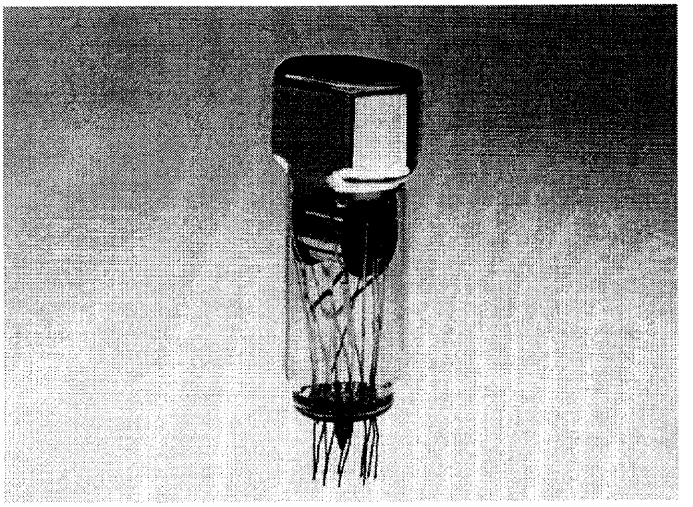
S83069EM1, S83069EM2

Photomultiplier

35 mm x 46.5 mm Modified Hexagonal 8-Stage, Head-On PMT

PRELIMINARY DATA SHEET

The BURLE S83069EM1 is a 35 mm x 46.5 mm modified hexagonal end-window PMT with a 8-stage circular alkali-antimonide dynode structure, bialkali photocathode, and semiflexible leads to which a 12-pin base is soldered. The S83069EM2 is provided without the temporary base. The PMT features high QE (typically 32% at 370 nm), typical gain of $6.2x10^4$ at 800 V, and compact size. This tube is designed primarily for application to medical diagnostic systems of the Anger camera type. However, it is also expected to be useful in general scintillation-counting applications and in the detection and measurement of low-level light events in the blue region of the spectrum.



GENERAL DATA

Photocathode Spectral Responsivity	See Figure 1
Useful Spectral Range	300-660 nm
Wavelength of Maximum Response	370±10 nm
Photocathode Composition	Bialkali
Faceplate Material	Schott B270 Glass or Equivalent
Faceplate Geometry	Plano-Plano
Dynodes:	
Secondary Emitting Surface	Alkali-Antimonide
Structure	Circular
Interelectrode Capacitances (approximate):	
Anode to 8th Dynode	4±1 pF
Anode to Combination of All Other Electrodes	5±1 pF
Socket	BURLE AJ2259

ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage:	
Between anode and cathode	1200 V
Between adjacent dynodes	250 V
Between dynode 1 and cathode..	300 V
Anode Current (Averaged over 30 s)	0.1 mA
Temperature Range for Storage and Operation..	-40 to +70 °C

PERFORMANCE DATA

The following values obtain for the voltage divider network in Table 1 with 800 V cathode to anode potential difference (except as noted). Ambient temperature during measurements was approximately 22 "C.

	Min.	Typ.	Max.	Units
Cathode Responsivity:				
Blue Response[1]	7.0	9.6	--	µA/Blm
Anode Responsivity:				
Blue Response [2]	0.11	0.24	--	A/Blm
Current Amplification	--	$2.5x10^4$	--	--
Anode Dark Current [3]				
@ E = 1000 V	--	2.0	20.0	nA
Pulse Height[4]:				
^{57}Cobalt	--	113.0	--	mV
Pulse Height Resolution[4]:				
^{57}Cobalt	--	11.0	13.0	%

TABLE 1

Voltage Distribution	
Between the Following Electrodes: K = Cathode P = Anode Dy = Dynode	8.3% **of K-P Voltage Multiplied By:**
K-Dy1	2
Dy 1 -Dy2	1
Dy 2 - Dy 3	1
Dy3 - Dy4	1
Dy 4- Dy 5	1
Dy 5 - Dy6	1
Dy6 - Dy7	1
Dy7 - Dy8	1
Dy 8-P	3
K - P	12

NOTES:

1. Light from a tungsten-filament lamp operated at 2856°K is transmitted by a blue filter (Corning # C.S. 5-58, polished to 1/2 stock thickness) to the cathode. 300 volts are applied between the cathode and all other electrodes connected as the anode.
2. Light from a tungsten-filament lamp operated at 2856°K is transmitted by a blue filter (Corning #C.S. 5-58, polished to 1/2 stock thickness) to the cathode.
3. Anode dark current is measured at an ambient temperature of 22 °C The tube under test is held in essentially complete darkness for a minimum of 30 minutes prior to the test, which is conducted in complete darkness. Test voltage (E) is 1000 V. A second test is conducted with E= l200 V. Under this condition, anode dark current shall not exceed five times the value recorded with E=1000 V.
4. Tubes are to be tested with a ^{57}Co source of sufficient intensity to produce 1,500 to 12,500 cps. The radiation source is placed on the back side of a 1" dia. x 1" high Nal(TI) crystal. The crystal is coupled to the faceplate of the photomultiplier by a coupling fluid such as clear mineral oil or equivalent. A multi-channel analyzer (MCA) characterizes scintillation events in terms of an amplitude histogram as illustrated in Figure 2, on which are defined pulse height and pulse height resolution. Pulse height is given in millivolts developed across a hypothetical load of a 100 pF capacitor in parallel with a 100 kohm resistor.

SHIELDING

Electrostatic and magnetic shielding of the tube is ordinarily required. The application of high voltage, with respect to cathode, to insulating or other materials supporting or shielding the tube at the photocathode end should not be permitted unless such materials are chosen to limit leakage current to the tube envelope to $1x10^{-12}$ ampere or less. In addition to increasing dark current and noise output because of voltage gradients developed across the bulb wall, such high voltage may produce minute leakage current to the cathode, through the tube envelope and insulating materials, which can permanently damage the tube. In general, when a shield is used, it is recommended that it be connected to the cathode terminal.

Magnetic shielding is necessary if the tube is operated in the presence of strong magnetic fields.

AMBIENT ATMOSPHERE

Operation or storage of this tube in environments where helium is present should be avoided. Helium will permeate the tube envelope and may lead to eventual tube destruction.

ANODE-DARK CURRENT

A temporary increase in anode dark current by as much as 2 orders of magnitude may occur if these tubes are exposed momentarily to high-intensity ultraviolet radiation from sources such as fluorescent room lighting even though voltage i s not applied to the tubes. The increase in dark current may persist for a period of 24 to 48 hours following such irradiation.

Cooling of the tube is recommended in those applications where maximum current amplification with minimum dark current is required.

The base of the tube and its socket should never be allowed to become contaminated by handling. Such contamination produces electrical leakage and increased dark current. It is recommended that if the tube base or its socket is handled that it be washed with a solution of alkaline cleaner such as Alconox, or equivalent, and deionized or distilled water having a temperature not exceeding 60°C. The base or the socket should then be rinsed in de-ionized or distilled water (60°C) for several minutes and then be air-blown dry.

Warning - Personal Safety Hazards

Electrical Shock - Operating voltages applied to this device present a shock hazard,

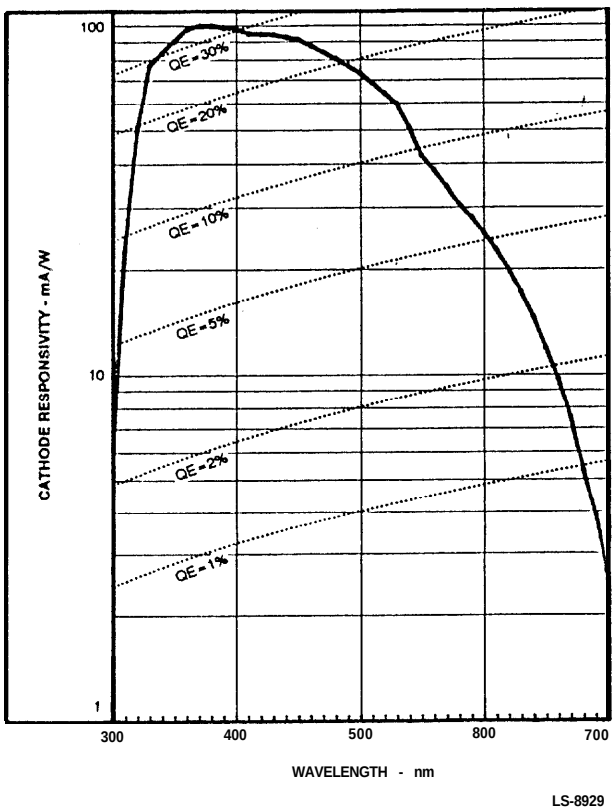


Figure 1 - Typical Photocathode Spectral Response Characteristics

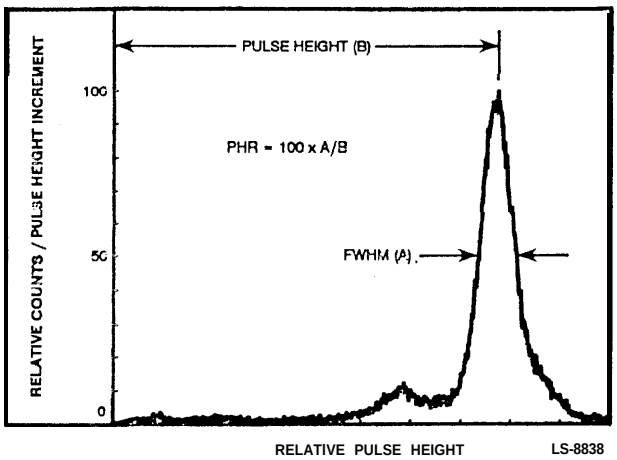
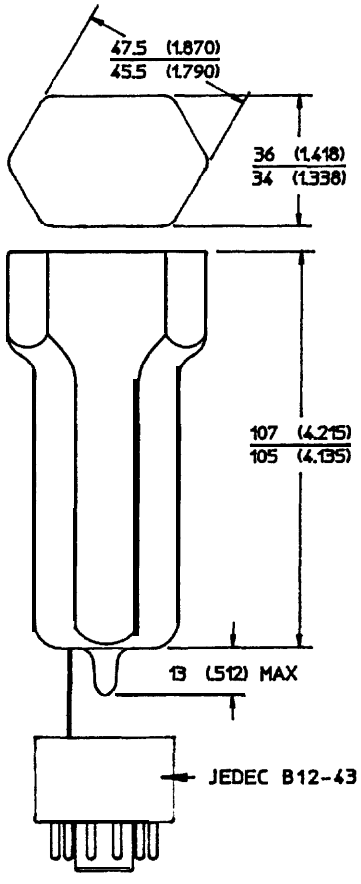
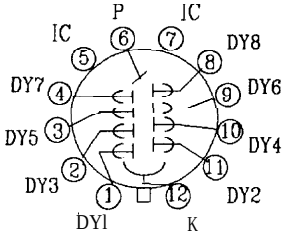


Figure 2 - MCA Display, Illustrating Definitions of Pulse Height and Pulse Height Resolution

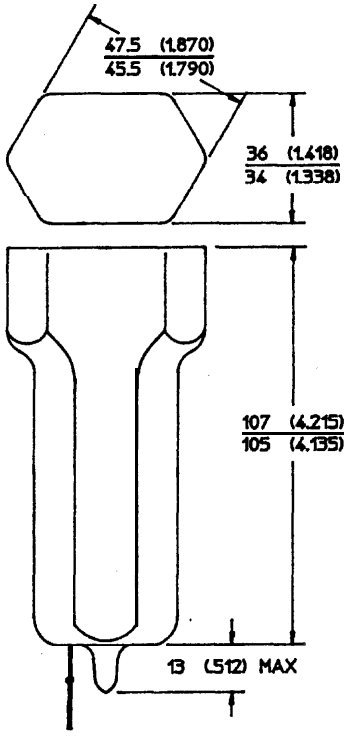
S83069EMI

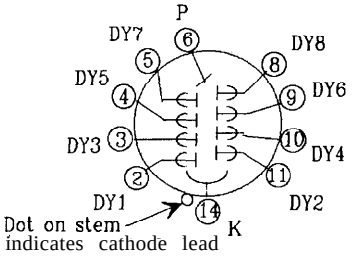




IC: INTERNAL CONNECTION, DO NOT USE
BASE PIN CONNECTIONS

S83069EM2





STEM LEAD IDENTIFICATION

Dimensions in millimeters. Dimensions in parentheses are inches.

Socket: BURLE AJ2259 (Not Supplied)

Figure 3 - Dimensional Outlines and Basing diagrams