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ARL 62-415
SUPPLEMENT II

A PORTABLE LOW-LEVEL LIGHTMETER
II: MODIFIED LOW-LEVEL LIGHTMETER FOR THE NEAR INFRARED

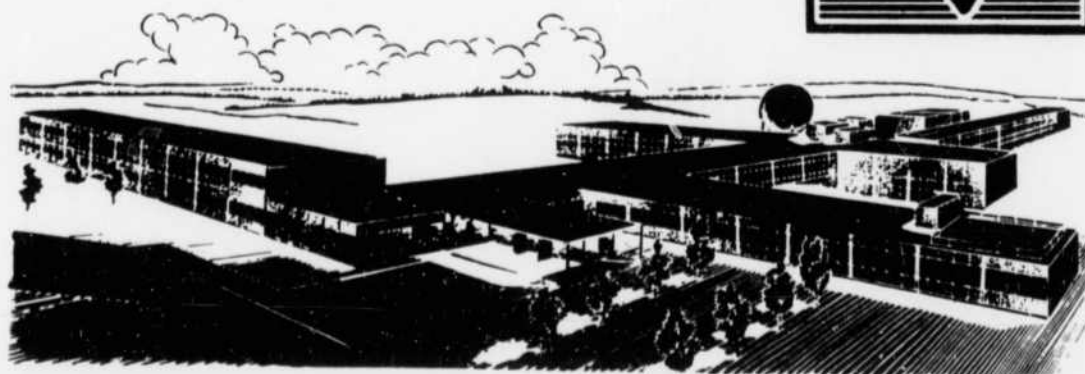
R. K. H. GEBEL

SOLID STATE PHYSICS RESEARCH LABORATORY

AUGUST 1962



AERONAUTICAL RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE



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AUGUST 1962

PROJECT 7072
TASK 70827

AERONAUTICAL RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

FOREWORD

This technical documentary report was prepared by Mr. R. K. H. Gebel of the Solid State Physics Research Laboratory, Aeronautical Research Laboratories, Office of Aerospace Research, United States Air Force. The work reported here was performed on Task 70827, "Light Amplification" of Project 7072, "Research on the Quantum Nature of Light".

This report supersedes WCRR TN 54-5, Supplement II, dated March 1955.

Abstract

Experiments to achieve a higher sensitivity in the low-level lightmeter for operation with a narrow bandwidth monochromator in near infrared observations has been advanced by an experimental photomultiplier tube made by the Dumont Tube Corporation. This tube produces a sensitivity approximately 5 times greater than was possible with previous lightmeters. Recommendations are made for further increasing effectiveness in use of the low-level lightmeter by incorporating a new Farnsworth 16-stage near infrared photomultiplier tube, 16PM1, with a very large aperture and short-focal-length lens.

A Portable Low-Level Lightmeter Supplement II: Modified Low-Level Lightmeter for the Near Infrared

Radames K. H. Gebel

Measurements with the low-level lightmeter for the near infrared have shown that a sensitivity higher than past achievements is desirable, especially if the low-level lightmeter is to be operated with a narrow bandwidth monochromator. The Dumont Tube Corporation has supplied an experimental photomultiplier tube of this kind. This modified low-level lightmeter (figure 1) containing the Dumont tube results in an arrangement approximately 5 times more sensitive than that in the previous lightmeters. (Threshold $6.5 \cdot 10^{-6}$ near infrared foot lambert.)

The dark current in an ordinary S-1 Photocathode is approximately 10,000 times greater than in an S-4 Photocathode. Therefore, any lightmeter working with an S-1 Photocathode instead of an S-4 and having like construction at the pick-up head will be less sensitive. However, since relatively large photocathodes are used in both infrared lightmeters, a reduction in the size of the photocathode in connection with shorter-focal-length lenses should make additional increase in sensitivity possible.

We, therefore, recommend that an attempt be made to incorporate the current Farnsworth 16-stage near infrared photomultiplier tube, 16PM1, recently released, into the low-level lightmeter for the near infrared. This tube has an effective photocathode of only 1/8 of an inch diameter. Very large aperture and short-focal-length lenses could be employed. A sensitivity better than 10^{-6} might be possible. Figure 2 shows the complete modified unit.

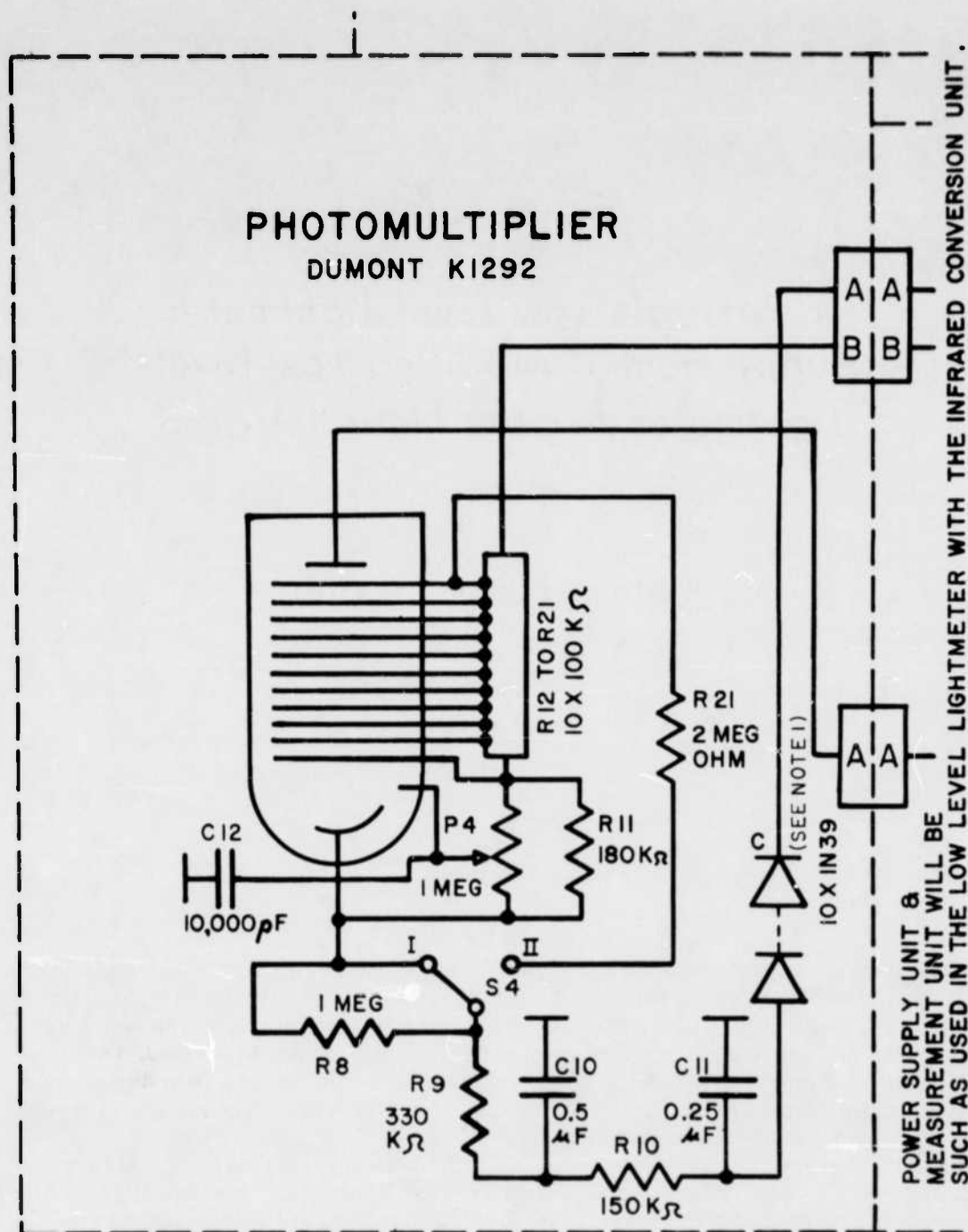


Figure 1. Schematic Diagram for Low-Level Lightmeter for the Near-Infrared

NOTE 1

When using germanium or silicon diodes for rectification or voltage doubling, careful matching for back resistance must be used. If proper matching is achieved, the number of diodes in series may be reduced. Maximum reverse working voltage for 1N39 is 200 volt d.c.

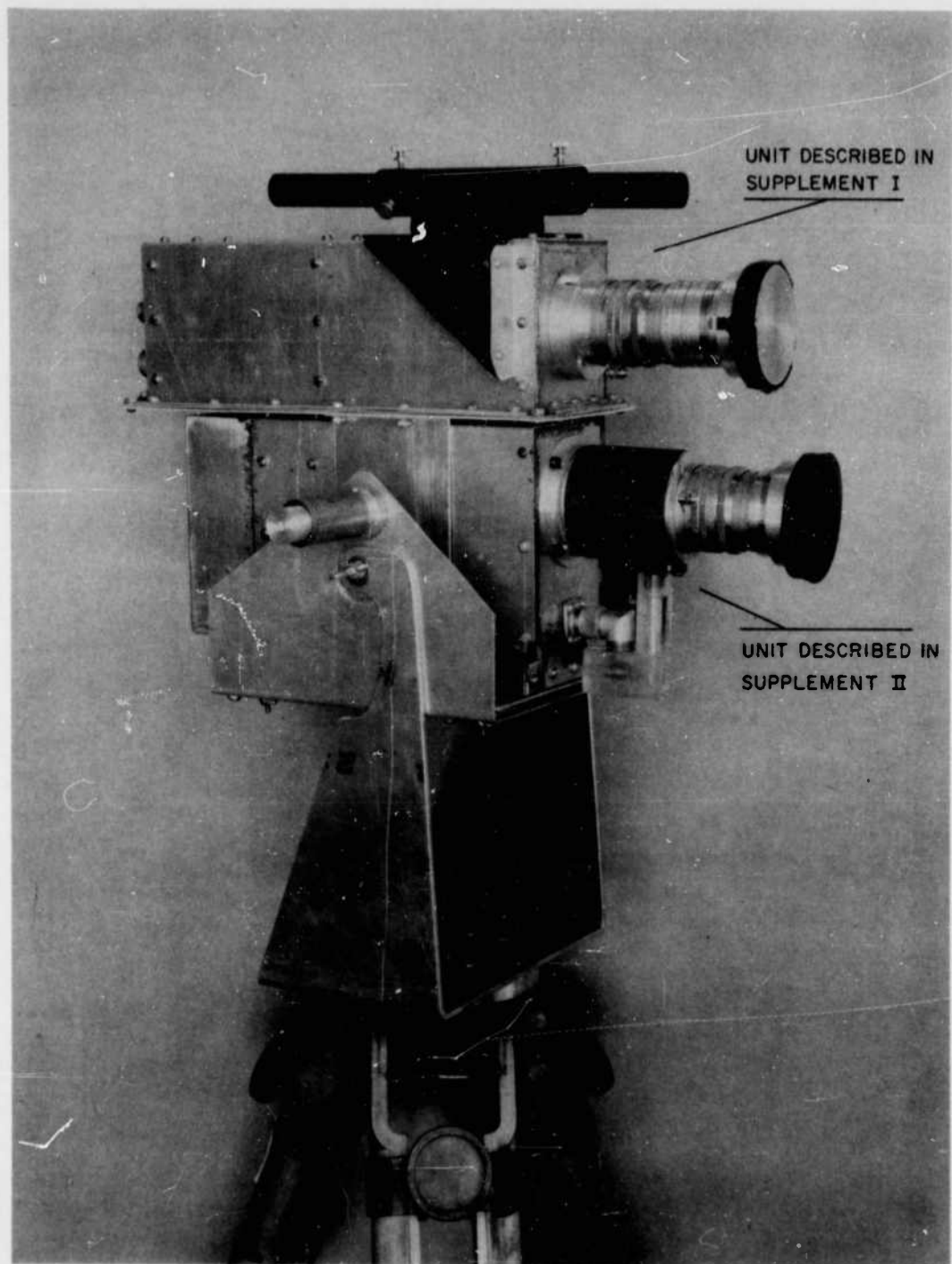


Figure 2.

Aeronautical Research Laboratories, Wright-Patterson AFB, Ohio. A PORTABLE LOW-LEVEL LIGHTMETER. II: MODIFIED LOW-LEVEL LIGHTMETER FOR THE NEAR INFRARED by R. K. H. Gebel Solid State Physics Research Laboratory. August 1962. 3 p. incl. illus. (Project 7072; Task 70827) (ARL 62-415, Supp II) Unclassified Report Experiments to achieve higher sensitivity in the low-level lightmeter for operation with a narrow bandwidth monochromator in near infrared observations has been advanced by an experimental photomultiplier tube made by the Dumont Tube Corporation. This u (over)	UNCLASSIFIED	UNCLASSIFIED
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