

Unisys A 10

MANAGEMENT SUMMARY

Unisys Corporation added the single-processor Models DX and FX and the dual-processor Model HX to the A 10 System of medium-scale mainframes. The three new models operate exclusively with the MCP/AS operating system and will replace the older A 10 Models D, F, and H. According to the vendor, the new models offer performance levels averaging 20 percent above the previous D, F, and H models which use the MCP operating system. The performance gains result from the use of the MCP/AS operating system, which more effectively manages and utilizes memory resources and from improvements in the MCP/AS microcode.

The A 10 System is designed for batch or on-line, general-purpose data processing in either a centralized or distributed environment. The A 10 System utilizes the concepts of multiprogramming (interleaving), pipelining, and multiprocessing to obtain increased capacity and system capability. The microprocessor-based central processor uses "look ahead" logic, multiple bus structures, and a series of functional processors to improve performance. The A 10 features 256K-bit dynamic RAM chips and Emitter Coupled Logic (ECL) circuitry, thereby reducing the footprint and the power requirements of the system.

Main memory consists of up to 96 megabytes, in 12-megabyte increments, of error-correcting integrated circuit (IC) memory. The memory controller includes 6K bytes of cache memory and can support up to 48 megabytes of main memory in the single-processor A 10 F/FX configurations. Two memory controllers with 6K bytes of cache each are required to support 96 megabytes of main memory in the

The A 10 System is a member of the Unisys A Series, a family of general-purpose, medium-to-large scale mainframes. The object code-compatible A Series ranges from the entry-level A 3 to the top-of-the-line A 15. The A 10 operates in either a centralized or distributed processing environment. The Models DX, FX, and HX feature the MCP/AS operating system providing better memory management and system performance.

MODELS: A 10 Models D, F, H, DX, FX, and HX.

CONFIGURATION: The Models D, DX, F, and FX are single-processor systems with 12 to 48 megabytes of main memory. The Models H and HX are dual-processor systems with 12 to 96 megabytes of main memory. Models F, FX, H, and HX have 6K bytes of cache memory and a multiply/divide accelerator. The Models H and HX have the capability to operate as partitioned or monolithic systems.

COMPETITION: IBM 9377-90, 4381-21, 4381-12, 4381-22, 4381-13, 4381-23, and 3090-200E.

PRICE: Purchase prices for basic configurations range from \$410,000 to \$962,000.

CHARACTERISTICS

MANUFACTURER: Unisys Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.



The Unisys A 10 HX is an intermediate-range, dual-processor mainframe with up to 96 megabytes of main memory, two I/O cabinets with a maximum of 80 DLPs, and up to 288 data communication lines.

Unisys A 10

▷ dual-processor A 10 H/HX configurations. The memory controller in the single-processor A 10 D/DX models supports up to 24 megabytes of main memory, but has no cache memory. The multiply/divide accelerator feature, which enhances the performance in applications involving repetitive operations using the multiply and divide functions, is only available on the F/FX and H/HX, and not on the D/DX models.

The dual-processor H and HX models can operate as either single monolithic system sharing peripherals, or partitioned into two single processors each with its own memory, operating system, and peripherals. All A 10 models are field upgradable to the next higher model. An upgrade package for A 9 Systems is also available, providing the necessary components for A 9 F/FX users to upgrade their systems to an A 10 Model HX dual-processor system.

The A 10 Models DX, FX, and HX use the MCP/AS operating system, a key product of the A Series Software Release Mark 3.6. A significant feature of the MCP/AS is the Actual Segment Descriptor Memory Management, which is capable of addressing up to 24 gigabytes of main memory and is available now on all A Series systems. No program conversion is required, provided that application programs have been compiled under system software release 3.4 Patch Release 1 or later, and DMS II data bases are at Release 3.5 or later. MCP/AS is not compatible with the B 5900, B 6900, and B 7900 systems; for these systems, Unisys will continue to support and enhance the MCP operating system.

Two software facilities, features of the MCP/AS operating system, further improve the memory and storage capacities of the A 10 System. The Memory Disk feature enables the user to specify some portion of the system's main memory as a disk unit, and no special programming is required. Programs compiled with Release 3.5 will interact with Memory Disk immediately, and recompilation is not necessary. The Mirror Disk feature provides a convenient means of duplicating realtime data on disk units. Through the maintenance of multiple copies of disk packs, the availability of critical data is virtually guaranteed and the need for pack backup is decreased, freeing the system for other functions. Mirror Disk is available on all supported disk types used on DLP-based systems, and recompilation is not necessary if the application program has been compiled with Release 3.5 or later.

COMPETITIVE POSITION

Almost 90 percent of Unisys' sales are to its already installed user base. This large and loyal user base accounted for a very profitable first quarter in 1987. In the past Unisys did not concentrate too much on new accounts; the primary market strategy was customer base retention and growth, not a confrontation with IBM. But lately, IBM has been aggressively marketing to Unisys users in the general-purpose data processing area, and the Detroit vendor is rising to the challenge.

▶ **Canada:** Unisys Canada, 2001 Sheppard Avenue East, North York, Ontario M2J 4Z7. Telephone (416) 495-0515.

MODELS: Unisys A 10 Models D, F, H, DX, FX, and HX.

DATA FORMATS

BASIC UNIT: 60-bit word consisting of 48 data bits, 3 control bits, 1 parity bit, and 8 error correcting bits.

FIXED-POINT OPERANDS: Each single-precision integer operand occupies one word and consists of a 6-bit octal exponent with sign and a 39-bit fraction with sign. Each double-precision operand occupies two words and consists of a 15-bit octal exponent with sign and a 78-bit fraction with sign. String operands may consist of a variable number of 4-, 6-, 7-, or 8-bit characters.

FLOATING-POINT OPERANDS: Integer and floating-point operands have the same format and may be freely combined in arithmetic operations.

INSTRUCTIONS: One to twelve 8-bit syllables in length. Syllables are packed six to a program word and executed sequentially from left to right. Three of the basic types of instruction syllables are operators, value calls, and name calls.

INTERNAL CODE: 8-bit EBCDIC is standard. Information coded in ASCII can also be processed. Characters are collated according to their binary value.

MAIN MEMORY

The memory subsystem is housed in an independently powered memory cabinet containing a card cage, two DC power supplies and up to two memory bases. Each memory base can be configured with up to two dual-port memory modules providing storage space for 2 or 4 million 60-bit words of main system memory. The interface between the memory subsystem and the central processor is provided by the Memory Control located in the processor cabinet. The Memory Control has the ability to address 48 megabytes of main memory. Two Memory Controls must be configured to address 96 megabytes of memory. The A 10 Models F/FX and H/HX Memory Control includes 6K bytes of high-speed, purgeless cache to reduce the average access time to memory. About 85 percent of memory data access requirements are handled in cache. When the Memory Control logic detects a cache fault, cache memory is deleted from the Memory Control path and system operations continue, but with diminished memory subsystem performance. Logic contained in the Memory Control performs single-bit error corrections on-line without interrupting other processor modules, and detects multiple-bit errors. All memory errors are logged into a memory register and periodically written to the system logon disk and stored for reference.

STORAGE TYPE: 256K-bit DRAM integrated circuit (IC) boards.

CAPACITY: 12 to 96 megabytes. See Table 1 for capacities of individual models.

CYCLE TIME: Information not available from vendor.

CHECKING: A parity bit with each word is generated during writing and checked during reading. The A 10 System generates and checks an eight-bit error detection byte during each main memory reference, permitting automatic rewrite correction of single-bit errors and detection of multiple-bit errors.

Unisys A 10

TABLE 1. SYSTEM COMPARISON

MODEL	A 10 D/DX	A 10 F/FX	A 10 H/HX
SYSTEM CHARACTERISTICS			
Date announced	Feb. 86/Sep. 86	Oct. 85/Sep. 86	Oct. 85/Sep. 86
Date first delivered	May 86/Sep. 86	Oct. 85/Sep. 86	Oct. 85/Sep. 86
Field upgradable to	A 10 F/FX	A 10 H/HX	—
Relative performance	2.6/3.1*	3.8/4.6*	7.0/8.4*
Number of processors	1	1	2
Cycle time, nanoseconds	—	—	—
Word size, bits	48	48	48
Operating systems	MCP MCP/AS	MCP MCP/AS	MCP MCP/AS
MAIN MEMORY			
Type	256K-bit DRAM	256K-bit DRAM	256K-bit DRAM
Minimum capacity, bytes	12MB	12MB	24MB
Maximum capacity, bytes	24MB	48MB	96MB
Increment size, increment	12M	12M	12M
Cycle time, nanoseconds	—	—	—
BUFFER STORAGE			
Minimum capacity	—	6KB	12KB
Maximum capacity	—	6KB	12KB
Increment size	—	—	—
INPUT/OUTPUT CONTROL			
Number of channels:			
Byte multiplexer	Not applicable	Not applicable	Not applicable
Block multiplexer	Not applicable	Not applicable	Not applicable
Word	Not applicable	Not applicable	Not applicable
Other	Up to 40 DLPs	Up to 40 DLPs	Up to 80 DLPs

*Relative performance rating based on the A 3 D as 1.0.

➤ The organization of a "Line of Business" (L.O.B.) team to develop software for specific market segments, and the implementation of a L.O.B. marketing strategy, signals just the beginning of a whole new approach to gain new customers in these specific market areas. Businesses targeted for the L.O.B. marketing strategy are familiar Unisys strongholds, including financial, education, government, health care, manufacturing and distribution. The A 10 might well be the most important system for this kind of strategy. As the high-end machine of the A Series low end, the A 10 can function equally well as a centralized mainframe, a departmental system, or a node in a network. Unisys considers the IBM 9377-90, 4381, and 3090-200E systems as prime competitors for the A 10, with the 4381, IBM's war-horse, leading the attack.

ADVANTAGES AND RESTRICTIONS

The A 10 System's advantages are not only the performance and reliability of its hardware, but the MCP/AS operating system as well. MCP/AS supports extended 32-bit memory addressing. Up to 24 gigabytes of main memory can now be addressed, enabling the user to take advantage of the large main storage available with A Series systems without experiencing disruptive application conversions such as those confronting IBM users migrating to MVS/XA. With the phaseout of the A 10 D, F, and H models, MCP/AS is now available on the entire A Series.

To address two of the frequently heard user complaints, limited mass storage and no user-friendly relational data base, Unisys offers two new products for the A Series. The semantic data base management system InfoExec consists of a series of data management products to enhance the production-oriented transaction processing capabilities of

➤ **RESERVED STORAGE:** Not available on the A 10 System.

CENTRAL PROCESSORS

The Central Processing Unit (CPU) consists of the following elements: the Multiple Logical Processor (MLP), the Message Level Interface Processor (MLIP), the Memory Controller (MC), the Host Console Port (HCP), and, on the Models H and HX, the Dual-Processor Link (DPL).

The microprocessor-based central processor uses an enhanced implementation of stack architecture, accessing up to 16 pairs of top-of-stack registers for instruction execution. Two pairs of these stacks are reserved to control the multiple processing modules; the rest are used for storage of operators awaiting execution. The CPU consists of three controllers which are responsible for executing instructions, servicing interrupts, and initiating input/output (I/O) operations. The Program Controller accesses program code from memory via the MC. The Program Controller has extensive look ahead capabilities and generates multiple hardware operators to be executed. The Task Controller works asynchronously with the Program Controller and schedules the hardware operators. The Stored Logic Controller, Address and State Unit, and Data Path are organized as a three-stage pipeline and contain the algorithm microcode, current-state attributes, data, and memory addresses needed to schedule and process A 10 algorithms. This three-stage processing of tasks is referred to as MLP organization.

The MLIP functions independently to control the operation of peripheral devices connected to the system. The MLIP logic contains four or eight MLI ports. Each MLI connects the MLIP to one Input/Output IODC base module.

The HCP interfaces the central processor with the Maintenance Subsystem and also performs error detection, logging, and control functions in the A 10. The Maintenance Subsystem operates in conjunction with the Maintenance Interface Processor (MIP) to access and display the state of the

Unisys A 10

TABLE 2. MASS STORAGE

MODEL	B 9484-5	B 9484-13	B 9494-5	B 9494-10
Cabinets per subsystem	Up to 8	2 to 16	2 to 16	2 to 8
Disk packs/HDAs per cabinet	2 removable	1 removable	1 fixed	2 fixed
Capacity*	130MB	252MB	542MB	1084MB
Tracks/segments per drive unit	—	—	—	—
Average seek time, msec.	24.7	27.7	21.7	21.7
Average access time, msec.	33	36	30	30
Average rotational delay, msec.	8.3	8.3	8.3	8.3
Data transfer rate	605KB per sec.	1.2MB per sec.	1.2MB per sec.	1.2MB per sec.
Controller model	B 9387-51 B 9387-52			
Comments	—	—	—	—

*Formatted capacity.

➤ the A 10. The WQF module of InfoExec runs on B Series workstations and on IBM/PC-compatible products delivering high-level query facilities at the end-user level. Because InfoExec uses DMS II, users already familiar with this data base management system will not have to learn a totally new language. The new B 9494-24 disk subsystem should fill the requirement for large-capacity mass storage nicely. The basic capacity is 5.04 gigabytes, upgradable in 5.04-gigabyte increments to 20.26 gigabytes.

Other user complaints remain unresolved, such as the limited variety of application software offerings, education, and documentation. If this sounds like an old familiar tune, well it is! And according to this year's user survey the ratings in this area are even slightly lower than last year's.

USER REACTION

Because the A 10 is simply a faster version of the older A 9 System, both systems were combined in tabulating the results for the 1987 Datapro survey of general-purpose computer users. Out of a total of 40 respondents, 13 users had an A 10 System installed. Eight respondents purchased, and four users rented, the systems directly from the manufacturer; one user leased a system from a third-party vendor. Eight respondents upgraded from other Unisys systems indicating a strong vendor loyalty; five respondents were first-time Unisys users.

The A 10 Systems were operating in a wide variety of installations: education, government agencies, retail and wholesale businesses, financial institutions, insurance companies, and health care facilities. The principal applications were payroll and personnel, scheduling and administration, accounting and billing, purchasing, order processing and inventory, process control, and sales and distribution.

The Data Base Management System, DMS II, was rated from good to excellent for technical support, maintenance, reliability, and efficiency by four users; six users gave DMS II a rating of fair to good. All users were quite satisfied with the operating system and the reliability of the A 10. The usual complaints were about troubleshooting, education, and documentation.

Only five respondents had implemented a disaster recovery plan; six users had established an information center, and

➤ system. In addition to its connection to the CPU, the MIP provides a special test link to the I/O and Data Communications Subsystems. The Maintenance Subsystem is configured with a dual, built-in fixed disk drive which provides storage for system diagnostic cases, and one mini-disk drive for firmware loading. The diagnostic software is system driven and runs on-line; normal preventive maintenance routines are run concurrently with application programs.

When the dual-processor system operates in monolithic mode, the DPL feature is needed to provide a message-passing mechanism for communications between two A 10 processors, and to maintain cache consistency.

SPECIAL FEATURES: The A 10 Models H and HX dual-processor systems can be split into two independent partitions to perform system applications such as work load management or subsystem maintenance. Partitioning can be accomplished statically using maintenance subsystem System Control Processor (SCP) command inputs, or dynamically using Operator Display Terminal (ODT) configuration commands. When in partitioning mode, the A 10 processor in one partition cannot access memory or communicate with processors in the other partition. Each processor has its own memory, operating system, and peripherals.

PHYSICAL SPECIFICATIONS: The A 10 system Models D, DX, F, and FX including processor, memory, and input/output cabinets are 105 inches long, 44 inches high, and 30 inches deep. They weigh approximately 1,650 pounds. The same configuration Models H and HX are 181 inches long, 44 inches high, and 30 inches deep, with an approximate weight of 2,075 pounds. Models D, DX, F, and FX will typically require 6.4 kVA and have a heat dissipation of 20,340 Btu per hour. Models H and HX require 12.0 kVA and have a heat output to air of 38,730 Btu per hour.

CONFIGURATION RULES

The basic A 10 Models D and DX consist of one A 10-DCP processor cabinet, one independent memory cabinet with one memory base and 12 megabytes of main memory, one dependent I/O cabinet with two I/O bases, two operator display terminals, one operator console DLP-3, and one modem. Main memory can be expanded up to 24 megabytes. Up to 40 data link processors providing 160 lines can be added to the system. The Models D and DX can be field upgraded to a Model F and FX, respectively, by simply exchanging processor cabinets.

The basic A 10 Models F and FX consist of one A 10-FCP processor cabinet with cache, one independent memory cabinet with one memory base and 12 megabytes of main memory, one dependent I/O cabinet with two I/O bases, two operator display terminals, one operator console DLP-3, and one modem. Main memory can be expanded up to 48

Unisys A 10

TABLE 2. MASS STORAGE (Continued)

MODEL	B 9494-12	Multi-Disk4	Multi-Disk8	B 9494-24
Cabinets per subsystem	1 to 8	2	2	1 to 8
Disk packs/HDAs per cabinet	1 fixed	2 fixed	2 to 4 fixed	2 fixed
Capacity*	868MB	245.6MB	500MB	3.4GB
Tracks/segments per drive unit	—	—	—	—
Average seek time, msec.	16	30	19.9	17
Average access time, msec.	24.3	38.3	28.2	25.3
Average rotational delay, msec.	8.3	8.3	8.3	8.3
Data transfer rate	3MB per sec.	1.2MB per sec.	2.4MB per sec.	3.4GB
Controller model	B 9389 B 9399	SMD interface	SMD interface	B 9389 B 9399
Comments	—	—	—	—

*Formatted capacity.

➤ one user was planning such a center during 1987. When asked about plans concerning future acquisitions, the wish-list for 1987 included additional software from the manufacturer or other suppliers, as well as expansions to present hardware and data communications facilities, laser printers, and power-conditioning systems.

As part of the survey, users were asked to rate their computer systems on a scale from excellent to poor. A weighted average was then calculated based on the total responses. The ratings of the A 9/A 10 systems are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	25	12	2	0	3.59
Reliability of system	22	17	1	0	3.52
Reliability of peripherals	6	30	4	0	3.05
Maintenance service:					
Responsiveness	16	20	3	1	3.27
Effectiveness	11	23	5	1	3.10
Technical support:					
Troubleshooting	5	28	6	0	2.97
Education	4	23	11	0	2.77
Documentation	1	20	15	3	2.49
Manufacturers software:					
Operating system	25	12	3	0	3.55
Compiler & assemblers	15	21	4	0	3.27
Application programs	5	16	14	3	2.61
Ease of programming	13	26	0	1	3.27
Ease of conversion	13	18	5	2	3.11
Overall satisfaction	15	24	1	0	3.35

*Weighted Average on a scale of 4.0 for Excellent.

When asked if their computer system performed as expected, 12 respondents said "Yes," and one was undecided. Eleven users would recommend their system to other users, one was undecided, and one would not. □

➤ megabytes in 12-megabyte increments. Up to 40 data link processors and a network support processor can be added to the system to provide more data communication capabilities. The Models F and FX are field upgradable to the Models H and HX.

The basic A 10 Models H and HX consist of two A 10-HCP processor cabinets with cache, one independent memory cabinet with one memory base and 12 megabytes of main memory, one additional memory base and 12-megabyte, dual-port memory module, two dependent input/output cab-

inets with two I/O bases, two operator display terminals, two operator console DLP-3, one A 10 dual-processor link, four IODC base exchanges for the two-processor system, and one modem. Two memory controls are required to expand the main memory to the 96-megabyte maximum.

Independently powered memory and I/O cabinets have a power source located inside the cabinets and do not depend on the central processor as a power source as the dependent cabinets do. Independently powered memory cabinets can provide the same degree of redundancy provided by two independent systems. Independently powered I/O cabinets can be configured to ensure that all key elements of the I/O subsystem and data communications network can be duplicated on a separate power source.

INPUT/OUTPUT CONTROL

The Input/Output Subsystem interfaces to the central processor via the MLI. Up to eight I/O bases can be directly interfaced to each processor. Each I/O base accommodates up to eight microprocessor-based Data Link Processors (DLPs), which are responsible for information transfer to and from the peripheral and data communication subsystem. The DLPs also perform the data transfers to and from main memory via the MLI. There is a special DLP for each type of peripheral subsystem. Some DLPs can service multiple peripherals of the same type through standard peripheral exchanges. Each DLP includes a microprocessor, a peripheral interface, and a quantity of local memory.

MASS STORAGE

For disk storage devices qualified on the A 10 System, see Table 2.

INPUT/OUTPUT UNITS

Tape drives and printers for use on the A 10 are covered in Table 3.

TERMINALS

For information on terminals available for the A 10, see Table 4.

COMMUNICATIONS

The A 10 data communications subsystem allows a modular approach to the design of small, medium, and large data communications networks. The subsystem off-loads communications responsibilities from the central processor and distributes them to one or more *Network Support Processors (NSPs)*. The NSP's internal architecture divides the communications workload between the NSP and a series of

Unisys A 10

► microprocessor-based *Line Support Processors (LSPs)*. The NSP and LSPs are incorporated into the I/O bases of the A 10 I/O data communications subsystem, providing a common data communications and I/O architecture. The third hardware component required for larger networks and increased protocol flexibility is the *Quad Line Adapter (QLA)* which provides the electrical interface for each communication line. The *Data Communications DLP II (DCDLP II)* with four communication lines allows for the configuration of small to medium networks.

The *Network Support Processor* is a programmable front-end processor that serves as the central element of the A 10 communications subsystem. It contains 512K bytes of IC memory. The NSP handles subsystem control, data link control, and line discipline control functions. Interaction between the NSP and the central system is performed at the message level, eliminating the need to interrupt the central system each time a character or word of data is to be transferred. The NSP is programmed by means of Burroughs' *Network Definition Language II (NDL II)*, a descriptive, parameter-driven language.

Line Support Processors are a series of specialized microprocessors that provide the connection between the QLAs and the NSP. Information is transferred between the LSP and the NSP at the message level, reducing NSP interruptions and allowing more information to be transferred at a time. A single LSP can support up to 16 half- or full-duplex communication lines with subbroadband speeds of up to 19.2 bits per second.

A *Line Adapter* provides the electrical interface between the LSP and each communication line. The Line Adapter maintains physical control of the line, accumulates characters, and transfers them to or from the LSP. Each Line Adapter includes 4K bytes of local memory for storage of translation tables, message buffers, line parameters, polling sequences, and the code required to control the communication line and line discipline.

The Line Adapters are packaged in sets of four. Each set, called a *QLA*, accommodates the electrical interfaces for four lines and may be specified as either character-oriented or bit-oriented. For each line position within a QLA, one of three types of electrical interfaces must be specified: RS-232 for U.S. modem connection; CCITT V.24 for international modem connection; or TDI/20, for direct connection. Different electrical interfaces can be intermixed within the same QLA, and character- and bit-oriented QLAs can be intermixed on the same LSP. Each LSP accommodates up to 4 QLAs and up to 16 communications lines.

Data Communication DLP II: The microcoded protocols used with the DCDLP II provide an interface to IBM 2780-compatible devices, access into a BNA-1 network environment, and enhanced connectivity without the need for an NSP/LSP implementation.

SOFTWARE

OPERATING SYSTEM: The *Master Control Program (MCP)* and the Software Release 3.6 *Master Control Program/Advanced System (MCP/AS)* designed to support the advanced architecture of the A Series family of computers, are the two operating systems used by the A 10. The operating system software consists of a group of routines organized in three-level hierarchical fashion. The first level is a kernel routine that fields all interrupt signals and transfers control to the appropriate MCP or MCP/AS routines. The second-level routines handle the dynamic resource allocation of main memory, disk storage, I/O devices, processors, and time among the concurrently operating programs. The

third-level routines handle utility functions such as job scheduling, control card interpretation, file control, library maintenance, etc. The multilevel MCP or MCP/AS in the dual-processor Models H and HX allows processing to continue while faulty hardware is being diagnosed or new system software is tested and debugged.

Jobs are submitted to the operating system through the ODT and/or the system input units, which can be a card unit or a disk or tape file performing as a "pseudocard unit." As the control statements for each task are analyzed, a partial stack is created on a schedule queue containing the estimated main memory requirements, the priority, the maximum amount of processing time and I/O time, the size and location of the file parameter block, the working storage stack size, and the size and location of code segments. The program scheduling priority ordinarily is specified by the programmer, although a default option automatically assigns a priority job one half the maximum allowable priority.

The operating system maintains a queue of jobs available for initiation. A scheduling routine evaluates resource and priority requirements of the programs in the queue and schedules their execution so as to utilize the system's resources efficiently in a multiprogramming mode, using either single or multiple processors. The job sequence is dynamically rescheduled whenever a high-priority job is introduced into the schedule. When the required resources are available (for example, when a job completes processing or suspends itself to await completion of an I/O operation), an available job with the highest priority is added to the processing mix. Jobs submitted from remote terminals are interpreted and entered into the schedule queue and are added to the multiprogramming mix in much the same way as batch jobs.

The operating system maintains control of tasks through the use of stacks, descriptors, and tables that summarize the history and current status of each task in process. A stack is created for each job in the system to provide storage for basic program and data references. When a task is activated, four high-speed registers are linked to the task's stack memory area. In addition, an area of high-speed local memory is available to contain additional portions of the active stack for fast access. The contents of the top-of-stack registers are maintained automatically by the central processor hardware according to the requirements of the executing program. Central processors can handle multiple active stacks organized into a tree structure. The tree-structured organization allows program code and program data and variables to be described at different stack levels, thus permitting program code to be reentrant and shared. The tree-structured stack also enables a single task to split itself into two independent tasks by establishing a new link on the stack to make full use of a multiprocessor configuration or to multiprogram independent processes.

Both data and program segments are referenced through descriptors. Segment Descriptors, maintained in a portion of the stack base known as the Segment Dictionary, are the basis for the Unisys implementation of virtual memory. In contrast to the fixed-page concept utilized in many storage allocation schemes, Unisys programs can be divided into variable-length segments, which are brought into main memory only as they are needed. In MCP/AS, Segment Descriptors contain a length field, actual segment descriptor (ASD) number field, and a touched bit. The length field specifies the length of the code segment in words. The touched bit indicates the status of the ASD number field. If the touched bit is on, the ASD number field points to an ASD table entry, and the ASD table entry points to the code segment in memory or on disk. If the touched bit is off, the code segment is on disk and has never been referenced. ►

Unisys A 10

TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
B 9495-82	9	1600	PE	75	120,000
B 9495-83	9	1600	PE	125	200,000
B 9495-32	9	1600	PE	75	120,000
	9	6250	GCR	75	470,000
B 9495-33	9	1600	PE	125	200,000
	9	6250	GCR	125	780,000
B 9495-24	9	1600	PE	200	320,000
	9	6250	GCR	200	1,250,000
BT3244	9	1600	PE	75	120,000
	9	6250	GCR	75	470,000
BT3266	9	1600	PE	125	200,000
	9	6250	GCR	125	780,000
BT3288	9	1600	PE	200	320,000
	9	6250	GCR	200	1,250,000
Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
B 9246-12	1200 lpm	132	10	6 or 8	4 to 20 in.
B 9246-24	2000 lpm	132	10	6 or 8	4 to 20 in.
B 9246-6	650 lpm	132	10	6 or 8	4 to 20 in.
B 9290-30	30 ppm	—	3.5 to 20	2.5 to 13.3	8½ by 11 in.

► A Data Descriptor is used to fetch data to the stack or to store data in a storage area outside the stack. The Data Descriptors contain a length or index field, ASD number field, touched bit, copy bit, indexed bit, and size field. The size field indicates the size of the data items in the data segment. The index bit indicates the status of the length or index field. If the indexed bit is on, the length or index field is an index. The touched bit indicates the status of the ASD number field. If the touched bit is on, the ASD number field points to an ASD table entry. The ASD table entry points to the data segment in memory or on disk. If the touched bit is off, the data segment has never been referenced by the program. If the copy bit is off, it specifies that the data descriptor is the original descriptor for a data segment.

The Actual Segment Descriptor Memory Management provides monolithic memory management of memory sizes up to 24 gigabytes. The ASD table is an area in memory which can contain up to 1 million entries. Each entry in this table is a multiple-word structure. The operating system will initially allocate an ASD table of a size that is proportional to the amount of main memory. The ASD ODT command allows the operator to display the size of the table and the maximum number of entries used, as well as to change the size of the table. The ability to change the size of the ASD table ensures the user the table is large enough for the work load, but not so large as to waste memory. The ASD table contains an entry for each code or data segment which has been touched. A touch will occur on the first reference to the code or data segment. At that time, the MCP/AS operating system will allocate an entry in the ASD table. An entry in the ASD table contains an address field and a presence bit. The presence bit indicates the status of the address field. If

the presence bit is on, the data or code segment is in memory and the address field contains a 32-bit physical memory address. If the presence bit is off, the data or code segment is on disk and the address field contains the record number of the item in the overlay or code file. With ASD Memory Management, when an area of physical memory is overlaid, all data and segment descriptors point to a common descriptor, the ASD; a bit maintained in the ASD entry specifies whether the segment has been altered. The segment will only be written to disk if it has been altered.

True dynamic memory allocation is a feature of the operating system. The compilers automatically divide all object programs into logical, relocatable segments. Moreover, all object programs are reentrant. Because code is never modified during execution, two or more jobs can concurrently make use of a single program segment residing in main memory. Program and data segments are automatically transferred from disk storage to main memory when needed. When necessary, the operating system automatically overlays these new segments over other program or data segments that have not been accessed recently.

Memory protection is provided by a combination of hardware and software features. Two registers associated with the stack mechanism, the Base of Stack register and the Stack Limit register, define the upper and lower limits of the stack. An interrupt is generated if an attempt is made to exceed these limits. When an element in a data array is referenced, an automatic comparison of the index value of the data element and the length of the data area as specified in the Data Descriptor, identifies any attempt by a program to reference beyond its designated data area. In addition, ►

Unisys A 10

► control bits in each word prevent a user program from altering program segments, data descriptors, segment descriptors, and memory links, control words, and tables maintained by the operating system.

The MCP and MCP/AS provide comprehensive I/O and file control facilities. They automatically assign peripheral devices to symbolic files whenever possible to minimize operator intervention. Three tables are maintained by the operating system containing label equation and file attribute information such as the access type, peripheral type, physical unit being used, etc. This allows modification of file specifications at program execution time. Blocking, buffering, label checking, and other standard I/O control functions are performed in accordance with the programmer's specifications. Magnetic tape drives or disk files can be freely used as backup or "pseudodevices" for card readers, punches, and printers. This makes it unnecessary to delay the processing of a job because of the nonavailability of a particular I/O unit.

Communication between the system operator and the operating system is accomplished through a combination of CRT display units, keyboards, control statements, and a comprehensive system log. The status of the system and of the jobs in progress is presented on the CRT displays. Messages and requests can be keyed by the operator, and the system responses are displayed on the CRT. Jobs are usually submitted to the system in the form of a set of control statements accompanied by a source-language deck, or alternatively through control statements entered through the console keyboard if the programs have previously been compiled and stored on disk. Jobs to be compiled must be accompanied by a compile statement identifying the compiler to be used and specifying one of three types of compilations: a compile and execute, compile for the library, or compile for the syntax. Optional control statements for all jobs contain an execution statement, process time statement, priority statement, and I/O statements which associate file labels with specific I/O devices.

Memory Disk is a major new feature of the MCP/AS operating system. With Memory Disk some portion of the system's main memory may be used as a disk unit. Up to two units of Memory Disk can be specified as a family or as individual units. Each unit is declared in terms of pages, 768K bytes per page. Up to 80 pages are possible per unit, or a total of 120 megabytes for two units. Each unit must be identified as a unique peripheral unit and will be treated as a disk. From 3 megabytes up to 120 megabytes of memory may be specified as disk, and files from any disk unit may be copied to the Memory Disk units.

The *Menu Assisted Resource Control (MARC)* module has been enhanced under MCP/AS to provide a more flexible system. The MARC module offers menu assistance for all system operations. Complete on-line help and teach information is available. A direct interface allows a user to define, create, and name commands to be executed by MARC. Products and features such as PrintS and ReprintS are supported by MARC.

Work Flow Management is an MCP/AS facility that provides enhanced facilities for the control of task initiation and resource allocation. The *Work Flow Language (WFL)* enables users to describe each job as a network of interrelated tasks. The WFL compiler accepts these control statements as input and generates machine code to control the tasks within each job as the user prescribes. Facilities provided by the Work Flow Management System include sequencing and synchronizing of related tasks via input from control statements, improved consistency in task restarts after system failures, job summary printouts, multiple job scheduling

queues for different levels of service, interfaces for installation-tailored system control programs, and accounting records grouped by job. WFL has been enhanced with the Print statement providing a batch interface to the PrintS and ReprintS system.

PrintS is integrated with the MCP/AS and provides routing and scheduling of files for printing and controls when and where to print. Printer backup file control descriptors maintain the number of copies to be printed by destination and handle the file after printing. Several descriptors control the presentation of printed files in terms of forms, banners, and transformation of data. *ReprintS* extends these PrintS facilities to remote printers.

Mirror Disk is the parallel functioning of two to four disks where all the units are exact copies of each other. This feature is an extension of the MCP/AS operating system. Critical operations, key object program packs, and data base systems should be mirrored. Each pack may be copied up to three times, with each pack family and each of its copies constituting a mirrored set. On-line creation of mirrors is allowed while still providing access to the master pack. An audit trail is maintained to identify which areas have already been copied, are to be copied, and are in the process of being copied. At the completion of the mirror creation, a recopy of updated areas will take place to ensure the mirrored copy is brought up to the level of the master. Members of a mirrored set residing off-line are audited and updated to match the master and then placed on-line.

PROGRAMMING LANGUAGES: A wide range of high-level and interpreter languages including APL, Algol, Basic, Cobol 68 and 74, Fortran 66 and 77, Pascal, PL/1, and RPG II is supported.

DATA BASE MANAGEMENT: *DMS II* is a comprehensive Data Base Management System which uses MCP or MCP/AS facilities for accessing records in the data base to achieve greater run-time efficiency. Through the operating system facilities, the DMS II data base can be accessed by application programs operating in multiple processing environments, such as batch, remote job entry, time-sharing, and transaction processing. DMS II incorporates a Data and Structure Definition Language (DASDL) that provides for the logical description of data in sets or subsets and for mapping the logical data into physical structures. A variety of retrieval methods is supported, including indexed sequential, indexed random, and bit vectors. The latter method creates indices that require small amounts of disk storage and permit very fast searches.

DMS II permits multiple indices to be established for accessing a file, and each file can be accessed by any of the available access methods to provide retrieval of information by different application programs. User-language interfaces to the data management system are provided for the Cobol, Algol, RPG, and PL/1 languages. When multiple programs are accessing the data base, DMS II provides lockout protection at the record level to prevent simultaneous updating of a record. DMS II recovery capabilities include the ability to audit transactions as they are referenced or added to the data base and a checkpoint/restart capability. A recovery utility is automatically initiated by the operating system in the event of system failure to effect recovery of the data base and restart of application programs. In addition, DMS II permits the data base to be dumped concurrently with updates to the files, so that dumps correspond to the current audit trail.

DMS Inquiry is an optional extension of DMS II and provides an easy-to-use language that enables non-EDP personnel to access the data base via remote terminals. ►

Unisys A 10

TABLE 4. TERMINALS

MODEL	ET 1100	ET 2150	B 25
DISPLAY PARAMETERS			
Max. chars./screen	2080	2080	2240
Screen size (lines x chars.)	24 x 80	24 x 80	29 x 80
Symbol formation	7 x 9 dot matrix	7 x 9 dot matrix	9 x 12 dot matrix
Character phosphor	P39 green	P39 green	P31 green
Total colors/no. simult. displayed	—	—	—
KEYBOARD PARAMETERS			
Style	Typewriter	Typewriter	Typewriter
Character/code set	128 ASCII	128 ASCII	128 ASCII
Detachable	Standard	Standard	Standard
Program function keys	10	10	10
OTHER FEATURES			
Buffer capacity	512K	512K	256K
Tilt/swivel	Standard	Standard	Standard
Graphics capability	No	Yes	No
TERMINAL INTERFACE	RS-232-C, TDI	RS-232-C, TDI	RS-232-C, RS-422 Centronics, parallel

Users can "browse" through information stored in the data base and retrieve it either serially or randomly, without the delays normally associated with programming and debugging an inquiry program. Users with appropriate security clearances can also update information in the data base and add new records or delete existing records. The DMS II audit trail captures a record of all data base maintenance functions to facilitate automatic recovery.

DMS II DB Analyzer gives detailed statistical and descriptive attributes of both the physical and logical data base implementation. The information is presented by means of a series of predefined report programs, aiding the user in determining the efficiency of the current implementation, changing the structure for increased efficiency, and deciding when reorganization is needed.

DMS II DB Monitor provides realtime monitoring and control of the status of a DMS II data base. DB Monitor provides dynamic monitoring of current data base performance statistics such as memory usage, audit trail attributes, sync point/control point frequency, buffers allocated for each structure, and user counts of the number of programs accessing the data base and one or more structures within it.

DM Interpreter is a DMS II facility which expands the capabilities and control characteristics of DMS II. It provides an interpretive interface to a DMS II data base, permitting non-DMS II languages access to DMS II-managed information. This allows for extended flexibility in a DMS II environment. It decouples the application from the data base and allows data base changes without a corresponding recompilation of the application program in most cases.

The *Advanced Data Dictionary System (ADDS)* is a DMS extension providing for the centralized definition, storage, and retrieval of data descriptions. Information about DMS II data base definitions, Cobol 74 file structures, and SDF screen formats is all stored in the ADDS data base. Line and page scrolling allows easy browsing of data base structures and their entities. A security mechanism restricts access to the dictionary contents by assigning an authorized usercode when ADDS is first brought on-line. Tracking of Cobol 74 programs is optionally enforced by the Dictionary Administrator. If enforced, all Cobol 74 programs must have a valid ADDS program name identified in the dictionary. A set of report programs provides on-line support and stores the specifications of printed reports for future viewing and modification.

Extended Retrieval with Graphic Output (ERGO): This enhanced inquiry and reporting system is used to access DMS II data bases and conventional files defined in ADDS. ERGO offers a graphic representation of information and defines the relationships between data sets and powerful selection expressions to filter the data used in reports. ERGO features a prompt mode and Help commands to guide the user. Multiple presentation formats allow the user to select the most appropriate graphic output representation.

Data-Aid is an interactive menu-driven system complemented by on-line Help and Teach. If a new data base is to be described, Data-Aid transfers the user to ADDS. Data-Aid monitors the generation of the data base software modules and the data base initialization, then transfers the user to ERGO to load the data base through the ERGO update capabilities, and report against it. On request, Data-Aid will initiate and track the Dump, Copy, and Recovery functions of the data base.

DATA MANAGEMENT: The *InfoExec* is based on semantic data model technology and consists of an integrated family of products. The InfoExec components required to establish a functional data base include SIM, ADDS, and DMS II.

The *Semantic Information Manager (SIM)* manages all physical aspects of the data base providing data independence for programs. Data independence allows the structure of a SIM data base to be changed without affecting the programs that access it, thereby minimizing the impact of any physical data base change. SIM provides full referential integrity, a particular type of logical consistency, in information contained in the data base. It ensures that relationships are correctly maintained when data items are changed. SIM also enforces data base security at several levels, including a user's ability to access, create, update, and delete data.

A SIM data base is defined and controlled by ADDS. Data dictionary support provides a menu assisted method of describing the data base, eliminating the need for a complex, syntax-oriented data definition language. All ADDS menus are complemented with on-line Help and Teach information to assist users.

The *Operations Control Manager (OCM)* provides administrative support for operations procedures such as data base archiving and reorganization.

The InfoExec series incorporates two inquiry and reporting facilities. The *Interactive Query Facility (IQF)* for conven-

Unisys A 10

► tional terminals permits authorized individuals to access and update the data base. IQF allows extensive control over report formats. Specified information can be extracted from the data base and transferred to a personal computer for analysis or update. Inquiries and reports are formulated interactively through menu guidance and report painting. All IQF updates to the data base are automatically subjected to the integrity and security constraints managed by SIM to prevent invalid information to corrupt the data base.

The *Workstation Query Facility (WQF)* for intelligent workstations is supported on Unisys PCs, B 25 workstations, or IBM PCs to assist users in formulating reports. Information is supplied by the mainframe and the workstation functions as a user interface, with pop-up and pull-down menus, function keys, mouse support, and graphics serving as guides.

DATA COMMUNICATIONS: The special-purpose programming tool *Network Definition Language II (NDL II)* enables users to define and generate customized NSP control programs for data communications applications. These programs equip the NSP to handle line disciplines, buffer management, message queuing, auditing, and supervision of the flow of messages between user-coded programs and remote terminals. This enables the user's application programs to deal with remote terminals in the same manner as with conventional, on-site peripheral devices. IBM data communications algorithms allow Unisys networks to interface to non-Unisys terminals utilizing 3270 and 2780/3780 protocols. IBM 3270 protocol supports both terminals and printers compatible with the IBM 3270 bisynchronous protocol for DLP-based systems. A point-to-point bisynchronous algorithm enables A Series DLP-based systems to support communications to IBM 2780/3780 RJE terminal devices.

The *Interactive Datacomm Configurator (IDC)* is an extensive tool to aid in the on-line development, implementation, and maintenance of data communications. It provides a menu-driven interface to configure the data communications subsystem from a workstation or the operator display terminal. The terminal network configuration can be changed dynamically without interruption to the network. A new enhancement enables the IDC to convert NDL to NDL II.

The *Generalized Message Control System (Gemcos)* generates an installation-defined Message Control System (MCS) that manages a transaction-oriented communications network, provides security, handles transaction routing, controls message formatting, and provides a transaction processing interface for application programs. All transaction terminals in the network are controlled by the Gemcos-created MCS and interfaced to the application programs and the data base. Gemcos enables users to develop transaction processing application programs independently of the network environment. The input to Gemcos is coded in the Transaction Control Language, a descriptive, free-form language that uses key words to describe both the network environment and the requirements for message routing, message formats, access control, and recovery.

The *Communication Management System (Coms)* is an advanced communication monitor facility. Coms provides most of the features offered by Gemcos and enables users to develop transaction programs independently of the network environment. Coms supports direct windows providing multiple views of the system and allows Cobol 74 programs to communicate with it. Verification of messages received by a terminal is confirmed back to the direct window. Programs communicate dynamically over a modem with a station. This dial-out capability is flexible and easy to use within an application program.

The *Command and Edit (Cande)* program enables multiple users at remote terminals to create programs or data files, compile and execute programs, edit and alter programs or files, search files, send messages to other terminals, and perform a variety of other functions. Files created through Cande can be saved and used later by the same user or by other users to whom access is granted. Cande provides the capability for interactive program development and testing concurrently with the execution of application programs. It also provides effective control of the access, security, and charging functions in a computer time-sharing network.

Remote Job Entry (RJE) enables users at remote batch terminals to enter jobs into the computer system in the same manner as if they were on-site in the computer room. RJE allows files to be transferred between remote systems and enables terminals attached to remote systems to be controlled by the host system.

Burroughs Network Architecture (BNA) software is designed to enhance the interaction of terminals with host CPUs in a network environment. BNA is also designed to facilitate a move into distributed data processing. Through BNA, A Series processors and terminals can be granted access to data bases throughout a network. Job tasks and information files can be transferred from one point to another, and data processing resources available in a network can be shared among participants regardless of location. BNA works with existing Unisys terminal networks and with the Global Memory multiprocessing facility available on B 6000 and B 7000 large-scale processors. BNA depends on logical links rather than physical links, relying on network tables maintained in the host processor for routing. All routing is through host mainframes. Services provided by BNA include those designated host and those designated network. Host services include coordination of communication between tasks being executed at various hosts; control of the creation, updating, and transfer of data from host to host; and handling of communication with logical points within the network. Network services perform message routing, linking hosts using the Burroughs Data Link Control (BDLC) bit-oriented protocol. Network services also permit connection of Unisys processors to packet-switching services using X.25 procedures. Links can also be established to non-Unisys machines using software such as NDL II.

PROGRAM DEVELOPMENT: The *Logic and Information Network Compiler II (Linc II)* is a fourth-generation programming language which generates complete on-line, realtime systems, including programs, data base descriptions, screen formats, transaction management, and network management. Where possible, the Linc II Interactive System utilizes menu and checklist formats to provide user guidance in the development process. The central menu is referred to as the Activities Menu and provides access to all areas within the Interactive System. All documentation for Linc II will be available on-line in the Linc II Interactive System.

The Linc II Data Dictionary facility provides for the user a new level of project control when developing Linc II applications, and allows the user to specify common data items and their characteristics to ensure consistency whenever those data items are used in Linc II developed applications. There are two levels within the Data Dictionary facility. The Global Level is for data items to be used across multiple Linc II applications, and the Local Level is for single Linc II applications.

Using Linc II, all screen and report formats are built through an interactive painting process. This process permits a screen or report format to be developed and displayed without requiring a generation, but a generation is still ►

Unisys A 10

► required to put the form into production. The Linc II enhanced generation process, using the interactive syntax checking and screen and report painting features, will significantly reduce the previous Linc generation times as well as the number of generations necessary to create the production version. The Linc II Logic Editor is used to enter the specifications for global logic, global setup data items, key words, profiles, teach/help text for a screen format, and all types of on-line and report logic. Linc II command syntax convention is still required by the Linc II Editor. As a page of logic is entered and the screen is transmitted, the Editor will verify all information for syntax errors and return the page with any errors highlighted. Temporary memory areas may be defined within the Editor to allow the user to store commonly used logic. Up to nine temporary memory areas can be used with each area allowing 23 lines of stored logic.

The *Query Mode* facility allows a user to perform generalized interrogations about a Linc II application specification. Essentially, Query provides a higher level "where used" capability which aids the user in remembering particular naming conventions devised for a Linc II application.

The *Test and Debug System (TADS)* is an interactive, source-level debugging tool supporting Cobol 74, Fortran 77, and Algol. The debugging code is generated at compilation time and is evoked when the application program is executed with the TADS option set. Program execution will terminate at the initiation of a conditional or unconditional breakpoint specified by the programmer via TADS. Data is then displayed and modified as appropriate, and the execution of program can continue.

UTILITIES: The operating system includes a variety of utility routines that perform functions such as system resource management, data transcription, library maintenance, and system log analysis. Also included are a multilingual system and an intelligent printer support facility. The System Log program accumulates statistics relating to the execution of programs, the number of file openings and closings, and data on system operation such as halt/load information, time/date changes, the amount of system overhead, and operator input messages. Errors detected during system operation are stored in a Maintenance Log that includes descriptor errors, invalid memory address errors, I/O errors, violations of memory protection, parity errors, and write lockout errors.

OTHER SOFTWARE: The *Intelligent Distributed Editor (IDE)* supports the Fortran 77, Cobol 74, and Algol languages and offers source file editing and text editing extensions. IDE is available in two versions. In the first version, functions are performed on the host system and interaction is achieved via a standard display terminal. The second version runs under Infoview II on an intelligent workstation, off-loading much of the mainframe overhead associated with editing into the workstation, thus balancing resource utilization between these processing units.

Reporter III is a report writer designed to simplify the retrieval, analysis, and reporting of information maintained in computer files. Reporter III accepts report specifications coded in a free-form report description language and generates a Cobol program tailored to produce the required report. The system can retrieve input data from multiple files and/or DMS II data bases, select data based on a wide range of criteria, perform arithmetic and statistical functions, sort data in ascending or descending order according to multiple keys, control access through a password system, produce automatically formatted reports, and create one or more files of extracted data for subsequent processing or reporting.

In addition to the basic version, *Reporter III* is available in an Advanced version, an Audit version, and an On-Line version. Reporter III (Advanced) adds the capabilities for generation of multiple reports in one pass through the input data, creation of summary-only (matrix) reports, and controlled formatting for special reports or preprinted forms. Audit-Reporter extends the Reporter III system by providing auditors with effective software tools for testing and evaluating the records produced by an EDP system. The On-Line Reporter is an optional module that can be added to any of the three preceding systems to provide an on-line mode of operation that enables users at remote terminals to enter, generate, compile, and execute report programs.

The *Screen Design Facility (SDF)* features both screen painting facilities and data entry functions such as field verification, status checking, required field, and many more. An extended inquiry capability displays all form libraries defined in the SDF indexed file or the ADDS dictionary.

The *Transaction Processing System (TPS)* provides the framework and methodology for implementing an application system for high-volume, on-line transaction processing. TPS has the ability to synchronize data base and input message recovery and to centralize, formalize, and simplify message interfaces and user programming. It also provides an interface to access remote data bases using BNA.

Infoview II manages the interconnection of intelligent workstations including the B 25 and ET 2000 with the A Series host mainframe. Up to five windows may be assigned using Unisys MT terminal emulation. One of these windows may be used to run an application program under the workstation native mode. Native mode for Infoview II will function under MS-DOS on an ET 2000 or BTOS on a B 25. Infoview II supports manipulation of the window environment with the keyboard arrow keys or a mouse device. To further control the local workstation environment, the commands View, Edit, Repeat, and Write, as well as a scrolling capability, have been added. Copy and paste functions support the transfer of text between windows, allowing for more effective editing when working with multiple source files.

PRICING AND SUPPORT

POLICY: The A 10 System is available for purchase or lease under a 1-year, 3-year, or 5-year lease agreement. The standard lease agreement entitles the customer to unlimited use of the equipment and includes full-time equipment maintenance coverage (24 hours a day, 7 days a week). The standard maintenance agreement for purchased systems covers maintenance of the equipment for eight consecutive hours per day on Monday through Friday only; extended maintenance is available at higher rates.

All maintenance charges listed in this report are for monthly maintenance Metro 1 (city) plan A.

All lease plans may include purchase options that allow 50 percent of the rental paid during the first 36 months to be applied toward the purchase price at any time during the lease period.

SUPPORT: Users can purchase Unisys' Program Product Service Agreement (PSA) which provides various Support Service packages. The availability of a particular service package is product dependent. Generally, PSAs provide for ongoing program product service and/or field service. Program product service deals with corrections by the program product design facility. Field service provides program product problem identification assistance via telephone and/or on-site. Five service packages (PSAs) are defined: Software Product Support (PSA 1) for computers and customers who

Unisys A 10

▶ will not require on-site program product problem assistance; Extended Software Product Support (PSA 2) for computers and customers who will require on-site program product problem assistance; Centralized Software Product Support (PSA 3) for selected program products where only telephone service is needed; Software Product Assistance (PSA 4) for micro and PC products only; and Basic Software Product Support (PSA 5) for certain products for which telephone and on-call services are not generally available.

Program products designated as source code products are available for a monthly license fee or for an extended license fee only when the program product (object) itself has been licensed. Organizations classified as educational institutions may license source code at no charge. Source code products are unwarranted and therefore carry no Product Support Agreements. Updated source files will be provided when there is a valid PSA for the program product itself.

Mainframe computer systems will be supported from a hardware and operating system (MCP/MCP/AS) standpoint for at least seven years from date of last manufacture. Reworked, refurbished, and remarketed models are guaranteed support from a hardware and operating system standpoint for a period of five years from date of delivery. Notification of termination of either hardware or operating system support, or both, will be provided at least 24 months in advance of such termination. Unisys will support the current and immediately preceding version of each major release of the operating system and utilities.

All software is unbundled. Program products for the A 10 system are offered under a plan which provides for the use of the products on a designated system on a month-to-month of extended basis.

EDUCATION: Users can obtain the necessary training by paying for individual courses. The currently available courses range from 1 to 10 days in length and fall into the following broad categories: Systems Management and Operations, Control Systems, Network Systems, Data Base Systems, Programming Systems, and Applications.

TYPICAL CONFIGURATION: The following configurations illustrate three typical A 10 Systems. The quoted prices include all necessary hardware, but no software.

A 10 Model DX:

One central processor with 12MB memory and 1 memory base, 1 I/O cabinet with 2 DLP bases, 2 operator terminals, 1 console DLP, 1 modem	\$410,000
4 X378-10 data communications DLP-III 16 data communication lines	33,600

1 BT3261-1 GCR tape unit, controller and DLP	70,450
1 BT3266 slave GCR tape unit	24,100
1 BT246-12 line printer (1200 lpm)	44,625
1 MD8-4 disk drive (1GB each)	32,500
1 MD8-2 disk drive (500MB each)	19,500
6 ET2150 workstations	17,370
Disk and printer DLPs	21,120

TOTAL PURCHASE PRICE: \$673,265

A 10 Model FX:

One central processor with 12MB memory and cache, 1 memory base, 1 I/O cabinet with 2 DLP bases, 2 operator display terminals, 1 console DLP, 1 modem	\$580,000
12MB dual-port memory increment	80,000
6 X378-10 data communications DLP-III 24 data communication lines	50,400
3 MD8-4 disk drives (1GB each)	97,500
1 MD8-2 disk drives (500MB)	19,500
1 BT3261-1 GCR tape unit, controller and DLP	70,450
1 BT3266 slave GCR tape unit	48,200
1 B9246-24 line printer (2000 lpm)	48,000
12 ET2150 workstations	34,700
Disk and printer DLPs	37,505

TOTAL PURCHASE PRICE: \$1,066,255

A 10 Model HX:

Two central processors with 24MB memory and cache, 2 memory bases, 2 I/O cabinet with 4 DLP bases, 2 operator display terminals, 2 console DLPs, 1 dual-processor link, 4 I/O base exchanges, 1 modem	\$962,000
2 12MB dual-port memory increments,	160,000
2 CP2000-P communications processor 48 data communication lines	96,230
6 B9494-12 disk drives (868MB each)	206,700
1 B9389 storage controller	53,600
1 B9399 string controller	26,100
1 BT3261-1 GCR tape unit, controller and DLP	70,450
3 BT3266 slave GCR tape units	72,300
1 B9246-24 line printer (2000 lpm)	48,000
1 B9246-12 line printer (1200 lpm)	44,625
24 ET2150 workstations	69,400
Disk and printer DLPs	24,570

TOTAL PURCHASE PRICE: \$1,833,975 ▶

Unisys A 10

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
PROCESSORS AND MAIN MEMORY					
A 10 D/DX	Basic System; includes one central processor, one memory cabinet with one memory base and 12 megabytes of main memory, one I/O cabinet with two DLP bases, two operator display terminals, one operator console DLP, and one modem	410,000	650.00	23,087	17,552
A 10 /FX	Basic system; includes one central processor, 6K-byte cache, one memory cabinet with one memory base and 12 megabytes of main memory, one I/O cabinet with two DLP bases, two operator display terminals, one operator console DLP, and one modem	580,000	922.00	32,664	24,834
A 10 H/HX	Basic system; includes two central processors, 12K-byte cache, one memory cabinet with one memory base, one additional dual port memory, and 24 megabytes of main memory, two I/O cabinets with two DLP bases each, two operator display terminals, two operator console DLPs, one dual processor link, four I/O base exchanges for a two-processor system, and one modem	962,000	1,595.00	54,273	41,286
A 10-DTF	D to F upgrade; includes one A 10D to A 10 F upgrade kit	187,000	—	10,533	8,008
A 10-FTH	F to H upgrade; includes one central processor, one I/O cabinet with two DLP bases, one operator console DLP, one additional memory with backplane and 12-megabyte dual port memory module, four I/O base exchanges for a two processor system	420,200	—	23,766	18,094
A 10-MB	Additional memory with backplane and 12-megabyte dual port memory module	90,000	160.00	5,093	3,878
A 10-DMK	Memory cabinet; includes backplane and 12-megabyte dual port memory module	120,000	250.00	6,844	5,224
A 10-DPM	Dual port memory; 12 megabytes	80,000	150.00	4,538	3,458
A 10-DPI	Dual port increment; 12 megabytes	80,000	150.00	4,538	3,458
SYSTEM OPTIONS					
A 10-IIO	Independently powered I/O cabinet; with one message level interface extension and two DLP bases	45,000	138.00	2,630	2,023
A 10-MLX	Message level interface extension	1,000	—	54	39
A 930-2	Input/Output base exchange for two-processor system	4,725	15.50	217	168
A 995-95	Line expansion module (LEM 1x2)	5,000	12.50	277	212
ET 1100-ODT	Freestanding operator display terminal	2,042	21.50	114	86
A 341-93	ODT adapter for additional operator display terminal (ET 1100)	3,536	15.50	214	160
A 304-PPC	Peripheral power control; power for B 9387-41/42, B 9387-51/52 and B 9389 controllers	1,155	—	83	68
DATA LINK PROCESSORS					
X 110-90	Card reader DLP	3,700	46.00	231	193
X 112-90	Card punch DLP	3,700	46.00	231	193
X 395-91	PE Magnetic tape DLP	7,560	46.00	379	301
X 395-92	GCR Magnetic tape DLP	7,560	46.00	379	301
X 393-90	NRZ magnetic tape DLP	7,200	46.00	379	301
X 304-90	Host transfer interlaced DLP	7,200	46.00	379	301
X 304-91	Host transfer sequential/interlaced DLP	7,560	46.00	379	301
X 246-91	Line printer DLP (B 9246-6/12)	4,725	46.00	268	220
X 246-92	Line printer DLP (B 9246-21)	4,725	46.00	268	220
X 293-30	Non-impact printer DLP (9290-30)	4,725	46.00	268	220
X 304-95	SMD disk DLP (DLP II)	9,345	49.00	555	435
X 304-97	XSMD disk DLP; (MD8)	14,500	49.00	816	631
X 304-99	SMD disk DLP expander	1,890	19.00	115	88
X 378-10	Data communications DLP II	8,400	39.00	489	381
MASS STORAGE					
B 9484-51	Dual disk pack drive; 130 megabytes	21,000	198.00	—	—
B 9484-13	Removable disk pack drive; 252 megabytes, single spindle	33,000	127.50	—	—
B 9494-5	Fixed disk drive; 542 megabytes, single spindle, interlaced	26,500	110.00	—	—
B 9494-10	Fixed disk drive; 1084 megabytes, dual spindle, interlaced	55,400	227.00	—	—
B 9494-12	Fixed disk drive; 868 megabytes, single spindle, thin film head	34,450	120.00	—	—
MD4-2	Fixed disk; 245.6 megabytes, (2-122.8MB drives)	14,400	55.50	—	—
MD4-4	Fixed disk; 491.2 megabytes, (4-122.8MB drives)	27,500	110.50	—	—
MD8-2	Fixed disk; 500 megabytes, (4-250MB drives)	19,500	90.00	—	—
MD8-4	Fixed disk; 1000 megabytes, (4-250MB drives)	32,500	180.00	—	—
B 9387-51	Controller; 1x8 spindle	15,750	71.00	—	—
B 9387-52	Controller; 2x8 spindle	21,000	106.00	—	—
B 9987-4	Dual port feature for B 9494-10	3,780	31.00	—	—
B 9987-2	Dual port feature for B 9484-13	2,100	24.50	—	—

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge.

Unisys A 10

		Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
MASS STORAGE (Continued)					
B 9987-3	Dual port feature for B9494-5	2,100	21.00	—	—
B 9389	Dual storage controller	53,600	176.00	—	—
B 9389-DH	Dual host option for B9389	5,450	19.00	—	—
B 9399	Dual string controller	26,100	85.00	—	—
B 9387-30	Expander (2x); exchange expansion rack, exchange module, required when more than four B 9387-51 or two B 9387-52 controllers are configured	11,235	18.00	—	—
MAGNETIC TAPE UNITS					
BT3244	Slave PE/GCR tape drive; 75 ips	22,475	155.00	1,365	1,090
BT3241-1	Controller; 1x8 with 75 ips drive and one DLP	57,960	355.00	3,450	2,740
BT3241-2	Controller; 1x8 with channel switch, 75 ips drive and two DLPs	75,745	445.00	4,530	3,590
BT3266	Slave PE/GCR tape drive; 125 ips	24,100	210.00	1,535	1,240
BT3261-6	Controller; 1x8 with 125 ips drive and one DLP	70,450	465.00	4,245	3,385
BT3261-2	Controller; 1x8 with channel switch, 125 ips drive and two DLPs	88,235	555.00	5,220	4,195
BT3262-1	Controller; 2x8 with 125 ips drive and two DLPs	115,210	725.00	6,880	5,474
BT3262	Controller; 2x8 with two channel switches, 125 ips drive and four DLPs	150,780	905.00	8,935	7,095
BT3288	Slave PE/GCR tape drive; 200 ips	32,500	290.00	2,080	1,685
BT3281-1	Controller; 1x8 with 200 ips drive and one DLP	86,000	530.00	5,120	4,070
BT3281-2	Controller; 1x8 with channel switch, 200 ips drive and two DLPs	103,785	620.00	6,140	4,880
BT3282-1	Controller; 2x8 with 200 ips drive and two DLPs	139,000	775.00	8,140	6,445
BT3282-2	Controller; 2x8 with two channel switches, 200 ips drive and two DLPs	174,570	955.00	10,195	8,070
B 9495-82	Magnetic tape unit; 120KB, 75 ips, PE	16,000	181.50	—	—
B 9495-83	Magnetic tape unit; 200KB, 125 ips, 1600 bpi, PE	22,447	206.50	—	—
B 9499-14H	Controller; 125 ips, includes 1x4 master electronic exchange, PE control module, cabinet for B 9495-82/83	11,465	154.50	—	—
B 9499-18M	Controller; 75 ips, includes 1x8 master electronic exchange, PE control module, cabinet for B 9495-82/83	21,060	154.50	—	—
B 9499-28M	Controller; 75 ips, includes 2x8 master electronic exchange, two PE control modules, cabinet for B 9495-82/83	51,240	337.00	—	—
B 9499-2XH	Controller; 125 ips, includes 2x16 master electronic exchange, two PE control modules, cabinet for B 9495-82/83	53,940	337.00	—	—
B 9499-3XM	Controller; 75 ips, includes 3x16 master electronic exchange, three PE control modules, cabinet for B 9495-82/83	83,310	496.00	—	—
B 9499-4XH	Controller; 125 ips, includes 4x16 master electronic exchange, four PE control modules, cabinet for B 9495-82/83	110,200	658.00	—	—
B 9495-32	Magnetic tape unit; 470/120KB, 75 ips, GCR	17,750	209.00	—	—
B 9495-33	Magnetic tape unit; 780/200KB, 125 ips, GCR	19,000	220.50	—	—
B 9495-24	Magnetic tape unit; 1250/320KB, 200 ips, GCR	36,225	312.00	—	—
B 9499-21	GCR/PE controller; 1x8	42,635	286.00	—	—
B 9499-22	GCR/PE controller; 2x8	85,288	567.50	—	—
B 9499-42	GCR/PE exchange for B 9499-22, 2x16	7,571	32.00	—	—
B 9999-3	Dual port switch	5,905	25.00	—	—
TERMINALS					
ET 1100	Terminal workstation with keyboard; RS-232-C, TDI	1,659	21.50	—	—
ET 2150	Terminal workstation with keyboard; character graphics, 512KB RAM	2,895	54.00	—	—
B 25	Microcomputer workstation with keyboard; 256KB RAM, 80186 processor	8,928	88.50	—	—
CARD EQUIPMENT					
B 9116	Card reader; 600 cpm, 80 columns	11,372	27.50	—	—
B 9213	Card punch; 300 cpm, 80 columns	31,085	630.00	—	—
B 9915	51-column read feature for B 9116	844	—	—	—
PRINTERS					
B 9246-6	Line printer; 650 lpm	15,435	205.00	—	—
B 9290-30	Nonimpact printing system; 30 ppm (laser)	65,000	698.00	—	—
B 9246-12	Train Printer; 1250 lpm, 132 positions	44,625	440.00	—	—
B 9246-21	Train Printer; 2000 lpm, 132 positions	40,300	826.00	—	—
COMMUNICATIONS EQUIPMENT					
A 378-11	Network support processor (NSP IV) DLP 2	36,750	215.00	2,216	1,756
A 378-1	Line support processor (LSP III)	4,200	16.50	163	140
A 378-7	Line support processor (LSP II) 56K-bit	10,290	41.50	452	376
A 378-2	Add-on memory; network support processor (NSP IV), 256K-bit	5,250	15.50	248	188
A 378-3	Quad line adapter (character)	3,150	26.00	—	125

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge.

Unisys A 10

		Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
COMMUNICATIONS EQUIPMENT (Continued)					
A 378-4	Quad line adapter (bit)	3,150	26.00	—	125
A 369-10	RS-232 electrical interface (character, bit)	NC	—	—	—
A 369-11	CCITT V.24 electrical interface (character, bit)	NC	—	—	—
A 369-12	TDI/20 electrical interface (character, bit)	NC	—	—	—
A 369-40	Autocall feature (character, bit)	NC	—	—	—
1-2-3-4-QD	Foreplane jumper cable for 1, 2, 3, and 4 quads	NC	—	—	—
X 394-93	FIPS Hyperchannel DLP 2 for A 3, A 9, A 10, A 12	21,000	150.00	1,345	1,075

Inter-System Control

A 320-IHC	Independent hub cabinet	22,270	142.50	865	711
A 320-5	Hub 16; (includes 2-port capability)	9,040	60.50	363	297
A 320-6	Hub expansion (additional 1-port capability)	771	6.00	39	31
A 320-2	Inter-system control host DLP/974	12,495	70.00	741	554

Peripheral Reconfiguration

A 890-PRC	Peripheral reconfiguration cabinet	5,512	37.50	238	197
A 890-3	Disk kit (B9387-4x, B9387-5x, B9389)	1,765	15.00	72	61
A 890-34	Disk kit (B9387-4x with B9387-3x exchange)	1,765	15.00	72	58
A 890-4	PE magnetic tape controller kit	3,859	22.50	163	127
A 890-8	GCR magnetic tape controller kit	2,095	15.00	89	71

Peripheral Power Control

A 304-PPC	Peripheral power control (power for B9387-41/42, B9387-51/52 and B9389 B9387-51/52 and B9389 controllers, one PPC per sub-system)	1,155	—	83	63
B 9387-RPC	B 9387 remote power control	236	—	20	17
CB 865	Cable; 50-ft., host to B9387 remote power control	850	—	59	48
B 9389-RPC	B9389 remote power control	210	—	11	23
CB 866	Cable; 100-ft., host to B9389 remote power control	619	—	32	23
CB 867	Cable; 200-ft., host to B9389 remote power control	1,018	—	52	38

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge.

SOFTWARE PRICES

		Limited Time-Plan	Annual Product Service Agreements	
		Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
A 10 SSD	System Software Facility; includes Master Control Program (MCP), Utility Programs, Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, and Cross Reference Symbolic (Model D)	2,025	11,220	6,492
A 10 ASD	System Software Facility; includes Master Control Program/Advanced System MCP/AS, Algol Compiler, DC Algol Compiler, Program Binder, AS Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, Utility Programs, and Cross Reference Symbolic (Model DX)	2,025	11,544	6,684
A 10 SSF	System Software Facility; includes Master Control Program (MCP), Utility Programs, Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, and Cross Reference Symbolic (Model F)	2,808	16,008	9,264
A 10 ASF	System Software Facility; includes Master Control Program/Advanced System MCP/AS, Algol Compiler, DC Algol Compiler, Program Binder, AS Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, Utility Programs, and Cross Reference Symbolic (Model FX)	2,800	15,960	9,240
A 10 SSH	System Software Facility; includes Master Control Program (MCP), Utility Programs, Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, and Cross Reference Symbolic (Model H)	3,089	17,616	10,200
A 10 ASH	System Software Facility; includes Master Control Program/Advanced System MCP/AS, Algol Compiler, DC Algol Compiler, Program Binder, AS Microcode, Menu Assisted Resource Control (MARC), SMF II Site Management, Workflow Language, Utility Programs, and Cross Reference Symbolic (Model HX)	3,075	17,532	10,152

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge.

Unisys A 10

		Limited Time-Plan	Annual Product Service Agreements	
		Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
Compilers				
A 10 ATD	Algol Test and Debug System	145	828	480
A 10 BSC	Basic Compiler	154	876	504
A 10 APL	APL/700	154	996	576
A 10 COB	Cobol Compiler (ANSI 68)	147	840	480
A 10 C74	Cobol Compiler (ANSI 74)	140	804	468
A 10 CTD	Cobol 74 Test and Debug	145	828	480
A 10 PL1	PL/1 Compiler	154	996	576
A 10 FOR	Fortran Compiler (Level H)	154	876	504
A 10 F77	Fortran Compiler (ANSI 77)	168	960	552
A 10 FTD	Fortran 77 Test and Debug	145	828	480
A 10 RPG	RPG II Compiler	154	876	504
A 10 PAS	Pascal Compiler	305	1,740	1,008
A 10 SRT	Sort Utility	187	1,020	588
A 10 APB	APL B	340	1,944	1,128
Productivity Aids				
A 10 LN2	Logic and Information Network Compiler (Linc II)	3,500	21,600	10,584
A 10 L2R	Linc II Run Time System	380	—	650
A 10 DCL	Linc II Development Partner; includes Linc II Compiler, Cobol 74 Compiler, Communications Management System (Entry), Extended Retrieval w/ Graphic Output, DMS II Data Base Interpreter	—	28,370	14,426
Support Utilities				
A 10 BAR	Activity Reporting	105	600	348
A 10 SMR	SMF II System Resource Management	410	2,223	1,287
A 10 LOG	Logger	68	372	216
A 10 BSL	Billing Support Library	50	288	168
A 10 SSL	Security Support Library	50	288	168
A 10 IPF	Intelligent Printer Support Facility	168	960	552
A 10 MLS	Multi Lingual System	120	684	396
A 10 DAC	Infoguard; requires SMF II Resource Management	500	2,700	1,500
Data Communications				
A 10 DCS	Data Communications Software package including Interactive Datacom Configurator, Network Definition Language II, NSP/LSP Firmware	158	900	516
A 10 NCS	Network Communications Subsystem; includes Network Administration Utility, Network Services II	150	900	540
A 10 BLC	BDLC Protocol for DC/DLP	75	428	248
A 10 BNS	BNA Network Services	882	4,788	2,772
A 10 BYC	Bysynchronous (2780) Protocol DC/DLP	75	428	248
A 10 RJE	Remote Job Entry	100	564	324
A 10 COE	Communications Management System (Entry)	394	2,138	1,238
A 10 COT	Communications Management System	693	3,768	2,184
A 10 X25	X.25 MCS	341	1,860	1,080
A 10 NDA	Network Definition Language II Analyzer	68	384	228
A 10 RMP	Remote Print System	225	1,284	744
A 10 DIA	Diagnostic MCS	79	432	252
A 10 MCB	Gemcos (Basic)	578	3,144	1,824
A 10 MCA	Gemcos (Advanced)	966	4,788	2,772
A 10 MCT	Gemcos (Total)	1,103	5,988	3,468
A 10 MCF	Gemcos Format Generator (requires MCA or MCT)	210	1,200	696
A 10 CDE	Command and Edit (Cande)	161	888	504
A 10 SDF	Screen Design Facility	189	1,080	624
A 10 EDI	The Editor	158	900	516
A 10 ESN	SNA 3270 Emulator	115	660	385
A 10 FSL	Format Support Library	90	540	300
A 10 HSV	Host Services	840	4,800	2,820
A 10 L62	SNA LU 6.2 Service Manager	115	660	385
A 10 PLS	Enhanced Poll/Select DC/DLP	75	428	248
A 10 SDL	SDLC Protocol	75	428	248
A 10 SJE	SNA/RJE	75	428	248
A 10 ST2	PU/T2 Emulator	80	460	268

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge.

Unisys A10

		Limited Time-Plan	Annual Product Service Agreements	
		Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
Reporting				
A 10 RP3	Reporter III	600	3,420	1,980
A 10 OR3	On-Line Reporter III; requires RP3	60	324	192
Data Management				
A 10 DM2	Data Management System II	1,045	5,880	3,120
A 10 DI2	DMS II Inquiry	209	1,080	624
A 10 DBA	DMS II Data Base Analyzer	190	1,080	624
A 10 DDM	DMS II Data Base Monitor	190	1,080	624
A 10 IDD	Advanced Data Dictionary System	670	3,720	2,160
A 10 DMT	DMS II DM Interpreter	155	1,008	516
A 10 DMC	DMS II Data Base Certification	135	780	456
A 10 DIC	Data Dictionary System	270	1,536	888
A 10 ERG	Extended Retrieval with Graphic Output (requires DM Interpreter)	500	2,820	1,620
A 10 DME	Data Aid	130	744	432
A 10 TPS	DMS II Transaction Processing System	160	972	564
A 10 IE1	Information Executive (InfoExec); package 1 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory	1,000	5,400	3,000
A 10 IE2	Information Executive (InfoExec); package 2 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory, Data Management System II (DMS II)	1,875	10,128	5,628
A 10 IQF	InfoExec Interactive Query Facility	655	3,540	1,968
A 10 OCM	InfoExec Operations Control Manager	155	840	468
A 10 QP	InfoExec Query Package; includes InfoExec IQF, InfoExec/WQF-Host	655	3,540	1,968
A 10 WQH	InfoExec Workstation Query Facility-Host	655	3,540	1,968
Networking System Software				
A 99 NCF	Network Control Facility; includes Network Control Manager, Distributed Control Agent, Graphics Display Module	375	2,160	1,260
A 99 CPG	Custom Protocol Generator	—	2,880	1,680
A 9 CPC	CP2000 Configurator	120	720	420
Workstation Integration				
A 10 DES	Data Entry System	380	2,172	1,260
DC 10 HLS	Host-Link Server (ET2000)	506	2,880	1,668
A 10 IDE	Intelligent Distributed Editor (B20, ET2000, PC)	155	884	516
A 10 DTS	Data Transfer System	155	888	516
A 10 DE2	On-Line Data Entry System (Odesy)	300	1,536	890
CP2000 Data Communications Software & Protocols				
CP 2000 COS	CP2000 Operating System Software	80	480	300
C 99 TTY	TTY Station Group	40	240	180
C 99 BSC	Bysynchronous Station Group	50	300	180
C 99 X25	X.25 Protocol	210	1,200	720
C 99 X21	X.21 Protocol	90	540	300
C 99 ST2	SNA PU, T2 Adapter	80	480	300
C 99 SDL	SDLC Station Group	50	300	180

*For 5-day, 9-hour service.

**Includes 7-day, 24-hour maintenance coverage.

NC—No charge. ■