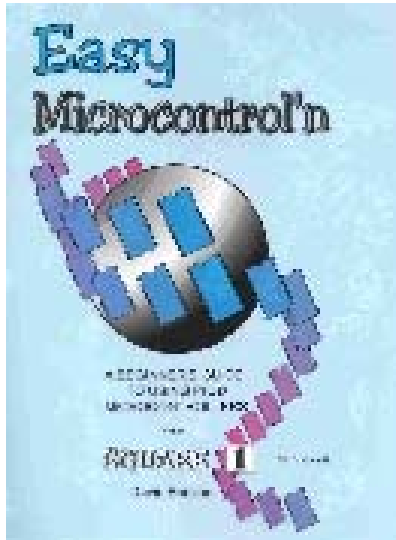


Easy Microcontrol'n

A Beginner's Guide to Using PIC ® Microcontrollers

by David Benson



Order Code 439-320

"Easy Microcontrol'n" © is intended to ease the beginner toward understanding and application of the PIC ® line of microcontrollers from Microchip Technology, Inc. Examples of assembly language programs range from a simple one to turn on LED's to more complex ones for timing and for event-counting. Writing programs is covered in-depth and the use of flow charts, as an aid to visualizing what a program does, is emphasized. The approach is hands-on with many examples, all of which may be demonstrated using a very simple demo board (a project) in the beginning of the book. By David Benson (8-1/2 x 11 format, 179 pages).

CONTENTS

PRODUCT OVERVIEW

PIC16F84

- Pins and Functions
- Package
- Clock Oscillator
- Reset
- Ports

Special Features

- Watchdog Timer
- Power-up Timer
- Sleep Mode

PIC Microcontroller Architecture

- Program Memory
- Weird Hex Notation
- File Registers
- Working Register (W)
- Option Register
- Stac
- Reset Vector

Interrupt Vector

- Option Register
- Program Counter
- Status Register
- Configuration bits

Circuit For Experiments

Circuit For Experimenting With The PIC16F84

- Circuit Module For Experiments - 18P Board (AKA '84 On A Board)

CHOOSING DEVELOPMENT TOOLS

MPLAB

- Choosing A Device Programmer
 - PICSTART Plus
 - 3rd Party Programmer

USING AN ASSEMBLER

- Source Code For The Assembler
 - Semicolon (;)
 - Tabs
- Style
- Headers
- Labels
- Equates
- Literals
- Origin
- End
- Program Format
- Files Used By Assembler
- Files Created By Assembler
- Preventing Some Gotchas
- Configuration Bits

MPLAB OVERVIEW - GETTING STARTED

- Using MPLAB - Getting Started
 - Toolbars
 - Select Development Mode And Device Type
 - Project
 - Text Editor
 - Edit Project
 - Assembler
- More MPLAB Operations

PROGRAMMING A DEVICE

WRITING PROGRAMS

- Programming Concepts
- Instruction Set
- Weird Move Instruction
- Instruction Format For The Assembler
 - Byte-Oriented Instructions
 - Bit-Oriented Instructions
 - Literal Instructions
 - Control Instructions (CALL and GOTO)
 - Destination Designator (d)
- Hexadecimal Numbers vs. MPASM Assembler
- Binary And Decimal Numbers vs. MPASM Assembler
- ASCII Characters vs. MPASM Assembler
- Addressing Modes
 - Immediate addressing
 - Direct Addressing
 - Indirect Addressing
 - Relative Addressing
 - Use Of The RETLW Instruction For Accessing
 - Tables of Data Via Relative Addressing
- Using The Ports
 - Data Direction
 - Port Read/Write
- Flags
- Simple Data Transfers
- Loop - Endless
- Loop With a Counter
- Loop Until
- Comparisons
- Bit Manipulation Using Bit Manipul
 - Instructions
- Bit Manipulation Using Logic Instructions
- Using Bit Manipulation
- Sequencing
- Subroutines
- Time Delay Loop
- Lookup Tables

Programming Style

INTERRUPTS

- Interrupt Control Register
- Interrupt Sources
 - External
 - Timer/Counter
 - Port B Interrupt On Change - Bits 7,6,5,4
- Global Interrupt Enable Flag
- Saving Status During An Interrupt (Context Saving)
- Where To Put The Interrupt Service Routine
- Interrupt Latency
- Multiple Interrupt Sources
- Example - External Interrupt

TIMING AND COUNTING

- Digital Output Waveforms
- Timing And Counting Using The PIC16F84's TMR0
 - On-Board Timer/Counter
 - Prescaler
 - Changing Prescaler Assignment
 - Using The Timer/Counter
 - Timer/Counter Experiments
 - Digital Output Using TMR0 - Internal Clock
 - Single Time Interval - Internal Clock
 - Single Time Interval - External Clock
 - Free Running Mode - Internal Clock
 - Free Running Mode - External Clock
 - Counting Events (Pulses)

FILE REGISTER BANK SWITCHING

- File Register Bank Switching
- Bank Switching Demo
- Interrupts And Bank Switching

PROGRAM MEMORY PAGING

- 14-Bit Core Mid-Range Parts
- Interrupts And Program Memory Paging
- Summary

LOCATING TABLES IN PROGRAM MEMORY

- Include Files

PIC16F84 DATA EEPROM MEMORY

- EEADR Register
- EEDATA Register
- EECON1 Register
- EECON2 "Register"
- Read Cycle
- Write Cycle
- Programming The Data EEPROM
- Code Protection

MORE ABOUT CONFIGURATION BITS

I/O CONVERSION

- Input Conversion
- Output Conversion

MULTIPLEXED 7-SEGMENT LED DISPLAY

MORE PIC MICROCONTROLLER BOOKS

APPENDICES

- Appendix A - Sources
- Appendix B - Hexadecimal Numbers
- Appendix C - Program Listings vs. Page Number