EPROM CONTROLLED DIGITAL THERMOMETER

Project report submitted by

TASOS ROUSHIAS

in part satisfaction of the award of
DIPLOMA of TECHNICIAN ENGINEER in
Electrical Engineering
of the

HIGHER TECHNICAL INSTITUTE
Nicosia
Cyprus

Project Supervisor: SOTIRIS HADJIOANNOU

June 1991

HERRICK CO.

EPROM CONTROLLED DIGITAL THERMOMETER

TASOS ROUSHIAS

SUMMARY

Thermometers are used in our everyday life for various applications. These applications are mainly to sense the temperature and give a signal. That signal is used either to control or to give visual information about the environment where the thermometer is used.

The project's requirements, about the thermometer, is to give in a three seven-segment display the temperature of the thermistor in degrees Celsius (°C).

The design is based on a frequency counter. The sensor is a negative temperature coefficient (NTC) thermistor which by the change of temperature its resistance changes (when the temperature increases the resistance decreases).The thermistor is used with a 555 timer IC. When the temperature changes, the output pulses of the 555 IC change in frequency. These pulses are then counted by the 7493 counters and stored in 7495 memory. The output of 7495 is the address of the memory location in the 2716 EPROM. That memory location contains the data of the respective temperature of the thermistor. That data is in binary and is used by the 7447 decoders to drive the seven segment displays.

The thermometer is calibrated to display temperatures from 0.0°C - 49.9°C in steps of 0.1°C.

The use of the EPROM is a nice way to display or control the temperature of specific circuits especially if there is a need of accurate results.

TABLE OF CONTENTS

TITLE i

ACKNOWLEDGEMENTS ii

CONTENTS iii

SUMMARY v

INTRODUCTION 1

CHAPTER 1

1.1 Digital Integrated Circuits 4

1.2 Transistor Transistor Logic 5

1.21 Numbering System 5

1.22 Types of TTL available 6

1.23 Typical Characteristics 6

1.3 Transducers 7

1.31 Characteristics of Ideal Transducers 8

1.32 Thermal Transducers 8

1.33 Thermistors 9

1.4 Displays 9

1.41 LED Displays 10

1.42 LCD Displays 11

1.5 Memory 12

1.51 UV-EPROM 14

CHAPTER 2

2.1 Block Diagram..... 14
2.2 Frequency counter..... 14
2.3 EPROM Controlled Digital
Thermometer..... 17

CHAPTER 3

3.1 Circuit Diagram..... 20
3.11 The 555 Timer IC..... 20
3.12 Counters..... 21
3.13 Memory..... 22
3.14 Displays..... 23
3.15 Oscillator
Flip-Flop
Monostable..... 24
3.16 Technical Hints..... 25

CHAPTER 4

4.1 Calibration..... 27
4.2 EPROM Programming..... 31
4.21 Program of EPROM 1..... 31
4.22 Program of EPROM 2..... 39

CHAPTER 5

5.1 Testing..... 41
5.2 Troubleshooting aids..... 42
5.3 Conclusions..... 44

REFERENCES..... 45

APPENDICES..... 46