

NAS Advanced Systems

MANAGEMENT SUMMARY

The Advanced Systems computers are plug-compatible mainframes that provide performance levels that are equal to or better than the IBM 4341, 4381, 303X and 308X Series models. NAS's strategy has been to offer these systems at a lower cost than the comparable IBM models.

The current Advanced Systems family consists of 11 processor models: the AS/6620, AS/6630 and AS/6550, the AS/8040, AS/8050, AS/8060, and the AS/9040, AS/9050, AS/9060, AS/9070 and AS/9080.

According to NAS, the performance of the AS/6620 is equal to or better than the IBM 4341 Model Group 12. The AS/6630 offers a 25 percent performance improvement over the AS/6620 and the AS/6650 offers a 20 percent improvement over that of the AS/6630. The performance of the AS/6630 is equal to or better than the IBM 4381-1 and the AS/6650 has a performance rating equal to that of the 4381-2. Upgrades are available from the AS/6620 to the AS/6630 and from the AS/6630 to the AS/6650.

The AS/8040 is aimed to compete with the IBM 3083 Model Group E processor. The AS/8040 has a performance rating approximately 20 percent higher than the IBM model, according to NAS. The performance of the AS/8050 equals that of the IBM 3083 Model Group B and the performance of the AS/8060 is equal to that of the IBM ▶

The NAS Advanced Systems family currently consists of 11 models that are compatible with IBM's 4341 and 4381 processors, and the 303X and 308X Series processors. The Advanced Systems are functionally compatible with the IBM software, firmware enhancements, and peripheral equipment.

MODELS: AS/6620, AS/6630, AS/6650, AS/8040, AS/8050, AS/8060, AS/9040, AS/9050, AS/9060, AS/9070 and AS/9080.

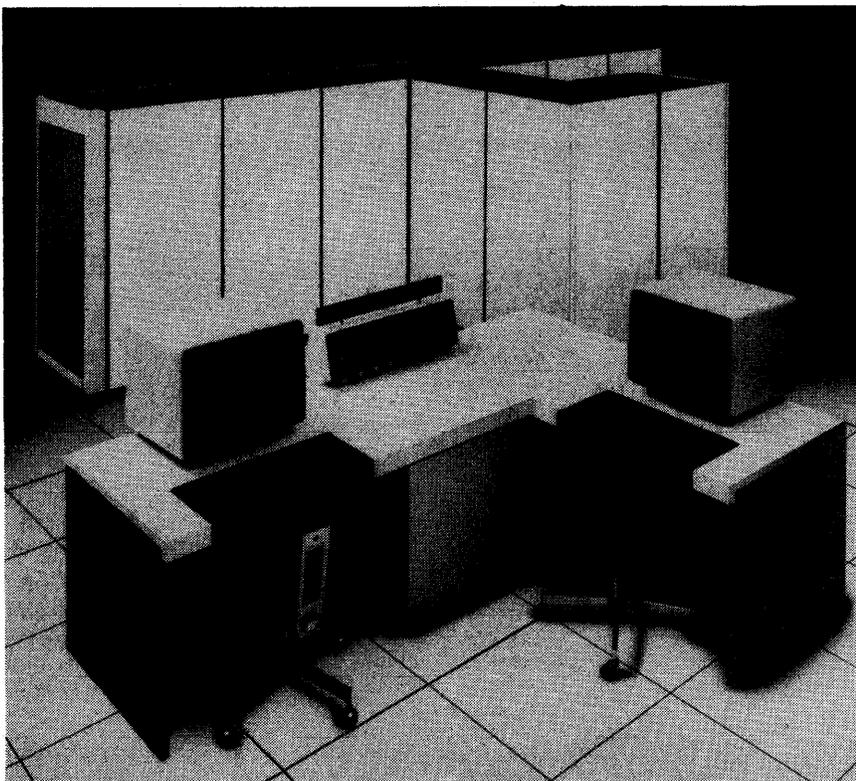
CONFIGURATION: One or 2 CPUs with from 2 to 64 megabytes of main memory, 16K to 256K bytes of buffer storage per processor, and 5 to 32 I/O channels.

COMPETITION: IBM 4341, 4381, 303X and 308X Series; Amdahl 470 and 580 Series; IPL 4400 Series; and Magnuson M80 Series.

PRICING: Purchase prices range from \$255,000 to \$4,908,000.

CHARACTERISTICS

MANUFACTURER: National Advanced Systems (NAS), 800 East Middlefield Road, Mountain View, California 94043. Telephone (415) 962-6100. ▶



The top-of-the-line AS/9000 Series is available in five processor models that are compatible with IBM's 3083, 3081, and 3084 systems. The AS/9000 Series processors have from 8 to 64 megabytes of main memory and from 6 to 32 I/O channels. The system console includes a service processor, two keyboard/display units, and two floppy disk drives.

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TABLE 1. CHARACTERISTICS OF THE ADVANCED SYSTEMS PROCESSOR MODELS

	AS/6620	AS/6630	AS/6650	AS/8040	AS/8050
SYSTEM CHARACTERISTICS					
Date of introduction	Feb. 1983	April 1982	Jan. 1980	May 1983	May 1983
Number of central processors	1	1	1	1	1
Comparable IBM model	4341-12	4381-1	4381-2	3033S	3033U
Principal operating systems	VM/370, OS/VS1, MVS	VM/370, OS/VS1, MVS	VM/370, OS/VS1, MVS	VM/370, OS/VS1, MVS	VM/370, OS/VS1, MVS
MAIN STORAGE					
Storage type	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS
Read cycle time, nanoseconds	420	420	350	360	360
Write cycle time, nanoseconds	420	420	350	360	360
Bytes fetched per cycle	8	8	8	8	8
Minimum capacity, bytes	2,097,152	4,194,304	4,194,304	8,388,608	8,388,608
Maximum capacity, bytes	16,777,126	16,777,126	16,777,126	16,777,126	33,554,432
Increment size, bytes	2,097,152	4,194,304	4,194,304	4,194,304	4,194,304
Interleaving	No	No	No	4-way	4-way
BUFFER STORAGE					
Cycle time, nanoseconds	60	60	50	20	20
Bytes fetched per cycle	8	8	8	8	8
Capacity, bytes	65,536	64K	64K	32K	64K
PROCESSING UNIT					
Machine cycle time, nanoseconds	60	60	50	40	40
Processing unit features:					
Direct Control	Optional	Optional	Optional	Optional	Optional
Channel-to-Channel Adapter	Optional	Optional	Optional	Optional	Optional
Extended Addressing	No	No	No	Yes	Yes
Extended Architecture Mode	No	No	No	Yes	Yes
Firmware features:					
Reloadable Control Storage	16K 72-bit word	16K 72-bit word	16K 72-bit word	16K 126-bit word	64K 126-bit word
Assist features	VSE: ECPS; VMA; ECPS 370 EF; ECPS: MVS	VSE: ECPS; VMA; ECPS 370 EF; ECPS: MVS	VSE: ECPS; VMA; ECPS 370 EF; ECPS: MVS	VMA: 370EF MVS/SP ASSIST PMA XA SEG. PROTECT	VMA: 370EF MVS/SP ASSIST PMA XA SEG. PROTECT EXT. ADDRESS
CHANNELS					
Maximum number of channels	8	8	10	16	24
Configuration:					
Block multiplexer channels	5 or 6	5 or 6	5, 6 or 8	7 to 15	7 to 23
Byte multiplexer channels	1 or 2	1 or 2	1 or 2	1 to 2	1 to 6
Maximum channel transfer rate:					
Block multiplexer, bytes/sec.	3 MB	3 MB	3 MB	3 MB	3 MB
Byte multiplexer, bytes/sec.	80 KB	80 KB	80 KB	80 KB	80 KB
Aggregate data rate, bytes/sec.	13 MB	13 MB	13 MB	13 MB	13 MB
Data streaming support	Standard	Standard	Standard	Standard	Standard

➤ 3083 Model Group J. NAS states that the AS/8050 has up to 30 percent better performance than the AS/8040; the AS/8060 has the same amount of increased performance over the AS/8050. Upgrades are available from the AS/8040 to the AS/8050 as well as from the AS/8050 to the AS/8060.

NAS also targets the AS/9040 at the IBM 3083 Model Group B market, and the AS/9050 is aimed at the IBM 3083 Model Group J. The performance of the AS/9050 is 25 percent greater than the performance of the AS/9040, according to NAS. The AS/9040 can be upgraded to an AS/9050, which in turn can be upgraded to an AS/9060 or AS/9070.

The AS/9060 is comparable in performance to the IBM 3081 Model Group G and offers a 25 percent performance increase over the AS/9050. The uniprocessor AS/9060 can be upgraded to an AS/9080.

The AS/9070 and AS/9080 are dual-processor versions of the AS/9050 and AS/9060, respectively. The AS/9070 competes with IBM's 3081 Model Group K and offers an 80 ➤

➤ **MODELS:** AS/6620, AS/6630, AS/6650, AS/8040, AS/8050, AS/8060, AS/9040, AS/9050, AS/9060, AS/9070, and AS/9080.

DATA FORMATS

All data formats, instruction formats, and other architectural features completely follow the IBM System/370 architecture.

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two consecutive bytes form a "halfword" of 16 bits, while 4 consecutive bytes form a 32-bit "word."

FIXED-POINT OPERANDS: Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode; 1 halfword (16 bits) or 1 word (32 bits) in binary mode.

FLOATING-POINT OPERANDS: 1 word consisting of 24-bit fraction and 7-bit hexadecimal exponent, in "short" format; 2 words, consisting of 56-bit fraction and 7-bit hexadecimal exponent, in "long" format; or 4 words in "extended precision" format.

INSTRUCTIONS: 2, 4, or 6 bytes in length, which usually specify 0, 1, or 2 memory addresses, respectively. ➤

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TABLE 1. CHARACTERISTICS OF THE ADVANCED SYSTEMS PROCESSOR MODELS (Continued)

	AS/8060	AS/9040	AS/9050	AS/9060	AS/9070	AS/9080
SYSTEM CHARACTERISTICS						
Date of introduction	May 1983	Sept. 1982	Sept. 1982	May 1982	Sept. 1982	May 1983
Number of central processors	1	1	1	1	2	2
Comparable IBM model	3033J	3083B	3083J	3081G	3081K	3084
Principal operating systems	VM/370 OS/VS1, MVS	VM/370 OS/VS1, MVS	VM/370 OS/VS1, MVS	VM/370 OS/VS1, MVS	VM/370, MVS	VM/370, MVS
MAIN STORAGE						
Storage type	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit word
Read cycle time, nanoseconds	360	342	342	270	342	270
Write cycle time, nanoseconds	360	342	342	270	342	270
Bytes fetched per cycle	8	8	8	8	8	8
Minimum capacity, bytes	8,388,608	8,388,608	8,388,608	16,777,126	16,777,126	16,777,126
Maximum capacity, bytes	33,554,432	33,554,432	33,554,432	33,554,432	33,554,432	67,108,864
Increment size, bytes	4,194,304	8,388,608	8,388,608	8,388,608	16,777,126	16,777,126
Interleaving	4-way	8-way	8-way	8-way	16-way	16-way
BUFFER STORAGE						
Cycle time, nanoseconds	18	19	19	15	19	15
Bytes fetched per cycle	8	8	8	8	8	8
Capacity, bytes	64K	64K	64K	256K	64K/CPU	256/CPU
PROCESSING UNIT						
Machine cycle time, nanoseconds	35	38	38	30	38	30
Processing unit features:						
Direct Control	Optional	Optional	Optional	Optional	Optional	Optional
Channel-to-Channel Adapter	Optional	Optional	Optional	Optional	Optional	Optional
Extended Addressing	Yes	Standard	Standard	Standard	Standard	Standard
Extended Architecture Mode	Yes	Optional	Optional	Optional	Optional	Optional
Firmware features:						
Reloadable Control Storage	16K 126-bit word VMA, 370 EF	16K 160-bit word VMA, 370 EF	16K 160-bit word VMA, 370 EF	16K 160-bit word VMA, 370 EF	16K 160-bit word VMA, 370 EM	16K 160-bit word VMA, 370 EF
Assist features	MVS/SP ASSIST PMA XA SEG. PROTECT EXT. ADDRESS	MVS/SP ASSIST				
CHANNELS						
Maximum number of channels	24	24	24	24	32	32
Configuration:						
Block multiplexer channels	7 to 23	6 to 23	6 to 23	12 to 23	12 to 30	12 to 30
Byte multiplexer channels	1 to 6	1 to 6	1 to 6	1 to 6	2 to 8	2 to 8
Maximum channel transfer rate:						
Block multiplexer, bytes/sec	3 MB	30 MB	30 MB	30 MB	30 MB	30 MB
Byte multiplexer, bytes/sec	100 KB	100 KB	100 KB	100 KB	100 KB	100 KB
Aggregate data rate, bytes/sec.	56 MB	60 MB	60 MB	75 MB	80 MB	96 MB
Data streaming support	Standard	Standard	Standard	Standard	Standard	Standard

➤ percent increase in performance over the AS/9050. The AS/9080 is aimed at the IBM 3084 market and offers an 80 percent increase in performance over the AS/9060. The AS/9070 can be upgraded to an AS/9080.

The Advanced Systems processors feature from 2 to 64 megabytes of main memory, from 16K to 256K bytes of buffer storage per processor, and from 5 to 32 I/O channels. For the characteristics of the individual models, please refer to Table 1.

The Advanced Systems processors are compatible with IBM's System/360, System/370, 4300, 303X and 308X Series software. Operating systems supported by the AS systems vary according to the model, but the principle operating systems for the AS processors include IBM's DOS/VS, DOS/VSE, VM/370, OS/VS1, SVS, MVS and MVS/XA. The AS processors also include firmware enhancements comparable to IBM's. The firmware enhancements implement several frequently used operating system functions in microcode for increased operational efficiency. Firmware assist features supported by the AS processors ➤

➤ **INTERNAL CODE: EBCDIC** (Extended Binary-Coded Decimal Interchange Code).

MAIN STORAGE

STORAGE TYPE: See Table 1.

CAPACITY: See Table 1.

CYCLE TIME: See Table 1.

CHECKING: Error checking and correction (ECC) circuitry in main memory performs automatic correction of all single-bit errors and detection of all double-bit and most other multiple-bit memory errors.

A reconfiguration capability is standard with all AS models. In the event of an unrecoverable error, or any other problem with a memory module, the operator can "dial out" the problem module (one-half million, one million, or two million bytes) and reconfigure the remaining memory for continuous operation.

STORAGE PROTECTION: The Store and Fetch Protection features, which guard against inadvertent overwriting and/or unauthorized reading of data in specified 2048-byte blocks of storage, are standard in all models. ➤

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➤ include System/370 Extended Facility, Virtual Machine Assist, VM Extended Control Program Support, OS/VS1 Extended Control Program Support, MVS/SP Assists and Preferred Machine Assists. The System/370 Extended Facility enables NAS users to execute the MVS/SE or MVS/SP enhancement program product that permits the MVS operating system to utilize the firmware enhancements.

NAS has an agreement with IBM that allows users to select NAS to serve as their support agent for selected IBM licensed programs. The agreement enables NAS to use IBM's support centers on behalf of the users, thus providing the customers with a single vendor contact. The NAS Support Agency service is provided for a number of licensed programs, including MVS/SP Version 1, VM/SP Release 1, and DOS/VSE Advanced Functions.

COMPETITIVE POSITION

Aside from the declared IBM system targets, the NAS Advanced Systems' chief competition comes from other vendors of plug-compatible mainframes. Their products include the M80 Series from Magnuson Computer Systems, the 4400 Series from IPL Systems, and the 470 and 580 Series from Amdahl Corporation. The M80 processors are direct replacements for IBM's 370/138, 370/148, and 4300 Series systems. The IPL Systems 4400 Series processors are direct replacements for the IBM 4331 and 4341 systems. The Amdahl 470 Series is compatible with the IBM 303X Series, while the 580 Series is compatible with the IBM 308X Series.

ADVANTAGES AND RESTRICTIONS

An advantage that the Advanced Systems processors have over their IBM counterparts is that they have fewer components, thus reducing power consumption, heat dissipation, and floor space requirements. Additionally, all Advanced Systems computers are air-cooled.

The Advanced Systems processors also have the ability, in a dual-processor system, to reconfigure to a uniprocessor system through the operator console or the operating system. Control of the input/output operations can be switched to the available processor. Perhaps the most significant advantage of all plug-compatible products, however, is the fact that a machine with equal or better performance can be attained at a substantially lower price.

The NAS AS/6600 Series, which is aimed at the IBM 4300 Series market, does not support MVS/XA. IBM has included support for MVS/XA on the 4300 Series with the recent 4381 announcement. NAS argues that system resources are drained so significantly by the use of MVS/XA in a production environment, that the most efficient use of MVS/XA would appear on the larger systems. Therefore, NAS has no future plans for MVS/XA support on the AS/6600 Series. ➤

➤ CENTRAL PROCESSORS

INDEX REGISTERS: Sixteen 32-bit general registers, used for indexing, base addressing, and as accumulators, plus four 64-bit floating-point registers per processor.

INSTRUCTION REPERTOIRE: The AS instruction set consists of the complete System/370 Universal Instruction Set, including the five S/370 instructions for Dynamic Address Translation.

INSTRUCTION TIMES: NAS states that individual instruction times are not currently available, but that average execution times for the AS systems will equal or exceed the performance of the comparable IBM processors (see Management Summary).

OPERATIONAL MODES: Like the System/370, the NAS AS computers can operate in either the Basic Control (BC) mode or Extended Control (EC) mode. The BC mode maintains general upward compatibility with the System/360 architecture and programming. In the EC mode, the Program Status Word (PSW) and the layout of the permanently assigned lower main storage area are altered to support Dynamic Address Translation and other system control functions; therefore, the virtual-storage-oriented operating systems must be used.

With the addition of the Extended Architecture option, the AS/8000 and AS/9000 Series processors also support 370-XA (Extended Architecture) mode. Extended Architecture provides 31-bit addressing, a dynamic channel subsystem, and bimodal operation (the intermix of programs with 24-bit and 31-bit addresses). In 370-XA mode, the AS/8000 and AS/9000 Series processors support MVS/SP Version 2 and related products, as well as the VM/XA Migration Aid.

PROCESSOR FEATURES: The timing features of the System/370 architecture are included in the AS central processors. These include a CPU timer and a Clock Comparator; the latter provides a means for causing an interrupt when the standard Time-of-Day Clock reaches a program-specified value. Additional instructions are provided to set and store the Time-of-Day Clock, Clock Comparator, and CPU Timer.

The Direct Control feature provides six external interrupt lines which operate independently of the normal data channels, plus the Read Direct and Write Direct Instructions which provide for single-byte data transfers between an external device and main storage. Direct Control is optional on the AS/6600, the AS/8000 and the AS/9000 Series.

The Extended Addressing feature is standard on the AS/8000 and AS/9000 Series processors. Extended Addressing allows the addressing of real storage beyond 16 megabytes as supported by MVS/SP Release 3 and subsequent releases. The Extended Channel Adapter is a prerequisite.

The Floating-Point Arithmetic feature provides instructions to perform floating-point arithmetic operations on both short (1-word) and long (2-word) operands.

The Extended Precision Floating-Point feature provides seven instructions for performing floating-point arithmetic on 4-word (16-byte) operands that provide a precision of up to 28 hexadecimal or 34 decimal digits.

The Channel-to-Channel Adapter permits direct communication between an AS processor and a System/370 via a standard I/O channel. It can be attached to either a selector channel or a block multiplexer channel and uses one control unit position on either channel. Either system can be equipped with the Channel-to-Channel Adapter, and it is ➤

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➤ USER REACTION

In the 1983 User Ratings of Computer Systems survey, we received 29 responses from the users of 32 installed NAS systems. Fifteen systems were purchased, eight systems were rented from the manufacturer and nine systems were leased from a third party. Of the systems represented, 28 had gone through a conversion process. Nine of the systems were used for manufacturing, five were installed by service bureaus and five were installed at government locations. The most common applications being run on the systems represented included accounting/billing, purchasing and payroll. Most of the respondents indicated that over 60 local and remote terminals/workstations were installed on site. Most of the systems had from four to eight megabytes of main memory and typical operating systems included MVS, OS/MVS, OS/MVT, DOS/VSE, VM/SP, VS/1, DOS/VM and OS/VS2. Cobol was the most frequently used programming language according to 22 of the survey respondents. According to the results of our survey, the NAS Series systems would be recommended to other users by 25 respondents; only two respondents indicated that they would not recommend the systems.

We asked the users to rate their NAS systems in several categories as being Excellent, Good, Fair or Poor. Those ratings have been compiled in the following chart.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	8	21	3	0	3.81
Reliability of mainframe	19	9	4	0	3.47
Reliability of peripherals	4	21	4	1	2.93
Maintenance service:					
Responsiveness	18	13	1	0	3.53
Effectiveness	15	13	3	0	3.39
Technical support:					
Trouble-shooting	9	15	6	1	3.03
Education	2	16	9	2	2.62
Documentation	2	17	9	2	2.63
Manufacturers software:					
Operating system	1	18	3	0	2.91
Compiler & assemblers	6	13	3	0	3.14
Application programs	2	9	4	1	2.75
Ease of programming	3	14	4	0	2.95
Ease of conversion	8	10	2	1	3.19
Overall satisfaction	7	23	1	0	3.19

*Weighted Average on a scale of 4.0 for Excellent.

Datapro talked with two NAS users to find out how well their systems performed. We first called an NAS AS/5000 E user in the engineering business. According to a company spokesman, their system had been converted from an IBM System/370 and the conversion went very smoothly. Immediately after installation defective boards were encountered; however, NAS sent in representatives from their plant to detect and resolve the problem in a very timely manner. The spokesman indicated that the machine's performance is very good and hardware support is excellent. This hardware support is reported to be much improved over IBM's support of the company's previous System/370.

➤ required on only one of the interconnected channels. The Channel-to-Channel Adapter is optional on the AS/6600, AS/8000 and AS/9000 Series.

Dynamic Address Translation is standard on all AS processor models. Instruction retry, command retry, and channel retry are also standard on all models. The AS/8000 Series and AS/9000 Series also feature enhanced I/O logout and a stage tracer for fault logging. On the AS/9000 Series, a Log-Out Analyzer speeds fault diagnosis and verification. In addition to the error-logging facility supported by the operating system, up to 9K bytes of status information is logged to the console diskette whenever there is a CPU or channel malfunction. The status information can be recalled and analyzed by a Field Engineer without affecting normal system operation. The AS/6600, AS/8000 and AS/9000 Series also have a remote support capability that allows information from a failing CPU to be accessed by a remote support site through a telecommunications link. This capability enables the remote support site to receive logout information from, and assume control of, the service processor of the failing CPU. The remote facility can then process the information to diagnose the problem.

SYSTEM CONSOLES: The operator communicates with an AS system via the system console, which also serves as a diagnostic console for maintenance purposes. The AS/9000 Series' service processor console includes two 20-inch four-color display units, two independent processors, and two flexible disk drives. A remote diagnostic capability is provided. The AS/9070 and AS/9080 include two service processor consoles.

MULTIPROCESSING CONFIGURATIONS: The AS/9070 and AS/9080 each consist of two independent processors that share a common main memory. If one processor fails, the system can be reconfigured to a uniprocessor system through the operator console or the operating system. A Channel Cross-Call feature allows control of input/output operations to be switched to the available processor.

INPUT/OUTPUT CONTROL

The AS/6600 Series processors include six integrated I/O channels: one byte multiplexer channel and four block multiplexer channels. The AS/8000 Series and AS/9000 Series uniprocessor models include one microprogram-controlled I/O Processor as standard, while the dual processor models include two I/O Processors. The AS/8000 Series and AS/9000 Series systems support from 8 to 32 channels. (See Table 1 for the exact number of channels available for each processor model.)

Expansion of channels on the AS/8040 and AS/9000 Series is accomplished via the extended channel group, which provides an additional I/O Processor with eight channels, and the prerequisite Extended Channel Adapter. The Extended Channel Adapter provides for the attachment of the Extended Channel Groups, permits all channels except Channel 0 to be block multiplexer channels, and provides data streaming support on all block multiplexer channels. The Extended Channel Adapter is standard on all AS/9000 Series models. Data streaming support is standard on all Advanced System models.

Each I/O channel implements the standard IBM interface and is provided with 256 Unit Control Words. On the AS/9000 Series, all block multiplexer channels can operate at up to 3.0 megabytes per second. The data transfer rate for byte multiplexer channels is 100K bytes per second for all processor models.

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► We also spoke with an NAS AS/9000 user in the manufacturing software development business who had migrated from an AS/7000 system due to increased power requirements. They had previously had an IBM System/360 installed, so a comparison could be made with regard to support and service from IBM. In extraordinary situations, hardware support required flying in specialists to diagnose problems; however, the response was about the same as had been experienced with IBM. The user indicated that board changes had to be made as a result of initial diagnostic testing. The performance of the processor has been as was expected. The only performance problems encountered were in the operating system change from OS/VS1 to MVS, which needed tuning in. According to the company spokesman, downtime has been minimal and overall the company is well satisfied with the system. □

► PERIPHERAL EQUIPMENT

The NAS systems can utilize all IBM System/360, System/370, 4300, 303X, or 308X Series input/output and mass storage devices, as well as their plug-compatible counterparts from independent vendors.

NAS currently markets the 7880/7380 and 7860/7360 Disk Storage Subsystems. The 7380 is a plug-compatible replacement for the IBM 3380 Disk Storage Facility. The 7360 is plug-compatible with and has twice the capacity of the IBM 3350 Direct Access Facility. The NAS 7803/7420 Magnetic Tape Subsystem is plug-compatible with IBM's 3803/3420 Magnetic Tape Subsystem. (See reports 70D6-655-01 and 70D6-655-02 in Volume 2 for detailed descriptions of these systems.)

SOFTWARE

The Advanced Systems offer complete functional compatibility with IBM System/360, System/370, 4300 Series, 303X and 308X Series software. NAS supports users of current IBM system software by providing new releases of the software and supplying software support services for its customers.

The AS systems include firmware that supports the following IBM operating system enhancements: System/370 Extended Facility (370 EF), which allows the use of the MVS/System Extensions (MVS/SE) and MVS/System Product (MVS/SP); OS/VS1 Extended Control Program Support (VS1:ECPS); Virtual Machine Assist (VMA); Virtual Machine Extended Control Program Support (VM:ECPS); and MVS/SP Assists, which consist of the Cross Memory Services Assist, Auxiliary Storage Management Assist, Real Storage Management Assist, and I/O Assist features. All of these enhancements improve system throughput by implementing a number of frequently used system routines in microcode. (See Table 1 for the microcode assist features available on the individual AS processors.)

Software products developed by NAS include the Advanced Conversational Editing and Programming System (ACEP), Performance Monitor, DISCERN, EXTEND/SP, and DP Technician.

ACEP is an on-line programming system that permits programmers to create, modify, and maintain programs and systems. ACEP can be used with IBM or IBM-compatible processors running under OS/VS1 or MVS. An optional System Productivity Facility (SPF) enables users to work with easy-to-understand screens and menus to arrive at programming decisions. The ACEP/SPF system includes capabilities for entering, editing, compiling, and saving source programs.

The NAS Performance Monitor is a new family of program products designed to measure and report on the performance and utilization of MVS systems. The Performance Monitor is designed for use with all NAS and IBM System/370-compatible computers. Three modules are available. The System Performance Interrogator (SPI) is used for on-line processing. SPI accumulates totals for separate functions and allows users to view the status of any function while the system is running. The System Performance Module (SPM) is used for batch processing. SPM provides historical information and analysis for capacity planning and scheduling. The third module, Job Analysis and Billing (JAB), quantifies all functions in terms of dollars. JAB enables users to integrate all data processing department functions, provide invoices to user departments, and pro-rate costs. Data obtained from the performance monitors can be formatted as charts, graphs, tables, and histograms.

DISCERN is an OS/VS1 system performance analyzer that monitors the system and provides statistics on system performance. DISCERN produces 15 different reports on system activity.

EXTEND/SP simulates the System/370 Extended Facility, substituting standard System/370 instruction set sequences for the machine instructions in the Extended Facility. EXTEND/SP is designed to enable System/370 users to take advantage of MVS/SP3 without making hardware modifications. According to NAS, EXTEND/SP, when used in conjunction with IBM's MVS/SE or MVS/SP operating systems, offers a 12 to 20 percent improvement in performance.

The DP Technician is a DASD management utility. Capabilities include volume configuration/dump/restore, catalog management, file management, file record retrieval, and DASD management. DP Technician can be used with all OS and OS/VS operating systems and supports IBM 3330, 3344, 3350, 3375, and 3380 disk subsystems. The IBM 3420 magnetic tape units are also supported.

PRICING

Equipment prices for NAS Advanced Systems are listed below. NAS offers two levels of software support. The Central Program Support Center function in Mountain View and San Diego, California, provides a Central Program Support Service, which includes telephone assistance 24 hours a day, 7 days a week, customer guidance in IPAR (Incident Program Analysis Report) preparation, problem diagnosis advice, temporary fix or bypass service, and PTF selection and application assistance. The Local Program Support Service at the customer site includes problem diagnosis, IPAR preparation and submission assistance, local fix or bypass development and assistance, and PTF/PUT application problem assistance. The Local Program Support Service is available as an option. Customers can elect to pay a monthly program support charge or to pay hourly rates.

NAS has a Support Agency service for selected IBM Licensed Programs. Under the terms of an agreement between NAS and IBM, licensed users can select NAS as their support agent. The agreement permits NAS to use the IBM support centers on behalf of the users. NAS is offering a combined Central and Local Program Support Service for the designated IBM programs. A remote, first-level interface is provided via a toll-free telephone number, and local support is provided via local NAS Systems Support Representatives. The Support Agency service provides support for the following licensed programs: MVS/SP Version 1, VM/SP Release 1, DOS/VSE Advanced Functions Release 3, Data Facility/ Device Support, Data Facility/Extended Function, Data Facility/Data Set Services, RMF, SAM-E, ACF/VTAM, ACF/NCP, SPF, Information System, VSE/VSAM, VSE/POWER, VSE/OCCF, VSE/IPCS, VSE/IPF, VSE/ICCF, VSE/Fast Copy, VSE/DITTO, BTAM-ES, VM/IPCS, RSCS, SPF/CMS, and IPF. ►

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EQUIPMENT PRICES

		<u>Purchase</u>	<u>Monthly Maint.*</u>
PROCESSOR COMPLEXES			
AS/6620	Processor with 2 megabytes of main memory, 64K bytes of buffer storage, 5 I/O channels, and a standalone operator console with color CRT	\$ 255,000	\$ 668
AS/6630	Processor with 4 megabytes of main memory, 64K bytes of buffer storage, 5 I/O channels, and a standalone operator console with color CRT	341,500	777
AS/6650	Processor with 4 megabytes of main memory, 64K bytes of buffer storage, 5 I/O channels, and a standalone operator console with color CRT	417,500	927
AS/8040	Compact processor with 8 megabytes of main memory, 64K bytes of buffer storage, 8 I/O channels, a single power distribution unit and color CRT	1,349,000	5,264
AS/8050	Compact processor with 8 megabytes of main memory, 64K bytes of buffer storage, 8 I/O channels, a single power distribution unit and color CRT	1,758,000	5,431
AS/8060	Compact processor with 8 megabytes of main memory, 64K bytes of buffer storage, 8 I/O channels, a single power distribution unit and color CRT	2,251,000	6,494
AS/9040	Processor with 8 megabytes of main memory, 64K bytes of buffer storage, I/O processor, 8 I/O channels, and service processor console with dual 4-color CRTs, keyboards, and 2 floppy disk drives	1,804,000	5,646
AS/9050	Processor with 8 megabytes of main memory, 64K bytes of buffer storage, I/O processor, 8 I/O channels, and service processor console with dual 4-color CRTs, keyboards, and 2 floppy disk drives	2,316,000	6,709
AS/9060	Processor with 16 megabytes of main memory, 256K bytes of buffer storage, I/O processor, 16 I/O channels, and service processor console with dual 4-color CRTs, keyboards, and 2 floppy disk drives	3,003,000	7,612
AS/9070	Dual processors with 16 megabytes of main memory, 64K bytes of buffer storage per processor, 2 I/O processors, 16 I/O channels and 2 service processor consoles with dual 4-color CRTs, keyboards, and 2 floppy disk drives	3,606,000	9,253
AS/9080	Dual processors with 16 megabytes of main memory, 256K bytes of buffer storage per processor, 2 I/O processors, 16 I/O channels, and 2 service processor consoles with dual 4-color CRTs, keyboards, and 2 floppy disk drives	4,908,000	14,200
PROCESSOR OPTIONS			
AS/6600 Series:			
	Additional Memory Increment, 4 megabytes	38,000	56
	Additional Block Channels Increment, 2 channels	20,000	40
	Additional Byte Channels, each	8,000	20
	Channel to Channel Adapter	20,000	25
	Direct Control	5,000	—
	High-speed Arithmetic (AS/6650 only)	80,000	250
	Hard Copy Printer	3,700	139
	AS/6620 to AS/6630 Upgrade	95,000	109
	AS/6630 to AS/6650 Upgrade	115,000	150
AS/8000 Series:			
	Additional Memory Increment, 4 megabytes	76,000	226
	Additional Channel Group, 8 channels	142,000	132
	Channel to Channel Adapter	14,000	56
	Additional Console	29,000	300
	Console Printer	6,000	139
	High-speed Arithmetic	200,000	300
	Preferred Machine Assist	50,000	N/C
	Extended Architecture	250,000	N/C
	AS/8040 to AS/8050 Upgrade	409,000	167
	AS/8050 to AS/8060 Upgrade	499,000	1,063
AS/9000 Series:			
	Additional Memory Increment for AS/9040, AS/9050 and AS/9060; 8 megabytes	152,000	452
	Additional Memory Increment for AS/9070 and AS/9080; 16 megabytes	304,000	904
	Additional Channel Group, 8 channels	142,000	132
	Channel to Channel Adapter	14,000	56
	Console Printer	6,000	139
	Additional Service Processor Console	139,000	417
	Direct Control	1,500	21
	Preferred Machine Assist	50,000	N/C
	Extended Architecture for AS/9040, AS/9050 and AS/9060	250,000	N/C
	Extended Architecture for AS/9070 and AS/9080	500,000	N/C
	AS/9040 to AS/9050 Upgrade	512,000	1,063
	AS/9050 to AS/9060 Upgrade	393,000	903
	AS/9050 to AS/9070 Upgrade	1,200,000	2,544
	AS/9060 to AS/9080 Upgrade	1,105,000	6,588
	AS/9070 to AS/9080 Upgrade	1,052,000	4,947

NAS Advanced Systems

SOFTWARE PRICES

	<u>One-Time License Fee</u>
ACEP (Advanced Conversational Editing and Programming System)	\$28,000
SPF (System Productivity Facility)	4,000
NAS Performance Monitor:	
SPI (System Performance Interrogator)	14,000
SPM (System Performance Module)	6,000
SPI and SPM	6,000
Performance Data Base for SAS Users:	
IMS Data Option	1,000
CICS Data Option	1,000
VM Data Option	1,000
JAB (Job Analysis and Billing):	6,000
IMS Option	7,000
CICS Option	2,000
VM Option	2,000
EXTEND/SP System/370 Extended Facility Simulator	5,000 to 15,000
DISCERN VS1 Performance Analyzer	6,500
DP Technician	12,000

LOCAL PROGRAM SUPPORT

	<u>Category A</u>	<u>Category B</u>
AS/6620	\$ 515	\$ 740
AS/6630	515	740
AS/6650	515	740
AS/8040	630	900
AS/8050	800	1,140
AS/8060	910	1,300
AS/8060	910	1,300
AS/9040	800	1,140
AS/9050	910	1,300
AS/9060	1,085	1,550
AS/9070	1,325	1,890
AS/9080	1,875	2,675 ■