

# P8079HP

## IMAGE INTENSIFIER ASSEMBLY

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### DESCRIPTION

The P8079HP image intensifier is a high performance direct replacement for the earlier devices P8076 and P8076FP.

The unit is a self focused image intensifier assembly designed for night vision systems and many other low light applications. It comprises three fibre-optic coupled electrostatic image intensifiers, encapsulated in silicone rubber together with e.h.t. multiplier, Automatic Brightness Control (ABC) and inverter circuits to form a rugged, compact, lightweight device. The intensifier is powered by a single d.c. input at 6.75 V, the current consumption being 50 mA maximum. The output image is inverted and its geometrical magnification is approximately unity.



## DESCRIPTION (continued)

The tube features:—

- **Extended Range** The range of a night vision system incorporating a P8079HP tube will be increased as depicted on page 9. This improvement results from a development which has substantially enhanced the limiting resolution of the intensifier. In practice, this may be as much as 25%, enabling target identification at 2000 m, a figure which is limited by the night vision system's lens.
- **Flash Protection** It is now generally known that image intensifiers sustain permanent damage when exposed to high intensity pyrotechnic flashes such as occur when ammunition explodes against a hard target. The P8079HP has been designed to contain sufficient flash protection to protect against all known battlefield conditions without suffering any loss in other operational parameters.
- **Increased Operating Temperature Range** Existing intensifiers have substantially reduced performance at temperatures in excess of 27 °C, with the gain dropping to less than 25% of its normal value at temperatures in excess of 35 °C. The P8079HP maintains good operational performance up to 35 °C, as shown on page 10.
- **Prolonged Battery Life with Maintained Performance** Current intensifiers show continuous deterioration of performance as the battery voltage decreases during life. The P8079HP has been designed to maintain its operational performance at input voltages down to approximately 4.5 V, as shown on page 11. Consequently this gives the user a longer operational life.

**Summary** The performance of existing night vision equipment may be substantially improved by the use of intensifier P8079HP, which takes advantage of the latest technology, and may be introduced without any modification to equipment. The P8079HP can be used where DEF STAN 59-60/90/077 or MIL-1-55340 (EL) are specified, having an identical mechanical outline to the tubes described by these specifications. This device now conforms to BS CECC 12001-001, Issue A, February 1982.

## DATA SUMMARY

Luminance gain (typical)	100 000	asb/lx
Useful cathode and screen diameter	25	mm
Overall diameter (approx)	70	mm
Overall length (approx)	195	mm
Net weight (approx)	0.9	kg

## GENERAL DATA

### Photocathode

Surface (see page 7)		S25
Useful diameter	25	mm
Typical luminous sensitivity (see note 1)	300	$\mu\text{A/lm}$
Typical radiant sensitivity:		
at 800 nm	25	mAW
at 850 nm	20	mAW
Flatness of external surface	flat to within 2 $\mu\text{m}$ over the entire surface	

### Screen

Surface	metal-backed P20	
Useful diameter	25	mm
Fluorescent colour (see page 8)	yellow-green	
Persistence	medium short	
Flatness of external surface	flat to within 2 $\mu\text{m}$ over the entire surface	

### Mounting position . . . . . any

The P8079HP must be contained in a cylindrical housing having a minimum internal diameter of 70.0 mm and a minimum length of 185 mm. The position of the P8079HP is determined axially by the bearing surface and angularly by the locating pin. The force on the bearing surface must not exceed 100 Newtons (10 kg force).

### Handling

Care should be taken to prevent damage to the tube input window and to the convolutions at the the screen end of the tube. These should not be used for withdrawing a tube from the equipment housing.

## Environmental Performance

To ensure a satisfactory performance in a rugged military environment the P8079HP is regularly subjected to quality assurance tests including:

1. Resistance to shock during operation and storage
2. Vibration
3. Dry heat
4. Low temperature
5. Operational endurance

## MAXIMUM AND MINIMUM RATINGS (Absolute values)

	Min	Max	
Voltage supply (see note 2)	–	±7.0	V
Photocathode illumination (see notes 3 and 4)	–	10	lx
Ambient temperature:			
continuous operation (see note 5)	–35	+35	°C
short term operation (2 hours max)	–54	+52	°C
long term storage	–35	+35	°C
short term storage (2 hours max)	–54	+68	°C

## CHARACTERISTICS (See note 6)

	Min	Max	
Luminance gain (see note 7)	50 000	–	asb/lx
Resolution at centre	40	–	lp/mm
Edge resolution (see note 8)	38	–	lp/mm
M.T.F. (see note 9):			
2.5 cycles/mm	90	–	%
7.5 cycles/mm	75	–	%
16 cycles/mm	45	–	%
Equivalent background illumination			
(see note 10)	–	0.2	μlx
Centre magnification (see note 11)	0.81	0.87	
Distortion (see note 12)	–	25	%
Axial eccentricity			see note 13
Screen luminance for cathode			
illuminance of 1.0 lx	10	550	cd/m <sup>2</sup>
Response time (see note 14)	–	1.5	s

## NOTES

1. Measured using as a source of white light a tungsten lamp of colour temperature 2856 K (C.I.E. illuminant 'A').
2. The input supply is applied between the d.c. input socket (positive) and the cathode contact flange (negative).
3. For short periods only. Prolonged exposure to high levels of photocathode illumination will shorten the life of the tube.
4. Internal flash protection is provided against localised and brief highlight intensities within the overall input scene. The flash protection mechanism will restore output screen luminance to normal working levels within 1.5 seconds.
5. Operation or storage outside the recommended range  $-54\text{ }^{\circ}\text{C}$  to  $+68\text{ }^{\circ}\text{C}$  must be avoided.
6. Unless otherwise specified all parameters are measured under the following conditions:
 

voltage supply (d.c.)	. . . . .	$6.75 \pm 1\%$	V
ambient temperature	. . . . .	$21 \pm 3$	$^{\circ}\text{C}$

7. Luminance gain =  $\frac{\pi L_v}{E_v}$  apostilb/lux

where  $L_v$  is the screen luminance in  $\text{cd/m}^2$  normal to the screen and  $E_v$  is the photocathode illuminance in lux.

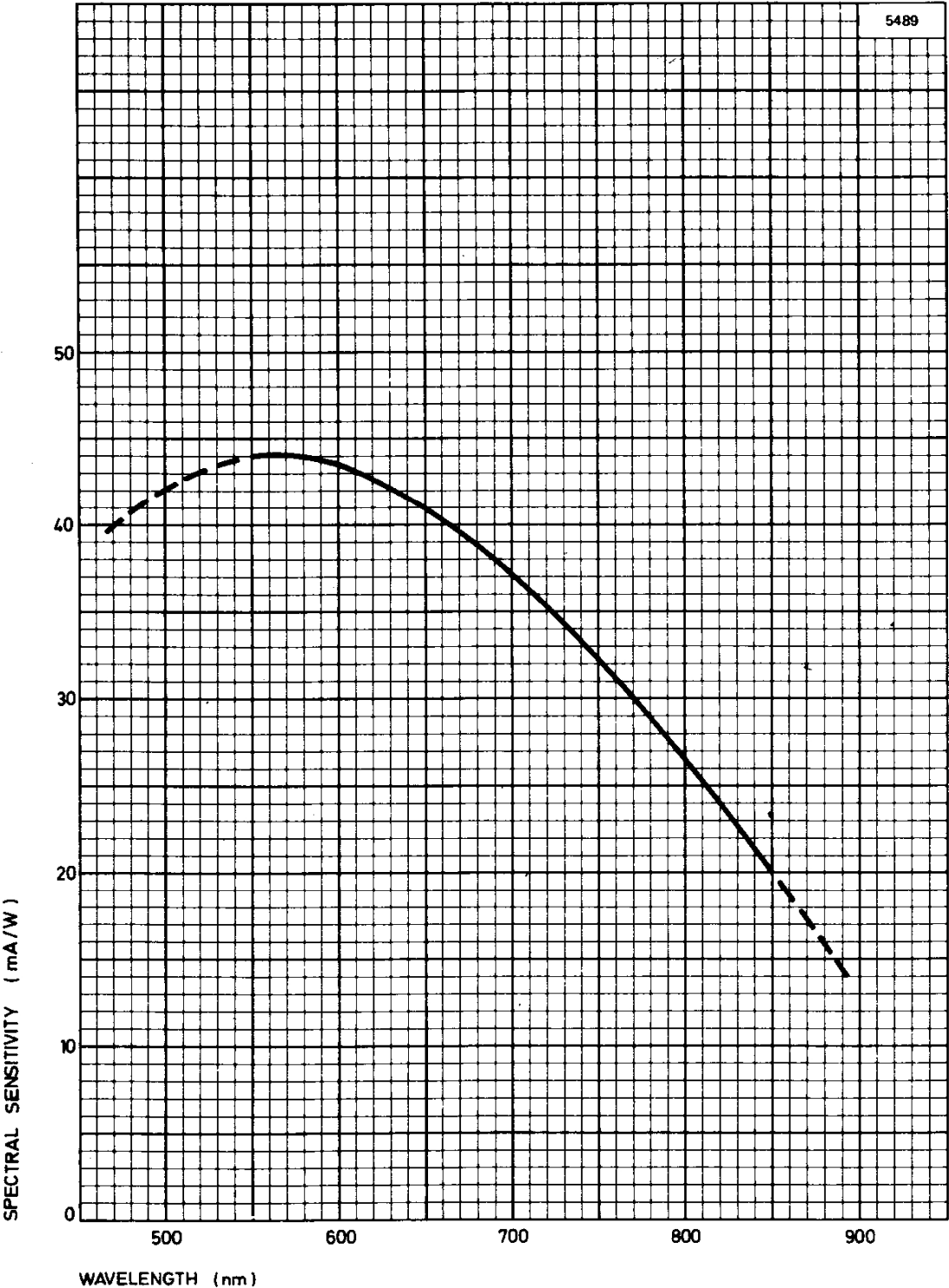
8. Measured at the photocathode at a distance of 7 mm from the centre.
9. M.T.F. is measured according to procedures defined in DEF. STAN. 59-60/90/077 or BS CECC 12001-001.
10. The value of input illuminance required to give an increase in screen luminance equivalent to the background luminance, measured at  $20\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ .
11. The magnification of a 2 mm diameter concentric circle on the photocathode, as measured on the screen.

12. Distortion =  $\frac{M_{20} - M_2}{M_2} \times 100\%$

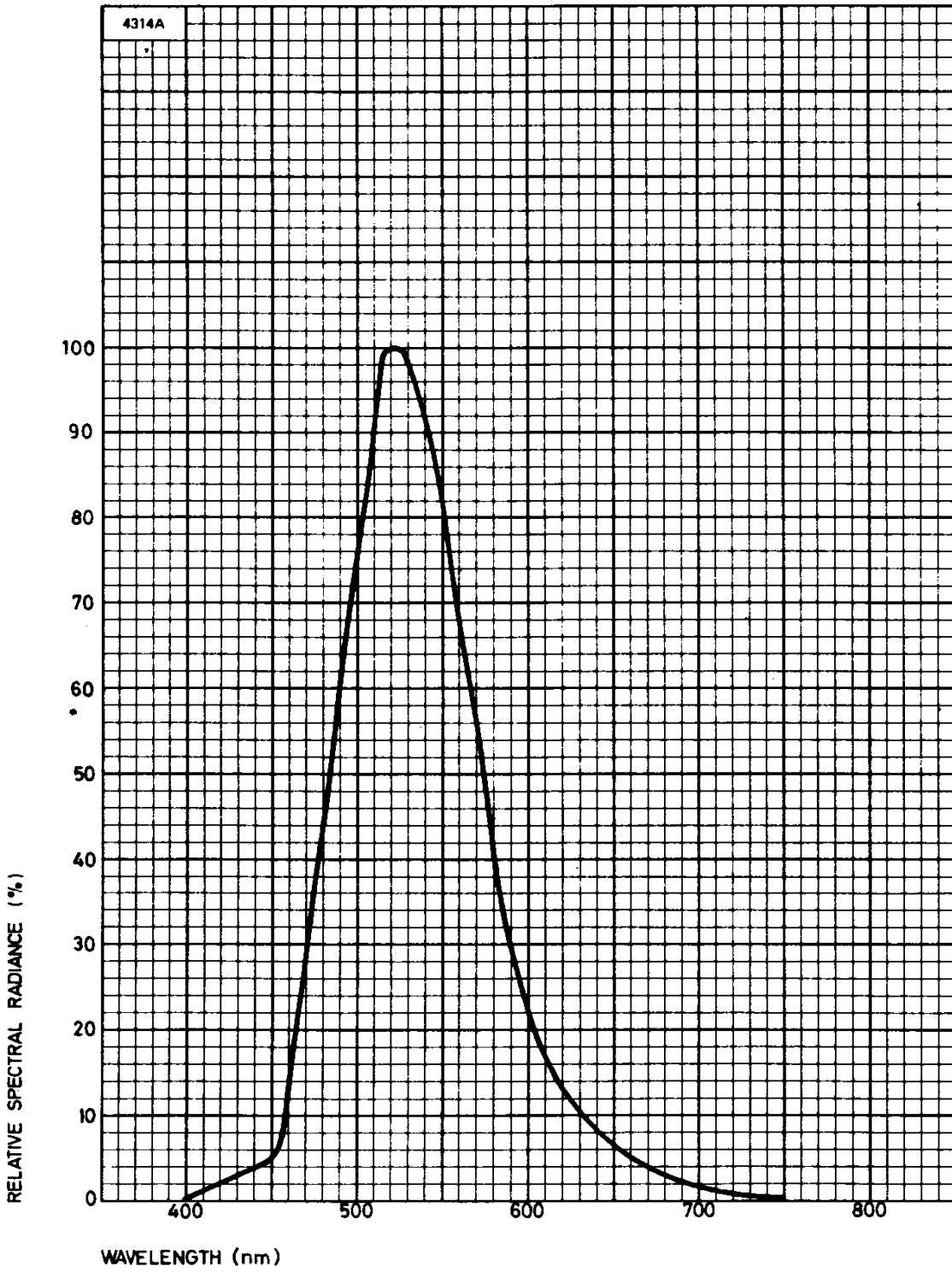
where  $M_{20}$  and  $M_2$  are the magnifications of 20 mm and 2 mm diameter circles on and concentric with the input fibre-optic.

13. The image on the screen of a point at the centre of the photocathode will lie within a concentric circle of diameter 1.5 mm.
14. From a base level of  $5 \times 10^{-3}$  lx the input illuminance is instantaneously increased to 10 lx. The screen luminance immediately rises, falls back and then stabilizes at a steady value. The response time is defined as the interval between the increase in illuminance and the subsequent attainment of an output luminance which remains above  $3.4 \text{ cd/m}^2$ .

TYPICAL PHOTOCATHODE SPECTRAL RESPONSE

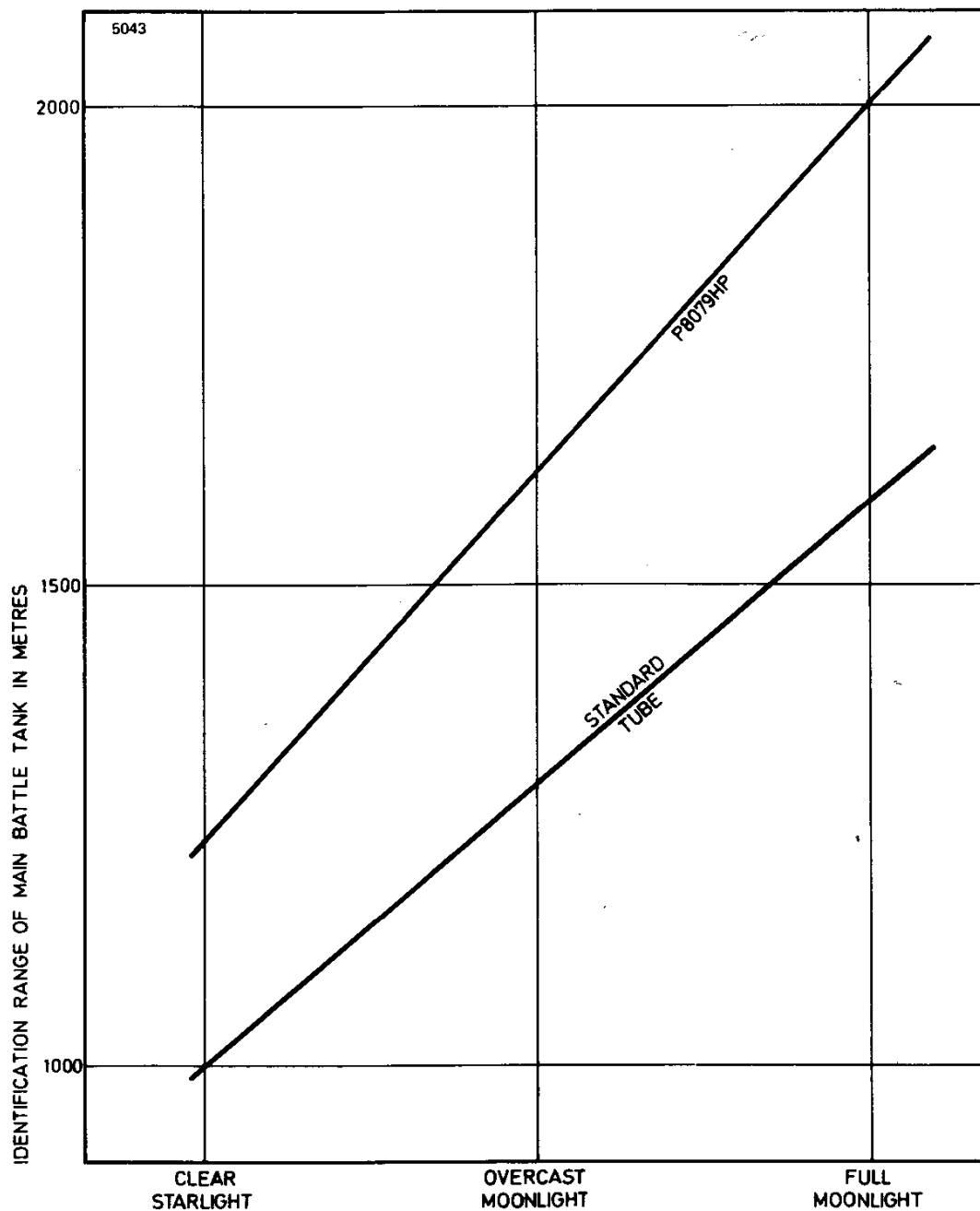


# TYPICAL SPECTRAL RADIANCE OF P20 PHOSPHOR

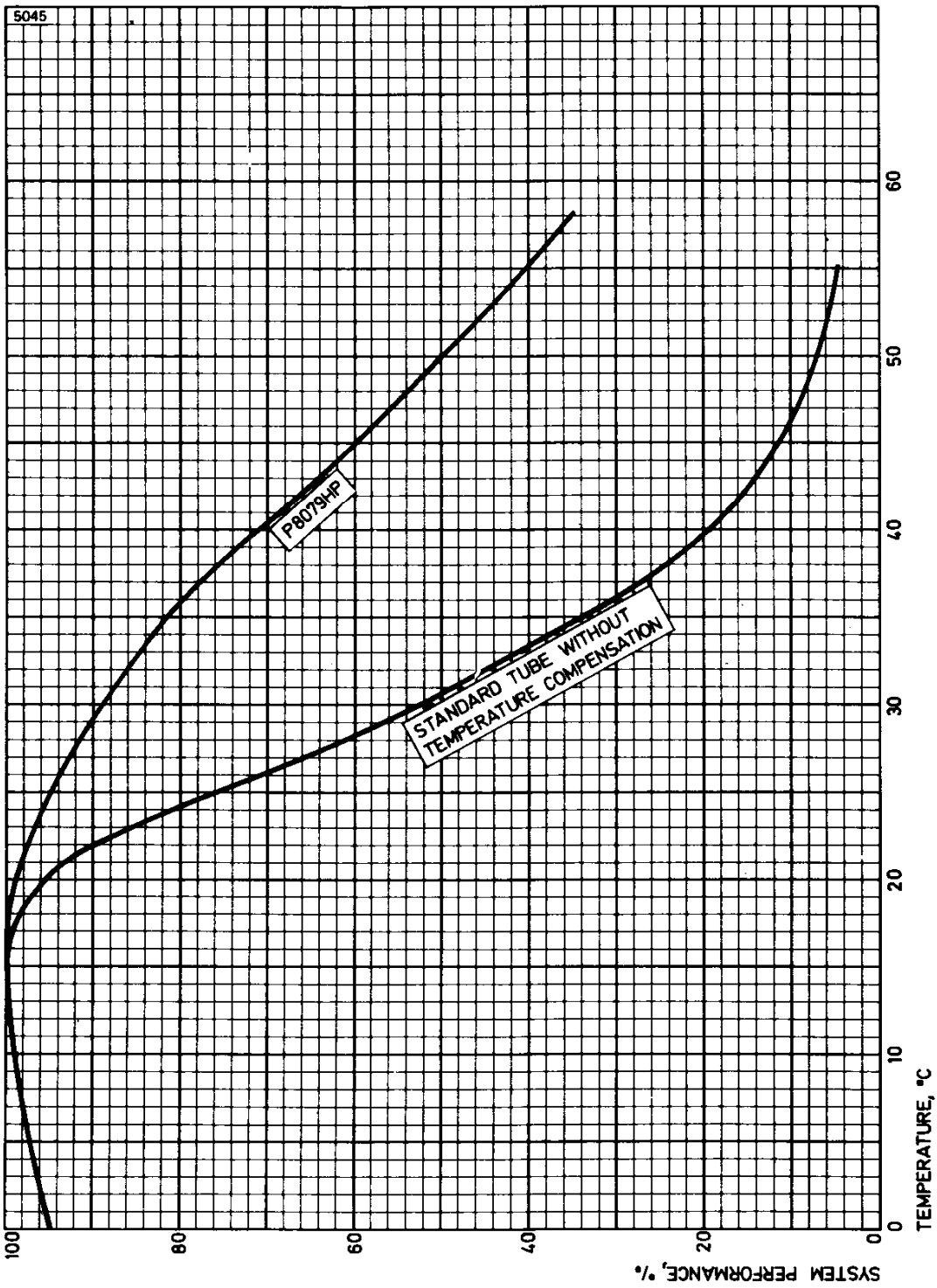




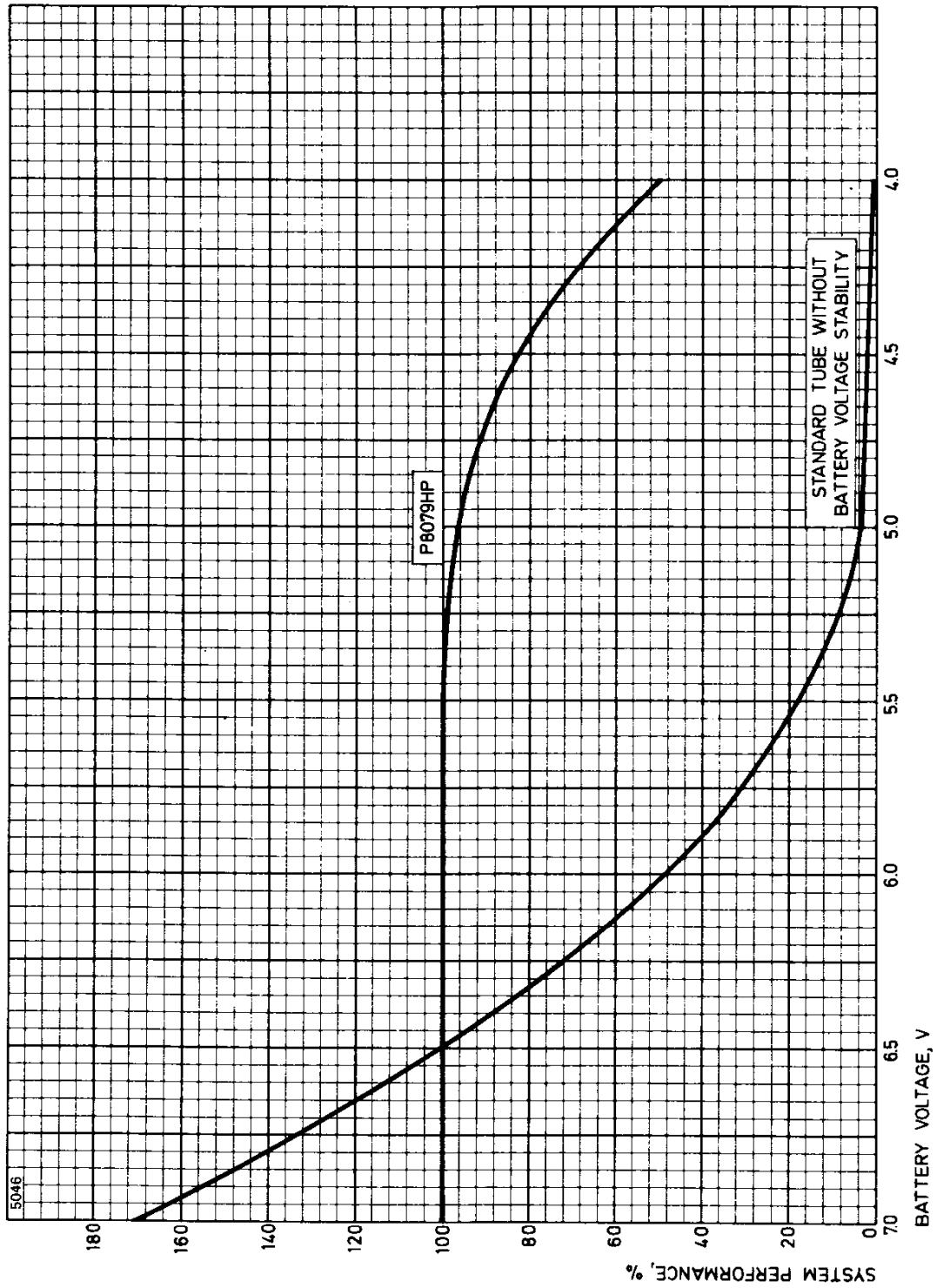
# RANGE IMPROVEMENT OF TYPICAL NIGHT VISION SYSTEM WHEN USING P8079HP TUBE



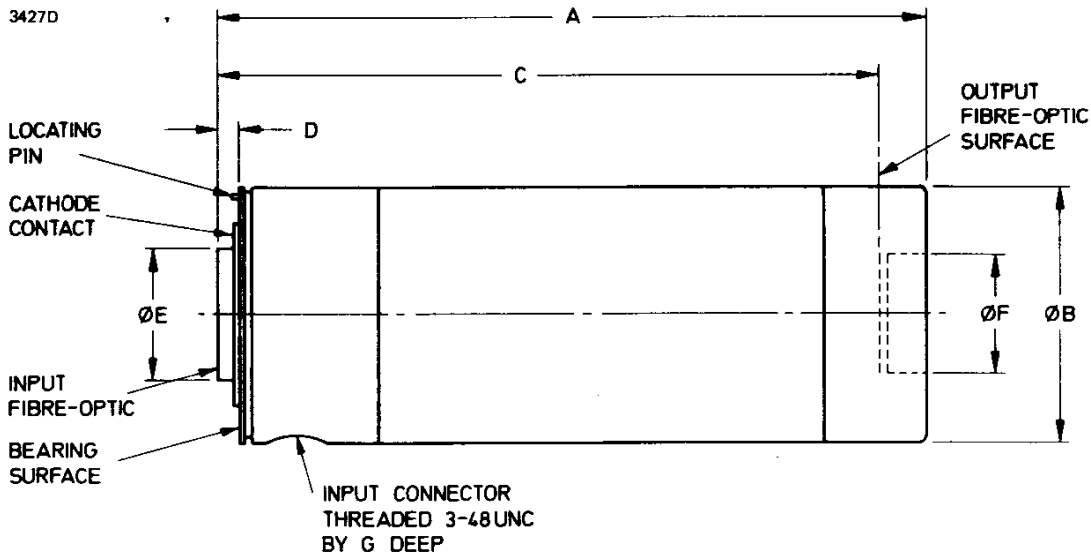
# SYSTEM PERFORMANCE VERSUS TEMPERATURE



# SYSTEM PERFORMANCE VARIATION WITH BATTERY VOLTAGE



## OUTLINE



Ref	Millimetres	Inches
A	196.0 max	7.717 max
B	70.0 max	2.756 max
C	183.0 max	7.205 max
D	6.1 nom	0.240 nom
E	35.7 max	1.406 max
F	32.7 min	1.287 min
G	5.0 min	0.197 min

Inch dimensions have been derived from millimetres.

**Note** Detailed dimensions are available on request.

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