digital

pdp8/e & pdp8/m small computer handbook

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digital equipment corporation

USERS THUMB INDEX

FOREWORD

Minicomputers, from Digital Equipment Corporation, are changing your world—in banks and hospitals, supermarkets and factories. Everywhere people are realizing that computers don't have to be large and expensive to get the job done. A Computer is no longer a multi-million dollar giant that can only survive in spotlessly clean rooms. Minicomputers are going where the job is, because they are rugged, dependable, and inexpensive.

You should know about minicomputers. The PDP-8/E Story shows our computers at work; designing, producing and testing new computers, saving time and money. Other industries, such as oil refineries and automobile manufacturers, are also using the power and speed of computers to produce better products. Minicomputers are not just for big business; hospitals, schools, laboratories and factories are using minis just as effectively. New and old companies are exploring minicomputers.

How large a computer should you buy? Most enterprises begin small, After the computer requirements are completely defined, a decision is then made to either continue with the existing system or to expand. The basic PDP-8/E can be expanded without having to sacrifice your initial investment.

Right now, there are more than 16,000 minicomputers serving in almost every field of endeavor and embracing every discipline known to man. The PDP-8/E and PDP-8/M are DEC's newest models of the PDP-8 family. We invite you to explore the advantages of owning this small machine with big ideas.

INTRODUCTION

This handbook is another in a series intended to familiarize the user with the Digital Equipment Corporation (DEC) PDP-8 family of small general-purpose computers. It explains the newest member of the family, the PDP-8/E Programmed Data Processor and how it is interfaced with the wide variety of peripheral equipment available.

Major topics are: The Programmed Data Processor, PDP-8/E Options, Interface & Installation, Support Services, and Appendices.

Another member of this series of handbooks is titled: An Introduction to Programming. The programming handbook familiarizes the user with the principles of programming the PDP-8 family of general-purpose computers. Together this handbook and the programming handbook describe the complete hardware and software aspects of the PDP-8 family. A newly released handbook called Programming Languages has been added to the handbook series which contains information on the primary languages for the PDP-8 family such as FOCAL, BASIC, PAL III, MACRO, PAL D, SABR, and 4K FORTRAN.

How to Use This Book

This book is neither a text book on computers nor a novel. It contains a wealth of information divided into specific areas of interest. For instance, Chapter 1 defines the basic processor and Chapter 3 defines the basic instructions. These two chapters offer information that allow the reader to compare a PDP-8/E with other processors.

A very important area to the reader who is buying a PDP-8/E is the extent of available, useable programs. Chapter 4 describes many of our commonly used programs, ranging from loaders to complete operating systems. Many more programs are further defined in Appendix A. However, these programs represent only a small fraction of the more than 1000 operating programs available to the PDP-8/E user.

Chapter 2 provides operating instructions. Because the operation of the processor requires similiar steps, learning to operate the processor can be compared with learning to drive a car.

To add additional capability (such as peripherals) Chapter 7 defines the complete line of options. Thousands of these options are presently operating in customer facilities.

For the customer requiring a special application, Chapters 9 and 10 illustrate in detail how a customer can design an interface to allow the PDP-8/E or the PDP-8/M to control his particular application.

The PDP-8/E Computer requires operating and programming skills.

Chapter 12 explains our courses of instruction designed to qualify customers in the areas of operation, maintenance, and programming. Chapter 12 also defines other various types of services including maintenance, depot level repair, software support, application support, etc.

THE COMPANY

In a little over thirteen years, Digital has become a major force in the electronics industry. The company has grown from three employees and 8,500 square feet of production floor space in a converted woolen mill in Maynard, Massachusetts, to an international corporation employing more than 6,000 people with well over two million square feet of floor space in more than 60 manufacturing, sales, and service facilities around the world. In addition to the corporate headquarters in Maynard, Massachusetts, other manufacturing facilities are located in Westfield and Westminster, Massachusetts. Internationally and outside the continental United States, Digital has manufacturing plants in England, Canada and Puerto Rico.

From its beginnings as a manufacturer of digital modules, the company has now grown to the point where it is the world's largest manufacturing supplier of logic modules and the third largest computer-manufacturer, by number of installations, in the industry. Digital's rise as a leader in the electronics industry began in 1957 with the introduction of the company's line of electronic circuit modules. These solid-state modules were used to build and test other manufacturers' computers. Two years later, Digital introduced its first computer, the PDP-1. The PDP-1 heralded a new concept for the industry—the small, on-line computer. And the PDP-1 was inexpensive—it sold for $120,000 while competitive machines with similar capabilities were selling at over $1 million. But the PDP-1 was more than a data processor; more than just a tool to manipulate data. It was a system that could be connected to all types of instrumentation and equipment for on-line, real-time monitoring control, and analysis. It was a system with which people and machines could interact.

Also, in 1958, Digital introduced the Systems Modules, high-quality, low-cost, solid-state, digital logic circuits on a single printed circuit card.

Today, electronic modules like the ones Digital introduced are used in most electronic equipment, from computers to television sets.

In 1965, Digital announced the first of the FLIP CHIP® module lines. These highly reliable modules include cards for internal computer logic, interfacing, control and analog-to-digital conversion.

In 1963, Digital Equipment Corporation introduced the PDP-5 computer, predecessor of the PDP-8 series. This was followed by the first PDP-8/I, and PDP-8/L. Over this seven year period, considerable improvement has been made, many options have been developed, over 60 peripherals and a variety of programs developed. As each new application need arises, Digital Equipment engineering responds with new equipment; each time further increasing the capability of the PDP-8 Family and making available a wider range of equipment.

Throughout the life span of the PDP-8 Family, DEC has developed more than 1,000 programs for a wide variety of applications. New programs are constantly in development by Digital's Programming Department and the PDP-8 Users. This means that each PDP-8/E user will have a wide variety of programs immediately available to him.

To further enhance the user's capability, the DECUS library contains a wide variety of programs developed by the PDP-8 users. This library is operated by DEC exclusively for customer use. Programs are available for as little as $1.00 each.

The PDP-8/E is designed for the inexperienced as well as the most sophisticated user. Digital Equipment Corporation provides training as well as maintenance.

PDP-8/E FEATURES

Digital's all new PDP-8/E is the most powerful, most expandable and most versatile 12-bit computer available today. Its low price and high performance makes it the ideal system for a variety of uses, extending all the way from minimal control units to fully expanded general purpose systems. It is fast, compact and easy to interface.

PDP-8/E offers features such as a unique internal bus system called OMNIBUS™, which allows the user to plug memory and processor options into any available slot location: the availability of 256 words of Read-Only or Read/Write memory; a 1.2 microsecond memory cycle time; the use of TTL integrated circuitry with MSI technology; expansion to 32,768 12-bit words of core storage; low-cost mass storage expansion with DECdisk or DECtape; and a space and money saving packaging design.

PDP-8/E Features at a Glance:

- A unique internal bus design called OMNIBUS which eliminates the need for back panel wiring. Processor options can be inserted in any available slot.
- Increased speed-memory cycle time of 1.2 microseconds.
- A new packaging scheme which makes PDP-8/E physically smaller than its predecessor, the PDP-8/I. And, with no predetermined locations needed for options, there is no wasted space in the logic panel.
- A full line of over 60 options and peripherals immediately available.
- More than 1000 programs immediately available to the user.
- Availability of 256 word increments of Read-Only memory and/or Read/Write memory.
- A Standard General Purpose register in the basic machine which becomes the MQ register when the EAE option is implemented.
- Six additional Processor IOT instructions which make flag manipulation and interrogation faster and easier.

- A six bit byte swap instruction allowing faster and more convenient character handling.
- TTL integrated circuit modules utilizing MSI technology.
- Over 11,000 compatible PDP-8 Family computers in use for sharing programs through Digital's users group, DECUS.
- Low-cost core memory expansion to 32,768 words and low-cost mass storage expansion with DECdisk, DECtape and IBM-compatible magnetic tape.
- Hardware Bootstrap Loader option.
- Provision for multiple (up to 17 total) teletypes.
- Worldwide, dependable service.
- Program and maintenance training included.
- Fully parallel processor.
- Link feature to facilitate multiple precision arithmetic.
- Full range of turnkey and applications-oriented systems available.
- Over seven years of software development by Digital.
- Expanded hardware multiply/divide.
- Eight auto-index registers.
- **FO**rmula **CA**lculator **L**anguage (FOCAL)
- **DI**gital Equipment Corporation **B**usiness **O**riented **L**anguage (DIBOL)
- FORTRAN
- BASIC
- Assemblers
- Editors
- Debugging Aids
- Operating Systems