HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

# GENERATING SIGNALS USING A PC

E.1116

ANTONIS ANTONIOU

JUNE 1988

# HIGHER TECHNICAL INSTITUTE

## ELECTRICAL ENGINEERING DEPARTMENT

## DIPLOMA PROJECT

# GENERATING SIGNALS USING A PC

E.1116

ANTONIS ANTONIOU

JUNE 1998

HIGHER TECHNICAL INSTITUTE
PROJECT NO.
2851

# CONTENTS


PAGE

**ACKNOWLEDMENT**

**INTRODUCTION**

**CHAPTER 1.**
**INTERFACING PRINCIPLES**

| | | |
|---|---|---|
| 1.0 | GENERALLY ABOUT COMPUTRES | 1 |
| 1.1 | DATA ACQUISITION SYSTEMS | 1 |
| 1.2 | GEREATION OF INPUT AND OUTPUT PORT FROM THE PC SYSTEM BUS | 3 |
| 1.2.1 | PC SYSTEM BUSSES –ISA | 3 |
| 1.2.1.1 | THE DATA BUS LINES D0 TO D7 | 4 |
| 1.2.1.2 | THE ADDRESS BUS LINES A0 TO A9 | 4 |
| 1.2.1.3 | CONTROL LINES | 5 |
| 1.3 | INTERFACE PRINCIPLES CIRCUIT | 5 |
| 1.4 | INPUT OPERATION OR READ CYCLE | 6 |
| 1.4.1 | OPERATION | 7 |
| 1.5 | OUTPUT OPERATION OR WRITE CYCLE | 7 |

| | | |
|---|---|---|
| 1.6 | ADC :ANALOGUE TO DIGITAL CONVERTER | 9 |
| 1.6.1 | DESCRIPTION | 9 |
| 1.6.2 | OPERATION | 9 |
| 1.7 | DAC:DIGITAL TO ANALOGUE CONVERTER | 11 |


**CHAPTER 2.**
**BLOCK DIGRAM OF THE WHOLE PROJECT**


| | | |
|---|---|---|
| 2.0 | INTERFACE CARD | |
| 2.1 | CIRCUIT DESCRIPTION | 13 |
| 2.1.1 | THE DECODING CIRCUIT | 13 |
| 2.1.2 | CIRCUIT OPERATION OF INPUT PORT | 14 |
| 2.1.3 | CIRCUIT OPERATION OF OUTPUT PORT | 14 |
| 2.2 | CIRCUIT DESIGN FOR INPUT PORT BLOCK B1 | 15 |
| 2.2.1 | CIRCUIT DESIGN FOR OUTPUT PORT B2 | 16 |
| 2.3 | READ AND WRITE CYCLES PROCEDURES | 16 |
| 2.3.1 | READ CYCLE OR INPUT CYCLE PROCEDURE FOR ADC | 16 |
| 2.3.2 | PROCEDURE OF THE OUTPUT OR WRITE CYCLE | 18 |

**CHAPTER 3.**
**PCB's CIRCUIT DECIGN**


| | | |
|---|---|---|
| 3.1 | PRINTED CIRCUIT BOARDS | 19 |
| 3.2 | PCB DESIGN | 19 |
| 3.3 | PCB1 DESIGH INFORMATION FOR THE DECODING CIRCUIT TOGETHER WITH AND OUTPUT PORT | 19 |
| 3.4 | PCB2 DESIGN INFORMATION FOR THE INPUT PORT | 22 |
| 3.5 | PCB3 DESIGN OF THE CARD WHICH IS INSERTED INTO THE COMPUTER ON THE ISA SLOT | 24 |


**CHAPTER 4.**
**SOFTWARE CONTROL**


| | | |
|---|---|---|
| 4.0 | INTRODUCTION | 26 |
| 4.1 | SOFTWARE STRUCTURE | 26 |
| 4.2 | SIGNAL GENERATION PROGRAMS | 27 |


**CHAPTER 5.**
**TROUBLESHOOTING CONCLUSIONS AND COMENTS**


| | | |
|---|---|---|
| 5.1 | TESTS AND CONCLUSIONS | 30 |

5.3 TROUBLESHOOTING OF INTERFACE CARD 30
5.4 CONCLUSIONS OF THE INTERFACE CARD 31
5.5 TESTS OF SOFTWARE 32

# ACKNOWLEDGMENTS

I would like to thank my supervisor Mr. M. Kasinopoulos for his excellent quidance and his helpful assistance during the design and troubleshooting of this project.
I would also like to dedicate to my parents and my sister.
Finally I would like to thank the lab assistants for their help in the electronics labs.

# SUMMARY

The main objectives of this project were to design an interface card in order to generate signals on the oscilloscope and to enter data into the PC.

The project is dealing with both hardware and software control
The first chapter refers generally to computers and to the Data Acquisition System , with full explanation of each part of the DAS.

In the second chapter there is full explanation of the project and block diagrams showing the hardware .

The third chapter is showing the PCB's design for the needs of this project. Also there are lists of the components used and information about the PCB's.

The fourth chapter explains the implementation of the Pascal programs.

At the last chapter troubleshooting is explained step by step. This chapter also contains the comments and conclusions.

# INTRODUCTION

Computers are an essential tool of modern society. They have several applications .One of the applications is to generate signals, and to read data from the outside world..

The computers have lead to a point where everything, is want to be controlled or just observed by the computer. This project is somehow a Data Acquisition System.

To generate these signals it is required to create an interface card which will consist of a Digital to analogue converter as an output port and Analogue to digital converter as an input port.
Through software those signals are outputted to the oscilloscope.

In this project there will be a demonstration of the different generated signals