Amdahl 580 Systems

MANAGEMENT SUMMARY

Since its initial introduction in November 1980, the Amdahl 580 Series of large-scale processors has been expanded to include a comprehensive line of plug-compatible mainframes. Two recent additions to this product line, the 5867 dual processor and the 5868 multiprocessor, have strengthened Amdahl's competitive position in the price/performance race against IBM's latest 308X models. Amdahl's commitment to performance upgradability is further demonstrated by the growth path which exists between the new models and existing models of the 580 product line. The 5840 and 5850 uniprocessors can be upgraded to the 5867 and 5868. The 5867 and 5868 can be upgraded, respectively, to the 5870 dual processor and 5880 multiprocessor. Depending upon the environment, the 5867 and 5868 processors offer 1.25 to 1.4 times more performance than that of the most powerful 580 uniprocessor, the 5860.

A number of enhancements to current 580 Series models have been made in an effort to provide the large-system user with increased performance and larger configurations. The uniprocessor models, the 5840 and 5850, now support up to 64 megabytes of main storage while the high-end 5880 features up to 128 megabytes of main storage in single-image mode or 64 megabytes of main storage on each processor of the 5880 in partitioned mode. Also, the maximum number of channels on the 5880 has been expanded to 48 I/O channels in single-image mode. In addition, new shipments of the 5850 uniprocessor provide users with a five to seven percent improvement in processor performance. ▷

Amdahl Corporation's top of the line is its 580 Series of high-performance, plug-compatible mainframes. All seven models in the series are fully compatible with comparable IBM hardware and software, and aim to offer improved price/performance over their IBM counterparts.

MODELS: 5840, 5850, 5860, 5867, 5868, 5870, and 5880.
CONFIGURATION: One (5840, 5850, 5860, and 5867) or two CPUs (5868, 5870, and 5880), 16 to 128 megabytes of memory, and 16 to 48 channels.
COMPETITION: IBM 308X, NAS AS/9000 Series.
PRICE: Base purchase prices are $2,000,000 (5840), $2,350,000 (5850), $2,600,000 (5860), $3,410,000 (5867), $4,070,000 (5868), $4,220,000 (5870), and $4,720,000 (5880).

CHARACTERISTICS

MANUFACTURER: Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, California 94086. Telephone (408) 746–6000. In Canada: One First Canadian Place, Suite 3940, P.O. Box 123, Toronto, Ontario, M5X 184 Canada. Telephone (416) 862–7479. ▶

The Amdahl Model 5860 is the most powerful uniprocessor that Amdahl has ever produced. This member of the Amdahl 580 family represents an evolutionary extension to the product line and offers a compatible growth path for Amdahl 470 users. The 5860 has twice the processing power of Amdahl's 470V/8. Standard features on the 5860 include 16 I/O channels, 16MB of main storage, two 32K high-speed buffers, power distribution unit, system console and air cooling.

Amdahl 580 Systems

▷ PROCESSORS AND PERIPHERALS

The performance increases of the 580 are made possible through improvements in system design, technology, and packaging, according to Amdahl. The processor incorporates a five-phase pipeline design which reduces the number of machine cycles per instruction. This technique produces a maximum execution rate of one instruction per cycle. The 470 systems, for comparison, execute one instruction per two cycles. The processor cycle time in the 580 is 23¼ nanoseconds. The memory cycle time is 280 nanoseconds. Data paths are 8 bytes wide, compared to 4 bytes in the 470, and the 580 uses a dual-bus structure to interconnect all functional units. Two 32K high-speed buffers (HSB), using the 470 "nonstore-through" technique, permit data to be modified in the buffer rather than in main storage. One HSB is used for rapid access to instructions and the other HSB is for fast access to data—a method Amdahl says reduces the interference between the instruction fetching and execution activities.

The system's block multiplexer channels all support the datastreaming feature, and can transmit data at up to six megabytes per second. The initial Input/Output Processor (IOP), with up to 15 block multiplexer channels, has a maximum aggregate data rate of 50 megabytes per second. Higher data rates can be obtained by adding a second IOP. Up to 256 subchannels are available on every channel, and subchannel queueing is provided as a standard feature. Up to 4 byte multiplexer channels are offered in the 580 Console Complex, each having a data rate of 200K bytes per second.

Extensive use of LSI technology and component packaging contributes to the system's overall performance. The 580 systems, like the 470, are all air cooled. The LSI chips used in the 580 have a higher density than those in the 470, but generate less heat. High-speed 4K RAM modules are used for microcode control stores, registers, and HSBs. These RAMs, plus the LSI chips, are intermixed on 14-layer Multiple Chip Carriers (MCC) that can implement an entire system function. Up to 121 LSI chips and RAM modules can be mounted on each MCC. Only eight MCCs are needed for a basic 580, including five for the CPU, and one each for the IOP, System Service Processor (SSP), and Memory Bus Controller (MBC). A ninth MCC is required when increasing the block multiplexer channels from 16 to the maximum 48. Up to 13 MCCs can be accommodated in the LSI "stack," a 5.6- cubic-foot enclosure with its two side walls made up of printed circuit boards for interconnecting the MCCs. The 580 employs a dual-bus design with eight-byte data paths. The A–Bus carries data from the SSP, IOP, and CPU to the MBC, which manages the system's memory activities. The B–Bus returns data to these three components from the MBC.

System compatibility is a key element of the Amdahl 580. To provide increased flexibility in this important area, the 580 uses Distributed Microcode on its Instruction Unit (I–Unit), Execution Unit (E–Unit), IOP, MBC, and the SSP. Amdahl claims this approach results in shorter control paths and reduced contention. The microcode control ▷

▶ MODELS: Amdahl 5840 (single processor), 5850 (single processor), 5860 (single processor), 5867 (dual processor), 5868 (multiprocessor), 5870 (dual processor), 5880 (multiprocessor).

DATE ANNOUNCED: November 1980 (5860 and 5880); October 1981 (5870); September 1982 (5850); June 1983 (5840); March 1984 (5867 and 5868).

DATE OF FIRST DELIVERY: Model 5860, 3rd quarter 1982; Model 5850, 3rd quarter 1983; Model 5840, 4th quarter 1983; Model 5870, 2nd quarter 1984; Model 5867, 3rd quarter 1984; Model 5868, 1st quarter 1985; Model 5880, 1st quarter 1985.

DATA FORMATS

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

BASIC UNIT: 8-bit bytes. 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.

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

SYSTEM CONFIGURATION

The Amdahl 580 is built from several interrelated components. Each element is implemented in a Multiple Chip Carrier (MCC), which contains all logic and circuitry required, in a compact package. All functions are housed within the 580 mainframe, and include the following:

- Instruction Unit (I–Unit), which processes instructions and controls the CPU

- Execution Unit (E–Unit), which performs the required computations

- Storage Unit (S–Unit), which manages the system's operand storage and retrieval activities

- Instruction Buffer (I–Buffer), that provides high-speed buffer storage for instruction streams

- Operand Buffer (O–Buffer), that provides similar storage capabilities for operand data

These components make up the Central Processor (CPU). Additional 580 elements include:

- Input/Output Processor (IOP), which manages I/O requests and provides up to 15 block multiplexer channels, and up to 4 byte multiplexer channels at 200K-bytes-per-second.

- Console Processor, which monitors CPU functions, provides maintenance and diagnostic routines via the System Support Processor (SSP). ▶

Amdahl 580 Systems

TABLE 1. SYSTEM CHARACTERISTICS

	5840	5850	5860	5867
SYSTEM CHARACTERISTICS				
Relative performance to 470V/8	1.2	1.75	2.0	2.7
Date announced	6/83	5/83	11/80	3/84
Date of first delivery	4th qtr. 1983	3rd qtr. 1983	3rd qtr. 1982	3rd qtr. 1984
Production status	Active	Active	Active	Active
Number of processors	1	1	1	2
Principal operating systems	MVS/370, MVS/ XA, VM/SP	MVS/370, MVS/ XA, VM/SP	MVS/370, MVS/ XA, VM/SP	MVS/370, MVS/ XA, VM/SP
Field upgradeable to	5850	5860, 5867, 5868	5867, 5868, 5870, 5886	5868, 5870, 5880
Basic system price (16MB)	$2,000,000	$2,350,000	$2,600,000	$3,410,000 (24MB)
PROCESSOR				
Cycle time, nanoseconds	23¼	23¼	23¼	23¼
BUFFER STORAGE				
Type	Bipolar RAM	Bipolar RAM	Bipolar RAM	Bipolar RAM
Cycle time, nanoseconds	N/A	N/A	N/A	N/A
Bytes, fetched per cycle	8	8	8	8
Capacity, bytes	2 x 32K	2 x 32K	2 x 32K	2 x 32K
MAIN STORAGE				
Type	Dynamic NMOS	Dynamic NMOS	Dynamic NMOS	Dynamic NMOS
Cycle time, nanoseconds	280	280	280	280
Parity checking	yes	yes	yes	yes
Error checking and correction	yes	yes	yes	yes
Bytes fetched per cycle	8	8	8	8
Minimum capacity, bytes	16M	16M	16M	24M
Maximum capacity, bytes	64M	64M	64M	64M
Memory increment size, bytes	8M	8M	8M	8 up to 32MB, 16 above 32MB
I/O CHANNELS				
Block multiplexer only, std.*	15	15	15	15
Byte multiplexer, standard*	1	1	1	1
Maximum channel data rates				
Block multiplexer, bytes per second	6M	6M	6M	6M
Byte multiplexer, bytes per second	200K	200K	200K	200K
Aggregate data rate, bytes per second	50-80M	50-80M	50-80M	50-80M
Channel-to-channel adapted	yes	yes	yes	yes
Data Streaming	yes	yes	yes	yes

*Channels should total 16 in 5840, 5850, 5860, 5867, and 5870; 32 in 5868 and 5880.

▷ store, typically centralized, is now distributed to the same MCC as the functional unit it controls. The performance of each functional unit can then be customized for optimum performance. Another factor, I/O protocol compatibility, is reduced to a single PCB, the Channel Interface Handler. Modifications to accommodate protocol changes are made simply by updating the Channel Interface Handler. A new hardware/firmware product called Macrocode will support the machine-check and channel-check capabilities of the 580. Amdahl indicated that Macrocode will play an important role in implementing future system compatibility techniques. Macrocode, along with hardware and microcode, will be used on the Amdahl 580 to implement System/370 Extended Architecture.

System reliability, availability, and serviceability are performed via several methods: 1) advanced error-checking and correction (ECC) circuitry, such as main memory ECC, buffer ECC, bus parity checking, E–Unit parity and residue checking, and instruction retry; 2) history RAMs which record bus and microcode transactions on an audit trail; 3) diagnostic circuitry integral with each MCC; and 4) improved component packaging, particularly in the MCC. ▷

▶ • Memory Bus Controller (MBC), which controls data accesses to the Main Storage Unit (MSU), data bus transfers, and provides overall system coordination and timing facilities

A second IOP can be configured giving the 580 a maximum of 31 block multiplexer channels per CPU.

The 580 comes in the 5840, 5850, and 5860, which are uniprocessors; the 5867 and 5870, a dual-processor arrangement; and the 5868 and 5880, a dual-CPU complex. The 5867 couples a 5850 CPU complex with a second 580 CPU; the 5870 couples a 5860 CPU complex. The 5868 is based on two tightly coupled 5850 CPUs while the 5880 is based on two tightly coupled 5860 CPUs. The 5840, 5850, 5860, 5867, and 5870 have a maximum of 64 megabytes of memory. The 5868 and 5880 support up to 128 megabytes of main memory. The 5840 is rated at 1.2 times the performance of the Amdahl 470V/8, the 5850 is 1.5 times the 470V/8, the 5860 is rated at 2.0 times the performance of the 470V/8, the 5867 and 5868 are rated at 2.7 times the performance of the 470V/8, the 5870 reportedly has 70 percent more power than the 5860, and the 5880 is rated at 3.5 times the 470V/8.

TECHNOLOGY

As in the 470 series of processors, the 580 makes extensive use of large-scale integration (LSI) chips using high-perfor- ▶

Amdahl 580 Systems

TABLE 1. SYSTEM CHARACTERISTICS

	5868	5870	5880
SYSTEM CHARACTERISTICS			
Relative performance to 470V/8	2.7	3.4	3.5
Date announced	3/84	10/81	11/80
Date of first delivery	1st qtr. 1985	4th qtr. 1983	4th qtr. 1983
Production status	Active	Active	Active
Number of processors	2	2	2
Principal operating systems	MVS/XA, VM/SP, MVS/370	MVS/XA, VM/SP, MVS/370	MVS/XA, VM/SP, MVS/370
Field upgradeable to	5880	5880	—
Basic system price (16MB)	$4,070,000 (32MB)	$4,220,000 (24MB)	$4,720,000 (32MB)
PROCESSOR			
Cycle time, nanoseconds	23¼	23¼	23¼
BUFFER STORAGE			
Type	Bipolar RAM	Bipolar RAM	Bipolar RAM
Cycle time, nanoseconds	N/A	N/A	N/A
Bytes, fetched per cycle	8	8	8
Capacity, bytes	4 x 32K	4 x 32K	4 x 32K
MAIN STORAGE			
Type	Dynamic NMOS	Dynamic NMOS	Dynamic NMOS
Cycle time, nanoseconds	280	280	280
Parity checking	yes	yes	yes
Error checking and correction	yes	yes	yes
Bytes fetched per cycle	8	8	8
Minimum capacity, bytes	32M	24M	32M
Maximum capacity, bytes	128M	64M	128M
Memory increment size, bytes	16 up to 64MB, 32 above 64MB	8M	8M
I/O CHANNELS			
Block multiplexer only, std.*	30	15	15
Byte multiplexer, standard*	4	1	2
Maximum channel data rates			
Block multiplexer, bytes per second	6M	6M	6M
Byte multiplexer, bytes per second	200K	200K	200K
Aggregate data rate, bytes per second	50-80M	50-80M	50-80M
Channel-to-channel adapted	yes	yes	yes
Data Streaming	yes	yes	yes

*Channels should total 16 in 5840, 5850, 5860, 5867, and 5870; 32 in 5868 and 5880.

▷ **SOFTWARE AND SUPPORT**

The 580 systems are completely compatible with IBM System/370 operating systems; in particular MVS/SP Releases 1 and 2, VM/SP Releases 1 and 2, as well as all available Amdahl software products. Amdahl's Universal Timesharing System (UTS), based on the UNIX operating system developed by Bell Laboratories, is now available.

Amdahl has announced it will support IBM's MVS/SP Version 2 and related data management facilities, also known as the System/370 Extended Architecture, or MVS/XA. In particular, the company said it will support the 31-bit addressing required in the new Extended Architecture mode, not only in its 580 Series, but also in its 470V/7 Series and 470V/8 product lines. Releases 1 and 2 of IBM's VM/SP and VM/SP High Performance Option program products will also be supported. Amdahl supports the new 3880 Storage Control Models 11 and 13.

Centralized system maintenance and troubleshooting are provided by the 580 Console Complex. Console maintenance features include 1) Scan-In/Scan-Out to record and ▷

▶ mance emitter-coupled logic (ECL) circuitry. Up to 400 of these circuits can be contained on a single LSI chip, compared to only 100 circuits per chip on the 470. In spite of its obviously increased packing density, a 580 chip generates only slightly more heat than a 470 chip. The 580, like the 470, is air cooled.

A new high-speed 4K RAM module was developed by Amdahl to handle such functions as Distributed Microcode control storage, high-speed buffer (HSB) storage, and system registers.

Amdahl combines up to 121 RAM and logic chips on a Multiple Chip Carrier (MCC). This increased packing density, with almost three times the number of chips per MCC as the 470, permits the implementation of an entire system function on a single MCC. Each system MCC is arranged in a small (only about 5.6 cubic feet) stack with a maximum of 13 MCCs possible. Each of the two stack side walls incorporates a 12-layer printed circuit board for MCC-to-MCC interconnections. A minimum of 8 MCCs is required for a basic 580 system. Compared to the 470, with as many as 59 MCCs required, the 580 provides more internal data paths and increased reliability.

Combining all functional units together are two data buses, the A–Bus and B–Bus. Each bus moves unidirectionally, and has a 72-bit-wide data path. The two buses are integral ▶

Amdahl 580 Systems

▷ recreate a particular condition; 2) isolation of faulty components at the console; 3) execution of diagnostic routines by the console; 4) error logging; 5) access to Hardware History Tables to assist in fault analysis; 6) Dynamic Error Analysis to analyze the error logs; and 7) dynamic monitoring of selected I/O channels. In addition, the 580 can access the Amdahl Diagnostic Assistance Center (AMDAC).

COMPETITIVE POSITION

The Amdahl 580 Series competes directly with IBM's 308X line of large-scale mainframes. The timely introduction of the new 580 models and the 580 Series enhancements followed closely on the heels of IBM's own announcement of six new processors: the 3083 Model groups EX, BX, and JX; the 3081 Model groups GX and KX; and the 3084 Model group QX. According to IBM, the new models are enhanced versions of the previous 308X models. In terms of price/performance comparisons, the expanded 580 product line directly responds to IBM's recent revisions. Specifically, the improved 5860 competes with the new 3081GX; the new 5867 and 5868 oppose IBM's 3081KX; and the 5870 and 5880 compete with IBM's 3084QX. Unlike the older IBM 308X models which cannot be field upgraded to the newer models, the Amdahl models feature full compatibility and field upgradability across the entire product line. However, IBM has recently tried to appease users with the older 308X models by offering an optional performance-improvement feature that causes the older models to perform closer to the level of the new models.

Plug-compatible rival National Advanced Systems has also reacted to the new IBM line with the addition of five new models to its AS/80X3 family. Although the new NAS product line does offer current users with a field-upgrading capability across intermediate and large-scale processor levels, the new models cannot surpass the expanded main memory and channel configurations of the Amdahl equipment.

ADVANTAGES AND RESTRICTIONS

The expansion of Amdahl's 580 Series enables this plug-compatible manufacturer to retain a highly competitive position in the price/performance race against IBM. Amdahl has succeeded in diversifying its 580 product line across uniprocessor, dual-processor, and multiprocessor levels. The increase of main memory to 64 megabytes on all 580 models along with the anticipated availability for 128-megabyte main storage and 48 input/output channels on all multiprocessor models provide a clear advantage in processing power. In addition to the performance improvements, Amdahl has reduced purchase prices on larger 580 models by 3 to 14 percent and reduced prices on selected model upgrades. However, maintenance charges for existing models were not reduced.

Another major advantage of the Amdahl 580 Series is complete compatibility with IBM 370 operating systems and all available Amdahl software offerings. Amdahl's support of both MVS/370 and MVS/XA is further enhanced by the 580 Conversion Assist Feature. This feature ▷

▶ parts of the stack side walls, and provide shorter data paths, simplified physical connections, and a reduction in the number of connections required among functional units. The A–Bus transports data from the Console, I/O Processor (IOP), and CPU to the Memory Bus Controller (MBC). The B–Bus returns data to these units from the MBC.

CENTRAL PROCESSOR

Within the Amdahl 580 CPU, two instruction functions are continuously performed in parallel: Instruction Fetch (I–Fetch) and instruction execution.

The I–Fetch component provides a double word of instruction flow and holds it in the Instruction Word Buffer (IWB) in the I–Unit until needed for execution. With each cycle instructions are moved in and out of the IWB at the rate of one, two, or three halfwords of instruction data.

INSTRUCTION UNIT (I–Unit): The I–Unit controls instruction execution and processes system interrupts. Specific functions of the I–Unit include:

• Instruction fetching, decoding, and buffering

• Determining effective operand addresses

• Provide register access for operands

• Maintain overlapped pipeline processing technique via control of Storage Unit (S–Unit), Execution Unit (E–Unit), and I/O Processors (IOPs)

After an instruction is fetched, a five-phase pipeline operation takes over. The pipeline concept, also used in the Amdahl 470, permits the I–Unit to have several instructions in various phases of execution simultaneously. With each processor cycle another instruction enters the pipeline from the IWB. The instruction preceding it moves into the next phase of execution. By the fifth processor cycle, at maximum execution rate, five instructions are in the pipeline simultaneously, in different execution phases. Since instruction flow involves five basic steps, at the maximum execution rate the result is an effective rate of one instruction per machine cycle. For comparison, the 470 executes at a maximum rate of one instruction per *two* cycles. This increased execution rate permits the 580 to execute twice as fast as Amdahl's previous top-end system, the 470V/8.

Extensive parity checking is performed throughout the I–Unit. All incoming instructions are checked for parity, and the results are checked again after completion of execution. All control registers and the program status word are checked each time they are used. In addition, parity is checked for the timer and the address generation function, and parity is also maintained for all program-referable data.

The 580 I–Unit is compatible with the IBM System/370 Principles of Operation opcodes. These elements are implemented within the CPU by a mixture of hardware, microcode, and a new class of firmware called Macrocode. Critical system functions are implemented in hardware for fastest execution, while other less critical functions can be implemented in microcode resident on the MCC used by the I–Unit. Macrocode is planned for future system enhancements.

STORAGE UNIT (S–Unit): All I–Unit data requests are processed by the S–Unit. Virtual-to-absolute address translations are performed in the S–Unit, which includes a Translation Lookaside Buffer (TLB) to facilitate rapid virtual-to-absolute translations. Data traffic between the CPU data buffers and main memory is controlled by the S–Unit. It also provides the bus interface between the CPU and the rest of the 580. ▶

Amdahl 580 Systems

makes possible the splitting of a 580 system into two logical systems or environments to allow for the operation of MVS/370 in one environment and MVS/XA in another. Starting with July 1984 shipments, the additional purchase of certain software products will no longer be required. At this time, VM/Extended Channel Support, MVS/Extended Channel Support, MVS/SP Assist, MVS/SE Assist, and MVS/SE Support will be shipped as part of macrocode, an innovative firmware facility. IBM's ACP (Airline Control Program) is no longer being commercially offered.

Amdahl has postponed the initial release of the 5868, 5870, and 5880 models. The vendor's cautious behavior is probably the result of manufacturing difficulties encountered with early shipments of the 5860. Further delays could jeopardize the solid position Amdahl has established for itself in the PCM marketplace.

USER REACTION

Four Amdahl 580 users responded to Datapro's 1984 Computer Survey. One of the respondents had installed the Model 5850 while the remaining three rated their 5860 installations. One system had been purchased, one was leased from a third-party vendor, and two were leased directly from the manufacturer. All four users indicated that their systems had been installed during the third and fourth quarters of 1983. One of the systems was used for manufacturing, one for retail/wholesale, and two were installed at government locations. The most common applications being processed included accounting/billing, payroll/person-nel, and order processing/inventory with additional emphasis on engineering/scientific, and purchasing applications.

All four respondents reported that over 60 local and remote terminals/workstations were installed. The majority of systems featured from 16 to less than 32 megabytes of main memory and the most widely used operating system was MVS. Every respondent was using both a Data Base Management System and a Communications Monitor. When asked about plans concerning future acquisitions, the users revealed intentions to expand present hardware and data communications facilities along with additional software from other suppliers. Furthermore, the respondents endorsed the system with a recommendation for other users and indicated that the system had fulfilled expectations.

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

A double word of data is accessed each cycle by the S-Unit from its high-speed buffers (HSB). The four storage arrays in the S-Unit: the data array, the data select array, the tag array, and the TLB array, are accessed simultaneously during this activity. The data array has 512 thirty-two-byte lines organized within its primary and alternate partitions, and contains the actual data lines. The tag array mirrors the data array in organization, and contains TLB pointers that indicate the pages to which the data lines belong. The data select array facilitates the virtual address selection process. The TLB array contains the virtual-to-absolute address translations.

Since the 580 processes I-Fetch and execution functions separately, two high-speed buffers (HSB) for instructions and operands are provided. Both the Instruction Buffer (I-Buffer) and the Operand Buffer (O-Buffer) have 32K bytes of storage, are two-way, set-associative, and are organized into primary and alternate partitions of 512 thirty-two-byte lines. If a line of requested data is not present within an HSB, the S-Unit sends a message to main memory requesting the desired line.

The high-speed TLB has 512 entries organized into primary and alternate partitions of 256 translations to speed virtual to absolute address translations. Within each TLB entry is Segment Table Origin (STO) information which eliminates the need for a separate STO stack, as in the 470. Address translations conform to the System/370 structure.

EXECUTION UNIT (E-Unit): The E-Unit executes the arithmetic and logical instructions contained in the 580's instruction set. Operands and opcodes are received from/returned to either the O-Buffer or the I-Unit Register Facility as required by the specific instruction. Performance is enhanced within the instruction pipeline via concurrent activity on two separate instructions by the E-Unit Logic Unit and Checker (LUCK) and the various execution-cycle processes (multiply, add, shift, pack, and decimal correct). LUCK and execution phase operations require one processor cycle. In addition, the 580 uses an 8-byte-wide data path, compared to a 4-byte path in the 470. Amdahl has optimized certain logic algorithms used with frequently executed instructions to improve execution speeds.

ADDITIONAL PROCESSOR FEATURES: Other features of the System/370 found in the Amdahl 580 processors include control registers, direct addressing, double word buffer, machine check handling, multiple bus architecture, channel command retry, channel indirect addressing, byte-oriented operand feature, console audible alarm, remote console, remote data link, console file, extended control mode, and program event recording.

Machine check handling analyzes errors and attempts recovery by retrying the failed instruction if possible. If retry is unsuccessful, it attempts to correct the malfunction or to isolate the affected task. Channels have the capability to perform channel command retry, a channel and control-unit procedure that causes a command to be retried without requiring an I/O interruption. Channel Indirect Addressing (CIA) is a companion feature to dynamic address translation, providing data addresses for I/O operations. CIA permits a single channel command word to control the transmission of data that crosses noncontiguous pages in real main storage. If CIA is not indicated, then channel one-level (direct) addressing is employed. The byte-oriented operand feature permits storage operands of most non-privileged operations to appear on any byte boundary. In-

Amdahl 580 Systems

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	2	0	0	3.50
Reliability of system	2	2	0	0	3.50
Reliability of peripherals	3	1	0	0	3.75
Maintenance service:					
Responsiveness	3	1	0	0	3.75
Effectiveness	2	2	0	0	3.50
Technical support:					
Trouble-shooting	0	4	0	0	3.00
Education	1	3	0	0	3.25
Documentation	0	3	1	0	2.75
Manufacturer's software:					
Operating system	1	2	1	0	3.00
Compilers/Assemblers	1	2	0	0	3.33
Applications software	0	3	0	0	3.00
Ease of programming	0	2	1	0	2.66
Ease of conversion	0	3	0	0	3.00
Overall satisfaction	1	2	0	0	3.33

*Weighted Average based on a scale of 4.0 for Excellent. □

structions must appear on even byte addresses. The console audible alarm is a device activated when predetermined events occur that require operator attention or intervention for system operation. Remote consoles are available in addition to the standard console. The remote data link allows establishment of communications with a technical data center to remotely diagnose system malfunctions. The console file is the basic microprogram loading device for the system, containing a read-only file device. The media read by this device contains all the microcode for field engineering device diagnostics, basic system features, and any optional system features. The extended control mode (EC) is a mode in which all features of the System/370 computing system, including dynamic address translation, are operational. Program event recording is a hardware feature used to assist in debugging programs by detecting and recording program events.

The optional Channel-to-Channel Adapter permits direct communications between an Amdahl 580 and an IBM System/370, 303X, or 308X via a standard I/O channel. It can be attached to a block multiplexer channel and uses one control unit position on either channel. In an interconnection between an Amdahl 580 and an IBM processor, either system can be equipped with the Channel-to-Channel Adapter, and it is required on only one of the interconnected channels. Up to two CCAs can be implemented in a system.

The Two-Byte Interface, with up to four available per IOP, doubles the bandwidth of the data path between the channel and the control units which support this option.

The 580/Accelerator provides users of Amdahl's 5840 and 5850 with access to the power of a larger processor during periods of increased demand. Depending on the installed processor and desired performance level, the user can select one of three options: 5840 accelerated to 5850 level, 5850 accelerated to 5860 level, and 5840 accelerated to 5860 level.

The 580/Conversion Feature assists users of systems converting from IBM MVS/370 to the MVS/XA operating environment. This feature combines 580 hardware circuitry with macrocode to split the 580 system into two logical systems with MVS/370 operating in one environment and MVS/XA operating in another.

The High-Speed Floating Point Feature is designed for use by large-system users with significant scientific processing needs. The feature provides additional computational capabilities that enables selected 580 processors (5860, 5870, and 5880) to make use of the floating-point instruction set.

OPERATIONAL MODE: Amdahl 580 operates in the Extended Control (EC) mode. 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 new system control functions; therefore, virtual-storage-oriented operating systems must be used.

The 580 can also operate in the Extended Architecture (XA) mode. This capability supports 31-bit addressing, with real and virtual address sizes of 2 billion bytes. Normal EC mode supports 24-bit addressing with a maximum of 16 million bytes of real and virtual address space per user program. The 580 will support bimodal operation, in which user programs with 24- and 31-bit addresses can execute concurrently, and a dynamic channel subsystem. Implementation of this capability will be available during the second quarter of 1984.

REGISTERS: Sixteen 32-bit general registers are used for indexing, base addressing, and as accumulators. Other program-visible registers are the same as in the System/370. Machine-dependent registers contained in the 580 processors are not visible to the user and may differ from the System/370.

INSTRUCTION REPERTOIRE: The Amdahl 580 instruction set consists of the complete System/370 Universal Instruction Set, including the five System/370 instructions for Dynamic Address Translation.

PHYSICAL SPECIFICATIONS: Environmental conditions for 580 processors are included in the following table.

Temperature Range	60° to 90° F (16° to 32° C)
Underfloor Temperature	50° to 66° F (10° to 19° C)
Relative Humidity Range (noncondensing)	35% to 55%
Maximum Wet Bulb Temperature	78° F (26° C)
Heat Output (BTUs/hr)	51,500
Power Consumption	22 to 27 KVA
Power Required	208V, 415 Hz
	208V, 60 Hz
	230V, 50 Hz
	380V, 50 Hz
	415V, 50 Hz
	Both 4-wire and three-phase
Mainframe dimensions (L x W x H)	123" x 36" x 70" (312 cm x 91 cm x 178 cm)
Mainframe weight	3600 lb. (1630 kg)
Minimum configuration room dimensions (L x W)	256" x 128" (650 cm x 325 cm)

MAIN STORAGE

STORAGE TYPE: Dynamic NMOS; 16K chips.

CYCLE TIME: 280 nanoseconds.

CAPACITY: 16 to 128 megabytes.

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.

STORAGE PROTECTION: Storage protection facilities are comparable to those implemented in the IBM System/370.

Amdahl 580 Systems

RESERVED STORAGE: The 580 processors reserve an area in lower memory for such purposes as interrupt handling routines, CPU ID, channel ID, and machine-check logouts.

The Amdahl 580 Main Storage Unit (MSU) uses four-way line interleaving and four-way quarterline (each quarterline is 8 bytes in length) multiplexing to provide up to 64 megabytes of storage. The data bus paths are 72 bits (double word) wide, and transfer 8-byte messages, plus parity, between the MSU and the Memory Bus Controller (MBC) every cycle. The most common data bus transactions are MSU data fetches, and the 580's bus system has been optimized to support this activity.

MEMORY BUS CONTROLLER (MBC): The primary data traffic manager within the 580 is the MBC. A key element in the instruction execution process of the 580, the MBC receives requests from the CPU, I/O Processor, or console over the A–Bus. The MBC includes the following components:

- Data Integrity Unit, which assures that copies of a currently-accessed data line which also exist in other system elements, such as the MSU and the two HSBs, contain the same data

- Interrupt Router, which directs external system interrupts to the CPU

- Timer Complex, which provides System/370 timing facilities such as the time-of-day clock, clock comparator, CPU timer, and interval timer

- I/O Router, which translates logical channel addresses to real addresses, formats them for IOP or console action, and facilitates channel reconfiguration

- Main Storage Controller (MSC), which provides the correct control signals for MSU memory requests, and generates error checking and correction (ECC) codes.

Once a request has entered the MSU from the MBC, the MSU accesses four quarterlines from one of the four interleaves present and latches them within the Main Storage Data-Out Register. The quarterlines (actually a 32-bit data line) are then routed over the B–Bus (move-in data path) to the appropriate component, such as the S–Unit, IOP, or console.

INPUT/OUTPUT CONTROL

The Amdahl 580 handles I/O activities with an Input/Output Processor (IOP) and up to 15 block multiplexer channels as standard. A second IOP is optional per CPU, and can provide an additional 16 block multiplexer channels in increments of eight channels. Each channel has 256 subchannels and can accommodate data transfer speeds up to 6.0 megabytes per second. The maximum aggregate data rate for the initial IOP with 16 channels is approximately 50 megabytes per second. Utilizing the second IOP increases the aggregate rate to approximately 80 megabytes per second.

The IOP is based on three components: 1) the I/O Controller (IOC), 2) the Bus Handler, and 3) the 16 Interface Handlers associated with the channels. An IOP, which includes the IOC and Bus Handler, is implemented on a single MCC. The IOC and Bus Handler are shared by the 16 channels.

Data flowing in and out of the IOP moves over the 580's two buses. The Bus Handler is the interface to the A–Bus and B–Bus for the IOP, and provides data buffering when needed. The IOC provides the processing capabilities of the IOP, and manages the Bus Handler and the 16 Interface Handlers. Normal data transfer activities, including channel bus and tag manipulation, and data buffering, are done by the Interface Handlers.

Data and commands are fetched directly from the Main Storage Unit, rather than from a shared HSB. This reduces contention between the I/O subsystem and the CPU.

Subchannel Queuing, a new 580 feature, holds I/O activities that have been denied access to the system, typically a result of a busy device or channel. The held request is then released for processing once the desired device or channel frees up. The feature helps to reduce the CPU load.

CONSOLE INPUT/OUTPUT

The command center of the 580 is the Console Complex, which provides an operator's console interface, and is the primary means of conducting both local and remote system diagnostics. The Console Complex and its associated components are implemented in microcode and contained in a single MCC.

The Console Complex includes the following:

- Microcoded System Support Processor with two megabytes of memory, capable of executing a subset of the Amdahl 580 instruction set

- An I/O channel, associated with one hard disk and two floppy disks

- Up to two local and two remote CRT/keyboard units, comparable to IBM 3277

- A system scanning facility

- Modem control facilities for access to Amdahl Diagnostic Assistance Center (AMDAC)

- A Bus Handler for attachment to the system's A–Bus and B–Bus.

PERIPHERAL EQUIPMENT

The Amdahl 580 systems can utilize all IBM System/370, 303X, and 308X input/output and mass storage devices, as well as their plug-compatible counterparts from independent vendors. Detailed coverage of many of these peripherals can be found in Volume 2 of DATAPRO 70.

COMMUNICATIONS CONTROL

Amdahl has two Communications Processors, the 4705 and the 4705E. The 4705 was announced in October 1980, and the 4705E in April 1983. Both models are program compatible with the IBM 3705–II. The 4705 has approximately 1.8 times the power of the 3705–II and has 64K to 512K bytes of memory, in 64K-byte increments. The 4705E has approximately 2.4 times the power of the 3705–II and has 256K to 1M-byte of memory, in 256K-byte increments. Up to 352 communications lines can be connected, and the start/stop, BSC, and SDLC protocols are supported. The 4705 and 4705E models are compatible with IBM 3705 communications software and access methods.

SYSTEM RELIABILITY

To ensure consistently high levels of reliability, availability, and serviceability in the 580, Amdahl has incorporated a wide range of features utilizing the 580's design, technology, and packaging.

Amdahl 580 Systems

➤ • Sophisticated ECC circuitry, including Main Storage ECC, buffer ECC, parity checking in the buses and E–Unit, and instruction retry

• History RAMs that provide an audit trail of system activities

• Diagnostic circuitry contained within each MCC

• Improved fault isolation from denser LSI design, which can implement an entire system function on a single MCC

• Improved reliability through fewer overall connections in the LSI and MCC packaging

• RAMs and LSI circuitry packaged on the same MCC

SERVICE AND SUPPORT

Amdahl's commitment to the efficient maintenance of the 580 is reflected both in the 580 itself and Amdahl's field-support organization.

The Console Complex is the hub of all diagnostic operations in the 580. Diagnostic functions in the System Support Processor are implemented in microcode for greater reliability, and include:

• Re-creation of a failed system condition through scan-in/scan-out records

• Isolation of defective Field Replaceable Units (FRUs) with an internal console-generated program

• An enhanced Maintenance Analysis Language to permit scanning the system trouble log and execute diagnostic routines as needed

• Access to history logs to aid in error diagnosis

• History logs analyzed by the Dynamic Error Analysis program

• Selective channel monitoring via the Integrated Channel Analyzer.

AMDAHL DIAGNOSTIC ASSISTANCE CENTER (AMDAC): Located at Amdahl headquarters in Sunnyvale, the East Coast center in Columbia, MD, Toronto, and London, AMDAC is maintained 24 hours per day and 7 days per week by technical support specialists to solve difficult problems that cannot be resolved by field engineering on site. Via the modem in the Console Complex, an on-line telephone hookup can be established between AMDAC and the customer system. AMDAC maintains a variety of system consoles, any of which can perform standard diagnostic tests on the user's system. Program Temporary Fixes (PTFs) can also be implemented on a 580 via the Console Complex.

Field Support Centers (FSC), located worldwide, help insure a smooth transition at installation time. In addition, FSCs are chartered to analyze and correct problems in supported operating systems.

SOFTWARE

Amdahl offers complete functional compatibility with IBM 360/370/303X/308X software. Operating systems supported include OS/VS1, SVS, MVS, MVS/SP, MVT, VM/370, VM/SP, and ACP. Support is included for such major IBM subsystems as HASP, ASP, TSO, TCAM, JES2, JES3, VTAM, TSCS, CMS, and IPCS.

VM/PERFORMANCE ENHANCEMENT (VM/PE): This product improved the performance and availability of an MVS system when running under VM/SP.

VM/SOFTWARE ASSIST (VM/SA): This product improves virtual machine performance under VM/SP by improving privileged instruction simulation.

UNIVERSAL TIMESHARING SYSTEM (UTS): This product provides a UNIX-based timesharing system for use on System/370 architecture processors.

CMS/ACCELERATOR (CMS/XL): This product is designed to improve performance in a CMS-intensive environment by reducing system overhead and system disk contention.

PRICING

The Amdahl 580 systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases can be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. The minimum lease term for a system upgrade is 12 months. Leases can be terminated after two years upon payment of 30 percent of the total remaining rental payments. A 90-day written notice is required for cancellation. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price. The purchase credit applies either to the original lessee or the current lessee.

Monthly maintenance charges are not included in lease charges. Maintenance is provided for 24 hours per day and 7 days per week. ➤

Amdahl 580 Series

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
PROCESSORS AND MAIN MEMORY					
5840	CPU Complex; includes two 32K-byte buffer storage units, one- or two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	1,550,000	8,200	102,045	81,635
	24 channels	1,680,000	8,400	109,260	87,405
	32 channels	1,810,000	8,600	116,475	93,175
	With 25,165,824 bytes of main memory and:				
	16 channels	1,650,000	8,600	109,740	87,790
	24 channels	1,780,000	8,800	116,955	93,560
	32 channels	1,910,000	9,000	124,170	99,330
	With 33,554,432 bytes of main memory and:				
	16 channels	1,750,000	9,000	117,435	93,945
	24 channels	1,800,000	9,200	124,650	99,715
	32 channels	2,010,000	9,400	131,865	105,485
	With 50,331,648 bytes of main memory and:				
	16 channels	1,950,000	9,800	132,825	106,255
	24 channels	2,080,000	10,000	140,040	112,025
	32 channels	2,210,000	10,200	147,255	117,795
	With 67,108,864 bytes of main memory and:				
	16 channels	2,150,000	10,600	148,215	118,565
	24 channels	2,280,000	10,800	155,430	124,335
	32 channels	2,410,000	11,000	162,645	130,105
5850	CPU Complex; includes two 32K-byte buffer storage units, one- or two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	1,850,000	9,350	119,900	95,920
	24 channels	1,980,000	9,550	127,115	101,690
	32 channels	2,110,000	9,750	134,330	107,460
	With 25,165,824 bytes of main memory and:				
	16 channels	1,950,000	9,750	127,595	102,075
	24 channels	2,080,000	9,950	134,810	107,845
	32 channels	2,210,000	10,150	142,025	113,615
	With 33,554,432 bytes of main memory and:				
	16 channels	2,050,000	10,150	135,290	108,230
	24 channels	2,180,000	10,350	142,505	114,000
	32 channels	2,310,000	10,550	149,720	119,770
	With 50,331,648 bytes of main memory and:				
	16 channels	2,250,000	10,950	150,680	120,540
	24 channels	2,380,000	11,150	157,895	126,310
	32 channels	2,510,000	11,350	165,110	132,080
	With 67,108,864 bytes of main memory and:				
	16 channels	2,450,000	11,750	166,070	132,850
	24 channels	2,580,000	11,950	173,285	138,620
	32 channels	2,710,000	12,150	180,500	144,390
5860	CPU Complex; includes two 32K-byte buffer storage units, two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	2,150,000	9,850	132,650	106,120
	24 channels	2,280,000	10,050	139,865	111,890
	32 channels	2,410,000	10,250	147,080	117,660
	With 25,165,824 bytes of main memory and:				
	16 channels	2,250,000	10,250	140,345	112,275
	24 channels	2,380,000	10,450	147,560	118,045
	32 channels	2,510,000	10,650	154,775	123,815

Includes 24-hour/7-day service; applies to both purchased and leased systems.

JUNE 1985

Amdahl 580 Systems

- Sophisticated ECC circuitry, including Main Storage ECC, buffer ECC, parity checking in the buses and E–Unit, and instruction retry

- History RAMs that provide an audit trail of system activities

- Diagnostic circuitry contained within each MCC

- Improved fault isolation from denser LSI design, which can implement an entire system function on a single MCC

- Improved reliability through fewer overall connections in the LSI and MCC packaging

- RAMs and LSI circuitry packaged on the same MCC

SERVICE AND SUPPORT

Amdahl's commitment to the efficient maintenance of the 580 is reflected both in the 580 itself and Amdahl's field-support organization.

The Console Complex is the hub of all diagnostic operations in the 580. Diagnostic functions in the System Support Processor are implemented in microcode for greater reliability, and include:

- Re-creation of a failed system condition through scan-in/scan-out records

- Isolation of defective Field Replaceable Units (FRUs) with an internal console-generated program

- An enhanced Maintenance Analysis Language to permit scanning the system trouble log and execute diagnostic routines as needed

- Access to history logs to aid in error diagnosis

- History logs analyzed by the Dynamic Error Analysis program

- Selective channel monitoring via the Integrated Channel Analyzer.

AMDAHL DIAGNOSTIC ASSISTANCE CENTER (AMDAC): Located at Amdahl headquarters in Sunnyvale, the East Coast center in Columbia, MD, Toronto, and London, AMDAC is maintained 24 hours per day and 7 days per week by technical support specialists to solve difficult problems that cannot be resolved by field engineering on site. Via the modem in the Console Complex, an on-line telephone hookup can be established between AMDAC and the customer system. AMDAC maintains a variety of system consoles, any of which can perform standard diag-

nostic tests on the user's system. Program Temporary Fixes (PTFs) can also be implemented on a 580 via the Console Complex.

Field Support Centers (FSC), located worldwide, help insure a smooth transition at installation time. In addition, FSCs are chartered to analyze and correct problems in supported operating systems.

SOFTWARE

Amdahl offers complete functional compatibility with IBM 360/370/303X/308X software. Operating systems supported include OS/VS1, SVS, MVS, MVS/SP, MVT, VM/370, VM/SP, and ACP. Support is included for such major IBM subsystems as HASP, ASP, TSO, TCAM, JES2, JES3, VTAM, TSCS, CMS, and IPCS.

VM/PERFORMANCE ENHANCEMENT (VM/PE): This product improved the performance and availability of an MVS system when running under VM/SP.

VM/SOFTWARE ASSIST (VM/SA): This product improves virtual machine performance under VM/SP by improving privileged instruction simulation.

UNIVERSAL TIMESHARING SYSTEM (UTS): This product provides a UNIX-based timesharing system for use on System/370 architecture processors.

CMS/ACCELERATOR (CMS/XL): This product is designed to improve performance in a CMS-intensive environment by reducing system overhead and system disk contention.

PRICING

The Amdahl 580 systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases can be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. The minimum lease term for a system upgrade is 12 months. Leases can be terminated after two years upon payment of 30 percent of the total remaining rental payments. A 90-day written notice is required for cancellation. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price. The purchase credit applies either to the original lessee or the current lessee.

Monthly maintenance charges are not included in lease charges. Maintenance is provided for 24 hours per day and 7 days per week.

Amdahl 580 Series

EQUIPMENT PRICES

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
PROCESSORS AND MAIN MEMORY				
5840 CPU Complex; includes two 32K-byte buffer storage units, one- or two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
With 16,777,216 bytes of main memory and:				
16 channels	1,700,000	8,200	102,045	81,635
24 channels	1,830,000	8,400	109,260	87,405
32 channels	1,960,000	8,600	116,475	93,175
With 25,165,824 bytes of main memory and:				
16 channels	1,830,000	8,600	109,740	87,790
24 channels	1,960,000	8,800	116,955	93,560
32 channels	2,090,000	9,000	124,170	99,330
With 33,554,432 bytes of main memory and:				
16 channels	1,960,000	9,000	117,435	93,945
24 channels	2,090,000	9,200	124,650	99,715
32 channels	2,220,000	9,400	131,865	105,485
With 50,331,648 bytes of main memory and:				
16 channels	2,220,000	9,800	132,825	106,255
24 channels	2,350,000	10,000	140,040	112,025
32 channels	2,480,000	10,200	147,255	117,795
With 67,108,864 bytes of main memory and:				
16 channels	2,480,000	10,600	148,215	118,565
24 channels	2,610,000	10,800	155,430	124,335
32 channels	2,740,000	11,000	162,645	130,105
5850 CPU Complex; includes two 32K-byte buffer storage units, one- or two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
With 16,777,216 bytes of main memory and:				
16 channels	2,010,000	8,500	119,900	95,920
24 channels	2,140,000	8,700	127,115	101,690
32 channels	2,270,000	8,900	134,330	107,460
With 25,165,824 bytes of main memory and:				
16 channels	2,140,000	8,900	127,595	102,075
24 channels	2,270,000	9,100	134,810	107,845
32 channels	2,400,000	9,300	142,025	113,615
With 33,554,432 bytes of main memory and:				
16 channels	2,270,000	9,300	135,290	108,230
24 channels	2,400,000	9,500	142,505	114,000
32 channels	2,530,000	9,700	149,720	119,770
With 50,331,648 bytes of main memory and:				
16 channels	2,530,000	10,100	150,680	120,540
24 channels	2,660,000	10,300	157,895	126,310
32 channels	2,790,000	10,500	165,110	132,080
With 67,108,864 bytes of main memory and:				
16 channels	2,790,000	10,900	166,070	132,850
24 channels	2,920,000	11,100	173,285	138,620
32 channels	3,050,000	11,300	180,500	144,390
5860 CPU Complex; includes two 32K-byte buffer storage units, two-byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
With 16,777,216 bytes of main memory and:				
16 channels	2,300,000	9,850	132,650	106,120
24 channels	2,430,000	10,050	139,865	111,890
32 channels	2,560,000	10,250	147,080	117,660

Includes 24-hour/7-day service; applies to both purchased and leased systems.

FEBRUARY 1985

Amdahl 580 Systems

- Sophisticated ECC circuitry, including Main Storage ECC, buffer ECC, parity checking in the buses and E–Unit, and instruction retry

- History RAMs that provide an audit trail of system activities

- Diagnostic circuitry contained within each MCC

- Improved fault isolation from denser LSI design, which can implement an entire system function on a single MCC

- Improved reliability through fewer overall connections in the LSI and MCC packaging

- RAMs and LSI circuitry packaged on the same MCC

SERVICE AND SUPPORT

Amdahl's commitment to the efficient maintenance of the 580 is reflected both in the 580 itself and Amdahl's field-support organization.

The Console Complex is the hub of all diagnostic operations in the 580. Diagnostic functions in the System Support Processor are implemented in microcode for greater reliability, and include:

- Re-creation of a failed system condition through scan-in/scan-out records

- Isolation of defective Field Replaceable Units (FRUs) with an internal console-generated program

- An enhanced Maintenance Analysis Language to permit scanning the system trouble log and execute diagnostic routines as needed

- Access to history logs to aid in error diagnosis

- History logs analyzed by the Dynamic Error Analysis program

- Selective channel monitoring via the Integrated Channel Analyzer.

AMDAHL DIAGNOSTIC ASSISTANCE CENTER (AMDAC): Located at Amdahl headquarters in Sunnyvale, the East Coast center in Columbia, MD, Toronto, and London, AMDAC is maintained 24 hours per day and 7 days per week by technical support specialists to solve difficult problems that cannot be resolved by field engineering on site. Via the modem in the Console Complex, an on-line telephone hookup can be established between AMDAC and the customer system. AMDAC maintains a variety of system consoles, any of which can perform standard diag-

nostic tests on the user's system. Program Temporary Fixes (PTFs) can also be implemented on a 580 via the Console Complex.

Field Support Centers (FSC), located worldwide, help insure a smooth transition at installation time. In addition, FSCs are chartered to analyze and correct problems in supported operating systems.

SOFTWARE

Amdahl offers complete functional compatibility with IBM 360/370/303X/308X software. Operating systems supported include OS/VS1, SVS, MVS, MVS/SP, MVT, VM/370, VM/SP, and ACP. Support is included for such major IBM subsystems as HASP, ASP, TSO, TCAM, JES2, JES3, VTAM, TSCS, CMS, and IPCS.

VM/PERFORMANCE ENHANCEMENT (VM/PE): This product improved the performance and availability of an MVS system when running under VM/SP.

VM/SOFTWARE ASSIST (VM/SA): This product improves virtual machine performance under VM/SP by improving privileged instruction simulation.

UNIVERSAL TIMESHARING SYSTEM (UTS): This product provides a UNIX-based timesharing system for use on System/370 architecture processors.

CMS/ACCELERATOR (CMS/XL): This product is designed to improve performance in a CMS-intensive environment by reducing system overhead and system disk contention.

PRICING

The Amdahl 580 systems are offered for purchase or for lease under two- or four-year operating lease plans. Leases can be renewed for 12-month periods. Lease payments must be made monthly in advance. Lease payments include the lessee charge, property taxes, and insurance, but not maintenance charges. The minimum lease term for a system upgrade is 12 months. Leases can be terminated after two years upon payment of 30 percent of the total remaining rental payments. A 90-day written notice is required for cancellation. For users wishing to purchase leased equipment, purchase credits of 55 percent of each monthly payment are allowed to a maximum aggregate credit of 50 percent of the purchase price. The purchase credit applies either to the original lessee or the current lessee.

Monthly maintenance charges are not included in lease charges. Maintenance is provided for 24 hours per day and 7 days per week.

Amdahl 580 Systems

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
PROCESSORS AND MAIN MEMORY					
5840	CPU Complex; includes two 32K-byte buffer storage units, one or two byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	2,000,000	8,200	102,045	81,635
	24 channels	2,150,000	8,400	109,260	87,405
	32 channels	2,300,000	8,600	116,475	93,175
	With 25,165,824 bytes of main memory and:				
	16 channels	2,160,000	8,600	109,740	87,790
	24 channels	2,310,000	8,800	116,955	93,560
	32 channels	2,460,000	9,000	124,170	99,330
	With 33,554,432 bytes of main memory and:				
	16 channels	2,320,000	9,000	117,435	93,945
	24 channels	2,470,000	9,200	124,650	99,715
	32 channels	2,620,000	9,400	131,865	105,485
	With 50,331,648 bytes of main memory and:				
	16 channels	2,640,000	9,800	132,850	106,255
	24 channels	2,790,000	10,000	140,400	112,025
	32 channels	2,940,000	10,200	147,255	117,795
	With 67,108,864 bytes of main memory and:				
	16 channels	2,960,000	10,600	148,215	118,565
	24 channels	3,110,000	10,800	155,430	124,335
	32 channels	3,260,000	11,000	162,645	130,105
5850	CPU Complex; includes two 32K-byte buffer storage units, one or two byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	2,350,000	8,500	119,900	95,920
	24 channels	2,500,000	8,700	127,115	101,690
	32 channels	2,650,000	8,900	134,330	107,460
	With 25,165,824 bytes of main memory and:				
	16 channels	2,510,000	8,900	127,595	102,075
	24 channels	2,660,000	9,100	134,810	107,845
	32 channels	2,810,000	9,300	142,025	113,615
	With 33,554,432 bytes of main memory and:				
	16 channels	2,670,000	9,300	135,290	108,230
	24 channels	2,820,000	9,500	142,505	114,000
	32 channels	2,970,000	9,700	149,720	119,770
	With 50,331,648 bytes of main memory and:				
	16 channels	2,990,000	10,100	150,680	120,540
	24 channels	3,140,000	10,300	157,895	126,310
	32 channels	3,290,000	10,500	165,110	132,080
	With 67,108,864 bytes of main memory and:				
	16 channels	3,310,000	10,900	166,070	132,850
	24 channels	3,460,000	11,100	173,285	138,620
	32 channels	3,610,000	11,300	180,500	144,390
5860	CPU Complex; includes two 32K-byte buffer storage units, two byte multiplexer channels, console with maintenance processor, power distribution unit; main memory and channels as listed below.				
	With 16,777,216 bytes of main memory and:				
	16 channels	2,600,000	9,850	132,650	106,120
	24 channels	2,750,000	10,050	139,865	111,890
	32 channels	2,900,000	10,250	147,080	117,660
	With 25,165,824 bytes of main memory and:				
	16 channels	2,760,000	10,250	140,345	112,275
	24 channels	2,910,000	10,450	147,560	118,045
	32 channels	3,060,000	10,650	154,775	123,815

*Includes 24-hour/7-day service; applies to both purchased and leased systems
NC—No charge

AUGUST 1984

Amdahl 580 Systems

		Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
	With 33,554,432 bytes of main memory and:				
	16 channels	2,350,000	10,650	148,040	118,430
	24 channels	2,480,000	10,850	155,255	124,200
	32 channels	2,610,000	11,050	162,470	129,970
	With 50,331,648 bytes of main memory and:				
	16 channels	2,550,000	11,450	163,430	130,740
	24 channels	2,680,000	11,650	170,645	136,510
	32 channels	2,810,000	11,850	177,860	142,280
	With 67,108,864 bytes of main memory and:				
	16 channels	2,750,000	12,250	178,820	143,050
	24 channels	2,880,000	12,450	186,035	148,820
	32 channels	3,010,000	12,650	193,250	154,590
5867	Attached CPU Complex consists of a 580 CPU tightly coupled to a 5850 CPU Complex; includes two 32K-byte buffer storage units per CPU, two-byte multiplexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.				
	With 25,165,824 bytes of main memory and:				
	16 channels	2,850,000	12,500	173,980	139,185
	24 channels	2,980,000	12,700	181,195	144,955
	32 channels	3,110,000	12,900	188,410	150,725
	With 33,554,432 bytes of main memory and:				
	16 channels	2,950,000	12,900	181,675	145,340
	24 channels	3,080,000	13,100	188,890	151,110
	32 channels	3,210,000	13,300	196,105	156,880
	With 50,331,648 bytes of main memory and:				
	16 channels	3,150,000	13,700	197,065	157,650
	24 channels	3,280,000	13,900	204,280	163,420
	32 channels	3,410,000	14,100	211,495	169,190
	With 67,108,864 bytes of main memory and:				
	16 channels	3,350,000	14,500	212,455	169,960
	24 channels	3,480,000	14,700	219,670	175,730
	32 channels	3,610,000	14,900	226,885	181,500
5868	Dual CPU Complex; includes two 32K-byte buffer storage units and two-byte multiplexer channels per CPU, console with maintenance processor and power distribution unit for each CPU; main memory and channels as listed below.				
	With 33,554,432 bytes of main memory and:				
	32 channels	3,410,000	13,950	207,650	166,120
	48 channels	3,670,000	14,350	222,080	177,660
	With 50,331,648 bytes of main memory and:				
	32 channels	3,610,000	14,750	223,040	178,430
	48 channels	3,870,000	15,150	237,470	189,970
	With 67,108,864 bytes of main memory and:				
	32 channels	3,810,000	15,550	238,430	190,740
	48 channels	4,070,000	15,950	252,860	202,280
	With 100,663,296 bytes of main memory and:				
	32 channels	4,210,000	17,150	269,210	215,360
	48 channels	4,470,000	17,550	283,640	226,900
	With 134,217,728 bytes of main memory and:				
	32 channels	4,610,000	18,750	299,990	239,980
	48 channels	4,870,000	19,150	314,420	251,520
5870	Attached CPU Complex consists of a 580 CPU tightly coupled to a 5860 CPU Complex; includes two 32K-byte buffer storage units per CPU, two-byte multiplexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.				
	With 33,554,432 bytes of main memory and:				
	16 channels	3,470,000	16,300	224,180	179,345
	24 channels	3,600,000	16,500	229,435	183,545
	32 channels	3,730,000	16,700	234,685	187,750

Includes 24-hour/7-day service; applies to both purchased and leased systems.

Amdahl 580 Systems

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 50,331,648 bytes of main memory and:				
16 channels	3,670,000	17,000	237,265	189,815
24 channels	3,800,000	17,300	242,520	194,015
32 channels	3,930,000	17,500	247,775	198,220
With 67,108,864 bytes of main memory and:				
16 channels	3,870,000	17,900	250,355	200,285
24 channels	4,000,000	18,100	255,610	204,485
32 channels	4,130,000	18,300	260,860	208,690

5880 — Dual CPU Complex; includes two 32K-byte buffer storage units and two-byte multiplexer channels per CPU, console with maintenance processor and power distribution unit for each CPU; main memory and channels as listed below.

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
32 channels	3,930,000	17,600	246,770	197,415
48 channels	4,190,000	18,000	255,250	204,195
With 50,331,648 bytes of main memory and:				
32 channels	4,130,000	18,400	259,855	207,885
48 channels	4,390,000	18,800	270,640	216,505
With 67,108,864 bytes of main memory and:				
32 channels	4,330,000	19,200	272,945	218,355
48 channels	4,590,000	19,600	286,030	228,815
With 100,663,296 bytes of main memory and:				
32 channels	4,730,000	20,800	302,380	241,895
48 channels	4,990,000	21,200	316,810	253,435
With 134,217,728 bytes of main memory and:				
32 channels	5,130,000	22,400	333,160	266,515
48 channels	5,390,000	22,800	347,590	278,055

PROCESSOR FEATURES

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
8-Megabyte Memory Increment	130,000	400	7,695	6,155
Two-byte Interface	1,400	NC	62	50
Eight-Channel Group	130,000	200	7,215	5,770
Channel-to-Channel Adapter	15,000	NC	625	500
Remote Operator's Console	10,000	50	400	325
High-Speed Floating Point Feature	150,000	500	6,250	5,000
Field Upgrade				
5840 to 5850	350,000	300	17,855	14,285
5850 to 5860	250,000	1,350	12,750	10,200
5850 to 5867	1,060,000	4,000	54,080	43,265
5850 to 5868	1,720,000	5,450	87,750	70,200
5860 to 5870	1,300,000	7,000	76,140	60,915
5860 to 5880	1,800,000	8,065	98,730	78,985
5870 to 5880	500,000	1,065	22,590	18,070

4705E COMMUNICATIONS PROCESSOR

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
4705E Processor with 256K bytes	36,000	330	1,500	900
Expansion Unit	25,000	50	1,040	625
256-Megabyte Memory Increment	6,000	30	250	150
Channel Adapter	4,000	15	165	100
Remote IPL	2,000	—	85	50
2-Channel Switch	4,000	15	170	100
Type 2 Communications Scanner	6,000	30	250	150
Type 3 Communications Scanner	16,000	70	670	400
Line Interface Base	1,000	—	40	25
Line Sets				
HD1E	2,400	—	100	60
FD1E	2,400	—	100	60
HD1GE	4,000	—	170	100
FD1TE	4,000	—	170	100
HD2E	5,000	—	210	175
FD2E	5,000	—	210	175
High-Speed Asynchronous Block	5,000	—	210	125
Integrated Line Switch	16,000	—	670	400

Includes 24-hour/7-day service; applies to both purchased and leased systems.
NC—No charge.

Amdahl 580 Systems

		Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
	With 25,165,824 bytes of main memory and:				
	16 channels	2,430,000	10,250	140,345	112,275
	24 channels	2,560,000	10,450	147,560	118,045
	32 channels	2,690,000	10,650	154,775	123,815
	With 33,554,432 bytes of main memory and:				
	16 channels	2,560,000	10,650	148,040	118,430
	24 channels	2,690,000	10,850	155,255	124,200
	32 channels	2,820,000	11,050	162,470	129,970
	With 50,331,648 bytes of main memory and:				
	16 channels	2,820,000	11,450	163,430	130,740
	24 channels	2,950,000	11,650	170,645	136,510
	32 channels	3,080,000	11,850	177,860	142,280
	With 67,108,864 bytes of main memory and:				
	16 channels	3,080,000	12,250	178,820	143,050
	24 channels	3,210,000	12,450	186,035	148,820
	32 channels	3,340,000	12,650	193,250	154,590
5867	Attached CPU Complex consists of a 580 CPU tightly coupled to a 5850 CPU Complex; includes two 32K-byte buffer storage units per CPU, two-byte multiplexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.				
	With 25,165,824 bytes of main memory and:				
	16 channels	3,100,000	12,500	173,980	139,185
	24 channels	3,230,000	12,700	181,195	144,955
	32 channels	3,360,000	12,900	188,410	150,725
	With 33,554,432 bytes of main memory and:				
	16 channels	3,230,000	12,900	181,675	145,340
	24 channels	3,360,000	13,100	188,890	151,110
	32 channels	3,490,000	13,300	196,105	156,880
	With 50,331,648 bytes of main memory and:				
	16 channels	3,490,000	13,700	197,065	157,650
	24 channels	3,620,000	13,900	204,280	163,420
	32 channels	3,750,000	14,100	211,495	169,190
	With 67,108,864 bytes of main memory and:				
	16 channels	3,750,000	14,500	212,455	169,960
	24 channels	3,880,000	14,700	219,670	175,730
	32 channels	4,010,000	14,900	226,885	181,500
5868	Dual CPU Complex; includes two 32K-byte buffer storage units and two-byte multiplexer channels per CPU, console with maintenance processor and power distribution unit for each CPU; main memory and channels as listed below.				
	With 33,554,432 bytes of main memory and:				
	32 channels	3,690,000	13,950	207,650	166,120
	48 channels	3,950,000	14,350	222,080	177,660
	With 50,331,648 bytes of main memory and:				
	32 channels	3,950,000	14,750	223,040	178,430
	48 channels	4,210,000	15,150	237,470	189,970
	With 67,108,864 bytes of main memory and:				
	32 channels	4,210,000	15,550	238,430	190,740
	48 channels	4,470,000	15,950	252,860	202,280
	With 100,663,296 bytes of main memory and:				
	32 channels	4,730,000	17,150	269,210	215,360
	48 channels	4,990,000	17,550	283,640	226,900
	With 134,217,728 bytes of main memory and:				
	32 channels	5,250,000	18,750	299,990	239,980
	48 channels	5,510,000	19,150	314,420	251,520
5870	Attached CPU Complex consists of a 580 CPU tightly coupled to a 5860 CPU Complex; includes two 32K-byte buffer storage units per CPU, two-byte multiplexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.				

Includes 24-hour/7-day service; applies to both purchased and leased systems.

Amdahl 580 Systems

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
16 channels	3,800,000	17,650	224,180	179,345
24 channels	3,930,000	17,850	229,435	183,545
32 channels	4,060,000	18,050	234,685	187,750
48 channels				
With 50,331,648 bytes of main memory and:				
16 channels	4,060,000	18,450	237,265	189,815
24 channels	4,190,000	18,650	242,520	194,015
32 channels	4,320,000	18,850	247,775	198,220
48 channels				
With 67,108,864 bytes of main memory and:				
16 channels	4,320,000	19,250	250,355	200,285
24 channels	4,450,000	19,450	255,610	204,485
32 channels	4,580,000	19,650	260,860	208,690

5880   Dual CPU Complex; includes two 32K-byte buffer storage units and two-byte multiplexer channels per CPU, console with maintenance processor and power distribution unit for each CPU; main memory and channels as listed below.

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
32 channels	4,260,000	18,715	246,770	197,415
48 channels	4,520,000	19,115	255,250	204,195
With 50,331,648 bytes of main memory and:				
32 channels	4,520,000	19,515	259,855	207,885
48 channels	4,780,000	19,915	270,640	216,505
With 67,108,864 bytes of main memory and:				
32 channels	4,780,000	20,315	272,945	218,355
48 channels	5,040,000	20,715	286,030	228,815
With 100,663,296 bytes of main memory and:				
32 channels	5,300,000	21,915	302,380	241,895
48 channels	5,560,000	22,315	316,810	253,435
With 134,217,728 bytes of main memory and:				
32 channels	5,820,000	23,515	333,160	266,515
48 channels	6,080,000	23,915	347,590	278,055

PROCESSOR FEATURES

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
8-Megabyte Memory Increment	130,000	400	7,695	6,155
Two-byte Interface	1,400	NC	62	50
Eight-Channel Group	130,000	200	7,215	5,770
Channel-to-Channel Adapter	15,000	NC	625	500
Remote Operator's Console	10,000	50	400	325
High-Speed Floating Point Feature	150,000	500	6,250	5,000
Field Upgrade				
5840 to 5850	350,000	300	17,855	14,285
5850 to 5860	250,000	1,350	12,750	10,200
5850 to 5867	1,060,000	4,000	54,080	43,265
5850 to 5868	1,720,000	5,450	87,750	70,200
5860 to 5870	1,300,000	7,000	76,140	60,915
5860 to 5880	1,800,000	8,065	98,730	78,985
5870 to 5880	500,000	1,065	22,590	18,070

4705E COMMUNICATIONS PROCESSOR

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
4705E Processor with 256K bytes	36,000	330	1,500	900
Expansion Unit	25,000	50	1,040	625
256-Megabyte Memory Increment	6,000	30	250	150
Channel Adapter	4,000	15	165	100
Remote IPL	2,000	—	85	50
2-Channel Switch	4,000	15	170	100
Type 2 Communications Scanner	6,000	30	250	150
Type 3 Communications Scanner	16,000	70	670	400
Line Interface Base	1,000	—	40	25
Line Sets				
HD1E	2,400	—	100	60
FD1E	2,400	—	100	60
HD1GE	4,000	—	170	100
FD1TE	4,000	—	170	100
HD2E	5,000	—	210	175
FD2E	5,000	—	210	175
High-Speed Asynchronous Block	5,000	—	210	125
Integrated Line Switch	16,000	—	670	400

Includes 24-hour/7-day service; applies to both purchased and leased systems.

FEBRUARY 1985

Amdahl 580 Systems

EQUIPMENT PRICES

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
16 channels	2,920,000	10,650	148,040	118,430
24 channels	3,070,000	10,850	155,255	124,200
32 channels	3,220,000	11,050	162,470	129,970
With 50,331,648 bytes of main memory and:				
16 channels	3,240,000	11,450	163,430	130,740
24 channels	3,390,000	11,650	170,645	136,510
32 channels	3,540,000	11,850	177,860	142,280
With 67,108,864 bytes of main memory and:				
16 channels	3,560,000	12,250	178,820	143,050
24 channels	3,710,000	12,450	186,035	148,820
32 channels	3,860,000	12,650	193,250	154,590

5867 Attached CPU Complex consists of a 580 CPU tightly coupled to a 5850 CPU Complex; includes two 32K-byte buffer storage units per CPU, two byte mulit- plexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 25,165,824 bytes of main memory and:				
16 channels	3,410,000	12,500	173,980	139,185
24 channels	3,560,000	12,700	181,195	144,955
32 channels	3,710,000	12,900	188,410	150,725
With 33,554,432 bytes of main memory and:				
16 channels	3,570,000	12,900	181,675	145,340
24 channels	3,720,000	13,100	188,890	151,110
32 channels	3,870,000	13,300	196,105	156,880
With 50,331,648 bytes of main memory and:				
16 channels	3,890,000	13,700	197,065	157,650
24 channels	4,040,000	13,900	204,280	163,420
32 channels	4,190,000	14,100	211,495	169,190
With 67,108,864 bytes of main memory and:				
16 channels	4,210,000	14,500	212,455	169,960
24 channels	4,360,000	14,700	219,670	175,730
32 channels	4,510,000	14,900	226,885	181,500

5868 Dual CPU Complex; includes two 32K-byte buffer storage units and two byte multi- plexer channels per CPU, console with maintenance processor and power distribu- tion unit for each CPU; main memory and channels as listed below.

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
32 channels	4,070,000	13,950	207,650	166,120
48 channels	4,370,000	14,350	222,080	177,660
With 50,331,648 bytes of main memory and:				
32 channels	4,390,000	14,750	223,040	178,430
48 channels	4,690,000	15,150	237,470	189,970
With 67,108,864 bytes of main memory and:				
32 channels	4,710,000	15,550	238,430	190,740
48 channels	5,010,000	15,950	252,860	202,280
With 100,663,296 bytes of main memory and:				
32 channels	5,350,000	17,150	269,210	215,360
48 channels	5,650,000	17,550	283,640	226,900
With 134,217,728 bytes of main memory and:				
32 channels	5,990,000	18,750	299,990	239,980
48 channels	6,290,000	19,150	314,420	251,520

5870 Attached CPU Complex consists of a 580 CPU tightly coupled to a 5860 CPU Complex; includes two 32K-byte buffer storage units per CPU, two byte multiplexer channels, console with maintenance processor and power distribution unit per CPU; main memory and channels as listed below.

	Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
With 33,554,432 bytes of main memory and:				
16 channels	4,220,000	17,650	224,180	179,345
24 channels	4,370,000	17,850	229,435	183,545
32 channels	4,520,000	18,050	234,685	187,750
48 channels				
With 50,331,648 bytes of main memory and:				
16 channels	4,540,000	18,450	237,265	189,815
24 channels	4,690,000	18,650	242,520	194,015
32 channels	4,840,000	18,850	247,775	198,220
48 channels				
With 67,108,864 bytes of main memory and:				
16 channels	4,860,000	19,250	250,355	200,285
24 channels	5,010,000	19,450	255,610	204,485
32 channels	5,160,000	19,650	260,860	208,690

*Includes 24-hour/7-day service; applies to both purchased and leased systems
NC—No charge

Amdahl 580 Systems

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint.* ($)	2-Year Lease ($)	4-Year Lease ($)
▶ 5880	Dual CPU Complex; includes two 32K-byte buffer storage units and two byte multiplexer channels per CPU, console with maintenance processor and power distribution unit for each CPU; main memory and channels as listed below.				
	With 33,554,432 bytes of main memory and:				
	32 channels	4,720,000	18,715	246,770	197,415
	48 channels	5,020,000	19,115	255,250	204,195
	With 50,331,648 bytes of main memory and:				
	32 channels	5,040,000	19,515	259,855	207,885
	48 channels	5,340,000	19,915	270,640	216,505
	With 67,108,864 bytes of main memory and:				
	32 channels	5,360,000	20,315	272,945	218,355
	48 channels	5,340,000	19,915	270,640	216,505
	With 100,663,296 bytes of main memory and:				
	32 channels	6,000,000	21,915	302,380	241,895
	48 channels	6,300,000	22,315	316,810	253,435
	With 134,217,728 bytes of main memory and:				
	32 channels	6,640,000	23,515	333,160	266,515
	48 channels	6,940,000	23,915	347,590	278,055
	8-Megabyte Memory Increment	160,000	400	7,695	6,155
	Two-byte Interface	1,400	NC	62	50
	Eight-Channel Group	150,000	200	7,215	5,770
	Channel-to-Channel Adapter	15,000	NC	625	500
	Remote Operator's Console	10,000	50	400	325
	High-Speed Floating Point Feature	150,000	500	6,250	5,000
Field Upgrade					
	5840 to 5850	350,000	300	17,855	14,285
	5850 to 5860	250,000	1,350	12,750	10,200
	5850 to 5867	1,060,000	4,000	54,080	43,265
	5850 to 5868	1,720,000	5,450	87,750	70,200
	5860 to 5870	1,300,000	7,000	76,140	60,915
	5860 to 5880	1,800,000	8,065	98,730	78,985
	5870 to 5880	500,000	1,065	22,590	18,070
4705E COMMUNICATIONS PROCESSOR					
	4705E Processor with 256K bytes	36,000	330	1,500	900
	Expansion Unit	25,000	50	1,040	625
	256-Megabyte Memory Increment	6,000	30	250	150
	Channel Adapter	4,000	15	165	100
	Remote IPL	2,000	—	85	50
	2-Channel Switch	4,000	15	170	100
	Type 2 Communications Scanner	6,000	30	250	150
	Type 3 Communications Scanner	16,000	70	670	400
	Line Interface Base	1,000	—	40	25
	Line Sets				
	HD1E	2,400	—	100	60
	FD1E	2,400	—	100	60
	HD1GE	4,000	—	170	100
	FD1TE	4,000	—	170	100
	HD2E	5,000	—	210	175
	FD2E	5,000	—	210	175
	High-Speed Asynchronous Block	5,000	—	210	125
	Integrated Line Switch	16,000	—	670	400

*Includes 24-hour/7-day service; applies to both purchased and leased systems

NC—No charge

AUGUST 1984

Amdahl 580 Systems

SOFTWARE PRICES

PROGRAM PRODUCTS	Monthly License Fee ($)	Monthly DSLO[1] ($)	Annual License Fee ($)	Annual DSLO[1] ($)
VM/Performance Enhancement (VM/PE)[2]	2,200	1,650	22,000	16,500
VM/Software Assist (VM/SA)	635	480	6,350	4,800
Universal Timesharing System (UTS)				
Academic License	1,000	750	10,000	7,500
Non-Academic License	1,500	1,125	15,000	11,250
CMS/Accelerator (CMS/XL)	800	600	8,000	6,000

[1]The Amdahl Distributed System License Option (DSLO) allows the user to license additional, unsupported copies of an Amdahl licensed program product for a reduced fee.
[2]A VM/PE workshop is required before installation at all sites at a one-time cost of $2,000.

LOCAL PROGRAMMING SUPPORT IS AVAILABLE AT NO ADDITIONAL CHARGE. ∎