Digital Equipment DECsystem-20
NEW PRODUCT ANNOUNCEMENT

The DECsystem-20, announced by Digital Equipment Corporation in January 1976, represents a move by DEC both to consolidate its own product line of minicomputers and the DECsystem-10 family of general-purpose computer systems, and to stregthen its position in the general-purpose computer marketplace. Introduced as the "bridge" computer, the DECsystem-20 occupies a position—in terms of price, performance, and functional capability—squarely between the PDP-11/70, the largest system in DEC's populous PDD-11 product line, and the 1060, 1080, and 1088 systems, the currently marketed processor models in the DECsystem-10 series of large-scale general-purpose computers.

Purchase prices for the new system will range from an entry-level price of $250,000 to about $400,000, with the majority of typical configurations expected to fall in the $350,000 price range. DEC is promoting the system as a medium-scale computer that offers large-scale features and is available at small-computer prices. According to DEC, the DECsystem-20 can exceed the performance of a System/370 Model 145 at prices in the System/370 Model 115 to Model 125 price range. Targeted markets include educational institutions, municipal governments, commercial installations with on-line transaction and data base requirements, and engineering computing departments.

The new Model 2040 central processor uses emitter-coupled logic (ECL) circuitry and has a subset of the DECsystem-10 instruction repertoire, including a Business Instruction Set with editing and character-handling capabilities. The major architectural innovation in the design of the 2040 processor is its packaging. The central processor, core memory, high-speed data channels, and controllers for up to eight disk drives and eight magnetic tape units are all housed in a single unit that requires an estimated 28 square feet of floor space. The initital version of the DECsystem-20 now being marketed includes a maximum of four magnetic tape units and four disk drives; support for the maximum complement of eight tape units and eight disk drives is scheduled for release by the end of the year. Each integrated I/O controller has a separate path to main memory, permitting concurrent input/output operations on two separate controllers. The maximum input/output bandwidth of the system is estimated at over seven million bytes per second.

The central processor has a capacity of from 64K to 256K 37-bit words (36 data bits plus one parity bit per word), with a cycle time of 1.28 microseconds. In addition two- or four-way interleaving can be inititated at system start-up through software-settable switches, providing a memory data transfer rate of over seven million bytes per second when the full four-way interleaving capabilities are invoked.

Like the larger DECsystem-10 models, the DECsystem-20 includes a PDP-11/40 minicomputer, but its functions have been enhanced beyond those of performing as a console and diagnostic computer. The PDP-11/40 front-end processor in the DECsystem-20 is equipped with 28K 18-bit words (16 data bits plus two parity bits) of core memory with a cycle time of 980 nanoseconds; it operates under control of the RSX-20F operating system to control all unit record equipment and communications lines, as well as performing system console functions. The PDP-11/40 also monitors the data paths and control logic of the central processor and includes facilities for remote and time-shared diagnostic procedures. Initialization of the main 2040 processor is also performed by the PDP-11/40.

The DECsystem-20 will run under control of a new operating system designated TOPS-20, which is based on the TENEX operating system developed specifically for the DECsystem-10's in the Department of Defense ARPA network. According to DEC, the TENEX operating system was selected as the basis for the DECsystem-20 system software because of its superior virtual memory management capabilities and its newer modular structure which makes it easier to modify and maintain. To the Basic TENEX structure, DEC has added some of the batch and time-sharing functions supported by the DECsystem-10 to provide software support for concurrent batch, time-sharing, and transaction processing.

The TOPS-20 operating system supports a user virtual memory environment of 256K 36-bit words, which is demand-paged in pages of 512 words each. The operating system also includes a new centralized file management system that provides for automatic allocation of disk space to user files and concurrent updating of files by multiple user programs. Centralized file operations and password file protection are also supported.

The TOPS-20 command language include facilities for both multistream batch processing and for time-sharing operations, including program creation, compilation, execution, debugging, and deletion of programs and their data. In addition, the TOPS-20 EDIT program provides powerful ▷

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line-oriented file editing capabilities, with some additional facilities for string searches, string replacement, and other advanced editing operations. A macro-based two-pass assembler language, called TOPS-20 MACRO, includes support for writing re-entrant code, a symbolic interactive debugging facility, and extensive pseudo operations. The TOPS-20 LINK utility provides sophisticated linking overlay loading., including tree-structured and relocatable overlays for programs written in the MACRO assembly language and other higher-level languages. Programming language support for the DECsystem-20 includes an ALGOL language based on ALGOL-60, APL, BASIC, a superset of ANS FORTRAN, and a COBOL compiler which includes facilities for on-line editing and debugging and its own SORT program. For data base management applications, DEC is providing a CODASYL-based DECsystem-20 Data Base Management System which includes a Data Manipulation Language for both COBOL and FORTRAN programs.

As a "bridge" computer, the DECsystem-20 has been designed to meet two important objectives. The first is to make available the large-system batch, time-sharing and transaction processing capabilities for scientific and commercial environments at a total system rental price of under $10,000 per month. DEC believes that a large potential market exists for its new system among commercial, scientific, education, and engineering customers, without necessitating a direct marketing compaign against IBM to capture the traditional batch processing shops.

The second important objective of the DECsystem-20 is to provide an upgrade system for DEC's numerous PDP-11 customers, particularly the top-end PDP-11/70 systems with purchase prices of up to $250,000 for large single-processor configurations. Compatibility between the 16-bit PDP-11 and the 36-bit PDP-20 architecuture will be provided primarily through software. The TOPS-20 command language currently provides a high degree of compatibility with the PDP-11/70 IAS command language. Full equivalency of command languages is expected to be achieved with the release of DEC's Integrated Command Language, a new job control language that is planned to provide compatibility across the entire DEC product line. In addition, subsequent releases of the BASIC language for the DECsystem-20 will be fully compatible with RSTS BASIC PLUS, the most widely used language on PDP-11 systems. DEC also plans a full implementation of the DECNET system to support the DECsystem-20 in network applications, Moreover, DEC states that it expects to provide simulators for executing PDP-11 assembly language programs on the PDP-20.

The DECsystem-20 joins the larger and more expensive DECsystem-10 as the systems with which DEC intends to expand its penetration into selected areas of the general-purpose computing marketplace, and the company states that it intends to add new models at both the upper and lower ends of the DECsystem-20 performance range to expand the system into a family of computers that eventually will displace the KI 10 processor-based models of the DECsystem-10 series. Customer deliveries of the DECsystem-20 began in February 1976. □

EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance 8-Hour	Monthly Maintenance 12-Hour
2040	Basic System Package; includes central processor, 64K words of main memory, one RP04-B disk drive, one TU45 magnetic tape drive, eight asynchronous communications lines, LA36-C console terminal, and system software package	250,000	1,603	1,811
MA20-A	32K basic memory module (for expansion beyond 128K; maximum of two per system)	24,500	130	147
MA20-E	32K expansion module for MA20-A (three per MA20-A)	10,000	100	113
RP04-A	Add-on disk drive, 20M words, single access; includes one RP04 disk pack	25,900	190	215
TU45B	Magnetic tape unit and control (maximum of two per system)	24,000	180	203
TU45	Add-on magnetic tape drive (maximum of three per TU45B)	14,000	120	136
CD20-A	Card reader; 300 cpm, table model	5,100	66	75
CD20-B	Card reader; 1200 cpm, console model	15,900	100	113
LP20-A	Line printer; 300 lpm, 64-character set	20,500	160	181
LP20-B	Line printer; 230 lpm, 96-character set	21,500	160	181
LP20-F	Line printer; 1200 lpm, 64-character set	44,000	260	294
LP20-H	Line Printer; 925 lpm, 96-character set	46,000	260	294
DC20-AA	Basic single-line communications group (maximum of four per system)	4,800	70	79
DC20-DA	Eight-line expansion (maximum of four per system)	1,200	60	68
H313-A	Single-line current loop interface	270	5	6

SOFTWARE PRICES

		One-Time License Fee	Annual Update Fee
QT001	FORTRAN	7,500	750
QT002	ALGOL	7,500	750
QT003	COBOL	7,500	750
QT004	BASIC	5,000	NA
QT005	APL Basic Package	7,500	750
QT006	APL Extended	19,500	1,500
QT007	Sort	2,500	250
QT008	Data Base Management System	25,000	2,500
QT009	CPL	5,000	500