

DIGITAL EQUIPMENT CORPORATION

our credentials

The PDP-10 is the successful culmination of many years of computer design research — a process which has enabled Digital Equipment Corporation to provide better computers at the lowest possible prices.

Starting with the PDP-1 in 1959, DIGITAL has pioneered the development of real-time systems for science and industry. Since then, each new system has increased in versatility, yet has consistently decreased the cost of computation. The PDP-1 was the first powerful real-time computer for under \$150,000. The PDP-8 showed that an effective computer could sell for less than \$20,000, and newer models in the PDP-8 family have lowered the cost to less than \$10,000.

In developing its time-sharing capability, DIGITAL has built a history of success very similar to the company's record in real-time applications. DIGITAL's customers have been building time-sharing systems around PDP computers since 1960. And, in 1963, DIGITAL began development of its own time-sharing system, the PDP-6. In 1964, the PDP-6 became the first time-sharing computer to be delivered with manufacturer-supplied hardware and software.

The PDP-10 reflects DIGITAL experience in both real-time and time-sharing. The system performs time-sharing and real-time operations equally well and simultaneously, and provides concurrent batch processing. Its performance in all three areas makes the PDP-10 the most cost effective system available today.

CONTENTS

MEETING YOUR NEEDS	
The functions, benefits, and services of the	
PDP-10	3
SOME OF OUR ACCOMPLISHMENTS	
Current PDP-10 applications	7
GETTING DOWN TO SPECIFICS	
Features which make the PDP-10 a better	
computer	11
A CHOICE OF SYSTEMS	
PDP-10 Configurations	16
SOFTWARE TO MATCH YOUR NEEDS	
Descriptions of PDP-10 software	21
A SELECTION OF HARDWARE	
Summary of hardware specifications	25
IN SUMMARY	
A final note	28

meeting your needs

The PDP-10 is a versatile computer system designed to perform conversational time-sharing, batch processing, and real-time operations equally well and simultaneously. A PDP-10 system can perform any or all of these tasks, responding to individual user requirements.

In conversational time-sharing, up to 63 users at local or remote locations can simultaneously share a broad range of system capabilities. Using a choice of several languages, a user can develop a program on his remote console and receive answers to mathematical or engineering problems in seconds.

For programs that don't require immediate processing, a user may initiate batch processing, and let the system software control a queue of card or tape jobs. With the PDP-10, batch processing proceeds concurrently with time-sharing and real-time tasks.

Real-time operations such as data acquisition and control may be the primary purpose of a PDP-10. Realtime system software and hardware assure the real-time user of attention when he needs it, and allow conversational time-sharing as well.

TIME-SHARING

A time-sharing system must have a monitor to allocate system resources such as core memory, peripherals, and central processing time, and to perform input/output functions. The PDP-10 time-sharing monitors provide practically instantaneous response for up to 63 simultaneous users, making each feel that he alone is receiving service.

The user must be able to write, edit, and debug programs in convenient languages. The PDP-10 offers FORTRAN IV, MACRO-10, COBOL, BASIC, AID, EDITOR, TECO, DDT, BATCH, PIP, and many other utility and library programs. Any mixture of these languages and programs may be used concurrently under the supervision of the monitor. And most of the software is re-entrant — that is, shared by the users for better efficiency.

Each user must have adequate storage and protection for his programs and data. The PDP-10 offers a wide variety of on-line bulk storage media, including a range of disks and magnetic tape transports. The monitor system guarantees that users' programs and data receive both hardware and software protection to insure privacy and prevent accidental program erasures.

BATCH PROCESSING

A good batch processing computer should be able to run strings of programs in a mixture of languages. The PDP-10 can handle any stream of programs — a mixture of FORTRAN, MACRO-10, and COBOL for example, and perform continuous batch processing.

Batch processing should be flexible. Normally batch processing operates without operator attention. However, the PDP-10, unlike other systems, allows the operator to start or stop the batch system, re-arrange the queue or call for a print-out to analyze program errors.

Batch processing should not be restricted to any set of input or output devices. With the PDP-10, the operator can select and assign the desired input, output, and temporary storage devices to be used in batch processing.

Batch processing should not interrupt the tasks of other system users. The PDP-10 batch processor may run concurrently with real-time and time-sharing operations.

REAL-TIME OPERATIONS

Real-time operations must be handled fast and efficiently. PDP-10 system software provides response in microseconds to real-time requests, and processes information at speeds sufficient to meet the most demanding requirements.

A good real-time system should be able to handle more than one job. The PDP-10 monitor can efficently control many real-time jobs. The hardware priority interrupt system assures the real-time tasks of prompt service; yet, for flexibility, priorities can be changed through software.

PDP-10 hardware and software protect the real-time programs and data from being destroyed accidentally. In addition, the system makes it possible to create and debug programs on-line while real-time tasks are being performed.

Ease of interfacing with real-time equipment was a major design criteria of the PDP-10. System options include digital-to-analog and analog-to-digital converters, discrete input/output devices, and high resolution real-time clocks. Special input or output subsystems can be designed to match user requirements.

DESIGNED FOR SAVINGS

Modular design and exceptional computing power combine to make the PDP-10 the most cost effective system on the market today. In fact, the PDP-10 is as powerful as computers that cost twice as much.

With modular hardware, the buyer purchases the system that he currently needs, yet he can readily expand at any time. Proven modular software keeps software development to a minimum. Economical on-line storage further reduces the cost of expansion.

The hardware and software design features of the PDP-10 provide exceptional computing power, as demonstrated by benchmarks run for many prospective customers. And every PDP-10 is backed by an extensive warranty covering all parts and labor.

Overall, the cost effectiveness of the PDP-10 reduces the buyer's initial investment and helps to reduce his operating and expansion costs.

ROOM TO GROW

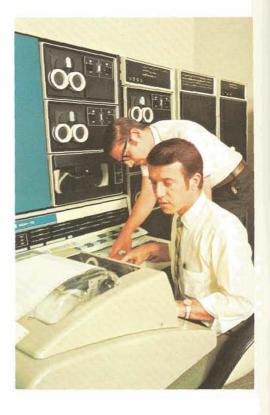
The modularity of PDP-10 hardware and software permits easy and economical system expansion.

With three levels of compatible monitors, systems can be tailored in the field to meet individual requirements. Thus a single-user system can become a small time-sharing system and a small time-sharing system can expand to service 63 users.

The input/output system can accommodate up to 128 discrete devices and device controllers, permitting almost limitless expansion of on-line storage and other input/output equipment.

In bulk storage, for instance, one controller can handle up to four fixed head disks; disk pack systems can expand to eight drives; and a disk file can grow from 20 million to 100 million words. Magnetic tape controllers can accommodate up to eight tape drives.

Additional core memory — up to 262,144 words — and additional processors make the PDP-10 a truly large-scale system.



HELP WHEN IT COUNTS

The complete spectrum of PDP-10 support — software, service, and training — are indicative of DIGITAL's customer awareness.

Excellent hardware and software aren't enough. The system must be installed properly. The customer must be trained in its use. Software must be explained and thoroughly documented. Finally, if hardware or software difficulties occur, they must be handled by fast, efficient service organizations.

SOFTWARE SUPPORT

PDP-10 software support begins long before the computer is installed. A software specialist, armed with a knowledge of the customer's needs, instructs programmers in the special uses of the computer. He helps them apply the software and gives over-the-shoulder assistance as the customer designs and implements his special programs.

The software specialist also introduces the programmers to the available manuals and other software services. For instance, he'll suggest that the customer join DECUS — the Digital Equipment Computer Users Society — to share software of other DIGITAL customers. DECUS is the world's second largest computer users' organization.

He'll also make the customer aware of the Program Library and the frequent Software Newsletters that he'll receive. And he'll introduce him to SIS — Software Information Services — the department at DIGITAL which maintains a telephone answering service for customer inquiries and problems.

After installation and hardware debugging of the PDP-10, the software specialist runs acceptance tests to prove that the computer operates as a system. He demonstrates the use of all equipment and all of the standard PDP-10 software.

Software support doesn't stop once the system has passed acceptance. The software specialist makes frequent visits to deliver and install new software, advise the customer in making software modifications, or help him with special requirements. And he is always available via the telephone, or in person, when questions need to be answered.

SERVICE

The Digital Equipment Corporation service organization backs every PDP-10 sold. The organization is constantly growing with over 60 service centers throughout the world, and over 500 trained service engineers. It maintains every PDP-10 during its warranty period and is ready to provide maintenance services tailored to each customer's needs.

A wide range of services is available to the PDP-10 customer. Routine and remedial maintenance are available via resident engineers, single or multi-shift maintenance contracts, or on a per call basis.

In addition to its local service centers, DIGITAL also maintains regional PDP-10 support teams that are ready to answer specific questions.

Service contracts can be written to conform to the customer's work week, number of hours of operation, and type of coverage desired. Each contract includes all parts and labor for routine and remedial maintenance. Customers contracting for resident engineers also receive the bonus of the specialist's broad experience and can seek his advice on operation and best utilization of the equipment.

Every DIGITAL service specialist spends 75 percent of his first year in training and returns to the main plant each year for refresher courses and retraining. Senior field service engineers — about half the total force — have an average of more than six years of computer experience and a total of nine years in the electronics field.

TRAINING COURSES

As an important part of the support program, Digital Equipment Corporation offers training courses for customer maintenance and programming personnel. More than 30 full-time instructors at the training centers teach over 300 courses and instruct nearly 4000 students per year.

Each PDP-10 customer is entitled to send one man to a formal 5-week introduction course for maintenance and two men to four weeks of software training, at no charge. Additional personnel may attend at nominal rates.

The maintenance course covers the central processor, DECtape and basic input/output operation.

Software training is comprised of two weeks on the general programming tools and two weeks emphasis on monitor systems. Machine time is provided so that the student can become proficient with system software and utility programs.



PDP-10's are serving business, industry, and science in a multitude of installations throughout the world. They keep track of bubble chamber events in physics laboratories, analyze blood chromosomes, work in banks, teach in high schools and universities, and perform a myriad of other tasks. New applications are constantly appearing and current applications steadily grow. Customers find new approaches, add new equipment, develop more software. Systems designed solely for real-time tasks often expand to include program development or business data processing. The applications described here demonstrate the PDP-10's inherent flexibility.

some of our accomplishments

TIME-SHARING UTILITIES

Power, versatility, and low cost have made the PDP-10 a prime choice of the new commercial time-sharing utilities. For the customers served by these utilities, the PDP-10 performs scientific data analysis, helps make better management decisions, aids in engineering and architectural design, demonstrates computer applications to high school classes, makes investment analyses, and provides management information services.

Major PDP-10 time-sharing utilities are located throughout the U.S. and Canada, and installations are planned for Europe in 1969. General-purpose time-sharing, batch processing, and specialized services are being offered by these PDP-10 customers.

UNIVERSITY COMPUTING

University computer centers use the PDP-10 to solve student and faculty computing problems, develop new programs, process administrative data, and to provide computer-aided instruction.

One Canadian university uses the PDP-10 in research and instruction, sharing it among the sciences, business administration, and engineering departments. Several Australian universities provide campus-wide services via the PDP-10. A West Coast university is developing computer-aided instruction programs on the PDP-10. And many U.S. and European universities are turning to the PDP-10 for their "next generation" computer.

Computer science departments are using PDP-10's to study the uses of computers themselves. One Eastern institution employs the PDP-10 as part of a dual processor system which studies the computer-directed operation of a mechanical hand. Hand motions are observed by an electric eye which provides feedback of pertinent information. A leading Western university incorporates the PDP-10 in its study of graphic systems, while another examines new frontiers in artificial intelligence. At a Mid-Western university, the PDP-10 is central to the study of computer-aided design of computers.



IN-HOUSE TIME-SHARING

Some PDP-10 utility users find that their need for computing time has grown enough to justify buying their own PDP-10. Large industrial firms use the PDP-10 in addition to existing business computer systems. Smaller progressive firms are considering replacement of their entire computer facility with the PDP-10 to provide time-sharing terminals plus batch processing for business applications.

A large New York bank uses the PDP-10 for such applications as developing bond coupon schedules, customizing loan agreements, conducting regression and correlation analysis studies, analyzing investment opportunities, and providing financial advice. A major electronics manufacturer has replaced all of his time-sharing services with a PDP-10. And several European industrial firms have just completed installation of their PDP-10 time-sharing systems.

HYBRID SIMULATION

In hybrid systems, the PDP-10 is combined with analog equipment to simulate the operation and/or control of complex systems. The PDP-10 interfaces easily with analog computers of all the major manufacturers.

Already in operation are both single-user systems and time-sharing systems which operate several hybrid experiments simultaneously. Many installations combine conversational time-sharing with the experiments.

At an aeronautics firm, the PDP-10 is used to simulate the dynamic behavior of helicopters. Another aircraft manufacturer simulates jet engine design. A consulting firm performs research on speech forms. Simulation of chemical processes, biological systems, and rocket re-entry problems are other possible applications for the PDP-10.

CHEMICAL LABORATORIES

In chemical laboratories, the PDP-10 collects data from analytical equipment, makes component identifications and analyses, and builds chemical models.

At a German chemical institute, the PDP-10 collects and reduces data from on-line analytical equipment including gas chromatographs, mass spectrometers, spectrophotometers, and diffractometers. The laboratory simultaneously develops programs for substance identification, model building, and spectral analysis.

PDP-10 analytical chemical systems may be used in both research and production environments.

BIOMEDICINE

The PDP-10 is becoming increasingly important in biomedical research for mathematical modeling and pattern recognition. In applied medicine, it has found uses in clinical chemistry, multiphasic screening centers, hospital information systems, and intensive care units.

One biomedical research facility uses the PDP-10 for research in artificial intelligence, developing models for biological and biomedical applications, as well as for conversational time-sharing of other activities.

A school of public health is using the PDP-10 to investigate the genetic information carried by blood chromosomes.

The PDP-10 can also coordinate other DIGITAL computers for patient interviewing, clinical chemistry, pulmonary research, cytology, nuclear medicine, intensive care monitoring, neurology, radiation treatment planning, and ECG analysis.

PHYSICS RESEARCH

High energy and nuclear physics laboratories use the PDP-10 for both on-line and off-line analysis of real-time applications.

U.S. and European universities use the PDP-10 to digitize and evaluate bubble chamber film. A Canadian nuclear laboratory and U.S. and German universities perform on-line collection, analysis, and display of data from low energy accelerators. Collection and analysis of hodoscope data is performed by multiprocessor system in a national laboratory. Another German university employs a multiprocessor system to acquire and reduce synchrotron data. In all branches of physics research, only the PDP-10 provides fast response for on-line data collection, plus sufficient memory and computing power.

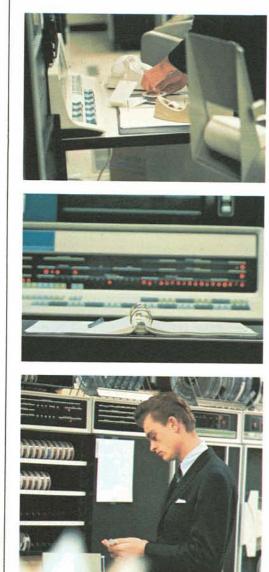
INDUSTRY

The PDP-10 is used in industry for data acquisition and analysis, and for various types of process and production control.

At a midwestern brass plant, a time-shared PDP-10 maintains inventory records, performs production scheduling, demand forecasting, order shipment; provides management reports, and performs miscellaneous management and engineering calculations. And PDP-10's can be used for aircraft testing, automobile production control, chemical plant operation, and steel plant control.



getting down to specifics









Many unique hardware and software features combine to make the PDP-10 a better computer. Some contribute to system flexibility. Others make it possible to run multiple programs and for several users to share the same program. Still others help to cut processing time. The end result is a system with exceptional computing power and flexibility. The most important of these features are described in this section.

□ Three levels of monitors to match user needs. □ Re-entrant (sharable) programs to make efficient use of core space. □ Multi-programming hardware to protect users' programs. □ 36-bit word length for arithmetic precision. □ 366-instruction repertoire for increased programming efficiency and power. □ 16 general purpose registers for faster processing. □ Asynchronous memory system with multiple data paths for optimum throughput and fast transfer of data. □ Memory expansion to 262,144 directly addressable words for large scale problem solving. □ Hardware priority interrupt system that can be programmed for flexibility.

getting down to specifics

MONITOR SYSTEMS

The three monitor systems for the PDP-10 serve separate user requirements.

The single user monitor is designed for systems which operate only one program at a time.

The multi-programming monitor lets several users share the resources of the PDP-10, allocating core space and time to each user. The monitor switches control between the multiple programs in core memory at microsecond speeds, assuring fast response.

The swapping monitor increases the capacity of the multi-programming system by moving programs between high speed disk or drum storage and core memory. Swapping greatly increases the number of programs which can be executed concurrently for a given amount of core memory.

All language processors (FORTRAN, MACRO, COBOL, BASIC, and AID) operate identically under the multi-programming and swapping monitor systems. The monitors also protect users' programs on all forms of bulk storage. For systems using disk storage, an easy-to-learn set of commands, the Concise Command Language, simplifies communication between the user and his job.

RE-ENTRANT SOFTWARE

To make efficient use of memory, language processors and important utility programs were designed to be re-entrant. Only one copy of the re-entrant program need be in core to handle any number of users simultaneously. Re-entrant programming significantly reduces the amount of core memory required in multi-user operation.

Re-entrant programs for the PDP-10 include FORTRAN, MACRO, COBOL, BASIC, AID, and TECO.

MULTI-PROGRAMMING HARDWARE

Multi-programming hardware allows multiple programs to reside in core simultaneously. Switching between programs is thus easier and faster and response time is improved.

The multi-programming hardware protects the monitor and all other core resident programs by shielding them from the active program. Two sets of protection and relocation registers permit a user program to exist in two non-contiguous blocks of memory.

Multi-programming hardware is used by both the multi-programming and the swapping monitors.

36-BIT WORD LENGTH

The 36-bit word stores 25 to 30 percent more information than the 24- and 32-bit systems. For example, the 36-bit word stores five 7-bit USASCII characters, whereas the small word length computers store only three or four characters.

Computational accuracy is higher than that of computers with shorter word size. The PDP-10 has two more decimal digits of accuracy in single precision floating arithmetic than computers with 32-bit word size.

INSTRUCTION REPERTOIRE

The 366 instruction repertoire of the PDP-10 simplifies assembly coding and can reduce the size of higher level programs by 30 to 50 percent.

The instruction set — the largest available on any computer in its class — divides logically into families and is easily learned. It also includes an extensive set of floating point and byte manipulation instructions. With an efficient instruction set, fewer instructions are required to perform a given function. Assembly language programs are therefore shorter than with other computers.

The instruction set also simplifies monitor systems, language processors, and utility programs. For example, compiled programs are 30 to 50 percent shorter, require less memory, and execute faster than those of comparable computers.

GENERAL PURPOSE REGISTERS

Sixteen high-speed integrated circuit registers improve program execution. Depending on program requirements, these registers can serve as accumulators, normal memory locations, and/or index registers.

Intermediate results of computations are stored in the registers rather than in core memory; thus, no instructions are needed to store and retrieve the data. With the registers, data is available within nanoseconds.

Fifteen of the registers can be used for indexing. All sixteen registers can be used as fast memory locations so that program segments with sixteen or fewer instructions can be executed repetitively at very high rates.

MEMORY SYSTEM

The speed and configuration of the PDP-10 memory system greatly enhance its computing power. Memory banks are asynchronous and operate in parallel.

Asynchronous operation permits modules of various speeds to be used in the same system without timing problems. Faster operation is also possible, since the system need not wait for cycle completion.

A memory bus system allows transmission of full 36-bit words at speeds of over one million words per second. Memory modules operate in parallel. Thus arithmetic processors and high speed data channels can access memory simultaneously, each using its own memory bus which is separately connected to each memory module. Parallel operation improves processor utilization, yielding manyfold improvements over systems which have a single route to memory.

MEMORY EXPANSION

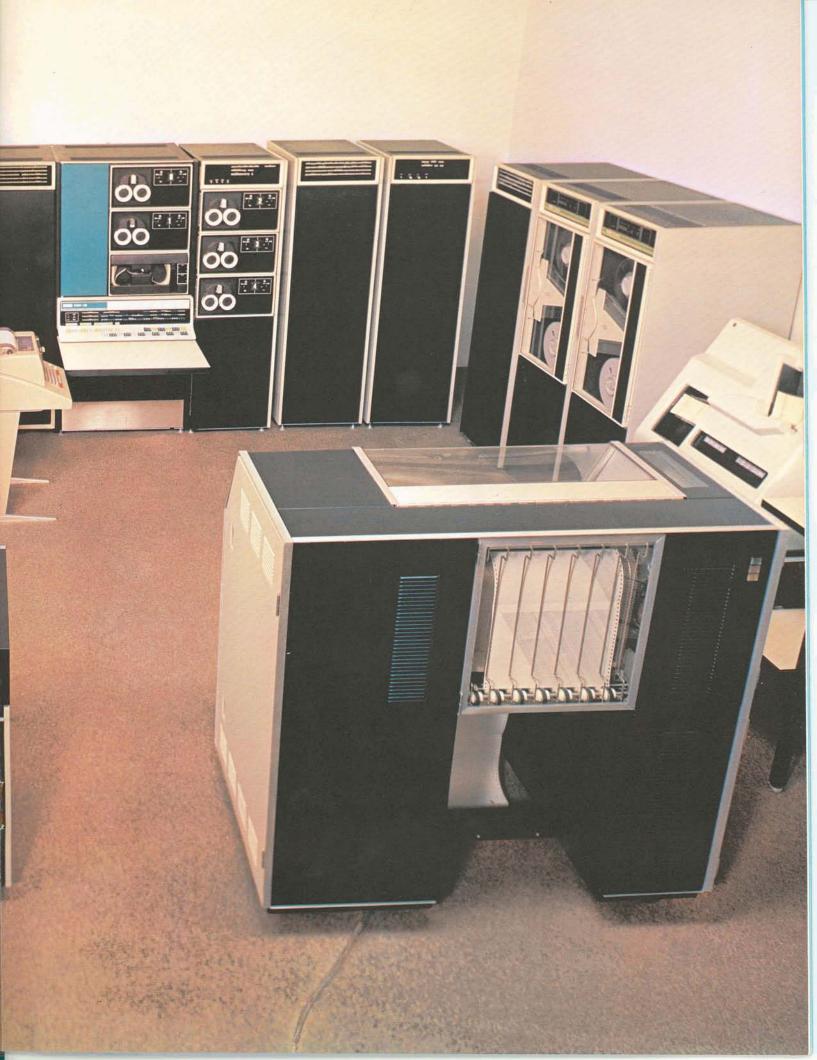
PDP-10 memory can be modularly expanded to 262,144 words of core, all of which (including the 16 accumulators and 15 index registers) can be directly addressed. Total memory capacity can be comprised of combinations of modules in 8,192-, 16,384-, 32,768-, 65,536-, and 131,072-word blocks.

PRIORITY INTERRUPT SYSTEM

Both real-time and time-sharing systems must provide immediate response to external requests for service. Otherwise, real-time data may be lost, or a time-sharing user will wait an unreasonable length of time to receive his answers.

To provide immediate service, the PDP-10 has a multi-level priority interrupt system that is capable of response in microseconds. The system is a hardware feature that is programmable for increased flexibility. Interrupt levels may be changed in priority, and the entire interrupt system or any level may be selectively turned on or off through the software.



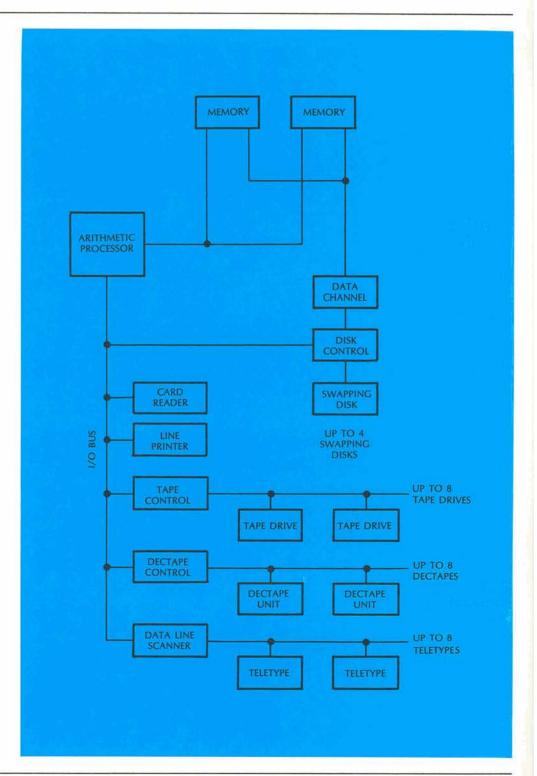


a choice of systems

The PDP-10 is flexible, making it possible to configure a wide variety of systems. All configurations, from the small single-user system to the large swapping system, use the same arithmetic processor. However, within any basic configuration, the user can specify memory size, input/output equipment, and storage facilities, and can readily expand as conditions change. The systems shown typify four configurations which serve business, industry, and science in many diverse applications.

8-USER SWAPPING SYSTEM

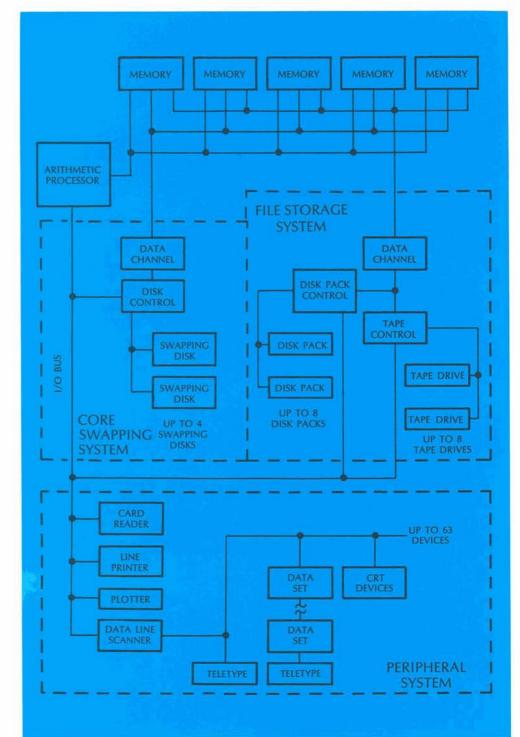
The eight-user swapping system is designed to support small universities and industrial firms requiring in-house time-sharing facilities. It can be easily expanded, in eight-user groups, to the large swapping system shown.



LARGE SWAPPING SYSTEM

The large time-sharing system can support up to 63 users. It includes file storage units as well as swapping storage units, additional memory, and more peripheral equipment.

For very large systems, the file storage disk may replace or supplement the disk packs. A computer-based communication system may be substituted for the data line scanner. Synchronous data phone units are also available to connect the system to remote batch devices and other computers.

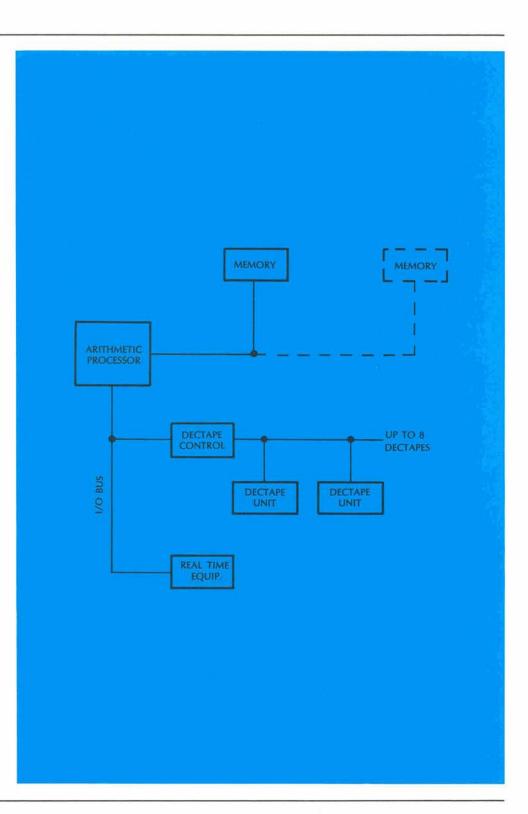


a choice of systems

SINGLE-USER SYSTEM

The single-user system can be as simple or as elaborate as the user requires. The system shown consists of an arithmetic processor, one or more core memory units, a DECtape control and DECtape units, a console Teletype, and a paper tape reader and punch. This system is connected to real-time equipment.

By adding more core memory and a data line scanner, the single-user system may be easily converted to a multi-programming system.

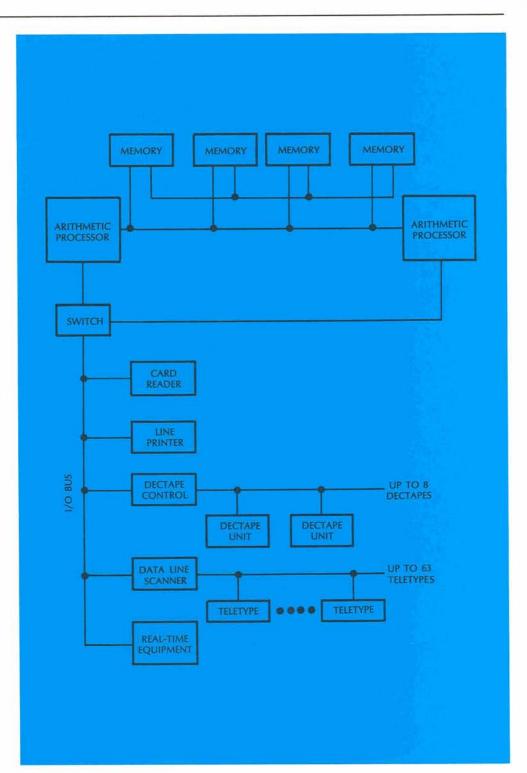


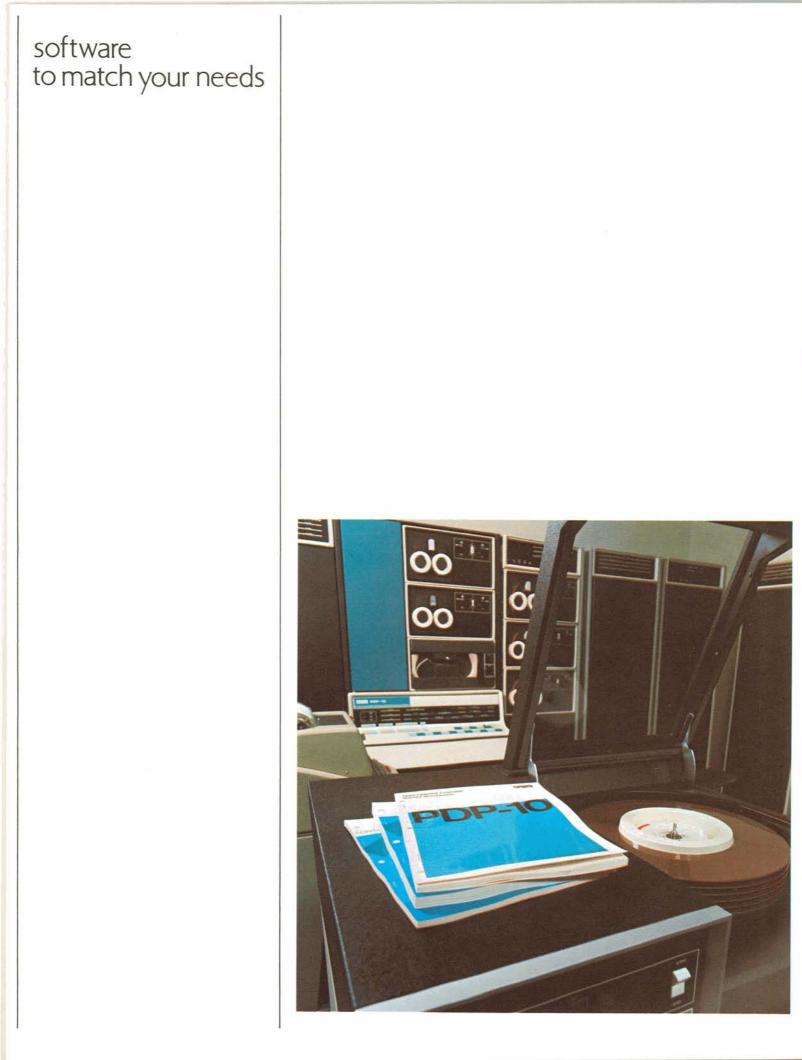
MULTI-PROCESSOR SYSTEMS

The user may expand PDP-10 monitor systems to fit many multi-processor configurations, as already demonstrated by several PDP-10 customers. DIGITAL expects to announce multi-processor monitor systems in 1970.

The systems can take many forms. The processors may work independently or communicate through shared memory. One may serve as the input/output processor while the other performs most of the calculation. Or the processors can share all input/output and processing in a system configured for maximum redundancy and failsoft capability. Multi-processor systems can also combine a PDP-10 arithmetic processor with other DIGITAL computers.

The dual processor system shown shares both peripherals and core memory. Since both processors can access memory at the same time, they can compute in parallel. This system doubles the computing power of a single processor system. Cost effectiveness is more than doubled, since the additional processor is only a small fraction of overall system cost.





Aside from a monitor and the utility programs, each customer's software requirements are as individual as his application. The PDP-10 provides a wide choice of software languages—FORTRAN IV, MACRO-10, COBOL, BASIC, and AID. All these programs are re-entrant, so they can be shared. The list also includes a batch processor, editors, a debugging program, time-sharing accounting programs, and many other utility and diagnostic programs.

software to match your needs

LANGUAGE PROCESSORS

FORTRAN IV

The FORTRAN IV compiler produces highly efficient object code, resulting in programs that are 30 to 50 percent shorter than those of most other FORTRAN compilers. The compiler is also re-entrant so that it can be employed simultaneously by many time-sharing users.

FORTRAN IV exceeds current ASA requirements by providing many additional features. Included are mixed mode expressions, unlimited subscript dimensions, zero or negative DO loop parameters, and literal text and constants.

The FORTRAN IV Operating System operates under control of all PDP-10 monitor systems and controls input/output, format interpretation, and numerical conversion. The system is device independent, allowing the user to specify line printers, punches, etc., at run time. The operating system is highly modular so that only those subroutines that are required are loaded into core.

The PDP-10 FORTRAN IV library contains 110 functions, including all scientific functions specified by ASA standards.

MACRO-10

MACRO-10 is a powerful two-pass assembler which provides direct access to the powerful PDP-10 instruction set. It is completely device independent, allowing the user to specify input and output devices at run time. MACRO-10 contains complete macro facilities, conditional assembly features, concatenation of completely general argument strings, indefinite repeat operations, and unlimited nesting of macros.

COBOL

A COBOL compiler, currently under development, will exceed the latest ASA level 2 specifications. In addition, the compiler contains features to improve its usefulness for time sharing. For instance, user-developed programs are re-entrant. Also the time-shared terminal may be used during compilation to enter programs and control information or to obtain instructions from the compiler or monitor. The terminal may also be used as an input/output device for the remote storage and retrieval of data.

The COBOL compiler requires a system with disk file storage and at least 32,768 words of core memory.

CONVERSATIONAL LANGUAGES

AID

AID provides a simple language for solving engineering and scientific problems. Based on the famous JOSS* language, AID allows the user to state his problem in terms of formulae and receive results in symbolic form.

AID provides facilities for editing, program storage and recall on disk, and the ability to create new programs by combining existing program segments. *JOSS is the trademark of the Rand Corporation

BASIC

Advanced BASIC* is an easy-to-learn, conversational problem-solving language for scientific, business, and educational applications. BASIC produces machine language directly and runs at high speed in minimal core.

BASIC has internal editing and debugging capabilities, provides 13 commands for easy matrix computation, and handles single alphabetic/alphanumeric strings as well as purely numeric ones. The user can also store and access information on all types of mass storage devices and request Teletype output in desired formats. *BASIC is the trademark of Dartmouth College

BATCH PROCESSING

BATCH

BATCH is a program which, under control of the monitor, supervises the sequential execution of a group of programs. Any program that can be developed on a console can be run under the batch processing system. The programs usually run without operator attention. However, at any time, the operator can arrange to interrupt, skip, repeat or prematurely terminate one of the jobs. In time sharing, BATCH shares processor time and system facilities with other users. And many users can each use BATCH concurrently.

DIAGNOSTIC PROGRAMS

System operation is checked by a comprehensive set of diagnostic routines supplied with each PDP-10 system. In many cases, the diagnostic software is capable of determining the cause of a machine failure, and pin-pointing the exact module. Many of the diagnostic programs operate under control of the time-sharing monitors and may be run without system downtime.

UTILITY PROGRAMS

TECO

TECO is an extremely powerful and concise text editing language with more than 30 commands for inserting, deleting, appending, searching, and displaying text. Editing is performed on a character, line, or variable-character string basis. In addition to conventional editing operations, it also provides iterative string search, match, and substitution operations.

EDITOR

EDITOR is an easy-to-use line editor that produces or modifies MACRO, FORTRAN, or other source files from a Teletype. Versions of EDITOR are available for use with either DECtape or disk storage.

DDT-10

This widely copied DIGITAL program applies more than 50 commands to the conversational on-line debugging of any user MACRO-10, FORTRAN IV, or COBOL program. The user can stop the program at dynamically chosen break-points and examine and modify data and instructions in terms of his own symbols and/or FORTRAN statement numbers. DDT is also used to search a program for a particular instruction, data, or effective address.

LOADER

LOADER assigns consecutive core space and loads independently assembled or compiled programs prior to execution. Core occupied by the LOADER program is recoverable after loading. Special options include chaining facilities, storage map listing, and automatic library searching.

PIP

PIP transfers files between standard input/output devices, eliminating the need for a satellite computer. PIP also can perform merging, editing, sequencing, and syntax checking.

TIME-SHARING ACCOUNTING PROGRAMS

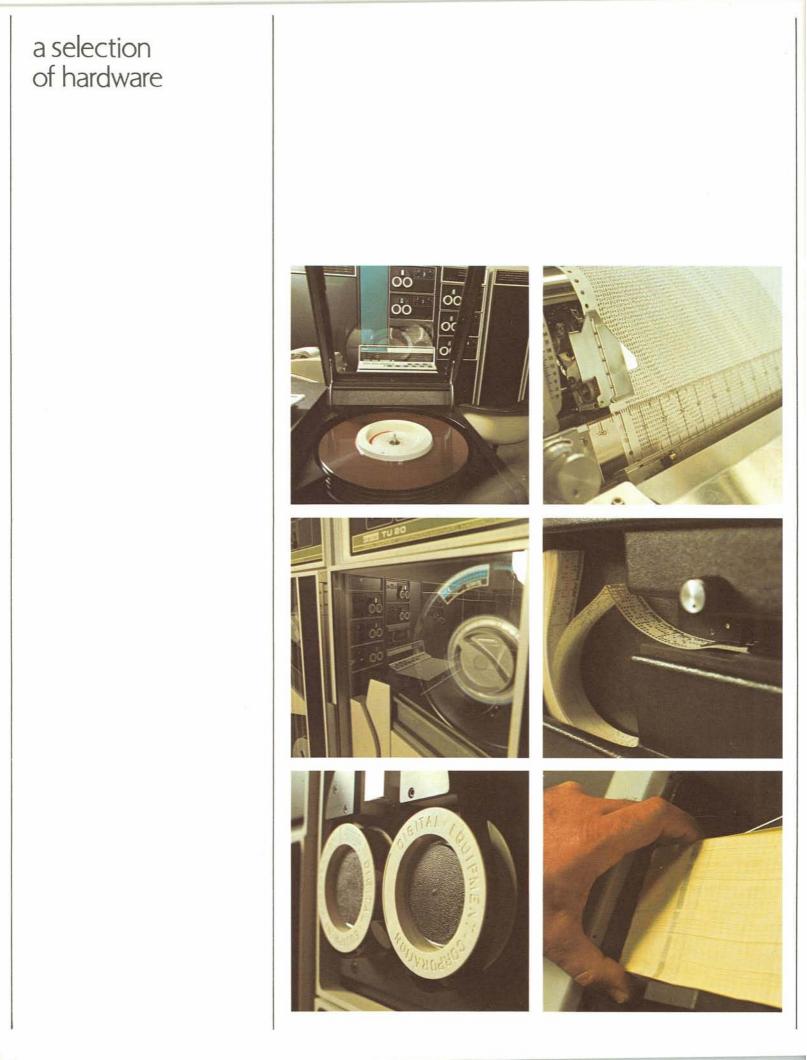
Accounting information for the time-sharing swapping system is gathered and organized by a series of accounting programs.

One program checks to see that users are properly authorized and determines whether they are restricted to a certain time period or physical location. Another program records processor time for each user, the integral of processor time and core size, connect time, and user identity.

Other programs periodically gather usage data for cross-checking, analyze the data to provide information for billing purposes, and enable the operator to add users, change pass words and perform other related functions.

OTHER UTILITY PROGRAMS

Other utility programs for the PDP-10 include a monitor system builder, a file updating system, and programs for crossreference listing, code translation, and source and binary comparisons. Additional programs allow the user to obtain a summary of file system status, receive an on-demand summary of system status on his Teletype, and save or retrieve selected disk files on a backup magnetic tape.



A PDP-10 system consists of one or more arithmetic processors, core memories, on-line storage, communications equipment, and input/output devices. DIGITAL provides optional equipment, to satisfy practically any hardware requirement. Each piece of equipment is designed to perform specific tasks, taking full advantage of PDP-10 capabilities. At the same time, the options complement the PDP-10 in both quality and appearance.

a selection of hardware

ARITHMETIC PROCESSOR	366 Instructions 16 General Purpose Registers Multi-programming Hardware Priority Interrupt System Console Teletype Paper Tape Reader and Punch Operator Console
MEMORY	Parity Checking 36-bit Word 1.0 μsec Memory Bulk Core Up to 262,144 Directly Addressable Words
DISK SYSTEMS	High-Speed Swapping Disks (to 2,000,000 Words) Disk Packs (to 40,000,000 Words) High-Capacity Storage Disk (to 100,000,000 Words)
MAGNETIC TAPE UNITS	Seven and Nine Channels 45 and 75 Inches per Second 200, 556, 800 Bits per Inch Industry Compatible
DECTAPE SYSTEMS	Compact 4-inch Diameter Reels Fixed Address Recording

DECTAPE SYSTEMS

73,984 Words per Reel File-Oriented with Directories

LINE PRINTERS	64 Character, 300 and 1000 lines/minute 96 Character, 600 lines/minute 128 Character, 500 lines/minute
CARD READER/PUNCH	1000 cpm Reader (833 cpm for 50 Hertz) 200-365 cpm Punch
COMMUNICATIONS EQUIPMENT	Data Line Scanner Computer-Based Communication System Local Terminals (Teletypes and Display) Data Phones Telegraph Lines Automatic Data Set Control Automatic Dialing Capability
CRT DISPLAY SYSTEMS	Alphanumeric Keyboard Terminal Point Plotting Display Vector Display Fully Buffered Graphic Display Satellite Computer Display Systems
PLOTTERS	Width — 12 or 18 Inch Step Size — .01 or .005 Inches .1 or .05 Millimeters
REAL-TIME INTERFACE EQUIPMENT	A/D and D/A Converters Digital Input and Output Subsystems

Special Systems

in summary

PDP-10 success is built on flexibility, performance, and economy-factors which allow it to serve many applications equally well.

The PDP-10 performs time sharing, batch processing, and real-time operations, concurrently and efficiently. Modular hardware and a comprehensive range of proven software make it possible to implement these functions for a wide variety of uses.

The performance of the PDP-10 is the result of many practical design features, including the 366instruction repertoire, re-entrant software, multi-programming hardware, and a flexible priority interrupt system. And this performance is available at a cost of less than one-half that of comparable systems.

As investigations prove, considering all factors — price, performance, features — the PDP-10 is today's best buy for any large computing requirement.

digital is worldwide



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