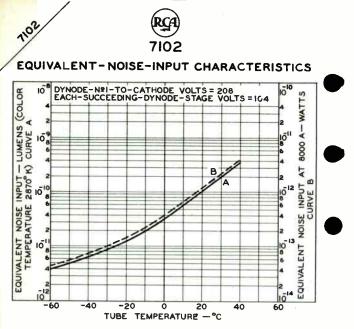
JERSEY

ELECTRON TUBE DIVISION RADIO CORPOLATION OF AMERICA, HARRISON, NEW









92CS - 9462

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

Photomultiplier Tube

9-STAGE, SIDE-ON TYPE HAVING S-4 RESPONSE

For UC-Operated Control Applications Such as Automobile-Headlight Control

GENERAL

Spectral Response			S-4
Wavelength of Maximum Respon	nse	4000 ± 50	0 angstroms
Cathode, Opague,			Cs-Sh-
Minimum projected length ^a .			. 0.93 in
— Minimum proj∞cted width ^a .			. 0.31 in
Window Lime Glass,	(Corning ^o	No.0080), or	equivalent 🖛
Dynode Material			Cs-Sb-
Direct Interelectrode Capaci	tances (A	pprox.)	
Anode to dynade No.9			. 4.2 pF
Anode to all other electro	des		5.5 pE
Maximum Overal! Length			. 3.12 in
Maximum Seated Length			. 2.69 in
Length		1.5	6 + 0.09 in
From base seat to center o	of useful a	athode area	
Maximum Diameter			. 1.31 in
Uperating Position			Anv
Weight (Approx.)			. 1.6.07
Lnvelope			. JEDEC TO
Base Small-Shell Neosub	magnal II-	-Pin (JEDEC N	n. RII-104)
		Non-	hydrosconic
Socket	mohenol	No. 78SLLT. or	equivalent
Magnetic Shield	Millend	No. 808018. or	Aduivalent
	·····		SARIAGIENT

ABSOLUTE-MAXIMUM RATINGS

DC	Su	ppl	I y	Vo	tag	e	
D	~ ÷			-			

Between anode and cathode	250	V
Between dynode No.9 and anode	250	٧
Between consecutive dynodes.	250	٧-
Between Jynode No.1 and cathode.	250	٧
Average Anode Current ^e).1.	πA
Ambient Temperature	75 '	C

TERMINAL DIAGRAM (Bottom View)

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



- Indicates a change.



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CHARACTERISTICS RANGE VALUES Under conditions with dc supply voltage (E) across a voltage divider providing 1/10 of E between cathode and dynode No.1:

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 V (except as noted)

Sensitivity	Min	Тур	Max	
 Radiant, at 4000 angstroms. Luminous, at 0 c/s¹ Electrode Dark Current At 250C 	-	3.4x10 ⁴ 34	2	A/W A/1m
At anode	-	-	x 10 ⁻⁷ 7.5x10-7	A A

With E = Adjustable dc voltage

						Min	Typ	Max	
Anode-to-Cathode	Voltage ⁹					630	900	1100	V
DC values	-								•

^a On plane perpendicular to the indicated direction of incident light and passing through the major axis of the tube.

- ^b Made by Corning Glass Works, Corning, New York.
- G Madw by Amphenol Electronics Corporation, 1830 South 54th Avenue, Chicago 54, Illinois. d wal to see Willow and a second se
- d Madr by James Millen Manufacturing Company, 150 Exchange Street, Malden 48, Massachusetts.
- Averaged over any interval of 30 seconds maximum. Under the following conditions: The light source is a tungaten-filament lamp having a lime-glass envelope. It is operated at a color temperature of \$870°K and a light input of 10 microlumens is used.
- Under the following conditions: Light incident on the cathode is transmitted through a filter (Corning C. S. No. 3-67, Glass Code No. 3482-Manufactured by the Corning Glass Works, Corning, New York) from a tungstenfilament lamp operated at a color temperature of 2870° K. The value of light flux incident on the filter is 10 microlumens. Supply voltage (E) is adjusted to give an anode current of 50 microampres.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-4 Response is shown at the front of this Section

DIMENSIONAL OUTLINE and AVERAGE-ANODE-CHARACTERISTICS and VARIATION-IN-SENSITIVITY-OF-PHOTOCATHODE Curves shown under Type 6328 also apply to the 7117

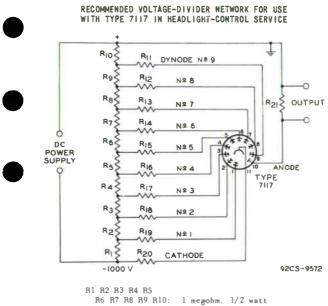
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nd Devices Harrison, N. J.

DATA I



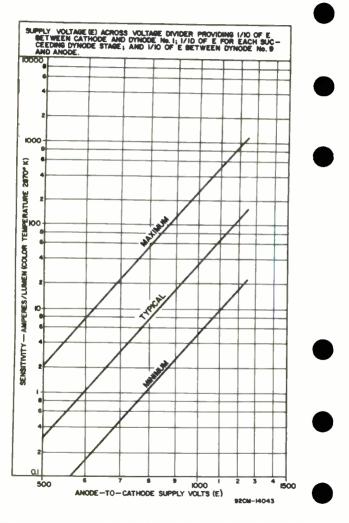
Hö H7 H8 H9 H10: 1 megohm. 1/2 watt
R11: 2 megohms, 1/2 watt
R12: 5.1 megohms, 1/2 watt
R13 R14 R15 R16
R17 R18 R19 R20: 8.2 megohms, 1/2 watt
R21: 820,000 ohms, 1/2 watt

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Sensitivity Characteristics



DATA 2

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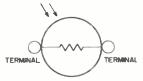
Photoconductive Cell

CADMIUM-SULFIDE, HEAD-ON TYPE

DATA

General:

Spectral Response
Sensitive Surface, Including Metallic Strips:
Shape
Length (Minimum) 0.65 in.
Width (Minimum)
Area (Minimum) 0.35 sq. in.
Maximum Overall Length
Greatest Diameter
Seated Length 0.25" ± 0.06"
Maximum Axial Distance from
External Surface of Window to
Sensitive Surface 0.15"
Case
Envelope Seals Hermetic
Operating Position
Weight (Approx.)
Base



DIRECTION OF LIGHT: INTO FACE OF CELL

A indicates that the primary characteristic of the element within the envelope symbol is designed to vary under the influence of light.

Maximum Ratings, Absolute-Naximum Values:

VOLTAGE BETWEEN TFRM'NALS (DC or Peak AC) POWER DISSIPATION: Sensitive surface fully	•		•	•		250 max.	volts
illuminated: Continupus service						0.3 max.	watt
Demand service ^a						0.5 max.	watt
Sensitive surface partial illuminated:	l y	,					
Continuous service						0.85 max.	watt/sq. in.
Demand service ^a						1.42 max.	watt/sq. in.
PHOTOCURRENT							ma
AMBIENT-TEMPERATURE RANGE.	•	•	•	•	•	-75 to +60	OC

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Electron Tube Division World Radio History

- Indicates a change.

Harrison, N. J.

Sensitivity.

Characteristics:

Under conditions with ac voltage (rms) of 50 volts, 60 cps between terminals and ambient temperature of 25°C

Nin. Nedian Nax.

OCILITYICY.				
Radiant ^b , at 5800 angstroms.	_	290	- ал	np/watt
Luminous ^c , at O cps		0.82		/lumen
Illuminationd, e	. 1	2		ma/fc
Decay Current ^{d, f}	-	-	40	µа
Photocurrent:				
Rise		. See a	accompanying	Curve
Decay		. See a	accompanying	Curve

^a The demand rating may be utilized twice every 24 hours for a period of 20 minutes each time provided the interval between demand periods is not less than 4 hours.

b For conditions where the incident power is 6.9 µwatt.

C Far conditions where light flux from a tungsten-filament lamp operated a: 28700 K is transmitted through a filter (Corning No.C.S. 1-62, Glass Ne.5900 which has an effective transmission of luminous flux of 13.3 per cent) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. Area of illuminated sensitive surface is approx. 0.35 sq. in.

- ^d This characteristic is determined after the 7163 has been exposed to 500 footcandle illumination (white fluorescent light) for a period of 16 to 24 hours.
- 24 mours. 6 For conditions where light flux from a tungsten-filament lamp operated at 2870° k is transmitted through a filter (corning No.C.S. 1-62, Gass No.5900 which has an effective transmission of luminous flux of 13.3 per cent) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. The sensitive surface of the cell is fully illuminated.
- ⁷ Measured 10 seconds after removal of incident-illumination level as established in (e).

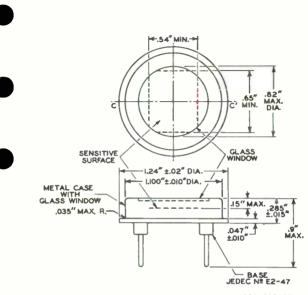
OPERATING CONSIDERATIONS

Electrical connection can be made to the base pins of the 7163 by soldering directly to the pins. Soldering of connections to the pins may be made close to the pin seals provided care is taken to conduct excessive heat away from the pin seal. Otherwise, the heat of the soldering operation will crack the glass seals of the pins and damage the cell. Connection can also be made to the base pins by use of insulated clips.

> SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-15 RESPONSE is shown at front of this section



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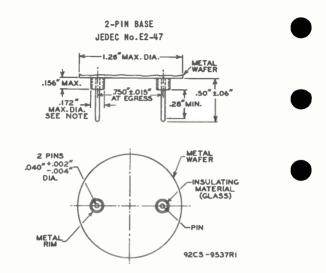


92CS-9536R3

PLANE THROUGH MINOR AXIS (CC') OF SENSITIVE SURFACE AND THE CELL AXIS MAY VARY FROM PLANE THROUGH CELL AXIS AND THE, TWO PINS BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE CELL AXIS) OF \pm 10°.



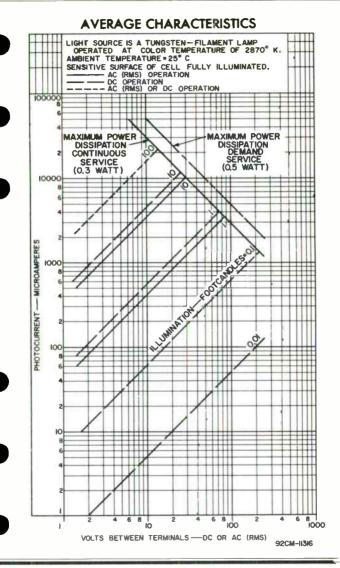
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NOTE: FOR SOCKET DESIGN, PROVICE CLEARANCE HOLE HAVING MINIMUM DIAMETER OF 0.188".





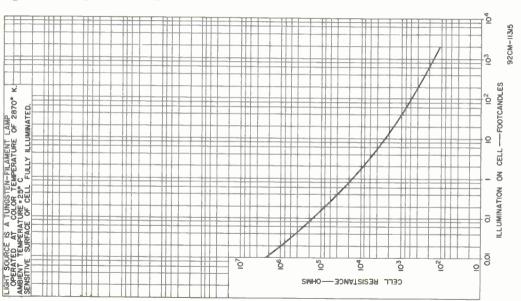




RADIO CORPORATION OF AMERICA Electron Tube Division DATA 3 5-62



00 RESISTANCE CELL AGE AVER

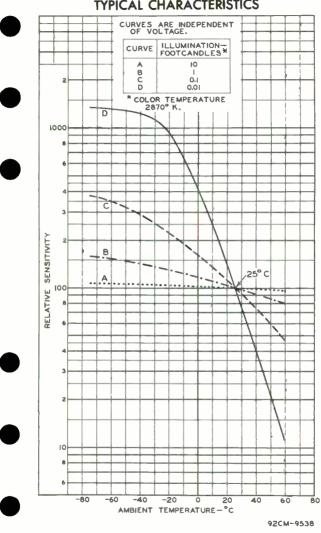


AMERICA Harrison, N. J.

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CORPORATION

RADIO CORP(Electron Tube Division

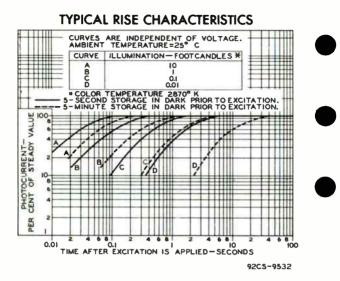




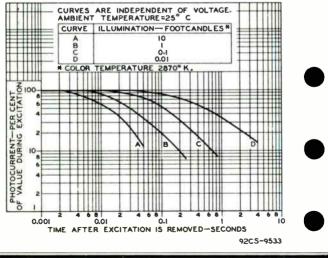


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DATA 4 5-62

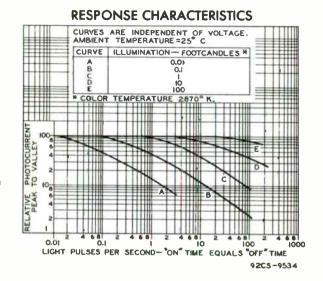


TYPICAL DECAY CHARACTERISTICS



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.





RC1

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5 5-62

- I CONTRACTOR AND INCOME



MAGNETIC FOCUS

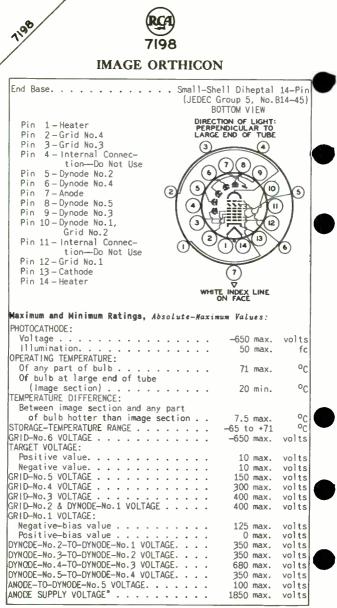
MAGNETIC DEFLECTION

7100

Shock and vibration resistant For use under adverse environmental conditions

	DATA
	General:
	Heater, for Unipotential Cathode: Voltage (AC or DC)6.3 ± 10% volts Current at 6.3 volts0.6 amp Direct Interelectrode Capacitance:
	Anode to all other electrodes 12 $\mu\mu 1$ Wavelength of Maximum Response 4500 ± 300 angstroms Photocathode, Semitransparent;
	Response
	diagonal does not exceed the specified value. The corresponding electron image on the target should have a size such that the corners of the rectangle iust touch the target ring.
	Orientation of . Proper orientation is obtained when the vertical or horizontal scam is es- sentially parallel to the plane passing through center of faceplate and pin 7
	of the shoulder base. Focusing Method
)	Pin 1 - Grid No.6 Pin 5 - Grid No.5 Pin 2 - Photocathode Pin 6 - Target Pin 3 - Internal Connec- Pin 6 - Target Pin 4 - Internal Connec- Pin 7 - Internal Connec-
	tion-Do Not Use tion-Do Not Use

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



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



PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode 125 max. Heater positive with respect to cathode 10 max.	volts volts
Typical Operating Values:	
Photocathode Voltage (Image focus)400 to -600	volts
Grid-No.6 Voltage (Accelerator)-	
Approx. 75% of photocathode voltage300 to -450	volts volts
Target-Cutoff Voltage [®] 3 to +1 Grid-No.5 Voltage (Decelerator) 0 to 125	volts
Grid-No.4 Voltage (Beam focus)	volts
Grid-No.3 Voltage [▲]	volts
Grid-No.2 & Dynode-No.1 Voltage 300	volts
Grid-No.1 Voltage for picture cutoff45 to -115	volts
Dynode-No.2 Voltage	volts
Dynode-No.3 Vo'tage	volts volts
Dynode-No.5 Voltage	volts
Anodo Voltano 1250	volts
Target-Temperature Range	OO
Target-Temperature Range	volts
of Focusing Coil∳75 Field Strength of Alignment	gausses
Coil (Approx.) 0 to 3	gausses
Performance Data:	
With conditions shown under Typical Operating Values and altitude up to Go.ooo feet (unless otherwise noted) Cathode Radiant Sensitivity	
at 4500 angstroms 0.02 Anode Current (DC)—For Highlight Illumination on Photocathode at	
0.01 footcandle.	10 μa
Ratio of Peak-to-Peak Video-Signal Current to RMS Noise Current for	e Curve
	e Curve Curves
Vibration Tests. These tests are performed on a sar of tubes from each production run with highlight i tion on photocathode of 0.003 footcandle. Tubes a associated components [#] are vibrated on apparatus p dynamic conditions similar to those described in 5272A ^D , paragraph 4.7.1.	l <mark>lumina-</mark> nd their roviding
Resonance. Tubes and associated components [#] are view of the method of MIL-E-5272A ^C , paragraph 4.7. 25 ⁰ C and at vibration accelerations not exceed in each of three mutually perpendicular axes for oronemilion cycles, whichever is less. After vi	1.1) at ing 10 g 3 hours
4-60	DATA 2



the center resolution of the tubes will be at least 525 times as determined with an RETMA Resolution Chart, or equivalent, with not more than 0.003-footcandle highlight illumination on the photocathode.

- Tubes and associated components[#] are vibrated Cycling. (per the method of MIL-E-5272A^D, paragraph 4.7.1.2 pertaining to specimen without vibration isolators) in each of three mutually perpendicular axes at 25° C and at vibration accelerations not exceeding 5 g. One survey cycle is made for each axis. The cycle has a duration of one hour during which time the frequency is varied from 5 to 500 and back to 5 cycles per second. Durina this test, the tubes will maintain center resolution of at least 350 lines as determined with an RETMA Resolution Chart, or equivalent, with not more than 0.003-footcandle highlight illumination on the photocathode. After vibration the center resolution, determined under the same conditions as above, will be at least 525 lines.
- Shock Tests. These tests are performed on a sample lot of tubes from each production run with no voltages applied to the tubes. Tubes alone are subjected in these tests (per the method of MIL-E-5272A^D, paragraph 4.15.2.1) to 12 impact shocks of 30 g, each shock impulse having a time duration of 11 ± 1 milliseconds. The intensity is within ± 10 per cent as measured with a filter having a bandwidth of 0.2 to 250 cycles per second. The maximum g is reached in approximately 5-1/2 milliseconds. The shock is applied in the following directions: a) vertically, perpendicular to longitudinal axis, 3 shocks in each direction; b) horizontally, perpendicular to longitudinal axis, 3 shocks in each direction. After shock tests, the tubes are operable and will have resolution of at least 525 lines as determined with an RETMA Resolution Chart, or equivalent, with not more than 0.003-footcandle highlight illumination on the photocathode.
- Temperature-Humidity Tests. These tests are performed on a sample lot of tubes from each production run and with no voltages applied to the tubes. The tubes are subjected (per MIL-E-0052728(USAF)[®], paragraph 4.4.1, Procedure I) to relative humidities up to and including 95 per cent at temperatures up to and including +71° C. Following this test the tubes are operative, and there will be no picture streaking or other evidence of arcing when operated under the following conditions: grid-No.1 voltage adjusted for cutoff; photocathode voltage = -650 volts; dynode-No.2 voltage = 1700 volts; and anode voltage = 1800 volts. In addition, the leakage resistance



determined separately between each of six specific Diheptalbase pins (pins 5,6,7,8,9, and 10) and the 13 other Diheptalbase pins tied together and grounded will be greater than 500 megohms when a voltage of 350 volts is applied between that specific pin and the others.

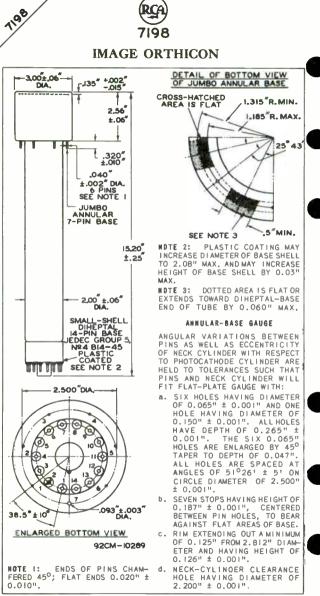
- Ratio of dynode voltages is shown under *typical Operating Values*.
- Normal setting of target voltage is +2 v∞lts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- Adjust to produce maximum signal.
- Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside or and at the image end of the focusing coil.
- ** Measured with amplifier having flat frequency response.
- Tube sockets and components assembly which consists of the deflecting coils, focusing coil, and alignment coil.
- 1 January 1956.
- 5 June 1957.

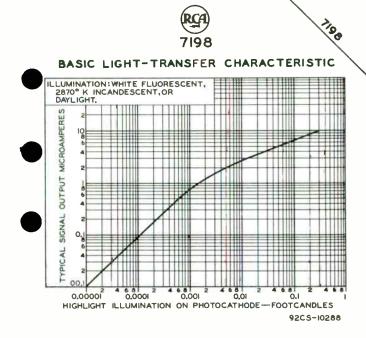
OPERATING CONSIDERATIONS

The operating position of the 7198 should preferably be such that any loose particles in the neck of the tube will not fail down and strike or become lodged on the target. Therefore, it is recommended that the tube never be operated in a vertical position with the Diheptal-base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20⁰ with the vertical.

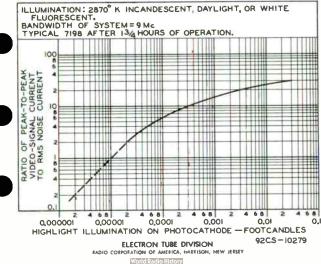
Resolution capability of 7198 is in excess of 600 TV lines.

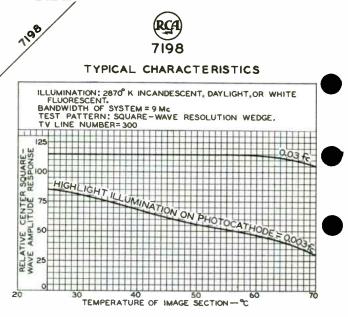
SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device having S-10 Response is shown at the front of this Section





TYPICAL CHARACTERISTIC



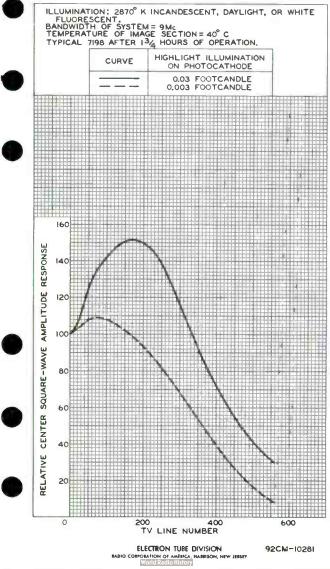


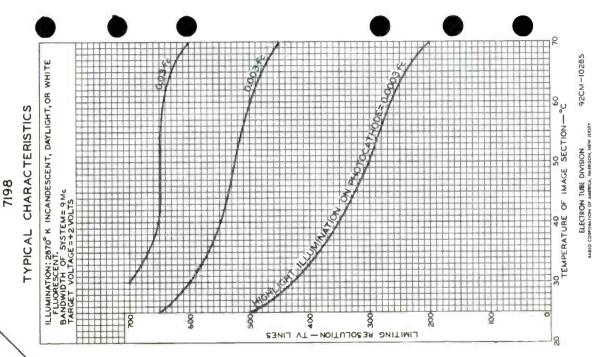
92CS-10280

ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History





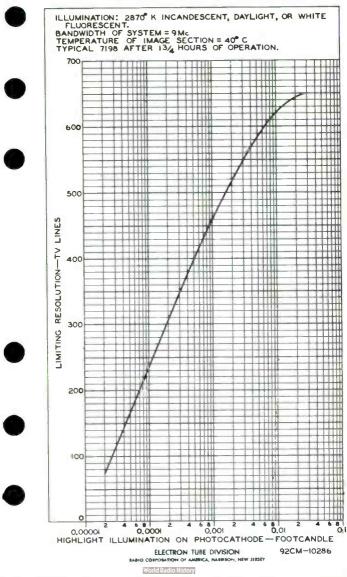




OGIL



TYPICAL CHARACTERISTIC



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MULTIPLIER PHOTOTUBE

9-STAGE TYPE HAVING S-19 RESPONSE

For detection and measurement of ultraviolet radiation

DATA

7-58	ELECTRON TUBE DIVISION	TENTATIVE DATA 1
•,": See next page.		
(DC or Peak AC). SUPPLY VOLTAGE BETW DYNODE No.9 (DC o	VEEN ANODE AND CATHODE VEEN ANODE AND or Peak AC)	1250 max. volts 250 max. volts 0.5 max. mm -80 tc +75 °C
Pin 1 - Dynode No. Pin 2 - Dynode No. Pin 3 - Dynode No. Pin 4 - Dynode No. Pin 5 - Dynode No. Pin 6 - Dynode No.		Pin 7 - Dy node No.7 Pin 8 - Dynode No.8 Pin 9 - Dynode No.9 Pin 10 - Anode Pin 11 - Photo- cathode
Useful Cathode Au Maximum Diameter . Weight (Approx.) Operating Position Bulb Socket Base Small	rea	tion with Graded Sea BRS-11T, or equivalent in (JETEC No.B11-88) Non-hygroscopic
Anode to dynode M Anode to all othe Maximum Overall Ler	d width de Capacitances (Appro do.9 er electrodes. 	0.94 0.31 [*] 4.4 μμ 6 μμ [*] 5.69 [*] 5.12 [*]
	num Response	3300 ± 500 angstroms

RCA 7200

MULTIPLIER PHOTOTUBE

Characteristics:

1200

Under conditions with dc 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 dc (except as noted)

		Min.	Median	Max.	
	Sensitivity:				
1					
	Radiant, at		65000		μa/μa
	3300 angstroms.	-	00000	-	ματμον
	Cathode radiant, at		0.005		- (
	3300 angstroms.	-	0.065	-	µа/µм
	Luminous:#			~~~	
	At 0 cps Cathode luminous	15	40	300	amp/lumen
	Cathode luminous•.	20	40		µa/lumen
	Current Amplification	-	1000000	-	1
	Equivalent Anode-Dark-				
	Current Input≜□ .	-	2 × 10 ⁻¹⁰	2×10^{-9}	lumen
	Equivalent Noise				
	Input:				
	Luminous*				
	At +25° C	_	7.5×10^{-13}	_	lumen
	At -78° C		4 × 10-14	_	lumen
	Ultraviolet†—	_	4 X 10		(unier)
			c. c 10=16		
	At +25° C	-	6.6×10^{-16}		watt
	At -78° C		4×10^{-17}		watt

- On plane perpendicular to the indicated direction of incident light.
- * Averaged over any interval of 30 seconds maximum.

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.

- For conditions the same as shown under (#) except that the value of light flux is 0.01 lumen and 100 volts are applied between cathode and all other electrodes connected together as anode.
- 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 1000 volts is recommended.
- Under the following conditions: Supply voltage (E) is 1000 volts, external shield operated at -1000 volts with respect to anode, 25° C tube temperature, ac-amplifier bandwidth of 1 cycle per second, tungsten light source at 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. The output current is measured through a filter which passes only the fundamental frequency of the pulse.

Determined under the same conditions as shown under (*) except that use is made of monochromatic source having radiation of 2537 angstroms.

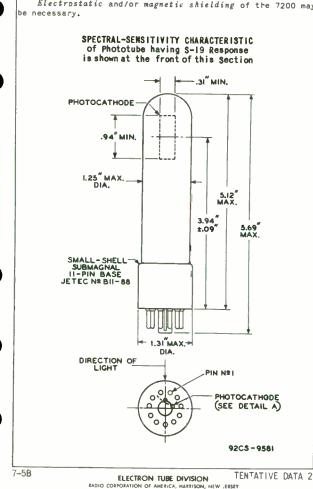


MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

The use of an average anode current well below the maximum rated value of 0.5 milliampere is recommended when stability of operation is important.

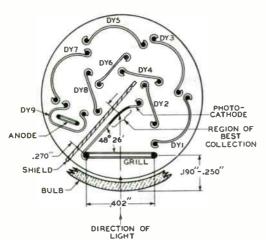
Electrostatic and/or magnetic shielding of the 7200 may





MULTIPLIER PHOTOTUBE

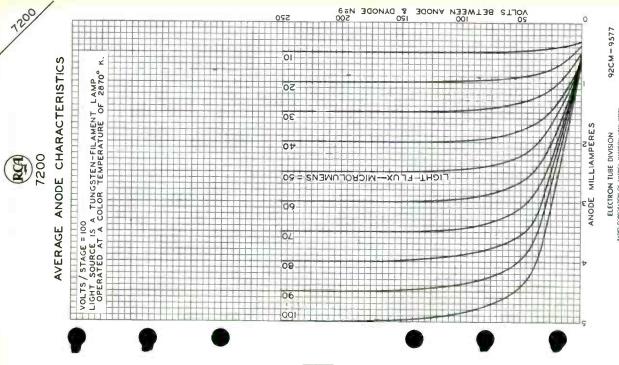
DETAIL A



92CS-8674RI

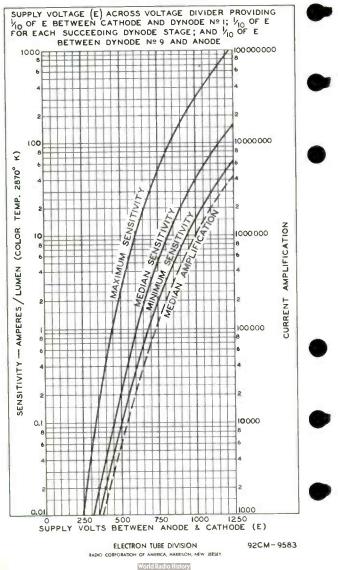
NOTE I: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the perpendicular erected at center of bottom of base.

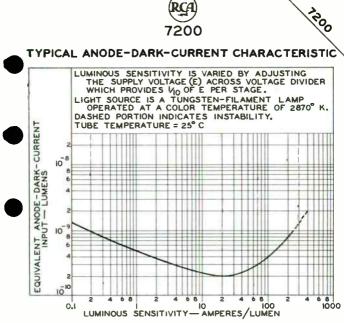
NOTE 2: THE MAXIMUM ANGULAR VARIATION BETWEEN THE PLANE THROUGH PINS I AND II AND THE PLANE DF THE GRILL WILL NOT EXCEED $6^{\rm O}$.





CHARACTERISTICS





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PHOTOJUNCTION CELL

GERMANIUM P-N ALLOY JUNCTION, HEAD-ON TYPE HAVING S-14 RESPONSE

Por computer, punched-tape, punched-card, and sound pickup-from-film applications

				DAT	'A			
	eral:							
Wave Wind Leng Diar Enve Oper Weig Lead	stral Res elength d dow inimum d gth (Exc meter elope Se: rating Pr ght (App ds, Flex inimum l iameter :	af Maxim iameter iuding f als bsition rox., av ible	um Resp lexibl	ponse e leads ois).	5). 0.	520" +		oms ass 50' 03' 10 10 11 1'
				DENT R	ON OF ADIATION: OF CELL			
				+				
			(λ				
					\rightarrow			
				$ \land $	4.00			
			_	\bigcirc	0+00	PPER-PL		
	λ indicate envelope s	s that the symbol is	primary designed	i charact d to var	eristic oj y 4nder t	the ei he infi	ement within the uence of light.	
May	imum Rati	inge 46	l t. a	Values				
	ARIZING \			101063			50 max. vol	
	ER DISSI							
POWE						. 0.	.025 max. wa	
	ENT TEM	PERATURE		 	· · · · · ·	. 0.	.025 max, wa 50 max,	ati
AM:B	'ENT TEMP racterist					. 0.		ati
AMB Char	acterist	tics:		 	nr valta		50 max.	o(
AMB Char	r <mark>acterist</mark> ider cond	tics: litions i	usth po) larızı f 25° C	ng valta	ge of		o(
AMB Char	r <mark>acterist</mark> ider cond	tics: litions i	usth po	f 25° C	ng valta , unless Vedsan	ge of other	50 max. 2.5 volts and	o(
AMB Char Un Sens	acterist ader cond amb:ent sitivity:	tics: litions i tempero	with po iture o	f 25° C	, unless	ge of other	50 max. 2.5 volts and	o(
AMB Char Un Sens	acterist ader cond amb:ent sitivity: adiant in	tics: ditions i tempero	with po iture o	f 25° C	', unless Yedian	ge of other	50 max. 2.5 volts and wise noted	
AMB Char Un Sens Ra	racterist ader cond amb:ent sitivity: adiant ir 15000 ar	tics: ditions i tempero	with po iture o	f 25° C Nin. -), unless Vedian 0.68	ge of other Max.	50 max. 2.5 volts and wise noted μa/watt/mete	
AMB Char Un Sens Ra	acterist ader cond amb:ent sitivity: adiant in	tics: ditions i tempera intensity ngstroms.	with po iture o	f 25° C	', unless Yedian	ge of other	50 max. 2.5 volts and wise noted	
AMB Char Un Sens Ra 11 Dark	racterist ader cona amb:ent adiant in 15000 ar Iluminati Current t polariz	tics: difions i tempero intensity ngstroms. ion 1 . t: zing volt		f 25° C Nin. -), unless Vedian 0.68	ge of other Max.	50 max. 2.5 volts and wise noted μa/watt/mete	
AMB Char Un Sens Ra 11 Dark At	racterist ader cona amb:ent adiant in 15000 ar Iluminati c Current t polariz age of 2	tics: ditions i temperod intensity ngstroms iont • t: zing volt 2.5 volts		f 25° C Nin. -), unless Vedian 0.68	ge of other Max.	50 max. 2.5 volts and wise noted μa/watt/mete	er ²
AMB Char Un Sens Ra 11 Dark At	racterist ader cona amb:ent sitivity: adiant in 15000 ar Iluminati current t polariz age of 2 t polariz	tics: ditions i temperod intensity ngstroms ionit t: zing volt 2.5 volts zing volt		f 25° C Nin. -), unless Vedian 0.68	other Max. 0.5	50 max. 2.5 volts and wise noted μa/watt/mete	er ² μa
AMB Char Un Sens Ra 11 Dark At	racterist ader cona amb:ent sitivity: adiant in 15000 ar Iluminati current t polariz age of 2 t polariz	tics: ditions i timpera intensity ngstroms ionit cing volt 2.5 volts ion volts		f 25° C Nin. -), unless Vedian 0.68	ge of other Max. 0.5	50 max. 2.5 volts and wise noted μa/watt/mete	er ²

RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY



PHOTOJUNCTION CELL

Photocurrent:

For conditions where the light source is a tungsten-filament lamp op₄rated at a color temperature of 2870° K.

The value of illumination incident on the window is 73 foot-candles.

OPERATING CONSIDERATIONS

The *flexible leads* of the 7223 are usually soldered to the circuit elements. Soldering of the leads may be made close to the seals provided care is taken to conduct excessive heat away from the seals. Otherwise, the heat of soldering will open the seals and damage the cell.

A *clamp* around the metal shell of the cell may be used to hold the cell in position. However, care must be taken in clamping to avoid crushing or otherwise damaging the metal shell, the glass window, or the lead seals. Do not solder or braze directly to the metal shell of the cell.

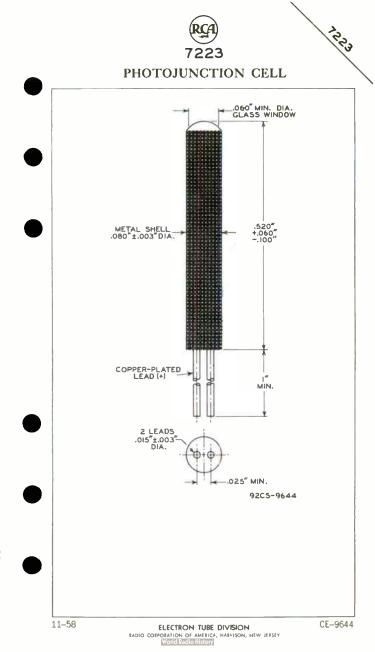
The cell must be *polar;zed* by connecting the positive voltage to the copper-plated lead.

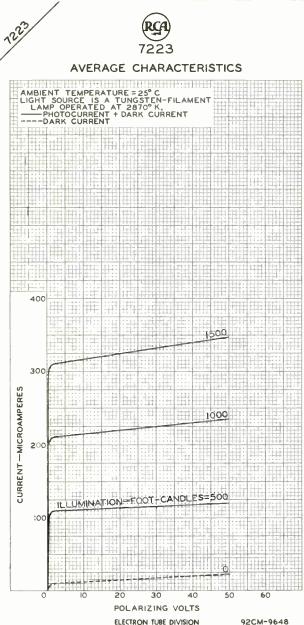
The use of an optical system to focus the incident radiation onto the window is suggested, especially when the level of incident radiation is low.

Exposure of the 7223 to intense radiation, such as focused sunlight, should be avoided under all conditions including the condition when no voltage is applied to the cell. Permanent damage to the cell may result if it is exposed to radiant energy so intense as to cause excessive heating of the cell.

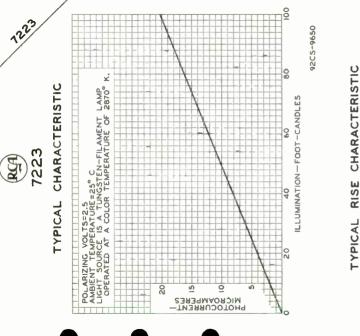
With no radiation on the window of the cell, some dark current will flow across the junction. This current can be reduced, as shown in the accompanying curve, by operation of the cell at reduced ambient temperature.

> SPECTRAL-SENSITIVITY CHARACTERISTIC of Photojunction Cell having S-14 Response is shown at the front of this Section

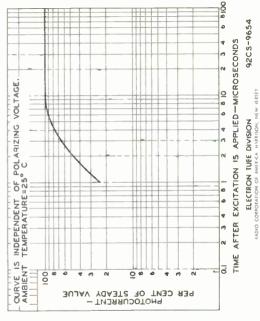


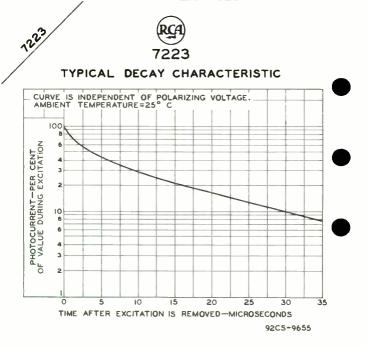


RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History

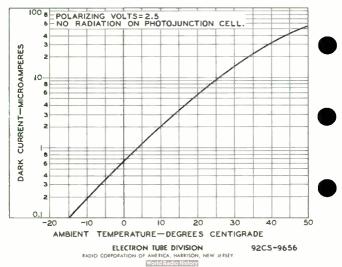












RCA 7262 VIDICON

600-LINE RESOLUTION

202

For use in small, compact, transistorized TV cameras

DATA

General:

LOW-POWER (0.6-WATT) HEATER

Heater. for Unipotential Cathode: Voltage. 6.3 ± 10% . . . ac or dc volts Current. 0.095 . .amp Direct Interelectrode Capacitance: Target to all other electrodes 4.6 шf Spectral Resoonse. . . See Curves Photoconductive Laver: Maximum useful diagonal of rectangular image (4 x 3 aspect ratio). 0.62" Orientation of quality rectangle-Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer. Focusing Method. Magnetic Deflection Method. . . . Magnetic • . . 5.12" ± 0.06" Overall Length 1.125" ± 0.010" Greatest Diameter. Weight (Approx.) 2 oz Operating Posifion . . Anv Bulb Base Connector Cinch No.54A18088, or equivalent Base Small-Button Ditetrar 8-Pin (JEDEC No.68-11) . . Cinch Ng.54A18088. or equivalent Pin 1 -Heater $(4)_{\Box}(4)$ Pin 7 - Cathode Pin 2 - Grid No. 1 Pin 8 - Heater 6 Pin 3-Internal Flange - Target Connection-Short Index Pin -(2) Do Not Use Same as Pin 4 - Same as Pin 3 Pin 3 Pin 5 - Grid No.2 SHORT Pin 6-Grid No.4, Grid No.3 DIRECTION OF LIGHT: INTO FACE END OF TUBE Maximum Ratings, Absolute Values: For scanned area of 1/2" x 3/8" GRID-No.3 & GRID-No.4 VOLTAGE. . 350 max. volts GRID-No.2 VOLTAGE. . . . 350 max. volts GRID-No.1 VOLTAGE: Negative-bias value. . 125 max. volts Positive-bias value. . . 0 max. volts : See next page.

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ELECTRON TUBE DIVISION

TENTATIVE DATA 1

VIDICON

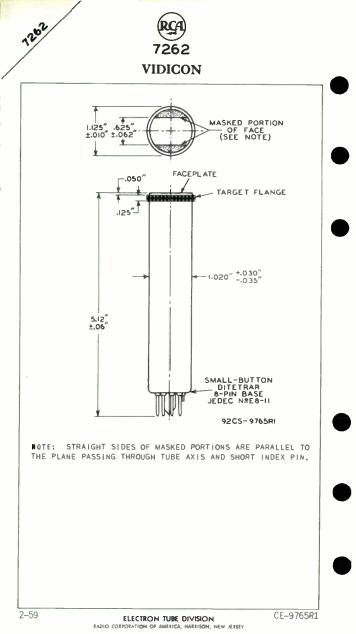
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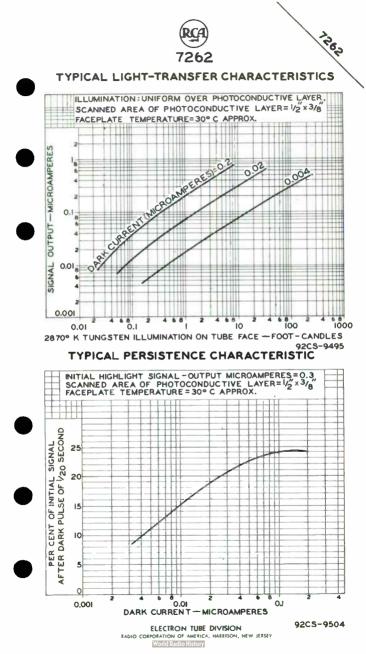
1202

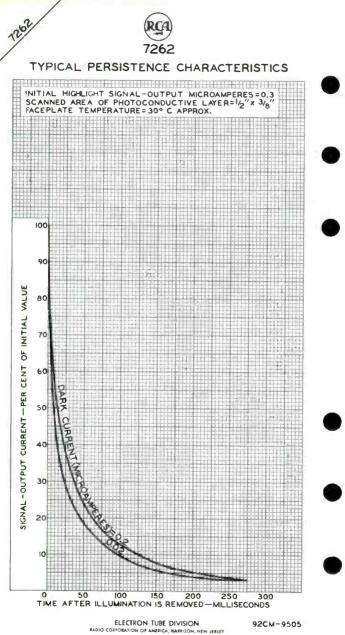
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	. 125 max.	volts
Heater positive with respect to cathode		volts
DARK CURRENT	. 0.25 max.	μa
PEAK TARGET CURRENT	. 0.55 max.	μa
FACEPLATE:		
Illumination	. 1000 max.	
Temperature	. 60 max.	. °Cl
Typical Operation:		
For scanned area of 1/2" x 3	18" and	
faceplate temperature of 300°	to 35° C	
Grid-No.4 (Decelerator) &		1
Grid-No.3 (Beam-focus	2500 + 200	
electrode*) Voltage	250 [°] to 300	
Grid-No.2 (Accelerator) Voltage	300	volts
Grid—No.1 Voltage for picture	-45 to -100) volts
cutoff• Average "Gamma" of Transfer	-40 (0 -100	, vorts
Characteristic for signal-		
output current between 0.02 μa		
ard 0.2 µa	0.65	
Visual Equivalent Signal-to-		
Noise Ratio (Approx.)*	300:1	
Minimum Peak-to-Peak Blanking		
Voltage:		
When applied to grid No.1.	75	volts
When applied to cathode Field Strength at Center of	20	volts
Focusing Coil (Approx.).	40	gausses
Field Strength of Adjustable	40	94000000
Alignment Coil [®]	0 to 4	qausses
5		
Naximum-Sensitivity Operation for Li		
Faceplate Illumination (Highlight)	2	ft-c
Maximum Target Voltage required to		
produce dark current of 0.2 μa in any tube"	110	volts
Target Voltaget	60 to 100	· · · ·
	0.2	μa
Dark Current	0.4 to0.5	μa
Signal-Output Current:#		r
Peak	0.2 to0.3	μa
Average	0.08 to 0.	1 µa
Average-Sensitivity Operation for Li	ve-Scene Pick	kup
Faceplate Illumination (Highlight)	15	ft-c
Maximum Target Voltage required to	15	, (-0
produce dark current of 0.02 µa		
in any tube**.	60	volts
Target Voltaget	30 to 50	volts
2-59 ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, MARRISON, N	TENTATIVI ew jersey	E DATA. 1



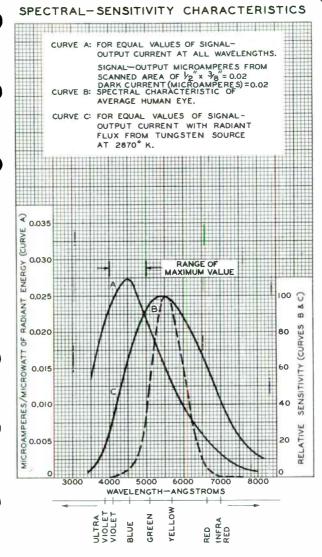
	0.02	μa
Dark Current	0.3 to C.4	μa μa
Peak	0.3 to 0.4 0.1 to 0.2	μа μа
Hinimum-Lag Operation for Film	Pickup	
Faceplate Illumination (Highlight) Maximum Target Voltage required to		t-c
produce dark current of 0.004 µa in any tube [*] Target Voltaget Dark Current Target Current (Highlight) [•] Signal-Output Current: [#]		lts lts μa μa
Peak	0.1 to 0.2	μa
This capacitance, which effectively is the o 7262, is increased when the tube is mounted and focusing-coll assembly. The resistive c impedance is in the order of 100 megofms.	utput impedance of in the deflecting-y omponent of the out	the oke put
Beam focus is obtained by combined effect of g should be adjustable over indicated range, and an average field strength of 40 gausses.		
Definition, focus uniformity, and picture qua creasing grid-No.4 and grid-No.3 voltage. In grid No.3 should be operated above 250 volts.	lity decrease with general, grid No.4	de- and
 With no blanking voltage on grid No.1. Measured withhigh-gain, low-noise, cascode-inp bandwidth of 5 Mc. Because thenoise insuch a of the high-frequency type, the visual equi ratio is taken as the ratio of the highlight; 	ideo-signal current	ing ely ise to
 rms noise current, multiplied by a factor of 3 The alignment coil should be located on the list a distance of 3-11/6 inches from the f. positioned so that its axis is coincident with the deflecting yoke, and the focusing coil. 	ube so that its cer ace of the tube, and h the axis of the tu	
The target voltage for each 7262 must be adjus gives the desired operating dark current.		
the operating target-voltage range normally en	countereu.	
 The deflecting circuits must provide extreme good black-level reproduction. Dark-current to the scanning velocity. Any change in scann black-level error in direct proportiom to t velocity. 		
■ Video amplifiers must be designed properly to of this magnitude to avoid amplifier overload	o handle targetcurre or picture distortio	ants on.
Defined as the component of the target current component has been substracted.	after the dark-curr	rent
2-59 ELECTRON TUBE DIVISION	TENTATIVE DAT	TA 2



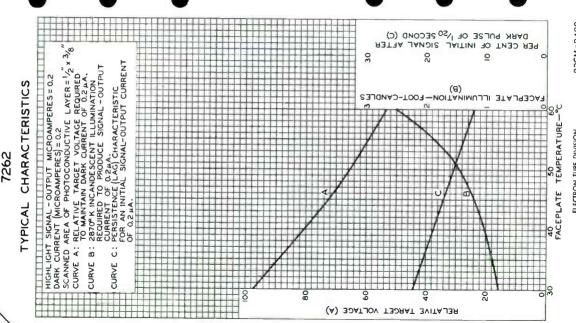








ELECTRON TUBE DIVISION BADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY WORK REGIO HISTOTY 1202

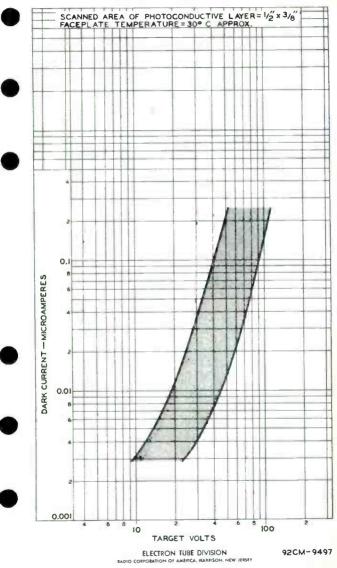


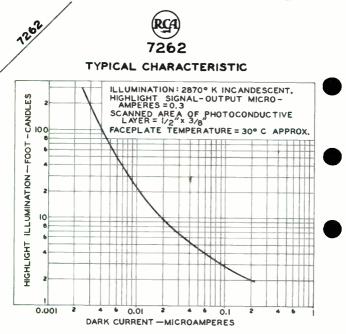
9499 92CM-

> DIVISION TUBE ELECTRON



DARK-CURRENT RANGE





92CS-9493

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

Vidicon

LOW-POWER (0.6-WATT) HEATER 600-T0-900-LINE RESOLUTION For Live-Scene Pickup with Compact, Transistorized TV Cameras in Industrial Closed-Circuit Systems. The 7262-A is Unilaterally Interchangeable with Type 7262.

DATA

Ger	neral:
۲ \	ater, for Unipotential Cathode: /oltage (AC or DC)6.3 ± 10% volts Current at 6.3 volts0.095 amp
Di	rect Interelectrode Capacitance: ⁴ Farget to all other electrodes
Pho	ectral Response See Curve stoconductive Layer: Maximum useful diagonal of
)	rectangular image (4 x 3 aspect ratio) 0.62"
(Drientation of quality rectangleProper orientation is obtained when the horizontal scan is essentially parallel
	to the straight sides of the masked portions of the face-
	plate The straight sides are parallel to the plane
	passing through the tube axis and short index pin. The
	masking is for orientation only and does not define the proper scanned area of the photoconductive layer.
For	cusing Method
De	flection Method
0.44	arall length $$
Gre	eatest Diameter
Ope	erating Position
D.,	16
So	clot
Ra	so Small-Button Ditetrar 8-Pin (JEDEC No.E8-II)
	Basing Designation for BOTTOM VIEW 8HM
)	Pin 1 - Heater Op Pin 7 - Cathode
	Pin 2-Grid No.1 (3) (6) Pin 8-Heater
	Pin 3 - Internal Con- Flange - Target
	nection— 3 Short Index Pin - Da Not Use
	Do Not Use Same as Pin 4 - Same as Pin 3 Over 8 Pin 3
	Pin 5-Grid No.2 SHORT
	Pin 6-Grid No.4,
	Grid No.3 DIRECTION OF LIGHT: INTO FACE END OF TUBE
Ma	ximum Ratings, Absolute-Maximum Values:
	For scanned area of 1/2" x 3/8"
GF	RID-No.3 & GRID-No.4 VOLTAGE
GR	PD-No.2 VDLTAGE · · · · · · · · · · · · · · · · · 750 max. volts



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I

GRID-No.1 VOLTAGE:	
	volts
	volts
PEAK HEATER-CATHODE VOLTAGE:	
	volts
	volts
TARGET VOLTAGE	volts
DARK CURRENT 0.25 max.	μa
PEAK TARGET CURRENT [®] 0.55 max.	μa
FACEPLATE:	
[]]umination	fc
Temperature	°C
Typical Operation:	
For scanned area of 1/2" x 3/8" and	
faceplate temperature of 30° to 35° C	
Grid-No.4 (Decelerator) &	_
Grid-No.3 (Beam-Focus-	
	volts
Grid-No.2 (Accelerator) Voltage 300	volts
	volts
Average "Gamma" of Transfer	voit3
Characteristic for signal-	
output current between 0.02 µa	
and 0.2 µa 0.57	
Visual Equivalent Signal-to-	
Noise Ratio (Approx.)	
Lag:	
Ťypical	%
Maximum	%
Minimum Peak-to-Peak Blanking Voltage:	
	volts
	volts
Field Strength at Center of	
Focusing Coil (Approx.) 40 ga	usses
Field Strength of Adjustable Alignment Coil ⁴ 0 to 4 ga	
	usses
Maximum-sensitivity operation - 0.1 footcandle on face;	plate 🛛
Faceplate Illumination	
(Highlight)	fc
	volts
	μa
Signal-Output Current:*	-
Typical 0.14	μа
Intermediate-sensitivity operation - 0.5 footcandle on face	eplate
Faceplate Illumination	
(Highlight)	fc
Target Voltage ^{®,#}	volts
Dark Current 0.1	μa
Dark Current" 0.1 Signal-Output Current:®	-
Typical 0.27	щa





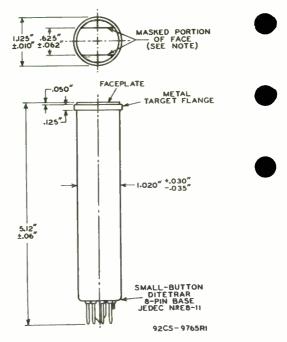
Average-sensitivity operation - 1 footcandle on faceplate

Faceplate Illumination	
(Highlight) 1	fc
Target Voltage","	volts
Dark Current"	μa
Signal-Output Current:*	
Typical 0.2	μa
Minimum 0.15	µа

- This capacitance, which effectively is the output impedance of the 7262-A, is increased when the tube is mounted in the ceflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.
- Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.
- Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gauses.
- Definition, focus uniformity, and picture quality decrease with decreasing grid-Mo.4 and grid-Mo.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.
- 📱 With no blanking voltage on grid No.1.
- Measured with a peak signal-output current of 0.35 microampere using a high-gain. low-moise, cascode-input-type amplifier having bandwidth of 5 Mc. Bycause the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight viseo-..ignal current to rms noise current, multiplied by a factor of 3.
- Defined as the per cent of initial value of signal-output current 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- The alignment coll should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.
- Indicated range for each type of service serves only to illustrate the g operating target-voltage range normally encountered.
- [#] The target voltage for each 7262-A must be adjusted to that value which gives the desired operating dark current.
- The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is propurional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct porportion to the change in scanning velocity.
- Defined as the component of the highlight target current after the dark-current component has been subtracted.



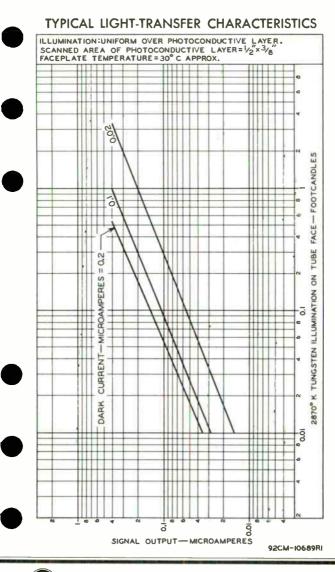
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NOTE: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.



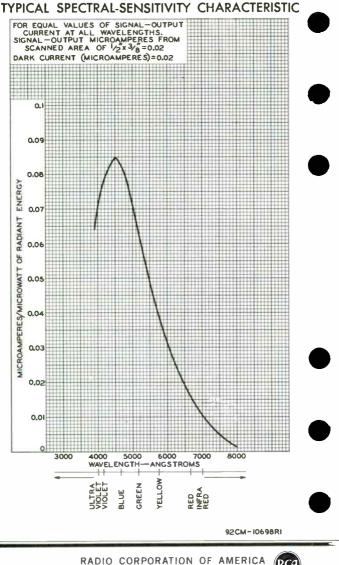
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RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

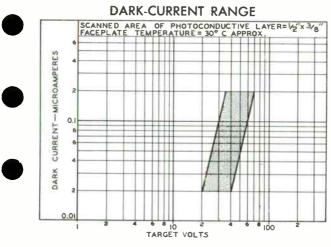
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DATA 3 1-61



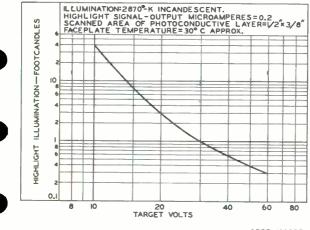
Electron Tube Division

Harrison, N. J.



92CS-10684RI

TYPICAL CHARACTERISTIC



92CS-10685RI



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World Radio History

Vidicon

volts

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For Use Under Severe Shock and Vibration, High Humidity, and at Altitudes up to 50,000 Feet in Small. Compact, Transistorized TV Cameras. The 7263-4 is Unilaterally Interchangeable with Type 7263. DATA General: Heater, for Unipotential Cathode: Voltage (AC or DC). 6.3 ± 10% Current at 6.3 volts. 0.095 Direct Interelectrode Capacitance: Target to all other electrodes. . . 4.6 Spectral Response See Curve Photoconductive Laver: Maximum useful diagonal of rectangular image (4 x 3 aspect ratio) 0.62" Orientation of quality rectangle---Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin. Socket. Cinch No.54A18088[®]. or equivalent Pin 1 - Heater Pin 7 - Cathode 3 Pin 2-Grid No.1 Pin 8-Heater ----Pin 3-Internal Flange - Target EE2 Connection-(2 Short Index Pin -Do Not Use Same as Pin 4-Same as Pin 3 Pin 3 Pin 5-Grid No.2 SHORT Pin 6-Grid No.4. DIRECTION OF LIGHT: INTO FACE ENC OF TUBE Grid No.3 Maximum Ratings, Absolute-Naximum Values: For altitudes up to 50,000 feet and scanned area of 1/2" x 2/8" GRID-No.3 & GRID-No.4 VOLTAGE . . 750 max. GRID-No.2 VOLTAGE 750 max. GRID-No.1 VOLTAGE: Negative-bias value . . 300 max. Positive-bias value . . . () max.

LOW-POWER (0.6-WATT) HEATER 600-T0-900-LINE RESOLUTION



RADIO CORPORATION OF AMERICA **Electron Tube Division** Morld Radio History

Harrison, N. J.

volts

volts

volts

volts

7263-A

PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. TARGET VOLTAGE. OARK CURRENT. PEAK TARGET CURRENT*. FACEPLATE: 111umination. Temperature.	125 max. 10 max. 100 max. 0.25 max. 0.55 max. 1000 max. 71 max.	volts volts volts µa µa fc oc
Typical Operation:		
For scanned area of 1/2" x 3/ faceplate temperature of 30° t	18" and to 35 [°] C	-
Grid-No.4 (Decelerator) & Grid-No.3 (Beam-Focus- Electrode) Voltage	250 [€] to 300 300 -45 to -100	volts volts
output current between $0.02 \ \mu a$ and $0.2 \ \mu a$.	0.57	
Visual Equivalent Signal-to- Nojse Ratio (Approx.)‡	300:1	
Lag: Typical Maximum Minimum Peak-to-Peak Blanking	25 20	% %
Voltage: When applied to grid No.1 When applied to cathode Field Strength at center of	75 20	volts volts
focusing coil (Approx.)		gausses
Alignment Coil [®]	0 to 4	gausses
Naximum-sensitivity operation — o.1 foot Faceplate Illumination (Highlight) Target Voltage [#] , [*]	candle on fac 0.1 35 to 70 0.2	fc
	0.14	μa
Intermediate-sensitivity operation — 0.5 for Faceplate []]umination (Highlight) Target Voltage [#] ,* Oark Current [®]	0.5 30 to 60 0.1 0.27	fc
Average-sensit:vity operation — 1 footc Faceplate Illumination (Highlight) Target Voltage#,*	andle on face 1 20 to 40 0.02	fc volts μa

RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.



Signal-Output €urrent:T		
	0.2	μa
Minimum	0.15	μa
. ▲ all a state of the state	Incodered of	1 h o
This capacitance, which effectively is the Dutput 7263-A, is increased when the tube is mognited in th	ne deflecting-)	/oke
and focusing-coil assembly. The resistive compon impedance is in order of 100 megohns.		
Made by Cinch Manufacturing Corporation, 1026 So Chicago 24, Iklinois.		
★ video amplifiers must be designed properly to hand	le target curre	ants

- of this magnitude to avoid amplifier overload or picture distortion.
- Beam focus is obtained by combined effe+t o: grid-No.3 voltage which should be adjustable over indicated range, and a focusing cαll having an average field strength of Mu gausses.
- Definition, rocus uniformity, and picture ruality decrease with decreasing grid-Mo.4 and grid-Mo.3 voltage. In general, grid No.4 and grid No.3 should be operated above 250 volts.
- With no blanking voltage on grid No.1.
- Measured with high-gain, low-noise, cascade-input-type amplifier having bandwidth of 5 Mc and a peak signal-output current of 0.35 microampere. Because the neise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the high-type video-signal current to rmc noise current, multiplied by a factor of 3.
- Defined as the per cent of initial v∝lue of signal-output current 1/20 second after illumination is removid. Values shown are for initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- 6 The alignment coll should be located on the tube so that its center is at a distance of 3-11/16 incress from the face of the type, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.
- Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- The target voltage for each 7263-A must be adjusted to that value which gives the desired operating dark current.
- The deflecting circuits must provide extremely linear scarning good black-level reproduction. Dark-current signal is proportiona
 Any change in signing velocity product for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in skanning velocity products a black-leve' error in direct proportion to the change in scanning velocity.
- Defined as the component of the highlight target current after the dark-current component has been subtracted.



SPECIAL PERFORMANCE DATA

In connection with the following tests, sample 7263-A's will maintain resolution as determined with a RETMA Resolution Chart, or equivalent, and will faithfully reproduce all resolution wedges and grey scales of the chart.

Vibration Tests:

These tests are performed under conditions for Average-Sensitivity Operation on a sample lot of tubes from each production run. Tubes and their associated components are vibrated on apparatus providing dynamic conditions similar to those described in MIL-E-52728⁰, paragraph 4.7.1.



Resonance. Tubes and associated components^D are vibrated (per the method of MIL-E-52728^D, paragraph 4.7.1) for 1 hour at +25° C, for 15 minutes at 0° C, and for 15 minutes at +55^G C.

Tubes and associated components⁹ are vibrated Cycling. (per the method of MIL-E-52728^D, paragraph 4.7.1.2 pertaining



7263-A

to specimen without vibration isolators) for 1 hour at $\pm 25^{\circ}$ C, for 15 minutes at 0° C, and for 15 minutes at $\pm 55^{\circ}$ C.

Temperature-Pressure (Altitude) Tests:

Tubes and associated components $\hat{\Psi}$ are subjected (per the method of MIL-E-5400°, paragraph 3.2.20, 3.2.20.1, and 3.2.20.1.1) to the separate and combined effects of varying temperature 0° to $\pm 55^{\circ}$ C and varying barometric pressure 30 to 3.4 inches of mercury. The pressures correspond to sea level and to an altitude of 50,000 feet, respectively.

Shock Tests:

These tests are performed with no voltages applied and on a sample lot of tubes from each production run. Tubes and their associated components⁹ are subjected in these tests (per MIL-E- 5400° , paragraph 3.2.21.2.1) to 18 impact shocks of 15 g consisting of 3 shocks in opposite directions along each of three mutually perpendicular axes of the tube. Each shock impulse has a duration of 11 ± 1 milliseconds with a maximum impact acceleration occurring at approximately 5.5 milliseconds. Tube mounting accessories assure the rigid fastening of the tube to the shock-test apparatus.

Temperature-Humidity Tests:

These tests are performed with no voltages applied to the 7263-A. The 7263-A and associated components are subjected (per the method of MLL-E-5400°, paragraph 3.2.20.2B) to relative humidities up to and including 100 per cent at temperatures up to and including +50° C.

- \tilde{S} Tube socket such as Cinch No.5#A18088 and RCA Assembly No.200SDU501, or equivalent, which consists of the deflecting colls, focusing coll, alignment coll, shield, and target connector.
- 5 June 1957, Procedure I of Military Specifications.
- 1 January 1956.

OPERATING CONSIDERATIONS

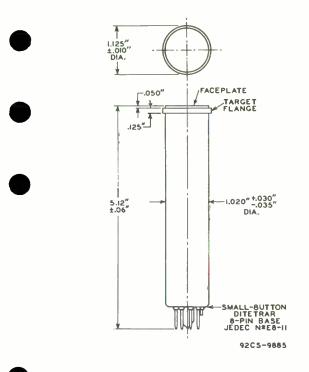
The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube. This spring contact may conveniently be provided as part of the focusing-coil design.

Support for the 7263-A should be provided such that, under vibration and shock, the tube will not be displaced with respect to the focusing, deflecting, and alignment fields. Suitable support is provided for the tube and its socket in the RCA Deflection Assembly 200SDU501, or equivalent. Orientation of the 7263-A in its support should be such that the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.



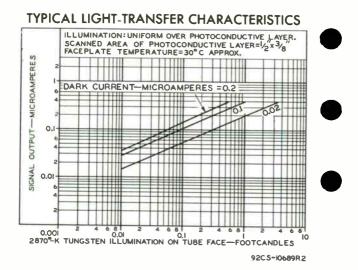
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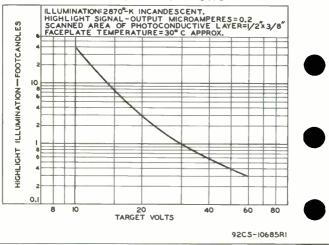




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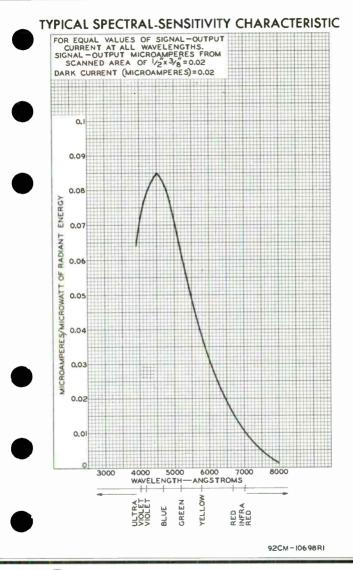


TYPICAL CHARACTERISTIC



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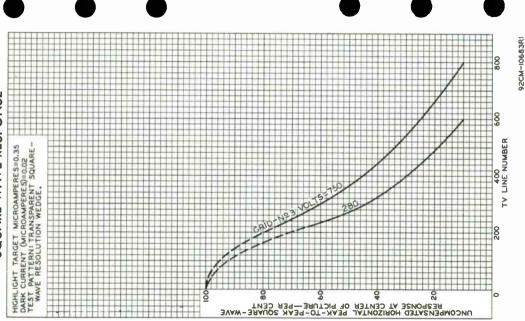


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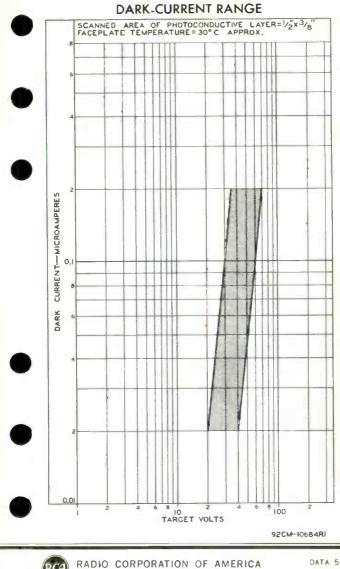
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7263-A



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Electron Tube Division

DATA 5 1-61



MULTIPLIER PHOTOTUBE

14-STAGE, HEAD-ON, SPHERICAL-FACEPLATE TYPE WITH 1.68"-DIA., SPHERICAL, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE VERY SHORT TIME-RESOLUTION CAPABILITY

DATA

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General:	
Spectral Response	
Wavelength of Maximum Response 4 Cathode. Semitransparent:	400 ± 500 angstroms
	Scherical
Window:	• • • • • • • • • • • • • • • • • • •
Area	2.2 sq. in.
	1.68 in.
	1.51
Direct Interelectrode Capacitances (Approx.):	
Anode to dynade No.14	2.4 µµf
Anode to all other electrodes	5.5 <i>μ</i> μf
Oynode No.14 to all other	
electrodes	7.5 μμf
Maximum Overall Length	7.5"
Seated Length	6.69" ± 0.19'
Neight (Approx.)	,
Bulb	
Socket Alden No.220FT with 20 cont	
Base Small-Shell Bidecal 20-Pin	
Basing Designation for BOTTOM VIEW	200
Pin 1 – No Connec – Pin	14 - Oynode No.8
	15 - Dynode No.6
	16 - Dynade No.4
	17 - Dynode No.2
Rin E Dunada No 7	18-No Connec-
Pin 6 - Dynade No 9	19-Grid No.1
Pin 7 - Dynode No. 11	(Focusing
Pin 8-Dynode No.13	Electrode)
Pin 9-Grid No.2 🔿 🖊 🖉 Pin	20 - Photocathode
	al Collar-No
Electrode)	Connection
Pin 10 - Anode DRECTION OF LIGHT: Pin 11 - Dynode No.14	(if used,
Pin $12 - 0$ ynode No. 12	connect only to
Pin 13 - Oynode No.10	photo-
	cathode)
2-59	TENTATIVE DATA 1
ELECTRON TUBE DIVISION	IENTATIVE DATA 1

MULTIPLIER PHOTOTUBE

VERY-LOW-LIGHT-LEVEL, LOW-NOISE, HIGH-GAIN SERVICE

With supply voltage (E) across voltage divider providing electrode voltages shown in Table I-Column A

Maximum Ratings, Absolute Values:

1204

SUPPLY VOLTAGE BETWEEN ANODE AND		
	max. vo	olts
SUPPLY VOLTAGE BETWEEN DYNODE No.14		
	max, vo	olts
SUPPLY VOLTAGE BETWEEN CONSECUTIVE		
	max. vo	olts
SUPPLY VOLTAGE BETWEEN ACCELERATING		.
		olts
		olts
		olts
	max.	
AMBIENT TEMPERATURE	max.	00

Characteristics Range Values for Equipment Design:

With E = 2000 volts (except as noted) and focusing-electrode as well as accelerating-electrode voltage adjusted to give maximum gain

	Min.	Median	Nax.	
Sensitivity:				
Radiant, at 4400				
angstroms Cathode radiant.	-	0.7	-	amp/µw
at 4400 angstroms .	_	0.056	_	μa/μw
Luminous:*				
At O cps	120	875	4500	amp/lumen
With dynode No.14				
as output elec-		610		
trodet	-	612	-	amp/lumen
With tungsten light				
source ⁴		70	_	µa/lumen
With blue light	50	10	_	ματιμικετι
source**	0.05		_	μa
Current Amplification .		12.5×10^{6}	_	pace
Equivalent Anode-Dark-				
Current Input®		5 x 10 ⁻¹⁰	2 × 10 ⁻⁹	lumen
Equivalent Noise				-
Input:*				
At +25° C	-	3.3 × 10 ⁻¹²	1.5×10^{-11}	lumen
At -50° C	-	9 × 10 ⁻¹³		lumen
Anode-Pulse Rise Time".	-	3		milliµsec

↑ ▲ == ♦ = = ★ □, See next page.

TENTATIVE DATA 1 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

World Radio History

ELECTRON TUBE DIVISION



MULTIPLIER PHOTOTUBE

HIGH-OUTPUT-PULSE SERVICE

With supply voltage (E] across voltage divider providing electrode voltages shown in Table I-Column B

Maximum Ratings, Absolute Values:

SUPPLY VOLTAGE BETWEEN ANODE AND		
CATHOOE (DC)	max. v	olts
SUPPLY VOLTAGE BETWEEN OYNODE No.14		
	max. v	olts
SUPPLY VOLTAGE BETWEEN CONSECUTIVE		1
	max. v	olts
SUPPLY VOLTAGE BETWEEN ACCELERATING		.
		olts
	max. v	
		olts
	max.	
AMBIENT TEMPERATURE	max.	°C

Characteristics Range Values for Equipment Design:

With E = 2400 volts (except as noted) and focusing-electrode as well as accelerating-electrode voltage adjusted to give maximum gain

			Min.	Nedian	Nax.	
Sensitivity:						
Radiant, at 4400 angstroms. Cathode radiant, a			-	0.7	-	amp/µw
4400 angstroms.			-	0.056		μa/μa
Luminous:# At O cps With dynode No.:			-	875	-	amp/lumen
as output electrodet. Cathode luminous:			-	612	-	amp/lumen
With tungsten light source▲ With blue light			50	70	-	µa/lume n
source**•			0.05	-		μa
● ,#,†,▲, **, ♦ ,●, ● ,★,□,‡,	See	next	page.			

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ELECTRON TUBE OIVISION

TENTATIVE OATA 2

RADIO CORPORATION OF AMERICA. HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

	Min.	Median	Max.	
Current Amplification	-	12.5×10^{6}		
Equivalent Anode-Dark- Current Input ^{®®} Equivalent Noise Input:** At +25 ⁰ C	-	1.1×10^{-9} 4.6×10^{-12}	-	lumen
At -50° C	_	1.2×10^{-12}	_	lumen
 Averaged over any interval of Under the following conditi 	ions: T	he light source	is_atu	ngsten-
filament lamp operated at a input of 0.1 microlumen is 0.01 megohm.	color t used. T	emperature of 2 he load resisto	в70 ⁰ к. r has a v	A light alue of
An output current of opposit may be provided by using dyn. this arrangement, the load i and the anode serves only as	ode No.1 s connec	4 as the output ted in the dyno	electrode	. with
Under the following conditi f lament lamp operated at a of light flux is 0.01 lumen a ard all other electrodes con sistor has a value of 0.01 me	color te and 200 w mected	mperature of 287 olts are applied	'О ^О К. Th Jbetween	e value cathode
** Under the following conditi transmitted through a blue fil to 1/2 stock thickness) from codor temperature of 2870° K is 0.01 lumen. The load re 200 volts are applied between ed together as anode.	lter (Con) à tungs . The v sistor l	ning, GlassCode sten—filament la alue of light fl has a value of (No.5113 p mp operat ux on the).01 mego	olished ed at a filter hm. and
For spectral characteristic ACTERISTIC OF 2870° K LIGHT LIGHT FROM 2870° K SOURCE AFT at front of this section.	SOURCE	AND SPECTRAL CI	ARACTERI	STIC DF
Measured at a tube temperatu (E, adjusted to give a luminou Dark current caused by therm of a refrigerant.	us sensit	ivity of 2000 an	nperes per	lumen.
For maximum signal-to-noise (E) below 2000 volts is recom	ratio, mmended.	operation with a	a supply	voltage
Under the following condition 250-C tube temperature, ext ac-amplifier bandwidth of 1 action of the second	ernal-si cycle pr	ield potential	of -2000	volts.

25%-C tube temperature, external-shield potential of -2000 volts, ac-amplifier bandwidth of 1 cycle per second, tungsten light source 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. 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-pulserise time is determined primarily by transittime variations in the multiplier stages 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.

For maximum signal-to-noise ratio, operation with a supply voltage (E) below 2300 volts is recommended.

★★ Same as (★) except the supply voltage (E) is 2400 volts, and the external—shield potential is -2400 volts.

1204



MULTIPLIER PHOTOTUBE

	TABLE I	
VOLTAGE TO	BE PROVIDED BY DIV	IDER
	COLUMN A	COLUMN B
Between	5.4% of Sapply Voltage (E) multiplied by	2.75% of Supply Voltage (E) multiplied by
Cathode and Focusing Electrode	*	+
Cathode and Dynode No.1	2	2
Dynode No.1 and Dynode No.2	1	1
Dynode No.2 and Dynode No.3	1	1
Dynode No.3 and Dynode No.4	1	1
Dynode No.4 and Dynode No.5	1	1
Dynode No.5 and Dynode No.6	1	1 1
Dynode No.6 and Dynode No.7	1	1.2
Dynode No.7 and Dynode No.8	1	1.5
Dynode No.8 and Dynode	1	1.9
No.9 Dynode No.9 and Dynode	1	2.4
No.10 Dynode No.10 and Dynode	-	
No.11 Dynode No.11 and Dynode	1	3
No.12 Dynode No.12 and Dynode	1.25	3.8
No.13 Dynode No.13 and Dynode	1.5	4.8
No.14 Dynode No.14 and Anode	1.75	6
Anode and Cathode	18.5	36.4

Focusing electrode is connected to arm of potentiometer between cathode and dynodw No.1. Focusing-electrode voltage is adjusted to give maximum gain.

TENTATIVE DATA 3



MULTIPLIER PHOTOTUBE

OPERATING CONSIDERATIONS

Exposure of the 7264 to strong ultraviolet radiation may cause an increase in anode dark current. After cessation of such irradiation, the dark current drops rapidly.

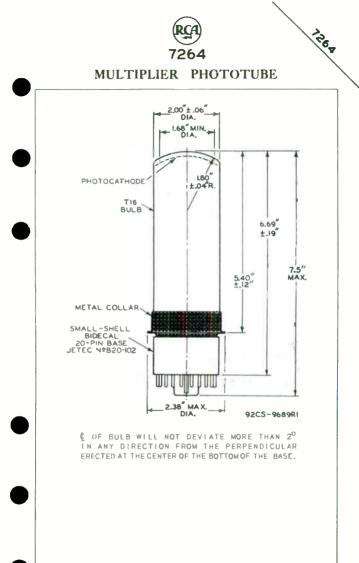
The operating stability of the 7264 depends on the magnitude and duration of the anode current. When the 7264 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 7264 usually recovers a substantial percentage of such loss in sensitivity.

Operation at an average anode current well below the maximum rated value of 2 milliamperes is recommended when stability is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

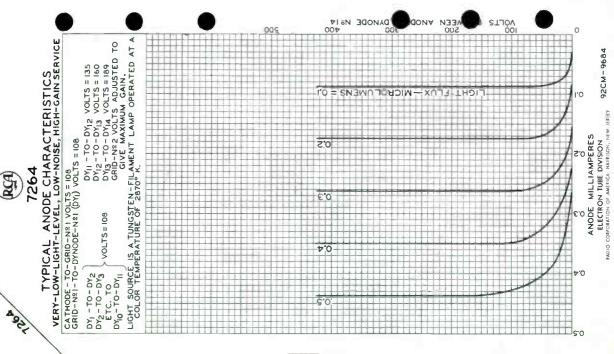
Electrostatic and/or magnetic shielding of the 7264 may be necessary. It is to be noted that the use of an external magnetic and/or electrostatic shield at high negative potential is a safety hazard unless the shield is connected to the potential source through an impedance in the order of 10 megohms. If the shield is not so connected, extreme care should be poserved in providing adequate safeguards to prevent personnel from coming in contact with the high potential of the shield.

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

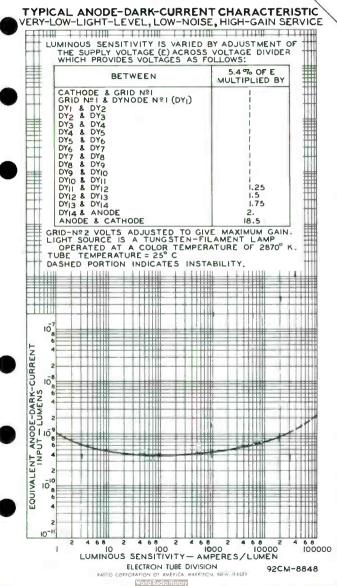
120



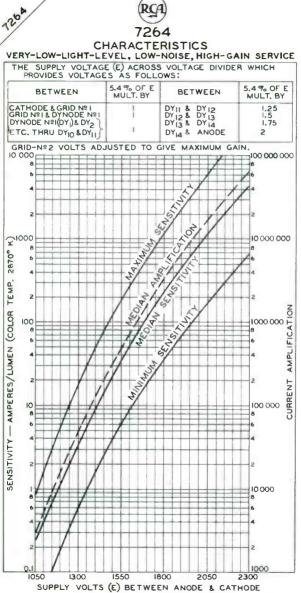
CE-9689R1





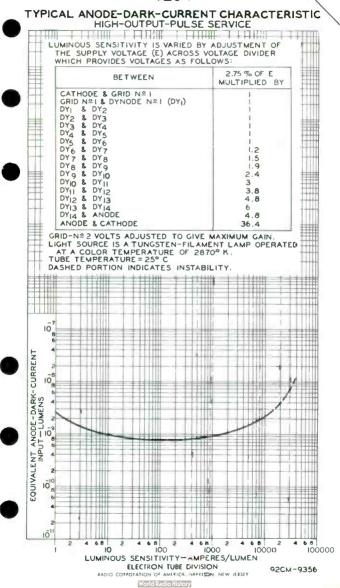






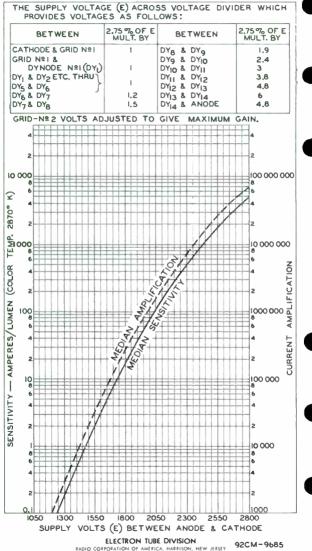
ELECTRON TUBE DIVISION 92CM-9687 RADIO CORPORATION OF AMERICA HARRISON, NEW JEFSEY







CHARACTERISTICS HIGH-OUTPUT-PULSE SERVICE





MULTIPLIER PHOTOTUBE

14-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE WITH 1.68"-DIA., CURVED, CIRCULAR, SEMITRANSPARENT CATHODE AND S-20 RESPONSE VERY SHORT TIME-RESOLUTION CAPABILITY

DATA	ł
General:	l
Spectral ResponseS-20 Wavelength of Maximum Response 4200 ± 500 angstroms Cathode, Semitransparent:	
ShapeCurved Circular Window:	
Area 2.2 sq.in. Minimum diameter 1.68 in. Inoex of refraction 1.51	
Direct Interelectrode Capacitances (Approx.): Anode to dynode No.14 2.8 µµf Anode to all other electrodes 6 µµf Dynode No.14 to all other electrodes 7.5 µµf Maximum Overall Length	
Pin 1 -No Connec- tion Pin 2 -Dyrode No.1 Pin 3 -Dyrode No.5 Pin 5 -Dyrode No.7 Pin 6 -Dyrode No.7 Pin 7 -Dyrode No.7 Pin 7 -Dyrode No.7 Pin 7 -Dyrode No.1 Pin 9 -Grid No.2 Pin 7 -Dyrode No.13 Pin 9 -Grid No.2 Pin 9 -Grid No.2 Pin 9 -Grid No.2 Pin 10 -Anode Pin 10 -Anode Pin 12 -Dyrode No.12 Pin 13 -Dyrode No.10 Pin 15 -Dyrode No.8 Pin 15 -Dyr	
Maximum Ratings, Absolute Values: SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC). SUPPLY VOLTAGE SETWEEN DYNODE No.14 AND ANODE (DC). \$: see next page.	
2-59 ELECTRON TUBE DIVISION TENTATIVE DATA 1	

RADIO CORPORATION OF ONE FIELD ARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

SUPPLY VOLTAGE BETWEEN	CONSEC			
DYNODES (DC)			600 m	ax. volts
SUPPLY VOLTAGE BETWEEN	ACCELE	R_	000 11	in fores
ATING ELECTRODE AND	DYNODE	No. 13		
(DC).			±600 m	ax. volts
DYNODE-No.1 SUPPLY VOL	TAGE (C)	500 m	ax. volts
FOCUSING-ELECTRODE SUP		TAGE (DC).	500 m	ax. volts
AVERAGE ANODE CURRENT.			1 m	
AMB!ENT TEMPERATURE .	• • • •		85 m	ax. ^o C
Characteristics Range	Values	for Equipmen	nt Design:	
Under conditions with age divider providing				
With $E = 2400$ vol:	ts (Ex	cept as note	d) and acc	eler-
ating-electrode vo	ltage a	djusted to g	ive maximu	n gain
	Min.	Nedian	Max.	
Sensitivity:				
Radiant, at 4200				
angstroms.	-	0.6		amp/µw _i
Cathode radiant, at		0.064		
4200 angstroms Luminous:#	_	0.004	_	μa/μw
At 0 cps	165	1400	6800	amp/lumen
With dynode No.14	100	1400	0000	amp? rumen
as output				
electrodet	_	980	_	amp/lumen
Cathode luminous:				.
With tungsten				
light source ⁴	100	150	-	µa/lumenj
With blue light	0.05			I
source** •	0.05		-	μa
With red light source ^{D®}	0.30			
Current Amplification.	0.50	9.35 x 10 ⁶	_	μa
Guivalent Anode-Dark-		3.00 10		
Current input®		2 ×10 ⁻¹⁰	8× 10-10	lumen
quivalent Noise				
Input:*				
At +25° C	_	7.5 ×10-13	3.3 ×10-12	
At -80° C	-	1 × 10-13	-	lumen
node-Pulse Rise Time‡	-	3	_	milliµsec
reatest Delay Between				
Anode Pulses: Due to position from				(
which electrons are				
simultaneously re-				
leased within a				
circle centered on				
tube face and having				
§,●,≝,†, ▲, **, ♦ ,□,⊕,⊕, ● , ● , , ,‡,	Pag. 17			
3.50			TENTAT	IVE DATA 1
-J3 El	LECTRON	TUBE DIVISION	LCMINI	ITC DATA I

RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

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7										axin.				
	0.1	micro	n u n	ên 👘	is ⊔	sed.	The	load	resist	f 287D gr has	a valu	e of (.01 #	negohr
T	and	the a	1000	e s(≥г∨е	s on	ly as	COLL	ector.	to that s the c j in th				
		er th Ament light all d cor ha								light erature is are ether a	source of 28 applied s anod	is i 70 ⁰ K I betu e. T	a two . Thu ween o he lo	gster e valu athor and re
**	tra pol oper on meg	nsmit ished rated the f ohm, trode	ted to at ilte and s c	th 1/ a c 20 cnn	2 S olor S O. V ecte	gh a toci ter 01 olts d to	t blu thi perat lumen are gethe	e fil cknes ture (. Th appl er as	ter {(is} fro of 2870 e load ied be anode.	t incid Dorning Mati K. 1 resist Tween), Gla ingste The val or has cathod	ss Co n-fil ue of a va e and	ide N amen ligt lu⊮ c I all	0.511 t lar it fli of 0.0
T	at 1	ront	OT	tn ::	s se	CLIO	n.			FCE, SE SPECT THRCUG				
	equ tem 0.0 volt toge	ivale perat l lum is are sther	ent) en. e ap as	of Th Pli anoi	'um 287 ⊨e 1 ed t }e,	a t 00 j oad oetwe	resisten co	ten-f he va stor : athode	llamen lue of has a v e and a	t incid ninge, (t lamp light alue o ll othe	flux f 0.01 f elec	n th mego trode	ata e fil hm, a s cor	ter ind 20 inection
	at i	ront	or	thi	5 S6	ectio	on.			rce. se D SPECT THROUG				
	Mea: (E) Dari of a	sured adjus k curi a refr	at ited rent rige	a t to ca ran	ube giv ⊮sec t.	tem eal by	perat umino ther	ure o us se nionic	f 25 ⁰ (nsitivi ; emiss	C and w ity of ion may	ith th 1000 a be re	e sup npere: duced	ply v per by 1	lume lume he u
•	(E)	below	/ 28	00	rolt	s is	reco	ommend	ed.	ration				
A .	equa	ween . al to cer wh	the tich	"c pa	ff sses	peri onl	od. y the	The of fund	o. In output amental	y volt ar, ac- ce of 2 radiat s "ph" current i frequ	is me ency o	asure the	d thi buist	ough S.
ł	Nea: puls tra inc on 1	sured se hei nsit- ident the pr	bet ight time -lig hoto	wee the tati	n 1 This sria spo hode	0 pe s and t ion t ap	r cen ode-p os in proxi	nt and uise i the matel	190 pe rise ti multip y 1 mi	r cent me is c lier st limete	of th letermi ages r in d	e max ned p only iamet	imum Fiman and w ef ce	anod ily ith inter
11	Thes	se val	ues	al	50 r	ерге	sent	the d	ifferer	trons	time o	t trai	sit I	betwe





MULTIPLIER PHOTOTUBE

TABLE 1		
VOLTAGE TO BE PROVIDED BY	YDIVIDER	
Between	5.4% of Supply Voltage (E) multiplied by	
Cathode and Focusing Electrode Cathode and Dynode No.1 Dynode No.1 and Dynode No.2 Dynode No.2 and Dynode No.3 Dynode No.3 and Dynode No.4 Dynode No.5 and Dynode No.5 Dynode No.5 and Dynode No.6 Dynode No.6 and Dynode No.7 Dynode No.7 and Dynode No.8 Dynode No.9 and Dynode No.9 Dynode No.9 and Dynode No.10 Dynode No.10 and Dynode No.12 Dynode No.13 and Dynode No.13 Dynode No.13 and Dynode No.14 Dynode No.14 and Anode Anode and Cathode	1.6 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

OPERATING CONSIDERATIONS

Exposing the 7265 to strong ultraviolet radiation may cause an increase in anode dark current. After cessation of such irradiation, the dark current returns rapidly toward its initial value.

The operating stability of the 7265 depends on the magnitude and duration of the anode current. When the 7265 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extend of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 7265 usually recovers a substantial percentage of such loss in sensitivity.

Operation at an average anode current well below the maximum rated value of I milliampere is recommended when stability is important. When maximum stability is required, the anode current should not exceed 250 microamperes.

Electrostatic and/or magnetic shielding of the 7265 may be necessary.

The metal collar (See Dimensional Outline) is connected internally to the focusing electrode. Extreme care should be taken in the design of apparatus to prevent operating personnel from coming in contact with the collar when the circuit application is such that the collar is at high potential.

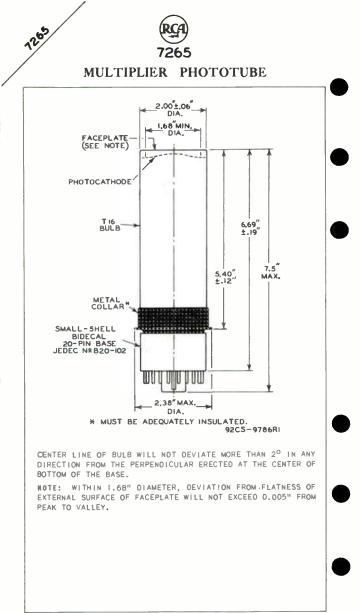


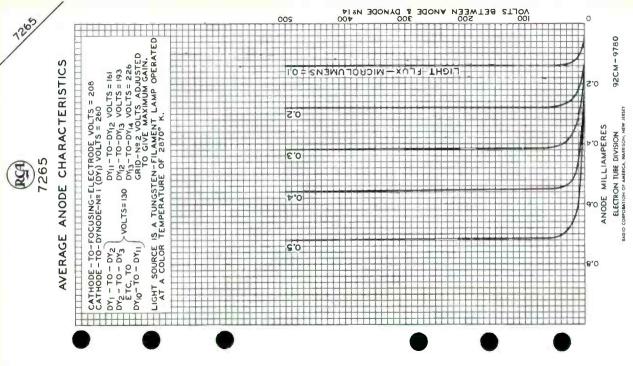
MULTIPLIER PHOTOTUBE

Adequate light shielding should be provided to prevent extraneous light from reaching any part of the 7265. Although the metallic coating on the inner side wall of the glass bulb serves to reduce the amount of extraneous light reaching the electrodes, it is inadequate to shield completely the entire structure from extraneous light.

> SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-20 Response is shown at the front of this Section



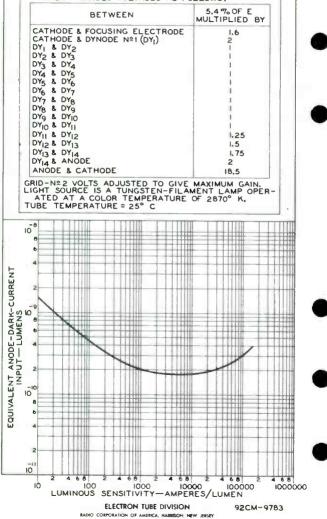






TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC

LUMINOUS SENSITIVITY IS VARIED BY ADJUSTMENT OF THE SUPPLY VOLTAGE (E)ACROSS VOLTAGE DIVIDER WHICH PROVIDES VOLTAGES AS FOLLOWS:





CHARACTERISTICS

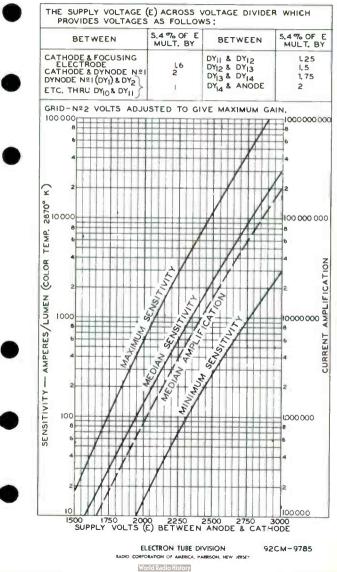


Image Orthicon

MAGNETIC FOCUS

MAGNETIC DEFLECTION

ANTI-GHOST IMAGE SECTION

For Outdoor and Studio Pickup with Black-and-White TV Cameras

DATA

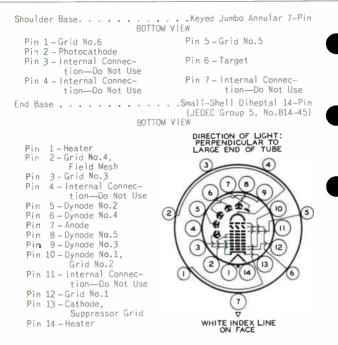
General:

Henten for Beleve ett 1.0 et 1.
Heater, for Unipotential Cathode:
Voltage (AC or DC) 6.3 ± 10% volts
Current at 6.3 volts 0.6 amp
Direct Interelectrode Capacitance (Approx.):
Anode to all other electrodes
Spectral Response
Wavelength of Maximum Response 4500 ± 300' angstroms
Photocathode, Semitransparent:
Rectangular image (4 x 3 aspect ratio):
Useful size of 1.8" max. diagonal
Note: The size of the optical image focused on the
photocathode should be adjusted so that its maximum
diagoral does not exceed the specified value. The
corresponding electron image on the target should
have a size such that the corners of the rectangle
just touch the target ring; a condition that may be
achieved in some camera designs with a 1.6" diagonal
image on the photocathode.
Orientation of Proper orientation is obtained when the
vertical scan is essentially parallel to
the plane passing through center of face-
plate and pin 7 of the shoulder base.
The horizontal and vertical scan should
preferably start at the corner of the
raster nearest pin6 of the shoulder base.
Focusing Method
Deflection Method
Overall Length. 15.20" ± 0.25" Greatest Clameter of Bulb. 3.00" ± 0.06"
Greatest Diameter of Bulb
Minimum Deflection-Coil Inside Diameter
Deflecting-Coil Length
Focusing-Coil Length
Alignment-Coil:
Length
Position on neck Centerline of coil located
8.5" from flat area of the
jumbo annular base.
Photocathode Distance Inside End of Focusing Coil 1/2"
Operating Position The tube should never be operated in a
vertical position with the Diheptal-base end up
nor in any other position where the axis of the
tube with the base up makes an angle of less than
20° with the vertical.
Weight (Approx.)



RADIO CORPORATION OF AMERICA Electron Tube Division

7293A



NOTE: In the tube symbol, the suppressor grid connected to the cathode, and the field-mesh grid connected to grid No.4, are intentionally without numbers to avoid upsetting industry practice of associating functional camera control knobs with specified grid numbers. For example, beam-focus control is generally associated with knob identified as Gu (grid No.4).

Maximum and Minimum Ratings, Absolute-Maximum	Values:
PHOTOCATHODE: Voltage	-700 max. volts 50 max. fc
OPERATING TEMPERATURE: Any part of bulb	65 max. ^O C
Of bulb at large end of tube (Target section)	35 min. ^o C
TEMPERATURE DIFFERENCE: Between target section and any part	
of bulb hotter than target section	5 max. ^o C
GRID-Nø.6 VOLTAGE.	-700 max. volts
Positive value	10 max. volts
Negative value	10 max. volts
GRID-No.5 VOLTAGE.	
and the second	the second s

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



7293A

GRID-No.4 VOLTAGE	volts volts volts
Negative-bias value	volts volts
Heater negative with respect to cathode. 125 max. Heater positive with respect to cathode. 10 max. ANODE SUPPLY VOLTAGE ^a	volts volts volts volts
Typical Operating Values: ^b	
Photocathode Voltage (Image Focus) ^c 400 to -540 Grid-No.6 Voltage (Accelerator)	volts
Approx. 75% of photocathode voltaged-300 to -405Target-Cutoff Voltage*-3 to +1Grid-No.5 Voltage (Decelerator)0 to 40Grid-No.4 Voltage (Beam Focus)*140 to 180Grid-No.2 & Dynode-No.1 Voltage.300Grid-No.1 Voltage for Picture Cutoff-45 to -115Dynode-No.2 Voltage.600Dynode-No.2 Voltage.1000Dynode-No.5 Voltage.1200Anode Voltage.1250Target-Temperature Range.35 to 45Minimum Peak-to-Peak Blanking Voltage.5	volts volts volts volts volts volts volts volts volts volts volts volts volts volts volts volts
	ausses ausses

Performance Data:

Cathode Radiant Sensitivity

With conditions shown under Typical Operating Values and with camera lens set to bring the picture highlights one stop above the "knee" of the light-transfer characteristic

•		_

at 4500 angstroms –	0.028		μa/μw	
Luminous Sensitivity	60		- (1	
(2870 ^o K)	60 30	50	µa/lm	
Signal-Output Current	20	00	μa	
(Peak to peak) 5	-	30	μa	
Ratio of Peak-to-Peak				
Highlight Video-Signal				
Current to RMS Noise Current for bandwidth of 4.5 Mc 30:1	37:1			
Photocathode Illumination at	27:1	_		
2870° K required to reach				
"knee" of light-transfer				
characteristic –	0.01	0.028	fc	



RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

Nin. Average Max.

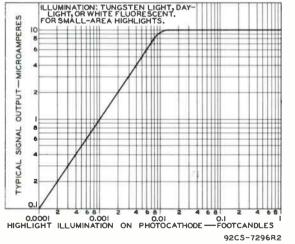
7293A

Amplitude Response at 400 TV						
lines per picture height (Per						
cent of large-area black to						
large-area white) ^h	30	40	-		%	
Limiting Horizontal Resolution.	500	_	-	TV	lines	
4 Duesda weltane welves are shown unde	 Publoal	Aberat	ind Tale			

- Dynode-voltage values are shown under Typical Operating Talues.
- b With 7293A operated in RCA-TK-11 or -TK-31 camera. Other cameras may sequire slightly different voltage ranges.
- C Adjust for best focus.
- d for minimum highlight flare or "ghost" the grid-No.6 voltage should be 73 per cent of the photocathode voltage.
- Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- f adjust to give the most uniformly shaded picture near maximum signal.
- g Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located mutside of and at the image end of the focusing coil.
- ^h Weasured with amplifier having flat frequency response.

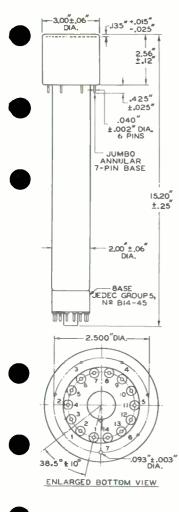


BASIC LIGHT-TRANSFER CHARACTERISTIC



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.





DETARL OF BOTTOM VIEW OF JUMBO ANNULAR BASE CROSS-HATCHED AREA IS FLAT I.315"R.MIN. I.385"R.MAX. 25° 43'

SEE NOTE I .5"MIN.

NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.050" MAX.

ANNULAR-BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT 10 PHOTO-CATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- a. SIX HOLES HAVING DIAMETER OF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF D.047". ALL HOLES ARE SPACED AT ANSLES OF 51°26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES TO BEAR AGAINST FLAT AREAS OF BASE.
- c. RIM EXTENDING OUT A MINIMUM OF-0.125" FROM 2.812" DIAM-ETER AND HAVING HEIGHT OF 0.126" ± 0.DDI".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200" ± 0.001".



92CM-8293R3

The local division in which the

Electron Tube Division

RADIO CORPORATION OF AMERICA



Image Orthicon

MAGNETIC DEFLECTION ANTI-GHOST IMAGE SECTION

For Outdoor and Studio Pickup with Blackand-White TV Cameras. The 7293A/L is Directly Interchangeable with the 7293A in All Cameras.

The 7293A/L is the same as the 7293A except utilizes a longer-life non-deteriorating glass target.

The sturdy, long-life, non-deteriorating, glass target of type 7293A/L is characterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electronic rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as secondary emission and resistivity, are essentially constant ano sensitivity of the 7293A/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "stickingpicture" and raster "burn-in" due to underscanning are significantly reduced. The resistance of the 7293A/L to image "burnin" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS

Dos and Don'ts on Use of RCA-7293A/L Dos

- 1. Allow 72934/L to warm up prior to operation.
- 2. Hold temperature of the 7293A/L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- 4. Adjust beam-focus control for best usable resolution.
- 5. Condition spare 7293A/L's by operating several hours once each month.
- Determine proper operating point with target voltage adjusted to exactly 2 volts above target cutoff.
- 7. Uncap lens before voltages are applied to the 7293A/L.

Don'ts

LONG-LIFE TARGET

MAGNETIC FOCUS

- 1. Don't force the 7293A/L into its shoulder socket.
- Don't operate the 7293A/L without scanning.
- 3. Don't operate a 7293A/L having an ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turn off beam while voltages are app¹ied to photocathoce, grid No.6, target, dynodes, and anode during warm-up or standby operation.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 4-65

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World Radio History

Image Orthicon



MAGNETIC FOCUS

MAGNETIC DEFLECTION

EXCELLENT RESOLUTION CAPABILITY For Outdoor and Studio Pickup with High-Quality Black-and-White TV Cameras. The 7295B is Unilaterally Interchangeable with Types 7295 and 7295A.

DATA

DATA				
General:				
Heater, for Uripotential Cathode: Voltage (AC or DC). 6.3 ± 10% volts Current at 6.3 volts. 0.6 amp Direct Interelectrode Capacitance: anode to al' other electrodes. 12 pf Target-to-Mesh Spacing. 0.602 inch Spectral Response. 0.5002 inch Wavelength of Maximum Response. 4500 ± 300 angstroms Photocathode, Semitransparent: Rectangular image (4 x 3 aspect ratio): Useful size. 1.6" max. diagonal Note: The size of the optical image focused on the				
photocathode should be adjusted so that its maximum diagonal does not exceed the specified value. The corresponding electron image on the target should have a size such that the corners of the rectangle				
just touch the target ring. Orientation Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of the faceplate and the grid- No.6 envelope terminal. The horizontal and vertical scan should start at the corner of the picture between the grid-No.6 and the photocathode envelope terminals. Focusing Method				
Position on neckCenterline of magnetic field should be located 9.25" from the flat area of the shoulder. Operating Position. Weight (Approx.). Socket				
Terminal Over Pin 2-Field Mesh Terminal Over Pin 4-Photocathode (PC) Terminal On Side of Envelope Opposite Base Key -Grid No.6 (G ₆)				

See basing dlagram on next page.

Electron Tube Division



RADIO CORPORATION OF AMERICA

Harrison, N. J.

7295B

Terminal Over Pin 9-Grid No.5 (G5) Terminal Over Pin 11-Target End Base. . . . Small-Shell Diheptal 14-Pin (JEDEC Group 5, No. B14-45) BOTTOM VIEW DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE Pin 1-Heater 66 Pin 2-Grid No.4 7 (8 Pin 3-Grid No.3 9₆₅ 6 Pin 4-Do Not Use Pin 5 - Dynode No.2 Pin 6-Dynode No.4 (5) ío Pin 7 - Anode Pin 8-Dynode No.5 61 4 Pin 9-Dynode No.3 PC Pin 10 - Dynode No.1. TARGE T Grid No.2 Pin 11 - Do Not Use 3 12 Pin 12-Grid No.1 FIELD SH Pin 13 - Cathode 2 (13) Pin 14 - Heater I. (14)

Maximum and Minimum Ratings, Absolute-	-Naximum Values:
PHOTOCATHODE:	
Voltage	-700 max. volts
Illumination	
OPERATING TEMPERATURE:	· · · · · · · · · · · · · · · · · · ·
Any part of bulb	••• 65 max. °C
Of bulb at large end of tube	· · · · · · · · · · · · · · · · · · ·
(Image section)	••• 35 min. ^o C
TEMPERATURE DIFFERENCE:	· · › ›› ›› · · · · · · · · · · · · · ·
Between image section and any part	
 of bulb hotter than image section . 	••• 5 max. °C
GRID-No.6 VOLTAGE	
TARGET VOLTAGE:	700 max. volts
Fositive value	· · 10 max. volts
Negative value	. 10 max. volts
Negative value	• 10 max. volts
CRID No E VOLTAGE	• . 30 max. volts
GRID-No.5 VOLTAGE	 . 300 max. volts
GRID-No.4 VOLTAGE	350 max. volts
GRID-No.3 VOLTAGE	• • 400 max. volts
GRID-No.2 & DYNODE-No.1 VOLTAGE	• • 350 max. volts
GRID-No.1 VOLTAGE:	•
Negative-bias value	 . 125 max. volts
Positive-bias value	 0 max. volts
VOLTAGE PER MULTIPLIER STAGE	 . 350 max. volts
ANODE SUPPLY VOLTAGE	1650 max. volts
PEAK HEATER-CATHODE VOLTAGE:	-
Heater negative with respect to cathode	de . 125 max, volts
Heater positive with respect to cathode	de . 10 max. volts

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



Typical Operating Values:*

	Photocathode Voltage	-600	volts
	Grid-No.6 Voltage (Image Focus) Approx.		
,	50% of photocathode voltagef	–250 to –350	volts
	Target Voltage Above Cutoff ⁹	2.3	volts
	Field-Mesh Voltage ^c	15 to 25	volts
	Grid-No.5 Voltage (Decelerator)		volts
	Grid-No.4 Voitage (Beam Focus)	70 to 90	volts
	Grid-No.3 Voltage ^h .	250 to 275	volts
	Grid-No.2 & Dynode-No.1 Voltage	280	volts
	Grid-No.1 Valtage for picture cutoff.	-45 to -115	volts
	Dynode-No.2 Voltage	600	volts
	Dynode-No.3 Volfage	800	volts
	Dynode-No.4 Voltage	. 1000	volts
	Dynode-No.5 Voltage	. 1200	volts
	Anode Voltage	1250	volts
	Recommended Target-Temperature Range ^b .		°C
	Minimum Peak-to-Peak Blanking Voltage .	. 5	volts
	Field Strength of Focusing Coil		
	(Approx.):		
	At center of scanning section	60	gausses
	In plane of photocathode		qausses
	Field Strength of Alignment Coil		gausses

Performance Data:

With conditions shown under Typical Operating Values including Recommended Target-Temperature Range, target voltage adjusted to 2.3 volts above cutoff, and with the camera lens set to bring picture highlights one stop above the "knee" of the accompanying Basic Light-Transfer-Characteristic Curve

	Min.	Average	Nax.	
Cathode Radiant Sensitivity at 4500 angstroms Luminous Sensitivity	- 30	0.030	-	a/w µa/lm
Signal-Output Current		00	_	μα/ ΠΠ
(Peak to Peak) Ratio of Peak-to-Peak High-	10	-	40	μa
light Video Signal Current to RMS Noise Current for Bandwidth of 4.5 Mc Photocathode Illumination at 2870° K Required to bring Picture Highlights	60.1	75.1	_	
One Štop above "Knee" of Light-TransferCharacteristic. Amplitude Response at 400 TV Lines per Picture Height	-	-	0.110	fc
(Per cent of large-area black to large-area white) ^k . Uniformity: ^m	60	75	-	%
Ratio of Shading (Back- ground) Signal to Highlight Signal	_	0.10	0.15	

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

Min. Average Max.

Decrease from Peak Highlight Signal Level of Signal from any Point on Scanned Area of Target. - 12 25 %

^a Cinch Manufacturing Corporation, 1026 South Homan Avenue, Chicago 24, 111inois,

b Operating outside the Recommended Target-Temperature Range shown under Sysical Operating Values will not damage the 72958 provided the Maximum Immperature Ratings of the tube are not exceeded. Optimum performance, however, is only obtained when the tube is operated within the Recommended Target-Temperature Range.

- C With respect to grid No.4.
- d Dynode-voltage values are shown under Sypical Operating Values.
- With 7295B operated in RCA TK-60 camera at fixed photocathode voltage.
- f Adjust for optimum focus.
- 9 The target supply voltage should be adjustable from -5 to 5 volts.
- h Adjust to give the most uniformly shaded picture near maximum signal. j Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coll, with the indicator located outside of and at the image end of the focusing coll.
- k Measured with amplifier having flat frequency response.
- With uniform illumination on photocathode.

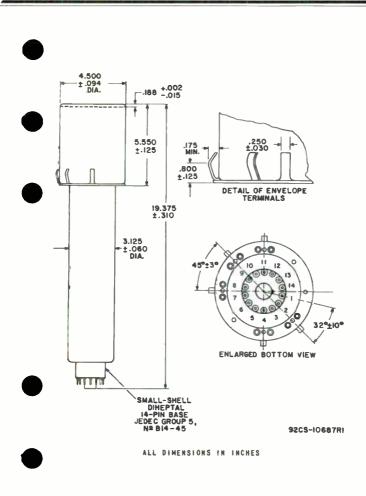
OPERATING CONSIDERATIONS

The tube should never be operated in a vertical position with the Diheptal/base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20° with the vertical.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device having S-10 Response is shown at the front of this Section



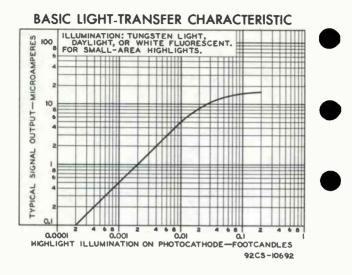
RADIO CORPORATION OF AMERICA Electron Tube Division World Redio History





RADIO CORPORATION OF AMERICA Electron Tube Division DATA 3 6-63

7295B



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History



Image Orthicon

LONG-LIFE TARGET MAGNETIC FOCUS

FIELD-MESH TYPE MAGNETIC DEFLECTION

For High-Quality Black-and-White Ti Pickup in Studio or Outdoor Service. The 7295B/L is Directly Interchangeable with the 7295, 7295A, and 7295B in all Camerus.

The 7295B/L is the same as the 7295B except utilizes a stable, long-life glass target.

The stable, long-life, glass target of type 7295B/L is characterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electronic rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as mecondary emission and resistivity, are essentially constant and sensitivity of the 7295B/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "sticking picture" and raster "burn-in" due to underscanning are significantly reduced. The resistance of the 7295B/L to image "burnin" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS Dos and Don'ts on Use of RCA-7295B/L Dos

- 1. Allow the 7295B/L to warm up prior to operation.
- 2. Hold temperature of the 7295B/L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- Adjust beam-focus control for best usable resolution.
- 5. Condition spare 7295B/L's by operating several hours once each month.
- Determine proper operating point with target voltage adjusted to the desired voltage above target cutoff.

7. Uncap lens before voltages are applied to the 7295B/L.

Don'ts

- 1. Dwn't force the 7295B/L into its shoulder socket.
- 2. Don't operate the 7295B/L without scanning.
- 3. Don't operate a 7295B/L baving an ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turn off beam while valtages are applied to photocathode, grid No.6, target, dynodes, and anode during warmup or standby operation.

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 9-65

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MULTIPLIER PHOTOTUBE

10-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE WITH 1.68"-DIAMETER, CURVED, CIRCULAR, SEMITRANS-PARENT PHOTOCATHODE AND S-20 RESPONSE

DATA

	General:
	Spectral Response
	Wavelength of Maximum Response 4200 ± 500 angstroms Cathode. Semitransparent;
	Shape
	Window:
	Area
	Minimum diameter 1.68 in. Index of refraction 1.51
	Direct Interelectrode Capacitances (Approx.);
	Anode to dynode No.10
	Anode to all other electrodes 5.5 $\mu\mu$ f
	Dynode No.10 to all other electrodes 6.5 $\mu\mu f$ Maximum Overall Length
	Maximum Overall Length
	Maximum Diameter
	Operating Position
	Weight (Approx.)
	Bulb
	(JEDEC Group 5, No.B14-38), Non-bygroscopic
	Basing Designation for BOTTOM VIEW
	Pin 1-Dynode No.1 Pin 12-Internal Pin 2-Dynode No.2 Connection-
	Fin 3-Dynode No.3 (7.0) Do Not Use
	Pin 4-Dynode No.4 Pin 13-Focusing
	Pin 5-Dynode No.5
	Pin 6-Dynode No.6 🕢 🗘 🖂 Pin 14-Photo-
	Pin 7-Dynode No.7 3 Arrow Cathode Pin 8-Dynode No.8 Arrow Metal
	Pin 9-Dynode No.9 Ore Collar-No Connection
	Pin 10 - Dynode No. 10 DIRECTION OF LIGHT: (If used,
	Pin 11 - Anode INTO END OF BULB connect only
	 to photo-
	cathode)
	Maximum Ratings, Absolute Values:
	SUPPLY VOLTAGE BETWEEN ANODE AND
	CATHODE (DC)
	SUPPLY VGLTAGE BETWEEN DYNODE No. 10
	AND ANGDE (DC)
	DYNODES (DC) 600 max. volts
	DYNODE-No.1 SUPPLY VOLTAGE (DC)
	FOCUSING-ELECTRODE SUPPLY VOLTAGE (DC) . 500 max. volts
1	AVERAGE ANODE CURRENT 1 max. ma
	AMBIENT TEMPERATURE
l	•: See next page.
	2-59 ELECTRON TUBE DIVISION TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

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; 1/8 of E between cathode and focusing electrode; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode

With E = 1800 volts (Except as noted)

1320

	Nin.	Nedian	Max.	
Sensitivity:				
Radiant, at 4200				
angstroms.	-	9600	-	μa/μow
Cathode radiant,				
at 4200				
angstroms	_	0.064	-	µa/µw
Luminous	5	22.5	150	amp/lumen
Cathode luminous:	-			
With tungsten				
light source▲.	120	150	_	µa/lumen
With blue light	110	100		jacir rumon
source**•	0.05	_	_	
With red_light	0.05	_	-	μa
source ^{0§}	0.3			
Current	0.9	-	-	μa
Amplification		1.5×10^{5}		
	_	1.0 X 10°	-	
Equivalent Anode-				
Dark-Current		0 10 10	4 4 40-9	1
Input ^e	-	3 × 10 ⁻¹⁰	1.4×10^{-9}	lumen
Equivalent Noise				
Input:*				
At +25° C	-	1.9×10^{-12}	4.3×10^{-12}	lumen
At -80° C	-	3 × 10 ⁻¹³	6 × 10 ⁻¹³	lumen
Anode-Pulse Rise				
Time [®]	-	2.5	-	
Greatest Delay Be-				
tween Anode				
Pulses:				
Due to position				
from which elec-				
trons are simul-				
taneously re-				
leased within a				
circle centered				
on tube face and				
having a di-				
ameter of —				
		.+		
1.12"	-	井	-	milliµsec
1.00	-	יכ	-	milliµsec
 Averaged over any int 	erval of	' 30 seconds ma	ıximum.	
≜,▲, ***, ♦,□,§,+,≡,★,●,†.	See next	page.		
			TENTA	TU/E DATA 4
2–59	ELECTRO	ON TUBE DIVISIO	N IENIA	TIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MULTIPLIER PHOTOTUBE

- Ł Under the following conditions: The light source is a tungstem-filament lamp operated at a color temperature of 2870° K. A light input of 0.1 microlumen is used. The load resistor has a value of 0.01 meguhm.
- Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode und all other electrodes connected together as anode. The load resistor has a value of 0.01 megohm.
- Under the following conditions: Light incident on the cathode is transmitted through a Dlue filter (Corning, Glass Code No.5145 polished to 1/2 stock thickness) from a tungsten-filament lame operated at a color temperature of 2070° 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.
- For spectral characteristic of this source, see sheet SPECTRAL CHARACTERISTIC of 2070 K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC DF LIGHT FROM 2070 K SOURCE AFTER PASSING THROUGH INDICATED BLUE FLITER at front of this section.
- Under the "ollowing conditions: Light incident on the cathode is transmitted through a red filter (Corning, Glass Code Wo.2418, or equivalent) 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.
- For spectral characteristic of this source, see sheet SPECTRAL CHAR-ACTERISTIC OF 2870° K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING THROUGH INDICATED RED FILTER at front of this section.
- 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 thermicnic emission may be reduced by the use of a refrigerant.
- For maximum signal-to-noise ratio, operation with a supply voltage (E) below 1800 volts is recommended.
- Under the following conditions: Supply voltage (E) is 1860 volts, external-shield potential of -1800 volts, ac-amplifier bandwidth of 1 cycle per second, tungsten light source of 2870° k interrubed 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 adulo incluency to react 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 primarily by transit-time variations in the multiplier stages 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.

OPERATING CONSIDERATIONS

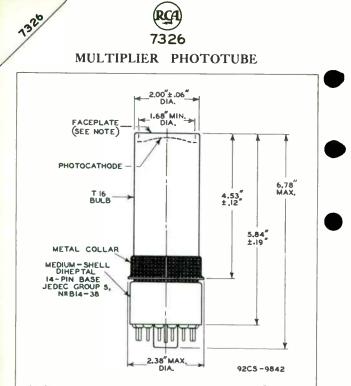
Operation at an average anode current well below the maximum rated value of 1 milliampere is recommended when stability is important.

Electrostatic and/or magnetic shielding of the 7326 may be necessary.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-20 Response is shown at front of this Section

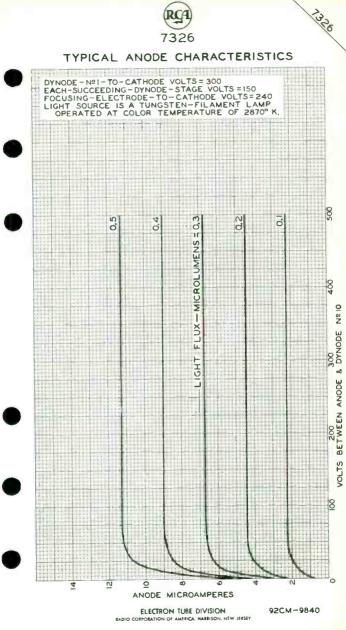
TENTATIVE DATA 2

1320



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the perpendicular erected at the center of bottom of the base.

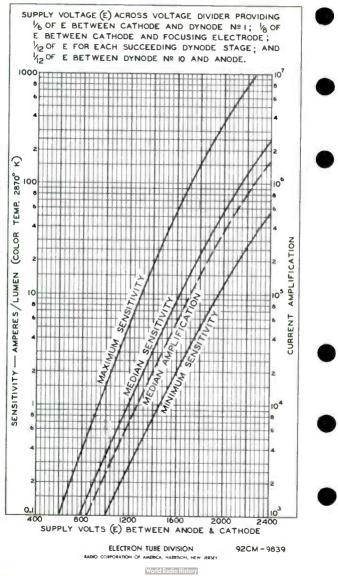
NOTE: WITHIN 1.6B" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.005" FROM PEAK TO VALLEY.

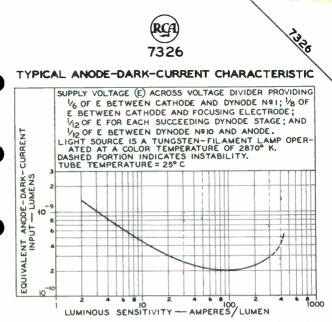




1320

CHARACTERISTICS





9205-9841



(

Image Orthicon

"MICRODAMP" CONSTRUCTION FOR REDUCED MICROPHONICS

FIELD MESH FOR REDUCED "WHITE EDGE" EFFECTS

MAGNETIC FOCUS

MAGNETIC DEFLECTION

For High-Quality Black-and-White Studio TV Cameras, Live Pickup. and Magnetic Tape Recording Requiring High-Signal-to-Noise Ratio. The 73898 is Unilaterally Interchangeable with the 7389 and 7389A.

General:

Heater, for Unipotential Cathode:	
Voltage (AC or DC) 6.3 ± 10%	volts
Current at 6.3 volts 0.6	amp
Direct Interelectrode Capacitance:	
Anode to all other electrodes 12	pf
Target-to-Mesh Spacing D.001	inch
Spectral Response	S-10
Wavelength of Maximum Response 4500 ± 300	angstroms
Photocathode, Semitransparent:	
Restangular incord (A v 2 versa) tille	

Rectangular image (4 x 3 aspect ratio):

- Orientation of. . Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of faceplate and the gr.d-No.6 envelope terminal. The horizontal and vertical scan should start at the corner of the picture between the grid-No.6 and the photocathode envelope terminals.

Focusing Method	• •		•	•	• •					•			. N	lagr	netic	
Deflection Method.													. N	lagr	netic	
Overall Length					• •					- 19	Э.;	375	۳.±	: 0.	310"	
Greatest Diameter o	if Bi	ulb)							4	1.1	500	Η ±	0.	094"	
Minimum Deflecting-	Coi		nsi	de	Dia	met	e;								3.2"	
 Deflecting—Coil Len 	igth.														- 7"	
Focusing-Coil Lengt	h .														15"	
Alignment-Coil:														-		
Position on neck			.Ce	ente	erli	r.e	сf	ma	ıgг	et	ic	fi	eld	l sh	ould	
			be	2 10	cat	ed	9.	25"	' f	ron	n f	the	- f]	эt	area	
			of	- th	ie s	hou	ld	er.								
Operating Position					. S	ee	0.0	era	tı	nø	Сс	ns	ī de	rat	1075	
Weight (Approx.) .														2.3	3 lbs	
Socket			. 0	linc	h a	Par	t	No.	3N	14,	. ()r	equ	iva	lent	



RADIO CORPORATION OF AMERICA Electronic Components and Devices Under Devices DATA I 2-64

7389B

Envelope Terminals. . 5 BOTTOM VIEW Terminal Over Pin 2-Field Mesh Terminal Over Pin 4 - Photocathode (PC) Terminal On Side Of Envelope Opposite Base Key-Grid No.6 (G6) Terminal Over Pin 9-Grid No.5 (G₆) Terminal Over Pin 11 - Target End Base. Small-Shell Diheptal 14-Pin (JEDEC Group 5, No. B14-45) DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE BOTTOM VIEW Pin 1-Heater DY5 P G6 Pin 2-Grid No.4 7 DY. 8 DY3 Pin 3-Grid No.3 Pin 9 4 - Do Not Use G5 DY2 Pin 5-Dynode No.2 DY Pin 6 - Dynode No.4 10 62 Pin 7-Anode Pin 8-Dynode No.5 61 Pin 9-Dynode No.3 ۲ IC(4 (III)IC Fin 10 - Dynode No.1. PC TARGET Grid No.2 G3(3 12)G Pin 11-Do Not Use Pin 12-Grid No.1 FIELD Pin 13-Cathode 13 Pin 14 - Heater G4 I (14 Maximum and Minimum Ratings, Absolute-Maximum Values:

Photocathode:		
Voltage	max. volts	
	max. fc	
Operating Temperature:		
Any part of bulb 65	max. ^o C	
Of bulb at larg end of tube		
	min. ^o C	
Temperature Difference:		
Between image section and any part	-	
g, and a state of the state of	max. °C	
Grid-No.6 Voltage	max. volts	
Target Voltage:		
	max. volts	
	max. volts	
the second se	max. volts	
Grid-No.5 Voltage		-
Grid-No.4 Voltage		
Grid-No.3 Voltage		
Grid-No.2 & Dynode-No.1 Voltage 350	max. volts	
Grid-No.1 Voltage:	max. volts	
ingenting and include the training of the second seco	max. volts	-
	max. voits	
Peak Heater—Cathode Voltage: Heater negative with respect to cathode. 125	max. volts	
deter reget o net respect in the rest	max. volts	
neater positive with respect to cathode. 10	max. VUIUS	

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.



	Anode-Supply Voltage ⁴ 1650 max. Voltage Per Multiplier Stage 350 max.	volts volts
	Typical Operating Values: ^e	
	Photocathode Voltage600	volts
	Grid-No.6 Voltage (Image focus) Approx. 70% of photocathode voltage ^f 370 to -470	volts
	Target Voltage Above Cutoff ⁹	volts
	Field-Mesh Voltage ^c	volts
)	Grid-No.5 Voltage (Decelerator) 40 Grid-No.4 Voltage (Beam Focus) 70 to 90	volts volts
	Grid-No.3 Voltage ^h	volts
	Grid-No.2 & Dynode-No.1 Voltage 280	volts
	Grid-No.1 Voltage for Picture Cutoff45 to-115 Dynode-No.2 Voltage	volts volts
	Dynode-No.3 Voltage	volts
	Dynode-No.4 Voltage	volts
	Anode Voltage	volts volts
	Recommended-Target-Temperature Range: ^b 35 to 45	°C
	Minimum Peak-to-Peak Blanking Voltage. 5 Field Strength of Focusing Coi!(Approx.):j	volts
	At center of scanning section: 60	gausses
	In plane of photocathode	gausses
	Field Strength of Alignment Coil 0 to 3	gausses

Performance Data:

With conditions shown under Typical Operating Values including Recommended Target-Temperature Range, target voltage adjusted to 2.3 volts above cutoff, and with the camera lens set to bring the picture highlights 1/2 stop above the "knee" of the accompanying Basic Light-Transfer-Characteristic Curve

	Min.	Typ.	Max.	
Cathode Radiant Sensitivity at 4500 angstroms Luminous Sensitivity Anode Current (DC)	30	0.030 60 30		a/w μa/lm μa
Signal-Output Current (Peak to Peak) Ratio of Peak-to-Peak High-	10	-	40	μa
light Video-Signal Current to RMS Noise Current for Bandwidth of 4.5 Mc Photocathode Illumination at 2870° K Required to bring Picture Highlights	35:1	95:1	-	
<pre>1/2 Stop above "Knee" of Light Transfer Character- istic. Amplitude Response at 400 TV Lines per Picture Height (Per</pre>	-	0.070	0.130	fc
cent of large-area black to large-area white) ^k	60	75	-	%



7389B

	Min.	Typ.	max.	
Uniformity:"				
Ratio of Shading (Back- ground) Signal to Highlight Signal Decrease from Peak	-	0.10	0.15	
Highlight Signal Level of Signal from any Point on Scanned Area of Target		12	25	of,
^a Cinch Manufacturing Corporation, 1026 Sout 111 incis.	h Homan	Avenue,	Chicago	24,
^b Operating outside the Recommended forget-fe fypical Operating folues will not damage th femperature Ratings of the tube are not exce however, is only obtained when the tube is mended forget-femperature Range.	eeded.	ODTIMUM	performal	nce,
C with respect to grid No.8.				

- with respect to grid No.4.
- d Dynode-voltage values are shown under Typical Operating Values.
- With 73898 operated in RCA TK-60 comera at fixed photocathode voltage. f Adjust for optimum focus.
- 9 The target supply voltage should be adjustable from -5 to 5 volts.
- h Adjust to give the most uniformly shaded picture near maximum signal. Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil. j.
- k Measured with amplifier having flat frequency response.
- With uniform illumination on photocathode.

OPERATING CONSIDERATIONS

The tube should never be operated in a vertical position with the Diheptal/base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20° with the vertical.

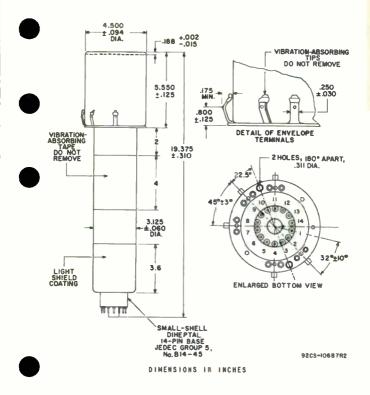
> SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device having S-10 Response is shown at the front of this Section



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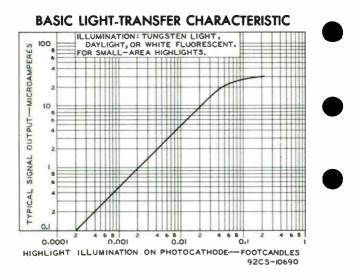
RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

7389B





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RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Image Orthicon

"MICRODAMP" CONSTRUCTION FOR REDUCED MICROPHONICS FIELD MESH FOR REDUCED "WHITE EDGE" EFFECTS

LONG-LIFE TARGET MAGNETIC FOCUS

FIELD-MESH TYPE MAGNETIC DEFLECTION

For Extremely High-Quality Performan, e in Black-and-White Studio TV Cameras and Television Tape-Recording Operations. The 7389B/L is Directly Interchangeable with the 7389, 7389A, and 7389B in all Cameras.

The 7389B/L is the same as the 7389B except utilizes a stable, long-life glass target.

The stable, long-life, glass target of type 7389B/L is characterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electronic rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as secondary emission and resistivity, are essentially constant and sensitivity of the 7389B/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "sticking picture" and rester "burn-in" due to underscanning are significantly reduced. The resistance of the 7389P/L to image "burn-in" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS

Dos and Don'ts on Use of RCA 7389B/L Dos

- 1. Allow the 7389B/L to warm up prior to operation.
- 2. Hold temperature of the 7389B/L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- 4. Adjust beam-focus control to best usable resolution.
- 5. Condition spare $7389\mathrm{B/L's}$ by operating several hours once each month.
- Determine proper operation point with target voltage adjusted to the desired voltage above target cuto'f.
- 7. Uncap lens before voltage are applied to the 7389B/L.

Don'ts

- 1. Don't force the 7389B/L into its shoulder socket.
- 2. Don't operate the 7389B/L without scanning.
- 3. Don't operate a 7389B/L having an ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turn off beam while voltages are applied to photocathode gridNo.6, target, dynodes, and anode during warm-up or standby operation.





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MONOVOLTAGE TYPE HAVING 5-21 RESPONSE

For use, in combination with suitable optical systems, in viewing an object or specimen irradiated with near-ultraviolet radiation DATA

2010	ł
General:	
Spectral Response	
Photocathode, Semitransparent: Shape	
Fluorescent Screen:	l
Shape Circular Minimum useful diameter 0.57"	
Phosphor	ł
Phosphorescence	
Persistence	
Overall Length	l
[Maximum Radius (Including side tip) 0.75"	l
Weight (Approx.)	
Terminal Connections (See Dimensional Outline):	
ORECTION OF INCIDENT RADIATION:	

PHOTOCATHOOE END OF TUBE

CL - Collector

G₁ - Grid No.1 (Focusing Electrode}



G2 - Grid No.2 (Focusing & Accelerating Electrode) K - Photocathode

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Maximum Ratings, Absolute-Maximum Values:

Ohenne Ale tekt	I
AMBIENT TEMPERATURE	l
(Continuous operation)* 0.35 max. µa	
AVERAGE PHOTDCATHODE CURRENT	ł
Average (DC)	
Peak instantaneous	I
FLUORESCENT-SCREEN VOLTAGE:	l

Characteristics:

At Ambient Temperature of 25° C

Fluorescent-Screen Voltage (DC) ^D Median Paraxial Magnification Factor		volts
Median Conversion Ĕfficiency† Minimum Resolution▲		lumens/watt line pairs
		Dor mm



Median Equivalent Screen-Background Input at 2537 angstroms§.... 1 x 10⁻¹⁰ watt/cm²

- For Curves, see front of Cathode-Ray Lube, Storage Lube, & Nonoscope Section. See also Operating Considerations.
- Referred to photocathode.

7404

* Averaged over any interval of 10 seconds maximum.

- Defined as the ratio of the linear size of the image on the fluorescent screen to the linear size of the image on the photocathode. The image on the photocathode consists of two parallel lines 0.08° long, each located 0.08° from the tube axis. Size of the image on the fluorescent screen is determined by measuring the spacing between the two parallel lines.
- Defined as the quotient of luminous flux output to incident radiant flux at 2537 angstroms.
- A The resolution, both horizontally and vertically in a 0.15-inchdiameter circle centered on the photocathode, is determined with a pattern consisting of alternate black and while lines of equal width. Any two adjacent lines are designated as a "line-pair".
- Q Defined as that value of incident radiation required to cause an increase in screen brightness equal to the screen-background brightness.

OPERATING CONSIDERATIONS

The curves giving the spectral-energy emission characteristic and the persistence characteristics of phosphor P20 are located in the front of the Cathode-Ray Tube, Storage Tube, & Monoscope Section. Only persistence-characteristic curve A applies to the 7404.

Subjecting the 7404 to intense incident-radiation levels may temporarily decrease the tube's sensitivity even though there is no voltage applied. The magnitude and duration of this decrease depend on the length of exposure. Permanent damage to the tube may result if it is exposed to radiant energy sogreat as to cause excessive heating of the photocathode.

Support for the 7404 may be provided at the photocathode end by a cushioned arrangement and at the screen end by a suitable fixture which will exert adequate but not excessive pressure to hold the tube firmly against the cushion.

Connections to the two terminals of the tube, indicated on the Dimensional Outline, should not be soldered to the terminals. They may be made by spring fingers engaging the rim or the straight side of each terminal.

Magnetic shielding of the 7404 is required to minimize the effects of extraneous fields on tube performance. It is to be noted that ac magnetic fields are particularly objectionable in that they seriously impair tube resolution. If an iron or steel case is used, care should be taken in its construction to insure that the case is completely demagnetized.

The high voltage at which the 7404 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the user from coming in contact with the high voltage. Precautions must include safeguards which eliminate all hazards to operating personnel. In the use of high-voltage tubes, such as the 7404, it should always be



remembered that high voltage may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections. Before any part of the circuit is touched, the voltage-supply switch should be turned off and both terminals of any capacitors connected to ground.

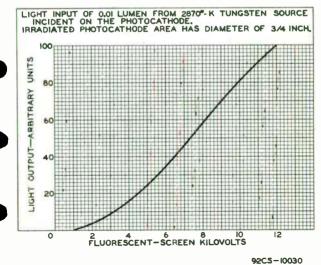
The curve showing the Tentative Spectral-Sensitivity Characteristic of Photosensitive Device having S-21 Response located at the front of this Section applies to the 7404

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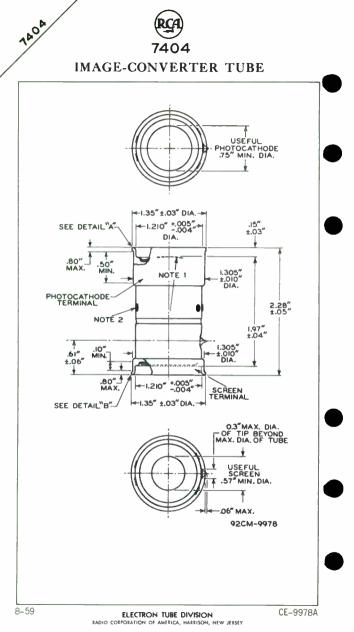
DATA 2

200

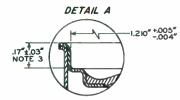
AVERAGE CHARACTERISTIC



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







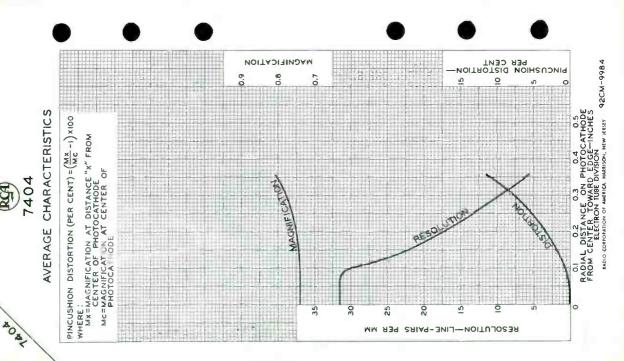
DETAIL B



NOTE 1: RADIUS OF CURVATURE OF FACEPLATE IS 1.230" ± 0.005"; FACEPLATE THICKNESS AT CENTER IS 0.030" ± 0.005". NOTE 2: FIVE INSULATED LEAD TIPS WILL NOT EXTEND BEYOND MAXIMUM OUTSIDE DIAMETER OF TUBE. LEADS ARE USED ONLY DURING TUBE MANUFACTURE.

NOTE 3: DEPTH IS MEASURED TO TANGENT OF THE TWO RADII.

Trop w





PHOTOCONDUCTIVE CELL

CADMIUM-SULFIDE, HEAD-ON TYPE

DATA

General:	
Spectral Response. Wavelength of Maxim Sensitive Surface:	
Shape Length (Minimum) Width (Minimum) Area (Minimum) Maximum Length (Exc Oiameter Leads, Flexible. Minimum length Oiameter Operating Position	
	TERMINAL TERMINAL
	DIRECTION OF LIGHT: INTO END OF BULB
λ indicates that the envelope symbol is	e primary characteristic of the element within the designed to vary under the influence of light.
	solute-Maximum Values:
VOLTAGE BETWEEN TER (DC or Peak AC). PHOTOCURRENT POWER DISSIPATION. AMBIENT TEMPERATURE	
Characteristics:	
	oltage of 12 volts between termi- an ambient temperature of 25° C
	an anoient temperature of 25° (
nats and	
	Nin. Median Max.
Sensitivity: Radiant ⁶ , at 5800 angstroms Luminous ⁷ Illumination ⁷ Rise Decay,	Nin. Nedian Max.

World Radio History

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PHOTOCONDUCTIVE CELL

- For conditions where the incident power is 2 x 10⁻⁹ watt.
- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870⁰ K.
- Incident illumination on the sensitive surface is 0.01 footcandle.
- Measured approximately 20 seconds after removal of incident-illumination level of 0.01 footcandle.

OPERATING CONSIDERATIONS

The flexible leads of the 7412 are usually soldered to the circuit elements. Soldering of the leads may be made close to the seals provided care is taken to conduct excessive heat away from the seals. Otherwise, the heat of soldering will break the seals and damage the cell.

A *clamp* around the glass envelope may be used to hold the celi in position. However, care must be taken in clamping to avoid cracking the glass envelope or introducing strains in the envelope which could lead to eventual breakage.

The voltage between terminals of the 7412 may be applied without regard to polarity.

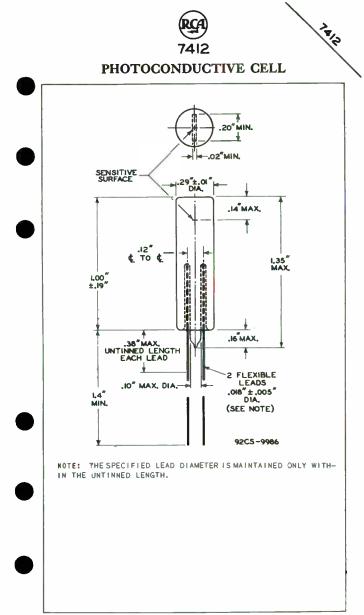
The angle of view of the 7412 may be narrowed by the use of a hood of the desired length placed in front of the cell.

If the source of radiation is some distance from the cell, the use of a lens system may be desirable to utilize more effectively the available radiation. *However, the radiation* should not be focused onto such a small area that localised overheating of the sensitive surface may result with consequent adverse affects on its characteristics. Exposure of the 7412 to radiation (even without voltage applied) so intense as to cause excessive heating of the cell may permanently damage it.

For a given illumination, the output current will have its highest value when the incident illumination is normal (angle of incidence is 90°) to the face of the cell. For smaller angles of incidence, the output current decreases. The decrease depends upon several factors including the angle of incidence of the illumination, the amount of illumination, and the area of sensitive surface illuminated.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Photoconductive Cell having S-15 Response is shown at the front of this Section

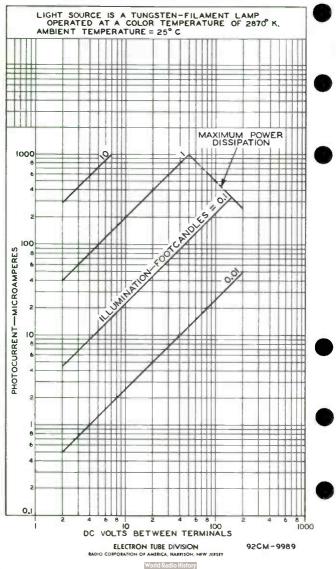
7412

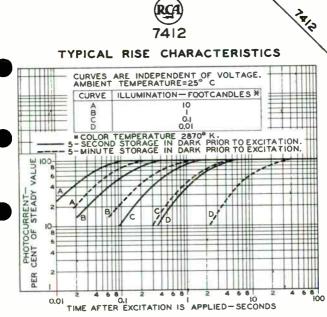




7412

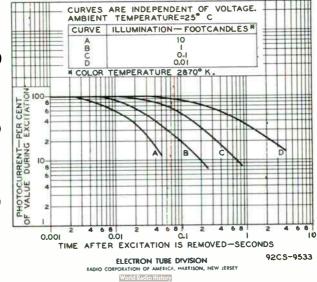
AVERAGE CHARACTERISTICS

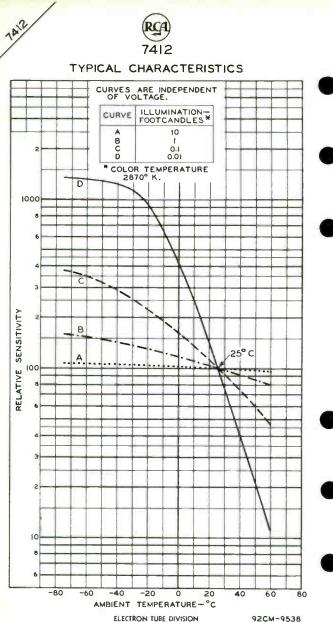




92CS-9532

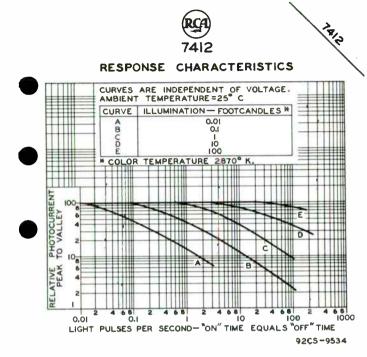
TYPICAL DECAY CHARACTERISTICS





RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9538



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MAGNETIC DEFLECTION

15/3

For color and high-quality black-and-white TV cameras

MAGNETIC FOCUS

	For color and high-quality black-and-white TV cameras
	DATA
	General:
	Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 ± 10% volts
	Voltage (AC or DC) 6.3 ± 10% volts
	Current at 6.3 volts 0.6 amp Direct Interelectrode Capacitance:
1	
	Anode to all other electrodes . 12 μμτ Maximum Target-to-Mesh Spacing 0,0008 inch
	Maximum larget-to-mesh spacing. 0.0000
	Photocathode, Semitransparent:
	Response
	Wavelength of maximum response 4000 1 000 angustions
	Rectangular image (4 x 3 aspect ratio): Useful size of
	Note: The size of the optical image focused on the
	photocathode should be adjusted so that its maximum
	diagonal does not exceed the specified value. The
	corresponding electron image on the target should
	have a size such that the corners of the restangle
	just touch the target ring.
	Orientation of Proper orientation is obtained when the
	vertical scan is essentially parallel to
	the plane passing through center of face-
	plate and pin 7 of the shoulder base.
	The horizontal and vertical scaw should
	start at the corner of the raster near-
	est pin 6 of the shoulder base.
	Focusing Method
	Deflection Method
	Overall Length
	Greatest Diameter of Bulb
	Minimum Deflecting-Coil Inside Diameter
	Poffecting-Coil Length
	Focusing-Coil Length
	Alignment Coil:
	Length
	Position on neck Centerline of coil located 8.5" from the
	flat area of the jumbo annular base.
	Photocathode Distance Inside End of Focusing Coil 1/2
	Operating Position See Operating Considerations
	Weight (Approx.)
	Shoulder Base Keyed Jumbo Annular 7-Pir BOTTOM VIEW
	Pin 1-Grid No.6 Pin 5-Grid No.5
	Pin 2 - Photocathode
	Pin 3-Internal Connec- Pin 6-Target
	tion-Do Not Use
	Pin 4 - Internal Connec- Pin 7 - Internal Connec-
	tion—Do Not Use tion—Do Not Use
	See basing diagram on next page.

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



IMAGE ORTHICON

		_					
	End Base	•	S	ma (J	11 EC	-Shell Diheptal 14-Pin DEC Group 5, No.B14-45) BOTTOM VIEW	
	Pin 1-Heater Pin 2-Grid No.4,				DIF	RECTION OF LIGHT: ERPENDICULAR TO INGE END OF TUBE	_
	Field-Mesh Grid Pin 3-Grid No.3 Pin 4-Internal Connec-				LA (ARGE END OF TUBE	
	tion-Do Not Use Pin' 5 - Dynode No.2			1	1	000	
	Pin 6-Dynode No.4 Pin 7-Anode	2	Į	(5	1 10 J	
	Pin 8-Dynode No.5 Pin 9-Dynode No.3			0	1		
	Pin 10 - Dynode No.1, Grid No.2		1	+			
	Pin 11 - Internal Connec- tion-Do Not Use		0	1	1		
	Pin 12-Grid No.1 Pin 13-Cathode, Suppressor Grid				W	VHITE INDEX LINE	
	Pin 14-Heater					ON FACE	
	NOTE: In the tube symbol, the suppres and the field-mesh grid connected without numbers to avoid upsettli ting functional camera control k For example. beam-focus control i Identified as Gg (grid No.4).	so l t ng not s	rg in is gei	rli gri du wi	d c Id Ist th	connected to the cathode, No.a, are intentionally ry practice of associa- n Specific grid numbers. Ily associated with knob	
	Maximum and Minimum Ratings, Abs	٥l	ut	e-	No	aximum Values:	
	PHOTOCATHODE: Voltage					-550 max. volts	
	OPERATING TEMPERATURE:	•	•	•	•	50 max. fc	
	Of any part of bulb Of bulb at large end of tube	•	•	•	•	50 max. ^о С	
	(Image section)	•	•	•	•	35 min. ^o C	
Į	Between image section and any of bulb hotter than image se	pa	rt	0		5 max. ^o C	
	GRID-No.6 VOLTAGE					-550 max. volts	
	Positive value	•	•	•	•	10 max. volts	
ŀ	GRID-No.5 VOLTAGE	•		:	:	10 max. volts 150 max. volts	
	GRID-No.4 VOLTAGE	•	•	•	•	300 max. volts 400 max. volts	
l	GRID-No.2 & DYNODE-No.1 VOLTAGE GRID-No.1 VOLTAGE:	•	•		:	350 max. volts	
	Negative-bias value Positive-bias value	•	•	•	•	125 max. volts 0 max. volts	
		•	•		•	V Hax. VULLS	

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IMAGE ORTHICON

PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode 125 max. volts ANDDE-SUPPLY VOLTAGE*								
Photocathode Voltage (Image focus)*400 to -540 volts Grid-No.6 Voltage (Accelerator) Approx. 65% of photocathode voltage260 to -350 volts Target-Cutoff Voltage	Heat Heat ANODE-	er negative w er positive w SUPPLY VOLTAG	ith respect ith respect E [*]	tocat	thode	10 m 1350 m	ax. ax.	volts volts
Grid-No.6 Voltage [Accelerator)— Approx, 65% of photocathode voltage260 to -350 volts Target-Cutoff Voltage]	Typica	1 Operating V	alues:					
Approx. 65% of photocathode voltage260 to -350voltsTarget-Cutoff Voltage(Decelerator)3 to +1voltsGrid-No.5 Voltage(Decelerator).0 to 125voltsGrid-No.4 Vo'tage (Beam focus)140 to 180voltsGrid-No.2 & Dynode-No.1 Voltage225 to 330voltsGrid-No.1 Vo'tage for picture cutoff45 to -115voltsDynode-No.2 Voltage600voltsDynode-No.3 Voltage800voltsDynode-No.4 Voltage1000voltsDynode-No.5 Voltage1200voltsDynode-No.5 Voltage35 to 45°CMinimum Peak-to-Peak Blanking Voltage5voltsField Strength at Center of Focusing Coil0 to 3gaussesField Strength of Alignment Coil (Approx.)0 to 3gaussesPerformance Data:Nith conditions shown under Typical Operating Walkes and with picture highlights at the "knee" of the light-transfer characteristic Min. Average Nax.Cathode Radiant Sensitivity at 4500 angstroms5-Signal-Output Current (Peak to Peak)5-Ight Video-Signal Current to Reach-to-Peak High-1-Ight Video-Signal Current to Reach-to-Peak High0.028Ight Video-Signal Current to Reak to Areacteristic-0.028Mande Current (DC)30-µaMat Abo Solse Current for Bandwidth of 4.5					• • •	-400 to	-540	volts
 Field Strength at Center of Focusing Coil⁴	Appr Target Grid-N Grid-N Grid-N Grid-N Dynode Dynode Dynode Anode Target	ox. 65% of ph -Cutoff Voltage (o.4 Voltage (o.4 Voltage (o.2 & Dynode- o.1 Voltage -No.2 Voltage -No.2 Voltage -No.4 Voltage -No.5 Voltage -Temperature -Temperature	No.1 Volta Range.	yolta r) ge cuto	۰۰۰۰ ۱۰۰۰	-3 to 0 to 1 140 to 225 to 300 -45 to 600 800 100 120 125 35 to	+1 25 180 330 -115	volts volts volts volts volts volts volts volts volts volts volts
Coil (Approx.)	Field of F	Strength at C ocusing Coil	Center		• • •	75		gausses
With conditions shown under Typical Operating Values and with picture highlights at the "knee" of the light-transfer characteristic Hin. Average Nax.Cathode Radiant Sensitivity at 4500 angstroms	Coil	(Approx.).	•••••			0 to	3	gausses
Values and with picture highlights at the "knee" of the light-transfer characteristic Hin. Average Nax.Cathode Radiant Sensitivity at 4500 angstroms	Perfor	mance Data:						
Cathode Radiant Sensitivity at 4500 angstroms at 4500 angstroms Anode Current (DC) Signal-Output Current {Peak to Peak} Ight Video-Signal Current to RMS Noise Current for Bandwidth of 4.5 Mc Photocathode Illumination at 2870° K Required to Reach "Knee" of Light- Transfer Characteristic These Pricture Height (Per cent of large-area		Values and	with pic	ture	highli fer ch	ghts at tracteri	the stic	
at 4500 angstroms 0.028 - µa/µw Anode Current (DC) 30 - µa Signal-Output Current {Peak to Peak] 5 - 38 µa Ratio of Peak-to-Peak High- light Video-Signal Current to RMS Noise Current for Bandwidth of 4.5 Mc 40:1 55:1 - Photocathode Illumination at 2870° K Required to Reach "Knee" of Light- Transfer Characteristic 0.028 0.04 fc Amplitude Response at 400 TV Lines per Picture Height (Per cent of large-area black to large-area		0.11.1.0			Min.	Average	<i>Hax</i> .	
<pre>(Peak to Peak)</pre>	at 4 Anode	500 angstroms Current (DC).			-		_	
Bandwidth of 4.5 Mc 40:1 55:1 - Photocathode Illumination at 2870° K Required to Reach "Knee" of Light- Transfer Characteristic 0.028 0.04 fc Amplitude Response at 400 TV Lines per Picture Height (Per cent of large-area black to large-area	(Pea Ratio ligh	k to Peak) of Peak-to-Pe t Video-Signa	ak High- I Current	•	5	489	38	μа
Transfer Characteristic 0.028 0.04 fc Amplitude Response at 400 TV Lines per Picture Height (Per cent of large-area black to large-area	Band	width of 4.5 athode Illumi 870 ⁰ K Requir	Mc nation ed to	•	40:1	55:1	-	
		n "Knee" of L				0 000	0.04	
	Reac Tran Amplit Line (Per	ude Response s per Picture cent of larg	at 400 TV e Height ge-area	•	-	0.028	0.04	î.c.

8-59

ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARKISON, NEW JERSEY 15/3

7513 IMAGE ORTHICON

- Ratio of dynode voltages is shown under Typical Operating Talues. Direction of current should be such that a north-speking pole is attracted to the image end of the focusing coll, with the indicator located outside of and at the image end of the focusing coll.
- Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- Adjust to give the most uniformly shaded picture near maximum signal. Mithin this range, the actual focusing-voltage value will not differ by more than 25 from that for any other tube when all other operating content of the same of most and the same defined in the same of the same of the same of the same of the same defined and the same of the photocathode voltage and with all other voltages held constant.
- ** Measured with amplifler having flat frequency response.

OPERATING CONSIDERATIONS

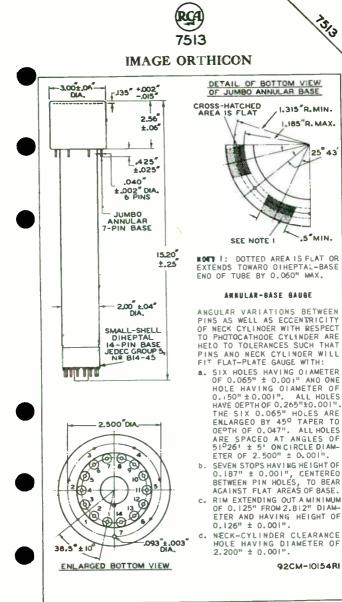
The operating position of the 7513 should preferably be such that any loose particles in the neck of the tube will not fall down and strike or become lodged on the target. Therefore, it is recommended that the tube never be operated in a vertical position with the Diheptal-base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20° with the vertical.

Resolution in excess of 500 lines at the center of the picture can be produced by the 7513.

To utilize the resolution capability of the 7513 in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use a video amplifier having a bandwidth of at least 6 megacycles.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Photosensitive Device having S-10 Response is shown at the front of this Section

7513



CE-10154R1

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

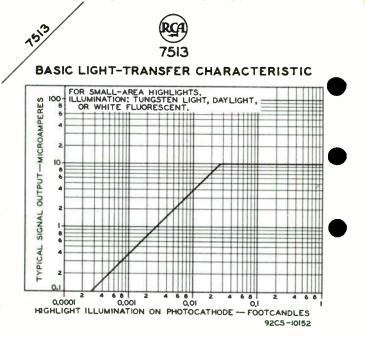


Image Orthicon

LONG-LIFE TARGET MAGNETIC FOCUS MAGNETIC DEFLECTION PRECISION CONSTRUCTION TYPE

For Studio Pickup with Color and High-Quality Black-and-White TV Cameras. The 7513/L is Directly Interchangeable with the 7513 in All Cameras.

The 7513/L is the same as the 7513 except utilizes a longer life non-detericrating glass target.

The sturdy, long-life, non-deteriorating, glass target of type 7513/L is characterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electron c rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as mecondary emission and resistivity, are essentially constant and sensitivity of the 7513/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "sticking picture" and raster "burn-in" due to underscanning are significantiy reduced. The resistance of the 7513/L to image "burnin" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS

Dos and Don'ts on Use of RCA-7513/L Dos

- 1. Allow the 7513/L to warm up prior to operation.
- 2. Hold temperature of the 7513'L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- 4. Adjust beam-focus control for best usable resolution.
- Condition spare 7513/L's by operating several hours once mach month.
- Determine proper operating point with target voltage adjusted το exactly 2 volts above target cutoff.
- 7. Uncap lens before voltages are applied to the 7513/L.

Don'ts

- 1. Don't force the 7513/L into its shoulder socket.
- 2. Don't operate the 7513/L without scanning.
- 3. Don't operate a 7513/L having ar ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turn off beam while voltages are applied to photocathode, grid No.6, target, dyrodes, and anode during warm-up or standby operation.





7629Å

Image Orthicon



SEMICONDUCTIVE TARGET, S-IO RESPONSE VERY HIGH SENSITIVITY MAGNETIC FOCUS HIGH RESOLUTION MAGNETIC DEFLECTION

> For Studio and Remote Low-Light Level Color and Black-and-White TV Pickup. Sensitivity Equivalent to Film having ASA Exposure Index of 20,000.

> > DATA

General:

<u> </u>	dellet at .
	Heater, for Unipotential
	Cathode:
	Volzage (AC or DC). . . . 6.3 ± 10% volts Current at 5.3 volts. . . 0.6 amp
	Current at 6.3 volts 0.6 amp Direct Interelectrode
	Capacitance:
	Anode to all other electrodes 12 pf
	Spectral Response
	Photocathode, Semitransparent:
	Rectangular image (4 × 3 aspect ratio):
	Useful size of
	Note: The size of the optical image focused on the
	photocathode should be adjusted so that its maximum diagonal does not exceed the specified value. The
	corresponding electron image on the target should have
	a size such that the corners of the rectangle just
	touch the target ring.
	Crientation of Proper orientation is obtained when
	the vertical scan is essentially parallel to the plane
	passing through center of faceplate and pin 7 of the
	shoulder base.
	Focusing Method Magnetic Deflection Method
	Dueral Longth 15 20"+0 25"
	Overall Length
	Minimum Deflecting-Coil Inside Diameter
	Deflecting Coil Cleveland Electronics,
	Part No.0Y-1ª, or equivalent
	Deflecting-Coil Length
	Focusing Coil
	Part No.OF-2ª, or equivalent
	Focusing-Coil Length
·	Part No.0A-3ª, or equivalent
	Alignment-Coil Length
	Photocathode Distance Inside End of Focusing Coil 1/2"
	Socket Cinch Part No.3M14 ^b , or equivalent Operating Position The tube should never be operated in a
	vertical position with the diheptal-base end up nor in any
)	other position where the axis of the tube with the base
	up makes an angle of less than 20 ^D with the vertical.
	Weight (Approx.)



7629A

Shaulder Base Keyed Jumbo Ann BOTTOM VIEW	ular 7-Pin
Pin 1 - Grid No.6 Pin 5 - Gr Pin 2 - Photocathode Pin 6 - Ta Pin 3 - Do Not Use Pin 7 - Do Pin 4 - Do Not Use End Base	rget Not Use
Pin 7 - Anode Pin 8 - Dynode No.5 Pin 9 - Dynode No.3 Pin 10- Dynode No.1, Grid No.2 P'n 11- Do Not Use P'n 12-Grid No.1 Pin 13- Cathode Pin 14-Heater Pin 14-Heater	og v v v v v v v v v v v v v
Maximum and Minimum Ratings, Absolute-Maximum Values	2
PHOTOCATHODE: Voltage550 max. Illumination	
Of any part of bulb	°C
(Target section) 0 min. TEMPERATURE DIFFERENCE: Between target section and any	°C
part of bulb hotter than target section	
Positive value 10 max. Negative value 10 max. GRID-No.5 VOLTAGE. 150 max. GRID-No.4 VOLTAGE. 300 max. GRID-No.3 VOLTAGE. 400 max. GRID-No.1 VOLTAGE. 350 max. GRID-No.1 VOLTAGE. 350 max.	volts volts volts volts
Negative-bias value	volts volts
respect to cathode	volts
	10115

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

RCA

Typical Operating Values:^d

Photocathode Voltage (Image Focus) ^e	volts
(Accelerator)	volts volts volts volts volts volts
Grid-No.1 Voltage for Picture Cutoff	volts volts volts volts volts volts
Blanking Voltage 5 Field Strength at Center of	volts
Focusing Coilt	gausses
Coil	gausses

Performance Data:

With conditions shown under Typical Operating Values and with camera lens set to bring the picture highlights one stop above the "knee" of the accampanying Basic Light-Transfer-Characteristic Curve

Hi	n. Typ.	Max.	
Cathode Radiant Sensitivity at 4500 argstroms	- 0.033 10 65 - 30	-	a/w μa/lm μa
	4 6	10	μа
of 4.5 Mc. Photocathode [l]umination at 2870 ^o K Required to bring Picture Highlights One Stop above "Knee" of	- 32:1	-	
Light Transfer Characteristic Peak-to-Peak Response to Square-Wave Test Pattern of 400 TV Lines Per Picture Height (Per cent of large-area black to	- 0.007	-	fc
large-area white)	- 65	-	Ж

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 9-63

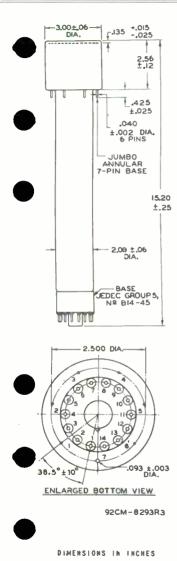
7629A

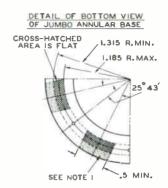
- Made by Cleveland Electronics Inc., 1974 East 61st Street, Cleveland, whio.
- Made by Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago 2%, Illinois.
- C Dynode voltage values are shown under fypical Operating Values.
- With 7629A operated in properly adjusted RCA TK-31 camera.
- Adjust for best focus.
- Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to 5 volts.
- 9 Adjust to give the most uniformly shaded picture near maximum signal.
- ^h Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with indicator located outside of and at the image end of the focusing coil.
- Measured with amplifier having flat frequency response.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this Section



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History





NOTE I: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

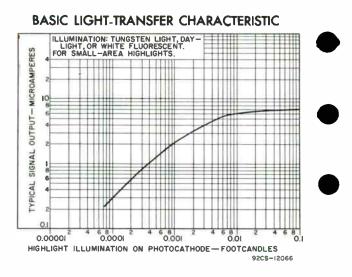
ANNULAR BASE GAUGE

Angular variations between pins as well as eccentricity of neck cylinder with respect tophotocathode cylinder are held to tolerances such that pins and neck cylinder will fit flatplate gauge with:

- a. Six holes having diameter of 0.065" ± 0.001" and one hole having diameter of 0.150" ± 0.001". All holes have depth of 0.265" ± 0.001". The six 0.065" holes are enlarged by 45° taper to depth of 0.047". All holes are spaced at angles of 51°26' ± 5' on circle diameter of 2.500" ± 0.001".
- b. Seven stops having height of C.187" ± 0.001", centered between pin holes, fo bear against flat areas of base.
- c. Rim extending out a minimum of C.125" from 2.812" diameter and having neight of 0.126" ± 0.001".
- d. Neck-cylinder clearance hole having diameter of 2.200" ± 0.001".



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Participation History



Vidicon

DATA I 3-61

7697

For Industrial TV Applications with Black-and-White TV Cameras

DATA

Genera	1:

Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 \pm 10% volts Current at 6.3 volts 0.6 amp Direct Interelectrode Capacitance: Target to all other electrodes 3.1 $\mu\mu$ f Spectral Response	
Maximum useful diagonal of rectangular image (4 x 3 aspect ratio) 0.625" Orientation of quality rectangleProper orientation is obtained when the horizontal scan is essentially parallel to	
the plane passing through the tute axis and short index pin. Focusing Method	
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Internal Con- nection- Do Not Use Pin 4 - Same as Pin 3 Pin 5 - Grid No.2 Pin 6 - Grid No.4, Grid No.3 Direction of LIGHT: INTO FACE END OF TUBE	
Maximum Ratings, Absolute-Maximum Values:	
For scanned area of 1/2" x 3/8" GRID-No.3 & GRID-No.4 VOLTAGE	
Positive-bias value 0 max. volts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode 125 max. volts Heater positive with respect to cathode 10 max. volts	

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.

7697

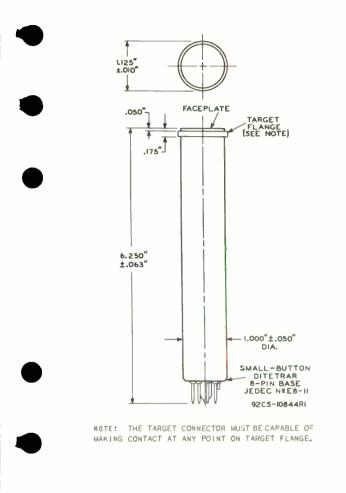
PEAK TARGET CURRENT *	0.6 max.	μа	
FACEPLATE:			
Illumination	500 max. 71 max.	fc °C	•
Typical Operation:			-
For scanned area of 1/2" x 3	7/8" and		
faceplate temperature of 30°			
Grid-No.4 (Decelerator) & Grid-No.3			
(Beam-Focus-Electrode ^b) Voltage	200° to 300	volts	
Grid-No.2 (Accelerator) Voltage	300	volts	
Grid-No.1 Voltage for picture cutoff ^d .	-45 to -100	volts	-
Average "Gamma" of Transfer			
Characteristic for signal-output	0.55		
current between 0.05 µa and 0.2 µa Target Voltage to produce 0.02 µa	0.55		
dark current:			
Maximum	30	volts	
Typical	25	volts	
Minimum Peak-to-Peak Blanking Voltage:	20	10110	
When applied to grid No.1	30	volts	
When applied to cathode	10	volts	
Field Strength at center of focusing			
coil (Approx.).	40	gausses	
Field Strength of Adjustable Alignment Coil ^e	0.4 - 4		
	0 to 4	gausses	
Naximum-sensitivity opera	ation		
Faceplate Illumination (Highlight)	0.5	fc	
Target Voltagef	35 to 70	volts	
Dark Current ^g	0.2	μa	
Signal-Output Current: ^h Typical	0.2		
Typical	0.2	μа	
^a Video amplifiers must be designed properly to h this magnitude to avoid amplifier overload or	andle target c picture distor	urrents of tion.	
Beam focus is obtained by combined effect of should be adjustable over indicated range, an	grid-No.3 volt d a focusing co	age which bil having	
an average field strength of 40 gausses.			
^C Definition, focus uniformity, and picture qu creasing grid-No.4 and grid-No.3 voltage. In grid No.3 should be operated above 250 volts.	n general, grid	No.4 and	
With no blanking voltage on grid No.1.			
e The alignment coil should be located on the tu at a distance of 3-11/16 inches from the fa positioned so that its axis is coincident wit	nce of the tub	e, and be	
positioned so that its axis is coincident wit the deflecting yoke, and the focusing coil.	th the axis of	the tube,	
The target voltage for each 7697 must be adju gives the desired operating dark current.	sted to that va	alue which	
g The deflecting circuits must provide extreme	elv linear sca	nning for	
good black-level reproduction. Dark-current to the scanning velocity. Any change in scan	signal is pro	portional	
black-level error in direct proportion to the cha	inge in scanning	velocity.	
I madiate the second se			

 Defined as the component of the highlight target current after the darkcurrent component has been subtracted.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

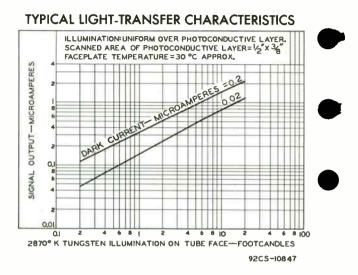






RADIO CORPORATION OF AMERICA Electror: Tube Division World Radio History DATA 2 3-61

7697



RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.



Vidicon



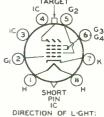
MAGNETIC FOCUS I" - DIAMETER MAGNETIC DEFLECTION

For Live-Scene Pickup with Calor or Black-and White TV Cameras in Industrial Closed-Circuit Systems. The 7735A is Uailaterally Interchangeable with Type 7735.

GENERAL

Heater, for Unipotential Cathode
Voltage (AC or DC) 6.3 ± 10% V
Current at 6.3 volts
Direct Interelectrode Capacitance ^a
Target to all other electrodes 4.6 pF
Spectral Response See Accompanying Curve
Photoconductive Layer
Maximum useful diagonal of rectangular
image (4 x 3 aspect ratio) ^b
Focusing Method
Deflection Method
Overall Length 6.25 ± 0.25 in
Greatest Diameter
Operating Position
Weight (Approx.)
Bulb
Focusing Coil Cleveland Electronics ^{c,d} No.VF-115-5, +
or equivalent
or equivalent Deflecting YokeCleveland Electronics ^{c,d} No.VY-III-3, →
or equivalent
Alignment Coil Cleveland Electronics ^{c,d} No.VA-118, +
or equivalent
Socket
Base Small-Button Ditetrar 8-Pin, (JEDEC No.E8-11)
Basing Designation for BOTTOM VIEW
TARGET

Pin 3-Do tot Use Pin 4-Do Not Use Pin 5-wrid No.2 Pin 6-brid No.3 and No.4 Pin 8-let r



INTO FACE END OF TUBE

MAXIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

For scanned area of 1/2" x 3/8"



Grid-No.3&Grid-No.4 Voltage 750 ٧ Grid-No.2 Voltage. 750 ۷

- Indicates a change.



RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

7735A

	Grid-No.l Voltage 300 Positive bias value. 0 Peak Heater-Cathode Voltage 0 Hwater negative with respect to cathode. 125 Hwater positive with respect to cathode. 10 Target Voltage. 100 Dark Current 0.25 Peak Target Current ^f 0.55 Faceplate 111umination Illumination 7	ν μΑ μΑ fc	
		0	
	TYPICAL OPERATION		
	For scanned area of 1/2" x 3/8"		
	Faceplate temperature of 30° to 35°C		
-	Grid-No.4 (Decelerator) & Grid-No.3 (Beam-Focus Electrode ⁹) Voltage	V V V	
	Visual Equivalent Signal-to-Noise Ratio (Approx.) ^k		
_	Ratio (Approx.) ^k		
	Maximum value	% %	
	When applied to grid No.1	V	
	When applied to cathode	Ý	
	Field Strength at Center of Focusing Coil (Approx.)	G	
	Coil ⁿ	G	
	Maximum-sensitivity operation -0.1 footcandle on faceplate	-	
-	Faceplate Illumination (Highlight) 0.1 Target Voltage ^{p, q}	fc V μA	
		щ A	
	Intermediate-sensitivity operation-0.5 footcandle on footpla		
	Faceplate Illumination (Highlight) 0.5 Target Voltage ^{p, q}	fc γ μA	
		ш А	
	Average-sensitivity operation-1 footcandle on faceplate		
		fc	
	in ground and ground a state of the state of	V	
	Dark Current ^r	uА	
		uА	
		u A	
	- Indicates a chang		

DATA I

RADIO CORPORATION OF AMERICA Electronic Components and Devices World Recipilistory



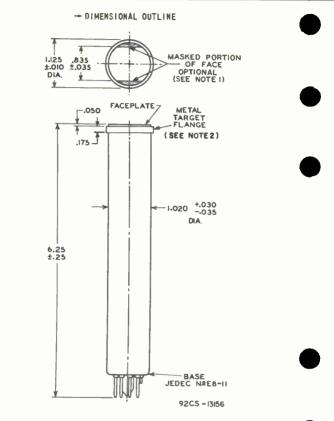
- ^a This capacitance, which effectively is the output impedance of the 7735A, is increased when the tube is mounted in the deflecting-yoke and focusing-ccil assembly. The resistive component of the output impedance is in the order of 100 megohams.
- b Orientation of quality rectangle—Proper crientation is obtained when the horizontal acan is essentially parallel to the straigut ides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.
- ^C Made by Cleveland Electronics Inc., 1974 Eas. 61st St., Cleveland, Ohio.
- These components are chosen to provide tube operation with minimum beamlanding error.
- ^e Made by Cinch Manufacturing Corporation, 1026 S. Homan Ave., Chicago 24, Illinois.
- ¹ Video amplifiers must be designed properly to handle target gurrents of this magnitude to avoid amplifier overload or picture distantion.
- 9 Beam focus is obtained by combined effect of grid-No.3 voltage which should be adjustable over indicated range, and a focusing coil having an average field strength of 40 gauss.
- h Definition, focus uniformity, and pictur* quality decrea.e with decreasing grid-No.4 and grid-No.3 voltage. In general, gr.d No.4 and grid-No.3 should be operated above 250 volts.
- j With no blanking voltage on grid No.1.
- With no binnering intropy on point of the neutropy amplifier having bandwidth of 5 Me and speak signal-output -urrent of 0.35 microsmpere. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight video-signal current to rus noise current, multiplied by a factor of 3.
- By a factor of c. The fined as the per cent of initial value of signal-output current 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- n The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from th- face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil
- P The target voltage for each 7735A must be adjusted to the value which gives the desired operating dark current.
- 9 Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- The deflecting circuits must provide extremely linear acanning for good black-level reproduction. Dark-current signal is proportional to the acanning velocity. Any change is scanning velocity produces a blacklevel error in direct proportion to the change in scanning velocity.
- ⁸ Defined as the component of the highlight target current after the darkcurrent component has been subtracted.

OPERATING CONSIDERATIONS

The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube. This spring contact may conveniently be provided as part of the focusing-coil design.

The deflecting yoke and focusing coil used with the 7735A are designed to cause the scanning beam to land perpendicularly to the target at all points of the stanned area with minimum beam-landing error and resultant superior uniformity of sensitivity and focus over the scanned area. The recommended location of these components is shown in Recommended Location and Length of Deflecting, Focusing, and Alignment Components.





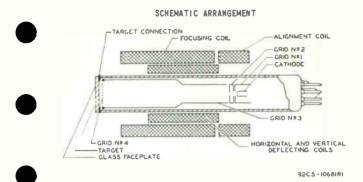
DIMENSIONS IN INCHES

Note 1: Straight sides of masked portions are parallel to the plane passing through tube axis and short pin.

Note 2: Target contact flange in the form of a metal ring encircling the tube and having the indicated diameter may be located along the tube axis in any part of or all of the spacebetween the dashed lines.

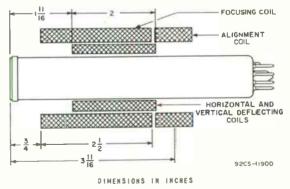
-ladicates a change.







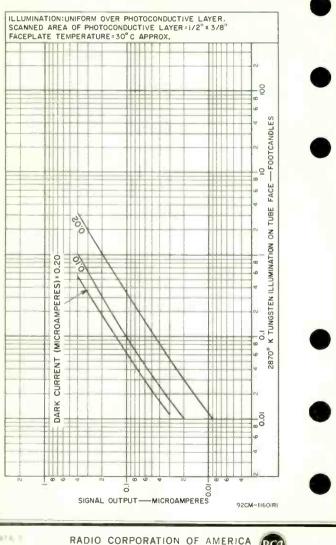
To obtain minimum beam-landing error





RADIO CORPORATION OF AMERICA Electronic Components and Devices World Rector History DATA 3 7-65

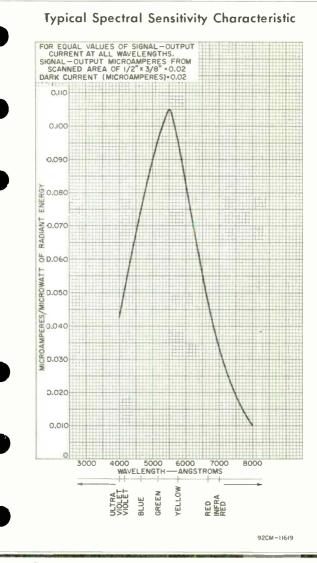
Typical Light Transfer Characteristics



Electronic Components and Devices

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DATE 1

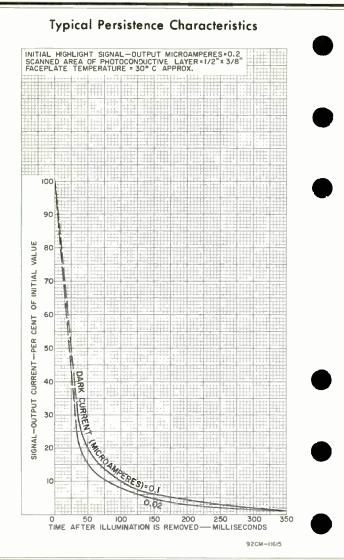




RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History

Harrison, N. J.

DATA 4

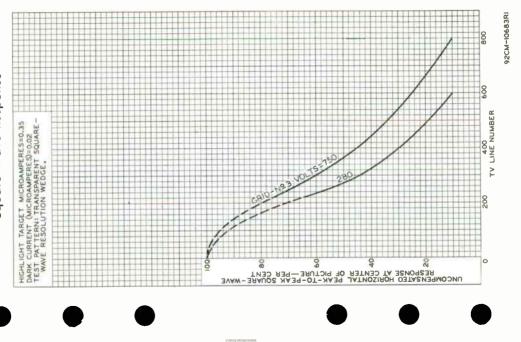


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RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



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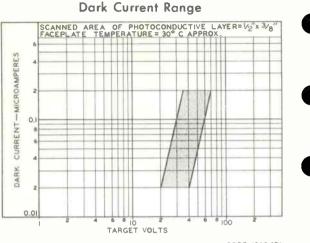


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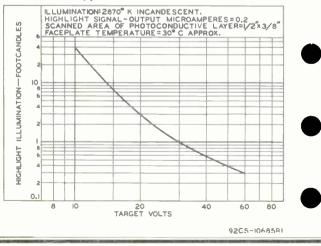
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RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

RC

Vidicon



MAGNETIC FOCUS

1" - DIAMETER

MAGNETIC DEFLECTION

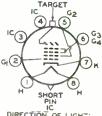
For Live-Scene Pickup with Color or Black-and White TV Cameras in Broadcast, Industrial, and Clased-Circuit Systems. The 7735B is Unilaterally Interchangeable with Types 7735 & 7735A.

GENERAL

Heater, for Unipotential Cathode
Voltage (AC or DC)
Current at 6.3 volts 0.6 A
Direct Interelectrode Capacitance ^a
Target to all other electrodes 4.6 pF
Spectral Response See Accompanying Curve
Photoconductive Layer
Maximum usefu diagonal of rectangular
image (4 × 3 aspect ratic)
Focusing Method
Focusing Method
Deflection Method Magnetic
Overall Length
Greatest Diameter
Operating Position
Weight (Approx.)
BUID
Bulb
or equivalent Deflecting Yoke Cleveland Electronics ^{C,d} No. VY-111-3,
Deflecting Yoke Cleveland Electronics ^{C,d} No. VY-111-3.
OF equivalent
Alignment Coil Cleveland Electronics ^{C,d} No.VA-118,
OF equivalent
SOCKET
Dase
Basing Designation for SOTTOM VIEW
Pin 1 Houton



1-Heater Pin 2-Grid No.1 Pin 3-Do Not Use Pin 4 - Do Not Use Pin 5-Grid No.2 Pin 6-Grids No.3 and No.4 Pin 7 - Cathode Pin 8-Heater Flange - Target Short Pin - Make No Connection



DIRECTION OF LIGHT:

ABSOLUTE-MAXIMUM RATINGS

For scanned area of 1,2" x 3/8"

Grid-No.3	& Grid-No.4	٧o	lt	ag	e.						1000	٧
Grid-No.2	Voltage	• •	•								1000	V



RADIO CORPORATION OF AMERICA Electronic Components and Devices

Herrison, N. J.

DATA 1 10-65

7735B

Grid-No. I Voltage Negative bias value Positive bias value Peak Heater-Cathode Voltage Heater negative with respect t Heater positive with respect t Target Voltage Dark Current	co cathode. co cathode.	· · · · · I · · · · · I · · · · · I	100 V 0 V 10 V 25 μA 55 μA	۰
Faceplate Illumination		IC	000 fc 71 °C	
TYPICAL OPERATION AN	D PERFORMANC	E DATA		
For scanned area	of 1/2" x 3	/8"		
Faceplate temperat				-
	Low- Voltage Operation	High Voltage Operation		•
Grid-No.4 (Decelerator) &				
Grid-No.3 (Beam-Focus	250 to 3009	750	v	
Electrode) Voltage Grid-No.2(Accelerator) Voltage.	300	300	v	
Grid-No.1 Voltage for Picture				
Cutoffh	-45 to -100	-45 to -100	V	
Average "Gamma" of Transfer				
Characteristic	0.65	0.65		
Signal-output current be-				
tween 0.02 µA & 0.2 µA				
Visual Equivalent Signal-to- Noise Ratio (Approx.) ^j	300:1	300:1		
Lag ^k				
Maximum value	28	28		
Typical value	23	23	%	
Minimum Peak-to-Peak				
Blanking Voltage	75 ·	75	v	
When applied to grid No.1 When applied to cathode	20	20	ý	
Limiting Resolution at Center	20			
of Picture			(=	
Typical value	750	900	TV	
Minimum value	750	-	Lines	
Amplitude Response to a				
400 TV Line Square-Wave	35	50	ą,	Ä
At center of picture	55	50	14	
Field Strength_at Center of				
Focusing Coil ^m	53	68	G	
Peak Deflecting-Coil Current	105	375	mA	
Horizontal	185	43	mA mA	
Vertical	25	+5		-
Field Strength of Adjustable	0 to 4	0 to 4	G	
Alignment Coil				

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. Electronic Components and Devices



High-sensitivity operation-0.5	fooscandle on facepla	te
	Low- High-	
	Voltage Voltage	
	Operation Operation	2
Faceplate Illumination (Highlight)	0.5 -	fc
Target Voltagen, p	30 to 60 -	v
Dark Current9	0,10 -	
Signal-Output Current ^r	0.10 -	μ A
Typical.	0.07	
Typically is a set of the set of	0.27 -	μA
Average-sensitivity operation-1.		i t e
Faceplate Illumination (Highlight)	1.0 -	fc
Target Voltage ^{n, p} .	20 to 40 -	v
Dark Current ⁴	0.025 -	μA
Signal-Output Current ^r		μια
Typical	0.275 -	μ A
Minimum	0.265 -	
	0.205 -	μ A
High-Light Level Operation-10		e
Faceplate Illumination (Highlight)	10 -	fc
Target Voltagen, P		

Target Voltage ^{n,p} Dark Current ^q Signal-Output Current ^r					-	۷ 4.4
Typical				0.3	-	μ A

- a This capacitance, which effectively is the output impedance of the 7735B, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms
- b Orientation of quality rectangle is obtained when the horizantal scan is essentially parallel to the straight side: of the masked portions of the faceplate. The straight sides are parallel to the place pasaing through the tube axis and short pin. The masking is for orientation only and dows not define the proper scanned aresofthe photoconductive layer.
- Made by Cleveland Electronics Inc., 1974 Esst 61st St., Cleveland, Ohio.
 These components are chosen to provide tule operation with minimum beamlanding error.
- Made by Cinch Manufacturing Corporation, 1026 S. Homan Ave., Chicugo 24, Illinois.
- Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.
- Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid-No.4 and grid-No.3 should be operated above 250 volta.
- h With no blanking voltage on grid No.1.
- Measured with high-gain. low-noise, cascode-input-type amplifier having bandwidth of 5 Mc/s and a peak signal-output current of 0.35 microsapere. Because the noise in such asystem is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight video-signal current to rms noise current, multiplied by a factor of 3.
- k Defined as the per cent of initial value of mignal-output current 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.3 microampere and a dark current of 0.025 microampere.
- ^m The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.
- ⁿ The target voltage for each 7735B must be asjusted to the value which gives the desired operating signal current.
- Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

DATA	2
10-6	5



⁹ The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change is a scanning velocity produces a blacklevel error in direct proportion to the change in scanning velocity. ⁹ Machine the compared of the biablight harder current after the dark.

Pefined as the component of the highlight target current after the darkurrent component has been subtracted.

OPERATING CONSIDERATIONS

Target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube.

Faceplate-temperature should not exceed $71^{\circ}C$ ($160^{\circ}F$), either during operation or storage of the 7735R. Operation with a faceplate temperature in the range from about 25° to $35^{\circ}C$ (77° to $95^{\circ}F$) is recommended.

Provisions should also be made in the camera installation to hold the faceplate temperature of the 7735B at a steady value within the recommended range. Dark current increases with increasing temperature. It is highly desirable to operate the 7735B at a steady temperature to maintain dark current at a preselected value. This mode of operation ensures both optimum and stable day-to-day performance. If such provisions cannot be made, changes in target voltage may be required from time to time to maintain the desired picture quality.

As shown under Uncompensated Horizontal Square-Wave Response, a substantial increase in both limiting resolution and amplitude response of the 7735B may be obtained by increasing the operating voltages on grid No.4 and grid No.3. The focusing-coil field strength must be increased and more deflecting power is required at higher electrode voltages as indicated under Typical Operation and Performance Data.

Operation at higher electrode voltages may introduce additional beam-landing errors that maybe partially compensated for by repositioning the deflecting components. Full compensation may require the application of a modulating voltage of suitable waveform, at both horizontal and vertical scan rates, to the cathode, grid No.1, and grid No.2 of the 7735B.

Dos and Don'ts on Use of RCA-7735R

Dos

1. Adjust camera scanning to utilize maximum useful area of photoconductive layer.

 Orient the vidicon so that horizontal scan is essentially parallel to the plane passing through tube axis and short pin.
 Align electron beam.

4. With lens capped, adjust target voltage for each individual vidicon to the highest value that will still give uniform background.

5. Match any visible raster pattern of photoconductive layer with new scan by reorienting the vidicon as required.

 Use only sufficient beam current to bring out picture highlights.



DATA 2

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7. Open lens iris or increase the scene illumination to obtain the "snappiest" picture without noticeable smear from moving objects. Target voltage should be reduced if light on the tube and'or resultant signal is excessive.

8. Always caplens when transporting camera (see "Don'ts" 5).

Don'ts

1. Don't underscan the photoconductive layer.

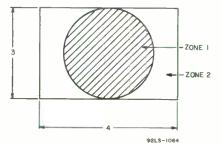
 Don't change camera size and centering controls once the scanned area of photoconductive layer has been properly positioned.

Don't rotate vidicon from its griginal operating position in deflecting yoke.

4. Don't turn beam of vidicon on without normal scanning or remove scanning before beam of vidicon is turned off.

5. DON'T ALLOW IMAGE OF THE SUN OF OTHER VERY INTENSE SOURCE OF ILLUMINATION TO BE FOCUSED ON PHOTOCONDUCTIVE LAYER AT ANY TIME.

SPURIOUS SIGNAL TEST



This text is performed using a uniformly diffused white test pattern that is separated into two zones as shown above. The 7735B is operated under the conditions specified under Typical Operation and Performance Data with the lens adjusted to provide a target current of 0.3 microampere. The 7735B is adjusted to provide maximum picture resolution. Spurious signals are evaluated by size which is represented by equivalent numbers of raster lines in a 525 TV line system. Allowable spot size for each zone is shown in Table 1. To be classified as a spot, a contrast ratio of 1.5:1 must exist for white spots and 2:1 for black spots. Smudges. streaks, ormottled and grainy background must have a contrast ratio of 1.5:1 test.



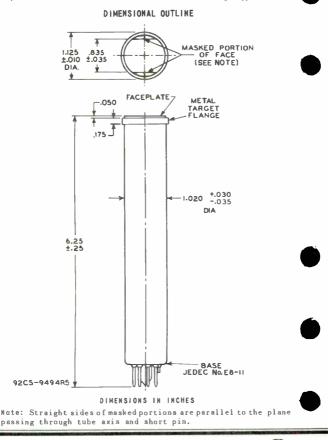
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 3

7735B

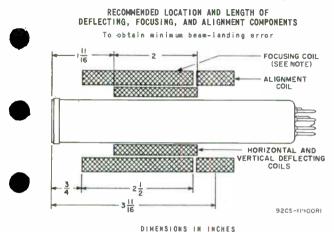
TABLE (For sc	anned area of 1/2"	x 3/8")
Equivalent Number of Raster Lines	ZONE Allowed Spots	ZONE 2 Allowed Spots
Over 3	0	0
3 but not including 1	1	2
l or less	footnote s	footnote \$

Minimum separation between any 2 spots greater than 1 raster line is limited to 16 raster lines.

Spots of this size are allowed unless concentration causes a smudged appearance.

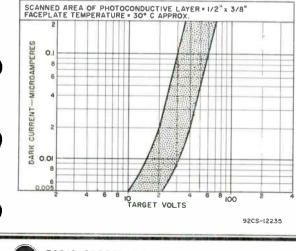


RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



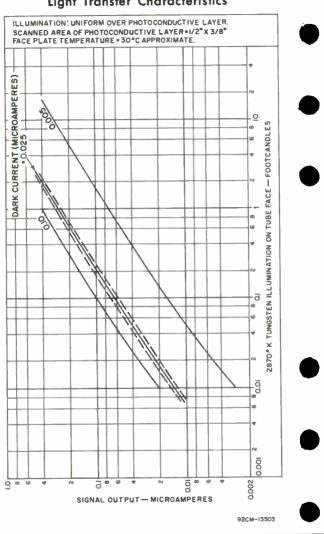
Note: Cross-Hatching indicates wound position of focusing coil.

Range of Dark Current





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 4



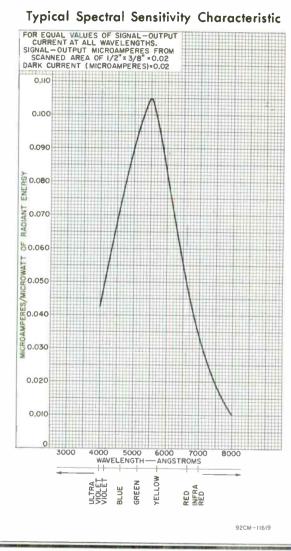
Light Transfer Characteristics

DATA 4

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World Radio History

Harrison, N. J.

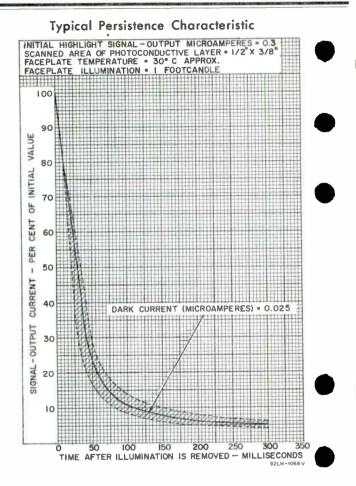


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RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

7735B

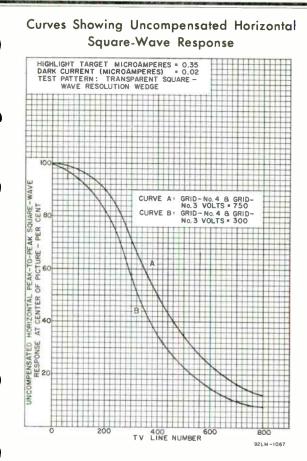




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DATA 5





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

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Second Second

Multiplier Phototube

IO-STAGE, HEAO-ON, SPHERICAL-FACEPLATE TYPE HAVING ENCLOSED, IN-LINE OYNODE STRUCTURE, 1.68"-OIAMETER, SPHERICAL, SEMITRANSPARENT PHOTOCATHOOE, S-II RESPONSE, AND VERY SHORT TIME-RESOLUTION CAPABILITY

OATA

General:
Spectral Response
Wavelength of Maximum Response 4400 ± 500 angstroms
Cathode, Semitransparent:
ShapeSpherica)
Window:
Area (Projected) 2.2 sq.in.
Minimum diameter 1.68 in. Index of refraction 1.51
Direct Interelectrode Capacitances
(Approx.):
Anode to dynode No.10 3.8 $\mu\mu$ f
Anode to all other electrodes 5 muf
Dynode No.10 to all other electrodes. 6.5
Maximum Overall Length
Seated Length
Maximum Diameter
Operating Position
Weight (Approx.)
Bulb
Socket Cinch No.3M14, or equivalent
Base Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)
(JEDEC Group 5, NO.B14-38) Basing Designation for BOTTOM VIEW
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 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 - Internal Con-
nection
Do Not Use
Pin 13 - Focusing Electrode DIRECTION OF LIGHT:
Pin 14 - Photocathode INTO ENO OF BULB
Maximum Ratings, Absolute-Maximum Values:

SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC) . 2500 max. volts



General:

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

DATA I 3-61

7746

SUPPLY VOLTAGE BETWEEN DYNODE No.10				
AND ANODE (DC)	400	max.	volts	
SUPPLY VOLTAGE BETWEEN CONSECUTIVE				
DYMODES (DC)	300	max.	volts	
SUPPLY VOLTAGE BETWEEN DYNODE No.1				
AND CATHODE (DC)	600	max.	volts	
SUPPLY VOLTAGE BETWEEN FOCUSING				
		max.		
AVERAGE ANODE CURRENT ^A				
AMBIENT TEMPERATURE	75	max.	°C	

Characteristics Range Values for Equipment Design:

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table |

With E = 2000 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Nin.	Median	Max.	
Sensitivity:				
Radiant, at 4400		5		
amgstroms	-	9.6×10^{5}	-	amp/watt
Cathode radiant, at				
4400 angstroms	_	0.056		amp/watt
Luminous, at O cps [®] .	200	1200	6000	amp/lumen
Cathode luminous:				
With tungsten				
light source*	50	70	-	µa/lumen
With blue	0.05			
light source∳* Current Amplification .	0.05	4 7 407	-	μa
Equivalent Amplification .	_	1.7 × 10	-	
Equivalent Anode-Dark- Current Input at				
luminous sensitivity				
of 230 amperes/lumen.		$9 \times 10^{-10}_{-12} \\ 6 \times 10^{-9}_{-12} \\ 2 \times 10^{-9}_{-12} \\ 2 \times 10^{-9}_{-12} \\ 2 \times 10^{-9}_{-12} \\ 3 \times 10^{-10}_{-12} \\ 3 \times 10^{-10$	2 5 4 10-9	Jumen
Equivalent Noise Input	_	6 2 10 12	J.J X 10	lumen
Anode-Pulse Rise Time* .	_	2×10^{-9}	_	sec
Greatest Delay Between		2 4 10		000
Anode Pulses:				
Due to position from				
which electrons are				
simultaneously re-				
leased within a circle				
centered on tube face				
having a diameter of-		108		
1.4 [°]	-	3 x 10 100	-	sec
1.4" 1.6"	-	5×10^{-10}	-	sec
With E = 1500 volts (Exc			d focusing	-electrode
voltage adjusted to give				
Contract States and States				-

	Nin.	Nedian	Hax.		
Sensitivity:					
Radiant, at 4400		5			
angstroms	-	1×10^{9}		amp/watt	
Cathode radiant,					•
at 4400 angstroms .	-	0.056	-	amp/watt	
Luminous, at 0 cps [•] .	23	130	680	amp/lumen	

RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

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	Nin.	Nedian	Max.	
Cathode luminous: With tungsten light source* Current Amplification.	50 -	70 1.8 × 10 ⁶	-	µa/lumen
Equivalent Anode-Dark- Current input [®] at luminous sensitivity of 20 amperes/lumen. Equivalent Noise Input [®]	-	8 × 10-10	2.5×10^{-9} 1 × 10 ⁻¹	lumen lumen
Pulse Height Resolution*	_		G	4

With E = 1000 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Min.	Median	Max.	
Sensitivity:				
Radiant, at 4400		3		
angstroms	-	4.3×10^{3}	-	amp/watt
Cathode radiant,				
at 4400 angstroms .	-	0.056	-	amp/watt
Luminous, at 0 cps• .	1	6	30	amp/lumen
Cathode luminous:				
With tungsten				
light source*	50	70	-	µa/lumen
Current Amplification .	-	8.6×10^4		
Equivalent Anode-Dark-				
Current Input [®] at				
luminous sensitivity		10		
of 6 amperes/lumen.	-	5×10^{-10}	-	lumen
Equivalent Noise Input	-	5×10^{-12}	-	lumen

- ▲ Averaged over any interval of 30 second, maximum.
- Under the following conditions: The light source is a turgsten-filament lamp operated at a color temperature of 2870° K. A light input of 0.1 microlumen is used.
- Under the following conditions: The light source is a tungsten-filament lamp 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 logether as snode.
- Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning No.C.S, 5-58, 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 or light flux on the filter is 0.01 luren. A voltage of 200 volts is applied between cathode and all other electrodes cannected together as mode.
- For spectral characteristic of this source, see sheet SPECTRAL CHARACTER-ISTIC OF 2870° K LIGHT SOURCE AND SPICTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING TH"DUGH INDICATED BLUE FILTER at front of this section.
- Measured at a tube temperature of 25° C. Dark current may be reduced by the use of a refrigerant.
- Under the following conditions: Supply voltage (E) is as shown, 25°-C tube temperature, external shield is connected to cathode, bandwidth 1 cycle per second, tungsten light source of 2870° K interrupted at a low audio frequency to produce incident radiation puises alternating between zero and the value stated. The "on" period of the puise is equal to the "off" period. The von" period of the puise.
 - Measured between 10 per cent and 90 per cent of maximum anode-pulse height. This anode-pulse rise time is primarily a function of transittime variations in the multiplier stages and is measured under conditions with an incident-light spot approximately 1 millimeter in diameter centered on the photocathode.



RADIO CORPORATION OF AMERICA Electron Tube Division World Performission, N. J. 7746

- These values 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.
- Heasured with supply voltage (E) = 1200 to 1300 volts; radiation source, an isotope of cesium having an atomic mass of 137 (Cs¹³⁷); scintillation counter crystal, a cylindrical 2* x 2* thallium-activated sodium-iode type [kg[171] — type 80850, Scral No.Al281, manufactured by Harshaw Cherical Co., 1985 E. 97 Street, Cleveland 6, Ohiol.

VOLTAGE TO BE PROVIDED	BY DIVIDER
Between	8.06% of Supply Voltage (E) multiplied by
Cathode and Dynode No.1	2
Dynode No.1 and Dynode No.2	1.4
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Anode	1
Anode and Cathode	12.4

TABLE 1

Focusing electrode is connected to arm of potentiometer between cathode and dynode No.1. The focusing-electrode voltage is varied to give maximum current amplification.

OPERATING CONSIDERATIONS

The operating stability of the 7746 is dependent on the magnitude of the anode current and its duration. When the 7746 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 7746 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anone current well below the maximumrated value of 2 milliamperes is recommended when stability of operation is important. When maximum stability is required, the average anode current should not exceed 10 microamperes.

Electrostatic and/or magnetic shielding of the 7746 may be necessary.

Adequate *light shielding* should be provided to prevent extraneous light from reaching any part of the 7746.





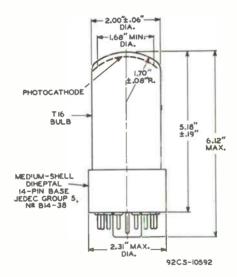
RADIO CORPORATION OF AMERICA Electron Tube Division Word Rector Island





The high voltages at which the 7746 is operated are very dangerous. Care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Precautions should include the enclosure of high-potential terminals and the use of interlock switches to break the primary circuit of the high-voltage power supply when access to the apparatus is required.

SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-11 Response is shown at front of this Section

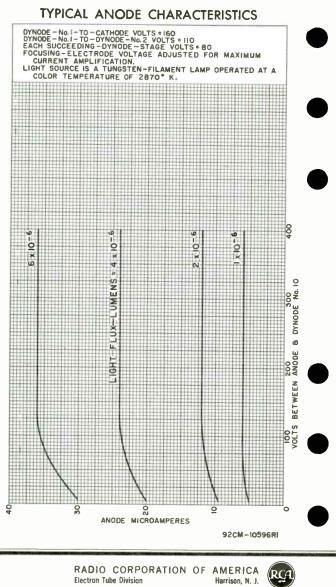


CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2^{O} , N ANY DIRECTION FROM THE PERPENDICULAP ERECTED AT THE CENTER OF BOTTOM OF THE BASE.



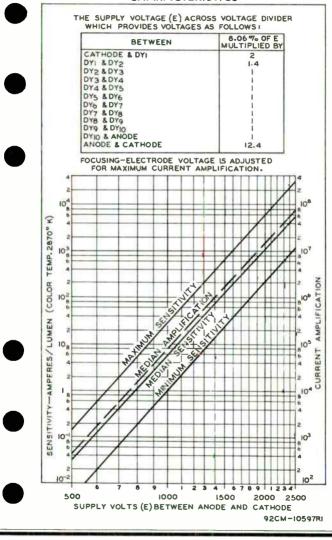
RADIO CORPORATION OF AMERICA Electron Table Division Harrison, N. J. DATA 3 3~61





World Radio History

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World Radio History

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Electron Tube Division

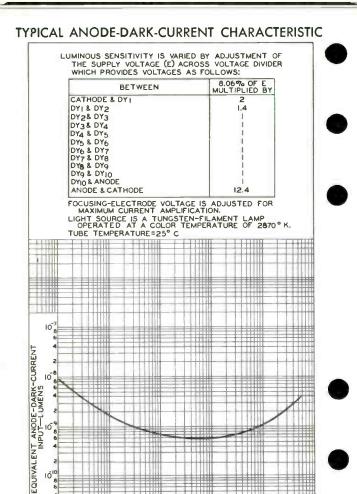
CHARACTERISTICS

7746

4 2 10¹¹

0.1

6.8



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LUMINOUS SENSITIVITY-AMPERES / LUMEN



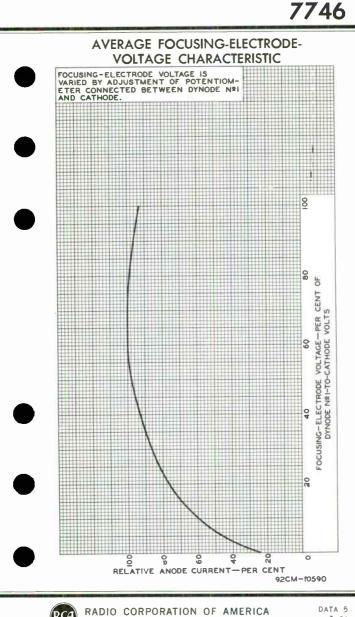
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92CM-10593RI

10000

68

1000



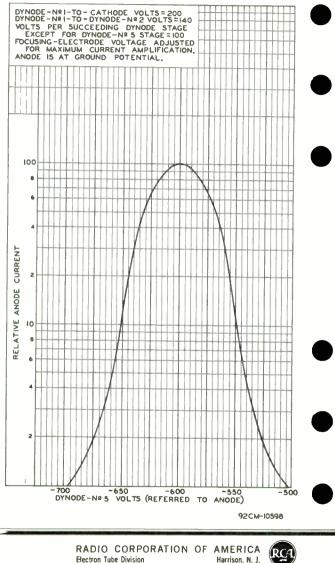
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Multiplier Phototube

6-STAGE, HEAD-ON, FLAT-FACEPLATE, COMPACT TYPE HAVING IN-LINE DYNODE STRUCTURE, 0.5"-DIAMETER CURVED, CIR-CULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

n	۸.	٠	۸.
υ.	A	J.	A

	Spectral Response
	Wavelength of Maximum Response 4400 ± 500 angstroms
	Cathode, Semitransparent:
	Shape
	Window:
	Area 0.2 sq. in.
	Minimum diameter 0.5 in.
	Index of refraction 1.51
	Direct Interelectrode Capacitances (Approx.):
,	Anode to dynode No.6
	Anode to all other electrodes 2.8 $\mu\mu f$
	Maximum Overall Length
	Seated Length
	Maximum Diameter
	Operating Position
	Weight (Approx.)
	Bulb
	Socket
	Base
	Basing Designation for BOTTOM VIEW

Pin 1 - Dynode No.1 Pin 2 - Dynode No.3 Pin 3-Dynode No.5 Pin 4 – Anode Pin 5-Dynode No.6 Pin 6 - Dynode No.4

General:



Pin 7 - Dynode No.2 Pin 8 - Internal Connection---Do Not Use Pin 9 - Photocathode

Maximum Ratings, Absolute-Maximum Values:

CATHODE (DC or Peak AC)	
SUPPLY VOLTAGE BETWEEN DYNODE No.6	
AND ANODE (DC or Peak AC)	S
SUPPLY VOLTAGE BETWEEN CONSECUTIVE	
DYNODES (DC or Peak AC) 200 max. volt	s
SUPPLY VOLTAGE BETWEEN DYNODE No.1	
AND CATHODE (DC or Peak AC) 400 max. volt	s
AVERAGE ANODE CURRENT	a
AMBIENT TEMPERATURE	Ç



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

Harrison, N. J.

Characteristics Range Values for Equipment Design:

Under conditions with dc supply voltage (E) across a voltage divider providing 1/4 of E between cathode and dynode No.1; 1/8 of E for each succeeding stage; and 1/8 of E between dynode No.6 and anode

With E = 1200 volts (Except as noted)

Sensitivity; Radiant, at 4400	Mın.	Hedian	Hax.	
angstroms Cathode radiant, at		0.00024	-	amp/µw
4400 angstroms Luminous, at 0 cps ^e .	. 0.1	0.048	1.0	amp/watt amp/lumen
Cathode luminous: With tungsten		ŕ		
light source* . With blue light		60	-	µa/lumen
source♥* Current Amplification.		0.06 5 x 10 ³	_	μa
Equivalent Anode- Dark-Çurrent				
Input ⁴ Equivalent Noise	. –	1×10^{-8}		lumen
Input · · · · · ·	•	3 × 10-10	1×10^{-9}	lumen

Averaged over any interval of 30 seconds maximum.

Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 28700 k. A light input of 10 microlumens is used. The load resistor has a value of 0.01 megohm.

Under the following conditions: The light source is a tungsten-filament lamp 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 together as anode.

Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning, Glass Code No.5113 polished tin 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870⁰ K. The value of light flux on the filter is 0.01 umen. The load resistor has a value of 0.01 megohm and 200 volts are applied between cathode and all other electrodes connected Under together as anode.

For spectral characteristic of this source, see sheet SPECTRAL CHAR-ACTERISTIC OF 2870° K LIGHT SOURCEAND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTR BL front of this section.

Measured at a tube temperature of 25^0 C and with the supply voltage (() adjusted to give a luminous sensitivity of 0.3 ampere per lumen. Dark current may be reduced by the use of a refrigerant.

Under the following conditions: Supply voltage (E) is as shown, 250-C Under the following conditions: Supply voltage (E) is as shown, 25--c tube temperature, external shield is connected to cathode, bandwidth i cycle per second, tungsten light source of 2870° k interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the valuestated. The 'on' period of the pulses equal to the 'off' period. The output current is measured through a filter which passes only the fundamental frequency of the pulses

OPERATING CONSIDERATIONS

The use of an average anode current will below the maximum-rated value of 0.5 milliampere is recommended when stability of operation is important.

Electron Tube Division



RADIO CORPORATION OF AMERICA Harrison, N. J.



Electrostatic and/or magnetic shielding of the 7764 may be necessary.

The high voltages at which the 7764 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.

> SPECTRAL-SENSITIVITY CHARACTERISTIC of Phototube having S-II Response is shown at front of this Section

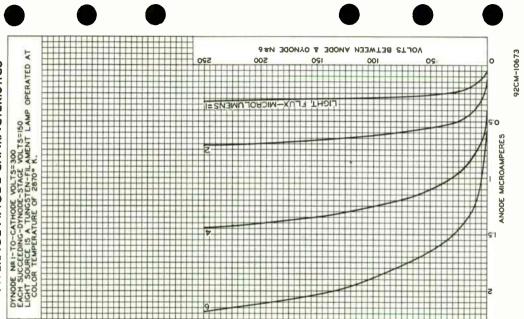
.735" ±.020' DIA. .5" MIN DIA. __J PHOTOCATHODE 2.18 2.75" MAX Τ6 BULB SMALL-BUTTON NINAR 9-PIN BASE JEDEC Nº E9-37 UUUU .78* MAX. DIA. 92CS-10696



RADIO CORPORATION OF AMERICA Electron Tube Division DATA 2



CHARACTERISTICS ANODE AVERAGE



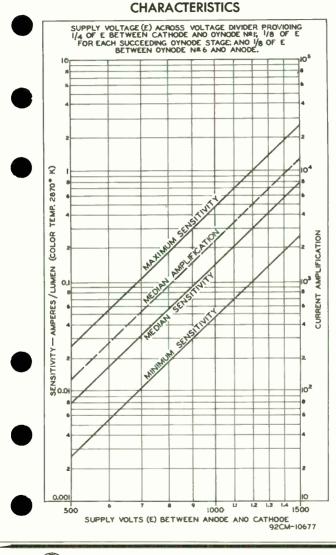
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CORPORATION

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7764

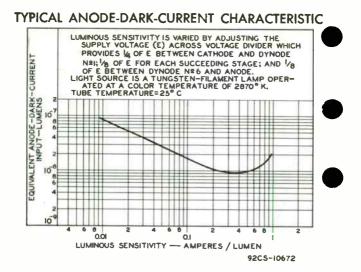


RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

DATA 3 10-60

7764



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



Multiplier Phototube

IO-STAGE, HEAD-ON, IN-LINE FLAT-FACEPLATE DYNODE STRUCTURE For Low-Level Light Applications having Space Restrictions Encountered in Geological Exploration and Biological Tracer Studies DATA General: Spectral Response. S-11 Wavelength of Maximum Response 4400 ± 500 angstroms Curved. €ircular Minimum area C.2 sq. in. Minimum diameter 0.5 in. Window Lime Glass (Corning^a No.0080). or equivalent Index of refraction. 1.51 . Copper—Beryllium Direct Interelectrode Capacitances (Approx.): Anode to dynade No.10. . . 2.4 pf Dynode No.6 to all other electrodes. 4.3 pf Dynode No.4 to all other electrodes. 4.6 nf Maximum Overall Length Maximum Diameter 0.78" Base Small-Button Thirteenar 12-Semiflexible Lead. (JECEC No.E12-72), and Protective Plastic Shell Lead 1 - Uynode No.1 Lead 2 - Dynode No.3 (5 Lead 3 - Dynode No.5 Lead 4 - Dynode No.7 (9) (4 Lead 5 - Dynode No.9 6 Lead 6 - Anode Lead 7 - Dynode No.10 $(\mathbf{3})$ T Lead 8-Dynode No.8 (2 Lead 9-Dynode No.6 (12) Lead 10 - Dynode No.4 Lead 11 - Dynode No.2 DIRECTION OF RADIATION: Lead 12 - Photocathode INTO END DF BULB Maximum Ratings, Absolute-Maximum Values: SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC or Peak AC). . . 1500 max. volts



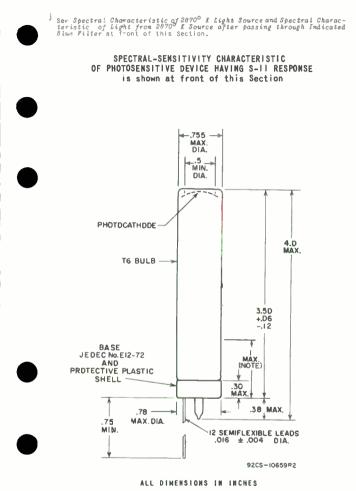
RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J. DATA | 7-63

Indicates a change.

SUPPLY VOLTAGE BETWEEN DYNC No.10 AND ANODE (DC or Pe SUPPLY VOLTAGE BETWEEN CONS DYNODES (DC or Peak AC). SUPPLY VOLTAGE BETWEEN DYNC AND CATHODE (DC or Peak A AVERAGE ANODE CURRENT • AMBIENT TEMPERATURE. Characteristics Range Value	eak AC). SECUTIVE DDE No.1 AC).		max. max. max.	volts volts volts ma oC
Under conditions with o voltage divider provio and dynode No.1; 1/12 o stage, and 1/12 of E bo With E = 1250 volts (Except	ling 1/6 o of E for ea etween dyn c as noted)	of E between ach succeedin ode No.10 an	i cathodi ng dynodi nd anode	e
	Min.	Typical	Max.	
Sensitivity: Radiant at 4400 angstroms Cathode radiant,at	_	1.28×10 ⁴	_	a/w
4400 angstroms	-	0.048	-	a/w
Luminous: At O cps ^d Cathode luminous: With tungsten	7	16	60	a/lm
light source ^e	4×10 ⁻⁵	6×10 ⁻⁵	-	a/lm
With blue light source f,j Current Amplification Equivalent Anode-Dark- Current Input at a	4×10 ⁻⁸	6x10 ⁻⁸ 2.67x10 ⁵	-	a
luminous sensitivity of 7.5 a/lm ⁹ Equivalent Noise Input ^h .		5×10-10 3×10-12	5×10 ⁻⁹ 1×10 ⁻¹¹	lm lm
 A Made by Corning Glass Works, C Magnetic shielding material from the Magnetic Shield Divis Opera Bidg., 20 North Wacker C Averaged over any interval of Under the following conditions: lamp haying a lime-glass envelto of 2870° K and a light input o 	n the form sion, Perfec Drive, Chica 30 seconds : The light ope. It is o of 10 microl	of foil or tay tion Mica Comp go 6, Illinois maximum. source is a tu perated at a co umens is used.	ngsten-fil lor temper	ament rature
Under the following conditions: lamp haying a lime-glass envelt of 2870° K. The value of lig applied between cathode and 2 Under the following conditions mitted through a blue filter polished to 1/2 stock thickness. Corning, New York, from a tur temperature of 2870° K. The vi is 0.01 lumen and 200 volts a electrodes connected as anode	: The light ope, Itiso of flux is all other el (Corning C.S — Manufactur ngsten-filam alue of ligh ire applied l	source is a tu perated at a co 0.01 lumen and ectrodes conn	ngsten-fil lor temper g 200 volt ected as a	lament rature s are node.
e inctrodes connecteu as andue 9 At a tube temperature of 25° a refrigerant. Uncer the following condition tube temperature, external interrupted at a low audio pusses alternating between ze of the putse is equal to the	C. Dark cur	rent may be re	duced by	use of

RADIO CORPORATION OF AMERICA Electron Tube Division d Radio History Harrison, N. J.

RC



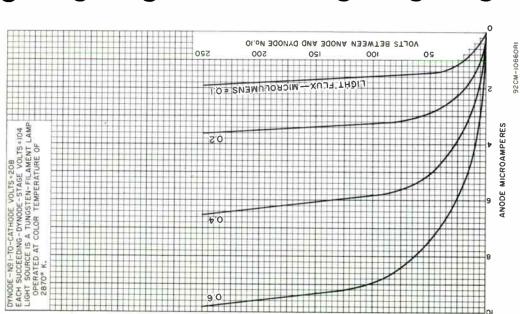
NOTE: WITHIN THIS LENGTH, MAXIMUM DIAMETER DE TUBE IS 0.78".



RADIO CORPORATION OF AMERICA Electron Tube Division World Racio History, Harrisen, N. J.

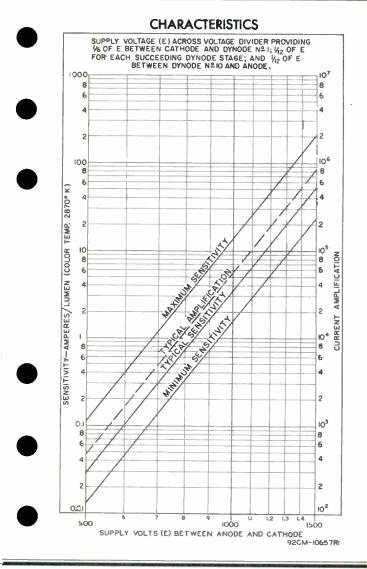
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CHARACTERISTICS ANODE TYPICAL





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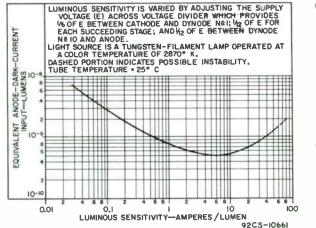




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DATA 3 7-63

TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC





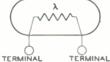
Photoconductive Cell

CADMIUM-SELENIDE, HEAD-ON TYPE

DATA

General:

Spectral Response.	• •		 . See Accompanying Curve
Wavelength of Maxim	num R	esponse	 . 7300 ± 500 angstroms
Sensitive Surface:			
Shape			 Rectangular
			0.220" ± 0.015"
			0.008" ± 0.003"
			0.0C176 sq. in.
			eads)
			0.29" ± 0.01"
			•••• Glass
			Hermetic
Mininum length .			 1.5"
Diameter			 0.016" = 0.003"
Operating Position			
Weight (Approx.) .			



DIRECTION OF LIGHT: INTO END OF BULB

 λ -indicates that the primary characteristic of the element within the envelope symbol is designed to vary under the influence of light.

Maximum Ratings, Absolute-Naximum Values:

VOLTAGE BETWEEN TER	MS	IN/	ALS	S							
(DC or Peak AC).											
PHCTOC'JRRENT									1000	max.	μa
POWER DISSIPATION.									30	max.	mw
AMBIENT TEMPERATURE									50	max.	°C

Characteristics:

	With minal	dc vo s ano	olta i an	ige ai	of nb1	22. ent	.5 νο! temp:	ts betwee rature of	enter of 25 ⁰	C C
							Min	Nedian	Nax.	
	ant≜ at									
	astroms.							6550	-	a/w
	nous®,*.							41	_	a/lm
	mination							500	_	µa/fc
Photoc	urrent♥.	• •			• •	•	-	-	0.05	μa

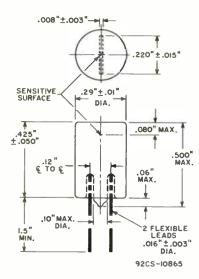


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Harrison, N. J.

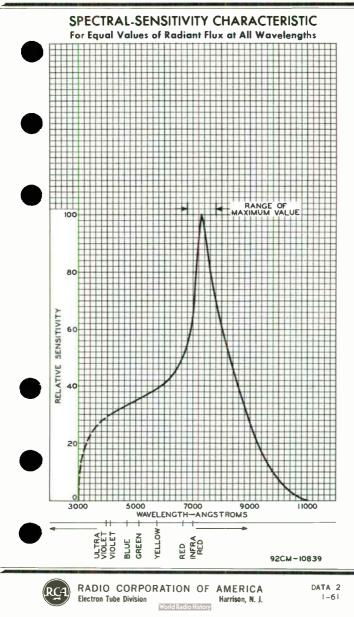
World Radio History

- A For conditions where the incident power is 7.65 x 10^{-10} watts.
- For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K.
- Incident illumination on the sensitive surface is 0.01 footcandle. Neasured 20 seconds after removal of incident-illumination level of 0.01 footcandle.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.





World Radio History

Multiplier Phototube



General:

12-STAGE, HEAD-ON, SPHERICAL-FACEPLATE TYPE HAVING ENCLOSED, IN-LINE DYNODE STRUCTURE, I.68"-DIAMETER, SPHERICAL, SEMITRANSPARENT PHOTOCATHODE, S-II RESPONSE, HIGH CURRENT AMPLIFICATION, AND EXTREMELY SHORT RISE TIME

DATA

deneral:
Spectral Response
Shape
Area (Projected) 2.2 sq. in. Minimum diameter 1.68 in. Index of refraction. 1.51
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Bulb
Pin 1 - No Connection Pin 2 - Dynode No.1 Pin 3 - Dynode No.5 Pin 5 - Dynode No.7 Pin 6 - Dynode No.7 Pin 6 - Dynode No.9 Pin 7 - Dynode No.11 Pin 8 - Anode Pin 9 - No Connection Pin 11 - No Connection Pin 12 - Dynode No.12 Pin 13 - Dynode No.12 Pin 15 - Dynode No.6 Pin 16 - Dynode No.2 Pin 18 - No Connection Pin 18 - No Connection Pin 19 - Grid No.1 Pin 19 - Grid No.1
Ficusing Electrode) Pin 20 - Photocathode



RADIO CORPORATION OF AMERICA **Electron Tube Division**

DATA I 5-61

Harrison, N. J.

Maximum Ratings, Absolute-Maximum Values:

SUPPLY VOLTAGE BETWEEN ANODE AND	
CATHODE (DC)	
SUPPLY VOLTAGE BETWEEN DYNODE No.12	
AND ANODE (DC) 400 max. volts	-
SUPPLY VOLTAGE BETWEEN CONSECUTIVE	
DYNODES (DC)	
SUPPLY VOLTAGE BETWEEN DYNODE No.1	
AND CATHODE (DC) 600 max. volts	
SUPPLY VOLTAGE BETWEEN FOCUSING	
ELECTRODE AND CATHODE (OC) 600 max. volts	
AVERAGE ANODE CURRENT ^b 2 max. ma	-
AMBIENT TEMPERATURE	

Characteristics Range Values for Equipment Design:

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table 1 With $E = a_{300}$ volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Hin.	Median	Max.	
Sensitivity:				
Radiant, at 4400				
angstroms	April 1	4.8 x 10 ⁶	_	a/w
Cathode radiant, at				
4400 angstroms	-	0.056	_	a/w
Luminous, at 0 cps ^c .	1.4×10^{3}	6×10^{3}	50×10^3	a/lm
Cathode luminous:				
With tungsten				
light source ^d	50	70		µa/lm
With blue light				,
source ^{e, f}	0.05	-	_	μa
Current Amplification.	_	8.6×10^{7}	-	,
Equivalent Anode-Dark-				
Current Input [®] at				
luminous sensitiv-			_	
ity of 6000 a/lm	-	4 x 10-10	2.5×10^{-9}) lm 👝
Equivalent Noise Input ^h	-	3×10^{-12}	-	l m l
Anode-Pulse Rise Time .	-	2 x 10 ⁻⁹	-	sec
Greatest Delay Between				
Anode Pulses:				
Due to position from				
which electrons are				
simultaneously re-				
leased within a circle centered on tube face	•			
having a diameter of-				•
1.4"		2 10-10k		
1.6"	-	3 × 10-10 ^k 5 × 10-10k	-	sec
···· · · · · · · · · · · · · · · · · ·	-	0 X TO .0%	-	sec

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World Radio History

	With E = 1800 volts (Exc voltage adjusted to give					trode
		Ni	n. Ne	dian	Nax.	
	Sensitivity: Radiant, at 4400 angstroms	•	- 5.1	× 10 ⁵		a/w
	Cathode radiant, at 4400 angstroms			.056		a/w
	Luminous, at 0 cps ^c Cathode luminous: With tungsten	•	- 6	940	-	a/lm
•	light source ^d Current Amplification Equivalent Anode-Dark- Current Input ^g at		0 - 9.1	70 × 10 ⁶	_	µa/lm
	luminous sensitivity of 160 a/lm Equivalent Noise Input ^h .	•		10-10 × 10-12	_	lm 1m
	With E = 13co volts (Exc voltage adjusted to give					ctrode
		Ni	n. Ne	dian	Nax.	
	Sensitivity: Radiant, at 4400 angstroms Cathode radiant.		- 2.9	× 10 ⁴	_	a/w
	at 4400 angstroms Luminous, at 0 cps ^c Cathode luminous:	•		.056 36	300	a/w a/lm
	With tungsten light source ^d Current Amplification. Equivalent Anode-Dark- Current Input ^g at luminous sensitivity		50 ~ 5 :	70 × 10 ⁵	_	µa/îm
	of 9 a/lm Equivalent Noise Input ^h . Pulse Height Resolution		- 3×	10 ⁻¹⁰ 10 ⁻¹² 8.5	2 × 10-9 - -	lm lm %
	 a Made by Cinch Manufacturi Chicago 24, []]inols. b Averaged over any Interval 	of 30	seconds ma	×lmum.		
	C Under the following cond filament lamp operated at input of 0.1 microlumen is					
	Under the following cond filament lamp operated at of input flux is 0.01 lume and all other electrodes c	onnecte	a together	as anode.		
	^e Under the following condi- transmitted through a blu No.513 pollshed to 1/2 s lamp operated at a color flux on the filter is 0.0 between cathode and all of f	tions: e filt stock t tempera 1 lumen ther el-	Light in er (Cornin hickness) ture of 28 . A volta ectrodes co	ncident on g C.S. No.5 from a tun 70° K. The ige of 200 v prinected to	the cath i-58, Glas igstem-fl e value of volts is a gether as	ode is s Code lament light anode.

For spectral characteristic of this source, see sheet SPERTRAL CHAR-ACTERISTIC OF 2070° K LIGHT SOURCE AND SPECTRAL CHARACTERISTIC OF LIGHT FROM 2870° K SOURCE AFTER PASSING THROUGH INDICATED BLUE FILTER at front of this section.



7850

- 9 Measured at a tube temperature of 25⁰ C. Dark current may be reduced by the use of a refrigerant.
- Under the following conditions: Supply voltage (E) is as shown, 25^o-C tube temperature, external shield is connected to cathode, bandwidth 1 cycle per second, tungsten light source 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. 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 primarily a function of transittime variations in the multipiler stages and is measured under conditions with an incident light spot approximately 1 millimeter in diameter centered on the photocathode.
- These values 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.
- from the center and from the periphery of the specified distance of th

Between	6.95% of Supply Voltage (E) multiplied by
Cathode and Dynode No.1	2
Dynode No.1 and Dynode No.2	1.4
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Dynode No.11	1
Dynode No.11 and Dynode No.12	1
Dynoge No.12 and Anode	1
Anode and Cathode	14.4

between cathode and dynode No.1. The focusing-electrode vo'tage is varied to give maximum current amplification.

TABLE |

RADIO CORPORATION OF AMERICA Electron Tube Division History Harrison, N. J.



OPERATING CONSIDERATIONS

The operating stability of the 7850 is dependent on the magnitude of the anode current and its duration. When the 7850 is operated at high average values of anode current, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 7850 usually recovers a substantial percentage of such loss in sensitivity.

The use of an average anode current well below the maximum-rated value of 2 milliamperHs is recommended when stability of operation is important. When maximum stability is required, the average anode current should not exceed 10 microamperes.

Electrostatic and/or magnetic shielding of the 7850 may be necessary.

Adequate *light shielding* should be provided to prevent extraneous light from reaching any part of the 7850-

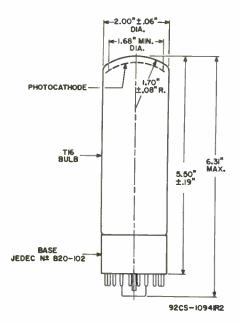
The high voltages at which the 7850 is operated are very dangerous. Care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Precautions should include the enclosure of high-potential terminals and the use of interlock switches to break the primary circuit of the high-voltage power supply when access to the apparatus is required.

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



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7850

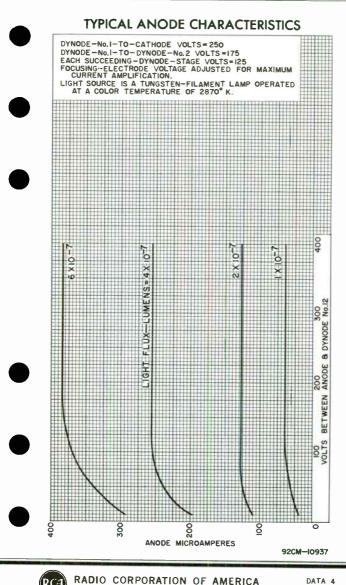


CENTER LINE OF BULB WILL NOT OEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.





RADIO CORPORATION OF AMERICA **Electron Tube Division**



Electron Tube Division World Radio History

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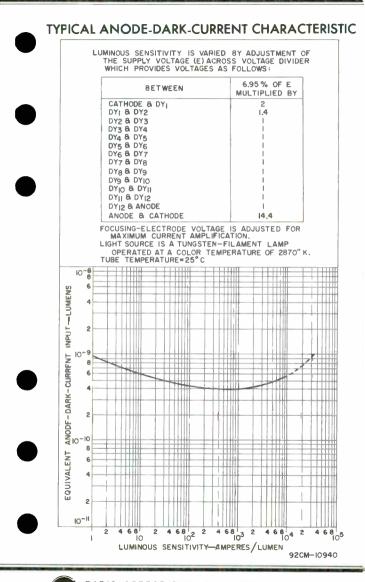
Harrison, N. J.

CHARACTERISTICS

THE SUPPLY VOLTAGE (E) ACROSS VOLTAGE DIVIDER WHICH PROVIDES VOLTAGES AS FOLLOWS : 6.95 % OF E BETWEEN MULTIPLIED BY CATHODE & DY 2 DY1 & DY2 1.4 DY2 & DY3 DY3 8 DY4 DY4 & DY5 DY5 & DY6 DY6 8 DY7 DY7 & DY8 DYA & DYA DY9 & DYIO DYIO & DYII DYIL & DYI2 DY12 & ANODE ANODE & CATHODE 14.4 FOCUSING-ELECTRODE VOLTAGE IS ADJUSTED FOR MAXIMUM CURRENT AMPLIFICATION. 1058 8109 Ŷ 6 6 4 4 SENSITIVITY---AMPERES/LUMEN (COLOR TEMPERATURE 2870° 2 2 104 SENSTUT ID⁸ A 8 - ANRIE CALON 6 6 4 4 WAT INUM 2 2 AMPLIFICATION ID³ 107 WE DIAN A Ŕ 8 6 6 4 4 WINING 2 2 CURRENT 10² 106 8 8 6 6 4 4 2 2 10 105 8 6 6 4 4 2 104 E 8 9 I 3000 2 з 4 5 234567 6 8 9 1 1000 2000 SUPPLY VOLTS (E) BETWEEN ANODE AND CATHODE 92CM-10946

> RADIO CORPORATION OF AMERICA Electron Tube Division or America Harrison, N. J.

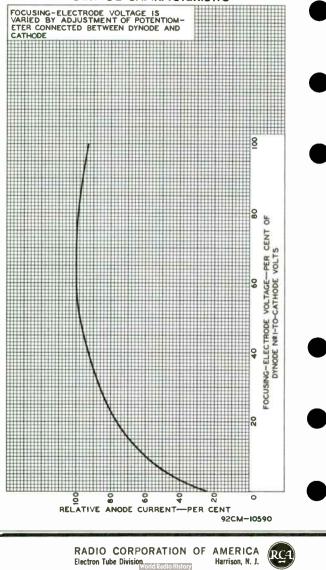


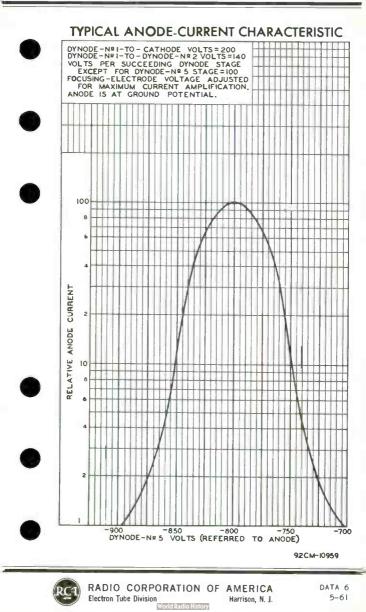




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AVERAGE FOCUSING-ELECTRODE-VOLTAGE CHARACTERISTIC





- - -

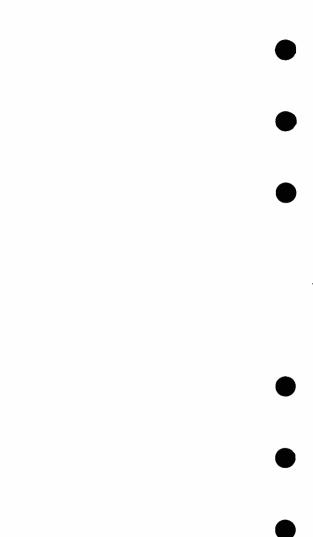


Image Orthicon

SEMICONDUCTIVE TARGET, S-20 RESPONSE VERY HIGH SENSITIVITY MAGNETIC FOCUS VERY HIGH RESOLUTION MAGNETIC DEFLECTION

> For Extremely Low-Light-Level Black-and-White TV Pickep High-Resolution Pictures at 10^{-5} Foot-candle, and Useful Pictures at 10^{-6} Footcandle

DATA

General:
Heater, for Unipotential Cathode: Voltage (#C or DC)
Ancde to all wther electrodes
Useful size of
Orientation of Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of faceplate and pin 7 of the shoulder base.
Focusing Method Magnetic Deflection Method
Deflecting-Coil Length
Focusing Coil Length
 Alignment-Coil Length



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Shoulder Base	
BOTTOM VIEW	_
Pin 1 -Grid No.6 Pin 5 -Grid No.5 Pin 2 - Photocathode Pin 6 - Target Pin 3 - Do Not Use Pin 7 - Do Not Use Pin 4 - Do Not Use End Base Small-Shell Diheptal 14-Pin (JEDEC No.B14-45)	
BOTTOM VIEW	
Pin 1 - Heater Pin 2 - Grid No.4 Pin 3 - Grid No.3 Pin 4 - Do Not Use Pin 6 - Dynode No.2 Pin 6 - Dynode No.5 Pin 9 - Dynode No.5 Pin 9 - Dynode No.1, Grid No.2 Pin 11 - Do Not Use Pin 12 - Grid No.1 Pin 13 - Cathode Pin 14 - Heater DIFECTION OF LIGHT: PREFENDICULAR TO DIFECTION OF LIGHT: PREFENDICULAR TO PREFENDICULAR TO PREFENDICULAR TO DIFECTION OF LIGHT: PREFENDICULAR TO DIFECTION OF LIGHT: PREFENDICULAR TO PREFENDICULAR TO PREFEN	
Maximum and Minimum Ratings, Absolute-Kaximum Values:	
PHOTOCATHODE: Voltage	
ILLUMINATION fc OPERATING TEMPERATURE:	
Any part of bulb	
(Target section) 0 min. ^o C TEMPERATURE DIFFERENCE:	
Between target section and any part of bulb hotter than	
target section	
Fositive value 4 max. volts	
Negative value 10 max. volts	
GRID-No.5 VOLTAGE	
GRID-No.4 VOLTAGE	
GR ID-No.3 VOLTAGE	
Negative bias value	
Positive bias value	
VOLTAGE PER MULTIPLIER STAGE	
ANODE-SUPPLY VOLTAGE ^c 1350 max. volts	

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



PEAK HEATER-CATH Heater negativ Heater positiv	e with e with	n re	spec spec	t to t to	o cat	thode. thode.	. 125 . 10	max. volts max. volts
Typical Operatin Photocathode Vol (Image Focus). Grid-No.6 Voltag (Approx. 75% p	tage e (Acc	ele	 rato	r)-	•••	•••	-400 to	-540 volts
voltage) Target-Cutoff Vc Grid-No.5 Voltag Grid-No.4 Voltag Grid-No.2 Voltag Grid-No.2 & Dyno Grid-No.1 Voltag	ltage e (Dec e (Bea ef de-No.	ele um Fi	rato ocus	r).)	· · · ·	•••	-300 to -3 to 0 to 140 to 225 to 300	1 volts 125 volts 180 volts 330 volts
Picture Cutoff Dynode-No.2 Volt Dynode-No.3 Volt Dynode-No.4 Volt Dynode-No.5 Volt Anode Voltage. Minimum Peak-to-	age. age. age. age.	•	• • • •	· ·	· · · · · · · · · · · · · · · · · · ·		-45 to 600 800 1000 1200 1250	volts volts volts volts volts
Blanking Volta Field Strength a Center of Focu Field Strength o	ge t sing C	loil	⁹ .			• •	5 75	volts gæusses
Alignment Coil Performance Data		٠	• •	•••	• •	•••	0 to	3 gausses
With co ting Vo	onditio ilues d	ınd	with	an	11/1	umenat	al Oper ion lev ootcand	el
					Min.	Ty	þ. Max	
€athode Radiant Sensitivity at 4200 angstroms Luminous Sensi-			•••		_	G.07	13 -	a/w
tivity Anode Current (D Signal-Output Current (Peak		•••	•••		120	170 0.3	-	μa/lm μa
to Peak) Ratio of Peak-to Peak Highlight Video-Signal Current to RMS Noise Current for Bandwidth	- of			•	~~	D.1		μa
4.5 Mc Limiting Hori-	• • •	• •	•••	•	-	3:1	-	
zontal Resolut	ion .	• •			-	650) _	TV Lines

RADIO CORPORATION OF AMERICA **Electronic Components and Devices** Harrison, N. J. World Radio History

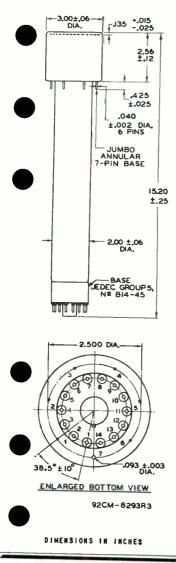
DATA 2 9-63

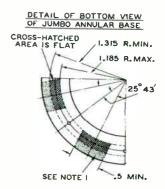
- ^a Made by Cleveland Electronics Inc., 1974 East 61st Street, Cleveland, Orio.
- Mæde by Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago 24, Illinois. ь
- C Dynode voltage values are shown under Typical Operating Values.
- With 7967 operated in properly adjusted RCA TK-31 camera.
- Normal setting of target voltage is +2 volts from target cutoff. target supply voltage should be adjustable from +3 to 5 volts. The
- f Adjust to give the most uniformly shaded picture near maximum signal. 9 Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with indicator located outside of and at the image end of the focusing coil.
- ${f h}$ with output from the 7967 coupled into a low-noise video amplifier.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-20 Response is shown at front of this Section



RADIO CORPORATION OF AMERICA Harrison, N. J. Electronic Components and Devices





NOTE 1: OOTTED AREA IS FLAT OR EXTENCS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

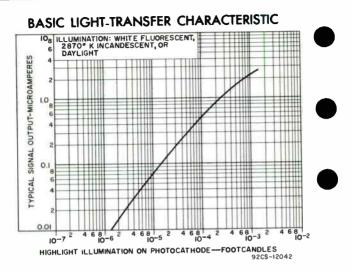
ANNULAR BASE GAUGE

Angular variations between pins as well as eccentricity of neck cylirder with respect to photocathode cylinder are held to tolerances such that pins and neck cylinder will fit flatplate gauge with:

- a. Six holes having diameter of $0.065^{\circ}\pm0.001^{\circ\prime\prime}$ and one hole having diameter of $0.150^{\circ\prime}\pm0.001^{\circ\prime\prime}$. All holes have depth of $0.265^{\circ\prime\prime}\pm0.001^{\circ\prime\prime}$. The six $0.065^{\circ\prime\prime}$ holes are enlarged by $45^{\circ\prime}$ taper to depth of $0.047^{\circ\prime\prime}$. All holes are spaced at angles of $51^{\circ}26^{\prime\prime}\pm5^{\prime\prime}$ on circle diameter of $2.500^{\circ\prime}\pm0.001^{\circ\prime}$.
- b. Seven stops having height of 0.187^s ± 0.001", centered between pin holes, to bear against flat areas of base.
- c. Rim extending out a minimum of 0.125" from 2.812" diameter and having height of 0.126" ± 0.001".
- Neck-cylinder|clearance hole having diameter of 2.200" ± 0.001".



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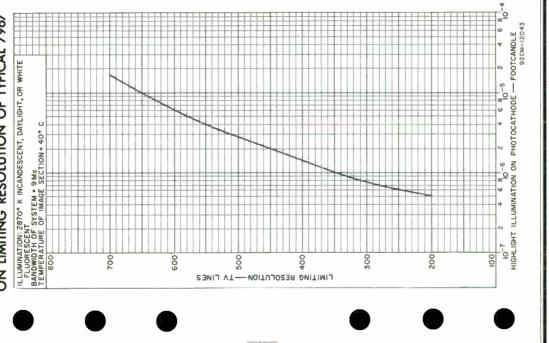


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ILLUMINATION PHOTOCATHODE | RESOLUTION OF LIMITING Ö 5 EFFE ON LI



DATA 4 9-63

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AMERIC Harrison, N.

5

CORPORATION Components and Devices

RADIO Electronic

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Vidicon

1-1/2" DIAMETER

MAGNETIC DEFLECTION

MAGNETIC FOCUS

For Broadcast Film-Pickup or Data Transmission with Color or Black-and-White TV Cameras Requiring Resolutions of more than 1200 TV Lines

General:

deneral.	
Heater, for Unipotential Cathode: Voltage (A2 or DC)	
Photoconductive Layer: Maximum useful diagonal of rectancular image (4 × 3 aspect ratio) ^b	
Basing Designation for BOTTOM VIEW	
Maximum Ratings. Absolute-Maximum Values: For scanned area of c.6" x 0.8"	
Grid-No.4 Voltage	

Grid-No.4	Vcltage.								+	+	1500	volts
Grid-No.3	Vcltage.										15(40	volts
					_			-	1 n	dic	ates a	change.



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Harrison, N. J.

DATA I 4-65

Grid-No.2 Voltage.550 voltsNegative-bias value.300 voltsPositive-bias value.0 voltsPeak Heater-Cathode Voltage:125 voltsHeater negative with respect to cathode.125 voltsHeater negative with respect to cathode.10 voltsDark Current .0.25 μ aPeak Target Current f0.060 μ aFaceplate:111 umination111 umination1000 fcTorpical Operation:1000 voltsGrid-No.4 (Decelerator) Voltage .1400 voltsGrid-No.3 (Beam-Focus Electrode) Voltage .300 voltsGrid-No.4 (Decelerator) Voltage .0.65Minimum Peak-to-Peak Blanking Voltage:0.65Minimum Peak-to-Peak Blanking Voltage:0.65Minimum Peak-to-Peak Blanking Voltage:0.65Minimum Value.25 %Limiting Resolution:25 %At corners of picture1500 TV linesMinimum value.1200 TV linesMinimum value.1200 TV linesMinimum value.60 %Field Strength at Center of FocusingCoil (Approx).60 %Field Strength at Center of FocusingCoil (Approx).60 %Field Strength at Center of FocusingCoil (Approx).20 %Maxium value.20 %Field Strength at Center of FocusingCoil (Approx).60 %Field Strength at Center of FocusingCoil (Approx).60 %Field Strength at Center of FocusingCoil (Approx).60 %Field Strength at Cent				
Negative-bias value. 300 volts Positive-bias value. 0 volts Peak Heater-Cathode Voltage: 125 volts Heater negative with respect to cathode. 10 volts Target Voltage. 125 volts Peak Target Current* 0.25 µa Faceplate: 110mination 1000 fc Illumination 1000 fc Topperature. 71 °C Typical Operation: 71 °C Grid-No.4 (Decelerator) Voltage* 1400 volts Grid-No.2 (Accelerator) Voltage* 300 volts Grid-No.2 (Accelerator) Voltage* 0.65 wolts Grid-No.1 Voltage for picture cutoffi. 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to grid No.1. 75 volts Lag:* Maximum value. 25 % % Maximum value. Minimum Peak-to-Peak Blanking Voltage: <t< td=""><td></td><td></td><td>volts</td><td></td></t<>			volts	
Positive-bias value		Negative-bias value	volts	
<pre>Heater negative with respect to cathode</pre>		Positive-bias value 0	volts	
Heater positive with respect to cathode. 10 volts Target Voltage 125 volts Dark Current 0.25 µa Peak Target Current ^f 0.60 µa Faceplate: 11000 fc Illumination 71 °C > Temperature. 71 °C > Typical Operation: For scanned area of 0.6" x 0.8" and faceplate temperature of 30° to 35° C Grid-No.4 (Decelerator) Voltage ⁹ 1400 volts Grid-No.2 (Accelerator) Voltage. 300 volts Grid-No.3 (Beam-Focus Electrode) Voltage ¹ . .450 to 1000 volts Grid-No.1 Voltage for picture cutoff. 45 to -100 volts Grid-No.2 (Accelerator) Voltage. 300 volts Grid-No.1 Voltage for picture cutoff. 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to grid No.1. 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to cathode. 20 volts Lag: ⁶ Maximum value. Minimum value.			volts	
Dark Current		Heater positive with respect to cathode 10		
Faceplate: Illumination1000fcTemperature.71°CTypical Operation:For scanned area of $0.6" \times 0.8"$ and faceplate temperature of go° to gf° CGrid-No.4 (Decelerator) Voltage*1400voltsGrid-No.3 (Beam-Focus Electrode) Voltageh.800 to 1000voltsGrid-No.2 (Accelerator) Voltage*300voltsGrid-No.1 (Decelerator) Voltage*0.65voltsGrid-No.2 (Accelerator) Voltage.0.65Minimum Peak-to-Peak Blanking Voltage:0.65When applied to grid No.1.75voltsLagi*Maximum value.20voltsMaximum value.25%Limiting Resolution:1200TV linesAt center of picture— Typical value.900TV linesMinimum value.900TV linesAmplitude Response to a 400 TV Line Square— Wave Test Pattern at Center of Picture— Typical value.900TV linesMinimum value.60%Field Strength of Adjustable Alignment Coil**0 to 4gaussPeak Deflecting-Coil Current for Specified Deflecting Yoke: Horizontal240maWertical50maMicage-Sensitivity OperationFaceplate Illumination (Highlight)10fcTarget Voltage***0.02 μ a		Dark Current		
Faceplate: Illumination1000fcTemperature.71°CTypical Operation:For scanned area of $0.6" \times 0.8"$ and faceplate temperature of go° to gf° CGrid-No.4 (Decelerator) Voltage*1400voltsGrid-No.3 (Beam-Focus Electrode) Voltageh.800 to 1000voltsGrid-No.2 (Accelerator) Voltage*300voltsGrid-No.1 (Decelerator) Voltage*0.65voltsGrid-No.2 (Accelerator) Voltage.0.65Minimum Peak-to-Peak Blanking Voltage:0.65When applied to grid No.1.75voltsLagi*Maximum value.20voltsMaximum value.25%Limiting Resolution:1200TV linesAt center of picture— Typical value.900TV linesMinimum value.900TV linesAmplitude Response to a 400 TV Line Square— Wave Test Pattern at Center of Picture— Typical value.900TV linesMinimum value.60%Field Strength of Adjustable Alignment Coil**0 to 4gaussPeak Deflecting-Coil Current for Specified Deflecting Yoke: Horizontal240maWertical50maMicage-Sensitivity OperationFaceplate Illumination (Highlight)10fcTarget Voltage***0.02 μ a		Peak Target Current [†] 0.60	,	
 Temperature		Faceplate:	fr	
For scanned area of 0.6" x 0.8" and faceplate temperature of 30° to 35° C Grid-No.4 (Decelerator) Voltage ⁹ 1400 volts Grid-No.3 (Beam-Focus Electrode) Voltage ^h 800 to 1000 volts Grid-No.1 Voltage for picture cutoff ¹	+			
faceplate temperature of go° to go° C Grid-No.4 (Decelerator) Voltage ⁹	+	Typical Operation:		
Grid-No.4 (Decelerator) Voltage1400voltsGrid-No.3 (Beam-Focus Electrode) Voltage300 to 1000voltsGrid-No.2 (Accelerator) Voltage.300voltsGrid-No.1 Voltage for picture cutofil45 to -100voltsAverage "Gamma" of Transfer Characteristicfor signal-output current between 0.02 μa45 to -100and 0.6 μa0.65Minimum Peak-to-Peak Blanking Voltage:0.65When applied to grid No.1.75voltsLag:Maximum value.33%Typical value.25%Limiting Resolution:1500TV linesAt center of picture—1200TV linesTypical value.900TV linesAnt Corners of picture—900TV linesMinimum value.60%Field Strength at Center of Focusing0 to 4 gaussCoil (Approx.).46 gaussPeak Deflecting Coil Current for50 maAperage-Sensitivity Operation50 maFaceplate Illumination (Highlight)10for Target Voltage".0.02Laget Voltage".0.02Laget Voltage".0.02Laget Voltage0.02Laget Voltage0.02Laget Voltage0.02Laget Voltage".0.02Laget Voltage".0.02Laget Voltage".0.02Laget Voltage0.02Laget Voltage0.02Laget Voltage0.02Laget Voltage".0.02Laget Voltage0.02				
Grid-No.3 (Beam-Focus Electrode) Voltage"800 to 1000 volts Grid-No.2 (Accelerator) Voltage300 volts Grid-No.1 Voltage for picture cutoff45 to -100 volts Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 µa and 0.6 µa 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to grid No.1 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to cathode				-
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 µa and 0.6 µa0.265 Winnimum Peak-to-Peak Blanking Voltage: When applied to grid No.1		Grid-No.4 (Decelerator) Voltage ⁹		
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 µa and 0.6 µa0.265 Winnimum Peak-to-Peak Blanking Voltage: When applied to grid No.1		Grid-No.2 (Accelerator) Voltage		
Average "Gamma" of Transfer Characteristic for signal-output current between 0.02 µa and 0.6 µa0.265 Winnimum Peak-to-Peak Blanking Voltage: When applied to grid No.1		Grid-No.1 Voltage for picture cutoff45 to -100	volts	
and 0.6 µa 0.65 Minimum Peak-to-Peak Blanking Voltage: When applied to grid No.1		Average "Gamma" of Fransfer Characteristic		
Winnum Peak-to-Peak Blanking Voltage: 75 volts When applied to grid No.1. 75 volts Lag:* 20 volts Maximum value. 20 volts Limiting Resolution: 33 % At center of picture— 75 volts Typical value. 1500 TV lines Minimum value. 1200 TV lines At corners of picture— 7000 TV lines Typical value. 900 TV lines Ant corners of picture— 900 TV lines At corners of picture— 900 TV lines At corners of picture— 900 TV lines Applitude Response to a 400 TV Line Square— 900 TV lines Wave Test Pattern at Center of Picture: 60 % Minimum value. 60 % § Field Strength of Adjustable Alignment Coil** 0 to 4 gauss Peak Deflecting-Coil Current for Specified Deflecting Yoke: 50 ma Horizontal 10 fc faceplate Illumination (Highlight) 10 fc Target		and 0.6 μ_a , 0.65		
When applied to cathode. 20 volts Lag:* Maximum value. 33 % Maximum value. 25 % Limiting Resolution: 25 % At center of picture— 1500 TV lines Minimum value. 1200 TV lines At corners of picture— 900 TV lines Typical value. 900 TV lines At corners of picture— 900 TV lines At corners of picture— 900 TV lines Applitude Response to a 400 TV Line Square— 900 TV lines Wave Test Pattern at Center of Picture: 60 % Field Strength at Center of Focusing 60 % Field Strength of Adjustable Alignment Coil* 0 to 4 gauss Peak Deflecting-Coil Current for Specified Deflecting Yoke: 40 ma Vertical 240 ma Auerage-Sensitivity Operation 70 ma Faceplate Illumination (Highlight) 10 fc Target Voltage* 0.02 µa		Minimum Peak-to-Peak Blanking Voltage:		
Lag: ^k Maximum value		When applied to grid No.1		
Typical value			VOITS	
Limiting Resolution: At center of picture— Typical value		Maximum value		
At center of picture— Typical value			%	
Typical value. 1500 TV lines Minimum value. 1200 TV lines At corners of picture— 1200 TV lines Typical value. 900 TV lines Amplitude Response to a 400 TV Line Square— 900 TV lines Wave Test Pattern at Center of Picture: 60 % Field Strength at Center of Focusing 60 % Coil (Approx.). 46 gauss Field Strength of Adjustable Alignment Coil ^m 0 to 4 gauss Peak Deflecting-Coil Current for Specified Deflecting Yoke: Horizontal 50 ma Auerage-Sensitivity Operation 70 fc Faceplate Illumination (Highlight) 10 fc Target Voltage ^{n.P} 20 to 50 volts Dark Current ⁹ 0.02 µa				
At corners of picture— Typical value		Typical value		
Typical value. 900 TV lines Amplitude Response to a 400 TV Line Square- Wave Test Pattern at Center of Picture: 900 TV lines Minimum value. 60 % Field Strength at Center of Focusing Coil (Approx.). 60 % Field Strength of Adjustable Alignment Coil ^m 0 to 4 gauss Peak Deflecting-Coil Current for Specified Deflecting Yoke: 240 ma Horizontal 50 ma Average-Sensitivity Operation 10 fc Target Voltage ^{n.P} . 20 to 50 volts Dark Current ⁹ . 0.02 µa			lines	
Amplitude Response to a 400 TV Line Square- Wave Test Pattern at Center of Picture: Minimum value			lines	
Minimum value. 60 % Field Strength at Center of Focusing 60 gauss Coil (Approx.). 46 gauss Field Strength of Adjustable Alignment Coil ^m 0 to 4 gauss Peak Deflecting-Coil Current for Specified Deflecting Yoke: 46 gauss Horizontal 50 ma 50 ma Average-Sensitivity Operation Faceplate Illumination (Highlight) 10 fc Target Voltage ^{n.P} 20 to 50 volts Dark Current ⁹ 0.02 µa		Amplitude Response to a 400 TV Line Square-		Þ
Field Strength at Center of Focusing Coil (Approx.)			CT.	
Coil (Approx.)		Field Strength at Center of Focusing	%	
Peak Deflecting-Coil Current for Specified Deflecting Yoke: Horizontal		Coil (Approx.)	gauss	
Specified Deflecting Yoke: Horizontal 240 ma Vertical 50 ma Average-Sensitivity Operation Faceplate Illumination (Highlight) 10 fc Target Voltage".P, 20 to 50 volts Dark Current ⁹			gauss	
Horizontal		Specified Deflecting Yoke:		
Average-Sensitivity Operation Faceplate Illumination (Highlight) 10 fc Target Voltage ⁿ , ^ρ , 20 to 50 volts Dark Current ^q 0.02 μa			та	
Faceplate Illumination (Highlight) 10 fc Target Voltage ^{n, φ} , 20 to 50 volts Dark Current ^q 0.02 μa			ma	
Target Voltage ^{n, ρ} , 20 to 50 volts Dark Current ^q 0.02 μa		• • •		
Dark Current ^a μa		Faceplate Illumination (Highlight) 10		
Signal-Output Current' (Typical) 0.5 µa		Dark Current ^q		
		Signal-Output Current' (Typical) 0.5		_

--- Indicates a change.

DATA I

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RCA



Minimum-Lag Operation

Faceplate Illumination							fc
Target Voltage ^{n, p}							
Dark Current ⁹							μa
Signal-Output Current ^r	(typical).	٠	*	٠	٠	0.0	μa

- ^a This capacitance, which effectively is the output impedance of the 8051 is increased when the tube is mounted in the deflecting-yoke and focusing-alignment assembly. The resistive component of the output impedance is in the order of 100 megohms.
- b Proper orientation of quality rectangle sobtained when the korizontal scan is essentially parallel to the plane passing through the aris and short indexpin. Themasking is for orientation only and does not define the proper :canned area of photoconductive layer. Final orientation should be such that the image also fits inside of any internal rask of the mesh assembly.
- Cleveland Electronics Inc., 1974 East 61st St., Cleveland, Onio.
- d For minimum geometric distortion, the deflecting yoke should be 'ocated in its proper axial position 3/4-inch form the face of the tube.
- Alden Products Co., 9140 North Main Str⊬et, Brockton 64, Mass.

f Video amplifiers must be designed properly to handle target currents of this magnit⊾de to avoid amplifier overload or picture distortion.

- G Grid-No.4 voltage must always be greater than grid-No.3 voltage. For minimum "pcrthole" effect, grid-No.4 voltage should be acjusted to approximately 1.6 times the grid-No.3 voltage value, and the focusingalignment assembly and deflecting yoke positioned as shown in accompanying diagram.
- ^h Beam focus is obtained by the combined effect of grid-No.4 v+ltage, which should be adjustable over indicated range, and a focusing coil having an average field strength of N6 jauss.
- J with no blanking voltage on grid No.1.
- k Defined as the per cent of initial value of Signal-output current 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- The alignment coil should be located or the tube so that it: center is at a distance of 6 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.
- n Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- P The target voltage for each 8051 must be adjusted to that value which gives the desired operating dark current.
- The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a blacklevel error in direct proportion to the change in scanning velocity.
- P Defined as the component of the highlight target current after the darkcurrent component has been subtracted.

OPERATING CONSIDERATIONS

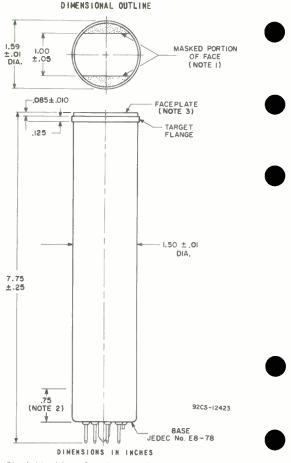


The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube.

> SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-18 RESPONSE is shown at front of this section



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 4-65



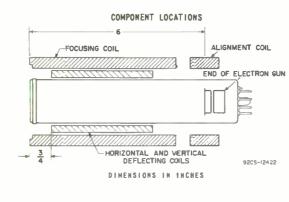
Note 1: Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin. Note 2: Within this area the minimum bulb diameter dimension does not apply.

Note 3: Faceplate thickness is 0.135" ± 0.005".

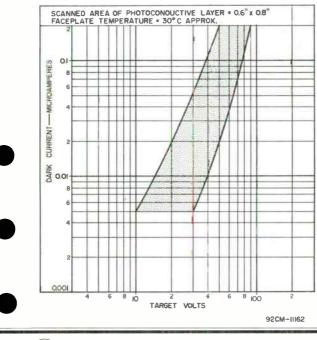
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RANGE OF DARK CURRENT

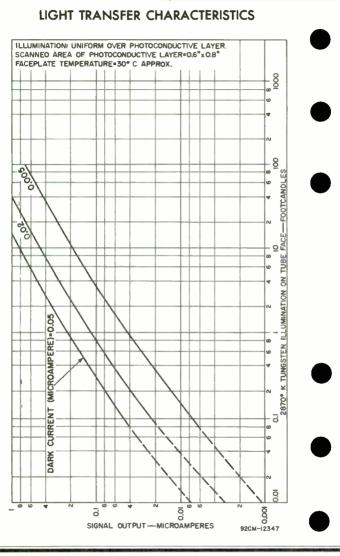




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DATA 3 4-65



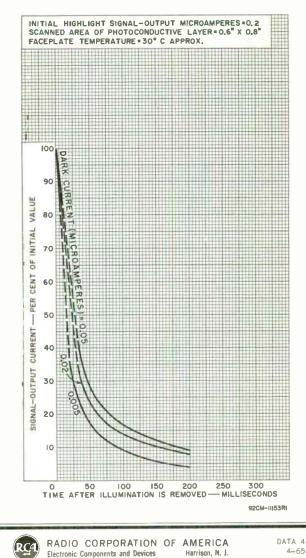
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World Radio History

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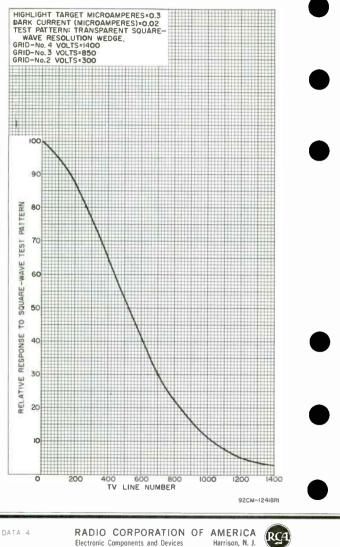




World Radio History

Harrison, N. J.

UNCOMPENSATED HORIZONTAL RESPONSE TO A SQUARE-WAVE TEST PATTERN



Multiplier Phototube

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 1.68" MINIMUM-DIAMETER, FLAT, CIRCULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

DATA

Spectral Response	S-11 500 angstroms
Cathode, Semitransparent: Shape	Circular
	2.20 sq. in. 1.68 in. 1.51
Anode to dynode No.10	5.81" 1.87" ± 0.19"
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 Connec-	
tion—Do Not Use Pin 13 - Focusing Electrode Pin 14 - Photocathode	LIGHT: BULB
Maximum Ratings, Absolute-Maximum Values:	
SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC) 2000 SUPPLY VOLTAGE BETWEEN DYNODE No.10) max. volts
AND ANODE (DC)) max. volts

DYNODES (DC). . 250 max. volts



General:

RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

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SUPPLY VOLTAGE BETWEEN

DYNODE No.1 AND CATHODE (DC).						600 max.	volts
SUPPLY VOLTAGE BETWEEN FOCUSING							
ELECTRODE AND CATHODE (DC)							volts
AVERAGE ANODE CURRENT ^b							
AMBIENT TEMPERATURE		٠	•	•	•	75 max.	oC

Characteristics Range Values for Equipment Design:

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table | With E = 2000 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Nin.	Nedian	Nax.	
Sensitivity:				
Radiant, at 4400 angstroms ^c Cathode radiant,	_	9.6×10^4	stea	a/w
at 4400 angstroms ^d Luminous, at	0.048	0.6	-	a/w
O cps ^e Cathode Luminous ^f Equivalent Anode-	_	120 7.5 × 10 ⁻⁵	-	a/lm a/lm
Dark-Current Input at 4400 angstroms ⁹ Equivalent Noise	_	4 × 10 ⁻¹³	_	w
Input at 4400 angstroms ^h	-	5.3 × 10 ⁻¹⁵	-	w
With E = 1500 volts voltage adjusted t				
	Nin.	Nedian	Max.	
Sensitivity: Radiant, at 4400 angstroms ^c Cathode radiant, at 4400	7.2×10 ³	1.5×10^{4}	1.76 × 10 ⁵	a/w
angstroms ^d	0.048	0.06	-	a/w
Luminous, at O cps ^e Cathode luminous ^f		19 7.5 × 10 ⁻⁵		a/lm a/lm
Current Ampli- fication Equivalent Anode-		2.5×10^{5}	_	
Dark-Current Input at 4400 angstr o ms ^j	{	5.5×10 ⁻¹³ 4.4×10 ⁻¹⁰	9 × 10 ⁻¹³	w lm
Equivalent Noise Input at 4400 angstroms ^h	{ -	3.3 × 10 ⁻¹⁵ 2.7 × 10 ⁻¹²	1.3 × 10-14	w lm



RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. World Radio History

With E = 1250 volt < (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Hin.	Nedian	Nax.	
Sensitivity:				
Radiant, at 4400				
angstroms ^c	_	4.8×10^{3}	-	a/w
Cathode radiant,				
at 4400				
angstroms ^d	0.048	0.06	-	a/w
Luminous, at				
0 cpse.	-	6 7.5 × 10 ⁻⁵	-	a/lm
Cathode luminous	_	7.5 x 10-5	-	a/lm
Equivalent Anode-				
Dark-Current				
Input at 4400		a a 14 17		
angstroms ^g	_	2.3×10^{-13}	-	W
Equivalent Noise				
Input at 4400		7 45 4D-15		
angstroms ^h	-	7.45 x 10 ⁻¹⁵	-	W

- ^a Cinch Manu⁴scturing Corporation, 1026 South Homan Avenue, Chicago 24, 111inois.
- b Averaged over any interval of 30 seconds maximum.
- Averages over any interval of poseconds meanmann. C under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning No.C.S.5-58, Glass Code No.5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, New York) from a Lungsten-filament lamp operated at a color tempyrature of 2870 K. The value of light flux incident on the filter is 10 microlumens, Radiant sensitivity is determined on the basis of th+ S-11 Spectral Response-Characteristic curve located at the front of this Section.
- d Under the same conditions as shown under (C) except value of light flux incident on the filter is 0.1 lumen.
- ^e Under the following conditions: The light source is a tungsten filament lamp operated at a color temperature of 2870^o K. A light input of 10 microlumers is used.
- ^f Under the following conditions: The light source is a tungsten-filament lamp operased at a color temperature of 2870° K. The value of light flux is 0.01 'umen and 200 volts are applied between cathode and all other electrodes cunnected together as anode.
- g At a tube temperature of 25 $^{\rm O}$ C. Dark current may be reduced by use of a refrigerant.
- ^h Under the following conditions: Supply voltage (E) is as shown, 25^o C tube temperature, external shield is connected to cathode, bandwidth 1 cycle per second; light source as shown uncer (c) interrupted at a low audio frequency to produce incident radiation pulses alternating between zero and the value stated. The 'm' 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.
- j At a tube temperature of 25° C and with supply voltage (E) adjusted to give a radiant sensitivity of 7200 amperes per watt. Dark current may be reduced by the use of a refrigerant.



Between	8.3% of Supply Voltage (E) multiplied by
Cathode and Dynode No.1	2
Dynode No.1 and Dynode No.2	1
Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9	1
Dynode No.9 and Dynode No.10	1
Dynode No.10 and Anode	1
Anode and Cathode	12
ocusing electrode is connected to	arm of potentiometer
etween cathode and dynode No.I. 1	he focusing-electrode
oltage is varied to give maximum o	urrent amplification.

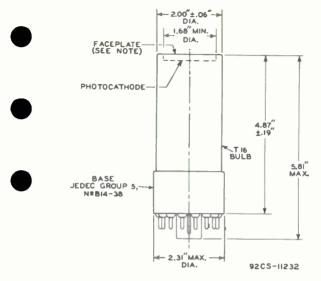
TABLE I

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-11 RESPONSE is shown at the front of this section



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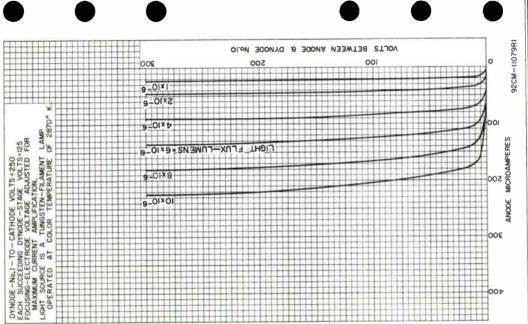
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm C}$ in any DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE: WITHIN 1.68" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.0.0" FROM PEAK TO VALLEY.



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CHARACTERISTICS ANODE TYPICAL



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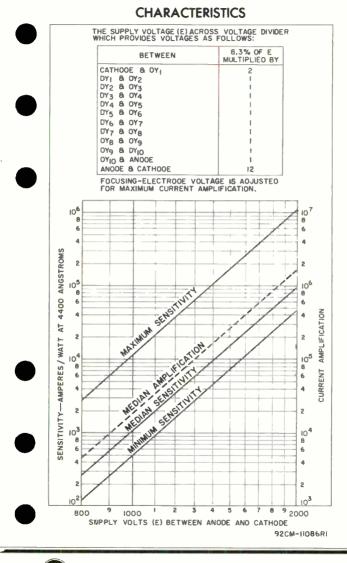
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RADIO CORPC Electron Tube Division

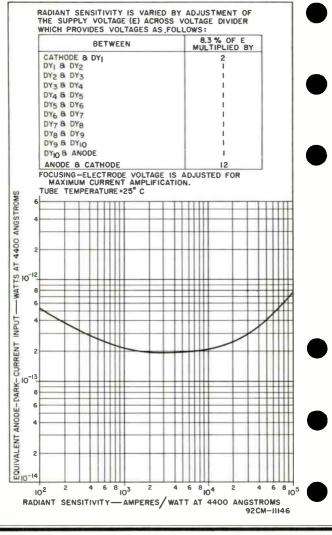




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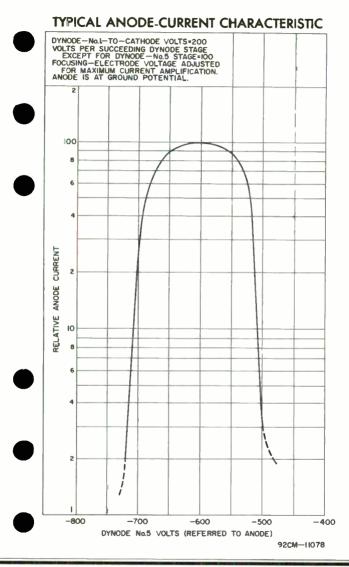
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TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



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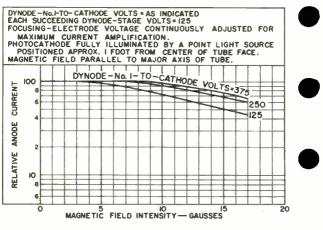




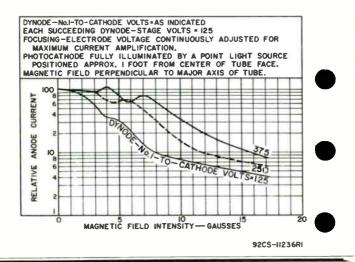


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TYPICAL ANODE-CURRENT CHARACTERISTICS



92CS-11235RI



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History



Multiplier Phototube

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING VENETIAN-BLIND-TYPE DYNODE STRUCTURE, 2.59" MINIMUM-DIAMETER, FLAT, CIRCULAR, SEMITRANSPARENT PHOTOCATHODE AND S-11 RESPONSE

DATA

General:
Spectral Response,
Spectral Response
Cathode, Semitransparent:
Shape.'Circular
Window:
Minimum area 5.27 sq. in.
Minimum diameter 2.59 in.
Index of refraction 1.51
Direct Interelectrode Capacitances (Approx.):
Anode to dynede No.10
Anode to all other electrodes 8.5 µµf
Maximum Overall Length 6.31"
Seated Length
Maximum Diameter
Weight (Approx.)
Bulb
Socket
Base
(JEDEC Group 5, No.B14–38)
Basing Designation for BOTTOM VIEW
Pin 1-Dynode No.1
Pin 2-Dynode No.2
Pin 2-Dynode No.2 Pin 3-Dynode No.3
Pin 2-Dynode No.2 Pin 3-Dynode No.3 Pin 4-Dynode No.4
Pin 2 – Dynode No.2 Pin 3 – Dynode No.3 Pin 4 – Dynode No.4 Pin 5 – Dynode No.5
Pin 2 – Dynode No.2 Pin 3 – Dynode No.3 Pin 4 – Dynode No.4 Pin 5 – Dynode No.5
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 2 – Dynode No.2 Pin 3 – Dynode No.3 Pin 4 – Dynode No.4 Pin 5 – Dynode No.5
Pin2 - Dynode No.2Pin3 - Dynode No.3Pin4 - Dynode No.4Pin5 - Dynode No.5Pin6 - Dynode No.6Pin7 - Dynode No.7Pin8 - Dynode No.7
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - 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 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.5 Pin 5 - Dynode No.6 Pin 7 - Dynode No.6 Pin 8 - Dynode No.7 Pin 8 - Dynode No.8 Pin 9 - Dynode No.9 Pin 10 - Dynode No.10 Pin 12 - Internal Connec-
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.5 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.9 Pin 10 - Dynode No.10 Pin 11 - Anode Pin 12 - Internal Connec- tion-Do Not Mse
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.8 Pin 9 - Dynode No.9 Pin 10 - Dynode No.9 Pin 11 - Anode Pin 12 - Internal Connec
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - 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.9 Pin 12 - Internal Connec- tion-Do Not Mse Pin 13 - Focusing Electrode
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.8 Pin 9 - Dynode No.9 Pin 10 - Dynode No.9 Pin 11 - Anode Pin 12 - Internal Connec
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.5 Pin 6 - Dynode No.6 Pin 7 - Dynode No.7 Pin 8 - Dynode No.7 Pin 8 - Dynode No.9 Pin 10 - Dynode No.9 Pin 12 - Internal Connec- tion-Do Not Mse Pin 13 - Focusing Electrode Pin 14 - Photocathode Maximum Ratings, Absolute-Maximum Values:
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.5 Pin 5 - Dynode No.6 Pin 7 - Dynode No.6 Pin 8 - Dynode No.7 Pin 8 - Dynode No.8 Pin 9 - Dynode No.9 Pin 10 - Dynode No.10 Pin 11 - Anode Pin 12 - Internal Connec- tion-Do Not Nse Pin 13 - Focusing Electrode Pin 14 - Photocathode Maximum Ratings, Absolute-Maximum Values: SUPPLY VOLTAGE BETWEEN ANODE AND
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.9 Pin 10 - Dynode No.9 Pin 10 - Dynode No.10 Pin 11 - Anode Pin 12 - Internal Connec- tian-Do Not Mse Pin 13 - Focusing Electrode Pin 14 - Photocathode Maximum Ratings, Absolute-Maximum Values: SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC)
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.9 Pin 10 - Dynode No.9 Pin 10 - Dynode No.9 Pin 12 - Internal Connec- tian-Do Not Mse Pin 13 - Focusing Electrode Pin 14 - Photocathode Maximum Ratings, Absolute-Maximum Values: SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC)
Pin 2 - Dynode No.2 Pin 3 - Dynode No.3 Pin 4 - Dynode No.4 Pin 5 - Dynode No.5 Pin 6 - Dynode No.7 Pin 8 - Dynode No.7 Pin 8 - Dynode No.7 Pin 9 - Dynode No.9 Pin 10 - Dynode No.9 Pin 10 - Dynode No.10 Pin 11 - Anode Pin 12 - Internal Connec- tian-Do Not Mse Pin 13 - Focusing Electrode Pin 14 - Photocathode Maximum Ratings, Absolute-Maximum Values: SUPPLY VOLTAGE BETWEEN ANODE AND CATHODE (DC)

DYNODES (DC). . 250 max. volts



RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J. DATA I 1-62

SUPPLY VOLTAGE BETWEEN DYNODE No.1	
AND CATHODE (DC)	max. volts
SUPPLY VOLTAGE BETWEEN FOCUSING	
ELECTRODE AND CATHODE (DC) 600	
AVERAGE ANODE CURRENT ^b	max ma
AMB: ENT TEMPERATURE	max. ^O C

Characteristics Range Values for Equipment Design:

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table 1 With E = 2000 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Nin.	Nedian	Nax.		
Sensitivity: Radiant, at 4400 angstroms ^c . Cathode radiant, af 4400	_	9.6×10^4	-	a/w	
angstroms ^d	0.048	0.6	-	a/w	
Luminous, at 0 cps ^e Cathode Luminous ^f Equivalent Anode- Dark-Current	_	120 7.5 × 10 ⁻⁵	-	a/lm a/lm	
Input at 4400 angstroms ⁹ Equivalent Noise	-	4 × 10 ⁻¹³	-	w	
lnput at 4400 angstroms ^h	_	5.3 × 10 ⁻¹⁵	-	W	
With E = 1500 volts voltage adjusted t	(Except a o give m Nin.	s noted) and ; aximum curre Nedian	focusing-ele nt amplific Nax.	ctrode ation	
Sensitivity: Radiant, at 4400 angstroms ^c Cathode radiant at 4400				a/w	
angstroms ^d	0.048	0.06	-	a/w	
Luminous, at O cps ^e Cathode Luminous [†]		19 7.5 × 10 ⁻⁵	-	a/lm a/lm	
Currert Amplification Equivalent Anode- Dark-Current	_	2.5 × 10 ⁵	-		
Input at 4400 angstroms ¹ Equivalent Noise	{ -	5.5 × 10 ⁻¹³ 4.4 × 10 ⁻¹⁰	9 × 10 ⁻¹³ -	w lm	
Input at 4400 angstroms ^h	{ -	3.3 × 10 ⁻¹⁵ 2.7 × 10-12	1.3×10 ⁻¹⁴	w lm	



With E = 1250 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

	Nin.	Nedian	Max.	
Sensitivity:				
Radiant, at 4400		7		
angstroms ^c	_	4.8×10^{5}	-	a/w
Cathode radiant at				
4400 angstroms ^d	0.048	0.06	-	a/w
Luminous at 0 cps ^e	-	6	-	a/lm
Cathode luminousf	-	7.5×10^{-5}	-	a/lm
Equivalent Anode-Dark-				
Current Input at 4400				
angstroms ^g	_	2.3×10^{-13}		W
Equivalent Noise Input at				
4400 angstroms ^h	_	7.45×10^{-15}	_	w
inde anglerione i i i i i i		11.0 1 40		**

- ⁴ Cinch Manufacturing Corporation, 1026 South Homan Avenue, Chicago 24, 111inois.
- b Averaged over any interval of 30 seconds maximum.
- C Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning Ko.C.S.5-58, Glass Code Ko.5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Morks, Corning, New York) from a tungsten-filament lamp operated at a color temperature of 2270 K. The value of light flux incident on the filter is 10 microlumens. Radiant sensitivity is determined on the basis of the S-11 Spectral Response-Characteristic curve Incated at the form of the Section. the front of this Section.
- ^d Under the same conditions as shown under (c) except value of light flux incident on the filter is 0.1 lumen.
- Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 2470° K. A light input of 10 microlumens is used.
- Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 28700 K. The value of light flux is 0.01 lumen and 200 volts are applied between catacher and all other electrodes connected together as anode.
- [¶] At a tube temperature of 25⁰ C. Dark current may be reduced by use of a refrigerant.
- A refrigerance H under the following conditions: Supply voltage (E) is as shown, 25° C tube temperature, external shield is connected to cathode, bandwidth 1 cycle per second, light source as shown under (c) interrupted at a low audio frequency to produce incident radiation pulses alternæting 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.
- At a tube temperature of 25°C c and with supply voltage (E) adjusted to give a radiant sensitivity of 7200 ampere. per watt. Dark current may be reduced by the use of a refrigerant.



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Between	8.3% of Supply Voltage (E) multiplied by	
Cathode and Dynode No.1	2	
ynode No.1 and Dynode No.2 ynode No.2 and Dynode No.3		
node No.3 and Dynode No.4	1	
node No.4 and Dynode No.5 node No.5 and Dynode No.6	1	
node No.6 and Dynode No.7	1	
node No.7 and Dynode No.8	1	
node No.8 and Dynode No.9 node No.9 and Dynode No.10	1	
node No.10 and Anode	1	
odé and Cathode	12	

TABLE 1

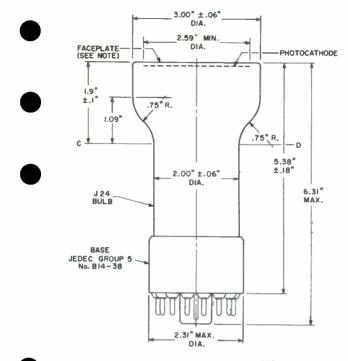
between cathode and dynode No.1. The focusing-electrode voltage is varied to give maximum current amplification.

> SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-II RESPONSE is shown at the front of this Section





RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History



92CM-11080RI

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ in any direction from the Perpendicular erected at the center of BOTTOM of the base.

NOTE: WITHIN 2.59" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.

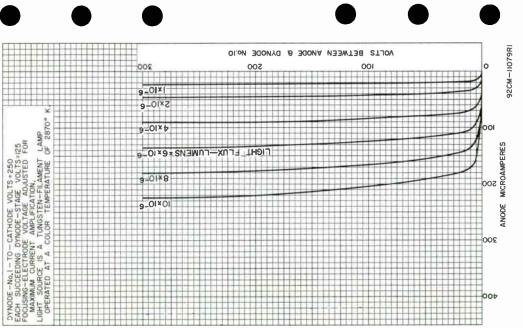


RADIO CORPORATION OF AMERICA Electron Tube Division World Redio History Harrison, N. J.

DATA 3



CHARACTERISTICS ANODE TYPICAL

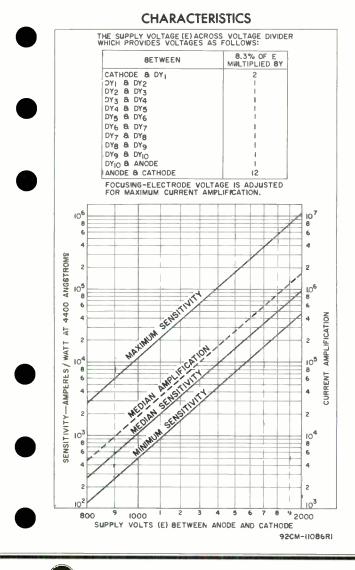


AMERICA Harrison, N. J.

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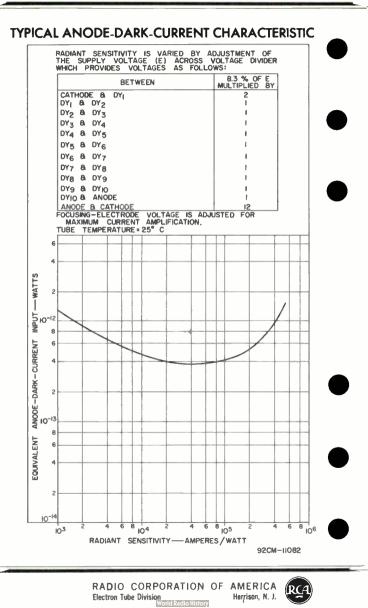
CORPORATION

RADIO CORPC Electron Tube Division

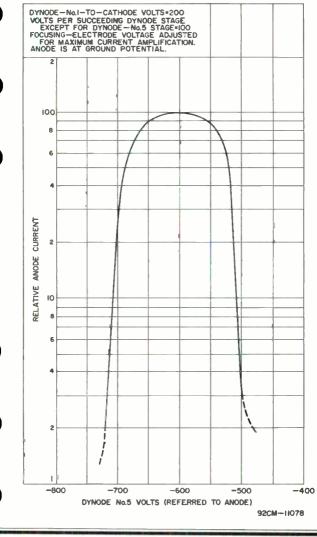




RADIO CORPORATION OF AMERICA Harrison, N. J. DATA 4 1 - 62



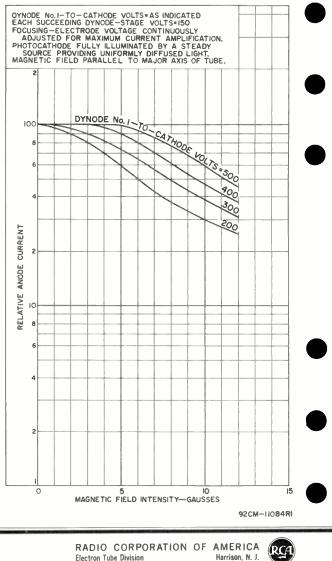




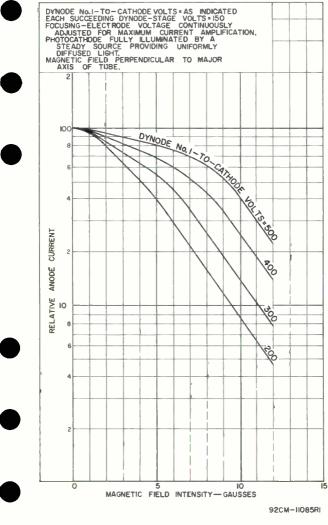


RADIO CORPORATION OF AMERICA Electror Tube Division Harrison, N. J.

TYPICAL ANODE-CURRENT CHARACTERISTIC



TYPICAL ANODE-CURRENT CHARACTERISTIC





RADIO CORPORATION OF AMERICA Electron Tube Division DATA 6







World Radio History

.

Multiplier Phototube



General:

IO-STAGE, HEAD-ON, FLAT-FACEPLATE TYPE HAVING VENETIAN-8LIND-TYPE DYNODE STRUCTURE, 4.38" MINIMUM DIAMETER, FLAT, CIRCULAR, SEMITRANSPARENT PHOTOCATHODE AND S-II RESPONSE

DATA

genera	n n	
Spectr	al Response	S-11
Wavele	ngth of Maximum Response 4400 ± 5	00 angstroms
Cathoo	e, Semitransparent:	5
		Circular
Wind	OW:	
Mi	nimum area	sq. in.
Mi	nimum diameter 4.38	in.
Ir	dex of refraction 1.51	
	Interelectrode Capacitances	
(App	rox.):	
Anod	e to dynode No.10	щuf
	e to all other electrodes 8.5	<u>uu</u> f
	m Overall Length	7.69"
Seated	Length	5.75" ± 0.19"
Maximu	m Diameter	5.31"
Operat	ing Position	Anv
Weight	(Approx.)	. 1 lb 7 oz
Bulb .		
Socket		or equivalent
Base .	Medium-Shell Dil	heptal 14-Pin
	(JEDEC Group 5	
Basi	ng Designation for GOTTOM VIEW	
	1 - Dynode No.L	
	2 – Dynode No.2	
Pio	3 - Dynode No.3	
Pio	4 - Dynode No.4	~
Pio	5 – Dynode No.5	9
Pin	6 Dynode No.6	10
Pin	6 - Dynose No.6 7 - Dynose No.7	MTG .
Pio	8 – Dynode No.8	190
Pin	9 – Dynode No.9	12
	10 - Dynode No.10	13
Pin	11 - Anode	6
Pin	12 Internal Conner	
	tion—Do Not Use DIRECTION OF	LIGHT:
Pin	13 - Focusing	BULB
	Electrode	
Pin	14 – Photocathode	
7 111	ra - morocarmore	
Maximu	m Ratings, Absolute-Naximum Values:	
SUPPLY	VOLTAGE BETWEEN ANODE AND	
	DDE((DC)) max. volts
	VOLTAGE BETWEEN DYNODE No. 10	mani foita
AND	ANODE (DC)) max. volts
SUPPLY	VOLTAGE BETWEEN CONSECUTIVE	
DYNO		max. volts



RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

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8055

SUPPLY VOLTAGE BETWEEN DYNODE No.1	
AND CATHODE (DC)	olts
SUPPLY VOLTAGE BETWEEN FOCUSING	
ELECTRODE AND CATHODE (DC) 600 max. v	olts
AVERAGE ANODE CURRENT ^b 2 max.	
AMGIENT TEMPERATURE	°C
Characteristics Range Values for Equipment Design:	

Under conditions with dc supply voltage (E) across a voltage divider providing electrode voltages shown in Table !

With E = 2000 volts (Except as noted) and focusing-electrode voltage adjusted to give maximum current amplification

Min, Median Max.

	<i>min</i> .	neutan	<i>mux</i> .		
Sensitivity: Radiant, at 4400					
angstroms ^c	-	9.6×10^{4}	-	a/w	
4400, angstroms ^d . Luminous, at 0 cps ^e .	0.048	0.06	-	a/w a/lm	
Cathode luminous ^f .	-	7.5 × 10 ⁻⁵	_	a/1m	
Equivalent Anode- Dark-Current Input at 4400 angstroms ⁹ . Equivalent Noise	-	4 × 10 ⁻¹³	-	W	
Input at 4400 angstroms ^h	_	5.3 x 10 ⁻¹⁵	_	W	
With E = 1500 volts (Ex voltage adjusted to	cept as	noted) and fo			
	Min.	Nedsan	Max.		
Sensitivity: Radiant, at 4400 angstroms ^c 7	.2 x 10 ³	1.5 × 10 ⁴	1.76 x 10 ⁵	a/w	
Cathode radiant, at 4400 angstroms ^d	0.048	0.06	-	a/w	
Luminous, at 0 cps ^e . Cathode luminous ^f .	_	19 7.5 × 10 ⁻⁵	-	a/lm a/lm	
Current Amplification Equivalent Anode-	-	2.5 × 10 ⁵	_		
Dark-Current Input at 4400 angstroms ^j . {	_	5.5×10^{-13} 4.4 × 10 ⁻¹⁰	9 × 10 ⁻¹³	w lm	
Equivalent Noise Input at 4400 angstroms ^h {		3.3 × 10 ⁻¹⁵ 2.7 × 10 ⁻¹²	1.3×10-14	w lm	
With E = 1250 volts (E: voltage adjusted to	xcept as	noted) and f	ocusing-elec	trode ation	
	Min.	Nedsan	Max.		
Sensitivity: Radiant, at 4400 angstroms ^c	-	4.8 × 10 ³	_	a/w	
Cathode radiant, at 4400 angstroms ^d	0.048	0.06	_	a/w	

RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.



Luminous, at 0 cps ^e . Cathode luminous ^f . Equivalent Anode-Dark-	•	_	6 7.5×10 ⁻⁵	-	a/lm a/lm
Current Input at 4400 angstroms ⁹ Equivalent Noise			2.3×10^{-13}	-	w
Input at 4400 angstroms ^h		_	7.45 × 10 ⁻¹⁵	_	w

- ^a Cinch Manufacturing Corporation, 1026 South Homan Avenue, Chicago 24, Illinois.
- b Averaged over any interval of 30 seconds maximum.
 - ² Under the following conditions: Light .ncident on the cathode is transmitted through a blue filter (forning wo.C.S.5-58, Gluss Code No.5113 polished to 1/2 stock thickness—Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filament lump operated at a color temperature of 2870 K. The value of light flux incident on the filter is 10 microlumens. Radiant sensitivity is determined on the basis of an S-11 Spectral Response Characteristic curve lucated at a front of this Section.
- Under the same conditions as shown under (c) except value of light flux incident on the filter is 0.1 lumen.
- ^e Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 2470⁶ K. A light input of 10 microlumens is used.
- ^f Under the following conditions: The light source is a tungsten-filament lamp operated at a color temperature of 2070^o K. The value of light flux is 0.01 lumen and 200 volts are applied between cathode and all other electrodes connected together at anode.
- $^{(1)}$ At a tube temperature of 25 $^{(2)}$ C. Dark current may be reduced by use of a refrigerant.
- ^h Under the following conditions: Supply voltage (E) is as shown, 25^o C tube temperature, external shield is controled to cathode, bandwidth 1 cycle per second, light source as shown under (c) 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 fi'ter which passes only the fundamental frequency of the pulses.
- At a tube temperature of 25° C and with supply voltage (E) acjusted to give a radiant sensitivity of 7200 amoeres per watt. Dark current may be reduced by the use of a refrigerant.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2

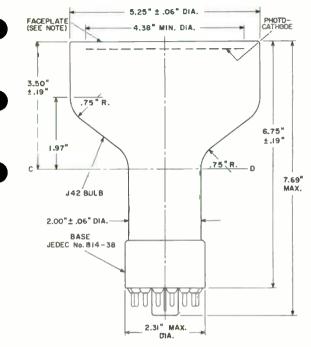
VOLTAGE TO BE PROVIDE	D BY DIVIDER
B et ween	8.3% of Supply Voltage (E) multiplied by
Cathode and Dynode No.1	2
Dynode No.1 and Dynode No.2 Dynode No.2 and Dynode No.3	1
Dynode No.3 and Dynode No.4	1 Î
Dynode No.4 and Dynode No.5	1
Dynode No.5 and Dynode No.6	1
Dynode No.6 and Dynode No.7	1
Dynode No.7 and Dynode No.8	1
Dynode No.8 and Dynode No.9 Dynode No.9 and Dynode No.10	1
Dynode No.10 and Anode	1 1
Anode and Cathode	12

TABLE I

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOTUBE HAVING S-II RESPONSE is shown at front of this Section



RADIO CORPORATION OF AMERICA Electron Tube Division World Redio History



92CM-11148RI

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN $2^{\rm O}$ IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

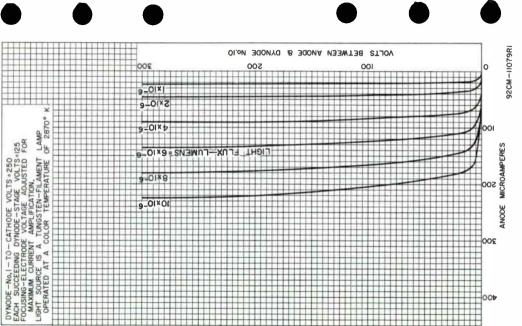
NOTE: WITHIN 4.38" DIAMETER, DEVIATION FROM FLATNESS OF EXTERNAL SURFACE OF FACEPLATE WILL NOT EXCEED 0.010" FROM PEAK TO VALLEY.



RADIO CORPORATION OF AMERICA Electron Tube Division Herrison, N. J. World Radio History DATA 3



CHARACTERISTICS ANODE TYPICAL

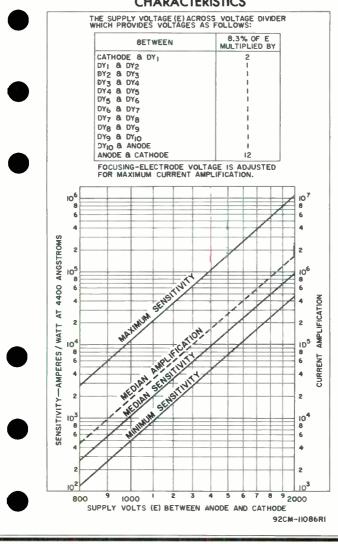


AMERICA Harrison, N. J.

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CORPORATION

RADIO CORPC Electron Tube Division



CHARACTERISTICS

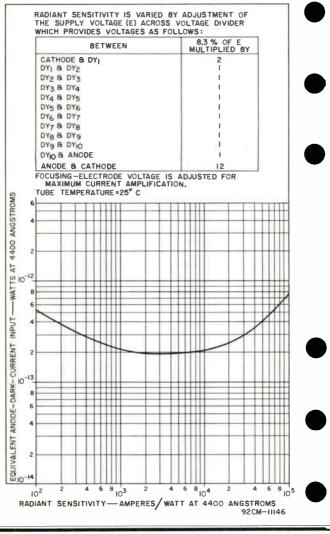
Electron Tube Division

RADIO CORPORATION OF AMERICA Harrison, N. J.

World Radio History

DATA 4 1-62

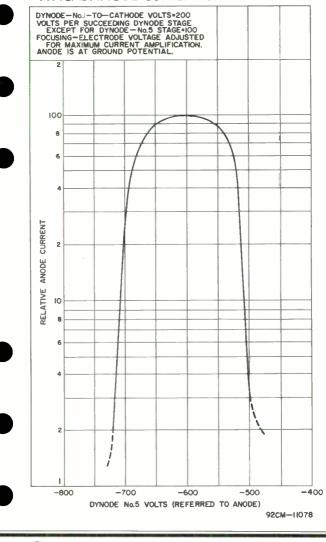
TYPICAL ANODE-DARK-CURRENT CHARACTERISTIC



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. World Radio History



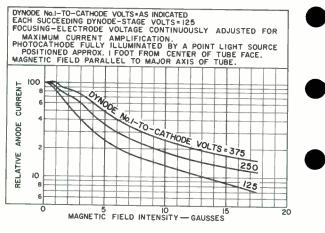
TYPICAL ANODE-CURRENT CHARACTERISTIC



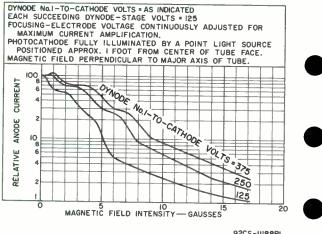


RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 5

TYPICAL ANODE-CURRENT CHARACTERISTICS



92CS-11187Ri



92CS-1/188RI

RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N, J, World Radio History



Image Orthicon



FIELD MESH SEMICONDUCTIVE TARGET

MAGNETIC FOCUS MAGNETIC DEFLECTION

For Low-Light-Level Studio and Remote Color (Scene illumination-40 fc or less) and Black-and-White (Scene illumination-as low as I fc) TV Pickup Service

DATA

DATA
General:
Heater, for Unipotential Cathode:
Voltage (AC or DC) 6.3 ± 10% volts
Current at 6.3 volts 0.6 amp
Direct Interelectrode Capacitance:
Anode to all other electrodes 12 pf
Spectral Response
Wavelength of Maximum Response 4500 ± 300 angstroms
Photocathode, Semitransparent:
Rectangular image (4 x3 aspect ratio):
Useful size of 1.8" max. diagonal
Note: The size of the optical image focused on the
photocathode should be adjusted so that its maximum
diagonal does not exceed the specified value. The
corresponding electron image on the target should have
a size such that the corners of the rectangle just
touch the target ring.
Orientation of Proper orientation is obtained when
the vertical scan is essentially parallel to the plane
passing through center of faceplate and pin 7 of the
shoulder base.
Focusing Method
Verlection Method
Overall Length
Greatest Diameter of Bulb
Minimum Deflecting-Coil Inside Diameter 2.2/8*
Deflecting Coil
Deflecting Coil
Deflecting Coil Length
Focusing Coil
Focusing Coil Length
Focusing Coil Length
Alignment Cail Length
Alignment-Cail Length
Operating Position
Operating Position The tube should never be operated in
a vertical position with the diheptal-base end up nor
in any other position where the axis of the tube with the base up makes an angle of less than 20° with the
vertical.
Weight (Approx.)
observer,



Electronic Components and Devices

RADIO CORPORATION OF AMERICA Harrison, N. J.

Shoulder Base	
Pin 1-Grid No.6 Pin 2-Photocathode №in 3-Do Not Use №in 4-Do Not Use	Pin 5 -Grid No.5 Pin 6 -Target Pin 7 -Do Not Use
End Base	Small-Shell Diheptal 14-Pin (JEDEC No.B14-45) BOTTOM VIEW
<pre>Pin 1 -Heater Pin 2 -Grid No.4 & Field Mesh #in 3 -Grid No.3 Pin 4 -Do Not Use Pin 5 -Dynode No.2 Pin 6 -Dynode No.4 Pin 7 -Anode Pin 8 -Dynode No.5 Pin 9 -Dynode No.3 Fin 10 -Dynode No.1, Grid No.2 Pin 11 -Do Not Use Pin 12 -Grid No.1 Fin 13 -Cathode & Suppressore Fin 14 -Heater</pre>	DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE
Suppressor ^c	WHITE INDEX LINE

Maximum and Minimum Ratings, Absolute-Naximum Values: PHOTOCATHODE -

FRUIDUATHOUE				
Voltage	-550	max.	volts	
Illumination.	50	max.	fc	
OPERATING TEMPERATURE: Of any part of bulb	55	max.	°C	
Of bulb at large end of tube	55	HIGX.	-0	
(Target section)	0	min.	°C	
TEMPERATURE DIFFERENCE:				
Between target section and any				•
part of bulb hotter than	E		°C	
target section	5		0	
GRID-No.6 VOLTAGE	-550	max.	volts	
TARGET VOLTAGE:				
Fositive value	10	max.	volts	
Megative value	10	max.	volts	
GRID-No.5 VOLTAGE	150	max.	volts	
GRID-No.4 VOLTAGE	300	max.	volts	-
GRID-No.3 VOLTAGE	400	max.	volts	
CRID No. 2 & DYNODE No. 1 VOLTAGE				
GRID-No.2 & DYNODE No.1 VOLTAGE	350	max.	volts	
GRID-No.1 VOLTAGE:				
Negative bias value	125	max.	volts	
Positive bias value	0	max.	volts	
VOLTAGE PER MULTIPLIER STAGE	350	max.	volts	
ANCDE-SUPPLY VOLTAGE	1350	max.	volts	

RADIO CORPORATION OF AMERICA Electronic Components and Devices

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PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	volts volts
Typical Operating Values: ^e	
Photocathode Voltage (Image Focus)*	volts
(Accelerator) - Approx. 75% photocathode voltage300 to -405 Target-Cutoff Voltage ⁹ 3 to 1	volts volts
Grid-No.5 Voltage (Decelerator) 0 to 125	
Grid-No.4 Voltage (Beam Focus) f 140 to 184	
Grid-No.3 Voltage ^h	
Grid-No.2 & Dynode-No.1 Voltage	volts
Grid-No.1 Voltage for Picture Cutoff45 to -115	
Dynode-No.2 Voltage	volts
Dynode-No.3 Voltage	volts
Dynode-No.4 Voltage	volts
Dynode-No.5 Voltage	volts
Anode Voltage	volts
Minimum Peak-to-Peak	
Blanking Voltage 5	volts
Field Strength at Center of	
Focusing Čoli ^j	gausses
Field Strength of Alignment Coil 0 to 3	gausses

Performance Data:

With conditions shown under Typical Operating Values and with camera lens set to bring the picture highlights one stop above the "rnee" of the accompanying Basic Light-Transfer-Characteristic Curve

Min. Typical Max.

Cathode Radiant Sensi- tivity at 4500				0.033	_	a/w
angstroms			40	65		µa/lm
Luminous Sensitivity Anode Current (DC)			-	30	_	<i>µ</i> а, пл µа
Signal-Output Current (Peak to Peak)			_	5	_	μa
Ratio of Peak-to-Peak Highlight Video-Signal Current to RMS Noise Current for Bandwidth of 4.5 Mc Photocathode Illumination at 2870° K Required to bring Picture High-		•	-	37:1	_	
lights one stop above ⊤he "Knee" of Light ⊤ransfer Characteristic	•		_	0.007	_	fc

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

DATA 2 9-63

World Radio History

Harrison, N. J.

P	Peak-to-Peak Response to Square-Wave Test Pattern at 400 TV Lines per Picture Height (Per cent of large-area black to large-area wnite)k	
	¹ Made by Cleveland Electronics Inc., 1974 East 61st Street, Cleveland, Ohio,	
	Made by Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago 24, Illinois.	
	The suppressor grid connected to the cathode and the field-mesh grid connected to grid No.4 are not given as numbered grids in order to conform with industry practice of associating functional camera control knobs with specific grid numbers. For example, beam-focus control is gererally associated with knob identified asG4 (grid No.4), regardless of its position with respect to the cathode.	
d e	Dynode-voltage values are shown under Typical Operating Falues.	
	With 8092A operated in RCA-IK-11 or -TK-31 camera. Other cameras may require slightly different voltage ranges.	-
f	Adjust for bost forus	
۳ h	Normal setting of target voltage is +2 volts from target cutoff. The	
j.	Adjust to give the most uniformly shaded picture near maximum signal.	
1	Direction of current should be such that a north-seeking pole is at- tracted to the image end of the focusing coil, with indicator located outside of and at the image end of the foruring coil.	

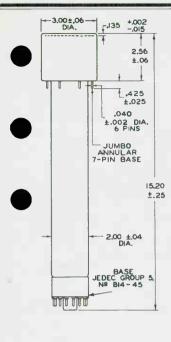
Measured with amplifier having flat frequency response.

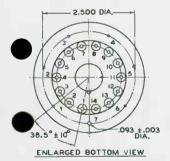
SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this Section

RCA

Electronic Components and Devices World Radio History

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

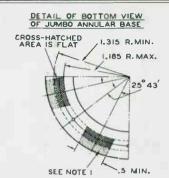




DIMENSIONS IN INCHES







NOTE I: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

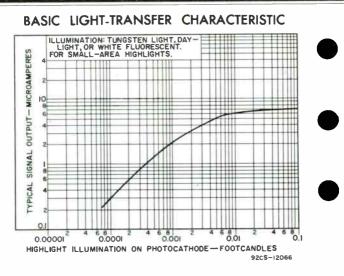
ANNULAR BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- a. SIX HDLES HAVING DIAMETER OF 0.065" ± 0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ± 0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51° 26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTER-ED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.
- c. RIM EXTENDING OUT A MINI-MUM OF 0.125" FROM 2.812" D'AMETER AND HAVING HEIGHT OF 0.126" ± 0.001".
- d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2,200" ± 0,001".



RADIO CORPORATION OF AMERICA Electronic Components and Devices. Phys. Harrison, N. J. DATA 3 9-63



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History



Image Orthicon

MAGNETIC FOCUS

MAGNETIC DEFLECTION

ANTI-GHOST IMAGE SECTION

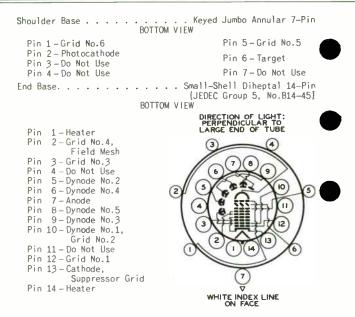
For Studio Black-and-White TV Cameras. The 8093A is Unilaterally Interchangeable with the 8093.

DATA

	2414
	General:
	Heater, for Unipotential Cathode:
-	Voltage (AC or DC) 6.3 ± 10% volts
	Current at heater volts = 6.3 0.600 amp
	Direct Interelectrode Capacitance (Approx.);
	Anode to all other electrodes 12 uuf
	Target-to-Mest Spacing (Average) 0.001"
	Spectral Response
	Wavelength of Maximum Response 4500 ± 300 angstroms
-	Photocathode, Semitransparent:
	Rectangular image (4 x 3 aspect ratio):
	Useful size of 1.8" max. diagonal
	Note: The size of the optical image focused on the
	photocathode should be adjusted so that its maximum
	diagonal does not exceed the specified value. The
	corresponding electron image on the target should
	have a size such that the corners of the rectangle
	just touch the target ring; a condition that may be
	achieved in some camera designs with a 1.6" diagonal
	image on the photocathode. Orientation of Proper orientation is obtained when the
	vertical scan is essentially parallel to the plane
	passing through center of faceplate and pin 7 of the
	shoulder base. The horizontal and vertical scan should
	preferably start at the corner of the raster nearest
	pin 6 of the shoulder base.
	Focusirg Method
	Deflection Method
-	Overall Length
	Overall Length
	Minimum Deflection-Coil Inside Diameter
	Deflecting-Coil Length
	Focusing-Coil Length
	Alignment-Coil:
	Length
-	Position on neck
	8.5" from flat area of the
	jumbo annular base. Photocathode Distance Inside End of Focusing Coil 1/2"
	Operating Position The tube should never be operated in a
	vertical position with the Diheptal-base and up nor im any
	other position where the axis of the tube with the base up
	makes an angle of less than 20° with the vertical.
	Weight (Approx.)

RLA

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NOTE: In the tube symbol, the suppressor grid connected to the cath-ode, and the field-mesh grid connected to grid No.4, are intentionally without numbers to avoid upsetting industry practice of associating functional camera control knobs with specified grid numbers. For example, beam-focus control is generally associated with knob identified as G₄ (Grid No.4).

Maximum and Minimum Ratings, Absolute-Maximum Values:

PHOTOCATHODE: Voltage	volts fc
OPERATING TEMPERATURE: Any part of bulb	oC
Of bulb at large end of tube (Target section)	°C
Between target section and any part of bulb hotter than target section 5 max.	• _C
GRID-No.6 VOLTAGE :	volts
Positive value 10 max.	volts
Negative value 10 max.	volts
GRID-No.5 VOLTAGE	volts
GRID-No.4 VOLTAGE	volts
GRID-No.3 VOLTAGE 400 max.	volts
GRID-No.2 & DYNODE-No.1 VOLTAGE 350 max.	volts

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	GRID—No.1 VOLTAGE: 125 max. Positive—bias value 0 max. PEAK HEATER-CATHODE VOLTAGE: 0 max. Heater negative with 125 max. respect to cathode. 125 max. Heater positive with 10 max. ANODE SUPPLY VOLTAGE ^a 1350 max. AVOLTAGE PER MULTIPLIER STAGE 350 max.	volts volts volts volts volts volts volts
		10.10
,	Typical Operating Values: ^b	
	Photocathode Voltage (Image Focus) ^c 325 to -475	volts
	Grid-No.6 Voltage (Accelerator) — Approx. 75% of photocathode voltage ^d 210 to -360 Target-Cutoff Voltage ^e	volts volts volts volts volts volts volts volts volts volts volts volts volts gausses
	Field Strength of Alignment Coil 0 to 3	gausses

Performance Data:

With conditions shown under Typical Operating Values and with camera lens set to bring the picture highlights one stop above the "knee" of the light-transfer characteristic Min Average Mar

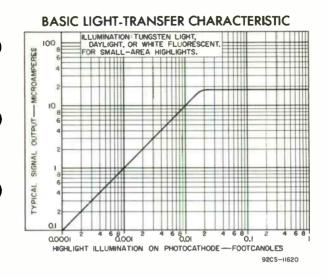
	<i>m</i> 1 <i>m</i>	лиетаре	Max.	
Cathode Radiant Sensitivity at 4500 angstroms		0.028		
Luminous Sensitivity	_	0.020	_	µа/µ₩
(2870° K)	30	60	_	ua/lm
Anode Current (DC)	_	30	50	μa
Signal-Output Current				,
(Peak to peak)	5	-	30	μa
Ratio of Peak-to-Peak				
Highlight Video-Signal Current to RMS Noise				
Current for bandwidth of				
4.5 Mc	40	45	_	
Photocathode Illumination at		40		
2870° K required to bring				
picture highlights one stop				
above the "knee" of light-				
transfer characteristic	-	0.040	0.060	fc



Amplitude Response at 400 TV lines per picture height (Per cent of large-area					_							
black to large-area white) ^h . Limiting Horizontal	30	50	-	%.								
Resolution.	500	675	_	TV lines	Ū							
Uniformity: Ratio of shading (Back- ground) signal to high-												
light signal Variation of highlight signal (Per cent of maximum highlight	_	0.12	0.15									
signal) ^j	-	20	25	%								
A Dynode-voltage values are shown up	nder Tvøi	cal Operat	ing Tal	ues.								
b with 80934 operated in RCA-TK-11	 Dynode-voltage values are shown under <i>Typical Operating Talues</i>. b with 8093A operated in RCA-TK-11 or -TK-31 camera. Other cameras may require slightly different voltage ranges. 											
C Adjust for best focus.												
d For minimum highlight flare or "g /3 per cent of the photocathode v	oltage.											
sormal setting of target voltage target supply voltage should be a	formal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.											
f adjust to give the most uniformly	shaded p	icture nea	rmaxim	um signal.								
Direction of current should be such to the image end of the focusing side of and at the image end of t	that a nor coil, wit he focusi	th-seeking h the indi	pole i cator l	s attracted ocated out-								
	b Measured with amplifier having flat frequency response.											
J variation of response over scanne	at freque											

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-10 RESPONSE is shown at front of this section



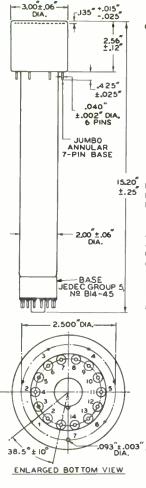




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DATA 3

5-62



DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE CROSS-HATCHED AREA IS FLAT I.185"R. MAX.

SEE NOTE I .5"MIN.

NOTE I: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

ANNULAR-BASE GAUGE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTO-CATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAUGE WITH:

- a. SIX HOLES HAVING DIAMETER OF 0.065" ±0.001" AND ONE HOLE HAVING DIAMETER OF 0.150" ± 0.001". ALL HOLES HAVE DEPTH OF 0.265" ±0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45⁰ TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT AN-GLES OF 51⁰26' ± 5' ON CIRCLE DIAMETER OF 2.500" ± 0.001".
- b. SEVEN STOPS HAVING HEIGHT OF 0.187" ± 0.001", CENTERED BETWEEN PIN HOLES TO BEAR AGAINST FLAT AREAS OF BASE.
 - . RIM EXTENDING OUT A MINIMUM OF 0.125" FROM 2.812" DIAM-ETER AND HAVING HEIGHT OF 0.126" ± 0.001".
- d. NECK-CYLINDER CLEARANCE HOLE
 HAVING DIAMETER OF 2.200"
 ± 0.001".

92CM-8293R3

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.



8093A/L

Image Orthicon

LONG-LIFE TARGET, FIELD-MESH, ANTIGHOST IMAGE SECTION MAGNETIC FOCUS MAGNETIC DEFLECTION

For High-Quality Pictures in Black-and-White TV Service Using Conventional Lighting Facilities and Ordinary Operating Techniques. The 8093A/L is Directly Interchangeable with the 8093 and 8093A in All Cameras.

The 8093A/L is the same as the 8093A except utilizes a longer life non-deteriorating glass target.

The sturdy, long-life, non-deteriorating, glass target of type 8093A/L is characterized by high gain, resistance to "burn-in", and the absence of any granular structure. Because charge transportation through this target material is electromic rather than ionic as in ordinary glass targets, the electrical characteristics of the target, such as secondary emission and resistivity, are essentially constant and sensitivity of the 8093A/L is stable throughout life.

Other important advantages of this target are that the undesirable characteristics of scene retention or "sticking picture" and raster "burn-in" due to underscanning are significantly reduced. The resistance of the 8093A/L to image "burnin" provides a highly desirable operational feature because it is not necessary to use an orbiter or continually move the camera when focused on a stationary scene.

OPERATING CONSIDERATIONS

Dos and Don'ts on Use of RCA-8093A/L

Dos

- 1. Allow the 8093A/L to warm up prior to operation.
- 2. Hold temperature of the 80934/L within operating range.
- 3. Make sure alignment coil is properly adjusted.
- 4. Adjust beam-focus control for best usable resolution.
- Condition spare 8093A/L's by operating several hours once each month.
- Determine proper operating point with target voltage adjusted to exactly 2 volts above target cutoff.
- 7. Uncap lens before voltages are applied to the 8093A/L.

Don'ts

- 1. Don't force the 8093A/L into its shoulder socket.
- Don't operate the 8093A/L without scanning.
- 3. Don't operate a 8093A/L having an ion spot.
- Don't use more beam current than necessary to discharge the highlights of the scene.
- Don't turn off beam while vo'tages are applied to photocathode, grid No.6, target, dyrodes, and anode during warm-up αr standby operation.



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World Radio History

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Vidicon

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Grid-No.2 Voltage Grid-No.1 Voltage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	850	٧
Negative bias value. Positive bias value. Peak Heater-Cathode Vo				:	•	:	:	:	:	:	•	:	:	:	300 0	v v
Heater negative with Heater positive with Target Voltage Dark Current Peak Target Currentf . Faceplate	10 10	esi	peo peo	t :	to	•	cal	the t	ode •	•	;	;	:	:	125 10 100 0.2 0.6	۷ ۷ ۷ با
Illumination • • • • Temperature. • • •	:	:	:	:	:	:	:	:	:	:	:	:	:	:	50009 71	fc °C

TYPICAL OPERATION AND PERFORMANCE DATA

For scanned area 1/2 x 3/8 inch and faceplate temperature of 30° to 35 °C

		Inter- mediate Voltage Operation			
Grid-No.6 (Decelerator) & Grid-No.3 Voltage. Grid-No.5 Voltage. Grid-No.4 (Beam-Focus Electrode) Voltage. Grid-No.2 (Accelerator) Voltage. Grid-No.1 Voltage for Picture Cutoffh.	300 180 {20 to 60 300 ∫ -45 to	500 300 { 50 to 100 300 { -45 to	750 450 { 90 to 150 300 ∫ -45 to	V V V	
Typical Electrode Currents Grid No.6 & 3 Grid No.5	1.7 0.05 0.0015 375 28 23	2.5 0.2 0.006 450 28)-100 3 0.3 0.008 500 28	یم با با پر پر	
Visual Equivalent Signal-to-Noise Ratio (Approx.)k. Average "Gamma" of Transfer Characteristic for Signal-Output Current between	300:1	23 300:1	23 300: I	97 70	
0.02 μA and 0.2 μA. Minimum Peak-to-Peak Blanking Voltage When applied to grid No.1. When applied to cathode. Limiting Resolution at	0.65 75 20	0.65 75 20	0.65 75 20	v v	
Center of Picture	600	700	800 Indicates	TV Lines	-

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Amplitude Response to a 400 TV Line Square-Wave Test Pattern at Center of Picture	
Peak Deflecting-Coil Current Horizontal	
Vertical	
Alignment Coil ^m	
High-sensitivity operation-0.1 footcandle on faceplate Faceplate llumination (Highlight) 0.1 fc	
Target Voltage ^{n, p}	
Signal-Output Current ^r 0.1 μA Average-sensitivity operation—1 footcandle on faceplate	
Faceplate Illumination (Highlight) I fc Target Voltage ^{n.p}	
Dark Currentq	
TypicalΟ.265 μΑ MinimumΟ.25 μΑ	
^a Thi - capacitance which effectively is the output impedance of the 8134, is increased when the tube is mounted in the deflecting-yoke assembly. The resistive component of the output impedance is in the order of 100 megohms.	
Dotinguinas, to megonias, and show the provided and the straight sides of the horizontal scan is essentially paralle, to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short pin.	
to the plane passing through the lube axis and short pin. C Made by Cleveland Electronics Inc., 1974 East 61st St., Cleveland, Ohio. d Made by Cineh Manufacturing Company, 1226 S. Homan Ave., Chicago 24,	
 Thirnois and the current of the company. The second /li>	
not exceed (30 VDIS). ⁴ Vid+o amplifiers must be designed properly to handle peak target cur- ren's of this magnitude to avoid amplifier overload or picture distortion.	
For condition where "white light" is uniformly diffused overestire tube face.	
With no blanking voltage or grid No.1. J Defined as the per cent of initial value of signal-output current 1/20 second after illumination is removed. Values shown are for snitial signal-output current of 0,0 3 microampete and a dark current ol 0,035	
micloampere,	
k Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 MHz and a peak signal-output current of 0.35 micro- ampere. Because the noise in such a wystem ins predminately of the higk-frequency type, the visual equivalent signal-to-noise ratio is tak-n as the ratio of the highlight video-sägnal current to rms noise current, multiplied by a factor of 3.	
The alignment coil should be located on the tube so that its center is at a distance of 4-15/16 inches from the fare of the tube, and be po- sitioned so that its axis is coincident with the axis of the tube and	
the deflecting yoke. ^I Ind-cated range for each type of service serves only to illustiate the operating target-voltage range normally encountered.	
P The target voltage for each 8134 must be adjusted to that value which gives the desired operating signal current.	
9 The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produce a black- level error in direct proportion to the change in scanning velocity.	
Defined as the component of the highlight target current after the dark- current component has been subtracted.	
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OPERATING CONSIDERATIONS

Resolution of the 8134 is about 600 TV lines per picture height when operated with a grid-No.6 & 3 voltage of 300 volts and a grid-No.5 voltage of 180 volts. A resolution capability of about 800 TV lines is obtained when the 8134 is operated with a grid-No.6 & 3 voltage of 750 volts and a grid-No.5 voltage of 450 volts.

The target connection may be made by a suitable springfinger contact bearing against the edge of the metal ring at the face end of the tube.

Do and Don'ts on Use of RCA-8134

Dos

 Adjust camera scanning to utilize maximum useful area of photoconductive layer.

2. Orient the vidicon so that horizontal scan is essentially parallel to the plane passing through tube axis and short index pin.

3. Align electron beam.

 With lens capped, adjust target voltage for each individual vidicon to the highest value that will still give uniform background.

5. Match any visible raster pattern on photoconductive layer with new scan by reorienting the vidicon as required.

6. Use only sufficient beam current to bring out picture highlights.

7. Open lens iris or increase the scene illumination to obtain the "snappiest" picture without noticeable smear from moving objects. Target voltage should be reduced if light on the tube and/or resultant signal is excessive.

Always cap lens when transporting camera (see "Don'ts" 5).
 Don'ts

1. Don't underscan the photoconductive layer.

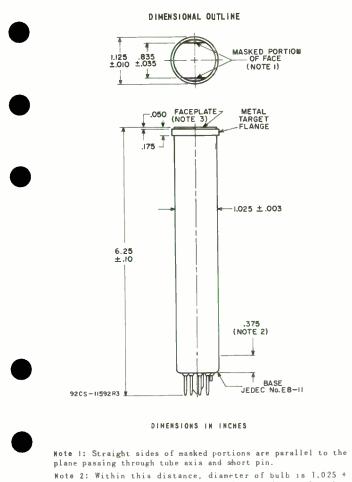
2. Don't change camera size and centering controls once the scanned area of photoconductive layer has been properly positioned.

3. Don't rotate vidicon from its original operating position in deflecting yoke.

4. Don't turn beam of vidicon on without normal scanning or remove scanning before beam of vidicon is turned off.

 DON'T ALLOW IMAGE OF THE SUN OR OTHER VERY INTENSE SOURCE OF ILLUMINATION TO BE FOCUSED ON PHOTOCONDUCTIVE LAYER AT ANY TIME.



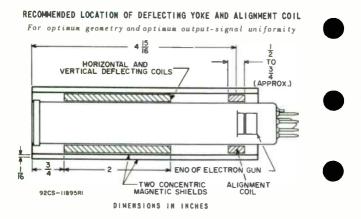


0.003-0.030 inches. Tube is acceptable regarding camber when it can be inserted into a l-inch long cylinder gauge which has an inner diameter of 1.0280 + 0.0011-0.0000 inches. The gauge must pass along the tube length from the base to the metal target flange.

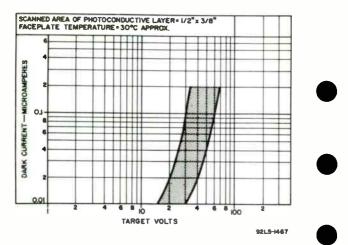
Note 3: Faceplate thickness is 0.094 ± 0.012 inches.



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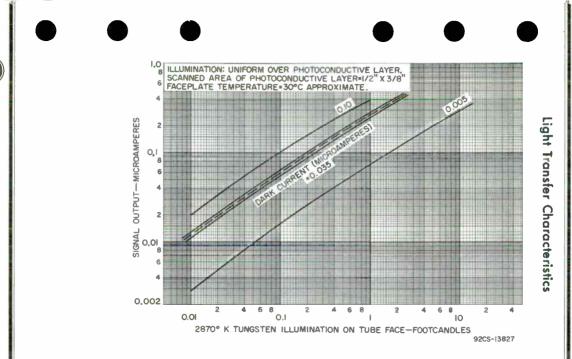


Range of Dark Current





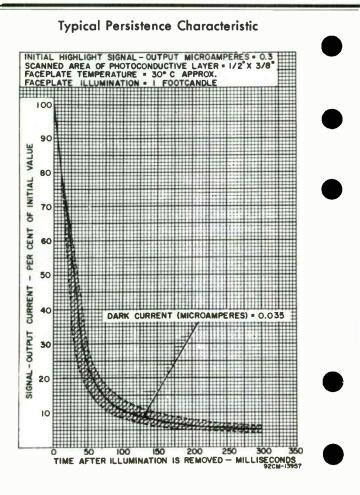




8134

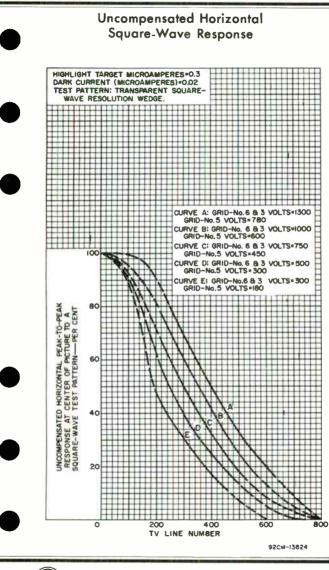
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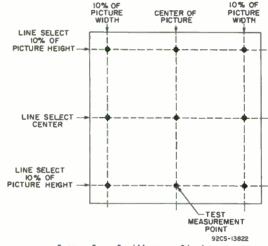
Vidicon



SEPARATE GRID-No.5 CONNECTION LOW-POWER (O.6-WATT) DARK HEATER ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

For Compact, Lightweight, Transistorized TV Cameras in Industrial and Other Closed-Circuit TV Systems. Designed to Provide High-Quality Service in Color TV Cameras.

The 8134/V1 is electrically and mechanically identical with the 8134 except for the primary difference that it is tested to meet extremely stringent criteria or signal uniformity or shading, and associated characteristics such as beam astigmatism and beat pattern.



SIGNAL UNIFORMITY TEST POINTS

5 cm x 5 cm Oscilloscope Display

SIGNAL-UNIFORMITY TEST

The 8134/V1 is tested for Signal Uniformity in an RCA Monochrome TK-27 Simulator as follows:

Heater Voltage											6.0	٧
Grid-No.6 & Grid-No	.3	Vol	tage								850	V
Grid-No.5 Voltage .											365	V
Grid-No.2 Voltage .											100 to 300	V
Grid-No.1 Voltage .	•	• •	• •	•	•	•	٠	•	•	•	-20	V

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8134/V1

Beam current is adjusted to just discharge the target by varying the grid-No.2 voltage within the specified range. The camera is interconnected with appropriate camera controls, picture monitor, and oscilloscope. An opaque mask, having an 0.44×0.33 -inch rectangular opening, is centered on the face of the 8134/V1. The tube face is illuminated with uniform light from a collimated point source.

After target voltage is adjusted to 10 volts (dc), the brightness of the light source is varied to obtain a peak signal current of 0.4 microampere. To assure full target signal is being discharged, the beam control is adjusted until peak signal amplitude is obtained on the display of the oscilloscope. The illumination is then reduced to obtain a peak signal current of 0.3 microampere without further adjustment of beam current. The signal amplitude is set to 100 per cent at the exact center of picture — 5 cm on the oscilloscope with the blanking level equal to zero.

With horizontal and vertical scanning centered, the scan amplitudes are adjusted to just match the optical window provided by the 0.44×0.33 -inch mask. The beam of the 8134/Vlis aligned for the most symmetrical and uniform signal with the horizontal line selector passing through the center of the picture. The line selector is then repositioned at a point 10 per cent down from the top of the picture and then 10 per cent up from the bottom of the picture. If required, additional adjustments in alignment are made to obtain minimum total deviation over the entire picture area from the 100 per cent signal amplitude.

Best possible electrical focus is maintained throughout these adjustments consistent with achieving the absolute minimum deviation in signal uniformity. Immediately prior to final measurement, the beam astigmatism of the 8134/VI is such that at least 300 TV lines vertical resolution is visible at the center of the picture when the horizontal resolution is adjusted for 400 TV lines, or more. Under these conditions, no brat patterns shall be discernible in the picture.

The difference in signal between the 100 per-cent signal area and the other eight points shown under Signal Uniformity Test Points is noted. The permissible signal spread between the highest and lowest points does not exceed 15 per cent.



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Vidicon

ELECTROSTATIC For Transis		MAGNETIC DEFLECTION gh-Performance TV Cameras
Gereral:		
Heater, for L Voltage (AC Current at Direct Incere Target to a Spectral Resp Wavelength of Protoconducti Maximum use rectangul aspect ra (rientation tained wh the strai the tube orientati of the pho such that mesh asse Focusing Meth Deflection Me Overall Lengt Graatest Dian Operating Pos Weight (Appro Bulb Diameter	ve Layer: ful diagonal of ar image (4 x 3 itio) of quality rectang'e- en the horizontal scan ght sides are parallel to axis and short pin. T pn only and does not defi tocconductive 'ayer. F the image fits inside o mbly. mod h ithod eter ixt,)	. 0.095 amp . 11 p
Socket Base	N all-Button Super-Ditet	lo.15VYA-333, cr equivalen No.208-SPEC, or equivalen rar 8-Pin (JEDEC No.E8-78 %8M
Pin 1-Heat Pin 2-Grid Pin 3-Grid Pin 4-Grid & N Pin 5-Grid	$\begin{array}{c} & & & & & & & \\ & & & & & & \\ & & & & $	5 6 Pin 6 - Grid No.2 Pin 7 - Cathode Pin 8 - Heater 7 K Fiange - Target Short Pin - Do Not Use 8 H
	DIRECTION OF LI	IGHT: F TUBE

Maximum Ratings, Absolute-Naximum Values:							
For Scanned Area of 0.6" x 0.8"							
Grid-No.6 & Grid-No.3 Voltage ^e 1500 max. Grid-No.5 Voltage ^e	volts volts volts volts						
Grid-No.1 Voltage: Negative bias value	volts volts						
Heater negative with respect to cathode	volts						
respect to cathode. 10 max. Targe: Voltage. 125 max. Dark (urrent. 0.25 max. Peak Target Current ^f . 0.6 max. Facep'ate: 110 max. 100 max. 100 max.	volts volts µa µa						
Temperature	oC						
For Scanned Area of 0.6" x 0.8"							
Faceplate Temperature of 28° to 34° C							
Grid-Mo.6 (Decelerator) & Grid-No.3 Voltage ^e	volts volts						
Electrode) Voltage	volts volts						
Grid-No.1 Voltage for Picture Cutoff ⁹ 45 to -100 Lag: ^h	volts						
Typical 25 Maximum 30 Average "Gamma" of Transfer Charac-	% %						
teristic for Signal-Output Current between 0.02 μa and 0.6 μa 0.65 Minimum Peak-to-Peak							
Blanking Voltage: When applied to grid No.1	volts volts						
At center of picture— Minimum	TV lines TV lines						

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At corners of picture-

Minimum

Center of Picture:

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1000

55

60



%

%

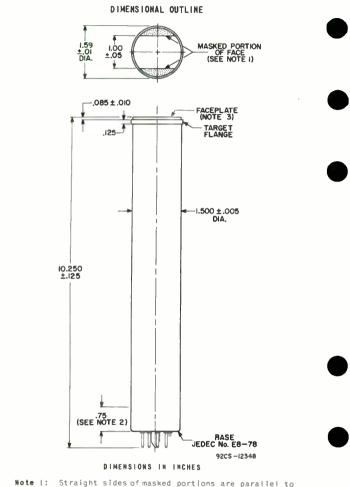
TV lines

Alignment-Coil Field Strength ^j 0 to 2 Peak Deflecting-Coil Current for Specified Deflecting-	gauss
Alignment Assembly: Horizontal	ma ma
Faceplate Illumination (Highlight) 10 Target Voltage ^{k,m} 20 to 60 Dark Current ^m 0.02 Signal-Output Current: ^P	fc volts μa
typical = 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1	μa
Minimum-Lag Operation Faceplate 'llumination (Highlighti	fc
Faceplate 'llumination (Highlight)	volts
Dark Current" 0.005	μa
Signal-Output Current: ^P Typical 0.5	uЭ
Typical 0.5	μa
 This capacitante, which effectively is the output impedance of the is increased when the tube is mounted in the deflecting-yoke ass the resistive component of the output impedance is in order of 100 mm be located in hts proper axial position 5/4 inch from the face of the C Cleveland Electronics Inc., 1974 East 6ist St., Cleveland, Ohio G Alden Products Co., 9140 North Main St., Brockton 64, Massacuss Grid-Mo.6 & 3 voltage must always be greater than grid-Bo.5 voltage is 1.67 to 2; best geometry being provided when the ratio is and must uniform signal output when restions 2. The maximum voltage difference between the electrodes, however, not exceed 800 voltage must always be greater than grid-Bo.5 voltage is 1.67 to 2; best geometry being provided when the ratio is and most uniform signal output when the ratio is 2. The object of the naximum voltage on grid No.1. With no blanking voltage on grid No.1. Defined as the per cent of initial value of signal-output current of 0.2 microampere and adark current of 0.02 microampere in the ube, and be positive that its axis is coincident with the axis wf the tube and the def yoke. K indicated ranue for each type of service serves only to illustriated of end of the desired operating dark current signal is proportiang for the desired operating dark current signal is proportiang for each super on the daysted to that value whice the desired operating dark current signal is proportiang for each super insignal output current signal is proportiang for the desired operating dark current signal is proportiang in the the deflecting vertices are and a state to the current signal is proportiang to the change in scanning velocity. And change in scanning velocity produces aplace are for each type of service serves only to illustriated operating dark current signal is proportiang for bachesis error in direct proportion to the change in scan	should etube. etts. obtage. should did-No.5 s 1.67, should mmance. is mag- nt 1/20 al sig- micro- is at a oned so lecting ate the h gives or good to the k-level
The target connection may be made by a suitable spring-	finger e face
contact bearing against the edge of the metal ring at the end of the tube.	



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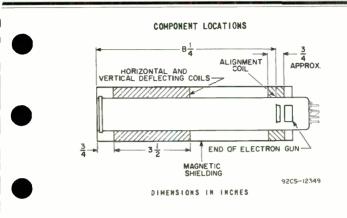
the plane passing through tube axis and short index pin. Note 2: Within this area the minimum bulb diameter dimension does not apply.

Note 3: Faceplate thickness is 0.135" ± 0.005".

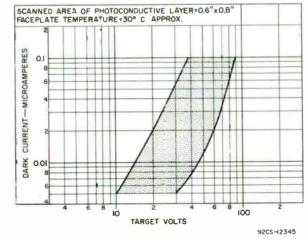
RADIO CORPORATION OF AMERICA Harrison, N. J.



Electronic Components and Devices

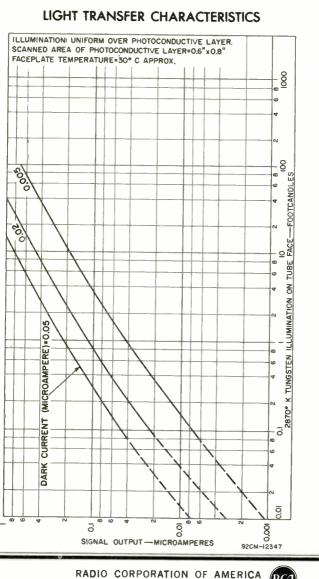


TYPICAL RANGE OF DARK CURRENT



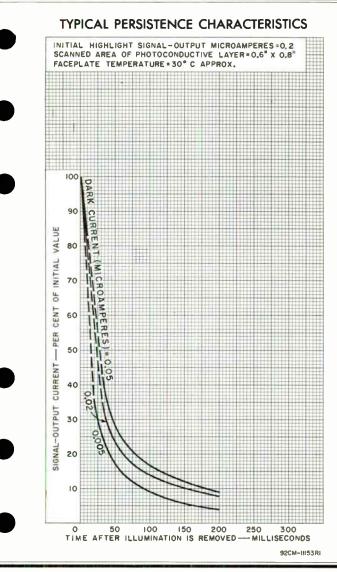


RADIO CORPORATION OF AMERICA Electropic Components and Devices World Distribution University Harrison, N. J.



Electronic Components and Devices Harrison, N. J.





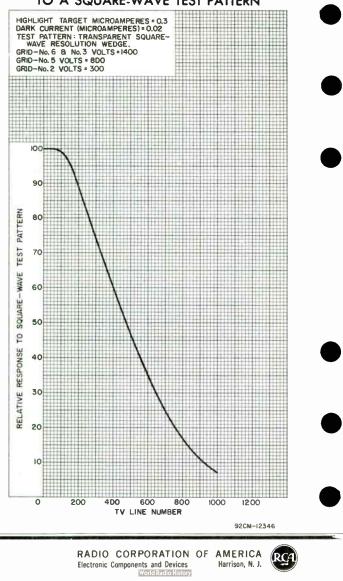


RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.

DATA 4 3-64

UNCOMPENSATED HORIZONTAL RESPONSE TO A SQUARE-WAVE TEST PATTERN



Vidicon

I" - DIAMETER

MAGNETIC FOCUS

MAGNETIC DEFLECTION For Live-Scene, or Film Pickup with Black-and White or Color Cameras. Features High Resolution with High Sensitivity and Low Lag. Grid No.3 and Grid No.4 Have Separate Base Terminals,

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)		6.3 ± 10% volts
Current at 6.3 volts		0.6 amp
Dimect Interelectrode Capacitance:*		
Target to all other electrodes		4.6 pf
Spectral Response		See Curve
Photoconductive Layer:		
Maximum useful diagonal of rectangular		

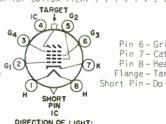
u of rectandulai

image (4 x 3 aspect ratio). 0.62" Orientation of quality rectangle-Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short pin. The masking is for orientation only and does not define the proper scanned area of the photoconcuctive layer.

Focusing Nethod														Mag	ane	tie	с
Deflection Method														Mar	ane	ti	с
Overall Length											6	. 21	50"	± (j.1	25	89
Greatest Diameter											1	.1	25"	'±(0.0	10	н
Operating Position																An	У
Weight (Approx.)															2	0	Z
Bulb					• •											. Ti	8
Focusing Coil	C, e	eve	ela	nd	E10	ec t	rc	n i	СS	b.,	C	Nc.	VF	-1	15-	12	,
														μiν			
Deflecting Yoke	C] 6	eve	ela	nd	E1(ec t	ro	i n	сs	b ,	С	No).V	Y- :	111	-3	,
											. (٥r	eo	∣ui∖	/al	en	t
Alignment Coil		C1	ev	el	and	El	ec	tr	on	ic	sb.	, Ф.	No	. V/	4-1	18	,
											(٥r	eq	μiv	/al	en	t .

Socket. Cinche No. 54A18088, or equivalent Basing Designation for BOTTOM VIEW. 8MĒ

Pin 1-Heater Pin 2-Grid No.1 Pin 3-Grid No.4 Pin 4-Do Not Use Pin 5-Grid No.2



DIRECTION OF LIGHT:

Pin 6-Grid No.3 Pin 7 - Cathode Pin 8 - Heater Flange - Target Short Pin - Do Not Use



RADIO CORPORATION OF AMERICA Electronic Components and Devices listory

Harrison, N. J.

DATA I 3-64 Maximum Ratings, Absolute-Maximum Values:

For scanned area of 1/2" x 3/8"

Grid-No.4 Voltage Grid-No.3 Voltage Grid-No.2 Voltage	•	1000 max. volts
Grid-No.1 Voltage: Negative bias value Positive bias value Peak Heater-Cathode Voltage:	•••	300 max. volts 0 max. volts
Heater positive with Heater positive with		125 max. volts
respect to cathode	 	100 max. volts 0.25 max. µa
Faceplate: Illumination		1000 max. fc

Typical Operation and Performance Data:

For scanned area of $1/2" \times 3/8"$ and faceplate temperature of 30° to 35° C

		ow-Voltage Operation	Hıgh-Voltage Operation	
Grid-No.4 (Decelerator) Voltage		500	750	volts
Grid-No.3 (Beam-Focus Electrode) Voltage ¹ .		3009	4509	volts
Grid-No.2 (Accelerator) Voltage.		300	300	volts
Grid-No.1 Voltage for Picture Cutoff ^h Lag ^j , Typical		-45 to -100 20	-45 to -100 20	volts %
Average "Gamma" of Transfer Character- istic for signal- output current				
between 0.02 µa and 0.2 µa		0.65	0.65	
nal-to-Noise Ratio (Approx.) ^k Minimum Peak-to-Peak	•	300:1	300:1	
Blanking Voltage: When applied to • grid No.1. • • • •		75	75	volts
When applied to cathode		20	20	volts
Limiting Resolution: At center of picture . At corner of picture .		900 600	1000 700	TV lines TV lines





	Low-Voltage High-Voi Oferation Operat								
Amp`itude Response to a 400 TV Line Square- Waye Test Pattern at									
Center of Picture	3 5 45	%							
of Focusing Coil ^f Peak Deflecting-Coil Current:	41 ± 4 52 ± 4	4 gauss							
Horizontal	180 220 33 40	ma ma							
Cail ^m	0 to 4 0 to	4 gauss							
	uity Operation - e on Faceplate								
Faceplate Illumination (Highlight) Target Voltage ^{•, p} Dark Currert ⁴ Signal-Output Current: ^r Typical	0.1 35 to 70 0.2 0.14	fc volts µа							
	sitivity Operation -								
0.5 Poorcanal Faceplate 'llumination	e on Faceplate								
(Highlight). Target Vol:age ^{n, p} Dark Currewt ^a Signal-Output Current: ^r Typical	0.5 30 tc 60 0.10 0.27	fc volts μa μa							
	uity Operation -								
1.0 Footcandin Faceplate 'llumination	e on Faceplate								
(Nighlight) Target Voltage ^{n, p} Dark Current ^q Signal-Output Current: ^r	1.0 20 to 40 0.02	fc volts μa							
Minimum.	0.20 0.15	µа µа							
	High-Light Level Operation - 10 Footcandles on Faceplate								
Faceplate Illumination (Highlight) Target Voltage ^{n,p} Dark Current ⁴	10 10 to 22 0.005	fc volts μa							
Signal-Output Current:" Typical	0.3	μа							

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

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World Radio History

- ^a This capacitance, which effectively is the output impedance of the 8507, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.
- ^b Cleveland Electronics Inc., 1974 East 61st Street, Cleveland, Ohio.
- C These components are chosen to provide tube operation with minimum beam-landing error when mounted in the recommended position along the tube axis.
- d Cinch Manufacturing Corporation, 1026 S. Homan Avenue, Chicago 24, Illinois.
- Video amplifiers must be designed to handle target currents of this magnitude to avoid amplifier overload or picture distortion.
- Beam focus is usually attained by varying the focus-coil current to obtain a field-strength value within the range shown under Typical Operation and Terformance Data. If the field-strength of the focus coil is fixed, beam focus is obtained within a ± 10 per cent range of the grid-Ho.4 and grid No.3 voltages. However, the recommended ratio of 0.6 between grid No.3 and grid No.4 must bemaintained as these voltages are varied.
- In general, grid No.3 should be operated above 250 volts and be 0.6 of grid-No.4 voltage.
- \boldsymbol{h} with no blanking voltage on grid No.1.
- j Defined as the per cent of initial value of signal-output current 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- k Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc and a peak signal-output current of 0.35 microampere. Because the noise in such asystem is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight video-signal current to rms noise current, multiplied by a factor of 3.
- The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.
- n The target voltage for each 8507 must be adjusted to that value which gives the desired operating dark current.
- P Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- 9 The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a blackleve' error in direct proportion to the change in Scanning velocity.
- ⁷ Defined as the component of the highlight target current after the darkcurrent component has been subtracted.

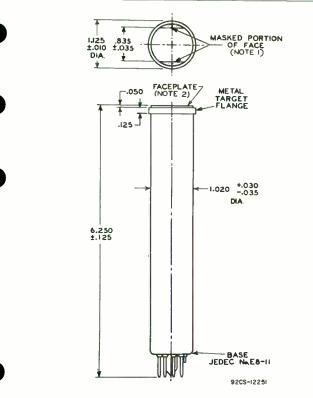
OPERATING CONSIDERATIONS

The resolution capability of the 8507 at the center of the picture is about 1000 TV lines and about 700 TV lines at the corner. This high resolution is obtained when the 8507 is operated with a grid-No.4 voltage of 750 volts and a grid-No.3 voltage of 450 volts. When the 8507 is operated at agrid-No.4 voltage of 500 volts and a grid-No.3 voltage of 300 volts, its resolution is about 900 TV lines at the center and 600 TV lines at the corner of the picture.

The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube. This spring contact may conveniently be provided as part of the focusing-coil design.



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DIMENSIONS IN INCHES

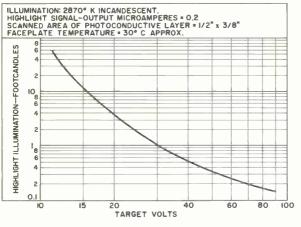
Note 1: Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin. Note 2: Faceplate thickness is 0.094" ± 0.012".



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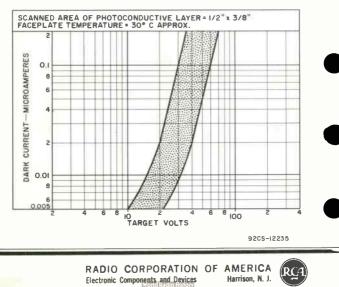
DATA 3 3-64

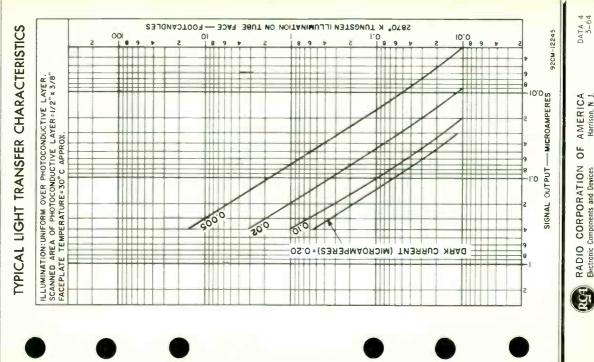
TYPICAL CHARACTERISTIC



9205-12236

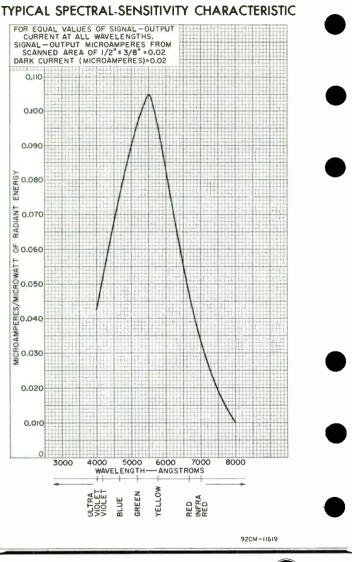
DARK-CURRENT RANGE





Harrison, N.

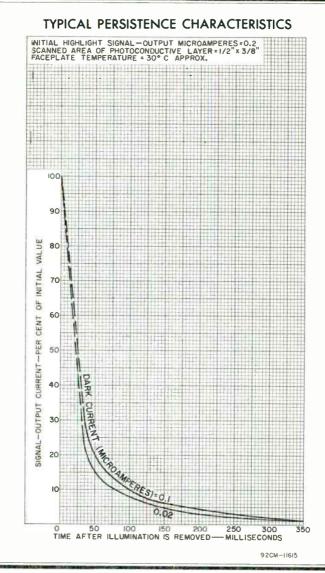
Electronic Components and Devices



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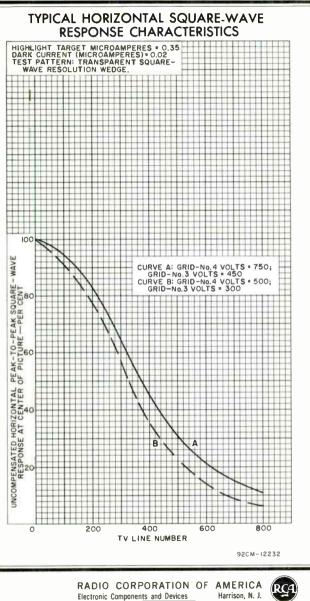




Electronic Components and Devices

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Vidicon

MAGNETIC FOCUS

I-1/2" Diameter MAGNETIC DEFLECTION

For Black-and-White Pickup in Industrial Closed-Circuit TV Systems Requiring Limiting Resolutions of more than 1200 TV Lines

General:

General:
Heater, for Unipotential Cathode: Voltage (AC cr DC)
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Do Not Use Pin 4 - Grid No.4 Pin 5 - Grid No.2 Pin 6 - Grid No.3 Pin 7 - Cathode Pin 8 - Heater Flange - Target Short Index Pin - Do Not Use Pin 4 - Drid No.4 Pin 5 - Grid No.3 Pin 7 - Cathode Pin 8 - Heater Flange - Target Pin 9 - Do Not Use Pin 9 - Do Not Use Pin 9 - Do Not Use
DIRECTION OF LIGHT: INTO FACE END OF TUBE
Maximum Ratings, Absolute-Maximum Values:
For scanned area of 0.6" x 0.8"
Grid-No.4 Voltage



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 6-64

Grid-No.1 Voltage: 300 max. Negative-bias value. 0 max. Positive-bias value. 0 max. Peak Heater-Cathode Voltage: 125 max. Heater negative with respect to cathode. 10 max. Target Voltage. 100 max. Dark Current . 0.25 max. Peak Target Current f 0.60 max. Faceplate: 110 umax. Illumination. 1000 max.	volts volts volts volts volts volts μa μa fc	
Typical Operation:	C	
For scanned area of $o.6" \ge o.8"$ and		
faceplate temperature of 28° to 34° C		
Grid-No.4 (Decelerator) Voltage ⁹ 1400 Grid-No.3 (Beam-Focus Electrode ^h) 800 to 1000 Grid-No.2 (Accelerator) Voltage 300 Grid-No.1 Voltage for	volts volts volts	
picture cutoffj45 to -100 Average "Gamma" of Transfer Characteristic for signal-output current between	volts	
0.62 µa and 0.6 µa 0.65 Minimum Peak-to-Peak Blanking Voltage		
When applied to grid No.1	volts volts	
Maximum value	90 90	
	lines lines	
	lines	I
Minimum value	%	
Focusing Coil (Approx.)	gauss	
Alignment Coil ^m	gauss	
Horizontal	ma ma	
Maximum-Sensitivity Operation- 0.1 Footcandle on Faceplate		
Faceplate Illumination (Highlight)	tc	

RADIO CORPORATION OF AMERICA **Electronic Components and Devices** World Radio History

Harrison, N. J.



Target Voltage ^{n, p}	30 to 60 0.1	volts µa
Signal-Output Current:	0.1	μα
Typical	0.2	μa
Average-Sensitivity Cperation—		
1.0 Footcandle on Faceplate		
Faceplate Illumination		
(Highlight).	1.0	
Target Voltage ^{n. p} .	17 to 3 5	
Dark Current [¶]	0.02	μa
Signal-Output Corrent:	0.00	
Typical	0.20	μa
Minimum	0.15	μa
High-Light Level Operation—		
10 Footcandles on Faceplate		
Faceplate Plum nation		
(H`ghlight)	10	fc
Target Voltage ^{n, p}	10 to 20	volts
Dark Current [¶]	0.005	μa
Signal-Output Current:"		,
Typical	0.3	μð

- ^a This capacitance, which effectively is the output impedance of the 8521, is increased when the tube is mounted in the deflecting-yoke and focusin)-alignment assembly. The resistive component of the output impedance is in the order of 100 megohms.
- Proper orientation of quality rectangle is obtained when the horizontal scin is essentially parallel to the plane passing through the axis and short index pin. The masking is for orientation only and dows not define the proper scarned area of photoconductive layer. Final orientation should be such that the image also fits inside of any internal mask of the mesh assembly.
- C Cleveland Electronics Inc., 1974 East 61st St., Clevelard, Ohio. d
- d For minimum geometric distortion, the deflecting yoke should be located in its proper axial position 3/4-irch from the face of the tube.
- Alden Products Co., 9140 North Ma n Street, Brockton 64, Mass.
- f Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.
- Grid-No.4 voltage must always be greater than grid-No.3 voltage. For minimum "porthole" effect, grid-No.4 voltage should be adjusted to approximatily 1.6 tim-s the grid-No.3 voltage value, and the focusingalignment assembly and deflecting yoke positioned as shown in accompanying diagram.
- B Beam focus is obtained by the combined effect of grid-No.3 voltage, which should be adjustable over indicated range, and a focusing coil having an average field strength of #6 gauss.
- With no blanking voltage on grid No.1.

Electronic Components and Devices

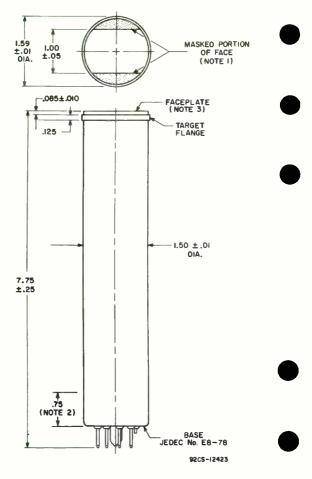
- k For initial signal-output current of 0.2 μ a and a dark current of 0.02 μ a.
- The alignment coil should be located on the tube so that its center is at a distance of 6 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting ycke, and the focusing coil.
- Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- ^p The target voltage for each 8521 must be adjusted to that value which gives the desired operating dark current.
- ^q The deflecting circuits nust provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning veloc ty. Amy change in scenning velocity produces a blacklevel error in direct proportion to the change in scanning velocity.
- Defined as the component of the highlight target current after the darkcorrent component has been subtracted.

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DIMENSIONS IN INCHES

Note I: Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin. Note 2: Within this area the minimum bulb diameter dimension does not apply.

Note 3: Faceplate thickness is 0.135" ± 0.005".

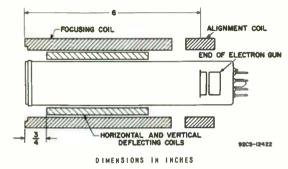


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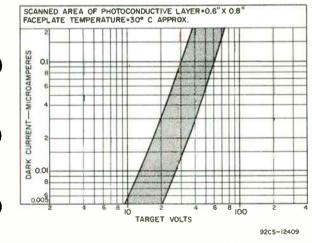
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COMPONENT LOCATIONS



RANGE OF DARK CURRENT





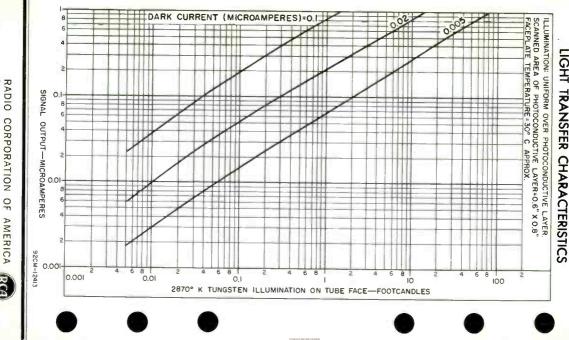
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DATA 3 6-64

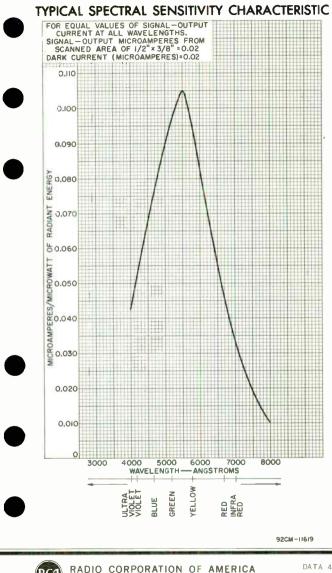
RADIO Electronic Components CORPORATION and Devices OF

Harrison, N.

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8521

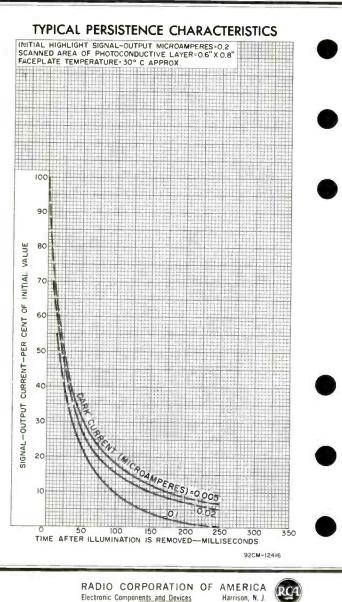


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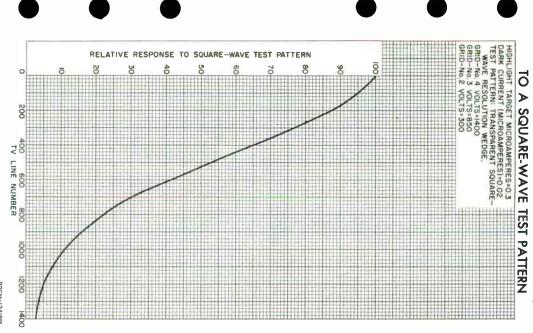
Electronic Components and Devices

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Harrison, N. J.







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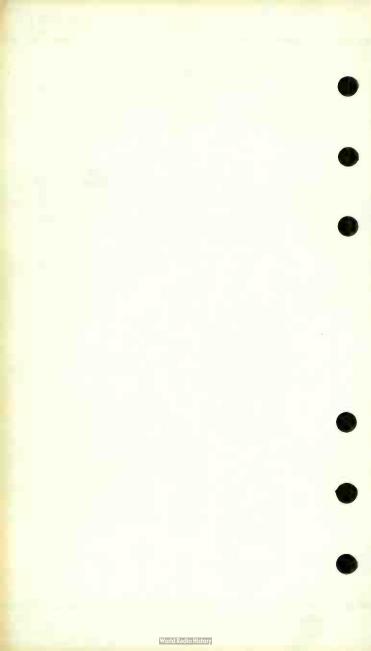
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92CM-12418R

DATA 6-64 J



Vidicon

MAGNETIC DEFLECTION

LOW-POWER (0.6-WATT)"DARK HEATER" I" DIAMETER PRECISION BUL8* ELECTROSTATIC FOCUS For Compact, Lightweight, Transistorized TV Cameras in Industrial and Other Closed-Circuit TV Systems Where Severe Environmental Conditions May be Encountered

0-----

General:
Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 ± 1.0% volts Current at 6.3 volts 0.095 amp Direct Interelectrode Capacitance: Target to all other electrodes 5.0 pf Spectral Response See Typical Spectral-Sensitivity Characteristic, shown under Type 8134
Photoconductive Layer: Maximum useful diagonal of rectang Ilar image (4 x3 aspect ratio) ⁶
Maximum Ratings, Absolute-Maximum Values:
For scanned area of 1 2" x 3/8"
Grid-Nc.6 & Grid No.3 Voltage ^f 1000 volts

RUGGEDIZED

Grid-Nc.6	& Grid N	0.3	Vo	lta	ige	f.							•	10.00	volts
Gr'd-No.5	Voltage*					• •		•	•	•	٠		•	1000	volts
Grid-No.4	Voltage.	•	• •	•	•	• •	٠	•	•	•	٠	٠	٠	300	volts volts
Grid-No.2	Voltage.	•	• •	٠	•	• •	٠	•	•	•	•	٠	٠	100	VOLLS



RADIO CORPORATION OF AMERICA Harrison, N. J. **Electronic Components and Devices**

DATA I 4-65

World Radio History

1 1/-1 --bl -

Gr.d-No.1 Voltage:		
Negative-bias value	300 volts	
Positive-bias value	0 volts	
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	125 volts	
Heater positive with respect to cathode	10 volts	
Target Voltage	100 volts	
Dark Current	0.2 µa	
Peak Target Current ⁹	0.6 µa	
Faceplate:	,	
Illumination	1000 fc	(
Temperature	71 °C	

Typical Operation and Performance Data:

For scanned area of 1/2" x 3/8" and faceplate temperature of 30° to 35° C and standard TV scanning rate

* 5 ** 55				
	Low- Voltage	Inter- mediate- Voltage	High- Voltage	
Grid-No.6 (Decelerator) & Grid-No.3 Voltage Grid-No.5 Voltage	300 180	500 300	750 450	volts volts
Grid-No.4 (Beam-Focus Electrode) Voltage Grid-No.2 (Accelerator)	20 to 60	50 to 100	90 to 150	volts
Voltage Grid-No.1 Voltage for	300 -45 to	300 -45 to	300 -45 to	volts
picture cutoffh Typical Electrode Currents:	-100	-100	-100	volts
Grid No.6 & 3 Grid No.5	1.7 0.05 0.0015 375	2.5 0.20 0.006 450	3 0.30 0.008 500	µа µа µа
Maximum value Typical value Average "Gamma" of Transfer Characteristic for	20 15	20 15	20 15	910 91
signal-output current between 0.02 & 0.2 μa Minimum Peak-to-Peak Blanking Voltage:	0.65	_	-	
Applied to grid-No.1 Applied to cathode Limiting Resolution at	75 20	_	_	volts volts
picture center Amplitude Response to a 400 TV Line Square Wave	600	700	750	TV lines
Test Pattern at picture center	20	25	30	9g
Coil ^k	0 to 1	0 to 1	0 to 1	gauss

DATA |

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.



Average-Sensitivity Operation

Under typical operating conditions specified

for either low- or high-voltage operation

Faceplate Illumination	- (1	Hig	ghl	li	ghi	t)					1	fc
Target Voltage ^{m, n}			۰.		•						20 to 40	volts
Dark Current [®]												μa
Signal-Output Current ⁹							•	•	•		0.2	μa

High-Sensitivity Operation

Under typical operating conditions specified for either low- or high-voltage operation"

Faceplate Illumination	()	Hig	3h i	liç	3h 1)			0.1	fc
Target Voltage ^{m, n}									30 to 60	volts
Dark Current ^p										μa
Signal-Output Current ⁹							•		0.10	μa

- a The precision outer-diameter bulb permits the use of low-power, closefitting detlecting yokes of small size and low impedance.
- ^b This capacitance, which effectively is the sutput impedance of the 8567 is increased when the tube is mounted in the deflecting-yoke assembly. The resistive component of the output impedance is in order of 100 megohms.
- C Proper orientation of quality rectangle is obtained when the harizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short pin.
- d C'eveland Electronics Incorporated, 1974 East 61st Street, Cleveland Obio, Thi, component is not designed to withstand severe environmental canditions, it is recommended that custom components be used in such service.
- Cinch Man⊾facturing Corporation, 1026 South Homan Avenue, Chicago 24, Elinois.
- f The maximum voltage difference between grids No.6 & 3 and No.5 should not exceed 500 volts.
- 9 Video amplifiers must be designed properly to handle peak target currents of this magnitude to avoid amplifier overload or picture distortion.
- h with no b'anking voltage on grid No. 1.
- J Defined as the per cent of initial value of signal-output current 1/20 second after illumination is removel. Values shown are for initial ignal-output current of 0.2 microampere and a dark current of 0.02 microampere.
- The alignment coil should be located on the tube so that its center is st a distance of 4-15/16 inches from the face of the tube, and be gositioned so that its axis is coincident with the axis of th, tube and the deflecting yoke.
- Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- n The target voltage for each 8567 must be adjusted to that value which gives the desired operating dark current.
- P The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark current signal is proportional to the scanning velocity. Any change in scanning velocity produces a blacklevel error in direct proportion to the change in scanning velocity.
- 9 Defined as the component of the highlight target current after the dark-current component has been subtracted.
- f Operation at this higher sensitivity level will result in a decrease in the resolution capability of the 8567.

ENVIRONMENTAL TESTS

The 8567 is designed to withstand the following operational and non-operational environmental tests.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

World Radio History

OPERATIONAL TESTS

Rejection Criteria

Tubes are operated as specified under Typical Operation, Low-Voltage Operation. Throughout these tests, the amplitude of any generated spurious signals must not exceed 80 per cent of the maximum white-signal value and the tube must provide a resolution of at least 200 TV lines.

Sinusoidal Vibration

These tests are performed on apparatus which applies variable-sinusoidal frequency vibration to the tube. The tube is vibrated in each of three orthogonal axes, one axis being parallel to the major axis of the tube, according to the schedule specified below. A vibration cycle has a duration of 4.5 minutes per axis in which time the frequency is varied from 20 to 1000 and back to 20 cycles per second. One vibration cycle is performed for each axis and the total test period is 13.5 minutes.

Double Ampli- tude	Peak Acceleration	Sweep Frequencies	Sweep Cycle Duration per Axis
inches	gʻs	cps	minutes
0.250	-	20 to 40)
-	20	40 to 400	
-	Decreased linearly from 20 to 3	400 to 1000	
_	Increased linearly from 3 to 20	1000 to 400	> 4.5
	20	400 to 40	
0.250	-	40 to 20)

Random Vibration

The 8567 is also subjected to random vibration having a spectral density of 0.1 g^2/cps in a bandwidth of 20 to 1000 cycles per second (10 g's — rms value) for a period of 3 minutes in each of the three orthogonal axes specified above. The total test period for each tube is 9 minutes.

NON-OPERATIONAL TESTS

Rejection Criteria

After completion of these tests, tubes will meet the performance characteristics specified under Typical Operation.

Shock

These tests are performed on apparatus which provides half-wave sinusoidal shock pulses. The 8567 is subjected to three impact shocks in each direction of the three orthogonal axes specified above. The peak acceleration of the impact shock is 30 g's and the time duration is 11 milliseconds. Each tube is subjected to a total of 18 impact shocks.

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Sinusoidal Vibration

These tests are performed on zpparatus which applies variable sinusoidal frequency vibration to the tube. The tube is vibrated in each of the three orthogonal axes previously specified. Avibration cycle has a duration of 30 minutes per axis in which time the frequency is varied from 5 to 2003 and back to 5 cycles persecond. One vibration cycle is performed for each axis and the total test period is 90 minutes.

Double Amplitude inches	Peak Accelera- tion g's	Sweep Frequencies cps	Sweep Cycle Duration per Axis minutes
0.250	_	5 to 20)
-	5	20 to 2000	30
-	5	2000 to 20	
0.250	-	20 to 5	J

Random Vibration

The 8567 is also subjected to rindom vibration having a spectral density of 0.05 g²/cps in % bandwidth of 20 to 2000 cycles per second (10 g's — rms value) for a period of 10 minutes in each of the three orthogonal axes specified above. The total test period for each tube is 30 minutes.

Acoustical Noise

The 8567 is subjected to an overall external moive of 140 db for a period of 5 minutes.

Static Acceleration

The 8567 is subjected to a static acceleration of 20 g's in each of the three orthogonal axes specified above for a period of 5 minutes. The total test period for each tube is 15 minutes.

> DIMENSIONAL OUTLINE, RECOMMENDED LOCATION OF DEFLEC-TING YOKE AND ALIGNMENT COIL, DARK-CURRENT RANGE, TYPICAL LIGHT-TRANSFER CHARACTERISTICS, TYPICAL SPECTRAL-SENSITIVITY CHARACTERISTIC, TYPICAL PERSISTENCE CHARACTERISTICS,

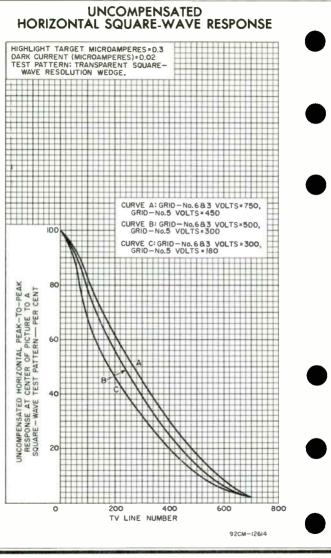
> > and

TYPICAL HORIZONTAL-DEFLECTION-CURRENT-CHARACTERISTIC shown under Type 8134 also apply to the 8567



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World Radio History



DATA 3

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World Radio History

Photomultiplier Tube^a

S-4 RESPONSE

VERY SMALL, RUGGEDIZED, SIDE-ON, 9-STAGE TYPE TESTED FOR SHOCK, VIBRATION, CONSTANT ACCELERATION, AND TEMPERATURE CYCLING

For Ultra-Compact Systems in Low-Light Detection and Measurement Applications

GENERAL

Direct Interelectrode Capacitance: (Approx.) Anode-to-dynode No.9	Spectral Response. Spectral Response. Spectral Response. Spectral Response. Wavelength of Maximum Response. 4000 ± 500 angstroms Catabode. Cesium-Antimony M nimum projected length ^b . 0.375 in M.nimum projected width ^b . 0.06 in Minimum orojected area ^b . 0.023 sq. in Secondary-Emitting Surface. Cesium-Antimony Window. Lime Glass, (Corning ^c No.0080), or equivalent
Maximum Diameter 0.53 in Operating Position Any Weight (Approx.) 0.17 oz Bułb T-4 Magnetic Shield See footnote (4) Base See Dimensional Outline and Base Drawing Basing Designation for BOTTOM VIEW 12FZ Lead 1 - Arode INCIDENT RADIATION Lead 5 - Drnode No.8 200 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	Anode-to-dynode No.9
Lead 1 - Arode Lead 5 - Dynoce No.8 Lead 4 - Dynode No.7 Lead 5 - Dynode No.5 Lead 6 - Dynode No.5 Lead 7 - Dynode No.3 Lead 9 - Lynoie No.2 Lead 10 - Lynoie No.1 Lead 11 - Photocathode NCIDENT RADIATION INCIDENT br>INCIDENT RADIATION INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT INCIDENT IN	Maximum Diameter 0.53 in Operating Position Any Weight (Approx.) 0.17 oz Bułb T-4 Magnetic Shield See footnote (d) Base See Dimensional Outline and Base Drauing
B (7) (6) DY6	Lead 1 - Arode Lead 2 - Dynoce No.8 Lead 4 - Dynode No.7 Lead 5 - Dynode No.5 Lead 5 - Dynode No.5 Lead 6 - Dynode No.5 Lead 7 - Dynode No.4 Lead 9 - Dynode No.4 Lead 9 - Dynode No.4 Lead 9 - Dynode No.4 Lead 9 - Lynode No.2 Lead 10 - Lynode No.1 Lead 11 - Photocathode Lead 12 - Eynode No.9 DY9 (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)

MAXIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

		Voltage										
Bet	we n	node	and c	at hode	е						1250	٧
		inode a										
Bet	we en	CONSPCE	utive	lynoc	les						250	V
Bet	ween	dynode	No.1	and c	nthod						250	V



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8571

Average Anode Current ^f Ambient Temperature Lead Temperature 1/16" ± 1/32" from pr	• • •	•••	l for 10 se		20 μA 5 °C 50 °C
CHARAC	TERIS	TICS RA	NGE VALUES		
Under conditions with dc su viding 1/10 of E between c ceeding dynode stage; and With E = 1000 volts (e	pply vo athode: 1/10 of	ltage (8 anddynod Ebetwe	E) across a v le No.1; 1/10 en dynode No	of E for eacl	r pro- n suc-
1000 Doits (6	xcept	as not Min	еа) Тур	Max	
Sensitivity		111 0 10	ryp	max	
Fadiant, at 4000 angs Cathode Radiant, at	troms	-	7.3×10 ⁴	-	A/W
4000 angstroms. Luminous, at 0 c/s ⁹ . Cathode Luminous ^h . Cathode Quantum Effi- ciency at 3800 Ang-		20 2×10-5	0.034 75 3.5×10 ⁻⁵	300	A/W A/1m A/1m
stroms (Approx.) Current Amplification.	•••	-	10.5 2.1x10 ⁶	-	%
Equivalent Anode-Dark-	••••	-	1x10-10k	5×10-10 ^k	1
Current Input	•••	{ - •	🖣 lx10-13	5.1x10 ^{-13^m}	1m W
Anode-Pulse Rise Time ⁿ Electron Transit Time ^p	•••	` -	1.4x10 ⁻⁹ 6x10 ⁻⁹	-	s
	• • •		•••••	-	5
With E = 750 volts (ex	cepta	s noted	()		
Sensitivity		Min	Тур	Max	
Radiant, at 4000 angs Cathode Radiant, at	troms.	-	1×10 ⁴	-	A/W
4000 angstroms.		-	0.034	-	A/W
Luminous, at 0 c/s ^g , Cathode Luminous ^h .		- 2x10-5	10 3.5×10 ⁻⁵	-	A/1m A/1m
Cathode Quantum Effic	iency		0.5410	_	<i>M /</i> 107
at 3800 Angstroms (Ap Current Amplification.		-	10.5 3×10 ⁵	-	%
Equivalent Anode-Dark-	•••	, -	1×10-10 ^k	5x10-10 ^k	1
Current Input ^j	•••	{ I	1x10 ⁻¹³ "	5.1x10 ^{-13^m}	lm W
Anode-Pulse Rise Time ⁿ Electron Transit Time ^p	•••	`-	1.8x10 ⁻⁹ 7.4x10 ⁻⁹	-	5
Floor on Transie Time.	• • •	-	7.4XIU *	-	5
Alternate designation is	Multip	Lier Pho	tntube.		
Gn a plane parallel to th Structure.	e gril	WIFPS.	See Schemai	tic Arrangemen	nt of
C Made by Corning Glass Wor	ks, Cni	ning, N.	Y.		
d Magnetic shielding materi- the Mignetic Shield Divis Avenue, (hicago 22, 111)n	al in th ion, Pr	e form nf efection	foil or tape Mica Gompany	e as available 7, 1322 North B	from
Coperation with a supply vo	ois, or ltage (∶equiva. E) of Lei	lent. ss than 500 v	olts de is ue	ually
Coperation with a supply vo not recommended. If such a limited to such a value t exceed approximately 5x1	supply hat the	voltage	e is used, il e cathode pho	lumination mu tocurrent doe	st be
f Averaged over any interva	0" 9 amp 1 of 30	ere. Secondi	maximum		
,		5000142			

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Electronic Components and Devices World Radio History Harrison, N. J.



- 9 Under the following conditions: The light source is a tungsten-filament Lamp having a line gluss envelope. It is operated at a coing terminatent lamp having a line gluss envelope. It is operated at a coin temper-ature of 2870°K. A light input of 1 mirolumen is used and the approxi-mate spot it ze of the beam incident on the tube envelope is 0.35 inch by 0.05 inch. The tube is rotated to provide maximum anode output current.
- h Under the collowing conditions: The light source is a tungsten-filament The approximate spot size of the beam incident on the tube envelope is 0.35 inch by 0.05 inch. The tube is rotated to provide maximum output CUPPent
- j At a tube temperature of 22°C. Dark current may be reduced by use of a refrigerant.
- k With supply voltage (E) adjusted to give a luminous sensitivity of 20 amperes per lumen.
- At 4000 angstroms.
- ⁿ Measured between 10 per cent and 90 per ent 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.
- 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 ampli-tude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.

SPECTRAL-SENSITIVITY CHARACTERISTIC OF PHOTOSENSITIVE DEVICE HAVING S-4 RESPONSE

is shown at the front of this section

ENVIRONMENTAL TESTS

The 8571 is designed to withstand the following environmental tests:

Shock. With no voltage applied, the 8571 is subjected to a total of 18 impact shocks, three in each direction of the three orthngonal axes, on apparatus which applies half-wave sinusoidal shock pulses. The peak acceleration of the impact shock is $30 \pm 3g$'s and the time duration is 11 ± 1 milliseconds.

Vibration. With no voltage applied, the 8571 is vibrated, in each of the three orthogonal axes and as specified below, on apparatus which applies variable-sinusoidal frequency vibration to the tube. A vibration sweep has a duration of 5 minutes per axis in which time the frequency is varied logarithmically from 5 to 2000 and back to 5 cycles per second. Six vibration sweeps are performed for each axis and the total test period is 1-1/2 hnurs.





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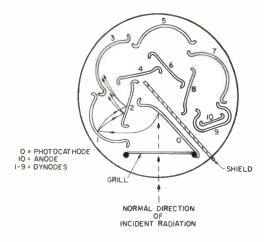
Double Amplitude inches	Accelera- tion g ⁺ s	Fre- quency c/s	Total Sweep Duration Per Axis minutes
0.45 - 0.45	20 20	5-30 30-2000 2000-30 30-5	30

Constant Acceleration. With no voltage applied, the 8571 is subjected for five minutes to an acceleration test level of 15 g's in both directions of the three orthogonal axes in a centrifuge providing constant acceleration.

Temperature Cycling. With no voltage applied, the 8571 is subjected to temperature cycling from -45°C to +75°C and back to -45°C in a period of 8 hours. Three temperature cycles are performed.

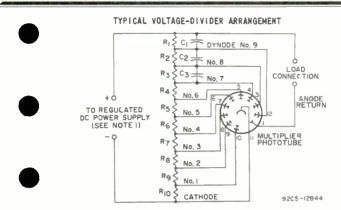
SCHEMATIC ARRANGEMENT OF STRUCTURE

(Top View)

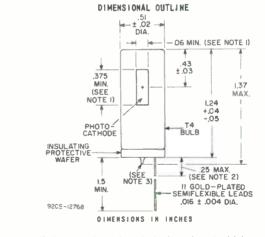




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 R_1 through $R_{10} = 20,000$ to 5,000,000 ohms. NOTE 1: Adjustable between approximately 500 and 1250 volts. NOTE 2: Capacitors C1 through C3 should be connected near tube base for optimum high-frequency performance.



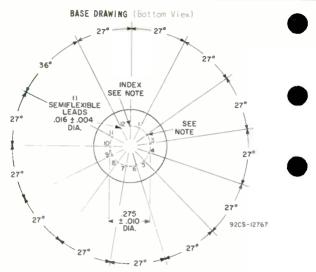
NOTE 1: Minimum projected cathode length and width on plane parallel to grill wires. NOTE 2: Soldering or welding to the leads within this region is

not recommended.

NOTE 3: A 0.15 inch minimum hole diameter should be provided in circuit boards or similar mounting arrangements to allow for clearance of the exhaust tip of the 8571.

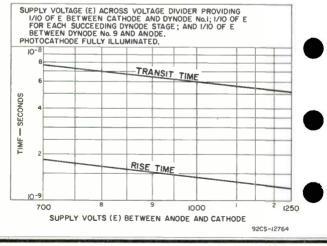


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NOTE: Lead is cut off within 0.10 inch of the glass button for indexing.

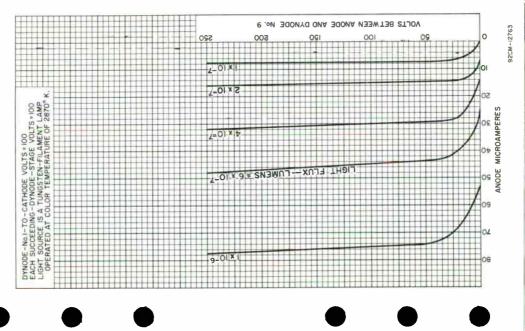
Typical Time Resolution Characteristics



DATA 3

8571

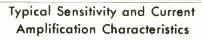


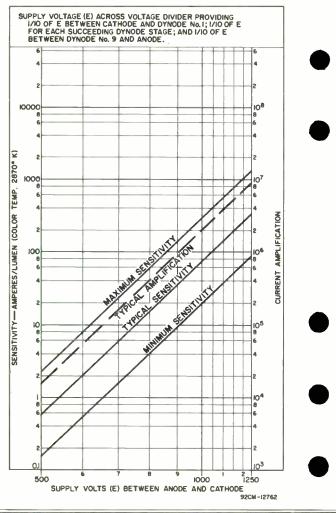


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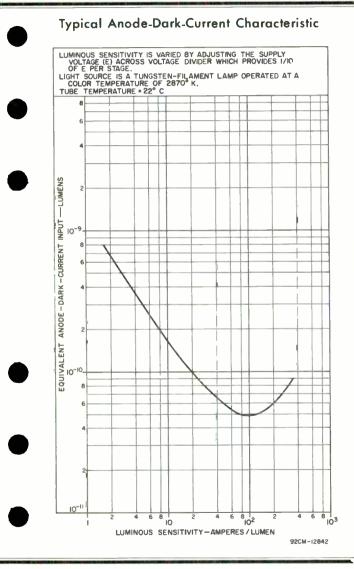
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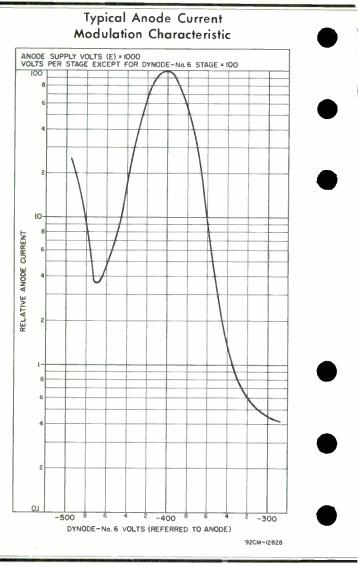




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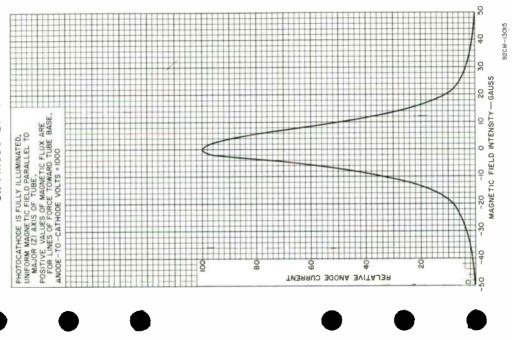
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Grid-Ne	0.2	VOID	tage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	7:	0
RCA	RA	DIO	CC	RI	PC 1ts	R	AT 5 D	T C evic)N ces		O F	-	A N Ha	ЛE	R son,	IC N.	A J.			

DATA I 4-65

volts

Grid-No.1 Voltage:				
Negative bias value		. 300	volts	-
Positive bias value		0	volts	
Peak Heater-Cathode Voltage:				
Heater negative with respect to cathode		125	volts	
 Heater positive with respect to cathode 		10	volts	
larget Voltage		125	volts	
Dark Current.		0 25	щa	
Peak Target Current [†]		0.55	μa	
Faceplate:				
Illumination		1000	fc	
Temperature		71	°C	

Typical Operation and Performance Data:

For scanned area of $1/2" \ge 3/8"$ and faceplate temperature of 30° to 35° C

	Low- Voltage	High- Voltage	
Grid-No.4 (Decelerator) Voltage Grid-No.3 (Beam-Focus	500	750	volts
Electrode) Voltage ⁹	300 ^h 300	450 ^h 300	volts volts
Picture Cutoff ^j	-45 to -100	-45 to -100	volts
Average "Gamma" of Transfer Characteristic for signal-output			
current between 0.02 µa and 0.2 µa . Visual Equivalent Signal-to-Noise		0.65	
Ratio (Approx.) ^k Lag ^m -Typical Value for	300:1	300:1	
minimum lag operation Minimum Peak-to-Peak Blanking Voltage:	7.5	7.5	%
When applied to grid No.1 When applied to cathode	75 20	75	volts
Limiting Resolution:		20	volts
At center of picture At corner of picture	900 600	1000 700	TV lines TV lines
of Focusing Coil ⁹	41 ± 4	52 ± 4	gauss
Certer of Picture	35	45	%
Horizontal	180	220	ma
Field Strength of Adjustable	33	40	ma
Alignment Coilm	0 to 4	0 to 4	gauss



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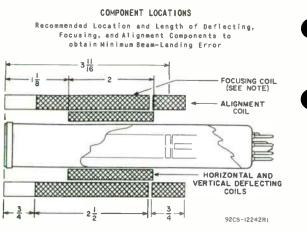
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Average-Sensitivity Operation for Live-Scene Pickup 10 Footcandles on Faceplate
Faceplate l'lumination (Highlight). 10 fc Target Voltage ^{p,q} 25 to 60 volts Dark Current ^r 0.02 µa Signal-Output Current ^s (Typical). 0.3 µa
Minumum-Lag Operation for Film Pickup 100 Footcandles on Faceplate
Faceplate Illumination (Highlight).100fcTarget Voltage ^{9,9} 12 to 30voltsDark Current ^r 0.004µaSignal-Output Current ^s (Typical).0.3
a This capacitance, which effectively is the output impedance of the 8572 is increased when the tube is mounted in the deflecting-yoke and focus- ing-alignment assembly. The resistive component of the output impedance is in the order of 100 megohms.
Proper orientation of quality rectangle is obtained when the horizontal scan is essentially parallel to the pl.ne tassing through the axis and short pin. The masking is for orientation only and does not define the proper scanned area of photocondu tive layer. Final orientation should be such that the image also fit in:ide of any internal mask of the mesh assembly.
C Clevelard Electronics Inc., 1974 East Wist St., Cleveland, Dhip.
d These components are chosen to provide tube operation with minimum beam-landing error when mounted in the recommended position along the tube axis.
Cinch Manufacturing Corporation, 1025 S. Homan Avenue, Chicago 24, Illinois.
f villeo amplifiers must be designed to han⊂le target currents of this magnitude ≇o avoid amplifier overload or picture distortion.
9 geam focus is usually attained by varyin- the focus-coil current to obtain a field-strength value within the range shown unver fypical Operation and Performance Data. If the field-strength of the focus coil is fited, beam focus is obtained within a ± 10 per cent range of the grid-No.1 and grid-No.3 voltages. However, the recommended ratio of 0.6 between grid No.3 and grid Nc.4 must be maintain*d as these voltages are varied.
h In general, grid No.3 should be operated above 250 volts and be 0.6 of grid-No.4 voltage.
With no blanking voltage on grid No.1.
k Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc and a peak signal-output current of 0.35 microampere. Because the noise in such a system is predominately of the high-frequen- cy type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight video-signal current to rms noise current, multiplied by a factor of 3.
Defined as the per cent of initial value of signal-output 'urrent 1/20 second after illumination is removed. Values shown are for initial signal-output current of 0.3 microampere and a dark current of 0.004 microampere.
The alignment coil should be located on the tube so that its enter is at a distance of 3-11/16 inches from the face of the tube, and be positionec so that its axis is coinciden: with the axis of the tube, the deflecting yoke, and the focusing coil.
P The target voltage for each 8572 must be adjusted to that value which gives the desired operating dark current.
Indicated range for each type of service serves only to illustrate the operating target=voltage range normally escountered.
The deflecting circuits must provide *xtr*mely linear scanning for good black-level reproduction. Dark currint ignal is proportional to the scanning velocity. Any change in scanning velocity produles a black- level error in direct proportion to be manye in scanning velocity.
³ Defined as the component of the highlight target current after the dark-current component has been subtracted.
-
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Electronic Components and Devices

OPERATING CONSIDERATIONS

The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube. This spring contact may conveniently be provided as part of the focusing-coil design.



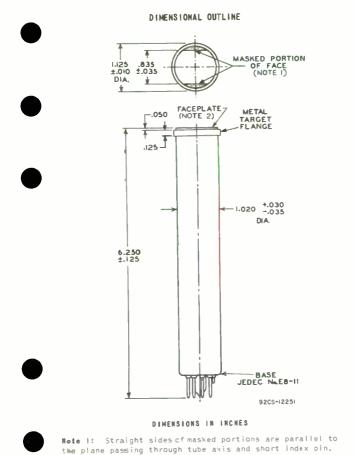
DIMENSIONS IN INCHES

Note: Cross-hatching indicates wound portion of focusing coil.



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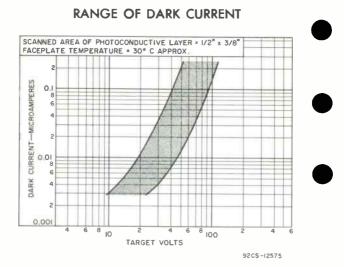
RADIO CORPORATION OF AMERICA Electronic Components and Devices



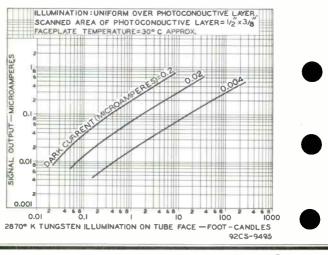
the plane passing through tube arts and short in **Note 2:** Faceplate thickness is $0.024" \pm 0.012"$.



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LIGHT TRANSFER CHARACTERISTICS

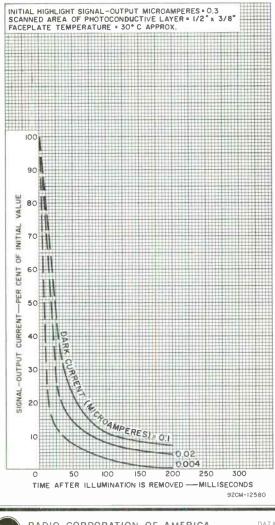


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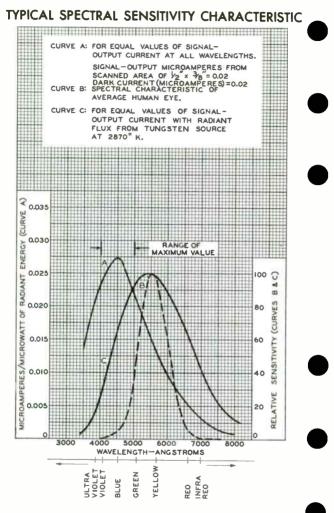
RCA

TYPICAL PERSISTENCE CHARACTERISTICS



RCA

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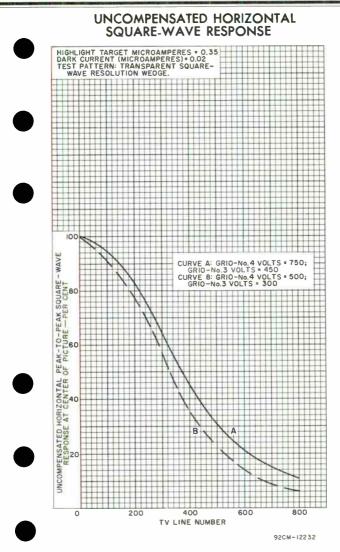


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DATA 4

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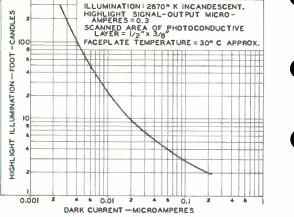


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92CS-9493



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DATA 5

Vidicon

LOW-POWER (0.6-WATT) "DARK HEATER" MAGNETIC FOCUS

I" - DIAMETER MAGNETIC DEFLECTION

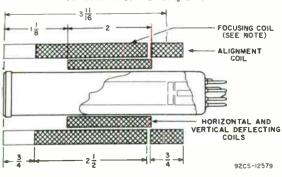
For Live-Scene Pickup in Industrial Closed-Circuit TV in Compact Transistorized Black-and-White or Color Cameras. Features High Resolution with High Sensitivity and Low Lag. Grid No.3 and Grid No.4 Have Separate Base Terminals.

The 8573 is the same as the 8507 except for the following:

General:

Heater, for Unipotential Cathode:	
Current at 6.3 volts	0.095 amp
Overall Length	5.12" ± 0.06"

RECOMMENDED LOCATION AND LENGTH OF DEFLECT-ING, FOCUSING, AND ALIGNMENT COMPONENTS



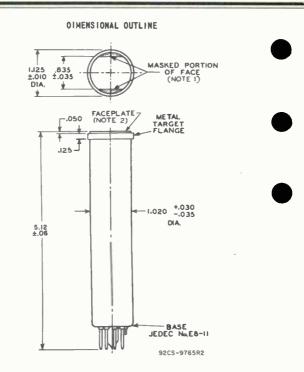
For Ninimum Beam-Landing Error

DIMENSIONS IN INCHES

Note: Cross-hatching indicates wound portion of focusing coil.



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DIMENSIONS IN INCHES

Note 1: Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin. Note 2: Faceplate thickness is 0.094" ± 0.012".



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DATA

Photomultiplier Tube

12-STAGE, HEAD-ON TYPE

BIALKALI PHOTOCATHODE OF HIGH QUANTUM EFFICIENCY IN-LINE ELECTROSTATICALLY-FOCUSED DYNODE STRUCTURE

For use in pulse counting applications such as counting of low-activity radioactive materials releasing low-energy particles when used in conjunction with suitable scintillators.

GENERAL

													~				-		
Spectral Re	espons	se .			. S	ee	а	CC	OW	Danj	yin	g i	Sp	e C	tre	ıl.	Res	;poi	n s e
													- (Ch	are	ic î	eri	ist	ics
Wavelength	of Ma	ay imu	im F	2es	рол	se					.3	85	0	ŧ!	500) a	паз	str	oms
Cathode, So			-		p 011				0	K	Ån	ŧ i	- m0	n i i	dø	(F	lia	l ka	11)
Cathode, St	CINICIO	113 Pd	1 61		•	•	•	•	• • •		~		6.0	ha	- 17	- 1	64	ect.	ion
Shape .	• • .•	• •	•	•	•	•	•	*	•	• •	•		sh	ne	rH	201	50	50 L	101
Minimum	proje	cted	ar	ea.	•	•	•	•	•	• •	•	•	•	•	•	2.	54	sq	
Minimum	diame	ter.					•	•		• •		•	•	•	•	• •	_ L.	.80	in
Window.				. Ру	rex	ι,	Co	rn	ing	gå	No.	77	40	, 1	or	eq	i u i v	va l	ent
Shape .														.	Pia	and)-C(onc	ave
Index of	refr	actio	n.	at	589	33	аг	as	tro	oms								1	.47
Dynodes	1011							3 -											
Substrat	~												C	00	ne	r _ 1	lor	v11	ium
Secondar	C • •	**1	· .					•	•	• •	•	•	•••	Ro	20	i ri	ium.	_ <u>^</u>	ide
Secondar	y-emi	L L I M	1 2	u; i	aci	۳.		1.	•	121		÷	1.	00	17	- 1 - 1 E -	Cin.	- ¥	100
Structur	е	• •	. •		•	. : !	n-		ne	, E P	eci	ire	151	aι	ΤÇ		JC U	5 1	ype
Direct Int	erele	ctro	le	Cap	bac	i ta	Inc	es	- (App	ro)	(,)						_	_
Anode to																			
Anode to	all	othei	r e	lac	tro	ode	25											6	pF
Maximum Ov	erall	Lend	ath														. 5	.71	in
Seated Len	ath .													.4	.9	8	± 0	.08	in
Maximum Di	amoto	r	•			-	-	-	-								. 2	.10	i i n
Operating	Dee 14		•	•	•••	•	•	•	•	•••				•		•			Anv
operating	rusit	ion.	•	• •	• •	•	•	*	*	• •	•	•	•	•	1	•	• •		
Weight (Ap	prox.)	•	•	• •	•	٠	•	•	• •	•	•	•	٠	•	•	• •	C	
Bulb.					• •	•	٠	•		• •	•	•	۰.	÷	*	•	• •		116
Socket					• •	R	CA.	Pa	rt	No	.DI	P2	18	D	or	١Ņ.	o.D	P21	24 P
Mannetic S	hield												. S	ee	f	00	tno	te	(c)

MAXIMUM AND MINIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

DC Supply Voltage

With V show	anode and oltage Dis n in Table	tribution							V V
With k show	oltage Dis m in Table	tribution					{3500 800	max min	V V
Between Between	anode and dynode No.	dynode No 12 and dy	.12 node N	No.11	•••	:	800 800	max max	V
	consecutiv dynode No.						400 ∫800 {300	max	V V V
	focusing e I ode Curren						800 0.2	max	V mA
	mperature						-100 t	o +85	°C



RADIO CORPORATION OF AMERICA Electronic Components and Devices WorkElectronicitistory

BASING DIAGRAM	
Basing Designation for Bottom View	
Pir 2 - Dynode No.3	
Pin 3-Dynode No.5	
Pir. 4 - Dynode No. 7 NC () DY3	
Pir 5 - Dynode No.9 $(21) = (1)$	
Pin 6-Dynode No.11	
Pin /- Anode	-
Pin 9-Do Not Use G(17) VI 5 DYg	
Pin 10 - Electron Multiplier	
Pin 11-Do Not Use	
Pin 12-Dynode No. 10 DY4 B	
Pin 13 - Dynode No.8 Pin 14 - Dynode No.6 DY6 3 (2) (3) (3) (3) (3) (3) (3) (3) (3) (3) (3	_
Pip 15 Dupode No. 4 DYo COURS NO	
Pin 16 - Dynode No. 2	
Pin 17 – Focusing Electrode 218	
Pin 18 - Do Not Use DIRECTION OF RADIATION: INTO END OF BULB	
Pin 19 – Do Not Use	
Pin 20 – Do Not Use	
Pin 21-Photocathode	

CHARACTERISTICS RANGE VALUES

Under conditions with dc supply voltage (E) across avoltage divider providing electrode voltages shown in Table I.

With E = 1100 V (Except as noted)

Voltage Distribution I of Table I

Sensitivity Radiant, at 3850 angstroms	Min _	Тур 880	Max -	A/W
Cathode radiant, at 3850 angstroms Luminous [†]	-	0.088 0.8	-	A/W A/W A/Im
Cathode luminous: With tungsten light source ⁹ With blue light source ¹ 8 Cathode quantum efficiency		7.7x 0-5 0x 0-10	-	A/Im A
at 3850 angstroms	-	28 1×10 ⁴	-	af Ja
Anode Dark Current ^j Equivalent Anode-Dark- Current Input	- { -	1x10 ⁻⁹ 5x10 ^{-12^k}	4x10-9	A Im
Pulse Height ^{n,p} Pulse Height Resolution ^p	-	4.4x10 ^{-15^m} 0.15 7.5	- 8.0	W V %
Dark Noise Spectrum ⁴ Pulse Height Spectrum with Fe ⁵⁵ Source ⁷	-	z a a	-	
Mean Gain Deviation ^s With count rate change of 10,000 to 1,000 c/s ^t	_		_	%
For a period of 16 hours at a count rate of 1,000 c/s".	-	1	-	10 %

DATA 1

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With E = $2000 \vee (Except as noted)$			
Voltage Distribution I of Table I			
Min	Тур	Max	
Sensitivity Radiant, at 3850 angstroms Cathode radiant, at	3.5×10 ⁵	-	A/W
3850 angstroms	0.088 300	3000	A/W A/lm
Cathode luminous: With tungsten light source [®] - With blue light source ^h 8x10 ⁻¹⁰	7.7x10 ⁻⁵ 10x10 ⁻¹⁰	-	A/lm A
Dathode quantum efficiency at 3850 angstroms Current Amplification Anode Dark Current ^j	28 4x10 ⁶ 1x10 ⁻⁹	- 4×10-9	%
Equivalent Anode-Dark- Current Input	5x10 ^{-12^k} 4.4x10 ^{-15^m}	4X10 -	A Im W
Anode-Pulse Rise Time ^v Electron Transit Time ^w	2.7×10 ⁻⁹ 3.7×10 ⁻⁸	-	S
With E = 2500 V (Except as noted)			
Voltage Distribution I of Table I			
Min	Тур	Max	
Sensitivity Radiant, at 3850 angstroms Cathode radiant, at	3.2x10 ⁶	-	A/W
3850 angstroms Luminous ^f Cathode luminous:	0.088 2.8x10 ³	-	A/W A/lm
With tungsten light source ⁹ – With blue light source ^h 8x10 ⁻¹⁰ Cathode guantum efficiency	7.7x10 ⁻⁵ 10x10 ⁻¹⁰	-	A/lm A
at 3850 angstroms Current Amplification Anode Dark Current ^j	28 3.6x10 ⁷ 1x10 ⁻⁹	- 4×10-9	%
Equivalent Anode-Dark- Current Input	5x10-12 ^k 4.4x10 ^{-15^m}	-	lm W
Anode-Pulse Rise Time ^v Electron Transit Time ^w	2.3x10 ⁻⁹ 3.3x10 ⁻⁸	-	s
With E = 3000 V			
Voltage Distribution II of Table I			
Min	Тур	Max	
Pulse Current Space-charge limited (Saturated) ^x	0.75	-	A
Linear ^y	0.25	-	A

RCA

RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

DATA 2 7-65

- Made by Corning Glass Works, Corning, New York.
- A socket is supplied with each 8575. The DP2118 is a molded teflon socket while the DP2124 is a printed-circuit board socket on a teflon base material. Additional sockets may be obtained from RCA, Photo-multiplier Marketing, Lancaster, Pa.
- Magnetic shielding in the form of foil or tape as available from the Magnetic shield Division, Perfection Mica Company, 1322 North Elaton, Chicago 24, Illinoia, or equivalent. The shielding must be operated at cathode potential and be insulated from the tube envelope by ma-terial such as Scotch Electrical, Type 33, manufactured by Minneaota Mining and Manufacturing Company, St. Paul 6, Minneaota, or equivalent.
- Averaged over any interval of 30 seconds maximum.
- Tube operation at room temperature or below is recommended.
- Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color tempera-ture of 2870° K and a light input of 0.1 microlumen is used.
- Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color tempera-ture of 2870° K. The value of light flux is 100 microlumens and 500 volta are applied between cathode and all other electrodes connected as anode
- Under the following conditions: Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.5-58, polished to 1/2 stock thickness-Manufactured by the Corning Glass Works, Corning, New York) from a tungsten-filmment lamp operated at a color temperature of 2870 %. The value of light flux incident on the filter is 100 microlumens and 500 volts are applied between cathode and all other electrodes connected as anode.
- At a tube temperature of 22° C. Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.5-58, polished to one-half atock thickness), The light flux incident on the filter is 0.1 microlumen. The supply voltage E is adjusted to obtain an anode current of 2.6 microsamperes. Sensitivity of the 8575 under these con-ditions is approximately equivalent to 200 amperes per lumen. Dark current is mesaured with light source removed.
- With supply voltage E adjusted tivity of 200 amperes per lumen. voltage E adjusted to give an equivalent luminous sensi--
- At 3850 angstroms.
- At 3850 angetroms. Pulse height is defined as the amplitude of the snode pulse voltage (referred to snode) measured across a 100 kilohm resistor and a total capacitance of 100 ± 3% pF in parallel. Under pulse conditions, the interatage voltages of the 875 should not deviate more than 2% from the interatage voltage of the 875 should not deviate more than 2% from the interatage voltage of the 855 should not deviate more than 2% from the interatage voltage of the 8550, Serial No.Al651, or equivalent) are used. This scintillator is manufactured by the Harshaw Chemical Corporation, 1945 East 97th Street, Cleveland 6, Ohio, and is rated by the manifacturer as having an easily of 8.2 per cent to 8.3 per cent. The Cal³⁷ acurce is in direct contact with the metal end of the acapility of 60,000 centiatokes) manufactured by the Dow Corning Corp., Midland, Michigan, or equivalent. Michigan, or equivalent.
- Pulse height resolution is defined as the quotient of the full width of the photopeak at half height by the pulse height at maximum count rate under the conditions of (n).
- When the content on the following conditions: The light source is a tung-aten-filament lamp having a lime-glass envelope. It is operated at a low color temperature to assure the high probability of single photo-electron emission from the photocathode of the 8575. The intensity of the light source is adjusted for approximately 50 per cent counting loss. A Nuclear Data Model No.ND-1304 Multichannel Pulse-Height Analyzer is not be approximated to approximately 50 per cent counting loss. A Nuclear Data Model No.ND-1304 Multichannel Pulse-Height Analyzer is used to measure photoelectron pulse height.
- Measured using a Harshaw Type HG 0.005° beryllium window Nal(Tl) scintil-lator, 0.04° thick and 7/8° in diameter and an isotope of iron having an atomic mass of 55 (Fe55) and an activity rate of one microcurie.
- Mean gain deviation is defined as the percentage change, regardless of aign, from the average pulse height for a given radistion source and scintillator over a specified time or count rate interval.
- Under the following conditions: The scintillator and Cal37 radiation assurce of (Π) are employed. The radiation source is initially centered, on the major axis of the tube and the asintillator, at a point pro-viding spulse count rate of 10,000 c/s. The pulse height of the photo-peak is measured under this condition. Next, the radiation source is



Harrison, N. J.



moved rapidly, in approximately 30 meconds, to a new position that is equivalent to a count rate of $1,000\ c/s$. The new position is also centered in the major axis of the tube. The pulse height under this condition is measured. The difference in pulse height between these two measurements is typically 1 per cent.

- ^U Under the same conditions as (t) except the count rate position of 1,000 c,s is maintained for 16 hours and the pulse height is asspled at 1 hour intervals.
- Weasured between 10 per cent and 9^H per cent of maximum anode-pulse height. This anode-pulse rise time is primarily a function of transit time valiation and is measured under conditions with the incident light fully illuminating the photocathode.
- 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 asode terminal reaches peak amplitude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.
- The interstage voltages of the 8575 do not deviate more than 2 per cent from the recommended voltage distribution shown by Poltage Distribution I of fable J. Capacitors are connected ucross the individual resistora making up the voltage-divider arrangement to insure the operating condition.

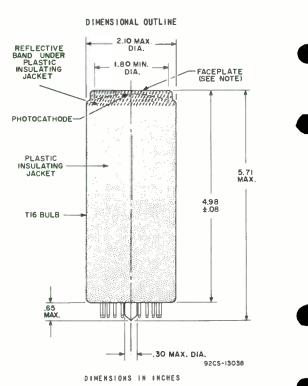
 ${}^{\underline{y}}$ Maximum deviation from linearity is 2 per cent.

- ² See accompanying fypical Noise Spectra.
- aa See accompanying Differential Pe55 Spectrum.

VOLTAGE TO BE	ROVIDED BY DIVID	ER
Between	Distribution I 6.1% of Supply Voltage (E) multiplied by	Distribution II 4.6% of Supply Voltage (E) multiplied by
Cathode and Dynode No. 1	4.0	4.0
Dynode No. 1 and Dynode No. 2	1.0	1.0
Dynode No. 2 and Dynode No. 3	1.4	1.4
Dynode No.3 and Dynode No.4	1.0	1.0
Dynode No.4 and Dynode No.5	1.0	1.0
Dynode No. 5 and Dynode No. 6	1.0	1.0
Dynode No.6 and Dynode No.7	1.0	1.0
Dynode No.7 and Dynode No.8	1.0	1.0
Dynode No.8 and Dynode No.9	1.0	1.0
Dynode No. 9 and Dynode No. 10	1.0	1.5
Dynode No. 10 and Dynode No. 11	1.0	2.0
Dynode No. 11 and Dynode No. 12	1.0	4.0
Dynode No. 12 and Anode	1.0	2.0
Anode and Cathode	16.4	21.9
Focusing Electrode is connect	cted to arm of p	otentiometer be-
tween cathode and dynode No.		
age is varied to give maximu plier shield is operated at		

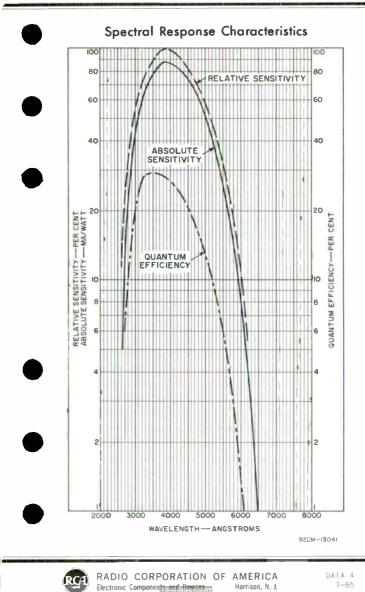
TABLE I



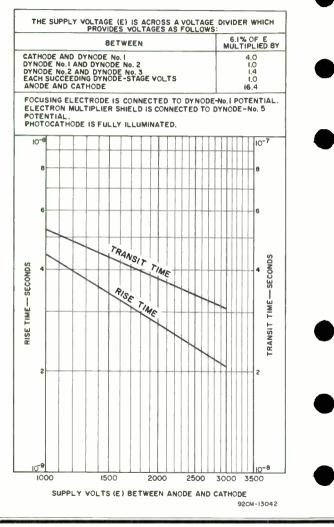


Note: Within 1.80" minimum diameter, deviation from flatness of external surface of faceplate will not exceed 0.010" from peak to valley.



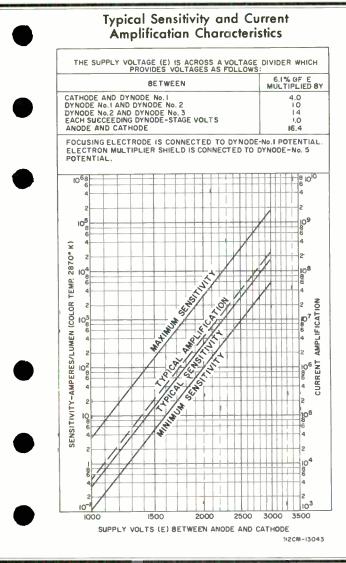


Typical Time-Resolution Characteristics



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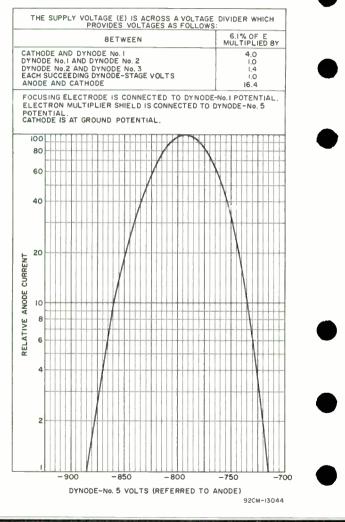






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Typical Dynode Modulation Characteristic





THE SUPPLY VOLTAGE (E) ACROSS A VOLTAGE PROVIDES VOLTAGES AS FOLLOWS: 8ETWEEN			6.1% OF E MULTIPLIED 8		
CATHODE AND DYNODE No.1 DYNODE No.2 EACH SUCCEE ANODE AND (AND DYNODE AND DYNODE DING DYNODE	No. 2 No. 3	ΤS		4.0 1.0 1.4 1.0 6.4
ELECTRON M POTENTIAL, FOCUSING-EL CURRENT AM LIGHT SOURC COLOR TEMP TUBE TEMPE	ECTRODE V PLIFICATION E IS A TUNG ERATURE OF	OLTAGE IS A STEN-FILAN 2870° K.	DJUSTED FO	R MAXIMU	JM
2				1	2
10 ⁻⁷					8 ¹⁰⁻⁷
4				/	4
ERES 2			/	/ 1	10 ⁸
AMPE			1		6
ENT 2			/		2
anobe dark current — Amperes		CURRENT	/		10 ⁻⁹
DARK		CURRY			4
NODE (00	25		1	8 ^{10¹⁰}
4 8 6	1				6
2	/				- 2
10 ¹¹		EADCI		~	8 ^{10¹¹}
4	-		17		4
10-12	4 6 6 2	4 6 8	2 4 6 8	2 4 6	10 ⁻¹²

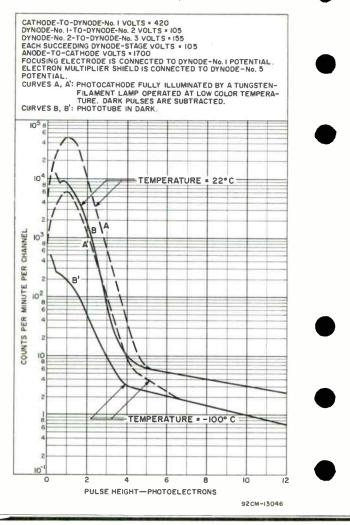


(RCA)

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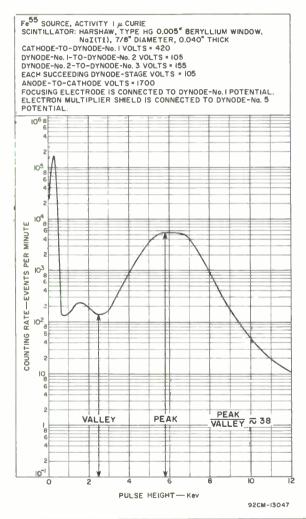
DATA 6 7-65

Typical Noise Spectra



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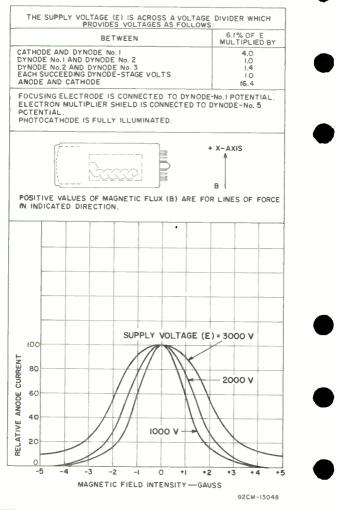






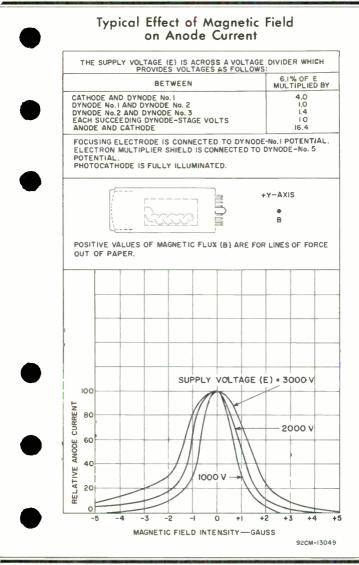
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Typical Effect of Magnetic Field on Anode Current





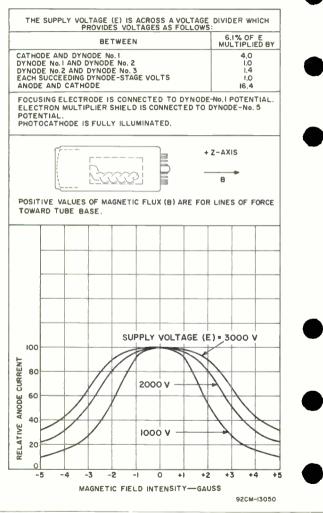






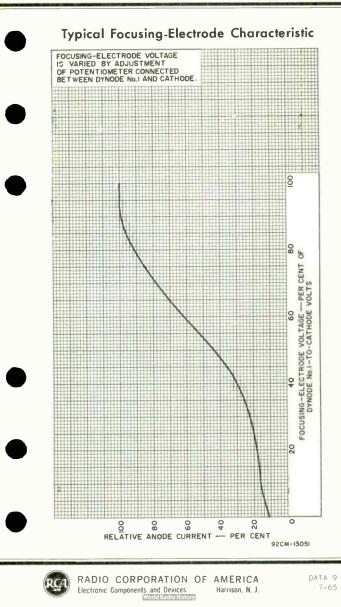
RADIO CORPORATION OF AMERICA Electronic Components and Devices

Typical Effect of Magnetic Field on Anode Current

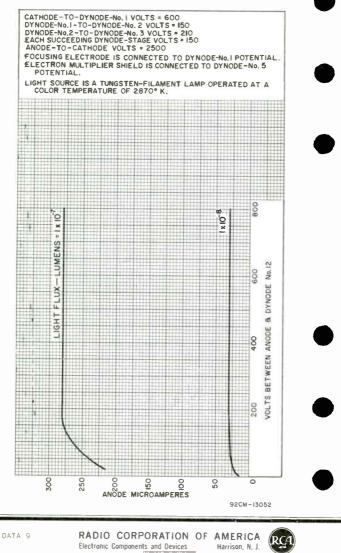


DATA 8

RADIO CORPORATION OF AMERICA Electronic Components and Devices Wolf Child Island Harrison, N. J.



Typical Anode Characteristics



8644, 8645

Photomultiplier Tubes

S-20 RESPONSE 3/4-INCH DIAMETER, IO-STAGE, HEAD-ON TYPES MULTIALKALI PHOTOCATHODES OF HIGH QUANTUM EFFICIENCIES IN-LINE ELECTROSTATICALLY-FOCUSED DYNODE STRUCTURES

For Miniaturized Low-Level Light Detection and Measurement Systems and Laser Detection Equipment to 8000 Angstroms (Typical Quantum Efficiency is 2.5% at 6943 Angstroms)

GENERAL Wavelength of Maximum Response. 4200 ± 500 angstroms Minimum diameter. 0.5 in Minimum clameter. (indow. . . . Borosilicate, Corning^a No.7056, or equivalent Shape · · · · · · · · · · Plano-Concave **Dvnodes** Secondary-emitting surface. Beryllium-Oxide Structure In-Line Electrostatic-Focus Type Direct Interelectrode Capacitances (Approx.) 2.4 oF Anode to all other electrodes 3.6 pF Maximum Overall Length (Excluding leads) 3.8 in 8645. . . . 4.55 in Maximum Diameter 8644.... . 0.78 in 8645. 0.93 in . Operating Position. Any Weight (Approx.) 8644 With base attached. . . . 1.7 oz Without pase. 0.8 oz 4.5 oz Bulb. Magnetic ShieldSee footnote (b) ABSOLUTE-MAXIMUM RATINGS 8644 8645

(DC or Peak AC)					
Between anode and cathode			 2100	1800	V
Between anode and dynode No.10.			 300	300	ý
Between consecutive dynodes			 . 200	-	V
Between dynode Nc.1 and cathode			 400	-	V
Average Anode Current ^c			 0.5	0.5	mA
Ambient Temperature ^d			 85	85	00

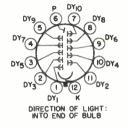


8644, 8645

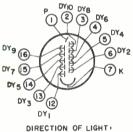
TERMINAL DIAGRAMS (Bottom View) 8644

With Base Attached

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 LIGHT

9215-1184

Lead	1 – Anode
Lead	2 – Dynode No.10
Lead	3 – Dynode No.8
Lead	4 - Dynode No.6
Lead	5 – Dynode No.4
Lead	6 - Dynode No.2
Lead	7 – Photocathode
Lead	12 - Dynode No.1
Lead	13 - Dynode No.3
Lead	14 - Dynode No.5
Lead	15-Dynode No.7
Lead	16 – Dynode No.9



Harrison, N. J.

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

CHARACTERISTICS RANGE VALUES

Under conditions with dc supply voltage (E) across a voltage divider providing 1/6 of E between cathode and dynode No. ; 1/12 of E for each succeeding dynode stage; and 1/12 of F between dynode No.10 and anode. This voltage is provided by the integral voltage-divider network of type 3645.

With E = 1500 volts dc (Except as noted)

For Both Types Sensitivity Radiant, a* 4200		Min	Тур	Max	
angstroms	•	-	5.lx10 ³	-	A/W
at 4200 angstroms Luminous ^e Cathode lumincus:		ų.	0.064 12	60	A/W A/lm
With turgsten light source ^f With blue light		1.2×10-4	1.5×10 ⁻⁴	-	A/lm
source ^g With red light			8.5×10 ⁻⁸	-	A
source [†] Current Amplification . Equivalent Anode-Dark-		4×10 ⁻⁷	5_2x10 ⁻⁷ 8x10 ⁴	-	A
Current Input ^{j,k} Anode Dark Current	. 	-	4x10 ⁻¹¹ 9.4x10 ^{-14^m} 6x10 ⁻¹⁰	6×10-10 1.4×10 ⁻¹² "	lm ₩ A
Equivalent Noise Input ⁿ	•	-	2.5×10-12 6×10 ^{-15^m}	-	lm W
Anode-Pulse Rise Time ^p . Electron Transit Time ^q .	•	-	1.8x10 ⁻⁹ 2x10 ⁻⁸	-	5 5
With E = 2000 volts dc (Exc	cept as r	oted)		-
With E = 2000 volts dc (For Type 8644 Only	Exc	cept as r Min	ioted) Typ	Max	-
For Type 8644 Only Sensitivity Raciant, at 4200 angstroms	•	,	'	Max_	A/W
For Type 8644 Only Sensitivity Radiant, at 4200	•	,	Тур	Max	A/W A/W A/lm
For Type 8644 Only Sensitivity Radiant, at 4200 angstroms Cathode radiant, at 42C0 angstroms. Luminouce Cathode lumirous: With tungsten light		Min - - - 1.2×10 ⁻⁴	Typ 4.7x104 0.064 110	Max - -	A/W
For Type 8644 Only Sensitivity Radiant, at 4200 angstroms Cathode radiant, at 4200 angstroms Luminole ⁶ Cathode luminous: "Vith tungsten light source ⁴ With blue light source ⁴		Min - - - 1.2×10 ⁻⁴	Typ 4.7x104 0.064 110	Max - -	A/W A/lm
For Type 8644 Only Sensitivity Radiant, at 4200 angstroms Cathode radiant, at 42C0 angstroms Luminouce Vith tungsten light source ⁹ With blue light source ⁹ With red light source ⁴ Current Amplification.	· · ·	Win - - 1.2×10 ⁻⁴ 5.5×10 ⁻⁸	Typ 4.7x10 ⁴ 0.064 110 1.5x10 ⁻⁴ 8.5x10 ⁻⁸ 5.2x10 ⁻⁷ 7.3x10 ⁵	Max - - - -	A/W A/lm A/lm
For Type 8644 Only Sensitivity Radiant, at 4200 angstroms Cathode radiant, at 4200 angstroms Luminouce Cathode lumirous: Vith tungsten light source ⁴ With blue light source ⁴ With red light source ⁴		Win - - 1.2×10 ⁻⁴ 5.5×10 ⁻⁸	Typ 4.7x10 ⁴ 0.064 110 1.5x10 ⁻⁴ 8.5x10 ⁻⁸ 5.2x10 ⁻⁷	Max - - - 6x10 ⁻¹⁰	A/W A/1m A/1m A



8644, 8645

- ^a Made by Corning Glass Works, Corning, New York.
- ^b Magnetic shielding material, for type 8644, in the form of foil or tape as available from the Magnetic Shield Division, Perfection Mica Company, 1322 North Elston, Chicago 24, Illinoia, or equivalent. Type 8645 has an integral magnetic shield.
- C Averaged over any interval of 30 seconds maximum.
- d Tube operation at room temperature or below is recommended.
- e Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color tempera-ture of 2870° K and a light input of 1 microlumen is used.
- Under the following conditions: The light source is a tungsten-filament Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color tempera-ture 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. This characteristic cannot be measured after type 8645 is encapsulated in its potting compound.
- Inder the following conditions: Light incident on the cathode is trans-mitted through a blue filter (Corning C.S. No.5-58, polished to 1/2 atock 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. This characteristic can not be measured after type 8645 is encapsulated in its potting compound.
- 8053 is encapsulated in its potting targets. b Under the following conditions: Light incident on the cathode is trans-mitted through a red filter (Corning C.S. No.2-62-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. This charactercathode and all other electrodes connected as anode. This character-istic can not be measured after type 8645 is encapsulated in its potting compound.
- At a tube temperature of 22° C. Dark current may be reduced by use of a refrigerant
- k With supply voltage (E) adjusted to give a luminous sensitivity of 30 amperes per lumen.
- At 4200 angstroms. This of 428 lumens per watt. This value is calculated using a conversion factor
- Under the following conditions: Supply voltage (E) is as shown, 22° C tube temperature, external shield connected to cathode, bandwidth loycle per ascond, 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 Under the following conditions:
- 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.
- 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 ampli-tude. The transit time is measured under conditions with the incident light fully illuminating the photocathode.

OPERATING CONSIDERATIONS

Terminal Connections and Mounting Considerations

Type 8644

The 8644 is supplied with a small-shell duodecal base attached to semiflexible leads to facilitate testing. After testing, the attached base should be removed prior to installing the 8644 in a given system.

The semiflexible leads of the 8644 may be soldered or welded into the associated circuit. However, extreme caution, must be exercised when making such connections to the leads to prevent tube destruction due to thermal stress of the glass-A heat sink placed in contact with the semimetál seals.

Electronic Components and Devices





RADIO CORPORATION OF AMERICA Harrison, N. J.



flexible leads between the point being soldered, or welded, and the glass button is recommended.

Excessive bending of the leads-especially in the region close to the glass button-must be avoided.

Direct clamping to the bulb for mounting purposes is not recommended. It is suggested that a resilient material, such as Silastic^r RTV 881, RTV 882, or equivalent, be used between the bulk and clamp.

The application of high voltage, with respect to cathode, to insulating or other materials supporting or shielding the 8644 at the photocathode end of the tube should not be permitted unless such materials are chosen to limit leakage current to the tube envelope to 1×10^{-12} ampere or less. In addition to increasing dark current and noise output because of voltage gradients developed across the bilb wall, such high voltage may produce minute leakage current to the cathode through the tube envelope and insulating materials which can permanently damage the tube.

Type 8645

Support for the 8645 may be effected by clamping directly to the magnetic shield. However, only that amount of uniformly distributed pressure necessary to hold the tube firmly in position should be employed.

Shielding

Type 8644

Electrostatic and magnetic shielding of the 8644 is usually required. When a shield is used it must be at cathode potential.

The accompanying Typical Effect of Magnetic Firld on Anode Current (8644) curve shows the effect of magnetic fields on anode current of the 8644 under the conditions indicated. The effects of hysteresis due to residual magnetism of the materials used in the tube structure have keen neglected.

Type 8645

The 8645 is encapsulated with an insulating plastic potting compound in a magnetic shield and has an integral voltagedivider network. The magnetic shield is electrically connected to the photocathode.

The accompanying Typical Effect of Magnetic Field on Anode Current (8645) curve shows the effect of magnetic fields on anode current of the 8645 under the conditions indicated. The effects of hysteresis due to residual magnetism of the materials used in the tube have been neglected.

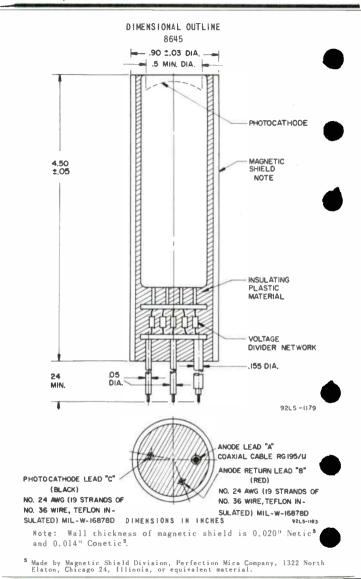
The voltage-divider network and supply voltage connections for the 8645 are shown under accompanying Integral Voltage-Divider Network (8645).

" Trademark of Dow Corning Corporation, Midland, Michigan.





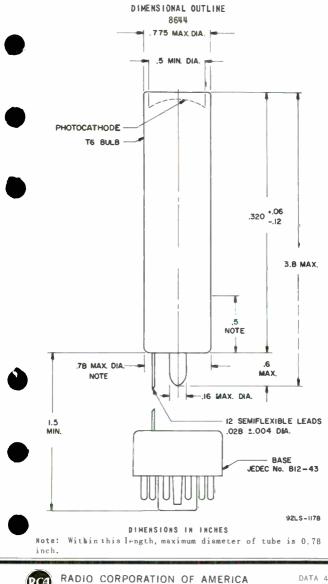
8644, 8645



DATA 3

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.





Electronic Components and Devices

World Radio History

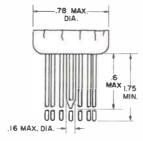
Harrison, N. J.

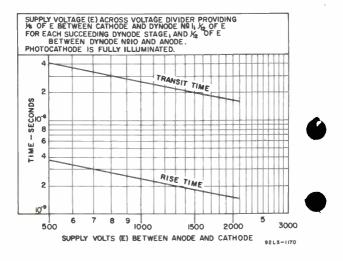
DATA 4 12-65

Typical Time-Resolution Characteristics

DIMENSIONAL OUTLINE 8644

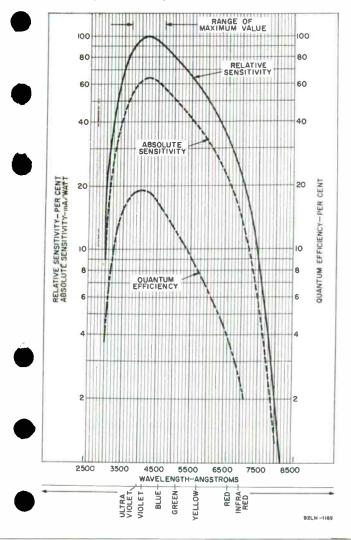
Detail with 8ase Removed







RADIO CORPORATION OF AMERICA Electronic Components and Devices World Data Bullicom



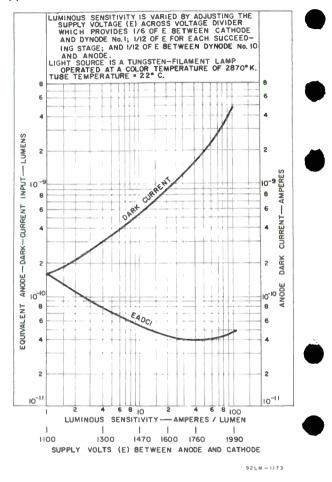
Spectral Response Characteristics



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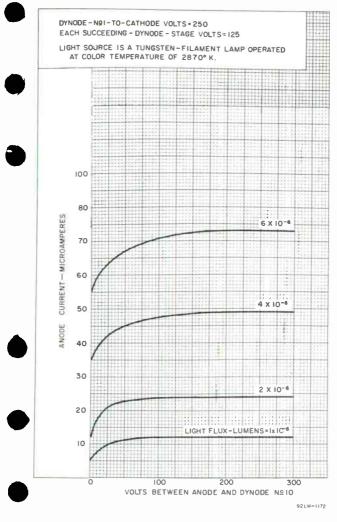
DATA 5 12-65

Typical Dark Current and EADCI Characteristics











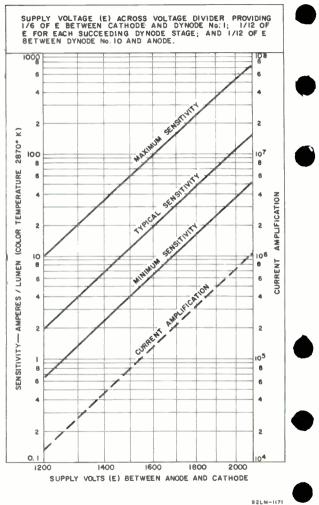
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DATA 6

8644, 8645

Typical Sensitivity and Current Amplification Characteristics

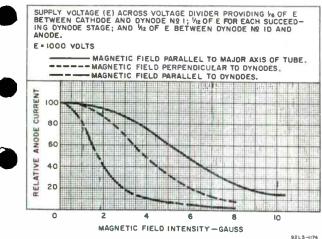


DATA 6

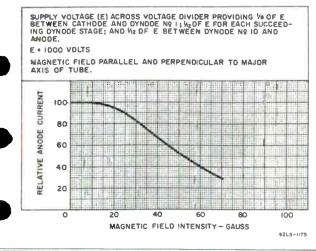
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Typical Effect of Magnetic Field on Anode Current 8644



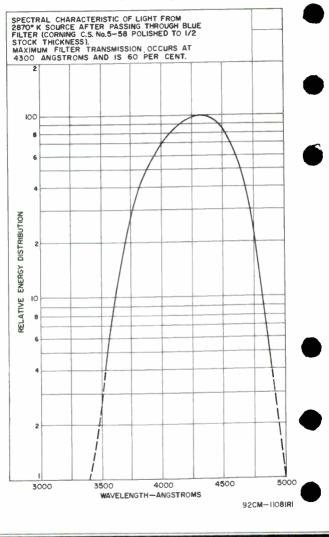
Typical Effect of Magnetic Field on Anode Current 8645





RADIO CORPORATION OF AMERICA Electronic Components and Devices

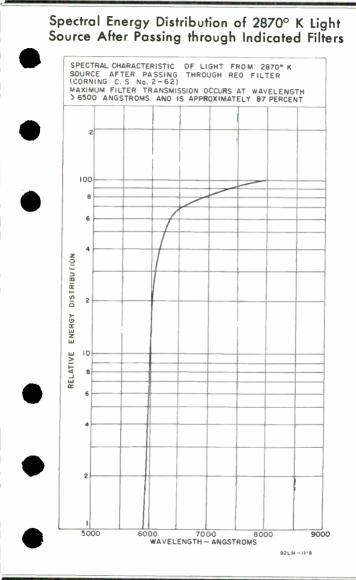
Spectral Energy Distribution of 2870° K Light Source After Passing Through Indicated Filters



CATA 7

RADIO CORPORATION OF AMERICA Electronic Components and Devices







RADIO CORPORATION OF AMERICA Electromic Components and Devices Marrison, N. J. 4 -

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World Radio History

RCA TUBE Handbook HB-3

THYRATRON, IGNITRON, & GLOW-DISCHARGE TUBE SECTION

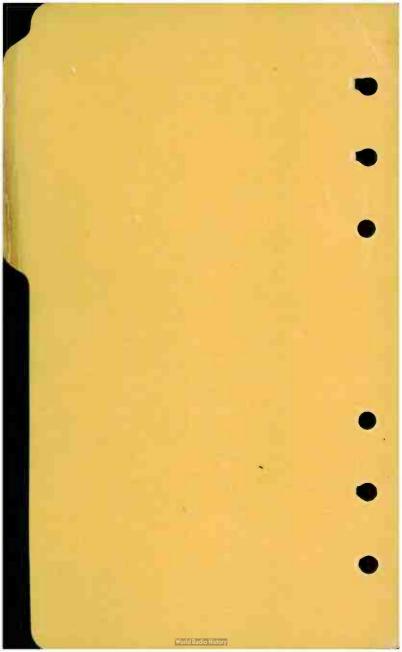
This Section contains data on thyratrons, ignitrons, and glow-discharge (coldcathodc) tubes used for voltage-regulator, relay, and voltage-reference applications.

For further Technical Information, write to Commercial Engineering, Tube Division, Radio Corporation of America, Harrison, N. J.

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SEPARATOR

World Radio History



Selection Guide for RCA THYRATRON, GLOW-DISCHARGE, GNITRON, and VACUUM-GAUGE TUBES

ES

TUB

CUUM-GAUGE

4

>

and

RON,

IGNIT

GLOW-DISCHARGE,

TRON,

THYRA' TUBES

World Padio History

GE

Amp

4.80

1.85

12.112.1

30.2

30.2

75.6

75.6

14C

140

192

192

355

355

5

10

100

32

40

8 15

Per tube.

56

GLOW-DISCHARGE TUBES

IGNITRONS

Anode Current^a

Av for Inter-

Time

vals

Sec

27.8

11.6

22 9.2

18

7.5

18

14

14

5.8

11

4.6

11

4.6

10

6

6

6.25

6.25

6.25

1.25

0.06

5.8

7.5

MAXIMUM RATINGS

For power-supply frequencies of 25 to C cbs

Peak

Amp

846

354

1692

708

3400

1410

1130

466

0080

2830

2260

13600

5660

4530

1890

480

700

1600

2400

3000

4000

Intermittent Rectifier Service and Frequency-Changer Welder Service 10

945

Resistance-Welding Control Serviceb

Demand

Power

KVA

150

300

300

000

600

200

200

1200

400

400

2400

2400

800

800

-

Resistance-Welding-Capacitor Discharge Service

500 60 di schgs sec

500 60 dischgs sec

RMS

Supply

Volts

250

600

250

600

250

600

250

600

250

600

250

600

250

600

250

Peak Anode

Inverse

04

Forward

Volts

1500

1200

500

500

1500

600

d

3000

RCA

Туре

5550

5551A

5552A

5553B

5551A

5552AC

5553B

5550

			and the second se	_			-
	Average DC Operating Volts		Coperating rrent Range Ma.		Average DC Starting Volts	RCA Type	INTRATEON,
	Voltage-Regul	ato	r Types	_			A
l	59		0.4 to 2		67	991	집
l	75		5 to 30		105		ž
l	75		5 to 40		100	0A3	
l	78		5 to 40		100	0A3A	GLOW-DISCHARGE,
l	108		5 to 30		115	082	9
l	108		5 to 30		115	^{6074^a}	
	108		5 to 40		115	0C3	ы М
	110		5 to 10		15	OC3A	Q
l	150		5ιο 10		160	OD3A	Þ
	151		5 ±o 10		156	DOA2	
	151		5 to 30		156	6073 ^b	1
	153		5 to 10		160	003	
l	Voltage-Refe	renc	e Types				ရှ
1	86.5		1.5 to 3.5		107	-5651AC	
	87		1.5 to 3.5		107	[□] 5651	전
	Relay Types						IGNITRON,
1	Maximum Pea	ik	Maximum	С	athode		
	Inverse Anoo	de			eres	RCA	and
l	Volts		Peak		Average	Туре	
'	180		100		25	1C21d	
	200		100		25	[□] 5823 ^e	8
	225		100		25	0A4G ^e	Ş
		÷					VACUUM-GAL

- a "Prenium" version of OB2 intended for applications critical to shock and vibration.
- b "Premium" version of OA2 intended for applications critical to shock and vibration.
- С Like the 5651 but has greater voltage stability.
- d For operation from a dc supply.
- For operation from an ac supply.
- Miniature

SELECTION GUIDE THY, GLOW-DIS, IGN, & VAC-GA TUBES 10 - 63 C Intermittent Rectifier Service only. d Forward volts = 6000, inverse volts = 3000. RADIO CORPORATION OF AMERICA Electronic Component and Devices Harrison N J

b Two tubes in inverse-parallel circuit.

Selection Guide for RCA THYRATRON, GLOW-DISCHARGE, IGNITRON, and VACUUM-GAUGE TUBES

THYRATRONS

				Iriodes				
		MAXI	MUM RATING	S	Filom	nt E		
	Anode		node Tempera-		Filament-F or		RCA	
	Curr	_	ture	Inverse	Heate		Туре	
	Av Amp	Peak Amp	Range oc	Anode Volts	Volts	Amp		
	_	_	por Types	10110	101123	Amp		
	0.5	2	40 to 80	5000	2.5 F	5	5557	
	0.64	$\frac{2}{2.5}$	25 to 70	2500	2.5F	6	627	
	1.8	10	25 to 55	15000	5.0 F	10	5563A	
	2.5	15	40 to 80	1000	5.0H	4.5	5559	
	4	16	30 to 50	10000	5.0H	10	677	
	6.4	40	40 to 80	2500	5.0 H	10	676	
	Gas T							
	0.04	0.2	-40 to +70	350	2.5 H	2.6	629	
	0.045	35	-50 to +90	3000	6.311	2.3	6130/3C45	
	0.075	0.3	-75 to +90	350	6.3H	0.6	884	
	0.075	0.3	-75 to +90	350	2.5H	1.5	885	
	1	8	-55 to +75	1250	2.5 F	6.3	C1K/6014	
	2.5	30	-55 to +75	1250	2.5 F	9	C3J/5632	
	2.5	30	-55 to +75	1250	2.5 F	9	C3JA/5684	
	2.5	30	-55 to +75	1250	2.5 F	9	C3JL	
	6.4	77	-55 to +75	1250	2.5 F	21	C6J/5C21	
	6.4	77	-55 to +75	1250	2.5 F	21	C6JA/5685	
	18	100	-55 to +75	1250	2.5 F	31	C16J/5665	
	Gas a	nd Mei	rcury-Vapoi	Types				
	1	3	-40 to +80	1250	2.5 F	5	714/7021	
	1	8	- 40 t.o +80	1250	2.5 F	6.3	716/6855	
,	1.5	6	-40 to +80	1250	2.5 F	7	3023	
	2.5	30	-40 to +80	1500	2.5 F	9	710/6011	
	6.4	77	-40 to +80	1500	2.5 F	21	760/6858	

Triodes

THYRATRONS

Tetrodes

	MAXI	MUM RATING	S	Filam	ont E	Y
Ano Curr		Tempera- ture	Peak Inverse	Filament-F or Heater-H		RCA Type
Av	Peak	Range	Anode			i y pe
Amp	Amp	°C	Volts	Volts	Amp	
Mercu	ry-Vap	por Types				
2.5	15	40 to 80	1000	5 H	4.5	5560
2.5	30	40 to 80	1500	5 H	5	632B
3.2	40	40 to 80	2500	5 H	5	672A
6.4	40	40 to 80	2000	5 H	10	172
6.4	40	40 to 80	2500	5 H	10	105
Gas T	pes					
0.025	0.1	-55 to +90	500	6.3H	0.15	5696
0.1	0.5	-75 to +90	1300	6.3H	0.6	² 2D21
0.1	0.5	-75 to+150	1300	6.3H	0.6	¹² 5727
0.1	1	-55 to +90	1300	6.3H	0.6	502A
0.1	1	-75 to +90	13(0	6.3H	0,6	2050
0.1	1	-75 to t90	1300	6.3H	0.6	2050A
0.5	5	-75 to +90	1300	6.3H	2.6	6012
0.8	8	-75 to +90	1500	6 3 H	2.6	3D22A

VACUUM-GAUGE TUBES

Gas Press	Gauge	RCA	
in mm of Hg (Torr) in microns		Туре	Туре
1 to 0.0001 1 to 0.001*	1000 to 0.1 1000 to 1*	Thermo- couple	1946
1.5 to below 0.01 0.5 to 0.01*	1500 to below 10 500 to 10*	Pirani	1947
0.001 to below 0.0001 0.001 and below*	l to below 0.1 0.1 and below [*]	Ionization (Hard Glass)	1949

* Range of greatest sensitivity.

Miniature

World Radio History



GRID-CONTROLLED RECTIFIER CIRCUITS

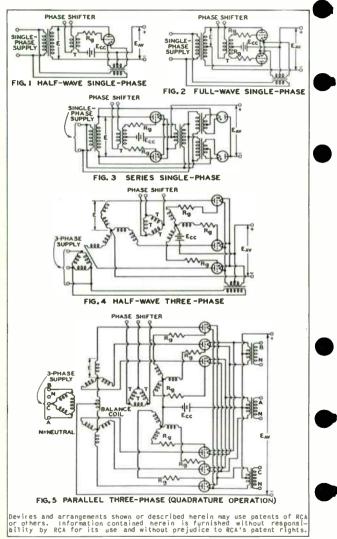
Numerical Relationships Among Electrical Quantities

RATIO	Fig. I	Fig. 2	Fig.3	Fig.4	Fig.5°	Fig. 6	Fig.7	Fig	
Voltage Ratios									
E/Eav	2.22	1.11	1.11	0.854	0.854	0.427	0.785	0.	
E _{bmi} /E	1.41	2.83	1.41	2.45	2.45	2.45	2.83	2.	
E _{bmi} /E _{av}	3.14	3.14	1.57	2.09	2.09	1.05	2.22	2.	
Em/Eav	3.14	1.57	1.57	1.21	1.05	1.05	Lit	<u>।</u> г.	
Er/Eav	1.11	0.472	0.472	0.177	0.04	0.04	0 . 106	0.	
Frequency Ratio									
fr/f	1	2	2	3	6	6	4		
Current Ratics									
p [/] av	1.57	0.785	0.785	0.578	0.289	0.578	0.5	0.4	
b/lav	<u> </u>	0.5	0.5	0.33	0.167	0.33	0.25	0.1	
Resistive Load									
1pm ^{/1} av	3.14	1.57	1.57	1.21	0.52	1.05	1.1	E	
lpm/1b	3.14	3.14	3.14	3.63	3.14	3.14	4.5] €	
Inductive Load		1							
pm ^{/1} av	-	1	I	L. L	0.5	l l'			
Power Ratios									
Resistive Load									
Pas ^{/P} dc	3.49	1.74	1.24	-		-	-	·	
Pap/Pdc	2.69	1.23	1.24	-	-		-	·	
Pal/Pdc	2.69	1.23	1.24	-	-	-	-		
Inductive Load®									
Pas ^{/P} dc	-	1.57	1.11	1.71	1.48	1.05	1.57	1.	
Pap ^{/P} dc	-	ı	1.11	1.21	1.05	1.05	1.11	6	
Pal/Pdc		1.11	ı . 11	1.21	1.05	1.05	1.11	ļь	
Bleeder current for balance co The use of a la	of 25 il and rote fil	full-1 thus av	oad cur oid poo ut chos	rent w' r regul e is as	11 prov ation a	/ide ex t light	citing loadin	curr g.	
							RECI		

4-57



GRID-CONTROLLED RECTIFIER CIRCUITS

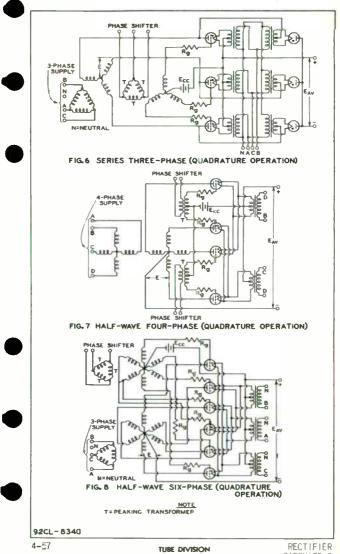


RECTIFIER

CIRCUITS 1



GRID-CONTROLLED RECTIFIER CIRCUITS



World Radio History



VOLTAGE REGULATOR

MINIATURE GLOW-DISCHARGE TYPE

GENERAL DATA

	GENERAL PATA	
	Electrical:	
	Cathode	
	Mechanical:	
	Mounting Position. Any Maximum Overall Length 2-5/8" Maximum Seated Length 2-3/8" Length Base Seat to Bulb Top (Excluding tip) 2" ± 3/32" Maximum Diameter 3/4" Weight (Approx.) 0.3 oz Bulb T-5-1/2 Base Small-Button Miniature 7-Pin (JETEC No.E7-1) Basing Designation for BOTTOM VIEW 5B0	*
	Pin 1 - Anode Pin 2 - Cathode Pin 3 - Internal Connection- Do Not Use Pin 4 - Cathode Pin 5 - Anode Pin 5 - Internal Connection- Do Not Use Pin 7 - Cathode	
	Maulaum and Minimum Dahlama, dhachada Malasat	
	Maximum and Minimum Ratings, Absolute Values: AVERAGE STARTING CURRENT♥	
	DC CATHODE O IRRENT {30 max. ma	
	FREQUENCY. 	+
	Circuit Values:	
D	Shunt Capacitor 0.1 max. µµf Series Resistor See Operating Considerations	
	CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN	-
	Nin. Av. Hax.	
	DC Amode-Supply Voltage 185" volts	
-	Anode Breakdown Voltage 156 185° volts	
)	Anode Voltage Drop	
	Averaged over starting period not exceeding 10 seconds. This starting period must we followed by a steady-state operating condition of at least 20 minutes, or tube performance will be impaired.	
	Not less than indicated supply voltage should be provided to insure "starting" throughout tube life.	
	* Maximum individual tube value during useful life.	
	 Ninimum individual tube value during useful life. 	
	Indicates a change.	

TUBE DIVISION RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY World Radio History 0P2



RA OA2

VOLTAGE REGULATOR

OPERATING CONSIDERATIONS

-Sufficient resistance must always be used in series with the OA2 to limit the current through the tube. The value for the series resistor is dependent on the maximum anodesupply voltage and the ratio of the current through the load to the operating current of the OA2, and should be chosen to limit the operating current through the tube to 30 milliamperes at all times after the starting period.

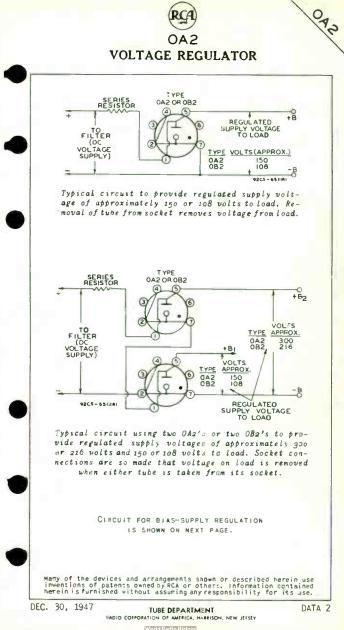
The maximum load current that can be regulated by the OA2 is determined by the minimum and maximum values of the supply voltage. After the value of series resistor for the maximum supply voltage has been calculated as indicated above, it is then in order to determine if this value will permit adequate starting voltage when the supply voltage falls to its minimum value. If adequate starting voltage is not obtained, a new load current of lower value must be used and the calculations repeated. It will be apparent from such calculations that the higher the minimum supply voltage and the smaller the difference between its minimum and maximum values, the higher will be the load current that can be regulated.

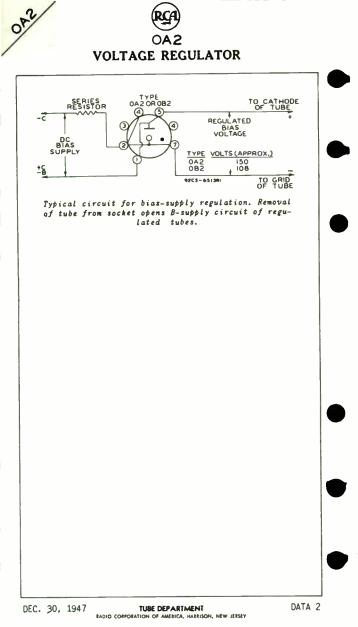
When equipment utilizing the OA2 is "turned on", a starting current in excess of the average operating current is permissible as indicated under Maximum Ratings. When the tube is subjected to such high starting currents, the regulated voltage may require up to 20 minutes to drop to its normal operating value. This performance is characteristic of voltage-regulator fubes of the glow-discharge type. Similarly, the regulation is affected by changes in current within the operating current range. For example, the regulation of a tube operated for a protracted period at 5 milliamperes and then changed to 25 milliamperes, may be somewhat different from the value that will be obtained after a long period of operation at 25 milliamperes. Likewise, the regulation may change somewhat after a long idle period.

In order to handle more load current, two or more OA2's may be operated in parallel, but such parallel operation requires that a resistance of approximately 100 ohms be used inseries with each OA2 in order to equalize division of the current between the paralleled tubes. The disadvantage of this method, of course, is that the use of resistors impairs the regulation which can be obtained.

If the associated circuit has a capacitor in shunt with the OA2, the capacitor should be limited in value to 0.1 μ f. A larger value may cause the OA2 to oscillate and thus give unstable regulation performance.

TUBE DIVISION





World Radio History



VOLTAGE REGULATOR

GLOW-DISCHARGE TYPE

GENERAL DATA

					L .
Electrical:					
Cathode				.Cold	
Mechanical:					
Nounting Position Maximum Overall Length. Seated Length Maximum Diameter. Dimensional Outline Weight (Approx.) Bulb. Base. Base. Basing Designation for BOTTOM V	Octal 6-1	See Ger Pin (J8	1	. Any 4-1/8" 3/16" -9/16" ection 1.3 oz 3T-12 .B6-3) . 4AJ	
Pin 1 No Connec- JUMPER	5) F	'in 5-	Anode		
tion 3			Jumper		
Pin 2 - Cathode) F	'in 8-	No Con	nec-	
Pin 3-Jumper 2	D		tion		
0(
Maximum and Minimum Ratings, Abso	lute Value	s:			
AVERAGE STARTING CURRENT			max.	ma	
DC CATHODE CURRENT.			max.	ma	
FREQUENCY		15	min.	ma	
AMBIENT-TEMPERATURE RANGE			max,	cps OC	1
Circuit Values:				0	
Shunt Capacitor		0 1	max.		1
	See Operat			µ† itions	
CHARACTERISTICS RANGE VALUE	S FOR EQUI	PMENT	DESIGN		-
	Hin.	Av.	Max.		
DC Anode-Supply Voltage	105	-	-	volts	
Anode Breakdown Voltage	-	100	105*	volts	
Anode Voltage Drop	68 •	75	85*	volts	
egulation(5 to 40 ma)	~	5	6.5*	volts	
With suitable socket connections, jur to open power-supply circuit when volt socket.	age regulate	or tube	is remov	eđ <mark>fro</mark> m	
Averaged over starting period not exc period must be followed by a steady- least 20 minutes, or tube performance					
Not less than indicated supply volta "starting" throughout tube life.	age should !	be prov	ided to	insure	
Maximum individual tube value during					
Minimum individual tube value during	useful life.				
					1
					1

CAO



VOLTAGE REGULATOR

OPERATING CONSIDERATIONS

Sufficient resistance must always be used in series with the OA3 to limit the current through the tube. The value for the series resistor is dependent on the maximum anodesupply voltage and the ratio of the current through the load to the operating current of the OA3, and should be chosen to limit the operating current through the tube to 40 milliamperes at all times after the starting period.

The maximum load current that can be regulated by the GA3 is determined by the minimum and maximum values of the supply voltage. After the value of series resistor for the maximum supply voltage has been calculated as indicated above, it is then in order to determine if this value will permit adequate starting voltage when the supply voltage falls to its minimum value. If adequate starting voltage is not obtained, a new load current of lower value must be used and the calculations repeated. It will be apparent from such calculations that the higher the minimum supply voltage and the smaller the difference between its minimum and maximum values, the higher will be the load current that can be regulated.

When equipment utilizing the OA3 is "turned on", a starting current in excess of the average operating current is permissible as indicated under Maximum Ratings. When the tube is subjected to such high starting currents, the regulated voltage may require up to 20 minutes to drop to its normal operating value. This performance is characteristic of voltage-regulator tubes of the glow-discharge type. Similarly, the regulation is affected by changes in current within the operating-current range. For example, the regulation of a tube operated for a protracted period at 5 milliamperes and then changed to 35 milliamperes, may be somewhat different from the value that will be obtained after a long period of operation at 35 milliamperes. Likewise, the regulation may change somewhat after a long idle period.

In order to handle more load current, two or more OA3's may be operated in parallel, but such parallel operation requires that a resistance of approximately 100 ohms be used in series with each OA3 in order to equalize division of the current between the paralleled tubes. The disadvantage of this method, of course, is that the use of resistors impairs the regulation which can be obtained.

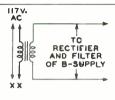
If the associated circuit has a capacitor in shunt with the OA3, the capacitor should be limited in value to 0.1 μ f. A larger value may cause the OA3 to oscillate and thus give unstable regulation performance.

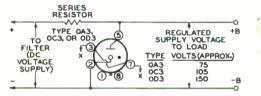
-- Indicates a change.

043

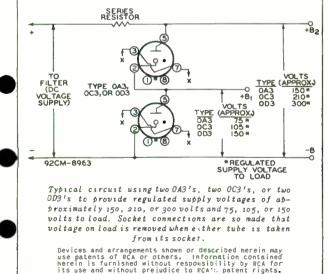






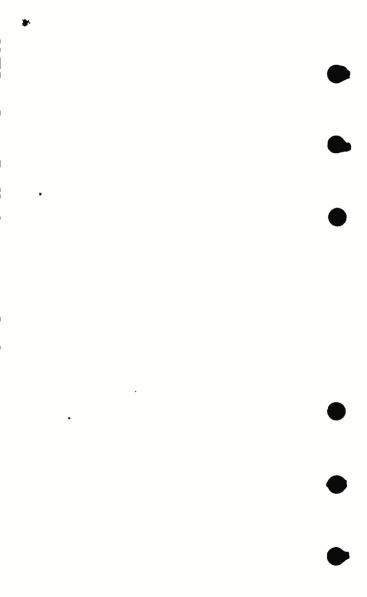


Typical circuit to provide regulated supply voltage of approximately 75, 105, or 150 volts to load. Removal of tube from socket removes voltage from load.



4-56

CE-8963



World Radio History

Voltage-Regulator

GLOW-DISCHARGE TYPE

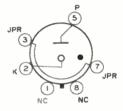
75 VOLTS

For Applications Requiring a Relatively Constant DC Output Voltage, Independent of Load and Supply-Voltage Variations

Mechanical:

Operating Position
Type of Cathode
Maximum Overall Length
Maximum Seated Length
Maximum Diameter
Dimensional Cutline See General Section
Bulb
Base Intermediate-Shell Octal 6-Pin, Arrangement 1
(JEDEC Group 1, No.86-8)
Basing Designation for BOTTOM VIEW 441

Pin 1 - No nternal Connection Pin 2 - Cathode Pin 3 - Jumper^a Pin 5 - Anode Pin 7 - Jumper^a Pin 8 - No Internal Connection



VOLTAGE REGULATOR

Maximum and Minimum Ratings, Absolute-Maximum Values:

Average Lathode				
Starting Current ^b			100 max.	ma
DC Cathode Current			∮40 max.	ma
				ma
DC or AC Jumper Surrent			2 max.	amp
Ambient-Temperature Range.		• •	-55 to +90	oC

Circuit Values:

Shunt Capacitor.						0.1 max.	μſ
Series Resistor.					See	Operating	Considerations

- ^a with suitable socket connections, the jumper within the tube base (between pins 3 and 7) provides for opening the power-supply circuit to protect circuit components when the voltage-regulator tube is removed from its socket.
- b Averaged over starting period not exceeding 10 seconds. When starting currents greatly in excess of the maximum di-cathode-current rating of 40 milliamperes are encountered, it may be necessary to operate these tubas as much as 20 minutes under steady-state conditions to assure statle operation.



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CHARACTERISTICS RANGE VALUES

Values are initial unles:	s oth	e rwi se	spec	fied		
		Mın.				
DC Anode Supply Voltage DC Anode Starting Voltage in:	• •	• • •	• • •	. See	Note 1	
Total darkness	_	_	_	160	volts	
Normal ambient light			100	105	volts	
(5 to 50 footcandles) Anade Voltage Drop	-	-	100	100	VOITS	
for dc cathode current of:						
5 ma	-	70 70	76	- 79	volts volts	
30 ma		70	78	81	volts	
Regulation for dc-cathode-						
current range of: 5 to 30 ma	2	_	3	4.5	volts	
5 to 40 ma	2	-	5	6.5	volts volts	6
Tube Noise for dc cathode current o				5		4
40 ma	_	-	_	5	rms mv	
for dc anode supply voltage						
of 50 volts and anode resistor of 3000 ohms	_	_	_	10	щa	
01 2000 00003			_	10	μα	

Note 1: The minimum value to insure starting throughout useful tube life must be equal to the dc anode starting voltage plus the voltage drop across the series resistor at the maximum value of the load current.

Note 2: The maximum values for the specified regulation range apply throughout useful tube life.

OPERATING CONSIDERATIONS

In any given application, the following two considerations must be met to assure safe and reliable operation:

- The dc cathode current must be kept within the minimum (Ikmin) and maximum (Ikm) ratings.
- 2. The dc anode starting voltage, E_b (stg), must be available under the worst probable conditions.

Instantaneous cathode starting currents in excess of the maximum dc-cathode-current rating (40 milliamperes) are permissible as indicated under Maximum and Minimum Ratings. When the tubes are subjected to such high starting currents, as much as 20 minutes may be required for the regulated dc voltage to reach its normal operating value. The regulated dc voltage may also change after long idle periods. To assure a constant regulated voltage a single value of operating current should be maintained.

Another effect associated with VR tubes is "spot jump". sometimes referred to as "jitter". This phenomenon is an instantaneous shift of the glow on the surface of the cathode and is responsible for small instantaneous changes in anode voltage drop. These changes can be minimized by operating the voltage-regulator tubes at dc cathode currents sufficiently above the minimum dc-cathode-current rating (5 milliamperes)

Electronic Components and Devices





RADIO CORPORATION OF AMERICA Harrison, N. J.



to assure that the glow covers a substantial portion of the cathode surface.

The level of ambient radiation directly affects the dc anode starting voltage of VR tubes. The maximum values required to start any tube under normal ambient-light conditions and in total darkness are given usder *Characteristics Range Values*. Shielding should be considered when VR tubes are operated in the presence of strong, varying, magnetic, or nuclear-radiation fields to assure proper performance.

Ambient temperature should be kept relatively constant to minimize voltage drift.

Coupling effects can be minimized by shunting the VR tube with a capacitor not larger than 0.1 μf_{\star}

Series connection of VR tubes may be employed to obtain dc regulated voltages greater than those obtainable from a single tube. Different types may be used provided the series current is kept within the maximum dc-cathode-current rating of the lowest-rated tube.

Parallel connection of VR tubes may be employed where it is necessary to obtain dc load currents greater than those obtainable from a single tube but at a loss in regulation. This loss in regulation results from the requirement that a resistor keused inseries with each VR tube when in parallel operation.

Combinations of regulated dc voltages may also be obtained by series connection of VR tubes with tapped output as shown in Typical Circuit 1.

To determine the value of the series resistor for small load currents in a circuit of this type, disconnect the łoads and adjust the series resistor for a tube current of not more than 40 milliamperes.

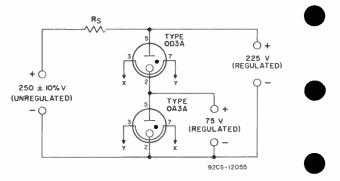
Regulated bias voltages may also be obtained as shown in Typical Circuit 2. In this circuit, a single OA3A can supply a regulated dc voltage of -75 volts.

The jumper between pins 3 and 7 inside the base makes it possible with suitable socket connections, to open powersupply circuits to protect circuit components when one of the VR tubes is removed from its socket.

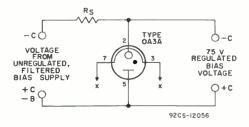


RADIO CORPORATION OF Electronic Components and Devices World Religion History DATA 2

TYPICAL CIRCUIT 1



TYPICAL CIRCUIT 2

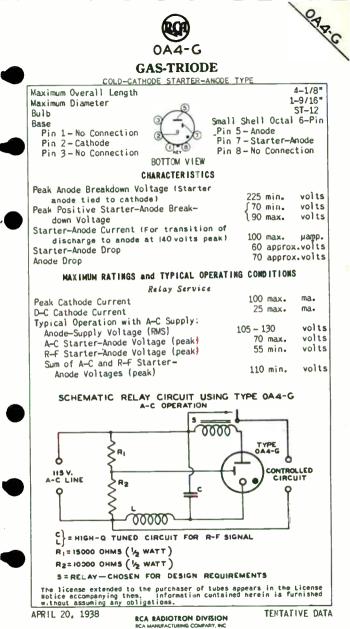


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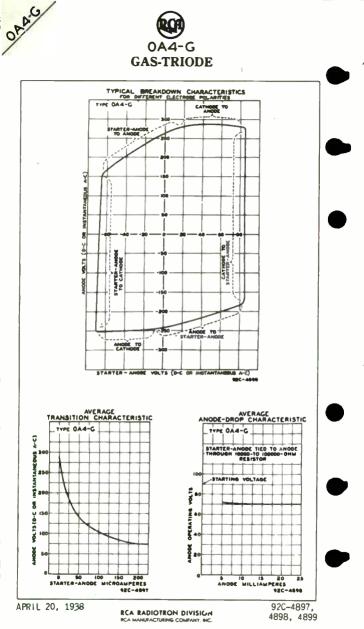
> RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History



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World Radio History



World Radio History

	RCA				100
	0B2				
VOLTA	GE REG	JULA'	TOR		
MINIATURE	E GLOW-DIS	CHARGE	TYPE		
	GENERAL D	ATA			
Electrical:					
Cathode		• • •	• • •		. Cold
Wechanical:					
Maximum Overall Length . Maximum Overall Length . Length, Base Seat to Bull Maximum Diameter . Weight (Aoprox.) Bulb Base, Small-Bu Basing Designation for	utton Mini	ature 7	tip). -Pin	2"	Any 2-5/8' 2-3/8' ± 3/32' • 3/4' 0.3 of T-5-1/2 • .580
Pin 1 - Anode Pin 2 - Cathode Pin 3 - Internal Connection- Do Not Use Pin 4 - Cathode) Pi	n 6 -	Anode Interna Connect Do Not Cathode	ion- Use
Maximum and Minimum Rati	ngs, Absol	ute Val	ues:		
AVERAGE STARTING CURRENT	• • • • •			75 ma>.	m
DC CATHODE CURRENT				∫30 max. 5 min.	m m
FREQUENCY. AMBIENT-TEMPERATURE RANG	ε		::-	0 max.	ср
Circuit Values:					
Shunt Capacitor Beries Resistor			::	0.1 max. See noi	
CHARACTERISTICS RA	NGE VALUE	S FOR E	QUIPME	NT DESIG	SN
		Min.	Aυ.	Nax	
DC Anode-Supply Voltage. Anode Breakdown Voltage.		133"	115	133	volt
Anode Voltage Drop		101	108	114*	volt
Regulation (5 to 30 ma.)		-	1	4	volt
 Averaged over starting period must be followed by least 20 minutes, or tube period. Not less than indicated sustanting throughout tube 	od not exce y a steady- performance upply volta	eding 10 state op will be ge shoul	second erating impaire d be pi	ls. This g conditio d. rovided to	startin on of ai
* Maximum individual tube val					
Minimum individual tube va					
The operating consider under Type 0.					s hown
			و المسر	ndicates a	change
	_	_		ivitares d	unginge

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JAN. 3, 1955

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World Radio History



7-P'N MINIATURE, 75-VOLT, GLOW-DISCHARGE TYPE

GENERAL DATA

	GEREKAL DATA
Ele	trical:
Cat	nde
Mac	anical:
	rating Position
	mum Overall Length
	mum Seated Length 2.38
lon	ith, Base Seat to Bulb Top (Excluding tip). 2.00" ± 0.09
	mum Diameter
	ensional Outline.
Bu1)
Bas	e Small-Button Miniature 7-Pin (JETEC No.E7-1
B	using Designation for BOTTOM VIEW5E
þ	a 1 - Anode () Pin 5 - Anode
	Cathodo
	in 3 – Internal
· ·	Connection- J/ 9 Do Not Use
	Co Not Use Pin 7 - Cathode
P	n 4 - Cathode
	0
Max	mum and Minimum Ratings, Absolute Values:
AVE	AGE STARTING CURRENT▲
-	(3C max m
	ATHODE CURRENT
	QUENCY
AMB	ENT-TEMPERATURE RANGE
Мах	mum Circuit Values:
Shu	t Capacitance 0.1 max. µ
	CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN
	Nin. Av. Max.
DC .	Anode-Supply Voltage * – – volt
Ano	le Breakdown Voltage:
	ider total darkness – – 145** volt
U	ider normal ambient light
	conditions 105 115** volt
	le Voltage Drop 68• 75 83 volt
Reg	alation (5 to 30 ma.) 3 4.5 volt
	veraged over starting period not exceeding 10 seconds. This startin
	eriod must be followed by a steady-state operating condition of a east 20 minutes, or tube performance will be impaired.
]#	he minimum value to incure "starting" throughout tube life must h
	qual to the anode breakdown voltage plus the voltage drup across the eries resistor at the maximum value of the load current.
	aximum individual tube value during useful life.
	inimum individual tube value during useful life.

ELECTRON TUBE DIVISION



OPERATING CONSIDERATIONS

Sufficient resistance must always be used in series with the OC2 to limit the current through the tube.

The value for the series resistor is dependent on the dc supply voltage, anode voltage drop, load current, and cathode current and should be chosen to limit the operating current through the tube to 30 milliamperes at all times after the starting period.

002

TENTATIVE DATA



GLOW-DISCHARGE TYPE

GENERAL DATA

		GENERAL D	ATA			
Electric	al:					
Cathode						.Cold
Mechanic	al:					
Maximum Seated L Maximum Dimensio Weight (Bulb.			· · · · · · · · · · · · · · · · · · ·	See Ger	eral S	. Any 4-1/8" 3/16" -9/16" iection 1.3 oz ST-12
Base Basing	Designation fo	mall-Shell r BOTT OM VI		Pin (JE	TEC No	. 4AJ
Pin 2-	No Comnec- tion Cathode Jumper ^A	JUMPER 5		Pin 5 - Pin 7 - Pin 8 -	Jumper	
Maximum	and Minimum Rat	ings. Absol	ute Valu	05.		
DC CATHO FREQUENC	STARTING CURREN DE CURRENT Y TEMPERATURE RAN		••••	{40 5) max.) max.) min.) max. to +90	ma ma cps oC
Circuit	Values:					
	pacitor	:::::			max. e note	µf below
СН	ARACTERISTICS R	ANGE VALUES	FOR EQU	IPMENT	DESIGN	
			Hir.	Aυ.	Nax.	
Anode Br Anode Va	-Supply Voltage eakdown Voltage ltage Crop on (5 to 40 ma)		133 103•	- 115 108 2	133° 116° 4°	volts volts volts volts
With su to open socket.	itable socket conn power-supply circ	ections, jump uit when volt	oer within age regula	base ac tortube	ts as a is remov	switch ed from
Average period least 2	d over starting pe must be followed D minutes, or tube	riod not exce by a steady- performance	eding 10 s state oper will be in	econds. Tating compaired.	This s andition	tarting n of at
Not les "starti	s than indicated sg" throughout tub	supply voltage life.	ge should	be prov	ided to	insure
	individual tube v individual tube v					
The op	rating conside under Type O				ation	shcwn
				🗕 Indi	cates a	change.
4-56						DATA

°C3

		0		/
	ć	0	/	
	7	/		
2	/			
/				

GLOW-DI SCHARGE TYPE

GENERAL DATA

	Electrical:	
	Cathode	
	Mechanical:	
	Mounting Position	
_	Maximum Overall Length	
	Maximum Diameter	
	Dimensional Outline See General Section	
+	Weight (Approx.)	
+	Base	
	Basing Designation for BOTTOM VIEW	
	Pin 1 - No Connec- JUMPER S Pin 5 - Anode	
	tion 🔐 🔶 Pin 7-Jumper*	
	Pin 2 - Cathode R Pin 8 - No Connec-	
	Pin 3-Jumper 2 1 tion	
	() • (0)	
	Maximum and Minimum Ratings, Absolute Values:	
	AVERAGE STARTING CURRENT	
	DC CATHODE CURRENT	
-	[5 min. ma]	
T	FREQUENCY	
*	Circuit Values:	
	Shunt Capacitor 0.1 max. μf Series Resistor	
		_
+	CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN	
	Hin. Av. Hax.	
	DC Anode-Supply Voltage 185 volts Anode Breakdown Voltage 160 185° volts	
	Anode Breakdown Voltage 160 185° volts Anode Voltage Drop 142° 153 165° volts	
	Regulation (5 to 40 ma) 4 5.5* volts	
	with suitable socket connections, jumper within base acts as a switch to open power-supply circuit when voltage regulator tube is removed from	
	to open power-supply circuit when voltage regulator tube is removed from socket.	
	Averaged over starting period not exceeding 10 seconds. This starting	
	period must be followed by a steady state operating condition of at least 20 minutes, or tube performance will be impaired.	
	Not less than indicated supply voltage should be provided to insure "starting" throughout tube life.	
	Maximum individual tube value during useful life.	
	Minimum individual tube value during useful life.	
	The operating considerations and circuit information shown	
	under Type OA3 also apply to Type OD3	
	-+ Indicates a change.	
	4-56 DATA	

Voltage-Regulator



GLOW-DISCHARGE TYPE

105 VOLTS

4 A. J

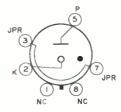
For Applications Requiring a Relatively Constant DC Output Voltage, Independent of Load and Supply-Voltage Variations

Mecharical:

	Operatir	ig P	o-i	tio	n.																		Any	
	Type cf	Cat	Fode	ê.																			Cold	
,	Maximum	0ve	ral		eng	jth																3-1	/16"	
	Maximum	Sea	ted	[,a	ngt	h																2-	-1/2"	
	Maximum	Dia	meto	er.																		1-9	1/32"	
	Dimensio	nal	Qu	81.1	ne											Se	e i	Ge	ne	ra	Ł	Sec	tion	
	Bulb																							
	Base			, h	nte	e m	ed	ia	te	-SI	he l	1	Oct	al	6	5-P	in		Ar	- ra	110	aeme	ent 1	
														J	DE	EC	Gr	οu	D.	1.	Ň	lo.E	6-8)	

Basing Designation for BOTTOM VIEW.

Pin 1 - No Internal Connection Pin 2 - Cathode Pin 3 - Jumper^a Pin 5 - Anode Pin 7 - Jumper^a Pin 8 - No Internal Connection



VOLTAGE REGULATOR

Maximum and Minimum Ratings, Absolute-Maximum Values:

Starting Cwrrent					100 max.	та
DC Cathode Current					∫40 max.	ma
DC or AC Jumper Current .					l 5 min. 2 max.	ma
						amp OC
Ambient-Temperature Range		٠	٠	٠	-55 to +90	°C

Circuit Values:

.

Shunt Capacitor						0.1 max.	μf
Series Resistor					.See	Operating Considerat	tons

- ^a With suitably socket connections, the jumper within the tube base (between pins 3 and 7) provides for opening the power-supply circuit to protect circuit components when the voltage-regulator tube is removed from its socket.
- ^b Averaged over starting period not exceeding 10 seconds. When starting currents greatly in excess of the maximum dc-cathode-current rating of %0 milliamperes are encountered, it may be necessary to operate these tubes as much as 20 minutes under steady-state conditions to assure stable opera ion.



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CHARACTERISTICS RANGE VALUES

Values are initial unless	othe	rwise	spec	fied	
		Min.			
DC Anode Supply Voltage DC Anode Starting Voltage in:		• • •	• •	. See	Note 1
Total darkness	_	_	-	210	volts
Normal ambient light (5 to 50 footcandles)			115	1 2 7	volts
Anode Voltage Drop	_	_	115	161	VUILS
for dc cathode current of:		4.05			. 1.4
5 ma				111	
40 ma		105		112	
Regulation for dc-cathode- current range of:					
5 to 30 ma	2	-	1	2	volts volts
5 to 40 ma Tub⊳ Noise for dc cathode current of		-	2	4	volts
40 ma		_	_	15	rms mv
DC Leakage Current					
for dc anode supply voltage of 50 volts and anode resistor					
of 3000 ohms	-	-	-	10	μa
Note 1: The minimum value to insure	starti	ng thr	oughou	ut usei	ul tube

Note 1: The minimum value to insure starting throughout useful tube life must be equal to the dc anode starting voltage plus the voltage drop across the series resistor at the maximum value of the load current.

OPERATING CONSIDERATIONS

shown under Type OA3A also apply to the OC3A



Note 2: The maximum values for the specified regulation range apply throughout useful tube life.

Voltage-Regulator



GLOW-DISCHARGE	ETYPE
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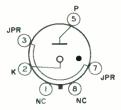
150 VOLTS

For Applications Requiring a Relatively Constant OC Output Voltage, Independent of Load and Supply-Voltage Variations

Mechanical:

Operating Position.			 				Any
Type of Cathode			 				Cold
Maximum Overall Len	gth.		 				3-1/16"
Maximum Seated Leng	th.		 				2-1/2"
Maximum Diameter							
Dimensional Outline		• •	 		. See	General	Section
Bulb							
Base Inte							
0				3L)	EDEC G	roup 1,	No.86-8)

Pin 1 - No Internal Connection Pin 2 - Cathode Pin 3 - Jumper® Pin 5 - Anode Pin 7 - Jumper® Pin 8 - No Internal Connection



VOLTAGE REGULATOR

Maximum and Minimum Ratings, Absolute-Maximum Values:

Average Lathode						
Starting Current ^b					100 max.	ma
DC Cathode Current						ma
						та
DC or AC Jumper Current						amp
Ambient-Temperature Range.	•	•		٠	-55 to +90	°C

Circuit Values:

Shunt	Capacitor.							0.1 max.	μf
Series	Resistor.					See	Ot	erating Conside	rations

With suitable socket connections, the jumper within the tube base (between pins 3 and 7) provides for opening the power-supply (invuit to protect circuit components when the voltage-regulator tube is removed from its socket.

From its succet. b Averaged over starting period not exceeding 10 seconds. When starting currents greatly in excess of the maximum dc-cathode-current rating of 40 milliamperes are encountered, it may be necessary to operate these tubes as much as 20 mirutes under steady-state conditions to assure stable operation.



RADIO CORPORATION OF Electronic Components and Devices World Racio History

CHARACTERISTICS RANGE VALUES

Values are initial	unle	s s	othe	erwi se	speci	fied	
		1	Vote	Nin.	Aυ.	Nax.	
DC Anode Supply Voltage DC Anode Starting Voltage		•	• •	•••	•••	. See	Note 1
Total darkness Normal ambient light		•	-	-	_	225	volts
(5 to 50 footcandles).				_	160	180	volts
Anode Voltage Drop fcr dc cathode current o							1.4
5 ma			_	145 145			
4C ma		•	-	145	150	162	volts
current range of: 5 to 30 ma 5 to 40 ma				-	2		volts volts
Tube Noise for dc cathode cui						010	0000
40 ma DC Leakage Current		•	-	-	_	15	rms mv
for do anode supply volt of 50 volts and anode re		or					
ot 3000 ohms	• •	·	-		-	10	μa
Note 1: The minimum value to life must be equal to	insu the	re dc	star anod	ting ti le star	hrougho ting vo	ut usef ltage p	ul tube plus the

voltage drop across the series resistor at the maximum value of the load current.

The maximum values for the specified regulation range apply throughout useful tube life. Note 2:

OPERATING CONSIDERATIONS shown under Type OA3A also apply to the OD3A

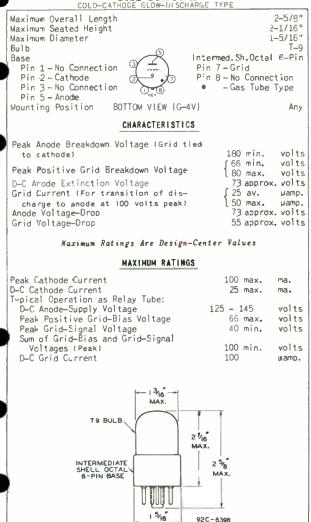
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Harrison, N. J.



(C)

GAS-TRIODE



Dec. 1, 1942

RCA RADIOTRON DIVISION RCA MUNICIPATION COMPANY, INC.

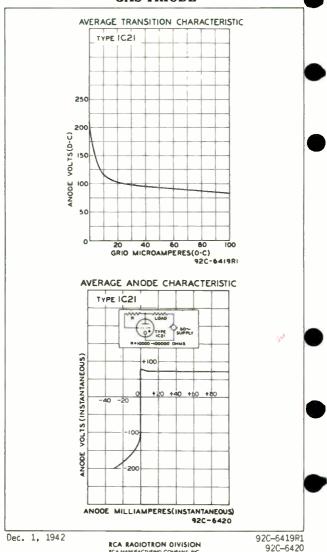
IA X

TENTATIVE DATA





GAS-TRIODE



RCA MANUFACTURING COMPANY INC



THYRATRON

GAS TETROOE, MINIATURE TYPE

GENERAL DATA

Electrical:		
Heater, for Unipotential Cathode: <u>Min.</u> <u>Av.</u>	Max.	
Voltage (AC or DC) 5.7 6.3	6.9	volts
	0.66	amp
Cathode:	0.00	Carille
Heating Time, prior to		
tube conduction 10 ~	1.00	sec
Direct Interelectrode Capacitances (Approx.):0		
Grid No.1 to Anode	0.026	Jun F
Input	2.4	mut
Output	1.6	IIII F
Ionization Time (Approx.):		P.4.
For conditions: dc anode volts = 100; grid-No.1		
square-pulse volts = 50; peak anode amp.		
during conduction = 0.5	0.5	#sec
Deion:zation Time (Approx.): -		
For conditions: dc anode volts = 125; grid-No.1		
volts = -100, grid-No.1 resistor (ohms) =		
1000; dc anode amp. = 0.1	35	μsec
For conditions: dc anode volts = 125; grid-No. 1		
volts = -10; grid-No.1 resistor (ohms) =		
1000; dc anode amp. = 0.1	75	#sec
Maximum Critical Grid Current, with ac anode-		
supply volts (rms) = 460, and average anode		
amp. = 0.1	0.5	µamp
Anode Voltage Drop (Approx.)	8	volts
Grid-No.1 Control Ratio (Approx.) with grid-No.1		
resistor (megohms) = 0; grid-No.2 volts = 0		250
Grid-No.2 Control Ratio (Approx.) with grid-No.1		
resistor (megohms)=0; grid-No.2 resistor		
(megohms)= 0; grid-No.1 volts = 0		1000
⁰ Without external shield,		
Mechanical:		
		-
Mounting Position		. Any
Maximum Overall Length	• •	2-1/8"
Maximum Seated Length	1/2"	1-1/8"
Maximum Diameter.	-1/2 1	214"
Bulb.	••••	3/4"
Base Small-Button Mi	n i aturo	7 014
Basing Designation for BOTTOM VIEW.	mature	704
	• • • •	. / DN
Pir 1-Grid No.1 @ S Pin 5	- Grid	No.2
Pin 2-Cathode Pin 6	- Anode	
Pir 3-Heater Pin 7	-Grid	No.2
Pir 4 - Heater		
elent		
0-		
← Indicates a change.		
UNE 15 1040		

JUNE 15, 1948

TUBE DEPARTMENT EADIO COEPORATION OF AMERICA, HARRISON, NEW JERSEY 2021

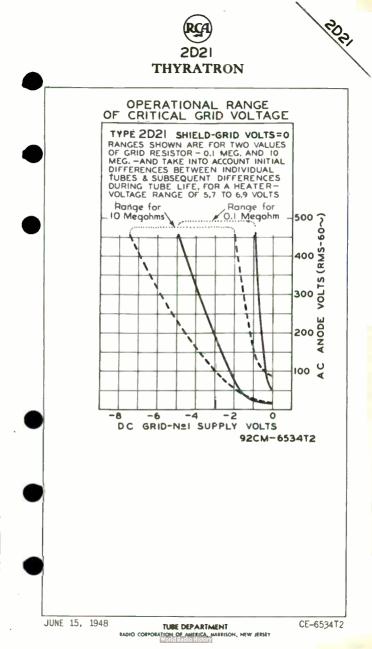


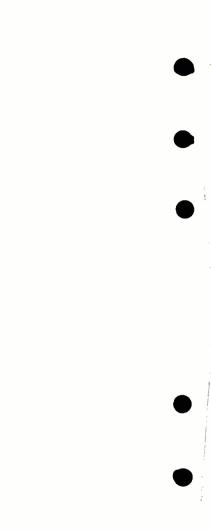
RELAY and GRID-CONTROLLED RECTIFIER SERVICE

Inve		-	5. /	theal													
Forv	NODE			10301	ute	Va	lue.	s :									
Forv		VOL	TAGE														
Inve													6	50	ma	х.	volt
	erse.												-		ma		volt
RID-M	10.2	(SHI	ELD-	GRIC)) V	OL T	AGE										
													-1	00	ma	c.	volt
									•				-		-		volt
RID-N	10.1	(CON	TROI	-GRI	01	VOL	TAG			•	•					••	vore
													-1	nn	ma		volt
																	volt
						00				•	•	•		10	ma.		vore
													0	5	ma		am
Aver	ane		• •							•	•						am
Sure	A F	or d	urat	inn	of	0 1	50		ma	<u>, 1</u>	1	1			-		am
						•••	300		ilia	· ·	1	•		10	ma,	•	am
Aver	-ane	CONN	Lot.										+0	01	-		
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													*0	0.1			
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ABICA	егр тттс	NDED	ATUR		I re	spe	τι	0 0	at	noc	le					к.	volt
MDIC		MPER	AIUH	IL KA	INGE	• •	•	•	•			-	/5 t	0	-90		0
уріса	1 0p	erat	ing	Cond	liti	ons	for	. 6	el	a y	Se	iΓv	ice:				
														00			
rid-h	lo 2	Volt	age.		•	• •	•	•	•		11		4		•	•	volt
NS C	id_N	010	Biac	Val			• •	•	•					-			volt
C Gri	d_No	1 0	120	Valt	lay	e	• •		•			-			•	•	volt
ask C	eid	No 1	5105	1011	aye			•	•					-		•	volt
rid N	0 1	C:	Sig	Dan:	401	tage	e	•	•						•	•	volt
node	0.1-		Den:	resi	star	nce	• •								•	•	megohr
noue-	CITC	urt	Resi	stan	ce#.	• •	• •	•	•	1	20	00	20	00	•		ohm
ex i mu	m Ci	rcui	t Va	lues	:												
rid-N	0.1-	Circi	uit.	Resi	star	nce							10	ma	ыx.	л	eqohm
Avera	iged c	vera	iny ii	nterv	al o	1 30	se		max								
Appro	ximat	eły 1	.80° (out o	f ph	ase	witt	h t	he	ano	de	vo	l tage				
Suffi	cient	resl	stand	ce, i	nclu	ding	the	e t	ube	10	ad,	, m	ust b	e u	sed	un	der any
Ledia	tions	01 0	pera	LION	το ρ	reve	nt e	IXC	eed	ing	21	he i	curre	nt	rat	Ing	s.
1010	ates	a cha	inge.														
	Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Avera Av	Average, RID-No.1 Peak, be Average, ATHODE CU Peak Average Surge, f RID-No.2 Average RID-No.1 Average EAK HEATE Heater n Heater p MBIENT TE ypical Op MS Anode rid-No.1- node-Circ aximum Cir rid-No.1- Averaged o Appreximat Sufficient	Average, dur RID-No.1 (CON Peak, before Average, dur ATHODE CURREN Peak Average Surge, for d RID-No.2 CURR Average RID-No.1 CURR Average EAK MEATER-CA Heater negat Heater posit WBIENT TEMPER ypical Operat WS Grid-No.1 C Grid-No.1 C Grid-No.1 C Grid-No.1 C Grid-No.1 C Grid-No.1 C Grid-No.1 Average Average Average Automotion C Grid-No.1 C Grid-No.1 Average Automotion C Grid-No.1 Average Automotion C Grid-No.1 Average Automotion C Grid-No.1 Average Automotion C Grid-No.1 Average Automotion C Grid-No.1 C Grid-No	Average, during RID-No.1 (CONTROL Peak, before and Average, during ATHODE CURRENT: Peak Average, for durat RID-No.2 CURRENT: Average RID-No.1 CURRENT: Average EAK HEATER-CATHOC Heater negative Heater positive WBIENT TEMPERATUR ypical Operating WS Anode Voltage. rid-No.1 Sigs rid-No.1 Sigs rid-No.1 Sigs rid-No.1 Sigs ak Grid-No.1 Sig rid-No.1 Circuit Averaged over any i Approximately 180° Sufficient resistant conditions of opera	Average, during anoo RID-No.1 (CONTROL-GRI Peak, before anode c Average, during anod ATHODE CURRENT: Peak. Average Surge, for duration RID-No.2 CURRENT: Average Average Average EAK HEATER-CATHODE VC Heater negative with Heater positive with Heater positive with MBIENT TEMPERATURE RA ypical Operating Cond MS Anode Voltage. MS Grid-No.1 Bias Volt cak Grid-No.1 Signal mode-Circuit Resistan aximum Circuit Values rid-No.1-Circuit Resi	Average, during anode c Average, during anode c RID-No.1 (CONTROL-GRID) Peak, before anode cond Average, during anode c ATHODE CURRENT: Peak Surge, for duration of i RID-No.2 CURRENT: Average	Average, during anode cond RID-No.1 (CONTROL-GRID) VOL Peak, before anode conduct Average, during anode condu ATHODE CURRENT: Peak Surge, for duration of 0.1 RID-No.2 CURRENT: Average RID-No.1 CURRENT: Average	Average, during anode conduct RID-No.1 (CONTROL-GRID) VOLTAG(Peak, before anode conduction, Average, during anode conducti ATHODE CURRENT: Peak	RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction. Average, during anode conduction AtHODE CURRENT: Peak. Average Surge, for duration of 0.1 sec. RID-No.2 CURRENT: Average Average EAK HEATER-CATHODE VOLTAGE: Heater negative with respect to c Heater negative with respect to c MBIENT TEMPERATURE RANGE. ypical Operating Conditions for R WS Anode Voltage. rid-No.1 Bias Voltage c Grid-No.1 Bias Voltage rid-No.1-Circuit Resistance aximum Circuit Yalues: rid-No.1-Circuit Resistance Averaged over any interval of 30 sec. Approximately 180° out of phase with t sufficient resistance, including the t conditions of operation to prevent exc.	Average, during anode conduction RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction Average, during anode conduction ATHODE CURRENT: Peak	Average, during anode conduction RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction Average, during anode conduction ATHODE CURRENT: Peak	Average, during anode conduction RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction Average, during anode conduction Average, during anode conduction Average, for duration of 0.1 sec. max. RID-No.2 CURRENT: Average RID-No.1 CURRENT: Average EAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode Heater positive with respect to cathode Heater negative with respect to cathode Heater negative with respect to cathode Heater negative with respect to cathode Heater No.1 Bias Voltage C Grid-No.1 Bias Voltage C Grid-No.1 Bias Voltage rid-No.1-Circuit Resistance rid-No.1-Circuit Resistance Averaged over any interval of 30 sec. max. Approximately 180° out of phase with the anode Sufficient resistance, including the tube load, conditions of operation to prevent exceeding ti	Average, during anode conduction RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction Average, during anode conduction ATHODE CURRENT: Peak	Average, during anode conduction RID-No.1 (CONTROL-GRID) VOLTAGE: Peak, before anode conduction1 Average, during anode conduction ATHODE CURRENT: Peak 0 Average 0 Surge, for duration of 0.1 sec. max 0 Surge, for duration of 0.1 sec. max 0 RID-No.2 CURRENT: Average +0. RID-No.1 CURRENT: Average +0. EAK MEATER-CATHODE VOLTAGE: Heater negative with respect to cathode +0. RIENT TEMPERATURE RANGE75 t ypical Operating Conditions for Relay Service: WS Anode Voltage 0 MS Grid-No.1 Bias Voltage 5 c Grid-No.1 Bias Voltage 5 rid-No.1-Circuit Resistance 1200 20 aximum Circuit Yalues: rid-No.1-Circuit Resistance 10 Averaged over any interval of 30 sec. max. Approximately 180° out of phase with the anode voltage Sufficient resistance, including the tube load, must be conditions of operation to prevent axceeding the curre	Average, during anode conduction -10 RID-No.1 (CONTROL-GRID) VOLTAGE: -100 Average, during anode conduction -10 Average, during anode conduction -10 Atherage, during anode conduction -10 Atherage, during anode conduction -10 Atherage, during anode conduction -10 Atherage 0.1 Surge, for duration of 0.1 sec. max. 10 RID-No.2 CURRENT: 40.01 Average +0.01 RID-No.1 CURRENT: +0.01 Average +0.01 EAK HEATER-CATHODE VOLTAGE: +00.01 Heater positive with respect to cathode 100 Heater positive with respect to cathode 00 MS Grid-No.1 Bias Voltage -75 to Ypical Operating Conditions for Relay Service: MS Anode Voltage. 0 MS Grid-No.1 Bias Voltage -6 -6 eak Grid-No.1 Signal Voltage. 5 6 rid-No.1-Circuit Resistance 10 1.0 mode-Circuit Resistance 10 1.0 mode-Circuit Resistance 10 1.0 Averaged over any int	Average, during anode conduction -10 ma; RID-No.1 (CONTROL-GRID) VOLTAGE: -100 ma; Peak, before anode conduction -10 ma; Average, during anode conduction -10 ma; Athous -10 ma; Athous -10 ma; Average, during anode conduction -10 ma; Average 0.1 ma; Surge, for duration of 0.1 sec. max. 10 ma; RID-No.2 CURRENT: Average Average +0.01 ma; RID-No.1 CURRENT: +0.01 ma; Average +0.01 ma; EAK HEATER-CATHODE VOLTAGE: 100 ma; Heater positive with respect to cathode 25 ma; MBIENT TEMPERATURE RANGE. -75 to ~90 ypical Operating Conditions for Relay Service: MS Grid-No.1 Bias Voltage - MS Grid-No.1 Bias Voltage - - - MS Grid-No.1 Bias Voltage - - - eak Grid-No.1 Signal Voltage. 10 1.0 - - mode-Circuit Resistance 1.0 1.0 - - mode-Circuit Resistance 1.0 1.0 - - rid-No.1-Circuit	Average, during anode conduction -10 max. RID-No.1 (CONTROL-GRID) VOLTAGE: -100 max. Peak, before anode conduction -10 max. Average, during anode conduction -10 max. AthCOE CURRENT: -100 max. Peak . 0.5 max. Average 0.1 max. Surge, for duration of 0.1 sec. max. 10 max. RID-No.2 CURRENT: Average Average +0.01 max. RID-No.1 CURRENT: +0.01 max. Average +0.01 max. RID-No.1 CURRENT: +0.01 max. Average +0.01 max. EAK HEATER-CATHODE VOLTAGE: 100 max. Heater positive with respect to cathode . 25 max. MBIENT TEMPERATURE RANGE. -75 to -90 ypical Operating Conditions for Relay Service: MS Anode Voltage. MS Grid-No.1 Bias Voltage 0 MS Grid-No.1 Bias Voltage -6 eak Grid-No.1 Signal Voltage 5 rid-No.1-Circuit Resistance 1200 2000 aximum Circuit Values: 10 max. rid-No.1-Circuit Resistance 10 max. Averaged over any interval of 30 sec. max.

2021

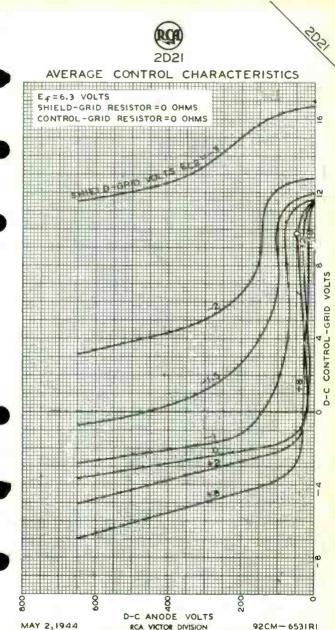
TUBE DEPARTMENT





World Radio History

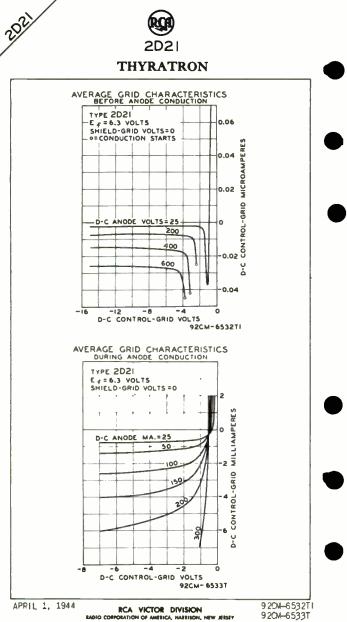
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CORPORATION OF AMERICAL HARPSON, NEW JERSEY

MAY 2,1944

92CM- 6531RI



World Radio History



GAS-AND -MERCURY-VAPOR THYRATRON

NEGATIVE-CONTROL TRIODE TYPE

+	L DATA				
Electrical:					
Filament, Coated: Voltage 2 Current at 2.5 volts Minimum heating time prior to tube conduction	7	•••	•••		volts . amp sec
Direct Interelectrode Capacitar Grid to amode Ionization Time (Approx.): For conditions: dc anode volt	ice (Appro	x.):0			зес µµ
peak grid volts = +30, a anode amperes = 6 Deionization Time (Approx.): For conditions: dc anode volt	and peak 			3	µsec
<pre>dc grid-supply volts = -20, sistor (ohms) = 10000, anode amperes = 1.5 For conditions: dc anode volt dc grid-supply volts = -500, sistor (ohms) = 100000.</pre>	and dc s = 120, grid re-			360	μsec
anode amperes = 1.5 Anode Voltage Drop (Approx.)		 	:	60 15	µsec volts
Mechanical:					
Mounting Position	circulati Mec with Bay	on of ledium lium-S	air (JE hell	-1/4" 2 aroun TEC No Small EC No.	6-1/8" ± 1/4" -1/16" d tube 3 oz ST-16 .C1-5) 4-Pin A4-10)
Pin 1-Filament	t?	Ρ	in 4	– Fila – Annod	ment
Pin 3-Grid	3		φαρ	- Higg	
CONTROL	SERVICE				
Maximum Ratings, Absolute Values:		y freq	uenc y	up to	100 c\$s
	Operating	Conder	nsed-l e Ran	Nercury	
PEAK ANODE VOLTAGE: Forward	200 max 200 max	(.	1250	max. max.	
⁰ without external shield.		+	Indic	ates a	change.
4.50			_		DATA

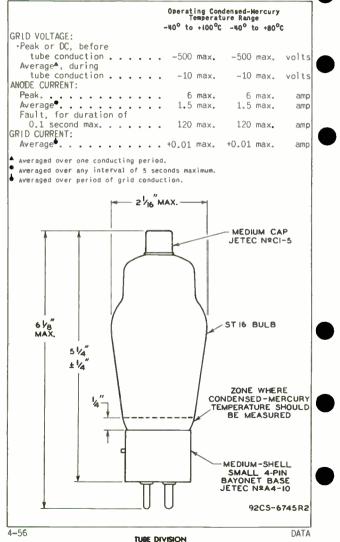
TUBE DIVISION

3623

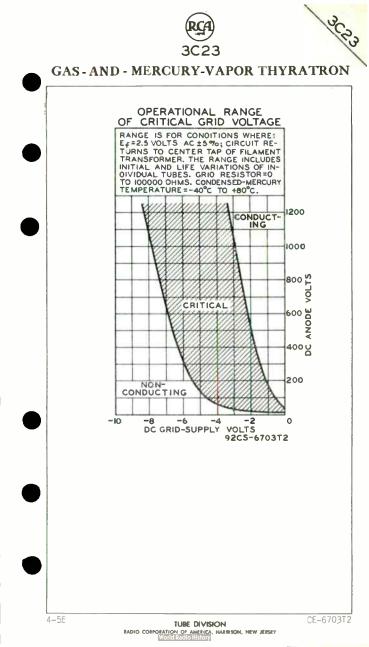


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GAS-AND-MERCURY-VAPOR THYRATRON



RADIO CORPORATION ON AMERICA, HARRINGN, NEW JERSEY



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NEGATIVE-CONTROL TETRODE TYPE

Supersedes Type 3D22

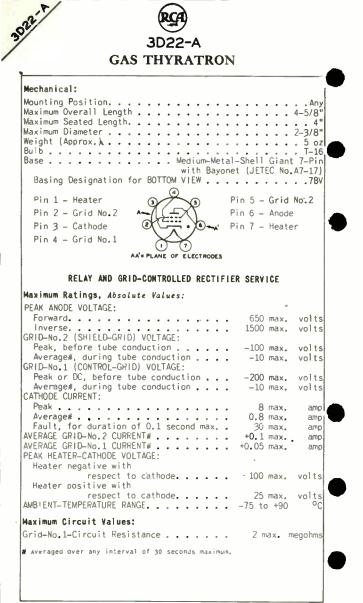
GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Voltage 5.7 6.3 6.9 ac or dc volt Current at 6.3 volts - 2.5 2.85 am Cathode: Minimum heating time prior to tube conduction . . 30 see Maximum outage time without reheating 30 see Direct Interelectrode Capacitances (Approx.): ⁰ Grid No.1 to anode . . 0.1 µµµ Grid No.1 to cathode, grid No.2, base shell, and heater . . 0.1 µµµ Ionization Time (Approx.): For conditions: dc anode volts = 10C, grid-No.1 square-pulse volts = +100, and peak anode amperes during con- duction = 8 	forcer, for ompotential eachood.			
Current at 6.3 volts – 2.5 2.85 am Cathode: Minimum heating time prior to tube conduction			ac or	dc volts
Cathode: Minimum heating time prior to tube conduction	Current at 6.3 volts 2.5			ало
<pre>tube conduction</pre>				
<pre>tube conduction</pre>				
Maximum outage time without reheating. 3 se Direct Interelectrode Capacitances (Approx.): ⁰ 9 Grid No.1 to anode			30	sec
Direct Interelectrode Capacitances (Approx.): ⁰ Grid No.1 to anode				sec
<pre>(Approx.):⁰ Grid No.1 to anode'0.1 μμ base shell, and heater0.1 μμ base shell, and heater0.1 μμ base shell, and heater</pre>				
Grid No.1 to anode	(Acorox.):0			
Grid No.1 to cathode, grid No.2, base shell, and heater 8.5 μμ Anode to cathode, grid No.2, base shell, and heater 8.5 μμ Ionization Time (Approx.): For conditions: dc anode volts = 100, and peak anode amperes during con- duction = 8 0.5 μse Peinorization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.1 velts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8	Grid No.1 to anode		0.1	ш
base shell, and heater 8.5 μμ Anode to cathode, grid No.2, base shell, and heater 4.6 μμ Ionization Time (Approx.): For conditions: dc anode volts = 10C, grid-No.1 square-pulse volts = +100, and peak anode amperes during con- duction = 8 0.5 μse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.1 volts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8	Grid No.1 to cathode, grid No.2.	-		
Anode to cathode, grid No.2, base shell, and heater 4.6 μμ Ionization Time (Approx.): For conditions: dc anode volts = 10C, grid-No.1 square-pulse volts = +100, and peak anode amperes during con- duction = 8 0.5 μse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.1 volts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8			8.5	щu
base shell, and heater4.6 μμ lonization Time (Approx.): For conditions: dc anode volts = 10C, grid-No.l square-pulse volts = +10O, and peak anode amperes during con- duction = 80.5 μse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.l volts = -200, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8		-		
<pre>Ionization Time (Approx.): For conditions: dc anode volts = 10C, grid-No.1 square-pulse volts = *10O, and peak anode amperes during con- duction = 8 0.5 µse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.1 volts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8</pre>			4.6	uu
For conditions: dc anode volts = 10C, grid-No.l square-pulse volts = +100, and peak anode amperes during con- duction = 8 0.5 µse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.l volts = -200, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8		•		
<pre>grid-No.l square-pulse volts = +100, and peak anode amperes during con- duction = 8 0.5</pre>				
and peak anode amperes during con- duction = 8 0.5 µse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.1velts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8				
duction = 8 0.5 μse Deionization Time (Approx.): For conditions: dc anode volts = 125, dc grid-No.lvelts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8				
<pre>Deionization lime (Approx.): For conditions: dc anode volts = 125, dc grid-No.1volts = -200, grid-No.1 resistor (ohms) = 1000, and dc anode amperes = 0.8</pre>			0.5	μseo
For conditions: dc anode volts = 125, dc grid-No.lvelts = -200, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8. 150 μser For conditions: dc anode volts = 125, dc grid-No.lvolts = -14.8, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8. 400 μser For conditions: dc anode-supply volts = 460 (rms), and average anode amperes = 0.8. 400 μser For conditions: ac anode-supply volts = 460 (rms), and average anode amperes = 0.8. 0.8 μam Anode Voltage Drop (Approx.): For conditions: grid-No.l resistor (megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 re- sistor (megohms) = 0, and grid-No.2 re- sistor (megohms) = 0, grid-No.1 resistor (megohms) = 0, grid-No.1 resistor (megohms) = 0, grid-No.1 resistor (megohms) = 0, grid-No.2 resistor (megohms) = 0, grid-No.2 resistor (megohms) = 0 to 0.1, and grid-No.1 volts = -3 150 P witnout external shield. 650	Deionization Time (Approx.):	•		
dc grid-No.Ivelts = -200, grid-No.I resistor (ohms) = 1000, and dc anode amperes = 0.8				
resistor (ohms) = 1000, and dc anode amperes = 0.8				
amperes = 0.8 150 μset For conditions: dc anode volts = 125, dc grid-No.l volts = -14.8, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8 400 μset Maximum Critical Grid-No.1 Current: 400 μset For conditions: ac anode-supply volts = 460 (rms), and average anode amperes 0.8 μam Anode Voltage Drop (Approx.) 10 volt 0 volt Grid-No.1 Control Ratio (Approx.): For conditions: grid-No.l resistor (megohms) = 0 to 0.1, grid-No.2 re-sistor (megohms) = 0, and grid-No.2 150 Grid-No.2 Control Ratio (Approx.): For conditions: grid-No.1 resistor 150 Grid-No.2 Control Ratio (Approx.): For conditions: grid-No.1 resistor 150 Grid-No.2 Control Ratio (Approx.): For conditions: grid-No.1 resistor 150 Grid-No.2 Control Ratio (Approx.): For conditions: grid-No.1 resistor 150 Volts = 0				
For conditions: dc anode volts = 125, dc grid-No.lvolts = -14.B, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8			150	useo
dc grid-No.lvolts = -14.8, grid-No.l resistor (ohms) = 1000, and dc anode amperes = 0.8 400 μse Maximum Critical Grid-No.l Current: For conditions: ac anode-supply volts = 460 (rms), and average anode amperes = 0.8 0.8 μam Anode Voltage Drop (Aoprox.) 10 volt Grid-No.l Control Ratio (Approx.): For conditions: grid-No.l resistor (megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 re- sistor (megohms) = 0, and grid-No.2 re- sistor (megohms) = 0, and grid-No.2 re- for conditions: grid-No.l resistor (megohms) = 0, grid-No.2 resistor (megohms) = 0, grid-No.1 resistor (megohms) = 0 to 0.1, and grid-No.1 volts = -3				,
resistor (ohms) = 1000, and dc anode amperes = 0.8				
amperes = 0.8				
<pre>Maximum Critical Grid-No.1 Current: For conditions: ac anode-supply volts = 460 (rms), and average anode amperes = 0.8</pre>			400	μsee
For conditions: ac anode-supply volts = 460 (rms), and average anode amperes = 0.8				,
<pre>= 460 (rms), and average anode amperes = 0.800.8 μam Anode Voltage Drop (Approx.)</pre>				
<pre>= 0.8</pre>				
Anode Voltage Drop (Approx.) 10 volt Grid-No.1 Control Ratio (Approx.): For conditions: grid-No.1 resistor (megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 volts = 0	· · · · · · · · · · · · · · · · · · ·		0.8	μam
For conditions: grid-No.1 resistor (megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 volts = 0			10	volt
For conditions: grid-No.1 resistor (megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 volts = 0	Grid-No.1 Control Ratio (Approx.):			
<pre>(megohms) = 0 to 0.1, grid-No.2 re- sistor (megohms) = 0, and grid-No.2 volts = 0</pre>	For conditions: grid-No.1 resistor			
<pre>volts = 0</pre>	(megohms) = 0 to 0.1, grid-No.2 re-			
<pre>Grid-No.2 Control Ratio (Approx.): For conditions: grid-No.1 resistor (megohms) = 0, grid-No.2 resistor (megohms) = 0 to 0.1, and grid-No.1 volts = -3</pre>	sistor (megohms) = 0, and grid-No.2			
For conditions: grid-No.1 resistor (megohms) = 0, grid-No.2 resistor (megohms) = 0 to 0.1, and grid-No.1 volts = -3			150	
<pre>(megohms) = 0, grid-No.2 resistor (megohms) = 0 to 0.1, and grid-No.1 volts = -3</pre>	Grid-No.2 Control Ratio (Approx.):			
<pre>(megohms) = 0 to 0.1, and grid-No.1 volts = -3 without external shield.</pre>	For conditions: grid-No.1 resistor			
volts = -3				
Without external shield.				
	volts = -3	•	650	
with all other electrodes and base shell connected to grownd.				
	with all other electrodes and base shell conne	cied i	o ground.	•

4.1200c





SPECIAL PERFORMANCE TESTS

Made in conformance with indicated sections of MIL-E-1B Specifications dated 2 May 1952

4.9.19.2 (F-66) High-Frequency Vibration:

The tube is rigidly mounted on a table vibrating with simple harmonic motion at a frequency of 50 \pm 2 cps with a fixed amplitude of 0.040" \pm 0.0025" (total excursion is double the amplitude). Maximum acceleration is 10g. No voltage is applied during vibration. Tube is vibrated for 10 minutes in such manner that table motion is along shortest line between anode and cathode. This test will not cause tube to be inoperative.

4.10.19 (F-64) Thyratron High-Voltage Operation:

Min. Max.

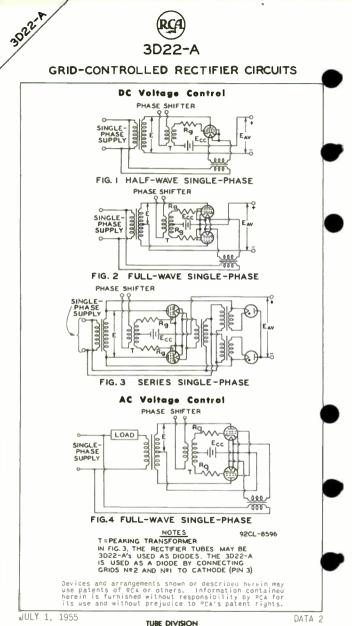
3022 A

Grid-No.1 Supply Voltage (1) -4.4 -9.2 volts This test is made after two light taps with a felt hammer (similar to type used for noise tests) in direction from cathode to anode under the following conditions: heater voltage of 6.3 volts rms, anode supply voltage of 500 volts rms, grid No.2 tied to cathode, load resistance of 2000 ohms, and grid-No.1 circuit-resistance of 2 megohms. Tube conduction is indicated by an oscilloscope connected between anode and cathode and ceases when the grid-No.1 supply voltage is increased negatively within indicated range.

Gr:d-No.1 Supply Voltage (2) -4.4 -9.2 volts This test is made as for Grid-No.1 Supply Voltage (1), except that the taps are made in direction from anode to cathode.

OPERATING CONSIDERATIONS

Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratikgs of the tube.



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA





GRID-CONTROLLED RECTIFIER CIRCUITS Numerical Relationships Among Electrical Quantities

Ε	=	Trans, Sec. Voltage (RMS)	Lav	=	Average DC Output Current
Eav	=	Average DC Output Voltage	I b	=	Average Anode Current
Ebmf	=	Peak Forward Anode Voltage	I _p	=	Anode Current (FMS)
Ebmi	=	Peak Inverse Anode Voltage	1 pm	=	Peak Anode Current
Em	=	Peak DC Output Voltage	Pac	=	Load Volt-Amperss
Er	=	Major Ripple Voltage (RMS)	Pal	=	Line Volt-Amperes
1	w	Supply Frequency -	Pao	=	Trans, Pri. Vol:-Amperes
f r	w	Major Ripple Frequency	Pas		Trans. Sec. Volt-Amperes
		P _{dc} = DC Power	(Eav	>	(av)

Note: Conditions assumed involve sine-wave supply; zero voltage drop in tubes; no losses in transformer and circust: no back emf in the load circuit; and no phase-back.

RATIO	Fig.1	Fig.2	Fig.3	Fig.4
Voltage Ratios				
E/Eav	2.22	1.11	6.0	-
Ebmi/E	1.41	2.83	1.41	1,41
Ebmi/Eav	3.14	3.14	1,57	-
E _m /E _{av}	3.14	1.57	1.57	-
Er/Eav	1.11	0.472	0.472	-
E _{bmf} /E:				
Resistive Load	1.41	1.4.	1.41	1,41
Inductive Load®	1.41	2.83	1.41	1,41
Frequency Ratio				
fr/f	1	2	2	-
Current Ratios				
lp/lav	1.57	0.785	0.785	-
lb/lav	1	0.5	0.5	-
Resistive Load				
lpm/'av	3.14	1.57	1.57	- 1
I pm/1b	5,14	3.14	3.14	3.14
Inductive Load				
Ipm/#av		1	1	-
Power Ratios				
Pac/lbEbmf		-	-	1.5
Resistive Load				
Pas/Pdc	3.49	1.74	1.24	-
Pap ^{/P} dc	2.69	1.23	1.24	-
Pal ^{FP} dc	2.69	1.23	1.24	-

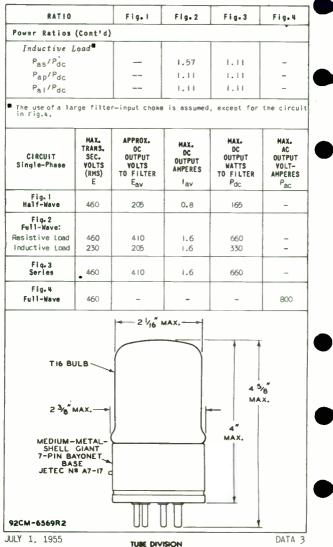
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World Radio History

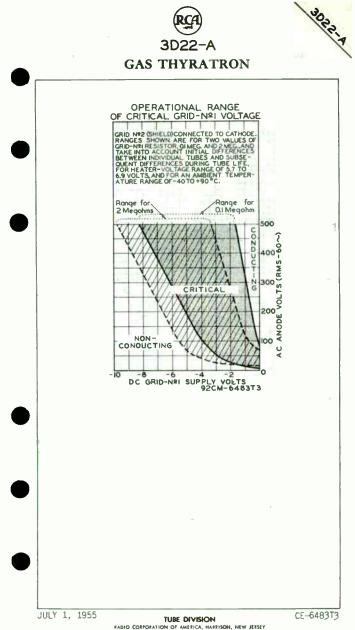




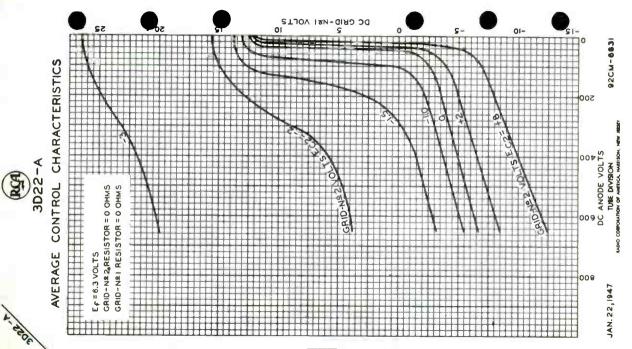
GAS THYRATRON

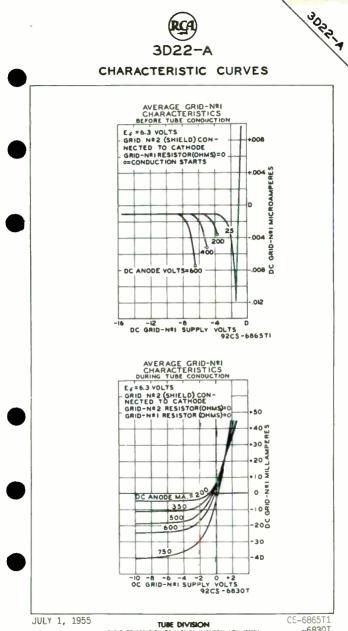


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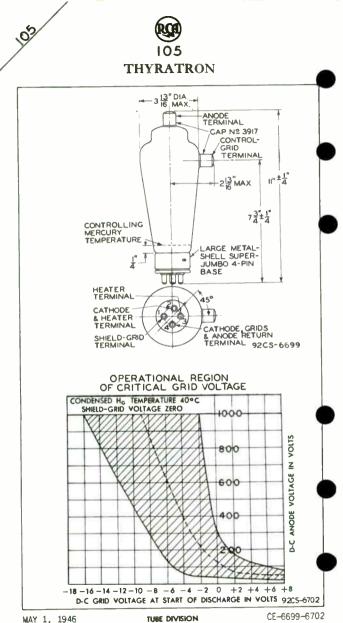
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THYRATRON

MERCURY-VAPOR TETRODE

					_
Electrical: DA	TA				
Lieurical:		nuous		mitten	τ
		ice	Ser	vice	_
Heater, for Unipotential Cathode	э:			-	_
Voltage*	5.0	5.0	5.5	5.0	volt
Current	10.0	10.0	11.0	10.0	an
Direct Interelectrode Capacitar					
Grid-Ne.1 to Anode (Approx.)	0.3	0.3	0.3	0.3	μц
Peak Voltage Drop (Approx.)	16	16		15	volt
Approx. Control Characteristics		10	10	10	AOTI
Anode Voltage	100	1000	100	3.0000	
Grid-No.2 Voltage.				1000	volt
Code No. 1 V lane.	0	0	0	5	Volt
Grid-No.l Voltage	+1	- 9	+1	-9	volt
Ionization Time (Approx.)	10	10	10	10	usec
Deionization Time (Approx.)	1000	1000	1009	1000	usec
Mechanical:					
Hannahana Dradatin					
Mounting Position	• • •	••• 1		L, Bas	e Dow
Overall Length	• • •	• • •	• • •	11"	$\pm 1/4$
Seated Length.	• • •	• • •	• 10-		
Greatest Radius	• • •	•••	•	2-	13/16
Bulb				• •	ST-3
Caps	• • •	• • •		• No	. 391
Base	Super-	Jumbo	4-Pin, 1	vith B	ayone
Hastimum Dublinum Abas Juda Haba					
Maximum Ratings, Absolute Value Continu					
		-	mitten	6	
PEAK FORMARD ANONT VOLT			rvice	-	
PEAK FORWARD ANODE VOLT. 250		750			.volt
PEAK INVERSE ANODE VOLT. 250	0	750	10000) bax	.volt
GRID-No.1 (CONT.GRID) VOLT .:					
Before Conduction100	0	-1.000	-1000) nax	.volt
During Conduction1	0	-10	-10) max	.volt
GRID-No.2 (SH'LD GRID) VOLT .:					
Before Conduction50	0	-500	-500	Dax	.volt
During Conduction1	0	-10	-10		.volt
INSTANTANEOUS ANODE CUR .:		2.5	10		
Below 25 Cycles 12.	8	5.0	8.0	im (ax.am
25 Cycles and Higher . 4		77	16		X.8L
AVERAGE ANODE CURRENT. 6.		2.5	<u>مر</u>		LX.an
SURGE ANODE CUR., for	**	2.7	4.0	, 126	يريد ، حيلا
0.1 sec., max. 40	0	100	140		×
INSTANTANEOUS GRID-No.1 CUR. 1.0		400	160		x.em
		1.0	1.0		x.am
AVERAGE GRID-No.1 CUR 0.2	2	0.25	0.25		x.am)
INSTANTANEOUS GRID-No.2 CUR. 2.0		2.0	2.0		x.anj
AVERAGE GRID-No.2 CUR. 0.1		0.5	0.5		(X.80)
TIME OF AVERAGING CURRENT 1	5	5	15		X.880
CONDMERCUFY TEMP. RANGE4 40-80) 3	10-95	25-50		°(
* Must be applied 5 minutes befo	3763 5770	de vo	ltage 4	e anel	ind
Recommended condensed-mercury	ter.per	ature	= 1000	e abbi	
				TAT 1 V	
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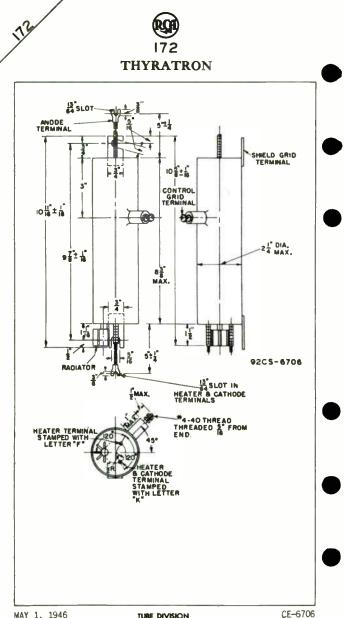


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THYRATRON

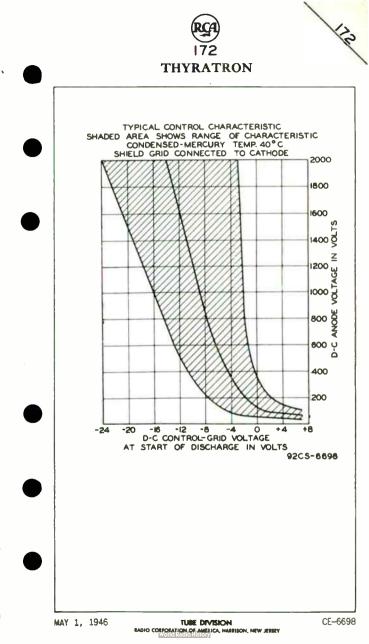
METAL MERCURY-VAPOR TETRODE

Electrical:	DI	ATA				
	Conti	nuous	Wel	der-Cor	trol	
	Ser	vice		Servio	8	
Heater, for Unipotential	Catho	de:				
Voltage*	5.0	5.0	5	•0	5.5	volts
Current	10.0	10.0	10	.0]	1.0	amp
Direct Interelectrode Ca	pacits	nce (A	pprox.):		
Grid No.l to Anode	0.07	0.37	0.		.07	րաք
Peak Voltage Drop	16	16		16	16	volts
Approx. Control Characte	ristic	8:				
Anode Voltage	100	2000	1	00 2	000	volts
Grid-No.1 Voltage .	+1.0	-14	+1	.0	_14	volta
Grid-No.2 Voltage .	0	0		0	0	volts
Ionization Time(Approx.)	10	10		10	10	μвес
Deionization Time						
(Approx.)	1000	1300	10	00]	000	µusec
Mechanical:				•		
Mounting Position			Verti	cal. Re	diato	Down
Overall Rigid Length				10-11/	16 1	1/16"
Greatest Radius						2-5/8"
				e Out]	ine I	
Maximum Ratings, Absolut	e Valu	188:				
				Welde	r-	
		Conti	nuous	Contr	ol	
		Seri	/ice	Serv	ce	
PEAK FORWARD ANODE VOLT.			max.		max.	volts
PEAK INVERSE ANODE VOLT.	•	2000	max.	750	Dax.	volta
GRID-No.1 (CONT. GRID) V						
Before Conduction		1000		-1000		volts
During Conduction	• •	-10	max.	-10	max.	volts
GRID-No.2 (SHL'D GRID) V	OLT.:					
Before Conduction			max.	-300		volts
During Conduction		-5.0	max.	-5.0	лал.	volts
INSTANTANEOUS ANODE CUR.	1					
Below 25 Cycles	• •		mex.	13.0		amp
25 Cycles and Higher.			BAX.		max.	amp
AVERAGE ANODE CURRENT**	• •	6.4	max.	2.5	max.	ຣຫຼ
SURGE ANODE CURRENT for						
0.1 sec. m			mex.		zax.	கூற
INSTANTANEOUS GRID-No.1			фах.		max.	amp
AVERAGE CRID-No.1 Cur.**			max.	0.25		amp
INSTANTANEOUS GRID-No.2			max.		max.	amp
AVERAGE GRID-No.2 CUR. ++			BAX.		max.	amp
CONDMERCURY TEMP. RANG	E▲	40	- 80	30 -	95	°c
* Must be applied at le	ast 5	minute	s befo	re and	de vo	ltage
is applied.	-					
** Averaged over any 15-	second	inter	val.			
Recommended condensed				re 40°0		
MAY 1, 1946	TUBE D	NON		TE	TATI	VE DATA
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MAY 1, 1946

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History



502-A GAS THYRATRON



2005 A. 205

GENERAL DATA

Electrical:

Maximum Ratings, Absolute Values: PEAF ANODE VOLTAGE:				
RELAY and GRID-CONTROLLED R	ECTI	FIER	SERVICE	-
Pin 1 - No Connec- tion Pin 2 - Heater Pin 3 - Anode Pin 4 - No Connec- tion		Pin Pin	5 - Grid No.: 6 - Grid No.: 7 - Heater 8 - Catnode, Shell	
Mounting Position Maxinum Overall Length Seated Length Maxinum Diameter Weight (Approx.)	 al 8	•••	2-5/ 1-31/32" ± 3/3 1-5/1 2 Wetal Shell M	32" 16" oz 18G -
Anode Voitage Drop	•••	8	vol	ts
= 1000, and dc grid-No.l supply volts = -15	-	2	μα	
For conditions: dc anode ma = 100, grid-No.l-circuit resistor (ohms = 1000, and dc grid-No.l supply volts = -250) 	10	μ5	ec
Grid No.1 to cathode & shell, grid No.2, and heater Ionization Time (Approx.). Deionization Time (Approx.):	 	2.5 0.5	μ μ5	μf ec
Direct Interelectrode Capacitances: Grid No.1 to anode	•••			μf
Voltage	.3	7 0.66 10	a	ts mp ec

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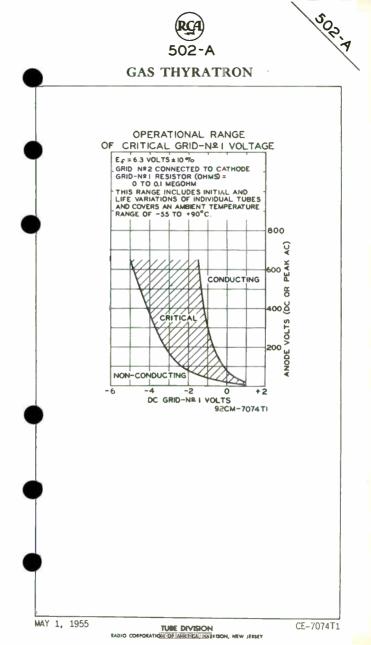


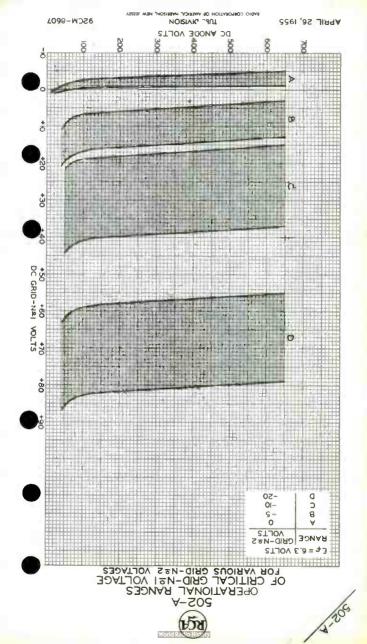
GRID-No.2 (SHIELD-GRID) VOLTAGE:			
Peak, before tube			
conduction	-100 max.	-100 max.	volts
Average [®] , during tube			
conduction	-5 max.	-5 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:			
Peak, before tube			
conduction	-250 max,	-250 max.	volts
Average [®] , during tube			
CATHODE CURRENT:	10 max.	-10 max.	volts
Peak	1.0 max.	1.0 max.	amp
Average	0.2 max.	0.1 max.	
Fault, for duration of			
0.1 second max	10 max.	10 max.	amp
GRID-No.2 CURRENT: Average	+0.01 may	+0.01 max.	атр
GRID-No.1 CURRENT:	TU.UI max.	TO.UI max.	amp
Average	+0.01 max.	+0.01 max.	атр
PEAK HEATER-CATHODE VOLTAGE:	•		
Heater negative with	100	400	
respect to cathode Heater positive with	100 max.	100 max.	volts
respect to cathode	25 ma×.	25 max.	volts
AMBIENT-TEMPERATURE RANGE.		-55 to +90	°C
			-

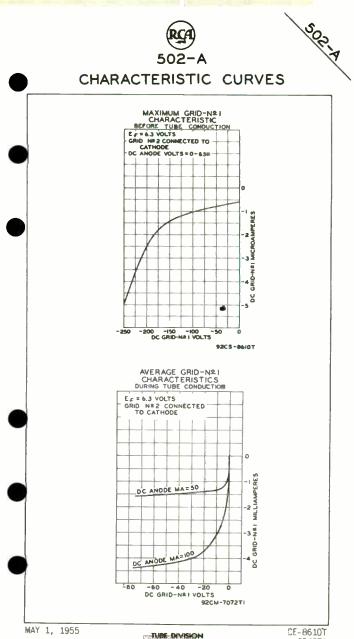
Averaged over 1 cycle.

Averaged over any interval of 30 seconds maximum.

For Dimensional Outline, see GENERAL SECTION







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MERCURY-VAPOR TRIDDE

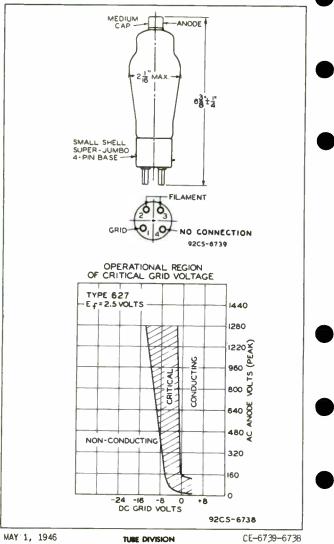
Filament: Voltage*2.5volts Current6.0amp Direct Interelectrode Capacitance: Amode to Grid (Approx.) 2.5
Mechanical:
Mounting Position. Vertical, Base Down Overall Length 6-3/8" ± 1/4" Sasted Length 6" ± 1/4" Maximum Diameter 2-1/16" Bulb Sasted Cap. Sasted Base Small Shell Super-Jumbo 4-Pin
Maximum Ratings, Absolute Values: For frequencies up to 150 cycles
PEAK FORWARD ANODE VOLTAGE 1250 max. volts PEAK INVERSE ANODE VOLTAGE 2500 max. volts PEAK CRID VOLT. (Before Conduction). -500 Lax. volts PEAK ANODE CURRENT 2.5 max. amp AVERACE ANODE CURRENT** 0.64 max. amp SURGE ANODE CURRENT for 0.1 sec. max. 25 max. amp GRID CURRENT, Before Conduction (Grid Neg.) 4 max. µamp PEAK GRID CURRENT** 0.25 max. amp CONDMERCURY TEMPERATURE RANGE* 25-70
* Filament voltage must be applied at least 10 seconds before start of tube conduction.
** Averaged over any 30-second interval.
Recommended Condensed-Mercury Temperature 40 to 45°C.

MAY 1, 1946

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



GAS TRIODE

DATA

Ele	ctr	ical	:
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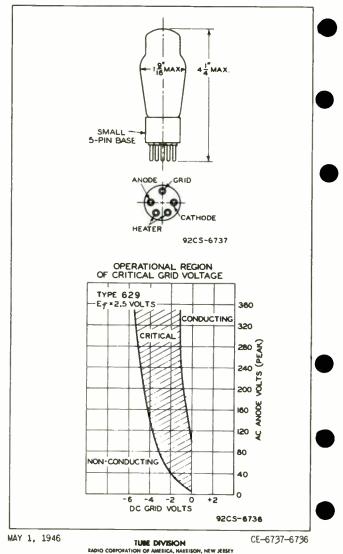
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Current 2.6 Direct Interelectrode Capacitances (Ap Grid to Anode 3.3 Grid to Cathode 3.3 Anode to Cathode 1.8	volts prox.): циг циг
Peak Voltage Drop 15 . Control Characteristic . Negative Ionization Time (Approx.) 10 . Delonization Time (Approx.) 1000 .	volts µseconds µseconds
Mechanical; Mounting Position	
Maximum Ratings, Absolute Values: PEAK FORWARD ANODE VOLTAGE PEAK INVERSE ANODE VOLTAGE PEAK CRID VOLTAGE	2.0 max. amp 2.5 max. µamp 20 max. ma. 0.4 max. ma. -45 to +5 volts
 Heater voltage must be applied at lestart of tube conduction. ** Averaged over any 10-second interval 	

MAY 1, 1946









MERCURY-VAPOR THYRATRON

NEGATIVE-CONTROL TETRODE TYPE

GENERAL DATA

	Electrical:
	Heater, for Unipotential Cathode: Voltage
	Minimum heating time prior to tube corduction 5 minutes Direct Interelectrode Capacitances (Approx.): Grid No.1 to anode 0.04 μμf
	Grid No.2 to anode
	Mechanical:
	Mounting Position
	Temperature Control:
	HeatingWhen the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the con- densed-mercury temperature up to the minimum value of the operating range specified under Naximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.
D	CoolingWhen the operating conditions are such that the maximum value of the operating condensec-mercury temperature is exceeded, provision should be made for forced-air cooling sufficient to prevent ex- ceeding the maximum value.
	Under operating conditions where the average anode current does not exceed 0.5 impere, the heater voltage may be increased to 5.5 volts.

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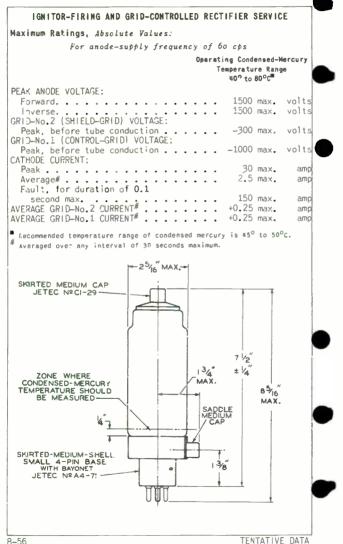
TENTATIVE DATA

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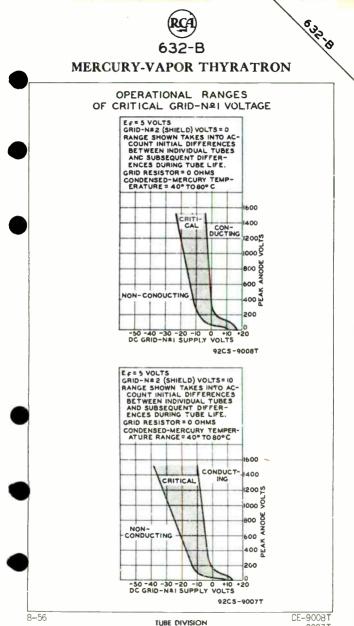


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MERCURY-VAPOR THYRATRON



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672-A THYRATRON 61218

MERCURY-VAPOR TETRODE

Supersedes Type 872

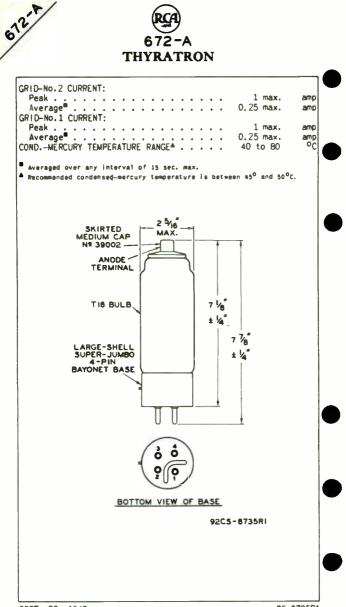
GENERAL DATA

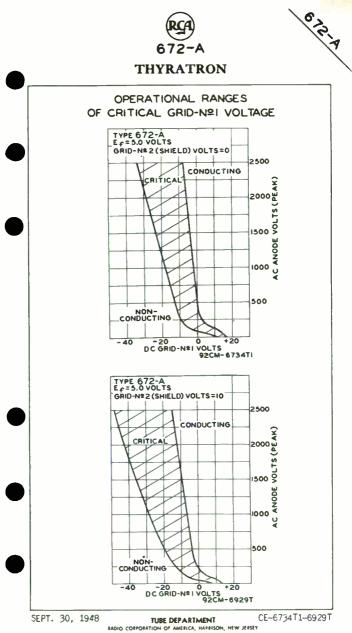
GENERAL DATA	- 1
Electrical:	
Heater, for Unipotential Cathode: Voltage	- 1
Min. Heating Time, prior to tube conduction. 5 minute Direct Interelectrode Capacitances: 0.04 μμ Grid No.1 to Anode 3 μμ	۱f
Inization Time (Approx.)	
Mechanical:	
Mounting Position. Vertical, Base Dow Overall Length. 7-7/8" ± 1/4 Seated Length. 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Bulb 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Bulb 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Maximum Diameter 7-1/8" ± 1/4 Bulb 7-1/8" ± 1/4 Base 7-1/8" ± 1/4 Base 8-1/1 Basing Designation for BOTTOV VIEW 4C	" " 8 m
Pin 1 - Grid No.1 Pin 2 - Heater, Cathode Pin 4 - Grid No.2 Cap - Anode	
GRID-CONTROLLED RECTIFIER SERVICE	
Por frequencies up to 150 cycles	
Maximum Ratings, Absolute Values:	
PEAK ANODE VOLTAGE: Forward	
Peak, before ander conduction300 max volt: GRID-No.1 (CONTROL-GRID) VOLTAGE:	s
Peak, before anode conduction1000 max. volts	s
CATHODE CURRENT: Peak	p
Average [®] 3.2 max. amm Surge, for duration of 0.1 sec. max 150 max. amm	- 1
■ See next page.	
(continued on next page)	
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JUNE 1, 1948

TENTATIVE DATA

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY





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MERCURY-VAPOR TRIODE

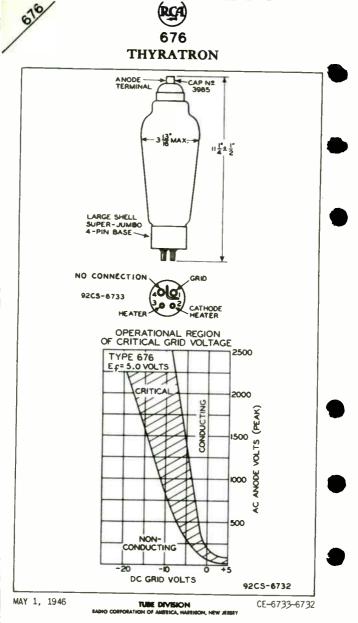
DATA

	Electrical: DATA	
	Heater, for Unipotential Cathode:	
	Voltage#	
1	Current 10 amp	Ł
	Direct Interelectrode Capacitance:	L
•	Grid to Anode (Approx.) 5 utf Peak Voltage Drop 12 volte	L
	Peak Voltage Drop 12 volts	L
	Control Characteristic Negative	L
	Ionization Time (Approx.) 10 useconds	L
	Deionization Time (Approx.) 1000 µseconds	Ł
	Mechanical:	L
	Mechanitour :	L
	Mounting Position Vertical, Base Down	Ł
	[Overal] Length	
	Maximum Diameter	
	Bulb	
	Cap	L
	Base Large Shell Super-Jumbo 4-Pin	L
		L
	Maximum Ratings, Absolute Values:	1
	For frequencies up to 150 cycles Welder-	L
	Continuous Control	L
	Sewrice Service	L
	PEAK FORWARD ANODE VOLTAGE 2500 Max. 750 Max. volts	
	PEAK INVERSE ANODE VOLTAGE 2500 max. 750 max. volts	L
	PEAK GRID VOLTAGE:	L
	Before Conduction500 max500 max. volts	
	PEAK ANODE CURRENT 40 max. 77 max. amp AVERAGE ANODE CURRENT 6.4 max. 2.5 max. amp	
7	SURGE ANODE CURRENT for	
	0.1 sec. max. 200 max. 200 max. амр	1
	GRID CURRENT: Before con- duction (Grid Negative) 5 max. 5 max. µamp	
	PEAK GRID CURRENT	
	THE OF AVEDACING CURPENTS, 15 max. 5 max. 800	
	CONDMERCURY TEMP. RANGE 40 - 80 40 - 90 °C	1
5		
	* Heater voltage must be applied for at least 5 minutes be-	-
	fore anode voltage is applied.	
	▲ Recommended condensed_mercury temperature range, 45 - 55°C	۰l
		1
5		
		ļ
		1

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World Radio History

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MERCURY-VAPOR TRIODE

DATA

	Electrical:
	Heater, for Unipotential Cathode: Voltage*
	Mechanical:
	Mounting Position Vertical, Base Down Overall Length 11-1/4* ± 1/2* Maximum Diameter 3-13/16* Bulb ST-30 Cap No. 3985 Base Large Shell Super-Jumbo 4-Pin
	Maximum Ratings, Absolute Values:
	For frequencies up to 150 cycles
	PEAK FORWARD ANODE VOLTAGE 10000 max. volts PEAK INVERSE ANODE VOLTAGE 10000 max. volts PEAK GRID VOLTAGE: Before Conduction
	Before Conduction
,	PEAK ANODE CURRENT
	* Heater voltage must be applied for at least 5 minutes be- fore anode voltage is applied.
	** Averaged over any 15-second interval.
	Recommended condensed-mercury temp. range, 35 - 45°C.
)	

MAY 1, 1946

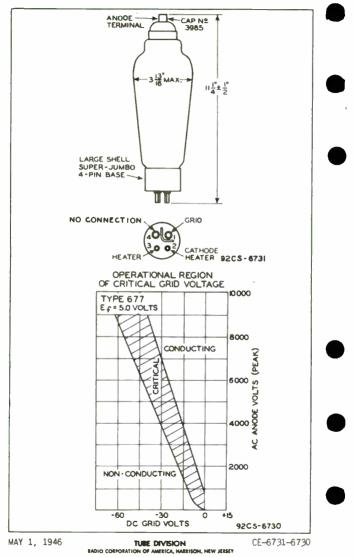
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THYRATRON



710/6011

Gas and Mercury-Vapor Thyratron

HEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical:

<pre>Filament, Coated: Voltage (AC or DC) between pins 1 and 4 2.5 volts Current at 2.5 volts 9 ± 2 amp Minimum heating time prior to tube conduction 20 sec Direct Interelectrode Capacitances (Approx.):* Grid to anode 2 µµt Grid to cathode 12 µµt Ionization Time (Approx.) 10 µsec Deionization Time (Approx.) 1000 µsec Peak Tube Voltage Drop at anode amperes = 8 10 volts</pre>
Mechanical:
Operating Position
Thermal:
Type of Cooling Convection Temperature Rise of Condensed Mercury to Equi- librium Above Ambient Temperature (Approx.): No load
GRID-CONTROLLED-RECTIFIER SERVICE
Maximum and Minimum Ratings, Absolute-Naximum Values:
For anode-supply frequency of 60 cps

PEAK ANODE	٧ť)Ľ	ΓA(GE	:														
Forward.																			
Inverse.	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	1500	max.	volts



 RADIO CORPORATION OF AMERICA
 DATA

 Electron Tube Division
 World redict History
 Harrisson, N. J.
 5–62

PEAK NEGATIVE GRID VOLTAGE:	
Before tube conduction	volts
During tube conduction 10 max.	volts
CATHODE CURRENT:	
Peak	amp 🕌
Average ^b	amp
Fault	amp
CONDENSED-MERCURY TEMPERATURE	
RANGE (Operating) ^c	°C
# Without sytematic biald	

Without external shield. b

Averaged over any interval of 5 seconds maximum.

For longest life, the operating condensed-mercury temperature range after warm-up should be kept between +80° and +80° C which corresponds approxi-mately to +10° to +50° C ambient.



Harrison, N. J.



Gas and Mercury-Vapor Thyratron

NEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical:*

Current at 2.5 volts 5.0 ± 0.5 Minimum heating time prior to	olts amp											
tube conduct on	sec											
Direct Interelectrode Capacitance (Approx.):												
Grid to anode	μμf											
Ionization T'me (Approx.) 10	usec											
Deionization Time (Approx.)	usec											
Maximum Critical Grid Current 5	μa											
Peak Tube Voltage Drop at anode	'											
	olts											
Mechanical:												
Operating Position Vertical, base of	lown											
Maximum Överall Length	1/8"											
Maximum Diameter												
Weight (Approx.)												
Bulb												
Cap												

Socket.....Small 4-Contact Base....Medium-Shell Small 4-Pin with Bayonet (JEDEC No.A4-10)

Pin 1-Filament Pin 2-No Internal Connection



Pin 3-Grid Pin 4-Filament Cap-Anode

Thermal:

GRID-CONTROLLED-RECTIFIER SERVICE*

Maximum and Minimum Ratings, Absolute-Maximum Values:

For anode-supply frequency of 60 cps

PEAK	ANO	DE	VOLTAGE:

Electron Tube Division

	Forward	1			• •		•								1250	ma≺.	volts
	Inverse														1250	max.	volts
Pł	AK NEGA	TIVE	GRI	0 V C	LTAG	E:											
	Before																
	During	tube	cono	duct	ion.	•	•	•	•	•	•	-	•	•	10	max.	volts



RADIO CORPORATION OF AMERICA

DATA 5-62

World Radio History

Harrison, N. J.

714/7021

ANODE CURRE	T:														
Peak														3 max.	amp
Average ^c .														1 max.	amp
														50 max.	amp 🖉
CONDENSED-M															
RANGE (Op	erat	ting	j)d.											-40 to +80	°C —
a With circui b Without ext				ila	me	nt-	۰tr	ans	sfo	r m	ег	ce	nt	er-tap.	

C Averaged over any interval of 5 seconds maximum.

d Far longest life, the operating condensed-mercury temperature range after warm-up should be kept between +x0° and +80° C which corresponds approximately to +10° to +50° C ambient.

RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History





Gas and Mercury-Vapor Thyratron

NEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical:*

Filament, Coated: Voltage (AC or DC) 2.5 Current at 2.5 volts 6.3 ± 0.8	volts amp
Minimum heating time prior to	
tube conduction	sec
Direct Interelectrode Capacitance (Approx.): ^b	
Grid to anode	μµf
Ionization Time (Approx.) 10	μsec
Deionization Time (Approx.) 1000	μsec
Maximum Critical Grid Current 10	µа
Peak Tube Voltage Drop at anode amperes = 5	volts

Mechanical:

Operating Position							Vertical, base down
Maximum Överall Length.							
Diameter							1.438" to 1.562"
Weight (Approx.)							3 oz
Bulb							
Socket							Small 4-Contact
Base					. N	led	ium-Shell Small 4-Pin
			w	itł	18	lay	onet (JEDEC No.A4-10)

Pin 1 - Filament Pin 2 - Anode



Pin 3-Grid Pin 4-Filament



Thermal:

GRID-CONTROLLED-RECTIFIER SERVICE*

Maximum and Minimum Ratings, Absolute-Naximum Values:

For anode-supply frequency of 60 cps

PEAK ANODE VOLTAGE:									
Forward								1250 max.	volts
Inverse								1250 max.	volts
PEAK NEGATIVE GRID VOLTAG									-
Before tube conduction									
During tube conduction	• •	•	•	•	•	•	•	10 max.	volts



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5-62

CATHODE CURRENT:"

Peak													8 max.	атр
Average ^c .													1 max.	атр
Fault													80 max.	amp
CONOENSEO-M	ER	CUP	RΥ	T	EMF	PER	A?	TUI	RE					
RANGE (Op	er	at	ing	;) '	٥.								-40 to +80	oC

^a With circuit returns to filament-transformer center-tap.

b Without external shield.

C Averaged over any interval of 5 seconds maximum.

d For longest life, the operating condensed-mercury temperature range after warm-up should be kept between + 30° and + 80° C which corresponds approximately to + 10° to + 50° C ambient.





Gas and Mercury-Vapor Thyratron

NEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical:*

Filament, Coated: Voltage (AC or DC)
tube conduction 60 sec
Direct Inferelectrode Capacitance (Approx.): b
Grid to anode 4 μμf
Ionization Time (Approx.) 10 µsec
Deipnization Time (Approx.) 1000 µsec
Maximum Critical Grid Current 10 µa
Peak Tube Voltage Drop at anode
amperes = 20
Mechanical:
Operating Position Vertica', base down
Maximum Overall Length
Maximum Diameter
Weight (Approx.)
Cap
Socket Super-Jumbo 4-Contact

Pin 1-Grid Pin 2-Filament Pin 3-Filament



Pin 4 - No Internal Connection Cap - Anode

Large-Metal-Shell Super-Jumbo 4-Pin

Thermal:

Base. . .

Type of Cooling		•	•	•••	.Convection
Equilibrium Above Ambient Temperature (Approx.)	 			30	°C

GRID-CONTROLLED-RECTIFIER SERVICE*

Maximum and Minimum Ratings, Absolute-Naximum Values:

For anode-supply frequency of 60 cps

PEAK ANODE VOL	LTAGE:								
Forward							1500	max.	volts
Inverse							1500	max.	volts
PEAK NEGATIVE	GRID VOLTAG	E:							
Before tube	conduction						500	max.	volts
During tube									



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J.

CATHODE CURRENT:

Peak			 77 max.	amp
Average ^c			 6.4 max.	amp
Fault			 770 max.	amp
CONDENSED-MERCURY	TEMPERATURE	RANGE		
(Operating) ^d			 -40 to +80	°C

^a With circuit returns to filament-transformer center-tap.

b Without external shield.

C Averaged over any interval of 15 seconds maximum.

d For longest life, the operating condensed-mercury temperature range after warm-up should be kept between $\pm 10^9~{\rm Am}+80^9~{\rm C}$ which corresponds approximately to $\pm 10^9~{\rm to}+50^9~{\rm C}$ ambient.



RADIO CORPORATION OF AMERICA Electron Tube Division 884,885 THYRATRONS



For new equipment design, RCA-884 is recommended.

For new equipment design, R	
<u>GENERAL</u>	DATA
Electrical: Type 884	Type 885
Current 0.6 Direct Interelectrode	ential Cathode 2.5±10% a-cord-cvclts 1.5 amp.
Capacitances: Grid to Anode 6 Grid to Cathode . 2 Anode to Cathode. 0.6 Tube Voltage Drop . 16	5 μμf 2 μμf 0.6 μμf 16approx.volts
Physical:	
Mounting Position . Any Maximum Overall Length 4-1/8 Maximum Seated Length 3-9/16 Maximum Diameter 1-9/16 Bulb ST-12 Base	Any 4-5/16 inches 3-9/16 inches 1-9/16 inches ST-12 {Small 5-Din
Basing Designation G-602	5A2
Pin 1 - No Connection Pin 2 - Heater Pin 3 - Anode Pin 5 - Grid Pin 7 - Heater Pin 8 - Catnode BOTTOM	Pin 1 - Heater Pin 2 - Anade Pin 3 - Grid Pin 4 - Cathode Pin 5 - Heater
RELAXATION OSCILLATOR - SW	weep-C rcuit Service≜
Maximum Ratings, Absolute Values:	
PEAK ANODE VOLTAGE PEAK CATHODE CURRENT PEAK GRID CURRENT PEAK VOLTAGE BETWEEN ANY TWO ELEC OR BETWEEN ANY ELECTRODE AND D-C HEATER-CATHODE POTENTIAL AMBIENT TEMPERATURE RANGE	
△ For best lift results, it is desirab about 10 seconds after applying heate cathtde to reach normal operating tem	le to delay tube conduction for r voltage in order to mllow the perature.
 In sweep circuits designed so that milliamperes will not be exceeded dur sultant average cathode current is average-current capability of the c average cathode current is omitted be ficance. 	athode that a ma≮imum rating for cawse it has no practi⊂al sighi~
The resistance of the grid resistor s per maximum instantaneous volt applie in excess of \$00000 onms may cause ci	hould be not less than 1000 ohms d to the grid. Resistance values rcuit instability.
🛶Indicates a change.	
DEC 15, 1944 PCA MICTOR D	DATA 1





THYRATRONS

(continued from preceding page)

RELAY & GRID-CONTROLLED RECTIFIER SERVICE At Frequencies Below 75 Cycles per Second

Maximum Ratings, Absolute Values:

	PEAK ANODE VOLTAGE	
	PEAK CATHODE CURRENT	Ł
	AVERAGE CATHODE CURRENT #	L
	PEAK VOLTAGE BETWEEN ANY TWO ELECTRODES	L
Ì	OR BETWEEN ANY ELECTRODE AND HEATER 350 max. volts	
	D-C HEATER-CATHODE POTENTIAL100 to + 25 volts	
	AMBIENT TEMPERATURE RANGE	

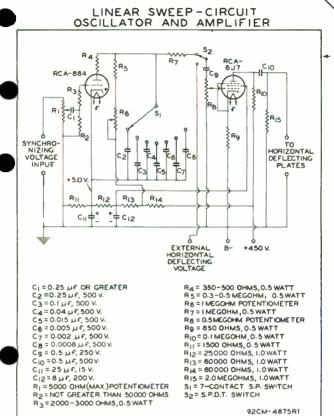
¹ The heater voltage should be applied for 10 seconds before tube conduction occurs.

> RCA VICTOR DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

For an averaging period of 30 seconds.

- ndicates a change.





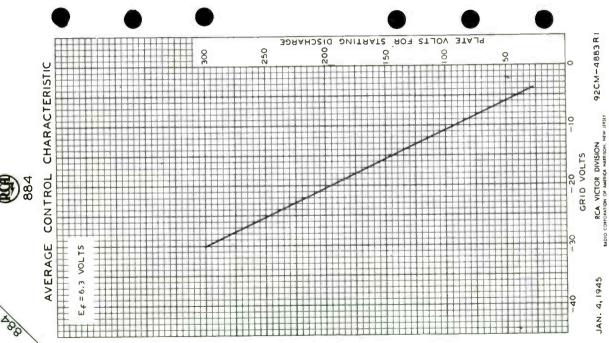
APPROXIMATE F	FREQUENCY	RANGE (CYCLES/	SEC.)
---------------	-----------	---------	---------	-------

SWITCH	(s ₁) om	c2	с ₃	C _A	C ₅	¢6	c,	с _ө
R ₆ AT	MAX.	20	40	110	280	670	1500	3600
•	MEN.	60	130	340	880	2200	4900	11400

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations. ______ Indicates a change.

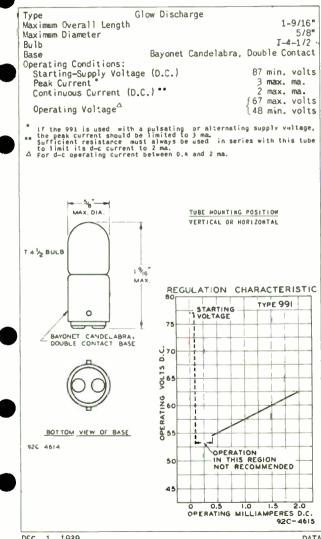
DEC. 15, 1944

RCA VICTOR DIVISION EADIO COEPORATION DE AMERICA, HARRISON, NEW JEESEY 884





VOLTAGE REGULATOR



DEC. 1, 1939

RCA RADIOTRON DIVISION RCA MANUFACTURING COMPANY, INC. WORL RADIO HISTORY 991

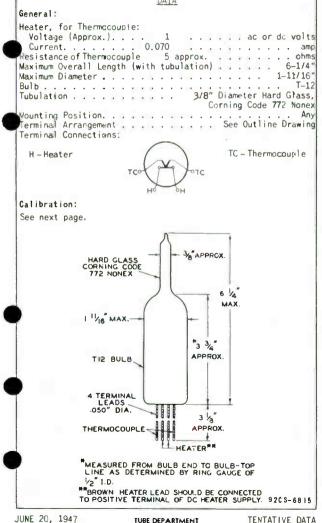


1926

VACUUM-GAUGE TUBE

THERMOCOUPLE TYPE

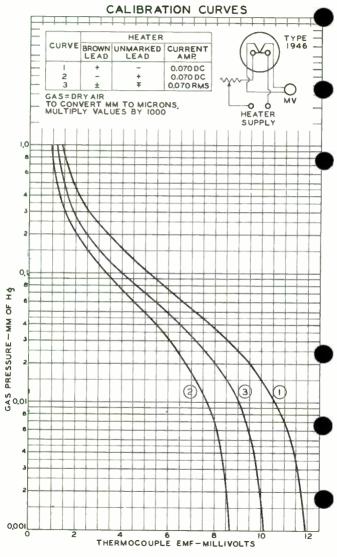
DATA



RADIO CORPORATION OF AMERICA, HARISON, NEW JERSEY







MAR. 11, 1947

TUBE DEPARTMENT RADIO CORPORATION DE AMERICA SIDITISON, NEW JERSEY 92CM-6852



1981

VACUUM-GAUGE TUBE

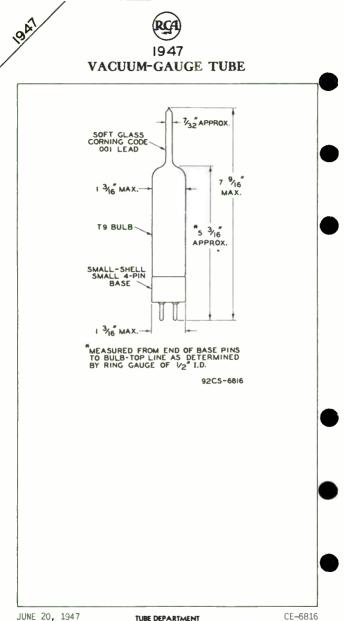
PIRANI TYPE

	DATA
General:	
	atinum Iridium:
	Approx.) 10
	/aries with
	ressure) 70-100 ma.
	& No.2 un-
	n better than
	m of mercury 135.8
	all Length (including tubulation) 7-9/16"
Maximum Dian	
Bulb	
Tubulation .	
	Corning Code 001 Lead
Mounting Pos	
Base	BOTTOM VIEW BOTTOM VIEW
Pin 1-Fila	
Pin 2 – Fila	
Pin 3 - No (Pin 4 - Inte	
	hection - base of tube
	lot Use
	ngs, Absolute Values:
FILAMENT VOL	_TAGE 16 max. volts
Calibration	for 1947 in Accompanying Circuit:
See curve on	following sheet.
	PIRANI GAUGE BRIDGE CIRCUIT
	R3 1, TO PINS NEI
	8 Nº 2 OF 2 TYPE 1947
	MAD LASS MAD
	What & went
	RI ANR7
	R2
	12 V.
	92CS-6853
R1:	50 0hms R3 + METER: 15 0hms R6: 120.7 0hms 25 0hms R4 R5: 10 0hms each R7: 135.8 0hms
	 With switch S in position 2, adjust R2 so that meter reads 2.5 milliamperes.
STEP	2: With switch S in position 1. and with dry air
	 With switch S in position 1, and with dry air at atmospheric pressure in the 1947, adjust R1 Se that meter reads 5,0 milliamperes.
	3: With no further adjustments and with switch S
	in position 1, proceed to use gauge.

JUNE 20, 1947

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY WORLRADIO HISTOTY

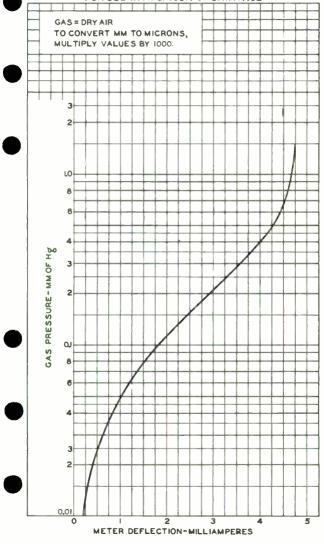
TENTATIVE DATA





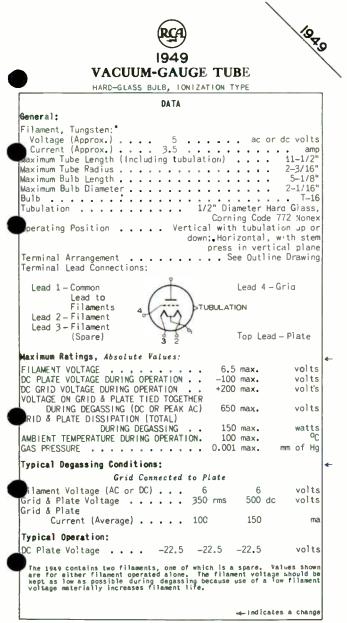


CALIBRATION CURVE FOR USE WITH CIRCUIT ON DATA PAGE



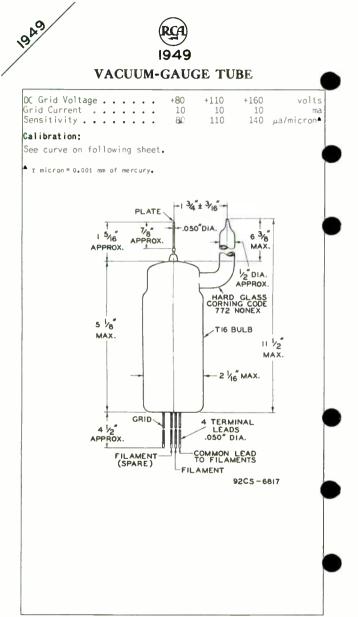
TUBE DEPARTMENT

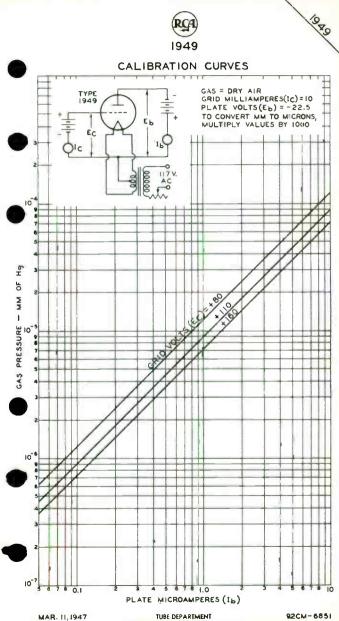
4



MARCH 1, 1954

TUBE DEP A RTMENT





BADIO CORPORATION OF MARTICA, HARVISON, NEW JEISEY





GENERAL DATA

	Electrical:		•
)	Heater, for Unipotential Cathode: <u>Mis.</u> <u>Av.</u> <u>Nax.</u> Voltage (AC or DC) 5.7 6.3 6.9 v Current, with heater volts = 6.3 0.54 0.60 0.66 Cathode:	olts amp	
	Heating Time, prior to tube conduction 10 Direct Interelectrode Capacitances (Approx.):•	sec	
)	Grid No.1 to Anode 0.26 Input	µµ⊥f µµ⊥f µµ⊥f	
	square-pulse volts = 50; and peak anode amp.	μsec	
		μsec	
	1	µsec	
	amp. = 0.1 0.5	µamp olts 250	
	(megohms) = 0; grid-No. volts = 0 • Without external shield.	800	
	Maximum Seated Length	T-12 -Pin 6BS .1 .2	
	() ■ (6) ← Indicates a change.		



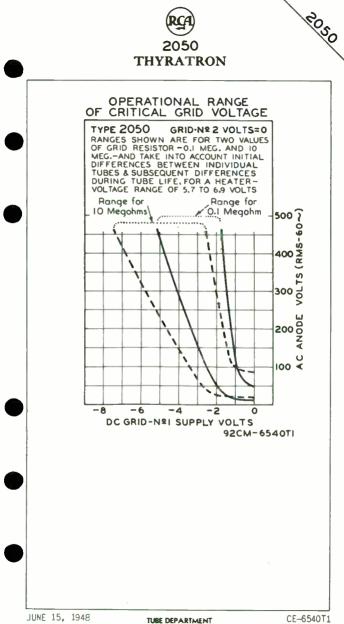
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RCA 2050 THYRATRON

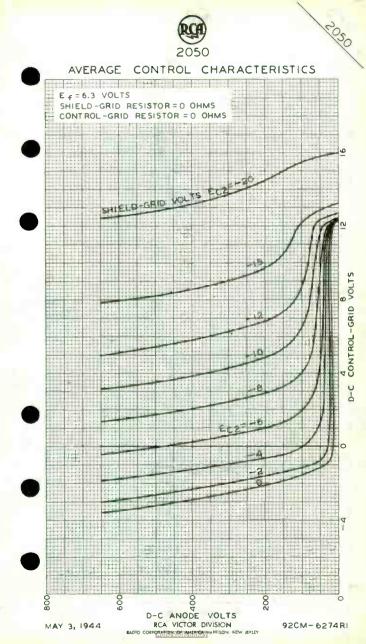
RELAY and GRID-CONTROLLED RECTIFIER SERVICE

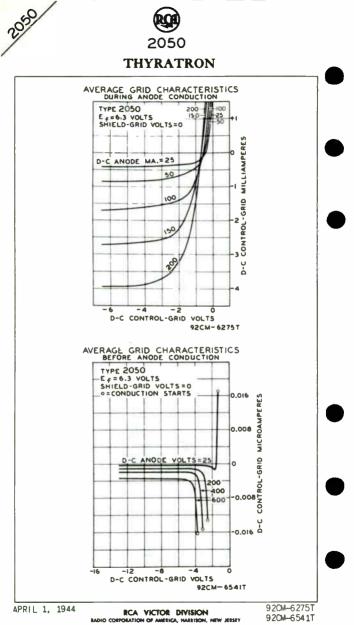
- 1				
	Maximum Ratings, Absolute Values:			
	PEAK ANODE VOLTAGE: Forward	650 m 1300 m		
	Peak, before anode conduction100 max.	-100 m	max. volts	
	Average, during anode conduction	-10 m	max, volts	
	Peak, before anode conduction250 max. Average, during anode	-250 r	max. volts	
	CATHODE CURRENT:	-10 r	max, volts	
	Peak 1.0 max. Average [®] 0.2 max.	1.0 r 0.1 r	p	
	Surge, for duration of 0.1 sec. max 10 max.	10 r	max. amp	
	GRID-No.2 CURRENT: Average [®] +0.01 max. GRID-No.1 CURRENT:	+0.01 r	nax. amp	
-	Average [®] +0.01 max. PEAK HEATER-CATHODE VOLTAGE: Heater negative with	+0.01 r	max. amp	
	respect to cathode 100 max. Heater positive with	100 r	max. volts	5
	respect to cathode 25 max. AMBIENT TEMPERATURE RANGE75 to +90	25 r -75 to	nax. volts +90 ^o C	
+	Typical Operating Conditions for Relay Serv	ice:		
	RMS Anode Voltage. 117 Grid-No.2 Voltage. 0 RMS Grid-No.1 Bias Voltage. 5° DC Grid-No.1 Bias Voltage. - Peak Grid-No.1 Signal Voltage. 5 Grid-No.1-Circuit Resistance 1.0 Anode-Circuit Resistance#. 1200	400 0 -6 6 1.0 2000	volts volts volts volts volts megohn ohns	5 5 5
	Maximum Circuit Values:			
	Grid-No.1-Circuit Resistance: For average anode current below 0.1 amp. For average anode current above 0.1 amp.	10 ma: 2 ma:		
	 Averaged over any interval of 30 sec. max. Approximately 180⁰ out of phase with the anode vo <i>sufficient</i> resistance, including the tube load, m conditions of operation to prevent exceeding the -> Indicates a change. 		ed under any ratings.	

JUNE 15, 1948



TUBE DEPARTMENT RADIO CORPONIZION OF AMERICA, HARRISON, NEW JERSEY





2050-A

Gas Thyratron

TETRODE TYPE

For Relay and Grid-Controlled-Rectifier Service

GENERAL DATA

E	lect	tri	ical	1:
---	------	-----	------	----

	ts amp
Cathode: Minimum heating time prior to tube conduction	sec
Grid No.1 to anode 0.15 µ	u⊥f u⊥f
For dc anode volts = 100, grid-No.1 volts (square-wave pulse) = 50, peak	sec
volts = -250, grid-No.1 resistor (ohms) = 1000, dc anode amperes = 0.1 50 μs With dc anode volts = 125, grid-No.1	ec
volts = -10, grid-No.1 resistor (ohms) = 1000, dc anode amperes = 0.1 100 μs Maximum Critical Grid-No.1 Current for dc anode supply volts (rms) = 460,	ec
0.1	μa ts
connected to cathode at socket	
Mechanical:	
Operating Position	ny 6"





RADIO CORPORATION OF AMERICA **Electron Tube Division** <u>/orld Radio History</u>

Harrison, N. J.

Basing Designation for BOTTOM VIEW. 68S

Pin 2-Heater Pin 3 - Anode Pin 5 - Grid No.1



DELAY AND OPID_CONTROLLED_RECTIFIER SERVICE

Pin 6-Grid No.2 Pin 7-Heater Pin 8-Cathode

RELAY AND GRID-CONTROLLED-RECTIFIER SERVICE								
Maximum and Minimum Ratings,	Maximum and Minimum Ratings, Absolute-Naximum Values:							
For anode supply	freque	ncy o	f 60 cp	s				
PEAK ANODE VOLTAGE:								
Forward	180	max.			volts			
Inverse	360	max.	1300	max.	volts			
VOLTAGE:								
Peak, before tube	100		100		volts			
conduction	-100	max.	-100	max.	VOITS			
Average [®] , during tube conduction	-10	may	_10	max.	volts			
GRID-No.1 (CONTROL-GRID)	-10	max.	-10	11101 A +	10113			
VOLTAGE:								
Peak, before tube								
conduction	-250	max.	-250	max.	volts			
Average ^b , during tube								
conduction	-10	max.	-10	max.	volts			
CATHODE CURRENT:								
Peak	1	max.		max.	amp			
Average ^b	0.2	max.	0.1	max.	amp			
Fault, for duration of 0.1 second maximum	10	max.	10	may	amp			
GRID-No.2 CURRENT:	10	max.	10	max.	curity			
Average ^b	+0.01	max.	+0.01	max.	amp			
GRID-No.1 CURRENT:					P			
Average ^b	+0.01	max.	+0.01	max.	amp			
PEAK HEATER-CATHODE VOLTAGE:								
Heater negative with								
	100	max.	100	max.	volts			
Heater positive with	25		25					
respect to cathode AMBIENT-TEMPERATURE RANGE	20	max.	25	max.	volts °C			
AMBIENI-TEMPERATURE RANGE	-70 t	0 +30	-15 (0	730	Ç			
Typical Operation for Relay S	Service	:						
RMS Anode Voltage	117		400		volts			
Grid No.2		ected	to catl	iode at	socket			
RMS.Grid-No.1 Bias Voltage ^c .	5		-		volts			
DC Grid-No.1 Bias Voltage	-		-6		volts			
Peak Grid-No.1 Signal								
Voltage.	5		6		volts			
Grid-No.1-Circuit								



megohm

RADIO CORPORATION OF AMERICA **Electron Tube Division** Harrison, N. J.

1

1200

1

2000

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

- For average anode current below
- 0.1 ampere. 10 max. megohms For average anode current above 0.1 ampere. 2 max. megohms
- ^a Without external shield.

b Averaged over any interval of 30 seconds maximum.

C Approximately 180° out of phase with the anode voltage.

d Sufficient resistance, including the tube load, must be used under any conditions of operation to prevent excewding the current ratings.

OPERATING CONSIDERATIONS

The heater is designed to operate on either ac or dc at 6.3 volts. Regardless of the heater-voltage supply used, the heater voltage must never be allowed to deviate from its rated range. Heater operation outside of this voltage range will impair tube performance and may cause tube failure. Low heater voltage causes low cathode temperature with resultant cathode sputtering and consequent destruction of the cathode; high heater voltage causes high cathode temperature with resultant heating of the grid and consequent grid emission which produces unpredictable shifts in the critical grid-No.1 voltage

The cathode should be allowed to reach normal operating temperature before anode current is drawn. The delay period should not be less than to seconds after application of heater voltage. Unless this recommendation is followed, the cathode will be damaged.

The shield grid (grid No.2) is normally connected to the cathode at socket. It may, however, be used as a control electrode because the control characteristic of grid No.1 may be shifted by varying the potential of grid No.2. As grid No.2 is made negative, the grid-No.1 characteristic is shifted in the positive direction. The use of grid No.2 as the control electrode (with grid No.1 connected to cathode at socket) has the advantage of increased sensitivity but consideration must be given to the higher preconduction current, higher capacitance to ande, and less stability of operation.

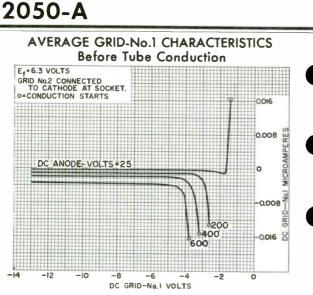
A grid-No.1 resistor having a value as high as 10 megohms to give circult sensitivity can be used with the 2050-A because its control-grid current is very low. However, when a high value of grid resistor is used, care should be taken to keep the tube base and socket clean and dry in order to make the effect of leakage currents between the control-grid base pin and anode base pin very small.

Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings of the tube.



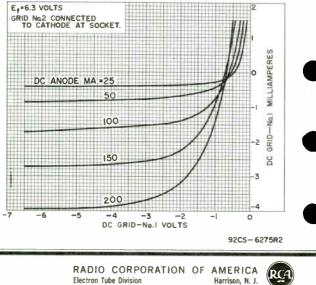


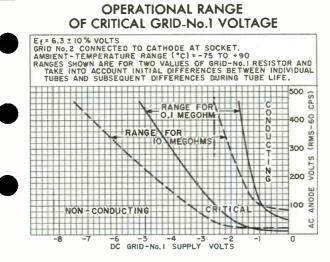




92CS-654IR2





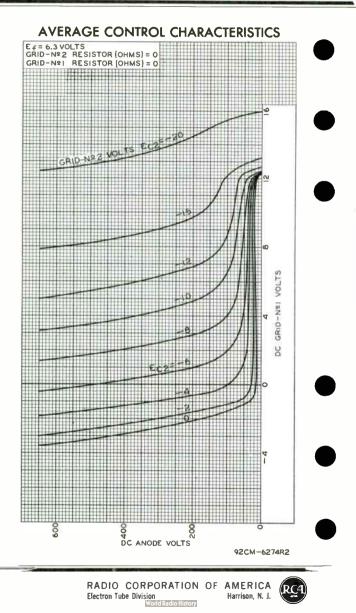


92CS-6540R3



RADIO CORPORATION OF AMERICA Electron Tube Division

DATA 3 3-61



5550

Ignitron



GENERAL DATA

	Generation Price
	Electrical: 🔷
	Cathode Excitation
	Peak ignitor veltage required to fire 200 volts Peak ignitor current required to fire 30 amp Starting time at required voltage or current . 100 μsec Tube Voltage Drop:
	At peak anode current of 1697 amperes 30 volts At peak anode current of 70.4 amperes
)	Mechanical:
	Operating PositionVertical, flexible lead up Maximum Overall Length (Including flexible lead)
	Maximum Diameter
	P-Anode Terminal (Flexible lead) K-Cathode Terminal (Lower por- tion of shell)
)	Cooling: Type Air or water-cooled clamp Clamp height (Approx.)
	RESISTANCE-WELDING-CONTROL SERVICE*
	Two Tubes in Inverse-Parallel Circuit
	Maximum Ratings, Absolute-Maximum Values:
	For frequencies from 25 to 60 cps Ratings I—A and I—B Apply to Operation with
	a Clamp-Temperature Range of 10 ⁰ to 75 ⁰ C
	RATING I-A
	Column Column 1 ^b 2 ^b
,	SUPPLY VOLTAGE (RMS)

DEMAND POWER (During conduction). 50 max. 150 max. kva

---- Indicates a change.



RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

DATA I 3-61

5550

	Column	Column	
	2 b	2 ^b	
DUTY C,d ANODE CURRENT (Per tube):	10 max.	1.8 max.	[%]
Peak	282 max.	846 max.	amp
conduction)® Average (Averaged over any interval of 27,8 seconds	200 max.	600 max.	атр
maximum) [®]	9 max.	4.86 max.	amp
second maximum	1680 max.	1680 max.	атр
RATING	-B		
	Column 1 ^b	Column 2 ^b	
DUTY ^{c,d}	1 ⁶ 600 max. 50 max.	2 ⁶ 600 max. 150 max.	volts kva %
DEMAND POWER (During conduction). DUTY ^{c,d} ANODE CURRENT (Per tube): Peak.	1 b 600 max. 50 max. 24 max.	20 600 max. 150 max. 4.32 max.	kva
DEMAND POWER (During conduction). DUTY ^{c,d} ANCDE CURRENT (Per tube):	118 max.	20 600 max. 150 max. 4.32 max. 354 max.	kva %
DEMAND POWER (During conduction). DUTYC.d ANCDE CURRENT (Per tube): Peak. Demand (RMS, during conduction) Average (Averaged over any	2 b 600 max. 50 max. 24 max. 118 max. 83 max.	20 600 max. 150 max. 4.32 max. 354 max.	kva %

Ratings II-A and II-B Apply to Operation with a Clamp-Temperature Range of 10° to 50° C

RATING II-A

	Column 1 ^b	Column 2 ^b	
SUPPLY VOLTAGE (RMS) DEMAND POWER (During conduction). DUTYC,d ANODE CURRENT (Per tube):	100 max.	300 max.	volts kva %
Peak	564 max.	1692 max.	amp
Demand (RMS, during conduction) [®] Average (Averaged over any interval of 2.2 seconds	400 max.	1200 max.	amp
maximum) ^e	22.4 max.	12.1 max.	amp
Fault, for duration of 0.15 second maximum	3360 max.	3360 max.	amp

RATING II-B

	Column 1 ^b	Column 2 ^b	
SUPPLY VOLTAGE (RMS) DEMAND POWER (During conduction). DUTY ^{c,d}	100 max.	300 max.	

RADIO CORPORATION OF AMERICA **Electron Tube Division**

(RC-

World Radio History

Harrison, N. J.

ANODE CURRENT (Per tube):						
Peak.		236	max.	708	max.	атр
Demand (RMS, during						
conduction)		167	max.	500	max.	атр
Average (Averaged over any interval of 9.2 seconds						
maximum)•		22.4	max.	12.1	max.	атр
 Fault, for duration of 0.15 	5					
second maximum		1400	max.	1400	max.	атр

RESISTANCE-WELDING CAPACITOR-DISCHARGE SERVICE

Maximum Ratings, Absolute-Naximum Values:

RATING I

CLAMP TEMPERATURE	() max. 40	max. oc					
PER SECOND 6	0 max. 60	max.					
Forward	M may 3000	may volts					
rurwaru	10 max. 2000	Max. Voito					
Inverse	10 max. 3000	max. volts					
ANODE CURRENT:							
Peak	0 max. 500	max. amp					
Average ^f	3 max. 15	max. amp					
Averaging time-interval ^f 3. DURATION OF CATHODE-SPOT	3 max. 0.66	max. sec					
PER DISCHARGE 0.0	0.02 max. 0.02	max. sec					
D. MING ST							
RATING II	RATING II						
CLAMP TEMPERATURE	0 max. 40	max. °C					

CLAMP TEMPERATURE	60	max.	40	max.	UC C
NUMBER OF DISCHARGES PER SECOND.	6D	max.	60	max.	
PEAK ANODE VOLTAGE:					
Forward	6000	max.	6000	max.	volts
Inverse	3000	max.	3000	max.	volts
ANODE CURRENT:					
Peak	500	max.	500	nax.	атр
Averagef	2.5	max.	8	max.	атр
Averaging time-interval ^f	4	max.	1.25	max.	Sec
DURATION OF CATHODE-SPOT					
PER DISCHARGE	0.02	max.	0.02	max.	sec

IGNITOR

Maximum Ratings, Absolute-Nazimur	R	Va	L	es	:					
PEAK IGNITOR VOLTAGE:										
Positive										
Negative	•	•	-	•	•	•	•	5	max.	volts
IGNITOR CURRENT:								4.00		
Peak.	•	•	•	•	٠	•	٠	100	max.	атр
Average (Averaged over any interval of 5 seconds maximum								4		
										amp
RMS	•	•	*	•	٠	•	•	10	max.	атр

-Indicates a change.



RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

DATA 2 3-61

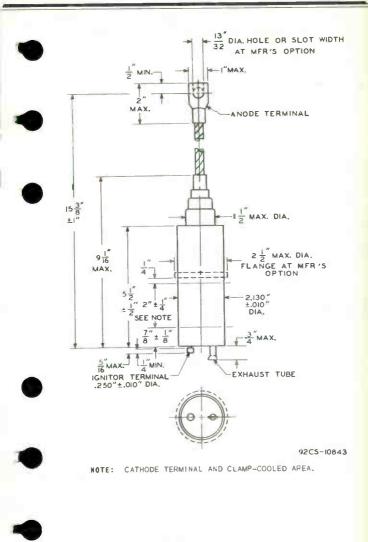


5550

- RMS Voltage, current, and demand kva are on the basis of full-cycle conduction (no phase delay) regardless of whether or not phase control is used.
- ^b Column 1 represents operation at maximum average anode current; Column 2 represents operation at maximum demand power.
- C Defined as (cycles "on")/(cycles "on" + cycles "off") during the specified averaging time.
- d For supply voltages between 250 volts and 600 volts, duty is proportional to supply voltage. For supply voltages lower than 250 volts, ine values for 250 volts apply.
- For supply voltages between 250 volts and 600 volts, demand anode current and averaging time are each inversely proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.
- f with the use of log-log paper, straight-line interpolation between tabulated points may be used to obtain average-anode-current and maximumaveraging-time ratings at clamp temperatures between the two tabulated values.



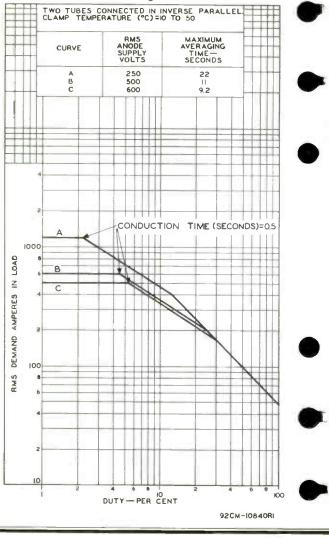




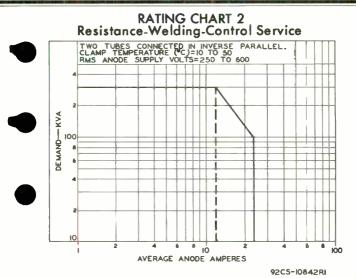


RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 3 3-61





RADIO CORPORATION OF AMERICA Electron Tube Division World Recipilistory



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RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 4 3-61



AJEGE

WATER-COOLED, STEEL-JACKETED, MERCURY-POOL-CATHODE TYPE HAVING MOUNTING PLATE FOR THERMOSTATIC CONTROL

For resistance-welaing control

GENERAL DATA

Electrical: Cathode Excitation. Cyclic Cathode-Spot Starting Minimum Requirements for Cathode Excitation: . .By Ignitor Peak ignitor voltage required to fire . . . 200 volts Peak ignitor current required to fire . . . 30 amp Starting time at required voltage or current..... 100 µsec. Tube Voltage Drop: At peak anode current of 3400 amoeres . . . 26 volts At peak anode current of 176 amperes. . . . 13 volts Mechanical: Operating Position. Vertical, flexible lead up Maximum Overall Length (Including flexible lead).... Maximum Radius (Including water connections). 2-7/8" Weight.... • • • 3.6 lbs Terminal Connections (See Dimensional Outline): P - Anode I - Ignitor Terminal Terminal (Flexible Within lead) iacket K - Cathode skirt at Terminal €athode (Bar oppoend) site anode terminal) Coolina: Туре. Minimum inlet water temperature . Water oc . 10 Maximum outle: water temperature. 00 40 Minimum water flow. 1 gpm Maximum water-temperature rise. . . A Maximum pressure drop 2.5 psi INTERMITTENT RECTIFIER SERVICE and FREQUENCY-CHANGER WELDER SERVICE Maximum Ratings, Absolute-Naximum Values: For zero phase-control angle and frequencies from 50 to 60 cps RATING I PEAK ANODE VOLTAGE: Forward. . 500 max. volts Inverse. 500 max. volts

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ELECTRON TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



					- 1
ANODE CURRENT:			700	max.	amp
Peak	rval	•			1
of 6 seconds maximum)		•	40	max.	атр
Fault, for duration of 0.15 sec ond maximum		•	8750	max.	amp
RATING	II				
PEAK ANODE VOLTAGE:					
Forward	1200 1200	max.			volts volts
ANODE CURRENT:					
Peak	135	ma×.	600	max.	атр
Average (Averaged over any interval of 10 sec-					
onds maximum).	22.5	max.	5	max.	атр
Average (Averaged over any					
interval of 0.2 sec-	22 5	may	100	max.	атр
ond maximum)	22.0	116474	200	110,271	
second maximum	7500	max.	7500	max.	amp
RATING	III				
PEAK ANODE VOLTAGE:					. 1
Ferward		max.		max.	volts volts
Inverse	1500	max.	1200	max.	VOILS
Peak	108	max.	480	max.	amp
Average (Averaged over any					
interval of 10 sec- onds maximum)	18	max.	4	max.	атр
Average (Averaged over any	-0				
interval of 0.2 sec-	10		20		amp
ond maximum)	18	max.	80	max.	anip
second maximum	6000	max.	6000	max.	атр
RESISTANCE-WELDING-	CONTRO	L SERV	VICE®		
Two Tubes in Inverse	-Paral	lel C	ircuit		1
Maximum Ratings, Absolute-Naximu					
For frequencies fr					
Ratings I-A and I-B Apply to D	pe rat i	on El	ther (D WI	th-
out Water-Saving Thermost Saving Thermostat Shunted	at, o	r (2)	With	Wate	or
Saving Thermostat Shunted RATING					-
SUPPLY VOLTAGE (RMS)		max	250	max-	volts
OEMANO POWER (Ouring con-					I
duction)	200	max.	600	max.	kva
. See next page,					

See next page.

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5551rA

ELECTRON TUBE DIVISION

TENTATIVE DATA 1



Altece

4-59	RADIO COR			, NEW JE		TIVE	DATA 2
	: See next page.						
			43	niaX.	4./	mex.	%
duct	D POWER (During	con-		max. max.			kva
SUPPLY	VOLTAGE (RMS)		G II-B 600	max.	600	max.	volts
S	econd maximum .			max.	6720	max.	amp
Fau	nterval of 25.6 nds maximum)# . lt, for duration	of 0.15	-	max.		max.	amp
d Ave	and (RMS, during uction)# rage (Averaged c	ver any	800	max.	2400	max.	атр
Pea	CURRENT (Per tu		1130	max.	3400	max.	атр
duc DUTY▲	tion)	· · · · ·		max. max.		max. max.	kva %
DEMAN	Y VOLTAGE (RMS) D POWER (During	con	250	max.	250	max.	volts
		RATIN	G II-A				- · · · ·
R	atings II-A and aving Thermosta	II-B App t Not Shu	ly to Ope nted by A	ratic uxili	n with arv Co	Wate ntact	r- or
	it, for duration econd maximum .			max.	2800	max.	amp
i o	nterva} of 7.5 : nds maximum)≇ .	sec-	56	max.	30.2	max.	amp
d Ave	and (RMS, during uction)# rage (Averaged o		333	max.	1000	max.	amp
Pea	CURRENT (Per to		466	max.	1410	max.	amp
duc DUTY●	tion)			max. max.		max. max.	kva %
DEMAN	Y VOLTAGE (RMS) D POWER (During	cor-		max.	600	max.	volts
		RATI	NG I-B				
	lt, for duration econd maximum .			max.	6720	max.	amp
i	nterva: of 18 s nds maximum)≢ .	ec-		max.	30.2	max.	amp
d	and (RMS, durin uction)# rage (Averaged)	~ 	. 800	max.	2400	max.	атр
Pea	CURRENT (Per t		. 1130	max.	3400	max.	атр
DUTY	t		. 15	max.	2.8	max.	%

World Radio History

5551-A IGNITRON

1	ANODE CURRENT (Per tube):	400		1410		атр	
	Peak	466	max.	1410	max.	- 1	
	Demand (RMS, during con- duction)#	333	max.	1000	max.	атр	
	Average (Averaged over any interval of 10.7 sec-						
	pnds maximum) <i>#</i>	36	max.	21	max.	amp	
	Fault, for duration of 0.15 second maximum	925	max.	2800	max.	amp	

IGNITOR

Maximum Ratings, Absolute-Naximum Values:

PEAK IGNITOR VOLTAGE:

5551-4

	Positive Eq	qual to	anode v	/olts
	Negative	. 5	max. v	volts
	ICNITOD CHODENT.			
	Peak	. 100	max.	атр
1	Average (Averaged over any interval			атр
	of 5 seconds maximum).	. 1	max.	
ļ	RMS	. 10	max.	amp

RN: voltage, current, and demand kva are on the basis of full-cycle conduction (no phase delay) regardless of whether or not phase control is used.

- Defined as (cycles "on")/(cycles "on" + cycles "off") during the specified averaging time.
- For supply voltages between 250 volts and 600 volts, duty is proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.
- For supply voltages between 250 volts and 600 volts, demand anode current and averaging time are each inversely proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.

OPERATING CONSIDERATIONS

The 5551-Ass equipped for mounting a thermostatic control with a mounting plate calibrated either for controlling the flow of cooling water through the water jacket, or for protection of the ignitron against overheating.

When the cooling water is circulated successively through the water jackets of two or more ignitrons, the water-sauing thermostat, if used should be mounted on the ignitron connected directly to the water supply.

The water-saving thermostat, which has normally open contacts, is calibrated to close a circuit energizing a solenoid valve in the water-supply line and thus permit water flow to start when the temperature of the thermostat mounting plate exceeds approximately 35° C. Because of the lag between the heating of the ignitron envelope and the functioning of the water-saving thermostat to start water flow through the water jackets, the ignitron may overheat before the flow of cooling water starts.



Such overheating can be prevented by the #se of an auxiliary contactor shunted across the contacts of the water-saving thermostat and actuated by the welding-control switch. The contactor causes the solenoid valve in the water-supply line to open as soon as welding current flows.

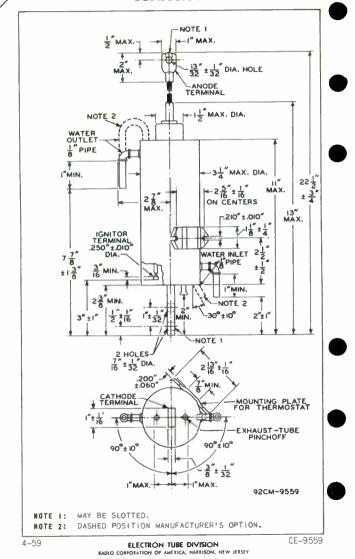
If the water-saving thermostat is not shunted by an auxiliary contactor, it will be necessary to use a lower value of maximum average current than that which is specified when the auxiliary contactor is employed. The lower average current value is achieved by increasing the maximum averaging time and decreasing the maximum duty. Although the same maximum conduction time is permitted for both of these operating conditions, the use of the water-saving thermostat alone, without the auxiliary contactor requires a longer interval between successive welds than when the thermostat is shunted by the contactor.

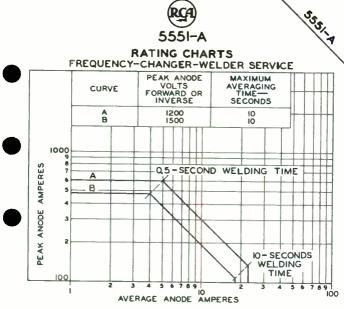
When a protective thermostat is used, it should be mounted on an ignitron from which the cooling water discharges into the drain. The protective thermostat is calibrated to open aset of normally closed contacts at a jacket temperature of approximately 52° C. The opening of these contacts causes a protective device to function. This device may be a relay opening the ignitor firing controls, or preferably, a circuit breaker which removes power from the ignitrons.

Care must be taken to insure that the water jacket of each ignitron is completely filled before power is applied. Tube operation with a partially filled water jacket may cause abnormal heating of the tube envelope, with resultant arc-kack which impairs tube life. It is also necessary to arrange the cooling system so as to prevent any draining of the water jackets when the flow of water ceases.

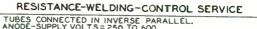


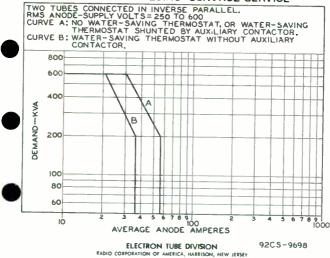






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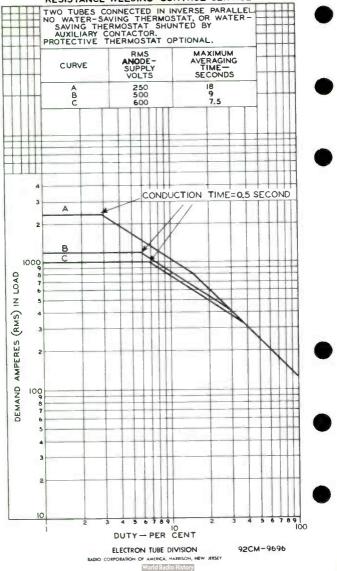






5551-4

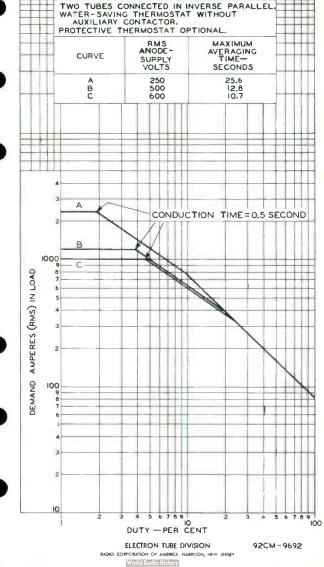
RATING CHART RESISTANCE-WELDING-CONTROL SERVICE





A. ICC







41.1666

WATER-COOLED, STEEL-JACKETED, MERCURY-POOL-CATHODE TYPE HAVING MOUNTING PLATE FOR THERMOSTATIC CONTROL For resistance-welding control

GENERAL DATA

Electrical:

ł

Electrical:
Cathode Excitation
Mechanical:
Operating Position Vertical, flexible lead up Maximum Overall Length (Including flexible lead)
P-Anode Terminal (Flexible lead) K-Cathode Terminal (Bar oppo- site anode terminal)
Cooling: Type
INTERNITTENT DEATIERED DERVICE
INTERMITTENT RECTIFIER SERVICE Maximum Ratings, Absolute-Maximum Values:
For zero phase-control angle and
frequencies from 25 to 60 cps PEAK ANODE VOLTAGE: Forward

ELECTRON TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, MARRIDON, NEW JERSEY

RCA) 5552-A

5552-4

IGNITRON

				_	
ANODE CURRENT:					
Peak	enval -	 .f	1600	max.	атр
6 seconds maximum)			100	max.	алтр
Fault, for duration of 0.15 se	ec-		0000		ľ l
ond maximum	•••	•••	6000	max.	алтр
RESISTANCE-WELDING-	CONTROL	650	V 1059		1
Two Tubes in Inverse					
Haximum Ratings, Absolute-Naximu			.,		
For frequencies fr			cts		
Ratings I-A and I-B Apply to C	-			D wi	th-
out Water-Saving Thermost	tat, o	r (2	} With	Wate	er-
Saving Thermostat Shunted	by Au	×	ary Co	ntac	tor
RATING					
	Colur 1*		Coli		
SUPPLY VOLTAGE (RMS)	250 r		-		volts
DEMAND POWER (During con-	400		1000		.
dwction)	400 r 19 r	nax. nax.	1200 3.5		kva %
ANODE CURRENT (Per tube):					~
Peak . Demand (RMS, during con-	2260 r	nax.	6800	max.	атр
duction)#	1600 r	nax.	4800	max.	атр
Average (Averaged over any interval of 14 sec-					
onds maximum)#	140 r	nax.	75.6	max.	ало
Fault, for duration of					
0.15 second maximum	13450 n	nax.	13450	max.	amp
RATING			<u>.</u>		
	Colum 1*	877	Colu		
SUPPLY VOLTAGE (RMS)	600 r		-		volts
DEMAND POWER (During con-					
duction)	400 r 47 r		1200		kva %
ANODE CURRENT (Per tube):					~
Peak Demand (RMS,during con-	945 r	nax.	2830	max.	amp
	666 m	nax.	2000	max.	алор
Average (Averaged over any					
interval of 5.8 sec- onds maximum)#	140 m	nav	75.6	may	amo
Fault, for duration of	140 1		10.0	1161 / 16	caub
0.15 second maximum	5600 m	nax.	5600	max.	атр
•,•,†,#,*: See next page					
4-59 ELECTRON THE					DATA 1



41.566G

Ratings II-A and II-B Apply to Operation with Water-Saving Thermostat Not Shunted by Auxiliary Contactor

	RA	TI	G II-A				
				4 8	Col 2	1171171 #	
SUPPLY VOLTAGE (RMS) DEMAND POWER (During con-			250	max.	250	max.	volts
duction) DUTY-1 ANODE CURRENT (Per tube):	•			max. max.		тах. так.	
Peak		•••	2260	max.	6800	max.	amp
conduction) Average (Averaged over interval of 23.5 sec-	anj		1600	max.	4800	max.	amp
onds maximum)# Fauit, for duration of		•••	80	max.	43	max.	amp
0.15 second maximum.		• •	13450	max.	13450	max.	amp
	RA'	FIN	G II-B				
				4 11 12 4	Coli		
SUPPLY VOLTAGE (RMS) DEMAND POWER (During con-			600	max.	600	max.	volts
duction)			400	max.	1200	max.	
DUTY ⁴ ANODE CURRENT (Per tube):		• •	26	max.	4.8	max.	%
Peak Demand (RMS, during		•••	945	max.	2830	max.	amp
conduction)≇ Average (Averaged over interval of 10 sec-			666	max.	2000	тах.	amp
onds maximum)# Fault, for duration of		• •	80	max.	43	max.	amp
0.15 second maximum.			5600	max.	5600	max.	amp
-			ITOR				
Maximum Ratings, Absolute	- No	1x i	mum Val	ues:			

PEAK IGNITOR VOLTAGE: Positive Equal to anode volts Negative . . . 5 max. volts IGNITOR CURRENT: Peak 100 max. amp Average (Averaged over any interval of 5 seconds maximum). 1 max. атр . . . RMS. 10 max. amp

●,▲,†,#,*: See next page. 4-59

ELECTRON TUBE DIVISION

TENTATIVE DATA 2



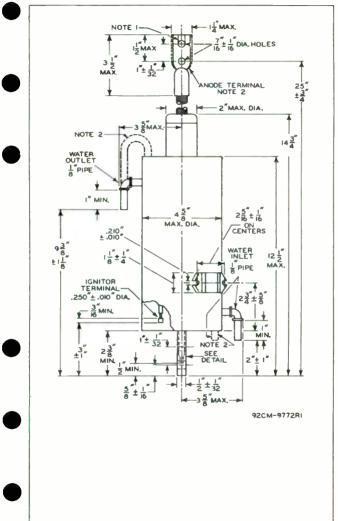
- RMS voltage, current, and demand kva are on the basis of full-cycle conduction (no phase delay) regardless of whether or not phase control is used.
- Defined as (cycles "on")/(cycles "on" + cycles "off") during the specified averaging time.
- f cgr supply voltages between 250 volts and 600 volts, duty is proportion aT to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.
- For supply voltages between 250 volts and 600 volts, demand anode current and averaging time are each inversely proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.
- Column 1 represents operation at maximum average anode current; Column 2 represents operation at maximum demand current.

OPERATING CONSIDERATIONS for the 5552-A are the same as those shown for Type 5551-A

5552-4

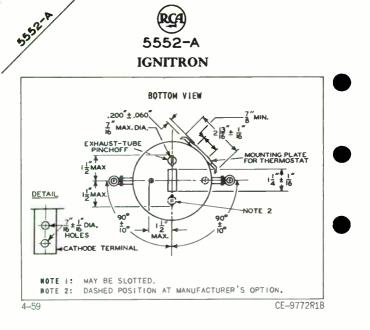
- 2



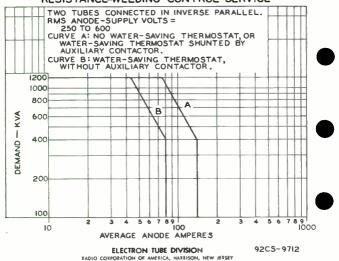


World Radio History

*1.565G



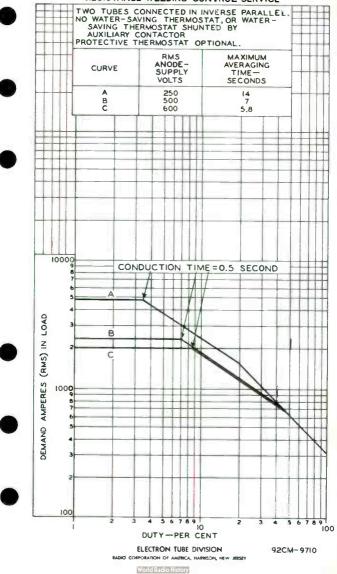
RATING CHART RESISTANCE-WELDING-CONTROL SERVICE





4.75cg

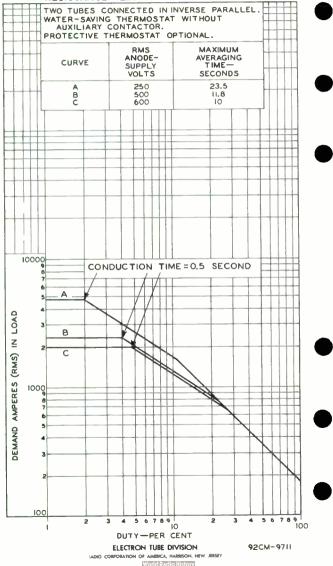
RATING CHART RESISTANCE-WELDING-CONTROL SERVICE





5552-1

RATING CHART RESISTANCE-WELDING-CONTROL SERVICE





53533.B

WATER-SOOLED, STEEL-JACKETED, MERCURY-POOL-CATHORE TYPE HAVING MOUNTING PLATE FOR THERMOSTATIC CONTROL

For resistance-welding control

GENERAL DATA

Electrical:

ciectrical:
Cathcde Excitation
At peak anode current of 13600 amperes
Mechanical:
Operating Position
P-Anode Terminal (Flexible lead) K-Cathode Terminal (Bar oppc- site anode terminal)
Cooling: Type
INTERMITTENT RECTIFIER SERVICE and FREQUENCY-CHANGER WELDER SERVICE
Maximum Ratings, Absolute-Maximum Values:
For zero phase-control angle and frequencies
from 50 to 60 cps
RATING I PEAK ANODE VOLTAGE:
Forward 600 max. 600 max. volts Inverse 600 max. 600 max. volts
4-59 ELECTRON TUBE DIVISION TENTATIVE DATA 1 RADIO CORPORATION OF AMERICA "ARRINGN, NEW JERSEY

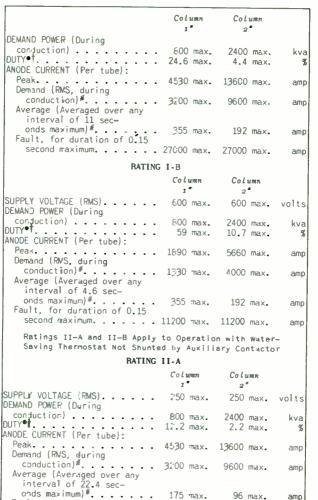
S553-B IGNITRON

555310

NODE CURRENT: Peak	1140	may	4000	may	amp
Average (Averaged over any	. 1140	max.	4000	max.	anp
interval of 6.25 sec-					
onds maximum)	. 190	max.	54	max.	amp
Average (Averaged over any interval of 0.2 sec-					
ond maximum).	. 190	max.	666	max.	amp
Fault, for duration of 0.15					
second maximum		max.	50000	max.	amp:
	ING II				
EAK ANODE VOLTAGE:	1200		1200	-	volts
Forward	1200	max.			volts
NODE CURRENT:					
Peak	. 840	max.	3000	max.	amp
Average (Averaged over any					
interval of 6.25 sec- onds maximum)	140	max.	40	max.	amp
Average (Averaged over any	• 10	115475	10	1110473	
interval of 0.2 sec-					
ond maximum)	. 140	max.	500	max.	amp
Fault, for duration of 0.15 second maximum.		may	37500	max	amp
		1162.	27.000	1164.0.0	amp
	NG III				
PEAK ANODE VOLTAGE:	. 1500		1500	-	volts
Forward					volts
NODE CURRENT:					
	. 672	max.	2400	max.	amp
Average (Averaged over any					
interval of 6.25 sec- onds maximum)	. 112	max.	32	max.	amp
Average (Averaged over any	• • • • •		/-		
interval of 0.2 sec-					
ond maximum) Fault, for duration of 0.15	. 112	max.	400	max.	amp
second maximum	. 30000	max.	30000	max.	amp
RESISTANCE-WELDI					
Two Tubes in Inve			Circuit		
laximum Ratings, Absolute-Nax					
For frequencies					
Ratings I-A and I-B Apply to out Water-Saving Thermo	o Operat	ion E	ither (U Wi1 Wata	in
Saving Thermostat Shunt	ed by A	uxili	iary Co	ntact	or
	ING I-A				
	~ .		Coly	mn 2*	
SUPPLY VOLTAGE (RMS)	Coli				volts



555331B



4-59

TENTATIVE DATA 2

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





RATING	II-B				
	Colu	1 M M F	Colu		
SUPPLY VOLTAGE (RMS)	600	max.	600	max.	volts
Conduction) DUTY ^{OI} ANODE CURRENT (Per tube):			2400 5.3		kva %
Peak	1890	max.	5660	max.	amp
Demand (RMS, during conduction)# Average (Averaged over any	1330	max.	4000	max.	атр
interval of 9.4 sec− onds maximum)# Fault. for duration of 0.15	175	max.	96	max.	amp
second maximum	11200	max.	11200	max.	amp
IGNI	TOR				

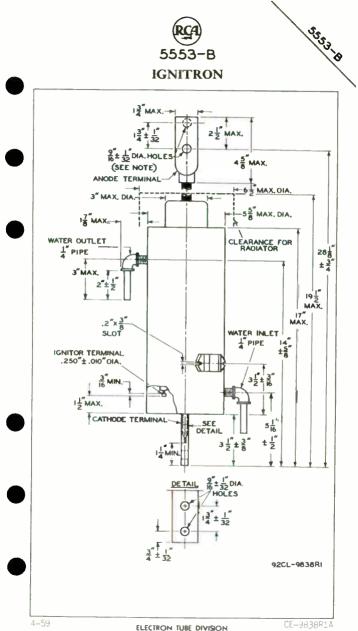
Maximum Ratings, Absolute-Maximum Values:

PEAK IGNITOR VOLTAGE:

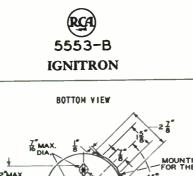
.....Equal to anode volts Pasitive. . . . 5 max. volts Negative. IGNITOR CURRENT: . . . 100 max. Peak. . . amp Average (Averaged over any interval 1 max. amp of 5 seconds maximum) RMS 10 max. amp .

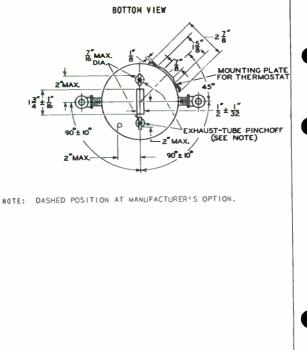
- RMS voltage, current, and demand kva are on the basis of full-cycle conduction (no phase delay) regardless of whether or not phase control is used.
- Defined as (cycles "on")/(cycles "on" + cycles "off") during the specified averaging time.
- For supply voltages between 250 volts and 600 volts, duty is proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.
- Column 1 represents operation at maximum demand power.
- For supply voltages between 250 volts and 600 volts, demand anode current and averaging time are each inversely proportional to supply voltage. For supply voltages lower than 250 volts, the values for 250 volts apply.

OPERATING CONSIDERATIONS for the 5553-B are the same as those shown for Type 5551-A



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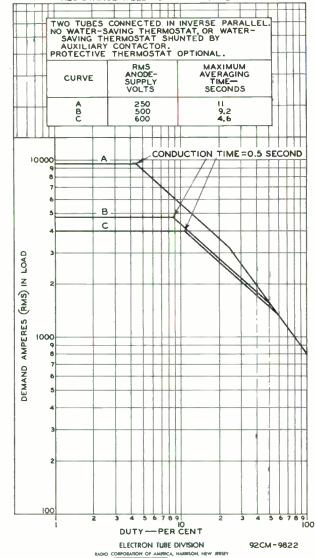


553.8



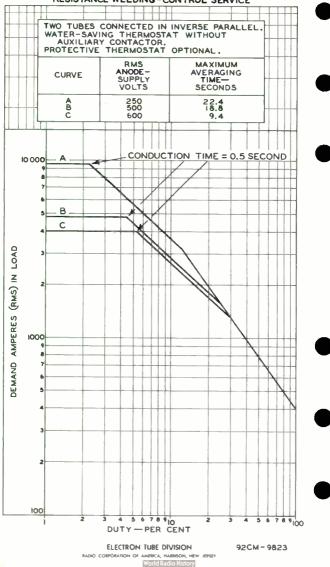
BI CCCC

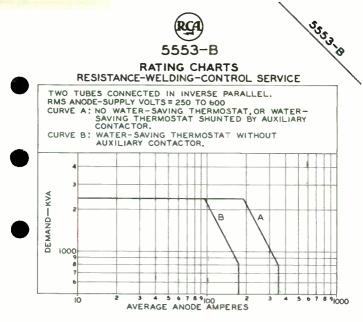
RATING CHART RESISTANCE-WELDING-CONTROL SERVICE



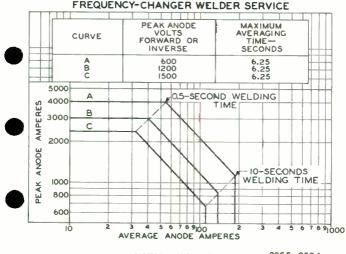


RATING CHART RESISTANCE-WELDING-CONTROL SERVICE





92CS - 9825



ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History



MERCURY-VAPOR THYRATRON

NEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical: Filament, Coated:

Min. Av. Max. Voltage. 2.38 2.5 2.62 ac or dc volts Current at 2.5 volts. - 5.0 5.5 amp Minimum heating time prior to tube conduction. 5 sec 5 Direct Interelectrode Capacitances (Approx.):0 7 puff Grid to anode. 7 puff Ionization Time (Approx.). 10 usec Deionization Time (Approx.). 16 volts
Mechanical:
Operating Position
Temperature Control:
HeatingWhen the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the con- densed-mercury temperature up to the minimum value of the operating ranges specified under Maximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required. CoolingWhen the operating conditions are such that the
maximum value of the operating condensed-mercury temperature is exceeded, provision should be made for forced-air cooling sufficient to prevent ex- ceeding the maximum value.
Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):* No load
 Without external shield. With filament volts = 2.38 and no heat-conserving enclosure.
4.50 DATA

World Radio History

5551



MERCURY-VAPOR THYRATRON

CONTROL SERVICE Maximum Ratings, Absolute Values: For anode-supply frequency of 60 cps Operating Condensed-Mercury-Temperature Range 40° to 90° C 40° to 80° C 40° to 60° C PEAK ANODE VOLTAGE: Forward. 2500 max. 1250 max. 5000 max. volts Inverse. 1250 max. 5000 max. 10000 max. volts GRID VOLTAGE: Peak or DC, before tube conduction. -500 max. -500 max. -500 max. volts Average^A, during tube conduction. -10 max. -10 max. -10 max. volts ANODE CURRENT: 3 max. 2 max. 1 max. Peak . атр 1 max. 0.5 max. 0.25 max. amp Fault, for duration of 0.1 second maximum. . . . 40 max. 40 max. 40 max. amp GRID CURRENT: Average, positive with anode positive . . . 0.05 max. 0.05 max. 0.05 max. amp Averaged over one conducting period. Averaged over any interval of 15 seconds maximum.

Averaged over period of grid conduction.

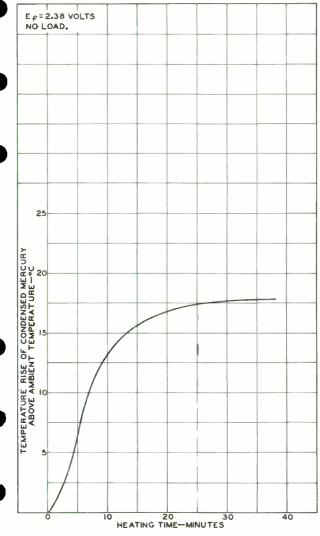
DIMENSIONAL OUTLINE

for Type 5557 is the same as that shown for Type 3C23

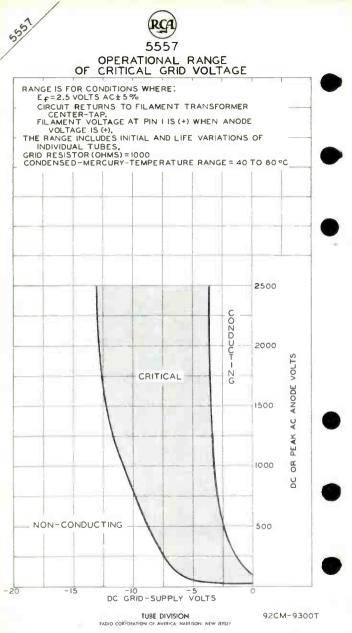
--- Indicates a change.



5557 RATE OF RISE OF CONDENSED-MERCURY TEMPERATURE

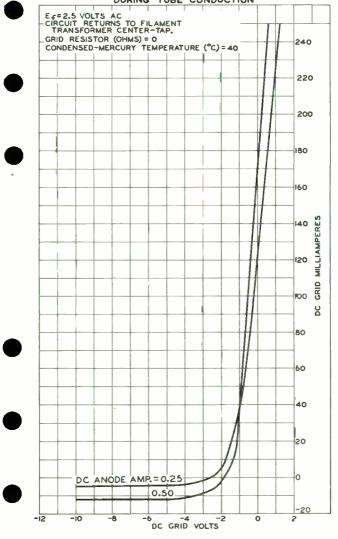


TUBE DIVISION EAGO CORFORATION OF AMERICA, HARRISON, NEW JESSEY World Racio History 5551





AVERAGE GRID CHARACTERISTICS DURING TUBE CONDUCTION



1566





THYRATRON

MERCURY-VAPOR TRIODE

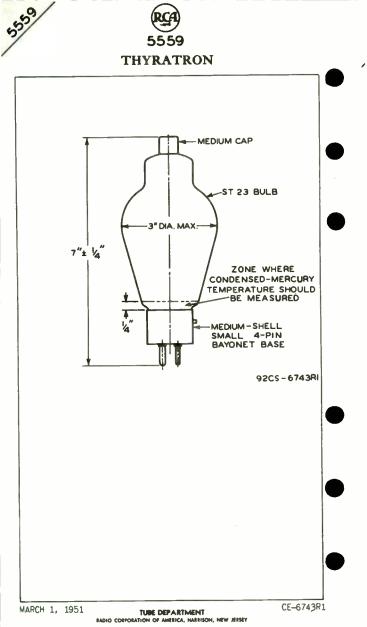
DATA

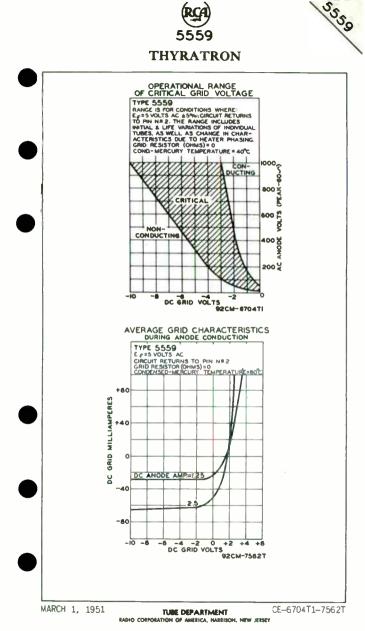
MARCF 1, 1951				DATA
·			- ndicates	
 Recommended operating) temperature is 40			
** Averaged over any int				
OPERATING FREQUENCY.			150 max.	
CONDMERCURY TEMPER	ATURE RANGE		+0.25 max.	
GRID CURRENT: Average""			+0.25 max.	
Fault, for 0.1 sec	. maximum		200 max.	
Average**.		· · · ·	2.5 max.	
CATHODE CURRENT: Peak			15 max.	. amp
During Conduction.			-10 max.	
Before Conduction.			-500 max.	volts
GRID VOLTAGE:	• • • • • • •	• • • •	1000 max.	volts
Forward			1000 max.	
PEAK ANODE VOLTAGE:				
Maximum Ratings, Acs	olute Values:			
Returns	XX		Cap - A	athode node
Pin 2-Cathode; Circuit	(\)	Pin 4-H	
Pin 1-Heater	XTX		Pin 3-G	
	ata			
Basing Designation	for BOTTOM VIE	W		. 4BL
Base	 Medium—: 	Shell Sm	all 4-Pin.	Bayonet
Bulb			• • • • • •	ST-23
Maximum Diameter				± 1/4" . 3"
Overa'l Length Seated Length	• • • • • • •	••••		" ± 1/4" " ± 1/4"
Mounting Position		· · · · V	ertical, B	ase Down
Mechamical:				
resistor (megohms	5) = 0		••••	. 220
Grid-No.1 Control Ra resistor (megohms	atio (Approx.) wi	ith grid—N	••••	
Deionization Time (A Anode Voltage Drop (pprox.) 1000	• • • •		μsec
Ionization Time (App	rox.1. 10	• • • •		· μsec
Grid to Anode Grid to Cathode	2.5		• • • • •	. _{µµ} f . _{µµ} f
Direct Interelectrod	le Capacitances):	
to tube conducti	on., 5			minutes
Cathode: Minimum Heating Ti	mo orior			
Curnent	4.5			amp
Heater, for Unipoten Voltage				. volts
Marken Ken Heters	1.1.0.1.1.1.			
Electrical:				

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TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





World Radio History

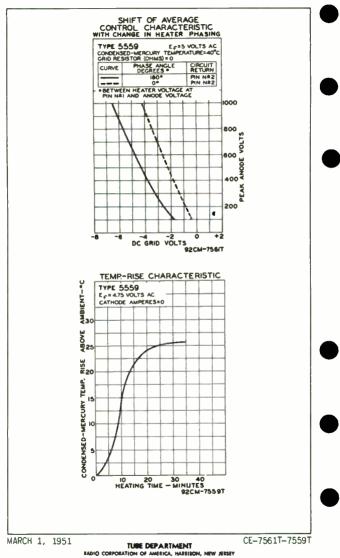
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THYRATRON



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THYRATRON

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MERCURY-VAPOR TETRODE

DATA

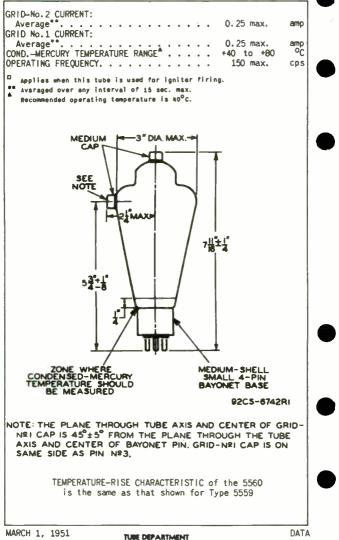
Electrical:	
Heater, for Unipotential Catho Voltage	5.0 volts
Cathode:	
Minimum Heating Time, prior	
to tube conduction Direct Interelectrode Capacita	5 minutes
Grid No.1 to Anode	
Grid No.1 to Cathode	4.4 μμf
Ionization Time (Approx.)	10 μsec
Deionization Time (Approx.) 1	1000 μsec
Anode Voltage Drop (Approx.)	16 volts
Grid-No.1 Control Ratio (Appro resistor (chms) = 0; grid-No.1 a	nd grid-No.2 volts = C 170
Grid-No.2 Centrol Ratio (Appro resistor (chms) = 0; grid-No.1 a	ox.) with grid No.I nd grid—Nc.2 volts = 0 300
Mechanical:	
	Vertical, Base Down
Overall Length	
Seated Length	
Bulb	
Caps (Two)	Medium
Base Me	edium-Shell Small 4-Pin, Bayonet
Basing Designation for BOTTO	DM VIEW 4CD
Pin 1-Heater	Pin 4-Heater,
Pin 2-Cathode;	L. X Cathode
Circuit (Top Cap - Anode
Returns 2	Side Cap-Grid No.1
Pin 3-Grid No.2	-(•)
Maximum Ratings, Absolute Valu	ies:
PEAK ANODE VOLTAGE:	
Forward	
GRID-No.2 (SHIELD-GRID) VOLTAG	GE: THE LOOP MAKE VOILS
Before Conduction	300 max. volts
During Conduction	5 max. volts
GRID-No.1 (CONTROL-GRID) VOLTA	AGE:
Before Conduction	
During Conduction	–10 max. volts
Peak	30 max. ⁰ 15 max. amp
Average ^{**}	0.5 max. ^o 2.5 max. amp
Average	
Fault, for 0.1 sec. maximum.	200 max. amp
Fault, for 0.1 sec. maximum.	
F.sult, for 0.1 sec. maximum.	



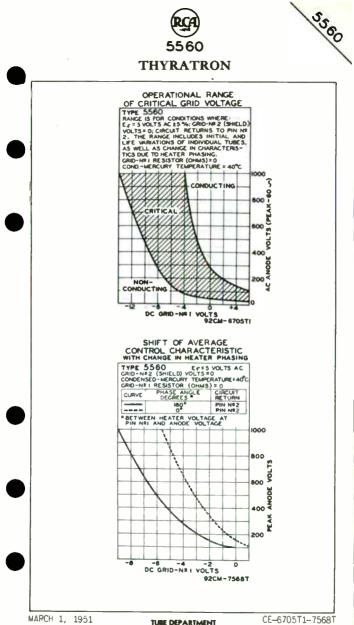
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RCA) 5560

THYRATRON

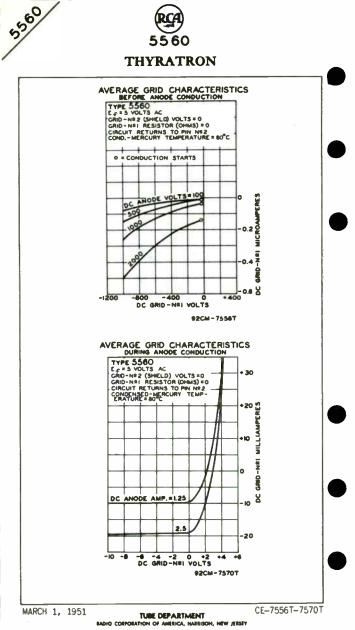


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TUBE DEPARTMENT EADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



World Radio Hist

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MERCURY-VAPOR THYRATRON

NEGATIVE-CONTROL TRIODE TYPE Supersedes Type 5563

GENERAL DATA

Electrical:

Filament, Coated:

<pre>Min. Av. Max. Voltage</pre>
<pre>Voltage 4.75 5 5.25 volts Current at 5 volts 10 11 amp Minimum Heating Time: On initial installation, with no voltage on grid or anode, for redistribution of mercury to lower part of tube 15 minutes During subsequent operation, to allow filament to reach operating temperature prior to tube conduction 1 minute Direct Interelectrode Capacitances:⁰ Grid to anode</pre>
 Voltage
Voltage 4.75 5 5.25 volts Current at 5 volts - 10 11 amp Minimum Heating Time: On initial installation, with ne voltage 0 11 amp On initial installation, with ne voltage on grid or anode, for redistribution of 15 minutes During subsequent operation, to allow fliament to reach operating temperature 15 minutes prior to tube conduction . . 1 minute Direct Interelectrode Capacitances: ⁰ 4 μμf Grid to anode. . 10 μsec Derinzation Time (Approx.) 100 μsec Derinzation Time (Approx.) 1000 μsec Maximum Critical Grid Current for 'rstantaneous anode volts = 20030 50 μa Anode Voltage Drop (Approx.): At anode amperes = 70. . 25 volts At anode amperes = 70. Grid Control Ratio (Approx.): Under conditions: 10000-ohm grid resistor, . . . Marker and tout of phase with anode voltage at pin 4 out of ph
Voltage 4.75 5 5.25 volts Current at 5 volts 10 11 amp Minimum Heating Time: On initial installation, with no voltage on grid or anode, for redistribution of mercury to lower part of tube 15 minutes During subsequent operating temperature prior to tube conduction 1 minute Direct Interelectrode Capacitances: ⁰ Grid to cathode 10 μsec Deicnization Time (Approx.)
Voltage

RADIO CORPORATION OF AMERICA. HARRISON, NEW JERSEY

5563-A

MERCURY-VAPOR THYRATRON

Temperature Control:

5563-1

- Heating--when the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating range specified under Naximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.
- Cooling--When the operating conditions are such that the maximum value of the operating condensed-mercury temperature for the applicable service rating is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

CONTROL SERVICE--In-Phase Operation® Maximum Ratings, Absolute Values:

For supply frequency of 25 to 60 cps

Operating Condensed-Mercury-Temperature Range 25 to 55 °C 25 to 50 °C

PEAK ANODE VOLTAGE:

	Forward	
	GRID VOLTAGE:	
	Peak or DC, before tube conduction	
	Average ^A , during tube conduction	•
	Peak 10 max. 6.4 max. amp	
	Average ^{e.} amp Fault, for duration of	
	C.1 second maximum 70 max. 70 max. amp GRID CURRENT:	
*	Average positive 100 max. 100 max. ma Peak positive with	
	enode negative 5 max. 5 max. ma	
	Aaximum Circuit Values:	
	Grid-Circuit Resistance 0.1 max. 0.1 max. megohm	
	With filament volts = 4.75 and no heat-conserving enclosure.	(
	 Filament voltage has a phase angle of either 0° cr 180° with respect to the anode voltage. 	
	. See next page. → Indicates a change.	

4-57



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MERCURY-VAPOR THYRATRON

	-Quadrat	ure O	peration	00	
Maximum Ratings, Absolute V	alues:				
For supply fre	quency o	f 25	to 60 cp	s	
	Operatin	g Can	den sed – M	ercur	y -
			ure Ran		-
	25 to	55 ^a C	25 to	50 °E	
PEAK ANODE VOLTAGE:					
Forward	15000	max.	20000	max.	volts
GRID VOLTAGE:	15000	max.	20000	max.	volts
Peak or DC, before t⊯be conduction Average≜, during	-500	max.	-500	max.	volt
Average, during tube conduction ANODE CURRENT:	-10	ma≻.	-10	max.	volt
Peak	11.5	max.	11.5	max,	am
Peak		max.	2.5	max.	am
O 1 second maximum . GRID CURRENT:				max.	
Average positive Peak positive with					m
anode negative	5	max.	5	max_	ma
Maximum Circuit Values:					
Grid-Circuit Resistance	0.1	ma×.	0.1	max.	megohr
HIGH-SPEED LOAD-CI	RCUIT PR	OTECT	ION SERV		
HiGH-SPEED LOAD-CI Maximum Ratings, Absolute V		OTECT	ION SERV		
Maximum Ratings, Absolute V	<i>alues:</i> Operatin	g Con	densed-M	ICE ⁴	-
Maximum Ratings, Absolute V	<i>alues:</i> Operatin Tem	g Con sperat	densed-M ture Rang	ICE ⁶ ercur ge	y-
Maximum Rating\$, <i>Absolute V</i>	<i>alues:</i> Operatin Tem	g Con sperat	densed-M	ICE ⁶ ercur ge	y-
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE:	<i>alues:</i> Operatin Tem 40 to	g Coni iperat 55 ^o C	densed-M ure Ran 40 to	ICE ⁴ ercur ge 50 °C	y-
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward.	alues: Operatin Tem 40 to 15000	g Con iperat 55 ^o C max.	densed-M ure Ran 40 to 20000	ICE ⁶ ercur ge 50 °c max.	y- volt:
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward Irverse GRID VOLTAGE:	alues: Operatin Tem 40 to 15000	g Con iperat 55 ^o C max.	densed-M ure Ran 40 to	ICE ⁶ ercur ge 50 °c max.	y- volt:
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward	alues: Operatin Tem 40 to 15000 15000	g Con Iperat 55 °C max. max.	densed-M ure Ran 40 to 20000	ICE ercur ge 50 °C max. max.	volts
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward. Inverse. GRID VOLTAGE: Peak or DC, before tube conduction. Average ⁴ , during tube conduction. ANODE CURFENT:	alues: Operatin Tem 40 to 15000 15000 -500 -10	g Cont perat 55 °C max. max. max.	densed-M sure Ran 40 to 20000 20000 -500 -10	HCE ⁴ ercur ge 50 °C max. max. max.	volt: volt: volt: volt:
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward Irverse. GRID VOLTAGE: Peak or DC, before tube conduction Average ⁴ , during tube conduction ANODE CURRENT: Peak	alues: Operatin Tem 40 to 15000 15000 -500 -10 100	g Con perat 55 °C max. max. max. max.	densed-W ure Ran 40 to 20000 20000 -500 -10 100	ICE ercur ge oc max. max. max. max. max.	y- volt: volt: volt: amu
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward. Inverse. GRID VOLTAGE: Peak or DC, before tube conduction. Average ^A , during tube conduction. ANODE CURRENT: Peak. Average ^D	aiues: Operatin 40 to 15000 15000 -500 -10 100 70	g Con perat 55 °C max. max. max. max. max.	densed-M ure Rans 40 to 20000 20000 -500 -10 100 70	ICE ercur ge oc max. max. max. max. max. max.	volt: volt: volt: volt: amm amm
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward Irverse. GRID VOLTAGE: Peak or DC, before tube conduction Average, during tube conduction ANODE CURRENT: Peak	aiues: Operatin 40 to 15000 15000 -500 -10 100 70	g Con perat 55 °C max. max. max. max.	densed-M ure Rang 40 to 20000 20000 -500 -10 100 70	ICE ercur ge oc max. max. max. max. max. max.	volt: volt: volt: volt: amm amm
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward Irverse GRID VOLTAGE: Peak or DC, before tube conduction Average, during tube conduction ANODE CURRENT: Peak Average	aiues: Operatin 40 to 15000 15000 -500 -10 100 70	g Con perat 55 °C max. max. max. max. max.	densed-M ure Rans 40 to 20000 20000 -500 -10 100 70	ICE ercur ge oc max. max. max. max. max. max.	volt: volt: volt: volt: amm amm
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward. Inverse. GRID VOLTAGE: Peak or DC, before tube conduction. Average ^A , during tube conduction. ANODE CURRENT: Peak. Average ^D	alues: Operatin Ten 40 to 15000 15000 -500 -10 100 70 1.05	g Con perat 55 °C max. max. max. max. max. max. max. max.	densed-M ure Ran 40 to 20000 -500 -10 100 70 1.05	ICE ercur ge 50 °C max. max. max. max. max. max. max. max.	volts volts volts volts amp amp
Maximum Ratings, Absolute V PEAK ANODE VOLTAGE: Forward. Irverse. GRID VOLTAGE: Peak or DC, before tube conduction. Average, during tube conduction. ANODE CURRENT: Peak. Average Average Average Maximum Circuit Values:	alues: Operatin Ten 40 to 15000 15000 -500 -10 100 70 1.05	g Con perat 55 °C max. max. max. max. max. max. max. max.	densed-M ure Ran 40 to 20000 -500 -10 100 70 1.05 0.1	ICE ercur ge 50 °C max. max. max. max. max. max. max.	y- volts volts volts amp

RADIO CORPORATION OF AMERICA, HARVISON, NEW JERSEY



MERCURY-VAPOR THYRATRON

Averaged over one grid-conducting period.

Averaged over any period of 20 seconds maximum.

⁰ Filament voltage is 60⁰ to 120⁰ out of phase (leading or lagging) with the anode voltage.

In this service, the faults may occur in quick succession or may be separated by several months.

Averaged over any period of 0.1 second maximum.

Averaged over any period of 20 seconds maximum. This average-anodecurrent value is specified to indicate the number of faults that are permissible within the 20-second interval. The number of faults that may occur in any 20-second interval depends on the value of anode current over the averaging period less than 0.1 second and may te determined by

> Number of Faults = Average Anode Current Ouration during fault × of Fault

Scample:

5503-1

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δ

Assume that the maximum average anode current is 70 amperes for the maximum duration of 0.1 second. On substitution of these values in the equation, the permissible number of faults is determined to be 3. If the average anode current is less than 70 amperes over an averaging period of less than 0.1 second, it will be obvious that a greater number of faults may occur.

OPERATING CONSIDERATIONS

I rays are produced when the 5563-A is operated with a peak inverse anode voltage above 16000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure it provides the required protection to the operator.

Shields and rf filter circuits should be provided for the 5563-A if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Radio-frequency filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the 5563-A.

-+Indicates a change.



MERCURY-VAPOR THYRATRON

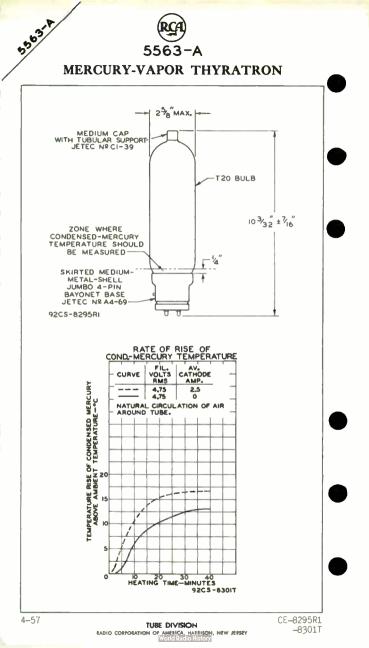
For Circuit Figures, see Front of this Section

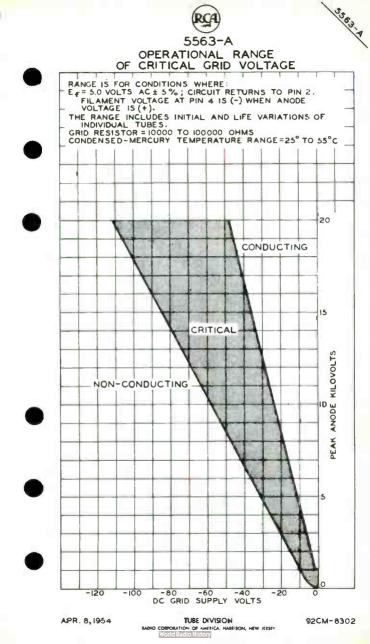
CIRCUIT	MAX. TRANS. SEC. VOLTS (RMS) E	APPROX. OC OUTPUT VOLTS TO FILTER Eav		c	MAX. DC OUTPUT KW TO FILTER Pdic				
Fig.I Half-Nave Single-Phase In-Phase Operation	14000 [⊟] 10600▲	6300 4700	. .		10 8.5				
Fig.2 Full-Wave Single-Phase In-Phase Operation	7000 [₽] 5300♠	6300 4700	3. 3.		20 17				
Fig.3 Series Single-Phase In-Phase Operation	∤4000[⊡] 10600▲	12700 9500		.2 .6	40 34				
Fig.4 Half-Wave Three-Phase In-Phase Operation	8100 ⁰ 6100 *	9500 7100		.8 .4	45 38				
Fig.5 Parallel Three-Phase Quadrature Operation	B100 ^D 6100	9500 7100		.0	143 106				
Fig.6 Series Three-Phase Quadrature Operation	8100 ^D 6100 ^A					143 106			
Fig.7 Half-Wave Four-Phase Quadrature Operation	7000 ⁰ 5300	9000 6700	Resis- tive Land 10.0 10.0	Induc- t ive Load 10.0 10.0	Resis- tine Load 90 67	Induc tive Load 90 67			
Fig.8 Half-Wave Six-Phase Quadrature Operation	7000 ⁰⁰ 5300		Resis- tive Load II.0 II.0	Induc- tive Load 11.5 11.5	Resis- tsve Load 105 78	Induc tive Load 110 81			

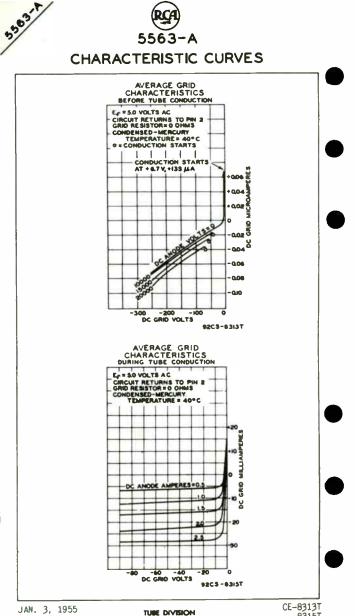
For maximum peak inverse anode voltage of 20000 volts, and condensedmercury-temperature range of 25 to 50 °C.

For maximum peak inverse anode voltage of 15000 volts, and condensedmercury-temperature range of 25 to 55 °C.

556³¹8





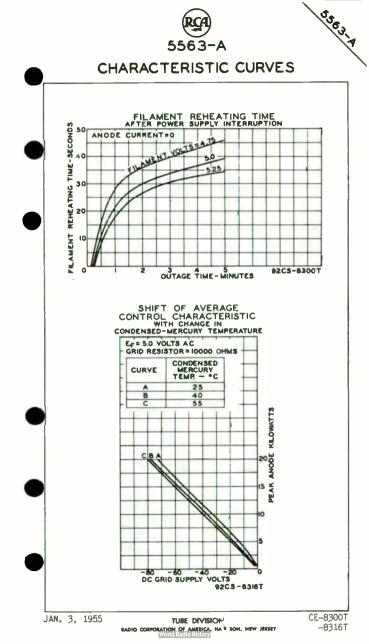


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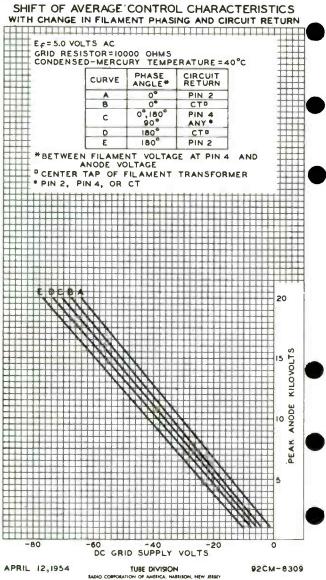
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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



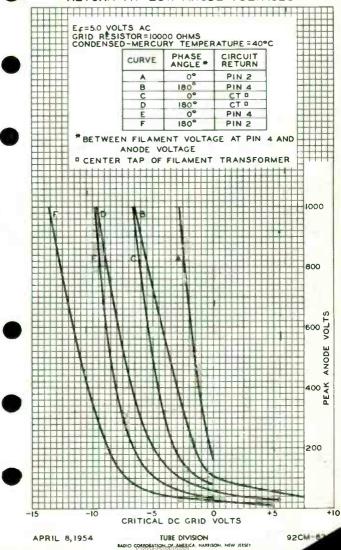


5503-1





22503 it SHIFT OF AVERAGE CONTROL CHARACTERISTICS WITH CHANGE IN FILAMENT PHASING AND CIRCUIT RETURN AT LOW ANODE VOLTAGES

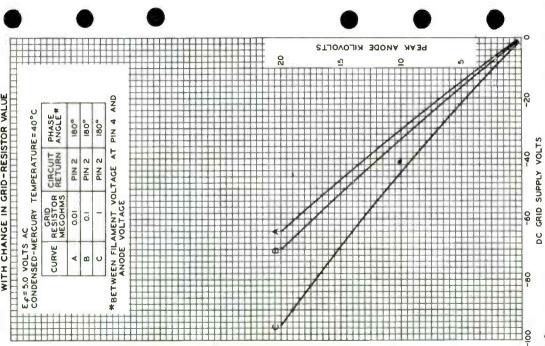






ACTERISTICS VALUE CHARAC1 SISTOR VAL R ONTROL 1 GRID Ζ Ū CHANGE (₹ WITH Ч ⊢ SHIF

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TUBE DIVISION ORATION OF AMERICA, MART

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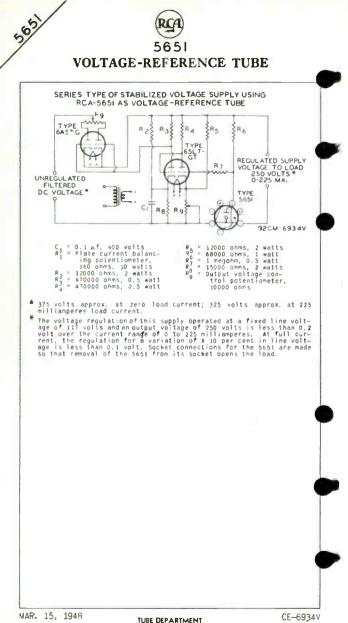
565

VOLTAGE-REFERENCE TUBE

MINIATURE GLOW-DISCHARGE TYPE

	DATA
	General:
	Cathode
	Maximum Overall Length
ſ	Maximum Seated Length
-	Maximum Diameter
	Bulb
	Mounting Position
	Base Small-Button Miniature 7-Pin Basing Des gnation for BOTTOM VIEw
	Pin 1- Anode (5 Pin 5- Anode
	Pin 2- Cathode 3 Pin 6- Internal
	Pin 3 - Internal Connection
	-Do Not Use Pin 7 - Cathode
	Pin 4 - Cathode
	Maximum Ratings, Absolute Values:
	DC OPERATING CURRENT (Continuous) 3.5 max. ma AMBIENT TEMPERATURE RANGE
	Characteristics and Operation Range Values:
	Hin. Av. Max.
	DC Starting Voltage 107 115° volts
	DC Operating Voltage 82 87 92 volts
	DC Operating Current 1.5 - 3.5 ma
	Regulation (1.5 ma. to 3.5 ma.) 3 volts Stability ^a 0.1 volt
-	Circuit Values:
	Shunt Dapacitor
	Series Resistor See NOTE Below
	A supply voltage of not less than this value should be provided to insure "starting" throughout tube life.
1	Defined as the maximum voltage fuctuat on at any current level within the operating current range.
	NOTE: A series resistor must always be used with the 5651. The resistance value must be chosen so that (1) the maximum current rating of 3.5 ma. is not exceeded at the nighest anode-sepply voltage employed, and (2) the minimum current rating of 1.5 ma. is slways exceeded when the anode- supply voltage is at its lowest value.
	is not exceeded at the highest anode-supply voltage employed, and (2)
	supply voltage is at its lowest value.
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TUBE DEPARTMENT



TADIO COPPORATION OF ANSRIDA MARRISON, NEW JERSEY

5651A

Voltage-Reference Tube

7-PIN MINIATURE, GLOW-DISCHARGE TYPE Especially Useful as a Voltage-Reference Tube in DC Power Supplies

DATA

General:

Cathode	
Operating Position	
Maximum Överall Length	
Maximum Seated Length	
Length, Base Seat to Bulb Top (Excluding tip) 1-1/2" ± 3/32"	
Diameter 0.650" tc 0.750"	
Dimensional Outline (See General Section: JEDEC No.5-2	
Bulb	
Base	
Basing Designation for BOTTOM VIEW	
· ·	

Pin 1 - Ampde Pin 2 - Cathode Pin 3 - Da not use Pin 4 - Cathode



Pin 5 - Ancde Pin 6 - Do not use Pin 7 - Cathode

Maximum and Minimum Ratings, Absolute-Maximum Values:

DC OPERATING CURRENT	(Continuous)	 		3.5 max.	ma
DC OPERATING CURRENT	(Continuous)	 		1.5 max.	
AMBIENT TEMPERATURE R	ANGE	 		-55 to90	oC

Characteristics and Operation Range Values:

)	DC Starting Voltage DC Operating Voltage (Varia- tion from tube to tube):	•	∦ın. _	Αυ. 107	∦¤x. 115ª	volts
)	At 1.5 ma At 2.5 ma	•	83.5	85.5 86.5 -	87.5	volts volts volts volts
	operating voltage (over ambient temperature range of -55 to 90° C) Percentage Variation of Operating Voltage: ^b During first 300 hours	•	_	-4		mv/ºC
)	of life ^c	•	-	-	0.1	%
	During subsequent 1000 hours of life		-	-	0.1	%

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.

DATA I 8-63

	Min.	Aυ.	Max.	
Short-term (100 hours) Variation of Operating Voltage after first 300				
hours of life ^b	-	-	0.05	%
Instantaneous Voltage Fluctuation (Voltage jump)⁴	_		0.1	vol t
Circuit Values:				
Shunt Capacitor	_	_	0.02	μf
Series Resistor		е		· · · ·

- A dc supply voltage of 115 volts minimum should be provided to insure "starting" throughout tube life.
- b DC operating current = 2.5 ma.
- c After initial 3-minute warm-up period.
- d Defined as the maximum instantaneous voltage fluctuation at any current level within the operating current range.
- A series resistor must always be used with the 5651A. The resistance value must be chosen so that (1) the maximum current rating 07 3.5m as not exceeded at the highest anode-supply voltage employed, and (2) the minimum current rating of 1.5 mais always exceeded when the anode-supply voltage is at its lowest value.

SPECIAL TESTS AND PERFORMANCE DATA

Stability Life Performance:

This test is performed on a sample lot of tubes to assure that the tubes have been properly stabilized. Lifetesting is performed under the following conditions: DC anode-supply volts = [35, dc operating milliamperes = 2.5, anode-circuit resistance (ohms) = 20000. At the end of 300 hours of operation, tubes will not show a change in dc operating voltage greater than 0.1 per cent from the initial dc operating voltage. At the end of 1300 hours of operation, tubes will not show achange in dc operating voltage greater than 0.1 per cent from the operating voltage at 300 hours. During any 100-hour interval between 300 and 1300 hours of operation, tubes will not show a change in dc operating voltage greater than 0.05 per cent from the dc operating voltage at the start of the interval.

INSTALLATION AND APPLICATION

Nake no connections to pins g and 6. Any potentials applied to these pins may cause erratic tube performance. The three pin terminals for the cathode (pins 2,4, and 7) and the two for the anode (pins 1 and 5) offer the equipment designer several different possibilities for connection of the 5651A. Any pair of interconnected pins can be used as a jumper connection to acircuit common to either the cathode or to the anode. The use of such a jumper connection provides ameans for opening the circuit to protect circuit components when the 5651A is removed from its socket. Under no circumstances should the current through any pair of interconnected pins exceed one ampere.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

If the load for the regulated power supply is disconnected either directly or by removing the 5651A from its socket, the rectifier capacitors will charge to the rectifier peak voltage. It is important, therefore, that these capacitors be rated to withstand such voltage.

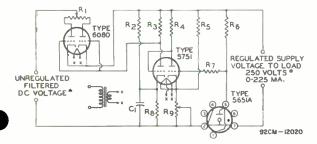
A warm-up period of 3 minutes should be allowed each time the equipment is turned on to insure minimum voltage drift of the 5551A.

When a shunt capacitor is used with the 5651A, its value should be limited to 0.02 μ f. A large value of capacitance may cause the tube to oscillate and thus give unstable performance.

Shielding should be utilized for the 5651A to insure maximum stability when the tube is operated in the presence of strong rf or magnetic fields.

SERIES-TYPE STABILIZED-VOLTAGE SUPPLY-CIRCUIT Using RCA-5651A as Voltage-Reference Tube

The voltage regulation of this supply operated at a fixed line voltage of 117 volts and an output voltage of 250 volts is less than 0.2 volt over the current range of 0 to 225 micliamperes. At full current, the regulation for a variation of ±10 per cent in line voltage is less than 0.1 volt.



C, - 0.1 µf, 400 volts R1 - Plate current balancing potentiometer, 160 ohms, 10 watts R, - 12000 ohms, 2 watts R_a - 470000 ohms, 1/2 watt R_-470000 ohms, 1/2 watt

Electronic Components and Devices

R_s~12000 ohns, 2 watts R₆-68000 ohms, I watt R, - 1 megohm, 1/2 watt R₈ - 15000 ohms, 2 watts Ro-Output voltage-control potentiometer. 10000 onms

- 375 volts approx. at zero load current; 325 volts approx. at 225 milliamperes load current.
- Socket connections are made so that removal of the 5651A from its socket opens the load.

Information furnished by RCA is indicated to be accurate and re-liable. However, no responsibility is assumed by RCA for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of RCA.



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Xenon Thyratron

NEGATIVE-CONTROL TRIODE TYPE

GENERAL DATA

Electrical:

Min. Av. Max. Filament, Coated and Mid-Tapped: Valtage (AC or DC) between pins 2 and 3. 2.5 2.4 2.6 volts 9 11 Current amp Minimum heating time prior to tube conduction. 30 sec Direct Interelectrode Capacitances (Approx.): Grid to anode 2 μµf Ionization Time (Approx.) 10 µsec 1000 *µ*sec 10 μa Anode Voltage Drop at peak anode amperes = 10. 10 volts Maximum Commutation Factor^a averaged over first 350 volts of inverse amode-voltage rise. 0.66 va/µsec² Mechanical: Operating Position. Any 6-3/4"

. . 6" 2-3/16" 3 oz . . . Special Metal Shell Base. Terminal Diagram: BOTTOM VIEW (2 3

Pin 1 - Grid Pin 2 - Filament Pin 3-Filament

Pin 4 - Filament Tap & Circuit Returns Cap - Anode

GRID-CONTROLLED-RECTIFIER SERVICE

Maximum and Minimum Ratings, Absclute-Naximum Values:

For anode supply frequency of 60 cps

PEAK ANODE VO	LTAGE:												
Forward											900	max.	volts
			•	•						•	1250	max.	volts
PEAK NEGATIVE													
	conduction.												
During tube	conduction.	•	•	•	•	•	•	•	•	•	10	max.	volts



RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.

ANODE CURRENT:

Peak			30 max.	amp
Average ^b			2.5 max.	amp
Fault			300 max.	amp
AMBIENT-TEMPERATURE	RANGE during	operation .	-55 to +75	°C

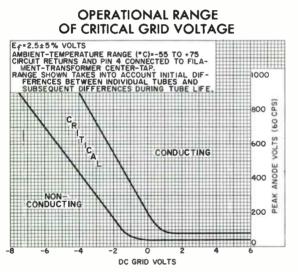
a Defined as the product of the rate of current decay in amperes per microsecond just before conduction ceases and the rate of inversevoltage rise in volts per microsecond following current conduction,

Averaged over any period of 4.5 seconds.

OPERATING CONSIDERATIONS

 \mathcal{C}_{ircuit} returns should be connected to filament midtap (Pin 4).

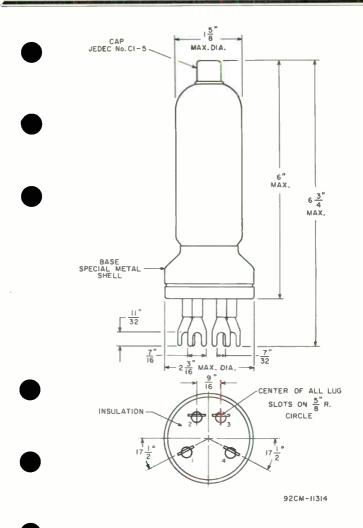
Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the maximum current ratings of the tube.



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RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

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THYRATRON

GAS-TETROOE, MINIATURE TYPE

GENERAL DATA

Electrical: Heater, for Unipotential Cathode: Voltage	
Minimum Heating Time, prior to tube conduction 10 sec Direct Interelectrode Capacitances (Approx.):0 Grid No.1 to Anode 0.03 μμf	
Input	
For conditions: dc anode volts = 100; grid-No.1 square-pulse volts = +50; peak cathode amperes during conduction = C.150 C.5 μsec Deionization Time (Approx.):	
For conditions: dc anode volts = 500; grid-No.1 volts = -100, grid-No.1 resistor (ohms) = 1000; dc cathode amperes = 0.025 25 µSec	
For conditions: dc anode volts = 500; grid-No.1 volts = -13; grid-No.1 resistor (ohms) = 1000; dc cathode amperes = 0.025 40 µSec	
Maximum Critical Grid-Nc.1 Current, with ac anode-supply volts (rms) = 350, and	
average cathode amperes = 0.025 0.5 μamp Anode Voltage Drop (Approx.)	
Grid-No.2 Control Ratio (Approx.) with grid-No.1 volts = 0, grid-No.2 resistor (whms) = 0	
^O without external shield.	
Mechanical: Any Mounting Position. -3/4" Maximum Overall Length. -1/2/" Maximum Seated Length. -1/2" Length. -1/2" Maximum Seated Length. -1/2" Maximum Diameter -3/4" Bulb	

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





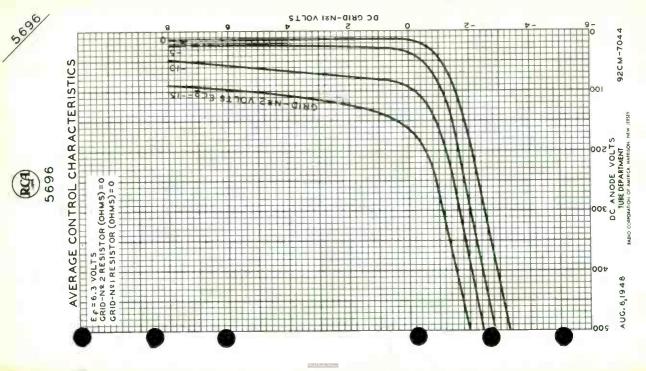
THYRATRON

RELAY and GRID-CONTROLLED RECTIFIER SERVICE	-
Haximum Ratings, Absolute Values:	
PEAK ANODE VOLTAGE: 500 max. volts	
Forward	1
GRID-No.2 (SHIELD-GRID) VOLTAGE:	
Peak, before anode conduction50 max. volts	-
Average, during anode conduction10 max. volts	
GRID-No.1 (CONTROL-GRID) VOLTAGE:	
Peak, before anode conduction100 max. volts	
Average, during anode conduction [®] 10 max. volts	
CATHODE CURRENT:	
Peak 0.1 max. amp Average 0.025 max. amp	
Surge, for duration of 0.1 sec. max 2 max. amp	
GRID-No.2 CURRENT:	
Average	
GRID-NO.1 CURRENT:	
Average	1
PEAK HEATER-CATHODE VOLTAGE: '	
I HEALER HEGGLIVE WITH LEOPEEL TO BATHODE .	
Heater positive with respect to cathode . 25 max. volts AMBIENT TEMPERATURE RANGE	
ANDIENT TEMPENATORE NANGET TITTTTTTTTTTTTTTTT	1
Typical Operating Conditions for Relay Service:	
RMS Anode Voltage	
Grid No.2 Connected to cathode at socket	
RMS Grid-No.1 Bias Voltage ^D	
Peak Grid-No.1 Signal Voltage 5 volts	
Grid-No.1-Circuit Resistance 0.1 megohn	
Anode-Circuit Resistance# 5000 ohms	
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 10 max.megohms	5
Averaged over any interval of 30 sec. max.	
Approximately 180° out of phase with the anode voltage.	1
≸ Sufficient resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings.	
	-
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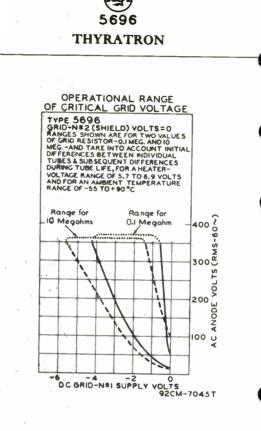
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TUBE DEPARTMENT

TENTATIVE DATA



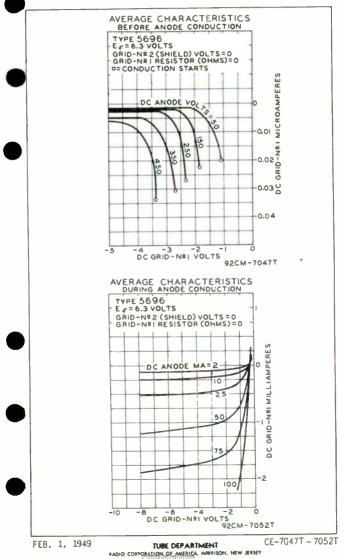


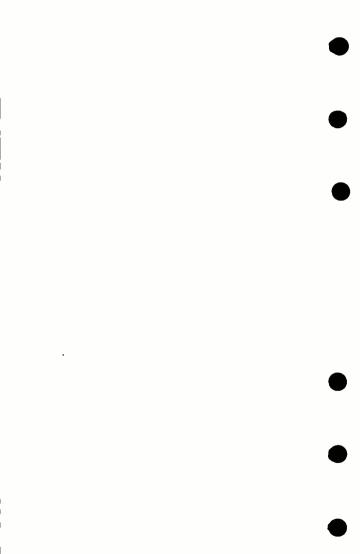






THYRATRON





World Radio History



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GLOW-DISCHARGE TRIODE

COLD-CATHODE, MINIATURE TYPE

GENERAL DATA



GLOW-DISCHARGE TRIODE

	CATHODE Peak. Avera		T:	•••		• • •	100 max. 25 max.	ma. ma
	₩ith	starter	LECTRODE —electro ATURE	de vol	tage posi		100 max. -60 to +75	ma
			ing Cond				-00 10 17.	ý č
	Typical	•	-				C	
	AC Anod		y Voltad		with 60-C	ycie Al	. 117	volts
1	AC Star	ter-Éle	ctrode \	/oltage	*	• • • •	. 11/	VUILS
	Min.	Peak Po	sitive 1	Frigger	ing Volta ing Volta	ge	· 70 · 35	volts volts
					f In-Phas oltage an			
					oltage) .		. 105	volts
	С	HARACTE	RISTICS	RANGE	VALUES FO	R EQUIPM	ENT DESIG	N
			For Firs	t-Quad	rant Oper	ation On	ťy	
					Note	Min	. <u>Nax.</u>	
			n Voltag		1	200	-	volts
		do	ode Brea wn Volta	ige	2	73	105 ⁰	volts
	rent	(DC or	fer Cur- Instanta transit	10				
	of di	scharge	to anot	le				
			peak .		3	-	400 ^a	µamp
			Drop ode Volt		4	-	85 ^a	volts
	0.00	2.000	age Di	-	5	-	75 ⁰	volts
	Note 1:	with a of 0 vo	variable lts, anoc -electroc	dc anode le-circu le serie:	voltage. it series i s resistand	dc starter resistance	-electrode of 3000 of	voltage ims, and
	Note 2:						c starter-e of 3000 oh ohms.	lectrode ms, and
	Note 3:	with a series resista	variable resistand nce of 2	dc star ce of 30 megohms	rter-electi 00 ohms, a	rode volta nd starte	age. anode- r-electrode	circuit series
	Note 4:	sertes	resistanc	eorsvi	uuu onms.		ter-electro illiamperes starter-el	I
	Note 5:					variable d Tent of 10 Te of 3000	c starter-e milliamper ohms.	lectrode es, and
	• Avera	ged over	any inte	rval of	15 seconds	maximum.		
		+			during lif			
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1								

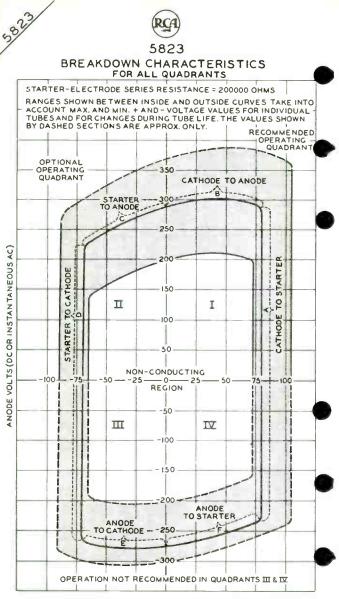


GLOW-DISCHARGE TRIODE

OPERATING NOTES

RCA-5823 is recommended for operation only in that part of the breakdown characteristic designated by Quadrant I. Operation in Quadrant II is satisfactory but changes in tube ratings are necessary. Operation in Quadrants III and IV is not recommended, because the anode and starter electrode are not designed for efficient cathode operation; their use in this manner will result in unstable operation and shorter tube life. The information given for Quadrants III and IV is of value to the equipment designer in that it indicates the need for precautions to be taken in order that the peak inverse voltage rating is not exceeded.

Because of the asymmetrical shape of its anode characteristic the 5923 can be used as a rectifier. When so used (with starter electrode connected through 50000-ohm resistor to anode), the 5823 has a maximum peak inverse anode voltage rating of 200 volts, a maximum peak cathode current of 100 milliamperes, and a maximum dc cathode current of 25 milliamperes. Operation at values of dc cathode current less than 8 milliamperes is not recommended because of resulting instability.

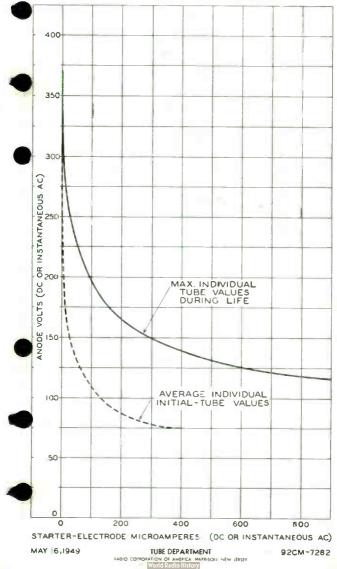


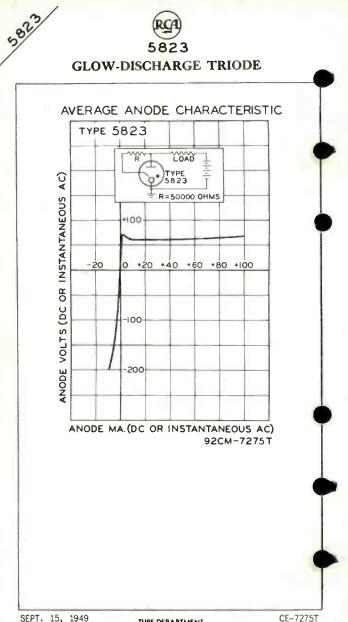
STARTER-ELECTRODE VOLTS (DC OR INSTANTANEOUS AC)



erac

TRANSITION CHARACTERISTIC





TUBE DEPARTMENT EADIO CORPORATION OF AMERICAL HARRISON, NEW JERSEY CE-7275T



GAS THYRATRON

NEGATIVE-CONTROL TETRODE TYPE

GENERAL DATA

Electrical:	
Heater, for Unipotential Cathode: <i>Min. Av. Max.</i>	
Voltage	
Minimum heating time prior to tubw conduction,	
Direct Interelectrode Capacitances	
Grid No.1 to anode 0.23 μμ	
and heater 5.8 μμf Anode to cathode, grid No.2,	
and heater 3.9 μμf Ionization Time (Αρργοχ.):	-
For conditions: dc anode volts = 100, grid-No.2 volts = 0, grid-No.1 square-pulse volts = +50, and peak anode amperes during conduction = 50.5 µsec	
Deionization Time (Approx.). Maximum Critical Grid-No.1 Current: For conditions: ac anode-supply volts = 450 (rms), and average anode am-	
peres = 0.5	
(megohms) = 0, and grid-No.2 volts = 0	
For conditions: grid-No.1 resistor {megohms) = 0, grid-No.2 resistor {megohms) = 0, and grid-No.1 volts = 0	
Mechanical:	
Mounting Position	+ + +
with External Barriers and Sleeve (JETEC No.BG-100) • Without external shield Indicates a change.	
4-56 DATA 1	





Pin 2 - Heater Pin		ter
Vin 2 - Heater Vin 3 - Grid No.1 RELAY AND GRID-CONTROLLED RECTIFIER	n 7 - Heat n 8 - Grid SERVICE	ter
For anode-supply frequency of 60	che	
	cps	
cimum Ratings, Absolute Values:		
THODE CURRENT: Peak . Average [#] . Fault, for duration of 0.1 second max. ERAGE GRID-No.2 CURRENT [#] . ERAGE GRID-No.1 CURRENT [#] . K HEATER-CATHODE VOLTAGE: leater negative with respect to cathode. Heater oositive with respect to cathode. BIENT-TEMPERATURE RANGE.	-100 max -10 max -200 max -10 max 0.5 max 20 max +0.05 max +0.05 max 100 max 25 max	volts volts volts volts amp amp amp vamp vamp
rimum Circuit Values:		
id-No.1-Circuit Resistance	2 max.	megohme
veraged over any interval of 30 seconds maximum.		



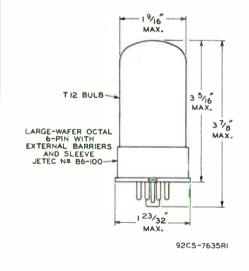
GAS THYRATRON

TABLE I

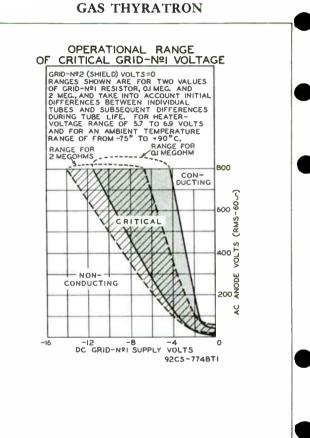
 $\begin{array}{l} E_{cc_1} = DC \; Grid-No.1 \; \text{Supply Voltage (Volts)} \\ E_{cc_2} = DC \; Grid-No.2 \; \text{Supply Voltage (Volts)} \\ R_{g_1} = Grid-No.1 \; \text{Resistor (Megohms)} \\ R_{g_2} = Grid-No.2 \; \text{Resistor (Ohms)} \end{array}$

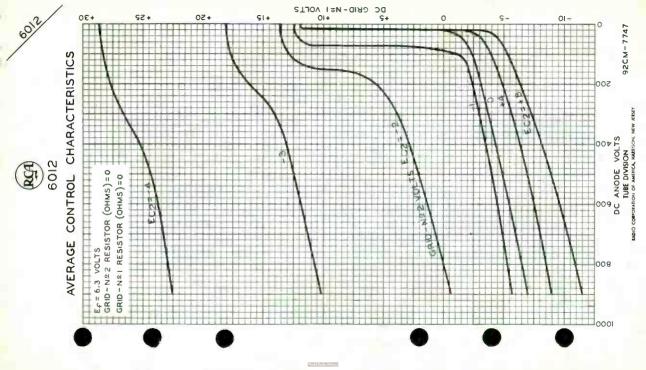
DC Anode Volts	125		250		R _g ,	6	p *	c
DC Anode Amperes	0.5	1.0	0.5	1.0	"gł	Ecci	R ₉₂ *	Ecc2
DEFONIZATION	175 350 650	225 375 700	250 450 1100	275 475 1200	0.001 0.1 2	} -13	1000	0
µsec (Approx.)	100 125 250	125 150 275	100 150 275	125 175 300	0.001 0.1 2	}-100	1000	0

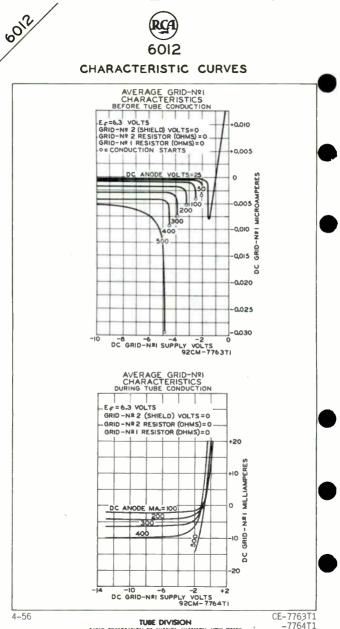
Series resistor between grid No.2 and cathode.











BADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

-7764T1



BREANISM T

VOLTAGE REGULATOR

MINIATURE GLOW-DISCHARGE TYPE

Intended for applications where very stable characteristics and dependable performance under shock and vibration are paramount: The 6073 is a "premium" version of the 042.

	DATA						
	General:						
	Cathode						
	Mechanicali: —						
	Mounting Position						
	Pin 1 - Anode Pin 2 - Cathode Pin 3 - Internal Connection- Do Not Use Pin 4 - Cathode Pin 5 - Awode Pin 6 - Leternal Cwnnection- Do Not Use Pin 7 - Cathode						
	Maximum Ratings, Absolute Values:						
	AVERAGE STARTING CURRENT (See note below) . 75 max. ma						
	DC CATHODE CURRENT						
	AMBIENT TEMPERATURE RANGE						
	Characteristics Range Values for Equipment Design:						
	Min. Av. Hax.						
	DC Anode-Supply Voltage 185 volts						
1	Anode Breakdown Voltage 156 1850 volts Anode Voltage Drop 140a 151 1850 volts						
l	Regulation (5 to 30 ma) 2 50 volts						
	Circuit Values:						
	Shunt Capacitor						
	Series Resistor See note below						
	NOTE: The notes and circuit information shown under Type OA2 are also applicable to the 6073.						
	▲,⊕,★: See next page.						
N	AY 1, 1952 TUBE DEPARTMENT TENTATIVE DATA						
	RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY						

World Radio History







VOLTAGE REGULATOR

Shock and Vibration Tests:

These tests are made as indicated in the JAN Specifications JAN 1-A for Electron Tubes, May, 1946 under the sections as follows: Section F-6b (9e) Shock Test: Instantaneous Impact Acceleration . . . 900 max. g Section F-6b (9f) Vibration Test: Vibrational Acceleration. 2.5 max. g Not less than indicated supply voltage should be provided to insure "starting" throughout tube life. 4 Naximum individual tube value during life. Ninimum individual tube value during life. .

TENTATIVE DATA



PREMIUM TRU

VOLTAGE REGULATOR

MINIATURE GLOW-DISCHARGE TYPE

Intended for applications where very stable characteristics and dependable performance under shock and vibration are paramount. The 6074 is a "premium" version of the OB2.

	DATA		
General:			
Cathode			Col
Mechanical:			
Mounting Position. Maximum Overall Length Maximum Seated Length, Length, Base Seat to B Maximum Diameter Buib. Base. Base. Base. Basing Designation	Bulb Top (Excluding	g tip). 2" d T 7-Pin (JETEC No	An 2-5/8 2-3/8 3/32 3/4 -5-1/ .E7-1 58
Pin 1-Anode Pin 2-Cathode Pin 3-Internal Connection- Do Not Use Pin 4-Cathode		Pin 5 - Anode Pin 6 - Internal Connect Dc Not Pin 7 + Cathode	
Maximum Ratings, Abso			
AVERAGE STARTING CURRE			m
DC CATHODE CURRENT	• • • • • • • • • •	. 30 max. 15 min.	m m
AMBIENT TEMPERATURE RA	NGE	-55 to +90 0 max.	o cp
Characteristics Range	Values for Equipme	ent Design:	
	427.	Av. Nax.	
DC Anode-Supply Voltag Anode Breakoown Voltag	le 133▲		volt
Anode Voltage Drop		115 133 [®] 108 114 [®]	volt
Regulation (5 to 30 ma	i)	1 4	volt
Circuit Values:			
Shunt Capacitor Series Resistor	· · · · · · · · · · · ·	- 0.1 See note	μ belo
NOTE: The notes and circu applicable to the e	iit information shown 1074.	under Type &A2 ar	e als
▲, ♣, ♣: See next page.			
WAY 1, 1952	TUBE DEPARTMENT	TENTATIV	E DAT



VOLTAGE REGULATOR

Shock and Vibration Tests:

6074

These tests are made as indicated in the JAN Specifications JAN 1-A for Electron Tubes, May, 1946 under the sections as follows:

Section F-6b (9e) Shock Test: Instantaneous Impact Acceleration . . . 900 max. Section F-6b (9f) Vibration Test: Vibrational Acceleration. 2.5 max.

- Not less than indicated supply voltage should be provided to insure "starting" throughout tube life.
- Maximum individual tube value during life.
- A Minimum individual tube value during life.

TENTATIVE DATA

g

q



HYDROGEN THYRATRON

POSITIVE-CONTROL TRICDE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathod	e:
Voltage 6.	3 {+5% -10% ac or dc volts
Current a: 6.3 volts:	(-10%
Minimum	2 amp
Maximum,	
Minimum heating time	2.5 amp
Direct Interelectrode Capacitan	ces 2 minutes
(Approx.):	
Grid to anode	3.9 щит
Gr d to cathode	8.6 <u>µµ</u> f
[lonization Time (Approx.)]	0.6 μsec
Deiomization Time (Approx.).	
Anode-Cathode Voltage Drop (App	rox.)
at middle of pulse duration. Maximum Variation in Firing Time	150 volts
maximum variation in irring time	(Jitter). 0.06 <i>µ</i> sec
Hechanical:	
Operating Position	
Maximum Overall Length	5-3/16"
Seated Length	
Maximum Diameter	•••••••••••••••••••••••••••••••••••••••
Weight (Approx.)	· · · · · · · · · · · · · · · · · · ·
Cooling	Natural
	Small (IEDEC No C1-11)
Base Medium-Shell Small	4-P n. Micanol (JEDEC No A4-91)
Basing Designation for BOTTOM	VIEW
	0
Pin 1-Heater	Pin 3-Grid
Pin 2-Cathode,	Pin 4 - Heater.
Circuit	Cathode
Returns	Cap - Anode
0~	-4
PULSE-MODULAT	
Maximum and Minimum CCS® Rating	
	For tressures down
	to 70 mm of Hg#
DC ANODE-SUPPLY VOLTAGE	800 min, volts
PEAK ANODE VOLTAGE:	2000
Forward (E _{bmf})	3000 max volts
After arode-current pulse:	5% of Ebm f min a volts
During first 25 µsec	
After first 25 µsec	3000 max. volts
□, •, #, *, ▲: See next page.	VIII
4-59	DATA 1
ELECTRON TUE	E DIVISION DATA I

ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA HARRISCIN NEW JERSEY

6I30/3C45

HYDROGEN THYRATRON

For pressures down to 70 mm of Hat GRID VOLTAGE: Negative (DC or Peak), volts before conduction. . 200 max. 175 min. volts Peak positive-pulse. . ANODE CURRENT: 35 max. amo Peak . . 0.045 max. Average⁰ . . amp 750 max. amp/µsec Rate of rise OPERATION FACTORT. 3 x 108 max. 6 max. *μ*sec PULSE DURATION®. . 0C AMBIENT-TEMPERATURE RANGE. . -50 to +90 Typical Operation: At 2000 pps in accompanying circuit with pulse duration of 0.5 µsec volts 1250 DC Anode-Supply Voltage. . . . Peak Anode Voltage: volts 3000 Forward. Inverse: Immediately after anodevolts current pulse. 530 GRIC VOLTAGE: volts 0 Negative, before conduction. . . . volts Peak positive-pulse (Unloaded) . 175 ohms Effective Grid-Circuit Resistance. ANODE CURRENT: 35 Peak . amp . Average⁰ 0.035 amp 2.1×10^{8} Peak Power Output to Pulse 43000 watts Transformer (T). . . Maximum Circuit Values: 1500 max. ohms Effective Grid-Circuit Resistance. . Defined as the time interval between the point on the rising portion of the grid pulse which is 26 per cent of the peak unloaded-pulse amplitude and the point on the anode-current pulse which is 26 per cent of its peak amplitude. The anode-current pulse has a maximum time rise of 0.05 µsec. The grid pulse has a minimum peak amplitude of 130 volts, a maximum rise time of 0.5 µsec, and is supplied by a driver having a maximum internal impedance of 1500 ohms. . Continuous Commercial Service. Corresponds to altitude of about 50,000 feet. In applications where the anode voltage is applied instantaneously, the power-supply filter should be designed so that the peak forward anode voltage is applied at a rate not to exceed 75,000 volts per second. Exclusive of spike not having more than 0.05 µsec duration. Averaged over any cycle. t

Defined as Peak Porward Anode Volts x Pulse-Repetition Rate (pps) x Peak Anode Amperes (excluding spike).

•.•: See next page.

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HYDROGEN THYRATRON

Pulse duration is defined as the time interval between points on the pulse envelope at which instantaneous amplitudes are equal to 70.7 per Cent of the maximum amplitude excluding spike.

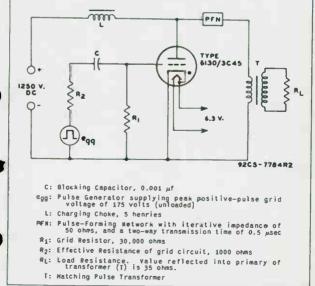
Operation with a bulb temperature within the approximate range of 60° to 90° C measured on the bulb directly opposite the anode is recommended for longest life. To attain this temperature under operating conditions involving low ambient temperature, the use of a heat-conserving eaclosure for the tube may be necessary.

OPERATING CONSIDERATIONS

The anode is brought out of the tube to a Small cap. The Connector for this cap should be of the heat-radiating type and the connector lead should have ample current-carrying capability for the operating requirements.

Shielding of the 6130/3C45 should be provided if it is operated in the presence of strong electric fields which will ionize the gas within the tube. Any such ionization will cause erratic performance.

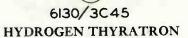
Ccoling of the 6130/3C45 is accomplished by natural circulation of air around it. Under no circumstances should a stream of cooling air be applied to the glass envelope.



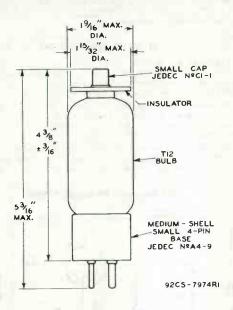
TYPICAL PULSE-MODULATOR CIRCUIT

4-59

ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON NEW JERSEY DATA 2



Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



6130

CE-7974R1

World Radio History

RCA
2X2-A

HALF-WAVE VACUUM RECTIFIER

For applications critical as to severe shock and vibration GENERAL DATA

Electrical: Heater, for Unipotential Cathode:

Nin. Av. Nax. Voltage. . . 2.25 2.50 2.75 ac volts Current at 2.50 volts. 1.55 1.75 1.95 amo Mechanical: Mounting Position. . Anv Maximum Overall Length . 4-17/32" . . Seated Length. . . 3-25/32" ± 1/8" Maximum Diameter . . 1-9/16" Dimensional Outline. . See General Section Weight (Approx.) . 1.3 oz Eulb.... .ST-12 Cap. . . Small (JETEC No.C1-1) Small-Shell Small 4-Pin (JETEC No. A4-5) Base Basing Designation for BOTTOM VIEW . 4AB

Pin 1 - Heater Pin 2 - No Connection Pin 3 - No Connection



Pin 4 - Heater, Cathode Cap - Plate

HALF-WAVE RECTIFIER

Maximum Ratings, Design-Center Values:		
PEAK INVERSE PLATE VOLTAGE 12500 max. vo	lts	
PEAK PLATE CURRENT 60 max.	ma	
DC OUTPUT CURRENT 7.5 max.	ma	
HOT-SWITCHING TRANSIENT CURRENT,		
for duration of 0.2 second max 100 max.	ma	
AMBIENT TEMPERATURE 70 max.	oC	1
Typical Operation:		
	its	í.
Total Effective Plate-Supply Impedance 0.3 mege	ohm	
Filter Input Capacitor 0.1	μf	
DC Output Current	mа	
DC Output Voltage (At input to filter) 4500 vol	lts	
	- 1	r i

SHOCK TEST DATA

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. The tubes are subjected to a total of 3 blows in each of the 3 primary mutually

SEPT. 1, 1955

TUBE DIVISION RADIO CORPORTION OF AMERICA, HARRISON, NEW JERSEY

indicates a change.

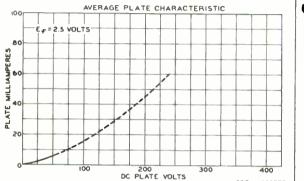






HALF-WAVE VACUUM RECTIFIER

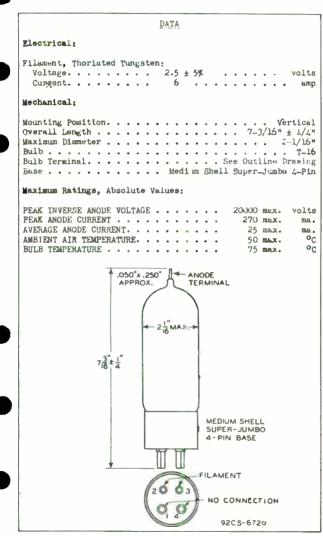
perpendicular tube planes when tested in the Navy Type, High-Impact (flyweight) Shock Machine. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and will not be inoperative.



92CM-4507T3



15-10-12 HALF-WAVE HIGH-VACUUM RECTIFIER

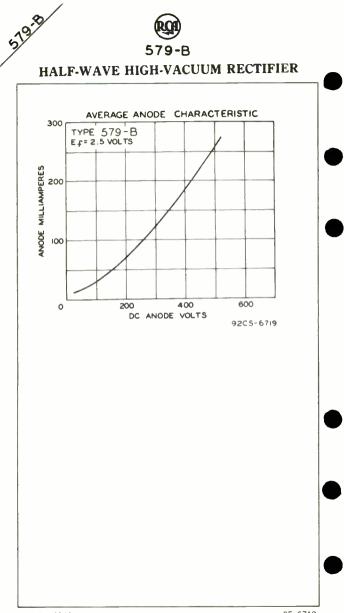


MAY 1, 1945

TENTATIVE DATA

TUBE DIVISION

RADIO CORPORATION OF IMERICA, HAIRISON, NEW JERSEY





VACUUM-GAUGE TUBE

HYDROGEN SENSITIVE, IONIZATION TYPE

GENERAL DATA

GENERAL DATA
Electrical:
Heater, for Unipotential Cathode: Voltage
Mechanical:
Mounting Position
Pin 1 - Cathode Pin 2 - Heater Pin 3 - Ion Collector Pin 6 - Cathode Pin 6 - Cathode Pin 7 - Heater Pin 8 - Getter
Pin 1 - Cathode Pin 5 - Plate, Shell DO NOT USE FOR GETTER CONNECTION Find - Plate, Getter Connection to Hexagonal Section of Tubulation
LEAK DETECTOR
Maximum Ratings, Absolute Values:
PLATE VOLTAGE. 300 max. volts ION-CGLLECTOR VOLTAGE -30 max. volts PLATE CURRENT. 50 max. ma. PLATE DISSIPATION. 7 max. watts PEAK HEATER-CATHODE VOLTAGE. 0 max. volts
Typical Operation: Plate Voltage. 185 volts Minimum Plate-Supply Voltage. 250 volts Ion-Ccllector Voltage. -22.5 volts Plate Current. 32 ma. Ion-Ccllector Current. 6 watts
 with no hydrogen in the gauge. When hydrogen from minute leaks enters the gauge tube, the ion-collector current may increase by less than 15. In order to obtain a definite reading of such small changes in ion- collector current, it is necessary to use an amplifier capable of ampli- fying do currents of the order of 0.005 µamp.
The metal shell of the 1945 contains an indirectly-heated cathode, an ion-collector and a plate made of palladium. The palladium plate located across the inner end of the tubulation serves, when cold, as a vacuum-tight barrier to the vacuum system. This construction permits the metal enclosure to be exhausted to a much better vacuum than

JUNE 20, 1947

TUBE DEPARTMENT PADIO COPPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History

TENTATIVE DATA



(continued from preceding page)

normally exists in a vacuum system. However, when heated, the palladium plate serves as a permeable membrane which permits any hydrogen in the vacuum system to which the 1945 is connected to flow into the tube.

Practical application of the 1945 to locating a leak consists simply of connecting it to the vacuum system and of probing the system with a jet of gas containing a high percentage of hydrogen. If a leak is present, hydrogen enters the vacuum system at the point of leakage, passes through the hot palladium plate, and produces an increase in current to the ion-collector.

Because of its high vacuum, the 1945 can detect far smaller leaks than are detectable using conventional ionization gauges operating at the same pressure as the vacuum system. Actually, an increase in hydrogen pressure of less than 10^{-7} mm of mercury (10^{-4} microns) can be detected by the 1945.

The 1945 can be connected to a hard-glass, soft-glass, or metal vacuum system.

Connection to a hard-glass system may readily be made by breaking off the tip of the glass tubulation (see Outline Drawing), and sealing the (Corning Code 772 Nonex) tubulation to the glass system.

Connection to a soft-glass system requires a graded seal between the hard-glass tubulation of the 1945 and the soft glass of the system.

Connection to a metal system requires that the glass tubulation first be removed by pinching the glass with pliers at a point close to the Kovar seal. Then, the 1945 can be connected to a metal system by a straight pipe coupling which is necessary for clearance of the metal exhaust tubulation. Always apply the wrench to the hexagonal section and never to the metal shell. After the coupling has been tightened, it should be coated with Glyptal to insure that the joint is vacuum tight.

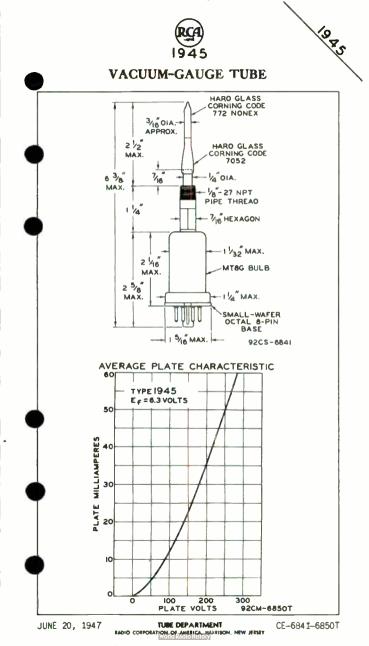
Suitable support should be provided for the 1945. In a glass system, it should be supported by a suitable clamp encircling the metal shell. The clamp should be lined with an asbestos pad so that the clamp does not place a strain on the welds. In a metal system, the 1945 can usually be supported by the pipe coupling.

For safety reasons, it is advisable to have the metal shell of the 1945 at ground potential (positive polarity).

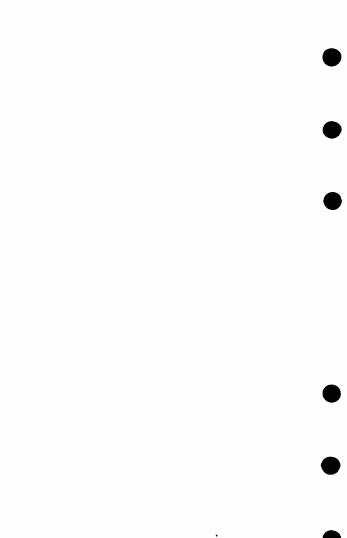
JUNE 20, 1947

1945

TUBE DEPARTMENT TENTATIVE DATA



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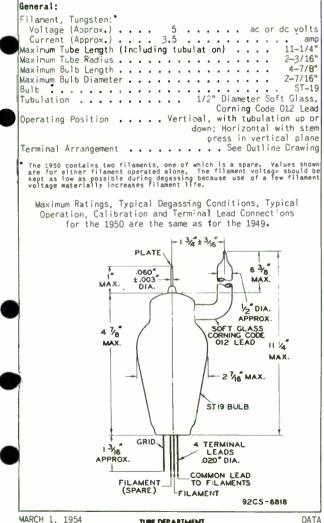
World Radio History



VACUUM-GAUGE TUBE

SOFT-GLASS BULB, IONIZATION TYPE

DATA



TUBE DEPARTMENT RADIO CORPORATION OF AMERICAL HARRISON, NEW JERSEY

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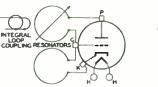
FIXED-TUNED OSCILLATOR TRIODE

"PENCIL TYPE" WITH INTEGRAL RESONATORS For radiosonde service at 1680 Nc

The 5794 is the same as the 6562 except for the following stems:

Mechanical:

- H Heater
- K Cathode



G - Grid

5102

P - Plate

OPERATING CONSIDERATIONS

The flexible heater leads of the 5794 are usually soldered to the circuit elements. Soldering of these connections should not be made closer than 3/4" from the end of the tube. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube. Under no circumstances should any of the electrodes be soldered to the circuit elements. Connections to the electrodes should be made by spring contact only.

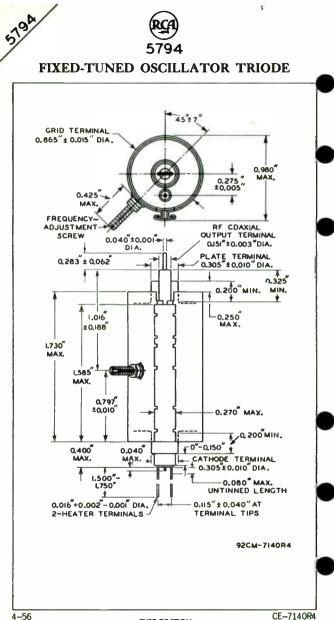
The 5794 should be supported by a suitable clamp around the metal snell either above or below the frequency-adjustment screw. It is essential, however, that the pressure exerted on the shell by the clamp be held to a minimum because excessive pressure can distort the reasonators and result in a change of frequency.

The plate and cathode connections should have flexible leads which will accommodate variations in the relative positions of the plate and cathode terminals in individual tubes.

The 5794 may be mechanically tuned by adjustment of the frequency-adjustment screw located on the metal shell of the tube. A clockwise rotation of the frequency-adjustment screw will decrease the frequency, while a counterclockwise rotation will increase the frequency. The range of adjustment provided by the screw is ±12 megacycles.

- indicates a change.

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:
Filament, Thoriated Tungsten: Voltage
O with no external shield.
Hechanical:
Mounting Position. Any Overal: Length
Pin 2 - No Connection Pin 3 - No Connection
HALF-WAVE RECTIFIER
Maximum Ratings, Absolute Values:
For supply frequencies up to 250 kc
PEAK INVERSE PLATE VOLTAGE 60000 max. volts PEAK PLATE CURRENT 40 max. ma AVERAGE PLATE CURRENT
duration of 0.1 sec. max 100 max. ma PLATE DISSIPATION 3.5 max. watts BULB TEMPERATURE 80 max. °C
Typical Operation at 70 kc in Half-Wave Circuit with Capacitor-Input to Filter:
AC Plate-Supply Voltage (RMS)21200voltsFilter-Input Capacitor350µµfEffective Plate-Supply Impedance120000ohmsDC Outout Current2maAC Utout Voltage at Input to Filter(Approx.):At half-load current (1 ma)26000voltsAt full-load current (2 ma)26700voltsVoltage Regulation (Approx.):1300volts

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TUBE DEPARTMENT RADIO CORPORATION OF AMERICA MARRISON, NEW JERSEY

TENTATIVE DATA



HALF-WAVE VACUUM RECTIFIER

CHARACTERISTICS RANGE	VALUES FOR	ECUI PMENT	DESIGN		
	Note	Hin.	Max.		
Filament Current Plate-Filament Capacitance	1	1.15	1.35	3mp	
Plate-Filament Capacitance	-	2.14	2.26	μµf	

Note: With 1.6 volts dc on filament.

5823

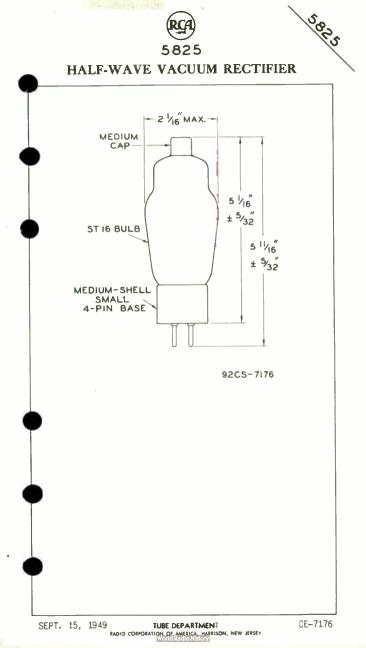
OPERATING NOTES

When the filament is supplied from an rf power source which is at a high dc potential above ground, adjustment of the filament voltage by direct measurement is usually impractical. However, a simple method utilizing visual comparison of filament temperatures can be used for adjustment of filament power. The color temperature of the filament operating from an rf power source may be checked visually by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 5825 is operated from a dc or low-frequency ac supply of 1.6 volts, provides a convenient means for adjusting the amount of rf excitation to produce 1.6 volts (rms) at the filament terminals.

The filament must never under any condition of operation be allowed to reach a temperature higher than that caused by operating the filament on dc or lowfrequency ac at a voltage of 1.68 volts. Operation at higher temperatures will cause impaired performance of the tube. During circuit adjustment, however, it is permissible to allow the filament voltage to rise to 2 volts for the brief interval required to make the adjustment.

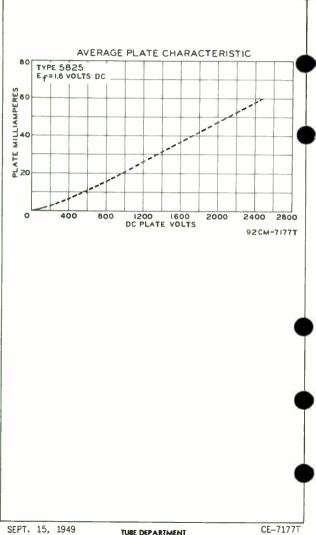
Soft x-rays are produced when the -5825 is operated at a plate voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

SEPT. 15, 1949





5825 HALF-WAVE VACUUM RECTIFIER







HALF-WAVE VACUUM RECTIFIER

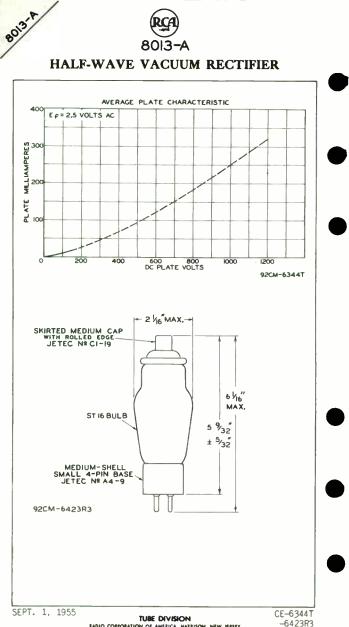
GENERAL DATA

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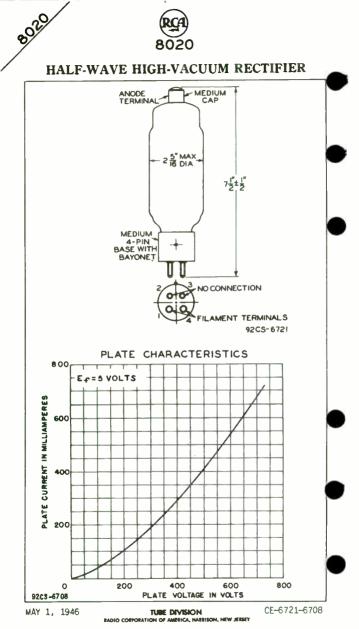


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020 HALF-WAVE HIGH-VACUUM RECTIFIER

			<u>DA</u>	<u>CA</u>					
Electrical	:								
Filament,									
-	• • • •		5					• • •	
Direct Int					• •	• •	• • •	•••	
	Filament								- 144
Tube Volta				* *	•••	• •	• • •		• http://www.
	· · ·	ю ва.	20	0					volt
Mechanical	:								
Mounting P	osition.				• -	Vert	ioal.	Base	Dove
Overall Le									
Maximum Di									
Bulb									
Cap									
Base	• • • •	• • •	• • •	• •	• 10	edium	4-P:	in, E	Bayone
		RECT	FIR	S R	ICE				
Maximum Re	tings, Ab	solute	Valu	9 8 :					
PEAK INVER	SE ANODE	VOLTAGI	ε		• •	. 4	0000	Bax.	volt
PEAK ANODE								BAX.	
AVERAGE AN	ODE CURRE	INT	•••	• •	• •	•	100	Bax.	-
	SURG	e – Lini	ETTING	DIO	X5 55	RVICE			
Maximum Re	tings, At	solute	Valu	9 8 :					
FILAMENT V	OLTAGE .					•	5.8	мах.	volt
PEAK FORWA								BOX.	
AVERAGE AN	ODE DISSI	IPATION	• • •	• •	• •	•	75	BRX.	watt
Typical Op	eration:								
Filament V							5.5		volt
Peak Forwa	rd Anode	Voltage			• •	. 1	0000		volt
Minimum Pe	ak Anode	Curren	t.,	• •	• •		2	• •	8.0



RCA TUBE Handbook HB-3

RECEIVING TUBE SECTION — Part 1

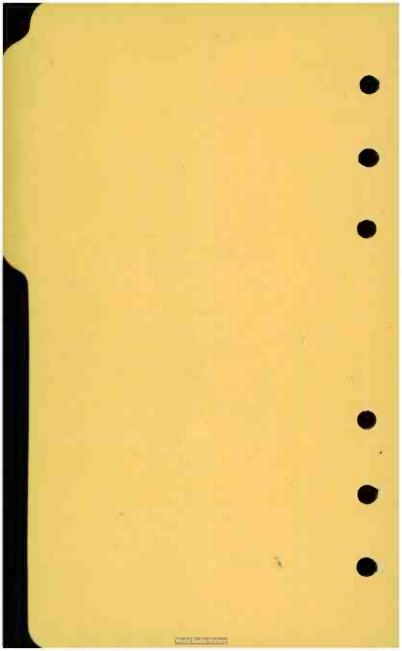
This Section contains data for those tubes used primarily in broadcast and hometelevision receivers.

For further Technical Information, write to Commercial Engineering, Tube Division, Radio Corporation of America, Harrison, N. J.

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SEPARATOR

Receiving Tubes—Part 1



Beam Power Tube 5AQ5 6GC5 12AQ5 35B5 5C25 6FE5 12CA5 35C5 5V6GT 6L6 12CU5/12C5 35L6GT 6AQ5A 6L6GB ⁺ 012L6GT 50B5 6AS5 6L6GC ⁺ 012V6GT 50C5 6CM6 6V6 012W6GT 50C5 6CU5 6V6GTA 25C5 50L6GT 6CC5 06W6GT 25C5 50L6GT 6CC5 06W6GT 25F5A 6973 ⁺ 66D55 12AB5 34CD5A 7408 ⁺ Power Pentode 50FK5 50FK5 66H95 66K6GT 25FH5 50FK5 66H5 8BQ5 35EH5 60FX5 66F6 12EH5 50EH5 7189 ⁺	
0 5V6GT 0 6L6 1 12CU5/12C5 0 35L6GT 50B5 6Kap5A 0 6L6GB ⁺ 0 12L6GT 50B5 6BU8 4BU8 4GS8 6BU8 0 6AQ5A 0 6L6GC ⁺ 0 12V6GT 50C5 35L6GT 3BU8 4BU8 4GS8 6BU8 0 6AQ5A 0 6L6GC ⁺ 0 12V6GT 50C5 3GS8 0 6HS8 0 6CM6 6V6 0 12W6GT 50FE5 3GS8 0 6HS8 0 6CL5 0 6V6GTA 25C5 0 50L6GT 34GD5 7027A ⁺ 7007A ⁺ 0 6DS5 1 12AB5 34GD5 0 7027A ⁺ 7408 ⁺ 7408 ⁺ 7408 ⁺ 6GH8 6BN8 6GH8 6BN8 6BN8 6BN8 6BN8 6BN8 6BN8 6BN8 6BN8 6BN8 6BN8	
Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	
Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	
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Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	
Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	
Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	
Power Pentode 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 <	(
Power Pentode 0 6BQ5 0 6K6GT 2.5EH5 50FK5 0 6EH5 0 8BQ5 0 3.5EH5 0 60FX5 0 60FX5 0 6BN8	1
□ 6CK6 4 7868 + U 4. CATHODE-DRIVE RF AMPLIFIERS (GROUNDED-GRID)	
■ 6GK6 ▲ 7868 † ₩ 4. CATHODE-DRIVE RF AMPLIFIERS (GROUNDED-GRID)	
2. AUTOMATIC GAIN CONTROL CIRCUITS (AGC & AVC)	
Diode — Sharp-Cutoff Pentode Medium-Mu Twin Triode	
\Box 6KL8 \Box 12KL8 \Box 4BC8 \Box 4BZ7 \Box 6BC8 \Box 6BS8	
Diode – Remote-Cutoff Pentode – 4BS8 – 5BQ7A – 6BQ7A – 6FW8	
\Box 6EQ7 \Box 12EQ7 \Box 20 EQ7 High-Mu Triode	
Twin Diode—Medium-Mu Triode \bigcirc 2CW4 \Box 6AB4 \bigcirc 6CW4 \bigcirc 6DS4	
$\Box 6BF6 \qquad \circ 6SR7 \qquad \Box 12BF6 \qquad \circ 12SR7 \qquad \diamond 2DS4$	(
Twin Diode-High-Mu Triode	
\square 3AV6 \square 6AV6 \square 12AT6 \bigcirc 12SQ7GT \square 6DT8 \square 12AZ7 \square 12AZ7A \square 12U18	
□ 4AV6 ○ 6SQ7 □ 12AV6 □ 18FY6 □ 12AT7	
□ 6AT6 0 6 SQ7 GT 0 12 SQ7 □ 18 FY 6 A	
Medium-Mu Triode—Sharp-Cutoff Pentode 5. COLOR KILLERS	
□ 5AN8 □ 6AZ8 □ 6BH8 □ 6CU8 Quadruple Diode	
□ 5GH8 □ 6BA8A □ 6CH8 □ 6GH8 □ 6JU8	
GAN8A GCH8A	
□ Miniature O Octal ▲ Novar † For high-fidelity equipment, ◇ Nuvistor	
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In this Application Guide, RCA receiving tubes are classified by function (application) and by structure (diode, triode, etc.).

Triodes are designated as low-, medium-, or high-mu types on the following basis: low, less than 10; medium, 10 or more, but less than 50; high, 50 or more. Where applicable, tubes are designated as sharp-, semiremote, or remote-cutoff on the basis of the ratio, in per cent, of the negative control-grid voltage to the screen-grid voltage (or, for triodes; the plate voltage) as given in the characteristics or typical operation values. These terms are defined as follows: sharp, less than 10 per cent; semiremote, 20 per cent or more.

APPLICATIONS

 Audio-Frequency Amplifiers Automatic Gain Control (AGC and AVC) Circuits Burst Amplifiers Cathode-Drive RF Amplifiers (Grounded-Grid) Color Killers Color Matrixing Circuits Complex-Wave Generators Converters Dampers Demodulators (Color TV) Detectors DC Restorers Discriminators Frequency Dividers FM Detectors Gated Noise, AGC. 	 Mixers-RF Mixer-Oscillators-RF Multivibrators Noise Inverters Oscillators Phase Inverters Phase Splitters Radio-Frequency Amplifiers Reactance Circuits
16. Gated Noise, AGC, and Sync Amplifiers	35. Sync Separators 36. Tuning Indicators
17. Harmonic Generators	37. Vertical-Deflection
	Circuits
18. Horizontal-Deflec-	
tion Circuits	38. Video Amplifiers

 I. AUDIO-FREQUENCY AMPLIFIERS Voltage Amplifiers Medium-Mu Triode with Twin Diode 6BF6 0 6SR7 0.12BF6 0 12SR7 						
		Cutoff Pentode				
Medium-Mu Tw 5J6 6J6A High-Mu Trio	o 6SN7GTB □ 7 AU7	□ 9AU7 □ 12AU7A	○ 12SN7GTA □ 19J6			
 ○ 12SF5 High-Mu Trio □ 3AV6 □ 4AV6 □ 6AT6 □ 6AV6 	de with Twin GBN8 GCN7 6SQ7 6SQ7GT	Diode Di2AT6 Di2AV6 0 12SQ7 0 12SQ7 0 12SQ7GT	□ 14GT8 □ 18FY6 □ 18FY6A			
High-Mu Trio	de with Tripl	e Diode □ 19T8				
High-Mu Twin GEU7 † 65L7GT 12AX7 †	Triode □ 12AX7A † □ 12AZ7	□ 12 AZ7 A □ 12B Z7	 0 12SL7GT □ 20EZ7 □ 7025 † 			
Sharp-Cutoff 3DT6A [*] 4DT6A [*]	Pentode 5GX6* 6DT6A*	□ 6GX6* □ 6HZ6*	□ 5879 † □ 7543 †			
Remote-Cutoff Pentode with Diode						
Power Amplif Power Triode 2A3			×			
Miniature Octal * Dual-control grids † For high-fidelity equipment						



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Twin Diode—High-Mu Triode 3AV6 6BN8 12AT6 4AV6 6CN7 12AV6 6AT6 6SQ7 12SQ7 6AV6 6SQ7GT 12SQ7GT	□ 14GT8 □ 18FY6 □ 18FY6A	
Triple Diode GBJ7		Horizontal ARC
Triple Diode-High-Mu Triode 578	TUBE	Twin Diode—High-Mu Triode 68N8
Quadruple Diode □ 6JU8		14. FREQUENCY DIVIDERS
Sharp-Cutoff Pentode □ 3DT6A* □ 5GX6* □ 6DT6A* □ 4DT6A* □ □		□ 12FQ8
12. DC RESTORERS		15. FM DETECTORS (See 13. DISCRIMINATORS)
Diode-Sharp-Cutoff Pentode 5AM8 5AM8 6AM8A	□ 6AS8	I6. GATED NOISE, AGC, AND SYNC AMPLIFIERS High-Mu Triode-Sharp-Cutoff Pentode 6KA8
Triple Diode □ 6BJ7		Sharp-Cutoff Pentode
13. DISCRIMINATORS FM Twin Diode		Pentagrid Amplifier 3BY6 3CS6 6BY6 6CS6
□ 3AL5 □ 6AL5 □ 12AL5 Twin Diode—High-Mu Triode □ 6EN8 □ 14GT8		17. HARMONIC GENERATORS (See 7. COMPLEX-WAVE GENERATORS)
Triple Diode—High-Mu Triode		18. HORIZONTAL-DEFLECTION CIRCUITS Oscillators
Beam Tube		Medium-Mu Triode - Sharp-Cutoff Pentode
Miniature	O Øct	al * Dual-control grids
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6. COLOR MATRIXING CIRCU	ITS	9. DAMPER			
Medium-Mu Twin Triode GCG7 GGU7 GFQ7 GFQ7	□ 8CG7 □ 8FQ7 □ 12B17A	Half-Wave O 6AU4GTA O 6AX4GT O 6AX4GT O 6AX4GTE	0 6DA4 0 6DE4	▲ 12BS3 ○ 12D4 ○ 12D44	 17D4 17DE4 17DM4
7. COMPLEX-WAVE GENERATO High-Mu Twin Double-Plat 12FQ8		▲ 6AY3 ▲ 6BA3 ▲ 6B13 ▲ 6BS3	 ▲ 6DW4 ○ 6W4GT ○ 12AX4GTA ○ 12AX4GTB 	 ○ 17AX4GT ○ 17AX4GTA △ 17AY3 △ 17BH3 	 ○ 19AU4 ○ 19AU4GTA ▲ 22BH3 ○ 22DE4
Sharp-Cutoff Twin-Plate	Tetrode—Diode	o 6QQ4	▲ 12AY3	▲ 17BS3	o 25AX4GT
Sharp-Cutoff Three-Plate □ 6KM8	Tetrode—Diode		ULATORS (COLOR Twin Triode	τν)	
Sharp-Cutoff Three-Plate □ 6FN8	Tetrode-Medium-Mu Triode	e Iligh-Mu T □ 12AZ7	win Triode □ 12AZ7A		
8. CONVERTERS Medium-Mu Triode—Sharp-	Cutoff Pentode	Sharp•Cut □ 6GY6	off Pentode		
□ 5EA8 □ 5U8 □ 5GH8 □ 5X8 □ 5KE8 □ 6EA8	□ 6GH8 □ 6U8A □ 6GH8A □ 6X8 □ 6KE8 □ 19X8	Pentagrid □ 6BY6	Amplifier		
High-Mu Twin Triode □ 6DT8 □ 12AZ7 □ 12AT7	□ 12AZ7A □ 12DT8	II. DETEC Diode-Sh D 5AM8	TORS arp-Cutoff Pent	ode □ 6AS8	□ 6KL8
Sharp-Cutoff Pentode □ 6AU6 □ 12AU6	□ 18GD6A	□ 5AS8	mote-Cutoff Pen		\square 12KL8
Pentagrid	□ 12BE6 ○ 12SA7GT	□ 6EQ7	□ 12CR6	□ 12EQ7	□ 20 EQ7
□ 6BA7 ○ 6SA7GT □ 6BE6 □ 12BA7 ○ 6SA7	o 12SA7 □ 18FX6 □ 18FX6A	Twin Diod □ 3AL5 □ 6AL5	e 0 6H6	□ 12AL5	o 12H6
		Twin Diod □ 12BF6	<mark>e—</mark> Medium-Mu Tr	iode	
🗆 Mi	niature	O Octal	A Novar		
RADIO CORPORATION Electronic Components and Devices	Development Art A	d Radio History ¹			

21. MIXERS - RF			Sharp-Cutoff Pentode		
Medium-Mu Twin Triode		m 70	□ 6GY6 *		
□ 5J6 □ 6J6A	□ 12AV7 □	19J6 - 8			
High-Mu Triode		- H	25. OSCILLATORS		
♦ 2CW4 □ 6AB4		GUIDE	Radio Frequency—UHF		
•	V	2 Z	Medium-Mu Triode		
22. MIXER-OSCILLATORS-	RF			□ 6AF4	♦ 6DV4
Medium-Mu Triode-Sharp		8 7	♦ 2DV4 □ 3DZ4	□ 6AF4A	□ 6DZ4
		6CO8	□ 2DZ4		
			Radio Frequency-VHF		
Medium-Mu Triode-Sharp	-Cutoff Pentode	6CQ8 6KE8 6U8A 6X8 19EA8 19EA8 19X8	Madium My Twin Triada		
□ 5AT8 □ 5KE8		6KE8 6U8A	□ 5J6 □ 6J6A	□ 12 AV 7	□ 19J6
□ 5B8 □ 5U8				- 16/11	- 1900
□ 5BR8 □ 5X8		6X8	Ingu-mu IIIode		
□ 5CG8 □ 6AT8A □ 5EA8		19EA8 19X8	GAB4		
U JEAO	0	1976	Power Triode		
High-Mu Twin Triode			\Box 6C4 (Class C)		
□ 6DT8 □ 12AT7	□ 12DT8				
			Low Frequency, Sweep	21	-
23. MULTIVIBRATORS			Medium-Mu Triode-She		
Medium-Mu Triode-Sharp	-Cutoff Pentode		$\Box 5AN8 \Box 6AZ8 \Box 6AZ8$	GBH8	□ 6CU8
□ 5GH8 □ 6GH8	GH8A		$\Box 6AN8A \qquad \Box 6BA8A \\ \Box 6AU8A $	□ 6CH8	
M II - M. T. I - T. I			DAUGA		□ 8CX8
Medium-Mu Twin Triode			High-Mu Triode with T	win Diode	
$\Box \ 6CG7 \qquad \circ \ 6SN7GTB$ $\Box \ 6GU7 \qquad \Box \ 7AU7$		D12SN7GTA	$\Box 6BN8 \Box 6CN7$		
□ 6GU7 □ 7AU7	🗆 12AU7A		High-Mu Triode- Sharp	-Cutoff Pentode	
High-Mu Twin Triode				-catori rentone	
□ 12AX7 □ 12AX7A					
			High-Mu Twin Triode		
24. NOISE INVERTERS			□ 12AX7 □ 12AX7 A		
High-Mu Triode-Sharp-Co	utoff Pentode				
□ 6KA8 □ 8KA8			26. PHASE INVERTERS		
01110			Medium-Mu Triode-Hig	h-Mu Triode	
			□ 12DW7		
Miniature	0	Octal	() Nuvistor	* Dual-control	rida
				Duan-control	Be 11010
	RCA	RECEIVING	PADIO		
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Medium-Mu T	win Triode			Sharp-Cuto	off Pentode		
□ 6CG7	□ 7AU7	□ 8FQ7	□ 12AU7	□ 3AU6	□ 4EW6	□ 6AU6	□ 6EJ7
□ 6FQ7	□ 8CG7	□ 9AU7	□ 12BH7A	□ 3CB5	□ 4JC6 _	□ 6AU6A	□ 6EW6
0 6SN7GTB			o 12SN7GTA	□ 3CB6	🗆 4JD6 🗖	□ 6BC5	□ 6HS6
				□ 3CF6	□ 5E₩6	□ 6CB6	□ 6JC6
Amplifiers				□ 3DK6	0 6AB7	□ 6CB6A	□ 6JD6
Beam Power	Tube			□ 3JC6	0 6AC7	□ 6CF6	□ 12AU6
• 6AU5GT	0 6EX6	0 12DQ6A	▲ 17GT5	🗆 3JD6 🗖	GAG5	□ 6DC6	□ 12AW6
O 6AV5GA	▲ 6GJ 5	0 12DQ6B	0 17GW6	🗆 4AU6	□ 6AH6	□ 6DE6	□ 18GD6/
O 6BG6A	▲ 6GT5	▲ 12GJ5	▲ 17JB6	□ 4CB6	□ 6AK5	□ 6DK6	□ 19HS6
○ 6BQ6GTB/	0 6GW6	▲ 12GT5	▲ 22JG6	Cl . C .	(C. D	. I. D' I	
6CU6	▲ 6JB6	0 12GW6	○ 25AV5GA		ff Pentode wi		
O 6CB5A	▲ 6JE6	▲ 12JB6	o 25BQ6GTB/	□ 5AM8	□ 6AN8A	\Box 6AS8	\Box 6KL8
O 6CD6GA	o 12AV5GA	o 17BQ6GTB	25CU6	□ 5AS8			\square 12KL8
0 6DN6	o 12BQ6GTB/	0 17DQ6B	0 25CD6GB	Somiromoto	-Cutoff Pento	do	
0 6DQ5	12CU6	▲ 17GJ5	0 25DN6	□ 3BZ6			
O 6DQ6B					□ 6BZ6	GCM6	
				□ 4BZ6	□ 6EH7	□ 6HR6	\square 12BZ6
	DIATE-FREQUEN			□ 5GM6			□ 19HR6
	•			Remote-Cut	off Pentode		
	riode-Sharp	utoli letrod	e	□ 6BA6	○ 6SK7GT	0 12SK7	□ 18F\6
⊐ 5CQ8	□ 6CQ8			0 6SK7	□ 12BA6	0 12SK7GT	□ 18FW6/
Medium-Mu T	riode-Sharp-	Cutoff Pentod	e				
□ 5AN8	□ 6AZ8	□ 6CH8	□ 6CX8		off Pentode w		
□ 6AN8A	□ 6BH8		□ 8CX8	□ 6EQ7	□ 12EQ7	□ 20 EQ7	
GAU8A		- 0000	- 00/10				
				20. LIMITE	RS		
High-Mu Tri	ode— Sharp-Cu	toff Pentode		Beam Tube			
□ 6AW8A	□ 6JV8	□ 8A₩8A	□ 8JV8	□ 3BN6	□ 4BN6	□ 6BN6	
□ 6GN8	□ 6KV8	□ 8GN8	□ 10HF8		L 4610		
□ 6HF8			□ 11KV8	Sharp-Cuto	ff Pentode		
				□ 3AU6	□ 6AU6A	□ 6HS6	□ 12AU6
				□ 4AU6	□ 6GX6	□ 6HZ6	□ 19HS6
				□ 5GX6			
				Sharp-Cuto	ff Pentode wi	th Diode	
				□ 6KL8	□ 12KL8		
🗆 Mir	liature	0 Octal	A Novar			remote-cutoff chara nplifier applications	



29. REACTANCE CIRCUITS Medium-Mu Triode—Sharp-Cutc 5AN8 6AZ8 0 6AN8A	6BA8A D 6CH8	32. RELAY CONTROL CIRCUITS Medium-Mu Twin Triode D 12FV7
High-Mu Triode with Twin Dio	des	High-Mu Twin Triode 6EV7 9 G 22 SYNC ANDLIELEDS
High-Mu Triode—Sharp-Cutoff □ 6AW8A □ 8AW8A		
30. RECTIFIERS Power-Supply Types Half-Wave (Diode) □ 35W4 □ 36AM3A □ ○ 35Z5GT	36 AM3B □ 50 DC4	Medium-Mu Triode Sharp-Cutoff Pentode GAU8A GAZ8 GCX8 SCX8 Medium-Mu Twin Triode GCG7 GTAU7 GI2AU7A High-Mu Triode with Twin Diode GCN7 High Mu Triode Sharp Cutoff Pentode
Full-Wave (Twin Diode) 0 3DG4 0 5U4GB 0 0 5AS4A 0 5V3A 0 ▲ 5BC3 0 5V4G 0	5Y3GT □ 6CA4 5Y4GT □ 6X4 5Z4 ○ 6X5GT 6AX5GT □ 12X4	High-Mu Triode-Sharp-Cutoff Pentode 6AW8A
High-Valtage Types (For rf-rectifier or pulsed low Half-Wave (Diode)	ocurrent applications)	34. SYNC CLIPPERS Medium-Mu Triode-Sharp-Cutoff Tetrode 5CQ8 6CQ8
o 1B3GT o 1J3 □	1V2 0 3A3 1X2B	Medium-Mu Triode-Sharp-Cutoff Pentode 5AN8 6AU8A 6CH8 6CX8 6AN8A 6AZ8 6CU8 8CX8
31. REGULATORS High-Voltage, Low Current Sharp-Cutoff Beam Triode		High-Mu Triode Sharp-Cutoff Pentode 6AW8A 6HF8 8AW8A 8GN8 6EB8 6JV8 8EB8 8JV8 6GW8 10HF8 10HF8
o 6BK4		High-Mu Twin Triode D 12BZ7
	Miniature RCA RECEIVING TUBE GUIDE 4 8-63	C Octal RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Medium-Mu Tw □ 6CG7 □ 6GU7	in Triode 0 6SN7GTB □ 7AU7	□ 9AU7 □ 12AU7A	0 12SN7GTA	
High-Mu Trio □ 6AW8A □ 6EB8	de-Sharp-Cut GGN8 GHF8		□ 8GN8 □ 10HF8	1
High-Mu Twin 0 6SL7GT □ 12AX7	Triode □ 12AX7A	o 12SL7GT	□ 7025	
27. PHASE SP Medium-Mu Tr □ 5CQ8	LITTERS iode-Sharp-C	utoff Tetrode		
Medium-Mu Tr D 5AN8 D 6AN8A	iode— Sharp-C □ 6AZ8 □ 6BA8A	utoff Pentode □ 6CH8 □ 6CU8	□ 7199	
High-Mu Trio GAW8A	de—Sharp-Cut □ 8AW8A	off Pentode		
28. RADIO-FR Medium-Mu Tr D 2BN4A	EQUENCY AMPLI iode □ 3BN4A		□ 6BN4A	
Medium-Mu Tr: □ 5CQ8	iode— Sharp-C □ 6CQ8	utoff Tetrode		F
□ 4BQ7A	in Triode 5BK7A 5BQ7A 5J6 6BC8	 6BK7B 6BQ7A 6BS8 6BZ7 	□ 6FW8 □ 6J6A □ 19J6	

High-Mu Trio	de		
♦ 2CW4	□ 3GK5	♦ 6DS4	GFQ5A
♦ 2DS4	□ 6AB4	□ 6ER5	□ 6GK5
□ 2FH5	♦ 6C₩4	□ 6FH5	♦ 13C₩4
High-Mu Twin	Triode		
□ 6DT8	□ 12AZ7	□ 12AZ7A	□ 12DT8
Power Triode			
L OL4 (LIASS	()		
Sharp-Cutoff	Tetrode		
D 2CY5	D 3CY5	□ 6CY5	□ 6FV6
Sharp-Cutoff	Pentode		
□ 3AU6	0 6AB7	□ 6BH6	0 6SJ7
□ 3BC5	0 6AC7	□ 6CB6	□ 12AU6
□ 3CB6		GCB6A	□ 12A₩6
□ 3CF6	GAK5	□ 6CF6	0 12SJ7
□ 4AU6	GAU6A	□ 6DC6	□ 18GD6A
□ 4CB6	GBC5	\square 6DE6	
Sharp-Cutoff	Pentode with	Diode	
□ 6KL8	□ 12KL8		
Remote-Cutof	f Pentode		
□ 3BA6	0 6SK7	□ 12BA6	o 12SK7GT
□ 6BA6	o 6SK7GT	o 12 SK 7	□ 18FW6
□ 6BJ6			□ 18FW6A
Remote-Cutof	f Pentode wit	h Diode	
□ 6EQ7	□ 12EQ7	□ 20 EQ7	



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Power Pento O 6K6GT	ode			S RE		
38. VIDEO A Medium-Mu □ 5AN8 □ 6AN8A □ 6AV8A	AMPLIFIERS Triode-Sharp 6AZ8 6BA8A	□ 6BH8	ode □ 6CU8 □ 6CX8 □ 8CX8	- 30105 3		
High-Mu Tri	iode-Sharp-Cu	utoff Pentode				
□ 6AW8A □ 6EB8 □ 6GN8	□ 6HF0 □ 6JV8 □ 6KV8	□ 8 AW8 A □ 8 EB8 □ 8 GN8	□ 8JV8 □ 10HF8 □ 11KV8	E GUID 1-9NIA		
Sharp-Cuto 12BY7A	ff Pentode			ECEIV		
Sharp-Cutof	ff Pentode wit	th Diode		A N		
□ 5AM8	□ 5AS8	□ 6AM8A	🗆 6AS8			
Beam Power □ 25BK5	Tube					
Power Pento	ode					
0 6AG7	□ 6CL6	□ 6GK6				

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		m : D	_		Pent
	Sharp-Cutoff 3BU8 3GS8	□ 4BU8	□ 4GS8	□ 6BU8 □ 6HS8	□ 3]
	Pentagrid Amp □ 3BY6	olifier □ 3CS6	□ 6BY6	□ 6CS6	36. Ind 6
)	35. SYNC SEPA Medium-Mu Tri □ 5CQ8	ARATORS iode-Sharp-C □ 6CQ8	utoff Tetrode		Twi O 6
	D 5AN8	iode— Sharp-Ca GAU8A GAZ8 GAZ8 GCH8	utoff Pentode GCU8 GCX8 GGH8	□ 6GH8A □ 8CX8	37. <i>Osc</i> Med □ 6
	Medium-Mu Tw: □ 6CG7	in Triode □ 7AU7	□ 12AU7A		Med □ 6
	High-Mu Trio □ 6CN7	de with Twin	Diode		Hig D 6
	High-Mu Trio GAW8A GEB8 GEN8 GGN8 GHF8	de— Sharp-Cut	off Pentode BAW8A 8EB8 8GN8	□ 8JV8 □ 8KA8 □ 10HF8 □ 11KV8	□ 6 □ 6 0 6 Hig
	High-Mu Twin □ 12BZ7	Triode			Am¢ Lov □]
)	Sharp-Cutoff □ 3BU8 □ 3GS8	Twin Pentode □ 4BU8	e □ 4GS8	□ 6BU8 □ 6HS8	Med D (
	Pentagrid Am □ 3BY6	plifier □ 3CS6	□ 6BY6	□ 6CS6	Bea

Pentagrid	Amplifier		
□ 3BY6	□ 3CS6	□ 6BY6	□ 6CS6
36. TUNING	INDICATORS		
Indicator	with Triode	Unit	
6E5	6U5		
Twin Indic	ator Units		
o 6AF6G			
	AL-DEFLECTIO		
Oscillator	s and Amplif	iers (Combined.)
Medium-Mu	Triode-Low-	Mu Triode	
□ 6DE7	□ 6EW7	□ 10 DE 7	□ 13DE7
Medium-Mu	Dual Triode		
□ 6CM7	□ 6CS7	□ 8CM7	
High-Mu Tr	iode-Low-Mu	Triode	
	▲ 6FD7	□ 10DR7	0 13EM7
□ 6DR7	▲ 6GF7	0 10EM7	▲ 13FD7
□ 6EA7	0 6GL7	▲ 10GF7	▲ 13 GF 7
0 6EM7			
High-Mu Tr	iode—Beam P	ower Tube	
▲ 15KY8			
Amplifiers	1		
Low-Mu Tri			
□ 12 B4A			
Medium-Mu	Triode		
	IIIOuc		
Beam Power			
□ 5AQ5		□ 6CM6 □ 6CZ5	□ 6EM5 □ 8EM5
\Box 5CZ5	□ 6AQ5A		

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World Radio History

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Types Not Recommended for New Equipment Design

Туре	Name	Tu Dimer and B Diag	nsions asing ram∆	Filam Unless sp	with con-	Use Values to right give operating conditions and characteristics for indicated typical use	Piate Sup- ply	Cathode Resistor	Screen Sup- ply	Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- cation Factor	Load for Stated Power Output	Power Out- put
		Dia.	B, D.	Volts	Amps.		Volts	Ohms(Ω) ax. Peak Inv	Volts	Ma	Ma	Ohms	Micromhos	Plate Ma.,	Ohns	Watts
1X2-A	Half-Wave Rectifier	B13	97	1.25F	0.2	Pulsed Rectifier in TV Receivers		ax. Peak Inv ax. Peak Pla			:0000	IVIAX.	Average 1	riate Ma.,	0.5	
						Class A Amplifier	250	-45v			60.0	800	5250	4.2	2500	3.5
2A3	Power Triode	К11	4D	2.5F	2.5	Push-Pull Class AB ₁ Amplifier	300 300	780û → 62v			80.0¢				5000 3000	10.0† 15.0†
	Medium-Mu					Class A Amplifier	80	1500			17.5	2100	6500	13.5		
2AF4-B	Triode	A1	7DK	2.35⊕	0.6	Oscillator at 1000 Mc.	100	Grid Rea	., 10000	ohms	17	Gr	id Current	(Approx.)	, 750 μa.	
2 DZ 4	Medium-Mu Triode	A1	7DK	2.35⊕	0.6	UHF Oscillator in TV Receivers	135	10000 Ω			15.5	Plate-Cire	cuit Resist	ance; 2700	ohms	
2EN5	Twin Diode	A2	7FL	2.1⊕	0.45	Horizontal Phase Detector		Peak Heate			E 200			Max.	DC Plate	Ma., 5
3A2	Half-Wave Rectifier	B5	9DT	3.15	0.22	Pulsed Rectifier in TV Receivers	Max.	Peak Inver Peak Plate	se Plate	Volts, 180	000		Ma	x. Average	Plate Ma	., 1.5
3 B 2	Half-Wave Rectifier	F38	8GH	3.15	0.22	Pulsed Rectifier in TV Service		Peak Plate Total DC		Inverse P	ate Volt			e Plate Vol Max, Aver		Ma., 1.1
3GS8/ 3BU8	Sharp-Cutoff Twin Pentode	B4	9LW	3.15⊕	0.6	Class A Amplifier (With both sections operating)			Fo	r other ch	aracteris	tics, refer to	o Type 4G	S8/4BU8.		
3LF4	Beam Power Tube	J2	6BA	1.4F 2.8F	0.1	Class A Amplifier	1		Fc	or other ch	aracteris	tics, refer to	o Type 3Q	5-GT.		
3Q4	Power Pentode	A2	7BA	1.4F 2.8F	0.1	Class A Amplifier			:	For other	characte	ristics, refer	to Type 3	3V4		
3Q5-GT	Beam Power Tube	F6	7AP	1.4F 2.8F	0.1 0.05	Class A Amplifier	11C 110	- 6.6v - 6.6v	110 110	1.4	10.0 8.5	100000	2 200 2000		8000 8000	0.40 0.33
354	Power Pentode	A2	78A	1.4F 2.8F	0.1	Class A Amplifier	90 90	-7v -7v	67.5 67.5	1.4 1.1	7.4 6.1	100000 100000	1575 1425		8000 8000	0.27 0.235
3V4	Power Pentode	A2	6BX	1.4F 2.8F	0.1	Class A Amplifier	90 90	- 4.5v - 4.5v	90 90	2.1	9.5 7.7	100000 120000	2150 2000		10000 10000	0.27 0.24
4GS8/	G1 C					Class A Amplifier	100	:	67.5	6.0		1		each section		
4G50/ 4BU8	Sharp-Cutoff Twin Pentode	B4	9LW	4.2⊕	0.45	(With both sections operating)	100	:	67.5	3.6	2.0			each section	n, 0	
	Full-Wave					With Capacitive-	May	AC Vulta pe				ed for 100 n			tal Effect	Supply
5AZ4	Rectifier	73	5T	5.0F	2.0	Input Filter		Peak Invers				Peak Plate			per Plate,	
5BE8	Medium-Mu Triode—	B2	9EG	4.7⊕	0.6	Triode Unit as Class A Amplifier	150	560			18	5000	8500	40	<u> </u>	
JDLO	Sharp-Cutoff Pentode					Pentode Unit as Class A Amplifier	250	68Ω	110	3.5	10	400000	5200			
5 8 18	Twin-Diode- Sharp-Cutoff Pentode	82	9FE	4.7⊕	0.6	Class A Amplifier	200	180Ω	150	2.8	9.5	300000	6200			
20110	High-Mu Triode—	82	9EG	5.2⊕	0.6	Triode Unit as Class A Amplifier	250	39 0Ω		—	7.3	12000	4400	53		
5DH8	Sharp-Cutoff Pentode	BZ	AFR	5.20	0.0	Pentode Unit as Class A Amplifier	125	56Ω	125	3.8	13.5	150000	8600			
5DJ4	Full-Wave	F25	BKS	5.0F	3.0	With Capacitive- Input Filter	and N	DC Output In. Total E	ffect. Su	pply Imp	ed. per P	late, 83 ohn		Peak Inver Peak Plate		
31234	Rectifier					With Inductive- Input Filter		DC Output Peak Inven			volts per	Plate, 600	Max. l	Peak Plate	Ma. per I	Plate, 1000

RCA RECEIVING TUBE DATA 10-64

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RCA RECEIVING-TUBE DATA

Types Not Recommended for New Equipment Design

Туре	Name	Dime and E Diag	be nsions Basing ram	Filom Unless sp types hav Heater trolled wa	ter or ent (F) ecified all re heaters. with con- rmup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bios Volts (v) or Cathode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tance	conduc- tance	Amplifi- cation Foctor	Load for Stated Power Output	Power Out- put
	Full-Wave	Dim. E2	B. D.	Volts	Amps.		Velts	Ohms (Ω) ting-Supply	Velts Voltage	Ma. per Plate.	Ma. 300 min	Ohms peak volts	Micrombos	Plate Curr	Ohms rent. 200 r	Watts nax. ma
024	Gas Rectifier Full-Wave	F2 E2	4R			Rectifier	DC	Output Curr	ent, 75 r	nax., 30 m	in. ma.	-	DC C	Output Vol Plate Curr	tage, 300 :	max. vo
0Z4-G	Gas Rectifier	F2	4R			Rectifier		Output Curr Max. Peak	ent, 75 r	nax., 30 m	in. ma.			utput Volt	age, 300 i	
1A3	Diode	A2	5AP	1.4	0.15	Rectifier		Max. Peak	Plate Ma	a., 5		Max	Peak Hea		le Volts, 1	
1A5-GT	Power Pentode	F6	6X	1.4F	0.05	Class A Amplifier	85 90	- 4.5v - 4.5v	85 90	0.7	3.5 4.0	300000 300000	800 850		25000 25000	0.100
1A7-GT	Pentagrid Converter o	F7	7Z¥	1.4F	0.05	Converter	90	0v	45	0.7	0.6	600000	Oscillator	rid (#2): 9 r-Grid (#1 on Transco) Resisto	r, 0.2 1
1AX2	Half-Wave Rectifier	88	9Y	1.4F	0.65	Pulsed Rectifier in TV Receivers	M	x. Peak Inv	te Ma., 4	15		М	ax. Averag	e Plate Ma	a., 0.5	
1B3-GT	Half-Wave Rectifier	F20	30	1.25F	0.2	Pulsed Rectifier in TV Receivers		ax. Peak Inv ax. Peak Pla			6000	М	ax. Averag	e Plate Ma	a., 0.5	
1DN5	Diode— Semiremote- Cutoff Pentode	A2	68W	1.4F	0.5	Pentode Unit as Class A Amplifier	67.5	0v	67.5	0.55	2.1	600000	630			
1H5-GT	Diode— High-Mu Triode	F7	5Z#	1.4F	0.05	Triode Unit as Class A Amplifier	90	0v			0.15	240000	275	65		
1J3	Half-Wave Rectifier	F20	3C	1.25F	0.2	Pulsed Rectifier in TV Receivers		Max. Peak I Max. Peak F			26000 (verage Pla		
1L6	Pentagrid Converter o	A2	7DC	1.4F	0.05	Converter	90	0v	45	0.6	0.5	650000	Anode-Gri Oscillator Conversior	Grid (#1) n Transcon	Resistor, d., 300 m	, 0.2 m
1LA6	Pentagrid Converter o	J2	7 A K	1.4F	0.05	Converter	90	0v	65	0.6	0.55	750000 0	$\begin{array}{c} \text{Otal Cath}\\ \text{Conversion}\\ \text{ias of } -3 \end{array}$	Transcond	l. (for grid	
1LB4	Power Pentode	J2	5AD	1.4F	0.05	Class A Amplifier	90	- 9v	90	1.0	5.0		925		12000	0.200
1LH4	Diode— High-Mu Triode	J2	5AG	1.4F	0.05	Triode Unit as Class A Amplifier			Fo	or other ch	aracteris	tics, refer t	o Type 1H	5-GT.		
1LN5	Sharp-Cutoff Pentode	J2	740	1.4F	0.05	Class A Amplifier	90	0v	90	0.35	1.6	1.1§	800			
1N5-GT	Sharp-Cutoff Pentode	F7	5Y#	1.4F	0.05	Class A Amplifier	90	0v	90	0.3	1.2	1.5§	750			
1R5	Pentagrid Converter▲	A2	7AT	1.4F	0.05	Converter	45 90	0v 0v	45 67.5	2.1 3.5	0.7	400000	Conversion Conversion		d., 280 µn	nhos.
154	Power Pentode	A2	7AV	1.4F	0.1	Class A Amplifier	45 90	- 4.5v - 7v	45 67.5	0.8	3.8 7.4	100000 100000	1250 1575		8000 8000	0.06
155	Diode— Sharp-Cutoff Pentode	A2	6AU	1.4F	0.05	Pentode Unit as AF Amplifier		Supply, 90 leg. resistor.	Grid Bi	as, 0 volts	. Grid R	esistor, 10	megohms.			
1T4	Remote-Cutoff Pentode	A2	6AR	1.4F	0.05	Class A Amplifier	45 90	0v 0v	45 67.5	0.7 1.4	1.7 3.5	350000 500000	700 900		—	-
1U4	Sharp-Cutoff Pentode	A2	6AR	1.4F	0.05	Class A Amplifier	90	0v	90	0.50	1.1	1.0§	900			
1U5	Diode— Sharp-Cutoff Pentode	A2	68 W	1.4F	0.05	Pentode Unit as Class A Amplifier	67.5	0v	67.5	0.4	1.6	600000	625			
1-v	Half-Wave Rectifier	К4	4G	6.3	0.3			AC Plate Vol DC Output M				al Effectiv				



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Types Not Recommended for New Equipment Design

Туре	Name	Dime and	ube ensians Basing gram ()	Filan Unless sp types ha Heater	ter or nent (F) pecified all ve heaters. with con- armup time.	Use Values ta right give aperating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Cur- rent	Plate Cur- rent	AC Plate Resis- tance	conduc- tance	Amplifi- cation Factor	Load for Stated Power Output	Power Out- put
		Dim.	B. D.	Volts	Amps.		Volts	Ohms (Ω)	Volts	Ma.	Ma.	Ohms	Micromhos		Ohms	Watts
6U5	Electron-Ray Tube	К3	6R	6.3	0.3	Visual Indicator		& Target S Bias, -22								
6V6	Beam Power Tube	E4	7AC	6.3	0.45	Single-Tube Class A Amplifier Push-Pull Class AB, Amplifier	250 315 250 285	-12.5v -13v -15v -19v	250 225 250 285	4.5 2.2 5.0 4.0	45.0 34.0 70.0 70.0	50000 80000	4100 3750		5000 8500 10000 8000	4.5 5.5 10.0† 14.0†
6Y6-G	Beam Power Tube	F28	7AC:	6.3	1.25	Single-Tube Class A Amplifier	135 200	-13.5v -14v	135 135	3.5	58.0	9300 18300	7000	-	2000 2600	3.6
7A4	Medium-Mu Triode	J2	5AC	6.3	0.3	Amplifier			Fo	or other cl	haracteri	stics, refer	to Type 6J	5.		
7A5	Beam Power Tube	13	6AA	6.3	0.75	Class A Amplifier	110 125	- 7.5v - 9v	110 125	3.0 3.3	40.0	16000 17000	5800 6000		2500 2700	1.5
7A6	Twin Diode	J2	7AJ	6.3	0.15	Delector Rectifier	Max.	AC Voltag	e per Pla	te, 150 Vo	olts, RM	S Ma	x. DC Out	put Curren	t per plat	e, 8 Ma.
7A7	Remote-Cutoff Pentode	J2	8V	6.3	0.3	Class A Amplifier			Fo	or other cl	haracteris	stics, refer	to Type 6S	K7.		
788	Octode Converter	J2	8U	6.3	0.15	Converter	250	- 3v	100	3.2	3.0	700000	4.2 ma. C	id (#2): scillator-G n Transco	rid (#1)	Resistor •
7AF7	Medium-Mu Twin Triode	J2	8AC	6.3	0.3	Each Unit as Class A Amplifier	250	-10v			9.0	7600	2100	16		
7AG7	Sharp-Cutoff Pentode	J2	8V	6.3	0.15	Class A Amplifier	250	250 Ω	250	2.0	6.0	1 meg.	4200			
7B4	High-Mu Triode	J2	5AC	6.3	0.3	Amplifier			Fo	or other cl	haracteris	tics, refer t	o Type 6S	F5.		
787	Remote-Cutoff Pentode	J2	8V	6.3	0.15	Class A Amplifier	250	- 3v	100	1.7	8.5	750000	1750			
7 B 8	Pentagrid Converter®	J2	8X	6.3	0.3	Converter			Fe	or other c	haracteri	stics, refer	to Type 6A	.8.		
7C5	Beam Power Tube	13	6AA	6.3	0.45	Class A Amplifier			F	or other c	haracteri	stics, refer	to Type 6V	76.		
7C6	Twin Diode- High-Mu Triode	J2	8W	6.3	0.15	Triode Unit as Class A Amplifier	250	- 1v	—	-	1.3	100000	1000	100	_	
7C7	Sharp-Cutoff Pentode	J2	8V	6.3	0.15	Class A Amplifier	250	- 3v	100	0.5	2.0	2.0§	1300			
7F7	High-Mu Twin Triode	J2	8AC	6.3	0.3	Each Unit as Class A Amplifier	250	- 2v			2.3	44000	1600	70		
7F8	Medium-Mu Twin Triode	J2	88W	6.3	0.3	Each I nit as Class A Amplifier	250	500Ω			6.0		3300	48		
7H7	Semiremote- Cutoff Pentode	J2	8V	6.3	0.3	Class A Amplifier	100 250	- 1.5v 180Ω	100 150	2.6 3.2	7.5	350000 800000	4000 4000			
737	Triode-Heptode	J2	861.	6.3	0.3	Triode Unit as Oscillator	250 🗨		Grid Res		5.0	Triode-	Grid & He	ptode-Grid	Current,	0.4 ma.
	Converter					Heptode Unit as Mixer	250	- 3v	100	2.8	1.4	1.5§	Convers	ion Transc	ond., 290	µmhos.
7K7	Twin Diode- High-Mu Triode	J2	88F	6.3	0.3	Triode Unit as Class A Amplifier	250	- 2v			2.3	44000	1600	70	-	
7N7	Medium-Mu Twin-Triode	13	8AC	6.3	0.6	Each Unit as Class A Amplifier	90 250	0v - 8v		_	10.0 9.0	6700 7700	3000 2600	20 20		
7V7	Sharp-Cutoff Pentode	J2	8V	6.3	0.45	Class A Amplifier	300	1601	150	3.9	10.0	300000	5800	5		

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Types Nat Recommended for New Equipment Design

Туре	Name	and B Diag	nsions lasing ram∆	Filam Uniess sp types hav Heater trolled wa	rmup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathade Resistor	Screen Sup- ply	Screen Cur- rent	Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- catian Factor	Load for Stated Power Output	Power Out- put
		Dim.	8. D.	Volts	Amps.	Triode Unit as	Velts	Oluus (Volts	Ma	Ma	Ohms	Micrombes		Ohms	Watts
6K8	Triode-Hexode	E3	8K	6.3	0.3	Oscillator	100	Grid R	tes., 5000	0 ohms	3.8	Triode-	Grid & He	xode-Grid	Current,	0.15 ma.
UNO	Converter		, in	0.5	0.5	Hexode Unit as Mixer	100 250	- 3v - 3v	100 100	6.2 6.0	2.3 2.5	400000 600000		n Transco n Transco		
6KL8	Diode—Sharp- Cutoff Pentode	B 4	9LQ	6.3	0.3	Pentode Unit as Class A Amplifier	100	2.2 M Ω Grid. Res	100	2.2	5.5	550000	4300			
						Single-Tube Class A Amplifier	250 250	-14v 168Ω	250 250	5.0 5.4	72.0				2500 2500	6.5 6.5
6L6-GB	Beam Power Tube	F22	7AC	6.3	0.9	Push-Pull Class A Amplifier	270 270	-17.5v 1240	270 270	11.0	134.0¢				5000 5000	17.5
						Push-Pull Class AB, Amplifier	360 360	-22.5v 248Ω♠	270 270	5.0	88.0 4 88.0 4				6600 9000	26.5 24.5
6L7	Pentagrid Mixer a	E3	π	6.3	0.3	Mixer Service	250	- 6v	150	9.2	2.3	Grid-N	o. 3 Peak	lo. 3) Bias Swing, 16 cond., 350	, — 15 vol volts mini	ts. mum.
6N7	Medium-Mu Twin Power	E4	8B	6.3	0.8	Class A Amplifier (as Driver)°	250 300	- 5v - 6v			6.0 7.0	11300 11000	3100 3200	35 35	20000 or more	excee 0.4
6N7-GT	Triode	F6	8B 1	0.5	0.0	Class B Amplifier	300	0v	Power	r Output f		at stated p			8000	10.0
6Q7	Twin Diode High-Mu Triode	E3	7V	6.3	0.3	Triode Unit as Class A Amplifier	100 250	- 1v - 3v			0.8 1.1	58000 58000	1200 1200	70 70		
6 R 7	Twin Diode— Medium-Mu Triode	E3	7V	6.3	0.3	Triode Unit as Class A Amplifier	250	— 9v			9.5	8500	1900	16		
658-GT	Triple Diode- High-Mu Triode	F6	8CB	6.3	0.3	Triode Unit as Class A Amplifier	250	- 2v			0.9	91000	1100	100		
6SB7-Y	Pentagrid Converter	E2	8R	6.3	0.3	Mixer	100	- lv	100	10.2	3.6	500000		1 Resistor		
6SC7	High-Mu Twin Triode	E2	8S	6.3	0.3	Each Unit as Amplifier	250	- 2v	—		2.0	53000	1325	70		
6SF5 SF5-GT	High-Mu Triode	E2 F6	6AB 6AB1	6.3	0.3	Class A Amplifier	250	- 2v			0.9	66000	1500	100		
6SF7	Diode— Remote-Cutoff Pentode	E2	7AZ	6.3	0.3	Pentode Unit as Class A Amplifier	100 250	- 1v - 1v	100 100	3.4 3.3	12.0 12.4	200000 700000	1975 2050			
6SG7	Semiremote- Cutoff Pentode	E2	8BK	6.3	0.3	Class A Amplifier	100 250	- 1v - 2.5v	100 150	3.2 3.4	8.2 9.2	250000 1.0§	4100 4000			
6SH7	Sharp-Cutoff Pentode	E2	88K	6.3	0.3	Class A Amplifier	100 253	-1v -1v	100 150	2.1 4.1	5.3 10.8	350000 900000	4000 4900			
6SK7 SK7-GT	Remote-Cutoff Pentode	E2 F7	8N 8N⊮	6.3	0.3	Class A Amplifier	100 250	- 1v - 3v	100 100	4.0	13.0 9.2	120000 800000	2350 2000			
6SR7	Twin Diode— Medium-Mu Triode	E2	8Q	6.3	0.3	Triode Unit as Class A Amplifier	250	- 9v			9.5	8500	1900	16		
6557	Remote-Cutoff Pentode	E2	8N	6.3	0.15	Class A Amplifier	250	- 3v	100	2.0	9.0	1.0§	1850			
6T4	Medium-Mu Triode	A1	7DK	6.3	0.225	Oscillator in UHF TV Receivers Class A Amplifier		DC Plate DC Cathor 1500			18			Grid Ma., Plate Diss		.5 watts

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Types Not Recommended for New Equipment Design

Туре	Name	Dime and I Diag	be nsions Basing gram∆	Filam Unless s types ha Heater trolled wa	ter or ent (F) secified all ve heaters, with con- unnup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plote Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Cur- rent	Plote Cur- rent	AC Plate Resis- tance	Trans- conduc- tonce	Amplifi- cation Foctor	Lood for Stated Power Output	Power Out- put
	Medium-Mu	Dim.	8. D.	Veits	Amps,	Triode Unit as	Velts	Ohms (Ω)	Volts	Ma	Ma	Oluns	Micromhes		Ohms	Watts
6EH8	Triode— Sharp-Cutoff Pentode	82	9JG	6.3⊕	0.45	Class A Amplifier Pentode Unit as Class A Amplifier	125 125	-1v -1v	125	4	13.5	170000	7500 6000	40		
6EV7	High-Mu Twin Triode	B4	9LP	6.3	0.6	Relay Control	250 150	0v 0v	—		18.5 10.0			μa, 100 = μa, 100 =		0-ohm tlay
6EX6	Beam Power Tube	F33	5BT	6.3⊕	2.25	Horizontal Deflec- tion Amplifier	175	-30v	175	3.3	67	8500	7700	μa, 100 =		
6EY6	Beam Power Tube	F9	7AC	6.3⊕	0.68	Vertical Deflection Amplifier	250	-17.5v	250	3	44	60000	4400			
6EZ5	Beam Power Tube	F9	7AC	6.3	0.8	Vertical Deflection Amplifier	250	-20v	250	3.5	43	\$0000	4100			
6F5	High-Mu Triode	E3	5M	6.3	0.3	Class A Amplifier	100 250	- 1v - 2v			0.4	85000 66000	1150 1500	100 100		
6F6		E4	75			Pentode Class A Amplifier	250 285	-16.5v -20v	250 285	6.5 7.0	34.0 38.0	80000 78000	2500 2550		7000 7000	3.2
6F6-G	Power Pentode	F28	751	6.3	0.7	Triode Class A Amplifier	250	20v			31.0	2600	2600	6.8	4000	0.85
6F6-GT		F9	7S‡			Pentode Push-Pull Class A Amplifier	315	-24v	285	12.0♠	62.0♠				10000	11.0†
6 F 7	Low-Mu Triode	К5	7E	6.3	0.3	Triode Unit as Class A Amplifier	100	— 3v	—	—	3.5	16000	500	8		
017	Remote-Cutoff Pentode		12	0.5	0.5	Pentode Unit as Class A Amplifier	250	- 3v	100	1.5	6.5	850000	1100			
6F8-G	Medium-Mu Twin Triode	F24	8G	6.3	0.6	Each Unit as Class A Amplifier			Fo	or other cl	haracteris	stics, refer to	Type 6J	5.		
6FE5	Beam Power Tube	F15	SKB	6.3	1.2	Class A Amplifier	145	-16v	145	18	100	8000	9500		1000	5.6
6FW8	Medium-Mu Twin Triode	B2	LAB	6.3	0.4	Each Unit as Class A Amplifier	100	1.2v		—	15	2500	13000	33		
6G6-G	Power Pentode	1F21	7S‡	6.3	0.15	Pentode Class A Amplifier	180	- 9v	180	2,5	15.0	175000	2300		10000	1,1
6GV8	High-Mu Triode	B3	9LY	6.3	0.9	Triode Unit as Class A Amplifier	100	- 8V			5	7600	6500	50		
JUI VO	Power Pentode		JE T	0.5	0.7	Pentode Unit as Class A Amplifier	170	- 15V	70	2.7	41	25000	7500		. No. 1 rid. No. 2	
6G Y8	Triple High-Mu Triode	82	9MB	6.3	0.45	Each Unit as Class A Amplifier	125	— 1v			4.5	14000	4500	63		
ப5 ப5-GT	Medium-Mu Triode	E2 F7	6Q 6Q¥	6.3	0.3	Class A Amplifier	90 250	0v - 8v		_	10 9	6700 7700	3000 2600	20 20		
6J7	Sharp-Cutoff Pentode	E3	7R	6.3	0.3	Pentode Class A RF Amplifier	100 250	- 3v - 3v	100 100	0.5	2.0	1.0§ 1.0§	1185 1225			
6K7 6K7-GT	Remote-Cutoff Pentode	E3 F7	7R 7R⊯	6.3	0.3	Class A Amplifier	250	- 3v	125	2.6	10.5	600000	1650			

Note: For footnotes, see end of this section.

 \triangle For key to tube dimensions, description, and basing diagram, see end of this section.

Types Not Recommended for New Equipment Design

Туре	Name	Dime and I	ıbe nsions Basing gram∆	Filam Unless sp types hav @ Heater	ter or ent (F) ecified all re heaters, with con- rmup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- cation Factor	Load fer Statel Pewer Output	Power Out- put
		Dim.	8. D.	Velts	Amps.		Velts	Ohms (Ω)	Velts	Ma.	Ma.	Ohms	Micrombos		Ohms	Watts
6BY5-GA	Full-Wave Rectifier	F17	6CN	6.3	1.6	Television Damper Service	Max	. Peak Inve . Peak Plate . DC Plate	Ma., 52		00 (Abs.)		lax. Peak	Heater-Cat	hode Volt	s:{-450 +100
6 BZ 8	Medium-Mu Twin Triode	B2	LAB	6.3	0.4	Each Unit as Class A Amplifier	125	100Ω			10	5600	8000	45		
6C5	Medium-Mu Triode	E2	6Q	6.3	0.3	Class A Amplifier	250	- 8v		—	8.0	10000	2000	20		
6C6	Sharp-Cutoff Pentode	K9	8F	6.3	0.3	Amplifier Detector			F	or other o	haracter	istics, refer	to Type 6]	1 7.		
6C8-G	Medium-Mu Twin-Triode	F24	8G	6.3	0.3	Each Unit as Class A Amplifier	250	-4.5v			3.2	22500	1600	36		
6C9	Sharp-Cutoff Dual Tetrode	G1	10F	6.3	0.4	Each Unit as Class A Amplifier	125	- 1V	80	1.5	10	100000	8000			
6CH8	Medium-Mu Triode— Sharp-Cutoff	82	9FT	6.3	0.45	Triode Unit as Class A Amplifier Pentode Unit as	200	— 6v			13	5750	3300 6200	19		
	Pentode	[Class A Amplifier	200	180Ω	150	2.8	9.5	300000				
6CK4	Low-Mu Triode	F9	8JB	6.3	1.25	Vertical Deflec- tion Amplifier		. DC Plate Peak Cath				Max. Peak Max. Plate	IO (Abs			
6CM8	High-Mu Triode—	B2	9FZ	6.3⊕	0.45	Triode Unit as Class A Amplifier	250	- 2v			1.8	50000	2000	100		
001110	Sharp-Cutoff Pentode			0.00		Pentode Unit as Class A Amplifier	250	180Ω	150	2.8	9.5	600000	6200			
6CR6	Diode— Remote-Cutoff Pentode	A2	7EA	6.3	0.3	Pentode Unit as Class A Amplifier	250	- 2v	100	2.6	6	800000	2200	Grid-No. cond. of 1		
6D6	Remote-Cutoff Pentode	К9	6F	6.3	0.3	Class A Amplifier	250	- 3v	100	2.0	8.2	800000	1600			
6DC8	Twin Diode— Remote-Cutoff Pentode	B 4	9HE	6.3	0.3	Class A Amplifier	250	- 2v	100	2.7	9	1§	3800			
6DM4	Half-Wave Rectifier	F15	4CG	6.3	1.2	Damper Service	Max Max	. Peak Heat	er—Cath er—Cath	ode Volts ode Volts	, - 5000	DC Compo	onent Not nent Not t	to Exceed 1	900 Volts 00 Volts))
6DN6	Beam Power Tube	F33	5BT	6.3	2.5	Horizontal Deflec- tion Amplifier	Max	. DC Plate . DC Catho	de Ma., 2	200		Max. Peak Max. Plate	Dissipatio	on, 15 watts	۰. ۱	
6DQ6-A	Beam Power Tube	F22	BAM	6.3	1.2	Horizontal Deflec- tion Amplifier	Max	. DC Plate . DC Catho	de Ma., 1	55		Max. Peak Max. Plate	Dissipatio	n, 18 watts		
6DW5	Beam Power Tube	B10	9CK	6.3	1.2	Vertical Deflection Amplifier		. DC Plate . DC Catho						ive-Pulse P pation, 11		a, 2200
	Twin Power					Each Unit as Class A Amplifier	250	- 7.3v	250	5.5	48	38000	11300			
6DZ7	Pentode	F17	8JP	6.3	1.52	Both Units as Push-Pull Class AB1 Amplifier	400 300	-11v 120Ω	250 250	13 15	100 80		_		9000 9000	18 12
6EH5	Power Pentode	A3	700	6.3	1.2	Class A Amplifier	110	62Ω	115	11.5	42	11000	14600		8000	1.4

Note: For footnotes, see end of this section.

 \triangle For key to tube dimensions, description, and basing diagram, see end of this section.

RCA

RADIO CORPORATION OF AMERICA Electronic Components And Devices Harrison, N. J.

RCA RECEIVING TUBE DATA

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(2)

World Radio History

Types Not Recommended for New Equipment Design

Туре	Name	Dime and	ibe nsions Basing gram ()	Filam Unless sp types hav ⊕ Heater	ter or ent (F) ecified all re heaters, with con- innup time.	Use Values ta right give operating canditians and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- cation Factor	Lood for Stated Power Output	Power Out- put
		Dim.	B. D.	Volts	Amps.		Volis	Ohms (Ω)	Volts	Ma.	Ma.	Ohms	Micromhos		Ohms	Watts
6A Q8	Medium-Mu Twin Triode	B2	LA6	6.3	0.435	Each Unit as Class A Amplifier	250	- 2v	_		10	9700	6000	57		
6AR5	Power Pentode	A3	6CC	6.3	0.4	Class A Amplifier	250	-18v	250	5.5	32.0	90000	2300		7600	3.4
6AS5	Beam Power Tube	A3	7CV	6.3	0.8	Class A Amplifier	150	- 8.5v	110	2.0	35		5600		4500	2.2
SAV5-GA	Beam Power Tulic	F19	6CK	6.3	1.2	Horizontal Deflec- tion Amplifier		. DC Plate . DC Catho				Max. Peak Max. Plate				00 (Abs.)
	Medium-Mu Triode	B2	9AE		0.45	Triode Unit as Class A Amplifier	150	5 60 Ω			18	5000	8500	40		
6AX8	Semiremote Cutoff Pentode	82	SAL	6.3	0.45	Pentode Unit as Class A Amplifier	250	1200	110	3.5	10	400000	4800			1
688	Twin-Diode- Semiremote- Cutoff Pentode	E3	8E	6.3	0.3	Pentode Unit as Amplifier	250	- 3v	125	2.3	10	600000	1325			
6BD6	Remote-Cutoff Pentode	A2	78K	6.3	0.3	Class A Amplifier	250	- 3v	100	3.0	9.0	800000	2000			
6BF5	Beam Power Tube	A3	78Z	6.3	1.2	Class A Amplifier	110	- 7.5v	110	4.0	36.0	12000	7500		2500	1.9
6BF6	Twin-Diode Medium-Mu Triode	A2	7BT	6.3	0.3	Triede Unit as Class A Amplifier	250	— 9v	·		9.5	8500	1900	16		Output, lliwatts
6BG6-GA	Beam Power Tube	F40 F33	5BT	6.3	0.9	Horizontal Deflec- tion Amplifier		. DC Plate				Max. Peak Max. Plate				0 (Abs.)
6BH3	Novar Half-Wave Rectifier	C4	9HP	6.3	1.6	Television Damper Service	Max		er Cath	node Volts	s, -5500	(DC Composition) (DC Composition)	onent Not	to Exceed	900 Volts)
0040	Medium-Mu Triode—	84	9DX	6.3⊕	0.6	Triode Unit as Class A Amplifier	150	- 5v			9.5	5150	3300	17		
6BHS	Sharp-Cutoff Pentode		304	0.30	0.0	Pentode Unit as Class A Amplifier	200	821	125	3.4	15	150000	7000			
6BK4	Sharp-Cutoff Beam Triode	F34	8GC	6.3	0.2	Voltage-Control		DC Plate			ts, 600 0 0			DC Plate I Plate Dissi		5 Watts
6BK5	Beam Power Tube	84	9BQ	6.3	1.2	Class A Amplifier	250	- 5v	250	3.5	35	100000	8500		6500	3.5
6BS8	Medium-Mu Twin Triode	B2	9AJ	6.3	0.4	Each Unit as Class A Amplifier	150	22012			10	5000	7200	36		
6BV8	Twin Diode- Medium-Mu Triode	B2	9FJ	6.3⊕	0.6	Triode Unit as Class A Amplifier	200	3300			11	5900	5600	33		
6701W4	Full-Wave	84	LD6	6.3	0.9	With Capacitive Input Filter		. AC Volts 1 . Peak Inve	rse Volts	, 1275		y Imped. pe	Max. F	C Output Peak Plate I ohms		
6BW4	Rectifier	84	801	0.3	0.9	With Inductive Input Filter		. AC Volts j . Peak Inve		, 1275		Input Choke	Max. F	OC Output Peak Plate I		
BX7-GT	Medium-Mu Twin Triode	F6	8BD	6.3	1.5	Vertical Deflection Oscillator Vertical Deflection	Max	DC Plate Plate Diss	ipation:	10 watts		ite: 12 watts ositive-Pulse				Ma., 180
	. white those					Amplifier		DC Cath.				issipation: 1				oth plate

Note: For footnotes, see end of this section.

 \triangle For key to tube dimensions, description, and basing diagram, see end of this section.

Types Not Recommended for New Equipment Design

Туре	Name	Dime and E Diag		Heat Filam Unless spi types hav Heater trolled was	ent (F) icited all a heaters, with con- mup time,	Use Yalues to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- cation Factor	Load for Stated Power Output	Pow Ou pu
		Dim.	B. D.	Velts	Amps.		Velts	Ohms (Ω)	Velts	Ma.	Ma	Ohnis	Micrombes	B.Co. The	Ohns al Effect.	Watt
5 T 4	Full-Wave Rectifier	F23	6T	5.0F	2.0	With Capacitive- Input Filter With Inductive- Input Filter	Max Max Max	AC Volts p Peak Inver AC Volts p Peak Inver	rse Volts, er Plate (rse Volts,	1550 (RMS), 55 1550	Max. 0 Max. Max.	Peak Plate DC Output Peak Plate	Ma., 675 t Ma., 225 Ma., 675	Imped. y	er Plate, lue of Inp 10 <u>he</u> nrie	150 c ut Ch
5U4-G	Full-Wave Rectifier	F39	6T:	5.0F	3.0	With Capacitive- Input Filter		. AC Volts p . Peak Inve			0 Max. Max.	DC Output Peak Plate	t Ma., 225 Ma., 675		al Effect. er Plate,	
5X4-G	Full-Wave Rectifier	F39	5Q	5.0F	3.0				F	for other r	atings, 1	efer to Typ	e 5U4-G.			
5¥4-GA 5¥4-GT	Full-Wave Rectifier	F25 F8	5Q	5.0F	2.0		Ma	x. Peak Plat	e Ma., 46	00		F	or other re	tings, refer	to Type	5AZ4
5Z3	Full-Wave Rectifier	K11	4C	5.0F	3.0				F	or other r	atings, r	efer to Typ	e 5U4-G.			
5 Z 4	Full-Wave Rectifier	E4	5L.	5.0	2.0	With Capacitive- Input Filter With Inductive-	Max	AC Volts p Peak Inver	rse Volts,	1400	Max.	Peak Plate	Ma., 375	Imped.	tal Effect per Plate, ue of Inp	50 ol
						Input Filter		Peak Inve				Peak Plate			5 henries	
6A7	Pentagrid Converter o	K5	70	6.3	0.3	Converter			F	for other o	haracte	ristics, refer	to Type 6	A8.		
6A8	Pentagrid Converter o	E3	8A 8A: 8A	6.3	0.3	Converter	250	- 3v	100	2.7	3.5	360000	4.0 n	e-Grid (# na. Oscillato ersion Tran	or-Grid (4	¥1) F
6AB5/ 6N5	Electron-Ray Tube	КЗ	6R	6.3	0.15	Visual Indicator	Grid Plat	e ds Target S 1 Bias, — 1 1e ds Target S 1 Bias, —15.	0.0 volts; Supply =	Shadow 1 135 volts	Angle, 0 Triode	°. Bias, 0 v Plate Resis	olts; Angle tor = 1.0 r	., 90°; Plat neg. Target	e Current	, 0.5 = 1.9
6AB7	Sharp-Cutoff Pentode	E2	8N	6.3	0.45	Class A Amplifier	300	- 3v	200	3.2	12.5	700000	5000			-
6AC5-GT	High-Mu Power Triode	F6	6Q:	6.3	0.4	Class B Amplifier Dynamic-Coupled Amplifier With 76 Driver	250 250	Averag	e Plate C	urrent of	Driver	developed i = 5.5 millia T = 32 mil	mperes.	circuit.	10000 7000	8
6AC7	Sharp-Cutoff Pentode	E2	8N	6.3	0.45	Class A Amplifier	300	1 60 Ω	150	2.5	10.0	1.0§	9000			-
6AH4-GT	Low-Mu Triode	F6	8EL	6.3	0.75	Vertical Deflection Amplifier		t. DC Plate t. DC Catho						sitive-Pulse ssipation, 7		lts, 2
6 AH 6	Sharp-Cutoff Pentode	A2	7BK	6.3	0.45	Class A Amplifier	300	1600	150	2.5	10.0	500000	9000			
6AL7-GT	Electron-Ray Tube	F6	8CH	6.3	0.15	Visual Indicator	Grid	et Voltage, Voltage = ode Bias Re	0 volts		E	rid Voltage eflecting-El Voltage =	ectrodes-			
6AM4	High-Mu Triode	81	9BX	6.3	0.225	Class A Amplifier	200	100ຄ			10	8700	9800	85		_
6A Q 6	Twin-Diode— High-Mu Triode	A2	7BT	6.3	0.15	Triode Unit as Class A Amplifier	100 250	-1v -3v			0.8	61000 58000	1150 1200	70 70		-
6AQ7-GT	Twin-Diode- High-Mu Triode	F6	SCK	6.3	0.3	Triode Unit as Class A Amplifier	250	- 2v		—	2.3	44000	1600	70		-



Types Not Recommended for New Equipment Design

Туре	Name	Dime and	ube Insions Basing gram ()	Filan Unless types h Heate	ater or ment (F) specified all ave heaters, r with con- cormup time,	Use Volues to right give operating conditions and characteristics for indicated typicol use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trans- conduc- tance	Amplifi- cation Factor	Lood for Stated Power Output	Power Out- put
		Dim.	B. D.	Veits	Amps.		Volts	Ohms (Ω)	Volts	Ma	Ma.	Dhms	Micromhos		Ohms	Watts
12AW6	Sharp-Cutoff Pentode	A2	7CM	12.6	0.15	Class A Amplifier	100 250	180Ω 180Ω	100 150	1.4 2.0	4.5 6.5	600000 800000	4500 5000			
12AX7	High-Mu Twin-Triode	B2	9A	6.3 12.6	0.3 0.15	Each Unit as Class A Amplifier	100 250	$-1\mathbf{v}$ $-2\mathbf{v}$			0.5	80000 62500	1250 1600	100 100		
12BK5	Beam Power Tube	B 4	9BQ	12.6⊕	0.6	Class A Amplifier	250	- 5 v	250	3.5	35	100000	8500		6500	3.5
12 BL 6	Remote-Cutoff Pentode⊙	A2	78K	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier	12.6	Grid-No. 1 Supply Volts, 0	12.6	0.5	1.35	500000	1350	for t	and Grid- ranscond. cromhos,	
12BR7	Twin Diade- High-Mu Triode	82	9CF	6.3 12.6	0.45	Triode Unit as Class A Amplifier	100 250	2700 2000			3.7 10	15000 10900	4000 5500	60 60		
12BV7	Sharp-Cutoff Pentode	B4	9BF	6.3 12.6	0.6	Class A Amplifier	250 250	68Ω - 8v	150 180	6	27 0.5 ×	85000	13000			
12BW4	Full-Wave Rectifier	B4	9DJ	12.6	0.45	With Capacitive Input Filter	Max. A Max. F	C Volts per	Plate (I Volts, 1	RMS) 450 275		DC Output			fect. Supp per Plate,	
12BZ7	High-Mu Twin Triode	B4	9A	6.3 12.6	0.6	Each Unit as Class A Amplifier	250	- 2 v	_		2.5	31800	3200	100		
12CN5	Remote-Cutoff Pentode ©	A3	7CV	10.0 to 15.9	0.45 approx. at 12.6 v	Class A Amplifier	12.6		12.6	3.5	4.5	40000	3800	Grid-No. Grid-No.		/olts, 0 megohms
12CT8	Medium-Mu Triode—	B4	9DA	12.6⊕	0.3	Triode Unit as Class A Amplifier	150	150Ω			9	8200	4900	40		
IXVIO	Sharp-Cutoff Pentode				0.0	Pentode Unit as Class A Amplifier	200	82 Ω	125	3.4	15	150000	7000	1 - 1 - 1 - 1		
12CX6	Remote-Cutoff Pentode⊙	A2	7 B K	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier	12.6	Grid-No. 1 Supply Volts, 0	12.6	1.4	3	40000	3100		1 Volts of 10 μa.	for Plate
12DE8	Diode— Remote-Cutoff Pentode©	62	9HG	10.0 to 15.9	0.2 approx. et 12.6V	Pentode Unit as Class A Amplifier	12.6		12.6	0.5	1.3	300000	1500	Grid-No. Grid-No.		
12DK6	Sharp-Cutoff Pentode	A2	7CM	12.6	0.15	Class A Amplifier	125	56Ω	125	3.8	12	350000	9800			
12DK7	Twin Diode— Power Tetrode⊙	82	9HZ	10.0 to 15.9	0.5 approx. at 12.6V	Tetrode Unit as Class A Amplifier	12.6		12.6	1	6	4000	5000		3500	0.010
12DL8	Twin Diode— Power Tetrode O	B 4	9HR	10.0 to 15.9	0.55 approx. at 12.6 v	Tetrode Unit as Class A Amplifier	12.6	Grid-No.	2 megohm 1 (Space-	resistor) Charge G	rid) Volt		Grid-No	actor (Grid 1 Ma., 75 sistance, 4	Plate	Plate) 7. Ma., 40
12DQ7	Power Pentode	B4	9BF	6.3⊕ 12.6	0.6	Class A Amplifier	200	680	125	5.6	26	53000	10500			
12 DS 7	Twin Diode— Fower Tetrode⊙	84	ULG	10.0 to 15.9	0.4 approx. at 12.6 v	Tetrode Unit as Class A Amplifier	12.6	12.6v	-0.5 (across 2.2 megohm resistor)	No. 1)	35	500	19000 (Grid- No. 2 to Plate)	1		
						Diude Units		-	D	iode Plate	Ma., w	th 10 Volts	Applied,	3 Ma.		
12 D U7	Twin Diode- Power Tetrode O	B2	XLP	10.0 to 15.9	0.25 approx. at 12.6V	Tetrode Unit as Class A Amplifier	12.6		12.6	1.5	12	6000	6200		2700	0,025

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Types Not Recommended for New Equipment Design

Туре	Name	Dime and E	ube ensions Basing gram () 8, 0,	Filom Unless sp types hav ⊕ leater	atter or ment (F) specified all are heaters. or with con- varmup time. Amis.	anarating conditions		Grid Bias Volts (v) or Cathode Resistor Ohms (Ω)	Screen	Screen Cur- rent Ma	Plate Cur- rent M1.	AC Plate Resis- tance Ohms	Trans- conduc- tance Micromhos	- cation Factor	Load for Stated Power Output Ohms	Power Out- put Watts
7W7	Sharp-Cutoff Pentode	J2	88J	6.3	0.45	Class A Amplifier			1			eristics, refer			<u> </u>	
7X7	Twin Diode- High-Mu Triode	J3	88Z	6.3	0.3	Triode Unit as Class A Amplifier	250	- 1v			1.9	67000	1500	100	[]	-
7Y4	Full-Wave Rectifier	J2	5AB	6.3	0.5	With Capacitive- Input Filter	Max.	Peak Inverse	se Volts,	1250	Max. D	C Output M	Ma., 70	Max. Peak	k Plate M	Ia., 180
724	Full-Wave Rectifier	£L	5AB	6.3	0.9	With Capacitive- Input Filter	Max.	Peak Inverse	e Volts,	1250		ax. DC Outpu			Total Effec. 1. per Plate	
9BR7	Twin Diode— High-Mu Triode	82	9CF	4.7⊕ 9.4	0.6 0.3	Triode Unit as Class A Amplifier	250	200Ω		[-]	10	10900	4000	60		
9CL8	Medium-Mu Triode- Sharp-Cutoff	B2	9FX	9.5⊕	0.3	Triode Unit as Class A Amplifier Tetrode Unit as	125		125	4	15	5000 100000	8000 5800	40		
9U8-A	Tetrode Medium-Mu Triode—	82	9AE	9.45⊕	0.3	Class A Amplifier Triode Unit as Class A Amplifier	125	+ +			12	5000	7500	40		
300-4	Sharp-Cutoff Pentode					Pentode Unit	125	- 1v	110	3.5	9.5	200000	5000		[!	1
10C8	High-Mu Triode— Sharp-Cutoff	B 2	9DA	10.5⊕	0.3	Triode Unit as Class A Amplifier Pentode Unit as	250 135	390 Ω 100Ω	135	3.2	7.3	12000 190000	4400 8000	53		
12AC6	Pentode Remote-Cutoff Pentode©	A2	7ВК	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier Class A Amplifier	12.6		12.6	.2	.55		+		1 Supply V 1 Res., 2.2	
12AD6	Pentagrid Converter⊙	A2	7СН	10.0 to 15.9	0.15 approx. at 12.6 v	Converter	12.6	Self- excited	12.6	1.5	0.45			. 1 Resistor, ion Transcor		
12AE6-A	Twin Diode— Medium-Mu Triode⊙	A2	7 B T	10.0 to	0.15 approx. at 12.6 v	Triode Unit as Class A Amplifier	12.6	0v	_	-	1	13000	1300	16.7		
12AE7	Dual Triode	B2	9A	10.0 to	0.45 approx.		12.6	Grid Re	es. 1 .5 me	egohms	1.9	3150	4000	13.0		
Jan J		1.		15.9	at 12.6V	Unit No. 2 as Class A Amplifier	12.6	Grid Re	es. 1 mego	əhm	7.5	985	6500	6.4	(=)	
12AF6	Remote-Cutoff Pentode O	A2	78K	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier	12.6	—	12.6	0.45	1.1	350000	1500		1 Supply V 1 Res., 2.2	
12AH7-GT	I win Irioae	F6	88E	12.6	0.15	Each Unit as Class A Amplifier	180	- 6.5v	/'	-	7.6	8400	1900	16		
12AJ6	Twin Diode Medium-Mu Triode⊙	A2	7BT	10.0 to 15.9	0.15 approx. at 12.6 v	Triode Unit as Class A Amplifier	12.6	Grid-No. Grid-No.		y Volts, 0 2.2 megohr	ms 0.75	5 450 00	1200	55	-	-
12AL8	Medium-Mu Triode— Power Tetrode O	84	965	10.0 to 15.9	0.55 approx. at 12.6 v	Triode Unit as Class A Amplifier Tetrode Unit as Class A Amplifier	12.6	(across Grid-No. (across Grid-No.	2.2 megohr 2.2 (Contr 2.2 megohr 2.1 (Space	trol Grid) hm res.) ce-Charge (Grid) Vol		Grid-No.	13 Factor (Grid o. 1 Ma., 75 Resistance, 48	5 Plate	o Plate) e Ma., 4
12AV7	Medium-Mu Twin-Triode	82	9A	6.3 12.6	0.45 0.225	Each Unit as Class A Amplifier	150	56Ω	-		18	48000	8500	41	Cutoff Vo	olts, —

Note: For footnotes, see end of this section.

 \triangle For key to tube dimensions, description, and basing diagram, see end of this section.



Types Not Recommended for New Equipment Design

		_																
Туре	Name	Dime and Dia			Dimensions and Basing Diagram∆		oter or nent (F) specified all ave heaters, r with con- rarmup time,	Use Yalues to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cothode Resistor	Screen Sup- ply	Cur- rent	Plate Cur- rent	AC Plate Resis- tance	conduc- tance	Amplifi- cation Foctor	Load for Stated Power Output	Power Out- put
		Dim.	8. D,	Volts	Amps.		Velts	Ohms (Ω)	Volts	Ma.	Ma.	Ohms	Micromitos		Ohms	Watts		
12GA6	Pent agr id Converter⊙	A2	7CH	10.0 to 15.9	0.15 approx, at 12.6V	Converter	12.6	12.6 1.6v 12.6 0.8 0.3 1§ Grid No. 1 Res., 33000 Conversion. Transcond										
12J5-GT	Medium-Mu Triode	F7	8Q‡	12.6	0.15	Amplifier	F	For other characteristics, refer to Type 6J5-GT.										
12J7-GT	Sharp-Cutoff Pentode	F7	7Bjc	12.6	0.15	Amplifier			F	or other c	haracteri	stics, refer t	o Type 6J	7.				
12J8	Twin Diode— Power Tetrode⊙	B 2	9GC	10.0 to 15.9	0.325 approx. at 12.6 v	Tetrode Unit as Class A Amplifier	12.6	12.6 – 0v 12.6 1.5 12 6000 5500						2700	0.02			
12K5	Power Tetrode⊙	A3	7EK	10.0 to 15.9	0.4 approx. at 12.6 v	Class A Amplifier	Grid-	Plate Volts, No. 1 (Spac Plate Ma., 4	e-Charge		olta, 12.6		cation Fac	Plate Res tor, Grid-N No. 2 to P	lo. 2 to P	ate, 7.2		
12K7-GT	Remote-Cutoff Pentode	F7	7R _a c	12.6	0.15	Amplifier			F	or other c	haracteri	stics, refer t	o Type 6k	7-GT.				
12KL8	DiodeSharp- Cutoff Pentode	B4	9L.Q	12.6	0.15	Pentode Unit as Class A Amplifier		For other characteristics, refer to Type 6KL8.										
12L6-GT	Beam Power Tube	F6	7AC‡	12.6⊕	0.6	Class A Amplifier	110 200	- 7.5v 180Ω	110 125	4.0	49 46	13000 28000	8000 8000		2000 4000	2.1 3.8		
12R5	Beam Power Tube	A3	7CV	12.60	0.6	Vertical Deflection Amplifier	Max. DC Plate Volts, 150 Max. Peak NegPulse Grid-No. 1 Volts, 150 Max. Peak Cathode Ma., 155 Max. Grid-No. 2 Volts, 150 Max. Plate Dissipation, 4.5 watts Max. Peak Positive-Pulse Plate Volts, 1500 (Abs.)											
125A7-GT	Pentagrid Converter▲	F6	8AD	12.6	0.15	Converter	250 Self- Excited 100 8.5 3.5 1.0§ Grid-No. 1 Resistor, 20000 ohms. Conversion Transcond., 450 micromho											
12SC7	lligh-Mu Twin Triode	E2	85	12.6	0.15	Each Unit as Class A Amplifier			F	or other c	haracteri	stics, refer t	o Type 6S	C7.				
12SF5	High-Mu Triode	E2	6AB	12.6	0.15	Class A Amplifier	1		F	or other c	haracteri	stics, refer t	o Type 6S	F5.				
12SF7	Diode— Remote-Cutoff Pentode	E2	7AZ	12.6	0.15	Pentode Unit as Amplifier			F	or other c	haracteri	stics, refer t	o Type 6S	F7.				
12SG7	Semiremote- Cutoff Pentode	E2	8BK	12.6	0.15	Class A Amplifier			F	or other c	haracteri	stics, refer t	o Type 6S	G7.				
12SH7	Remote-Cutoff Pentode	E2	8 8 K	12.6	0.15	Class A Amplifier			F	or other c	haracter	stics, refer t	o Type 69	H7.				
125K7 125K7-GT	Remote-Cutoff Pentode	E2 F7	8N 8N#	12.6	0.15	Class A Amplifier			F	or other c	haracteri	stics, refer t	o Type 6S	K7.				
125Q7-GT	Twin Diode— High-Mu Triode	E2 F7	8Q 8Q ₃₄	12.6	0.15	Triode Unit as Class A Amplifier	100 250	-1v -2v		—	0.5	110000 85000	925 1175	100 100				
12SR7	Twin Diode— Medium-Mu Triode	E2	8Q	12.6	0.15	Triode Unit as Class A Amplifier			F	or other c	haracteri	stics, refer to	o Type 6S	R7.				
12U7	Medium-Mu Twin Triode	82	7CK	10.0 to 15.9	0.15 approx. at 12.6 v	Each Unit as Class A Amplifier	12.6	0v			1	12500	1600	20				
14 A 7	Remote-Cutoff Pentode	35	8V	12.6	0.15	Class A Amplifier	100 250	-1v -3v	100 100	4.0 2.6	13.0 9.2	120000 800000	2350 2000					
14AF7	Medium-Mu Twin-Triode	J2	8AC	12.6	0.15	Each Unit as Class A Amplifier			F	or other o	haracter	istics, refer t	o Type 7A	F 7.				

World Radio History

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Types Not Recommended for New Equipment Design

Туре	1 1	Dime and I	Jbe Insions Basing gram∆	Filan Unless s types ha ⊕ Heater	nter or nent (F) pecified all we heaters. with con- armup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plote Sup- ply	Grid Bios Volts (v) or Cothode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tonce	Trons- conduc- tonce	Amplifi- cation Foctor	Lood fer Stated Pewer Output	Pow Out pu
		Dim.	B. D.	Velts	Amps.		Velts	Ohms (Ω)	Velts	Ma.	Ma.	Ohms	Micromhes		Olmes	Wa
12DV8	Twin Diode— Power Tetrode⊙	B4	9HR	10.0 to 15.9	0.375 approx. at 12.6 v	Class A Amplifier	Grid	-No. 2 (Con -No. 1 (Spac scond. (Grid	ce-Charge	e Grid) V	olts, 12.6	5	Grid-No. 1	tor (Grid-I Ma., 53 stance, 900	Plate	
12 DW 7	Dual Triode	B 2	9A	12.6	0.15 0.3	Unit No. 1 as Class A Amplifier Unit No. 2 as	250 250	-2v -8.5v			1.2	62500 7700	2200	100		-
						Class A Amplifier Triode Unit as										
12D Y8	Medium-Mu Triode—	B 2	ano	10.0	0.35	Class A Amplifier Tetrode Unit as	12.6				1.2	10000	2000	20		-
	Remote-Cutoff Tetrode O			to 15.9	approx. at 12.6V	Signal Seeker	10 15	— 6v	10		5 min. 3 max.	Grid No. 1	resistor 10	megohms.	Plate Loa Plate Loa	
12EA6	Remote-Cutoff Pentode O	A2	78K	10.0 to 15.9	0.19 approx. at 12.6 v	Relay Class A Amplifier	12.6		12.6	1.4	3.2	32000	3800	Grid-No. 1 Grid-No. 1	Supply V	/olts
12EC8	Medium-Mu Triode-	B2	9FA	10.0 to	0.225 approx.	Triode Unit as Class A Amplifier Pentode Unit as	12.6	4700Ω Grid Res.			2.4	6000	4700	25		_
	Semiremote- Cutoff Pentode O			15.9	at 12.6V	Class A Amplifier	12.6		12.6	0.28	0.66	750000	2000	Grid No.	1 Res., 3	3000
12ED5	Beam Power Tube	A3	7CV	12.6⊕	0.45	Class A Amplifier	1.25	- 4.5v	125	7	37	14000	8500		4500	1
12EG6	Pentagrid Amplifier 🖸	A2	7CH	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier	12.6	-0.6v†	12.6	2.8	.55	150000	800‡	Bias vo	n Grid-No ltage acro megohma	
12EH5	Power Pentode	A3	7CV	12.6⊕	0.6	Class A Amplifier	110	62Ω	115	11.5	42	11000	14600		3000	1
12EK6	Remote-Cutoff Pentode O	A2	7BK	10.0 to 15.9	0.19 approx. at 12.6 v	Class A Amplifier	12.6		12.6	1.7	4	50000	4200	Grid-No.	1 Supply 1 Res. (F .2 megoh	Зура
12EL6	Twin Diode— High-Mu Triode⊙	A2	7FB	10.0 to 15.9	0.15 approx. at 12.6 v	Class A Amplifier	12.6	0v			0.75	45000	1 200	55		_
12EN6	Beam Power Tube	F6	7AC	12.6⊕	0.6	Vertical Deflec- tion Amplifier	Max.	Peak Pos. Peak Neg. Peak Cath	Pulse Gr	id Volts,	250		Ma Ma	ax. Plate D ax. DC Pla	issipation te Volts, i	,7 w 300
12EQ7	Diode- Remote-Cutoff Pentode	B4	9LQ	12.6	0.15	Pentode Unit as Class A Amplifier	100	0v	100	3.5	9	250000	3800	Grid-No.	1 Res., 2.	2 me
12F8	Twin Diode— Remote-Cutoff Pentode⊙	B2	9FH	10.0 to 15.9	0.15 approx. at 12.6 v	Pentode Unit as Class A Amplifier	12.6	0v	12.6	0.38	1	330000	1000	Grid-No. cond. of 1		
12FK6	Twin Diode— Low-Mu Triode⊙	A2	7 B T	10.0 to 15.9	0.15 approx. at 12.6 v	Triode Unit as Class A Amplifier	12.6	Grid R	upply Vo es. (Bypa 2 megohn	assed),	1.3	6200	1200	7.4		_
12FM6	Twin Diode— Medium-Mu Triode⊙	A2	7 8 T	10.0 to 15.9	0.15 approx. at 12.6 v	Triode Unit as Class A Amplifier	12.6	0v			1	7700	1300	10		_
12FV7	Medium-Mu Twin Triode	B4	9A	6.3 12.6	0.9	Each Unit as Class A Amplifier	100	- 2v			16	2250	9600	21.5		-

RCA

Types Not Recommended for New Equipment Design

Туре	Name	Dime ond	ube ensions Basing grom∆ 8.0.	Filam Unless sp types hav ⊕ Heater	ter or ent (F) becified all re heaters. with con- umup time. Amps.	Use Yalues to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply Velts	Grid Bias Volts (v) or Cathode Resistor Ohms (Ω)	Screen Sup- ply Velts	Screen Cur- rent Ma	Plate Cur- rent Ma.	AC Plate Resis- tance Ohms	Trans- conduc- fance Micromous	Amplifi- cation Factor	Locici for Stated Pawer Output Ohms	Power Out- put Watts	
	Beam						100	- 7.5v	110	4	49	13000	8000		2000	2.1	1
25L6-GT	Power Tube	F6	7AC:	25.0	0.3	Amplifier	200	180 Ω	125	2.2	46	28000	8000		4000	3.8	
25 W4- GT	Half-Wave Rectifier	F6	4CG	25.0	0.3	Television Damper Service	Max.	Peak Inver Peak Plate DC Plate	Ma., 75		50 (Abs.)	Max. Peak			⁽³⁾ 1+20		
25Z5	Rectifier- Doubler	K4	6E	25.0	0.3	Rectifier- Doubler	For other ratings, refer to Type 25Z6-GT.										
25Z6-GT	Rectifier-	F6	7Q	25.0	0.3	Voltage Doubler	Max. AC Volts per Plate (RMS), 117 Max. DC Output Ma., 75 Wave, 30 ohms; Full-Wave, 15 ohms.										
	Doubler		7Q‡	25.0	0.3	Ifalf-Wave Rectifier	Max. AC Volts per Plate (RMS), 235 Min. Total Effect. Supply Imped. per Plate: at 117 vo Max. DC Output Ma. per Plate, 75 15 ohms; at 150 volts, 40 ohms; at 235 volts, 100 ohm										
34GD5	Beam Power Tube	A3	7CV	34.0	0.1	Class A Amplifier	110	- 7.5v	110	3	35	13000	5700		2500	1.4	1
35A5	Beam Power Tube	J 3	6AA	35.0	0.15	Single-Tube Class A Amplifier	110 200	- 7.5v 180Ω	110 125	3 2.0	40 43	14000 34000	5800 6100		2500 5000	1.5 3.0	
35B5	Beam Power Tube	A3	78Z	35.0	0.15	Class A Amplifier	110	- 7.5v	110	3.0	40.0	13000	5800		2500	1.5	
35DZ8	High-Mu Triode—	B10		35.0	0.15	Triode Unit as Class A Amplifier	120	1500Ω			0.8		1400	100			
33020	Power Pentode	BIO	9JE	35.0	0.15	Pentode Unit as Class A Amplifier	140	1800	120	6	45		7500		2500	2.0	
35GL6	Beam Power Tube	A3	7FZ	35.0	0.15	Class A Amplifier	110	- 7.5v	110	3	45	12000	7500		2500	1.8	
35Y4	Half-Wave Rectifier Heater Tap for Pilot	J3 Pilo	· · ·	35.0 n Pins 1	0.15 and 4	With Capacitive- Input Filter	Max. A Max. I	C Plate Vo DC Output	Ma.: Wi	S), 117. ith Pilot s ithout Pile	nd No S	tal Effect. I hunt Res., 6	Plate-Supp 0; With P	ly Impedat ilot and Sh	unt Res.,	90;	
35Z3	Half-Wave Rectifier	13	4Z	35.0	0.15	With Capacitive- Input Filter			Fo	or other ra	tings, re	fer to Type	35Z5-GT.				
35Z4-GT	Half-Wave Rectifier	F6	5AA	35.0	0.15	With Capacitive- Input Filter	Max. D	C Output 1	/Ia., 100			Total Effect				Up to 117	
35 Z 5-GT	Half-Wave Rectifier Heater Tap for Pilot	F6 Pilot		35.0 n Pins 2 a	0.15 and 3	With Capacitive- Input Filter	Min. To Max. I	otal Effect. DC Output	Ma.: W	pply Imp ith Pilot ithout Pil	and No	Shunt Res	15 ohms; ., 60; Wit	at 235 Vo th Pilot and	lts, 100 i Shunt F	ohms. Res., 90;	
36AM3-A	Half-Wave Rectifier	A3	58Q	36.0	0.1	With Capacitive- Input Filter		AC Plate V DC Output				Max. Peak I Tube Voltag			. = 150,	16 volts	
42	Power Pentode	K8	68	6.3	0.7	Amplifier			Fo	or other cl	aracteri	stics, refer to	Type 6F	6-G.			
43	Power Pentode	K8	6B	25.0	0.3	Class A Amplifier	95	-15v	95	4	20	45000	2000		4500	0.9	
50A5	Beam Power Tube	13		50.0	0.15	Single-Tube Class A Amplifier	100 200	- 7.5v 180Ω	110 125	4 2.2	49 46	13000 28000	8000 8000		2000 4000	2.1 3.8	
50FK5	Power Pentode	A3	7CV	50.0	0.1	Class A Amplifier	110	62Ω	115	8.5	32	14000	12800		3000	1.2	
00/10	Rectifier-Doubler	J 3	7DX	50.0	0.15	Rectificr-Douhler						refer to Typ					
50Y6-GT	Rectifier-Doubler	F6	7Q‡	50.0	0.15	Rectifier-Doubler						refer to Typ					
50Y7-GT	Rectifier- Douhler Heater Tap for	F6 Pilot La		50.0 ween Pins	0.15 6 and 7	Voltage Doubler Half-Wave	Max. I	C Volts per	ma., 65		Pla	n. Total Effe te, 15 ohms 'otal Effec. 1			•		
75	Pilot Twin Diode-	K5		6.3	0.3	Rectifier Amplifier	Max I 100	COutput M - 1v			volts, 1 0.5	5 ohms; at 1 110000	50 volts, 4 925	0 ohms; at : 100			ŀ
	High-Mu Triode						250	- 2v			1.1	85000	1175	100			1

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Types Not Recommended for New Equipment Design

Туре	Name	Dime and	ube ensions Basing gramA	Filam Unless sp types har Heater trolled wa	ter or ent (F) acified all re heaters, with con- irmup time.	Use Values to right give operating conditions and characteristics for indicated typical use	Plate Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Cur- rent	Plate Cur- rent	AC Plote Resis- tance	Trans- conduc- tance	Amplifi- cotion Factor	Load for Stated Pewer Output	Power Out- put
	-	Dim.	8. D.	Velts	Amps.	783 4 1 27 4.	Velts	Ohms (Ω)	Velts	Ma.	Ma.	Ohms	Micromhos		Ohms	Watts
14B6	Twin Diode— High-Mu Triode	J2	8W	12.6	0.15	Triode Unit as Class A Amplifier	100 250	-1v -2v		—	0.5	110000 85000	925 1175	100 100		
14C7	Sharp-Cutoff Pentode	J2	8V	12.6	0.15	Class A Amplifier	100 250	- 3v - 3v	100 100	0.9 0.8	2.9 3.0	700000 1.0+§	1575 1650	—	—	
14F7	High-Mu Twin Triode	J2	8AC	12.6	0.15	Each Unit as Class A Amplifier	250	- 2v	<u> </u>		2.3	44000	1600	70	<u> </u>	
14F8	Medium-Mu Twin Triode	J2	88W	12.6	0.15	Each Unit as Class A Amplifier	250	500Ω			6.0		3300	48		
14 Q7	Pentagrid Converter	J2	8AL	12.6	0.15	Converter	250	Self- Excited	100	8.5	3.5	1.0§		l Resistor, n Transcon		
14R7	Twin Diode— Remote-Cutoff Pentode	J2	8AE	12.6	0.15	Pentode Unit as Class A Amplifier	250	- 1v	100	2.1	5.7	1.0§	3200			
17BH3	Novar Half- Wave Rectifier	CI	9HP	17.0⊕	0.6	Television Damper Service			-	For other	ratings,	refer to Typ	e 6BH3.			
178Q6- GTB	Beam Power Tube	F16	6AM	16.8⊕	0.45	Horizontal Deflec- tion Amplifier	Max. DC Plate Volts, 600 Max. DC Cathode Ma., 112.5 Max. DC Cathode Ma., 112.5									00 (Abs.
17C9	Sharp-Cutoff Twin Tetrode	G1	10F	16.8	0.15	Each Unit as Class A Amplifier	125	— 1v	80	1.5	10	100000	8000			
17DM4	Half-Wave Rectifier	F15	4CG	16.8⊕	0.45	Television Damper Service	For other ratings, refer to Type 6DM4.									
17GE5	Beam Power Tube	L2	128 J	16.8	0.45	Horizontal Deflec- tion Amplifier	- Max. DC Plate Volts, 770 Max. DC Cathode Ma., 175 Max. Peak Positive-Pulse Plate Volts, 6500 (Abs.)								s.)	
17GT5	Beam Power Tube	C2	9NZ	16.8⊕	0.45	Horizontal Deflec- tion Amplifier		DC Plate V Peak Pos				thode Ma.,		fax. Peak (late Dissip		
17GV5	Beam Power Tube	L3	12DR	16.8	0.45	Horizontal Deflec- tion Amplifier			Fe	or other c	haracteri	stics, refer t	o Type 17	GE5		
17H3	Half-Wave Rectifier	B4	9FK	17.5⊕	0.3	Television Damper Service	Max	. Peak Inve . Peak Plate	e Ma., 45	0	00		Ma	ix, Average ix, Plate D	issipation	n, 3 watt
18A5	Beam Power Tube	F9	6CK	18.5⊕	0.3	Horizontal Deflec- tion Amplifier		. DC Plate . DC Catho						PosPulse Dissipatio		
19AU4- GTA	Half-Wave Rectifier	F15	4CG	18.9⊕	0.6	Television Damper Service		. Peak Inve . Peak Plat			00			Average P Plate Diss		
19BG6-GA	Beam Power Tube	F33	58T	18.9	0.3	Horizontal Deflec- tion Amplifier		. DC Plate . DC Plate				Max. Peak Max. Plate				00 (Abs.
19 J 6	Medium-Mu Twin Triode	A2	78F	18.9	0.15	Each Unit as Class A Amplifier	100		or both u		8.5	7100	5300	38	—	
19 T 8	Triple Diode— High-Mu Triode	82	9E	18.9	0.15	Triode Unit as Class A Amplifier	100 250	-1v -3v			0.8	54000 58000	1300 1200	70 70		
19X8	Medium-Mu Triode— Sharp-Cutoff	82	9AK	18.9	0.15	Triode Unit as Class A Amplifier Pentode Unit as	125	-1v -1v	125	2.2	12 9	6000 300000	6500 5500	40		
25CA5	Pentode Beam Power	A3	7CV	25.0	0.3	Class A Amplifier Class A Amplifier	110	- 4v	110	3.5	32	16000	8100		3500	1.1
25EC6	Tube Beam Power Tube	F29	58T	25.0⊕	0.6	Horizontal Deflec- tion Amplifier	125 - 4.57 125 4 37 15000 9200 - 4500 1.								(Abs.)	
25L6	Beam Power Tube	E4	7AC	25.0	0.3	Amplifier	110 200	- 7.5v	110	4 2	49 50	13000 30000	9000 9500		2000 3000	2.1



FOOTNOTES

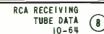
- Note 1: Subscript 1 on class of amplifier service (as AB₁) indicates that grid current does not flow during any part of input cycle.
- With tube mounted horizontally and pins No. 4 and No. 8 in a vertical plane (pin No. 4 on top). deflecting electrode No. 1 controls left-hand section of pattern, deflecting electrode No. 2 controls top right-hand section of pattern, deflecting electrode No. 3 controls bottom section of
- Supply voltage applied through 20000-ohm voltage-unopping resistor
- § Megohms.
- 50000 ohms.
- For two tubes.
- Grid # 2 tied to plate.
- × Applied through plate resistor of 250000 ohms.

- [°] Both grids connected together; likewise, both plates.
- A Grids # 2 and # 4 are screen. Grid # 1 is signal-input control grid.
- ‡ This diagram is like the one having the same designation except that Pin No. 1 has no connection,
- This diagram is like the one having the same designation except that base sleeve is connected to Pin No. 1.
- ⊙ For use in automobile receivers which operate directly from 12-volt storage batteries.
- ▲ Grids # 2 and # 4 are screen. Grid # 3 is signal-input control grid.
- Grids # 3 and # 5 are screen. Grid # 4 is signal-input control grid.
- [†] Power output is for two tubes at stated plate-to-plate load.

Symbol	Maximum Overall Length x Diameter	Description	Symbol	Maximum Overall Length x Diameter	Description	Symbol	Maximum Overall Length x Diameter	Description
AI	1-3/4" x 3/4"	Z-Pin	F6	3-5/16" x 1-9/32"		F40	5-11/16" x 2-1/16"	Octal-Glass Types
A2 A3	2-1/8" x 3/4" 2-5/8" x 3/4"	Miniature Types	F7 F8 F9	3-5/16" x 1-5/16" 3-3/8" x 1-9/32" 3-7/16" x 1-9/32"		G1	2.190" × 0.875"	10-Pin Miniature Type
81 82 84	1-3/4" x 7/8" 2 3/16" x 7/8" 2-5/8" x 7/8"	9-Pin Miniature Types Novar Types Octal-Metal Types	F10 F15	3-15/32" x 1-7/16" 3-13/16" x 1-9/32"		H2	3.23″ x 1.188″	9-Pin T9-Bulb Types
85 B8	2-11/16" x 7/8" 2-27/32" x 7/8"		F16 F17 F19	3-7/8" x 1-9/32" 3-7/8" x 1-9/16" 4" x 1-9/16"		J2 J3	2-25/32" x 1-3/16" 3-5/32" x 1-3/16"	Lock-In Types
810 813	3-1/16" x 7/8" 2-13/16" x 7/8"		F20 F21	4-1/16" x 1-9/32" 4-1/8" x 1-9/16"	Octal-Glass Types	K3 K4	4-3/16" x 1-3/16" 4-3/16" x 1-9/16"	
C1 C2	3.410" x 1.188" 3.54" x 1.562"		F22 F23 F24	4-1/4" x 1-9/16" 4-5/16" x 1-5/8" 4-15/32" x 1-9/16"		К5	4-17/32" x 1-9/16"	
E2 E3	2-5/8" x 1-5/16" 3-1/8" x 1-5/16"		F25 4-5/8" F28 4-5/8" F29 4-3/4" F33 5"	4-5/8" x 1-9/16" 4-5/8" x 1-13/16"		K8 K9	4-11/16" x 1-13/16" 4-15/16" x 1-9/16"	Other Types
E4 E5	3-1/4" x 1-5/16" 4-5/16" x 1-5/8"			4-3/4" x 1-9/16" 5" x 1-9/16" 5" x 1-23/32"		к11	5-3/8" x 2-1/16"	
F1 F2	2-5/16" x 1-5/16" 2-5/8" x 1-1/16"	Octal-Glass Types	F34 F38 F39	5" x 1-23/32 5-7/32" x 1-23/32" 5-5/16" x 2-1/16"		L2 L3	2.875" x 1.563" 3.625" x 1.563"	12-Pin T9-8ulb Type

World Radio History

KEY TO TUBE DIMENSIONS

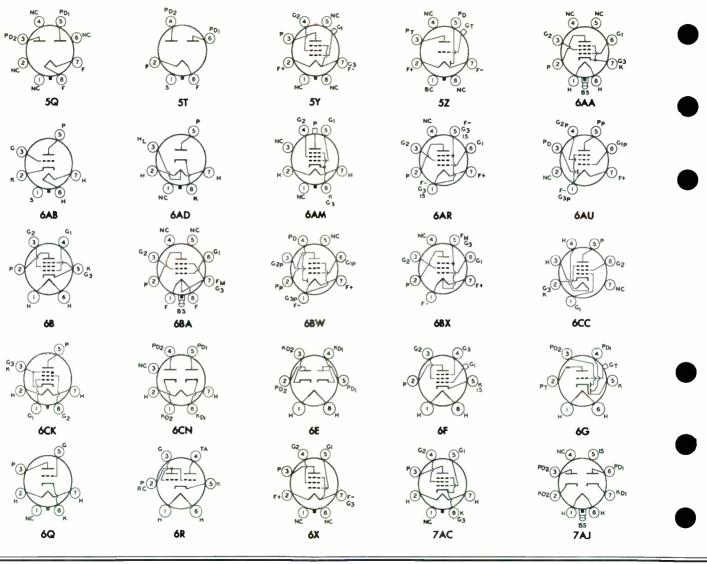


Types Not Recommended for New Equipment Design

Туре	Name	Tube Dimensions and Basing Diagram		Heater or Filament (F) Unless specified all types have heaters. Heater with con- trolled warmup time.		Use Values to right give eperating conditions and characteristics for indicated typical use	Plote Sup- ply	Grid Bias Volts (v) or Cathode Resistor	Screen Sup- ply	Screen Cur- rent	Plate Cur- rent	AC Plate Resis- tance	Trons- conduc- tance	Amplifi- cotion Factor	Load fer Stated Pewer Dutjet	Power Out- put
		Dim.	8. D.	Velts	Amps.		Velts	Ohms (\Omega)	Velts	Ma.	Ma.	Ohnes	Micromhos		Ohms	Watts
80	Full-Wave Rectifier	K8	4C	5.0F	2.0	With Capacitive- Input Filter With Inductive-	Max.	olts per Plat Peak Inversion	e Volts, 1	400	Max	Output Ma . Peak Plat . DC Outp	e Ma., 44	0 Imped	per Plat	ect. Suppl e, 50 ohn put Choke
84/6Z4	Full-Wave	K4	5D	6.3	0.5	Input Filter With Capacitive- Input Filter	AC V Max.	Peak Invers olts per Plat Peak Invers	e (RMS) e Volts,), 325 1250	DC Max	t. Peak Plat Output Ma . Peak Plat	., 60 e Ma., 180	0 Tot Imped	10 henr	ies
04/024	Rectifier		50	0.5	0.5	With Inductive- Input Filter		olts per Plat Peak Invers				. DC Outpu . Peak Plat			Value of 1 hoke, 10	
117L7-GT/	Rectifier-Beam Power Tube	F9	8A0	117	0.09	Amplifier Unit as Class A Amplifier	105	- 5.2v	105	4	43	17000	5300		4000	0.85
117M7-GT	Power Tube					Half-Wave Rectifier		AC Plate Vo Peak Invers				DC Outpu Peak Plate				ect. Plate- , 15 ohma.
117N7-GT	Rectifier-Beam Power Tube	F9	8AV	117	0.09	Amplifier Unit as Class A Amplifier Half-Waye	100	- 6v	100	5	51	16000	7000		3000	1.2
						Half-Wave Rectifier		AC Plate Vo Peak Invers				. DC Outp . Peak Plat				fect. Plate ce, 15 ohm
117P7-GT	Rectifier-Beam Power Tube	F9	BAV	117	0.09				I	or other	character	istics, refer	to Type 1	17 L 7/ M 7-	GT.	
117Z 3	Half-Wave Rectifier	A3	408	117	0.04	With Capacitive- Input Filter		Peak Inverse			Max.	DC Outpu Peak Plate	Ma., 540	Supply	tal Effect Imped., 2	0 ohms
117Z6-GT	Rectifier- Doubler	F6	701	117	0.075	Voltage Doubler Half-Wave	DC C	/olts per Pla Dutput Ma., /olts per Pla	60 te (RMS), 235	Half-W	otal Effect ave, 30 ohr fotal Effec	ns; Full-W t. Supply	ave, 15 oh Imped. p	ms. er Plate:	At 117
						Rectifier Single Tube	DC 0	Dutput Ma. 1 - 14v	per Plate 250	, 60 4.3	volts, 1 75	5 ohms; at 1 30000	50 volts, 4	0 ohms; at 2	35 volts, 1 2500	6.7
	D D					Class À Amplifier	350	-18v	250	2.5	53	48000	5200		4200	11.3
5881	Beam Power Tube	F10	7AC	6.3	0.9	Push-Pull Class A Amplifier	250 270		250 270	10 • 11 •	120 • 134 •				5000 5000	14.5† 17.5†
						Push-Pull Class AB ₁ Amplifier	360 360		270 270	5¢ 5¢	88 ф 88 ф				6600 3800	26.5† 18 †
7247	Dual Triode	B2	9 A	12.6	0.15	Unit No. 1 as Class A Amplifier Unit No. 2 as	250	- 2v			1.2	62500	1600	100		
				6.3	0.3	Class A Amplifier	250				10.5	7700	2200	17		
7695	Beam Power Tube	H2	9MQ	50	0.15	Class A Amplifier Push-Pull Class AB ₃ Amplifier	130 140		130 140	5 9 ф	100 210 ф	7000	11000		1100 1500	4.5
EM84/ 6FG6	Electron-Ray Tube	BS	9GA	6.3	0.27	Visual Indicator	Trio	de Plate Sup de-Plate Res de Grid-Supp Max. L	istance, i	1 meg.		Plate Ma., get, when t	Triod 0.06	escent-Tar e-Grid Res Fluorescen resistor =	istance, 0 t Target	.47 meg. Ma., 1.6



Types Not Recommended for New Equipment Design



World Radio History

RCA RECEIVING TUBE DATA 10-64

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Types Not Recommended for New Equipment Design

LC = Limited Connection—Do Not Use,

Except As Specified in Data

KEY: BASING DIAGRAMS (Bottom Views)

F+ = Filament (positive only)

F-= Filament (negative only)

= Internal Connection-

Do Not Use

P 2

PT(2

PD2

FM += Filament Tap

= Grid

= Heater

 $H_M = Heater Tap$

- = Gas-Type Tube
- = Base Sleeve BC
- BS = Base Shell
- = External Conductive Coating C
- CL = Collector
- DJ = Deflecting Electrode
- ES = External Shield
- = Filament F

(S) E

Subscripts for multi-unit types: B, beam unit; D, diode unit; HP, heptode unit; HX, hexode unit; P. pentode unit; T, triode unit; TR, tetrode unit;

= Heater Tap for Panel Lamp



4CG

= Shell

TA = Taraet

IS

κ

P

S

= Internal Shield

NC = No Internal Connection

RC = Ray-Control Electrode

= Plate (Anode)

= Cathode





4G

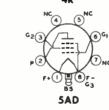
5AC

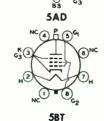
5BQ

F (2











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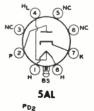
5AG

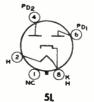
5D



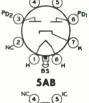
















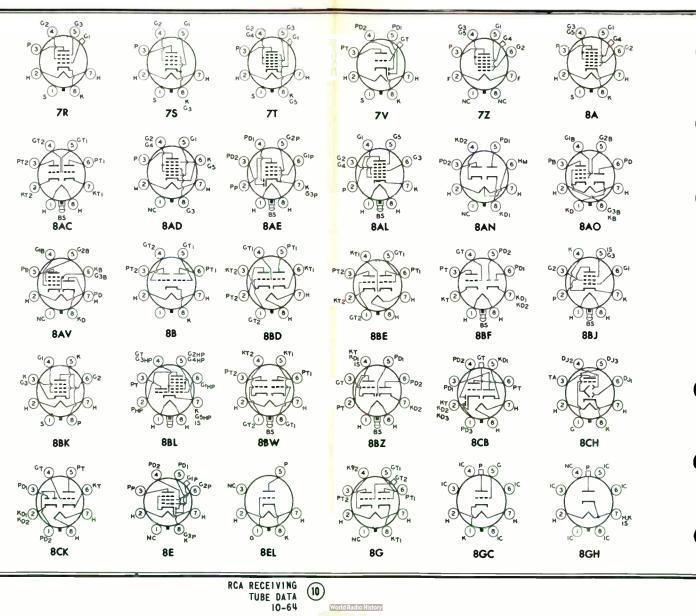




NC(2

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Types Not Recommended for New Equipment Design



6)G2

6)62

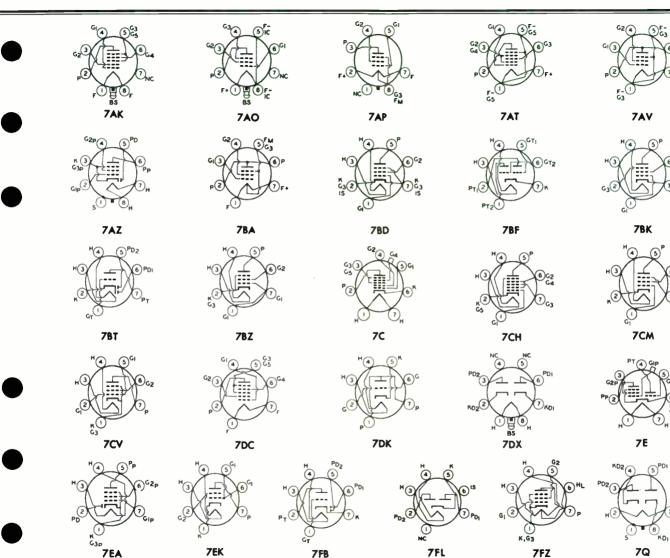
Gg IS

К G3р

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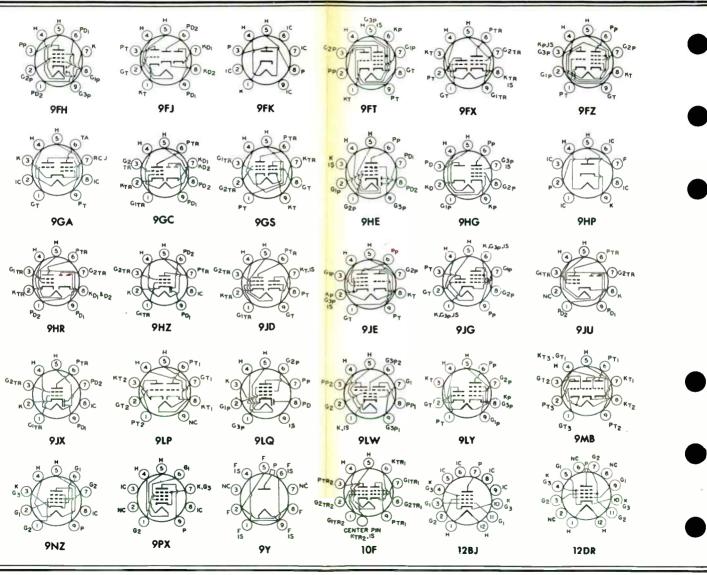
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Types Not Recommended for New Equipment Design



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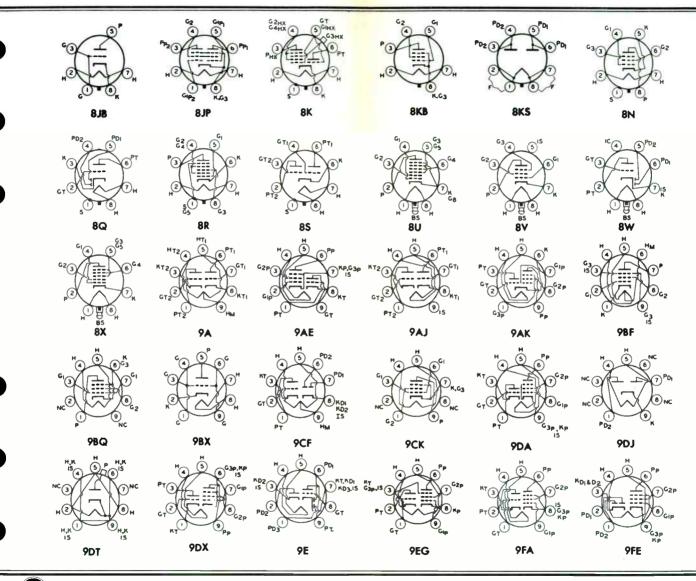
Types Not Recommended for New Equipment Design



World Radio History

RCA RECEIVING TUBE DATA

Types Not Recommended for New Equipment Design



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RCA

Related RCA Receiving-Tube Types

This listing groups HCA receiving-tube types which differ only in their heater ratings. The first column, in bold face, is arranged only by the alphabetical portion of the type designation.

eype des	- B				
648	6A8G 12A8GT	6A8GT	6BQ6GTB/ 6CU6	12BQ6GTB/ 12CU6	17BQ6GTB
6AF3	12AF3	3AF4A		25BQ6GTB 25CU6	
6AF4	2AF4B 6AF4A	JAP 4A	6BQ7A	4B07A	5B07 A
6AL5	3AL5	12AL5	GBRBA	5BR8	
6 AM8 A	5AM8		6BS3	12BS3	17BS3
6AN8A 6A05A	5AN8 5AO5	12AO5	6858 6808	4BS8 3BU8	4BU8
6ARII	11AR11	12/10/3	6BW4	12BW4	4000
6AS8	5AS8		6BW8	5BW8	
6AT6	12AT6		6BY6	3BY6	1076
6AT8A 6AU4	5AT8 19AU4	19AU4GTA	6BZ6	3BZ5 12BZ6	4 BZ 6
6AU6A	3AU6	4AU6	6BZ7	4BZ7	
UNUUN	12406	TADO	1005	0.5.05	
124074	7 AU7	9AU7	50C5 6C9	25C5 17C9	
6AU8A 6AV5GA	8AU8 12AV5GA	25AV5GA	6CA5	12CA5	25CA5
6AV6	3AV6	4AV6	6CB6	3CB6	4CB6
	12AV6		6CD6GA	6CB6A 25CD6GB	
6AW8A 6AX3	8AW8A 12AX3	17 AX3	6CE5	3CE5	
6AX4GT	6AX4GTA	12AX4GTA	6CF6	3CF6	
	12AX4GTB		6CG7 6CG8	8CG7 5CG8	6CG8A
6AY3	17 AX4GTA 12AY3	25AX4GT 17AY3	6CL8A	SCL8A	19CL8A
CATO	12/13	TINIS	6CM7	8CM7	1) CLOT
6B10	8B10	1004	6CM8 5CN7	5CM8	
68A6 68A7	3BA6 12BA7	12BA6	6C08	8CN7 5CQ8	
6BA8A	8BA8A		6056	3CS6	4CS6
6BC5	3BC5	4BC5	6CS7	8CS7	
68C8 68D6	4BC8 12BD6		6005	12CU5/ 12C5	17CU5
6BE6	3BE6	12BE6	6CW4	2CW4	13CW4
6BF6 6BG6GA	12BF6		6CX8 6CY5	8CX8 2CY5	3CY5
6BH3	19BG6GA 17BH3	22BH3	0015	4CY5	3013
6BH8	8 BH8	22013	6CY7	11CY7	
6BK5	12BK5	25BK5	6CZ5	5CZ5	
6BK7B 6BL8	5BK7A 4BL8		6DA4	17D4	
6BN4A	2BN4A	3BN4A	6DE4 6DE5	17DE4 4DE6	22DE4
6BN6	3BN6	4BN6	6DE7	4DE6 10DE7	1 3DE7
6BN8 6BQ5	8 BN8 8 BO5		6DK6	3DK6	4DK6
0 by 0	0.000	,		12 DK 6	



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RELATED TYPES

3-64

Related RCA Receiving-Tube Types

6DM4	12DM4	17DM4	6HF8	LOLIES	
6DN6	25DN6	1713014	6HM5/6HA5	10HF8 3HM5/3HA5	
6DQ6B	12DQ6A	12DQ6B	6HR6	1911R6	
-		17DQ6B	6HS6	19HS6	
6DR7 6DS4	10DR7 2DS4	13DR7	6858	3HS8	4HS8
6DT5	12DT5		6J5	6J5GT	12J5GT
6DT6A	3DT6A	4DT6A	6J6A 6J7	5J6 6J7GT	19J6 12J7GT
6DT8 6DV4	12178		6JB6	12JB6	12J7G1 17JB6
6DX8	2DV4 10DX8		6JC6	3JC6	4JC6
6DZ4	2DZ 4	3DZ4	6JD6	3JD6	4JD6
6EA5	3EA5		6JV8	8JV8	
6EAS	SEAS SEA8	19EA8	0 4 7		
6EB8	8EB8	176760	6K7 6K8	6K7GT 12K8	12K7GT
6EH5	12EH5	25EH5	6KA8	8KA8	
	50EH5		6KE8	5KE8	
6EH7	31:H7	4EH7	6KL8	12KI.8	
6EJ7 6EM5	3EJ7 8EM5	4EJ7	6KV8	11KV8	
6EM7	10EM7	13EM7	50L6GT	121.6GT	251.6
6E07	12E07	20E07	502001	25L6GT	2310
6ER5	2ER5	3ER5	6LC8	8LC8	
6ES8	4E.S8				
6EU8	5EU8		607	6Q7 GT	12Q7GT
6EW6 6EY6	4EW6 7EY6	SEW6	6S8GT	12S8GT	
	1610		6SA7	6SA7GT	12SA7
6F5	6F5GT	12F5GT	6SC7	12SA7GT 12SC7	
6FD7 6FE5	13FD7 50FE5		6SF5	6SF5GT	12SF5
6FG7	SFG7			12SF5GT	12010
6FH5	21115	3FH5	6SF7	12SF7	
6F07	8F07		6SG7	12SG7	
6FS5	2FS5		6SH7	12SH7	10010
6FV8	5FV8	6FV8A	6SJ7	6SJ7GT 12SJ7GT	12SJ7
60FX5	12 FX 5		6SK7	6SK7GT	1000
6GE5	12GE5	17GE5	0317	12SK7GT	12SK7
6GF7	10GF7	13GF7	6SL7GT	12SL7GT	
6GH8	5GH8	6GH8A	6SN7GTB	12SN7GTA	
6GJ5	12GJ5	17GJ5	6SQ7	6SQ7GT	12SQ7
6GK5	2 CK 5	3GK5		12SQ7GT	
6GM6 6GN8	4GM6 8GN8	5CM6 10GN8	6SR7	12SR7	
3658	4GS8	TUGNS	6T8A	5 T 8	1 9T 8
6GT5	12GT5	17GT5	6U8A	5U8 A	9U8A
6GW6	12GW6	17GW6	676	6V6GTA	5V6GT
6GX6	5GX6			12V6GT	
ENC	(UCCT/C	1017	6W4GT	25W IGT	
6H6 6HA5	6H6GT/G See 6HM5/	12H6	6W6GT	12 W6GT	
6HB6	15HB6	0143	6X4 6X8	12X4	1000
		k	010	5X8	19X8

RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History

Harrison, N. J.





DIODE CONSIDERATIONS DIODE-TRIODE AND DIODE-PENTODE TUBES

Certain multi-unit tubes contain one or more diode plates, each having its own base pin, in add:tion to a triode or pentode unit. Such types may employ either a unipotential cathode or a filamentary cathode.

In unipotential-cathode tubes the cathode is common to the triode or pentode unit and the diode(s). In filamentary-cathode tubes the filament is likewise common to the triode or pentode unit and the diode(s). However, in filament types, diode operation is affected by the position of the diode plate(s) with respect to the filament, and, therefore, the position of the diode plate(s) is specified on the individual tube data sheets.

The rectifying action of the diode is commonly used for the following purposes:

Detection: Detection may be accomplished by using either a half-wave or full-wave circuit arrangement to supply signal voltage to the triode or pentode unit of the tube or to another amplifier tube. The haif-wave circuit will provide approximately twice the rectified voltage obtaiwable from a full-wave circuit forthe same applied signal voltage. Since the amplitude variation of the envelope of the rectified voltage is usually of greater importance than rectifier power, the half-wave circuit is more commonly used in practice.

AVC: Regulation of amplifier gain, generally called Automatic Volume Control, may be accomplished by using the output of a diode rectifier in a number of ways. The diode output may be applied to the cortrol grids of the preceding amplifier tubes, or it may be applied, in the case of rf pentodes, to their suppressors, plates anc/or screens.

The above functions can be performed simultaneously by using a single diode, two diodes in parallel, or by two diodes operating independently. A number of typical circuit arrangements are shown on the following pages.

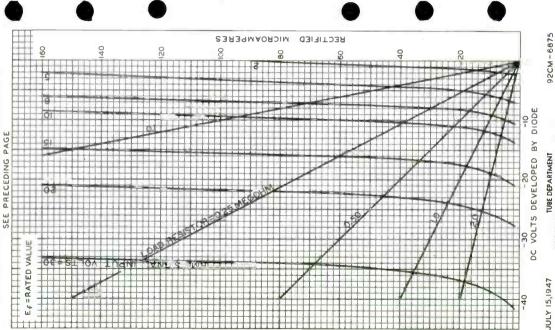
Average Characteristic Curves for diodes in diode-triode and diode-pentode tubes are shown on the next page.





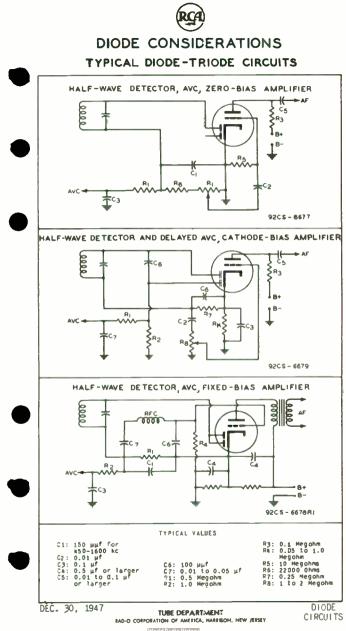


UNIT ICS F DIODE TERIS. SINGLE υ ٩ α 1 ∢ TION-Í \overline{O} `∢ DIODE TIFIC RECT AVERAGE HALF-WAVE

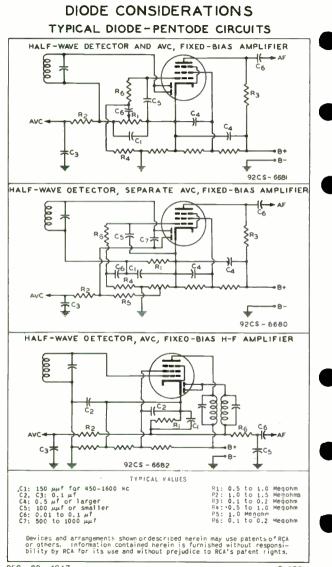


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TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DIODE

Note: Chart number references, listed below, supersede those which may appear on individual tube data sheets for these types.

Tube Chart Type No.	Tube Chart Type No.	Tube Chart Type No.	Tube Chart Type No.	Tube Chart Type No.
3AU6 2	58K7A 10	68Z7 10	6T8A 5	12AX7A 9
3AV6 9	5BQ7A 10	6C4 3	7AU7 3	12AY7 I
36C511	518 5	6CB611	80.G7 8	12SL7G ⁻ 5
36.8611	6AB4 4	6CB6A 11	ECN7 5	125N7GTA 8
3C.F6 I	6AG5	6CF6	8FQ78	I9T85
4AU6 2	6AT6 5	6CG7 8	9AU7 3	20EZ7 9
44V6 9	6AU6A 2	6CN7 5	€2AT6 5	5879 ⁴ 6
4BC5 11	6AV6 9	6EU79	12AT7 4	5879*7
48Q7A 10	68C5 I1	6FQ7 8	12AU6 2	7025 9
48Z7 10	6BK7810	6SL7GT 5	'2AU7A 3	71994 12
4CB611	6BQ7A 10	65N7GT8 8	12AV6 9	7199* 13

A Pentode Unit

Triode Unit or Triode Connection

SYMBOLS USED IN RESISTANCE-COUPLED AMPLIFIER CHARTS

- C = Blocking Capacitor (µf).
- C_k = Cathode Bypass Capacitor (µf).
- Cg2 = Screen-Grid Bypass Capacitor (µf).
- Ebb = Plate-Supply Voltage. Voltage at plate equals platesupply voltage minus drop in Rp and Rk.
- R_k = Cathode Resistor (ohms).
- Rgz = Screen-Grid Resistor (megahms).
- Rg = Grid Resistor (megohms) for following stage.
- Rp = Plate Resistor (megohms).
- V.G. = Voltage Gain.
- Eo = Output Voltage (peak volts). This voltage is obtained across Rg (for following stage) at any frequency within the flat reg on of the output vs. frequency curve, and is for the condition where the signal level is adequate to swing the grid of the resistance-coupled amplifier tube to the point where its grid starts to draw current.

Note: The listed values for E_0 are the peak output voltages available when the grid is driven from a low-impedance source. The listed values for the cathode resistors are optimum for any signal source, with a high-impedance source, protection against severe distortion and loss of gain due to input loading may be obtained by the use of a coupling capacitor connected directly to the input grid and a high-value resistor connected between the grid and ground.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. RES.-COUP. AMP. I 5-65

CIRCUIT ADVANTAGES

For most of the types shown, the data pertain to operation with cathode bias; for all of the pentodes, the data pertain to operation with series screen-grid resistor. The use of a cathode-bias resistor where feasible and a series screen-grid resistor where applicable offers several advantages over fixedvoltage operation.

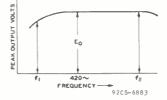
The advantages are: (1) effects of possible tube differences are minimized; (2) operation over a wide range of platesupply voltages without appreciable change in gain is feasible; (3) the low frequency at which the amplifier cuts off is easily changed; and (4) tendency toward motorboating is minimized.

NUMBER OF STAGES

These advantages can be enhanced by the addition of suitable cecoupling filters in the plate supply of each stage of a multi-stage amplifier. With proper filters, three or more amplifier stages can be operated from a single power-supply unit of conventional design without encountering any difficulties due to coupling through the power unit. When decoupling filters are not used, not more than two stages should be operated from a single power-supply unit.

GENERAL CIRCUIT CONSIDERATIONS

In the discussions which follow, the frequency (fg) is that value at which the high-frequency response beguns to fall off. The frequency (f1) is that value at which the low-frequency response drops below a satisfactory value, as discussed below. A variation of 10 per cent in values of



resistors and capacitors has only slight effect on performance. One-half-watt resistors are usually suitable for R_{g2} , R_{g} , and R_k resistors. Capacitors C and C_{g2} should have a working voltage equal to or greater than Ebb. Capacitor C_k may have a low working voltage in the order of 10 to 25 volts.



RES.-COUP. AMP. 1 RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

Resistance-Coupled Amplifiers

Triode Amplifier (Heater-Cathode Type)

Capacitors C and Ck have been chmsen to give an output voltage equal to 0.8 Eo for a frequency If]: of 100 cycles. For any other values of (f]), multiply values of C and Ck by 100/f]. In the case of capacitor Ck, the values shown in the charts arm for an amplifier with dc heater excitation; when ac is used, depending on the character of the associated zircuit, the gain, and the value of f], it may be necessary to increase thm value of Ck to mirimize hum disturbarces.

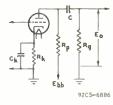


Diagram No.1

It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. The voltage output at fi, or "n" like stage equals $(0.B)^{n}E_{0}$ where E_{0} ispeak output voltage of final stage. For an amplifier of typical construction, the value of f2 is well above the audio-frequency range for any value of Rp.

Pentode Amplifier (Heater-Cathode Type)

Capacitors C, Ck, and C_{g2} have been chosen to give an output voltage equal to 0.7 E_0 for a frequency (f₁) of 100 cycles. For any other value of f₁, multiply values of C, Ck, and Cg2 by 10C/f₁. In the case of capacitor Ck, the values shown in the charts are for an amplifier with dc heater excitation; when ac is used, depending on the character of the associated circuits, the voltage

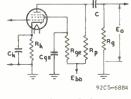


Diagram No.2

gain, and the value of f₁, it may be necessary to increase the value of C_k to minimize hum disturbances. It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. The voltage output at f₁ for "n" like stages equals $(0.7)^{n}E_{0}$ where E_{0} is the peak output voltage of final stage. For an amplifier of typical construction, and for R_p values of 0.1, 0.25, and 0.5 megohm, approximate values of f₂ are 20000, IC000, and 5000 cps, respectively.

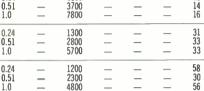
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RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. RES.-COUP. AMP. 2 5-65

12AY7

See Circuit Diagram 1 C. Ehb Ro R, R_{e2} Rk **C**_{g2} C 0.1 D.24 D.51 0.24 1800 0.51 3700 90 7800 1.0 D.1 0.24 1300 180 0.24 0.51 2800 1.0 5700 0.51 0.1 0.24 1200 300 0.24 0.51 2300 0.51



E.*

13

V.G.

24

26

27 29

30

28

30 31



3AU6, 4AU6, 6AU6A, 12AU6

See Circuit Diagram 2

E _{bb}	$R_{\rm p}$	R _{st}	R_{g2}	Rk	C _{g2}	\boldsymbol{c}_{k}	C	E °,	V.G.
90	0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.340 0.370 0.380 1.00 1.00 1.00 1.90 2.40	2700 2900 3100 6000 6200 6300 10800 13100	0.057 0.050 0.050 0.027 0.023 0.027 0.017 0.017	5.8 5.4 5.3 2.8 2.7 2.8 1.7 1.7	0.0081 0.0055 0.0034 0.0042 0.0027 0.0019 0.0025 0.0017	16 22 25 13 17 25 10 19	79 104 125 105 137 161 139 184
180	0.22 0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.520 0.520 0.520 1.05 1.15 1.20 2.40 2.70	1340 1390 1420 2700 2880 2960 5500 6000	0.059 0.059 0.059 0.039 0.037 0.036 0.028 0.022	8.8 8.7 8.6 5.5 5.4 5.4 3.2 2.8	0.0081 0.0053 0.0032 0.0041 0.0027 0.0019 0.0023 0.0015	31 43 48 34 43 50 33 40	143 192 223 189 249 294 230 323
300	0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.530 0.540 1.15 1.22 1.31 2.50 2.80	780 783 800 1590 1650 1720 3300 3500	0.077 0.077 0.077 0.057 0.049 0.045 0.036 0.031	13.° 13.2 13.1 8.4 7.4 7.2 5.3 4.2	0.0082 0.0053 0.0033 0.0045 0.0027 0.0017 0.0022 0.0015	53 65 74 56 72 82 57 72	200 270 316 275 357 418 352 466

Cathode resistors should be adequately bypassed.

RES.-COUP. AMP. 2

RADIO CORPORATION OF AMERICA Harrison, N. J. **Electronic Components and Devices** World Radio History





6C4, 7AU7, 9AU7, 12AU7A

See Circuit Diagram 1

E _{bb}	Rp	Rg	R_{g2}	R _k	\mathbf{C}_{g2}	Ck	C	E _o *	V.G.
90	0.047 0.047 0.047 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 0.22 0.47 1.0		1600 1800 2000 3000 3800 4500 6800 9500 11500		3.2 2.5 2.0 1.6 1.1 1.0 0.7 0.5 0.43	0.061 0.033 0.015 0.032 0.015 0.007 0.015 0.0065 0.0035	9 11 14 10 15 18 14 20 24	10 11 11 11 11 11 11 11 11 11
180	0.047 0.047 0.047 0.1 0.1 0.3 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.0		920 1200 1400 2000 2800 3600 5300 8300 10000		3.9 2.9 2.5 1.9 1.4 1.1 0.8 0.56 0.48	0.062 0.037 0.016 0.032 0.016 0.007 0.015 0.007 0.0035	20 26 29 24 33 40 31 44 54	11 12 12 12 12 12 12 12 12 12 12
309	0.047 0.047 0.047 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.0		870 1200 1500 1900 3000 4000 5300 8800 11000		4.1 3.0 2.4 1.9 1.3 1.1 0.9 0.52 0.46	0.065 0.034 0.016 0.032 0.016 0.007 0.015 0.007 0.0035	38 52 68 44 68 80 57 82 92	12 12 12 12 12 12 12 12 12 12

• One triode unit.

* Peak volts.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Wolicitation History RES.-COUP. AMP. 3 5-65



6AB4, 12AT7*

See Circuit Diagram 1

E _{bb}	$R_{\rm p}$	Rg	R _{g2}	R _k	\boldsymbol{C}_{g2}	Ck	C	E°,	V.G.
90	0.1 0.1 0.22 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		2680 3060 3390 5500 6300 6930 10900 12500 13500		2.4 2.00 1.84 1.33 1.01 0.92 0.63 0.52 0.47	0.026 0.014 0.0074 0.0136 0.0067 0.0038 0.007 0.0043 0.0031	8 11 13 10 14 15 13 14 18	24 25 28 25 28 28 28 26 28 28 28
180	0.1 0.1 0.22 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		1407 1674 1786 2890 3860 4660 6960 8450 9600		3.6 3.0 2.6 1.75 1.34 1.14 0.83 0.67 0.55	0.029 0.016 0.0083 0.0140 0.0077 0.0047 0.0047 0.0075 0.0046 0.0032	20 28 31 24 35 42 31 39 45	31 33 34 33 33 33 31 32 32
300	0.1 0.1 0.22 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		974 1404 2169 2510 4200 4950 5700 8720 9700		4.0 3.1 2.5 1.9 1.3 1.1 0.90 0.62 0.57	0.028 0.015 0.0083 0.015 0.0074 0.0046 0.0076 0.0041 0.0030	37 57 78 50 78 85 57 81 88	34 34 33 33 32 32 32 32 32

· One triode unit.

* Peak volts.



RADIO CORPORATION OF AMERICA Harrison, N. J.



5T8, 6AT6, 6CN7, 6SL7GT, 6T8A, 8CN7, !2AT6, 12SL7GT,[•] 19T8

See Circuit Diagram 1

E _{bb}	Rp	Rg	R_{g2}	R _k	C_{g2}	C,	C	E _*	V.G.
90	C.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 022 047 022 0.47 1.0 0.47 1.0 2.2		4200 4600 4800 7000 7800 8100 12000 14000 15000		2.5 2.2 2.0 1.5 1.3 1.1 0.83 0.7 0.6	0.025 0.014 0.0065 0.013 0.007 0.0035 0.006 0.0035 0.006	5.4 7.5 9.1 7.3 10 12 10 14 16	22 27 30 30 34 37 36 39 41
180	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.8 0.47 1.0 2.2		1900 2200 2500 3400 4100 4600 6600 8100 9100		3.6 3.1 2.8 2.2 1.7 1.5 1.1 0.9 0.8	0.027 0.014 0.0065 0.014 0.0065 0.0035 0.0065 0.0035 0.002	19 25 32 24 34 38 29 38 43	30 35 37 38 42 44 44 46 47
300	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 0.1 0.47 1.0 2.2		1500 1800 2100 2600 3200 3700 5200 6300 7200		4.4 3.6 3.0 2.5 1.9 1.6 1.2 1.0 0.9	0.027 0.014 0.0065 0.013 0.0065 0.0035 0.006 0.0035 0.006 0.0035 0.002	40 54 63 51 65 77 61 74 85	34 38 41 42 46 48 48 50 51

· One triode unit.

* Peak volts.



RADIO CORPORATION OF AMERICA Electronic Components and Electronic Components and Electronic History Harrison, N. J. RES.-COUP. AMP. 4



As Pentode: 5879

E _{bb}	R _p	Rg	R _{g2}	R _k	C_{g2}	Ck	C	\bm{E}_{o}^{*}	¥.G.
90	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2	0.35 0.35 0.35 0.80 0.80 0.80 1.9 1.9 1.9	1700 1700 1700 3000 3000 3000 7000 7000	0.044 0.046 0.047 0.034 0.035 0.036 0.021 0.022 0.023	4.6 4.5 4.4 3.2 3.1 3.0 1.8 1.7 1.7	0.020 0.012 0.006 0.010 0.005 0.003 0.005 0.003 0.003	13 17 20 15 21 24 21 25 28	29 39 47 43 59 67 59 75 87
180	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2	0.35 0.35 0.35 0.80 0.80 0.80 1.9 1.9 1.9 1.9	700 700 700 1200 1200 2500 2500 2500	0.060 0.062 0.064 0.045 0.046 0.048 0.033 0.034 0.035	7.4 7.3 7.2 5.5 5.3 5.2 3.5 3.4 3.3	$\begin{array}{c} 0.020\\ 0.012\\ 0.006\\ 0.010\\ 0.005\\ 0.003\\ 0.005\\ 0.003\\ 0.003\\ 0.002\end{array}$	24 28 33 24 31 34 27 32 37	39 56 65 87 101 98 122 140
300	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2	0.35 0.35 0.35 0.80 0.80 0.80 1.3 1.3 1.3 1.3	300 300 600 600 1200 1200 1200	0.075 0.077 0.080 0.056 0.057 0.058 0.044 0.046 0.047	10.8 10.6 10.5 7.9 7.5 7.4 5.3 5.2 5.1	0.020 0.012 0.006 0.010 0.005 0.003 0.003 0.005 0.003 0.002	25 32 35 28 37 41 34 42 48	51 68 83 109 123 125 152 174

See Circuit Diagram 2

* Peak volts.



RADIO CORPORATION OF AMERICA Electronic Componentis and Devices Harrison, N. J.

RES.-COUP.



As Triode: 5879

See Circuit Diagram 1

E ^{PP}	Rp	Rg	R_{g2}	Rk	C_{g2}	$\boldsymbol{\mathfrak{g}}_{\mathbf{k}}$	C	E _o *	V.G.	
90	0.047 0.047 0.047 0.1 0.1 0.22 0.22 0.22	D.047 D.1 D.22 0.1 0.22 0.47 0.22 0.47 1.00		1800 2100 2200 3200 3900 4300 6200 8100 9000		2.9 2.4 2.3 1.8 1.3 1.0 0.87 0.53 0.49	0.060 0.033 0.016 0.027 0.015 0.007 0.015 0.006 0.003	9 12 14 10 13 16 12 16 19	10 11 21 12 13 13 13 13 13 13	
180	0.047 0.047 0.047 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.00		1200 1600 1800 2200 2900 3400 4500 6400 8200		3.5 2.6 2.4 1.9 1.35 1.1 0.92 0.61 0.52	0.063 0.033 0.016 0.031 0.015 0.007 0.015 0.006 0.003	21 29 35 26 33 40 28 39 47	12 13 13 13 14 14 14 14 14	
300	0.047 0.047 0.047 0.1 0.1 0.1 0.1 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.00		1100 1500 1700 2000 3400 3700 4300 7200 7400		3.9 2.8 2.5 2.1 1.4 1.1 0.97 0.63 0.63	0.063 0.033 0.016 0.032 0.015 0.007 0.015 0.007 0.003	42 65 71 45 74 83 50 88 94	13 13 14 15 15 15 15 15 15 15	

* Peak volts.



RADIO CORPORATION OF AMERICA Electronic Components and Denices in History Harrison, N. J. RES.-COUP. AMP. 5



6CG7, 6FQ7, 6SN7GTB, 8CG7, 8FG7, 125N7GTA*

E	bb	R _p	Rg	R _{g2}	R _k	C _{g2}	\boldsymbol{C}_{k}	C	E _*	V.G.
	90	0.047 0.047 0.047 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 0.22 0.47 1.00		1870 2230 2500 3370 4100 4800 7000 9100 10500		3.1 2.5 2.1 1.8 1.3 1.1 0.80 0.65 0.60	$\begin{array}{c} 0.063\\ 0.031\\ 0.016\\ 0.034\\ 0.015\\ 0.006\\ 0.013\\ 0.007\\ 0.004\\ \end{array}$	14 18 20 15 20 23 16 22 25	13 14 14 14 14 15 14 14 15
	180	0 047 0.047 0.047 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.00		1500 1860 2160 2750 3550 4140 5150 7000 7800		3.6 2.9 2.2 1.8 1.4 1.3 1.0 0.71 0.61	0.066 0.055 0.015 0.028 0.015 0.007 0.016 0.007 0.004	33 41 47 35 45 51 36 45 51	14 14 15 15 16 16 16
	300	0.047 0.047 0.1 0.1 0.1 0.1 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.00		1300 1580 1800 2590 3130 3900 4800 6500 7800		3.6 3.0 2.5 1.9 1.4 1.2 0.95 0.69 0.58	$\begin{array}{c} 0.061 \\ 0.032 \\ 0.015 \\ 0.031 \\ 0.004 \\ 0.0065 \\ 0.015 \\ 0.0065 \\ 0.0035 \end{array}$	59 73 83 68 82 96 68 85 96	14 15 16 16 16 16 16 16 16

See Circuit Diagram 1

• One triode unit.

* Peak volts.



RES.-COUP. AMP. 5 RADIO CORPORATION OF AMERICA Electronic Components and Devices



Resistance-Coupled Amplifiers

RESISTANCE-COUPLED AMPLIFIER CHARTS



3AV6, 4AV6, 6AV6, 6EU7, 12AV6, 12AX7A, 20EZ7, 7025

E _{bb}	Rp	Rg	R_{g2}	Rk	C_{g2}	Ck	C	E _o *	V.G.
90	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		4400 4700 4800 7000 7400 7600 12000 13000 14000		2.7 2.4 2.3 1.6 1.4 1.3 0.9 0.8 0.7	0.023 0.013 0.007 0.012 0.006 0.003 0.006 0.003 0.002	5 6 9 11 9 11 13	29 35 41 39 45 48 48 52 55
180	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		1800 2000 2200 3000 3500 3900 5800 6700 7400		4.0 3.5 3.1 2.4 2.1 1.8 1.3 1.1 1.0	0.025 0.013 0.006 0.012 0.006 0.003 0.006 0.003 0.002	18 25 32 24 34 39 30 39 30	40 47 52 53 59 63 62 66 68
300	0.1 0.1 0.22 0.22 0.22 0.47 0.47 0.47	0.1 0.22 0.47 0.22 0.47 1.0 0.47 1.0 2.2		1300 1500 1700 2200 2800 3100 4300 5200 5900		4.6 4.0 3.6 3.0 2.3 2.1 1.6 1.3 1.1	0.027 0.013 0.006 0.013 0.006 0.003 0.006 0.003 0.006 0.003 0.002	43 57 66 54 69 79 62 77 92	45 52 57 65 65 68 69 73 75

See Circuit Diagram 1

· One triode unit.

* Peak volts.





RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison N. J. RES.-COUP. AMP. 6

Resistance-Coupled Amplifiers

RESISTANCE-COUPLED AMPLIFIER CHARTS



4BQ7A, 4BZ7, 5BK7A, 5BQ7A, 6BK7B, 6BQ7A, 6BZ7

See Circuit Diagram 1

E _{bb}	R _p	Rg	R _{g2}	R _k	C _{g2}	Ck	C	E _o *	V.G.
90	0.047 0.047 0.047 0.1 0.1 0.1 0.1 0.22 0.22 0.22	0.647 0.10 0.22 0.1 0.22 0.47 0.22 0.47 1.0		1580 1760 1820 2920 3570 4020 6040 7500 8800		4.0 3.5 3.0 2.1 1.7 1.4 0.98 0.78 0.63	0.058 0.032 0.015 0.029 0.015 0.0075 0.0135 0.0075 0.0075 0.0036	9 13 16 12 17 20 16 21 25	18 19 20 19 20 20 20 19 20 20
180	0.047 0.047 0.047 0.10 0.10 0.10 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 0.22 0.47 1.0		694 817 905 1596 1630 1860 3950 4500 5530		6.0 4.4 4.0 2.80 2.30 2.00 1.24 0.96 0.79	0.062 0.032 0.0155 0.030 0.0152 0.0073 0.0150 0.0072 0.0038	25 32 35 30 32 38 35 41 49	23 24 25 23 24 24 22 23 23
300	0.047 0.047 0.047 0.10 0.10 0.10 0.22 0.22 0.22	0.047 0.1 0.22 0.10 0.22 0.47 0.22 0.47 1.0		438 542 644 1009 1332 1609 2623 3900 4920		6.70 5.50 4.30 3.5 2.5 2.1 1.5 1.1 0.88	$\begin{array}{c} 0.062\\ 0.032\\ 0.016\\ 0.031\\ 0.015\\ 0.0074\\ 0.015\\ 0.0073\\ 0.0039\\ \end{array}$	38 48 57 42 56 64 50 70 84	26 27 25 26 25 24 24 24 24

· One triode unit.

* Peak volts.



RES.-COUP.

RADIO CORPORATION OF AMERICA Electronic Compagents and Devices Harrison, N. J.



(11)

3BC5, 3CB6, 3CF6, 4BC5, 4CB6, 6AG5, 6BC5, 6CB6, 6CB6A, 6CF6

See	Circ	uit	Diagram	2
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E _{bb}	Rp	Rg	\mathbf{R}_{g2}	Ric	C_{g2}	Ck	C	E _{0}*	V.G.
90	0.22 0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.480 0.480 0.500 1.04 1.04 1.10 2.50 2.50	3800 3800 4400 7200 7700 8400 16000 18600	0.046 0.049 0.045 0.033 0.033 0.031 0.018 0.016	5.5 5.5 5.3 2.9 2.8 2.6 1.4 1.2	0.0084 0.0054 0.0034 0.0044 0.0029 0.0020 0.0020 0.0023 0.0017	10 16 23 10 15 18 10 11	89 114 128 111 133 152 118 139
180	0.22 0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.550 0.620 0.650 1.00 1.00 1.00 2.60 2.60	1600 1800 1900 3400 3500 3800 7300 7400	0.072 0.062 0.059 0.059 0.059 0.059 0.029 0.029	9.5 8.5 6.0 6.0 5.8 2.7 2.7	0.0090 0.0053 0.0034 0.0048 0.0031 0.0020 0.0022 0.0016	30 36 43 34 41 46 33 38	161 208 239 183 229 262 227 281
300	0.22 0.22 0.22 0.47 0.47 0.47 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.600 0.680 0.700 1.25 1.34 1.53 2.60 3.00	980 1090 1150 2000 2150 2350 4000 4700	0.085 0.084 0.081 0.064 0.061 0.057 0.044 0.038	13.0 12.0 11.0 7.9 7.6 7.1 5.2 4.3	0.0085 0.0055 0.0033 0.0045 0.0029 0.0019 0.0023 0.0015	51 64 74 52 67 79 51 69	223 288 334 285 363 416 334 427

One triode unit.

* Peak volts.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. RES.-COUP. AMP. 7 5-65



7199 (Pentode Unit)

E _{bb}	Rp	Rg	R_{g2}	R _k	$\mathbf{C}_{\mathbf{g}2}$	Ck	C	E _o *	V.G.
90	0.22	0.22	0.560	3700	0.046	4.50	0.0090	12	73
	0.22	0.47	0.600	3900	0.043	4.30	0.0055	17	95
	0.22	1.0	0.640	4200	0.039	4.00	0.0033	19	109
	0.47	0.47	0.870	6000	0.036	2.70	0.0046	16	95
	0.47	1.0	0.980	6700	0.044	3.00	0.0030	22	113
	0.47	2.2	1.00	6700	0.043	2.80	0.0020	25	131
	1.0	1.0	2.00	12200	0.021	1.44	0.0028	15	119
	1.0	2.2	2.20	12800	0.024	1.74	0.0016	21	167
180	0.22 0.22 0.22 0.47 0.47 0.47 1.0 1.0	0.22 0.47 1.0 0.47 1.0 2.2 1.0 2.2	0.530 0.600 0.650 1.12 1.40 1.57 2.50 3.40	1570 1730 1820 3200 3500 3740 6500 7500	0.069 0.064 0.053 0.042 0.040 0.039 0.026	7.50 7.40 7.30 5.30 5.10 5.40 2.80 2.30	0.0088 0.0064 0.0034 0.0046 0.0028 0.0019 0.0024 0.0015	32 38 45 35 40 45 34 39	82 164 190 147 209 250 179 277
300	0.22	0.22	0.600	9200	0.086	11.2	0.0085	52	182
	0.22	0.47	0.670	1010	0.076	10.5	0.0052	66	236
	0.22	1.0	0.720	1100	0.076	10.0	0.0033	77	257
	0.47	0.47	1.25	1950	0.060	7.0	0.0044	41	221
	0.47	1.0	1.43	3210	0.053	6.4	0.0027	72	296
	0.47	2.2	1.45	2200	0.055	6.3	0.0019	82	345
	1.0	1.0	3.00	4100	0.040	4.2	0.0022	57	295
	1.0	2.2	3.30	4340	0.037	3.6	0.0016	74	378

See Circuit Diagram 2

* Peak volts.

RES.-COUP. AMP. 7

RADIO CORPORATION OF AMERICA Electronic Components and Devicer

Harrison, N. J.





7199 (Triode Unit)

See Circuit Diagram 1

Ebb	Rp	t R _g	IR_{g2}	R _k	$\mathbf{C}_{\mathbf{g}2}$	Ck	C	E°,	V.G .
90	0.047 0.047 0.047 0.10 0.10 0.10 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.0		1292 1401 1470 2630 3090 3440 6550 8270 9130		3.3 2.8 2.4 1.60 1.24 1.10 0.70 0.51 0.44	0.060 0.032 0.016 0.029 0.015 0.008 0.015 0.0077 0.0045	8 10 11 9 12 14 12 16 18	12 13 13 13 13 14 12 12 12
180	0.047 0.047 0.047 0.10 0.10 0.10 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.0		723 836 948 1543 2002 2522 4390 6122 8060		4.0 3.5 2.9 2.0 1.6 1.2 0.79 0.57 0.47	0.061 0.032 0.016 0.031 0.016 0.0082 0.015 0.007& 0.007& 0.0046	16 20 24 17 24 30 24 33 41	14 14 15 14 14 13 13 12 12
300	0.047 0.047 0.047 0.10 0.10 0.10 0.22 0.22 0.22	0.047 0.1 0.22 0.1 0.22 0.47 0.22 0.47 1.0		534 726 840 1117 1613 2043 3133 4480 4930		4.0 3.6 3.0 2.3 1.7 1.31 0.93 0.69 0.56	0.061 0.031 0.015 0.031 0.0155 0.007B 0.007B 0.0079 0.0045	27 38 44 26 41 51 36 51 55	15 15 15 14 14 13 13 13

* Peak volts.



RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

RES.-COUP. AMP. 8 5-65

World Radio History

Harrison, N. J.



GRID-Nº 2 INPUT RATING CHART

The Grid-No.2 Input Rating Chart shown on the back of this page presents graphically the relationship between the grid-No.2 voltage and the maximum grid-No.2 input for certain multi-electrode tube types.

The chart shows that full rated grid-No.2 input is permissible at grid-No.2 voltages up to 50 per cent of the maximum rated grid-No.2 supply voltage. From the 50 per cent point to the full rated value of supply voltage, the grid-No.2 input must bedecreased. The decrease in allowable grid-No.2 input follows acurve of the parabolic form.

This chart is useful for applications utilizing either a fixed grid-No.2 voltage, or a series grid-No.2 voltagedropping resistor.

Where a fixed grid-No.2 voltage is used, it is necessary only to determine that the grid-No.2 input is within the boundary of the operating area on the chart at the selected value of grid-No.2 voltage to be used.

Where a grid-No.2 voltage-dropping resistor is used, the minimum value of resistor that will assure tube operation within the boundary of the curve can be determined from the following relation:

$R_{g2} \stackrel{\geq}{=} \frac{E_{c2} (E_{cc2} - E_{c2})}{P_{c2}}$

where:

- Rg2 = minimum value for grid-No.2 voltage-dropping resistor in ohms.
- Ec2 = selected value of grid-No.2 voltage involts.
- Ecc2 = grid-No.2 supply voltage in volts.
- $P_{c2} = \text{grid}-\text{No.2 input in watts corresponding to } E_{c2}$.

EXAMPLES

Example 1 - Use of a Fixed Grid-No. 2 Supply Voltage:

The tube data for a certain tube stipulates a maximum grid-No.2 supply voltage rating of 300 volts, and a maximum grid-No.2 input rating of 1 watt. It is desired to operate the tube with a fixed voltage of 200 volts between grid No.2 and cathode. This value is 66-2/3% of the maximum grid-No.2 supply voltage rating. From the chart, the maximum grid-No.2 input, therefore, must be limited to 88% of the maximum grid-No.2 input rating or 0.88 watt.

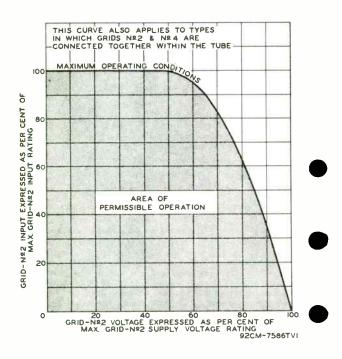


GRID-Nº 2 INPUT RATING CHART

Example 2 - Use of a Grid-No. 2 Voltage-Dropping Resistor:

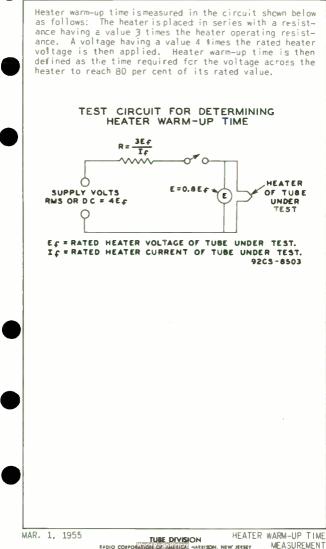
The tube data for a certain tube stipulates a maximum grid-No.2 supply voltage rating of 300 volts, and a maximum grid-No.2 input rating of 1 watt. It is desired to operate the tube with a grid-No.2-to-cathode voltage of 250 volts, obtained through a dropping resistor from a 300-volt power supply. Because 250 volts is 83% of 300 volts, the maximum grid-No.2 input must be limited, as shown on the chart, to 56% of the maximum grid-No.2 input rating, or0.56 watt. Then, the minimum value required for the grid-No.2 voltage-dropping resistor will be:

 $R_{g2} = \frac{250 (300 - 250)}{0.56} = 22,320 \text{ ohms}$





HEATER WARM-UP TIME MEASUREMENT FOR TUBE TYPES INTENDED FOR USE IN SERIES HEATER-STRING ARRANGEMENT



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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4

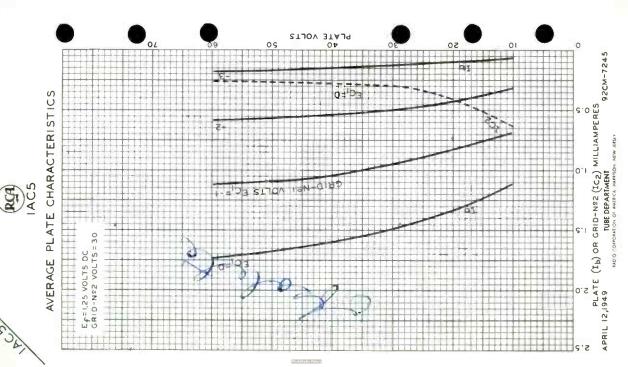
I

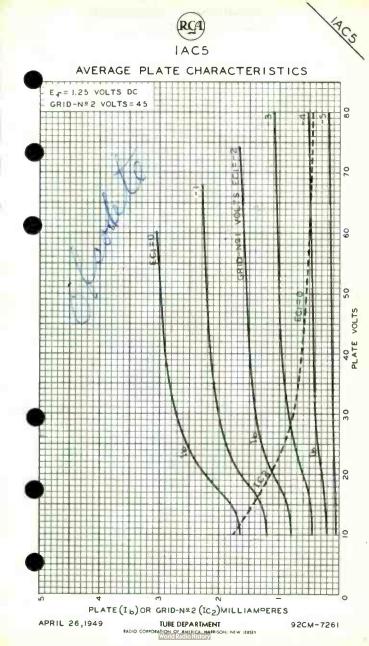
	SUBM						
	GE	NERAL	DATA				
Electrical:							
Filament, Coated: Voltage		1.25				de	volt
Current		0.04					am
echanical:							
Mounting Position							· An
Maximum Overall Leng Maximum Seated Lengt					• •		1-3/4
Length, Base Seat to	Bull To	op tex	 cludir	ng tip) i.;	 200" ±	1-1/2 0.060
Maximum Diameter Bulb].					0.4
ase	1:10		 Small-	Butto	n Sub-		T-j 8-Pi
		TTOM V					• • •
Pin 1 - No Connecti	on 🗸	0_6)			ament	. ,
Pin 2-Grid No.	MA	1-	1º			Connec	tion
Pin 3 - No Cognect/		5	110		7 – Pla		
Pin 4 - Filament (- GNO No.3	1 1	n	Y	Pina	s-Gri	d No.	2
	AMPLIF	IER -	Class	A			
Maximum Ratings, Des	ıgn-Cen	ter Va	lues:				
PLATE VOLTAGE						max.	volt
GRID-No. 2 (SCREEN) TOTAL CATHODE CURREN						max. max.	volt
Typical Operation an							
				30	45	67.5	volt
rid-No.2 Voltage . rid-No.1 (Control-G				30	45	67.5	volt
Prid-No.1 (Control-G Peak AF Grid-No.1 Vo				2	-3	-4.5	volt volt
Zero-Signal Plate Cu	rrent		. 0.		1.0	2.0	m
Zero-Signal Grid-No.					0.2	0.4	m
Plate Resistance Transconductance					. 17	0.15	megoh umho
load Resistance						25000	ohm
otal Harmonic Disto					10	10	
MaxSignal Power Ou	tput .			5	15	50	m

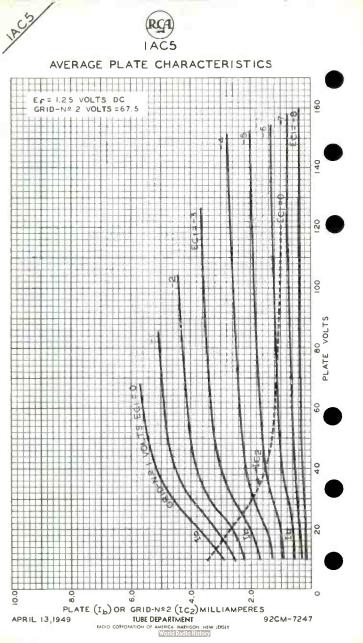
SEPT. 15, 1949

TENTATIVE DATA

TUBE DEPARTMENT







Half-Wave Vacuum Rectifier

ELECTRICAL

Rogov Volue

Filament (Coated) Voltage, AC or DC1.25 YWithout external shield Plate to filament.0.2 AMithout external shield Plate to filament.1.6 pfMECHANICAL	Bogey Values	
Direct Interelectrode Capacitance (Approx.) Without external shield Plate to filament		
Without external shield Plate to filment. I.6 pF MECHANICAL Operating Position		A
MECHANICALOperating PositionAny Maximum Overall LengthSetedSeated LengthSetedSeted LengthSeted<	Without external shield	
Operating Position	Plate to filament	۶F
Type of Cathode	ME CHAN I CAL	-
Maximum Overall Length	Operating Position	٦y
Seated Length		
Diameter		
<pre>Dimensional Outline (JEDEC No.9-98) See General Section Envelope JEDEC T9 Caps (Alternates) Small (JEDEC No.C1-1) Small with Tubular Support (JEDEC No.C1-34) Base Small-Button Duodecar 12-Pin (JEDEC No.E12-70) TERMINAL DIAGRAM (Bottom view)</pre>		
Envelope JEDEC T9 Caps (Alternates) Small (JEDEC No. C1-1) Small with Tubular Support (JEDEC No. C1-34) 8ase Small-Button Duodecar 12-Pin (JEDEC No. E12-70) TERMINAL DIAGRAM (Bottom View) Pin 1 - Filament, Internal Shield Pin 2 - Eo Not Use ^a Pin 3 - Eo Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 12 - Filament Cap - Plate To specified in Oberating Considerations Specified in Oberating For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak ^b		
Small (JEDEC No. C1-1) Small with Tubular Support (JEDEC No. C1-34) 8ase Small-Button Duodecar 12-Pin (JEDEC No. E12-70) TERMINAL DIAGRAM (Bottom View) Pin 1 - Filament, Internal Shield Pin 2 - Do Not Use ^a Pin 3 - Do Not Use ^a Pin 4 - See Mote Pin 5 - Do Not Use ^a Pin 8 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 10 - See Note Pin 11 - Do Not Use ^a Pin 12 - Filament Cap - Plate Mote: May be used only under conditions Spec field in Oberating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings Total dc and peak	Envelope JEDEC	61
Small with Tubular Support (JEDE: No. C1-34) 8ase Small-Button Duodecar (2-Pin (JEDEC No. E12-70) TERMINAL DIAGRAM (Bottom View) Pin 1 - Filament, Internal Shield Pin 2 - Eo Not Use ^a Pin 3 - Eo Not Use ^a Pin 5 - Eo Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 10 - See Note Pin 11 - Eo Not Use ^a Pin 12 - Filament Cap - Plate Total dc and peak ^b		
<pre>Base Small-Button Duodecar 12-Pin (JEDEC No.E12-70) TERMINAL DIAGRAM (Bottom View) Pin 1 - Filament, Internal Shield Pin 2 - Do Not Use^a Pin 3 - Do Not Use^a Pin 6 - Same as Pin 1 Pin 7 - Do Not Use^a Pin 9 - Do Not Use^a Pin 9 - Do Not Use^a Pin 10 - See Note Pin 12 - Filament Cap - Plate Note: May be used only under conditions Specified in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings Total dc and peak^b</pre>		
TERMINAL DIAGRAM (Bottom View) Pin 1 - Filament, Internal Shield Pin 2 - Lo Not Use ^a Pin 3 - Do Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Do Not Use ^a Pin 8 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 10 - See Mote Pin 11 - Bo Not Use ^a Pin 10 - See Mote Pin 12 - Filament Cap - Plate PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Corrent. 0.5 mA Filament Voltage, AC or DC 1.05 to 1.45 V Characteristics, Instantaneous Value Tube Voltage Drop for plate mA = 7 225 V ^a Socket terminals 2, 3, 5, 7, 8, 9, and II should not be used as tie points. ^b Tacetify Spercent of one horizontal acaming cycle is 10 microacconda. * Act args Plate be when the duration of the voltage pulle does not expate, 15 percent of one horizontal acaming cycle is 10 microacconda.))
Pin 2 - Eo Not Use ^a Pin 3 - Eo Not Use ^a Pin 4 - See Note Pin 5 - Eo Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 9 - Eo Not Use ^a Pin 10 - See Note Pin 12 - Filament Cap - Plate Note: May be used only under conditions PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak ^b		.,
Pin 3 - Do Not Use ^a Pin 4 - See Note Pin 5 - Do Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 10 - See Note Pin 11 - Do Not Use ^a Pin 12 - Filament Cap - Plate PULSED-RECTIFIER SERVICE Design-Maximum Ratings Total dc and peak ^b	Pin 1-Filament, Internal Shield	
Pin 4 - See Note Pin 5 - Bo Not Use ^a Pin 6 - Same as Pin 1 Pin 7 - Do Not Use ^a Pin 8 - Do Not Use ^a Pin 9 - Do Not Use ^a Pin 10 - See Note Pin 10 - See Note Pin 12 - Filament Cap - Plate Public Design-Maximum Ratings Por operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak ^b		
<pre>pin 5 - Bo Not Use^a Pin 6 - Same as Pin 1 Pin 7 - Do Not Use^a Pin 8 - Do Not Use^a Pin 9 - Bo Not Use^a Pin 10 - See Note Pin 12 - Filament Cap - Plate Note: May be used only under conditions Por operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak^b</pre>		
Pin 6 - Same as Pin 1 Pin 7 - Do Not Use ⁴ Pin 8 - Do Not Use ⁴ Pin 9 - Do Not Use ⁴ Pin 9 - Do Not Use ⁴ Pin 10 - See Note Pin 11 - Do Not Use ⁴ Pin 12 - Filament Cap - Plate PULSED-RECTIFIER SERVICE Design-Maximum Ratings PULSED-RECTIFIER SERVICE Design-Maximum Ratings Total dc and peak ⁶		
Pin 8 - Do Not Use ^a Pin 10 - See Note Pin 11 - Do Not Use ^a Pin 12 - Filament Cap - Plate Note: Nay be used only under conditions specified in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak ^b		
Pin 9 - Do Not Use ^a Pin 10 - See Note Pin 11 - Do Not Use ^a Pin 12 - Filament Cap - Plate PULSED-RECTIFIER SERVICE Design-Maximum Ratings Total do and peak ^b		
Pin 10 - See Note Pin 11 - Do Nct Use ^a Pin 12 - Filament Cap - Plate Note: May be used only under conditions specified in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Note: Nay be used only under conditions For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Net: Nay be used only under conditions PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Net: Nay be used only under conditions Possible Service Service Net: Nay be used only under conditions Possible Service Service Net: Nay be used only under conditions Possible Service		
Pin 11 - Do Nct Use ^a Pin 12 - Filament Cap - Plate Note: May be used only under conditions spec-fied in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak ^b		
Pin 12 - Filament Cap - Plate 126V Note: Nay be used only under conditions specified in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Total dc and peak 26000 V 0C Peak Plate Current 50 mA Average Plate Current 0.5 mA Filament Voltage, AC or DC 1.05 to 1.45 V Characteristics, Instantaneous Value 1.05 to 1.45 V Socket terminal=2, 3, 5, 7, 8, 9, and 11 should not be used as tie points. * * Socket terminal=2, 3, 5, 7, 8, 9, and 11 should not be used as tie points. * * Indicates a change - -		
Bight in Operating Considerations. PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak 2000 V DC 22000 V Peak Plate Current	Pin 12 – Filament I2GV	
PULSED-RECTIFIER SERVICE Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak DC 20000 V Peak Plate Current 50 mA Average Plate Current 0.5 mA Filament Voltage, AC or DC 1.05 to 1.45 V Characteristics, Instantaneous Value Tube Voltage Drop for plate mA = 7 225 V * Socket terminal=2, 3, 5, 7, 8, 9, and 11 should not be used as the points. This rating is epplicable when the duration of the voltage public does not system, 15 percent of one horizontal scanning cycle is 10 microacconda.		15
Design-Maximum Ratings For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Dotal dc and peak Yeak Plate Current	· · · · · ·	
For operation in a 525-line, 30-frame system Inverse Plate Voltage Total dc and peak Dotal dc and peak Yeak Plate Current		
Inverse Plate Voltage Total dc and peak ^b		
Total dc and peak ^b		
DC		v
Peak Plate Current 50 mÅ Average Plate Current 0.5 mÅ Filament Voltage, AC or DC 0.5 mÅ Filament Voltage, AC or DC 1.05 to 1.45 V Characteristics, Instantaneous Value Tube Voltage Drop for plate mA = 7 Socket terminal=2, 3, 5, 7, 8, 9, and 11 should not be used as tie points. b This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle is 10 microaceonda. * Indicates a change.		
Filament Voltage, AC or DC 1.05 to 1.45 V Characteristics, Instantaneous Value Tube Voltage Drop for plate mA = 7		nÅ
Characteristics, Instantaneous Value Tube Voltage Drop for plate mA = 7		
Tube Voltage Drop for plate mA = 7	•	V.
 ^a Socket terminal«2, 3, 5, 7, 8, 9, and 11 should not be used as the points. ^b This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal acanning cycle. In a 525-like 30-frame system, 15 per cent of one horizontal acanning cycle is 10 microseconda. 	Characteristics, Instantaneous Value	
This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal acanning cycle. In a 525-like 300-frame system, 15 per cent of one horizontal acanning cycle is 10 microaeconda. Indicates a change.	Tube Voltage Drop for plate mA = 7	٧
This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal acanning cycle. In a 525-like 300-frame system, 15 per cent of one horizontal acanning cycle is 10 microaeconda. Indicates a change.		
→ Indicates a change.	b This rating is applicable when the duration of the voltage pulse does not	5.
→ Indicates a change.	exceed 15 per cent of one horizontal scanning cycle. In a 525-line 30-frai	ae
RCA RADIO CORPORATION OF AMERICA DATA	- Indicates a chang	». 8.
RCA RADIO CORPORATION OF AMERICA DATA		
(在东北市建设)	RCA RADIO CORPORATION OF AMERICA	A

Harrison, N. J.

6-66

Electronic Components and Devices

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 4 and 10 may be used as tie points for components at or near the cathode potential: otherwise, do not use.

The high voltages at which the IAD2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-Radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.



Harrison, N. J.

3A3A

Half-Wave Vacuum Rectifier

Far High-Voltage Rectifier Circuits in Color and Black-and-White TV Receivers

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Characteristics and Ratings

Voltage (AC ¹ Eh Current at 3.15 VIh	3.15	
Direct Interelectrode Capacitance (Approx.) Without external shield		
P to (K + 1S + H)	۱.5	₽F
For ib = 7 mA	100	٧

MECHANICAL CHARACTERISTICS

Operating Position			•													Any
Type of Cathode										Co	ba'	teo	11	Uni	ipotent	ial
Maximum Overall Length.															3.812	in
Marimum Seated Length .															3.250	in
Maximum Diameter															1.281	in
Envelope																
Caps (Alternates)																
Small (JEDEC No.C1-1)																
Small with Tubular Sup	opc	ort	1	JE	ED8	ĒC	No	b.(01-	-34	1)					

Base (Alternates)

Intermeciate-Shell Octal: 6-Pin, Arrangement 1 (JEDEC Group 1, No.86-8) Short Intermediate-Shell Octal with External Barriers: 6-Pin, Arrangement 1 (JEDEC Group 1, No.86-60)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Do Not Use Pin 2 - Heater Pin 3 - Do Not Use Pin 5 - Do Not Use Pin 7 - Heater, Cathode, Internal Shield Pin 8 - Do Not Use Cap - Plate



Note: May be used only under conditions specified in Operating Considerations,

PULSED-RECTIFIER SERVICE

Design-Maximum Ratings For operation in a 525-line. 30-frame	system	
Peak Inverse Plate Voltage ^a . – Peak Plate Current ib	30000	V mA
Average Plate Current Ib(av) Heater Voltage, AC Eh 2.65 π	2 nin 3.65	mA max V



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 6-66

^a This rating is applicable when the duration of the voltage pulse does not exceed 15% of one horizontal acanning cycle. In a \$25-line, 30-frame system, 15% of one horizontal scanning cycle is 10 µs.

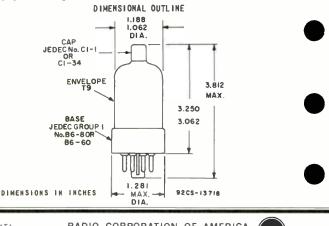
OPERATING CONSIDERATIONS

Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 orto a corona shield which connects to terminal 7. Socket terminals 4 and 6 may be used as tie points at or near catheode potential. Otherwise, do not use.

The high voltages at which the 3A3A is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential points in the electrical system. The interlock devices should function to break the primary circuits of the highvoltage supply when any gate or door on the protective housing is opened, and should prevent the closing of this primary circuit until the door is locked again.

It should be noted that high voltages may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitor should be grounded.

Operation of the 3A3A with a plate voltage above approximately 16000 volts (absolute value) results in the production of X radiations which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simply shielding should prove adequate, but the need for this precaution should be considered in equipment design.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

ELECTRICAL

Filament,Coated
Min Av Nax Voltage (AC)
Flate to filament & internal shield 1.3 PF
MECHAN I CA L
Operating Position. Any Maximum Overall Length. 3-9/16 in Seated Length. 2-13/16 ± 3/16 in Maximum Diameter. 1-9/32 in Bulb. 79 Cap. Small with Tubular Support (JEDEC No.Cl-34)
Bases (Alternates) Intermediate-Shell Octal:
B-Pin (JEDEC Group 1, No.88-6) 7-Pin, Arrangement 2 (JEDEC Group 1, No.87-166) 6-Pin, Arrangement 1 (JEDEC Group 1, No.86-8) 5-Pin, Arrangement 2 (JEDEC Group 1, No.85-82) Short Intermediate-Shell Octal: 7-Pin (JEDEC Group 1, No.87-47) Short Intermediate-Shell Octal with External Barriers: 6-Pin, Arrangement 1 (JEDEC Group 1, No.86-60) 5-Pin, Arrangement 2 (JEDEC Group 1, No.85-85) Basing Designation for BOTTOM VIEW
Pin 1 ^b - Limited Connection ^c Pin 2 - Filament Pin 3 - Same as Pin 1 Pin 4 ^d - Same as Pin 1 Pin 5 ^e - Same as Pin 1 Pin 5 ^e - Same as Pin 1 Pin 7 - Filament, Internal Shield Pin 8 - Same as Pin 1 Cap - Plate
PULSED-RECTIFIER SERVICE
Maximum Ratings, Design-Maximum Values
Maximum Katings, Design-Maximum Values

Inverse Plate Voltage Total dc and peak [†] . DC. Peak Plate Current. Average Plate Current Character						•		26000 22000 50 0.5	V V mA mA
Tube Voltage Drop for								100	۷



RADIO CORPORATION OF AMERICA Electromic Components and Devices World Rector History

IG3GT/IB3GT

RADIO-FREQUENCY RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values

For operation in a 525-line, 30-frame system

Peak Inverse Plate Voltag	e.,	к ж			-	4	×	33000	٧
Peak Plate Current	12.1					14	10	35	mA
Average Plate Current	•			e) 1.	 1.1	1.1		1.1	mA
Frequency Range of Supply	Vo	ltag	je					1.5 to 100	kc/s

Characteristics, Instantaneous Value

- Without external shield.
- ^b On the 5-pin bases, pin 1 is omitted.
- See Operating Considerations.
- d On the 5-pin bases, the 6-pin bases, and the 7-pin base JEDEC No.B7-166, pin 4 is omitted.
- On the 5-pin bases, the 6-pin bases, and the 7-pin base JEDEC No. B7-47, pin 1 is omitted.
- ^f This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microaeconds.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 1,3,4,5,6, and 8 may be connected to socket terminal 7 or to a corona shield which is connected to socket terminal 7. Socket terminals 4 and 6 may be used as tie points for components at or near filament potential. Otherwise, do not use.

Measurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulse- or rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 1G3GT/1B3GT is operated from a dc or low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of existation to produce 1.25 volts (rms) at the filament terminals.

The high voltages at which the IG3GT/IB3GT is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-Radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

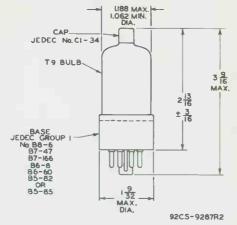


V

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

1G3GT/1B3GT

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Radio History

DATA 2 7-65





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HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

	GENERAL DATA		
Electrica	al:		
Voltage Current Direct In	, Coated: e*		ac volt , am , am
Mechanica	al:		
Maximum (Seated Le Maximum [Bulb Cap Base	g Position Overall Length ength Diameter Small with Tubular Suppor Intermediate- Arrangement 1 (Short Intermediate ith External Barriers, Arrangement Designation for BOTTOM VIEW	t (JEDEC N Shell Octa JEDEC No.E -Shell Oct 1 (JEDEC N	1-9792 T No.C1-34 1 6-Pin 36-8), o tal 6-Pi tal 6-Pi
Pin 2- Pin 3-	nection— Do Not Use -Filament	7 — Filamer Interr Shieid 8 — Same as p — Plate	nal I
	PULSED-RECTIFIER SERVICE		
Maximum R	Ratings, Design-Naximum Values:		
	For operation in a 525-line, 30-fra	me system ^C	נ
Total c DC. PEAK PLAT	PLATE VOLTAGE: dc and peak [®] TE CURRENT CURRENT	26000 max 22000 max 50 max 0.5 max	k. volt
	ristics:		
Character			volt
DC Plate	Voltage Current	225 7	m

ELECTRON TUBE DIVISION TENTAT





HALF-WAVE VACUUM RECTIFIER

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals Nos.1,3,4,5,6, and 8 may be connected to socket terminal No.7 or to a corona shield which is connected to socket terminal No.7. Socket terminals Nos.4 and 6 may be used as tie points for components at or near filament potential.

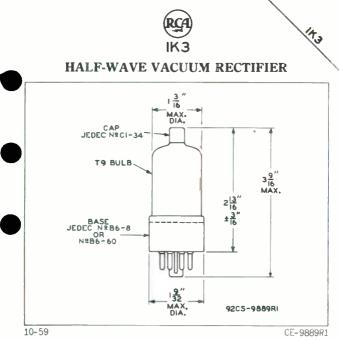
Neasurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulseor rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this colwr temperature with that obtained when the filament of another 1K3 is operated from a dc or low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of excitation to produce 1.25 volts (rms) at the filament terminals.

The high voltages at which the 1Kg is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

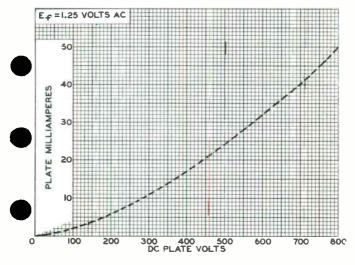
I rays. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce I rays which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

TENTATIVE DATA

4







ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY WORCREDITISTORY

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Electrical:

Filament Characteristics and Ratings:

Min. Av. Max.
Voltage (AC) 1.05 1.25 1.45 volts
Current at 1.25 volts 0.2 - amp Direct Interelectrode Capacitance
(Approx.): a
Plate to filament and internal
shield 1.6 pf
Mechanica I :
Operating Position
Type of Cathode
Maximum Overall Length
Sealed Length
Bulb
Cap Small with Tubular Support (JEDEC No. C1-34)
Bases (Alternates):
Intermediate-Shell Octal:
6-Pin, Arrangement 1 (JEDEC Group 1, No.B6-8) Short Intermediate-Shell Octal with External Barriers:
6-Pin, Arrangement 1 (JEDEC Group 1, No.86-60)
Basing Designation for BOTTOM VIEW
Pin 1 - See Note
Pin 2 – Filament
Pin 3-See Nate
Pin 5 - See Note
Pin 7-Filament, internal Shield
Pin 8 - See Note
Cap-Plate
NOTE: May be used only under conditions

NOTE: May be used only under conditions specified in Operating Considerations.

PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Naximum Values:

	For opera	st i on	11	n a	54	25-	-11	17.0	е,	30	-frame	syst «m Þ	
DC . Peal: Pl	Plate Vo dc and po ate Current	nt .	:	•••	:	:	:	•	:	:	22000 50	max. max.	volts volts ma ma
DC Mlat	eristics: e Voltage e Current												volts ma



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

- Without external shield.
- b As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.
- The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 20-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

Socket Connections. Socket terminals I, 3, 4, 5, 6, and 8 may be connected to socket terminal No. 7 or to a corona shield which is connected to socket terminal 7. Socket terminals 4 and 6 may be used as tie points for components at or near filament potential.

Measurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulse-or-rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another IK3/IJ3 is operated from a dcor low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of excitation to produce 1.25 volts (rms) at the filament terminals.

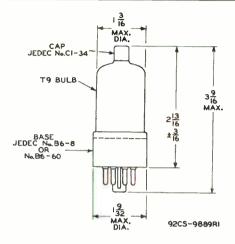
The high voltages at which the 1Kg/1Jg is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.



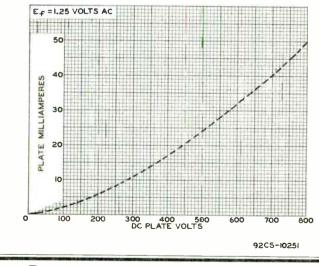


1K3/1J3



DIMENSIONS IN INCHES

AVERAGE PLATE CHARACTERISTIC

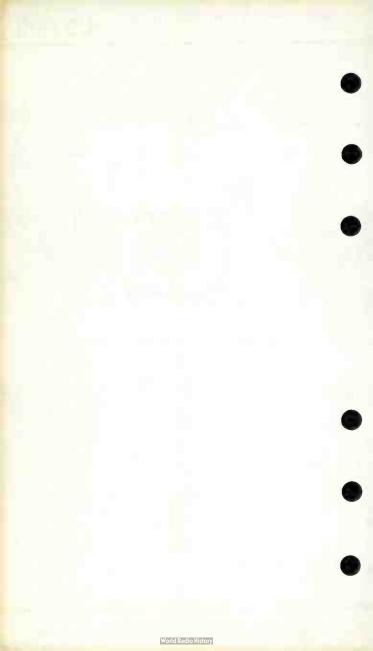


RADIO CORPORATION OF AMERICA

Harrison, N. J.

Electronic Components and Devices

DATA 2 3-64





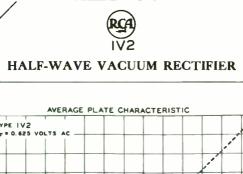


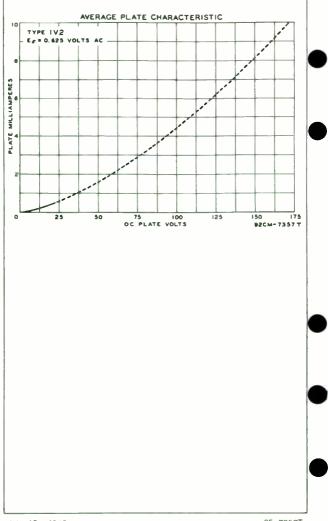
HALF-WAVE VACUUM RECTIFIER

GENERAL DATA
Electrical:
Filament, Coated: Voltage
^O with no external shield.
Hechanical:
Mounting Position
HALF-WAVE RECTIFIER
Pulsed-kectifier Service"
Maximum Ratings, Design-Center Values: PEAK (NVERSE PLATE VOLTAGE 7500 max. volts PEAK PLATE CURRENT 10 max. ma AVERAGE PLATE CURRENT 0.5 max. ma
The duration of the voltage pulse must not exceed 15% of one norizontal scanning cycle in a 525—line, 30—frame system as described in "Standards- of Good Engiseering Practice Concerning Television Broadcast Stations", Federal Communications Commission. In such a system, 15% of one scanning cycle is 10 microseconds.
OPERATING NOTES When the flament voltage is measured, it is recommended that a thermal rms voltmeter be used. The meter and its leads must be insulated to withstand 15000 volts and the stray capacitances to ground should be minimized.

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History

TENTATIVE DATA





12

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Filament, Coated:

	Nin.	Aν.	Nax.	
Voltage (AC) Current at 1.25 volts Direct Interelectrode Capacitance (Ap Plate to filament & internal shield	_ prox.)	0.2	1.45	volts amp µµuf
Mechanical:				
Operating Position	(JEDEC a) 9-P	. 2- 0.750 ee Gen No.C1 in (JE	2-7 7/16" erai S -2 or (DEC No	27/32" ± 1/8" 0.875" ection T6-1/2 C1-33) .E9-1)
Pin 1-Filament, Internal Shield Pin 2-Filament Pin 3-Limited Connection ^b Pin 4-Same as Pin 1	Pin Pin Pin a) Pin	6 - Sau 7 - Sau 8 - Sau	measP measP measP measP measP neasP ate	in 1 in 3 in 2

PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values: For operation in a 525-line, 30-frame system^C INVERSE PLATE VOLTAGE: Total dc and peak^d. . 22000 max. volts 18000 max. volts 45 max. ma AVERAGE PLATE CURRENT 0.5 max. ma Characteristics, Instantaneous Value: Tube Voltage Drop for plate ma. = 7 100 volts ^a Without external shield. ^b See Operating Considerations. ^C As described in "Standards of Good Engineering Practice Concerning Tele-vision Broadcast Stations," Federal Communications Commission. d

^d The duration of the voltage pulse must not exceed 15 per cest of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

- Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division



OPERATING CONSIDERATIONS

Socket Connections. Socket terminals 3 and 7 may be used as tie points for components at or near filament potential; otherwise, do not use.

Heasurement of Filament Voltage. To measure the filament voltage when the filament is at a high dc potential with respect to ground, it is recommended that a simple method utilizing visual comparison of the filament temperature be used. The color temperature of the filament, operating from a pulse-or-rf-power source, may be checked by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. 'A visual comparison of this color temperature with that obtained when the filament of another IX2B is operated from a dc or low-frequency ac supply of 1.25 volts, provides a convenient means for adjusting the amount of excitation to produce 1.25 volts (rms) at the filament terminals.

The high voltages at which the 1%2B is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of filament voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

I rays. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce I rays which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

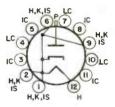




Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC). 2.5 ± 0.4 ampvolts ampCurrent at heater volts = $2.5 \ldots \ldots 0.330$ ampDirect Interelectrode Capacitance HApprox.):* P to (K + IS + H) .1.4
Mechanical:
Operating Position. Any Type of Cathode Coated Unipotential Maximum Overall Length 3.625" Seated Length 3.000" to 3.250" Diameter 1.062" to 1.188" Bulb 79 Cap Small (JEDEC Nc.C1-1) or
Small With Tubular Support (JEDEC No.C1-34) BaseSmall-Button Duodecar 12-Pin (JEDEC No.E12-70) Basing Designation for BOTTOM VIEW12EW

Pir	1 - Heater, Cathoo	le,
	Internal Shie	10
Pir	2 - Same as Pin 1	
Pin	3-Do Not Useb	
Pin	4 - See Note	
Pir	5-Do Not Use ^b	
Pin	6 - Same as Pin 1	
Pir	7 - See Note	
Pir	8-Do Not Useb	
Pir	9-Same as Pin 1	
	10 - See Note	
	11 - Do Not Useb	
Pin	12-Heater	
0	ap - Plate	
	NOME	



NOTE: May be used only under conditions specified in Operating Considerations.

PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Naximum Values:

Electronic Components and Devices

For aperation i	n	a 5	25.	-1:	t n e	2,	30))	fram	e system ^c	
Inverse Plate Voltage Total dc and peak DC Peak Plate Current. Average Plate Current	•	 		:	:	:	:			30000 max. 24000 max. 80 max. 1.5 max.	volts
Characteristics, Insta Tube Voltage Drop for Without external shield	pl:	ate	m	a.	=	7	•			100	volts

Socket terminals 3, 5, 8, and 11 should not be used as tie points.



RADIO CORPORATION OF AMERICA

Harrison, N. J.

DATA 3-64

2AS2

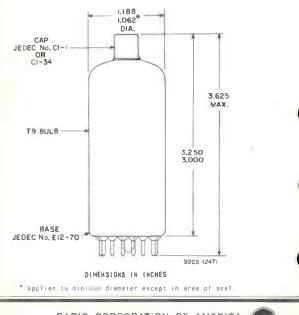
C A d cribed in Standards of Good Engineering Practice Concerning Trivision stop is Station, "Federal Comminications Commistion. d Thi rating is a studie when the duration of the voltage pulse does not exceed 15 percent of one horizontal scanning cycle, in a 525-line, 30-frame system, 15 percent of one horizontal scanning cycle is 10 microseconds.

OPERATING CONSIDERATIONS

Sucket Connections. Socket terminals 4, 7, and lomay be used as the points for components at or near the cathode potential; otherwise, do not use.

The high voltages at which the 2AS2 is operated are very dangereaus. Great can should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Laticular care against fatal shock should be till in in the measurement of heater voltage. Under all circumterc, circuit art which may be high potentials should be inclosed or adequately insulated.

X-radiation. The voltages employed in some televier in receivers and other high-voltage equipment are sufficiently high that high-voltage recifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Rectol History

2AV2

Half-Wave Vacuum Rectifier

Useful in High-Voltage, Low-Current Applications such as Pulse-Operated. Focus-Rectifier Circuits in Color TV Receivers

ELECTRICAL.

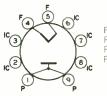
Filament Characteristics and Ratings

Vøltage (AC) Cørrent at 1.80 V .			
Direct Interelectrode	Capacitance	(Approx.) ^a	
P'ate to filament .			0.B pF 🛨

MECHANICAL

Operating Position
Type of Cathode Coated Filament
Maximum Overall Length
Maximum Seated Length
Length, Base Seat to Bulb Top (Excluding tip) 1-9/16 ± 3/32 in
Diameter
Dimensional Outline See General Section
Bull
Socket
Base
Basing Designation for BOTTOM VIEW

P'n 1-Plate P'n 2 - Do Not Use^b Pin 3 - Do Not Use^b Pin 4 - Filament Pin 5-Filament



Pin 6 - Do Not Useb Pin 7 - Do Not Useb Pin 8 - Do Not Useb Pin 9-Plate

HALF-WAVE PULSED RECTIFIER Design-Maximum Ratings

Except as Noted

For Operation in a 525-line, 30-frame system^C

														8250e	V
							+	٠			•			7000	V
late	Curi	rer	١t												
Peak														50	mA 🚽
														0.6	mÅ

Tube Voltage Drop for plate mA = 1. . 20



- Indicates # change.

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

Harrison, N. J.

DATA 9-65

- ^a Without external shield.
- **b** See Operating Considerations.
- c As described in "Standards of Good Engineering Practice Concerning Television Brosdcast Stations". Federal Communications Commission.
- The duration of the voltage pulse must not exceed 15 per cent of one horizontal acanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
- ^e Under no circumstances should this absolute-maximum value be exceeded.

OPERATING CONSIDERATIONS

The base pins of the 2AV2 fit the Socket Connections. Socket terminals 2, 3, 6, 7, and 8 Noval 9-contact socket. should not be used as tie points for external-circuit components. The socket should be made of material having low leakage and should have adequate insulation between its filament and plate terminals to withstand the maximum peak-inverse plate voltage. To provide the required insulation in Noval 9contact sockets having a cylindrical center shield, it is necessary to remove the center shield. In addition, it is recommended that socket clips for pins 2, 3, 6, 7, and 8 be removed to minimize leakage and the possibility of arc-over.

Measurement of Filament Voltage. It is recommended that a thermal rms voltmeter be used to measure filament voltage. The meter and its leads must be insulated to withstand 15,000 volts. To minimize loading of the rectifier circuit during this measurement, stray capacitances to ground should be kept as low as possible.

High Voltages. The high voltage at which the 2AV2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in measuring the filament voltage particularly in those circuits where the filament is not grounded. In all cases, all circuit parts which may be at high potentials should be enclosed and interlock switches should be used to open the primary circuit of the high-voltage power supply when access to the equipment is required.



Harrison, N. J.

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

DATA

9-PIN MINIATURE TYPE

For High-Voltage Rectifier Service in Transistorized TV Receivers

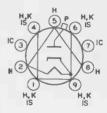
ELECTRICAL

Heater Character	istics and	Ratings			
Voitage (AC) Current at 2.30	• • • • • •	• • • • •		2.30 ± 0.30 0.300	V
Direct Interelect	trode Capac	itance (App	rex.)	0.300	A
Without external	l shield		· · ·		
P to (K + 1S + 1	H)	$\cdot\cdot\cdot\cdot\cdot\cdot$		1.0	pF

MECHANICAL

Operating Position
Type of Cathode Coated Unipotential
Maximum Overall Length
Seated Length
Diameter 0.750 to 0.875 in
Dimensional Outline (JEDEC No. 6-7) See General Section
Bulb
Cap
Base Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW

1 - Heater, Cathode,
Internal Shield
2 - Heater
3-Do Not Use
4 - Same as Pin 1
5 – Heater
6 - Same as Pin 1
7 - Do Not Use
8 - Heater
9-Same as Pin 1
p-Plate



PULSED-RECTIFIER SERVICE

For operation in a 525-line, 30-frame system

Maximum Ratings, Design-Maximum Values

Peak Inverse Peak Plate C Average Plat	urrent	 						80	mΑ
Tube ¥oltage	Charac Drop 1							80	٧

³ This rating is applicable where the duration of the voltage pulse does not exceed 15 percent of one horizontal stanning cycle. In a 525-line, 30-frame system, 15 percent of one horizontal scanning cycle is 10 microseconds.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.

DATA 9-65

OPERATING CONSIDERATIONS

The base pins of the 2BJ2 fit the Socket Connections. Noval 9-contact socket. Socket terminals 3 and 7 should not be used as tie points for external-circuit components.

The high voltages at which the 2BJ2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

The voltages employed in some television X~radiation. receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.



Harrison, N. J.

RADIO CORPORATION OF AMERICA **Electronic Components and Devices**

sec

Sharp-Cutoff Tetrode

11

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 2CY5 is the same as the 6CY5 except for the following items: Heater, for Unipotential Cathode: Voltage (AC or DC). 2.4 volts Current 0.6 \pm 6% amp

Warm-up time (Average). . . .



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.

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2ER5

High-Mu Triode



2FH5)
ZFHO)

High-Mu Triode



The 2FH5 is the same as the 6FH5 except for the following items: Heater Characteristics and Ratings

Current	• • • • • •		• •			•	. 0.600 ± 0.040	A
vc1*age	(AE or DC)	et 0.60	0 A.		•	•	. 2.35	V
warm-up	time (Aver	race)	• •			•	. 11	S

2FS5

Beam Hexode

The 2FS5 is the same as the 6FS5 except for the following items:

incarer characteristics and Ka	tings	
Current.	0.600 ± 0.040 Å	
Verage (A or DC) at 0.600		
Warn-up time (Average)	· · · · · · II s	



High-Mu Triode

The 2GK5 is the same as the 6GK5 except for the following items: Heater Characteristics and Ratings

<u></u>			
Current.		0.600 ± 0.040	A
Voltage	(AJ or DC) at 0.600 A	2.3	V
₩arm–up	time (Average)	11	s





RADIO CORPORATION OF AMERICA Electronic Components and Devices Work Dation Utility of Harrison, N. J.

2GU5

Beam Hexode

The 2GU5 is the same as the 6GU5 except for the following items:

Heater Characteristics and Ratings

Current.								0.600 ± 0.040	A	
Vcltage	(AC o	or DC)	at O	.600	Α.		 •	2.4	٧	
Warm-up	time	(Avera	age)		•	•	 •	11	S	



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History

For High-Voltage Rectifier Circuits in Color and Black-and-White TV Receivers

Electrical:	Min.	Aν.	Nax.	
Heater Characteristics and Ratings: Voltage (AC or DC) Current at heater volts = 3.15. Direct Interelectrode Capacitance (A Without external shield P to (K+IS+H)	2.65 	3.15 0.220): 1.5	3.65 -	volts amp pf
Mechanical:				. +
Operating Position. Type of Cathode . Maximum Qverall Length. Maximum Diameter. Dimensional Gutline (JEDEC No.9-51) Bulb. CMP Small with Tubular Bases (Alternates): Intermediate-Shell Octal: 6-Pin, Arrangement 1 (JEDEC Grow Short Intermediate Shell Octal wi 6-Pin, Arrangement 1 (JEDEC Grow Basing Designation for BOTTOM VIE Pin 1-Do Not Use Pin 2-Heater Pin 3-Do Not Use Pin 5-Do Not Use Pin 7-Heater, Cathode, Internal Shield Pin 8-Do Not Use Cap - Plate		See Gen (JEDE(bort (JEI) No. B6-8 ernal B	<pre>. 4 . 4 . 5/ 16" ± . 1 . 1 . 1 . 2 . No.C1 DEC No.) arriers 0)</pre>	-1/16" -3/16" -9/32" <i>lection</i> . T9 (-1) or (1-34)
	OFOUL	0E		

PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values:

For operation in a 525-line, 30-frame system

1			~			-							
Peak Inverse Plate Vo	oltage	a .										30000	volts
Peak Plate Current.									٠	٠		00	та
Average Plate Curren	t			•	•		•	•	•	•	•	1.7	ma

^a This rating is applicable when the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 655-line, 30frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.



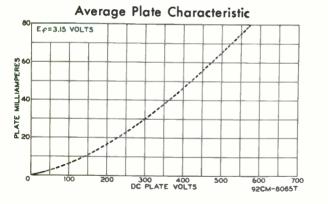
🛥 Indicates a change.

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 5-65

OPERATING CONSIDERATIONS

The high voltages at which the 3A3 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this protection should be considered in equipment design.





World Radio History



Harrison, N. J.

Medium-Mu Triode

7-PIN MINIATURE TYPE

The 34F4A is the same as the 6AF4A except for the following :	tems:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.030 Voltage (A. or DC) at heater	amp
amperes = 0.450	volts sec

3**AL5**

Twin Diode

7-PIN MINIATURE TYPE

The ALS is the same as the 6AL5 except	for	the following items:
Heater Characteristics and Ratings:		
Current		
amperes = 0.600		- 3.1 volts
Marm-up time (Average)	• •	• 11 sec



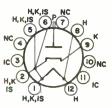
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. World Radio History DATA 6-64

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC)
Mechanical:
Operating Position

Pin 1-Heater, Cathode,
Internal Shield
Pin 2-Same as Pin 1
Pin 3-Do Not Use
Pin 4-No Internal Connection
Pin 5-Same as Pin 1
Pin 6-Same as Pin 1
Pin 7-Same as Pin 4
Pin 8-Heater
Pin 9-Same as Pin 1
Pin 10-Same as Pin 4
Pin 11 - Do Not Use
Pin 12 - Heater
Cap-Plate



PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Naximum Values:

For operation in a 525-line, 30-frame system^b

Peak inverse Plate Volta	age	e, c							30000	max.	volts
Peak Flate Current									88		ma
Average Plate Current .	•	•	•	•	•		•	•	1.7	max.	ma

- Without external shield.
- b As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.
- C This rating is applicable when the duration of the voltage rulsedoes not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-*rame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 6-64

OPERATING CONSIDERATIONS

The high voltages at which the 3AT2 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adeouately shielded. Relatively simple shielding should prove adeouate, but the need for this precaution should be considered in equipment design.

> RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.



3**AU6**

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3AEG is the same as the 6AUGA except for the following items: Heater Characteristics and Ratings:

Current. Voltage (AC or DC) = heater	0.600 ± 0.040	атр
amperes = 0.600	× · · · ·	volts
Warm-up time (Average)	11	sec

3AV6

Twin Diode-High-Mu Triode

7-PIN MINIATURE TYPE

The 3.4V6 is the same as the 6.4V6 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.04 Vo tage (AC or DC) at heater	0 amp
amperes = 0.600	volts
Warm-up time (Average)	sec



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 6-64



3**AW**3

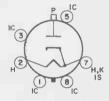
Half-Wave Vacuum Rectifier

Electrical:

	Min. Av. Max.
Heater Characteristics and Ratings: Voltage (AC or DC) Current at heater volts = 3.15. Direct Interelectrode Capacitance (Approx.): ^a P to (K+IS+H)	– 0,220 – amp
Mechanical:	
Operating Position. Type of Cathode . Maximum Overall Length. Diameter. Diameter. Dimensional Outline Bulb. Cap . Small with Tubular S Bases (Alternates;: Intermediate-Shell Octal: 6-Fin Arrangement 1 (IEDEC Group.	. Coated Unipetential

6-Fin, Arrangement 1 (JEUEC Group 1, No.BG-8) Short Intermediate Shell Octal with External Barriers: 6-Fin, Arrangement 1 (JEDEC Group 1, No.B-6-60) Basing Designation for BOTTOM VIEW.

Pin 1 - Do Not Use Pin 2 - Heater Pin 3 - Do Not Use Pin 5 - Do Not Use Pin 7 - Heater, Cathode, Internal Shield Pin 8 - Do Not Use Cap - Plate



PULSED-RECTIFIER SERVICE

Maximum Ratings, Design-Maximum Values:

For operation in a 525-line, 30-frame system ^D	
Peak Inverse Plate Voltage ^c	volts
Peak Plate Current	ma
Average Plate Current	ma

- without external shield.
- b As described in "standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.
- C This rating is applicable when the duration of the voltage pulse does not exceed 15 percent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 micro:econds.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 6-64

World Radio History

3**A**W3

OPERATING CONSIDERATIONS

The high voltages at which the JAW3 is operated are very dangerous. Great care should be taken in the design of equipment to prevent the operator from coming in contact with these high voltages. Particular care against fatal shock should be taken in the measurement of heater voltage. Under all circumstances, circuit parts which may be at high potentials should be enclosed or adequately insulated.

X-radiation. The voltages employed in some television receivers and other high-voltage equipment are sufficiently high that high-voltage rectifier tubes may produce X-radiation which can constitute a health hazard unless such tubes are adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

> RADIO CORPORATION OF AMERICA Electronic Components and Devices







7-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

"he 3AL5 is the same as the 6AL5 except for the following item	15 :
leater, for Unipotential Cathode:	
Voltage 3.15 ac or dc vo	its
Current 0.6	amp
Warm-up time (Average)* . 11	sec

3AU6 SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 3AU6 is the same as the 6AU6 except for t	he following items:
Heater, for Unipotential Cathode: Voltaoe	amp
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode	. 200 mex. volts . 200 max. volts

3AV6

TWIN DIODE-HIGH-MU TRIODE

7-PIN MINIATURE TYPE

Intended for use in equipment having series heater-string arrangement

The 3AV6 is the same as the 6AV6 except for the following items:
Heater, for Unipotential Cathode: Vo'taoe 3.15 ac or dc volts Current 0.6
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . 200 max. volts Heater positive with respect to cathode . 200 max. volts

 For definition of heater warm-up time and method of determining it, see sheet HEATER WARM-UP TIME MEASUREMENT at front of this Section.

▲ The dc component must not exceed 100 volts.

JULY 1, 1955

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World Radio History

1

Remote-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 3BA6 is the same as the 6BA6 except for the following items:

Heater, f										
Voltage	(AC	or DC).	• •						3.15	volts
Current									0.6 + 6%	amp
Warm−up	time	(Avera	ge).	•				•	11	sec

3**BC**5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 3BC5 is the same as the 6BC5 except for the following	ng items:
Heater, for Unipotential Cathode: Voltage (AC or DC)	volts % amp sec
PEAK HEATER-CATHCDE VOLTAGE: Heater negative with respect to cathode	
Heater positive with respect to cathode	x. volts

3**BE6**

Pentagrid Converter

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The gBE6 is the same as the 6BE6 except for the following items: Heater, for Unipotential Cathode:

vortage	(AU	OT	DC,).							3.15	volts
											0.6 ± 6%	атр
Warm-up	time	e (,	Avei	ra	ge)		•	•		•	11	sec

The dc component must not exceed 100 volts.



DATA



Medium-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 3BN4 is the same as the	6BN4	except	forthe	following	items:
Heater, for Unipotential Voltage (AC or DC) Current Warm-up time (Average)				0.45 ± 6%	volts amp sec

3BN4A

Medium-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 3BN4A is the same as the 6BN4A except for	or the	following	items:
Heater, for Unipotential Cathode:			
Vcltage (AC or DC)			
Current			
Warm-up time (Average)		11	sec.





3BN6

Beam Tube

7-PIN MINIATURE TYPE

The gBN6 is the same as the 6BN6 except for the following items: Heater Characteristics and Ratings: Current. 0.600 ± 0.040 amp Voltage (AC or DC) at heater

amperes = 0.600					(\mathbf{r})		3.15	volts
Warm-up time (Average)	i.	3	×	5	÷	63	11	sec

3BU8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, and Grid No.2

9-PIN MINIATURE TYPE

3BY6

Pentagrid Amplifier

7-PIN MINIATURE TYPE

The 3BY6 is the same as the 6BY6 except	for	the following items	:
Heater Characteristics and Ratings:			
Current	• •	0.600 ± 0.040 am	р
amperes = 0.600	• •	3.15 volt	s
Warm-up time (Average)	• •	11 se	С



RADIO CORPORATION OF AMERICA Electronic Components and Devices World Redio History Harrison, N. J.

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3BZ6 is the same as the 6BZ6 except for the following	items:
Heater Characteristics and Ratings: Corrent 0.600 ± 0.040	amp
clinge (AC or DC) at heater	amp
amperes = 0.€00 3.15 Werm-up time (Average) 11	volts
Peak Heater-Cathode Voltage: H ater negative with	
r pett to cathole 300 ^a max. H ater politive with	olts
respect to cathode	volts
a The dc component with citizceed 200 volts.	

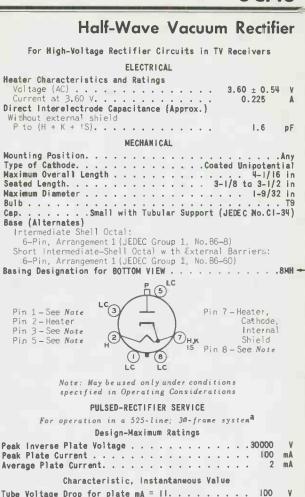
b The dc component is' t xceed 166 volts.







3CA3



A a described in "Standarda of Good Engineering Practice Concersing Television Broakcast Stations," Federal Communications Commission. The duty cycle of the voltage pulse must not exceed 15 per cent of one symaning cycle.

-Indicates a change.



DATA 9-65

DATA

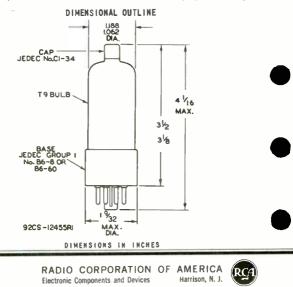
OPERATING CONSIDERATIONS

Socket terminals 1, 3, 4, 5, 6 and 8 may be connected to terminal 7 or to a corona shield which connects to terminal 7. Socket terminals 4 and 6 may be used as tie points at or near cathode potential. Otherwise, do not use.

The high voltages at which the 3CA3 is operated may be extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supply when any gate or door on the protective housing is opened, and should prevent the closing of this primary circuit until the door is locked again.

It should be noted that high voltages may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitor should be grounded.

Operation of the 3CA3 with a plate voltage above approximately 16000 volts (absolute value) results in the production of X-radiations which can constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Relatively simply shielding should prove adequate, but the need for this precaution should be considered in equipment design.



Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3CB6 is the same as the 6CB6-A except for the follows	ing stems:
Heater Characteristics and Ratings:	040
Current 0.600 ± 0.4 Voltage (AC or DC) at heater	040 amp
amperes = 0.600	volts
Warm-up time (Average)	sec
Peak Heater-Cathode Voltage: Heater negative with	
respect to cathode	. volts
Heater positive with respect to cathode	. volts

3CE5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3CE5 is the same as the 6CE5 except for the following i	tems:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
stuberes proop and a set of the set of the set	volts
Warm-up time (Average)	sec

3CF6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3CF6 is the same as the 6CF6 except for	the following items:
Heater Characteristics and Ratings:	
Current.	0.600 ± 0.040 amp
Voltage (AC or DC) at heater	
amperes = 0.600	3.15 volts
Warm-up time (Average)	11 sec
Peak Heater-Cathode Voltage:	
Heater negative with	
respect to cathode	300 max. volts
Heater positive with	
respect to cathode	200ª max. volts
a The dc component must not exceed 100 volts.	

Electronic Components and Devices



RADIO CORPORATION OF AMERICA Harrison, N. J.

3CS6

Pentagrid Amplifier

7-PIN MINIATURE TYPE

The 3CS6 is the same as the 6CS6 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
amperes = 0.600	volts
Warm-up time (Average)	sec

3CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



Full-Wave Vacuum Rectifier

GENERAL DATA

Electrical:

Filament, Coated: Voltage (AC or DC) Current at 3.3 volts.	•	•	•	•	•	•	•	•	•	•	33	.3	±	10	%	V0.	lts amp
Mechanical:																	
Operating Position												•	•	• •		•	Any
Maximum Overall Length.															4	4–5	/8"
Maximum Seated Length .															4-	-1/	16"
Diamezer											1	. 4	38	" t	0	1.5	62"
Bulb																	T12
Base					She	o ri	εÌ	de o	dit	m-	-Sh	el	1	0ct	al	5-	Pin
base	•			w	itl	h !	Ēx	te	rna	al	Ba	rr	ie	rs.	S	ty1	еA
																	34)
			0	r :	Sh												Pin
			0														e B
																	39)
Basing Designation fo	r -	RO.	тт	nи	V												
basing besignation to		50		CH41	v	101		•	•	•	•	•	•	• •		•	JUL

Pir 1-Filament Pir 2-Internal Connection-Do Not Use



Pin 3-Filament Pin 5-Plate No.2 Pin 7-Plate No.1

FULL-WAVE RECTIFIER

Maximum Ratings, Design-Naximum Values:

	PEAK INVERSE PLATE VOLTAGE 1050 max. volts
	AC PLATE SUPPLY VOLTAGE PER PLATE (RMS) See Rating Chart I
1	PEAK PLATE CURRENT PER PLATE 1.2 max. amp
	HOT-SWITCHING TRANSIENT PLATE CURRENT
	PER PLATE [®]
	DC OUTPUT CURRENT
	BULE TEMPERATURE (At hottest point on
	bulb surface) 200 max. ^O C

Typical Operation:

With capacitor input to filter

AC Flate-to-Plate Supply Voltage (RMS) Filter-Input Capacitor ^b	550 40	volts µf
Total Effective Plate Supply Impedance Per Plate	32	ohms
input to filter at full-load current of 350 ma	300	volts



RADIO CORPORATION OF AMERICA Electron Tube Division

Characteristics:

- Even occasional hot-switching with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect the life and reliability of rectifier tubes. If capacitor-input circuits are to be used, protect the circuits against the adverse effects of possible hot-switching, and do not exceed a hot-switching transient plate current per plate of 6.5 amperes during the initial cycles of the hot-switching transient. If hot-switching is required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current.
- Values of capacitance higher than those indicated may be used, provided the effective plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

RATING CHARTS and OPERATION CHARACTERISTICS

Rating Chart I represents graphically the relationships between maximumac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor input and choke input to filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

Rating Chart Il represents graphically the relationship between maximum rectification efficiency and maximum dc output current per plate for conditions of capacitor input to filter.

A choice of operating values of dc output current per plate and rectification efficiency should be made such that they fall within the area of permissible operation to insure that the maximum peak-plate-current rating will not be exceeded. If the operating values chosen fall outside the permissible operating area, a different choice of parameters should be made. For a given value of ac voltage input and dc output current, it is possible to reduce the rectification efficiency either by increasing the plate supply resistance per plate or by using a smaller value of input filter capacitor.

Rating Chart III represents graphically the relationships between minimum effective plate supply resistance per plate and maximum ac plate supply voltage per plate under no-load conditions of capacitor input to filter when occasional hotswitching is employed.

If occasional hot-switching is required with capacitorinput circuits, it is important to protect the tube and the circuits against the flow of plate currents having magnitudes in excess of the maximum hot-switching-current rating of 6.5 amperes. To limit the hot-switching current, adequate series plate supply resistance per plate is necessary. This resistance value may be determined with the formula shown in legend of *Rating Chart III*. To insure that the maximum hot-switching current is not exceeded, a value of series plate supply resistance per plate should be chosen such that it is equal to or greater than the minimum value indicated by the curve.

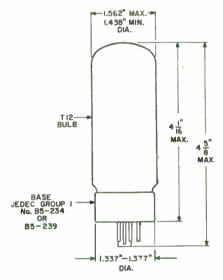


RADIO CORPORATION OF AMERICA Electron Tube Division Wood Particulations

3DG4



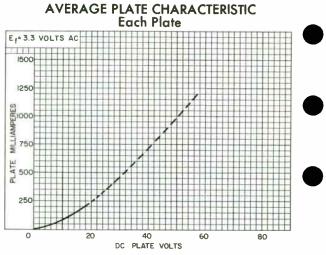
If appreciable series inductance is present in the plate supply, a value of series plate supply resistance smaller than that indicated by the curve may be employed provided it is experimentally determined that the combined effect of inductance and plate supply resistance used are adequate to limit the hot-switching current to the indicated maximumrated value.



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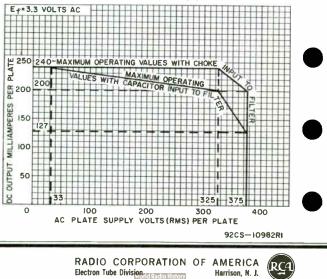


RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J. DATA 2 5-61

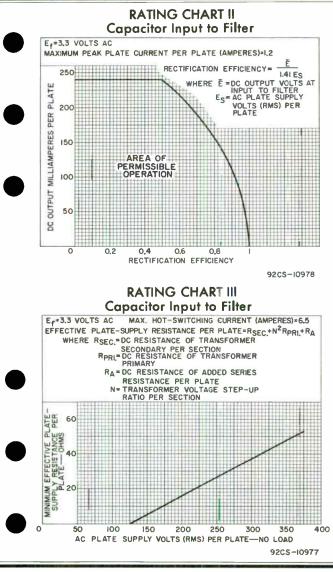


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RATING CHART I



3DG4



RADIO CORPORATION OF AMERICA **Electron Tube Division** orld Radio History

Harrison, N. J.

DATA 3 5-61

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World Radio History



Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 3DK6 is the same as the 6DK6 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
amperes = 0.600 3.15	volts
Warm-up time (Average)	sec
Peak heater-cathode voltage:	
Heater negative with	
respect to cathode	volts
Heater positive with	
respect to cathode 200 ^b max.	volts



Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

The 3DT6A is the same as the 6DT6A except for the following	items:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
amperes = 0.600	volts
Warm-up time (Average)	sec



RADIO CORPORATION OF AMERICA Electronic Components and Device History Harrison, N. J.

DATA 2-64

Medium-Mu Triode

7-PIN MINIATURE TYPE

The 3DZ4 is the same as the 6DZ4 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.030	amp
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average)	sec
Peak heater-cathode voltage:	
Heater negative with	
respect to cathode 180 max.	volts
Heater positive with	
respect to cathode 180° max.	sec

3EA5

3DZ4

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

The 3EA5 is the same as the 6EA5 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.030	amp
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average)	sec

3EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

The 3EH7 is the same as the 6EH7 expect for the following items: Heater Characteristics and Ratings: Current. Voltage (AC or DC) at heater . . . 0.600 ± 0.040 amp amperes = 0.600. volts 3.4

Electronic Components and Devices

b The dc component must not exceed 100 volts.

RADIO CORPORATION OF AMERICA Harrison, N. J.



3EJ7

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 3EJ7 is the same as the 6EJ7 except for the following	tems:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
amperes = 0.600	volts

3ER5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3ER5 is the same as the 6ER5 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.030	amp
Valtage (AC or DC) at heater	
amperes = 0.450 2.8	volts

3FH5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3FH5 is the same as the 6FH5 except for the following	tems:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.030	атр
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average)	SPC



3**FS**5

Beam Hexode

7-PIN MINIATURE TYPE

The gFS5 is the same as the 6FS5 except for the following items: Heater Characteristics and Ratings: Current. 0.450 \pm 0.030 amp Voltage (AC or DC) at heater emperes = 0.450. 2.9 volts Warm-up time (Average) 11 sec

3GK5

High-Mu Triode

7-PIN MINIATURE TYPE

 The 3GK5 is the same as the 6GK5 except for the following items:

 Heater Characteristics and Ratings:

 Current.
 0.450 ± 0.030

 Woltage (AC or DC) at heater

 amperes = 0.450.
 2.8
 volts

 Warm-up time (Average)
 11
 sec



Sharp-Cutoff Twin Pentode



9-PIN MINIATURE TYPE

3HM5/3HA5

High-Mu Triode

7-PIN MINIATURE TYPE

The 3HM5/3HA5 is the same as the 6HM5/6HA5 except for the following items:

Heater Characteristics and Ratings:

Current						0.450 ± 0.030	amp
Voltage (AC or DC) at I	nea	ate	٢				
amperes = 0.450						2.7	volts
Warn-up time (Average)							sec

3HS8

Sharp-Cutoff Twin Pentode

9-PIN MINIATURE TYPE

	The 3HS8 is the same as the 6HS8 except for the following	items:
	Heater Characteristics and Ratings	
,	Current 0.600 ± 0.040	атр
	Vo'tage (AC or DC) at heater	
	amperes = 0.600	volts
	Warm-up time (Average)	sec

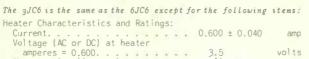


RADIO CORPORATION OF AMERICA Electronic Components and Devices Work Darkin History DATA 2-64

3JC6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE



3JD6

Sharp-Cutoff Pentode

Warm-up time (Average)

9-PIN MINIATURE TYPE

 The 3JD6 is the same as the 6JD6 except for the following items:

 Heater Characteristics and Ratings:

 Current.
 0.600 ± 0.040

 Vcltage (AC or DC) at heater

 amperes = 0.600.
 3.5
 volts

 Warm-up time (Average)
 11
 sec

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



Sharp-Cutoff Pentode



7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The AAU6 is the	same as the 6A	1U6 except fo	r the following items:
			gn-Naximum Values):
			0.450 ± 0.030 amp
	or DC) at heat		
Warm-up time	(Average)		. 11 sec



Twin Diode-High-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

4BC5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BC5 is the same as the 6BC5 exc	ept for the following items:
Heater Characteristics and Ratings	
Current	0.450 ± 0.030 amp
Voltage (AC or DC) at heater amp	
= 0.450	4.2 volts
Warm-up time (Average)	11 sec
Peak heater-cathode voltage:	
Heater negative with	
respect to cathode	200 max. volts
Heater positive with	
respect to cathode	200ª max. volts

The dc component must not exceed 100 volts.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J.

4BC8

Medium-Mu Twin Triode

With Semiremote-Cutoff Characteristic

9-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4BC8 is the same as the 6BC8 except for the following	items:
Heater Characteristics and Ratings (Design-Center Value	s):
Current 0.600 ± 0.040 Voltage (AC or DC) at heater amperes	amp
= 0.600	volts
Warm-up time (Average)	sec

4BL8

Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

 The 4BL8 is the same as the 6BL8 except for the following items:

 Heater Characteristics and Ratings (Design-Center Values):

 Current.
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4**BN6**

Beam Tube

RADIO CORPORATION OF AMERICA Electron Tube Division World Participations Harrison, N. J.



4BQ7A

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

 The 4BQ7A is the same as the 6BQ7A except for the following items:

 Heater Characteristics and Ratings (Design-Center Values):

 Current 0.600 ± 0.040 amp

 Voltage (AC or DC) at heater

 current = 0.500 4.2 volts

 Warm-up time (Average). 11 sec

4BS8

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

 The 4BS8 is the same as the 6BS8 except for the following items:

 Heater Characteristics and Ratings (Design-Center Values):

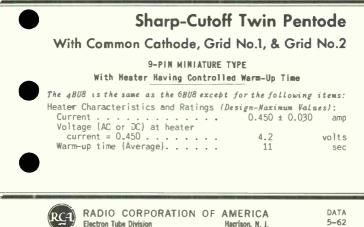
 Current 0.600 ± 0.040 amp

 Voltage (AC or DC) at heater

 current = 0.600 4.5 volts

 Warm-up time (Average). 11
 sec

4BU8



World Radio History

4BZ6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

4**B**Z7

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4BZ7 is the same as the 6BZ7 except for the following items:Heater Characteristics and Ratings (Design-Center Values):Current 0.600 ± 0.040 ampValtage (AC or DC) at heatercurrent = 0.600 4.2 voltsWarm-up time (Average). 11 sec

4CB6

Sharp-Cutott Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4CB6 is the same as the 6CB6 except for the following items: Heater Characteristics and Ratings (Design-Center Values): Current 0.450 ± 0.030 атр Voltage (AC or DC) at heater current = 0.450 volts 4.2 11 Warm-up time (Average). sec Peak heater-cathode voltage: Heater negative with 300^ª max. respect to cathode. volts Heater positive with 200^b max. volts respect to cathode. The dc component must not exceed 200 volts. The dc component must not exceed 100 volts.









Pentagrid Amplifier

7-PIN MINIATURE TYPE

The 4CS6 is the sume as the 6CS6 except	for the following items:
Heater Characteristics and Ratings: Current	0.450 ± 0.030 amp
amperes = 0.450 Warm-up time (Average)	4.2 volts 11 sec

4CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

The 4CY5 is the same as the 6CY5 except f	for the following items:	
Heater Characteristics and Ratings:		
Current.	0.300 ± 0.020 amp	
Voltage (AC or DC) at heater amperes = 0.300	4.5 volts	
Warm-up time (Average)	11 sec	



Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4DE6 is the same as the 6DE6 except for	or the following items:
Heater Characteristics and Ratings:	
Current	0.450 ± 0.030 amp
Voltage (AC or DC) at heater	
amperes = 0.450	4.2 volts
Warm-up time (Average)	11 sec



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4DK6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 1DK6 sthe same as the 6DK except for	the following items:
Hair Churact rities and Fitings: Current	0.450 ± 0.030 amp
mper = 0.10	· volts

4DT6A

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

The 4DT64 is the same as the 6DT6A except for the following items: Hencer Characteristics and Ritings:

Voltige (AC or DL) theter	0.450 ± 0.0	so emp
- secent = 0.150	4.2	volts
# rm-up time (sv rage)	11	SEC





.

4EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

Voltage AC	or DC1 at	heater		
ampere= =	2.450		4.4	volt

4EJ7

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 4EJ7 to the same as the 6EJ7 except for the following	stell:
Heater Characteristics and Ratings:	
Current 0.450 ± 0.0-0	Imp
Voltage (AC or DC) at heater	
amperes = 0.450 4.4	volt

4ES8

Variable-Mu Twin Triode

9-PIN MINIATURE TYPE

The 4ES8 is the same as the 6ES8 except for the following items: Heater Characteristics and Ratings:

Current.	•	•	0.600 ± C.	040 amp
Voltage (AC or DC) at heater amperes = 0.600			4	volts
Warm-up time (Average)			11	sec



4EW6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

The 4EW6 is the same as the 6EW6 except for the following	items:
Heater Characteristics and Ratings:	
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater	
anperes = 0.600 4.2	volts
Warm-up time (Average)	sec

4GM6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

> RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



Power Pentode

7-PIN MINIATURE TYPE

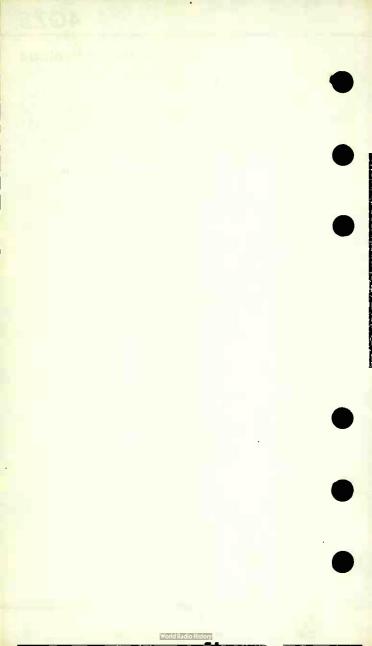
 The 46Z5 is the same as the 6GZ5 except for the following items:

 Heater Characteristics and Ratings:
 Current.
 0.040
 amp

 Voltage (AC or DC) at heater
 amperes = 0.600.
 4.0
 volts

 Warm-up time HAverage)
 11
 sec





4HM6

Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings: Current	4.2 volts 11 sec 200 max. volts
Grid No.1 to plate	Vithout With External External Shield Shield 0.031 0.024 pf
and heater	8.7 8.7 pf 2.15 3.0 pf
Characteristics, Class A, Amplifier: Plate Supply Voltage	ctrd to cathode at socket . 125 volts . 56 ohms . 0.156 megohm . 15000 µmhos . 3.2 ma
Mechanical: Operating Position	



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4HM6

Pin 1 -Cathode Pin 2 -Grid No.1 Pin 3 -Cathode Pin 4 -Heater Pin 5 -Heater Pin 6 -No Internal Connection



Pin 7 - Plate Pin 8 -Grid No.2 Pin 9 -Grid No.3, Internal Shield

AMPLIFIER - CLASS AT

Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE. . . . 250 max. volts GRID No.2 (SCREEN-GRID) SUPPLY VOLTAGE . . . 250 max. volts Rating Chart at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOLTAGE: Negative-bias value. 50 max. volts 25 max. ma GRID No.2 INPUT: For grid-No.2 voltages up to 125 volts . . 0.6 max. watt For grid-No.2 voltages between 125 and Rating Chart at front of Receiving Tube Section

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation 0.25 max. megohm For cathode-bias operation 1 max. megohm

With JEDEC shield No.315 connected to ground.





Sharp-Cutoff Twin Pentode

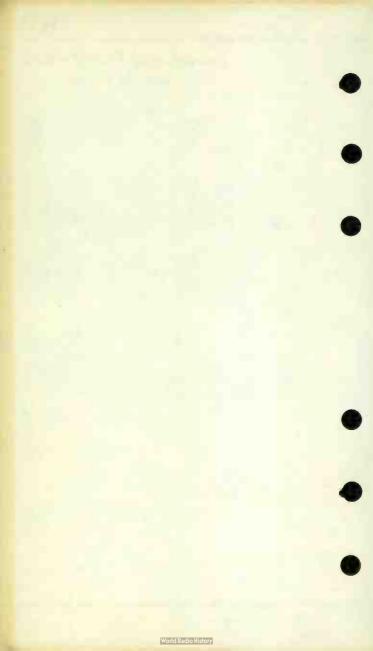
9-PIN MINIATURE TYPE

The 4HS8 is the same as the 6HS8 except for the following items: He ter Characteristics ind Ratings:

Current 0.450 ± 0	0.000 amp
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average) 11	sec



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Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

	r Characi rent tage (AC					•••	0.45	0±0.030	amp
2	mperes = (. 450					4.	2	volts
War	m−up time	/ Avoran	(م	•••	•••	•••	1	-	sec
	k heater-				•••	•••	1	-	500
				-					
П	eater neo						2.0	0	1.
		to catho		• •	• •	• •	20	0 max.	volts
H	eater pos								
		to catho					20	0 max.	volts
Direc	t Intere	ectrode	Capaci	tance	s:				
						57 A I		L7 4 L	
							iout,	With	
							rnal	Extern	
						Sh 1	eld	Shieli	d a
Gr	d No.1 to	plate.				0.0	31	0.024	pf
	d No.1 to				R,		/-		P .
	nternal s				~				
	ind heater					0	.7	8.7	pf
					• •	C	• /	0.7	pi
PIB	te to ca	indae, gr	Id NO.;	5 &					
	nternal					-			-
3	ind heate	r	• • •	• •	• •	2.	15	3.0	pf
Chara	cteristi	s. Class	A. Am	olifi	ert				
								4.05	
Plate	Supply No.3 (Su	citage .	· · · · ·	• •	• •	- •	•	125	volts
Grid	No.3 (50)	ppressor	Grid).	• Co	nne	c:ed	to ca	thode at	socket
Grid-	No.2 Sup	oly Volta	ge	• •	• •			125	volts
Catho	de Resis	tor						56	ohms
Plate	Resistar	nce (Appr	ox.) .				. 0.	143	megohm
Trans	conductar	nce					. 14	000	µmhos
Plate	Current							15	ma
	No.2 Curi							4	നമ
	No.i Volt					•••	•	-	11124
	nsconduct							4.5	volts
	No.1 Vol					• •	•	4.0	VOLUS
	insconduct							2 5	1.
11:0	nsconduci	lance (µn	105) -	200	• •	• •	• -	3.5	volts
Mecha	nical:								
00073	iting Pos	ition							. Any
	of Catho								
	num Overa								
	num Seate								
	h, Base								
	eter								
	sional Ou								
Bulb									T6-1/2
Base		5	imall-B	utton	No	val g	-Pin	(JEDEC N	o.E9-1)



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4HT6

Besing Designation for BOTTON VIEW . . . 9PM

- Pin 1-Cathode Pin 2 - Grid No.1 Pin 3-Cathode (3 Pin 4-Heater Pin 5 - Heater (2) Pin 6 - No Internal Connection
- (5 6
- Pin 7-Plate Pin 8-Grid No.2 Pin 9-Grid No.3, Internal Shield

AMPLIFIER - Class A

Maximum Ratings, Design-Naximum Values:

GRID-No.1 (CONTROL-GRID) VOLTAGE: Negative-bias value. 50 max. volts CATHDDE CURRENT. . . . 25 max. ma GRID-No. 2 INPUT: For grid-No.2 voltages up to 125 volts . . 0.6 max. watt For grid-No.2 voltages petween 125 and 250 volts. See Grid-No.2 Input

Rating Chart at front of Receiving Tube Section PLATE DISSIPATION. 2.5 max. watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation 0.25 max. megohm For cathode-bias operation 1 max. megohm

a with JEDEC shield No. 315 connected to ground.

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Harrison, N. J.



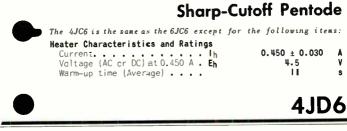












Sharp-Cutoff Pentode



The 4JD6 is the same as the 6JD6 except for the following items: Heater Characteristics and Ratings 0.450 ± 0.030 Δ.

Voltage							14	4.5	V
Warm-up	time (Avera	ge)	•••	•	•		• II	\$

4KE8

Medium-Mu Triode-Sharp-Cutoff Pentode

The 4KE8 is the same as the 6KE8 except for the following items: Heater Characteristics and Ratings

Current.							lh.	0.600 ± 0.040	A
Voltage								4.5	V
Warm-up	time	Avera	ige)	• •	•	•		11	\$



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DATA 6-66

World Radio History

5AM8

Diode-Sharp-Cutoff Pentode

CONTROLLED HEATER WARM-UP TIME

The 5AMB is the same as the 6AMBA except for the folloing ites:

Heater Characteristics and Ratings

0.600 ± 0.040 A 4.7 V

5AN8

Medium-Mu Triode— Sharp-Cutoff Pentode

CONTROLLED HEATER WARM-UP TIME

 The 5AN8 is the same as the 6AN8A except for the following items:

 Heater Characteristics and Ratings

 Stress, Stress

5AQ5

Beam Power Tube

CONTROLLED HEATER WARM-UP TIME

The SAQ5 is the same as the 6AQ54 except for the following items:

Heater Characteristics and Ratings

Voltage ACarpo in Den A . Eb

0.600 ± 0.040 A 4.7 V



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