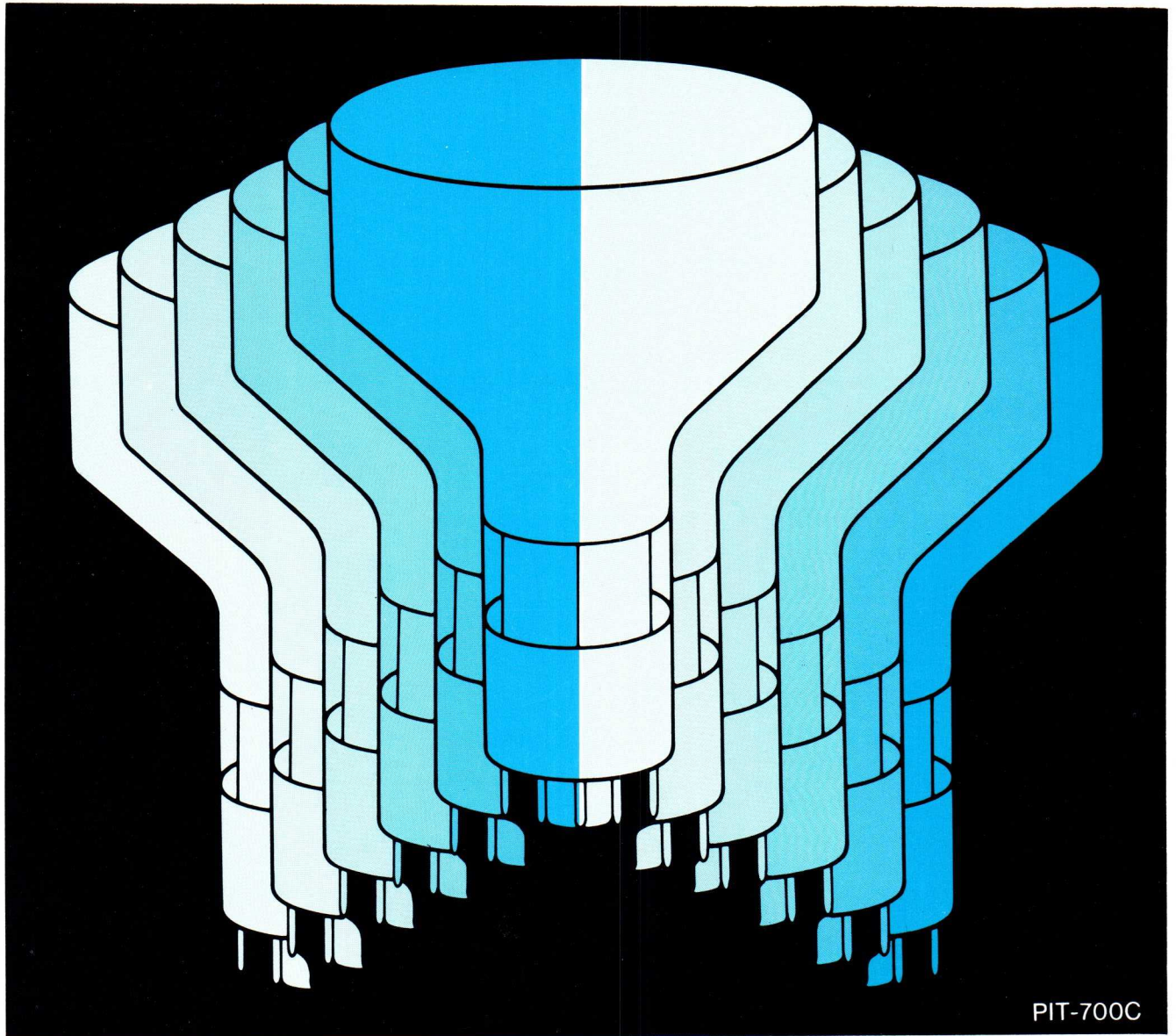




# Photomultiplier tubes

Including electron multipliers and PMT accessories



PIT-700C

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## Introduction

This catalog provides concise information on RCA's line of photomultipliers, auxiliary photomultiplier assemblies (APA's), integrated photodetection assemblies (IPA's), associated photomultiplier components and accessories, and electron multipliers.

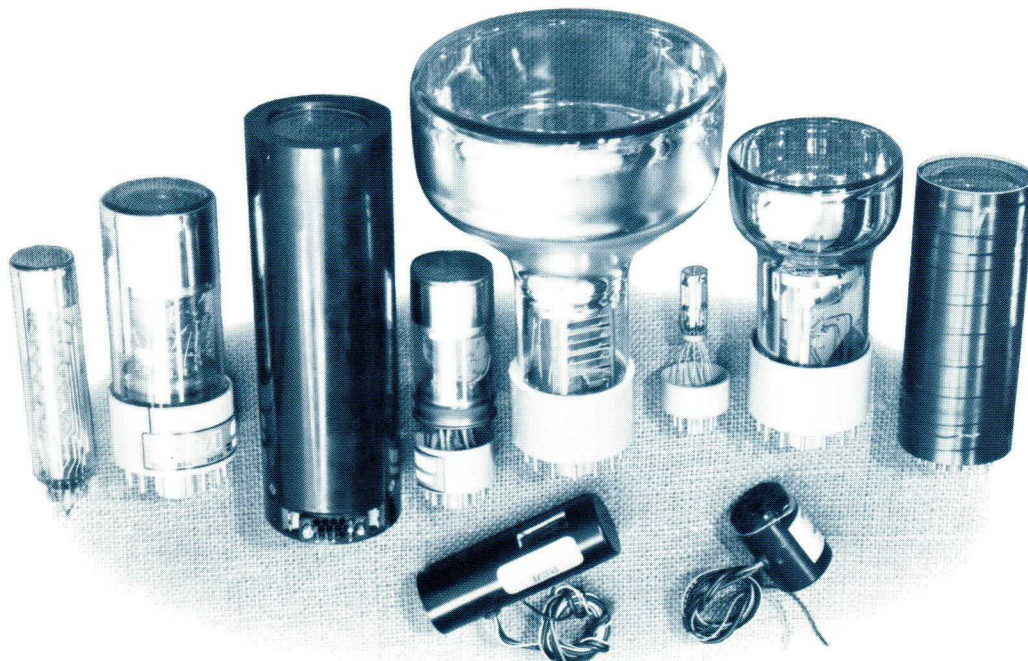
You are invited to review your photodetector requirements with your nearest RCA Sales Representative. See page 47.

Additional information on the devices shown in this catalog may also be obtained from your RCA Sales Representative or by writing to RCA Electro Optics and Devices, Publication Services, P.O. Box 3200, Somerville, NJ 08876. Please specify the types in which you are interested.

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Data in this catalog supersede that shown in publications of prior date.

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# RCA ELECTRO OPTICS

## Photomultiplier Tubes

4902



4902A



4900



4900A



S83006E



S83006EM1



### 10-Stage, Bialkali Photocathode Types Having "Teacup" First Dynodes

■ 51 mm-, 76 mm-, and 130 mm-Diameter Types

4902, 4902A	51 mm (2")
4900, 4900A	76 mm (3")
S83006E, S83006EM1	130 mm (5")

■ High Sensitivity Bialkali Photocathodes

Typical Cathode Blue Responsivity

4902, 4902A	8.7 $\mu\text{A}/\text{incident lumen}$
4900, 4900A	8.8 $\mu\text{A}/\text{incident lumen}$
S83006E, S83006EM1	9.3 $\mu\text{A}/\text{incident lumen}$

■ Typical Pulse Height Resolution

	Cs <sup>137</sup> Source, NaI(Tl) Scintillator	Co <sup>57</sup> Source, NaI(Tl) Scintillator
4902, 4902A	7.0%	10.2%
4900, 4900A	7.0%	10.0%
S83006E, S83006EM1	6.9%	—

The RCA 4902, 4900, and S83006E Series are 2, 3, and 5 inch-diameter, 10 stage head-on type photomultipliers designed primarily for use in scintillation counting applications and in photometric low-light-level detection systems where photomultipliers with large photocathode areas are required.

These tubes employ a "teacup" first dynode followed by a hybrid box-and-grid/circular-cage dynode structure. The first dynode is similar in appearance to a truncated paraboloid. This structure affords increased efficiency in collecting photoelectrons from all areas of the useful photocathode with resulting improvements in pulse height resolution capability.

The 4902, 4900, and S83006E have permanently attached bases; types 4902A, 4900A, and S83006EM1 are supplied with a temporary base attached to semi-flexible leads.

For further information or application assistance on these devices, contact your RCA Sales Representative or write Photo Tube Marketing, RCA, Lancaster, PA 17604.

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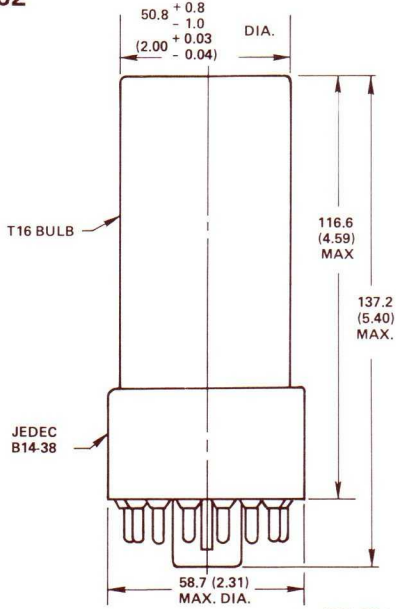
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PMT-100

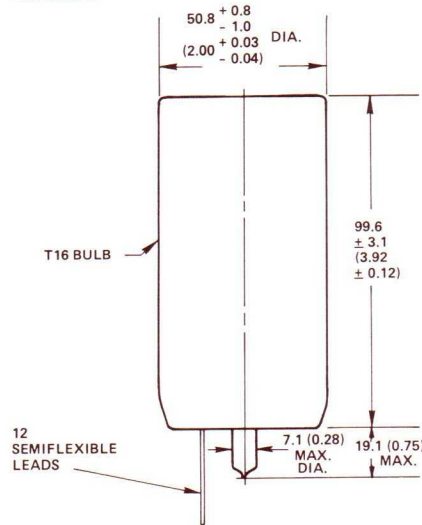
# "Teacup" PMTs

4902



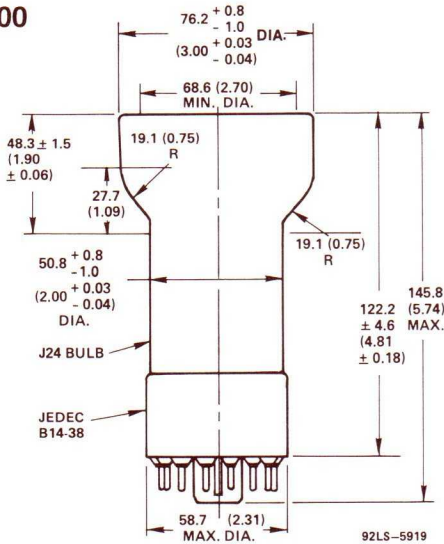
92LS-5894

4902A



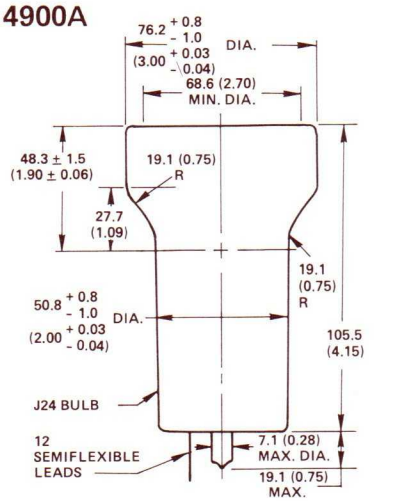
92LS-5895

4900



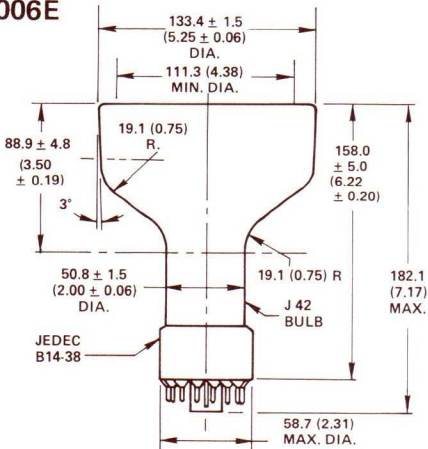
92LS-5919

4900A



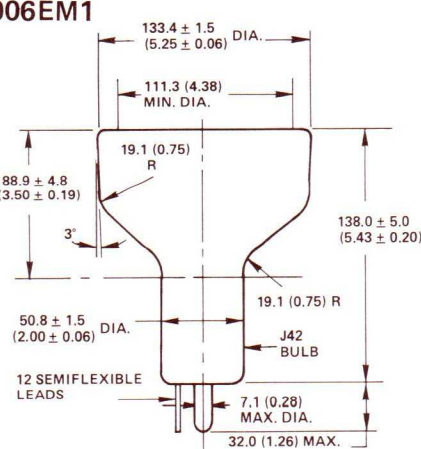
92LS-5920

S83006E



92LS-5921

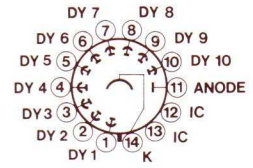
S83006EM1



92LS-5922

## Basing, Bottom View – All Types

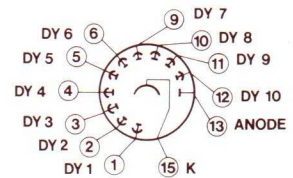
With Base Attached



1580

## Basing, Bottom View – All Types

With Base Removed



1607

## Socket for JEDEC B14-38 Base RCA AJ2260

### Magnetic Shields

Type 4902: RCA AJ2248

Type 4900: RCA AJ2253

Type S83006E: RCA AJ2254

Types 4902A,

4900A, and

S83006EM1: RCA AJ2232 (Foil)

## Warning – Personal Safety Hazards

Electrical shock – Operating voltages applied to these devices present a shock hazard.

Dimensions in millimeters.

Dimensions in parentheses are in inches.

# Spectral Response Characteristics and Data

RCA has changed its pure-numeric notation for specifying spectral-response characteristics to a more orderly system. The new designations are alphanumeric combinations that are based on (1) the photocathode material, (2) the window material, and (3) the photocathode operating mode. As illustrated below, the first two digits (Column I) in the designation indicate

the photocathode material; the following alpha character (Column II), the window material; and the next alpha character (Column III), the photocathode operating mode. Where required, the letter "X" is used as a suffix to the designation to indicate an extended response in the red or near infrared.

Column I
10 = AgOCs
15 = AgBiOCs
20 = CsSb
25 = CsBi
30 = CsTe
35 = KCsSb (Bialkali)
40 = NaKSb (High Temperature Bialkali)
50 = NaKCsSb (Multialkali)
51 = NaKCsSb (ERMA I)
52 = NaKCsSb (ERMA II)
53 = NaKCsSb (ERMA III)
60 = GaAs
71 = InGaAs (Type I)
72 = InGaAs (Type II)
73 = InGaAs (Type III)

Column II
A = 0080 (Lime Glass) or 7056 (Borosilicate Glass)
C = 7740 (Pyrex)
E = 9741 (UV-Transmitting Glass)
G = 9823 (UV-Transmitting Glass)
J = SiO <sub>2</sub> (Fused Silica)
M = UV-Grade Sapphire
P = LiF

Column III
D = Dormer-Window Type
R = Reflection Type
T = Transmission Type

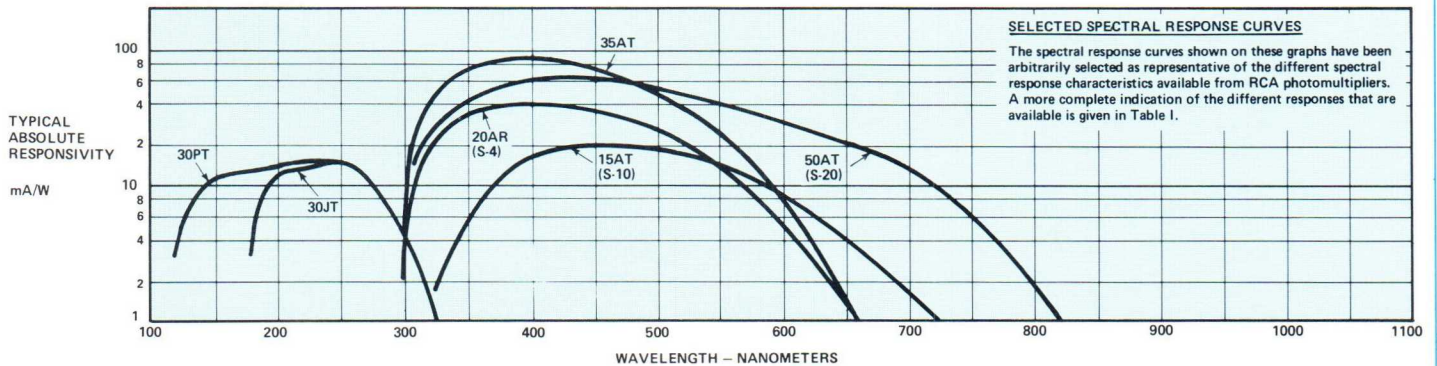
Column IV
X = Extended Response

### Examples:

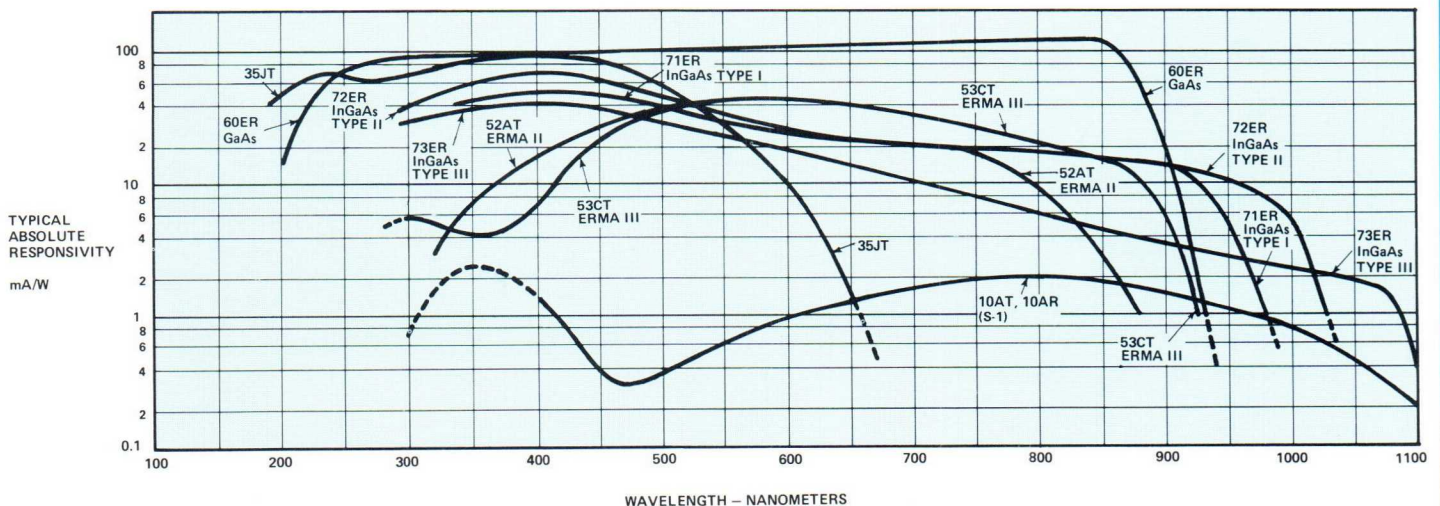
Tube type 931A has a spectral response that was previously designated as 102 (S-4). This tube type has a CsSb photocathode, a 0080 window, and a reflection type photocathode. Its new designation is 20AR.

Similarly, a tube type having a CsSb photocathode, a 0080 window, and a transmission type photocathode is designated 20AT. This response was previously designated 107 (S-11).

## Selected Spectral Response Curves



Typical Ultraviolet and Visible Spectral Response Characteristics



Typical "Broadband" Spectral Response Characteristics

# Spectral Response Data

Table I

RCA Spectral Response Designation	Former RCA Numeric Spectral Response Designations and JEDEC (S-numeric) Spectral Response Designations	Photo-cathode Material	Window Material	Mode Of Operation*	Wavelength Of Maximum Response (± 50 nm) nm	Approximate Spectral Response Range nm	Typical Quotient of Luminous to Absolute Responsivity <sup>■</sup> (± 10%) lm/W
10AR	101 (S-1)	AgOCs	0080 or 7056	R	800●	400 to 1200	92.7
10AT	101 (S-1)	AgOCs	0080 or 7056	T	800●	400 to 1200	92.7
15AT	106 (S-10)	AgBiOCs	0080 or 7056	T	450	320 to 695	509
15ET	127	AgBiOCs	9741	T	500	200 to 800	410
20AR	102 (S-4)	CsSb	0080 or 7056	R	400	300 to 660	1044
20ER	104 (S-5)	CsSb	9741	R	340	200 to 660	1262
20ERX	103	CsSb	9741	R	450	200 to 720	800
20AT	107 (S-11)	CsSb	0080 or 7056	T	440	300 to 660	808
25AR	105 (S-8)	CsBi	0080 or 7056	R	365	300 to 770	757
30JT	121	CsTe	SiO <sub>2</sub>	T	250	180 to 355	—
30PT	125	CsTe	LiF	T	250	105 to 355	—
35AR	136	KCsSb	0080 or 7056	R	400	300 to 660	837
35ER	118	KCsSb	9741	R	400	200 to 660	900
35JR	133	KCsSb	SiO <sub>2</sub>	R	400	165 to 660	910
35AT	115	KCsSb	0080 or 7056	T	400	300 to 660	1190
35CT	116	KCsSb	7740	T	385	260 to 660	1140
35ET	118	KCsSb	9741	T	400	200 to 660	1140
35JT	133	KCsSb	SiO <sub>2</sub>	T	400	180 to 660	1140
40AT	139	NaKSb	0080 or 7056	T	420	300 to 680	750
50AD	111	NaKCsSb	0080 or 7056	D	530	300 to 820	295
50ER	147	NaKCsSb	9741	R	375	200 to 810	614
50AT	110 (S-20)	NaKCsSb	0080 or 7056	T	420	300 to 820	428
50CT	113	NaKCsSb	7740	T	400	200 to 820	385
52AT	132 (ERMA II)	NaKCsSb	0080 or 7056	T	530	300 to 880	209
53AT	131 (ERMA III)	NaKCsSb	0080 or 7056	T	575	300 to 920	180
53CT	119 (ERMA III)	NaKCsSb	7740	T	575	260 to 920	160
60ER	128	GaAs	9741	R	850	200 to 930	116
71ER	140	InGaAs (Type I)	9741	R	400	200 to 980	199
72ER	141	InGaAs (Type II)	9741	R	400	200 to 1030	257
73ER	142	InGaAs (Type III)	9741	R	400	200 to 1100	280

\*D = Dormer-Window, R = Reflection, and T = Transmission.

●The range of wavelength within which maximum response may occur is 700 to 900 nm for these spectral responses.

■These values are calculated using the following formula:

$$k = \frac{680 \int_0^{\infty} \bar{v}(\lambda) \cdot W(\lambda) d\lambda}{\int_0^{\infty} R(\lambda) \cdot W(\lambda) d\lambda}$$

where k = conversion factor in lumens/watt.

$\bar{v}$  = the relative sensitivity of the average human eye (photopic)

$W(\lambda)$  = the relative distribution of radiant flux from a tungsten-filament lamp operated at a color temperature of 2856 K.

680 = a constant denoting the sensitivity of the eye at the wavelength of maximum sensitivity in lumens/watt.

and  $R(\lambda)$  = the relative spectral response of the photocathode as a function of wavelength.

The tolerance value shown for this conversion factor results from the slight differences in spectral-response shape and in the wavelength at which maximum spectral response occurs between tube types having the same window and photocathode materials.

# Photomultiplier Selection Guides

By spectral response, diameter (size), gain (current amplification), and by application

## By Spectral Response

Spectral Response Designation	Nominal Tube Diameter in	No. Of Stages	RCA Type	
10AR (S-1)	1-1/8	9	C31004	
		9	C31004A	
10AT (S-1)	3/4	10	C70102B	
	1-1/2	10	7102	
15AT (S-10)	2	10	6217	
15ET	1-1/2	10	4831	
20AR (S-4)	1/2	9	8571	
		1-1/8	9	1P21
	9		931A	
	9		931VA	
	9		4422	
	9		4471	
	9		4472	
	9		4473	
	9		6328	
	9	7117		
	20ER (S-5)	1-1/8	9	1P28
			9	1P28A
20ERX	1-1/8	9	1P28/V1	
		9	1P28A/V1	
20AT (S-11)	3/4	6	7764	
		10	4460	
		10	7767	
		12	4802	
	1-1/2	10	2060	
		10	4440	
		10	4441	
		10	4441A	
		10	6199	

## By Spectral Response

Spectral Response Designation	Nominal Tube Diameter in	No. Of Stages	RCA Type
20AT (S-11) (Cont'd)	1-1/2	10	C7151N
		2	10
	10		5819
	10		6342A
	10		6655A
	10		8053
	10		C7164C
	12		7850
	14		6810A
	3	10	2064B
		10	8054
	5	10	2065
		10	8055
	25AR (S-8)	1-1/8	9
30JT	3/4	12	C31005
30PT	3/4	12	C70128
35AR	1-1/8	9	931B
		9	4552
35ER	1-1/8	9	1P28B
35JR	1-1/8	9	4837
35AT	3/4	10	4516
		10	C70042Y (4886)
		12	C31005C
	1	10	C31016F
		1-1/8	11
	1-1/2	10	4517
		10	4855
		10	C7151Q

## By Spectral Response

Spectral Response Designation	Nominal Tube Diameter in	No. Of Stages	RCA Type
35AT (Cont'd)	1-1/2	10	C31007B
		10	C70132D
	2	5	C31024
		10	4518
		10	4523
		10	4523/V2
		10	4523/V3
		10	4856
		10	6342A/V1
		3	10
	10		4524/V5
	10		4900▲
	3-1/2	10	C31053A
		5	10
10	4525/V1		
35CT	2	12	4501/V3
		12	4507
		12	8575
		12	8575/V1
		12	8575/V2
		12	8850
		12	C31057
		12	C31057A
		12	C31057B
		35ET	5
14	8854		
35JT	2	12	4501/V4
		12	C31000M
40AT	1	10	C31016G
	1-1/8	11	C31059A

▲Variants of this "teacup" type photomultiplier having 2"- and 5"-diameter faceplates as well as variants having 2"- and 3"-hexagonal faceplates are under development.

# Photomultiplier Selection Guides (Cont'd)

## By Spectral Response

Spectral Response Designation	Nominal Tube Diameter in	No. Of Stages	RCA Type
40AT (Cont'd)	1-1/2	10	C31061A
	2	12	C31000AJ
50AD	1-1/2	10	4526
		10	4526/V1
50ER	1-1/8	9	4840
50AT (S-20)	3/4	10	8644
		10	8645
	1-1/8	11	C31059B
	1-1/2	10	4903
	2	10	4463
		10	7326
		14	7265
	3	10	4464
	5	10	4465
	50CT	2	12
52AT	3/4	6	C7291E
		10	4836
	1-1/2	10	C7151W
	2	5	C31024A
10		C7164R	
53AT	3/4	10	C70042K
53CT	2	12	8852
		12	8853
60ER	1-1/8	9	4832
	2	11	C31034
		11	C31034-02
		11	C31034A
		11	C31034A-02
71ER	2	11	C31034B
72ER	2	11	C31034C
73ER	2	11	C31034D

## By Diameter (Size)

Nominal Tube Diameter in	Spectral Response Designation	No. Of Stages	RCA Type
1/2	20AR	9	8571
3/4	10AT	10	C70102B
		6	7764
		10	4460
		10	7767
		12	4802
		12	C31005
	30JT	12	C31005
		12	C70128
	35AT	10	4516
		10	C70042Y (4886)
		12	C31005C
	50AT	10	8644
		10	8645
		6	C7291E
	52AT	10	4836
		10	C70042K
	1	35AT	10
40AT		10	C31016G
1-1/8	10AR	9	C31004
		9	C31004A
	20AR	9	1P21
		9	931A
		9	931VA
		9	4422
		9	4471
		9	4472
		9	4473
		9	6328
		9	7117
		20ER	9
	9		1P28A
	20ERX	9	1P28/V1

## By Diameter (Size)

Nominal Tube Diameter in	Spectral Response Designation	No. Of Stages	RCA Type	
1-1/8 (Cont'd)	20ERX	9	1P28A/V1	
	25AR	9	1P22	
		9	931B	
	35AR	9	4552	
		9	4552	
	35ER	9	1P28B	
	35JR	9	4837	
	35AT	11	C31059	
	40AT	11	C31059A	
	50ER	9	4840	
	50AT	11	C31059B	
	60ER	9	4832	
	1-1/2	10AT	10	7102
10			4831	
20AT		10	2060	
		10	4440	
		10	4441	
		10	4441A	
		10	6199	
		10	C7151N	
35AT		10	4517	
		10	4855	
		10	C7151Q	
		10	C31007B	
		10	C70132D	
40AT		10	C31061A	
		50AD	10	4526
			10	4526/V1
50AT		10	4903	
52AT	10	C7151W		
2	15AT	10	6217	
		10	2063	
	20AT	10	5819	
		10	5819	
		10	6342A	



# Photomultiplier Selection Guides (Cont'd)

By Diameter (Size)

Nominal Tube Diameter in	Spectral Response Designation	No. Of Stages	RCA Type	
2 (Cont'd)	20AT (Cont'd)	10	6655A	
		10	8053	
		10	C7164C	
		12	7850	
		14	6810A	
	35AT	5	C31024	
		10	4518	
		10	4523	
		10	4523/V2	
		10	4523/V3	
		10	4856	
		10	6342A/V1	
		35CT	12	4501/V3
			12	4507
			12	8575
	12		8575/V1	
			12	8575/V2
			12	8850

By Diameter (Size)

Nominal Tube Diameter in	Spectral Response Designation	No. Of Stages	RCA Type
2 (Cont'd)	35CT (Cont'd)	12	C31057
		12	C31057A
		12	C31057B
	35JT	12	4501/V4
		12	C31000M
	40AT	12	C31000AJ
	50AT	10	4463
		10	7326
		14	7265
	50CT	12	C31000A
	52AT	5	C31024A
		10	C7164R
	53CT	12	8852
		12	8853
	60ER	11	C31034
		11	C31034-02
		11	C31034A
		11	C31034A-02

By Diameter (Size)

Nominal Tube Diameter in	Spectral Response Designation	No. Of Stages	RCA Type
2 (Cont'd)	71ER	11	C31034B
	72ER	11	C31034C
	73ER	11	C31034D
3	20AT	10	2064B
		10	8054
	35AT	10	4524
		10	4524/V5
		10	4900▲
	50AT	10	4464
3-1/2	35AT	10	C31053A
5	20AT	10	2065
		10	8055
	35AT	10	4525
		10	4525/V1
	35ET	14	4522
		14	8854
	50AT	10	4465

▲Variants of this "teacup" type photomultiplier having 2"- and 5"-diameter faceplates as well as variants having 2"- and 3"-hexagonal faceplates are under development.

# Photomultiplier Selection Guides (Cont'd)

## By Gain (Current Amplification)

Typical Gain At Typical Operating Voltage★ (x 10 <sup>6</sup> )	No. Of Stages	Nominal Tube Diameter in	Spectral Response Designation	RCA Type
≥ 0.006	6	3/4	52AT	C7291E
≥ 0.01	6	3/4	20AT	7764
≥ 0.05	9	1-1/8	60ER	4832
	10	1-1/2	50AD	4526
		1-1/2	50AD	4526/V1
	12	3/4	30JT	C31005
≥ 0.08	10	3/4	53AT	C70042K
≥ 0.1	9	1-1/8	10AR	C31004
		1-1/8	10AR	C31004A
	10	3/4	10AT	C70102B
	10	3/4	20AT	4460
≥ 0.15	10	3/4	52AT	4836
	10	2	50AT	4463
	10	2	52AT	C7164R
	10	3	50AT	4464
	10	5	50AT	4465
≥ 0.2	10	3/4	20AT	7767
	10	3/4	50AT	8644
		3/4	50AT	8645
	10	1	40AT	C31016G
	10	1-1/2	10AT	7102
	10	1-1/2	52AT	C7151W
	10	2	35AT	6342A/V1
	12	3/4	30PT	C70128
≥ 0.3	10	1-1/2	15ET	4831
	10	2	20AT	6342A
		2	20AT	C7164C
	10	3	35AT	4900▲
	10	3-1/2	35AT	C31053A
≥ 0.4	5	2	52AT	C31024A
	10	1	35AT	C31016F
	10	2	35AT	4523

## By Gain (Current Amplification)

Typical Gain At Typical Operating Voltage★ (x 10 <sup>6</sup> )	No. Of Stages	Nominal Tube Diameter in	Spectral Response Designation	RCA Type
≥ 0.4 (Cont'd)	10	2	35AT	4523/V2
		2	35AT	4523/V3
	10	3	35AT	4524
		3	35AT	4524/V5
	10	5	20AT	8055
	10	5	35AT	4525
		5	35AT	4525/V1
	11	2	60ER	C31034
		2	60ER	C31034-02
	11	2	72ER	C31034C
		2	73ER	C31034D
	12	2	53CT	8852
2		53CT	8853	
≥ 0.5	10	1-1/2	35AT	C7151Q
	10	2	35AT	4518
	10	2	50AT	7326
	10	3	20AT	8054
≥ 0.6	9	1-1/8	20AR	4422
	10	1-1/2	20AT	4440
		1-1/2	20AT	4441
		1-1/2	20AT	4441A
	10	2	20AT	8053
	11	2	60ER	C31034A
2		60ER	C31034A-02	
≥ 0.7	10	3/4	35AT	4516
	10	1-1/2	35AT	4855
≥ 0.8	10	1-1/2	20AT	C7151N
	10	1-1/2	35AT	C70132D
	11	2	71ER	C31034B
≥ 0.9	10	1-1/2	50AT	4903
≥ 1	9	1-1/8	35AR	4552
	10	1-1/2	20AT	2060

★The typical operating voltage is that used to measure the tube's characteristics.

▲Variants of this "teacup" type photomultiplier having 2"- and 5"-diameter faceplates as well as variants having 2"- and 3"-hexagonal faceplates are under development.

## Photomultiplier Selection Guides (Cont'd)

### By Gain (Current Amplification)

Typical Gain At Typical Operating Voltage★ (x 10 <sup>6</sup> )	No. Of Stages	Nominal Tube Diameter in	Spectral Response Designation	RCA Type
≥1 (Cont'd)	10	1-1/2	35AT	4517
		1-1/2	35AT	C31007B
	10	2	20AT	6655A
	10	2	35AT	4856
	11	1-1/8	50AT	C31059B
	12	3/4	35AT	C31005C
	12	2	35CT	4507
≥2	9	1/2	20AR	8571
	9	1-1/8	20AR	931A
		1-1/8	20AR	931VA
		1-1/8	20AR	6328
		1-1/8	20AR	7117
	9	1-1/8	20ER	1P28
	9	1-1/8	20ERX	1P28A/V1
	9	1-1/8	35JR	4837
	10	3/4	35AT	C70042Y (4886)
	10	1-1/2	20AT	6199
	10	1-1/2	40AT	C31061A
	10	2	15AT	6217
	10	2	20AT	5819
	11	1-1/8	35AT	C31059
	≥3	9	1-1/8	20AR
1-1/8			20AR	4471
1-1/8			20AR	4472
9		1-1/8	20ERX	1P28/V1
9		1-1/8	25AR	1P22
12		2	50CT	C31000A
≥4	9	1-1/8	20AR	4473
	11	1-1/8	40AT	C31059A
	12	3/4	20AT	4802
≥5	5	2	35AT	C31024
	9	1-1/8	20ER	1P28A
	9	1-1/8	35ER	1P28B

### By Gain (Current Amplification)

Typical Gain At Typical Operating Voltage★ (x 10 <sup>6</sup> )	No. Of Stages	Nominal Tube Diameter in	Spectral Response Designation	RCA Type
≥6	12	2	40AT	C31000AJ
≥7	9	1-1/8	35AR	931B
≥10	12	2	35CT	8575
		2	35CT	8575/V1
		2	35CT	8575/V2
		2	35CT	8850
		2	35CT	C31057
		2	35CT	C31057A
		2	35CT	C31057B
		2	35CT	C31000M
	12	2	35JT	C31000M
≥25	9	1-1/8	50ER	4840
≥30	12	2	20AT	7850
	14	5	35ET	4522
≥40	14	2	50AT	7265
	14	5	35ET	8854
≥50	14	2	20AT	6810A

### By Application\*

#### Densitometry

Spectral Response	No. Of Stages	Tube Type
15AT (S-10)	10	6217
20AR (S-4)	9	1P21, 931A, 8571
20ERX	9	1P28/V1
35AR	9	4552, 931B

#### Colorimetry

Spectral Response	No. Of Stages	Tube Type
15AT (S-10)	10	6217
20AR (S-4)	9	1P21, 931A, 8571
25AR (S-8)	9	1P22
35AR	9	931B, 4552
50ER	9	4840
52AT	10	C7151W

# Photomultiplier Selection Guides (Cont'd)

## By Application\*

### Photometry

Spectral Response	No. Of Stages	Tube Type
15ET	10	4831
20AR (S-4)	9	1P21, 931A, 8571
20ERX	9	1P28/V1
35AR	9	931B, 4552

### Radiometry

Spectral Response	No. Of Stages	Tube Type
10AR (S-1)	9	C31004, C31004A
10AT (S-1)	10	7102, C70102B
15AT (S-10)	10	6217
15ET	10	4831
20AR (S-4)	9	1P21, 931A, 4471, 4472, 4473, 8571
20ER (S-5)	9	1P28, 1P28A
20ERX	9	1P28/V1, 1P28A/V1
20AT (S-11)	10	4441, 4441A, 6199
30JT	12	C31005
30PT	12	C70128
35AR	9	931B
35ER	9	1P28B
35JR	9	4837
35AT	11	C31059
35CT	12	8575, 8575/V1, 8850
35JT	12	C31000M
50AD	10	4526, 4526/V1
50AT (S-20)	10	4463, 7326, 8644, 8645,
	11	C31059B
	14	7265
50CT	12	C31000A
50ER	9	4840
52AT	10	4836, C7151W, C7164R
53AT	10	C70042K
53ET	12	8852, 8853
60ER	9	4832

## By Application\*

### Raman Spectrophotometry

Spectral Response	No. Of Stages	Tube Type
35CT	12	8850
53CT	12	8852, 8853
60ER	11	C31034, C31034-02, C31034A, C31034A-02
71ER	11	C31034B
72ER	11	C31034C
73ER	11	C31034D

### Photon Counting

Spectral Response	No. Of Stages	Tube Type
35ER	14	4522, 8854
35JR	12	C31000M
35CT	12	8575, 8575/V2, 8850
53CT	12	8852, 8853
60ER	11	C31034, C31034-02, C31034A, C31034A-02
71ER	11	C31034B
72ER	11	C31034C
73ER	11	C31034D

### Thermoluminescent Dosimetry

Spectral Response	No. Of Stages	Tube Type
35CT	12	4507

### High-Speed Inspection

Spectral Response	No. Of Stages	Tube Type
20AR (S-4)	9	931A, 4422, 6328, 7117, 8571
20AT (S-11)	10	5819, 6199, 6342A, 6655A
35AR	9	931B, 4552
35AT	10	6342A/V1
50ER	9	4840
52AT	10	C7164R

# Photomultiplier Selection Guides (Cont'd)

## By Application\*

### Process Control

Spectral Response	No. Of Stages	Tube Type
10AT (S-1)	10	7102
15AT (S-10)	10	6217
15ET	10	4831
20AR (S-4)	9	1P21, 931A, 4422, 4471, 4472, 4473, 6328, 7117
20ER (S-5)	9	1P28, 1P28A
20ERX	9	1P28/V1, 1P28A/V1
20AT (S-11)	6	7764
	10	4440, 4441, 4441A, 4460, 5819, 6199, 6342A, 6655A, 7767, 8053
35AR	9	931B, 4552
35ER	9	1P28B
35AT	10	4516, 4517, 4518, 4523, 4523/V2, 4523/V3, 4855, 6342A/V1
50ER	9	4840
50AT (S-20)	10	8644, 8645
52AT	10	4836, C7151W, C7164R
53AT	10	C70042K

### Imaging Devices

Spectral Response	No. Of Stages	Tube Type
15AT (S-10)	10	6217
20AR (S-4)	9	1P21, 931A, 931B, 4472, 4473
20AT (S-11)	6	7764
	10	7767
35AR	9	931B, 4552
35AT	10	4516
	11	C31059
50ER	9	4840
50AT (S-20)	10	4463, 4464, 4465
	11	C31059B
52AT	10	C7151W, C7164R

## By Application\*

### Laser Detection

Spectral Response	No. Of Stages	Tube Type
10AR (S-1)	9	C31004, C31004A
10AT (S-1)	10	7102, C70102B
50ER	9	4840
50AD	10	4526, 4526/V1
50AT (S-20)	10	4463, 4464, 4465, 7326, 8644, 8645
	11	C31059B
	14	7265
52AT	5	C31024A
	6	C7291E
	10	4836, C7151W, C7164R
53AT	10	C70042K
53CT	12	8852, 8853
60ER	9	4832
	11	C31034, C31034-02, C31034A, C31034A-02
71ER	11	C31034B
72ER	11	C31034C
73ER	11	C31034D

### Scintillation Counting

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	10	2060, 2063, 2064B, 2065, 4440, 5819, 6199, 6342A, 7767, 8053, 8054, 8055
	12	7850, 4802
35AT	5	C31024
	10	4516, 4517, 4518, 4523, 4523/V2, 4524, 4524/V5, 4525, 4525/V1, 4855, 4856, 4900, 6342A/V1, C31053A
	11	C31059
	12	C31005C
35CT	12	4501/V3, 8575, 8575/V1, 8575/V2, 8850, C31057B
35ET	14	4522, 8854
35JT	12	4501/V4, C31000M

# Photomultiplier Selection Guides (Cont'd)

## By Application\*

### Scintillation Counting (Ruggedized PMT's)

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	10	4441, 4441A, 4460, C7151N
35AT	10	C7151Q, C31016F
	12	C31057, C31057A
40AT	10	C31016G, C31061A
	11	C31059A
	12	C31000AJ

### High-Temperature Applications

Spectral Response	No. Of Stages	Tube Type
40AT	10	C31016G, C31061A
	11	C31059A
	12	C31000AJ

### Scanners – Transmission Types

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	6	7764
	10	6199
	10	6342A
35AT	10	4516
	10	C70042Y
	10	6342A/V1

### Scanners – Emission Types

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	10	6199
35AT	10	4855

## By Application\*

### Time Measurement

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	14	7850
35AT	5	C31024
35CT	12	8575, 8575/V2, 8850
35ET	14	4522, 8854
52AT	5	C31024A

### Pollution Monitoring

Spectral Response	No. Of Stages	Tube Type
35AT	11	C31059
35CT	12	4507, 8850
50AT	11	C31059B
	14	7265
50CT	12	C31000A
52AT	10	4836, C7151W, C7164R
53AT	10	C70042K
53CT	12	8852, 8853

### Radioimmunoassay (RIA)

Spectral Response	No. Of Stages	Tube Type
20AT (S-11)	10	6342A
	10	6655A
35AT	10	4518
	10	4523
	10	4523/V2
	10	4523/V3
	10	4524
	10	4524/V5
	10	4856
	10	4900

\*The listed photomultipliers are typical of those finding use in the different equipments. The listing is not all-inclusive and is intended to serve only as a general guide for initial type selection. Other photomultipliers may be satisfactory for the specified applications when all system requirements are considered.

•Type is intended for liquid scintillation counting applications.

# Glossary of Terms and Abbreviations

**Anode Dark Current** — The current, in a photomultiplier tube, measured in complete darkness. It is defined as that component of the output current remaining when ionizing radiation and optical photons are absent. Dark current and resulting noise are critical factors in limiting the lower level of light detection.

**Anode-Pulse Rise Time** — The time difference between the 10 and 90 per cent amplitude points on the output waveform for full-cathode illumination and delta-function excitation. Anode-pulse rise time is measured with a repetitive delta-function light source and a sampling oscilloscope. The trigger signal for the oscilloscope may be derived from the device output pulse so that light sources such as a scintillator light source may be employed.

**Be-O** — Beryllium oxide secondary emitting surface, beryllium copper substrate.

**Bialkali Photocathode (K-Cs-Sb)** — A photocathode having a spectral response similar to S-11, but having the advantage of lower dark noise at room temperature and higher peak quantum efficiency.

**Bialkali Photocathode (Na-K-Sb)** — A photocathode having a spectral response similar to that of the K-Cs-Sb bialkali photocathode but with the ability to withstand extremely high operating temperatures (up to 150° C).

**Blue Response** — The photoemission current produced by a specified luminous flux from a tungsten-filament lamp operated at a color temperature of 2856 K when the flux is filtered by a C.S. No.5-58 blue filter of half-stock thickness. This parameter is useful in characterizing response to scintillation counting sources.

**Box and Slot Cage** — A non-focused linear multiplier configuration that has a box-like dynode structure.

**Circular Cage (C)** — A focused multiplier configuration in a circular arrangement; it permits a compact layout and good time response.

**Cs-Sb** — Cesium antimony.

**Cs-Te** — Cesium telluride.

**Current Amplification (Gain)** — The ratio of 1) the signal output current to 2) the photoelectric signal current from the photocathode.

**Dark Pulses** — Pulses observed at the output electrode when the photomultiplier is operated in total darkness. These pulses are due primarily to electrons originating at the photocathode.

**Delta Function Light Source** — A light source whose rise time, fall time, and FWHM are no more than one-third of the corresponding parameters of the photomultiplier's output pulse.

**Dynode** — A secondary-electron emitting electrode.

**E<sup>2</sup>/B** — A figure of merit for a photomultiplier in liquid scintillation counting systems. E is the counting efficiency in percent and B is the coincidence background in cpm in the tritium energy window.

**ERMA** — An acronym for Extended Red MultiAlkali photocathode.

**Ga-As** — Gallium arsenide.

**Ga-P** — Gallium phosphide.

**H<sup>3</sup>** — Tritium.

**Hysteresis, Photomultiplier Tube** — A temporary anode-current instability exhibited when light levels are first applied, especially after a change in voltage. The time required to reach a stable anode current may vary from a few seconds to a minute or more.

**In-Line Cage** — A focused multiplier configuration in a linear structure; it permits more dynodes than the circular-cage configuration.

**InGaAs** — Indium Gallium Arsenide.

**IR** — Infrared.

**Multialkali Photocathode (Na-K-Cs-Sb)** — A photocathode sensitive from the ultraviolet to the red and near infrared regions of the spectrum. Compared with the cesium-antimony photocathode, it has improved response in the red region.

**Noise** — The random output which limits the minimum observable signal from the phototube.

**Non-Magnetic Photomultiplier Tube** — A photomultiplier using a structure having a minimum of ferro-magnetic materials. The ferro-magnetic materials that are present are usually limited to short lengths of Kovar or Dumet wire located in the glass stem of the tube.

**Opaque Photocathode (Reflection-Mode Photocathode)** — A photocathode wherein photoelectrons are emitted from the same surface as that on which the photons are incident.

**Pulse Height Resolution (PHR)** — The fractional full width at half maximum of the pulse height distribution curve (FWHM/A1), where A1 is the pulse height corresponding to the maximum of the distribution curve. In scintillation spectroscopy, it is customary to state PHR as a percentage.

**QUANTACON** — The RCA designation for photomultiplier tubes employing group III/V compounds as secondary emitters and/or photocathodes. A typical III/V secondary emitting compound is Ga-P; a typical III/V photocathode compound is Ga-As.

**Red-to-White Ratio** — The quotient of the anode current (measured using a specified red filter interposed between a tungsten-filament lamp and the tube) by the anode current measured with the filter removed.

**S, V, and A** — Shock, vibration and acceleration.

**Single Electron Rise Time (SERT)** — The anode-pulse rise time associated with single electrons originating at the photocathode. Measurement of SERT requires a photomultiplier having an adequate gain so that the single electron event may be viewed on a sampling oscilloscope.

**SiO<sub>2</sub>** — Fused silica.

**Teacup Cage** — An electrostatically-focused dynode structure in which the first dynode is a large truncated paraboloid similar in shape to a teacup. The large "teacup" structure improves photoelectron collection efficiency and resulting pulse height resolution capability.

**Transmission-Mode Photocathode** — A photocathode in which radiant flux incident on one side produces photoelectric emission from the opposite side.

**Tritium Efficiency** — The ratio of the average number of recorded counts per minute to the average number of disintegrations per minute in a standard tritium source. The ratio is expressed as a percentage.

**Tritium End Point (T.E.P.) Voltage** — That voltage at which the tube under test must operate to locate the tritium spectrum within a preset energy window.

**UV** — Ultraviolet.

**Venetian Blind Cage** — A non-focused linear multiplier structure. It has slower time response than focused multiplier structures and is characterized by large dynode areas.

# Photomultiplier Ratings and Characteristics

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode	Cathode	Anode		Cathode						
					Typ.	Typ.	Min.	Typ.	Min.	Typ.					
A/W	mA/W	A/lm	A/lm	μA/lm	μA/lm										
<b>1/2"-Diameter Side-On Types</b>															
20AR (S-4)	8571	9 C	1250	1000 D	7.8x10 <sup>4</sup>	37	20	75	20	35	2 @ 20	1.5	2	Short, ruggedized type. Design tested for S, V, and A. Dynode emitting surfaces, CsSb.	
<b>1-1/8"-Diameter Side-On Types</b>															
10AR (S-1)	C31004	9 C	1500	1250 D	232	1.9	0.5	2.5	10	20	300 @ 2	1.5	1	Variant of 931A for red and near IR applications. Dynode emitting surfaces, BeO.	
10AR (S-1)	C31004A	9 C	1500	1250 D	232	1.9	0.5	2.5	10	20	300 @ 2	1.5	1	Variant of C31004 having "anti-hysteresis" design. Dynode emitting surfaces, BeO.	
20AR (S-4)	931A	9 C	1250	1000 D	8.4x10 <sup>4</sup>	42	10	80	10	40	5 @ 20	2	1	Popular, low-cost, general-purpose type. Dynode emitting surfaces, CsSb.	
20AR (S-4)	931VA	9 C	1250	1000 D	8.4x10 <sup>4</sup>	42	4.5	80	10	40	5 @ 20	2	1	Variant of 931A intended for military applications. Dynode emitting surfaces, CsSb.	
20AR (S-4)	4422	9 C	1250	1000 D	2.5x10 <sup>4</sup>	40	4.5	24	—	40	5 @ 20	2	1	Variant of 931A for high speed inspection and process control systems. Dynode emitting surfaces, CsSb.	
20AR (S-4)	4471	9 C	1250	1000 D	1x10 <sup>5</sup>	31	10	100	10	30	5 @ 20	2	1	Variant of 931A having a min. red-to-white ratio of 5%. Dynode emitting surfaces, CsSb.	
20AR (S-4)	4472	9 C	1250	1000 D	1x10 <sup>5</sup>	31	10	100	10	30	5 @ 20	2	1	Variant of 931A having a min. red-to-white ratio of 7%. Dynode emitting surfaces, CsSb.	
20AR (S-4)	1P21	9 C	1250	1000 D	1.3x10 <sup>5</sup>	42	40	120	20	40	1 @ 20	2	1	High sensitivity, low dark current variant of 931A. Dynode emitting surfaces, CsSb.	
20AR (S-4)	4473	9 C	1250	1000 D	1.7x10 <sup>5</sup>	42	40	160	20	40	1 @ 20	2	1	Variant of 1P21 having a min. red-to-white ratio of 7%. Dynode emitting surfaces, CsSb.	
20AR (S-4)	6328	9 C	1250 Peak AC or DC	1000 D	8.4x10 <sup>4</sup>	42	10	80	10	40	5 @ 20	2	3	Variant of 931A having shorter length. For AC operation. Dynode emitting surfaces, CsSb.	
20AR (S-4)	7117	9 C	1250	1000 D	8.4x10 <sup>4</sup>	42	10	80	10	40	5 @ 20	2	3	Variant of 6328 designed for DC operation. Dynode emitting surfaces, CsSb.	
20ER (S-5)	1P28	9 C	1250	1000 D	1.3x10 <sup>5</sup>	50	17.5	100	10	40	5 @ 20	2	1	Variant of 931A for UV and visible applications. Dynode emitting surfaces, CsSb.	
20ER (S-5)	1P28A	9 C	1250	1000 D	2.5x10 <sup>5</sup>	50	35	200	10	40	5 @ 20	2	1	High-sensitivity variant of the 1P28 having a min. red-to-white ratio of 7%. Dynode emitting surfaces, CsSb.	
20ERX	1P28/V1	9 C	1250	1000 D	1.6x10 <sup>5</sup>	48	35	200	25	60	2 @ 40	2	1	Variant of 1P28 having higher sensitivity and "anti-hysteresis" design. Dynode emitting surfaces, CsSb.	
20ERX	1P28A/V1	9 C	1250	1000 D	1.6x10 <sup>5</sup>	60	35	200	25	75	2 @ 40	2	1	Variant of 1P28A having "anti-hysteresis" design. Dynode emitting surfaces, CsSb.	
25AR (S-8)	1P22	9 C	1250	1000 D	7.6x10 <sup>3</sup>	2.3	0.7	10	1.5	3	6 @ 0.8	2	1	Variant of 931A intended for colorimetric applications. Dynode emitting surfaces, CsSb.	



## Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup>  V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity  nA@A/lm	Anode Pulse Rise Time <sup>g</sup>  ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode	Cathode	Anode		Cathode						
					Typ.	Typ.	Min.	Typ.	Min.	Typ.					
A/W	mA/W	A/lm	A/lm	μA/lm	μA/lm	nA@A/lm	≤ ns								
<b>1-1/8"-Diameter Side-On Types (Cont'd)</b>															
35AR <sup>j</sup>	931B	9 C	1250	1000 D	3.8×10 <sup>5</sup>	52	30	400	25	55	1.5 @ 40	2	1	High sensitivity variant of 931A having an anode current drift (stability) of 2% maximum. Dynode emitting surfaces, CsSb.	
35AR	4552	9 C	1250	1000 D	8.4×10 <sup>4</sup>	54	10	100	35	65	0.8 @ 20	2	4	Bialkali photocathode type having a stiff lead duodecar base. Dynode emitting surfaces, CsSb.	
35ER	1P28B	9 C	1250	1000 D	2.3×10 <sup>5</sup>	45	100	250	25	50	2 @ 1000 V	2	1	High-sensitivity variant of 1P28 having a bialkali photocathode. Has an anode current drift (stability) of 1.5% maximum. Dynode emitting surfaces, CsSb.	
35JR	4837	9 C	1250	1000 D	1.4×10 <sup>5</sup>	59	50	150	40	65	1.5 @ 100	2	1	Variant of 1P28B having a fused-silica window and "anti-hysteresis" design. Dynode emitting surfaces, CsSb.	
50ER	4840	9 C	1250	1000 D	1.2×10 <sup>6</sup>	43	100	2000	50	70	3 @ 100	2	1	Variant of 1P28 having a multialkali photocathode. Replacement type for R446. Dynode emitting surfaces, CsSb.	
60ER	4832	9 C	1500	1250 D	2.7×10 <sup>3</sup>	54	7.5	20	200	400	0.5 @ 10	1.5	1	QUANTACON type having broad and essentially flat spectral response throughout its spectral range. Dynode emitting surfaces, BeO.	
<b>1-1/2"-Diameter Dormer-Window Types</b>															
50AD	4526	10 C	2000	1250 E	4.4×10 <sup>3</sup>	89	5	15	200	300	2 @ 20	2	5	Photocathode is deposited on a reflective substrate. Type is intended for use in applications having high background illumination. Has flying leads. Dynode emitting surfaces, BeO.	
50AD	4526/V1	10 C	2000	1250 E	4.4×10 <sup>3</sup>	89	5	15	200	300	2 @ 20	2	7	Variant of 4526 with permanently attached base. Dynode emitting surfaces, BeO.	
<b>3/4"-Diameter Head-On Types</b>															
10AT (S-1)	C70102B	10 I	1500	1250 G	306	2.8	1	3.3	20	30	800 @ 4	2	10	Ruggedized type for red and near IR systems. Design tested for S, V, and A. Dynode emitting surfaces, BeO.	
20AT (S-11)	7767	10 I	1500	1250 E	1.3×10 <sup>4</sup>	48	7	16	$\frac{40}{4k}$	$\frac{60}{6k}$	4 @ 7.5	2	10	Popular type for compact scintillation counting systems. Dynode emitting surfaces, BeO.	
20AT (S-11)	7764	6 I	1500	1200 B	404	40	0.2	0.5	$\frac{40}{4k}$	$\frac{50}{5k}$	3 @ 0.3	1.5	6	Variant of 7767 with 6 stages and stiff-lead stem. Dynode emitting surfaces, BeO.	
20AT (S-11)	4802	12 I	2000	1500 Q	2.4×10 <sup>5</sup>	60	100	300	$\frac{50}{5k}$	$\frac{75}{7.5k}$	50 @ 200	2	11	Similar to 7767 but has 12 stages. Dynode emitting surfaces, BeO.	
20AT (S-11)	4460	10 I	1500	1250 E	6.1×10 <sup>3</sup>	48	3	7.5	$\frac{40}{4k}$	$\frac{60}{6k}$	0.8 @ 7.5	2	10	Ruggedized type. Is 100% tested for S and V. Design tested for V and A. Dynode emitting surfaces, BeO.	
30 JT	C31005	12 I	2100	1500 Q	460 min. @ 253.7 nm	9.2 min. @ 253.7 nm	—	—	—	—	0.1 @ 3000 A/W	2	13	UV type for the 180 to 355 nanometer range. Dynode emitting surfaces, BeO.	
30PT	C70128	12 I	1800	1500 Q	3000 @ 253.7 nm	15 @ 253.7 nm	—	—	—	—	0.5 @ 3000 A/W	2	8	UV type for the 105 to 355 nanometer range. Dynode emitting surfaces, BeO.	

# Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode Typ. A/W	Cathode Typ. mA/W	Anode		Cathode						
		Min.	Typ.	Min.	Typ.										
<b>3/4"-Diameter Head-On Types (Cont'd)</b>															
35AT	4516	10 I	1800	1500 G	5.6×10 <sup>4</sup>	79	$\frac{10}{1.5^k}$	$\frac{47}{7^k}$	$\frac{53}{8^k}$	$\frac{67}{10^k}$	0.2 @ 7	2	10	Variant of 7767 with high-sensitivity bialkali photocathode. Dynode emitting surfaces, BeO.	
35AT	C70042Y (4886)	10 I	1200	1000 G	1.8×10 <sup>5</sup>	84	20	150	$\frac{50}{7^k}$	$\frac{71}{10^k}$	0.3 @ 20	2.5	13	High-gain, low dark current type for compact systems. Dynode emitting surfaces, CsSb.	
35AT	C31005C	12 I	2000	1500 Q	1.6×10 <sup>5</sup>	95	$\frac{-}{6.5^k}$	$\frac{133}{20^k}$	$\frac{-}{9^k}$	$\frac{80}{12^k}$	1 @ 100	2	11	A 12-stage type for compact scintillation counting systems. Dynode emitting surfaces, BeO.	
50AT (S-20)	8644	10 I	2100	1500 H	1.5×10 <sup>4</sup>	64	6	35	120	150	3 @ 30	1.5	10	For compact red and near IR detection applications. Dynode emitting surfaces, BeO.	
50AT (S-20)	8645	10 I	1800	1500 H	1.5×10 <sup>4</sup>	64	6	35	120	150	3 @ 30	2	9	Variant of 8644 with integral voltage divider and magnetic shield. Dynode emitting surfaces, BeO.	
52AT	4836	10 I	2000	1500 G	6.6×10 <sup>3</sup>	44	5	30	150	200	1 @ 30	1.5	10	ERMA II variant of 8644. Dynode emitting surfaces, BeO.	
52AT	C7291E	6 I	1500	1200 C	265	44	0.6	1.2	150	200	0.6 @ 1	1.5	11	Short, 6-stage type having an ERMA II photocathode. Dynode emitting surfaces, BeO.	
53AT	C70042K	10 I	2100	1500 G	3.6×10 <sup>3</sup>	45	5	20	150	250	6 @ 30	1.5	10	ERMA III variant of 8644. Dynode emitting surfaces, BeO.	
<b>1"-Diameter Head-On Types</b>															
35AT	C31016F	10 C	1500	1250 L	3.6×10 <sup>4</sup>	79	$\frac{5}{0.75^k}$	$\frac{30}{4.5^k}$	$\frac{47}{8^k}$	$\frac{67}{10^k}$	0.5 @ 7	1.5	12	Small, ruggedized type having "non-magnetic" structure. Design tested for S, V, and A. Dynode emitting surfaces, BeO.	
40AT	C31016G	10 C	1800	1500 L	1.9×10 <sup>4</sup>	64	$\frac{12}{1.2^k}$	$\frac{25}{2.5^k}$	$\frac{60}{6^k}$	$\frac{85}{8.5^k}$	0.1 @ 20	1.5	12	Variant of C31016F having a "high-temperature" bialkali photocathode permitting operation at temperatures as high as 150° C. Dynode emitting surfaces, BeO.	
<b>1-1/8"-Diameter Head-On Types</b>															
35AT	C31059	11 B	2000	1050 N	2.4×10 <sup>5</sup>	80	-	$\frac{-}{30^k}$	$\frac{-}{8^k}$	$\frac{70}{10.5^k}$	0.8 @ 200	1.5	14	Plug-in replacement for EMI 9524. Dynode emitting surfaces, CsSb.	
40AT	C31059A	11 B	2500	2000 P	2.5×10 <sup>5</sup>	50	$\frac{-}{6^k}$	$\frac{330}{33^k}$	$\frac{-}{6^k}$	$\frac{67}{6.7^k}$	2.5 @ 60	1.5	14	Variant of C31059 having a "high-temperature" bialkali photocathode permitting operation at temperatures as high as 150° C. Dynode emitting surfaces, BeO.	
50AT (S-20)	C31059B	11 B	2000	1000 P	6.4×10 <sup>4</sup>	64	20	150	80	150	5 @ 1000 V	1.5	14	Multialkali photocathode variant of the C31059 for the red and near IR regions of the spectrum. Dynode emitting surfaces, CsSb.	
<b>1-1/2"-Diameter Head-On Types</b>															
10AT (S-1)	7102	10 C	1500	1250 E	649	2.8	1	7	10	30	1900 @ 4	2.5	21	Variant of 6199 for red and near IR systems. Dynode emitting surfaces, BeO.	
15ET	4831	10 C	1250	1000 E	8.2×10 <sup>3</sup>	25	10	20	20	60	10 @ 40	2.5	15	Similar to 6199 except for photocathode and UV-transmitting glass window. Dynode emitting surfaces, CsSb.	

# Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Supply Voltage	Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns		
						Radiant <sup>e</sup>		Luminous <sup>f</sup>							
						Anode Typ.	Cathode Typ.	Anode		Cathode					
A/W	mA/W	Min.	Typ.	Min.	Typ.	μA/lm	μA/lm								
<b>1-1/2"-Diameter Head-On Types (Cont'd)</b>															
20AT (S-11)	6199	10 C	1250	1000 E	1.1×10 <sup>5</sup>	36	36	130	30	45	4.5 @ 20	2.5	21	Popular general-purpose type. Dynode emitting surfaces, CsSb.	
20AT (S-11)	2060	10 C	1250	1000 I	6.5×10 <sup>4</sup>	36	36	80	$\frac{30}{2.8^k}$	45	4.5 @ 20	2.5	19	Variant of 6199 with base attached to semiflexible leads. Dynode emitting surfaces, CsSb.	
20AT (S-11)	4440	10 C	1250	1000 E	2.2×10 <sup>4</sup>	36	10	27	$\frac{30}{2.8^k}$	45	16 @ 20	2.5	16	Sturdy type for compact scintillation counting systems. Dynode emitting surfaces, CsSb.	
20AT (S-11)	4441	10 C	1250	1000 E	2.2×10 <sup>4</sup>	36	10	27	$\frac{30}{2.8^k}$	45	16 @ 20	2.5	17	Ruggedized type having design tests for S, V, and A. Dynode emitting surfaces, CsSb.	
20AT (S-11)	4441A	10 C	1250	1000 E	2.2×10 <sup>4</sup>	36	10	27	$\frac{30}{2.8^k}$	45	16 @ 20	2.5	17	Ruggedized type. Is 100% tested for S and V. Design tested for V and A. Dynode emitting surfaces, CsSb.	
20AT (S-11)	C7151N	10 C	1600	1500 I	5.7×10 <sup>4</sup>	69	40	70	$\frac{50}{5^k}$	$\frac{85}{8.5^k}$	0.8 @ 20	2.5	20	Short, ruggedized type having "non-magnetic" construction. Is 100% tested for V. Design tested for S, V, and A. Dynode emitting surfaces, CsSb.	
35AT	C70132D	10 C	1800	1500 I	6.5×10 <sup>4</sup>	79	$\frac{10}{1.5^k}$	$\frac{55}{8.5^k}$	$\frac{-}{9^k}$	$\frac{67}{10^k}$	0.4 @ 6.7	2.5	18	Ruggedized, hemispherical faceplate type having "non-magnetic" construction. Design tested for S, V, and A. Dynode emitting surfaces, BeO.	
35AT	4517	10 C	1800	1500 I	7.9×10 <sup>4</sup>	79	$\frac{10}{1.5^k}$	$\frac{67}{10^k}$	$\frac{53}{8^k}$	$\frac{67}{10^k}$	0.2 @ 7	2.5	21	Variant of 6199 having a bi-alkali photocathode. Dynode emitting surfaces, BeO.	
35AT	4855	10 C	1800	1500 F	6.4×10 <sup>4</sup>	88	20	60	$\frac{-}{10^k}$	$\frac{82}{11.5^k}$	2 @ 60	2.5	21	Plug-in replacement for XP1010. Dynode emitting surfaces, BeO.	
35AT	C7151Q	10 C	1800	1500 I	3.9×10 <sup>4</sup>	79	$\frac{10}{1.5^k}$	$\frac{33}{5^k}$	$\frac{-}{8^k}$	$\frac{67}{10^k}$	0.3 @ 7	2.5	20	Variant of C7151N having a bi-alkali photocathode. Design tested for S, V, and A. Dynode emitting surfaces, BeO.	
35AT	C31007B	10 C	1800	1500 I	7.9×10 <sup>4</sup>	79	$\frac{10}{1.5^k}$	$\frac{67}{10^k}$	$\frac{53}{8^k}$	$\frac{67}{10^k}$	0.2 @ 7	2.5	21	Variant of 4517 having "anti-hysteresis" design. Dynode emitting surfaces, BeO.	
40AT	C31061A	10 C	2500	2000 F	1.5×10 <sup>5</sup>	64	$\frac{60}{6^k}$	$\frac{200}{20^k}$	$\frac{60}{6^k}$	$\frac{85}{8.5^k}$	4.5 @ 100	2	21	Variant of 4855 having a "high-temperature" bi-alkali photocathode permitting operation at temperatures as high as 150° C. Dynode emitting surfaces, BeO.	
50AT (S-20)	4903	10 C	1800	1500 I	7.1×10 <sup>4</sup>	77	10	165	120	180	1.3 @ 10	2.5	21	Variant of 4517 having a multialkali photocathode. Dynode emitting surfaces, BeO.	
52AT	C7151W	10 C	1500	1250 I	1×10 <sup>4</sup>	40	5	50	120	200	1 @ 20	2.5	21	Variant of 4517 having an ERMA II photocathode. Dynode emitting surfaces, BeO.	
<b>2"-Diameter Head-On Types</b>															
15AT (S-10)	6217	10 C	1250	1000 E	5.1×10 <sup>4</sup>	20	10	100	20	40	28 @ 20	3	22	Type is designed for color densitometers and comparators. Dynode emitting surfaces, CsSb.	
20AT (S-11)	6342A	10 C	1500	1250 E	2.5×10 <sup>4</sup>	65	15	31	$\frac{50}{5^k}$	80	4 @ 20	3	31	Popular type for scintillation counting and general-purpose applications. Dynode emitting surfaces, BeO.	

# Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode Typ.	Cathode Typ.	Anode		Cathode						
A/W	mA/W	Min. A/lm	Typ. A/lm	Min. μA/lm	Typ. μA/lm	Min. nA@A/lm	Typ. nA@A/lm								
20AT (S-11)	C7164C	10 C	1500	1250 E	2.4x10 <sup>4</sup>	65	10	30	$\frac{45}{4.5k}$	80	4 @ 20	3	31	Variant of 6342A having a low resistivity photocathode. Has a grating of opaque parallel conductive strips on the inner surface of the glass window. Replaces type 2020. Dynode emitting surfaces, BeO.	
20AT (S-11)	5819	10 C	1250	1000 E	8.1x10 <sup>4</sup>	40	10	100	$\frac{40}{4k}$	50	6 @ 20	3	22	General-purpose type. Dynode emitting surfaces, CsSb.	
20AT (S-11)	6810A	14 I	2400	2000 W	3.1x10 <sup>6</sup>	57	480	3800	$\frac{50}{5k}$	$\frac{70}{7k}$	1000 @ 2000	3.5	28	High-gain type for scintillation counting and general-purpose applications. Dynode emitting surfaces BeO.	
20AT (S-11)	8053	10 V	2000	1500 E	3.4x10 <sup>4</sup>	57	$\frac{9}{0.9k}$	$\frac{42}{4.2k}$	$\frac{-}{6k}$	$\frac{70}{7k}$	4 @ 9	10	31	Venetian-blind dynode type for scintillation counting and general-purpose applications. Dynode emitting surfaces, BeO.	
20AT (S-11)	2063	10 V	2000	1500 E	-	65	-	-	$\frac{-}{6k}$	$\frac{80}{8k}$	-	10	29	Variant of 8053 having base attached to flying leads. Dynode emitting surfaces, BeO.	
20AT (S-11)	7850	12 I	2600	2300 R	2.1x10 <sup>6</sup>	57	300	2600	$\frac{50}{5k}$	70	2400 @ 6000	2	24	High-gain general purpose type having a spherical-section faceplate. Dynode emitting surfaces, BeO.	
20 AT (S-11)	6655A	10 C	1250	1000 E	9.7x10 <sup>4</sup>	61	10	120	$\frac{40}{4k}$	76	6 @ 20	3	31	Similar to type 6342A except has CsSb dynode emitting surfaces.	
35AT	4518	10 C	2000	1500 J	3.9x10 <sup>4</sup>	79	$\frac{13}{2k}$	$\frac{33}{5k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	0.24 @ 10	2.5	31	Variant of 6342A having a bialkali photocathode. Dynode emitting surfaces, BeO.	
35AT	6342A/V1	10 C	1500	1250 E	1.8x10 <sup>4</sup>	86	$\frac{-}{1.5k}$	$\frac{16.7}{2.5k}$	$\frac{-}{9k}$	$\frac{80}{12k}$	6 @ 6.7	3	29	Similar to 6342A but has a bialkali photocathode and base attached to flying leads. Dynode emitting surfaces, BeO.	
35AT	4523	10 V	2500	1500 E	3.2x10 <sup>4</sup>	79	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	0.5 @ 13	10	31	Variant of 8053 having a bialkali photocathode. Dynode emitting surfaces, BeO.	
35AT	4523/V2	10 V	2500	1500 E	3.2x10 <sup>4</sup>	79	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	0.5 @ 13	10	29	Variant of 4523 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35AT	4523/V3	10 V	2500	1500 E	3.2x10 <sup>4</sup>	79	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	0.5 @ 13	10	29	Variant of 4523 having flying leads with no base attached. Dynode emitting surfaces, BeO.	
35AT	4856	10 C	1250	1000 E	1.3x10 <sup>5</sup>	74	$\frac{-}{1.5k}$	$\frac{125}{20k}$	$\frac{-}{8k}$	$\frac{69}{11k}$	1 @ 6.3	3	29	Similar to type 6655A but has a bialkali photocathode and base attached to flying leads. Dynode emitting surfaces, CsSb.	
35AT	C31024	5 I	3500	3000 A	4.9x10 <sup>5</sup>	98	-	440	$\frac{-}{10k}$	$\frac{88}{11k}$	10 @ gain of 10 <sup>6</sup>	1.5	30	QUANTACON type having high-gain GaP dynode emitting surfaces. Has a single-electron anode-pulse rise time of 800 ps typical.	
35CT	8575	12 I	3000	2000 S	1.4x10 <sup>6</sup>	97	$\frac{175}{23k}$	$\frac{1230}{160k}$	$\frac{77}{10k}$	$\frac{85}{11k}$	1 @ 200	2.5	26	Premium tube for scintillation counting systems. Dynode emitting surfaces, BeO.	

# Photomultiplier Ratings and Characteristics (Cont'd)

Spec- tral Res- ponse	RCA Type No.	No. Of Stages and Cage Struc- ture <sup>a</sup>	Max. Rating <sup>b</sup>	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out- line Draw- ing	Remarks <sup>h</sup>
				Sup- ply Volt- age	Opera- ting Supply Volt- age and Distri- bution <sup>c</sup>	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Respon- sivity	Anode Pulse Rise Time <sup>g</sup>		
						Radiant <sup>e</sup>		Luminous <sup>f</sup>							
						Anode	Cathode	Anode		Cathode					
						Typ.	Typ.	Min.	Typ.	Min.	Typ.				
V	V	A/W	mA/W	A/lm	A/lm	μA/lm	μA/lm	nA@A/lm	≤ ns						
<b>2"-Diameter Head-On Types (Cont'd)</b>															
35CT	8575/V1	12 I	3000	2000 S	1.4×10 <sup>6</sup>	97	$\frac{175}{23^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	1 @ 200	2.5	26	An 8575 supplied with an AJ2132 adapter making it interchangeable with type 56AVP. Dynode emitting surfaces, BeO.	
35CT	8575/V2	12 I	3000	2000 S	1.4×10 <sup>6</sup>	97	$\frac{175}{23^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	1 @ 200	2.5	26	An 8575 supplied with an AJ2144 socket rather than an AJ2145 type. Dynode emitting surfaces, BeO.	
35CT	C31057	12 I	3000	2000 S	1.4×10 <sup>6</sup>	97	$\frac{175}{23^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	1 @ 200	2.5	25	A ruggedized 8575 with flying leads. Design tested for S, V, and A. Dynode emitting surfaces, BeO.	
35CT	C31057A	12 I	3000	2000 S	1.4×10 <sup>6</sup>	97	$\frac{175}{23^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	1 @ 200	2.5	25	Variant of C31057 that is 100% tested for S and V. Dynode emitting surfaces, BeO.	
35CT	C31057B	12 I	3000	2000 S	1.4×10 <sup>6</sup>	97	$\frac{175}{23^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	1 @ 200	2.5	25	Variant of 8575 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35CT	4507	12 I	2500	1500 V	1.8×10 <sup>5</sup>	97	$\frac{19}{2.5^k}$	$\frac{160}{21^k}$	$\frac{73}{9.5^k}$	$\frac{85}{11^k}$	0.2 @ 50	2.5	27	A bialkali photocathode type having a spherical-section faceplate. Dynode emitting surfaces, BeO.	
35CT	4501/V3	12 I	2500	2500 <sup>m</sup> S	Has a minimum tritium (H <sup>3</sup> ) efficiency <sup>n</sup> of 58% and a typical E <sup>2</sup> /BP figure of merit of 155 at the tritium end point (TEP) voltage.								27	Variant of 4507 designed specifically for liquid scintillation counting systems. Dynode emitting surfaces, BeO.	
35CT	8850	12 I	3000	2000 T	1.4×10 <sup>6</sup>	97	$\frac{115}{15^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	0.6 @ 200	2.5	26	Premium QUANTACON type for photon counting applications. Has high-gain GaP first dynode emitting surface followed by BeO dynode emitting surfaces in succeeding stages.	
35JT	4501/V4	12 I	2500	1700 <sup>m</sup> S	Has a minimum tritium (H <sup>3</sup> ) efficiency <sup>n</sup> of 59% and a typical E <sup>2</sup> /BP figure of merit of 205 at the tritium end point (TEP) voltage.								27	Variant of 4501/V3 having improved liquid scintillation counting characteristics. Dynode emitting surfaces, BeO.	
35JT	C31000M	12 I	3000	2000 T	1.4×10 <sup>6</sup>	97	$\frac{115}{15^k}$	$\frac{1230}{160^k}$	$\frac{77}{10^k}$	$\frac{85}{11^k}$	0.6 @ 200	2.5	26	UV-variant of 8850. Has high-gain GaP first dynode emitting surface followed by BeO dynode emitting surfaces in succeeding stages.	
40AT	C31000AJ	12 I	2500	2000 S	4.9×10 <sup>5</sup>	71	$\frac{250}{25^k}$	$\frac{650}{65^k}$	$\frac{60}{6^k}$	$\frac{95}{9.5^k}$	3 @ 250	2.5	26	Has "high-temperature" bialkali photocathode permitting operation at temperatures as high as 150° C. Dynode emitting surfaces, BeO.	
50AT (S-20)	4463	10 V	2500	2000 E	1.1×10 <sup>4</sup>	68	12	25	120	160	4.8 @ 12	10	31	Variant of 8053 having a multialkali photocathode for red and near IR systems. Dynode emitting surfaces, BeO.	
50AT (S-20)	7265	14 I	3000	2400 W	3.1×10 <sup>6</sup>	64	800	7200	100	150	50 @ 1000	3	28	Variant of 6810A having a multialkali photocathode. Dynode emitting surfaces, BeO.	
50AT (S-20)	7326	10 I	2400	1800 E	3.8×10 <sup>4</sup>	64	12.5	88	120	150	3 @ 20	2.5	28	Variant of 7265 having 10 stages. Dynode emitting surfaces, BeO.	
50CT	C31000A	12 I	3000	2000 S	2.7×10 <sup>5</sup>	77	200	700	120	200	5 @ 200	2.5	26	Variant of 8575 having a multialkali photocathode. Dynode emitting surfaces, BeO.	

# Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup> V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode	Cathode	Anode		Cathode						
					Typ.	Typ.	Min.	Typ.	Min.	Typ.					
A/W	mA/W	A/lm	A/lm	μA/lm	μA/lm										
<b>2"-Diameter Head-On Types (Cont'd)</b>															
52AT	C7164R	10 C	1500	1250 J	8.4×10 <sup>3</sup>	50	20	40	120	240	30 @ 150	3	31	ERMA II variant of 6342A. Dynode emitting surfaces, BeO.	
52AT	C31024A	5 I	3500	2500 A	1.8×10 <sup>4</sup>	39	40	80	125	180	50 @ 2500 V	1.5	30	ERMA II variant of C31024. Has a single-electron anode-pulse rise time of 800 ps typical. Dynode emitting surfaces, GaP.	
53CT	8852	12 I	2500	1500 T	1.6×10 <sup>4</sup>	37	30	100	150	230	10 @ 100	2.5	26	Variant of 8850 having an ERMA III photocathode. Has high-gain GaP first dynode emitting surface followed by BeO dynode emitting surfaces in succeeding stages.	
53CT	8853	12 I	2500	1500 T	1.6×10 <sup>4</sup>	37	30	100	150	230	10 @ 100	2.5	27	Variant of 8852 having a spherical-section faceplate. Has high-gain GaP first dynode emitting surface followed by BeO dynode emitting surfaces in succeeding stages.	
60ER	C31034	11 I	2200	1500 M	3.5×10 <sup>4</sup>	73	100	300	300	630	50 @ gain of 10 <sup>6</sup>	2.5	23	An 11-stage QUANTACON type having a GaAs photocathode and a UV transmitting glass window. Spectral response over useful range is essentially flat. Has a maximum dark noise count rate of 100 cps at -20° C; 35 cps typical at -20° C. Dynode emitting surfaces, BeO.	
60ER	C31034-02	11 I	2200	1500 M	3.5×10 <sup>4</sup>	73	100	300	300	630	50 @ gain of 10 <sup>6</sup>	2.5	23	Variant of C31034 selected for low dark noise count rate. Its maximum is 12 cps at -20° C.	
60ER	C31034A	11 I	2200	1500 M	7.3×10 <sup>4</sup>	119	100	625	800	1025	50 @ gain of 10 <sup>6</sup>	2.5	23	High sensitivity variant of the C31034. Has a maximum dark noise count rate of 100 cps at -20° C; 35 cps typical at -20° C. Dynode emitting surfaces, BeO.	
60ER	C31034A-02	11 I	2200	1500 M	7.3×10 <sup>4</sup>	119	100	625	800	1025	50 @ gain of 10 <sup>6</sup>	2.5	23	Variant of C31034A selected for low dark noise count rate. Its maximum is 12 cps at -20° C.	
71ER	C31034B	11 I	2000	1500 M	4×10 <sup>4</sup>	50	60	200	—	250	35 @ 100	2.5	23	Variant of C31034 having an InGaAs Type I photocathode. Has a minimum quantum efficiency of 1.2% at 930 nm. Dynode emitting surfaces, BeO.	
72ER	C31034C	11 I	2000	1500 M	3.2×10 <sup>4</sup>	69	60	125	—	270	6 @ 100	2.5	23	Variant of C31034 having an InGaAs Type II photocathode. Has a minimum quantum efficiency of 0.56% at 1000 nm. Dynode emitting surfaces, BeO.	
73ER	C31034D*	11 I	2000	1500 M	1.7×10 <sup>4</sup>	42	30	60	—	150	10 @ 50	2.5	23	Variant of C31034 having an InGaAs Type III photocathode. Has a minimum quantum efficiency of 0.2% at 1060 nm. Dynode emitting surfaces, BeO.	

\*Objective data.

## Photomultiplier Ratings and Characteristics (Cont'd)

Spectral Response  See Page 3	RCA Type No.	No. Of Stages and Cage Structure <sup>a</sup>	Max. Rating <sup>b</sup>  V	Typical Characteristics at specified operating supply voltage, voltage distribution, and 22° C.										Out-line Drawing	Remarks <sup>h</sup>
				Operating Supply Voltage and Distribution <sup>c</sup> V	Responsivity <sup>d</sup>						Anode Dark Current @ Anode Luminous Responsivity nA@A/lm	Anode Pulse Rise Time <sup>g</sup> ≤ ns			
					Radiant <sup>e</sup>		Luminous <sup>f</sup>								
					Anode Typ. A/W	Cathode Typ. mA/W	Anode		Cathode						
		Min.	Typ.	Min.	Typ.	Min.	Typ.								
<b>3"-Diameter Head-On Types</b>															
20AT (S-11)	8054	10 V	2000	1500 E	3.5×10 <sup>4</sup>	65	$\frac{9}{0.9k}$	$\frac{43}{4.3k}$	$\frac{-}{6k}$	$\frac{80}{8k}$	4 @ 9	15	33	Venetian-blind dynode type for scintillation counting and general-purpose applications. Dynode emitting surfaces, BeO.	
20AT (S-11)	2064B	10 V	2000	1500 E	-	65	-	-	$\frac{-}{6k}$	$\frac{80}{8k}$	-	15	32	Variant of 8054 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35AT	4524	10 V	2500	1500 E	3.2×10 <sup>4</sup>	80	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	1 @ 13	15	33	Variant of 8054 having a bialkali photocathode. Dynode emitting surfaces, BeO.	
35AT	4524/V5	10 V	2500	1500 E	3.2×10 <sup>4</sup>	80	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	1 @ 13	15	32	Variant of 4524 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35AT	4900	10 T	1650	1350 E	3.2×10 <sup>4</sup>	96	$\frac{-}{1.5k}$	$\frac{27}{3.5k}$	$\frac{77}{10k}$	$\frac{81}{10.5k}$	3 @ 11.5	10	33	Variant of 4524 having a newly developed dynode structure which improves photoelectron collection efficiency.	
50AT (S-20)	4464	10 V	2500	2000 E	1.1×10 <sup>4</sup>	64	12	25	120	150	5 @ 12	15	34	Variant of 8054 having a multialkali photocathode. Dynode emitting surfaces, BeO.	
<b>3-1/2"-Diameter Head-On Types</b>															
35AT (S-11)	C31053A	10 V	2500	1500 E	3.5×10 <sup>4</sup>	100	-	31	-	88	10 @ 1500 V	15	35	Type is similar to the 4524 but has a larger photocathode area. Dynode emitting surfaces, BeO.	
<b>5"-Diameter Head-On Types</b>															
20AT (S-11)	8055	10 V	2000	1500 E	3.6×10 <sup>4</sup>	89	$\frac{9}{0.9k}$	$\frac{44}{4.4k}$	$\frac{-}{6k}$	$\frac{110}{11k}$	4 @ 9	20	39	Venetian-blind dynode type for scintillation counting and general-purpose applications. Dynode emitting surfaces, BeO.	
20AT (S-11)	2065	10 V	2000	1500 E	-	89	-	-	$\frac{-}{6k}$	$\frac{80}{8k}$	-	20	38	Variant of 8055 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35AT	4525	10 V	2500	1500 E	3.2×10 <sup>4</sup>	80	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	1.5 @ 13	20	39	Variant of 8055 having a bialkali photocathode. Dynode emitting surfaces, BeO.	
35AT	4525/V1	10 V	2500	1500 E	3.2×10 <sup>4</sup>	80	$\frac{10}{1.5k}$	$\frac{27}{4k}$	$\frac{-}{8k}$	$\frac{67}{10k}$	1.5 @ 13	20	38	Variant of 4525 having base attached to flying leads. Dynode emitting surfaces, BeO.	
35ET	4522	14 I	3000	2000 X	2.6×10 <sup>6</sup>	88	$\frac{650}{85k}$	$\frac{2300}{300k}$	$\frac{-}{8k}$	$\frac{77}{10k}$	60 @ 2000	3	36	UV-type having a spherical section faceplate. Has good time response and very high gain. Dynode emitting surfaces, BeO.	
35ET	8854	14 I	3000	2000 X	3.5×10 <sup>6</sup>	88	$\frac{770}{100k}$	$\frac{3100}{400k}$	$\frac{62}{8k}$	$\frac{77}{10k}$	60 @ 2000	3	36	QUANTACON variant of 4522. Has high-gain GaP first dynode emitting surface followed by BeO dynode emitting surfaces in succeeding stages.	
50AT (S-20)	4465	10 V	2500	2000 E	1.1×10 <sup>4</sup>	68	12	25	120	160	5 @ 12	20	37	Variant of 8055 having a multialkali photocathode. Dynode emitting surfaces, BeO.	

# Photomultiplier Ratings and Characteristics (Cont'd)

## Footnotes

- a Cage structure: B, box and slot; C, circular cage; I, in line; T, "teacup"; and V, venetian blind.
- b The maximum rated average anode currents for the different photocathode materials are tabulated below. These values are averaged over any interval of 30 seconds maximum. During tube operation, an average anode output current well below the maximum value should be employed. A range is shown for most photocathodes with the larger values applying to the larger tube sizes. Consult individual data sheets for specific maximum average anode current values.
- AgOCs (10) — 0.01 mA  
 AgBiOCs (15) — 0.75 mA  
 CsSb (20) — 0.02 to 2.0 mA  
 CsBi (25) — 1.0 mA  
 CsTe (30) — 0.5 mA  
 KCsSb (35) — 0.02 to 1.0 mA  
 NaKSb (40) — 0.02 mA  
 NaKCsSb (50, 51, 52, 53) — 0.01 to 1.0 mA  
 GaAs (60) — 100 nA  
 InGaAs (71, 72, 73) — 50 nA
- c For voltage distribution, see page 23.
- d Typical gain for the tubes at the specified operating voltage is the ratio of the typical anode responsivity (either luminous or radiant) by the typical cathode responsivity (either luminous or radiant).
- e At wavelength of maximum response of the spectral responsivity characteristic.
- f With a tungsten-filament lamp having a lime-glass envelope. Lamp is operated at a color temperature of 2856 K.
- g At the maximum rated supply voltage. The photocathode is fully illuminated.
- h See Glossary of Terms and Abbreviations, page 13.
- j Photocathode material is bialkali (KC<sub>2</sub>Sb). The spectral response of this tube, however, is nearly identical with that of the JEDEC registered S-4).
- k Blue response. Measured with a Corning C.S. No.5-58, 1/2 stock thickness, filter interposed between the tungsten light source and the tube.
- m At maximum TEP (tritium end point) voltage. TEP voltage is that voltage at which the tube under test must be operated to locate the tritium spectrum within a preset energy window.
- n Tritium efficiency is the ratio of the average number of recorded counts per minute to the average number of disintegrations per minute in a standard tritium source. The ratio is expressed as a percentage.
- p The E<sup>2</sup>/B is a figure of merit for a photomultiplier in a liquid scintillation counting system. E is the counting efficiency in percent and B is the coincidence background in cpm in the tritium energy window.

# Sockets and Magnetic Shields

## Sockets

Base Designation or Description	RCA Socket	Typ. Tube Type
B11-88, B11-104	AJ2256	931A
12-Pin Duodecar	AJ2257	4552
9-Pin, Small-Button	AJ2258	7764
B12-43, B12-186	AJ2259	6199
B14-38, B14-45	AJ2260	6342A
B20-102	AJ2261	6810A
14-Pin	AJ2262	C31059
14-Pin	AJ2263*	C31059A
21-Pin "Light Tight"	AJ2144, AJ2145	8575
21-Pin with Coax. Connector	AJ2100, AJ2101	C31024

## Magnetic Shields

Brief Description	RCA Shield	Typ. Tube Type
Foil	AJ2232	All Types
2-11/16" long, 1-5/16" dia. 1" x 3/8" window.	AJ2240	931A
2-13/16" long, 1-3/8" dia. 1-1/8" x 5/8" window.	AJ2241	6328

## Magnetic Shields (Cont'd)

Brief Description	RCA Shield	Typ. Tube Type
2-3/8" long, 1-3/8" dia. 1-1/8" x 5/8" window.	AJ2242	4552
3-3/8" long, 1-3/4" dia. 7/8" x 3/8" window.	AJ2243	4526
4" long, 1" dia.	AJ2244	4516
2.5" long, 1" dia.	AJ2245	7764
4.5" long, 1-1/4" dia.	AJ2246	C31059
4.5" long, 1-3/4" dia.	AJ2247	6199
5" long, 2-1/2" dia.	AJ2248	6342A
5" long, 2-1/4" dia.	AJ2249	C31024
4" long, 2-1/4" dia.	AJ2250	C31034
7" long, 2-1/2" dia.	AJ2251	6810A
6" long, 2-1/4" dia.	AJ2252	8575
5-9/16" long, 3-9/32" major dia. 2-3/8" neck dia.	AJ2253	8054
6-7/8" long, 5-3/4" major dia. 2-3/8" neck dia.	AJ2254	4525
10" long, 5-1/2" major dia. 3-1/4" neck dia.	AJ2255	4522

\*For high temperature operation.

• Diameters all I.D.



# Voltage-Distribution Considerations

No. Of Stages	Distribution Code	Voltage Distribution K, Dy1, Dy2, Dy3, --- P
5	A	4, 2, 2, 2, 1, 1.7♣, and 0.37▲
6	B	2, 1, 1, 1, 1, 1, and 1
	C	1.2, 1.2, 1.7, 1, 1, 1, and 1.
9	D	1, 1, 1, 1, 1, 1, 1, 1, and 1
10	E	2, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	F	2, 1, 1, 1, 1, 1, 1, 1, 1, and 0.75
	G	1.2, 1.2, 1.7, 1, 1, 1, 1, 1, 1, and 1
	H	1.1, 1.2, 1.7, 1, 1, 1, 1, 1, 1, and 1
	I	1.7, 1.3, 1.3, 1, 1, 1, 1, 1, 1, and 1
	J	1.8, 1.4, 1.5, 1.2, 1, 1, 1, 1, 1, and 1
	K	2, 1.4, 1, 1, 1, 1, 1, 1, 1, and 1
	L	3, 1, 1, 1, 1, 1, 1, 1, 1, and 1
11	M	1, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	N	150■, 1, 1, 1, 1, 1, 1, 1, 1, 2, and 1
	P	1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1
12	Q	1.2, 1.2, 1.7, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	R	2, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	S	4, 1, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	T	6, 1, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	U	660★, 1, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, and 1
	V	2, 1, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, and 1
14	W	2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1.25, 1.5, 1.75, and 2
	X	3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1

♣ Between dynode No.5 and suppressor grid

▲ Between suppressor grid and ground

■ 150 volts

★ 660 volts

K, cathode; Dy, dynode; and P, anode

The voltage distributions specified for the individual tube types are typical average distributions which are used to measure the tabulated characteristic values.

Interstage voltages for the tube electrodes may be supplied by individual sources but are usually obtained from resistive voltage-divider networks placed across the high-voltage supply. The power ratings of the individual resistors making up the network should be approximately twice that of the calculated dissipation values for circuit safety reasons. Resistors having tolerances of about 5% are satisfactory in most systems for circular-cage and focused in-line photomultipliers. Resistors having 10% tolerances may be used with venetian-blind tubes.

The voltage-divider arrangement should be located so that it will not affect tube operating temperature. Head-on type photomultipliers sometimes use zener diodes between cathode and dynode No.1 to provide constant voltage when tube sensitivity is varied by adjustment of supply voltage.

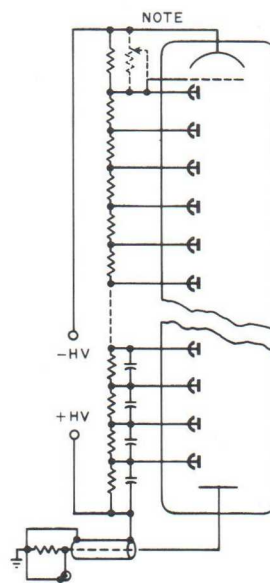
An important consideration is that the voltage-divider current should be maintained at a value of at least 10 times that of the expected average value of anode current. If this consideration is not observed, deviation from linearity and limitations on anode-current response to pulsed light may occur. The latter effect may be reduced by connecting capacitors between the tube socket terminals for the last 3 or 4 dynode stages and anode return. The values of the capacitors will depend upon the shape and the amplitude of the anode-current pulse, and the time duration of the pulse, or train of pulses. When the output pulse is assumed to be rectangular in shape, the following formula applies:

$$C = 100 \frac{i \cdot t}{V}$$

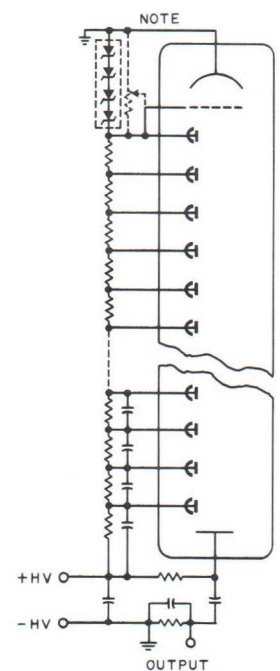
where C is in farads, i is the amplitude of the anode current in amperes, V is the voltage across the capacitor in volts, and t is the time duration of the pulse in seconds.

This formula applies for the anode-to-final dynode capacitor. The factor 100 is used to limit the voltage change across the capacitor to 1% maximum during a pulse. Capacitor values for preceding stages should take into account the smaller values of dynode currents in these stages. Conservatively, a factor of approximately 2 per stage is used. Capacitors are not required across those dynode stages where the dynode current is less than 1/10 of the current through the voltage-divider network.

Typical Voltage-Divider Arrangement for Fast Pulse Response and High Peak Current Systems. Anode Return at Ground Potential.



Typical Voltage-Divider Arrangement for Scintillation Counting Systems. Photocathode at Ground Potential.

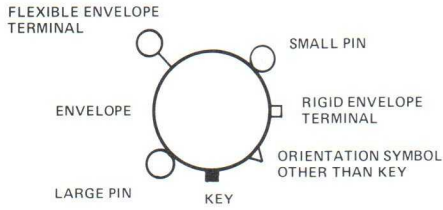


**Note:** In modern photomultipliers, the focusing electrode is normally connected to dynode No.1. In older tube types, the focusing electrode may be connected to the arm of a potentiometer, between cathode and dynode No.1, to permit adjustment for maximum anode current.

# Dimensional Outlines and Basing Diagrams for Photomultipliers

## Key to Terminal Connection Diagrams

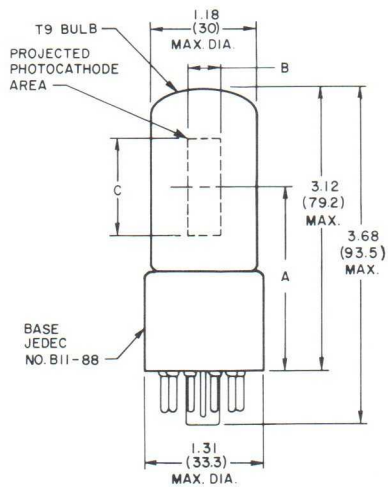
Diagrams show terminals viewed from the base end of the tube.



- DY - Dynode
- G - Grid
- IC - Internal connection (Do not use)
- NC - No connection (Do not use)
- P - Anode
- K - Photocathode

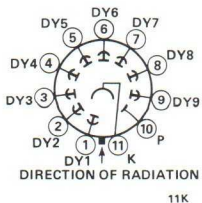
1

- 1P21
- 1P22
- 1P28
- 1P28A
- 1P28B
- 1P28/V1
- 1P28A/V1
- 931A
- 931B
- 931VA
- 4422
- 4471
- 4472
- 4473
- 4832
- 4837
- 4840
- C31004
- C31004A



Types	A	B	C
1P21, 1P22, 1P28, 1P28A, 1P28B, 931A, 931B, 931VA, 4422, 4471, 4472, 4473, 4837	1.94 ± .09 (49.3 ± 2.3)	.31 (7.9) min.	.94 (23.9) min.
1P28/V1, 1P28A/V1, C31004, C31004A, 4840	1.99 ± .09 (50.5 ± 2.3)	.31 (7.9) min.	.94 (23.9) min.
4832	1.94 ± .09 (49.3 ± 2.3)	.2 (5.1) min.	.5 (12.7) min.

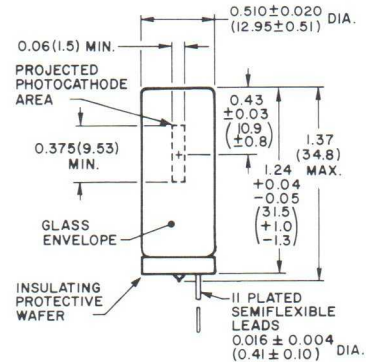
### Basing, Bottom View



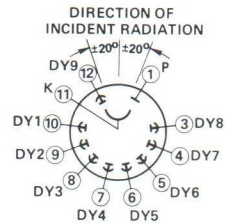
- Socket  
RCA AJ2256
- Magnetic Shield  
RCA AJ2240

2

8571



### Basing, Bottom View



### Socket

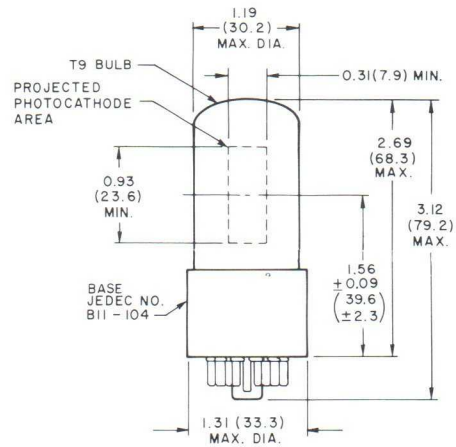
Not required. Type has semiflexible leads. Min. lead length = 1.5".

### Magnetic Shield

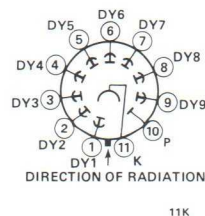
Not available from RCA.

3

6328  
7117



### Basing, Bottom View

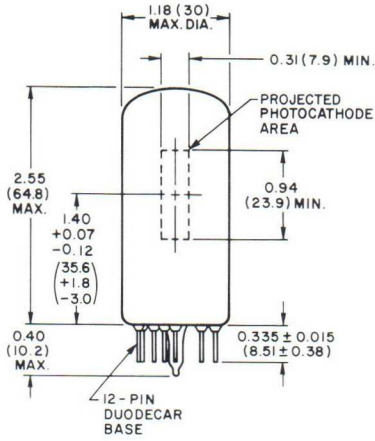


- Socket  
RCA AJ2256
- Magnetic Shield  
RCA AJ2241

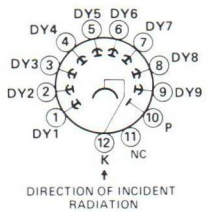
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

4

4552



**Basing, Bottom View**



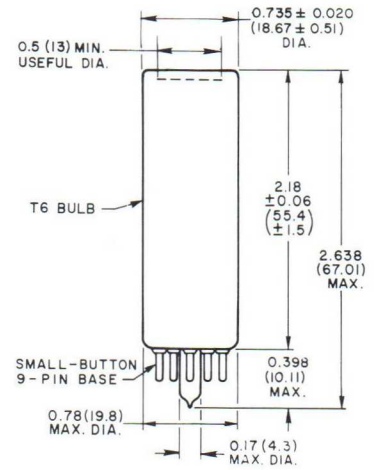
**Socket**  
RCA AJ2257

**Magnetic Shield**  
RCA AJ2242

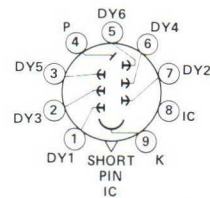
480

6

7764



**Basing, Bottom View**



**Socket**  
RCA AJ2258

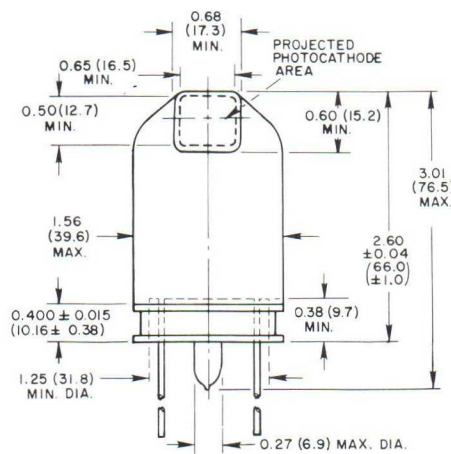
**Magnetic Shield**  
RCA AJ2245

1569

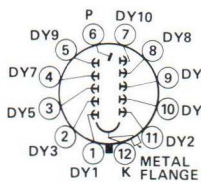
5

4526\*

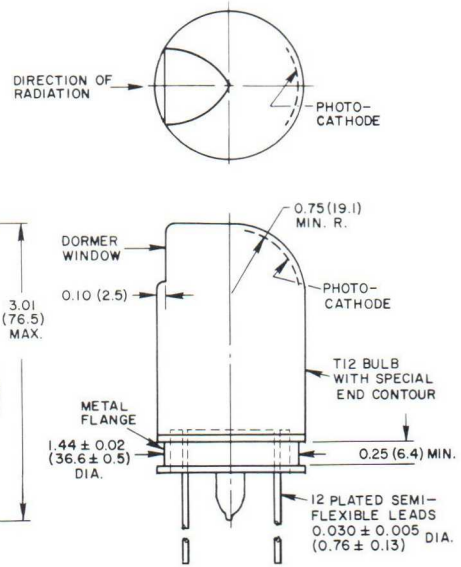
\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 1.5".



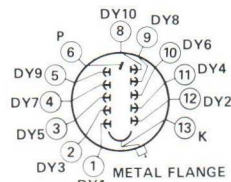
**Basing, Bottom View**  
With temporary base attached



1567



**Basing, Bottom View**  
With temporary base removed



1566

**Socket**  
For temporary base - RCA AJ2259

**Magnetic Shield**  
RCA AJ2243

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

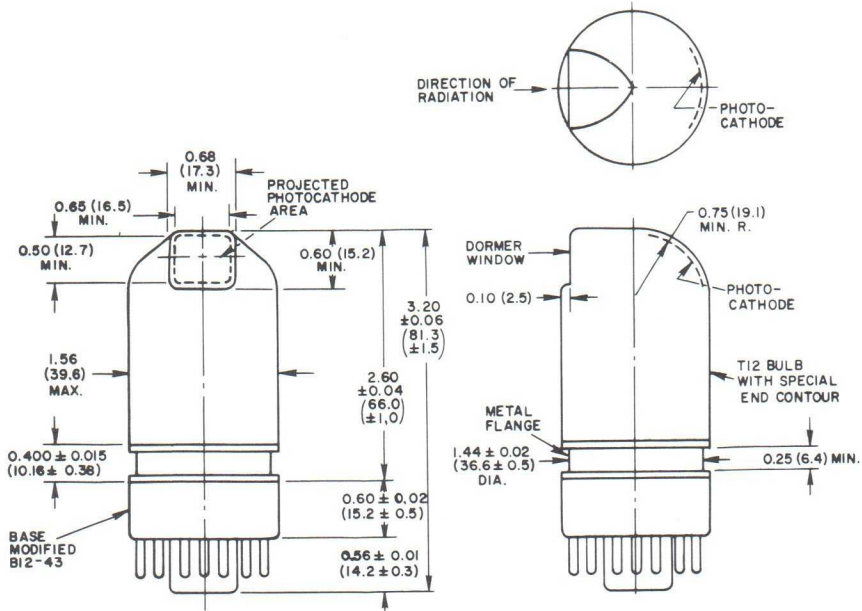
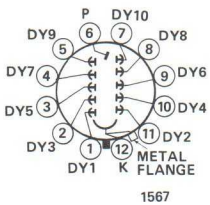
7

4526/V1

**Socket**  
RCA AJ2259

**Magnetic Shield**  
RCA AJ2243

**Basing, Bottom View**



8

C70128\*

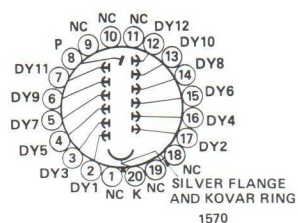
\*Type is supplied with a B20-102 base attached to semiflexible leads. Min. lead length = 1.5".

**Socket**  
For temporary base  
RCA AJ2261

**Magnetic Shielding**  
RCA AJ2244

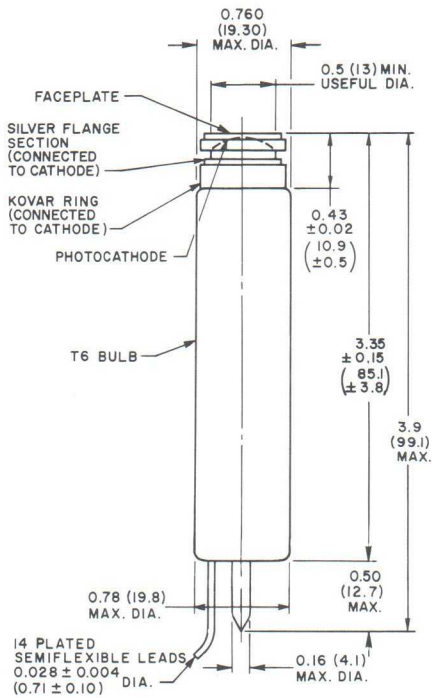
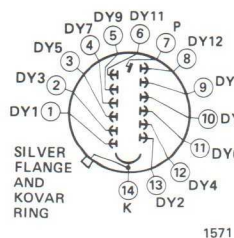
**Basing, Bottom View**

With temporary base attached



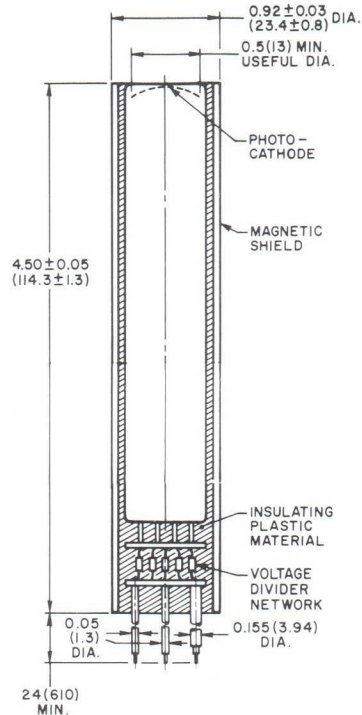
**Basing, Bottom View**

With temporary base removed

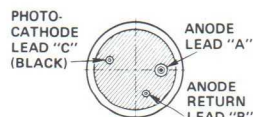


9

8645



**Lead Connections, Bottom View**



**Socket**

Not required. Type has semiflexible leads. Min. lead length = 24".

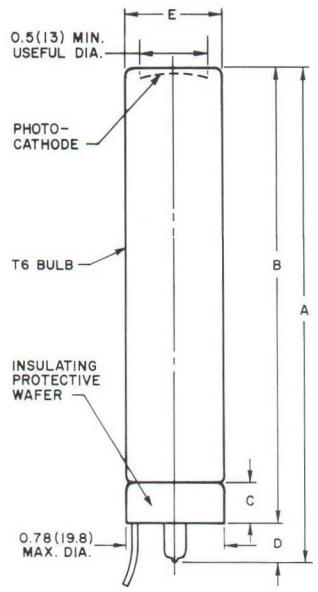
**Magnetic Shield**

Integral with tube and connected to photocathode.

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

10

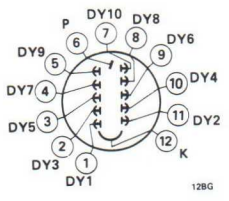
- 4460
- 4516
- 4836\*
- 7767
- 8644\*
- C70042K\*
- C70102B\*



Types	A	B	C	D	E
4516, 7767	3.94 (100.1) Max.	3.50 + .06 - .12 (88.9 + 1.5 - 3.0)	.30 (7.6) Max.	.38 (9.7) Max.	.755 (19.18) Max. Dia.
4836*, 8644*, C70042K*	3.80 (96.5) Max.	3.51 ± .18 (89.2 ± 4.6)	.28 (7.1) Max.	.30 (7.6) Max.	.755 (19.18) Max. Dia.
4460, C70102B*	3.38 (85.9) Max.	2.94 + .06 - .12 (74.7 + 1.5 - 3.0)	.30 (7.6) Max.	.38 (9.7) Max.	.755 (19.18) Max. Dia.

\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length for all asterisked types, except C70102B, = 1.5". For type C70102B, min. lead length = 0.75".

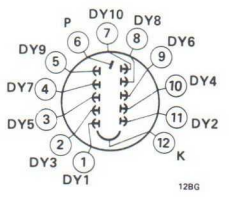
**4516**  
Basing, Bottom View



**Socket**  
Not required. Type has semiflexible leads. Min. lead length = 0.75".

**Magnetic Shield**  
RCA AJ2244

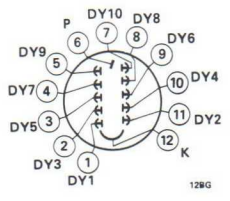
**7767**  
Basing, Bottom View



**Socket**  
Not required. Type has semiflexible leads. Min. lead length = 0.75".

**Magnetic Shield**  
RCA AJ2244

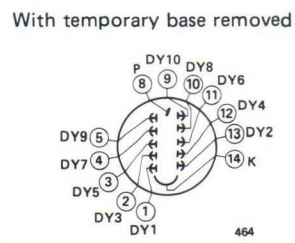
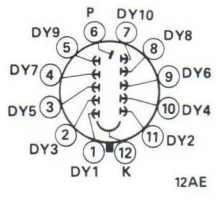
**4460**  
Basing, Bottom View



**Socket**  
Not required. Type has semiflexible leads. Min. lead length = 0.75".

**Magnetic Shield**  
RCA AJ2244

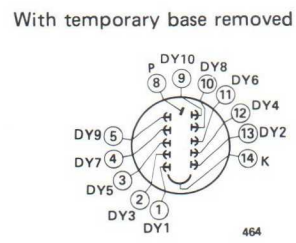
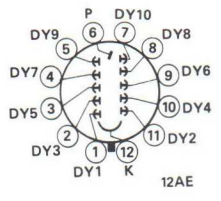
**4836**  
Basing, Bottom View  
With temporary base attached



**Socket**  
For temporary base, RCA AJ2259

**Magnetic Shield**  
RCA AJ2244

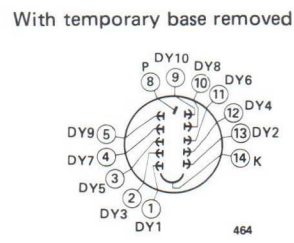
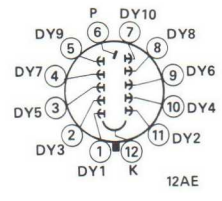
**8644**  
Basing, Bottom View  
With temporary base attached



**Socket**  
For temporary base, RCA AJ2259

**Magnetic Shield**  
RCA AJ2244

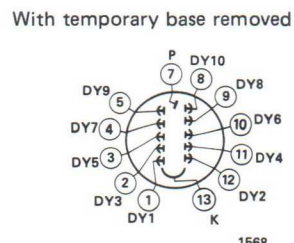
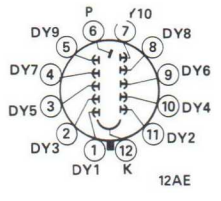
**C70042K**  
Basing, Bottom View  
With temporary base attached



**Socket**  
For temporary base, RCA AJ2259

**Magnetic Shield**  
RCA AJ2244

**C70102B**  
Basing, Bottom View  
With temporary base attached



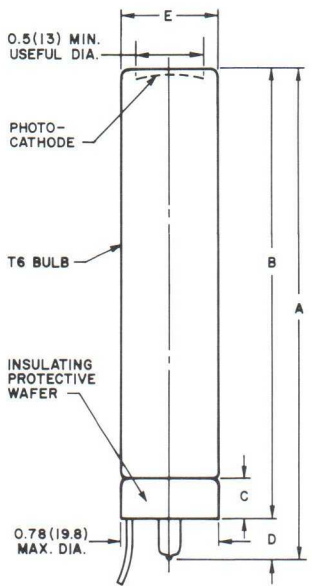
**Socket**  
For temporary base, RCA AJ2259

**Magnetic Shield**  
RCA AJ2244

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

11

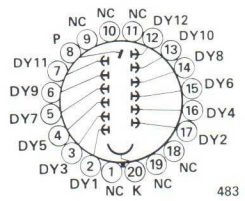
4802■  
C7291E\*  
C31005C■



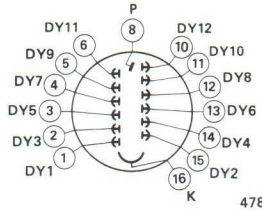
Types	A	B	C	D	E
C31005C■	3.94 (100.1) Max.	3.50 + .06 - .12 (88.9 + 1.5 - 3.0)	.30 (7.6) Max.	.38 (9.7) Max.	.755 (19.18) Max. Dia.
4802■	3.80 (96.5) Max.	3.51 ± .18 (89.2 ± 4.6)	.28 (7.1) Max.	.30 (7.6) Max.	.755 (19.18) Max. Dia.
C7291E*	3.30 (83.8) Max.	2.93 ± .15 (74.4 ± 3.8)	.28 (7.1) Max.	.30 (7.6) Max.	.77 (19.6) Max. Dia.

■ Type is supplied with a B20-102 base attached to semiflexible leads. Min. lead length = 1.5".  
\* Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 1.5".

**C31005C**  
Basing, Bottom View  
With temporary base attached

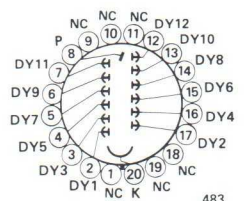


With temporary base removed

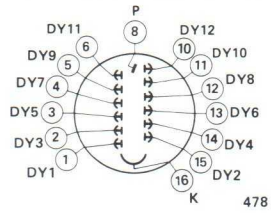


**Socket**  
For temporary base, RCA AJ2261  
**Magnetic Shield**  
RCA AJ2244

**4802**  
Basing, Bottom View  
With temporary base attached

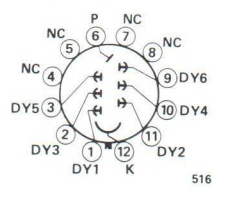


With temporary base removed

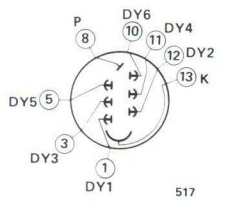


**Socket**  
For temporary base, RCA AJ2261  
**Magnetic Shield**  
RCA AJ2244

**C7291E**  
Basing, Bottom View  
With temporary base attached



With temporary base removed

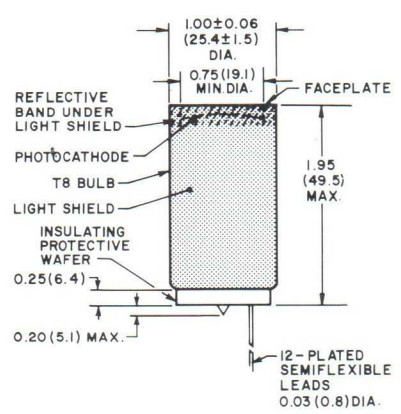


**Socket**  
For temporary base, RCA AJ2259  
**Magnetic Shield**  
RCA AJ2244

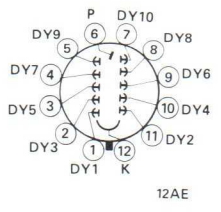
12

C31016F\*  
C31016G\*

\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 1.5".

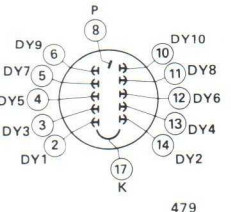


**Basing, Bottom View**  
With temporary base attached



**Socket**  
For temporary base, RCA AJ2259

**Basing, Bottom View**  
With temporary base removed

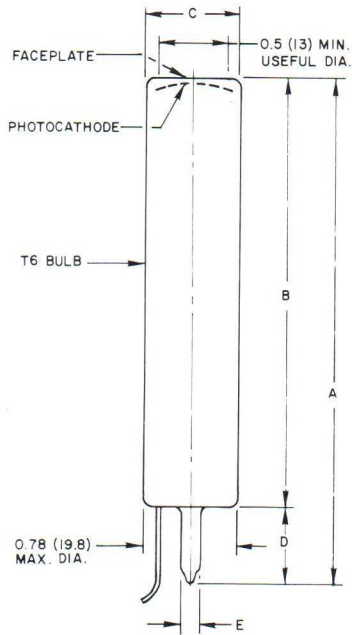


**Magnetic Shielding**  
RCA AJ2232 (Foil)

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

13

**C31005■**  
**C70042Y\***  
(4886)



Types	A	B	C	D	E
C31005■	3.9 (99.1) Max.	3.35 ± .15 (85.1 ± 3.8)	.760 (19.30) Max.	0.50 (12.7) Max.	0.16 (4.1) Max.
C70042Y*	3.94 (100.1) Max.	3.35 + .06 - .12 (85.1 + 1.5 - 3.0)	.775 (19.69) Max.	0.63 (16.0) Max.	0.17 (4.3) Max.

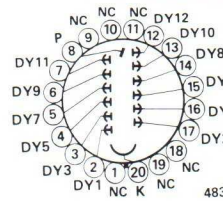
■ Type is supplied with a B20-102 base attached to semiflexible leads.  
Min. lead length = 1.5".

\* Type is supplied with a B12-43 base attached to semiflexible leads.  
Min. lead length = 1.5".

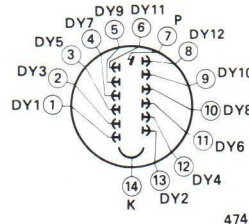
**C31005**

**Basing, Bottom View**

With temporary bast attached



With temporary base removed



**Socket**

For temporary base, RCA AJ2261

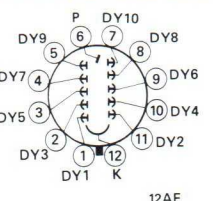
**Magnetic Shield**

RCA AJ2244

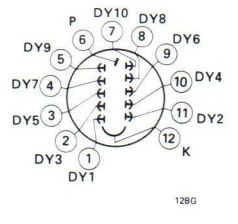
**C70042Y (4886)**

**Basing, Bottom View**

With temporary base attached



With temporary base removed



**Socket**

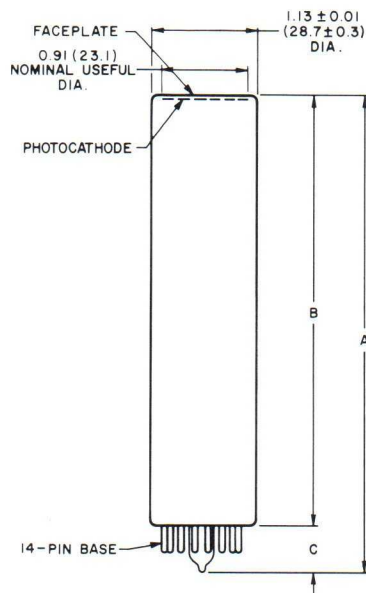
For temporary base, RCA AJ2259

**Magnetic Shield**

RCA AJ2244

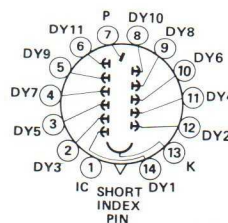
14

**C31059**  
**C31059A**  
**C31059B**



Types	A	B	C
C31059, C31059B	4.94 (125.5) Max.	4.42 ± .01 (112.3 ± .3)	.51 (13.0) Max.
C31059A	4.20 (106.7) Typ.	3.8 (97) Typ.	.45 (11.4) Max.

**Basing, Bottom View**



**Socket**

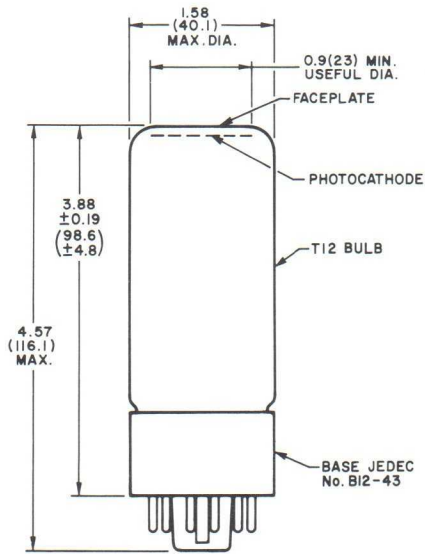
Types C31059, C31059B — RCA AJ2262  
Type C31059A — RCA AJ2263

**Magnetic Shield**  
RCA AJ2246

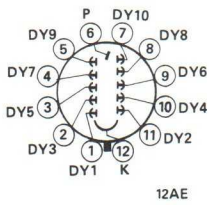
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

15

4831



Basing, Bottom View



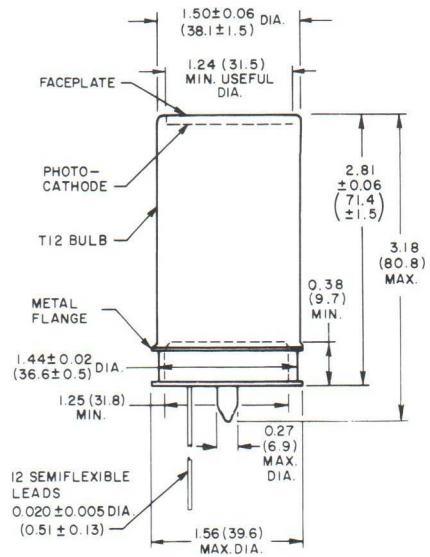
Socket  
RCA AJ2259

Magnetic Shield  
RCA AJ2247

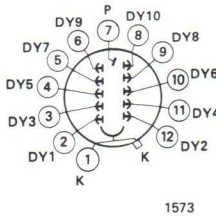
12AE

17

4441  
4441A



Basing, Bottom View

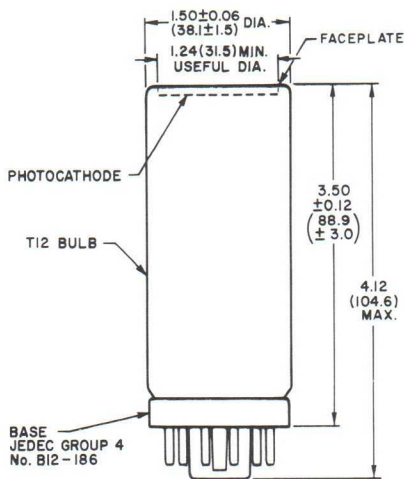


Socket  
Not required. Types have semiflexible leads. Min. lead length = 1.5''.

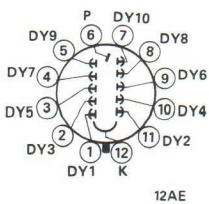
Magnetic Shield  
RCA AJ2232 (Foil)

16

4440



Basing, Bottom View



Socket  
RCA AJ2259

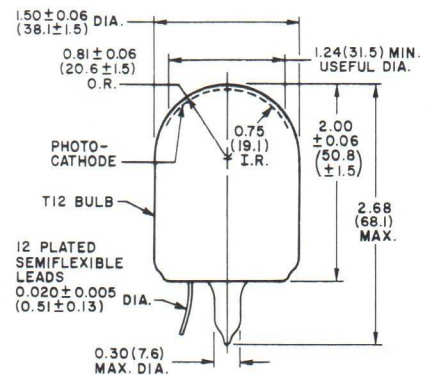
Magnetic Shield  
RCA AJ2247

12AE

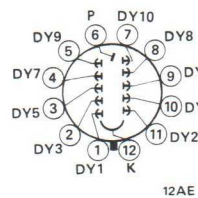
18

C70132D\*

\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 2''.

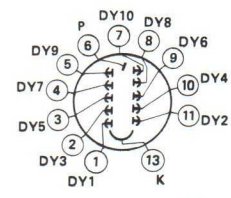


Basing, Bottom View  
With temporary base attached



Socket  
For temporary base, RCA AJ2259

Basing, Bottom View  
With temporary base removed



Magnetic Shield  
RCA AJ2232 (Foil)

287

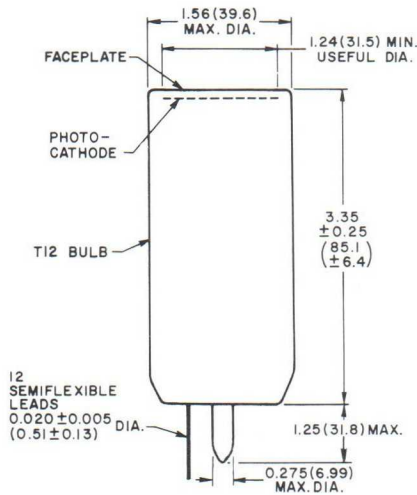


# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

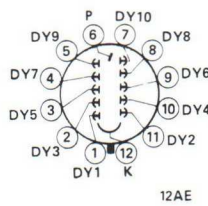
19

**2060\***

\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 2.4".



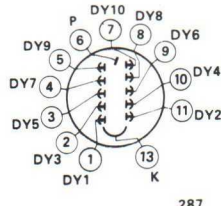
**Basing, Bottom View**  
With temporary base attached



12AE

**Socket**  
For temporary base, RCA AJ2259

**Basing, Bottom View**  
With temporary base removed

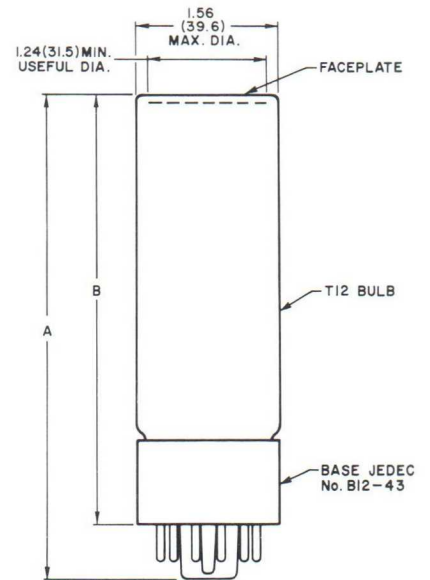


287

**Magnetic Shield**  
RCA AJ2247

21

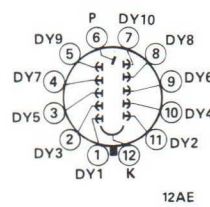
**4517  
4855  
4903  
6199  
7102  
C7151W  
C31007B  
C31061A**



**Socket**  
RCA AJ2259

**Magnetic Shield**  
RCA AJ2247

**Basing, Bottom View**



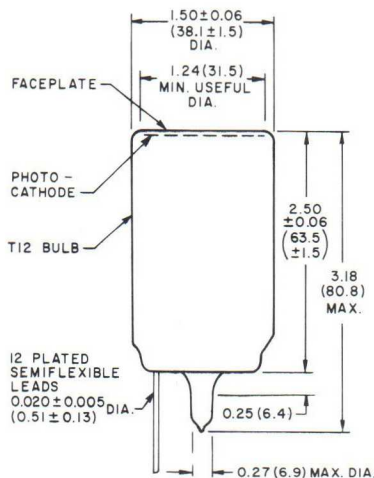
12AE

Types	A	B
4517, 4903, 6199, 7102, C7151W, C31007B	4.57 (116.1) Max.	3.88 ± .19 (98.6 ± 4.8) Max.
4855, C31061A	5.00 (127) Max.	4.409 ± .039 (112 ± 1)

20

**C7151N\*  
C7151Q\***

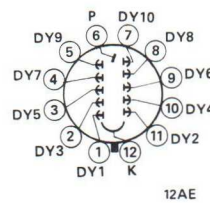
\*Type is supplied with a B12-43 base attached to semiflexible leads. Min. lead length = 2".



**Socket**  
For temporary base, RCA AJ2259

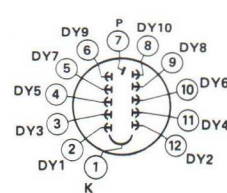
**Magnetic Shield**  
RCA AJ2232 (Foil)

**C7151N**  
**Basing, Bottom View**  
With temporary base attached



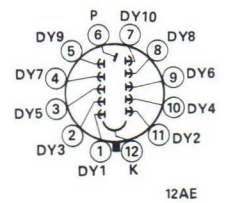
12AE

With temporary base removed



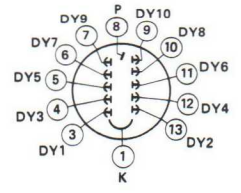
1574

**C7151Q**  
**Basing, Bottom View**  
With temporary base attached



12AE

With temporary base removed

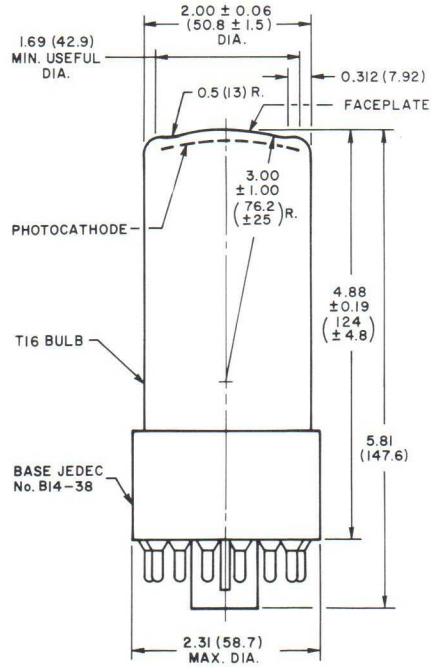


1575

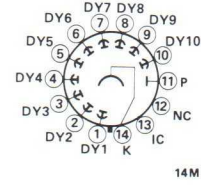
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

22

5819  
6217



Basing, Bottom View

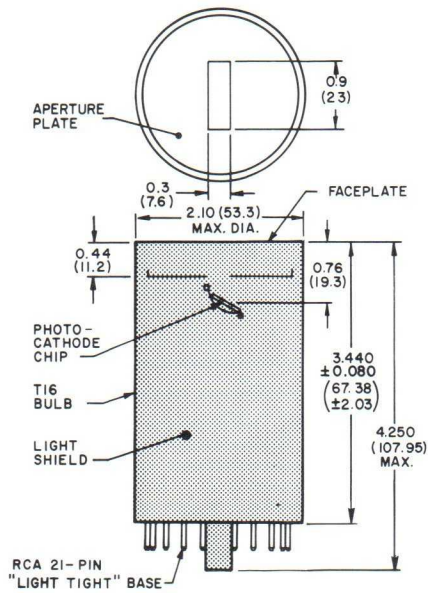


Socket  
RCA AJ2260

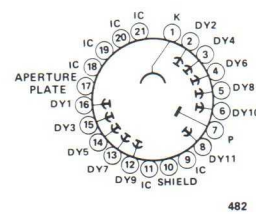
Magnetic Shield  
AJ2248

23

C31034  
C31034-02  
C31034A  
C31034A-02  
C31034B  
C31034C  
C31034D



Basing, Bottom View



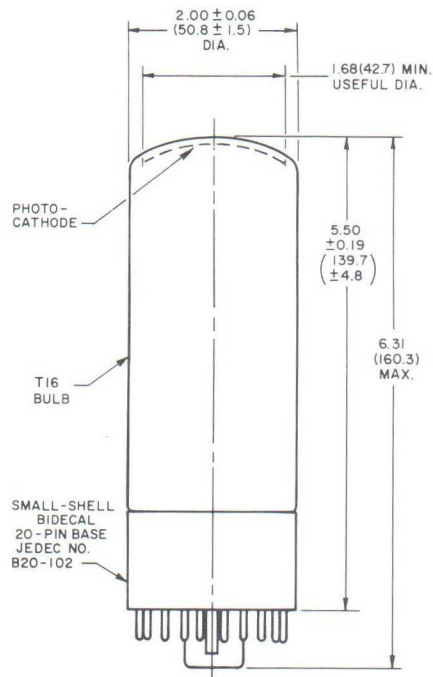
Socket  
RCA AJ2145  
(Supplied with tube)  
RCA AJ2144

Magnetic Shield  
RCA AJ2250

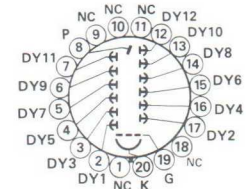
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

24

7850



**Basing, Bottom View**



20E

**Socket**

RCA AJ2261

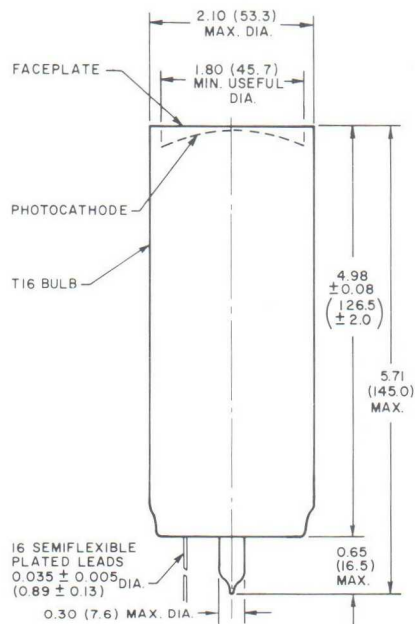
**Magnetic Shield**

RCA AJ2252

25

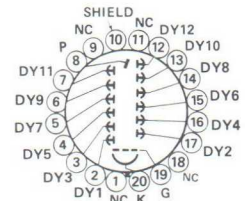
C31057\*  
C31057A\*  
C31057B\*

\*Type is supplied with a B20-102 base attached to semiflexible leads. Min. lead length = 1.5".



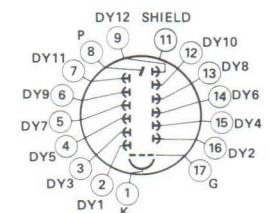
**Basing, Bottom View**

With temporary base attached



1541

With temporary base removed



1542

**Socket**

For temporary base, RCA AJ2261

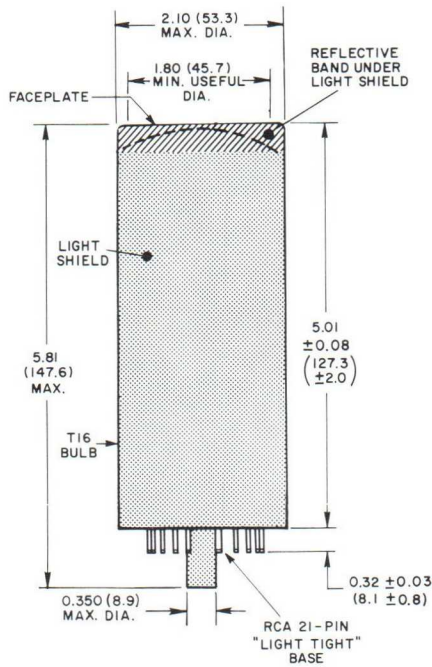
**Magnetic Shield**

RCA AJ2252

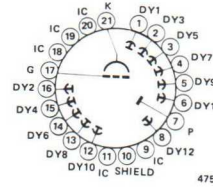
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

26

8575  
8575/V1  
8575/V2  
8850  
8852  
C31000A  
C31000M★  
C31000AJ



Basing, Bottom View



**Socket**

For types 8575, 8850, 8852, C31000A, C31000M, and C31000AJ – RCA AJ2145 (Supplied with tube)  
RCA AJ2144

For type 8575/V2 – RCA AJ2144 (Supplied with tube)

For type 8575/V1 – Not required. Type supplied with RCA AJ2132 socket adapter.

**Magnetic Shield**

RCA AJ2252

**Socket Adapters**

For types 8575, 8850 – RCA AJ2132

**Auxiliary Photomultiplier Assemblies**

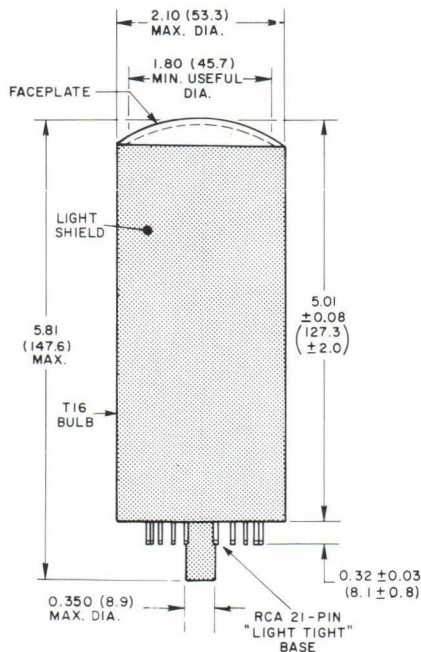
For types 8575, 8575/V2, C31000A, and C31000AJ – RCA AJ2207A  
RCA AJ2208

For types 8850, 8852, and C31000M – RCA AJ2209A

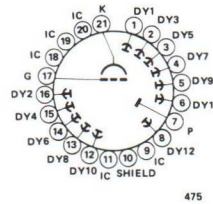
★Overall length for C31000M is 6.43" (163.3 mm) max., seated height is 5.70" ± 0.08" (144.8 mm ± 2 mm).

27

4501/V3  
4501/V4  
4507  
8853



Basing, Bottom View



**Socket**

RCA AJ2145 (Supplied with tube)  
RCA AJ2144

**Magnetic Shield**

RCA AJ2252

**Auxiliary Photomultiplier Assemblies**

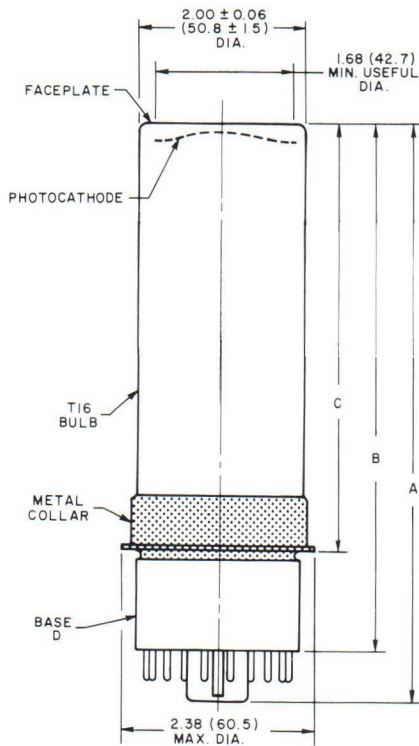
For types 4501/V3, 4501/V4 – RCA AJ2208

For type 8853 – RCA AJ2209A

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

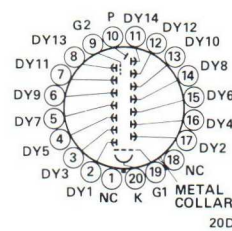
28

6810A  
7265  
7326

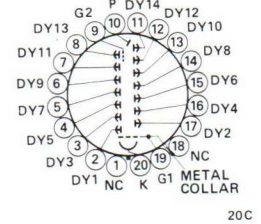


Types	A	B	C	D
6810A, 7265	7.5 (191) Max.	6.69 ± .19 (169.9 ± 4.8)	5.35 ± .12 (135.9 ± 3)	B20-102
7326	6.78 (172.2) Max.	5.84 ± .19 (148.3 ± 4.8)	4.53 ± .12 (115.1 ± 3)	B14-45

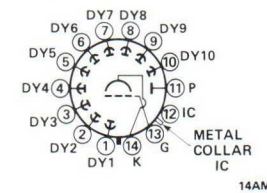
**6810A**  
Basing, Bottom View



**7265**  
Basing, Bottom View



**7326**  
Basing, Bottom View



**Socket**

For types 6810A and 7265 —  
RCA AJ2261

For type 7326 — RCA AJ2260

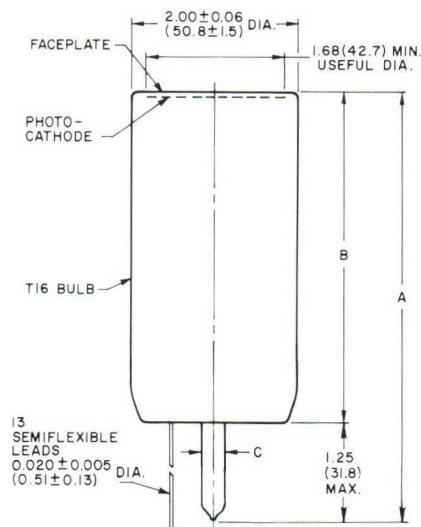
**Magnetic Shield**

For types 6810A and 7265 —  
RCA AJ2251

For type 7326 — RCA AJ2232 (Foil)

29

2063\*  
4523/V2\*  
4523/V3  
4856\*  
6342A/V1\*



Types	A	B	C
2063*, 4523/V2*, 4523/V3	—	4.33 ± .25 (110 ± 6.4)	.275 (7) Max. Dia.
6342A/V1*	5.88 (149.4) Max.	4.38 ± .25 (111.3 ± 6.4)	.38 (9.7) Max. Dia.
4856*	5.07 (128.8) Max.	3.75 ± .06 (95.3 ± 1.5)	.38 (9.7) Max. Dia.

\*Type is supplied with a B14-38 base attached to semiflexible leads. Min. lead length for types 2063, 4523/V2, and 4523/V3 = 2.5". For types 4856 and 6342A/V1, min. lead length = 2".

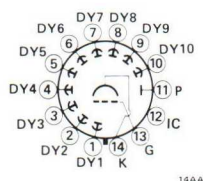
**Socket**

For all types except 4523/V3 —  
RCA AJ2260

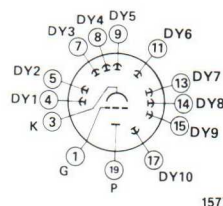
**Magnetic Shield**

RCA AJ2249

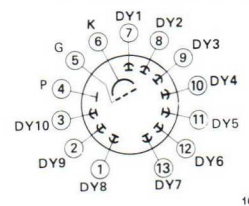
**All types except 4523/V3**  
Basing, Bottom View  
With temporary base attached



**2063, 4523/V2, 4523/V3**  
Basing, Bottom View  
With temporary base removed



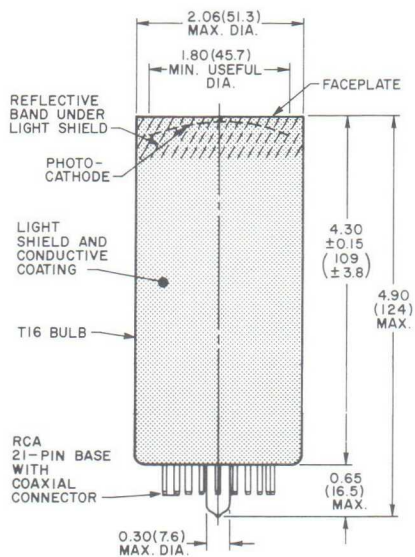
**6342A/V1, 4856**  
Basing, Bottom View  
With temporary base removed



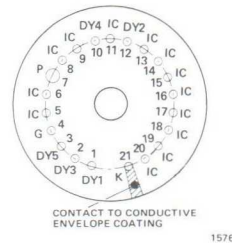
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

30

C31024  
C31024A



Basing, Bottom View



**Socket**

RCA AJ2100 (Supplied with tube)  
RCA AJ2101

**Magnetic Shield**

RCA AJ2249

**Coaxial Anode Cable**

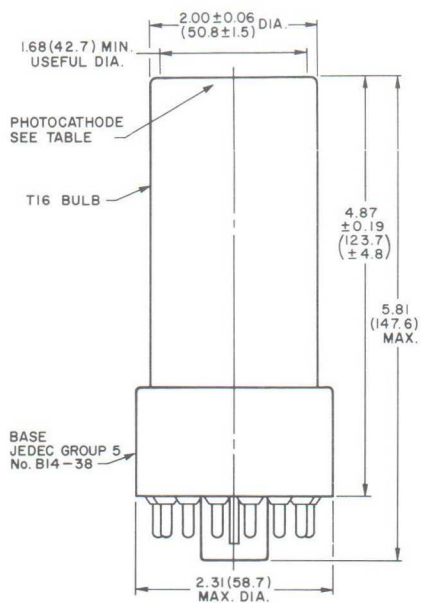
RCA AJ2102

**Auxiliary Photomultiplier Assemblies**

RCA AJ2175A  
RCA AJ2203A

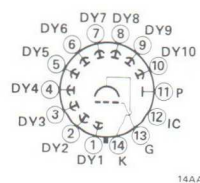
31

4463  
4518  
4523  
6342A  
6655A  
8053  
C7164C  
C7164R★



Types	Shape of Faceplate
4463	Plano-Plano
4518	Plano-Concave
4523	Plano-Plano
6342A	Plano-Concave
6655A	Plano-Concave
8053	Plano-Plano
C7164C	Plano-Plano
C7164R	Plano-Concave

Basing, Bottom View



**Socket**

RCA AJ2260

**Magnetic Shield**

RCA AJ2248

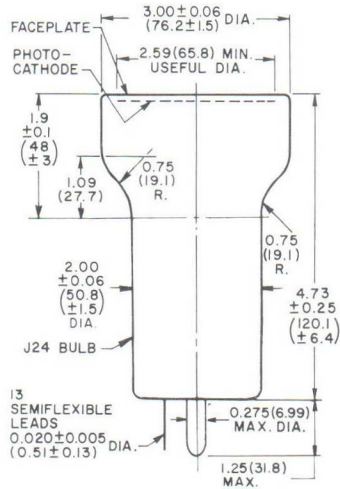
★Overall length for C7164R is 5.2" (132 mm) max., seated length is 4.25" ± .19" (108 mm ± 4.8 mm).

# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

32

**2064B\***  
**4524/V5\***

\*Type is supplied with a B14-38 base attached to semiflexible leads.  
Min. lead length = 2.5".



**Socket**

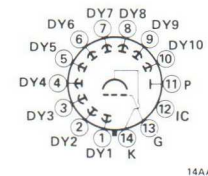
For temporary base,  
RCA AJ2260

**Magnetic Shield**

RCA AJ2232 (Foil)

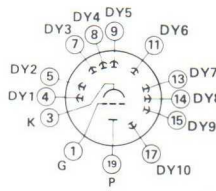
**Basing, Bottom View**

With temporary base attached



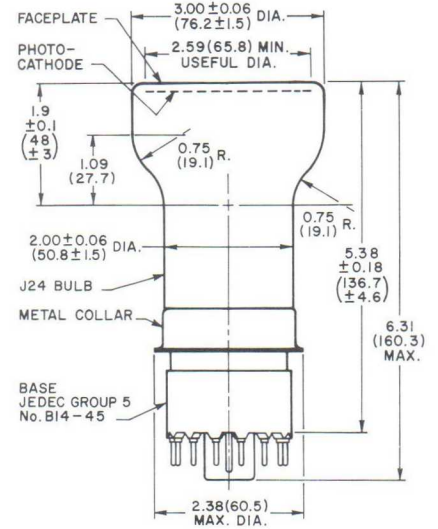
**Basing, Bottom View**

With temporary base removed

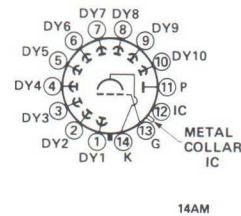


34

**4464**



**Basing, Bottom View**



**Socket**

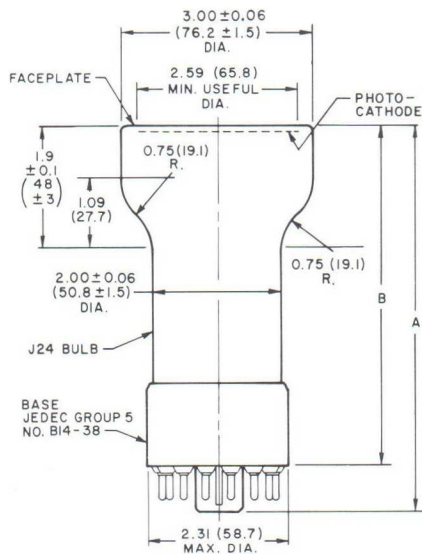
RCA AJ2260

**Magnetic Shield**

RCA AJ2232 (Foil)

33

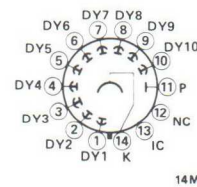
**4900**  
**4524**  
**8054**



Types	A	B
4900	5.74 (145.8) Max.	4.81 ± .18 (122.2 ± 4.6)
4524, 8054	6.31 (160.3) Max.	5.38 ± .18 (136.7 ± 4.6)

**4900**

**Basing, Bottom View**

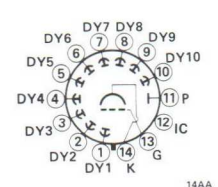


**Socket**

RCA AJ2260

**4524, 8054**

**Basing, Bottom View**



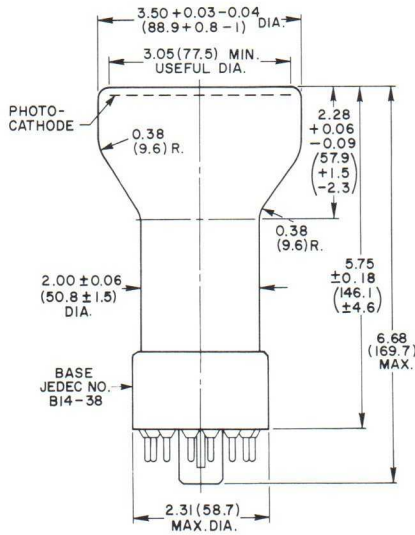
**Magnetic Shield**

RCA AJ2253

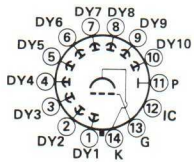
# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

35

C31053A



Basing, Bottom View

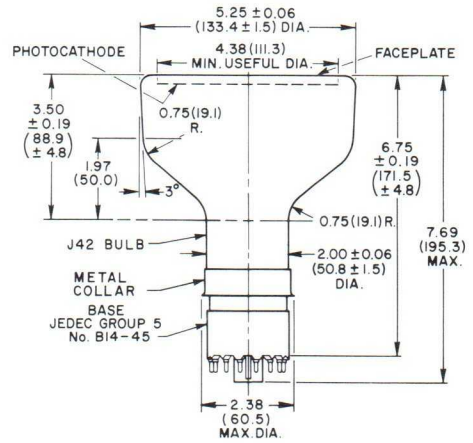


Socket  
RCA AJ2260

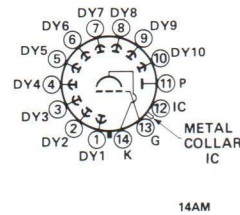
Magnetic Shield  
RCA AJ2232 (Foil)

37

4465



Basing, Bottom View

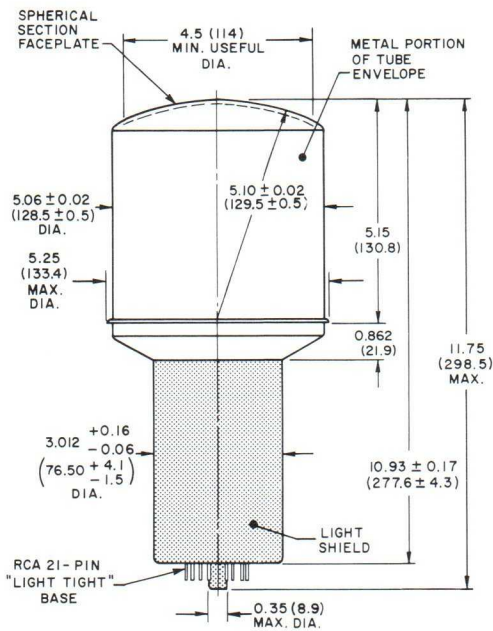


Socket  
RCA AJ2260

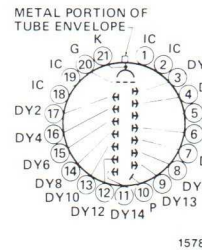
Magnetic Shield  
RCA AJ2232 (Foil)

36

4522  
8854



Basing, Bottom View



Socket  
RCA AJ2145 (Supplied with tube)  
RCA AJ2144

Magnetic Shield  
RCA AJ2255

Socket Adapters  
RCA AJ2143  
RCA AJ2143A

Faceplate Adapter  
RCA AJ2142

Auxiliary Photomultiplier Assemblies  
For type 4522 — RCA AJ2223A  
For type 8854 — RCA AJ2230A

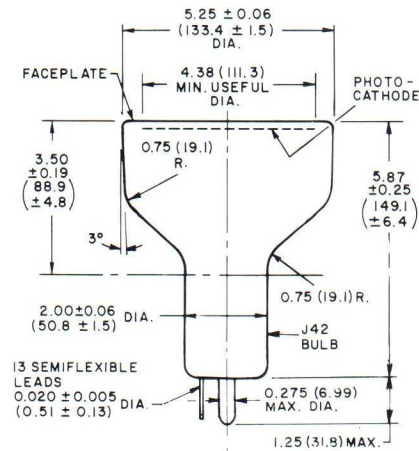


# Dimensional Outlines and Basing Diagrams for Photomultipliers (Cont'd)

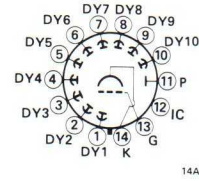
38

**2065\*  
4525/V1\***

\*Type is supplied with a B14-38 base attached to semiflexible leads. Min. lead length = 2.5''.

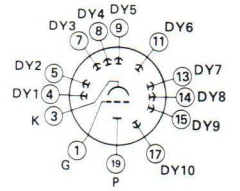


**Basing, Bottom View**  
With temporary base attached



**Socket**  
RCA AJ2260

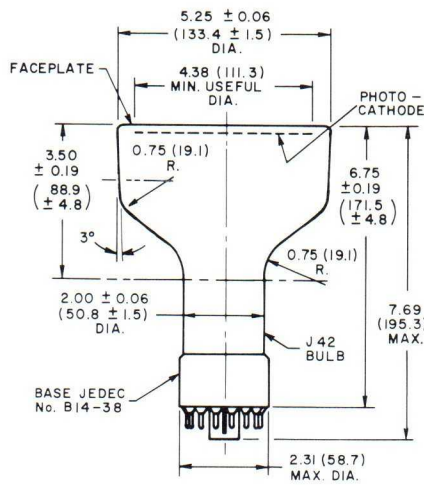
**Basing, Bottom View**  
With temporary base removed



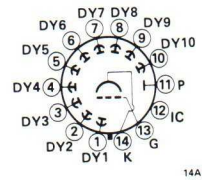
**Magnetic Shield**  
RCA AJ2232 (Foil)

39

**4525  
8055**



**Basing, Bottom View**



**Socket**  
RCA AJ2260

**Magnetic Shield**  
RCA AJ2254

The dimensions shown on the outline drawings are in inches. The dimensions shown in parentheses are in millimeters.

# RCA Special Line Photomultipliers

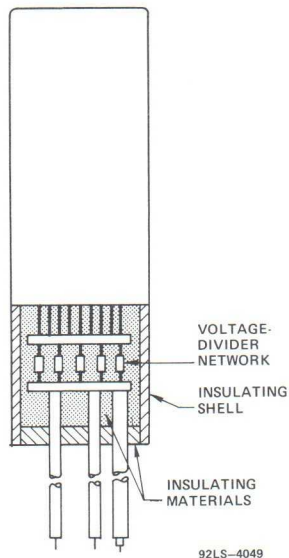
## Photomultipliers with Integral Voltage-Divider Networks and Integral Voltage-Divider Networks and Shields (Special Line Series)

All RCA photomultipliers can be supplied with integral electrostatic-magnetic shielding and/or voltage-divider networks. Those shown below are typical examples. Photomultipliers of the Special-Line Series supplied without shielding are classified as Configuration 1, those with shielding as Configuration 2. Three basic voltage-divider arrangements are available and are classified as arrangement A, arrangement B, and arrangement C. Arrangement A provides a voltage-divider network current of approximately  $20\ \mu\text{A}$ ; B,  $100\ \mu\text{A}$ ; and C,  $1000\ \mu\text{A}$ . The average values of anode current drawn from the tube should be  $1/10$  of these values. Capacitors are connected across the latter

stages of the tubes. The maximum ambient operating temperature range for these devices is  $-40^\circ\text{C}$  to  $+55^\circ\text{C}$ . Some photomultipliers, such as the C31034 series and the 4832 type, cannot use the specified voltage-divider network currents because of their low maximum average anode current ratings. Special divider networks are required for tubes of this type. Also special configurations must be designed to use RCA's high-temperature ( $+150^\circ\text{C}$ ) bialkali photocathode tube types. All voltage divider distributions can be modified, on special request, to meet specific customer needs.

### Tubes Without Shielding

#### Configuration 1



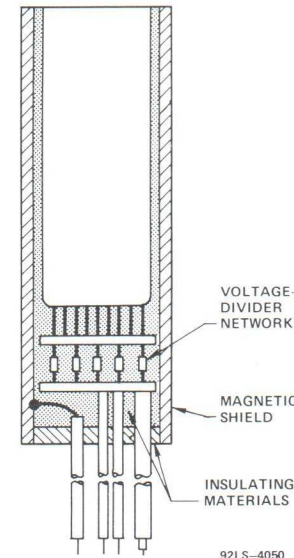
**1A** — Integral voltage-divider network only. Uses high value resistors in network and is recommended for applications requiring minimum power-supply drain. The average anode current drawn from the tube should be  $2\ \mu\text{A}$ , or less.

**1B** — Integral voltage-divider network only. Uses intermediate value resistors in network and is recommended for most applications. The average anode current drawn from the tube should be  $10\ \mu\text{A}$ , or less.

**1C** — Integral voltage-divider network only. Uses low value resistors in network and is recommended for applications requiring high linear average output current capability. The average anode current drawn from the tube should be  $100\ \mu\text{A}$ , or less.

### Tubes With Shielding

#### Configuration 2



**2A** — Integral voltage-divider network and shielding. Uses high value resistors in network and is recommended for applications requiring minimum power-supply drain. The average anode current drawn from the tube should be  $2\ \mu\text{A}$ , or less.

**2B** — Integral voltage-divider network and shielding. Uses intermediate value resistors in network and is recommended for most applications. The average anode current drawn from the tube should be  $10\ \mu\text{A}$ , or less.

**2C** — Integral voltage-divider network and shielding. Uses low value resistors in network and is recommended for applications requiring high linear average output current capability. The average anode current drawn from the tube should be  $100\ \mu\text{A}$ , or less.

As examples, the designation 7767/2C defines an RCA type 7767 having an integral shield and a voltage-divider arrangement providing a divider network current of  $1000\ \mu\text{A}$ . The designation 7767/1A defines a 7767 having a voltage-divider arrangement only which provides a divider network current of  $20\ \mu\text{A}$ .

# Auxiliary Photomultiplier Assemblies (APA's)

The APA is a socket and voltage-divider network housed in a metal container. Its use eliminates the need for voltage-divider network fabrication by the equipment designer. The voltage divider arrangement in the device is usually the standard one used for measuring the photomultiplier tube characteristics. See page 23. Some variants of the standard networks, however, are shown below. Other variants to meet customer needs are available or can be provided upon request.

Except for type AJ2208, each of the assemblies described below have both an anode signal output connector and a dynode

signal pick off connector. The assemblies provide a linear "negative-going" anode signal having the best possible time response and a slower linear "positive-going" signal from the dynode that may be used in pulse height analysis systems or as a trigger signal for the time base of a sampling oscilloscope. The positive going dynode signal also eliminates the need for an inverting amplifier in some equipment. The dynode output connector should be capped with a standard BNC shorting cap if not used.

Assembly Designation	For Use With Photomultiplier Types	Voltage Divider Distribution Code	Approximate Average Linear Anode Signal Output From Specified Photomultiplier Types $\mu\text{A}$	Maximum Applied Voltage To High-Voltage Connector <sup>a</sup> V	Dynode Pickoff	Signal Output Termination (Pure resistance)		Cathode Operating Mode
						Anode $\Omega$	Dynode $\Omega$	
AJ2175A	C31024 Series	1	30	3500	No.5	50	50 to 2000	-HV
AJ2203A <sup>b</sup>	C31024 Series	2	85	4500	No.5	50	50 to 2000	-HV
AJ2207A	8575, C31000 Series	3	185	3000	No.10	50	50 to 2000	-HV
AJ2208	4501/V3, 4501/V4, 8575, C31000 Series	3	150	2500	-	50	-	+HV
AJ2209A	8850, 8852, 8853, C31000M	4	140	2500	No.10	50	50 to 2000	-HV
AJ2223A	4522	5	180	3000	No.11	50	50 to 2000	-HV
AJ2230A	8854	6	150	3000	No.12	50	50 to 2000	-HV

<sup>a</sup> The absolute-maximum voltage which may be applied to the high voltage connector is that specified for the photomultiplier tube used with the assembly. See **Photomultiplier Ratings and Characteristics**.

<sup>b</sup> This assembly provides a linear peak anode current of up to 100 mA.

## Voltage Divider Distribution

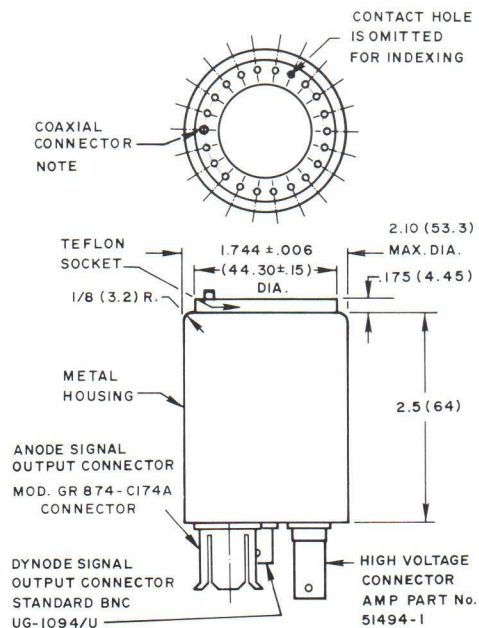
### Cathode to Anode

Code	K, Dy1, Dy2, Dy3, Dy4, - P
1	4, 2, 2, 2, 1, 1.7 <sup>▲</sup> , 0.37 <sup>●</sup>
2	1.6, 1, 1.45, 1, 1, 3.4 <sup>●</sup>
3	4, 1, 1.4, 1, - - - - 1
4	6, 1, 1.4, 1, - - - - 1
5	3, 1, 1, 1, - - - - 1
6	6, 1, 1, 1, - - - - 1

<sup>▲</sup>Between dynode No.5 and suppressor grid.

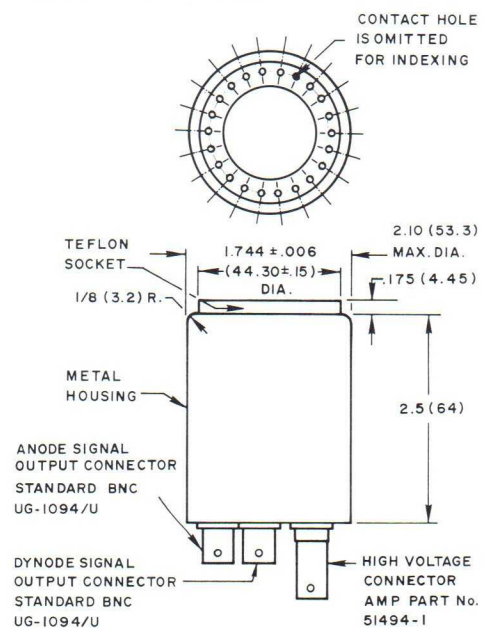
<sup>●</sup>Between suppressor grid and ground.

## Types AJ2175A and AJ2203A



**Note:** The coaxial connector mates with the coaxial anode connector of the C31024 series of photomultiplier tubes.

## Types AJ2207A, AJ2208\*, AJ2209A, AJ2223A, and AJ2230A



\*Type AJ2208 is not provided with a dynode signal output connector.

Dimensions in inches

# Integrated Photodetection Assemblies (IPA's)

IPA's are extremely convenient, low light level photodetection assemblies. They are composed of a photomultiplier tube, a power supply, voltage divider circuitry, and electrostatic/magnetic shielding. Optional optical filters and/or integral user-specified amplifiers are available in some types. Operation of

these devices requires only a low-voltage input power source and either a potentiometer for resistance programming or a low voltage (typically 5 volts) source for voltage programming of signal output current.

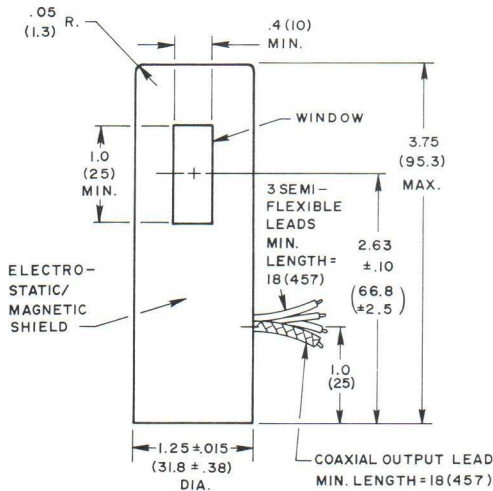
## Side-On Types

RCA IPA Type No.	Maximum Power Input Requirements		Approximate Spectral Response Range	Characteristics For an input voltage of 12 V, a programming voltage of 2 V, a tungsten-filament lamp at a color temperature of 2856 K, and an ambient temperature of 22° C.						Remarks
	Voltage	Current		Typical Output Responsivity		Linear DC Output Current	Output Pulse Current		Output Dark Current @ Output Responsivity	
				Radiant at $\lambda_{max}$ . A/W @ nm	Luminous A/lm		Linear	Peak (Non-linear)		
V	mA	nm			$\mu$ A	mA	mA	nA @ A/lm		
PF1006	+12 to +15	100	300 to 660	$4.1 \times 10^5$ @ 400	400	25	6	35	1.5 @ 40	Employs a 9-stage, side-on photomultiplier type 931B.
PF1039	+12 to +15	100	200 to 810	$8.6 \times 10^5$ @ 375	1500	25	6	35	3 @ 100	Variant of PF1006 employing a 4840 photomultiplier.

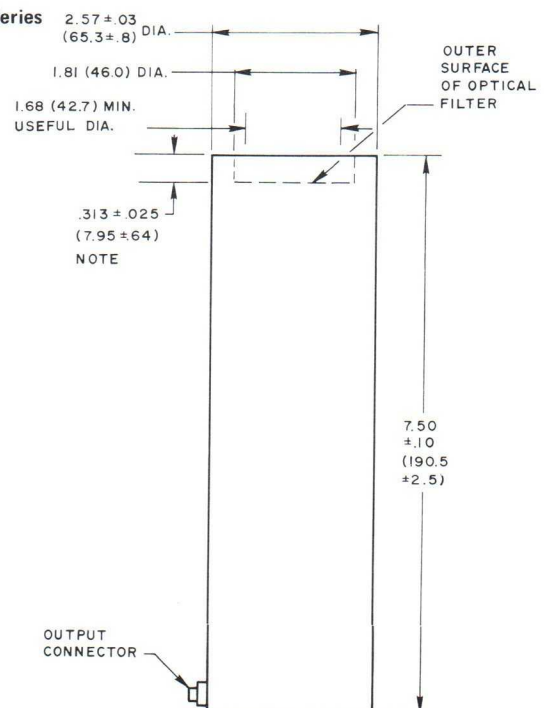
## Head-On Types

RCA IPA Type No.	Maximum Power Input Requirements		Approximate Spectral Response Range	Characteristics For an input voltage of $\pm 12$ V, a programming voltage of 1.2 V, a tungsten-filament lamp at a color temperature of 2856 K, and at an ambient temperature of 22° C. The characteristics are for an IPA having an integral pulse amplifier, no optical filter, and a $2000\Omega$ load on the amplifier output.					Remarks
	Voltage	Current		Responsivity at 632.8 nm V/W	Output Voltage Range V	Assembly Trans-impedance $k\Omega$	Output Impedance $\Omega$	Frequency Response (3 dB point) MHz	
PF1023-Series	$\pm 12$ to $\pm 15$	150 and 20	300 to 880	$8.2 \times 10^8$	0 to 8	50	50	Up to 3	A ruggedized series of customized IPA's. Amplifier type and optical filter are user specified. Type shown employs a 10-stage, ERMA II photocathode PMT.

PF1006, PF1039



PF1023 Series



Note: When an optical filter is not employed, this dimension will apply to the external surface of the tube faceplate rather than to that of the filter. Filter thickness will vary according to the type specified by the user.

Dimensions in inches. Dimensions in parentheses are in millimeters.

# Customized Photomultiplier Assemblies

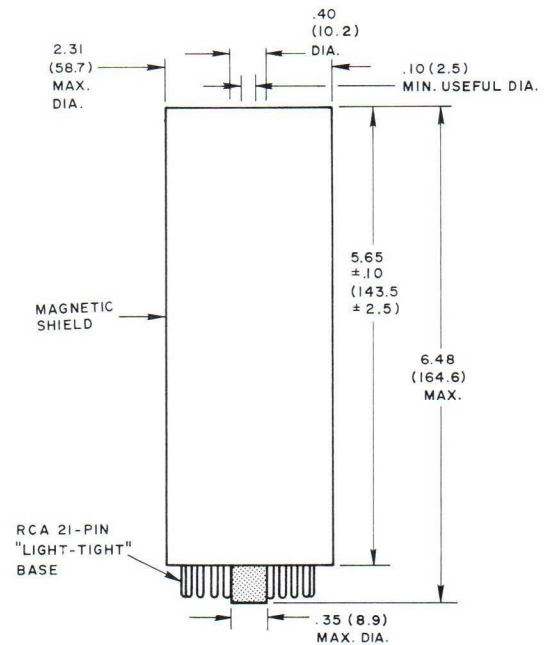
(For Applications Requiring Extremely Low Noise)

## PF1011

An assembly composed of a selected RCA QUANTACON photomultiplier type 8852 (ERMA III photocathode), an annular permanent magnet affixed to the tube's faceplate, and a magnetic shield. This assembly, in effect, provides a photo-detector having a useful photocathode diameter of only 2.5 mm and extremely low dark noise, yet retains all the attendant high-performance characteristics of the 2"-diameter 8852. This assembly has a typical dark noise count rate of only 2 cps at  $-20^{\circ}\text{C}$  and is designed for Raman spectroscopy, astronomy, laser detection, and other single photon counting applications.

## PF1012

This assembly is identical in construction to the PF1011 but it employs an RCA photomultiplier type 8850 (Bialkali photocathode). This assembly has a maximum dark noise count rate of 50 cps at  $22^{\circ}\text{C}$ , and is intended for star-tracking, astronomy, low level photon counting, and other applications requiring high sensitivity in the blue region of the spectrum in conjunction with extremely low noise.



## Auxiliary Components For Photomultipliers

### Socket Adapters

#### AJ2132

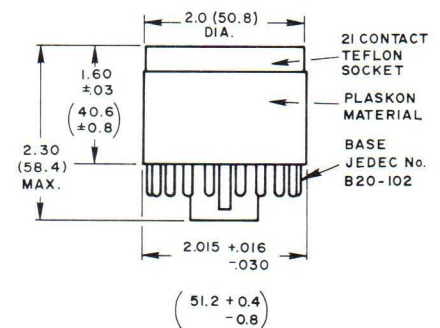
A teflon socket, voltage divider and capacitor network, and a JEDEC No. B20-102 base assembly that allows the replacement of 14-stage photomultipliers such as the 56AVP, 6810A, or 7264 by the high-performance 12-stage photomultiplier types 8575 or 8850.

#### AJ2143

A teflon socket, voltage divider and capacitor network, and a JEDEC No. B20-102 base assembly that allows the replacement of the 58AVP by the photomultiplier types 4522 or 8854.

#### AJ2143A

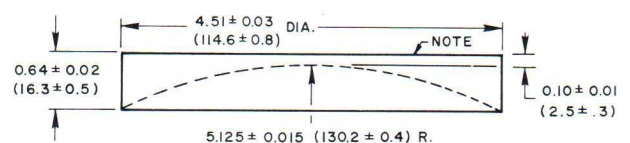
This adapter is identical with the AJ2143 but capacitors are not employed in the voltage divider network.



### Faceplate Adapter

#### AJ2142

An acrylic plastic faceplate adapter (or light pipe) which allows efficient optical coupling between the curved faceplates of the 4522 or 8854 and flat surfaces.



**Note:** Flatness: within 0.010 inch (0.3 mm) from peak to valley.  
Dimensions in inches. Dimensions in parentheses are in millimeters.

### Coaxial Anode Cable Assemblies

#### AJ2102, AJ2210

The AJ2102 is a coaxial cable assembly. It consists of approximately 5-1/2" of RG174/U cable with a General Radio Type 874 connector on one end and a miniature coaxial connector, which mates with the coaxial anode output connector of the

C31024 series, on the other end. Another cable assembly, the AJ2210, which consists of approximately 5" of RG174/U cable and the miniature coaxial connector can also be supplied on request.

# Power Supplies for Photomultipliers

## Compact, Solid-State Units

For All Photomultipliers Requiring Up to 1500 V DC and 1 mA

Type	Polarity (With respect to ground)	Maximum Ratings		Electrical Characteristics					
		DC Output Voltage V	Output Power (For any load) W	DC Output Voltage V	DC Output Current at 1500 V mA	DC Input Voltage V	Efficiency (At full load) %	Ripple (At full load) %	Typical Temperature Coefficient %/°C
PF1041N	Negative	1500	1.5	-100 to -1500	Up to 1	0 to 10	65	0.05	0.01
PF1041P	Positive	1500	1.5	+100 to +1500	Up to 1	0 to 10	65	0.05	0.01

For 1-1/8" Diameter, 9-Stage, Side-On Photomultipliers

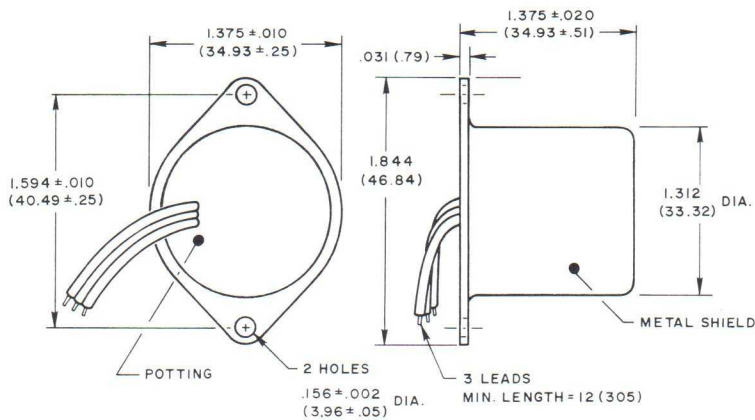
Type	Polarity (With respect to ground)	Electrical Characteristics							
		Operating Temperature Range °C	DC Output Voltage V	DC Input Voltage V	Input Current at Max. DC Output Voltage mA	Peak-to-Peak Ripple at Max. DC Output Voltage %	Regulation Line      Load		Typical Temperature Coefficient %/°C
PF1042*	Negative	-10 to +60	-500 to -1250	13.5 ± 1.5	< 100	< 0.05	< 0.1	< 0.1	0.01
PF1043■	Negative	-10 to +60	-100 to -1250	0 to 9	< 100	< 0.05	-	-	0.01

• The power supply includes an integral voltage divider network and an integral socket fitting small-shell submagnal bases.

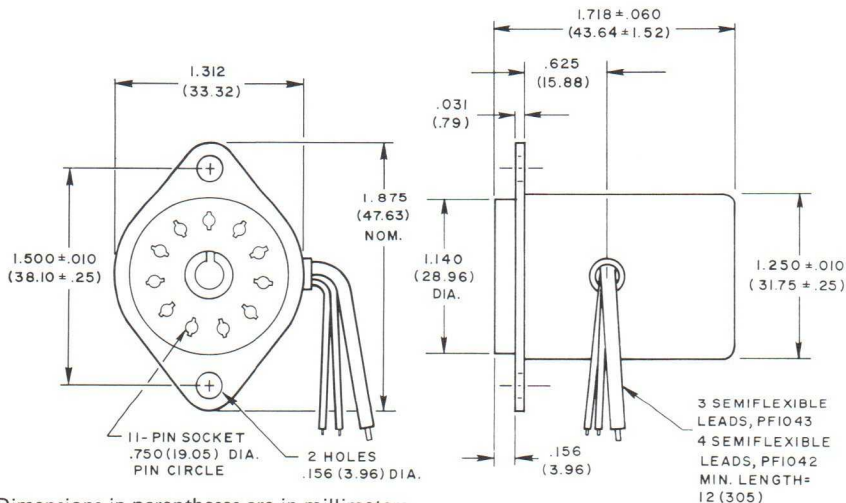
\* Output controlled by either resistance or voltage programming.

■ Output varies directly with input voltage.

### PF1041N, PF1041P



### PF1042, PF1043



Dimensions in inches. Dimensions in parentheses are in millimeters.

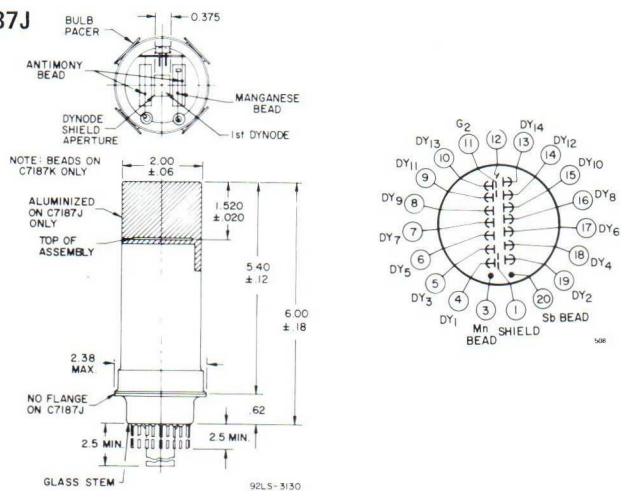
# Electron Multipliers

Electron multiplier structures are identical to those used in photomultiplier tubes. Electron multipliers are intended for use in vacuum systems in the detection and measurement of electrons, ions and other charged particles, as well as X-radiation and vacuum ultraviolet radiation. The maximum average anode current (30 second average) for all structures listed in the chart below is 10 microamperes.

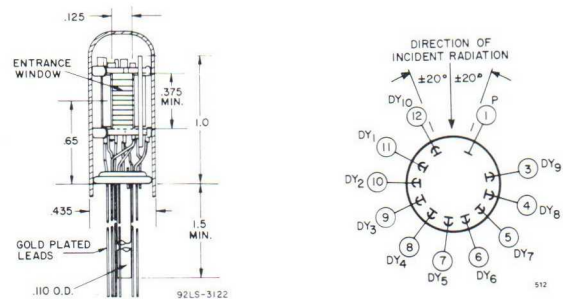
- For Particle and Radiation Detection
- For Use in a Vacuum System of  $10^{-5}$  Torr, or Lower
- Various Types Feature an Integral Voltage Divider
- High Stability Copper-Beryllium Dynodes

RCA Type No.	Multiplier Structure	RCA Photomultiplier Tube With Similar Structure	Number Of Dynodes	Radiation Opening in	Typical Operating Values		Remarks
					Anode To Dynode No. 1 Voltage (Equal volts per stage) V	Current Amplification At Specified Anode To Dynode Voltage	
C70129D	Circular-Cage	8571	10	0.06 x 0.375	2000 to 3000	$1 \times 10^5$	Has glass stem, 11 semiflexible leads. Shipped unsealed in bulb.
C7187J	In-Line	6810A	14	$0.375 \pm 0.010$ $\times 0.375 \pm 0.010$	3000 to 4000	$1$ to $10 \times 10^6$	Has glass stem, 19 semiflexible leads.
C31019B	In-Line	4460	14	$0.250 \pm 0.005$ dia.	3900 to 4500	$5 \times 10^5$	Supplied with support brackets and integral voltage divider. Has 3 semiflexible leads and is shipped in a plastic bag.
C70120E	Venetian-Blind	8053	14	$0.800 \pm 0.010$ dia.	3000 to 4000	$1$ to $10 \times 10^6$	Has 16 rod terminals. Shipped in a plastic bag.

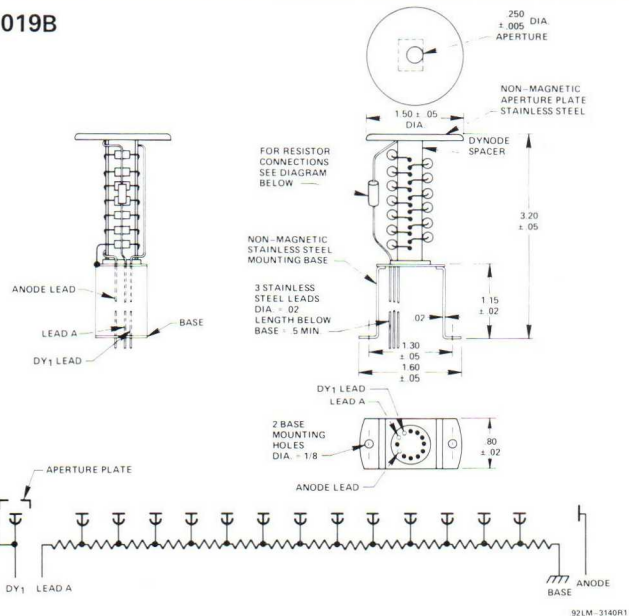
C7187J



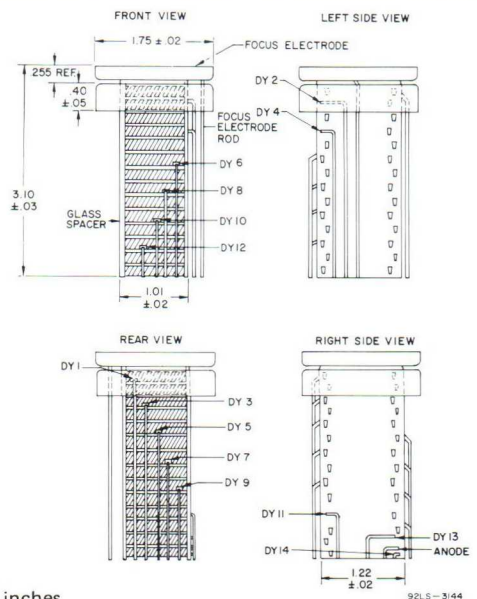
C70129D



C31019B



C70120E



Dimensions in inches

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