

Preface

A microcontroller is a single chip microprocessor system that contains data and program memory, serial and parallel input—output, timers, external and internal interrupts, all integrated into a single chip that can be purchased for as little as \$2.00. About 40% of microcontroller applications are in office automation, such as PCs, laser printers, fax machines, intelligent telephones, and so forth. About one-third of microcontrollers are found in consumer electronic goods. Products like CD players, hi-fi equipment, video games, washing machines, cookers, and so on fall into this category. The communications market, automotive market, and the military share the rest of the application areas.

There are many different types of microcontrollers available from many manufacturers. This book is about the PIC18F family of high-end 8-bit microcontrollers, developed and manufactured by Microchip Inc. The highly popular PIC18F45K22 microcontroller is used in the projects in this book. Many simple, intermediate level, and advanced projects are given in the book. Most projects are developed using the highly popular mikroC Pro for PIC compiler as well as the MPLAB XC8 compiler. All the projects are fully documented where the following is given for each project: project description, project hardware (and project block diagram where appropriate), project PDL, project program, and for some projects suggestions are given for possible modifications and improvements. All the projects have been tested and are working.

Knowledge of the C programming language will be useful. Also, familiarity with at least one member of the PIC16F series of microcontrollers will be an advantage. The knowledge of assembly language programming is not required because all the projects in the book are based on using the C language.

This book is written for students, for practicing engineers, and for hobbyists interested in developing microcontroller-based projects using the PIC series of microcontrollers. Attempt has been made to include as many projects as possible, limited only by the size of the book.

Chapter 1 presents the basic features of microcontrollers.

Chapter 2 provides a short tutorial on the C language and then examines the features of the highly popular mikroC Pro for PIC programming language and compiler used in projects in this book.

Chapter 3 is about the MPLB X IDE and the XC8 programming language and compiler. Both the mikroC Pro and the XC8 program listings are given for most projects in the book. The reader should be able to convert easily from one language to the other.

Chapter 4 describes the commonly used program development tools, such as the PDL and flowcharts. Examples are given for both tools.

Chapter 5 gives simple projects using the PIC18F45K22 microcontroller. In this chapter, the projects range from simple LEDs, 7-segment LED displays, LCD displays, sound projects, and so on.

Chapter 6 provides intermediate level projects. The projects in this chapter range from using the interrupts, using a keypad, generating waveforms in real time, serial communications, GPS data decoding, various bus systems, and so on.

Chapter 7 provides more advanced projects. Some of the projects covered in this chapter are using the Bluetooth communication, RFid, real-time clock, using graphics LCDs, SD cards, Ethernet-based projects, using the CAN bus, multitasking in microcontroller systems, stepping motors, and DC motors. Although the projects on motors are not advanced, they are given in this chapter for completeness.

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