

*DESIGN AND DEVELOPMENT OF A CONTROL MODULE FOR  
A LOW-LIGHT CAMERA INCORPORATED  
ON A MICROSCOPE*

Undergraduate Design Project  
Submitted to the Faculty of the  
Cavite State University  
Indang, Cavite

In partial fulfillment  
of the requirements for the degree of  
Bachelor of Science in Electronics and  
Communications Engineering



00001210

*Design and development of a control module  
for a low-light Camera Incorporated on a  
620.0042 Ar2 2004  
DP-134*

EDDANN C. ARCENA  
JOHN CHRISTENSEN L. MARTINEZ  
RICHARD A. PINLAC  
June 2004



## ABSTRACT

**ARCENA, EDDANN C., MARTINEZ, JOHN CHRISTENSEN L. and RICHARD A. PINLAC.** **Design and Development of a Control Module for a Low-Light Incorporated Camera on a Microscope.** Undergraduate Design Project. Bachelor of Science in Electronics and Communications Engineering. Cavite State University, Indang, Cavite. May 2004. Adviser: Engr. Michael T. Costa.

The Design and Development of a Control Module for a Low-Light Camera Incorporated on a Microscope was constructed in Naic, Cavite. The general objective of the study was to design and develop a control module for a low-light camera incorporated on a microscope.

The design project was proven to be a very effective learning device. It did not only provide easeness to students but also made teaching easier for biology instructors. It allowed students and instructors alike to view microorganisms and other specimen through a television monitor. It also provided the user with sensitive focusing controls, either manual or remote, by means of a stepper motor. An infrared transmitter unit was used to provide remote controls.

The Design and Development of a Control Module for a Low-Light Camera Incorporated on a Microscope comprised both software and hardware. Assembly language was used to develop the software. The primary component of the system was the MC6802 microprocessor unit, which controlled the whole system. The system also provided the following components: MC6821, which is a peripheral interface adapter that provides universal means of interfacing peripheral equipment to the MC6802; NMC27C16B CMOS EPROM, used for storing the program; 74LS138, used as a



decoder/demultiplexer; TC9149 infrared receiver IC which allowed communication between the remote control and the microprocessor; PAL16R8 stepper motor driver IC which accepts two signals from the microprocessor, clock and direction, and drives the stepper motor; a simple compound microscope and a low-light camera.

The design project was presented to the design project adviser and technical critic at the second floor of the Three-Storey Engineering Building of the College of Engineering and Information Technology. The whole system underwent a series of testing and evaluating through pilot testing and questionnaires in the Biological Sciences Building, College of Arts and Sciences. One hundred questionnaires were distributed to students conducting classes in the said building. Based on the final evaluation, the performance of the system had been found satisfactory.



## TABLE OF CONTENTS

	Page
BIOGRAPHICAL DATA .....	iii
ACKNOWLEDGMENT .....	v
ABSTRACT .....	viii
LIST OF FIGURES .....	xii
LIST OF TABLES .....	xiii
LIST OF PLATES .....	xiv
LIST OF APPENDIX FIGURES .....	xv
LIST OF APPENDIX TABLES .....	xvi
INTRODUCTION .....	1
Nature and Importance of the Study .....	2
Objectives of the Study .....	3
Time and Place of the Study .....	3
Scope and Limitation of the Study .....	3
Definition of Terms .....	5
REVIEW OF RELATED LITERATURE .....	8
MATERIALS AND METHODS .....	20
Materials .....	20
Methods .....	22
Design and construction of the control module.....	22
Incorporation of the low-light camera on the microscope .....	26



Software development .....	26
Testing of the machine .....	26
Evaluation of the machine .....	28
Cost computation .....	28
RESULTS AND DISCUSSION .....	29
Presentation and Analysis of the Design .....	29
Control Module .....	32
Software Description .....	34
Testing and Evaluation of the Machine .....	35
Cost Computation .....	39
SUMMARY, CONCLUSION AND RECOMMENDATION .....	44
Summary .....	44
Conclusion .....	45
Recommendation .....	45
BIBLIOGRAPHY .....	47
PLATES .....	48
APPENDICES .....	56
PROGRAM LISTING .....	86