

HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING

COURSE

DIPLOMA PROJECT

DEVELOPMENT OF A TERMINAL

DEVICE TESTING SYSTEM

E/1024

MICHAEL ANDRE

1996

**DEVELOPMENT OF A TERMINAL DEVICE  
TESTING SYSTEM**

by

**Andrie Michael**

**Project Report**

**Submitted to**

**the Department of Electrical Engineering**

**of the Higher Technical Institute**

**Nicosia, Cyprus**

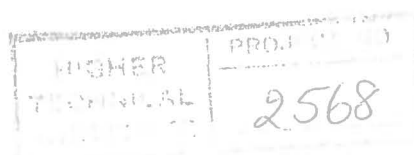
**in part satisfaction of award of diploma of**

**TECHNICIAN ENGINEER**

**in**

**ELECTRICAL ENGINEERING**

**June 1996**



## CONTENTS

<b>ACKNOWLEDGMENTS</b>	<b>1</b>
<b>SUMMARY</b>	<b>2</b>
<b><u>CHAPTER 1 INTRODUCTION</u></b>	<b>3</b>
1.1 System description	3
1.2 Summary of project requirements	5
<b><u>CHAPTER 2 HARDWARE DESIGN</u></b>	<b>6</b>
2.1 Circuit design	6
2.2 Block diagram	6
2.3 Circuit designs and explanations	10
2.3.1 Regulator circuit	10
2.3.2 Interface circuit	10
2.3.3 Frequency generator circuit	13
2.3.4 Switching circuit	14
2.3.5 Audio buffer circuit	18
2.3.6 Rectifier and comparator circuits	18
2.3.7 Analogue to Digital Converter circuit	21
2.3.8 Microprocessor circuit	24
<b><u>CHAPTER 3 PCB DESIGN</u></b>	<b>34</b>
3.1 Design and construction of the PCB	34
<b><u>CHAPTER 4 SOFTWARE DESIGN</u></b>	<b>35</b>
4.1 Introduction	35
4.2 General flowchart	35
4.3 Software program	38

<b><u>CHAPTER 5 TESTING THE PCB</u></b>	<b>41</b>
5.1 Testing the system	41
5.1.1 Testing the regulator and the frequency gen. circuits	41
5.1.2 Testing the interface circuit	41
5.1.3 Testing the audio buffer circuit	42
5.1.4 Testing the rectifier and comparator circuits	42
5.1.5 Testing the ADC	42
<b><u>CHAPTER 6 FUTURE EXPANSION</u></b>	<b>43</b>
<b><u>CONCLUSIONS</u></b>	<b>44</b>
<b><u>APPENDICES</u></b>	<b>45</b>
<b><u>APPENDIX A</u></b>	<b>45</b>
Components used	
<b><u>APPENDIX B</u></b>	<b>49</b>
Data sheets	
<b><u>APPENDIX C</u></b>	<b>64</b>
Instructions for testing the system	64

## ACKNOWLEDGMENTS

I would like to express my sincere thanks to the Cyprus Telecommunications Authority which has sponsored my project and gave me the opportunity to use the facilities of their Electronic laboratory.

I would also like to thank my project supervisor, Mr. Ch. Theopemptou for his helpful guidance given through the project period.

My thanks and appreciations are extended to the staff of CYTA electronic laboratory for their help through the project period. Especially I would like to thank :

- Mr. Aleco Alexandrou and
- Mr. Kyriaco Kylili

for their useful and helpful advises.

Thanks are expressed to anyone who helped in the completion of this project.

## SUMMARY

This project deals with the design and construction of a system that is test the handset, the microphone and the speaker, of a payphone or a cardphone.

The system can test the handset manually or automatically. Although the requirements of the project were to test the handset only manually, the project was extended and with some additional circuits, the handset can be tested and automatically. In order to test the handset automatically, a software program must be written. In this project a part of this software program is given, but not in detail. However, in the hardware design fully explanation is covered for both way of tests, manually or automatically. The handset, is going to be disconnected from the telephone system and is going to be connected to the testing system.

In manual test the testing can either be started from the external microphone or the external speaker, where in automatic test the equipment to be tested, is automatically tested by the program. The testing is able to be done by sending eight frequencies which are in the range of the BW ( bandwidth ) of the telephone, between 300 Hz and 3400 Hz.