

# NATIONAL BUREAU OF STANDARDS REPORT

10 039

A NARROW BEAM DECK FLOODLIGHT



U.S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

## NATIONAL BUREAU OF STANDARDS

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The Bureau comprises the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Radiation Research, the Center for Computer Sciences and Technology, and the Office for Information Programs.

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Office of Standard Reference Data—Clearinghouse for Federal Scientific and Technical Information<sup>4</sup>—Office of Technical Information and Publications—Library—Office of Public Information—Office of International Relations.

<sup>1</sup> Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

<sup>2</sup> Located at Boulder, Colorado 80302.

<sup>3</sup> Located at 5285 Port Royal Road, Springfield, Virginia 22151.

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## A NARROW BEAM DECK FLOODLIGHT

Prepared for  
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# A NARROW BEAM DECK FLOODLIGHT

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## ABSTRACT

The present manner of floodlighting the flight deck of an aircraft carrier tends to produce glare in the eyes of pilots approaching the carrier on the glide path. This report gives a trigonometric analysis of the problem and photometric measurements of a possible replacement unit for the present narrow-beam white deck floodlight.

## 1. INTRODUCTION

Information at the National Bureau of Standards indicates that the aft area of the carrier flight decks are floodlighted by a bank of narrow-beam light units ranging in number from five to nine. A typical configuration is shown in figure 1. The lights are installed along the aft edge of the island (the midship square of figure 1) and individually aimed to the points on the flight indicated by the circles. The lights are about 50 feet above the flight deck. The average distance of the farthest aft aiming points (A) is 400 feet (projected to deck level), to the middle row (C), 350 feet, and to the forward row (F), 300 feet.

Point AS (aft starboard) receives light from the unit aimed toward it, plus light from AC, CS, CC, FS, and FC. The total illuminance is approximately 1.1 footcandles. Point AP receives essentially the same illuminance as AS.

Point AC (aft, center) receives illumination from eight units; the total illuminance is about 1.3 footcandles.

The lights aimed to the aft points are inclined arc  $\tan 50/400$  or about  $7^\circ$  below the horizontal, the center row about  $8^\circ$ , and the forward row about  $9^\circ$ .

An intensity distribution plot of the light currently used shows about 40,000 candelas at  $7^\circ$  above the beam axis (that is, in a horizontal direction). Hence a pilot 1000 feet behind the light position and 50 feet



above the flight deck would be subject to an illuminance of 1,000,000 mile-candles if the floodlights were operated at full intensity.\* This illustration is the extreme case. The remainder of the lights are depressed a greater angle below horizontal and therefore contribute a much smaller amount of glare.

## 2. THE FLOODLIGHT UNIT

A floodlight was constructed at NBS which gives a much narrower beam vertically and a peak intensity of 550,000 cd (vs 400,000 cd for the present floodlight). The unit consists of a type MB-2 lampholder modified to accept a PAR-64 type lamp, manufactured by Multi-Electric Company, and a 1000W, 120V, Q1000PAR64/1 lamp\*\*operated at 115 volts. A 24-inch semi-cylindrical hood was attached to the lampholder. See figure 2. A 20-inch removable extension to the hood was available.

## 3. PHOTOMETRIC TESTS

The equipment used and procedure followed are detailed in NBS Technical Note 198. The photometric distance was 30 meters. A vertical and a horizontal intensity distribution through  $0.0^\circ$  was made with the hood plus the extension and another pair was made with the 24-inch hood only. See figures 3 and 4.  $0^\circ$  on the figures refers to the axis of the light.

## 4. DISCUSSION

At  $7^\circ$  above horizontal the intensity is essentially zero with the 44-inch hood and less than 10,000 cd with the 24-inch hood. If the three long-throw units presently used were replaced by three of the units described in this report, the illuminance at point AC of figure 1 would be about 1.4 footcandles and at points AP and AS, 1.6 footcandles, about 0.3 footcandles more than at present, but with much less intensity in a horizontal direction (7500 cd against 40,000 cd).

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\*Some carriers operate the floodlights at full intensity during landing operations.

\*\*See Appendix A.





It is noted that it would require a hood almost 10 feet long to cut off the present 16-inch diameter lights at or below the horizontal.

The lamp used is a 150-hour lamp when operated at rated voltage, 120 volts. Operated at 115 volts, the life will be about 300 hours. This life would not be comparable to the 800-hour life of the G-40 lamp now used, but the PAR-64 lamp has better lumen maintenance because of the halogen-cycle configuration.

The higher intensity below  $-1^\circ$  of the 44-inch hood configuration over the 24-inch hood (figure 4) is the result of reflection from the underside of the hood extension.

#### APPENDIX A

Vertical and horizontal intensity distributions of the lamp (Q1000PAR64/1) are given in figures 5 and 6.



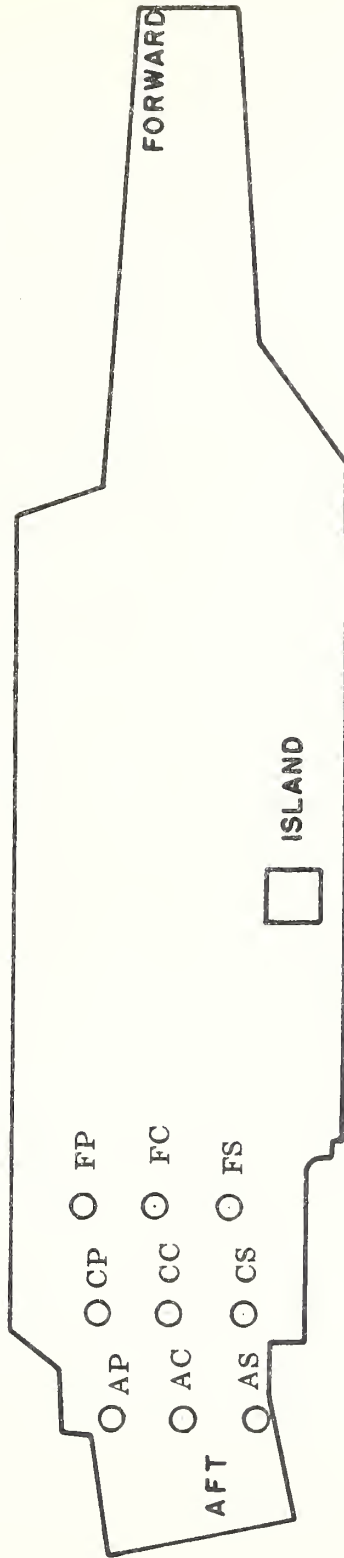


Figure 1. Typical Aiming Spot Arrangement for Overhead Flight Deck Floodlights.







Horizontal Intensity Distributions  
of a  
Deck Floodlight

Lamp: Q1000PAR64/1(VNSP)  
Lamp Voltage: 115V  
Lamp Current: 8.89A

Vertical Angle of Traverse:  $0.0^\circ$

44-inch hood

24-inch hood

Intensity (kilocandela)

500

400

300

200

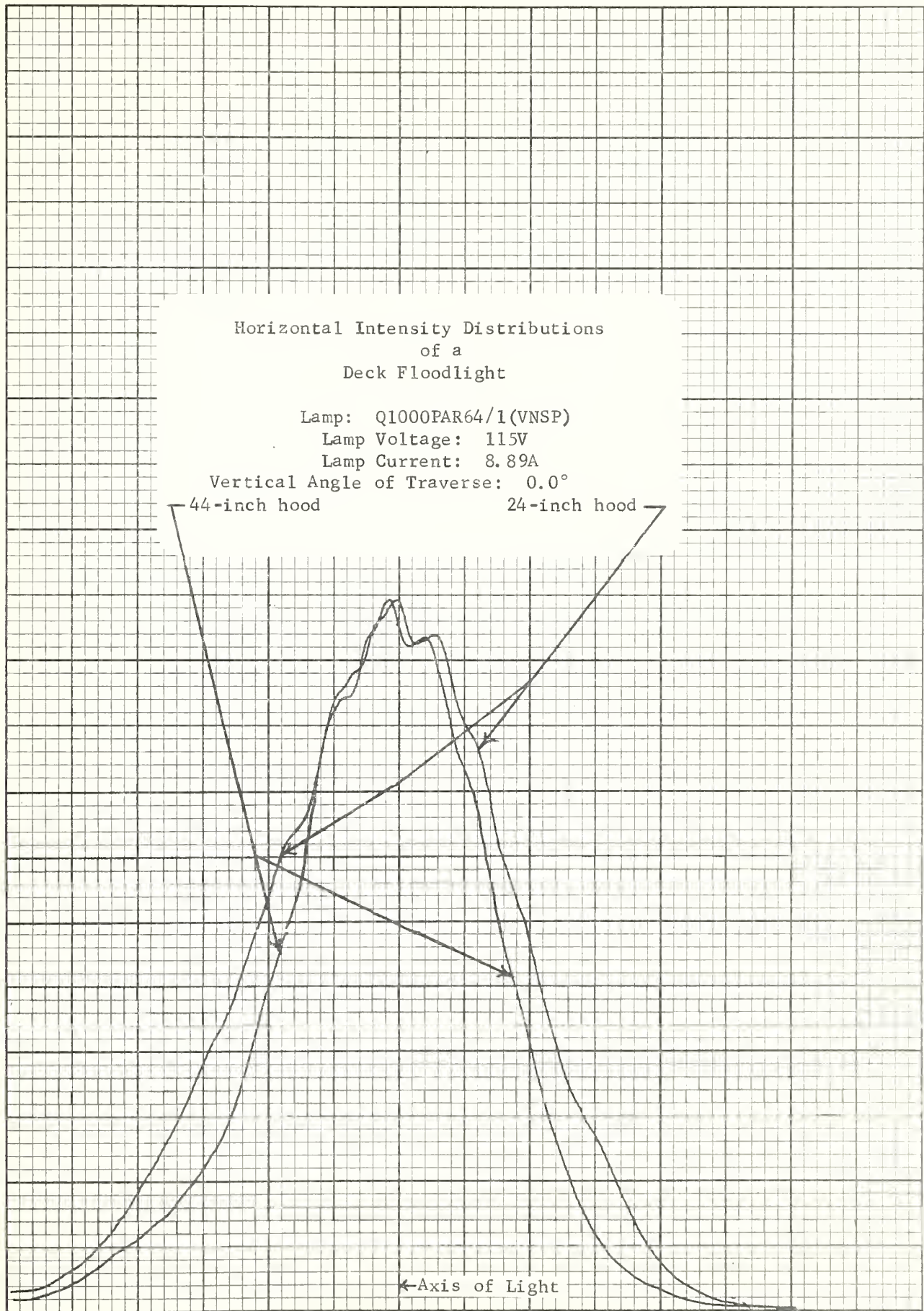
100

0

← Axis of Light

Degrees Left  
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Degrees Right  
Figure 3







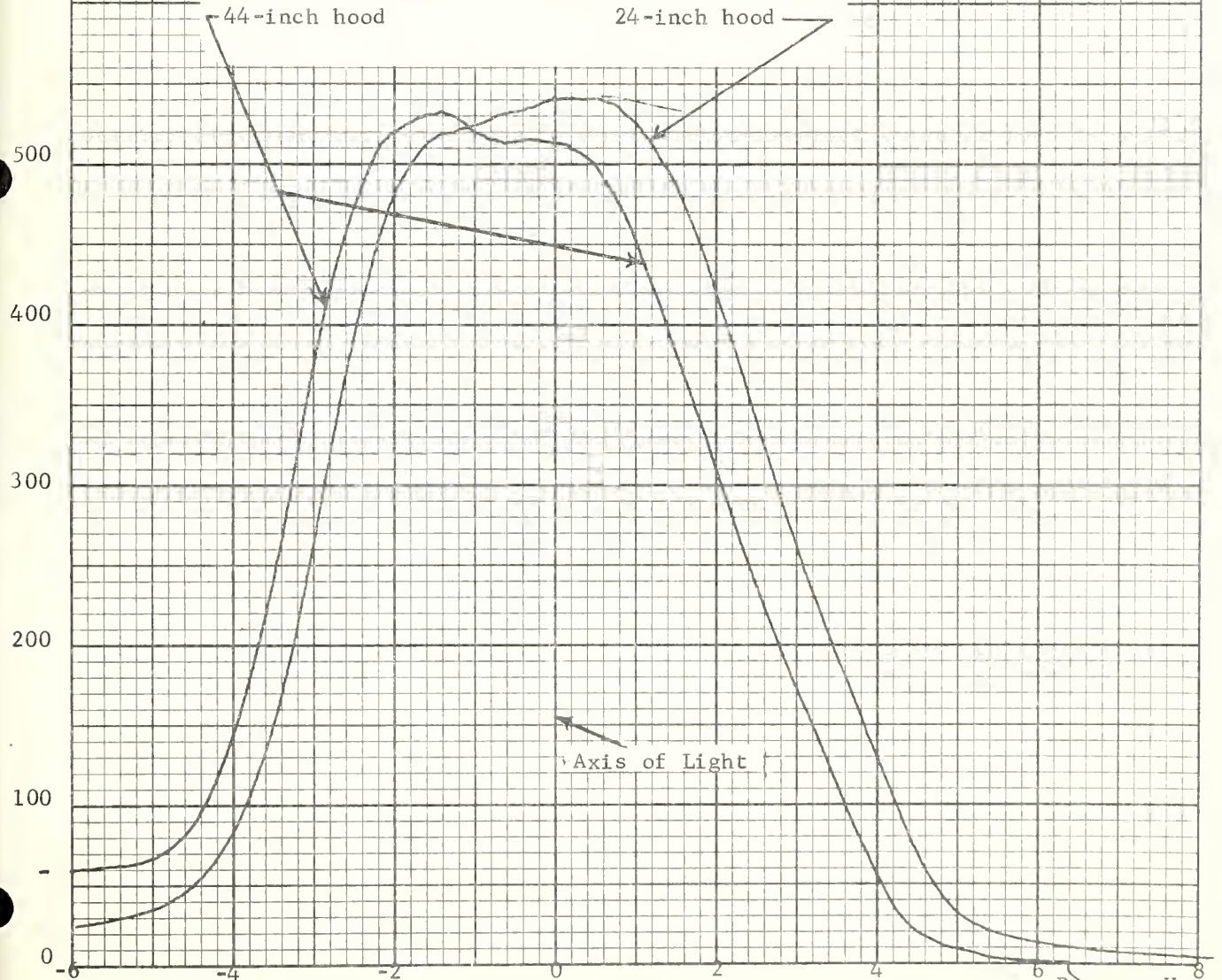
Vertical Intensity Distributions  
of a  
Deck Floodlight

Lamp: Q1000PAR64/1(VNSP)

Lamp Voltage: 115V

Lamp Current: 8.89A

Horizontal Angle of Traverse: 0.0°



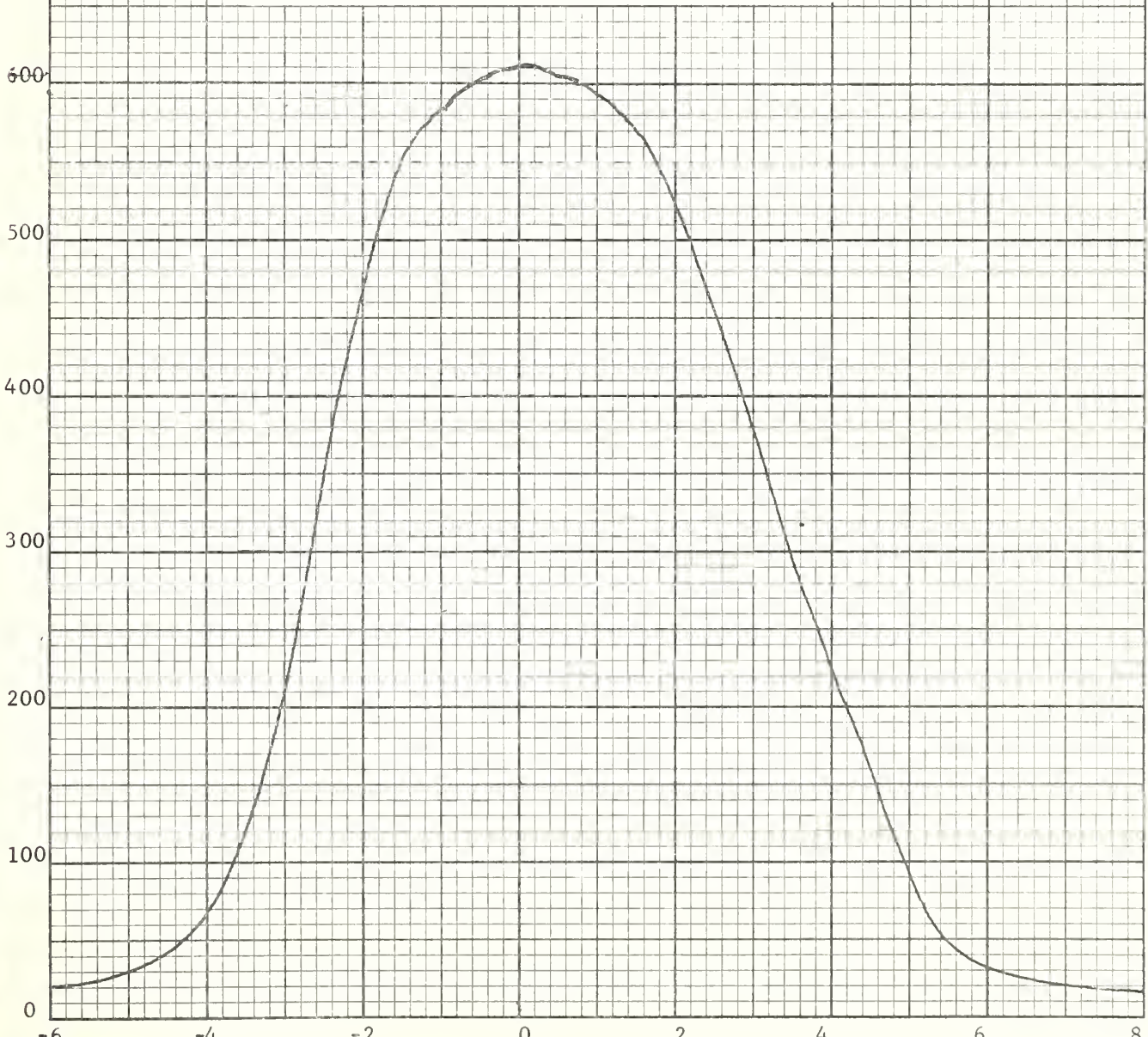


Vertical Intensity Distribution  
of a  
Q1000PAR64/1 Lamp (VNSP)

Voltage: 120V  
Current: 9.9A  
Cover: Clear

Horizontal Angle of Traverse: 0.0

Intensity (kilocandelas)





Horizontal Intensity Distribution  
of a  
Q1000PAR64/1 Lamp (VNSP)

Voltage: 120V  
Current: 9.9A  
Cover: Clear

Vertical Angle of Traverse:  $0.0^\circ$

