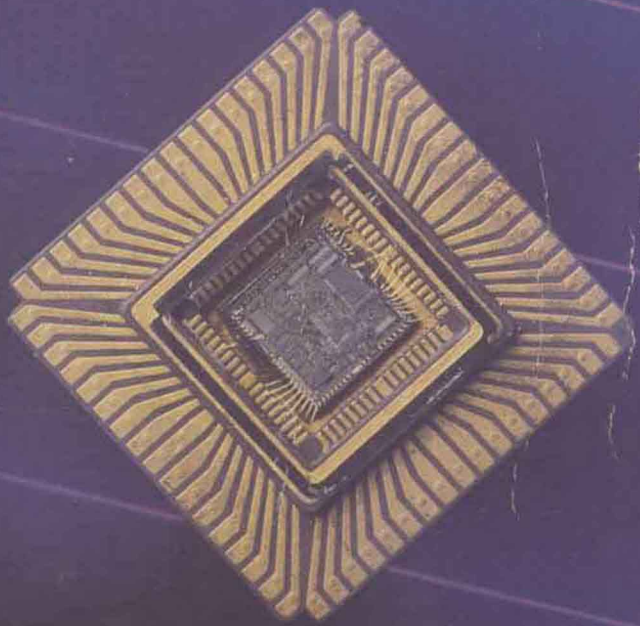
SYBEX

PROGRAMMING THE 80286

C. Vieillefond



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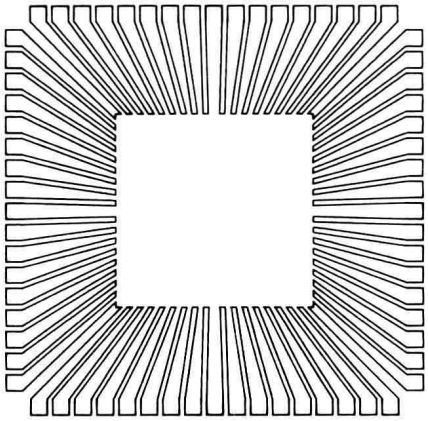

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PROGRAMMING THE 80286

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—C. V.

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INTRODUCTION

The study of a microprocessor would be incomplete without an in-depth examination of both its physical structure and its processing capabilities. For this reason, this book explores all of the characteristics of the 80286: both hardware and software.

The purpose of any book about a microprocessor is to bring to light its essential mechanisms, using examples, and to define the major characteristics of the chip. Ultimately, it is to achieve deeper insight into the microprocessor's potential and purpose.

Programming the 80286 begins by probing the hardware features of the processor and its environment.

The first chapters are intended to enable anyone wishing to design a basic board for the 80286 to map out the configuration requirements of a minimal system quickly and easily.

Therefore, this section is addressed to technicians, research engineers, designers, and anyone desiring to implement the 80286 chip into a board design.

Next, the book presents the software capabilities of this processor and demonstrates its structural orientation—the operating system.

I would like to stress that the presentation of all the processing mechanisms—memory management, multitasking, and privilege levels (which are basic concepts of all operating systems) is intended to be purely educational. These chapters are written for persons working on the software: development engineers, students, and users who want to optimize the powers of this processor.

Diagrams and flowcharts are used to illustrate and reinforce the various concepts presented. Exercises are provided at the end of most chapters to enable readers to retain the major points discussed and test their comprehension.

This book assumes the reader is familiar with the basic theory of microprocessors (the structure of a central processing unit, the concept of interrupts, and so on). On the other hand, it is written in such a way that the reader can quickly cover the ground between the 8086 and the 80286, as each new feature is presented.

With regard to the implementation and execution of the programs, you will need only an 80286-based system supporting either the Microsoft Macro Assembler under a DOS operating system or the Intel 286 development system.

HOW TO USE THIS BOOK

The following summarizes each chapter of this book.

Chapter 1—Overview of the 80286 Microprocessor: This chapter describes the input and output signals of the 80286. It presents the CPU's internal registers and the structure of the status flag register.

Chapter 2—80286 System Architecture: This chapter places the 80286 in its environment. It discusses the role of the 82284 clock generator and the 82288 bus controller, and it describes the interface between the CPU and peripheral circuits in its discussion of the read and write bus cycles.

Chapter 3—Memory Management and Virtual Addressing: This chapter introduces the advanced memory management features of the 80286. The concepts presented include memory segmentation; virtual addressing; virtual-to-physical address translation; descriptor tables; data, code, and system segment descriptors; and memory management registers.

The material in this chapter is essential to understanding the structure of the 80286.

Chapter 4—Protection: This chapter describes the 80286's protection mechanisms. It explains the notion of privilege levels and shows how gates are used to implement these levels.

It is important to understand the underlying principle of the gate and its role in ensuring data integrity.

Chapter 5—Task Switching: This chapter explains the basics of task switching, the data structures used to ensure proper task isolation, the task status segment, task gates, and interrupt tasks.

Chapter 6—Interrupts: This chapter examines the software characteristics of interrupts. Topics discussed include the interrupt descriptor table, interrupt and trap gates, real-address mode interrupts, maskable interrupts and non-maskable interrupts.

Chapter 7—System Initialization: This chapter explains the principle of system initialization in real-address mode and in protected mode.

Chapter 8—Programming the 80286: This chapter introduces the various addressing modes used by the 80286 and summarizes the instruction set as well as the basic tools used in program development.

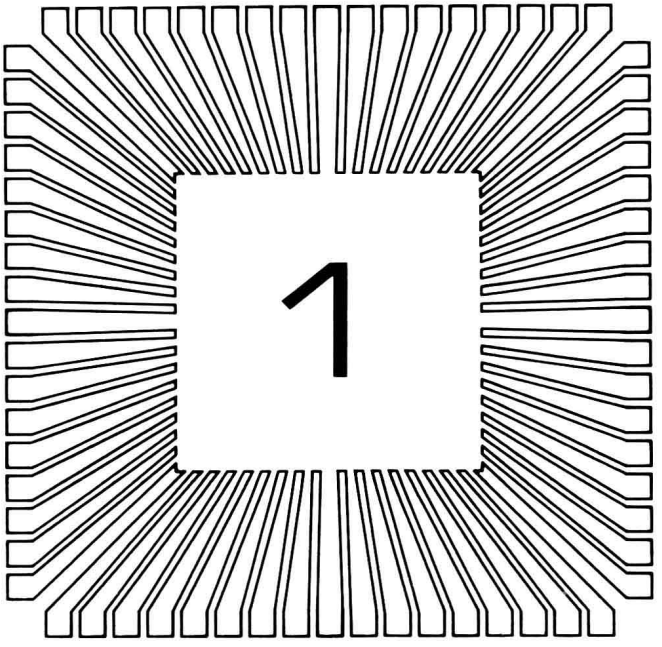
Chapter 9—The Instruction Set: This chapter presents the 80286 instruction set. The instructions are organized alphabetically according to their function.

Chapter 10—Sample Programs: This chapter contains program examples intended to illustrate the concepts presented in earlier chapters. Programs 1 to 11 are examples of using the 80286 instruction set. Program 12 is an example of CPU dialog with the 80287 numeric coprocessor. Program 14 implements the task switching mechanism. Program 15 demonstrates the role of the ENTER and LEAVE instructions.

Appendix A—The Build File Format: This appendix presents the syntax of the build files needed to run the program examples.

Appendix B—Exceptions in Protected Mode: This appendix summarizes the protected-mode exceptions to the CALL, INT, INTO, IRET, JMP, LDS, LES, MOV, POP, and RET instructions.

OVERVIEW OF THE 80286 MICROPROCESSOR



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