Unisys A 9

MANAGEMENT SUMMARY

The Unisys A 9 System was the first of the A Series computers to be announced by the vendor. That was in January 1984. Since then, six other "A" systems have joined the A Series, Unisys' flagship line of medium-to-large scale computers. And now the venerable A 9 is going into a well-earned retirement with the A 10 System taking its place. Unisys is no longer marketing the Models D and F but is offering a Model NX, which is a reworked and refurbished Model F. The Model NX is offered for purchase only. Standard five-day, eight-hour monthly maintenance service is available, and the system is fully supported by the vendor. Users of the A 9 Model D can upgrade to a Model F with the aid of an upgrade package which includes 6 megabytes of memory and 6 kilobytes of cache.

The A 9 System is designed for batch or on-line general-purpose data processing. The system supports a wide variety of mass storage and peripheral devices and uses all of the systems and applications software currently available for the A Series, including the enhanced operating system Master Control Program/Advanced System (MCP/AS).

The A 9 System consists of the system processor cabinet, a memory cabinet and two input/output (I/O) cabinets. The system processor cabinet contains the Central Processor Unit (CPU) with its main component, the Multiple Logical Processor (MLP). The MLP interfaces to the I/O data communications, the maintenance, and the memory subsystems. The three interface modules are the Message Level Interface Processor (MLIP), the Host Control Port (HCP), and the Memory Controller (MC).

The A 9 System is a medium-scale, general-purpose mainframe that is object code compatible with all the A Series computers and the B 7900 System. The A 9 employs multiple specialized functional processing units, each with different processing capacity and orientation, to provide balance in various workloads.

MODELS: A 9 Model NX. Models D and F are no longer marketed.
CONFIGURATION: The A 9 System has from 6 to 24 megabytes of main memory and up to 40 Data Link Processors.
COMPETITION: Honeywell DPS 8, IBM 4381, and NAS AS/6630 and AS/6650.
PRICE: Purchase price for NX model is $250,000.

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.

MODELS: Unisys A 9 NX.

DATA FORMATS

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

FIXED-POINT OPERANDS: Each single-precision integer operand occupies one word and consists of a 6-bit octal

The Unisys A 9 System is a general-purpose mainframe with a main memory range from 12 to 24 megabytes. The system includes two I/O cabinets with up to 40 Data Link Processors.

Unisys A 9

The maintenance subsystem also resides in the system processor cabinet. The maintenance system consists of two ET 2000 terminals, one 5.25-inch removable diskette, two 5.25-inch Winchester fixed disks with 10 megabytes each, and one Maintenance Interface Processor (MIP). All memory is housed in a single memory cabinet. The memory base contains a minimum of 12 megabytes of 64K RAM memory. Memory can be expanded up to 24 megabytes in 6-megabyte increments. If more than 12 megabytes of memory are required, a second base may be added to the same memory cabinet.

The two I/O cabinets have four I/O base modules (two in each cabinet). Each base module accommodates the peripheral Data Link Processors (DLP) or data communications subsystem, including the Network Support Processors (NSP) with 512K bytes of integrated circuit memory, the Line Support Processors (LSP), and Quad Line Adapters (QLA) with 4K bytes of local memory. The four I/O base modules have a capacity of 32 peripheral channels.

COMPETITIVE POSITION

The A 9 System is competing against the Honeywell DPS 8 Series, the IBM 4381, and IBM-compatible systems from Amdahl and NAS in the commercial computing arena. The A 9 has a very sizeable installed base, especially in the manufacturing and educational sector. The A 10 replaces the A 9 to provide these users with a faster system, more memory, and an upwards migration path.

For more information on the A 10 System, please refer to Page 70C-944YT-301 in this volume.

ADVANTAGES AND RESTRICTIONSThe

A 9 System features Emitter Coupled Logic (ECL) circuit technology, thereby lowering the power, air-conditioning, and floor space requirements and also reducing the total system component count. One of the key advantages of the A 9 System is the MCP/AS operating system supporting extended 32-bit memory addressing. Two MCP/AS software facilities further enhance the memory and storage capacities of the A 9. The Memory Disk feature enables the user to specify some portion of the system's main memory as a disk unit without any special programming. The Mirror Disk feature provides a convenient means of duplicating realtime data on disk units.

The rather small main memory capacity of the A 9 System remains unchanged, and the 64K-bit DRAM boards were not replaced with high-density 256K-bit memory boards featured on the A 10.

USER REACTION

Because the A 9 and the A 10 Systems are very similar in basic architecture, both systems were combined in tabulating the results for the 1987 Datapro survey of general-purpose computer users. Out of a total of 40 respondents, 27 users had an A 9 System installed. Eighteen respondents

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

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

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

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

MAIN MEMORY

The memory subsystem is housed in a memory cabinet containing a card cage, a DC power supply and up to two memory bases. Each memory base can be configured with up to two memory modules providing storage space for one or two million 60-bit words of main system memory. The interface between the memory subsystem and the central processor is provided by the Memory Control located in the processor cabinet. The Memory Control has the ability to address 24 megabytes of main memory and includes 6K bytes of high-speed purgeless cache to reduce the average access time to memory. About 85 percent of memory data access requirements are handled in cache. When the Memory Control logic detects a cache fault, cache memory is deleted from the Memory Control path and system operations continue, but with diminished memory subsystem performance. Logic contained in the Memory Control performs single-bit error corrections on-line without interrupting other processor modules, and detects multiple-bit errors. All memory errors are logged into a memory register and periodically written to the system log-on disk and stored for reference.

STORAGE TYPE: 64K-bit DRAM integrated circuit (IC) boards.

CAPACITY: 12 to 24 megabytes.

CYCLE TIME: Not available from vendor.

CHECKING: A parity bit with each word is generated during writing and checked during reading. The A 9 system generates and checks an eight-bit error detection byte during each main memory reference, permitting automatic rewrite correction of single-bit errors and detection of multiple-bit errors.

RESERVED STORAGE: Not available on the A 9 System.

CENTRAL PROCESSORS

The Central Processing Unit (CPU) consists of the following elements: the Multiple Logical Processor (MLP), the Message Level Interface Processor (MLIP), the Memory Controller (MC), and the Host Console Port (HCP).

The microprocessor-based central processor uses an enhanced implementation of stack architecture, accessing up to 16 pairs of top-of-stack registers for instruction execution. Two pairs of these stacks are reserved to control the multiple processing modules; the rest are used for storage of opera-

Unisys A 9

TABLE 1. SYSTEM CHARACTERISTICS

MODEL	A 9 NX
SYSTEM CHARACTERISTICS	
Date announced	January 1987
Date first delivered	January 1987
Field upgradable to	—
Relative performance	3.4*
Number of processors	1
Cycle time, nanoseconds	72.5
Word size, bits	48
Operating systems	MCP MCP/AS
MAIN MEMORY	
Type	64K-bit DRAM
Minimum capacity, bytes	12MB
Maximum capacity, bytes	24MB
Increment size, increment	6M
Cycle time, nanoseconds	—
BUFFER STORAGE	
Minimum capacity	6KB
Maximum capacity	6KB
Increment size	—
INPUT/OUTPUT CONTROL	
Number of channels:	
Byte multiplexer	Not applicable
Block multiplexer	Not applicable
Word	Not applicable
Other	Up to 40 DLPs

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

purchased, and two users rented, the systems directly from the manufacturer; seven users leased their systems from a third-party vendor. All 27 respondents used the A 9 as an organizational mainframe. Fifteen respondents upgraded from other Unisys systems indicating a strong vendor loyalty; eight respondents were first-time Unisys users; and four users converted from another vendor.

The A 9 System was operating in a wide variety of installations: manufacturing, education, government agencies, retail and wholesale establishments, financial institutions, insurance companies, and health care facilities. The principal applications were accounting and billing, payroll and personnel, order processing and inventory, purchasing, sales and distribution, scheduling and administration, manufacturing, and process control.

Only 11 respondents had implemented a disaster recovery plan, and 10 users were considering a recovery plan during 1987; 11 users had established an information center, and three users were planning such a center during 1987. When asked about plans concerning future acquisitions, the users listed as priorities additional software from the manufacturer or other suppliers, as well as expansions to present hardware and data communications facilities, laser printers, and power-conditioning systems.

All users were quite satisfied with the operating system and the reliability of the A 9. The usual complaints were about education, documentation, and applications software.

As part of the survey, users were asked to rate their computer systems on a scale from excellent to poor. A weighted average was then calculated based on the total responses.

tors awaiting execution. The CPU consists of three controllers which are responsible for executing instructions, servicing interrupts, and initiating I/O operations. The Program Controller accesses program code from memory via the Memory Controller. The Program Controller has extensive look ahead capabilities and generates multiple hardware operators to be executed. The Task Controller works asynchronously with the Program Controller and schedules the hardware operators. The Stored Logic Controller, Address and State Unit, and Data Path are organized as a three-stage pipeline and contain the algorithm microcode, current-state attributes, data, and memory addresses needed to schedule and process A 9 algorithms. This three-stage processing of tasks is referred to as MLP organization.

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

HCP interfaces the central processor with the Maintenance Subsystem, and also performs error detection, logging, and control functions in the A 9.

SPECIAL FEATURES: The Maintenance Subsystem operates in conjunction with the Maintenance Interface Processor (MIP) to access and display the state of the system. In addition to its connection to the CPU, the maintenance processor provides a special test link to the I/O and Data Communications subsystems. The Maintenance Subsystem is configured with a dual built-in fixed disk drive which provides storage for system diagnostic cases, and one mini-disk drive for firmware loading. The diagnostic software is system-driven and runs on-line; normal preventive maintenance routines are run concurrently with application programs.

PHYSICAL SPECIFICATIONS: The A 9 NX System including processor, memory, and input/output cabinets is 105 inches long, 44 inches high, 30 inches deep, and weighs approximately 1,650 pounds. Power consumption is 6.4 kVA and heat dissipation is 20,340 Btu per hour.

CONFIGURATION RULES

The basic A 9 NX consists of one A 9-FCP processor cabinet with cache, one dependent memory cabinet with one memory base and 12 megabytes of main memory, two dependent I/O cabinets with two I/O bases each, two operator display terminals, one operator console DLP-3, and one modem. Main memory can be expanded up to 24 megabytes in 6-megabyte increments. Up to 40 data link processors and a network support processor can be added to the system to provide more data communication capabilities.

INPUT/OUTPUT CONTROL

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

MASS STORAGE

For disk storage devices qualified on the A 9 System, see Table 2.

Unisys A 9

The ratings of the A 9/A 10 Systems are summarized in the following table.

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

*Weighted Average on a scale of 4.0 for Excellent.

When asked if their computer system performed as expected and if they would recommend their system to other users, 26 respondents said "Yes," and one was undecided. These respondents were certainly a very satisfied group of A 9 users. □

INPUT/OUTPUT UNITS

Tape drives and printers are covered in Table 3.

TERMINALS

For information on terminals available for the A 9, see Table 4.

COMMUNICATIONS

The A 9 Data Communications Subsystem allows a modular approach to the design of small, medium, and large data communications networks. The subsystem off-loads communications responsibilities from the central processor and distributes them to one or more *Network Support Processors (NSPs)*. The NSP's internal architecture divides the communications workload between the NSP and a series of microprocessor-based *Line Support Processors (LSPs)*. The NSP and LSPs are incorporated into the I/O Bases of the A 9 I/O data communications subsystem, providing a common data communications and input/output architecture. The third hardware component required for larger networks and increased protocol flexibility is the *Quad Line Adapter (QLA)* which provides the electrical interface for each communication line. The *Data Communications DLP II (DCDLP II)* with four communication lines allows for the configuration of small to medium networks.

The *Network Support Processor* is a programmable front-end processor that serves as the central element of the A 9 communications subsystem. It contains 512K bytes of IC memory. The NSP handles subsystem control, data link control, and line discipline control functions. Interaction between the NSP and the central system is performed at the message level, eliminating the need to interrupt the central system each time a character or word of data is to be transferred. The NSP is programmed by means of Unisys' *Network Definition Language II (NDL II)*, a descriptive, parameter-driven language.

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

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

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

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

Also available for the A 9 System is the *CP 2000 Communications Processor* which can be used as a front-end processor or placed in a remote location as a concentrator or controller. Together with the enhanced BNA Network Services software, the communications processor provides distributed processing capabilities, control of terminal networks, and gateways which allow Umisys mainframes to communicate with IBM systems through SNA networks.

SOFTWARE

OPERATING SYSTEM: The *Master Control Program (MCP)* and the Software Release 3.6 *Master Control Program/Advanced System (MCP/AS)* designed to support the advanced architecture of the A Series family of computers, are the two operating systems used by the A 9. 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.

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 maxi-

Unisys A 9

mum 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. The job sequence is dynamically rescheduled whenever a high-priority job is introduced into the schedule. When the required resources are available (for example, when a job completes processing or suspends itself to await completion of an I/O operation), an available job with the highest priority is added to the processing mix. Jobs submitted from remote terminals are interpreted and entered into the schedule queue and are added to the multiprogramming mix in much the same way as batch jobs.

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

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

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

The Actual Segment Descriptor Memory Management provides monolithic memory management of memory sizes up to 24 gigabytes. The ASD table is an area in memory which can contain up to 1 million entries. Each entry in this table is a multiple-word structure. The operating system will initially allocate an ASD table of a size that is proportional to the amount of main memory. The ASD ODT command allows the operator to display the size of the table and the maximum number of entries used, as well as to change the size of the table. The ability to change the size of the ASD table ensures the user the table is large enough for the workload, but not so large as to waste memory. The ASD table contains an entry for each code or data segment which has been touched. A touch will occur on the first reference to the code or data segment. At that time the MCP/AS operating system will allocate an entry in the ASD table. An entry in the ASD table contains an address field and a presence bit. The presence bit indicates the status of the address field. If the presence bit is on, the data or code segment is in memory and the address field contains a 32-bit physical memory address. If the presence bit is off, the data or code segment is on disk and the address field contains the record number of the item in the overlay or code file. With ASD Memory Management, when an area of physical memory is overlayed all data and segment descriptors point to a common descriptor, the ASD; a bit maintained in the ASD entry specifies whether the segment has been altered. The segment will only be written to disk if it has been altered.

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

Memory protection is provided by a combination of hardware and software features. Two registers associated with the stack mechanism, the Base of Stack register and the Stack Limit register, define the upper and lower limits of the stack. An interrupt is generated if an attempt is made to exceed these limits. When an element in a data array is referenced, an automatic comparison of the index value of the data element and the length of the data area as specified in the Data Descriptor, identifies any attempt by a program to reference beyond its designated data area. In addition, control bits in each word prevent a user program from altering program segments, data descriptors, segment descriptors, and memory links, control words, and tables maintained by the operating system.

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

Communication between the system operator and the operating system is accomplished through a combination of CRT

Unisys A 9

TABLE 2. MASS STORAGE

MODEL	B 9484-5	B 9484-13	B 9494-5	B 9494-10	B 9494-12	Multi-Disk4
Cabinets per subsystem	Up to 8	2 to 16	2 to 16	2 to 8	1 to 8	2
Disk packs/HDAs per cabinet	2 removable	1 removable	1 fixed	2 fixed	1 fixed	2 to 4 Winchester
Capacity	130MB formatted	252MB formatted	542MB formatted	1084MB formatted	868MB formatted	245.6MB formatted
Tracks/segments per drive unit	—	—	—	—	—	—
Average seek time, msec.	24.7	27.7	21.7	21.7	16	30
Average access time, msec.	33	36	30	30	24.3	38.3
Average rotational delay, msec.	8.3	8.3	8.3	8.3	8.3	8.3
Data transfer rate	605,000	1,200,000	1,200,000	1,200,000	3,000,000	1,200,000
Controller model	B 9387-51 B 9387-52	B 9387-51 B 9387-52	B 9387-51 B 9387-52	B 9387-51 B 9387-52	B 9389 B 9399	SMD interface
Comments	—	—	—	—	—	—

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

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

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

Work Flow Management is an MCP/AS facility that provides enhanced facilities for the control of task initiation and resource allocation. The *Work Flow Language (WFL)* enables users to describe each job as a network of interrelated tasks. The WFL compiler accepts these control statements as input and generates machine code to control the tasks within each job as the user prescribes. Facilities provided by the Work Flow Management System include sequencing and synchronizing of related tasks via input from control statements, improved consistency in task restarts after system failures, job summary printouts, multiple job scheduling queues for different levels of service, interfaces for installation-tailored system control programs, and accounting records grouped by job. WFL has been enhanced with the Print statement providing a batch interface to the PrintS and ReprintS system.

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

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

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

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

DMS II permits multiple indices to be established for accessing a file, and each file can be accessed by any of the available access methods to provide retrieval of information by different application programs. User-language interfaces to the data management system are provided for the Cobol, Algol, RPG, and PL/1 languages. When multiple programs are accessing the data base, DMS II provides lockout protection at the record level to prevent simultaneous updating of a record. DMS II recovery capabilities include the ability to audit transactions as they are referenced or added to the

Unisys A 9

TABLE 3. INPUT/OUTPUT UNITS

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

data base and a checkpoint/restart capability. A recovery utility is automatically initiated by the operating system in the event of system failure to effect recovery of the data base and restart of application programs. In addition, DMS II permits the data base to be dumped concurrently with updates to the files, so that dumps correspond to the current audit trail.

DMS Inquiry is an optional extension of DMS II and provides an easy-to-use language that enables non-EDP personnel to access the data base via remote terminals. 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 allow 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 the Advanced Data Dictionary System. ERGO offers a graphic representation of information and defines the relationships between data sets and powerful selection expressions to filter the data used in reports. ERGO features a prompt mode and Help commands to guide the user. Multiple presentation formats allow the user to select the most appropriate graphic output representation.

Data-Aid is a new 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

Unisys A 9

capabilities, and report against it. On request Data-Aid will initiate and track the Dump, Copy, and Recovery functions of the data base.

DATA MANAGEMENT: Included in DMS II described above.

DATA COMMUNICATIONS: The special-purpose programming tool *Network Definition Language II (NDL II)* enables users to define and generate customized NSP control programs for data communications applications. These programs equip the NSP to handle line disciplines, buffer management, message queuing, auditing, and supervision of the flow of messages between user-coded programs and remote terminals. This enables the user's application programs to deal with remote terminals in the same manner as with conventional on-site peripheral devices. IBM data communications algorithms allow Burroughs networks to interface to non-Burroughs 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 applications programs and the data base. Gemcos enables users to develop transaction processing applications programs independently of the network environment. The input to Gemcos is coded in the Transaction Control Language, a descriptive, free-form language that uses key words to describe both the network environment and the requirements for message routing, message formats, access control, and recovery.

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

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

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

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

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

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

Using Linc II, all screen and report formats are built through an interactive painting process. This process permits a screen or report format to be developed and displayed without requiring a generation, but a generation is still required to put the form into production. The Linc II enhanced generation process, using the interactive syntax checking and screen and report painting features, will significantly reduce the previous Linc generation times as well as the number of generations necessary to create the production version. The Linc II Logic Editor is used to enter the specifications for global logic, global setup data items, key words, profiles, teach/help text for a screen format, and all types of on-line and report logic. Linc II command syntax

Unisys A 9

TABLE 4. TERMINALS

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

convention is still required by the Linc II Editor. As a page of logic is entered and the screen is transmitted, the Editor will verify all information for syntax errors and return the page with any errors highlighted. Temporary memory areas may be defined within the Editor to allow the user to store commonly used logic. Up to nine temporary memory areas can be used with each area allowing 23 lines of stored logic.

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

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

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

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

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

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

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

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

Infoview II manages the interconnection of intelligent workstations including the B 25 and ET 2000 with the A Series host mainframe. Up to five windows may be assigned using Unisys MT terminal emulation. One of these windows may be used to run an application program under the workstation native mode. Native mode for Infoview II will function under MS-DOS on an ET 2000 or BTOS on a B 25. Infoview II supports manipulation of the window environment with the

Unisys A 9

keyboard arrow keys or a mouse device. To further control the local workstation environment, the commands View, Edit, Repeat, and Write, as well as a scrolling capability, have been added. Copy and paste functions support the transfer of text between windows, allowing for more effective editing when working with multiple source files.

PRICING AND SUPPORT

POLICY: The A 9 NX 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.

SUPPORT: Users can purchase Unisys' Program Product Service Agreement (PSA) which provides various Support Service packages. The availability of a particular service package is product dependent. Generally, PSAs provide for ongoing program product service and/or field service. Program product service deals with corrections by the program product design facility. Field service provides program product problem identification assistance via telephone and/or on-site. Five service packages (PSAs) are defined: Software Product Support (PSA 1) for computers and customers who will not require on-site program product problem assistance; Extended Software Product Support (PSA 2) for computers and customers who will require on-site program product problem assistance; Centralized Software Product Support (PSA 3) for selected program products where only telephone service is needed; Software Product Assistance (PSA 4) for micro and PC products only; and Basic Software Product Support (PSA 5) for certain products for which telephone and on-call services are not generally available.

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

All software is unbundled. Program products for the A 9 System 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.

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 configuration illustrates a typical A 9 NX Ssystem. The quoted prices include all necessary hardware, but no software.

One central processor with 12MB memory and cache, 1 memory base, 2 I/O cabinets with 2 DLP bases, 2 operator display terminals, 1 console DLP, 1 modem	$250,000
6 X378-10 Data Communications DLP III 24 data communication lines	50,400
2 B9494-12 disk drives (868MB each)	68,900
1 B9389 storage controller	53,600
1 B9399 string Controller	26,100
1 BT3261-1 GCR tape unit, controller and DLP	70,450
2 BT3266 slave GCR units	48,200
1 B9246-24 line printer (2000 lpm)	48,000
12 ET2150 workstations	37,700
Disk and printer DLPs	37,505
TOTAL PURCHASE PRICE:	$678,855

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint.* ($)	1-Year Lease** ($)	5-Year Lease** ($)
PROCESSORS AND MAIN MEMORY					
A 9 NX	System includes: one central processor, one memory cabinet, one memory base with 6 megabytes of main memory, one 6-megabyte increment of main memory, two I/O cabinets, four I/O base modules, one operator display terminal DLP, 6KB cache, two operator display terminals and system control processors	250,000	1,378.00	—	—
A 9-DTF	A 9 Model D to A 9 Model F upgrade package includes 6-megabyte memory increment, 6K cache memory	150,000	182.00	11,875	8,973
A 9-MB	Additional memory base with 6-megabyte memory module	70,000	146.00	3,992	3,047
A 9-MI	6-megabyte memory increment	60,000	125.00	3,422	2,612

Unisys A 9

		Purchase Price ($)	Monthly Maint.* ($)	1-Year Lease** ($)	5-Year Lease** ($)
SYSTEM OPTIONS					
A 9-IIC	Independent I/O Cabinet with two bases includes one Message Level Interface Expansion	45,000	143.50	2,640	2,033
A 9-930-2	I/O Base Exchange for two processor system; required for each base to be exchanged	4,725	15.50	217	168
A 995-95	Line Expansion Module (LEM 1x2)	5,000	12.50	277	212
A 9-MLX	Message Level Interface Expansion	1,000	—	54	37
A 341-93	ODT Adapter for additional operator display terminal (ET 1100)	3,536	15.50	214	160
CB50-ODT	ODT Extension Cable (50 ft.)	577	—	—	—
DATA LINK PROCESSORS					
X 110-90	Card reader DLP	3,700	46.00	231	193
X 112-90	Card punch DLP	3,700	46.00	231	193
X 395-91	PE Magnetic tape DLP	7,560	46.00	379	301
X 395-92	GCR Magnetic tape DLP	7,560	46.00	379	301
X 393-90	NRZ magnetic tape DLP	7,200	46.00	379	301
X 304-90	Host transfer interlaced DLP	7,200	46.00	379	301
X 304-91	Host transfer sequential/interlaced DLP	7,560	46.00	379	301
X 246-91	Line printer DLP (B 9246-6/12)	4,725	46.00	268	220
X 246-92	Line printer DLP (B 9246-21)	4,725	46.00	268	220
X 293-30	Non-impact printer DLP (9290-30)	4,725	46.00	268	220
X 304-95	SMD disk DLP (DLP II)	9,345	49.00	555	435
X 304-97	XSMD disk DLP; (MD8)	14,500	49.00	816	631
X 304-99	SMD disk DLP expander	1,890	19.00	115	88
X 378-10	Data communications DLP II	8,400	39.00	489	381
MASS STORAGE					
B 9484-51	Dual disk pack drive; 130 megabytes	21,000	198.00	—	—
B 9484-13	Removable disk pack drive; 252 megabytes, single spindle	33,000	127.50	—	—
B 9494-5	Fixed disk drive; 542 megabytes, single spindle, interlaced	26,500	110.00	—	—
B 9494-10	Fixed disk drive; 1084 megabytes, dual spindle, interlaced	55,400	227.00	—	—
B 9494-12	Fixed disk drive; 868 megabytes, single spindle, thin film head	34,450	120.00	—	—
MD4-2	Fixed disk; 245.6 megabytes, (2-122.8MB drives)	14,400	55.50	—	—
MD4-4	Fixed disk; 491.2 megabytes, (4-122.8MB drives)	27,500	110.50	—	—
MD8-2	Fixed disk; 500 megabytes, (4-250MB drives)	19,500	90.00	—	—
MD8-4	Fixed disk; 1000 megabytes, (4-250MB drives)	32,500	180.00	—	—
B 9387-51	Controller; 1x8 spindle	15,750	71.00	—	—
B 9387-52	Controller; 2x8 spindle	21,000	106.00	—	—
B 9987-4	Dual port feature for B 9494-10	3,780	31.00	—	—
B 9987-2	Dual port feature for B 9484-13	2,100	24.50	—	—
B 9987-3	Dual port feature for B9494-5	2,100	21.00	—	—
B 9389	Dual storage controller	53,600	176.00	—	—
B 9389-DH	Dual host option for B9389	5,450	19.00	—	—
B 9399	Dual string controller	26,100	85.00	—	—
B 9387-30	Expander (2x); exchange expansion rack, exchange module, required when more than four B 9387-51 or two B 9387-52 controllers are configured	11,235	18.00	—	—
MAGNETIC TAPE UNITS					
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	—	—

**For 5-day, 8-hour service.*
***Includes 7-day, 24-hour maintenance coverage.*
NC—No charge.

Unisys A 9

		Purchase Price ($)	Monthly Maint.* ($)	1-Year Lease** ($)	5-Year Lease** ($)
B 9499-3XM	Controller; 75 ips, includes 3x16 master electronic exchange, three PE control modules, cabinet for B 9495-82/83	83,310	496.00	—	—
B 9499-4XH	Controller; 125 ips, includes 4x16 master electronic exchange, four PE control modules, cabinet for B 9495-82/83	110,200	658.00	—	—
B 9495-32	Magnetic tape unit; 470/120KB, 75 ips, GCR	17,750	209.00	—	—
B 9495-33	Magnetic tape unit; 780/200KB, 125 ips, GCR	19,000	220.50	—	—
B 9495-24	Magnetic tape unit; 1250/320KB, 200 ips, GCR	36,225	312.00	—	—
B 9499-21	GCR/PE controller; 1x8	42,635	286.00	—	—
B 9499-22	GCR/PE controller; 2x8	85,288	567.50	—	—
B 9499-42	GCR/PE exchange for B 9499-22, 2x16	7,571	32.00	—	—
B 9999-3	Dual port switch	5,905	25.00	—	—
TERMINALS					
ET 1100	Terminal workstation with keyboard; RS-232-C, TDI	1,659	21.50	—	—
ET 2150	Terminal workstation with keyboard; character graphics, 512KB RAM	2,895	54.00	—	—
B 25	Microcomputer workstation with keyboard; 256KB RAM, 80186 processor	8,928	88.50	—	—
CARD EQUIPMENT					
B 9116	Card reader; 600 cpm, 80 columns	11,372	27.50	—	—
B 9213	Card punch; 300 cpm, 80 columns	31,085	630.00	—	—
B 9915	51-column read feature for B 9116	844	—	—	—
PRINTERS					
B 9246-6	Line printer; 650 lpm	15,435	205.00	—	—
B 9290-30	Nonimpact printing system; 30 ppm (laser)	65,000	698.00	—	—
B 9246-12	Train Printer; 1250 lpm, 132 positions	44,625	440.00	—	—
B 9246-21	Train Printer; 2000 lpm, 132 positions	40,300	826.00	—	—
COMMUNICATIONS EQUIPMENT					
CP 2000	Communications Processor	35,000	—	—	—
A 378-11	Network support processor (NSP IV) DLP 2	36,750	215.00	2,216	1,756
A 378-1	Line support processor (LSP III)	4,200	16.50	163	140
A 378-7	Line support processor (LSP II) 56K-bit	10,290	41.50	452	376
A 378-2	Add-on memory; network support processor (NSP IV), 256K-bit	5,250	15.50	248	188
A 378-3	Quad line adapter (character)	3,150	26.00	—	125
A 378-4	Quad line adapter (bit)	3,150	26.00	—	125
A 369-10	RS-232 electrical interface (character, bit)	NC	—	—	—
A 369-11	CCITT V.24 electrical interface (character, bit)	NC	—	—	—
A 369-12	TDI/20 electrical interface (character, bit)	NC	—	—	—
A 369-40	Autocall feature (character, bit)	NC	—	—	—
1-2-3-4-QD	Foreplane jumper cable for 1, 2, 3, and 4 quads	NC	—	—	—
X 394-93	FIPS Hyperchannel DLP 2 for A 3, A 9, A 10, A 12	21,000	150.00	1,345	1,075
Inter-System Control					
A 320-IHC	Independent hub cabinet	22,270	142.50	865	711
A 320-5	Hub 16; (includes 2-port capability)	9,040	60.50	363	297
A 320-6	Hub expansion (additional 1-port capability)	771	6.00	39	31
A 320-2	Inter-system control host DLP/974	12,495	70.00	741	554
Peripheral Reconfiguration					
A 890-PRC	Peripheral reconfiguration cabinet	5,512	37.50	238	197
A 890-3	Disk kit (B9387-4x, B9387-5x, B9389)	1,765	15.00	72	61
A 890-34	Disk kit (B9387-4x with B9387-3x exchange)	1,765	15.00	72	58
A 890-4	PE magnetic tape controller kit	3,859	22.50	163	127
A 890-8	GCR magnetic tape controller kit	2,095	15.00	89	71

**For 5-day, 8-hour service.*
***Includes 7-day, 24-hour maintenance coverage.*
NC—No charge.

Unisys A 9

SOFTWARE PRICES

		Limited Time-Plan	Annual Product Service Agreements	
		Monthly License Fee ($)	PSA 2 ($)	PSA 1 ($)
A 9-SSD	System Software Facility; includes Master Control Program (MCP), Utility Programs, Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Interactive Datacomm Configurator, Network Definition Language II, NSP/LSP Firmware, SMF II Site Management, Workflow Language, and Cross Reference Symbolic	2,025	11,508	5,616
A 9-ASD	System Software Facility; includes Master Control Program/Advanced System MCP/AS, Algol Compiler, DC Algol Compiler, Program Binder, AS Microcode, Menu Assisted Resource Control (MARC), SMF II Site Analysis, Workflow Language, Utility Programs, and Cross Reference Symbolic	2,025	11,544	6,684
A 9-SSF	System Software Facility; includes Master Control Program (MCP), Utility Programs, Algol Compiler, DC Algol Compiler, Program Binder, Microcode, Interactive Datacomm Configurator, Network Definition Language II, NSP/LSP Firmware, SMF II Site Management, Workflow Language, and Cross Reference Symbolic	2,808	12,288	7,164
A 9-ASF	System Software Facility; includes Master Control Program/Advanced System MCP/AS, Algol Compiler, DC Algol Compiler, Program Binder, AS Microcode, Menu Assisted Resource Control (MARC), SMF II Site Analysis, Workflow Language, Utility Programs, and Cross Reference Symbolic	2,800	15,960	9,240
Compilers				
A 9-ATD	Algol Test and Debug System	145	336	168
A 9-BSC	Basic Compiler	154	504	276
A 9-APL	APL/700	154	936	432
A 9-COB	Cobol Compiler (ANSI 68)	147	468	252
A 9-C74	Cobol Compiler (ANSI 74)	140	528	288
A 9-CTD	Cobol 74 Test and Debug	145	828	480
A 9-PL1	PL/1 Compiler	154	936	432
A 9-FOR	Fortran Compiler Level H	154	504	276
A 9-F77	Fortran Compiler (ANSI 77)	168	948	552
A 9-FTD	Fortran 77 Test and Debug	145	828	480
A 9-RPG	RPG II Compiler	154	816	480
A 9-PAS	Pascal Compiler	305	1,104	600
A 9-SRT	Sort Utility	187	768	372
A 9-APB	APL B	300	1,800	996
Productivity Aids				
A 9 LN2	Logic and Information Network Compiler (Linc II)	3,500	21,600	10,584
A 9 L2R	Linc II Run Time System	380	—	650
Support Utilities				
A 9-BAR	Activity Reporting	105	600	348
A 9-SMR	SMF II System Resource Management	410	1,860	900
A 9-LOG	Logger	68	396	228
A 10 IPF	Intelligent Printer Support Facility	168	960	552
A 9-BSL	Billing Support Library	50	264	120
A 9-SSL	Security Support Library	50	264	120
A 9-MLS	Multilingual System	120	732	420
Data Communications				
A 9-DCS	Data Communications Software; includes Interactive Data Communications Configurator, Network Definition Language II, and NSP/LSP Firmware	158	900	516
A 9 NCS	Network Communications Subsystem; includes Network Administration Utility, Network Services II	150	900	540
A 9 BLC	BDLC Protocol for DC/DLP	75	428	248
A 9 BYC	Bysynchronous (2780) Protocol DC/DLP	75	428	248
A 9-RJE	Remote Job Entry	100	372	204
A 9-COE	Communications Management System (Entry)	394	1,260	636
A 9-COT	Communications Management System	693	2,208	1,104

Unisys A 9

		Limited Time-Plan	Annual Product Service Agreements	
		Monthly License Fee ($)	PSA 2 ($)	PSA 1 ($)
A 9-X25	X.25 Message Control System	341	1,008	504
A 9-NDA	Network Definition Language II Analyzer (NDL II)	68	216	120
A 9-RMP	Remote Print System	225	1,284	744
A 9-DIA	Diagnostic MCS	79	436	252
A 9-MCB	Gemcos (Basic)	578	2,652	1,464
A 9-MCA	Gemcos (Advanced)	966	4,308	2,376
A 9-MCT	Gemcos (Total)	1,103	5,304	2,928
A 9-MCF	Gemcos Format Generator	210	924	504
A 9-CDE	Command and Edit (Cande)	161	696	384
A 9-SDF	Screen Design Facility	189	624	312
A 9-EDI	The Editor	158	852	396
A 9 ESN	SNA 3270 Emulator	115	660	385
A 9 FSL	Format Support Library	90	540	300
A 9 HSV	Host Services	840	4,800	2,820
A 9 L62	SNA LU 6.2 Service Manager	115	660	385
A 9 PLS	Enhanced Poll/Select DC/DLP	75	428	248
A 9 SDL	SDLC Protocol	75	428	248
A 9 SJE	SNA/RJE	75	428	248
A 9 ST2	PU/T2 Emulator	80	460	268
A 9-BNS	BNA Network Service	882	3,228	1,728
Reporting				
A 9-RP3	Reporter III	600	3,000	1,656
A 9-OR3	On-Line Reporter III	60	324	192
Data Management				
A 9-DM2	Data Management System II (DMS II)	1,045	5,820	2,760
A 9-DI2	DMS II Inquiry	209	984	540
A 9 DBA	Data Base Analyzer	190	1,020	576
A 9-DDM	Data Base Monitor	190	912	504
A 9-IDD	Advanced Data Dictionary	670	2,580	1,320
A 9-DMT	DM Interpreter	155	924	432
A 9-DMC	Data Base Certification	135	732	408
A 9-DIC	Data Dictionary System	270	1,212	672
A 9-ERG	Extended Retrieval with Graphic Output (requires DM Interpreter)	500	2,340	1,140
A 9-DME	Data Aid	130	744	432
A 9-TPS	Transaction Processing System	160	972	564
Workstation Integration				
DC 9-HLS	Host-Link Server (ET2000)	560	1,560	852
A 9-DTS	Data Transfer System	155	828	480
A 9-DE2	On-Line Data Entry System (Odesy)	300	1,488	864
A 9 DES	Data Entry System (ET2000)	380	1,824	1,008
Networking System Software				
A 99 NCF	Network Control Facility; includes Network Control Manager, Distributed Control Agent, Graphics Display Module	375	2,160	1,260
A 99 CPG	Custom Protocol Generator	—	2,880	1,680
A 9 CPC	CP2000 Configurator	120	720	420
CP2000 Data Communications Software & Protocols				
CP 2000 COS	CP2000 Operating System Software	80	480	300
C 99 TTY	TTY Station Group	40	240	180
C 99 BSC	Bysynchronous Station Group	50	300	180
C 99 X25	X.25 Protocol	210	1,200	720
C 99 X21	X.21 Protocol	90	540	300
C 99 ST2	SNA PU. T2 Adapter	80	480	300
C 99 SDL	SDLC Station Group	50	300	180 ■