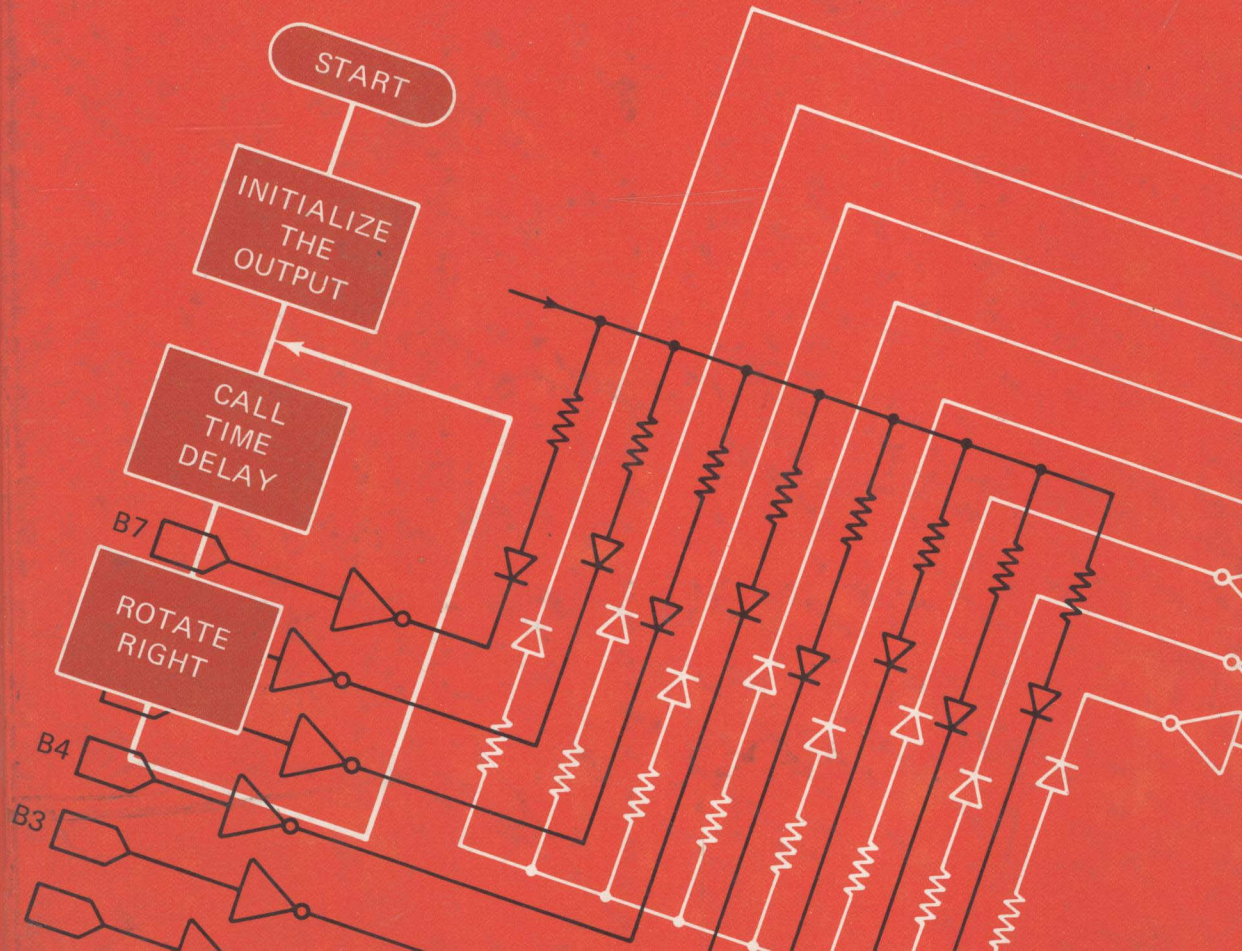
Microprocessor Instruction Sets and Software Principles

David L. Heiserman

Provides a global view of microprocessor programming principles and summarizes four major classifications of microprocessor devices: Z-80, 8080A/8085, 6502, and 6800



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Prentice-Hall, Inc., Englewood Cliffs, NJ 07632

Library of Congress Cataloging in Publication Data

Heiserman, David L.
Microprocessor instruction sets and software principles.

Includes index.
1. Microprocessors—Programming. I. Title.
QA76.6.H45 001.64'2 82-590
ISBN 0-13-581090-6 AACR2

Editorial/production supervision by Anne Simpson
Interior design by Daniela Lodes
Manufacturing buyer: Gordon Osbourne

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Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

ISBN 0-13-581090-6

Prentice-Hall International, Inc., *London*
Prentice-Hall of Australia Pty. Limited, *Sydney*
Prentice-Hall Canada Inc., *Toronto*
Prentice-Hall of India Private Limited, *New Delhi*
Prentice-Hall of Japan, Inc., *Tokyo*
Prentice-Hall of Southeast Asia Pte. Ltd., *Singapore*
Whitehall Books Limited, *Wellington, New Zealand*

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Preface

No one can expect to work successfully with a microprocessor system without being fully acquainted with its instruction set and operating principles. A hardware engineer, for example, cannot expect to make intelligent decisions regarding the layout of the memory and I/O ports, a microprogrammer cannot hope to design the simplest software routines, and a technician cannot be expected to test, debug, and modify any part of the system.

Manufacturers of the various microprocessors have responded to the obvious need for describing their own programming principles and instruction sets. Indeed, through the first years of microprocessor technology, the manufacturers' own data books were the most popular references for teaching and learning the fundamentals of microprocessor programming.

But the maturing of microprocessor technology is making it inappropriate to define a well-prepared microprocessor engineer, programmer, or technician as one who has a thorough understanding of one manufacturer's system. It is becoming increasingly necessary to deal with diverse instruction sets and dissimilar programming operations. The rapid pace of new developments and, indeed, practical necessity are justifying the idea that it is time to cut across lines of traditional, one-manufacturer biases and adapt to new and different instruction sets and programming principles.

In an attempt to provide the broadest possible view of microprocessor programming techniques, this book deals with the instruction sets and fundamental programming procedures for four different devices: the Zilog Z-80, Intel 8080A/8085, MOS Technology 6502, and the Motorola 6800. These devices have been selected because they exemplify the similarities and differences one encounters when transferring some previous knowledge of one microprocessor system to another.

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The reader, however, must not regard this book as a mere compilation of instructions sets for four different microprocessors. It is not simply four basic handbooks in a single volume. Rather, it is a tightly integrated presentation of microprocessor programming principles; and much would be lost in an attempt to treat the book as a source of information about a given microprocessor device.

The chapters are grouped according to categories of standard microprocessor instructions and operations: load immediate instructions, register transfer instructions, direct and indirect addressing operations, stack operations, arithmetic and logic functions, and so on. The individual chapters are generally organized in such a way that they present the most general principles first. Then one microprocessor is chosen as a model for demonstrating applications of those principles. Finally, the discussions show how these principles can be implemented with the three other types of microprocessor devices.

Relevant portions of the microprocessors' instruction sets are shown as needed in the text. Complete listings of all four instruction sets appear in the appendices as well.

Numerous examples throughout each chapter show specific applications of the principles being discussed. Those examples often demonstrate other important programming principles, such as the development of flowcharts and the organization of memory maps, and they encourage the reader to compare listings for several different microprocessors that are called upon to do the same overall task.

Where appropriate, exercises appear at the conclusion of sections within the chapters. The answers to most questions are included at the end of the book.

David L. Heiserman

Microprocessor Instruction Sets and Software Principles

Contents

Preface xvii

Chapter 1 A First Look at Microprocessor Programming 1

1-1 THE TWO PARTS OF THE MICROPROCESSOR TOOL 1

1-2 THE MICROPROCESSOR PROGRAMMING PROCESS 2

Defining the Task and Developing a Flowchart 3

Developing the Source-Code Program 7

Assembling the Object-Code Program 8

Entering the Program into the System 11

Executing, Debugging, and Documenting the Program 11

1-3 AN OVERALL PERSPECTIVE ON THIS BOOK 12

EXERCISES FOR CHAPTER 1 12

Chapter 2 More About Hardware and Program Instructions 14

2-1 A GENERAL VIEW OF THE HARDWARE SYSTEM 14

Exercises for Section 2-1 16

2-2 A GENERAL VIEW OF THE SYSTEM BUS CONFIGURATION 16

Exercises for Section 2-2 18

2-3 BUS ACTIVITY DURING THE EXECUTION OF A PROGRAM INSTRUCTION 18

2-4 DATA REGISTERS WITHIN THE MICROPROCESSOR DEVICE 22

Exercises for Section 2-4 24

Chapter 3 Program Memory and Program Instructions 25

3-1 MEMORY SIZE AND LOCATION 25

3-2 PROGRAM MEMORY 27

3-3 PROGRAM INSTRUCTIONS FOR PROGRAM MEMORY 28

3-4 THE ROLE OF THE PROGRAM COUNTER 29

3-5 BUS ACTIVITY DURING THE EXECUTION OF A PROGRAM 31

3-6 MEMORIES AND MEMORY MAPS 32

EXERCISES FOR CHAPTER 3 34

Chapter 4 Load Immediate Instructions 35

4-1 LOAD IMMEDIATE INSTRUCTIONS FOR THE Z-80 38

8-Bit Load Immediate Instructions 38

16-Bit Load Immediate Instructions 40

Exercises for Section 4-1 44

4-2 LOAD IMMEDIATE INSTRUCTIONS FOR THE 8080A/8085 45

8-Bit Load Immediate Instructions 45

16-Bit Load Immediate Instructions 46

Exercises for Section 4-2 49

4-3 LOAD IMMEDIATE INSTRUCTIONS FOR THE 6502 49

Exercises for Section 4-3 50

4-4 LOAD IMMEDIATE INSTRUCTIONS FOR THE 6800 51
8-Bit Load Immediate Instructions 51
16-Bit Load Immediate Instructions 52
Exercises for Section 4-4 54

Chapter 5 Register Transfer Instructions 55

5-1 Z-80 REGISTER TRANSFERS AND EXCHANGES 57
8-Bit Register Transfer Instructions 57
16-Bit Register Transfers and Exchanges 61
Exercises for Section 5-1 64

5-2 8080A/8085 REGISTER TRANSFERS AND EXCHANGES 64
8-Bit Register Transfer Instructions 65
16-Bit Register Transfers and Exchanges 67
Exercises for Section 5-2 68

5-3 6502 REGISTER TRANSFER INSTRUCTIONS AND EXCHANGE OPERATIONS 68
Register Transfer Instructions 69
Register Exchange Operations 70
Exercises for Section 5-3 71

5-4 6800 REGISTER TRANSFER INSTRUCTIONS 71
Exercises for Section 5-4 73

Chapter 6 Direct Memory Addressing 74

6-1 DATA TRANSFERS VIA DIRECT MEMORY ADDRESSING 75
Transferring 8-Bit Data via Direct Memory Addressing 75
Transferring 16-Bit Data via Direct Memory Addressing 77

6-2 Z-80 TRANSFER INSTRUCTIONS 79
8-Bit Transfer Instructions and Operations 79
16-Bit Transfer Instructions and Operations 84
Exercises for Section 6-2 89

6-3 8080A/8085 TRANSFER INSTRUCTIONS 89
Exercises for Section 6-3 93

6-4 6502 REGISTER/MEMORY TRANSFERS WITH DIRECT ADDRESSING 93
Zero-Page Addressing 93
Direct Addressing for Register/Memory Transfers 94
Exercises for Section 6-4 96
6-5 6800 REGISTER/MEMORY TRANSFERS USING DIRECT MEMORY ADDRESSING 97
8-Bit Transfers 97
16-Bit Transfers 98
Exercises for Section 6-5 100

Chapter 7 Operate Immediate Instructions 101

7-1 A GENERAL VIEW OF THE OPERATE IMMEDIATE INSTRUCTIONS 102
Logical AND Function 102
Logical OR Function 104
Logical EXCLUSIVE-OR Function 105
ADD Function 106
ADD WITH CARRY Function 108
SUBTRACT Function 109
SUBTRACT WITH BORROW Function 111
COMPARE Function 111
Exercises for Section 7-1 112
7-2 Z-80 OPERATE IMMEDIATE INSTRUCTIONS 112
Exercises for Section 7-2 118
7-3 8080A/8085 OPERATE IMMEDIATE INSTRUCTIONS 118
7-4 6502 OPERATE IMMEDIATE INSTRUCTIONS 120
The Logic Instructions 121
COMPARE Operations 122
The ADD WITH CARRY and SUBTRACT WITH BORROW Functions 123
Exercises for Section 7-4 125
7-5 6800 OPERATE IMMEDIATE INSTRUCTIONS 125
Special Carry-Status Instructions 127
Exercises for Section 7-5 128

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Chapter 8 Operate Register Instructions 130

8-1 AN OVERVIEW OF THE OPERATE REGISTER INSTRUCTIONS 130

AND the Contents of Two Registers 131

OR the Contents of Two Registers 131

EXCLUSIVE-OR the Contents of Two Registers 132

COMPARE the Contents of Two Registers 132

ADD the Contents of Two Registers 133

SUBTRACT the Contents of Two Registers 133

INCREMENT and DECREMENT the Content of a Register 134

16-Bit Operate Register Instructions 134

8-2 Z-80 OPERATE REGISTER INSTRUCTIONS 135

16-Bit Operations 138

Exercises for Section 8-2 141

8-3 8080A/8085 OPERATE REGISTER INSTRUCTIONS 142

16-Bit Operations 144

Exercises for Section 8-3 146

8-4 6502 OPERATE REGISTER INSTRUCTIONS 146

16-Bit Operations 150

Exercises for Section 8-4 152

8-5 6800 OPERATE REGISTER INSTRUCTIONS 153

Register-Only Instructions 153

Register/Memory Instructions 155

Synthesizing Other Important Operations 157

Exercises for Section 8-5 158

Chapter 9 Indirect Memory Addressing 159

9-1 INDIRECT ADDRESSING FOR THE 8080A/8085 160

9-2 INDIRECT ADDRESSING FOR THE Z-80 163

Indexed Addressing 163

Exercises for Section 9-2 168

9-3 6800 INDIRECT MEMORY ADDRESSING 168

Exercises for Section 9-3 171

9-4 INDIRECT ADDRESSING FOR THE 6502 171
Zero-Page, Single-Byte Indexing 171
Absolute Indexed Addressing 174
Pre-Indexed Addressing 174
Post-Indexed Addressing 175
Summary of 6502 Addressing Modes 176
Exercises for Section 9-4 177
9-5 A PERSPECTIVE ON INDIRECT AND INDEXED ADDRESSING 178

Chapter 10 An Introduction to Jump and Branch Instructions 179

10-1 JUMP INSTRUCTIONS FOR THE 8080A/8085 181
Unconditional Absolute Jump Instructions 181
Conditional Absolute Jump Instructions 182
Exercises for Section 10-1 184
10-2 JUMP INSTRUCTIONS FOR THE Z-80 184
The Z-80 Flag Register 186
Relative Jump Instructions 187
Exercises for Section 10-2 189
10-3 JUMP AND BRANCH INSTRUCTIONS FOR THE 6502 190
Branch, or Relative Jump, Instructions 191
Exercises for Section 10-3 193
10-4 JUMP AND BRANCH INSTRUCTIONS FOR THE 6800 193
Exercises for Section 10-4 196

Chapter 11 Magnitude Comparisons for Conditional Operations 197

11-1 COMPARING UNSIGNED VALUES 199
Comparing Two Unsigned Values 199
Comparing an Unsigned Byte with a Range of Values 206
Exercises for Section 11-1 211
11-2 COMPARING 8-BIT SIGNED VALUES 212
Signed Magnitude Comparisons for the 6800 213

Signed Magnitude Comparisons for the Z-80 and 6502 218
Signed Magnitude Comparisons for the 8080A/8085 220
Exercises for Section 11-2 225

Chapter 12 The Stack Pointer and Stack Operations 230

12-1 STACK INSTRUCTIONS FOR THE Z-80 232
Exercises for Section 12-1 238
12-2 STACK INSTRUCTIONS FOR THE 8080A/8085 238
Exercises for Section 12-2 240
12-3 STACK INSTRUCTIONS FOR THE 6502 240
Exercises for Section 12-3 243
12-4 STACK INSTRUCTIONS FOR THE 6800 243
Exercises for Section 12-4 245

Chapter 13 Subroutines, Call, and Return Instructions 246

13-1 CALL AND RETURN INSTRUCTIONS FOR THE Z-80 250
Exercises for Section 13-1 255
13-2 CALL AND RETURN INSTRUCTIONS FOR THE 8080A/8085 255
Exercises for Section 13-2 256
13-3 CALL AND RETURN INSTRUCTIONS FOR THE 6502 256
Exercises for Section 13-3 259
13-4 CALL AND RETURN INSTRUCTIONS FOR THE 6800 259

Chapter 14 Bit Testing, Setting, and Resetting Operations 262

14-1 BIT OPERATIONS FOR THE 8080A/8085 262
Bit Testing Operations 262
Bit Setting Operations 265

Bit Resetting Operations 268
Exercises for Section 14-1 271

14-2 BIT OPERATIONS FOR THE 6502 271
Bit Testing Instructions and Operations 271
Bit Setting and Resetting Operations 274
Exercises for Section 14-2 274

14-3 BIT OPERATIONS FOR THE 6800 275
Bit Testing Instructions 275
Bit Setting and Resetting Operations 277
Exercises for Section 14-3 279

14-4 BIT INSTRUCTIONS FOR THE Z-80 279
Bit Testing Instructions 279
Bit Setting Instructions 283
Bit Resetting Instructions 287
Exercises for Section 14-4 291

Chapter 15 Data Shift and Rotate Instructions 292

15-1 THE FAMILY OF DATA SHIFT AND ROTATE OPERATIONS 292
Data Shift Operations 293
Circular Rotate Operations 294
Rotate through Carry Operations 295

15-2 SHIFT AND ROTATE INSTRUCTIONS FOR THE Z-80 295
Shift Instructions and Operations 295
Circular Rotate Instructions 302
Rotate through Carry Instructions 307
Exercises for Section 15-2 311

15-3 SHIFT AND ROTATE INSTRUCTIONS FOR THE 6800 311
Shift Instructions and Operations 312
Rotate through Carry Instructions 314

15-4 SHIFT AND ROTATE INSTRUCTIONS FOR THE 6502 316

15-5 SHIFT AND ROTATE INSTRUCTIONS FOR THE 8080A/8085 318

Chapter 16 Input and Output Instructions 320

16-1 8080A/8085 I/O INSTRUCTIONS 320

Exercises for Section 16-1 322

16-2 Z-80 I/O INSTRUCTIONS 322

Exercises for Section 16-2 324

Chapter 17 Memory Block Operations 325

17-1 MEMORY BLOCK INSTRUCTIONS AND OPERATIONS FOR THE Z-80 326

Memory Block Transfer Instructions 326

Memory Block Exchanges 329

Memory Block Inputs and Outputs 332

Memory Block Search Instructions 335

Exercises for Section 17-1 337

17-2 MEMORY BLOCK OPERATIONS FOR THE 8080A/8085 337

Memory Block Transfers 337

Memory Block Exchanges 339

Loading and Dumping Memory Blocks to Memory-Mapped I/Os 341

Loading and Dumping Memory Blocks to I/O-Mapped I/Os 344

Memory Block Searches 347

Exercises for Section 17-2 351

17-3 MEMORY BLOCK OPERATIONS FOR THE 6502 351

Block Transfer Operations 352

Block Exchanges 354

Loading or Dumping a Memory Block to a Single Address 355

Block Searches 356

Exercises for Section 17-3 356

17-4 MEMORY BLOCK OPERATIONS FOR THE 6800 357

Block Transfers 357

Memory Block Exchanges 360

Memory Block Dumps and Loads 360
Block Searches 363
Exercises for Section 17-4 363

Chapter 18 BCD Arithmetic Instructions 364

18-1 BCD REGISTER PACKING 365
Exercises for Section 18-1 366
18-2 DECIMAL ADJUST OPERATIONS 366
Exercises for Section 18-2 368
18-3 DECIMAL ADJUST OPERATIONS 368

Chapter 19 Restart and Interrupt Routines 372

19-1 INTERRUPT SEQUENCES 373
19-2 INTERRUPT INSTRUCTIONS FOR THE 6502 AND 6800 375
Nonmaskable Interrupts 375
Maskable Interrupts 377
WAIT and Forced Interrupt Instructions 377
Exercises for Section 19-2 378
19-3 RESTART AND INTERRUPT INSTRUCTIONS FOR THE 8080A/8085 379
Restart Instructions 379
Nonmaskable Interrupts 380
Maskable Interrupts 380
Exercises for Section 19-3 382
19-4 RESTARTS AND INTERRUPTS FOR THE Z-80 382
Restart Instructions 382
Nonmaskable Interrupts 383
Maskable Interrupts 383
Exercises for Section 19-4 385

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