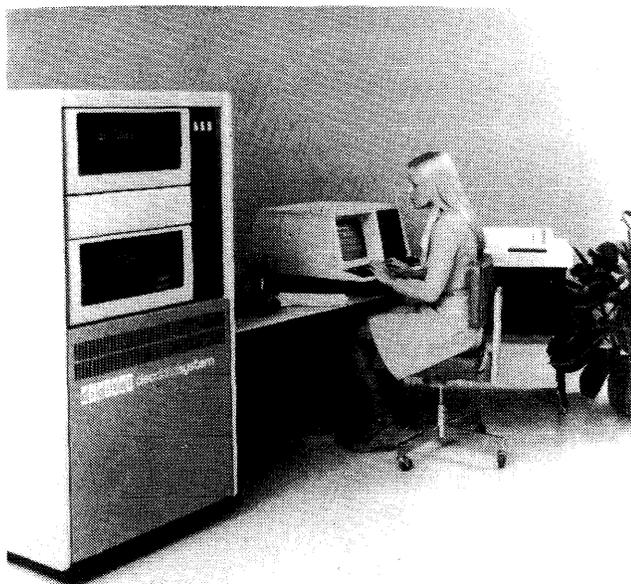


DEC Datasystem 500 Family



Utilizing the PDP-11/34 processor, this DEC Datasystem 530 offers the advantages of the CTS-500 software and supports a maximum of 32 terminals, 248K bytes of core memory, and up to 1.5 billion bytes of disk storage. Users can grow from the Datasystem 300 family into the Datasystem 530 and 570 systems without worrying about software compatibility, since DIBOL-11 is a standard language on all Datasystems.

MANAGEMENT SUMMARY

In August 1976, DEC reconfigured its existing Datasystem 500 family to reflect the company's current offerings in processors and peripheral subsystems. Gone are the Datasystem 540, 550, and 560 models, the PDP-11/40 and 11/45 processors, the RS03 fixed-head disk drive, and the RP03 and RP04 disk pack drives. Even the old hallmark terminal, the VT50 DECscope, has been replaced by the new VT52 DECscope, which boasts twice the screen capacity and a numeric keypad.

The Datasystem 500 family currently consists of four D530 models and two D570 models. The Datasystem 530 models are based on the DEC PDP-11/34 processor, which supports from 120K to 248K bytes of user core memory and a maximum of 32 terminals. The Datasystem 570 models are PDP-11/70-based, supporting from 248K to 3 million bytes of user core memory and a maximum of 63 terminals.

The current Datasystem 500 lineup is differentiated according to processors and standard disk drives, as follows:

- D532—PDP-11/34 and RP05 disk pack drives.
- D533—PDP-11/34 and RP06 disk pack drives.
- D534—PDP-11/34 and RK05 disk cartridge drives. ➤

The Datasystem 500 family represents the "heavy guns" among Digital's packaged systems. Offering up to 3 million bytes of core memory, 63 terminals, and 1.5 billion bytes of on-line disk storage, the D500 series (formerly known as the DS-500 series) features impressive growth potential. D500 systems are compatible with DEC's D320 and D350 systems through DIBOL-11, and offer COBOL, FORTRAN IV, BASIC-PLUS, RPG II, and Digital's DECform software, all running under the CTS-500 operating system on a PDP-11/70 or 11/34 processor.

CHARACTERISTICS

MANUFACTURER: Digital Equipment Corporation (DEC), 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111.

Digital Equipment Corporation (DEC) is the world's largest manufacturer of minicomputer systems. DEC's product lines include general-purpose computing systems, laboratory monitoring and control systems, process control systems, industrial control systems, editing and typesetting systems, and business computing systems. DEC maintains 125 sales and service offices in over 30 countries and has manufacturing facilities in Puerto Rico, Mexico, Canada, Ireland, Scotland, Hong Kong, and Taiwan in addition to six facilities in the U.S. The company employs 25,000 persons worldwide and has installed more than 65,000 computer systems.

VENDORS: Manufacturer and OEM suppliers. Contact DEC's Business Products Group to find the OEM supplier in your locale.

MODELS: D532, D533, D534, and D537 based on the PDP-11/34 processor; and Models D572 and D573 based on the PDP-11/70 processor.

DATA FORMATS

BASIC UNIT: 16-bit word plus two parity bits. The processor can also handle 8-bit bytes and is also capable of bit manipulation.

FIXED-POINT OPERANDS: 16-bit words or 8-bit bytes are used as operands in both single- and double-operand instructions. Bit manipulation is provided through Boolean AND/OR instructions.

FLOATING-POINT OPERANDS: None provided.

INSTRUCTIONS: All instructions are one word in length (16 bits). There are no decimal instructions in any PDP-11 processor; however, under the CTS-500 operating system, decimal pseudo-instructions have been implemented. Addressing in all PDP-11's is by byte. For all DS-500 models, the maximum directly addressable memory is 64K bytes, through the use of 16-bit internal registers. The addition of Memory Management increases the system memory limit to 248K bytes in the D530 models, and to 3 million bytes in the D570 models.

Eight address modes are provided with each operand address, consisting of three bits to specify address mode and ➤

DEC Datasystem 500 Family

CHARACTERISTICS OF THE DATASYSTEM 500 MODELS

MODEL*	D532	D533	D534	D537	D572	D573
Processor	PDP-11/34	PDP-11/34	PDP-11/34	PDP-11/34	PDP-11/70	PDP-11/70
Recommended No. of Terminals	Up to 13	Up to 13	Up to 13	Up to 13	Up to 50	Up to 50
Maximum No. of Terminals	32	32	32	32	63	63
Standard Disk	RP05 (88MB)	RP06 (176MB)	RK05 (4.8/7.2MB)	RK06 (14MB)	RP05 (88MB)	RP06 (176MB)
Memory (User):						
Type	Core	Core	Core	Core	Core/cache	Core/cache
Minimum (bytes)	120K	120K	120K	120K	248K	248K
Maximum (bytes)	248K	248K	248K	248K	3 million	3 million

*Two software options are available:

BASIC PACKAGE: CTS-500 Operating system and BASIC-PLUS Compiler.

EXTENDED PACKAGE: CTS-500 Operating system, BASIC-PLUS 2, FORTRAN, COBOL, RPG-II, DIBOL-II, and DECform compilers.

Line printers are optional and range from 180 cps to 1250 lpm.

- ● D537—PDP-11/34 and RK06 disk cartridge drives.
- D572—PDP-11/70 and RP05 disk pack drives.
- D573—PDP-11/70 and RP06 disk pack drives.

The basic packaged configuration of each Datasystem 500 model consists of either a PDP-11/34 processor with 128K bytes of core memory or a PDP-11/70 processor with 256K bytes, a basic disk subsystem with a storage capacity ranging from 4.8 megabytes to 176 megabytes, and one LA36 DECwriter.

The upper limits on Datasystem 500 equipment configurations are quite impressive. Both the D530 and D570 models can accommodate up to eight RK05 disk cartridge drives and eight RK06 dual disk cartridge drives, for a maximum of 1.5 billion bytes of disk storage. If printing is your forte, you can add up to eight LP11-RA printers rated at 1250 lpm each. Other configurable peripheral devices include the TUI6 and TUI0 reel-to-reel magnetic tape units, the CR11 and CD11-EA punched card readers, and additional VT52 DECscope and LA36 DECwriter terminals. Data communications options come in the form of single-line and multi-line interfaces and an IBM 2780 batch terminal emulator package.

The VT52 DECscope display terminal is an updated version of the VT50 offering a 1920-character screen and a numeric keypad that functions as a numeric entry device and can also be used with user software to provide a set of specialized functions.

The LA36 DECwriter provides hard-copy printing at 30 cps, using a 7-by-7 dot matrix printer. The LA36 features the full 96-character ASCII set and a paper adjustment that allows up to 5 carbon copies.

Users can intermix LA36 and VT52 terminals, since each terminal transmits an identifying code that enables the software to adapt to its specified characteristics.

- three bits to specify the register used to calculate the address. The modes consist of "Register" (operand in register), "Register Indirect" (operand address in register), "Auto Increment/Decrement Indirect" (self-incrementing/decrementing register which points to an address in memory), "Indexed," and "Indexed Indirect."

INTERNAL CODE: ASCII.

MAIN STORAGE

TYPE: Magnetic core.

CYCLE TIME: 1.0 microsecond per 16-bit word.

CAPACITY: A D530 series system's minimum memory size is 128K bytes (120K user), while its maximum memory size is 256K bytes (248K user). A D570 series system's minimum memory size is 256K bytes (248K user) while its maximum memory size is 3 million bytes, excluding cache memory.

CHECKING: A parity bit is standard with each word.

STORAGE PROTECTION: None, unless the memory map is considered. The process of mapping automatically protects storage.

RESERVED STORAGE: The uppermost 8K bytes are reserved for I/O registers.

CACHE MEMORY: A 240-nanosecond bipolar cache memory is provided with the PDP-11/70 CPU used in D570 series systems. This 2048-byte memory effectively reduces the main memory cycle time to less than 400 nanoseconds.

CENTRAL PROCESSORS

For specific information, please see Report M11-384-301.

GENERAL: The D530 series systems use TTL logic to achieve processor cycle times compatible with the core memory cycle time. The D570 series systems use Schottky logic, multilayer PC boards, and an additional bus to make their cycle times nearer to that of the various semiconductor memories available.

REGISTERS: D500 systems have eight user-accessible 16-bit registers (six general-purpose, one stack pointer, and one program counter), and one 16-bit processor status register. The general-purpose registers can be used as index registers,

DEC Datasystem 500 Family

PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION AND SPEED	MANUFACTURER
MAGNETIC TAPE	(8 maximum)	
TU16	Industry-compatible; 45-ips; 9-track; 800/1600 bpi; 72,000 cps maximum transfer rate; 12-inch reel	DEC
TU10	Industry-compatible; 45-ips; 7 or 9-track; up to 800 bpi; 36,000 cps maximum transfer rate; 12-inch reel	DEC
PRINTERS	(8 maximum)	
LA180	132 positions, 96 characters; 7 x 7 matrix; 180 cps	DEC
LP11-WA	132 positions, 96 characters; drum; 240 lpm	Dataproducts
LP11-SA	132 positions, 96 characters; drum; 925 lpm	Dataproducts
LP11-VA	132 positions, 64 characters; drum; 300 lpm	Dataproducts
LP11-RA	132 positions, 64 characters; drum; 1250 lpm	Dataproducts
CARD UNITS	(8 maximum)	
CR11	Card reader, 80-column; 300 cpm	Documation
CD11-EA	Card reader, 80-column; 1200 cpm	Documation
TERMINALS	(32 maximum on PDP-11/34, 63 maximum on PDP-11/70)	
VT52	DECscope, CRT/keyboard, 1920 characters, 80 characters by 24 lines, numeric keypad, direct cursor addressing, 64-character set; 9600 bps	DEC
LA36	DECwriter II, printer/keyboard, 132 positions, 96 characters, 7 x 7 dot matrix; 300 bps asynchronous, 30 cps print speed, 50 cps positioning speed	DEC

➤ The DEC Datasystems are sold as enhanced, packaged configurations of standard DEC minicomputer equipment plus an operating system and appropriate program development aids such as language processors, debug tools, utilities, edit-programs, etc. These systems are designed primarily for sale either to sophisticated end users or to "systems houses." A primary characteristic of both of these marketplaces is the ability to develop their own applications software, thus reducing the amount of hand-holding support needed directly from DEC. The DEC Datasystems are not turnkey systems dedicated to specific problem solutions with pre-programmed applications. Rather, applications programs must either be developed directly by the end user or prepared for him by a systems house.

The basic marketing strategy for DEC's D500 line is to promote the systems as alternatives to centralized computer facilities in large or geographically dispersed companies that have remote sites with either localized time-sharing requirements, numerous small-to-medium-scale data bases, or medium-scale batch processing requirements. A D500 system can be considered a centralized computing facility on its own merit for medium-sized companies or for divisions of larger companies, while at the same time maintaining contact with other systems in a network.

The Datasystems' Commercial Transaction System (CTS-500) is a multi-language operating system designed for business applications requiring large numbers of terminals, many simultaneous jobs, and on-line collection and retrieval of data. CTS-500 also offers data management services (DMS-500) to meet specific requirements ➤

➤ hardware stack pointers, or accumulators. In D530 series systems there are two stack pointers (kernel and user modes). D570 series systems have three stack pointers (kernel, user, and supervisor modes), plus a full duplicate set of general-purpose registers.

INDIRECT ADDRESSING: Single level is standard in all models.

INSTRUCTION REPERTOIRE: D530 models have 16 single-operand, 12 double-operand, 17 branch, 5 subroutine, 6 program control, 6 trap, 10 condition code operator and 3 miscellaneous instructions.

D570 models have 16 single-operand, 12 double-operand, 17 branch, 5 subroutine, 2 program control, 6 trap, 10 condition code operator, and 7 miscellaneous instructions.

INSTRUCTION TIMINGS: All times are machine timings for full-word, fixed-point operands, in *microseconds*.

Instruction	D530 Models	D570 Models
Load/Store	2.3	0.95/1.4
Add/Subtract	N/A	0.40
Multiply/Divide	8.8/12.5	3.4/7.9
Branch/No Branch	2.2/1.76	0.4/0.7

INTERRUPTS: Four-level automatic priority interrupt system, plus seven additional software-supported levels of interrupts for all models. Each of the interrupt levels can attach multiple, independently prioritized peripheral devices.

PHYSICAL SPECIFICATIONS: All Datasystem 500's are 50 inches high and 30 inches deep. The D530 systems are 22 inches wide and weigh 330 pounds, while the D570 systems are 44 inches wide and weigh 660 pounds. All systems require 115 VAC, 60 Hz (or 230 VAC, 50 Hz) power with a voltage tolerance of +10 percent. The operating temperature range for all Datasystem 500's is 65 to 75 degrees Fahrenheit. ➤

DEC Datasystem 500 Family

MASS STORAGE DEVICES

MODEL	DESCRIPTION*	CAPACITY/DRIVE	AVERAGE ACCESS TIME
RX11	Dual floppy disk drives, 55,600 bytes/second transfer rate	256,256 bytes each	357 milliseconds
RK05J	Disk cartridge drive (removable single disk), 180,000 bytes/second transfer rate	2.4 megabytes	70 milliseconds
RK05F	Disk cartridge drive (fixed single disk), 180,000 bytes/second transfer rate. (Each drive counts as two drives when configuring)	4.8 megabytes	70 milliseconds
RK06	Disk cartridge drive (removable double disk pack), 538,000 bytes/second transfer rate	14 megabytes	50.5 milliseconds
RP05	Disk pack drive (10 platters in a removable pack), 806,000 bytes/second transfer rate	88 megabytes	36.3 milliseconds
RP06	Disk pack drive (10 platters in a removable pack), 806,000 bytes/second transfer rate	176 megabytes	36.3 milliseconds

*All disk subsystems are manufactured by DEC.

▷ of on-line access to data stored for interactive data processing applications, allowing indexed random, indexed sequential, and relative access file structures. DEC-FORM is a group of utility programs designed for screen formatting, data entry, and file review operations, and is compatible with the CTS-300 version used on the Datasystem 320 and 350 models.

In addition, CTS-500 provides concurrent batch processing with on-line transaction processing, on-line program development, file maintenance utilities, and "Big Block Send and Receive," which allows 256 words (512 bytes) of data to be transmitted from one program to another. The idea here is to allow specific routines to be shared by other programs. For example, no matter how many jobs are running, the user may need only one disk accessing routine and one screen formatting routine. The other user programs can send data to those routines and receive responses, thus eliminating the need for every job to have its own disk accessing software. A better term might be "software resource sharing."

The original DEC Datasystem 500 line, introduced in February 1972, included the DS-520 for batch data processing, the DS-700 series for 16- or 32-user time-sharing, and the DS-800 series for processing data bases of up to 10 million bytes. The 520 and 700 used the PDP-11/20 as their base processor, while the 800 series used the PDP-11/15.

A significant upgrading of the Datasystem 500 family occurred in July 1973, when the original Model 520 was replaced by the Model 530. (The 520's PDP-11/20 is no longer manufactured.) This system for batch or time-shared operations was based on the more powerful PDP-11/40. At the same time, the DS-700 and 800 systems were replaced by the Models 540, 550, and 560. The 540 was also based on the 11/40, differing from the 530 only by the addition of the memory management feature, while the 550 and 560 models used the PDP-11/45. (The 800's PDP-11/15 is likewise no longer manufactured.) ▷

▶ INPUT/OUTPUT CONTROL

UNIBUS: All Datasystem 500's have a single column Unibus that treats all components or modules of a system as equal-level devices for data access/transfers, including the processor, memory modules, and peripherals. The priority of any device connected to the busses is determined by its physical position, and the processor is normally attached so that it has the highest priority.

There is no logical limit to the number of device attachments that can be made to the Unibus, with bus access and control handled by the interrupt system. The maximum Unibus data transfer rate is 2.5 million words/second, and it always operates in a master/slave manner.

32-BIT BUS: In addition to a standard Unibus, a special expanded-capability bus has been added to the PDP-11/70 (the base of the D570 systems). This bus is not accessible to normal programming needs such as loading registers, etc., but only to DMA transfers between cache memory and mass storage peripherals. Only special high-speed controllers interface this special bus, which handles four eight-bit bytes per transfer.

CONFIGURATION RULES: There is only one real limit upon D500 system configuration—the length of the Unibus—and that limit is such that any system approaching the maximum length would contain more equipment than is found in even the largest business systems or could be driven by existing programming. The Unibus can be expanded in groups of 19 units (20 minus one for connections), and the signals repowered through bus repeaters and additional power supplies. In general, each device that ties into the Unibus imposes one load per slot that it occupies. (That is, a one-card controller usually is one load and a two-card controller is two loads.) Each block, then, can handle 19 loads and 50 feet of cabling. Each repeater drives an additional 19 loads and 50 feet of cabling.

System expansion is accomplished through BA11-F expansion boxes which contain space for up to nine mounting panels called system units, plus a power supply. There are two types of system units available, one for CPU's, memories, etc., and one for peripheral controllers. Systems are configured by interconnecting the system units to form the necessary number of slots needed for the components. Each system unit contains 20 slots into which modules are inserted, some requiring up to six slots. ▶

DEC Datasystem 500 Family

▷ The major difference between a 560 and a 540 or 550 was in memory makeup. The latter models had 64K bytes of core installed, while the 560 had 32K bytes of core and 32K bytes of MOS memory.

The DS-570, introduced in February 1973, was based on the PDP-11/70 processor, introduced at the same time. With the DS-570 came the 240-nanosecond cache memory, memory mapping without overhead, and the special 32-bit data bus for high-speed DMA transfers.

A detailed description of the entire DEC PDP-11 family, which forms the hardware basis for all of the Datasystem 500's, is contained in Report M11-384-301.

A typical D570 system includes 384K bytes of core memory, two 300-lpm printers, two 88-million-byte disk drives, ten DECscope CRT's, five DECwriter printing terminals, one 9-track magnetic tape drive, and a communications interface, and sells for about \$250,000. A typical D530 system includes 256K bytes of core memory, one 300-lpm printer, three 14-million-byte disk drives, four DECscope CRT's, two DECwriter printing terminals, and a communications interface, and costs about \$115,000. For a more "in-depth" listing of the Datasystem 500 peripherals, mass storage, and pricing, please see the tables and price list in this report.

From a competitive standpoint, DEC expects to find Hewlett-Packard, IBM, and Data General among those on the battlefield. DEC's version of RPG II is said to be "99 percent compatible" with IBM's System/3 Model 10 RPG on a source level. In addition, DEC RPG II offers some additional features, such as the support of terminals as I/O devices.

Probably the greatest strength of the Datasystem 500 family is its growth potential. With DIBOL-11 as the common language among all Datasystems, including the smaller D322, and with COBOL, FORTRAN IV, RPG, and BASIC-PLUS 2 compilers, DEC isn't giving its users a reason for switching to a competitor because of software limitations. And with a top end of 3 million bytes of core memory, 1.5 billion bytes of disk, and 63 terminals, there should be little justification for switching because of insufficient hardware capabilities.

USER REACTION

Datapro contacted three Datasystem 500 users. These users had a total of 11 systems installed, and had been using them for an average of 20 months. The largest system in our survey consisted of a PDP-11/70 processor with half a million bytes of core memory, 440 million bytes of disk storage, 48 data communications lines, one 1600-bpi tape drive, and one 300-lpm printer. This system used a total of 48 terminals, of which half were from DEC and the other half from other manufacturers.

Applications included time-sharing services, software development, accounting, medical research, production control, sales analysis, and inventory control. All of the ▷

▶ Each expansion box contains space for nine system units, but each cabinet has space for only one expansion box.

All D500 models are supplied with sufficient cabinets, mounting chassis, power supplies, and Bus Repeaters to enable the maximum configuration to be implemented without difficulty. The D530 series processor is in one cabinet and will support up to 128K bytes of core memory, any of six peripheral device combinations, and up to four communications lines. This processor includes an expander cabinet and will accommodate up to 248K bytes of main memory, any of six peripheral device combinations, and up to four communications lines. The D570 systems include 128K bytes of core memory and expansion facilities for up to 3 million bytes plus peripherals. In D500 systems requiring 5 to 32 lines for communications (or up to 63 lines for the D570 models), a separate cabinet is supplied for the purpose.

In D570 systems, optional 32-bit high-speed I/O controllers (limited to four per system) can be used with the RK05 (fixed-head swapping disk) and 1600 bpi (fast) magnetic tape units.

SIMULTANEOUS OPERATIONS: Overlapped instruction execution and memory access are provided. The D570 models, with their cache memory system, do not require interleaving for greater effective speed. Instead of accessing alternate memories, they transfer three extra bytes into cache memory each time a location is read from main memory. DMA I/O operations are concurrent with processing and with one another.

MASS STORAGE

RX11 FLOPPY DISK: The RX11 is a flexible disk drive with a capacity of 256,256 bytes per drive. Up to two drives per controller can be configured. Average access time is 357 milliseconds; rotational speed is 360 rpm, yielding an average rotational delay of 83 milliseconds. A track-to-track move takes at least 10 milliseconds. The surface of the diskette is divided into 77 tracks, each with 26 sectors. The RX11 floppy disk drive is manufactured by DEC.

RK05 CARTRIDGE DISK DRIVES: There are two versions currently available, the RK05J and the RK05F. The RK05J is a removable cartridge disk drive with a capacity of 2.4 million bytes of data, while the RK05F is a fixed-disk unit offering 4.8 million bytes. Each RK05F is counted as two disk drives when configuring systems.

The D534 system is offered with a choice of either two RK05J drives (4.8 million bytes total), or one RK05J and one RK05F (7.2 million bytes total). The system can support a maximum of eight logical drives (19.2 million bytes). The drive types can be intermixed, but there must be at least one removable disk in the system.

Data is recorded on both sides of a single disk contained in an IBM 2315-style, front-loading cartridge. There are either 203 (RK05J) or 406 (RK05F) tracks where data is recorded in 12 sectors of 512 bytes each. Head movement time is 10 milliseconds for a single-track move, 85 milliseconds for a 200-track move, and 50 milliseconds average. The rotational delay averages 20 milliseconds. Data transfer rate is 180K bytes per second. The subsystem is manufactured by DEC.

RK06 CARTRIDGE DISK DRIVE: A removable cartridge disk drive used with the D537 system. Up to eight drives can be attached to an RK611 controller. Data is recorded on two disks contained in an IBM 5440-style top-loading cartridge. There are 200 tracks per inch, with 22 sectors per track and 512 bytes per sector. Each drive has a capacity of 14 million bytes, with subsystem expansion capabilities ranging to a maximum of 112 million bytes for eight drives. Average head positioning time is 38 milliseconds, and average rota- ▶

DEC Datasystem 500 Family

➤ systems were being used for multi-terminal, interactive processing. Many of them served over 100 terminals worldwide, including 30 to 40 local terminals.

The ratings assigned by these users are shown in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	0	0	0	4.0
Reliability of mainframe	3	0	0	0	4.0
Reliability of peripherals	2	1	0	0	3.7
Maintenance service:					
Responsiveness	2	1	0	0	3.7
Effectiveness	1	2	0	0	3.3
Technical support	1	0	2	0	2.7
Manufacturer's software:					
Operating system	3	0	0	0	4.0
Compilers and assemblers	1	1	0	0	3.5
Ease of programming	1	2	0	0	3.3
Ease of conversion	0	2	0	0	3.0
Overall satisfaction	2	1	0	0	3.7

*Weighted Average on a scale of 4.0 for Excellent.

As evidenced by the ratings they assigned, these users were impressed with their Datasystem 500's. One user rated his systems excellent in all respects (although, as a first-time computer user, he declined to comment on ease of conversion). Some noteworthy positive comments from the users included: "The operating system is easy to work with"; "I've only had 4.5 hours of down-time in two years"; "The equipment is extremely reliable"; and "Our system didn't go down until over two years after it was installed."

On the negative side, two users rated DEC's technical support as only fair. Both of these users said that they felt that the applications software support could be better. In one case the user specifically cited "worldwide software support" as a weakness, since he had systems in the U.S., Canada, and Australia. One user also stated that his printer was "mediocre," and that one tape drive had burned up a vacuum pump motor.

With an overall satisfaction rating of 3.7, it is obvious that there were not many complaints. The Datasystem 500's seem to combine reliability with workable software, and this is what users want most. The Datasystem 500 family appears capable of supporting the needs of most time-sharing users. With the hardware expansion potential and choices of programming languages it offers, the Datasystem 500 product line is a formidable opponent for competitive systems. □

➤ tional delay is 12.5 milliseconds, for an average access time of 50.5 milliseconds. Data transfer rate is 538,000 bytes per second. The subsystem is manufactured by DEC.

RP05 DISK PACK DRIVE: An IBM 3330-type unit used with the D532 and D572 systems. Up to eight drives can be attached to an RJP05 controller. Data is recorded on 19 of 20 surfaces contained in an IBM 3336-type disk pack. There are 411 tracks per surface, 22 sectors per track, and 512 bytes per sector, for a capacity of 88 million bytes per track.

A maximum configuration of eight RP05 drives provides just under 704 million bytes. Average head positioning time

is 28 milliseconds, and average rotational delay is 8.3 milliseconds, for an average access time of 36.3 milliseconds. Data transfer rate is 806,000 bytes per second. RP05 drives can be upgraded in the field to RP06 drives. The RP05 is manufactured by DEC.

RP06 DISK PACK DRIVE: A double-density version of the RP05 drives used with the D533 and D537 systems. The RP06 uses IBM 3336 Model 11-type disk packs, recording data on 19 of 20 surfaces. There are 815 tracks per surface, 22 sectors per track, and 512 bytes per sector, for a capacity of 176 million bytes per pack. A maximum configuration of eight drives yields 1.408 billion bytes of storage. Average head positioning time is 28 milliseconds, and average rotational delay is 8.3 milliseconds, for an average access time of 36.3 milliseconds. Data transfer rate is 806,000 bytes per second. The RP06 is manufactured by DEC.

INPUT/OUTPUT UNITS

Please refer to the Peripherals/Terminals table on page M11-385-403.

COMMUNICATIONS CONTROL

A communications option is available to provide an interface to DEC and non-DEC computers. Both single- and multiple-line interfaces are offered for local and remote communications. Utilizing both synchronous and asynchronous connections, these interfaces provide services such as:

- Programmable speeds and formats.
- 20-mA and EIA modem control.
- Dial-up characteristics.
- Program-selectable features (such as full- or half-duplex operation).
- Speeds up to 9600 bits/second.

Remote data communication with other computer systems can be done on a D500 through the CTS-500 IBM 2780 emulator option. Operating concurrently with the execution of user programs, the 2780 hardware/software packages permits on-site processing and RJE compatibility with an IBM 2780 Model 1 Data Transmission Terminal. Other features include:

- Automatic answering of incoming calls.
- Interactive mode for direct control of files by a system operator.
- Data transmission rates up to 4800 bits/second.

DECNET is a programming tool which allows interconnection of other Digital computer systems in a network and provides the ability to communicate with other mainframes using industry-compatible protocols. Networks under DECNET usually fall into one of three categories:

- Communications networks to move data from one location to another.
- Distributed computing networks to coordinate the activities of several independent systems.
- Resource-sharing networks.

SOFTWARE

OPERATING SYSTEM: CTS-500 (Commerical Transaction System) supports up to 32 jobs on a D530 and up to 63 jobs on a D570. This disk-resident operating system is an enhanced version of the earlier CTS-500/E operating system. Available with CTS-500 is an impressive group of compilers: DIBOL-11, COBOL, FORTRAN IV, BASIC-PLUS 2, RPG II, and DECFORM. CTS-500 offers interactive or batch processing, and allows sequential, indexed sequential, or random access to files. According to DEC, CTS-500 was designed for business applications requiring large numbers

DEC Datasystem 500 Family

► of terminal users, many simultaneous jobs, and high-volume on-line collection of data.

DMS-500 (Data Management System) is included in CTS-500 to meet specific requirements for on-line access to data stored for interactive data processing applications. DMS-500 (a group of modules) provides general methods for organizing and processing logical data records stored in indexed random, indexed sequential, and relative access file structures. Included is a disk sort utility for sequencing large multi-volume files.

CTS-500 also offers concurrent batch processing with on-line transaction processing, on-line program development, and a variety of housekeeping utilities.

"Big Block Send and Receive" is available with CTS-500. The maximum number of bytes that can be transferred in a block is 512 bytes. The purpose is to allow one specialized program or group of programs to be shared. For example, one program group would handle screen I/O, another might handle disk access, and still another might handle other tasks. By swapping information back and forth, each job could share programming expertise while cutting down on the total memory requirements.

LANGUAGES: CTS-500 supports compilers for the following programming languages.

COBOL can be run in a conversational remote job entry mode simultaneously with several interactive BASIC-PLUS jobs. Both can access the same sequential files. This allows the user to create files interactively using BASIC-PLUS and then process that data in conversational remote job entry mode, through COBOL. Under CTS-500 the COBOL compiler requires an average of 40K to 48K bytes of memory to compile and execute all elements of the COBOL language. Because of COBOL's interpretive architecture, the program size is almost unlimited. The procedure division resides in virtual memory as a string of blocks that are called in as needed.

FORTRAN IV is available on all Datasystems in the 500 series. It has been used mostly in problem-solving areas, although process control, information retrieval, and commercial data processing programs are sometimes written in FORTRAN.

BASIC-PLUS 2 is said to be from two to three times faster than the former BASIC-PLUS language. There are also some other enhancements, such as expansion of variable names to 30 characters. According to DEC, BASIC-PLUS 2 is still interactive, but more commercially oriented than its predecessor. It also features the CALL statement found in BASIC-11, and is compatible with other DEC debugging aids such as breakpoints, step mode, and change of variables. Other important features of BASIC-PLUS 2 include support for block-mode terminals and a decimal arithmetic package.

The Datasystem 500 version of *RPG II* is said to be 99% source-code compatible with the RPG II that is used on the IBM System 3 Model 10. In addition, the DEC version offers extensions such as the use of terminals as I/O devices.

DIBOL-11 is an enhanced version of the DIBOL language that was available on the Datasystem 340 and other DEC computers. DIBOL-11 provides software compatibility throughout the Datasystem family, from the 322 to 573. The Datasystem 310 can be included in this family through the use of DITRAN, which translates DIBOL-8 into DIBOL-11, thereby providing the multi-user programming elements that allow several application programs to run simultaneously.

DECFORM is a generative programming aid that allows a customer to tailor screen formatting, file interaction, and editing procedures. DECFORM is capable of screen formatting, checking, prompting, file examination with update, and inquiring. DECFORM runs under both CTS-500 and CTS-300 (for Datasystem 300's), and is available on all Datasystems except the D310.

There are five basic tasks that can be performed:

- Add—for basic data entry.
- Inquiry—for examination without change.
- Change—for file maintenance.
- Verify—pre-selected fields may be re-keyed.
- Delete (not available for sequential files).

Screen formatting is simply a matter of building a table describing field size, field name, horizontal position, and vertical position for each field on the screen that is desired. This table is passed over to the DECFORM compiler along with the name of the file to be accessed. The DECFORM compiler then generates a DIBOL-11 program. Formats can be divided into multiple screens to allow for more logical layouts and to eliminate crowding. Provisions are also made for passwords and other security procedures as well as format menus. Once the format is displayed, the operator may begin keying in data. Prompting and error messages are also displayed.

Editing functions of DECFORM include: display leading zeros, stop after every field is entered, retain previous screen when starting a new record, override checks through special characters, automatic duplication of fields, automatic incrementing of fields, establish initial values for fields, check digits, perform arithmetic functions (extensions, taxes, etc.), hide a field, and list running totals.

The following checks are available in DECFORM: alphanumeric, numeric, field required, field must be filled, constant insertion, range checks on numeric fields, table look-up, cross field comparisons, field protection (unalterable), subfield checking to individual character level, and data retrieval from other files. According to DEC, it is possible to use the above procedures to extend, discount, and tax an invoice while pulling alphanumeric descriptions from a table.

DITRAN, a recent software offering of the Digital Equipment Computer Users Society (DECUS), is a translator that converts DIBOL-8 into DIBOL-11. This enables users of the DEC PDP-8-based Datasystem 310 to convert to a larger Datasystem with a minimum of effort. Since DITRAN is not provided by DEC, the company offers no guarantees, and may not officially support DITRAN.

APPLICATION SOFTWARE: All applications software must be developed either by the user or by a systems house. DEC doesn't directly provide application packages at this time.

PRICING

POLICY: The DEC Datasystems are available for purchase or on third-party, full-payout leases for one-, three-, and five-year terms (arranged by DEC through Digital Leasing, a joint venture with U.S. Leasing Corporation).

The CTS-500 operating system is only available as part of a Datasystem configuration, not separately.

SUPPORT: Separately priced hardware maintenance by DEC is available through a worldwide field support force of more than 2,500. Purchase of a Datasystem generally includes full installation/setup of the hardware and desired operating system. ►

DEC Datasystem 500 Family

► Software support is available in two categories: license-only or continuing software updating. Prices quoted in this report reflect continuing software updating.

EQUIPMENT: The following typical system purchase prices include all controllers, adapters, and the CTS-500 software.

D530 Typical System: Includes PDP-11/34 processor with 256K bytes of core memory, three RK06 disk cartridge drives with a capacity of 14 million bytes each, one LP11-VA line printer rated at 300 lpm, four VT52

DECscopes, two LA36 DECwriters, and one communications interface. Purchase price is approximately \$115,000 including installation and software licensing.

D570 Typical System: Includes PDP-11/70 processor with 384K bytes of core memory, two RP05 disk pack drives with a total capacity of 88 million bytes each, two LP11-VA line printers rated at 300 lpm each, ten VT52 DECscopes, five LA36 DECwriters, one communications interface, and one TU10 9-track tape drive. Purchase price is approximately \$250,000 including installation and software licensing. ■

EQUIPMENT PRICES

		Purchase Price*	Purchase Price**	Monthly Maint.
DATASYSTEM 500 BASIC UNITS				
D532	PDP-11/34 processor, 128K bytes of core memory, one RP05 disk pack drive (88 million bytes), one LA36 DECwriter	\$ 77,430	\$ 85,130	\$401
D533	PDP-11/34 processor, 128K bytes of core memory, one RP06 disk pack drive (176 million bytes), one LA36 DECwriter	82,680	90,380	401
D534	PDP-11/34 processor, 128K bytes of core memory, two RK05J or one RK05J and one RK05F disk cartridge drives (4.8 or 7.2 million bytes, respectively), one LA36 DECwriter	50,070	58,360	295
D537	PDP-11/34 processor, 128K bytes of core memory, one RK06 disk cartridge drive (14 million bytes), one LA36 DECwriter	53,480	61,180	288
D572	PDP-11/70 processor, 256K bytes of parity core memory, 2K bytes of cache memory, one RP05 disk pack drive (88 million bytes), one LA36 DECwriter	126,280	133,980	537
D573	PDP-11/70 processor, 256K bytes of parity core memory, 2K bytes of cache memory, one RP06 disk pack drive (176 million bytes), one LA36 DECwriter	131,530	139,230	537
* Price includes CTS-500 operating system and BASIC-PLUS compiler.				
**Price includes CTS-500 operating system, BASIC-PLUS 2, FORTRAN, COBOL, DIBOL-II, RPG-II, and DECform compilers.				
Memory sizes include 8K bytes used for I/O registers. (Subtract 8K bytes for user memory size.)				
			Purchase Price	Monthly Maint.
MEMORY FOR PDP-11/34 (D530 SERIES)				
MM11-DP	32K bytes of core memory		3,530	25
MEMORY FOR PDP-11/70 (D570 SERIES)				
MJ11-BA	128K-byte parity core memory unit; includes frame, power supplies, and control; expandable to 512K bytes by the addition of three MJ11-BE's		18,590	70
MJ11-BE	128K-byte parity expander core memory		11,550	60
MJ11-BG	512K-byte parity core memory expansion unit; includes power supplies, control, and frame		53,240	250
MASS STORAGE				
RX11	Dual floppy disk drive; 256,256 bytes each, 10K bytes/sec transfer rate, 357-msec average access time		4,300	33
RK05J	2.4-megabyte removable disk cartridge drive, 180K bytes/sec transfer rate, 70-msec average access time		5,600	39
RK05F	4.8-megabyte non-removable disk drive, 180K bytes/sec transfer rate, 70-msec average access time		6,200	54
RK06-EA	Single-access 14-megabyte disk cartridge drive, 538K bytes/sec transfer rate, 50.5-msec average access time		10,450	78
RK06-FA	Dual-access 14-megabyte disk cartridge drive, 538K bytes/sec transfer rate, 50.5-msec average access time		13,200	88
RP05-AA	Single-access 88-megabyte disk pack drive, 806K bytes/sec transfer rate, 36.3-msec average access time; field upgradable to the RP06		31,400	190
RP05-BA	Dual-access 88-megabyte disk pack drive, 806K bytes/sec transfer rate, 36.3-msec average access time; field upgradable to the RP06		36,540	210
RP06-AA	Single-access 176-megabyte disk pack drive, 806K bytes/sec transfer rate, 36.3-msec average access time		36,650	190
RP06-BA	Dual-access 176-megabyte disk pack drive, 806K bytes/sec transfer rate, 36.3-msec average access time		41,790	210
MAGNETIC TAPE EQUIPMENT				
TU16	Industry-compatible tape unit; 45 inches/second; 9-track; 800/1600 bpi; 7200 cps transfer rate; 12-inch reel		11,290	60
TU10	Industry-compatible tape unit; 45 inches/second; 7 or 9-track; up to 800 bpi; 3600 cps transfer rate; 12-inch reel		12,180	74
CARD UNITS				
CR11	Card reader, 80-column; 300 cpm		6,170	53
CR11-EA	Card reader, 80-column; 1200 cpm		19,250	95
PRINTERS				
LA180	132 positions; 96 characters; 7 x 7 matrix; 180 cps		3,770	55
LP11-WA	132 positions; 96 characters; drum; 240 lpm		14,050	72
LP11-VA	132 positions; 64 characters; drum; 300 lpm		11,800	72
LP11-SA	132 positions; 96 characters; drum; 925 lpm		42,900	154
LP11-RA	132 positions; 64 characters; drum; 1250 lpm		38,470	154
TERMINALS				
VT52	DECscope CRT/keyboard; 1920 characters; numeric keypad; direct cursor addressing; 64-char. set; 9600 bps		2,200	20
LA36	DECwriter II printer/keyboard; 132 positions; 96-char. set; 7 x 7 dot matrix; 300 bps		2,470	19