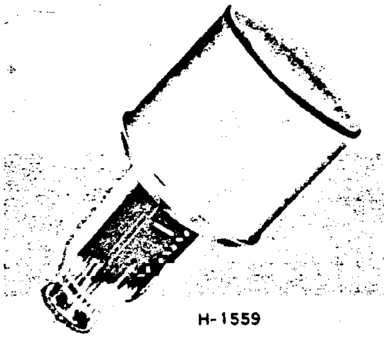


H-1559

RCA-4522
Photomultiplier Tube

Formerly RCA Dev. Type C70133

5.25"-Diameter, 14-Stage, Head-On Type Employing a Bialkali Photocathode and an In-Line Electrostatically-Focused Dynode Structure.

RCA&22 is a 14-stage, 5"-diameter, head-on type of photomultiplier tube intended primarily for use in nuclear physics applications, especially when a high degree of time definition is required. It features high quantum efficiency, ultraviolet response, uniform electron collection from the major portion of the photocathode, **fast** response, low dark current, high current amplification and a 50-ohm output transmission line.

The relative spectral response of the 4522 covers the approximate range from 2200 to 5800 angstroms at the 10 per cent points **as shown in Figure 1.** Maximum relative response occurs at about 4000 angstroms; and peak cathode quantum efficiency, at about 3600 angstroms.

Typical Spectral Response Characteristics

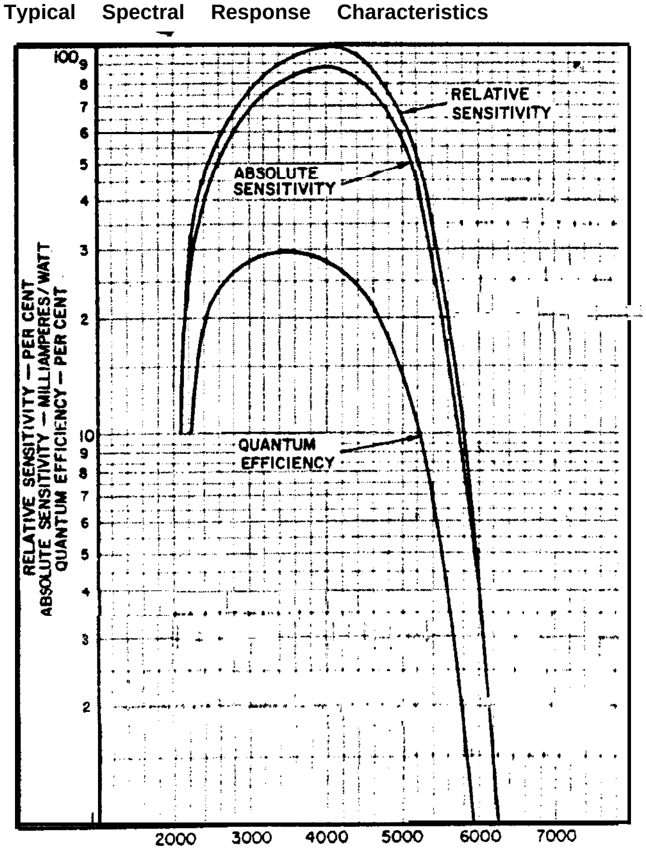


Figure 1 — WAVELENGTH — ANGSTROMS — 92LM – 2465

Typical Characteristics

- **Quantum Efficiency:** — 29%
  at 3600 Å
- **Current Amplification:** 3x 10^7
  at 2000 V 5
- **Anode Dark Current:** 6 x 10^{-8} A
  at 2.3 x 10^6 A/W (2000 A/1m)
  and 22° C
- **Anode Pulse-Current Capability:**
  at 3000 V
  Linear: 0.13 A
  Saturated: 0.32 A
- **Time Resolution Characteristics:**
  at 3000 V
  Anode-Pulse Rise Time: 2.9 x 10^{-9} s
  Electron Transit Time: 6.6 x 10^{-8} s
- **Pulse Height Resolution:** 7.5%
  with Cs^{137} source, NaI (T1) Scintillator
- **Mean Gain Deviation:** 1%
  for 24 hours at 1000 counts per second

Features

- **UV Response to 2200 Å**
- **Anode Transmission-Line Characteristic Impedance – 50 ohms**
- **4.5" Minimum Diameter Photocathode**
- **High Stability Copper-Beryllium Dynodes**
- **Available Accessories**
  RCA-AJ2144 and AJ2145, Sockets:
  The AJ2145 is supplied with the 4522
  RCA-AJ2142, Faceplate Adapter (Light pipe):
  To provide a flat input surface, especially for mounting of scintillators
  RCA-AJ2143, Socket Adapter:
  To allow replacement of types 58AVP and 58DVP by RCA-4522

RCA Electronic Components

Supersedes 1-68
Printed in U.S.A. | 6-68

Data

General:

Spectral Response	See **Figure 1**
Ravelength of Maximum Response	4000 ± 500 Å
Cathode, Semitransparent	Cesium-Potassium-Antimony (Bialkali)
Shape	Spherical Section
Minimum projected area	16 in^2 (103 cm^2)
Minimum diameter	4.5 in (11.4 cm)
Rindow	UV-transmitting, Corning[a] No.9741, or equivalent
Shape	Spherical Section
Index of refraction at 4047 angstroms	1.48
Dynodes:	
Substrate	Copper-Beryl 1ium
Secondary-Emitting Surface	Beryllium-Oside
Structure	In-Line Electrostatic-Focus
Direct Interelectrode Capacitances (Approx.):	
Anode to dynode No.14	5.5 pF
Anode to all other electrodes	7.0 pF
Maximum Overall Length	12 in (30.5 cm)
Maximum Diameter	5.25 in (13.3 cm)
Base	See Base Drawing
Socket	RCA-AJ2144 or AJ2145
Magnetic Shield	See Note **(b)**
Operating Position	Any
Weight (Approx.)	21 oz (590 g)

Maximum and Minimum Ratings, *Absolute-Maximum Values:*[c]

DC Supply Voltage:	
Between anode and cathode:	
With Voltage Distribution A or B, shown in Table I	3000 max. V
With Voltage Distribution C, shown in Table I	3500 max. V
Between anode and dynode No.14.	600 max. V
Between dynode No.14 and dynode No.13	800 max. V
Between other consecutive dynodes	400 max. V
Between dynode No.1 and cathode	800 max. V 300 min. V
Average Anode Current[d]	0.5 max. m.4
Ambient-Temperature Range	-100 to +85 °C

Characteristics Range Values for Equipment Design:

With a DC Supply Voltage (E) = 2000 Volts (Except as noted)

Voltage Distribution A, Table 1

	Min.	Typ.	Mox.	
Anode Sensitivity:				
Radiant[e] at 4000 Å	–	2.6×10^6	–	A/W
Luminous[f] (2870° K)	6.5×10^2	2.3×10^3	6.5×10^3	A/1m
With blue light source[g] (2870° K + C.S. No.5-58)	8.5×10^{-6}	3 x 10-5	8.5×10^{-5}	A

	Min.	Typ.	Max.	
Cathode Sensitivity:				
Radiant[h] at 1000 Å	–	8.8×10^{-2}		A W
Luminous[i] (2870° K)	–	7.7×10^{-5}	–	A/1m
With blue light source[k]				
(2870° K + C.S. No.5-58)	8 x 10-10	1×10^{-9}		A
Cathode Quantum Efficiency at 3600 Å	–	29		%
Current Amplification	–	3×10^{7}	–	
Anode Dark Current[m]	–	6×10^{-8}	1×10^{-6}	A
Equivalent Anode Dark Current Input	–	3×10^{-11}[n]	5×10^{-10}[n]	lm
	–	2.6×10^{-14}[p]	–	W

With E = 2.500 volts

Voltage Distribution B, Table 1

	Min.	Typ.	Max.	
Pulse Height Resolution[q]	–	7.5	–	%
Mean Gain Deviation'	–	1	–	%
Dark Pulse Specturm		See Figure 5		

With E = 3000 volts

Voltage Distribution A, Table 1

	Min.	Typ.	Max.	
Anode-Pulse Rise Time[s]	–	2.9×10^{-9}	–	s
Electron Transit Time'	–	6.6×10^{-8}		s

With E = 3000 volts

Voltage Distribution C, Table 1

	Min.	Typ.	Max.	
Pulse Current:"				
Linear"	–	0.13	–	A
Saturated	–	0.32	–	A

[a] Made by Coming Glass Works. Corning. New York 14830.

[b] Magnetic shielding is available irom manufacturers such as the Magnetic Shield Division, Perfection Mica Co., 1322 North Elston, Chicago 22, Illinois.

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

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

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

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

[d] Averaged over any 500-microsecond interval.

[e] This value is calculated from the typical anode luminous sensitivity rating using a conversion factor of 1140 lumens per watt.

[f] These values are calculated as shown below:

$$\text{Luminous Sensitivity (A/lm)} = \frac{\text{Anode Current (with blue light source (A)}}{0.13 \times \text{Light Flux of } 1 \times 10^{-7} \text{ (lm)}}$$

The value of 0.13 is *nn average* value. It is the ratio of the cathode current measured under the conditions specified in footnote (k) to the cathode current measured under the same conditions but. with the blue filter removed.

TABLE I			
Voltage Distribution			
Between the following Electrodes: Cathode (K), Dynode (Dy), ond Anode (P)	A 5.9% of K-P Voltage (E) Multiplied by:	B● 6.9% of Dyl-P Voltage (E) Multiplied by:	C 3.85% of K-P Voltage (E) Multiplied by
K - Dyl	3	♦	6
Dy1 - Dy2	1	1	1
Dy2 - Dy3	1	1.5	1.5
Dy3 - Dy4	1	1	1
Dy4 - Dy5	1	1	1
Dy5 - Dy6	1	1	1
Dy6 - Dy7	1	1	1
Dy7 - Dy8	1	1	1
Dy8 - Dy9	1	1	1
Dy9 - Dy10	1	1	1
Dy10 - Dy11	1	1	1
Dy11 - Dy12	1	1	1.5
Dy12 - Dy13	1	1	2
Dy13 - Dy14	1	1	4
Dy14 - P	1	1	2
Dyl - P		14.5	
K - P	17	–	26
Focusing electrode is connected to Dynode-No.1 voltage.			

● Use distribution B for optimum pulse-height resolution performance. See page 7, under Operating Voltage, **OPERATING CONSIDERATIONS.**

♦ Cathode-to-Dynode-No.1 Voltage maintained at 660volts

▲ Focusing electrode may **be** connected to arm of potentiometer between cathode and dynode No.1; the focusing-electrode voltage is varied to give maximum anode current.

g Light incident on the cathode is transmitted through a blue filter (Corning C.S. No.558 polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature of 2870° K. The value of light flux incident on the filter is 0.1 microlumen.

h This value is calculated from the typical cathode luminous sensitivity rating using a conversion factor of 1140 lumens per watt.

i These values are calculated as shown below:

$$\text{Cathode Luminous Sensitivity (A/lm)} = \frac{\text{Cathode Current (with blue lieht source) (A)}}{0.13 \times \text{Light Flux of } 1 \times 10^{-4} \text{ (lm)}}$$

The value of 0.13 is an average value. It is the ratio of the cathode current measured under the conditions specified in footnote **(k)** to the cathode current measured **under the** same conditions hut with the blue filter removed.

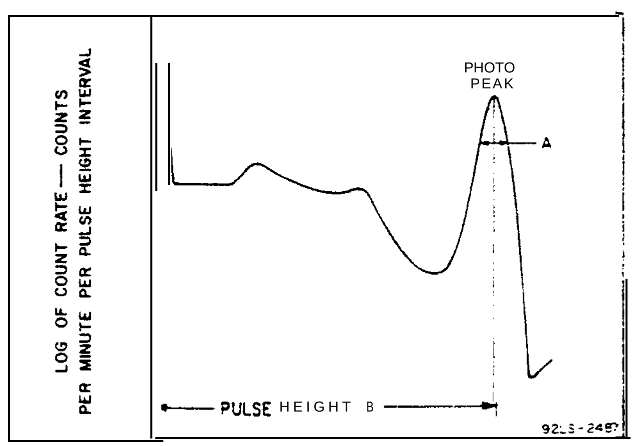
k Light incident on the cathode is transmitted through **a blue** filter (Corning C.S. No.5-58, polished to 1/2 stock thickness) from a tungsten-filament lamp operated at a color temperature **of 2870° K.** The **value** of **light flux incident** on the filter is 100 mcrolumens and 300 volts are applied between cathode and all other electrodes connected as anode.

m At a **tube** temperature of 22° C. Light incident on the cathode is transmitted through a blue filter (Coming C.S. No.5-58 polished to 1/2 stock thickness). The light flux incident on the filter is 0.1 microlumen. The supply voltage E is adjusted to obtain an anode current of 26 microamperes. Luminous sensitivity of the **tube** under these conditions is approximately equivalent to 2000 amperes per lumen. Dark current is measured with incident light removed.

n With supply voltage E adjusted to give a calculated value of anode **luininous** sensitivity of 2000 amperes per lumen.

p At 4000 Å. Calculated from the luminous EADCI value using a conversion factor of 1140 lumens per **watt.**

q With a supply voltage E of 2500 volts across a voltage divider providing electrode voltages shown in Table I, Distribution B. Anode load is a 10-kilohm resistor in parallel with a total capacitance of 1000 pF. Under pulse conditions, the interstage voltages of the **tube** should not deviate more than 2% from the interstage voltage values during no-signal conditions. 662 keV photons from a one-microcurie Cs^{137} source and a cylindrical 5" dia. x 4" thallium-activated sodium-iodide scintillator NaI (T1)-type Harshaw 20A16, Serial No.CW-675 or equivalent are used. The Cs^{137} source is in direct contact with the metal end of the scintillator container. The faceplate end of the crystal is coupled to the faceplate adapter (RCA-AJ2142) by an optical coupling material such **as Dow Corning*** 20-057. Pulse-height resolution in per cent is defined as 100 times the ratio of the width of the photopeak at half the maximum count rate in the photopeak height (A) to the pulse height at maximum photopeak count rate (B).



r Under the same conditions as shown in (q) except the tube is operated for a period of 1 hour with the radiation source located at the point providing a pulse count rate of 1000 counts per second. Following this time interval, the pulse height is sampled at l-hour intervals for a period of 24 hours.

Mean Gain Deviation in per cent is defined as follows:

$$MGD = \frac{\sum_{i=1}^{i=n} \left| \bar{p} - p_i \right|}{n} \bullet \frac{100}{\bar{p}}$$

where $\bar{p}$ = mean pulse height
p_i = pulse height at the "ith" reading
n = total number of readings

s Anode pulse rise time is the time interval between the 10 per cent and 90 per cent values of the maximum anode pulse height when the cathode is fully illuminated with light source approximating a step function and which has a negligible rise time.

† Electron transit time is the time interval between the arrival of a delta function light pulse at the entrance window of the tube and the time at which the output pulse at the anode terminal reaches peak amplitude.

u Using a pulsed light source having a pulse duration of 0.5 microsecond and repetition rate of 30 pulses per second. The interstage voltages of the tube should not deviate more than 2 per cent from the recommended voltage distribution shown by Voltage Distribution C of Table I. Capacitors are connected across the individual resistors making up the voltage-divider arrangement to insure this operating condition.

v Maximum deviation from linearity is 5 per cent.

■Made by Harshaw Chemical Corporation, 1945 East 97 Street, Cleveland 6, Ohio.

*Made by Dow Coming Corp., Midland, Michigan.

Typical Time Resolution Characteristics

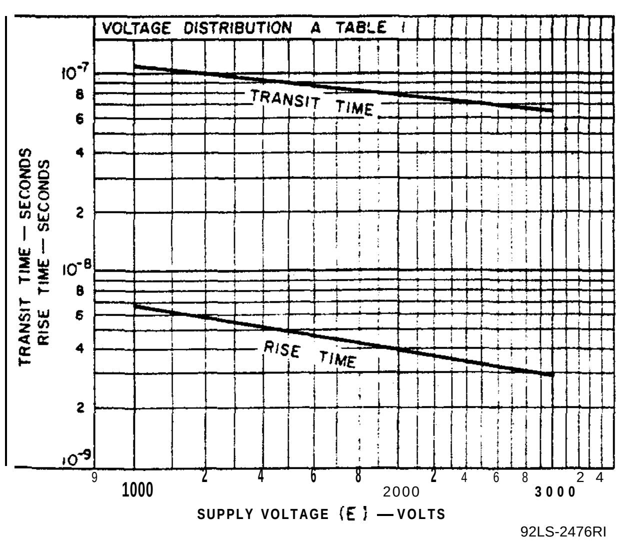


Figure 2

Operating Considerations

Terminal Connections

The base pins of the tube fit a 21-contact socket such as the RCA-AJ2144 and the AJ2145. The AJ2145 is a Teflon* socket designed specifically for chassis mounting and is supplied with a permanently attached metal flange. The AJ2144 is a Teflon socket supplied with an unattached Teflon clamp ring to permit chassis mounting, but the ring can be discarded to permit any desired mounting arrangement.

The 4522 can replace types 58AVP and 58DVP by use of Socket Adapter, RCA-AJ2143.

Sensitivity and Current Amplification Characteristics

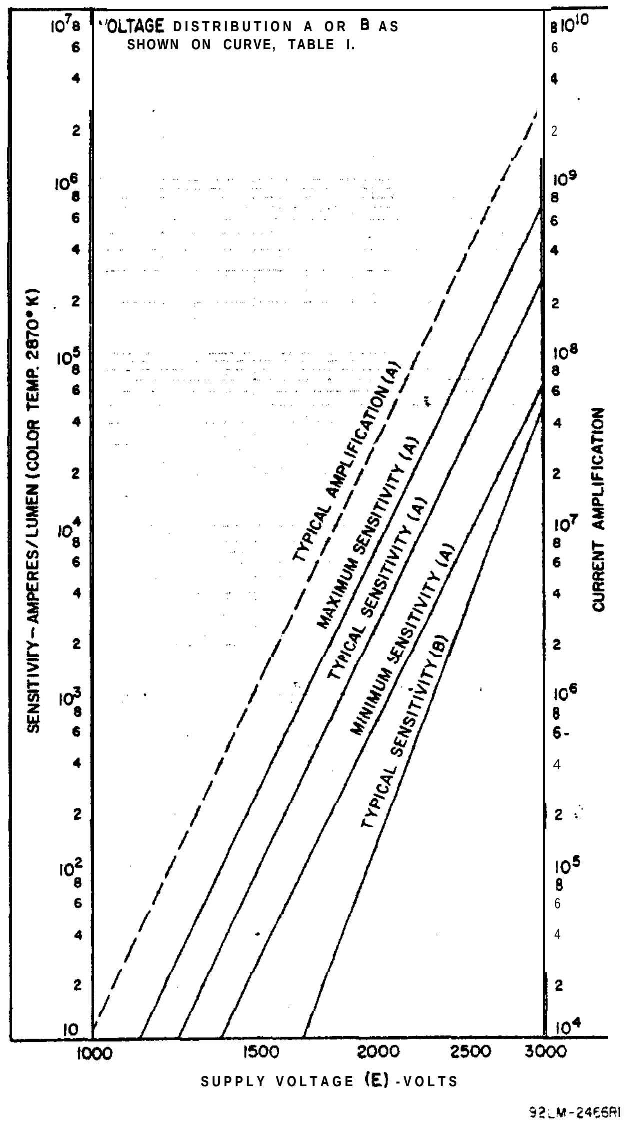


Figure 3

Cothode Current

A peak cathode current of 1 x 10^{-9} ampere at a tuhe temperature of 22° C or 1 x 10^{-11} ampere at -100° C should not be exceeded. Because of the resistivity of the photocathode, the voltage drop caused hy higher peak cathode currents may produce radial electric fields on the photocathode which can result in poor photoelectron collection by the first dynode. Photocathode resistivity increases with decreasing temperature.

Anode Dark Current

Anode' dark current and equivalent anode dark current input as functions of luminous sensitivity at a temperature of **+22° C** are shown in **Figure** 4. Dark current can be reduced by use of a refrigerant.

A temporary increase in anode dark current by as much as 3 orders of magnitude may **occur** if the tube **is** exposed momentarily to high--intensity ultraviolet radiation from sources such as fluorescent room lighting even though voltage is not applied to the tube. This increase in dark current may persist for a period of from 6 to 24 hours after such irradiation.

*Teflon is a registered trademark of the DuPont de Nemours, E.I. & Co., Inc., Wilmington, Del.

Typical EADCI and Anode Dork Current Chorocteristics

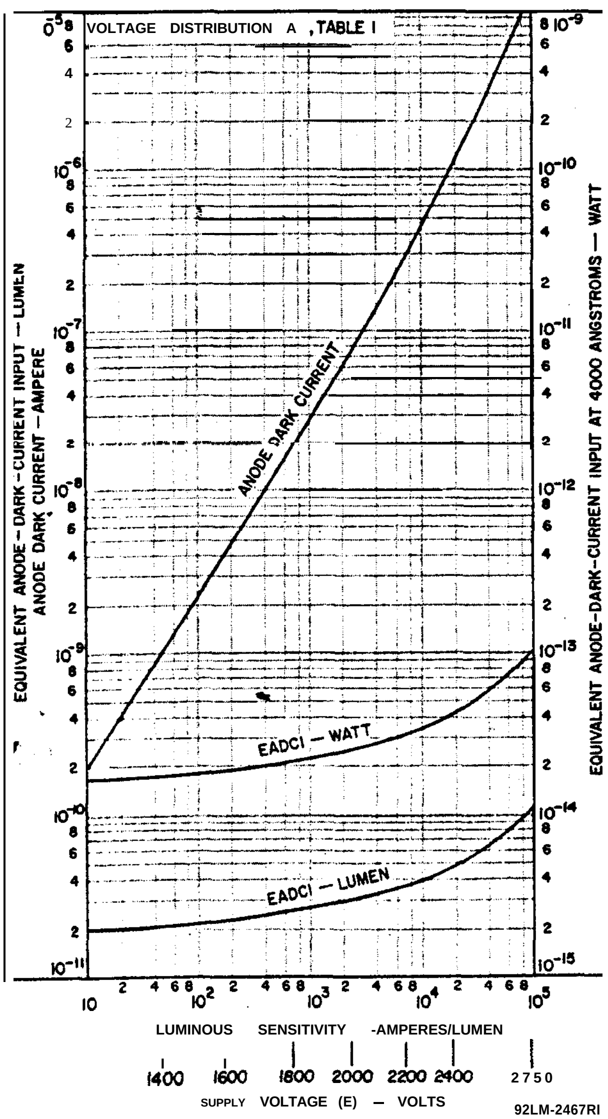


Figure 4

Typical Dark-Pulse Spectrum

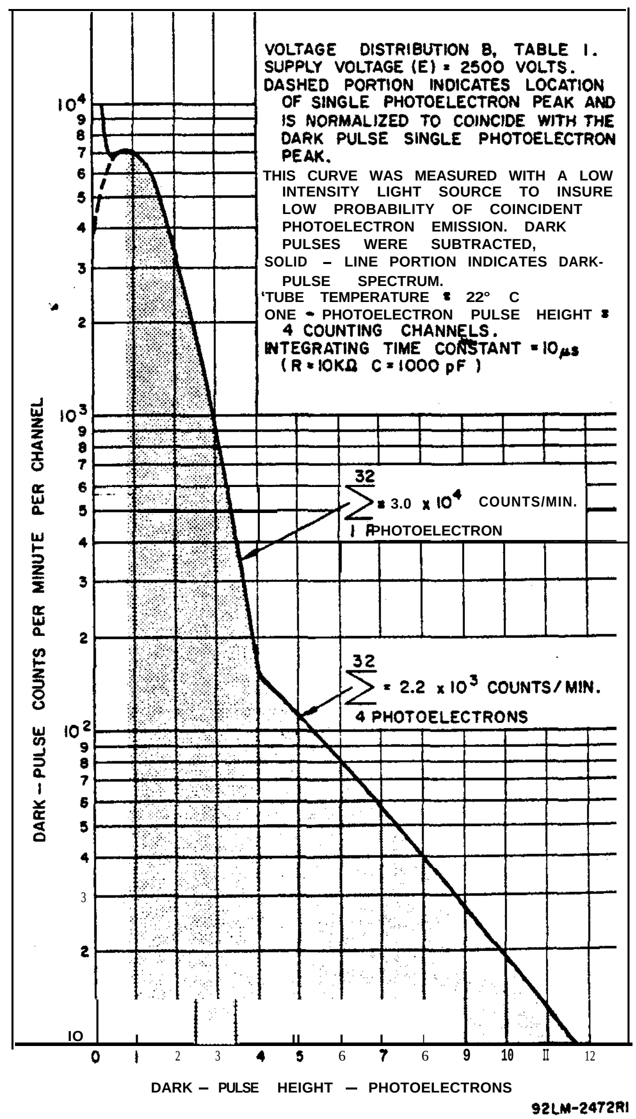


Figure 5

A typical tube with voltage applied in total darkness for a period of 24 hours often exhibits a lower value of Anode Dark Current than that shown under Characteristic Range Values.

Noise

A typical dark pulse spectrum for the 4522 is shown in Figure 5. The dashed-line portion shows the location of the single photoelectron peak. This curve was measured with a low intensity light source to insure low probability of coincident photoelectron emission.

The solid-line portion of Figure 5 shows the differential dark noise spectrum. The rapid change in slope of this curve in the pulse height region of less than 1/2 photoelectron is assumed to be due to electron emission from the fist. and second dynode surfaces.

The slope of the curves for the pulse height region between 1 and 4 photoelectrons is as expected for single photoelectron emission from the photocathode and the multiplication processes at the first. and second dynodes.

The slope of the curve for the pulse height region greater than 4 photoelectrons is presumed to be caused by electron emission from the photocathode due to such processes as ion bombardment.

When using the 4522 with counting systems care should be taken to choose the upper and lower discriminator threshold levels to optimize counting efficiency with respect to noise background. In particular, operation in the region below a pulse height of 1 photoelectron should be avoided because of the large number of noise events generated in the multiplier structure.

Operating Stability

The operating stability of the 4522 is dependent on the magnitude of the average anode current.

The use of an average anode current well below the the maximum rated value of 500 microamperes is recommended when stability of operation is important. When maximum stability is required, the average anode current should not exceed 0.1 microampere.

Operating Voltages

Table 1 shows three electrode voltage distributions recommended for the 4522.

Voltage Distribution A is used to measure the tube performance values listed under "Characteristic Range Values" on page 2 and is suggested for general purpose applications.

Typical Effect of Indicated Magnetic Field on Anode Current

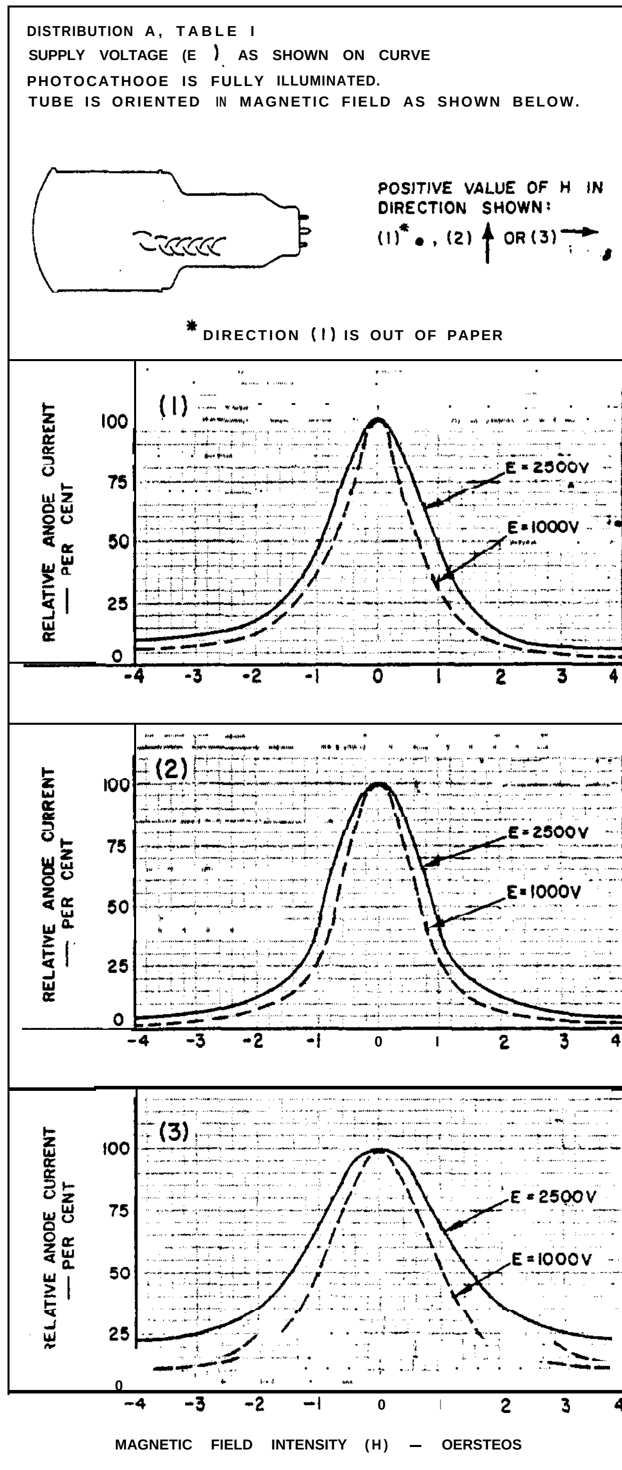


Figure 6

Voltage Distribution B is recommended where high dynode-No.1 gain is important, such as in low light level and scintillation counting applications. Voltage Distribution B maintains the Cathode-to-dynode-No. 1 voltage at 660 volts; it is especially useful when the supply voltage is adjusted over a wide range to achieve large changes in anode sensitivity. A suggested circuit using voltage distribution B is shown in **Figure 9.**

Voltage Distribution C is recommended for high peak-pulse current applications.

If desired, the focusing-electrode potential may be adjusted between photocathode voltage and dynode-No.1 voltage to optimize the magnitude, uniformity, and speed of response. The voltage for the focusing electrode can be obtained by connecting the focusing electrode to the arm of a potentiometer in the cathode and dynode No.1 portion of the voltage divider. Optimum focusing-electrode voltage for best collection efficiency will be approximately between 80 and 100 per cent of the cathode-todynode No.1 voltage as shown in **Figure 7.** However, where simplicity in voltage-divider design is desired, the focusing electrode may be connected directly to dynode No. 1 with little resulting decrease in output current.

The operating voltage between dynode No.14 and anode should be kept as low as will permit operation above the knee of the anode characteristic curves shown in **Figure 8.** With low operating voltage between dynode No.14 and anode, the ohmic leakage current to the anode is reduced. Operation above the knee occurs at approximately 170 volts for the light levels shown in **Figure 8.** However, when high pulse currents are drawn, saturation results from space-charge limitations and higher voltage will be required. To assure operation above the knee. it is necessary to increase the supply voltage between dynode No.14 and anode by an amount equal to the voltage drop across a particular output load. .

The operating voltages for the 4522 can be supplied by spaced taps on a voltage divider across a regulated dc power supply. The current through the voltage divider will depend on the voltage regulation and linearity required by the application. In general, the current in the divider should be at least 10 times greater than the largest value of anticipated anode current. The voltage-divider values should be adequate to prevent variation of dynode voltages by signal current.

When the ratio of peak anode current to average anode current is high, noninductive high-quality capacitors should be employed across the latter stages of the tube to serve as “electron charge reservoirs” over

Typical Focusing Electrode Characteristic

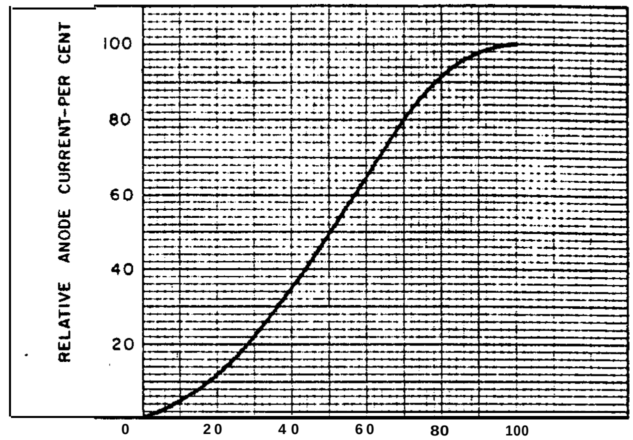


Figure 7

92LS- 2471RI

Typical Anode Chorocteristics

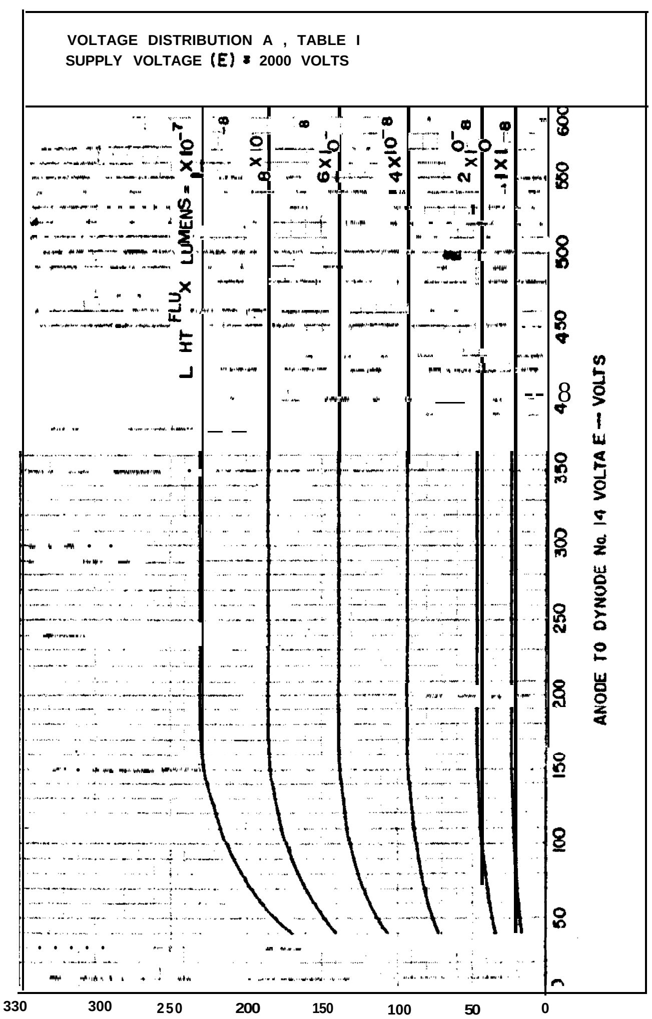


Figure 8

92LM -2473RI

the duration of the pulse. The values of these capacitors should be chosen so that sufficient charge is available **to prevent a change of more than a few per** cent in the interstage voltages during the pulse duration. Resistance **values greater thnn 10 megohms** should not be employed **between adjacent** tube elements. Location of the voltage-divider arrangement should be such that the power dissipated in the resistor-string does not increase the temperature of the tube. In most pulse applications, it is recommended that **the negative** high-voltage terminal be grounded.

In applications where it is essential that the negative high-voltage terminal is not grounded, it is necessary that leakage current to the glass faceplate of the tube be less than 1×10^{-12} amperes. In addition to increasing dark current and noise output because of voltage gradients developed across the glass faceplate, such high voltage may produce minute leakage current to the cathode, through the glass faceplate and insulating materials, which can permanently damage the tube.

Typical voltage-divider arrangements for use with the tube are shown in **Figures 9 and 10.** The choice of resistance values for the voltage-divider string is usually a compromise. If low values of resistance per stage are utilized, the power drawn from the supply and the required wattage rating of the resistors increase. Phototube noise may also increase, due to heating, if the divider network is mounted near the tube. The use of high values of resistance per stage may cause deviation from linearity if the voltage-divider current is not maintained at a value of at least 10 times that of the maximum average anode current and may limit anode current response to pulsed light.

The supply voltage may be applied in 500-volt steps up to 2000 volts, and 200-volt steps from 2000 to 3000 volts and with no less than 1 minute between each step.

Non-inductive damping resistors in series with each of the dynode leads of the latter stages of the tube may be used in high peak current applications to suppress spurious oscillations, Typical values for these resistors are in the range of 5 to 50 ohms. These values are chosen to provide sufficient damping while minimizing the voltage drop across the resistors.

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

In the **use** of the 4522, as with other tubes requiring high voltages, it should always be remembered that these high voltages may appear at points in the circuit which are normally at low potential, because of defective circuit parts or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any capacitors grounded.

Shielding

Magnetic shielding of the tube is generally required. Magnetic shielding materials are available from manufacturers such as the Magnetic Shield Division, Perfection Mica Company, 1322 North Elston, Chicago 22, Illinois. The curves in **Figure** 6 show the effect of magnetic fields on anode current under the conditions indicated. With increase in voltage between anode and cathode, the effect of a given magnetic field will cause less decrease in anode current.

Mechanical Considerations

Handling

The tube must be handled with care at all times. Wnen transporting the tube, it must be protected from rough handling that might damage the seals or other parts. Extreme care should be given to the glass-to-metal seal at the outer edge of the faceplate.

Appropriate eye protection (such as goggles or mask) should be used when handling this tube.

Mounting

Care must be taken in mounting the tube so that the tube envelope is not subjected to excessive pressure which could strip the glass-to-metal seals. In no case should mounting supports be used in the shaded areas indicated on the *Dimensional Outline.*

Typical Circuit Arrangement for Scintillation-Counting Applications

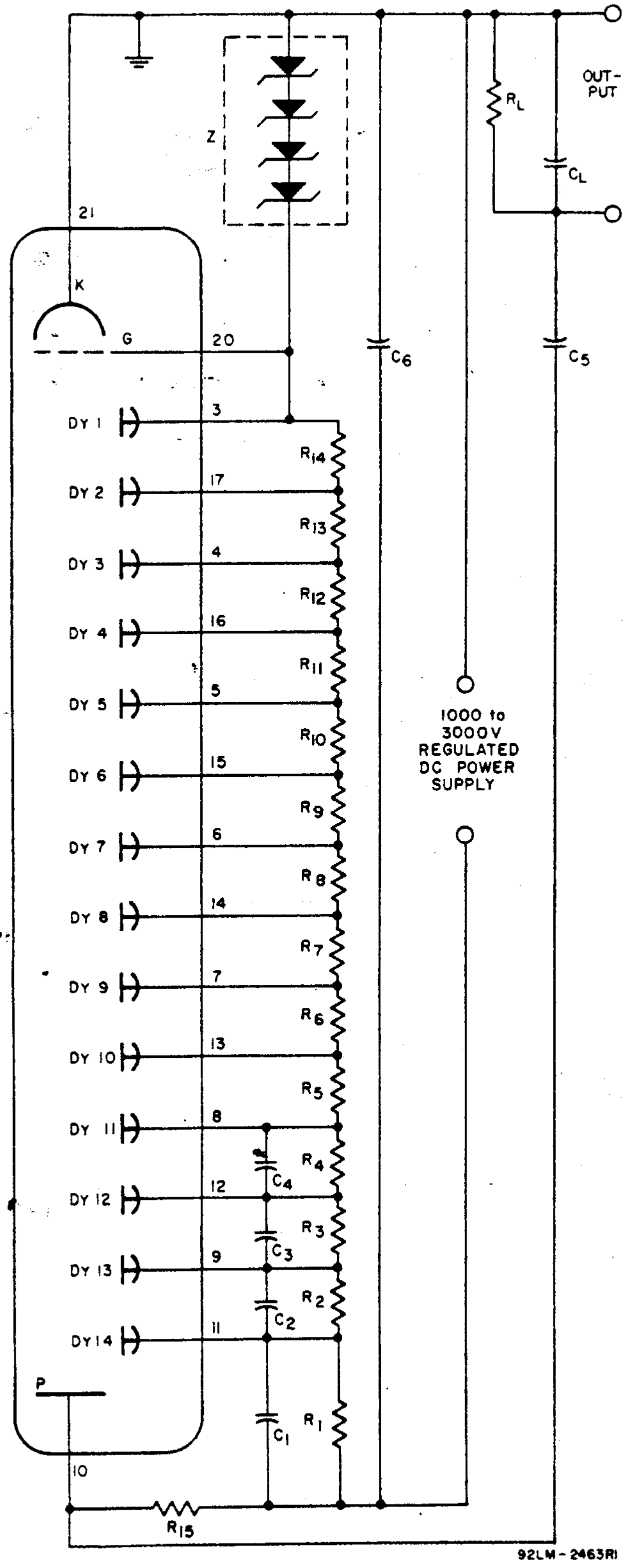


Figure 9

C_1: 0.05 µF, 20%, 500 V dc Ceramic-Disc Type
C_2: 0.02 µF, 20%, 500 V dc Ceramic-Disc Type
C_3: 0.01 µF, 20%, 500 V dc Ceramic-Disc Type
C_4: 0.005 µF, 20%, 500 V dc Ceramic-Disc Type
C_5 & C_6: 0.0047 µF, 20%, 6000 V dc Ceramic-Disc Type

R_1 through R_{12}: 51 KΩ, 5% 1W
R_{13}: 75 KΩ, 5% 1W
R_{14}: 51 KΩ, 5% 1W
R_{15}: 100 KΩ, 5% 1/2 W

Z: (2)-150 V, 1W zener diodes, or equivalent
(2)-180 V, 1W zener diodes, or equivalent

Note: The value of the load elements, R_L and C_L, depend on the application:

$R_L C_L$ = 10 microseconds for most applications

Typical Circuit Arrangement for Fast Pulse Response and High Peak Current Applications

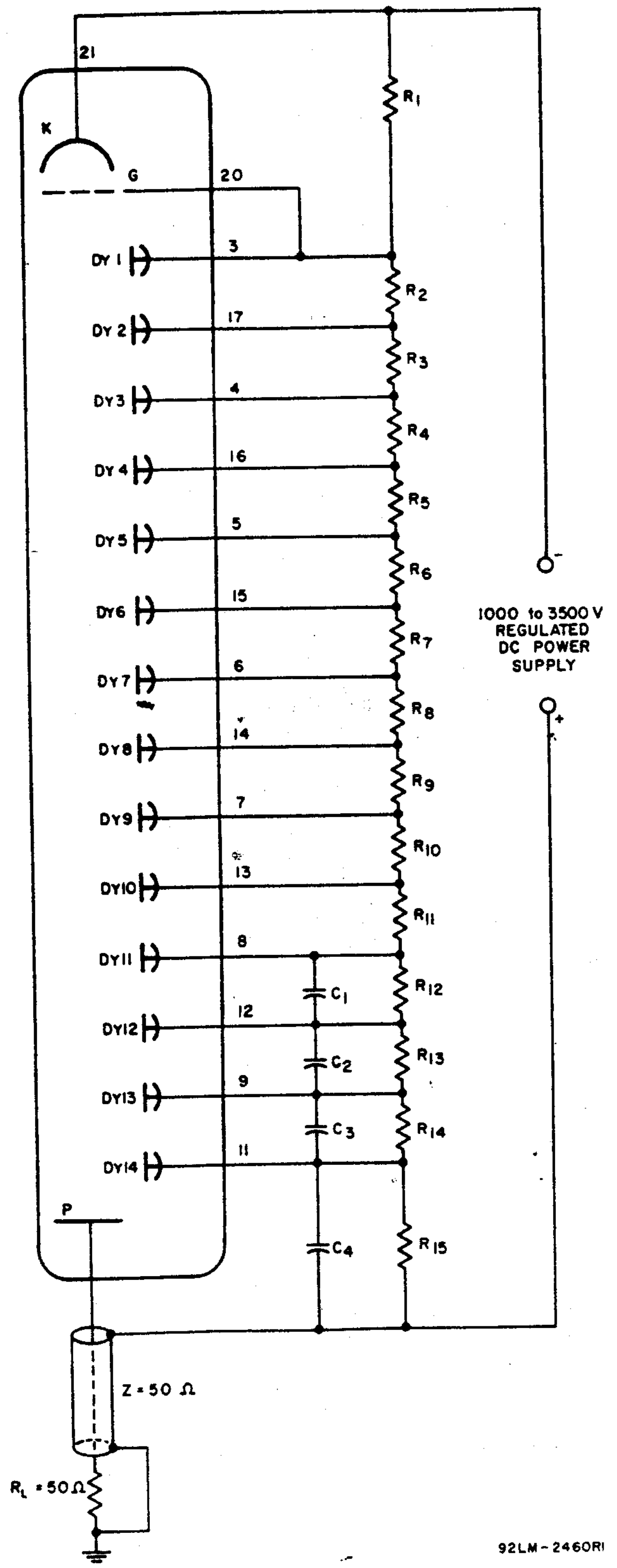


Figure 10

Fast Pulse Response Applications, to 3000 V

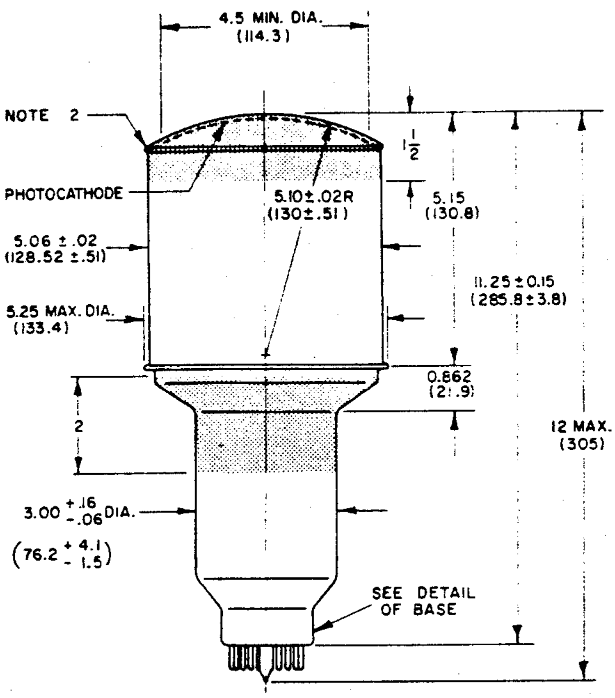
C_1: 0.005 μF, Ceramic Disc, 500 V
C_2: 0.01 μF, Ceramic Disc, 500 V
C_3: 0.02 μF, Ceramic Disc, 500 V
C_4: 0.05 μF, Ceramic Disc, 500 V
R_1: 300 KΩ (3-100 KΩ, 5%, 1/2 W in series)
R_2 through R_{15}: 100 KΩ, 5%, 1/2 W

High Peak Current Applications, to 3500 V

C_1: 0.005 μF, Ceramic Disc, 500 V
C_2: 0.01 μF, Ceramic Disc, 500 V
C_3: 0.02 μF, Ceramic Disc, 1000 V
C_4: 0.05 μF, Ceramic Disc, 500 V
R_1: 168 KΩ (3-56 KΩ, 5%, 2 W, in series)
R_2, R_4 through R_{11}: 27 KΩ, 5%, 1 W
R_3, R_{12}: 39 KΩ, 5%, 2 W
R_{13}, R_{15}: 54 KΩ (2-27 KΩ, 5%, 1 W, in series)
R_{14}: 108 KΩ (4-27 KΩ, 5%, 1 W, in series)

Note: Leads to all capacitors should be as short as possible to minimize inductance effects. Location and spacing of capacitors is critical and may require adjustment for optimum results.

Dimensional Outline

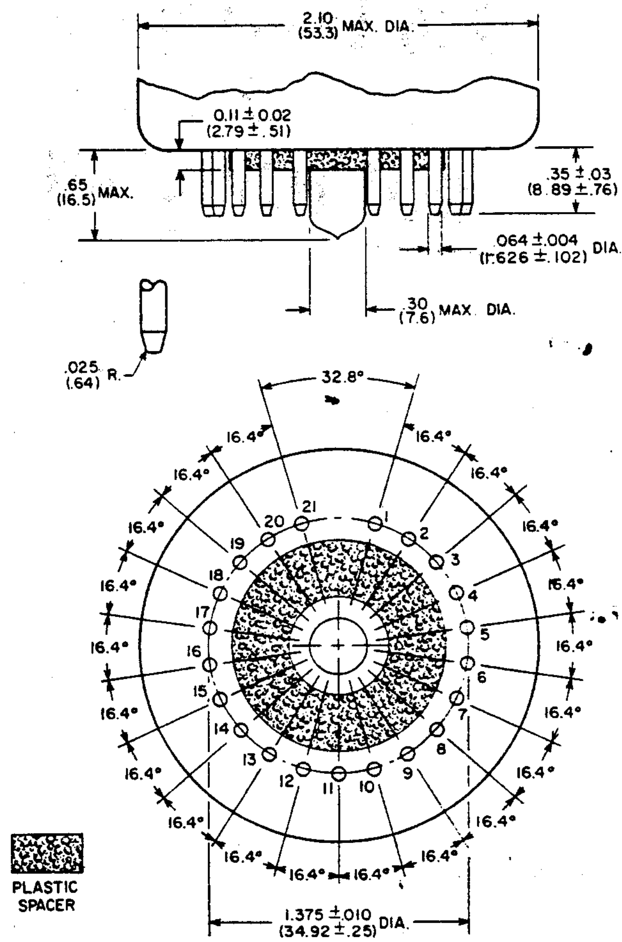


92LS-2469R1

Note 1: Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions (1 inch = 25.4 mm).

Note 2: See *Operating Considerations, Mounting.*

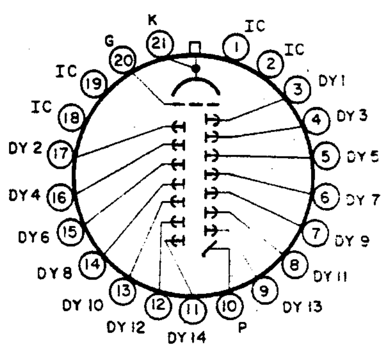
Detail of Base



92LS-2474

Pin No. 1: Internally connected – Do not use.
Pin No. 2: Internally connected – Do not use.
Pin No. 3: Dynode No.1
Pin No. 4: Dynode No.3
Pin No. 5: Dynode No.5
Pin No. 6: Dynode No.7
Pin No. 7: Dynode No.9
Pin No. 8: Dynode No.11
Pin No. 9: Dynode No.13
Pin No.10: Anode
Pin No.11: Dynode No.14
Pin No.12: Dynode No.12
Pin No.13: Dynode No.10
Pin No.14: Dynode No.8
Pin No.15: Dynode No.6
Pin No.16: Dynode No.4
Pin No.17: Dynode No.2
Pin No.18: Internally connected – Do not use.
Pin No.19: Internally connected – Do not use.
Pin No.20: Focusing Electrode
Pin No.21: Photocathode and Tube Envelope

Basing Diagram (Bottom View)



92LS-2259R