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› [The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications \(4th Edition\)](#)

### Pearson 0130930814 (4th Edition, Paperback)

# The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications (4th Edition)

By Walter A. Triebel and Avtar Singh

## PRODUCT OVERVIEW

This comprehensive textbook provides a systems-level understanding of the 80x86 microcomputer, essential for designers of microprocessor-based electronic equipment. It offers thorough, balanced, and practical coverage of both software and hardware topics related to the 8088 and 8086 microprocessors, extending to the 32-bit versions of the 80x86 family.

The book details how to assemble, run, and debug programs, and how to build, test, and troubleshoot interface circuits. It includes in-depth coverage of floating-point processing and the Single Instruction Multiple Data (SIMD) processing capability of advanced Pentium processors. Additional material covers number systems, logic functions, operations, conversions between number systems, and binary addition/subtraction.

New advanced topics include Floating Point Architecture and Instructions, Multimedia (MMX) Architecture and Instructions, and the hardware architecture of the Pentium 3 and Pentium 4 processors. The text covers Intel architecture microprocessor families: 8088, 8086, 80286, 80386, 80486, and the latest Pentium® processors. It illustrates DEBUG program commands for assembling, disassembling, loading, saving, executing, and debugging programs on the IBM PC, and introduces the 8088's instruction set. Practical implementation techniques, including the use of latches, transceivers, buffers, and programmable logic devices in memory and I/O interfaces, are also explored.

This volume serves as a valuable handbook for self-study in microprocessors, and is suitable for electrical engineers, electronic technicians, and computer programmers.



This image displays the front cover of 'The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, 4th Edition'. The cover features a blue background with a circuit board pattern on the left and the book's title and authors on the right. Key text visible includes 'The 8088 and 8086 Microprocessors', 'Programming, Interfacing, Software, Hardware and Applications', 'Walter A. Triebel', and 'Avtar Singh'. A red corner indicates 'UNAUTHORIZED' and 'Circulation of this edition outside the Indian subcontinent is UNAUTHORIZED'. A starburst shape highlights 'New Chapter on Connecting Assembly Language to C' and 'New Appendix on BIOS Interrupt and DOS Interrupt'.

## SOFTWARE ARCHITECTURE AND PROGRAMMING

Part I of the book delves into the software architecture of the 8088 and 8086 microprocessors. It guides the reader on how to write, execute, and debug assembly language programs. This section includes numerous practical concepts and software applications, exploring the various steps of the assembly language program development cycle.

### Key Learning Areas:

- **Software Architecture:** Understanding internal registers, flags, memory organization, and stack from a software perspective.
- **Software Development Tools:** Utilizing debugger commands (e.g., DEBUG) to assemble, execute, and debug instructions and programs.
- **Instruction Set:** Learning the function of each instruction, permissible operand variations, and statement writing.
- **Programming Techniques:** Basic techniques such as flowcharting, jumps, loops, strings, subroutines, and parameter passing.
- **Applications:** Step-by-step process for writing programs for practical applications, including block move routines.

The software section incorporates practical concepts and applications, demonstrating 32-bit addition/subtraction, bit masking, and the use of branch and loop operations for IF-THEN-ELSE, REPEAT UNTIL, and WHILE-DO program

structures. The study of software architecture and assembly language programming is closely integrated with the use of the DEBUG program on the PC, and the Microsoft MASM Assembler is also covered for creating, assembling, and debugging programs.

## HARDWARE ARCHITECTURE AND INTERFACING

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Part II examines the hardware architecture of microcomputers built with the 8088 and 8086 microprocessors. It provides a detailed understanding of the function and operation of each microprocessor's hardware interfaces: memory, input/output, and interrupt. The role of each subsystem in overall microcomputer system operation is thoroughly explored.

### Key Hardware Topics:

- **Microprocessor Architecture:** Pin layout, minimum and maximum mode signal interfaces, signal functions, and clock requirements for 8088 and 8086.
- **Memory and I/O Interfaces:** Extensive coverage of bus cycles, address maps, interface circuits (latches, buffers, transceivers, decoders), programmable logic devices for bus-control logic, and I/O instructions.
- **Memory Subsystems:** Devices and circuits for program storage (ROM, PROM, EPROM, FLASH), data storage (SRAM, DRAM), and cache memory. Includes bus interface circuit and memory subsystem design techniques like parity-checker/generator and wait-state generator circuitry.
- **Input/Output Interface Circuits:** Detailed studies of discrete parallel I/O circuits, 82C55A, 8254, and 82C37A peripheral ICs. Exploration of special-purpose peripheral ICs and interfaces, such as serial communication with 8250/16450 UART controllers and keyboard/display driving with the 8279 controller.
- **Interrupts:** Introduction to context switching, priority, interrupt vectors, interrupt vector table, interrupt acknowledge bus cycle, and interrupt service routines. External hardware interrupt interface circuits using discrete circuitry and the 82C59 programmable interrupt controller. Covers software interrupts, nonmaskable interrupts, reset operation, and internal interrupt processing.

The book also includes a study of the 8088-based microcomputer design used in the IBM PC, demonstrating practical implementation of microcomputer interfacing techniques. Material on hardware includes interface circuit operation, design, and troubleshooting, with examples for polling switches, lighting LEDs, scanning displays and keyboards, and printing characters.

## ADVANCED MICROPROCESSORS AND FUTURE TRENDS

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Part III provides detailed coverage of other microprocessors in the 80x86 family, including the 80286, 80386, 80486, and Pentium processors. The focus is on how their software and hardware architectures differ from earlier family members.

### Advanced Topics Covered:

- DISC, CRISP, and superscaler processor architectures.
- Real-mode and protected-mode operation.
- Burst, pipelined, and cached bus cycles.
- Virtual memory, instruction set extensions, and system control instructions.
- Descriptors, paging, protection, multitasking, and virtual 8086 mode.
- Big and little endian data organization, clock scaling, dynamic bus sizing, address and data parity, and code and data cache memory.

Expanded coverage in this edition includes floating-point architecture and multimedia architecture, introducing floating-point numbers, registers, and instruction sets relative to the 80486DX microprocessor. Material on MMX technology, SIMD data, MMX registers, and MMX instruction operation is introduced relative to the Pentium Processor with MMX technology. The book concludes with an examination of the newest Pentium family processors: the Pentium III and Pentium IV processors.

## SUPPLEMENTARY MATERIALS AND RESOURCES

An extensive package of supplementary materials is available to complement the 80X86 microprocessor program offered by this textbook. These resources are designed to facilitate a practical PC-hosted laboratory program for both students and instructors.

### Available Supplements:

- **Instructor's Solution Manual:** Accompanies "The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, 4th Ed." (ISBN 0-13-093082-2, Prentice Hall). Provides answers to all student exercises and transparency masters for over 300 illustrations. Includes a CD-ROM with programs and executable files for the 25 laboratory manual exercises, created with DEBUG's assembler or Microsoft Macro Assembler.
- **The 8088 and 8086 Microprocessors Laboratory Manual, 4th Ed.:** (ISBN 0-13-045231-9, Prentice Hall). Contains 25 skill-building laboratory exercises exploring software architecture, assembly language program development, PC internal hardware, and interface circuit operation, design, testing, and troubleshooting. Includes a CD with all necessary programs (source, listing, object code, run module) produced by Microsoft Macro Assembler.
- **PCuLAB (Microcomputer Directions, Inc.):** (P.O. Box 15127, Fremont, CA 94539, [www.mcdlab.com](http://www.mcdlab.com)). An easy-to-use, versatile external hardware expansion environment for personal computers, allowing experimentation with microcomputer interface circuits. Extends the ISA bus externally to form a bench-top laboratory unit for building, testing, and troubleshooting. Features a large solderless breadboard, a PC/AT compatible ISA bus slot, and built-in I/O devices (LEDs, switches, speaker), plus a continuity tester and logic probe.

## SPECIFICATIONS

<b>Publisher</b>	Pearson
<b>Publication Date</b>	September 8, 2002
<b>Edition</b>	4th
<b>Language</b>	English
<b>Print Length</b>	1040 pages
<b>ISBN-10</b>	0130930814
<b>ISBN-13</b>	978-0130930811
<b>Item Weight</b>	3.55 pounds
<b>Dimensions</b>	6.9 x 2.1 x 9.1 inches

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