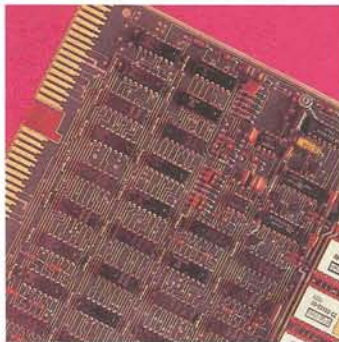# digital
PDP-11   Variations on a Theme

PDP-11: Compatibility Plus Performance

This uniquely successful computer family is based around a compatible set of processors—ranging from single-board microcomputers to full multipurpose computer systems. All of these processors are built upon a common architecture that uses a similar instruction set and input/output system.

This common architecture means you can expand a PDP-11 system when your workload grows, since nearly all of our peripherals and software will work with any PDP-11 processor. It also means you can have a mix of PDP-11 systems doing different things and they will be able to communicate among themselves. A single development and documentation effort will support them all. But most of all, this commonality means you can start today with the PDP-11 system you want, knowing it can grow with you in any direction to meet tomorrow's needs.

A key factor in the PDP-11 family's success is that all system elements—processor, memory, peripherals—plug into a UNIBUS®, a single, high-speed, data path.

The UNIBUS prevents any PDP-11 system from becoming obsolete. Its asynchronous design allows the processor, memory and peripherals to operate at their own speeds. Thus, larger or faster peripherals or memory can replace older versions without affecting the system. And since there is a compatible UNIBUS on all but the smallest PDP-11 system, you can freely exchange peripheral devices from system to system.

The UNIBUS has performance advantages as well. It gives fast devices direct memory access without the need for multiplexers or synchronizing hardware. Memory and peripherals can send, receive, or exchange data without processor intervention and without intermediate buffering in memory. Thus, an I/O device can be communicating with memory at the same time the processor is performing computations.

Direct communication over the UNIBUS means the PDP-11 does not require separate I/O instructions. The same instruction that performs a register-to-register transfer within the central processor can perform a memory to I/O device transfer, an I/O device to memory transfer, or a transfer between two I/O devices.

Software Compatibility

Since all PDP-11 processors use the same basic instruction set, programs developed on one PDP-11 are immediately usable on larger models and, by using the proper coding conventions, on smaller models as well. Common software means no conversion problems when you move to a larger PDP-11 system. Programs developed on one PDP-11 will run on other systems under the same operating software, regardless of the specific processor.

Programming Flexibility

The comprehensive PDP-11 instruction set and addressing modes yield over 400 commands, providing the programming flexibility of a large computer in a 16-bit mainframe. The set offers a wide choice of commands, so that a single instruction frequently suffices where several would be required

Digital's leadership of the minicomputer revolution remains unchallenged. Not only has the PDP-11 family redirected the path of computer technology, it has become the world's most popular minicomputer series in doing so.

Behind this success are 20 years of technological accomplishment. Digital's small computers moved computing power beyond the data processing centers of large organizations for the first time. Today our PDP-11s stand at the forefront of the shift to distributed processing.

Digital's PDP-11s hold a unique position not only because they are economical and efficient, but because they have the hardware, software, and supporting services to do what computer users want to do today.

Nothing illustrates this better than Digital's commitment to data communications. First we engineer all of our computer systems with data communications in mind. Then we complete the circle with a full range of communications-oriented hardware and software.

DECnet, for example, is the set of software tools that lets our PDP-11s, PDP-8s, DECsystem-10s and DECsystem-20s share peripherals, files, and programs among themselves. What DECnet does is simplify start-up of almost any sort of network using Digital computers, whether you plan to link dedicated microcomputers to a minicomputer, or set up a large-scale distributed processing network across a continent.

Digital customers are the beneficiaries of this sort of technological pioneering. When our engineers break new ground, they simply widen the scope of what you and your staff can do with the Digital products you already have.

The PDP-11 family covers the spectrum of small to large minicomputers. Yet all PDP-11s have much in common. If you're buying more than one, or if you think your requirements might grow or change, that makes things a lot easier for you. It means you don't have to buy more than you need now.

The UNIBUS, built into all but the smallest PDP-11s, guarantees that changing technology won't leave your system behind. It means you can easily attach larger or faster peripherals or memory whenever you want to. The UNIBUS also makes programming easier.

All PDP-11 processors, however small or big, respond to the same set of instructions, so programs written for one PDP-11 can run on a larger PDP-11, and vice versa.
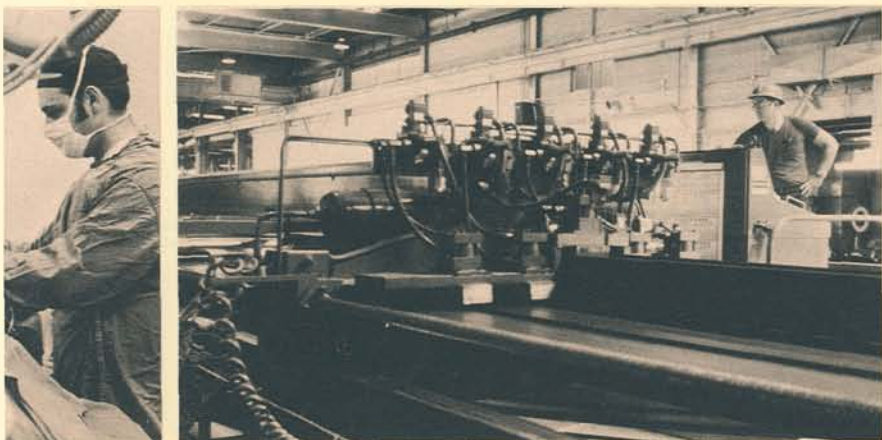
And this set of instructions is very large, which saves programmers' time.

Fully vectored hardware interrupts, eight general registers, and four priority levels help PDP-11s work efficiently.

in a traditional computer. Larger PDP-11 models provide a superset of the basic family instruction set.

The PDP-11 family allows bit, byte and word addressing in both single- and double-operand formats. This helps save memory space and simplifies the implementation of control and communications applications.

The PDP-11 family's use of double-operand instructions allows programmers to perform several operations with a single instruction. For example, ADD A,B adds the contents of location A to location B and stores the result in location B. It might take three instructions to do the same thing on another minicomputer.

The PDP-11 instruction set also contains a full set of conditional branches, eliminating excessive use of "jump" instructions. A branch is also included for overflow of a signed integer, eliminating the need for a separate subroutine.

Hardware Interrupts

The interrupt system for the PDP-11 is another advance in small computer technology. With fully-vectored interrupts, the system eliminates the high-overhead software that determines the device service routine and code necessary to save system status. The multilevel hardware interrupt system is a standard PDP-11 feature, not an extra-cost option.

This system allows interrupts to be enabled or disabled, through software, during program operation. Such masking allows priorities to change dynamically in response to system conditions. For example, a real-time program can disable data entry terminals whenever critical analog data is being collected. As soon as the scan is complete, the terminals are ready for use again.

Eight General Registers

With eight general registers, PDP-11s give the programmer the flexibility of a large-scale computer.

Since these are general purpose registers, the programmer can assign them dynamically, depending on whether the need is to achieve computational speed, manipulate a pointer, or use the registers for temporary storage.

Priority Scheduling

PDP-11 computer systems provide four priority levels, each of which can handle an almost unlimited number of devices. The priority of a device is a function of the device's physical location on the UNIBUS—the closer to the processor, the higher its priority on that level.

PDP-11 architecture directs the device causing the interrupt(s) to provide a direct vector to its own service routine, eliminating the slow and tedious operation of polling all devices to see which one interrupted.

The device also provides status information for its own service routine. Thus, the programmer has the flexibility of assigning a device to a higher priority and its service routine to a lower priority without writing special software.

The advantages of the PDP-11 processors are just a part of the PDP-11 story, however. The broadest range of operating systems in the computer industry is available for your use. The choice extends from single-user program development systems to powerful timesharing, real-time, and multipurpose operating systems.

The selection of industry-standard programming languages is just as comprehensive. The smallest PDP-11s can run several versions of FORTRAN, BASIC, and APL, while larger systems can also support COBOL and RPG II. And many of our systems are available with a range of application software and utilities.

The high degree of commonality among PDP-11 programming languages, system programs, and data management services facilitates migration from one operating system to another, as well as the mixing of different operating systems within a single location or information system.

The range of peripherals is just as thorough. Whether you need minimal disk storage or enough capacity for a large on-line data base, Digital can provide it. If you want terminals for inquiry/response, data entry, or hardcopy listings, Digital has them. And there's an equally broad selection of tape transports, unit record equipment, and special purpose interfaces.

Digital designs and builds most of this equipment specifically for use with our own computers. Yet, we've become such a leading peripherals manufacturer that you'll find them included in more and more computer systems from other vendors. Our DECwriters, in fact, are the industry's fastest-selling hardcopy terminals.

For PDP-11 users, this all means an exceptionally wide choice of high-quality peripherals, at exceptionally competitive prices.

But hardware and software are not the sum total of the PDP-11 family's strengths. Digital backs up its computer systems with a worldwide field service organization of over 4,000 people; a software support group dedicated to helping customers with all their software needs; and training facilities, also located worldwide, that offer over 100 scheduled courses.

There is a comprehensive range of operating systems that direct the processors' power toward specific ends.

On top of that, PDP-11 users have an exceptionally wide choice of programming languages, each of which is especially suited to particular tasks.

Digital has a full line of peripheral equipment to match the jobs you plan...

...and the supporting services to maintain your hardware and software and to train your people.

PDP-11s come in prepackaged systems to assure the right equipment mix for your purpose. All the right cables, plugs, and power supplies are included.

Digital further adapts PDP-11 systems for particular uses.

The PDP-11 family offers the Original Equipment Manufacturer a single source of supply, discount policies, and worldwide field service.

We Make Your Choice Easier

How do you match your application plans, your budget, and your long range goals to a minicomputer system? Digital takes much of the work out of it for you.

Our PDP-11 products are available in pre-configured systems. We sell these systems through marketing groups that specialize in solving problems in particular application areas. That means your sales representative will be used to dealing with the general type of application you plan.

Your first step is choosing the PDP-11 operating system that fits the type of application you have in mind. The next step is adding the processor and system device that your operating system requires. Then you add additional memory and peripherals to this basic system, choose a load device, console device, and hardware and software maintenance plan.

Digital's marketing groups provide additional applications-oriented hardware and software options for PDP-11 systems. Our Commercial Product Groups, for example, market the DEC Datasystem family, which has led the way toward interactive processing in the commercial environment.

All Datasystems built around PDP-11s provide the commercially oriented user with Indexed Sequential Access Method (ISAM) file support, and DECFORM, an easy to use forms creation and data entry programming language. All of them run the same source code written in the high-level DIBOL language, while supporting an increasing number of concurrent tasks and user terminals.

Original Equipment Manufacturers (OEMs)

OEMs as well as end users can profit from Digital's unequaled range of products. Digital is the only computer manufacturer that can offer the OEM a single source of supply for processors, software, and peripherals.

Digital's discount policies help OEMs offer high-quality products at competitive prices. And our worldwide hardware and software support augments OEM's own service organizations.

Whether you are an end user or OEM, the PDP-11 family structure protects your investment.

PDP-11
Operating Systems

Nearly 50,000 PDP-11s have been sold since the series introduction in 1970. The success of the PDP-11 family is not limited to any one market area or type of application; the PDP-11's advantages have been enough to make it pre-eminent across an enormous number of computing applications.

The range and unique strengths of the PDP-11 operating systems deserve major credit for this. RSTS/E ushered in a whole new era of economical timesharing; RT-11 let dedicated minicomputer test stands obsolete cumbersome industrial relays; the RSX family of operating systems made real-time data collection and process control practical and economical; MUMPS did the same for on-line data base information systems; IAS let users perform simultaneous timesharing, real-time, and batch processing on a single computer. One of these operating systems was designed with your application in mind.

The Single-User Operating System RT-11

RT-11 is an efficient, single-user, real-time disk operating system for interactive program development and dedicated on-line applications. There are over 4,000 RT-11-based systems in use, making this the world's most popular real-time operating system.

The compactness and efficiency of the RT-11 real-time system allow it to run on the lowest-cost hardware configurations, while giving full rein to a PDP-11's speed. And RT-11's simplicity makes it extremely easy to program.

RT-11 supports both single job (S/J) and foreground/background (F/B) monitors. The F/B monitor allows both a foreground and background program to operate. The foreground handles real-time functions and has priority on systems resources; program development or batch jobs can operate in the background whenever the foreground is not busy.

RT-11 includes a variety of system and program development utilities and offers optional support for FORTRAN IV, FOCAL, BASIC, APL, and MACRO assembler.

The Timesharing Operating System RSTS/E

RSTS/E (Resource Sharing Timesharing System/Extended) provides efficient timesharing for up to 63 simultaneous users. RSTS/E supports BASIC-PLUS, an enhanced version of Dartmouth Standard BASIC, and optionally, BASIC-PLUS-2, RPG II, COBOL, FORTRAN IV, and APL.

Each RSTS/E timesharing user can have virtually the entire system's processing power, utilities, and peripherals at his command during program development or execution.

The operating system's multitasking support gives it the flexibility that timesharing demands. Its dynamic scheduling algorithm allocates processor time, memory space, file space and peripherals to continually keep processing efficient. The system manager can also set priorities to favor specific jobs. RSTS/E also provides the system manager

Customers have successfully used PDP-11s for everything from running a lathe to running a business. The PDP-11 operating systems let the processors excel in each of these different areas.

One operating system is typically used with small PDP-11s set up to do a single task, such as controlling an industrial test stand in a factory.

Another is the timesharing operating system for PDP-11 computers.

Timesharing puts special demands on any operating system because it calls for a changing mix of users and protection of everyone's privacy. Even a relatively small PDP-11 system can provide timesharing service to numerous users.

Still another operating system is designed for a situation where many people want quick access to a central data file stored in the computer along with the ability to quickly change or update that central data base.

with a number of utilities that keep track of system usage and help in allocating system resources.

The operating system provides all the security locks necessary for a multi-user timesharing environment. Files can be protected from access on an individual, group, or system basis. Files can also be accessed by many users while being updated on-line. Total or selective file backup can be done on-line without disrupting users or it can be done off-line. Other protective measures include on-line backup/restart, installation-oriented protection schemes, catalogue-oriented file identification, and removable storage media.

RSTS/E's conveniences include easy-to-use system generation features, comprehensive documentation for all levels of users, and standardized and indexed error messages.

Extensive commercial and data management facilities include ISAM (Indexed Sequential Access Method), relative access method, decimal arithmetic, and line printer spooling. Sort facilities include a BASIC-PLUS sort package and an optional standalone multivolume sort package. This gives the RSTS/E user an integrated set of commercial applications development tools.

The Multi-User Data Base Management System
MUMPS-11

MUMPS-11 is a multi-user data base management system that includes both an operating system and a high-level language. The MUMPS-11 language was originally developed in 1968 by the Laboratory for Computer Science at the Massachusetts General Hospital.

The MUMPS-11 language has text-handling capabilities that facilitate the inspection of any piece of data for content (such as particular keywords) or for any format (such as letters, numbers or punctuation characters at particular positions in a piece of text). These capabilities are extremely important for accepting or rejecting newly entered data, and for facilitating the on-line correction of data at entry time. Other text-handling capabilities include the ability to combine several pieces of text into one, and to divide text into segments if desired.

The language's hierarchical file structure allows users to design data files to suit their own requirements. This is significant because the data in most record systems (for example, medical records, financial records, and so on) actually do have many different levels of importance and detail. The MUMPS-11 user can create file structures that mimic the logical structure of the data. The language's hierarchical file structure also simplifies storage or accessing of any given data item.

The MUMPS-11 language's high-level nature is suited to the kind of problems the language is used to solve. MUMPS-11 may be used by programmers with relatively little training. They can produce useful working code from the first day they start to program, even though full utilization of MUMPS-11's capabilities requires a substantial amount of programming experience.

Since MUMPS-11 is an on-line program development and data storage and retrieval system, a programmer can write, debug or modify a program to quickly develop a working application. A user can enter, inspect or change data interactively and efficiently. Since MUMPS-11 is implemented as an interpreter, it eliminates the need for any time-consuming compilation step or extra storage space for compiled code in addition to the source code.

Data base management activities usually involve sensitive information at some point. Therefore, safeguards must be established to allow access only to authorized personnel.

Each user of the MUMPS-11 system gains access to the system's programs using a special login sequence which involves one or two access codes (depending on the privileges of the user). These

codes, provided by the system manager, are the User Class Identifier code or UCI, and the Programmer Access Code or PAC. MUMPS-11 allows up to 16 UCIs (classes of user).

MUMPS-11 also uses a concept called "tied terminals" as part of its approach to data security. The system manager can "tie" any terminal to a given program. Simply striking a key on the tied terminal will cause it to begin executing its assigned program. It is then impossible for the user to go through the login procedure.

All PDP-11s can run MUMPS. A single PDP-11 system can support up to 64 MUMPS terminals.

The Real-Time Operating System RSX-11M

RSX-11M is the primary PDP-11 real-time operating system. It is ideal for factory automation, laboratory data acquisition, graphics, power monitoring, and other applications that demand an immediate response.

RSX-11M delivers all that these applications require of an operating system. It supports multitasking, dynamic memory management, multiple programming languages, interactive program development, and a wide range of equipment interfaces.

RSX-11M accomplishes multiprogramming by logically dividing available memory into a number of named partitions. Tasks execute in a specific partition, and all partitions in the system can operate in parallel.

RSX-11M systems with the memory management option protect the memory area assigned to a task from other tasks executing in the system. With memory management, each task has a specific address range in which to execute, and can reference and alter memory only within the area it owns. Very large programs can be executed using either disk or memory overlay structures.

Task scheduling in RSX-11M is primarily event-driven, in contrast to systems which use a static scheduling mechanism to determine a task's eligibility to execute. The basis of event-driven task scheduling is the software priority assigned to each active task. When a significant event, (such as I/O completion) occurs, the executive interrupts the executing task and searches for the highest priority task capable of executing.

Once a task is in memory, the executive normally allows it to run to completion in a multiprogrammed fashion, even if its memory is required for the execution of a higher priority, non-resident task. However, if the system manager wants to free memory for execution of a higher priority task, a task can be declared checkpointable when created.

A checkpointable task currently active in a partition can be interrupted and swapped out of memory to disk when a higher priority task requests its partition. Later, after the higher priority task has finished, the checkpointed task will be restored to active execution at the point where it was interrupted.

RSX-11M tasks can be written in MACRO assembly language or optionally, in BASIC-PLUS-2, FORTRAN IV, FORTRAN IV-PLUS, or COBOL.

RSX-11S

RSX-11S, a subset of RSX-11M, provides a dedicated, execute-only environment for monitoring and controlling many real-time processes concurrently. Program development and RSX-11S system generation takes place on a host RSX-11M system, allowing the RSX-11S system to be wholly dedicated to its real-time task.

The Multifunction Operating System IAS

IAS, the Interactive Application System, supports concurrent real-time, timesharing, and batch processing, making it the ideal multipurpose operating system. Since an IAS system also offers power-
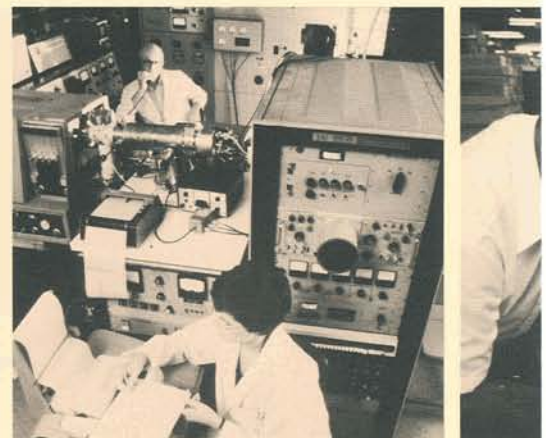
There's also real-time operating software for situations where a PDP-11 has to collect, analyze and respond immediately to information coming from a number of machines or instruments.

Tasks for the real time operating system can be written in a variety of programming languages.

Our multi-function operating system can per-form timesharing, real-time tasks and batch processing at the same time, on one computer.

ful, easy-to-use program development, it is a natural host for smaller RSX-11-based systems in a distributed computing arrangement.

An IAS system can handle data collection and process control tasks, using data from its own peripherals and from smaller satellite systems, and simultaneously produce management reports. At the same time, the system can offer efficient time-sharing service to scientists and engineers.

IAS has all the capabilities to do these many different tasks well. Its extensive system management facilities equip it for real-time tasks; its comprehensive file protection qualifies it for timesharing; its unmatched range of programming languages and utilities make it a general purpose operating system.

Among IAS's strengths are a single command language that's easy to learn and use; priority scheduling for real-time tasks; submission of batch jobs from interactive terminals; and timesharing services for efficient development of interactive application programs.

The operating system also provides a simple internal software interface for the development and use of special-purpose, multi-user interactive applications; a sophisticated file system providing device independence, file protection, sequential and random file access; dynamic allocation of system resources; use of shared, reentrant code to minimize memory requirements; system management facilities for system configuration, generation, and control; and facilities to account for and restrict the use of system resources.

Facilities include a MACRO assembler, a full set of system and user utilities, data management facilities for manipulation of records, files, and volumes, system management facilities, extensive user and system protection, and optionally, FORTRAN IV, FORTRAN IV-PLUS, BASIC, BASIC-PLUS-2 and COBOL language processors.

Digital's high-level languages let you move freely among operating systems. These languages span the breadth of the PDP-11 operating systems, and conform to the industry standards that exist. In some cases, more than one version of a particular language is available on a single operating system, each optimized to meet particular requirements.

BASIC-11

BASIC-11 is an easy-to-learn, conversational programming language that uses simple English words, abbreviations, and familiar mathematical symbols to perform operations. The BASIC instruction set contains powerful yet easy-to-learn commands that allow novices to quickly become accomplished applications programmers. With experience, programmers can start using the advanced techniques available in the language to perform intricate manipulations or to express a problem efficiently and concisely.

Digital's BASIC-11 is an immediate response, interactive language compatible with Dartmouth standard BASIC. It gives the user the capability to develop and debug a program in a minimum amount of time. BASIC-11 can be used for relatively large data processing tasks as well as quick, one-time calculations.

BASIC-11 is available under RT-11, RSTS/E, RSX-11M, and IAS.

BASIC-PLUS

BASIC-PLUS offers many additional functions not found in standard Dartmouth BASIC or most other versions of the language.

BASIC-PLUS has a comprehensive group of string operations that provide efficient processing of alphabetic data, including names, addresses, sentences and paragraphs. The BASIC-PLUS user can append strings or compare them. It's possible to extract, examine, or search for a string of characters contained within a larger string.

BASIC-PLUS has an immediate mode of operation that allows commands to be immediately executed instead of stored for later execution. BASIC-PLUS commands can also be more than one line long.

BASIC-PLUS includes a set of 13 commands for performing matrix input/output, addition, subtraction, multiplication, inversion, and transposition. The language also has extensions that provide a highly efficient means of handling records composed of fixed-length fields.

The language has program control and storage facilities that can store both programs and data on any mass storage device and retrieve them for use during program execution. A PRINT-USING statement provides for tabs, spaces, and column headings, plus precise specifications of output line formatting and floating dollar sign, asterisk fill, and comma insertion in numeric output. Listings can be on a line printer as well as on a terminal.

BASIC-PLUS is included with the RSTS/E operating system.

BASIC-PLUS-2

BASIC-PLUS-2 is a superset of BASIC-PLUS with true compilation capability. Therefore BASIC-PLUS-2 application programs run much faster

Digital's high-level programming languages put the computer's power in the programmer's hands. Since these languages conform to industry standards, most programmers are already familiar with them.

Each language is a tool that is good for particular kinds of projects. Whatever your application, there's a PDP-11 programming language to match it.

than BASIC-PLUS programs do. BASIC-PLUS-2 files also interface directly to the RMS-11 record management system, which allows the BASIC-PLUS-2 user to create files, do record mapping, and access records sequentially, randomly, or by key.

BASIC-PLUS-2 also provides a CALL statement that lets it access external subroutines. There are also a number of statements that allow the programmer to interactively observe and control program execution. BASIC-PLUS-2 is supported under the RSTS/E, RSX-11M and IAS operating systems.

COBOL

PDP-11 COBOL provides terminal-oriented, fast data processing for commercial applications. Source programs are written in the American National Standards Institute (ANS) COBOL-74 language. PDP-11 COBOL is a fully implemented intermediate level compiler conforming in language element, representation, symbology and coding format to the ANS specification. In addition, it includes a number of high-level specifications.

Major features include use of the Digital standard CALL sequences for external subroutines; use of the RMS-11 Record Management System; an ANS standard COBOL segmentation facility; and ANS standard string and substring manipulation. COBOL is an optional language processor for RSTS/E, RSX-11M, and IAS.

FORTRAN IV

PDP-11 FORTRAN IV is a substantially improved form of the standard scientific programming language that can be used on any PDP-11 configuration. New optimizations make programs small and fast. Powerful extensions permit markedly easier program coding. And FORTRAN IV's compilation speed minimizes program development time.

Since FORTRAN IV is a superset of ANS standard FORTRAN, programs written to this standard but used on other computer systems can run unmodified under FORTRAN IV.

FORTRAN IV-PLUS

A superset of FORTRAN IV, FORTRAN IV-PLUS supports the same enhancements to the ANS standard, but also includes numerous extensions. The primary differences between the FORTRAN IV and FORTRAN IV-PLUS compilers are that the FORTRAN IV-PLUS compiler produces highly optimized PDP-11 machine language code; creates hard code that uses the Floating Point Processor option in high-end PDP-11s; and can produce shareable code.

FORTRAN IV-PLUS conforms to the specifications for ANS FORTRAN X3.9-1966. It is available under RSTS/E, RSX-11M, and IAS.

APL-11

APL-11 uses one of the most concise, consistent, and powerful character sets ever devised. It is flexible enough to solve problems in text-handling and commercial data processing as concisely and as easily as it can solve problems in mathematics and statistics. It is available under RSTS/E and RT-11.

RPG II

RPG II is a complete report program generating system that provides users with a ready means of developing applications programs. It supports almost all functions offered by industry versions of RPG II, and provides significant improvements over RPG I. It is available under RSTS/E.

PDP-11 SORT

SORT is a fast-working utility program that lets the user rearrange, delete, and reformat records in a mass storage file; select a sorting process and input device that best suit the processing environment; and create new file indices for accessing a large data base.

SORT also allows the user to batch stream several sorting jobs and to define specification files for complex record definitions. The SORT program runs under the RSTS/E, RSX-11M, and IAS operating systems.

Data Management and Utility Services

The PDP-11 family provides a full range of data management tools. The choice extends from the operating systems' file control systems to block input/output support; to sequential and relative logical file/record support with a multi-key index sequential option; to a complete, CODASYL-standard data base management system.

Record Management System

RMS-11, Digital's Record Management System, allows user-written application programs to create, access, and maintain data files with efficiency and economy.

RMS-11's variety of file organizations and access modes gives the user the ability to choose the method best suited to the application. RMS-11 supports sequential, relative, and indexed files which users can access sequentially, randomly, or by key. The multi-keyed access option provides both generic and approximate key searches. Records can be either fixed or variable length.

RMS-11 also includes a set of utility programs for the creation and maintenance of files, and a set of operating system routines through which records are transmitted to and from user programs.

RMS-11 complements DBMS-11, Digital's Data Base Management System, by providing file and record handling capabilities for applications whose size and data structures do not require the complete data base management services of DBMS-11. RMS-11 is fully supported with COBOL and BASIC-PLUS-2 under RSTS/E, RSX-11M and IAS.

DBMS-11 Data Base Management System

DBMS-11 is a CODASYL-standard data base management system that uses the 'set definition' as the basic building block with which even the most complex data relationships can be defined.

DBMS-11 gives the data base administrator better overall control of data. It separates data definitions from data references and allows definition of logical, applications-oriented relationships. Redundant data is eliminated. Data protection is maximized. Program development and maintenance efforts are reduced. And the data base as a whole can be treated as a single entity rather than as a collection of similar but unrelated information and applications.

DBMS-11 supports multi-level sequential, hierarchical (tree), and network data structures, providing the data base administrator with enough flexibility to define a data base structure that accurately reflects the installation's needs.

DBMS-11 provides room for growth in several directions. If the user needs to grow beyond a DBMS-11 system, the DECSYSTEM-20 and DECsystem-10 both use CODASYL-standard data base management systems. This greatly simplifies the task of program conversion.

DBMS-11 is available under the IAS operating system and is supported by FORTRAN IV-PLUS, COBOL, BASIC-PLUS-2, and MACRO.
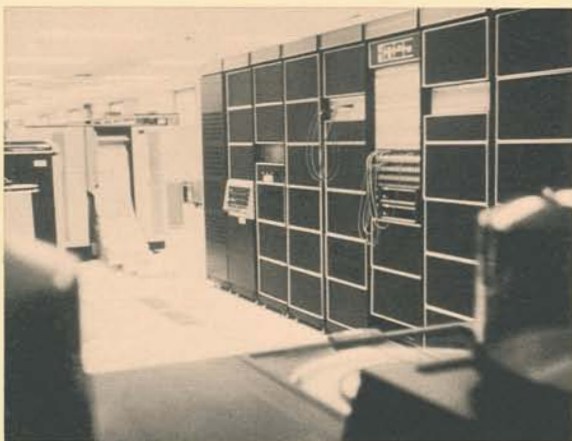
Data management services and utility software packages help you manage and work with the information in your computer system. Digital provides a full range of this software, from the most basic to the most comprehensive.

DECnet is just one of the software tools that lets PDP-11s communicate with each other, with other Digital computers, and with non-Digital computers.

The Processors

The PDP-11 processor family starts off with a microcomputer, includes two mid-range minicomputers, and culminates in a powerful 'supermini'. Not only do these PDP-11 models increase incrementally in size and power, but each model adds extra features that are appropriate for the kinds of applications its power can handle.

PDP-11/03

The PDP-11/03 has been made possible through the use of Large Scale Integration (LSI) technology. Digital has been able to create a chip set in the form and function of a standard PDP-11 yet small enough to be packaged along with 8K bytes of memory on a single circuit board. The PDP-11/03 includes the chassis, operator's console, processor, memory, backpanel with expansion space, power supply and interface modules.

The PDP-11/03 features a full PDP-11 instruction set, vectored interrupts, an asynchronous, bidirectional bus, microcoded debugging facilities, operator interface and bootstrap loader, real-time clock input, and power-fail/auto restart.

PDP-11/04

The PDP-11/04 is a low-cost system for data acquisition, converting analog signals to digital signals, analyzing pulse heights, storing accumulated data on magnetic tape, and other dedicated applications. It is the smallest PDP-11 with a UNIBUS.

The PDP-11/04 can have as little as 16K bytes of memory for straightforward applications, or as much as 56K bytes for more extensive programs, which can be written in a high-level language such as FORTRAN IV or BASIC.

PDP-11/34

The PDP-11/34 is a midrange member of the PDP-11 family. As a microprogrammed processor, the PDP-11/34 CPU is so compact that the entire CPU logic is contained on two circuit boards. There's considerable chassis space for later expansion.

The PDP-11/34 incorporates a number of large processor features which increase its capabilities beyond those found in other computers in its class. These features include: integral memory management hardware that provides program protection, memory relocation and addressing of up to 256K bytes, and integral extended instruction set (EIS) that provides hardware fixed-point arithmetic in double-precision mode (32-bit operands). A floating point processor is optional.

PDP-11/55

The PDP-11/55 is especially designed for fast execution of FORTRAN compiled tasks, whether for critical process control, laboratory simulation experiments, engineering and scientific calculations, or other applications of this kind.

Overlapped operations and high-speed components give the 11/55 its high performance. The processor takes full advantage of such advanced components as bipolar memory, a high-speed

Communications Software

Digital has been a leader in the trend towards interactive computing and distributed processing. As a result, we provide a particularly useful range of communications software.

DECnet

DECnet is the set of software tools that allow Digital computer systems — PDP-8s, PDP-11s, DECsystem-10s and DECSYSTEM-20s — to communicate programs and data among themselves. DECnet allows different Digital computers within a network to control and use remote peripherals as if they were local, to access remote files, and to send programs to another system for loading and execution. In other words, DECnet provides device sharing, file sharing, and program sharing.

This means DECnet lets you store information on one computer system, then down-line load it to other computer systems in your network when they request it. Similarly, DECnet's support for down-line system commands lets programs in one computer system send directives to other computer systems within a network.

One result of these features is that you can develop programs on a sophisticated host computer and then down-line load them to small, execute-only computers elsewhere in your network. Finally, DECnet's independence from line characteristics lets you include both full- or half-duplex lines, and serial or parallel transmission within your network.

DICAM

DICAM (Datasystem Interactive Communications Access Method) is a software package that lets our PDP-11-based DEC Datasystems communicate interactively with application programs on an IBM 360/370 host. DICAM does this by providing a communications path that makes the Datasystem communicate like an IBM 3271 remote display controller on an IBM system. That means an IBM host can support a Datasystem as easily as a standard host option, leaving you free to take advantage of the full range of 360/370 access methods, operating systems, and system management packages.

Remote Job Entry Packages

Digital has an assortment of remote job entry packages for non-Digital mainframes. An IBM 2780 emulator, an IBM HASP emulator, a Control Data Corporation UT200 emulator, and a Sperry UNIVAC 1004 emulator are all available.

The PDP-11 processor family starts off with a microcomputer, goes up through medium-scale minicomputers and culminates in a powerful "supermini."

*Each larger PDP-11 model adds extra fea-
tures that complement its increased
performance.*

(5.43 microsecond 64-bit double precision multiply) double precision floating point processor, and hardware memory management.

Overlapping occurs on several levels: instruction pipelining, where the next program instruction is fetched while the current one executes; CPU independent floating point calculation; and a bus structure that allows direct memory access without cycle stealing on the UNIBUS.

PDP-11/60

The PDP-11/60 is a midrange system that offers performance and reliability features usually found only in larger, more expensive systems. The 11/60 provides a cache memory system; a built-in floating point unit; an optional high speed floating point accelerator for fast execution speed in heavily computational applications; and an optional writeable control store (WCS) for special-purpose microprogramming.

This combination of features makes the 11/60 ideal for midrange, real-time applications including scientific and industrial data acquisition and control, problem solving in engineering departments, simulation, medical processing, and data communications, text composition, graphics, and transaction processing and management information systems.

The 11/60 brings more than power and economy to these applications. Parity checks on cache and core memory, error correction on MOS, and a WCS parity check add extra reliability.

Packaging enhancements such as extra cooling capability, built-in cable troughs, grounded cabinet panels, swing out card cages, and a shock-absorbing suspension add to the 11/60's reliability and ease of maintenance. An innovative operator's front console, a hardware diagnostic bootstrap loader, and a diagnostic control store module cut trouble shooting time.

PDP-11/70

The PDP-11/70 provides the highest throughput of any PDP-11 system. Its performance can be applied to applications involving many concurrent processes, or to a demanding single process. For example the 11/70 is ideally suited for a college computer center where it can simultaneously handle laboratory data acquisition, interactive student programming, and administrative batch processing. In its smaller configurations, the 11/70 is appropriate for very demanding single-function applications such as timesharing or dedicated real-time applications.

The unique feature of this computer is the throughput you get for the price. This means fast instruction processing, fast memory (an integral cache memory system yields an effective memory cycle time of less than 400 nanoseconds, while main memory is ECC MOS or parity core), fast 32-bit I/O paths that complement the UNIBUS, and high-speed mass storage devices.

The PDP-11/70 is compatible with the full line of PDP-11s and includes all the features that have made the PDP-11 family the world's fastest selling small computer family.

Peripherals

PDP-11 peripherals range from paper tape readers to high speed disk packs, from small auxiliary printers to full graphics subsystems, from A/D converters to heavy duty industrial controllers.

Disk Drives
Digital's disk family is comprehensive enough to provide appropriate on-line storage for the broad range of PDP-11 systems and their applications. The current disk product line consists of the RX01 floppy disk for small systems, the RK05J/RK05F and the RK06 cartridge disks for small to medium-sized PDP-11 systems, and the RP04/RP05/RP06 disk pack drives for large systems. The RS03/RS04 head per track disk drives complete the PDP-11 disk family. Digital states disk capacities in formatted form, that is, in terms of customer-useable storage.

RX01 Floppy Disk Drive—The RX01 is a floppy disk drive available with all PDP-11s. Each of these economical drives can store 256K bytes of data in an industry-compatible format with up to two drives per controller. Average access time is 483 milliseconds.

RK05J/RK05F Cartridge Disk Drives—The RK05J and RK05F are a complementary pair of entry-level disk products for small to medium-sized PDP-11 systems. The RK05J drive with removable cartridge offers 2.5M byte of storage, and an average access time of 70 msec. The RK05F, a double capacity disk drive with non-removable media, offers 5M bytes of economical on-line storage and an average access time of 76 msec. These disk drives can be mixed on the same controller and are fully software compatible.

RK06 Cartridge Disk Drive—The RK06 is Digital's newest disk offering. It uses a top-loading, removable cartridge with 14M bytes of storage and has an average access time of 50.5 msec. The RK06 features a track-following servo mechanism for accurate positioning, error detection and correction capability, and offset positioning retry capability. The RK06 has a dual access option.

RP04/RP05/RP06 Disk Pack Drives—The RP family of high-capacity disk pack drives offers both high performance and a low price per megabyte of storage. The RP04 is an 88M byte disk drive; the RP05 is a 88M byte disk drive that can be field-upgraded to 176M bytes; the RP06 is a 176M byte disk drive.

These drives use a removable disk pack and support such features as overlapped seeks, dual access, rotational position sensing (RPS), error correction capability (ECC), track following servo for accurate positioning, offset/retry positioning capability, and extensive diagnostic capability. The three drives all have a 36.3 msec average access time. They can be mixed on the same controller and are software compatible.

RS03/RS04 Fixed-Head Disk Drives—The RS03/RS04 fixed head per track disk drives are ultra high performance disks for special application requirements. Since these are fixed-head disks, there is no seek time involved. Their fast access times of 8.5 msec, and data transfer rates of up to 4M bytes/sec (8M bytes/sec on the RS04 with the track parallel feature), make these drives ideal for timesharing and other applications that require a significant amount of program swapping.

Whether you plan to use a large or small PDP-11, a timesharing or a real-time operating system, Digital builds the peripherals you need.

Digital has small, low-cost disk drives, larger models that can store a great deal of information, and still others that are especially fast.

The same applies to our tape transports.

Our hardcopy and video terminals are up-to-date and inexpensive.
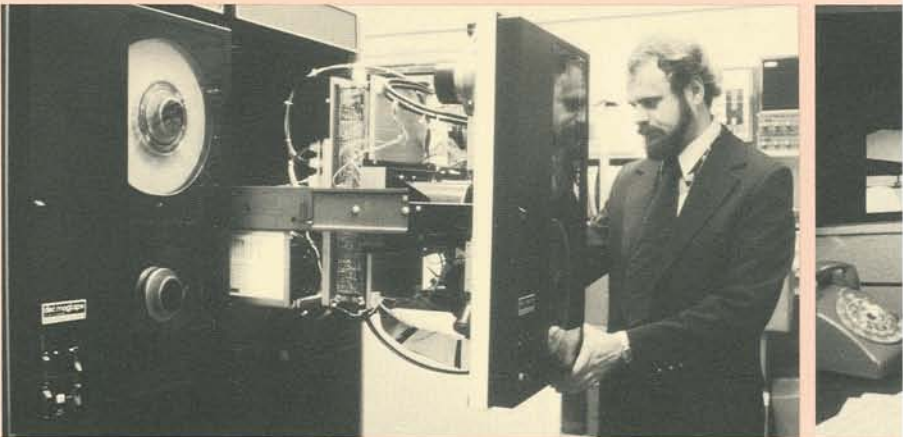
The RS03's capacity is 512K bytes; the RS04's is 1024K bytes. Both drives can be mixed on the same controller and are software compatible.

Tape Transports

Digital's selection of magnetic tape systems is just as comprehensive. The choice ranges from the economical TS03 to the industry-compatible TU45, a 1600 bpi, nine-track drive with 75 ips tape speed.

TS03 Tape Transport—The low cost TS03 transport reads and writes tape at 12½ ips. It can support up to two transports using 9-track, 800 bit/in, 7-in. reels.

TE10 Tape Transport—The larger TE10 reads and writes at 45 ips. It is expandable to a total of eight drives using nine-track, 800 bpi, industry-compatible reels.

TE16 Tape Transport—This industry-compatible system is program-selectable between 800 and 1600 bpi. It can expand to a total of eight, 9-track, 45 in./sec drives.

TU45 Tape Transport—The largest PDP-11 tape subsystem, the TU45 is similar to the TU16 system, but its drives read and write at 75 ips.

The TU45 can serve as a journaling device for data base management systems that require especially high speed.

Hardcopy and Video Terminals

Digital's terminal line includes the teletypewriter-compatible DECwriter II, the industry's fastest-selling impact teleprinter. The DECwriter operates at 30 characters per second, three times the speed of conventional teletypewriters, yet it is mechanically simpler and quieter than other terminals in this category.

DECscope Series—Digital's DECscope series of video terminals offer performance and operator-oriented design that, feature for feature, make them one of the most inexpensive sets of computer terminals on the market. These alpha-numeric CRTs form a range of plug-compatible devices, with each model offering additional features. Yet each model can operate on the same communications network.

A range of optional features is available for both the DECwriter II and DECscope families.

Graphics Equipment

The PDP-11 family includes graphics systems ranging from the low-cost VT55 graph drawing terminal, to the sophisticated DECgraphic-11 line of interactive graphics terminals and subsystems.

VT55 Graph Drawing Terminal—The VT55 is a DECscope that displays waveform and histogram graphics as well as alphanumerics. This makes it a valuable tool for applications that involve data acquisition, monitoring, trending, or simulation. An electrolytic printer is optional. The VT55 can be interfaced to any DIGITAL or non-DIGITAL computer.

The DECgraphics Family

The VT11 Systems—The VT11-A Graphics Display Subsystem is a dynamic refresh device that is ideally suited to interactive graphic applications. The user interacts with the VT11-A through a light pen. A full ASCII serial input keyboard and a 16-button box under program control are both optional.

The VT11 subsystem is a direct memory access device that operates as a UNIBUS peripheral. Thus it can add graphics capability to any of a wide variety of PDP-11 configurations. There are several VT11-based system packages.

The *GT41* is a table top graphics terminal with 32K bytes of internal MOS memory. The *GT43* is a cabinet-mounted graphics terminal package with 32K bytes of internal MOS memory and space for considerable expansion. These are both interactive graphics terminals.

The *GT46* is a self-contained 64K-byte, dual disk-based configuration that can run the RT-11 or RSX-11M operating systems as a standalone graphics system.

The VS60 Systems—The VS60 High Performance Graphic Display Subsystem is instruction-compatible with the VT11, but adds numerous sophis-ticated features, including character and vector scaling, windowing, clipping, and the ability to display over 16,000 inches of flicker-free vectors.

Applications can include advanced real-time data acquisition and display, dynamic simulations, cartography, and computer-aided design in the electronics, aerospace, architecture, and automobile industries.

Like the VT11, the VS60 is a UNIBUS peripheral and directly accesses PDP-11 memory without central processor overhead, leaving the CPU free for computational tasks.

The *GT62* Graphics Terminal System combines a VS60 Display with a PDP-11/34 processor to form a distributed satellite terminal that can be connected to any suitable host computer. This type of configuration lets the GT62 satellite perform real-time graphics support tasks while the host computer handles the heavy computational and data base manipulations.

DECgraphic-11 Software

DECgraphic-11 software provides comprehensive, high-level support for the VT11 and VS60 in all their configurations. System level software support is available for FORTRAN under RT-11 and RSX-11M, BASIC and FOCAL programming under RT-11, and host/satellite support for FORTRAN under the RSX-11M and IAS operating systems. The DECgraphic-11 programming capability allows easy transfer of application software from one DECgraphic-11 configuration to another.

Printers

Digital's printers are also well matched to PDP-11 characteristics and applications.

The LA180 DECprinter—The LA180 DECprinter I extends the DECwriter II's field-proven technology into higher-speed printing applications. It can print the full 96-character ASCII upper and lower case set across 132 columns at 180 characters per second.
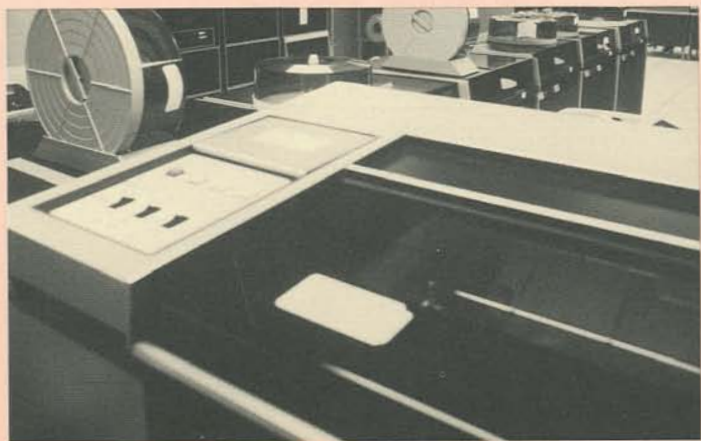
You can add on graphics equipment through the PDP-11 UNIBUS, or you can install one of our standalone graphics systems. Either way, Digital provides comprehensive software support.

Whether you plan a large or small amount of printing, Digital has the printers to handle it.

If you want to set up a communications network, here's the special hardware you'll need...

The LP11 Line Printers—The LP11 line printer series starts with a 132-column, 64-character model, the LP11-V, which operates at 300 lines per minute. The LP11-W version, which uses a 96-character set, runs at 230 lines per minute.

The next faster LP11 model, the LP11-C, uses a 64-character set and runs at 900 lines per minute; its twin with a 96-character set operates at 660 lines per minute.

The top of the line, heavy-duty LP11-R model prints a 64-character set at 1200 lines per minute; its 96-character twin prints at 900 lines per minute.

Card Readers and Paper Tape Reader

There are PDP-11 card readers for users who plan large, batch-oriented applications, as well as smaller units for users who will have only incidental use for unit record gear.

The 300 cards-per-minute CR11 reader, and the 285 cards-per-minute CM11 mark sense and punched card reader, cover the low end. For heavier batch requirements, PDP-11s can support the 1000 card-per-minute CD11 with a 1000-card hopper capacity. A larger CD11 model provides a 1200 card-per-minute capacity and a hopper size of 2250 cards.

The PC11 paper tape unit reads at 300 characters per second and punches at 50 characters per second.

Communications Interfaces

Digital also offers a full range of asynchronous and synchronous communications line interfaces that allow you to economically support a single terminal or a full network.

ASYNCHRONOUS INTERFACES—The DL11 single line asynchronous interface connects PDP-11 processors to local terminals (or to remote terminals through modems). A version of this interface is available for LSI-11-based systems.

For multiple terminal applications, the DZ11 eight- or 16-line asynchronous multiplexer performs the same function as the DL11, but more economically. For high throughput applications, the DH11 16-line programmable asynchronous multiplexer is appropriate. This is a direct memory access (DMA) device that has programmable transmission speeds and parameters.

SYNCHRONOUS INTERFACES—The DUP-11 single line asynchronous interface connects a PDP-11 to modems handling medium-speed (up to 9600 baud) synchronous transmission. The DUP-11 is capable either of byte- or bit-oriented protocol handling, so it supports Digital's Data Communications Message Protocol (DDCMP), IBM's Binary Synchronous (BISYNC) and Synchronous Data Link Control (SDLC) protocols, the International Standards Organization's High Level Data Link Control (HDLC) and ANSI's Advanced Data Communication Control Procedure (ADCCP). The older DU11 single line synchronous interface is also available. There's a version of the DU11 for LSI-11-based computer systems.

For high throughput synchronous transmission, there's the DQ11 single line synchronous interface. This is a direct memory access device that offers optional Cyclic Redundancy Checking (CRC) and character recognition. For multiple terminal applications, the DV11 communications preprocessor supports 16 communication lines, which can be synchronous or asynchronous, intermixed on a four-line basis.

The microprocessor-based DMC-11 is a high-speed network link between PDP-11 systems using Digital's DDCMP protocol. The DMC-11 can handle transmission as fast as 1 megabaud over a local cable up to 6,000 feet long, or as fast as 56 kilobaud over an 18,000-foot cable. It can operate at up to 19.2 kilobaud in remote applications using synchronous modems. An option allows you to
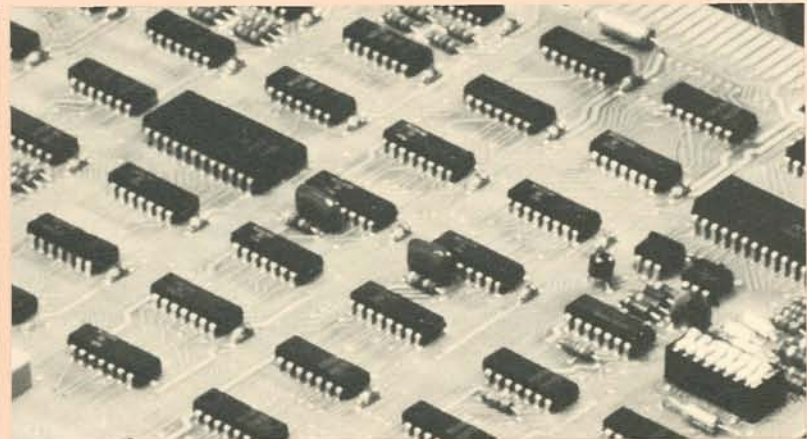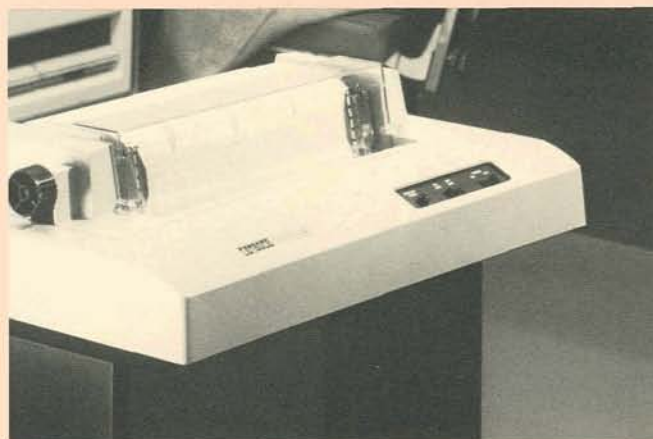
transmit at 250 kilobaud over direct digital communications networks.

As the DMC-11's protocol is implemented in hardware, it offers high reliability and throughput, low processor overhead, and ease of programming.

COMMUNICATIONS ACCESSORIES—There are numerous other communications products for special purposes. For applications that call for signal conversion, the DF11 signal conditioning options convert computer (TTL) signals to EIA or 20mA signals. The DF11B integral modems convert TTL signals to audio frequencies. DF11Bs are also used to connect PDP-11s directly to Bell Data Access Arrangements. The DN11 auto calling unit interfaces PDP-11s to Bell 801 auto calling units.

If telegraph transmission is an application requirement, there's the DC08 and H316 Telegraph Line Interfaces. For special error detection in serially transmitted data, you can attach the KG11 communications arithmetic element.

Digital's EIA-compatible terminals can directly connect to many of our data communications interfaces through the H312-A null modem and the BC03M and BC03P null modem cables.

*Planning direct digital communication?
There is an option for it.*

*There are numerous other communications
products for special purposes.*

We can help you get started.
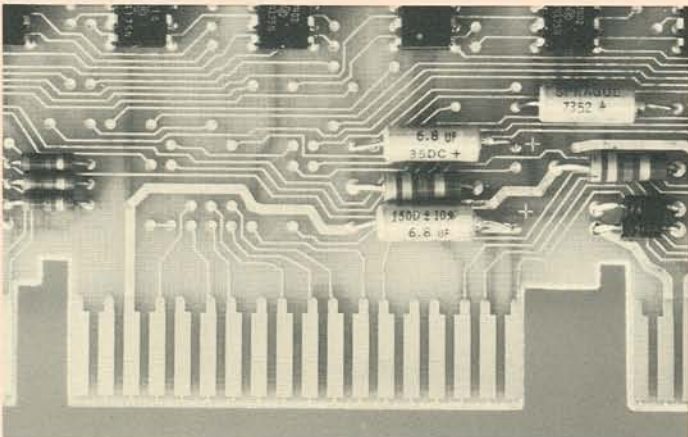
Corporate Services

The quality of products is important, but the quality of the organization behind them is crucial. Digital's success is due not only to exceptional products, but to the kind of services we offer our customers.

Expert System Analysis and Design

Before you solve a problem, you have to define it. Digital's system analysts can help you here. They are trained to match our systems to user needs. If necessary, Digital can also produce custom hardware and software for particular applications.

Consulting Help From Software Services—If you need expert software skills, Digital's Software Services consultants have them. These specialists can work on any phase of any application. They do feasibility studies and system analysis and design, write new software, and tailor our standard software to meet specific needs. They can help you with a crucial project, for example, or orient your staff to newly purchased software.

Software consulting is available on a time-and-materials basis in a variety of plans, including:

Resident Consulting—When you need a full-time, specialist for a new, complex installation or a long-term project, Software Services can provide resident consultants.

Weekly Consulting—For short term needs, weekly consulting provides 40 hours of on-site support.

Per-Call Consulting—Per-call consulting is available for the user who temporarily requires a few hours to a few days of consultants' time.

Computer Special Systems—Digital's Computer Special Systems group (CSS) consists of analysts, engineers, programmers, and manufacturing specialists who build custom hardware and software for particular applications. CSS handles everything from simple processor interfaces to project management of complete turnkey systems. There are CSS facilities worldwide.

Special Software—CSS will design and produce diagnostic, systems, and applications software, or modify standard software.

Special Systems—When you order a complete turnkey system from CSS, project managers oversee its analysis, design, and implementation, and will work with you to ensure proper installation and start-up.

Support—Although CSS builds custom products, they are fully documented, and are therefore maintained by Digital's worldwide field service organization.

Financing, Installation, and Training

Digital can provide financial counseling and leasing to help you acquire a system, we have project managers that will oversee delivery and installation, and we will provide educational programs to train your staff.

Leasing—Digital offers full payout leases that usually run from three to seven years. At the end of the term, you may elect to buy the equipment at 10% of the purchase price, turn the system in, or continue

the lease with significantly lower payments. Lease payment schedules are flexible and can be tailored to your needs.

Project Management—Digital can assign a project manager for particularly complex installations, or those for which we have turnkey responsibility. This person works with you, your sales representative, and with Digital's hardware, software, and service managers to see that your project goes smoothly.

Digital judges the project manager on the success of your system. So any project manager is involved from the beginning. He or she approves all hardware and software configurations, determines and maintains all schedules, and coordinates testing, training, and installation. The project manager also arranges for special services, like software consulting, special hardware, and field service options.

Educational Services—Digital offers over 100 standard courses in system management, operations, hardware, and software at 17 training centers around the world. We also offer on-site training and custom courses.

The courses fall into four general categories:

General interest computer science courses that provide a technical foundation for people who wish to gain basic computer experience.

Software systems courses that train users, programmers, and operators in operating systems, languages and utilities. There are courses for both beginning and advanced students.

Hardware courses that train users who plan to service their own equipment, or those who simply want an understanding of their hardware. There are courses in general hardware familiarization, hardware troubleshooting, and hardware maintenance.

Audio-visual courses provide self-paced instruction. You can purchase one of these courses and use it over and over again, training large numbers of people without the expense of travel.

Digital regularly schedules courses at our training centers. But we also offer on-site courses for training groups at your own offices or elsewhere. On-site instruction eliminates travel expenses, and allows our instructors to orient the course to your particular needs.

Field Service

Hardware Maintenance—Digital has a field service organization of over 4000 service engineers working out of more than 300 locations throughout the world. These field engineers are experts in Digital hardware. Many also specialize in specific applications. The world-wide service organization behind them insures the fastest and best possible response to your system maintenance needs.

Digital has a wide range of hardware maintenance services. The choices include:

Service Agreements—You may choose either a Basic Agreement designed for most applications, or a Critical Applications Agreement if you require a more intensive service program.

The Basic Agreement includes all materials and labor, preventive maintenance, installation of engineering changes, and flexible coverage time based on your needs.

The Critical Applications Agreement provides the same services plus response within four hours, continuous service until repairs are complete, and more frequent preventive maintenance.

Per-call service is designed for installations that are considered non-critical, have other backup equipment, or perform first-line maintenance themselves.

Other Services—If you wish to maintain your own equipment, we offer a variety of assistance. This includes off-site repair of major equipment and modules; recommended spares service, spare
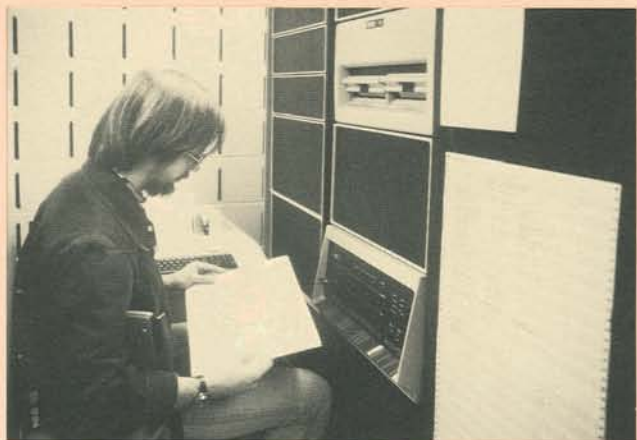
*There are plenty of courses to train
your people.*

*And worldwide hardware and software sup-
port to make sure our products perform.*

Join the industry's largest users group.

parts, tool kits, and test equipment; maintenance documentation and engineering updates; emergency parts service; and hardware maintenance training.

Software Services

Software Services is a customer support organization that helps Digital customers get maximum results from our system software, languages, and application packages.

Before you buy, Software Services people can give you technical presentations on our products, perform benchmarks, do systems analysis, and make technical evaluations of the applications you are considering.

When you buy software from Digital, Software Services installs it and makes sure that it performs as stated in our software product descriptions. Software Services also corrects any problems that arise during the one-year warranty period that covers most Digital software products.

During the warranty period you receive:

Software Dispatch—These monthly newsletters contain solutions to software problems, information on system enhancements and new software products, and general software information.

Software Updates—You are informed of all new operating system releases so that you may prepare your operation to use them if you wish.

Performance Reports—A formal problem reporting service provides you with responses to problem reports.

All of these services are also available to you after the warranty period ends.

Software Distribution Center—Digital's Software Distribution Center (SDC) stocks over 10,000 software items and documents. These include source and binary software products on DECtape, paper

tape, disks, magnetic tape, and cassette; paper and microfiche listings; textbooks, handbooks, and manuals. Periodic issues of the SDC price list keep you informed of current offerings.

In addition to pre-sales and warranty/maintenance, Software Services offers consulting help, described previously.

DECUS: A Community of Fellow Users

DECUS, Digital Equipment Computer Users Society, is a voluntary, not-for-profit users group, supported in part by Digital. It is the largest and most active user group in the computer industry.

The objective of DECUS is to advance the art of computation through mutual education and exchange of ideas and information. It also provides feedback to Digital on user hardware and software needs.

To further these goals, DECUS holds regular symposia, maintains a program library, publishes newsletters and symposia proceedings, and has a number of special interest and local subgroups.

Symposia—DECUS regularly schedules meetings of users in the United States, Canada, Europe, and Australia. Papers presented at these meetings are available to all members.

Program Library—This collection of programs submitted by users is available to all DECUS members. Last year, the library distributed over 80,000 programs.

Subgroups—Special interest groups focus on operating systems, languages, processors, and applications. There are also numerous local users groups.
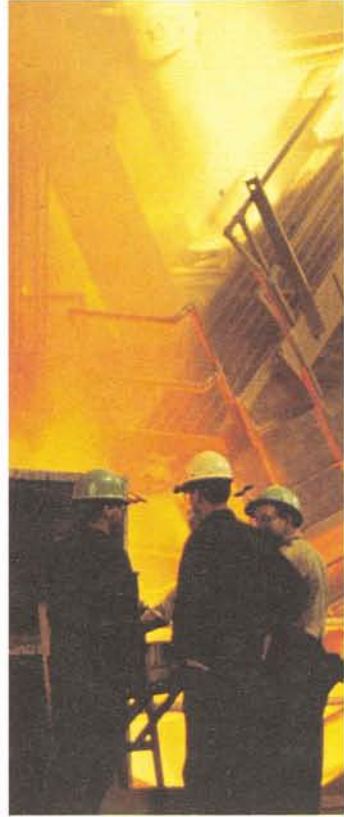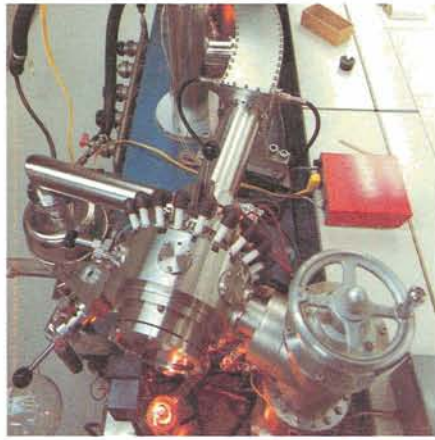
In Summary

What has been termed the minicomputer revolution came about for two reasons. The balance of minicomputer performance for the price has continually shifted in the customer's favor, and the sophistication of minicomputer systems has rapidly advanced.

The PDP-11 family of products represents the coming together of these two movements. Customers have been quick to realize that PDP-11s are a practical choice for more and more applications, often at enormous savings over alternate methods of solving the problem. Digital has been equally quick to develop tools to help customers accomplish this.

The result is over 50,000 PDP-11 installations crossing the spectrum of applications. With this much experience, and the unmatched range of PDP-11 products, we're ready to talk about the application that interests you.

digital