

Unisys A 2, A 3, and A 5

MANAGEMENT SUMMARY

The Unisys A 2, A 3, and A 5 Systems represent the entry-level systems for the vendor's premier A Series of computer systems. This unique family of computer systems offers a conversion-free performance increase of over 120 times from the low-end A 2 to the high-end A 15 Models M and N. Although the A 2, A 3, and A 5 Systems and the A 15 Systems operate at different performance levels, they are functionally compatible. All A Systems run the same operating system, use the same systems and applications software, and feature the same 48-bit word instruction set. In addition, the systems feature similar input/output subsystems and data communications subsystems, and most of the same peripherals can be attached.

The primary components of the A 2, A 3, and A 5 Systems are all contained in one cabinet and include the central processor, memory subsystem, I/O and data communications subsystem, and maintenance subsystem. The cabinets may contain up to four (A 3 Model K) integrated Winchester disk drives providing 123 megabytes of formatted data per drive. Despite their small size the systems support an impressive amount of mass storage and data communications lines. The A 2 and A 3 Models D and E each can support up to two gigabytes of mass storage. The A 3

The Unisys A 2, A 3, and A 5 Systems are designed to perform multiple applications, such as batch, on-line, and realtime processing. These small to medium, general-purpose systems can also function as nodes in a distributed data processing network.

MODELS: A 2; A 3 Models D, E, F, and K; and A 5 Model F.

CONFIGURATION: From 3 to 48 megabytes of main memory, 1 to 2 Central Processors, and 1 to 2 Input/Output Subsystems with 8 to 16 Data Link Processors.

COMPETITION: Honeywell Bull DPS 7000, IBM 4381, and NCR 8800.

PRICE: Purchase price for a basic system ranges from \$65,500 for the A 2 to \$224,000 for the A 5.

CHARACTERISTICS

MANUFACTURER: Unisys Corporation, P.O. Box 500, Blue Bell, Pennsylvania. 19424. Telephone (215) 542-4011. Canada: Unisys Canada, 2001 Sheppard Avenue East, North York, Ontario M2J 4Z7. Telephone (416) 495-0515.



The Unisys A 5 Model F is a single-processor system with 6 megabytes of memory, expandable to 24 megabytes in 3-megabyte increments. It contains two I/O bases in its processor cabinet and can accommodate one expansion cabinet with two additional I/O bases supporting a total of 160 data communications lines.

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▷ Models F and K and the A 5 Model F can each support 11.6 gigabytes of mass storage. For users requiring more mass storage capabilities or more data communications, an optional expansion cabinet is available for A 3 Models F and K and the A 5 Model F. The expansion cabinet is the same size as the basic processor cabinet and houses up to four 123-megabyte integrated disks and two additional I/O base modules with up to 48 communications lines.

To further improve their communications capabilities the A 2, A 3, and A 5 Systems use the CP2000 Communications Processor, which offloads communications processing from the host systems, saving valuable CPU resources for other processing tasks. The CP2000 can also be used as a remote controller/concentrator for terminal networks and connects to the host systems through the Integrated Control Processor (ICP). Unisys CPLAN, a high-speed local area network, can also be used to connect the A Series and other systems to the CP2000. In combination with BNA, CPLAN provides protocols for file transfers and access between computer systems.

COMPETITIVE POSITION

Unisys is streamlining and tightening up its A Series by retiring some systems and enhancing the remaining ones. The A 9, the first of the A Series, went into well-deserved retirement and the enhanced A 10 System took its place. The A 10 is now the entry system to the Unisys high-end A 12 and A 15 mainframes, while the A 2, A 3, and A 5 Systems form the entry level to the A Series. These low-end systems are available in packaged versions including pre-loaded operating software, a pregenerated network control system, the Linc II Entry, and specific systems software.

For years Unisys sold most of its mainframes to its existing user base or to first-time computer users. Now the company is reorganizing its marketing strategy to more effectively compete with the other computer vendors, primarily IBM. To keep up the good quarterly results Unisys has boasted since its inception, the vendor now has to substantially increase its computer sales, because most of the earlier profits came from consolidations within the company and the sale of Memorex and other subsidiaries.

The A 3 has a strong presence in the manufacturing industry, performing commercial applications such as inventory control, payroll, order processing, and purchasing. The strong competition in this commercial applications area is IBM's low-end 4381 Model Group 21. Although, the A Systems' performance has been rated very highly by the users, IBM is, and will be, holding the lion's share in this market segment. The NCR 8800 is competing with the A 2, A 3, and A 5 in the banking and financial sector where NCR has an established stronghold. The new Honeywell Bull DPS 7000 is a transaction processing system targeted for the hospital and health care industry, a segment of the market that is also of great interest to Unisys.

To counter the competition and to better address the needs of current and potential new users, Unisys has established

▶ **MODELS:** Unisys A 2; A 3 Models D, E, F, and K; and A 5 Model F.

DATA FORMATS

BASIC UNIT: Fixed-length memory word consisting of 59 bits: 48 data bits, 4 tag bits, and 7 check bits. The 7 check bits are used to perform single-bit error correction and multiple-bit error detection.

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.

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 left to right.

INTERNAL CODE: The 8-bit EBCDIC is standard. Information coded in ASCII can also be processed. ASCII is the primary data communications code.

MAIN MEMORY

The Memory Subsystem includes the Memory Modules, the Memory Control Unit (MCU), and the Memory Bus (M-Bus). In the single-processor models the MCU serves as the interface between the processor and the main memory. The MCU checks the integrity of data received from memory, logs software and hardware failures, and provides tag checks on certain types of memory access. Data is exchanged between the MCU and the central processor via the 52 bidirectional data lines on the M-Bus. In the dual-processor A 3 Model K, a Shared Access Memory (SAM) control is used in place of the MCU to serve as the interface between the two processors and main memory.

STORAGE TYPE: 256K-bit RAM memory chips.

CAPACITY: Memory capacities are listed in Table 1.

CYCLE TIME: Not available from vendor.

CHECKING: Logic in the Memory Control Unit (MCU) performs automatic correction of single-bit errors and detection of multiple-bit errors.

RESERVED STORAGE: Not offered on the A 2, A 3, and A 5.

CENTRAL PROCESSORS

The Central Processing Unit (CPU) is a stored logic processor that utilizes Transistor to Transistor Logic (TTL) compatible, Very Large Scale Integration (VLSI) gate arrays, storage devices, and drivers. Microcode is used as the source of control for operator execution. The central processor is functionally subdivided into six relatively independent submodules which perform specific functions.

The storage element of the central processor is organized as a *Register File* and made up of 32 words that are 48 bits wide. The majority of the E-Mode (Beta Level Instruction Set) processor state is contained in the Register File.

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TABLE 1. SYSTEM COMPARISON

MODEL	A 2	A 3 Model D	A 3 Model E	A 3 Model F	A 3 Model K	A 5 Model F
SYSTEM CHARACTERISTICS						
Date announced	April 1986	October 1984	May 1985	October 1984	October 1984	July 1986
Date first delivered	April 1986	November 1984	May 1985	February 1985	3rd quarter 1986	September 1986
Field upgradable to	A 3 Model D	Models E, F, K	Model F, K	Model K, A 5	—	—
Relative performance	1.0	1.8	1.8	1.8	3.2	4.0
Number of processors	1	1	1	1	2	1
Cycle time, nanoseconds	Not specified					
Word size, bits	48	48	48	48	48	48
Operating systems	MCP Release 3.7 MCP/AS					
MAIN MEMORY						
Type	256K-bit RAM					
Minimum capacity, bytes	6M	6M	6M	6M	6M	6M
Maximum capacity, bytes	24M	24M	24M	24M	48M	24M
Increment size, bytes	3M	3M	3M	3M	3M	3M
Cycle time, nanoseconds	Not specified					
BUFFER STORAGE						
Minimum capacity	—	—	—	—	—	—
Maximum capacity	—	—	—	—	—	—
Increment size	—	—	—	—	—	—
INPUT/OUTPUT CONTROL						
Number of channels:						
Byte multiplexer	—	—	—	—	—	—
Block multiplexer	—	—	—	—	—	—
Word	—	—	—	—	—	—
Other	8 DLPs	8 DLPs	8 DLPs	16 DLPs	16 DLPs	16 DLPs

➤ a Line of Business (L.O.B.) marketing strategy. Four different L.O.B.s have been identified so far: the Public Sector, Industrial and Commercial, Financial Services, and Communications and Airlines L.O.B. Responsibility for the development of the industry-specific applications software has been transferred to the respective L.O.B. organization. With this move, Unisys is trying to resolve the longtime user complaint about the lack of applications software available from the vendor.

ADVANTAGES AND RESTRICTIONS

The technological advances incorporated in the design of the low-end A Systems, such as the use of high-density 256K-bit RAM technology, transistor-to-transistor logic, VLSI circuits, and gate arrays, together with the MCP and MCP/AS operating system, provide the user with very efficient computer systems. The air-cooled A Systems are compact in size and have the ability to operate equally well in an office or computer room environment performing multiple data processing applications. The A 2, A 3, and A 5 Systems are object code compatible with all the A Series computers as well as the B 5900, B 6900, and the B 7900 Systems, protecting the user investment in applications software and data files.

Users can quadruple the performance from the small A 2 to the A 5, not only with software intact, but without changing processor cabinets. The performance upgrade involves only the exchange of some internal components and can be accomplished quickly on location. The exception is the dual-processor A 3 Model K, which cannot be field upgraded to the A 5.

As of late, Unisys has been improving its technical support, education, and most importantly, its documentation. The ➤

➤ The *Data Section* contains Rotate/Merge Logic and an Arithmetic/Logic Unit (ALU) which perform all mathematical and logic functions required by the software operators or other modules in the system.

The *Condition Logic Module* performs condition checking, tag storage and selection, counter and timer implementation, and address decoupling.

The *Code-Isolate Module* is a Program Controller (PC) that manages code streams and buffers, and decodes the E-Mode operators.

The *Control Store* (CS) contains 16K words by 73 bits of writable microcode, which generates the control signals to execute E-Mode operators, interrupts, and I/O routines.

The *Micro-Address Module* (MAM) is the microcode sequencer of the CPU and provides the next address to the CS.

The A 2, A 3, and A 5 Systems utilize buses to transfer data between the various modules. The 52-bit wide M-Bus transfers data between the MCU and the processor, and also between the Host Dependent Port (HDP) and the processor. The 52-bit wide Data Bus (D-Bus) serves as an internal communication channel in the processor. To accomplish these data transfers, both the M-Bus and the D-Bus communicate through a set of bidirectional buffers contained in the Data Section. The OPND1 Bus is 48 bits wide and transfers information from the Control Section and Condition Logic modules into the Data Section. These modules utilize this bus to read data from the Data Section. The 48-bit wide D-Bus OPND2 is internal to the Data Section.

The HDP serves as the interface between the central processor and associated I/O peripheral processors resident in either the internal Data Link Interface (DLI) or the external Message Level Interface (MLI). The HDP can support one DLI and two MLIs. The HDP transfers two bytes of data at a time, utilizing the upper 16 bits of the M-Bus. The logic supervising this transfer is contained in the central processor. The HDP ensures the integrity of the data by use of both vertical and longitudinal parity checking. The HDP acts as ➤

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➤ results are reflected in this year's Computer User Survey with noticeably better averages.

USER REACTION

The 1987 Datapro Computer User Survey yielded responses from 49 Unisys A 3 users. Only four users of the newer A 5 System responded and no responses were received from A 2 users. Therefore, the A 3 and A 5 Systems were combined to tabulate the results for the user survey.

Only 7 of the 53 respondents converted to Unisys from other vendors, 5 were first-time Unisys users, and 32 respondents upgraded from smaller Unisys systems, an indication of strong user loyalty. Fourteen respondents leased their systems from third-party vendors, 10 rented their systems from the manufacturer, and 29 users purchased theirs directly from the vendor.

The A Systems were installed mostly as organizational systems in many different businesses, mainly in manufacturing, retail/wholesale, and government. The principal applications were accounting and billing, payroll and personnel, order processing and inventory, purchasing, sales and distribution.

The data base management system DMS II was used by 48 respondents and rated from good to excellent. Only 10 respondents had established an information center and 3 were in the planning stage. Seven users were planning to implement a disaster recovery plan during 1987 and 26 respondents had such a plan already in place. When asked about plans concerning new acquisitions for 1987, most users listed expansions to present hardware and data communications facilities and the purchase of additional software from the manufacturer.

As part of the survey, users were asked to rate their equipment in 14 specific areas. A weighted average was then calculated based on the total number of responses. A summary of these ratings is included in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	28	23	2	0	3.49
Reliability of mainframe	43	9	1	0	3.79
Reliability of peripherals	20	29	3	0	3.33
Maintenance service:					
Responsiveness	22	27	4	0	3.34
Effectiveness	22	27	2	0	3.35
Technical support:					
Troubleshooting	14	27	11	1	3.02
Education	7	32	13	1	2.85
Documentation	4	24	21	3	2.56
Manufacturers software:					
Operating system	31	21	1	0	3.57
Compilers & assemblers	29	21	2	0	3.52
Applications programs	9	29	6	0	3.07
Ease of programming	29	20	3	0	3.50
Ease of conversion	23	26	3	1	3.34
Overall satisfaction	29	22	2	0	3.51

*Weighted Average on a scale of 4.0 for Excellent.

When A 3 users were asked whether their systems performed as expected, 47 said "Yes" and 2 were undecided. ➤

➤ a slave to the CPU, executing only low-level operations that do not include any decision-making capabilities.

SPECIAL FEATURES: The maintenance subsystem comprises a User Interface Processor (UIP), a Processor Interface Card (PIC), and a Power Control Card (PCC). Combined, these three modules perform system initialization, support remote maintenance, manipulate shift chains (scan paths), provide 4K words of history trace to maintain a history of selected input, and provide a system event analyzer. The subsystem also performs Operator Display Terminal (ODT) functions automatically or by user override, provides system clock circuits and control, initiates and reads self-testing Data Link Processors (DLPs) on the Data Link Interface, and provides remote power control capabilities. The ODT allows the operator to control the system operation and to access all internal states of the system during diagnostic testing.

PHYSICAL SPECIFICATIONS: The basic A 2, A 3, and A 5 Systems all have identically sized processor cabinets, which measure 29 inches deep by 36 inches wide by 44 inches high and occupy only 7¼ square feet of space. The A 2 and A 3 Model D weigh 530 pounds each, the weight for the A 3 Models E and F and the A 5 Model F is 675 pounds each, and the A 3 Model K weighs in at 700 pounds. Power consumption for the A 2 and A 3 Model D is 3.96 kVA; 4.32 kVA for the A 5; and 7.24 kVA for the A 3 Models E, F, and K. Heat output to air is 8.8 Btu for the A 2 and A 3 Model D; 11.06 Btu for the A 5; and 16.06 Btu per hour for the A 3 Models E, F, and K.

CONFIGURATION RULES

The basic A 2 System consists of one central processor; 6 megabytes of main memory expandable to 24 megabytes in 3-megabyte increments; one I/O base including one Data Communications (DC) DLP (4 lines), one Storage Module Device (SMD) DLP, one printer/tape DLP, and one disk storage module. A configuration may have up to eight DLPs supporting 16 data communications lines. The system also includes one freestanding operator display terminal.

The basic A 3 Models D, E, and F each have one central processor, 6 megabytes of main memory expandable to 24 megabytes in 3-megabyte increments, one 123-megabyte integrated Winchester disk, and one freestanding operator display terminal. Model D has one I/O base including one DC DLP (4 lines), one SMD DLP, one User Interface Processor (UIP) DLP, and one printer/streamer DLP. Up to eight DLPs supporting up to 16 data communications lines can be configured. Model E has two I/O bases and supports up to eight DLPs, a Network Support Processor (NSP) and two Line Support Processors (LSPs) supporting 24 data communications lines. Model F can support one expansion cabinet with two I/O bases, up to 16 DLPs and a maximum of 160 data communications lines.

The basic A 3 Model K includes two central processors; 6 megabytes of main memory expandable to 48 megabytes in 3-megabyte increments; one I/O base including one DC DLP (4 lines), two SMD DLPs, one UIP DLP, and one printer/streamer DLP; two to four 123-megabyte integrated Winchester disks; and two freestanding operator display terminals. One or two expansion cabinets, each with two I/O bases, can be added to provide up to 216 communications lines.

The basic A 5 Model F has one central processor, 6 megabytes of main memory expandable to 24 megabytes in 3-megabyte increments, one 123-megabyte integrated Winchester disk, and one freestanding operator display terminal. Also included are two I/O bases with one DC DLP ➤

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➤ When asked if they would recommend their system to others, 46 users answered "Yes" and 3 were undecided. The four A 5 users stated their system performed as expected, and three would recommend their systems to others, while one was undecided. □

➤ (4 lines), one SMD DLP, one UIP DLP, and one printer/streamer DLP. One expansion cabinet containing two I/O bases can be added to provide a total of 160 data communications lines.

By adding a CP2000 Communications Processor to the A 2, A 3, and A 5 Systems an additional 48 data communications lines can be supported. Optional DC DLPs can also provide additional communications lines.

The A Systems are also offered in packaged versions that include the basic hardware configurations described above, the Logic and Information Network Compiler II (Linc II) Entry and system software packages, and additional hardware.

The A 2 package includes the Linc II Entry and System Software Package 4 and a 123-megabyte integrated disk drive.

The A 3 Model D, E, and F package each consist of an additional 3 megabytes of memory and a 123-megabyte integrated disk drive, Linc II Entry and Advanced System (AS) Software Package 1, plus a single processor AS adapter.

The packaged version of Model K includes the Linc II Entry and AS Software Package 2, plus a dual-processor AS adapter.

The A 5 Model F package consists of an additional 123-megabyte disk, Linc II Entry, and AS System Software Package 2.

A complete and detailed listing of the various software packages can be found in the software price list which follows this report.

INPUT/OUTPUT CONTROL

The Input/Output Subsystem and the Data Communications Subsystem are combined into the Input/Output Data Communications (IODC) Subsystem. Up to eight DLPs are housed in an IODC Subsystem. Peripheral I/O devices are connected and controlled by these intelligent, microprocessor-driven function processors. Each DLP contains micro-coded control programs unique to the type of I/O device it controls. In general, a different DLP is used for each type of peripheral device connected to the system, but the dual-purpose DLP provides connectivity to both a tape unit and the system printer. The SMD DLP provides the interface for the built-in disks and the external Multi-Disks.

The A 2, A 3, and A 5 can support 8 to 16 DLPs and can support a band pass of 3.4 megabytes per second (burst rate).

MASS STORAGE

For information on mass storage devices, refer to Table 2.

INPUT/OUTPUT UNITS

For information on magnetic tape units and printers, refer to Table 3.

TERMINALS

For information on terminals, refer to Table 4.

COMMUNICATIONS CONTROL

The 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 independent, specialized communications modules.

Data Communications Data Link Processors (DCDLPs) are located in the IODC Subsystem. Each microprocessor-based DCDLP controls four lines and allows for the configuration of small to medium networks.

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 interruptions to the central system each time a character or word of data is transferred. The NSP contains a minimum of 256K bytes of integrated circuit memory and is programmed by means of Unisys' Network Definition Language II (NDL II), a descriptive, parameter-driven language. Each NSP can support up to four LSPs and up to 48 communications lines.

The *LSP* is a microprocessor-based unit that performs the low-level network control functions in the subsystem. The NSP off-loads most of the detailed data link control functions onto the LSP by downline loading the appropriate line discipline and parameters into the LSP memory. The LSP then controls individual line protocol functions (such as auto dialing, answering, and disconnecting), and code translation. Information is transferred between the LSP and the NSP at the message level. Message lengths are dependent upon the types of terminals being serviced. Each LSP supports up to 16 half-duplex or full-duplex communications lines connected via four Quad Line Adapters (QLAs). Each line can be configured with either single drop or multidrop support. The maximum aggregate data rate for all lines attached to a single LSP is 4800 bits per second.

Line Adapters provide the electrical interface between the LSP and each communications 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 and station parameters, polling sequences, and the code required to control the communications line and line discipline. The Line Adapters are packaged in sets of four. Each set of QLAs 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, CCITT V.35, or TDI/20. Different electrical interfaces can be intermixed within the same QLA, and character- and bit-oriented QLAs can be intermixed on the same LSP. Autocall is available for any Line Adapter as a no-charge feature.

The *CP2000 Communications Processor* is also available for the A 2, A 3, and A 5 Systems and can be used as a front-end processor. It enables users to take advantage of Burroughs Network Architecture (BNA) which allows the A Series and other Unisys systems to communicate with one another and with other vendors' computers, terminals and networks, including IBM systems using SNA and X.25 packet switching.

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TABLE 2. MASS STORAGE

MODEL	Multi-Disk4	Multi-Disk8	B9484-13	B9494-10
Cabinets per subsystem	2	2	2	2
Disk packs/HDA's per cabinet	2 to 4 Winchester	2 to 4 Winchester	1 removable	2 fixed
Capacity	122.8MB formatted	250MB formatted	252MB formatted	963.6MB formatted
Tracks/segments per drive unit	—	—	—	—
Average seek time, msec.	21.7	18	19.7	13.7
Average access time, msec.	30	26.3	28	22
Average rotational delay, msec.	8.3	8.3	8.3	8.3
Data transfer rate	1.2MB	1.2MB	1.2MB	1.2MB
Controller model	—	—	B9387-51 B9387-52	B9387-51 B9387-52
Comments	Employs Storage Module Device (SMD)	Employs extended SMD	BX304-90 DLP	BX304-90 DLP

► SOFTWARE

OPERATING SYSTEM: The *Master Control Program (MCP)* and the *Software Release 3.7 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 available for the A 2, A 3, and A 5 Systems. 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 A 3 Model K 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, an 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.

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 ASD 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 that 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

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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 9495-33	9	1600	PE	75	120,000
	9	6250	GCR	75	470,000
B 9495-32M with built-in formatter	9	1600	PE	75	120,000
	9	6250	GCR	75	470,000
B 9498	9	1600	PE	100	160,000/470,000
BT32XX	9	1600	PE	75	120,000
	9	6250	GCR	125/200	200,000/470,000
Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
B 9246-6	650 lpm	132	10	6 or 8	4 to 20
B 9246-12	1250 lpm	132	10	6 or 8	4 to 20
B 9290-30	30 ppm	—	3.5 to 20	2.5 to 13.3	8½ by 11
B 9246-24	2000 lpm	132	10	6 or 8	4 to 20

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, respectively. 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, 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, phys-

ical 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.

Communications 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,

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► 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. It 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 that 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 inteAGEMENT: *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, an optional extension of DMS II, provides an easy-to-use language that enables non-EDP personnel to access the data base via remote terminals. 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. ►

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TABLE 4. TERMINALS

MODEL	ET 1100	ET 2000	B 20
DISPLAY PARAMETERS			
Max. chars./screen	2080	2080	2240
Screen size (lines x chars.)	24 x 80	24 x 80	28 x 80
Symbol formation	7 x 9 dot matrix	7 x 9 dot matrix	7 x 9 dot matrix
Character phosphor	P39 green	P39 green	Green
Total colors/no. simult. displayed	—	—	—
KEYBOARD PARAMETERS			
Style	Typewriter	Typewriter	Typewriter
Character/code set	128 ASCII	ASCII	ASCII
Detachable	Standard	Standard	Standard
Program function keys	10	10	10
OTHER FEATURES			
Buffer capacity	—	—	—
Tilt/swivel	Standard	Standard	Standard
Graphics capability	No	Yes	Yes
TERMINAL INTERFACE	RS-232-C, TDI	RS-232-C, TDI	RS-232-C, TDI

► *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 to 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 Semantic Information Manager (SIM), ADDS, and DMS II.

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 conventional 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 from corrupting the data base.

The *Workstation Query Facility (WQF)* for intelligent workstations is supported on Unisys PCs and B 25 work-

stations 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 *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 keywords 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 communications monitor facility. *Coms* provides most of the features offered by Gemcos and enables users to

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► 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.

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 communications between tasks being executed at various hosts; control of the creation, updating, and transfer of data from host to host; and handling of communications 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: *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 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, keywords, 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 the 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

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► 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.

Host-Link allows users of intelligent workstations such as the ET 2000 to access and utilize host resources. These may be devices directly connected to the host, devices within the host data communications network, or peripherals attached to other intelligent workstations. Host-Link consists of two distinct sets of software and is designed to operate on Unisys (Burroughs) mainframes. The first set of software, called Host-Link Client, resides on the ET 2000 and operates under MS-DOS. It contains a complete set of programs to manage the ET 2000 part of the connection. The second set of software, called Host-Link Server, resides on the mainframe and is responsible for maintaining all aspects of the system. The major function of Host-Link Server is to provide the various file and device handling services to the ET 2000 Systems in the network.

The *Data Transfer System (DTS)* transmits business information between V Systems and B 20 microcomputers and provides access to sequential files on the mainframe for both input and output transfers.

PRICING AND SUPPORT

POLICY: The A 3 and A 5 Systems are available for purchase or lease under a one-year, three-year, or five-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 per week). The A 2 System is available for purchase only. 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 PSA 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. Four PSAs are defined: Software Product Support (PSA 1), for computers and customers who 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; and Basic Software Product Support (PSA 5), for certain products for which telephone and on-call services are not generally available.

Program products for the A 2, A 3, and A 5 Systems are offered under a plan which provides for the use of the products on a designated system on a month-to-month or extended basis. Software is offered bundled and unbundled.

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 Systems. The quoted prices include all necessary hardware components, but no software.

A 2

One central processor with 6MB memory, 1 data communications DLP, 1 SMD DLP, 1 printer/tape DLP, 1 disk storage module, 1 operator display terminal	\$60,000
1 3MB memory increment	18,000
3 MD4-2 disk drives	43,500
2 B9495-33/B9499-21 GCR tape units and controller	123,270
2 B9246-12 line printers (1250 lpm)	89,250
10 ET1100 terminals	16,659

TOTAL PURCHASE PRICE: \$350,679 ►

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► A 3 Model E:

One central processor with 6MB memory, 1 printer/streamer DLP, 1 SMD disk DLP, 1 123MB integrated disk, 1 network support processor IV with 256K memory, 1 line support processor and quad line adapter II, 1 user interface processor DLP, 1 operator display terminal	\$120,500
2 3MB memory increment	36,000
6 MD4-2 disk drives	87,000
2 BT3261-1 tape subsystem with controller and 1 DLP	140,900
2 B9495-33/B9499-21 GCR tape units and controller	123,270
1 X293-30 nonimpact printer DLP	4,725
1 B9290-30 laser printer	65,000
4 B9246-12 line printers	178,500
20 ET1100 terminals	33,318
TOTAL PURCHASE PRICE:	\$789,213

A 5 Model F:

Two central processors with 6MB memory, 1 printer/streamer DLP, 1 SMD DLP, 1 123MB integrated disk, 1 data communications DLP, 1 user interface DLP, 2 I/O bases, 1 operator display terminal	\$224,000
4 3MB memory increments	72,000
8 MD8-2 disk drives	63,000
1 X304-97 XSMD DLP	14,500
1 X304-99 SMD expander	1,890
2 A395-92 GCR tape DLPs	14,400
1 A304-94 SMD DLP	8,900
3 B9495-33/B9499-21 GCR tape units and controller	184,905
2 BT3261-1 tape subsystems with controller and 1 DLP	140,900
1 X293-30 nonimpact printer DLP	4,725
2 B9290-30 laser printer	130,000
4 B9246-12 line printers	178,500
1 A378-10 data communications DLP	8,400
1 A378-11 network support processor	36,750
2 A378-1 line support processors	8,400
4 A369-4 quad line adapters	12,600
20 ET1100 terminals	33,318
20 B20 workstations (21-3TS)	40,000
TOTAL PURCHASE PRICE:	\$1,177,188

EQUIPMENT PRICES

		Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
PROCESSORS AND MEMORY					
A 2	Basic System; includes one single processor, six megabytes of main memory, one data communications (DC) DLP with four lines, one storage module device (SMD) DLP, one printer/tape DLP, one disk storage module, and one operator display terminal	60,000	453.00	—	—
A 2-BPE	Linc II Entry bundled system; includes one single processor, six megabytes of main memory, DC DLP with four lines, one SMD DLP, one printer/tape DLP, one disk storage module, one operator display terminal, and one 123-megabyte integrated disk, plus Linc II Entry, Ergo, DMS II DB Interpreter, and System Software Package 4. (For a listing of the software included in the System Software Packages refer to the software price list.)	102,740***	526.00	—	—
A 3 Model D	Basic System; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP, one user interface processor (UIP) DLP, one 123-megabyte integrated disk, one operator display terminal	95,500	538.00	5,942	4,652
A 3-ED	Linc II Entry bundled system; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP one UIP DLP, one operator display terminal, AS adapter, and two 123-megabyte integrated disks, plus Linc II Entry, Ergo, DMS II DB Interpreter, Cobol compiler, COE, and System Software Package 1	176,355***	658.00	—	—
A 3 Model E	Basic System; includes one single processor, six megabytes of main memory, one network support processor (NSP) with 256K-bit memory, one line support processor (LSP) and quad line adapter (QLA), one UIP DLP, one printer/tape DLP, one I/O subsystem, one 123-megabyte integrated disk, and one operator display terminal	120,500	747.00	9,186	7,166
A 3-EE	Linc II Entry bundled system; includes one single processor, six megabytes of main memory, one SMD DLP, one printer/tape DLP, one UIP DLP, one operator display terminal, one NSP, one LSP, one QLA, AS adapter, and two 123-megabyte integrated disks, plus Linc II Entry, Ergo, Cobol compiler, DMS II Interpreter, COE, and System Software Package 1	176,355***	658.00	—	—

*For 5-day, 9-hour service.

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

***Includes hardware and 5-year extended license for software.

NC—No charge.

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		Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
PROCESSORS AND MEMORY (Continued)					
A 3 Model F	Basic System; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP, one UIP DLP, one 123-megabyte integrated disk, and one operator display terminal	120,500	645.00	7,446	5,820
A 3-EF	Linc II Entry bundled system; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP, one UIP DLP, one operator display terminal, AS adapter, and two 123-megabyte integrated disks, plus Linc II Entry, Ergo, DMS II DB Interpreter, Cobol compiler, COE, and System Software Package 1	197,605***	764.00	—	—
A 3 Model K	Basic System; includes one dual processor, six megabytes of main memory, one DC DLP with four lines, two SMD DLPs, one printer/tape DLP, one UIP DLP, two 123-megabyte integrated disks, and two operator display terminals	200,000	947.50	12,204	9,486
A 3-EK	Linc II Entry bundled system; includes one dual processor, six megabytes of main memory, one DC DLP with four lines, two SMD DLPs, one printer/tape DLP, one UIP DLP, two operator display terminals, AS adapter, and two 123-megabyte integrated disks, plus Linc II Entry, Ergo, Cobol compiler, DMS II DB Interpreter, COE, and System Software Package 2	275,610***	994.50	—	—
A 5 Model F	Basic System; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP, one UIP DLP, one 123-megabyte integrated disk, two I/O bases, and one operator display terminal	224,000	710.00	12,255	9,455
A 5-EF	Linc II Entry bundled system; includes one single processor, six megabytes of main memory, one DC DLP with four lines, one SMD DLP, one printer/tape DLP, one UIP DLP, two operator display terminals, two I/O bases, and two 123-megabyte integrated disks, plus Linc II Entry, Ergo, DMS II DB Interpreter, Cobol compiler, COE, and System Software Package 1	329,990***	783.00	—	—
A 3-3MB	Three-megabyte memory increment	18,000	52.00	1,047	804
SYSTEM UPGRADES					
A 3-2T3	Model A 2 to A 3 Model D upgrade kit	40,000	—	—	—
A 3-DTF	Model D to Model F upgrade kit; includes one I/O base expansion, and one power expansion	38,000	—	—	—
A 3-DTK	Model D to Model K upgrade kit; includes one I/O base expansion, one power expansion, one processor, and one SMD DLP	118,000	—	—	—
A 3-DTE	Model D to Model E upgrade kit; includes one I/O base expansion, one power expansion, one NSP 256KB memory, one LSP, and one QLA	39,000	—	—	—
A 3-ETF	Model E to Model F upgrade kit; includes one I/O base expansion	30,000	—	—	—
A 3-FTK	Model F to Model K upgrade kit; includes one processor	83,000	—	—	—
A 3-FT5	Model A 3 Model F to A 5 Model F upgrade kit	115,000	—	—	—
SYSTEM OPTIONS					
A 3-EC	Expansion cabinet with power and two I/O bases	35,000	106.00	2,044	1,572
B 9493-168	123-megabyte integrated fixed disk	7,500	73.00	488	393
A 3-1AS	AS Adapter for single processor (A 3 only)	10,000	47.00	—	—
A 3-ASU	AS Adapter for single field upgrade (A 3 only)	10,000	47.00	—	—
A 3-2AS	AS Adapter for dual processor (A 3 only)	10,000	47.00	—	—
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 246-96	Printer/Tape DLP II	5,000	34.00	300	238
X 304-91	Host transfer sequential/interlaced DLP	7,560	46.00	379	301
X 101-ICP	Integrated Communications Processor (A 2 to A 10, B 5925)	7,200	47.00	587	457
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

*For 5-day, 9-hour service.

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

***Includes hardware and 5-year extended license for software.

NC—No charge.



Unisys A 2, A 3, and A 5



Purchase Price (\$)	Monthly Maint.* (\$)	1-Year Lease** (\$)	5-Year Lease** (\$)
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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	—	—
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	—	—
B 9987-3	Dual port feature for B9494-5	2,100	21.00	—	—

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	—	—

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 9246-24	Line Printer; 2000 lpm, 132 positions	48,000	520.00	—	—

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 21	Microcomputer workstation with keyboard; 256KB RAM, 28x80 character display, Intel 8086 processor. RS-422	1,200	28.50	—	—

*For 5-day, 9-hour service.

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

***Includes hardware and 5-year extended license for software.

NC—No charge.



Unisys A 2, A 3, and A 5

		<u>Purchase Price (\$)</u>	<u>Monthly Maint.* (\$)</u>	<u>1-Year Lease** (\$)</u>	<u>5-Year Lease** (\$)</u>
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 378-2	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
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 369-41	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
CB 736	Inter-System Control Cable; 50 ft. (FCC)	NC	—	—	—
CB 737	Inter-System Control Cable; 100 ft. (FCC)	NC	—	—	—
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	61
A 890-4	PRC PE/NRZ magnetic tape controller kit	3,859	22.50	163	127
A 890-8	PRC GCR magnetic tape controller kit	2,095	15.00	89	71
CB 736	Inter-System Control Cable; 50 ft. (FCC)	NC	—	—	—
CB 737	Inter-System Control Cable; 100 ft. (FCC)	NC	—	—	—

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

***Includes hardware and 5-year extended license for software.

NC—No charge.

SOFTWARE PRICES

		<u>Limited Time-Plan Monthly License Fee (\$)</u>	<u>Annual Product Service Agreements</u>	
			<u>PSA 2 (\$)</u>	<u>PSA 1 (\$)</u>
A 2-SP1	System Software Package 1; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (Marc), Utilities, Workflow Language (WFL), Cande, Cross Reference Symbolic, Remote Print System, Interactive Data Comm Configurator (IDC), Network Definition Language (NDL), RPG Compiler, Communications Management System Entry (COE), and Sort Utility	280	1,610	940
A 2-SP2	System Software Package 2; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (Marc), Utilities, Workflow Language (WFL), Cande, Cross Reference Symbolic, Remote Print System, Interactive Data Comm Configurator (IDC), Network Definition Language (NDL), Cobol 74 compiler, Communications Management System Entry (COE), and Sort Utility	280	1,610	940
A 2-SP3	System Software Package 3; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (Marc), Utilities, Workflow Language (WFL), Cande, Cross Reference Symbolic, Remote Print System, Interactive Data Comm Configurator (IDC), Network Definition Language (NDL), RPG Compiler, Communications Management System Entry (COE), Sort Utility, Screen Design Facility, and Data Management System II	540	3,105	1,810

*For 5-day, 8-hour service.

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

Unisys A 2, A 3, and A 5

Annual Product Service Agreements

Limited Time-Plan Monthly License Fee (\$)	Annual Product Service Agreements	
	PSA 2 (\$)	PSA 1 (\$)

SOFTWARE PRICES (Continued)

		Limited Time-Plan Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
A 2-SP4	System Software Package 4; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Menu Assisted Resource Control (Marc), Utilities, Workflow Language (WFL), Cande, Cross Reference Symbolic, Remote Print System, Interactive Data Comm Configurator (IDC), Network Definition Language (NDL), Cobol 74 compiler, Communications Management Entry (COE), Sort Utility, Screen Design Facility, and Data Management System II	540	3,105	1,810
A 3-ASF	System Software Facility for Models D, E and F; includes Master Control Program (MCP/AS), Algol Compiler, DC Algol Compiler, Program Binder, Marc, Microcode, SMF II Site Management, Utilities, WFL, Cross Reference Symbolic	238	1,680	900
A 3-SSF	System Software Facility for Models D, E and F; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Marc, SMF II Site Management, Utilities, WFL, Cross Reference Symbolic	190	1,764	948
A 3-AS1	System Software Package 1 for Models D, E and F; includes SSF Systems Software Facility, IDC, NDL II, NSP/LSP Firmware, Cande, Data Management System II	725	4,140	2,400
A 3-SW1	System Software Package 1; includes D, E and F Systems Software Facility, IDC, NDL II, NSP/LSP Firmware, Cande, Data Management System II	510	3,528	2,208
A A3-ASK	System Software Facility for Model K; includes Master Control Program (MCP/AS), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Marc, SMF II Site Management, Utilities, WFL, Cross Reference Symbolic	398	2,292	1,512
A A3-SSK	System Software Facility for Model K; includes Master Control Program (MCP), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Marc, SMF II Site Management, Utilities, WFL, Cross Reference Symbolic	330	2,448	1,584
A 3-AS2	System Software Package 2 for Model K; includes ASK System Software Facility, IDC, NDL II, NSP/LSP Firmware, Cande, Data Management System II	912	4,896	2,844
A 3-SW2	System Software Package 2 for Model K; includes SSK System Software Facility, IDC, NDL II, NSP/LSP Firmware, Cande, Data Management System II	660	4,536	2,856
A 3-IPR	Interpro Package; includes Advanced Data Dictionary, Screen Design Facility, Communication Management System (Entry), Extended Retrieval with Graphic Output, DM Interpreter.	431	1,644	1,008
A 3-IP2	Interpro Package 2; includes Advanced Data Dictionary, Screen Design Facility, Communications Management System (Total), Extended Retrieval with Graphic Output, DM Interpreter	609	2,832	1,764
A 5-ASF	System Software Facility for Model F; includes Master Control Program (MCP/AS), Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Marc, Utilities, WFL, Cross Reference Symbolic	400	2,304	1,344
A 5-AS1	System Software Package 1 for Model F; includes ASF System Software Facility, IDC, NDL II, NSP/LSP Firmware, Cande, Data Management System II	790	4,548	2,652
A 5-IPR	Interpro Package; includes Advanced Data Dictionary, Screen Design Facility, Communication Management System (Entry), Extended Retrieval with Graphic Output, DM Interpreter.	565	3,252	1,896
A 5-IP2	Interpro Package 2; includes Advanced Data Dictionary, Screen Design Facility, Communications Management System (Total), Extended Retrieval with Graphic Output, DM Interpreter	800	4,608	2,688

Compilers

A 2 ATD	Algol Test and Debug System	80	420	240
A 3 ATD	Algol Test and Debug System	80	420	240
A 5 ATD	Algol Test and Debug System	90	528	300
A 2 BSC	Basic Compiler	120	540	240
A 3 BSC	Basic Compiler	132	600	336
A 5 BSC	Basic Compiler	140	816	480
A 3 APL	APL/700	132	756	300
A 2 COB	Cobol Compiler (ANSI 68)	120	600	300
A 3 COB	Cobol Compiler (ANSI 68)	132	660	336
A 5 COB	Cobol Compiler (ANSI 68)	140	816	480
A 2 C74	Cobol Compiler (ANSI 74)	120	480	240
A 3 C74	Cobol Compiler (ANSI 74)	126	504	252
A 5 C74	Cobol Compiler (ANSI 74)	125	720	420

*For 5-day, 8-hour service.

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

Unisys A 2, A 3, and A 5

		Annual Product Service Agreements		
		Limited Time-Plan Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
Compilers (Continued)				
A 2 CTD	Cobol 74 Test and Debug	80	456	264
A 3 CTD	Cobol 74 Test and Debug	126	504	252
A 5 CTD	Cobol 74 Test and Debug	90	528	300
A 3 PL1	PL/1 Compiler	132	720	360
A 5 PL1	PL/1 Compiler	200	1,152	672
A 3 FOR	Fortran Compiler (Level H)	132	600	336
A 5 FOR	Fortran Compiler (Level H)	140	816	480
A 2 F77	Fortran Compiler (ANSI 77)	120	540	300
A 3 F77	Fortran Compiler (ANSI 77)	132	600	336
A 5 F77	Fortran Compiler (ANSI 77)	125	720	420
A 2 FTD	Fortran 77 Test and Debug	80	456	264
A 3 FTD	Fortran 77 Test and Debug	80	420	240
A 5 FTD	Fortran 77 Test and Debug	90	528	300
A 2 RPG	RPG II Compiler	80	540	300
A 3 RPG	RPG II Compiler	80	540	300
A 5 RPG	RPG II Compiler	100	576	336
A 2 PAS	Pascal Compiler	120	540	300
A 3 PAS	Pascal Compiler	132	600	336
A 5 PAS	Pascal Compiler	200	1,152	672
A 3 SRT	Sort Utility	50	420	120
A 5 SRT	Sort Utility	75	432	252
A 2 APB	APL B	200	1,200	660
A 3 APB	APL B	200	1,200	660
A 5 APB	APL B	220	1,727	744
Productivity Aids				
A 2 LN2	Logic and Information Network Compiler (Linc II)	900	10,692	4,536
A 3-LN2	Logic and Information Network Compiler (Linc II)	2,400	12,384	7,704
A 5-LN2	Logic and Information Network Compiler (Linc II)	3,000	14,724	10,080
A 2 L2R	Linc II Run Time System	100	—	170
A 3 L2R	Linc II Run Time System	240	—	420
A 5 L2R	Linc II Run Time System	240	—	420
A 2 L2E	Linc II Entry	620	732	432
A 3 L2E	Linc II Entry	1,615	780	456
A 5 L2E	Linc II Entry	2,035	840	492
Support Utilities				
A 2 BAR	Activity Reporting	45	240	120
A 3 BAR	Activity Reporting	50	246	132
A 5 BAR	Activity Reporting	60	348	204
A 2 SMR	SMF II System Resource Management	100	540	300
A 3 SMR	SMF II System Resource Management	110	600	336
A 5 SMR	SMF II System Resource Management	175	1,008	588
A 2 LOG	Logger	40	240	120
A 3 LOG	Logger	44	264	132
A 5 LOG	Logger	60	348	204
A 2 BSL	Billing Support Library	30	240	120
A 3 BSL	Billing Support Library	33	264	132
A 5 BSL	Billing Support Library	60	348	204
A 2 SSL	Security Support Library	30	240	120
A 3 SSL	Security Support Library	30	264	132
A 5 SSL	Security Support Library	35	204	120
A 2 IPF	Intelligent Printer Support Facility	175	850	425
A 3 IPF	Intelligent Printer Support Facility	168	888	444
A 5 IPF	Intelligent Printer Support Facility	120	852	432
A 2 MLS	Multi Lingual System	40	240	144
A 3 MLS	Multi Lingual System	40	240	144
A 5 MLS	Multi Lingual System	60	348	204
A 2 DAC	Infoguard; requires SMF II Resource Management	250	1,356	756
A 3 DAC	Infoguard; requires SMF II Resource Management	300	1,620	900
A 5 DAC	Infoguard; requires SMF II Resource Management	375	2,028	1,128
Data Communications				
A 3-DCS	Data Communication Software; includes Interactive Datacomm Configurator. Network Definition Language II.	66	396	132

*For 5-day, 8-hour service.

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

Unisys A 2, A 3, and A 5

		<u>Annual Product Service Agreements</u>		
		<u>Limited Time-Plan Monthly License Fee (\$)</u>	<u>PSA 2 (\$)</u>	<u>PSA 1 (\$)</u>
Data Communications (Continued)				
A 5 DCS	Data Communications Software package including Interactive Datacom Configurator, Network Definition Language II, NSP/LSP Firmware	90	528	300
A 2 NCS	Network Communications Subsystem; includes Network Administration Utility, Network Services II	60	360	240
A 3 NCS	Network Communications Subsystem; includes Network Administration Utility, Network Services II	60	360	240
A 5 NCS	Network Communications Subsystem; includes Network Administration Utility, Network Services II	90	528	300
A 2 BLC	BDLC Protocol for DC/DLP	50	285	165
A 3 BLC	BDLC Protocol for DC/DLP	50	285	165
A 5 BLC	BDLC Protocol for DC/DLP	50	300	180
A 2 BNS	BNA Network Services	400	1,300	1,200
A 3 BNS	BNA Network Services	400	1,980	1,200
A 5 BNS	BNA Network Services	520	3,000	1,740
A 2 BYC	Bysynchronous (2780) Protocol DC/DLP	50	285	165
A 3 BYC	Bysynchronous (2780) Protocol DC/DLP	50	285	165
A 5 BYC	Bysynchronous (2780) Protocol DC/DLP	50	300	180
A 2 RJE	Remote Job Entry	45	240	120
A 3 RJE	Remote Job Entry	47	252	132
A 5 RJE	Remote Job Entry	55	324	192
A 3 COE	Communications Management System (Entry)	184	792	264
A 5 COE	Communications Management System (Entry)	210	1,212	708
A 2 COT	Communications Management System	300	1,680	960
A 3 COT	Communications Management System	315	1,680	960
A 5 COT	Communications Management System	410	2,364	1,380
A 3 X25	X.25 MCS	275	1,560	900
A 5 X25	X.25 MCS	260	1,500	876
A 2 NDA	Network Definition Language II Analyzer	40	240	120
A 3 NDA	Network Definition Language II Analyzer	42	252	132
A 5 NDA	Network Definition Language II Analyzer	55	324	192
A 3 RMP	Remote Print System	120	684	396
A 5 RMP	Remote Print System	160	924	540
A 2 DIA	Diagnostic MCS	40	240	120
A 3 DIA	Diagnostic MCS	42	252	132
A 5 DIA	Diagnostic MCS	55	324	192
A 3 MCB	Gemcos (Basic)	103	600	336
A 5 MCB	Gemcos (Basic)	175	1,008	588
A 3 MCA	Gemcos (Advanced)	138	732	468
A 5 MCA	Gemcos (Advanced)	260	1,500	876
A 3 MCT	Gemcos (Total)	207	864	600
A 5 MCT	Gemcos (Total)	350	2,016	1,176
A 3 MCF	Gemcos Format Generator (requires MCA or MCT)	103	600	336
A 5 MCF	Gemcos Format Generator (requires MCA or MCT)	110	636	372
A 3 CDE	Command and Edit (Cande)	80	444	192
A 5 CDE	Command and Edit (Cande)	105	612	360
A 2 SDF	Screen Design Facility	60	360	120
A 3 SDF	Screen Design Facility	66	396	132
A 5 SDF	Screen Design Facility	110	636	372
A 2 EDI	The Editor	35	240	120
A 3-EDI	The Editor	37	252	132
A 5 EDI	The Editor	55	324	192
A 2 ESN	SNA 3270 Emulator	75	430	250
A 3 ESN	SNA 3270 Emulator	75	430	250
A 5 ESN	SNA 3270 Emulator	75	430	250
A 3 FSL	Format Support Library	90	540	300
A 5 FSL	Format Support Library	80	468	276
A 2 HSV	Host Services	400	2,280	1,320
A 3 HSV	Host Services	400	2,280	1,320
A 5 HSV	Host Services	520	3,000	1,740
A 2 L62	SNA LU 6.2 Service Manager	150	855	495
A 3 L62	SNA LU 6.2 Service Manager	150	855	495
A 5 L62	SNA LU 6.2 Service Manager	150	855	495
A 2 PLS	Enhanced Poll/Select DC/DLP	50	285	165
A 3 PLS	Enhanced Poll/Select DC/DLP	50	285	165
A 5 PLS	Enhanced Poll/Select DC/DLP	50	300	180
A 2 SDL	SDLC Protocol	50	285	165
A 3 SDL	SDLC Protocol	50	285	165
A 5 SDL	SDLC Protocol	50	300	180

*For 5-day, 8-hour service.

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

Unisys A 2, A 3, and A 5

		Annual Product Service Agreements		
		Limited Time-Plan Monthly License Fee (\$)	PSA 2 (\$)	PSA 1 (\$)
Data Communications (Continued)				
A 2 SJE	SNA/RJE	50	285	165
A 3 SJE	SNA/RJE	50	285	165
A 5 SJE	SNA/RJE	75	432	252
A 2 ST2	PU/T2 Emulator	80	460	268
A 3 ST2	PU/T2 Emulator	80	460	268
A 5 ST2	PU/T2 Emulator	80	460	268
Reporting				
A 2 RP3	Reporter III	395	1,320	660
A 3-RP3	Reporter III	400	1,524	756
A 5 RP3	Reporter III	500	2,880	1,680
A 2 OR3	On-Line Reporter III; requires RP3	55	1,320	660
A 3-OR3	On-Line Reporter III	55	276	144
A 5 OR3	On-Line Reporter III; requires RP3	95	552	324
Data Management				
A 2 DM2	Data Management System II	350	1,800	900
A 3-DM2	Data Management System II (DMS II)	372	1,980	996
A 5 DM2	Data Management System II	455	2,616	1,536
A 2 DI2	DMS II Inquiry	50	240	120
A 3-DI2	DM Inquiry	55	288	144
A 5 DI2	DMS II Inquiry	120	696	408
A 2 DBA	DMS II Data Base Analyzer	80	420	240
A 3-DBA	Data Base Analyzer	85	444	276
A 5 DBA	DMS II Data Base Analyzer	105	612	360
A 2 DDM	DMS II Data Base Monitor	80	420	240
A 3 DDM	DMS II Data Base Monitor	85	444	276
A 5 DDM	DMS II Data Base Monitor	105	612	360
A 2 IDD	Advanced Data Dictionary System	125	720	240
A 3 IDD	Advanced Data Dictionary System	135	960	360
A 5 IDD	Advanced Data Dictionary System	220	1,272	744
A 2 DMT	DMS II DM Interpreter	60	240	120
A 3 DMT	DMS II DM Interpreter	65	276	144
A 5 DMT	DMS II DM Interpreter	80	468	276
A 2 DMC	DMS II Data Base Certification	60	240	120
A 3 DMC	DMS II Data Base Certification	65	276	144
A 5 DMC	DMS II Data Base Certification	80	468	276
A 2 ERG	Extended Retrieval with Graphic Output (requires DM Interpreter)	175	780	300
A 3 ERG	Extended Retrieval with Graphic Output (requires DM Interpreter)	180	900	360
A 5 ERG	Extended Retrieval with Graphic Output (requires DM Interpreter)	220	1,272	744
A 2 DME	Data Aid	60	342	198
A 3 DME	Data Aid	60	348	204
A 5 DME	Data Aid	80	468	276
A 3 TPS	DMS II Transaction Processing System	80	480	276
A 5 TPS	DMS II Transaction Processing System	105	612	360
A 2 IE1	Information Executive (InfoExec); package 1 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory	275	1,488	828
A 3 IE1	Information Executive (InfoExec); package 1 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory	330	1,788	996
A 5 IE1	Information Executive (InfoExec); package 1 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory	470	2,544	1,416
A 2 IE2	Information Executive (InfoExec); package 2 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory, Data Management System II (DMS II)	570	3,084	1,716
A 3 IE2	Information Executive (InfoExec); package 2 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory, Data Management System II (DMS II)	640	3,456	1,920
A 5 IE2	Information Executive (InfoExec); package 2 includes InfoExec/ADDS, InfoExec/SIM, InfoExec/SIM Directory, Data Management System II (DMS II)	840	4,536	2,520
A 2 IQF	InfoExec Interactive Query Facility	245	1,320	732
A 3 IQF	InfoExec Interactive Query Facility	245	1,320	732
A 5 IQF	InfoExec Interactive Query Facility	300	1,620	900
A 2 OCM	InfoExec Operations Control Manager	65	348	192
A 3 OCM	InfoExec Operations Control Manager	65	348	192

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Unisys A 2, A 3, and A 5

	Annual Product Service Agreements	
	Limited Time-Plan Monthly License Fee (\$)	PSA 2 (\$)

Data Management (Continued)

A 5 OCM	InfoExec Operations Control Manager	80	432	240
A 2 QP	InfoExec Query Package; includes InfoExec IQF, InfoExec/WQF-Host	368	1,980	1,104
A 3 QP	InfoExec Query Package; includes InfoExec IQF, InfoExec/WQF-Host	368	1,980	1,104
A 5 QP	InfoExec Query Package; includes InfoExec IQF, InfoExec/WQF-Host	450	2,436	1,356
A 2 WQH	InfoExec Workstation Query Facility-Host	245	1,320	732
A 3 WQH	InfoExec Workstation Query Facility-Host	245	1,320	732
A 5 WQH	InfoExec Workstation Query Facility-Host	300	1,620	900

Workstation Integration

A 2-DES	Data Entry System; (ET2000)	110	540	300
A 3-DES	Data Entry System; (ET2000)	116	564	312
A 5-DES	Data Entry System; (ET2000)	190	1,104	636
A 2-DTS	Data Transfer System; (B 20, PC)	50	240	120
A 3-DTS	Data Transfer System; (B 20, PC)	50	240	120
A 5-DTS	Data Transfer System; (B 20, PC)	85	492	288
A 2-IDE	Intelligent Distributed Editor; (B 20, ET2000, PC)	40	340	200
A 3-IDE	Intelligent Distributed Editor; (B 20, ET2000, PC)	60	348	204
A 5-IDE	Intelligent Distributed Editor; (B 20, ET2000, PC)	70	408	240
DC2-HLS	Host Link Server; (ET2000)	165	400	200
DC3-HLS	Host Link Server; (ET2000)	182	444	216
DC5-HLS	Host Link Server; (ET2000)	285	1,644	960
A 2 DE2	On-Line Data Entry System (Odesy)	200	945	550
A 3 DE2	On-Line Data Entry System (Odesy)	200	996	576
A 5 DE2	On-Line Data Entry System (Odesy)	300	1,728	1,008

Networking System Software

A 99 NCF	Network Control Facility; includes Network Control Manager, Distributed Control Agent, Graphics Display Module, (A 2, A 3, A 5)	375	2,160	1,260
A 99 CPG	Custom Protocol Generator; (A 2, A 3, A 5)	—	2,880	1,680
A 99 CPC	CP2000 Configurator; (A 2, A 3, A 5)	120	720	420

CP2000 Data Communications Software & Protocols

CP 2000 COS	CP2000 Operating System Software; (A 2, A 3, A 5)	80	480	300
C 99 TTY	TTY Station Group; (A 2, A 3, A 5)	40	240	180
C 99 BSC	Bysynchronous Station Group; (A 2, A 3, A 5)	50	300	180
C 99 X25	X.25 Protocol; (A 2, A 3, A 5)	210	1,200	720
C 99 X21	X.21 Protocol; (A 2, A 3, A 5)	90	540	300
C 99 ST2	SNA PU. T2 Adapter; (A 2, A 3, A 5)	80	480	300
C 99 SDL	SDLC Station Group; (A 2, A 3, A 5)	50	300	180

Progression Assistance

CS 3 BTA	B 1000 to A 3 Progression Assistance	395	—	1,310
CS 5 BTA	B 1000 to A 5 Progression Assistance	395	—	1,320

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