

# IBM 4381 Series

## MANAGEMENT SUMMARY

As part of efforts to strengthen its mid-range computer line up, IBM extended the growth path of its 4381 small main-frame line in May with the addition of four new follow-on processors. The new 4381 models will be available by first quarter 1988, and all upgrades between the new models will be available by second quarter 1988. In a related move, IBM extended graduated charges to MVS/XA, while also announcing a program to help VSE users migrate applications to MVS. The 4361 line, meanwhile, is no longer available as of May 1987. The new 9370 line first announced in October 1986 apparently replaces the old 4361 line. In the operating system software area, in June IBM announced Virtual Machine/Extended Architecture System Product (VM/XA SP) Release 1, which will supersede IBM's current VM/XA System Facility offering. The 4381 announcements in addition to the announcement of a new low-end 3090 were thought to be part of ongoing efforts to stem further user defections to the Digital Equipment Corporation camp, a vendor that has clearly emerged as Public Enemy No. 1 among top IBM strategists.

The four additional 4381 model groups extend the power range of the existing 4381 Series and now overlap the performance of the larger 3090 models. The move eliminates the performance gap between IBM's medium-scale and large-scale systems and provides for a much smoother transition to the larger IBM environment. New 4381 machines include the Model Groups 21, 22, and 23, all single processors, and the Model Group 24, a dual processor. These latest models apparently extend the product life of the 4300 line a while longer. Only last year, IBM announced the 4381 Model Groups 11, 12, 13, and 14, more powerful versions that replaced the 4381 Models 1, 2, and 3, which are no longer available.

Both standard and optional features make IBM's eight-model 4300 Series suitable for engineering/scientific applications as well as for computation-intensive and high-throughput commercial environments. The 4300 Series provides both peripheral and software compatibility with other systems based on IBM's System/370 architecture.

**MODELS:** 4381 Model Groups 11, 12, 13, 14, 21, 22, 23, and 24.

**CONFIGURATION:** The 4381 Series features six single processors and two dual processors. Memory ranges from 4 megabytes to 64 megabytes.

**COMPETITION:** Control Data Corporation Models 810 and 830; Data General Eclipse MV/20000; Digital Equipment Corporation VAX 8650, 8300, and 8800; Honeywell Bull DPS 8000; NAS AS/VL Series; and Unisys A 10, and V 340, V 380.

**PRICE:** From \$175,000 to \$1,130,000.

## CHARACTERISTICS

**MANUFACTURER:** International Business Machines Corporation, Old Orchard Road, Armonk, New York 10504. Contact your local IBM representative.

**CANADIAN ADDRESS:** IBM Canada Ltd., Markham, 3500 Steeles Avenue East, Markham, Ontario, L3R 2Z1 Canada. Telephone (416) 474-2111.

## DATA FORMATS

**BASIC UNIT:** An 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two



*The four new IBM 4381 processors, designated as Model Groups 21, 22, 23, and 24, are approximately 30 percent more powerful than the previously offered 4381 model groups. They feature up to 64 megabytes of main memory and use one-megabit, memory-chip technology.*

## IBM 4381 Series

TABLE 1. SYSTEM COMPARISON

MODEL	4381 Model Group 11	4381 Model Group 12	4381 Model Group 13	4381 Model Group 14
<b>SYSTEM CHARACTERISTICS</b>				
Date announced	February 1986	February 1986	February 1986	February 1986
Date first delivered	May 1986	April 1986	April 1986	April 1986
Field upgradable to	4381-12, -21, -22	4381-13, -23	4381-14, -23, -24	4381-24
Relative performance	1.0	2.1	2.8	4.9
Number of processors	1	1	1	2
Cycle time, nanoseconds	68	68	56	56
Word size, bits	32	32	32	32
Operating systems	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370
<b>MAIN MEMORY</b>				
Type	MOS	MOS	MOS	MOS
Minimum capacity, bytes	4 megabytes	8 megabytes	8 megabytes	16 megabytes
Maximum capacity, bytes	16 megabytes	32 megabytes	32 megabytes	32 megabytes
Increment size, bytes	—	—	—	—
Cycle time, nanoseconds	—	—	—	—
<b>BUFFER STORAGE</b>				
Minimum capacity	4 kilobytes	32 kilobytes	64 kilobytes	128 kilobytes
Maximum capacity	4 kilobytes	32 kilobytes	64 kilobytes	128 kilobytes
Increment size	—	—	—	—
<b>INPUT/OUTPUT CONTROL</b>				
Number of channels:				
Byte multiplexer	1 std., 1 opt.	1 std., 1 opt.	1 std., 1 opt.	1 std., 1 opt.
Block multiplexer	5 std., 6 opt.	5 std., 6 opt.	5 std., 6 opt.	10 std., 6 opt.
Word	—	—	—	—
Other	—	—	—	—

Note: A dash (—) in a column indicates that the information is unavailable from the vendor or not applicable.

➤ The latest model introductions are offered as more powerful versions of the Model Groups 11, 12, 13, and 14. The high-end Model Group 24 is approximately 30 percent more powerful than the Model Group 14; the Model Group 23 single processor is approximately 30 percent more powerful than the Model Group 13; and the Model Group 21 is approximately 30 percent more powerful than the Model Group 11. The new models feature greater maximum memory capacities, faster cycle times, denser chip technology, and more channel options.

Users who installed Model Groups 11 through 14 and Model Groups 1 through 3 will be able to upgrade to the new machines. Upgrades from Model Groups 1 through 3 to Model Groups 11 through 14 are also still available. With the addition of four new 4381s, users can take advantage of a six fold performance growth path from the Model Group 11 to the top-end Model Group 24. Users who install a Model Group 21 can improve performance by 50 percent by upgrading to a Model Group 22, according to IBM. An upgrade from a Model Group 22 to Model Group 23 represents a 60 percent improvement, and an upgrade from a Model Group 23 to a Model Group 24 represents an 80 percent improvement.

Overall, memory ranges from a minimum of 8 megabytes for the Model Group 21 to up to 64 megabytes for the Model Groups 23 and 24. The Models 22, 23, and 24 all use IBM's faster and denser one-megabit chip technology. The one-megabit chips can access stored data in 80 nanoseconds. In the cache memory area, the uniprocessors use a

➤ 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:** One 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. Floating-point notations can be expressed in single precision (32 bits), double precision (64 bit), or extended precision (128 bit) sums.

**INSTRUCTIONS:** 2, 4, or 6 bytes in length, specifying 0, 1, or 2 memory addresses, respectively.

The 4300 Series processors employ the System/370 Universal Instruction Set. The instruction set includes complete arithmetic facilities for processing variable-length decimal and fixed-point binary operands, as well as instructions which handle loading, storing, comparing, branching, shifting, editing, radix conversion, code translation, logical operations, packing, and unpacking. In addition, a group of privileged instructions, usable only by the operating system, handles input/output and various hardware control functions.

Also standard are some instructions that were optional on some models of the System/370. These include the dynamic address translation instructions of Load Read Address, Reset Reference Bit, Purge Translation Lookaside Buffer, Store Then AND System Mask, and Store Then OR System Mask; the VTAM support instructions of Compare and Swap and Compare Double and Swap; the OS/VS support instructions of Insert Program Status Word (PSW) Key, Set PSW Key from Address, and Clear I/O; and the extended-precision floating-point instructions.

## IBM 4381 Series

TABLE 1. SYSTEM COMPARISON (Continued)

MODEL	4381 Model Group 21	4381 Model Group 22	4381 Model Group 23	4381 Model Group 24
<b>SYSTEM CHARACTERISTICS</b>				
Date announced	May 1987	May 1987	May 1987	May 1987
Date first delivered	First Quarter 1988	First Quarter 1988	First Quarter 1988	First Quarter 1988
Field upgradable to	4381-22	4381-23	4381-24	Not applicable
Relative performance	1.5	2.2	3.5	6.1
Number of processors	1	1	1	2
Cycle time, nanoseconds	68	68	52	52
Word size, bits	32	32	32	32
Operating systems	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370	DOS/VSE, OS/VS1, MVS/SP, VM/SP, MVS/XA, VM/XA, VM/SP HPO, IX/370
<b>MAIN MEMORY</b>				
Type	MOS	MOS	MOS	MOS
Minimum capacity, bytes	8 megabytes	16 megabytes	16 megabytes	16 megabytes
Maximum capacity, bytes	16 megabytes	32 megabytes	64 megabytes	64 megabytes
Increment size, bytes	—	—	—	—
Cycle time, nanoseconds	—	—	—	—
<b>BUFFER STORAGE</b>				
Minimum capacity	8 kilobytes	32 kilobytes	64 kilobytes	128 kilobytes
Maximum capacity	—	—	—	—
Increment size	Not applicable	Not applicable	Not applicable	Not applicable
<b>INPUT/OUTPUT CONTROL</b>				
Number of channels:				
Byte multiplexer	1 std., 1 opt.	1 std., 1 opt.	1 std., 1 opt.	2 std., 2 opt.
Block multiplexer	5 std., 6 opt.	5 std., 6 opt.	5 std., 6 opt.	10 std., 12 opt.
Word	—	—	—	—
Other	—	—	—	—

Note: A dash (—) in a column indicates that the information is unavailable from the vendor or not applicable.

➤ single high-speed buffer and the dual processor uses two high-speed buffers, one for each instruction processor. The Model Group 21 has a buffer capacity of 8 kilobytes, the Model Group 22 features 32 kilobytes, the Model Group 23 features 64 kilobytes, and the dual Model Group 24 features a twin cache buffer totaling 128 kilobytes.

As for input/output capacity, the uniprocessor models feature six standard and six optional channels. The Model Group 24 dual processor features 12 standard channels and 12 optional channels. Users can also attach OEM devices to the new 4300 models using the Serial Original Equipment Manufacturer Interface (SOEMI). Additionally, IBM has added more datastreaming channels. Both the Models 21 and 22 feature up to 6 datastreaming channels, the Model Group 23 features up to 10, and the Model Group 24 features up to 20.

The new models are air cooled and can be installed with or without a raised floor. This means the machines can be installed in a traditional data processing environment or can be placed in end-user areas, according to IBM.

As an incentive to order the new models earlier than the announced delivery dates, IBM is offering a special 4381 installation option that can save potential customers from \$20,000 to \$75,000, according to IBM. For customers who order the new models before November 30, IBM will deliver the ordered model in two stages. Users will first take delivery on an "interim" 4381 from Model Groups 11, 12, 13, or 14 before December 31. The installed system will

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

**MAIN STORAGE**

**STORAGE TYPE:** Models within the 4381 Series use 64K-bit and 256K-bit MOSFET (Metal Oxide Semiconductor Field Effect Transistor) chips. They are based on SAMOS (silicon and aluminum metal oxide semiconductor) technology. The SAMOS process relies on silicon or silicon compounds to enhance gate reliability and to control chip surface leakage. The newest 4381 models use one-megabit chip technology.

**CAPACITY:** Main memory capacity for the 4381 Series ranges from 4 megabytes to 64 megabytes. See Table 1 for capacities of specific models. In addition to main memories, 4381 processors employ cache memories. Also referred to as buffer storage, cache memory is transparent to all programs. Uniprocessor 4381 systems have a single high-speed buffer between the main processor storage and the instruction processor; dual-processor Model Groups 14 and 24 have one high-speed buffer for each instruction processor. Refer to Table 1 for the sizes of the caches on individual machines.

**CYCLE TIME:** IBM does not release information on memory cycle time.

**CHECKING:** All data paths between the central processor and main storage are parity checked by byte. When data is stored, an error-correcting code is substituted for the parity bits. (An eight-bit modified Hamming code is appended to each eight-byte "doubleword" of data.) When the data is retrieved, single-bit errors are detected and corrected automatically, and most multiple-bit errors are detected and signalled so that appropriate program action can be taken.

## IBM 4381 Series

► then be converted to one of the newly announced models when they become available next year. List purchase prices range from \$225,000 for a low-end Model Group 21 to \$1,130,000 for a top-end Model Group 24 system.

In addition to the new hardware, IBM announced a new VSE migration aid and a new software pricing structure. To encourage 4381 users to convert from the VSE operating system to MVS/XA, IBM announced the MVS Migration System (MVS-MS). Announced with MVS-MS was the VSE/MVS Migration Assistant SolutionPac which includes project initiation services and optional switch-over assistance.

MVS-MS is intended to reduce the time and cost required to convert from VSE/SP Versions 1, 2, and 3 to an MVS operating environment. Conversion functions include loading and validating VSE source code and JCL; translation, compilation, and link edit; MVS JCL generation and job preparation; and switch over of files and data bases. After MVS applications are converted and tested, MVS-MS lets users switch over in a single process. This eliminates the need to set up dual production systems and sets a clear deadline for project completion, according to IBM. The company estimates a conversion team of five to seven people can carry out the conversion process quickly and with minimal disruption to current production and development operations.

In addition to the new conversion aid, IBM extended its graduated onetime charge pricing scheme to selected MVS/XA and Cross System products. Software charges are now based on the size of the central processor and its designated processor group, resulting in a decrease in charges for some selected IBM programs depending on pricing category. There are now four price group categories ranging from Group 10 at the low end to Group 40 which covers all IBM 3090 mainframes, except for the new entry-level Model 120E. The Model 120E and 4381 Model Groups 2, 3, 12, 13, 14, 22, 23, and 24 fall within Group 30. The 9370 Models 60 and 90, and the 4381 Model Groups 1, 11, and 21 fall within Group 20. The 9370 Models 20 and 40 fall within Group 10. IBM also extended graduated onetime charge options to selected license programs which previously had no onetime charge. As part of these announcements, IBM introduced new graduated group-to-group onetime charges and new version-to-version upgrade charges, which did not exist previously. Version-to-version upgrade charges announced on May 19, 1987 are available only until December 31, 1988. QMF Version 1 to Version 2 and SQL/DS Version 1 to Version 2 are excluded.

In the operating system software area, IBM announced a new VM extended architecture product, Virtual Machine/Extended Architecture Systems Product (VM/XA SP) Release 1 and related products, and also announced enhancements to the existing VM/XA offering, VM/XA Systems Facility (VM/XA SF) Release 2.

VM/XA SP Release 1 supersedes all releases of VM/XA SF and provides a migration path for VM/XA SF users. Enhancements include an interactive environment capable of ►

► The 4381 systems provide double-bit error detection and correction when the double-bit error consists of one solid failure and one intermittent failure.

The Store and Fetch Protection features, which guard against inadvertent overwriting or unauthorized reading of data in specified blocks of storage, are standard in all models.

Segment protection is provided in System/370 mode and page protection in System/370-XA mode. All models of the 4381 support system control program use of 2K or 4K storage protect keys when the processor storage is no more than 16 megabytes. Only 4K storage protect keys are supported when processor storage is more than 16 megabytes.

**RESERVE STORAGE:** Information is unavailable for reserved storage on the 4381.

### CENTRAL PROCESSORS

The 4300 Series processors are heavily microprogrammed processors that feature large-scale integration (LSI) technology, one-level addressing facility, virtual storage capability by dynamic addressing, channels with virtual storage, and System/370 Universal Instruction Set. CE maintenance support functions include support processors and remote support facilities. Other standard 4381 features include store and fetch storage protection, byte-oriented operands, clock comparator and CPU timer, time-of-day clock, interval timer, control storage, PSW Key handling, control registers, extended-precision floating point, machine check handling, and program event recording.

Microcode is loaded through the system diskette drive. The several diskettes supplied with the system contain field engineering diagnostics, basic system features, and optional system features selected by the user. The system diskette facility also allows storage of failure data from the 4300 Series processors. This data can be subsequently analyzed by field engineering for maintenance purposes.

The no-charge Problem Analysis Feature allows 4381 users to identify valid hardware problems as the cause of system interruptions. Screen-prompted instructions lead the user through the steps required to solve the problem. Using the Remote Support Facility, service information can be sent to and received from IBM Field Engineering. The Remote Operator Console Facility (ROCF) is used to run a subset of Problem Analysis from the user installation.

The 4381 features an 8-byte (64 bit)-wide data flow within the processor, as well as an 8-byte-wide or 16-byte (128 bit)-wide data flow among the processor, storage, and channels.

Mode of operation is selected at initial microcode load (IML) time. One operating mode is the Extended Control Program Support (ECPS:VSE) mode, which uses the extensive microcoding facilities of the 4300 to reduce DOS/VSE overhead and improve system throughput.

Two modes of operation are supported on the 4381: 370 mode and 370-XA mode. When the 4381 is operating in 370 mode, support is provided by MVS/SP JES2 or MVS/SP JES3, VM/SP, VM/SP HPO, VM/IS, DOS/VSE with VSE/AF, IX/370, and OS/VS1 with Basic Programming Extensions. When operating in 370-XA mode, the 4381 will support MVS/SP JES2 and MVS/SP JES3 and VM/XA SF and VM/XA SP. The Start Interpretive Execution (SIE) assist reportedly provides improved performance for V = R preferred guests under the Virtual Machine/Extended Architecture (VM/XA) Systems Facility.

With ECPS:VSE, a reduction of up to 20 percent of total CPU time has been measured by IBM when compared with ►

## IBM 4381 Series

▶ supporting large numbers of users. It also supports a bimodal Conversational Monitor System (CMS) which will operate in either System/370 mode with 24-bit addressing or 370-XA mode with 24- or 31-bit addressing. Additionally, program interfaces have been defined to allow the development of applications which are portable between System/370 and 370-XA CMS virtual machines. IBM believes the product enhancements will be an attractive growth path to VM/SP HPO users requiring larger processors running in single-image mode and will provide relief to user growth constraints. The product carries a onetime graduated charge of \$112,500 for Group 30 machines and \$216,000 for Group 40 machines. The monthly license charge is \$4,500. The product will be available in March 1988.

VM/XA SP Release 1 will let users define up to four preferred guests to be executed concurrently on the same processor complex. Additionally, up to three Virtual = Fixed preferred guests can be defined which will generally operate under the same considerations as Virtual = Real preferred guests. All guest operating systems which are supported by VM/XA as V = R preferred virtual machines are supported as V = F guests. The feature will be available by third quarter 1988.

VM/XA SP Release 2, which will become available by first quarter 1989, will let VM/XA SP users participate in SNA networks and also offers native support for SNA devices. VM/SP Release 2 no longer requires a guest such as VM/SP HPO or VCNA to handle SNA functions. The product carries a graduated onetime charge of \$112,500 for Group 30 machines and \$216,000 for Group 40 machines. The monthly license charge is \$4,500.

VM/XA System Facility Release 2 enhancements include support for the IBM 3800 Models 3 and 6 using Advanced Function Printing software, IBM 3174 Subsystem Control Unit and various 3270 displays and display printers, and additional CMS license program support. Other enhancements include improvements to object code servicing, program update tapes on request, and partitionable Expanded Storage and Block Paging, a feature that was to have been available by third quarter 1987. The product became available on June 26 and carries a basic initial license charge of \$11,220 and a basic monthly license charge of \$4,110.

VM Inter-System Facilities Release 1 now supports up to four processors in an environment using VM/SP HPO Release 4.2. This means an increased number of users can participate in the same application environment, while the processing complex itself appears to function as one single, large system. The addition of up to four processors is a step towards relieving system growth constraints. Release 1 carries a graduated onetime charge of \$63,000 for Processor Group 30 machines and a onetime charge of \$100,800 for Group 40 machines. The monthly license charge is \$2,100. Release 1 became available on June 26, 1987.

VM Inter-System Facilities Release 2 provides support for VM/SP HPO Release 5 and communicates with VM Inter-▶

▶ the same version of DOS/VSE running in a typical DB/DC environment without ECPS:VSE. Likewise, with ECPS:VS1, a reduction of up to 7 percent of CPU busy time for the OS/VS1 supervisor has been measured by IBM when compared to the same version of OS/VS1 without ECPS:VS1. With ECPS:VM/370, a reduction of up to 84 percent of CPU busy time for the VM/370 control program has been measured by IBM when compared to the same version of VM/370 running without ECPS:VM/370.

The 4381 consists of four separate functional units, a memory subsystem, an instruction processing unit, a channel subsystem, and a maintenance subsystem. The memory subsystem features main storage, a high-speed buffer, a swap buffer, and a memory control unit. The instruction processing unit includes a shifter (to and from memory), a storage address register, an arithmetic logic unit, local storage, control storage, and an instruction buffer; it also includes a 56-bit wide, high-speed hardware multiplier in 4381 Model Groups 12, 13, 14, 22, 23, and 24. The channel subsystem includes channel data buffers, a channel controller, and standard and optional channels. The maintenance subsystem includes a service processor, a service panel, a power-up microprocessor, a direct console attachment, diskette drives, a modem (which connects to the Remote Operator Console Facility and the Remote Service Facility), a direct instruction processor link, and a channel link for operator consoles.

The 4381 Model Group 14 and Model Group 24 dual processors incorporate standard 4381 processor features, in addition to two integrated instruction processors under a single control program. Each processor has access to a shared central storage facility. Each processor also has its own set of channels. The 4381 dual-processor models cannot be partitioned into two distinct uniprocessor systems.

The 4381 Model Groups 13, 14, 22, 23, and 24 take advantage of faster chip technologies to reduce processor cycle time; cycle time for Model Group 13 and 14 machines is 56 nanoseconds, and cycle time for Model Groups 23 and 24 machines is 52 nanoseconds, compared to the 68-nanosecond time of Model Groups 11, 12, 21, and 22. Otherwise, all four systems are architecturally similar.

The 4381 processors utilize reloadable control storage (RCS) to hold the microcode which controls their operations. The RCS is composed of 18K-bit, SAMOS-process N-channel FET chips; however, the amount of control storage has not been specified by IBM.

Three types of addresses are recognized, absolute, real, and logical. In all 4300 Series processors, a one-level addressing facility provides for improved virtual storage control by DOS/VSE.

The dynamic address translation facility, standard in all models, is the mechanism that translates the virtual storage addresses contained in instructions into real main storage addresses as each instruction is executed. All models can address a virtual storage space of 16,777,216 bytes.

Translation between the virtual and real addresses is accomplished by a hardware-implemented table-lookup procedure that accesses tables in main storage which are created and maintained by the operating system. The translation process is sped up by a group of high-speed registers (translation lookaside buffer) which hold recently referenced virtual storage addresses and their real storage equivalents.

Model Groups 11, 12, 13, 21, 22, and 23 of the 4381 support system control programs with either 2K or 4K virtual page sizes. However, only half of the high-speed buffer is employed when 2K virtual pages are used. The 4381 Model Group 14 and Model Group 24 dual-processor systems support only 4K virtual pages. ▶

## IBM 4381 Series

TABLE 2. MASS STORAGE

MODEL	3350	3370	3375	3380
Cabinets per subsystem	1 to 32	1 to 32	1 to 32	1 to 16
Disk packs/HDA's per cabinet	2	1	1	2
Capacity	317.5MB per HDA	729.8MB per HDA	819.7MB per HDA	2520/5040MB
Tracks/segments per drive unit	33,300	—	—	—
Average seek time, msec.	25	19	19	17
Average access time, msec.	33.4	29.1	29.1	25.3
Average rotational delay, msec.	8.4	10.1	10.1	8.3
Data transfer rate	1.19MB/sec.	1.85MB/sec.	1.85MB/sec.	3.0MB/sec
Controller model	3880 Model 1, 21	3880 Model 4	3880 Model 4	3880 Model 3, 23
Comments	Models A2, A2F, B2, B2F, C2, C2F	Models A1, A2, B1, B2, A11, A12, B11, B12	Models A1, B1, D1	Models AD4, AE4 BD4, BE4

➤ System Facilities Release 1 running with VM/HPO Release 4.2. Inter-System Release 2 can operate in mixed complex operations with Inter-System Release 1. Inter-System Release 2 provides a migration path for users also running Inter-System Release 1 and VM/SP HPO Release 4.2 who wish to upgrade to HPO Release 5. Release 2 has a basic monthly license charge of \$2,100 and a basic onetime charge of \$63,000 for Group 30 machines and \$100,800 for Group 40 machines. The release will be available by fourth quarter 1987.

### COMPETITIVE POSITION

With the introduction of four new and more powerful 4381 models, in addition to the new 9370 line, IBM is continuing its ongoing efforts to derail Digital, a company apparently cutting into IBM mid-range sales. The new models are said to deliver a 30 percent performance increase over the four existing 4381s that were announced only the year before. These more powerful versions reestablish a performance parity with supermini rivals including Digital, and plug-compatible mainframe rivals, particularly NAS. IBM's latest mid-range maneuvering hardly comes as a surprise in light of recent Digital successes. Digital successes are attributed to product strengths in areas where IBM has been weakest. Some of the more talked about issues concern product connectivity and software compatibility across product lines. With its highly successful VAX line, Digital has won new respect as a vendor that can deliver fully compatible systems that use a common I/O architecture, run the same operating system, and can be interconnected with non-Digital systems in multivendor environments. Although it surely has a lot of catching up to do, IBM has been moving aggressively in the Digital direction to pick up lost ground. It seems IBMers are tired of reading those trade press ads carrying the much-quoted Digital dig: "Digital Has It Now."

As part of plans to strengthen its mid-range position, IBM has phased out its old 4361 superminis and replaced them with the 9370 minicomputer line which it is now delivering. The 9370 is being marketed as a supermini that brings IBM 370 architecture and mainframe operating environments down to the departmental level. IBM tried out a similar marketing strategy with the 4361 line with limited success. The 4361 was a physically larger machine than the

➤ Classes of interrupts include I/O, external, program, supervisor call, machine check, and restart. Classes of interrupts are distinguished by the storage locations at which the old PSW is stored and from which the new PSW is fetched.

**SPECIAL FEATURES:** The *Engineering/Scientific Assist*, standard on the 4381, is designed to improve the performance of certain mathematical computations, such as matrix inversion, decomposition, and multiplication. *Engineering/Scientific Assist* reportedly reduces processor busy time by up to 65 percent for assisted functions. It includes a *Multiply and Add Facility* that provides vector/scalar capability for all models, a *Square Root Facility* on all models, and a *Mathematical Function Facility* on Model Groups 12, 13, 14, 22, 23, and 24. The *Mathematical Function Facility* includes short- and long-precision versions of exponentiation, common logarithm, and natural logarithm. The *Engineering/Scientific Assist* is supplied on a microcode diskette and installed as part of the IML process.

The *High Accuracy Arithmetic Facility (ACRITH)* is standard on all 4300 processors; it comprises a set of subroutines that can be called from VS Fortran or Assembler language programs. ACRITH implements floating-point instructions for the computation of the basic arithmetic operations (add, subtract, multiply, and divide) and the scalar (dot) product with maximum accuracy, providing direct rounding for the short and long floating-point hexadecimal formats. Maximum accuracy is defined as having no floating-point number between the rounded result and the exact result (at infinite precision).

The ACRITH Subroutine Library includes complex extensions for the following: standard functions (23 for short and 23 for long format), inclusion of complex zeroes of polynomials with complex coefficients, complex vector and matrix operations, and a linear system solver for complex matrices. Also included are a linear system solver for sparse matrices, a nonlinear system solver for systems of nonlinear equations, and MVS/XA 31-bit mode support.

**PHYSICAL SPECIFICATION:** The 4381 processors are air cooled. The system footprint for all models is 14.33 square feet. Including service clearances, the space required is 125.61 square feet. Single-processor models weigh 1,700 pounds and dual-processor models weigh 2,000 pounds. Power consumption on the uniprocessor models is 4.47 kVA at 50 Hz or 60 Hz; on the dual processors it is 7.2 kVA at 50 Hz or 60 Hz. Heat output on uniprocessor 4381s is 13,650 Btus per hour and 22,500 Btus per hour on dual processors. The processors can operate in both a computer room and office environment at a room temperature ranging between 50 degrees and 90 degrees Fahrenheit at a relative humidity of between 8 and 80 percent. Noise level is rated at 54.2 dB for the single processors and 55.3 dB for the dual processors.

## IBM 4381 Series

TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed, Inches/Sec.	Transfer Rate, Bytes/Sec.
3420: Model 3	7 9 9	556/800 800 1600	NRZI NRZI PE	75 75 75	41,700/60,000 60,000 120,000
Model 5	7 9 9	556/800 800 1600	NRZI NRZI PE	125 125 125	69,500/100,000 100,000 200,000
Model 7	7 9 9	556/800 800 1600	NRZI NRZI PE	200 200 200	111,200/160,000 160,000 320,000
Model 4	9 9	1600 6250	PE GCR	75 75	120,000 470,000
Model 6	9 9	1600 6250	PE GCR	125 125	200,000 780,000
Model 8	9 9	1600 6250	PE GCR	200 200	320,000 1,250,000
3422		1600/ 6250		125	200,000 780,000
3430	9 9	1600 6250	PE GCR	50 50	80,000 312,500
3480 Model B22	18	38,000 (bytes)	—	79	3,000,000
Model B11	18	38,000 (bytes)	—	79	1,500,000
Printers	Printing Speed	Print Positions	Horizontal Spacing, Chars./Inch	Vertical Spacing, Lines/Inch	Form Size, Inches
3262: Model 3	252-650 lpm	132	10	6 or 8	3½ to 16 wide, 6 to 14 long
Model 5	252-650 lpm	132	10	6 or 8	3½ to 16 wide, 6 to 14 long
Model 13	125-325 lpm	132	10	6 or 8	3½ to 16 wide, 6 to 14 long
3268: Model 2 & 2C	340 cps	132	10 or 16.7	3, 4, 6, or 8	16 wide continuous
3287: Model 1 & 1C Model 2 & 2C	80 cps 120 cps	132 132	10 10	6 or 8 6 or 8	— —
3800: Model 3	215 ppm	136, 163, 204	10, 12, 15	6, 8, 10, 12	6½ to 14¾ wide, 3½ to 11 long
Model 6	134 ppm	136, 163, 204	10, 12, 15	6, 8, 10, 12	6½ to 14¾ wide, 3½ to 11 long
3812	12 ppm	—	Variable	Variable	—
3820	20 ppm	—	10, 12 other	—	7 to 8½ wide, 10½ to 14 long
4245 Model 12 & D12	1200 lpm (48 char. set)	132	10	6 or 8	3½ to 22 wide, 3 to 24 long
4245 Model 20 & D20	2000 lpm	132	10	6 or 8	3½ to 22 wide, 3 to 24 long
4248 Model 2	2200 to 4000 lpm	132 std.; 168 opt.	10	6 or 8	—

## IBM 4381 Series

▷ 9370 that could not quite shed its mainframe heritage. Size and environmental requirements made it unsuitable for placement in an office. The 9370, on the other hand, features a smaller, rack-mount design that requires less power and air-conditioning than the 4361.

To bring some compatibility to its diverse mid-range line, IBM announced its Systems Application Architecture (SAA) strategy in March. SAA will establish a common applications interface across strategic IBM product lines that now include the 4381, 9370, the PS/2, System/3X, and the 3090. Essentially, SAA will let programmers and applications developers write applications for an SAA-designated machine that will run transparently on other SAA-designated machines. If successful, the SAA will let IBM continue to market machines with dissimilar architectures, but with applications portability. Although IBM mid-range machines are dissimilar in many respects in contrast to Digital offerings, IBM has long believed it was more important to market machines which address the needs of distinct market segments with specialized needs and operating environments.

The 4381 Series, for instance, continues to occupy a strategic position in the IBM world. Traditionally, 4300 machines have served as remote site machines or systems that serve the needs of VSE and MVS/SP users contemplating a conversion to MVS/XA. The machines run these operating systems in addition to the various VM products. The product line also provides a less costly alternative to IBM's large-scale 3090 environment.

The four 4381 follow-on models extend the MIPS (millions of instructions per second) performance range to 7.8 MIPS for the top-end Model Group 24. This now overlaps the performance of IBM's newest low-end 3090 model, the Model 120E single processor, which has been rated at 7.5 MIPS. The new systems erase the performance gap between IBM's 3090 and 4381 systems and provide one of the smoothest transitions ever offered between IBM medium- and large-scale systems.

The new performance plateau makes the 4381s more competitive with the Digital VAX processors ranging from the VAX 8600 to the VAX 8800, which are rated from roughly 4.4 MIPS at the low end to 12.7 MIPS at the high end.

In response to the new 4381s, NAS introduced its long-awaited AS/VL IBM plug-compatible line, four new Hitachi-based systems that replace the AS/66X0 and AS/80X3 lines. As usual, the NAS models deliver superior price/performance over comparable IBM systems. The systems offer four times the maximum memory at the top end and have MIPS ratings stretching from 5 MIPS at the low end to 17 MIPS at the high end.

### ADVANTAGES AND RESTRICTIONS

The 4381 provides users with many of the advantages of IBM's 370 extended architecture without the heavier overhead costs associated with IBM's much larger 3090 mainframes. The 4300s also run a variety of operating systems

### ► CONFIGURATION RULES

Single-processor models come with 4 to 64 megabytes of memory and 6 to 24 channels, depending on model. Dual-processor models come with 16 to 64 megabytes of memory and 12 to 24 channels, depending on model. All systems also come with a high-speed buffer. The two dual-processor systems feature a high-speed buffer for each instruction processor. A Model 3205 Color Display Console, a 3278 2A Display Console, or a 3279 Model 2C Color Display is required for all 4300 models. IBM recommends that the 3205 console use a separate operator control panel supplied with the processor. The 3278 should be equipped with a keyboard and an integrated operator control panel.

### INPUT/OUTPUT CONTROL

Single-processor systems feature six standard channels and six optional channels. The Model Group 14 dual processor features 12 standard channels and 6 optional channels, while the Model Group 24 dual processor features 12 standard channels and 12 optional channels.

The 4381 Model Groups 11, 12, 13, 21, 22, and 23 come equipped with six standard channels: five block multiplexer and one byte multiplexer. Four of the block multiplexer channels have data rates of up to three megabytes per second in datastreaming mode. The fifth block multiplexer channel has a data rate of up to two megabytes per second; this channel may alternatively be selected as a byte multiplexer channel. An additional group of 6 block multiplexer channels may be installed as an option, increasing maximum aggregate data rates to 22 megabytes per second on the Model Group 11; 24 megabytes per second on the Model Group 12; 30 megabytes per second on the Model Group 13; 24 megabytes per second on the Model Group 21 and the Model Group 22; and 32 megabytes per second on the Model Group 23.

On the Model Group 11, the optional channels consist of 2 two-megabyte and 4 one-megabyte datastreaming block multiplexer channels. On Model Groups 12, 21, and 22, optional channels consist of 2 three-megabyte channels and 4 one-megabyte channels. On the Model Group 13, optional channels consist of 5 three-megabyte channels and 1 one-megabyte channel. On the Model Group 23, the optional channels consist of 6 three-megabyte channels.

A Channel-to-Channel Adapter (feature 1850) allows the interconnection of two channels, which may be on a 4381 or System/370. Only one of the interconnected processors needs to be equipped with this feature.

The 4381 Model Group 14 dual processor comes with 12 standard channels: two byte multiplexer channels and 10 three-megabyte-per-second, high-speed block multiplexer channels. Two of the standard block multiplexer channels can be configured as byte multiplexer channels, for a system total of four byte multiplexer channels. Six additional block multiplexer channels can be configured with the 4381 Model Group 14, each with a data transfer rate of three megabytes per second.

The 4381 Model Group 24 dual processor comes with 12 standard channels: two byte multiplexer channels 8 three-megabyte-per-second, high-speed block multiplexer channels, and 2 two-megabyte-per-second channels. Two of the standard block multiplexer channels can be configured as byte multiplexer channels for a system total of four byte multiplexer channels. Twelve additional block multiplexer channels can be configured with the 4381 Model Group 24, each with a data transfer rate of three megabytes per second.

The 4381 Model Group 14 has a maximum aggregate data rate of 36 megabytes per second, and the Model Group 24 has an aggregate data rate of 60 megabytes per second. ►



## IBM 4381 Series

TABLE 4. TERMINALS

MODEL	316X	8775	3179	3180	3191
<b>DISPLAY PARAMETERS</b>					
Max. chars./screen	1920	960, 1920, 2560, or 3440	1920 to 2560	1920 to 3564	1920
Screen size (lines x chars.)	24 x 80	12 x 80, 24 x 80, 32 x 80, 43 x 80	24 x 80, 32 x 80	24 x 80 to 27 x 132	24 x 80
Symbol formation	8 x 16	9 x 16, 9 x 15, or 9 x 12 dot matrix	7 x 14 dot matrix	8 x 11 to 8 x 8 dot matrix	7 x 14
Character phosphor	Amber or green	—	—	Monochrome	Green or amber
Total colors/no. simult. displayed	8 foreground/8 background	—	8 displayed	None	Monochrome
<b>KEYBOARD PARAMETERS</b>					
Style	102-key and opt. 84-key; 3162 only	Typewriter	Typewriter	Data entry or typewriter	102, 122, 104 key
Character/code set	128/ASCII	75 or 94 EBCDIC	94	—	94
Detachable	—	Yes	Yes	Yes	Yes
Program function keys	12 to 24	10, 12, or 24	24	24	24
<b>OTHER FEATURES</b>					
Buffer capacity	—	—	—	—	—
Tilt/swivel	Standard	—	Standard	Standard	Standard
Graphics capability	—	—	—	—	—
<b>TERMINAL INTERFACE</b>					
	RS-232, RS-422A	3725 Communications Controller	3174, 3274 Controllers	3174, 3274, 3276 Controllers	3174, 3274 Controllers

▷ that are tailored to the specific needs of medium-scale environments.

Still another model line introduction incorporating new performance enhancements extends the life of IBM's long popular medium-scale line and extends the growth path of existing 4300 users who would rather not graduate to IBM's much larger and more expensive 3090 operating environment. The 4300 systems, for instance, continue to use impingement air cooling technology that allows the systems to be housed in room-temperature, air-conditioned offices without raised floors as well as in computer rooms. By contrast, IBM 3090 systems require chilled water cooling through the addition of a \$111,000 to \$121,000 power and coolant distribution unit.

New IBM circuitry technology has also been incorporated into the 4381 processor line, allowing for faster CPU cycle times and larger and denser main memory configurations. Additional channel capacity and the availability of more 3-megabyte-per-second channels deliver more I/O options. The availability of a SOEMI interface enhances connectivity options.

The 4300 systems support most of the same DASD mass storage devices and other peripherals, so users converting from one 4300 grouping to another can, in most cases, transport peripherals from older to newer systems. Speaking of peripherals, it must be noted that the amounts of storage provided by the 3380 Extended Capability drives and even by standard DASD drives give the 4300 systems an advantage over competitive systems. Few supermini vendors provide storage devices even approaching IBM's DASD subsystems in capacity. Of course, in the mainframe world, most IBM rivals have achieved storage capacity parity in the high-density storage area. In addition, all systems in the 4300 Series incorporate System/370 architecture and can run System/370 software—features which provide application compatibility not only within the 4300 family, but also between the 4300 Series, the new 9370 ▷

▶ In all, up to 16 three-megabyte-per-second datastreaming channels can be configured on the 4381 Model Group 14 and up to 20 three-megabyte-per-second channels can be configured with the Model Group 24 to support peripherals, such as the 3380 Direct Access Storage Device subsystem and the 3480 cartridge tape subsystem.

The 3088 Multisystem Channel Communication Unit is a standalone I/O Control Unit that provides channel-to-channel communication facilities for multiple IBM 308X, 3090, or 4381 processors. The 3088 permits interconnection of four to eight processor channels. The channel interfaces can be configured with 32 or 64 contiguous unit addresses that provide the function of a Channel-to-Channel Adapter. From 126 to 252 logical Channel-to-Channel Adapter links are provided. The 3088 requires one control unit position on each processor channel to which it is attached. One unshared subchannel is required on each attached channel for each unit address.

All 4300 processors can support the Device Attachment Control Unit (DACU), an option that permits configuration of high-performance, non-IBM input/output devices on IBM 4300 block multiplexer channels. The DACU provides simulated direct memory access (DMA) transfers to and from host main storage; such transfers are buffered in DACU storage. The DACU supports both RS-232-C and Digital Equipment Corporation Unibus interfaces.

The availability of a Serial Original Equipment Manufacturer Interface (SOEMI) lets users attach OEM devices to the 4381s.

### MASS STORAGE

For information about mass storage devices available on the 4381 Series, please refer to Table 2.

### INPUT/OUTPUT UNITS

For information about tape drives and printers available for the 4381 Series, please refer to Table 3.

In addition to the peripherals described in the tables, the 4381 Series also supports MICR and OCR devices. Speeds on the MICR devices range from 500 to 2,400 documents per minute, with the number of stackers ranging from 6 to 36; document sizes accommodated range from 2.5 to 4.17 inches wide and from 4.85 to 8.75 inches long. Speeds on the ▶

IBM 4381 Series

TABLE 4. TERMINALS (Continued)

MODEL	3192-G, -C	3192-D	3193	3278	3279
<b>DISPLAY PARAMETERS</b>					
Max. chars./screen	1920 or 2560	1920, 2560, 3440, 3564	3840	960 to 3564	1920 to 2560
Screen size (lines x chars.)	24 x 80, 32 x 80	24 x 80, 32 x 80, 43 x 80, 27 x 132	48 x 80	12 x 80 to 27 x 132	24 x 80 to 32 x 80
Symbol formation	—	—	11 x 24	7 x 12 or 7 x 14 dot matrix	9 x 12
Character phosphor	—	Green	Black or white background	—	—
Total colors/no. simul. displayed	7 colors	None	Monochrome	None	4 to 7 colors
<b>KEYBOARD PARAMETERS</b>					
Style	Typewriter	Typewriter; modifiable	Typewriter; modifiable	Data entry or typewriter	Typewriter
Character/code set	—	—	—	94	—
Detachable	Yes	Yes	Yes	Yes	Yes
Program function keys	24	24	—	12	12
<b>OTHER FEATURES</b>					
Buffer capacity	—	—	—	—	—
Tilt/swivel	Standard	Standard	—	No	Standard
Graphics capability	Standard (3192 G models)	—	—	—	Standard (S3G model)
<b>TERMINAL INTERFACE</b>					
	3174, 3274 Controllers	3174, 3274 Controllers	3174, 3274 Controllers	3274, 3276 Controllers	3274, 3276 Controllers

➤ superminis, and the 308X and 3090 systems. Now that 4300 systems will also be part of IBM's new SAA, applications meeting SAA specifications will be able to be transported to other SAA machines.

While the 4381 line can run under quite a few operating systems, MVS/XA, IBM's strategic operating environment, is inherently capable of fully exploiting the the 31-bit addressing mode of the 4381. The expansion of maximum main memory from 32 megabytes to 64 megabytes provides some additional memory constraint relief. Getting users to migrate to XA over the years has met with some resistance, particularly since XA software tends to be more expensive, and the conversion of applications from other operating environments, particularly VSE, is no small task. To encourage more conversions to XA, IBM extended graduated software pricing to MVS/XA and Cross System products and also brought out MVS Migration System (MVS-MS) and VSE/MVS Migration Assistant Solution-Pac which includes project initiation services and optional switch-over assistance. MVS-MS is intended to reduce the time and cost required to convert from VSE/SP Versions 1, 2, and 3 to an MVS operating environment.

Users at the 4300 level converting to MVS/XA will be charged less for XA software than 3090 users. Graduated software charges are now based on the size of the central processor and its designated processor group. The 4381 model groups are charged Processor Groups 20 and 30 rates, making many software products less expensive than the same products running on 3090 machines, which mostly fall within the most expensive Group 40 category. Of course, this has its drawbacks. A 4381 user, for instance, will pay a \$117,165 graduated charge for MVS/XA with JES3. This same user planning to migrate at some point to an IBM 3090 Model 150E, a Group 40 machine, will be hit with a \$104,220 increase for the right to use this same software product. While the hardware price/performance gap between 4300 and 3090 systems has been eliminated, ➤

➤ supported OCR equipment range from 96 to 665 documents per minute, with each reader accommodating two or three stackers. Document size ranges from 2.25 to 9 inches in width and from 3 to 14 inches in length.

A specialized device, the 3814 Switching Management System, is designed to aid in the management of complex configurations by providing centralized control of control-unit switching. The 3814 uses an integrated, microcode-driven processor and features password authorization, stored configurations, and self-diagnostic functions. An optional software facility, the Multi-System Configuration Manager (MSCM), works in conjunction with the 3814 System Attachment Feature in the MVS operating environment to provide centralized control from a single terminal for up to sixty-four 3814 devices.

**TERMINALS**

For information about IBM terminals, please refer to Table 4.

**COMMUNICATIONS**

The 4381 is a host system in the IBM communications hierarchy, which involves the host mainframe with front-end communications controllers, terminal controllers, and terminal networks. Within the typical IBM communications hierarchy, terminals and remote systems communicate with the software residing within the communications processor, which in turn, communicates with the access method residing in the central processor. The 4381 family supports the 3720 and 3725 Communications Processors and their predecessor, the 3705.

The 3725 Communication Controller Models 1 and 2 consist of a central control unit that operates under control of the Advanced Communications Function /Network Control Program (ACF/NCP), Emulator Program, or Partitioned Emulator Program. Main storage ranges from 512 kilobytes to 3 megabytes, which can be added in 256-kilobyte increments. It can be attached to either byte or block multiplexer or selector channels on the host processor. Up to six channel adapters are available. The Model 1 can have up to six channel adapters in a single frame and the Model 2 can have up to four channel adapters. With the optional two-processor switch feature, connection can be made to a maximum of eight processors, six of which can operate concurrently. The ➤

## IBM 4381 Series

▶ the pricing rift at the software level will still be difficult for many medium-size users to bridge.

## USER REACTION

Datapro's 1987 Computer Users Survey drew responses from 335 users of the 4381. Users surveyed rated systems that were available prior to the May announcements of the four new 4381 follow-on systems.

The 4381s had an average installed life of 22.51 months at the time the survey was taken. Of the 4381 users surveyed, 45.67 percent said they purchased their systems from IBM, 19.10 percent rented from IBM, and 33.43 percent leased from a third party.

Although IBM frequently emphasizes the engineering/scientific capabilities of the 4381, the traditional business data processing applications continue to dominate within sites surveyed. For instance, accounting/billing was the principal application 4381 users cited most often (74.03 percent). This was followed in popularity by payroll/personnel (57.31 percent), order processing/inventory (46.27 percent), purchasing (42.39 percent), sales/distribution (28.06 percent), and manufacturing (26.87 percent). Only 11.94 percent of the 4381 users cited engineering/scientific and only 10.75 percent cited mathematics/statistics as principal applications.

Other responses yielded some interesting information about the relative sizes of system configurations. Of the 4381 users surveyed, 86.54 percent said their systems were configured with between 8 megabytes and 32 megabytes of main memory. The four new 4381 models announced in May increased maximum memory capacity from 32 megabytes to 64 megabytes, giving users reaching the top real memory limits some constraint relief.

Likewise, 46.67 percent of the systems were configured with between 1.2 gigabytes and 10 gigabytes of disk memory. Some 38.10 percent of the systems were configured with more than 10 gigabytes of memory.

Cobol was by far the most popular programming language, cited by 77.48 percent of the 4381 respondents. Scientific languages, such as Fortran, ranked near the bottom. In-house personnel were cited as the greatest single source of applications programs; 92.24 percent of 4381 users employed in-house development. Users also said they obtained 51.94 percent of their application software from independent suppliers, 40 percent from packaged programs supplied by the manufacturer, and 29.25 percent from contract programming. Only 2.39 percent was prepared by the manufacturer's personnel.

Additionally, 40 percent of users surveyed said they had established an information center and another 44.78 percent said they had a disaster recovery plan in place.

The 4381 users' ratings of their systems are contained in the following table.

▶ Maintenance and Operator Subsystem (MOSS) allows for host-independent maintenance. The 3727 Operator Console provides an operator interface to the MOSS. Communications scanners and line interfaces are provided by a transmission subsystem. The scanners are microprocessor based and can control eight Line Interface Couplers with up to 32 lines.

The 3725 supports X.25, X.21, and V.35 attachment and line speeds ranging from 50 bits per second (bps) to 256K bps. The 3725 can also be directly attached to the IBM Token-Ring Network using the IBM Cabling System.

The 3725 Model 1 consists of the 3725 Communications Controller and the 3726 Communications Controller Expansion. Up to 96 full-duplex or half-duplex lines may be attached to the Model 1. The Model 2 allows for attachment of up to 80 full-duplex or half-duplex lines. The Model 2 is field upgradable to Model 1.

The 3720 Communication Controller and 3721 Expansion Unit are entry-level offerings within the 3725 family. They are said to have one-third the performance of the 3725. The 3720 can have up to four duplex 56K or 64K bps lines per scanner. The product line supports ACF/NCP Version 4 subset and supports IBM and non-IBM data terminal equipment (DTE) with X.25 interface when the X.25 SNA Interconnection PRPQ is used.

The 3720 features a main storage capacity of up to 2 megabytes and up to 10 megabytes of hard disk storage. Up to 28 lines can be attached to the 3720 Models 1 and 2, expandable to up to 60 lines with the addition of the 3721 Expansion Unit. Additionally, up to 16 lines and up to two IBM Token-Ring Networks can be attached to the 3720 Models 11 and 12. With the 3721 Expansion Unit, up to 48 lines and up to two IBM Token-Ring Networks can be attached. The 3720 Models 1 and 11 can have a maximum of four host attachments using one or two channel adapters and up to 2 two-processor switches.

Similar to the 3725, the 3720 uses MOSS facilities which incorporate problem determination facilities. The MOSS hard disk stores an ACF/NCP load module and dump, allowing the 3720 to automatically reload itself after a failure while preserving problem determination data.

The 4994 ASCII Device Attachment Control Unit comprises three models: the A Model supports up to 16 devices, the B Model supports up to 32 devices, and the C Model supports up to 48 devices. In conjunction with its program offering support, Host Loaded Yale ASCII Communications System, the 4994 allows the attachment of ASCII devices to a 4381 running VM/CMS. ASCII terminals appear to the host as IBM 3277 terminals. In order to be supported, devices must perform clear screen or clear to end of screen, provide absolute cursor positioning, and allow characters written to the screen to replace, not overstrike (except APL). Features provided include full-duplex operation between the 4994 and the terminals, type-ahead capability from the terminal, and normal keyboard functions. Physical connection is made via EIA RS-232-C or 20 ma current loop.

The 7171 ASCII Device Attachment Control Unit is similar to the 4994, but supports a maximum of 64 ASCII devices. The 7171 attaches to a 4300 Series block multiplexer channel and appears to the host as one or two 3274 Model D control units. Supported devices must feature point-to-point connection, 7-bit ASCII code, full-duplex character mode transmission, absolute cursor positioning, and the ability to clear the screen. Data can be transmitted at up to 19,200 bps.

▶ The Remote Operator Console Facility (ROCF), an extension of the 4300 Remote Support Facility, is designed to ▶

## IBM 4381 Series

	Excellent	Good	Fair	Poor	WA*
Ease of operation	101	203	25	1	3.22
Reliability of system	283	49	2	0	3.84
Reliability of peripherals	168	155	10	0	3.47
Maintenance service:					
Responsiveness	147	159	23	1	3.37
Effectiveness	141	164	17	1	3.38
Technical support:					
Troubleshooting	74	206	46	5	3.05
Education	55	206	61	4	2.96
Documentation	52	196	72	7	2.90
Manufacturers software:					
Operating system	94	205	29	3	3.18
Compiler & assemblers	102	215	14	0	3.27
Application programs	41	181	65	8	2.86
Ease of programming	39	223	60	3	2.92
Ease of conversion	37	173	91	10	2.76
Overall satisfaction	79	238	14	0	3.20

\*Weighted Average on a scale of 4.0 for Excellent.

When asked if their systems performed as expected, 96.42 percent of the 4381 users said "Yes," 0.60 percent said "No," and 2.09 percent were undecided. When asked if they would recommend the system to another user, 95.22 percent said "Yes," 0.90 percent said "No," and 2.39 percent were undecided. □

► facilitate dial-up and initialization of a remote 4300 Series processor from a real or emulated 3275 Model 2 Display Station at the host site. A network can include a 4300 Series processor with ROCF installed and an IBM System/370, 303X, 308X, 3090, or 4300 Series host processor running either of two software products that provide 3275 emulation, the MVS/Operator Communications Control Facility (MVS/OCCF) or the VM/Pass-Through Facility. MVS/OCCF is designed to operate on any IBM host computer that supports MVS/SP, while the VM/Pass-Through Facility requires the VM/SP program product.

System operations that can be performed from the host site include initial microcode load, reset, restart, compare/trace, and alter/display. Power-on for the remote 4300 processor must be performed at the remote site. A password verification function is provided to help protect against unauthorized access to the remote 4300 system. ROCF supports bisynchronous communications at 1200 bps.

After a remote 4300 is initialized from the host, communications control should continue through the existing network facilities of the host processor. ROCF is not designed to perform interactive jobs. When MVS/OCCF is used to initialize a remote 4381 MVS or DOS/VSE system, continued control can be provided by MVS/OCCF in conjunction with the Network Communications Control Facility. After a remote 4381 VM system has been initialized, continued control can be provided by the Programmable Operator Facility of VM/SP.

### SOFTWARE

**OPERATING SYSTEMS:** Any program written for an IBM System/370 computer operates on a 4300 Series processor in System/370 mode, provided that it is not time-dependent; does not require the presence of facilities, such as storage size, I/O equipment, and optional features, when the facilities are not included in the configuration; does not require the absence of system facilities, such as interruptions and operation codes, when the facilities are included in the 4300 processor; and does not depend on results or functions which IBM specifies to be unpredictable or model dependent.

Any program written for a System/360 will operate on a 4300 Series processor in System/370 mode, provided that it follows the above rules and does not depend on functions that differ between the System/360 and System/370.

The 4300 Series processors are supported by DOS/VSE (a significant expansion of DOS/VS), OS/VS1, MVS/SP, MVS/XA, VM/370, VM/XA SF, VM/XA SP, VM/IS, VM/SP High Performance Option, and IX/370.

*DOS/VSE* is a disk-resident operating system designed to control system resources and job processing; it is a prerequisite for VSE-related program products.

DOS/VSE is enhanced by the VSE/Advanced Functions (VSE/AF) and VSE System Product (VSE/SP) programs, which provide functional and performance-related capabilities. Both programs provide support for 4K pages in S/370 mode supervisor, allowing VSE to run as a VM guest using virtual address space extensions on IBM processors, such as the 4381 Model Group 14, which only supports 4K pages. The 4K paging capabilities allow these two programs to use the full cache storage on IBM 4381 processors.

VSE Performance Tool (VSE/PT) is a software system monitor for measuring and evaluating the performance of a DOS/VSE system.

DOS/VSE supports 4300 processors operating in System/370 or ECPS:VSE mode. The components of DOS/VSE are stored in DASD-resident system libraries and can be loaded into main storage when needed. The functions of DOS/VSE include initial program load, resource management, job control, linkage editing, paging management, library management, data management, system-to-operator communications, system utilities, system serviceability, and debugging aids.

The 4381 is currently supported by VSE/SP Version 1 Release 1, or the individual component VSE/AF Release 1.3.5 for the single-processor models; VSE/SP Version 2 Releases 1 or the individual component VSE/AF Version 2 Release 1 for the single processors; and VSE/SP Version 3 Release 1 or the individual component VSE/AF Version 2 Release 1 for the single processors.

*MVS* operating systems are offered in two distinct versions. These are MVS/370, officially known as MVS/SP Version 1, and MVS/XA, officially known as MVS/SP Version 2. The 4381 Series can also take advantage of two MVS/System Products, MVS/SP JES2 or MVS/SP JES3. MVS with Processor Support 2 provides the required basic SCP code. MVS/SP JES2 and MVS/SP JES3 are separately priced products that provide major extensions and enhancements to the MVS Base Control Program plus JES2 and JES3, respectively. The MVS/System Products replace the earlier MVS/System Extensions product and serve as the base for future enhancements to MVS, JES2, and JES3. MVS features include the System Resource Manager (SRM), which provides optimum system resource use; the Virtual Input/Output Facility (VIO), which stores temporary data in a buffer; and the Job Entry Subsystem (JES2 or JES3), which reduces restart and rerun costs.

*MVS/SP Version 1* continues to be actively developed. The operating system version allows multiple virtual storage areas of up to 16 megabytes each. These areas reside in a real memory space of up to 64 megabytes. The system uses 24-bit addressing, which can be stretched to 26 bits through the annexation of two protect bits.

*MVS/SP JES2* provides input/output spooling for local and remote unit record devices and class scheduling of batch jobs. It uses principles of HASP and supports Time Sharing Option (TSO) batch job submission and Remote Job Entry

## IBM 4381 Series

► (RJE) facilities. In the MVS/XA environment, MVS/SP JES2 provides virtual storage constraint relief by using the 31-bit addressing and extended private virtual storage capabilities of that operating system. Other facilities include spool restructure and constraint removal, spool offloading, and RAS features.

Among other capabilities, MVS/SP JES3 allows an installation to couple independent processors together through channel-to-channel adapters and shared DASD, providing a single system image. Like JES2, JES3 exploits the 31-bit addressing capabilities of the System/370 extended architecture to provide virtual storage constraint relief in MVS/XA environments. It also provides trace facilities and job networking features.

The 4381 Series is supported by MVS/System Product Version 1 Release 3.5 or later.

RMF (Resource Measurement Facility) is a centralized management tool for MVS users which monitors system activity to collect performance and capacity planning data. It can be used either dynamically by displaying selected real-time activity reports, or statistically by recording in SMF data sets for postprocessing. RMF measures processor usage, address space usage, channel activity, device activity and contention, detailed I/O queueing for logical control unit groups, detailed system paging, detailed system work load, and page/swap data sets.

*MVS/SP Version 2 (MVS/Extended Architecture)* provides virtual storage constraint relief by allowing address space sizes beyond the 16-megabyte maximum of MVS/370. Version 2 supports 31-bit real addressing and can handle multiple virtual address spaces of up to 2 gigabytes. It also supports larger and more flexible I/O configurations. Some of the I/O processing previously performed by the operating system is now a hardware function. Channel path selection and I/O busy condition management provide up to four channel paths to each I/O device. The facility also increases I/O device accessibility by allowing each central processor to initiate operations with any of the I/O devices and to handle any I/O interruption condition. Improved RAS features, including page protection for significant system areas, a new system trace facility, and improved dumping and formatting options, are also included. MVS/XA consists of two programs, MVS/SP and the Data Facility Product. The Data Facility Product provides data management, device support, program library management, and utility functions.

The 4381 Series is supported by MVS/System Product Version 2 Release 1.3 or later.

In the process of converting to MVS/XA, the VM/XA Systems Facility permits other operating systems to run with the 370-XA microcode as VM guest operating systems in both uniprocessor and dyadic-processor environments. (Such support is also available for VSE and OS/VS1.)

*VM/370* is an operating environment that manages a computer system's facilities in such a way that each user has use of the functional equivalent of a dedicated computer system. The four main components of VM/370 are Control Program (CP), Conversational Monitor System (CMS), Remote Spooling Communications Subsystem (RSCS), and Interactive Problem Control System (IPCS).

The CP makes all system resources (processor time, real storage, and I/O devices) available to many users at the same time. CP enables multiple independent virtual machines to run concurrently under control of different operating systems or different releases of the same operating system. The CMS creates and maintains source programs, supports a range of compilers, provides testing and debugging functions, and allows for time-sharing in either a

distributed system or centralized environment. The RSCS transfers unit record files between virtual machines and remote stations connected via BSC switched or nonswitched lines. The IPCS is intended to aid systems programmers in managing and resolving programming problems by reducing the need for using hard copy documentation.

*VM/System Product (VM/SP)* contains all functions available in the VM/Basic System Extensions and VM/System Extensions program products, which extend the system control program of VM/370. These Extensions are intended to make VM/370 and the CMS more flexible and productive and increase the number of devices supported. VM/SP provides the following functions as well: dynamic SCP transition with an IPL, interuser communications capability, CMS full-screen 3270 editor, additional CMS functions and productivity aids, a command retrieve capability, a trace table recording facility, and support for Structured Query Language/Data System (SQL/DS).

VM/SP provides native support for Systems Network Architecture (SNA) products. When used in conjunction with Advanced Communications Function/VTAM (ACF/VTAM), Network Communications Control Facility (NCCF), and Remote Spooling Communications Subsystem Networking, VM/SP allows an installation to take full advantage of the features of SNA. The VM/Group Control System within VM/SP allows ACF/VTAM and associated communications network management products to operate on VM/SP without a guest operating system.

Adjunct products include VM/SP High Performance Option (HPO) and VM/XA System Facility. VM/SP HPO provides a range of performance, operational, and (RAS) features.

The 4381 Series is currently supported by VM/SP Release 4 or later releases and VM/SP HPO Release 4.2 or later releases.

The *VM/XA Systems Facility* supports guest production and migration, allowing the migrating customer to continue production with the current operating system (MVS, VSE, VS1) while installing and testing MVS/XA. Full CMS support can be obtained by running VM/SP or VM/SP HPO as a guest of the VM/XA Systems Facility. (The CMS component of the Systems Facility is supported only for installation and maintenance.)

The VM/XA Systems Facility can exploit the full dyadic capabilities of the dual-processors, allowing guest systems that support dyadics, such as MVS/XA or VM/SP HPO, to run simultaneously on both instruction processors in full dyadic mode. This facility is intended to balance work loads and resource use between the two processors.

VM/XA extends the range of MVS/XA environments supported by VM for MVS, VSE, or VS1 users who need to migrate to the MVS/XA operating system. It emphasizes guest production, migration, testing, and maintenance, and provides increased flexibility for guest systems. Among its features, VM/XA allows development, testing, and execution of VM and MVS applications supported by the CMS. An associated product, VM/XA Realtime Monitor/Systems Facility (VM/XA RTM/SF) is a comprehensive systems monitoring aid that can be used to help detect and diagnose problems, analyze system performance, and provide operators with an awareness of machine operations. The 4381 Series is supported by VM/XA Systems Facility Release 2.

Two specialized versions of VM/SP are *VM/Integrated System (VM/IS)* and *VM/IS Base*. VM/IS is an entry-level system that provides load-and-go facilities for both 9370 and 4381 users. It replaces VM/SP Entry, which is no longer offered. VM/IS includes VM/IS Base and eight optional

## IBM 4381 Series

► applications packages containing 28 licensed programs. Targeted applications areas include business, office automation, data base, and engineering/scientific.

VM/IS Base includes full VM/SP Release 4 functions in addition to a set of system management functions that can be understood by operator personnel with little or no previous data processing experience. Users can obtain IBM programming support through the VM/Remote System Programming Support Offering for a fee.

*VM/XA SP Release 1* supersedes all releases of VM/XA SF and provides a migration path for VM/XA SF users. Enhancements include an interactive environment capable of supporting large numbers of users. It also supports a bimodal Conversational Monitor System (CMS) which will operate in either System/370 mode with 24-bit addressing or 370-XA mode with 24- or 31-bit addressing. Additionally, program interfaces have been defined to allow the development of applications which are portable between System/370 and 370-XA CMS virtual machines. IBM believes the product enhancements will be an attractive growth path to VM/SP HPO users requiring larger processors running in single-image mode and relief to user growth constraints. The product will be available in March 1988.

VM/XA SP Release 1 will let users define up to four preferred guests to be executed concurrently on the same processor complex. Additionally, up to three Virtual = Fixed preferred guests can be defined which will generally operate under the same considerations as Virtual = Real preferred guests. All guest operating systems which are supported by VM/XA as V = R preferred virtual machines are supported as V = F guests. The feature will be available by third quarter 1988.

VM/XA SP Release 2, which will become available by first quarter 1989, will let VM/XA SP users participate in SNA networks and also offers native support for SNA devices. VM/SP Release 2 no longer requires a guest such as VM/SP HPO or VCNA to handle SNA functions.

*OS/VS1* provides support for 4381 processors in System/370 mode. IBM plans no further releases of OS/VS1. However, OS/VS1 is highly compatible with MVS, used on large systems. The four major functions of the control program routines of OS/VS1 are job management through operator commands and job control statements; task management, which monitors and controls the entire system; data management, which controls all operations associated with input and output devices; and recovery management, which attempts to overcome the effects of a processor, channel, or I/O device malfunction. Additional features of OS/VS1 include automatic partition redefinition, dynamic dispatching or time slicing, concatenated procedure libraries, and I/O load balancing. The 4381 line is supported by OS/VS1 Release 7 with Basic Programming Extensions and Release 4 for single processors.

*IBM Interactive Executive for System/370 (IX/370)* is IBM's implementation of AT&T's Unix System V. It is a multiuser, multitasking system that runs as a guest under VM/SP Release 3.0 or later, with or without the VM/SP High Performance Option (Release 3.4 or later). IX/370 includes the Bourne Shell command language and provides virtual address space of 8 megabytes for each user, a hierarchical file system, extended file and logical record locking, and programming tools, including F77 Fortran with Ratfor dialogue and a C compiler and runtime libraries. Another feature is multiple IX/370 system support, which allows several IX/370 systems to coexist on the same processor either by running in several different virtual machines or by running several images of IX/370 in a single virtual machine. IX/370 supports IBM and other full-duplex ASCII terminals; 327X terminals, however, are not supported

as user terminals. IBM PCs, PC XT's, and PC AT's running PC/IX or Xenix can function as workstations for systems running IX/370. The 4381 Series runs under IX/370 Release 1.1.3

**PROGRAMMING LANGUAGES:** Languages available for the 4381 Series include Ada, Algol, APL2, Assembler H, Basic, C, Cobol, DSL/VS, Fortran, Intellect, Lisp/VM, Pascal/VS, PL/1, Prolog, and RPG II.

**DATA BASE MANAGEMENT:** DBMS products for the 4381 Series include Database 2 (DB2), Data Language/1 (DL/1), Information Management System/VS Data Base Facility (IMS/VS-DB), and SQL/Data System (SQL/DS).

*Database 2 (DB2)* is a relational product designed to take advantage of the facilities provided by the MVS/370 and MVS/XA operating systems. It permits multiple users to concurrently access and change data within the same DB2 table. Among the features of DB2 is sequential prefetch, which allows data base records to be buffered in anticipation of a subsequent request for them. This feature reportedly improves performance for most processes which scan the data base in physical record sequence.

Other features of DB2 include application plan segmentation, which allows a DB2 application plan to contain the code supporting every SQL statement in the program; support for multiple temporary files, which permits temporary files used internally by DB2 to be allocated from a pool of VSAM data sets; support for MVS Data Facility Hierarchical Support Manager (DFHSM), allowing DFHSM to manage volumes on which DB2 data resides, permitting DB2 logs and image copies to be automatically migrated and recalled; and the Double-Byte Character Set (DBCS), supporting any two-byte code representation.

DB2 also provides full recovery capabilities in case of system, storage media, or application program failure. A Selective Trace/Performance Instrumentation feature combines the accounting, statistics, and serviceability tracing functions of DB2 into a single instrumentation facility that can be controlled by commands.

*Data Language/1 (DL/1)* is available for the DOS/VSE environment. It provides sequential, indexed sequential, indexed direct, and direct access to data. Each data base structure and organization is described in a central data base description (DBD), allowing changes to be made once, instead of in every program using the data base. DL/1 also includes a High-Level Programming Interface (HLPI) to assist Cobol and PL/1 programmers.

*Information Management System/VS Data Base Facility (IMS/VS-DB)* executes as an application program under OS/VS1, MVS/370, and MVS/XA. It provides an interface between user application programs and data bases. It links data bases through logical relationships by creating networks and inverted files to meet the requirements of complex applications, allowing existing data to be accessed in new ways by new applications. According to IBM, IMS/VS-DB is particularly applicable for operational applications with large transaction volumes and critical response time requirements in MVS environments.

*SQL/Data System (SQL/DS)* is a full-scale relational data base management system with integrated query and report writing facilities; it is intended for use with DOS/VSE and VM/SP systems. SQL/DS includes the Structured Query Language (SQL) and an on-line help facility. It is designed to address analytical environments, such as planning and prototyping, for which data structure and application requirements change frequently. Among its capabilities, SQL/DS provides blocking of data by application programs to improve performance in multiuser mode, offers an ac- ►

## IBM 4381 Series

► counting facility for VM and VSE, and allows users to choose between two levels of read locking for their applications.

SQL/DS offers a number of data security and integrity options. The product allows an installation to take advantage of most available DASD backup and restore facilities for data base archive and restore procedures. The product supports log recovery during the user restore process to reapply all data base updates made after the data base archive. A log archiving feature allows only the SQL/DS log, instead of the entire data base, to be archived. A directory verification option provides early detection of data base errors during SQL/DS shutdown processing. Selective log processing allows SQL/DS to bypass selected portions of the SQL/DS log, allowing an installation to avoid corrupted portions of a data base or to ignore data base update transactions that should not be processed.

**DATA COMMUNICATIONS:** IBM offers a range of data communications products for systems interconnection, multsystem networking, and distributed processing.

The *Advanced Communications Function/Virtual Telecommunications Access Method (ACF/VTAM)* is the base for the major IBM communications subsystems. It runs under MVS/XA, MVS/370, and VSE, and provides an "operating system" for the network. Its functions are the same as those of a host operating system in terms of resource sharing and logical handling of user requests. ACF/VTAM allows creation of networks with multiple 4300, System/370, 303X, 308X, and 3090 processors. Under MVS/XA, ACF/VTAM provides virtual storage constraint relief by supporting 31-bit addressing. In MVS/XA and MVS/370 environments, ACF/VTAM provides integrated encrypt/decrypt capabilities. Under VSE, this product supports the extended virtual and real storage capabilities of VSE Advanced Functions, and uses the 4K paging capability of VSE Advanced Functions when executing in System/370 or VM mode.

The *Customer Information Control System/VS (CICS/VS)* is a general-purpose data communications monitor for terminal-oriented transaction processing environments. CICS/VS, available for both the DOS/VS and OS/VS operating environments, interfaces between user-written application programs and transaction processing access methods (BTAM, VTAM, TCAM, ACF/VTAM, ACF/TCAM) and data base managers (DL/1 DOS/VS, SQL/DS in DOS/VS, IMS/VS/DB, and DB2 in MVS). The user can generate a CICS/VS system configuration applicable to specific needs and define the environment in which the system is to execute.

**Multiregion Operation (MRO)** allows multiple connected CICS/VS regions to run within a system (partitions in DOS/VSE and address spaces in OS/VS2) while sharing terminals, transactions, and other resources. In addition, the Intersystem Communications (ISC) facility provides the capability for connecting CICS/VS systems through ACF/VTAM or ACF/TCAM so that a transaction running in one system can access files and DL/1 data bases, initiate transactions, queue messages, or communicate directly with another transaction running in a connected CICS/VS system.

The *File Transfer Program* for VM is an SNA-based facility that enables a VM installation to transfer or extend files between File Transfer Program network nodes without the aid of a spooling subsystem. It provides high-performance data transmission, file handling, and checkpoint-restart facilities. By supporting the native VM SNA environment, it complements the cross-systems bulk data transfer capabilities of File Transfer Program for MVS and VSE.

File Transfer Program for VM offers transmission functions for CMS files and VSAM data sets. A programmable

interface allows the user to access other, not directly supported, file organizations for remote data transmission.

The *Time-Sharing Option (TSO)* is a full-function time-sharing system that provides interactive computing through the following functions: maintenance of system libraries, catalogs, and procedure libraries; application development and maintenance of existing applications; and creation, maintenance, and control of development support libraries and production libraries. TSO Extensions (TSO/E) provides all of the functions of TSO and includes the following enhancements: virtual storage constraint relief for MVS/XA installations, with savings between 155 kilobytes and 350 kilobytes; selection at logon of region sizes consistent with MVS/XA capabilities; simplification of the process of sending data between nodes in a network; performance improvements in the area of sending work from the foreground to the batch stream for execution; and display of information about a command during command entry. Under MVS/XA, TSO/E also provides support for testing a program located in addresses above 16 megabytes.

**PROGRAM DEVELOPMENT:** IBM offers many tools to help programmers, end users, and various "knowledge workers" develop and maintain applications. IBM packages for the MVS/SP and MVS/XA environments include Application Prototype Environment (APE), the Screen Definition Facility/Customer Information Control System (SDF/CICS), Cross System Product Set (CSPS), Cross System Product/Application Development (CSP/AD), Cross System Product/Application Execution (CSP/AE), Interactive Instructional Authoring System (IIAS), Interactive System Productivity Facility/Program Development Facility (ISPF/PDF), IMS Application Development Facility II, Query Management Facility (QMF), Time Sharing Option (TSO), TSO Extensions (TSO/E), Conversational Monitor System, (CMS), and Interactive System Productivity Facility (ISPF).

The ISPF Version 2.1.2 for MVS is a common dialog manager for IBM licensed programs and application development. Capabilities include support of an ISPF/GDDM environment, extensions to the table services, an interface to TSO/E Release 2, and support for the 3290 terminal. Version 2.1.2 uses 31-bit addressing mode and includes APL2 support.

The ISPF/PDF Version 2.1.2 for MVS is used to create and maintain both source programs and text data. ISPF/PDF provides interfaces to many system facilities through the use of menus which relieve the user of the need to know the specific command syntax of the interactive system being used. Version 2.1.2 uses 31-bit addressing mode and supports the Kanji language. Both ISPF and ISPF/PDF provide virtual storage constraint relief and allow growth of ISPF and ISPF/PDF by using the extended address space of MVS/XA.

Facilities available for VM/SP, VM/XA, and VM/IS environments include APE, CSP/AD, CSP/AE, Cross System Product/Query (CSP/Q), IIAS, Interactive Instructional Presentation System, (IIPS), ISPF, ISPF/PDF, VM/Interactive Productivity Facility, and VM/IS-PF.

Products for the VSE environment include CSP/AD, CSP/AE, Decision and Information Productivity Facility (DIPF/VSE), IIAS, IIPS, ISPF, and ISPF/PDF.

**UTILITIES:** Utilities and special functions for the 4300 Series are handled both through intrinsic operating system capabilities and through specialized software products supplied with the operating systems.

Operating system utility functions include, among others, device configuration tasks, such as tape and DASD initial-►



## IBM 4381 Series

► ization; copying and restoring of DASD volumes; and functional recovery routines for system components.

The specialized adjuncts to the operating systems are discussed in the following paragraphs.

In the System Installation Productivity Options/Extended (System IPO/E), the IPO concept has been extended to facilitate the installation, management, and use of 4300 Series software products. IPO/E consists of a base set of integrated program products pregenerated, preconfigured, and pretested with the latest service levels preapplied, and ready to use in specific operating environments.

The *Data Base Edit Facility (DBEdit)* is a data maintenance tool that allows users to add, delete, update, and display records in relational data base tables. DBEdit takes advantage of the catalog facilities of DB2 in the MVS environment and of SQL/DS in the VM/SP environment.

The *Fortran Utilities for VM/370* program offering provides a set of Fortran-compatible system functions for programmers writing Fortran programs for the CMS of VM/370. The subroutines can execute with other programs written in either Fortran 77 or Fortran 66.

**OTHER SOFTWARE:** IBM offers several host-based office applications, described in the following paragraphs.

*Advanced Text Management System III (ATMS III)* provides facilities for entry, editing, and management of textual material. It runs under DOS/VSE, OS/VS1, and MVS/XA.

*Storage and Information Retrieval System (Stairs)* provides facilities for storage and contextual retrieval of large amounts of text, as well as for creation of Stairs data bases from machine-readable formats. It runs under DOS/VSE, OS/VS1, and MVS/XA.

Two products which can be installed and used in conjunction are *Document Composition Facility (DCF)* and *Document Library Facility (DLF)*. DCF provides for markup, full-page composition, and printing of text documents on remote or local system printers. DLF is a data repository that can store input from numerous sources, including text prepared on interactive systems using a submit-to-batch facility, text prepared by ATMS and other text processors, and input to or from application programs. The products can run under MVS, MVS/XA, DOS/VSE, and OS/VS1.

*Distributed Office Support System/370 (DISOSS/370)* is an office system support product that provides electronic mail and document processing facilities. It runs in MVS/VSE and DOS/VSE environments under the CICS/VS general-purpose data communications monitor.

The *Document Interchange Facility* comprises two complementary program products. Document Interchange Facility/Central executes in the host computer and processes requests from distributed system users to file documents in the DLF, format them through the DCF, and retrieve them from the library. Document Interchange Facility/Distributed executes in the distributed system, preparing user requests to file, format, and retrieve documents, and sending those requests to the host for processing. The Document Interchange Facility runs in both DOS/VSE and MVS/XA environments.

*Professional Office System (PROFS)* is a program product designed to help professionals and support personnel control job-related information. It provides facilities for document entry, processing, and distribution within a single system or across multiple systems; calendar management;

and other end-user services, such as conference room scheduling and electronic messaging. PROFS runs in the VM/SP environment. The system permits interchange of both revisable-form and final-form documents with DISOSS users. PROFS notes can be sent to DISOSS users. Through the system's integrated interface to DisplayWrite/370 VM/SP, PROFS supports IBM's Document Content Architecture (DCA).

*DisplayWrite/370* provides word processing functions for professional end users. It includes a full-screen text editor/formatter that provides basic and advanced text functions for creation and revision of documents. Document printing is supported by creating print datastreams. The product provides multilanguage support for automatic hyphenation, spelling verification and correction assistance, and a grade-level analyzer and synonym support for English.

DisplayWrite/370 processes both revisable-form and final-form text documents, which can be exchanged between IBM office systems products and applications supporting the Document Content Architecture. DisplayWrite/370 operates under the control of MVS/SP (MVS/370 or MVS/XA) or VSE and CICS/VS, or as a VM/SP application. Either an IBM 3270 information display or an IBM 3270-PC display terminal can be used as an input device.

DisplayWrite/370 includes an application programming interface and can be invoked by any CICS/OS/VS or CICS/DOS/VS application that provides the appropriate interface and maintains a document library.

A broad range of commercial, scientific/engineering, and technical applications is available for 4300 systems both from IBM and from third-party vendors.

One noteworthy aid is the *VM/SP End User Software Support System (VM/SP ES<sup>3</sup>)*, a family of software offerings that provide general business, office, and engineering/scientific application solutions. Eight optional packages offer application solutions.

Two separate products complement VM/SP ES<sup>3</sup>. The ES<sup>3</sup> Productivity Facility (PF) is a full-screen, menu-driven facility that provides an on-line introduction to supported applications, menus to help navigate to the applications, and on-line help screens. It can be tailored by the user to reflect a specific VM/SP application environment. VM/Remote System Programming (VM/RSP) allows a customer with only system administrator skills to install, operate, administer, and service a VM/SP ES<sup>3</sup> system. The product includes a single, toll-free interface to IBM for technical support of VM/SP ES<sup>3</sup>.

The *Vector Processing Subsystem/Vector Facility (VPSS/VF)* allows users to run application programs developed on IBM's 3838 array processor in System/370-XA (Extended Architecture) mode on the 4381. It yields results mathematically equivalent to those achieved on the native 3838. This facility requires no modification to standard application code. VPSS/VF requires three separately available software facilities: VPSS/XA, VS Fortran Version 2 Library, and Engineering and Scientific Subroutine Library.

### PRICING & SUPPORT

**POLICY:** The 4381 is available for purchase or monthly rental only. The standard rental contract includes equipment maintenance and entitles the customer to unlimited usage each month. The purchase option accrual equals 40 percent of the monthly charge, up to 50 percent of the ►



## IBM 4381 Series

► purchase price. Some peripherals and other devices for the 4300 Series are available for purchase, lease, and rent.

The Agreement for Lease or Rental of IBM Machines provides users with a single contract on which they can specify mixtures of rental and leased equipment, each with various terms. CPUs rented under the plan can be terminated or downgraded on 90 days notice, and all other rented equipment can be terminated or downgraded on 30 days notice. Base terms and extension terms are specified for each piece of equipment obtained through a leasing agreement. The basic lease term is two years, followed by one-year extension terms.

Volume discounts are given for purchase of multiple 4300 systems; discounts vary from one system grouping to another.

Charges for most software products are based on a continuous monthly charge. A onetime license fee is available for an increasing number of programs, particularly those aimed at entry-level users. In some cases this is offered as an alternative to monthly licensing. In other cases, it is the only license arrangement possible.

A new charge structure, introduced in October 1986, provides for graduated onetime charges. Under this approach, the price of the software depends on the model group to which a processor belongs. The four groups defined (10, 20, 30, and 40) allow for a four-tier processing structure for each applicable product. The 4381 Model Groups 11 and 21 belong to processor Group 20 and the Model Groups 12, 13, 14, 22, 23, and 24 belong to processor Group 30. Users who upgrade to larger model groups will have to pay an upgrade charge for the software.

Users who have multiple systems controlled from a central site can pay the Basic License Fee for the central site and the Distributed Systems License Option (DSLLO) fee for all other locations. Central Service, including the IBM Support Center, is provided through the customer location designated for the Basic License.

**SUPPORT:** For purchased or rented systems, the IBM 4300 Series is under maintenance group D. The minimum period of maintenance service is nine consecutive hours between 7 a.m. and 6 p.m., Monday through Friday. Charges for maintenance coverage outside this period are based upon the following percentages of the minimum monthly maintenance charge (MMC) added to the MMC:

	Consecutive Hours				
	*9	12	16	20	24
Monday-Friday (until 8 a.m. Saturday)	10	12	14	16	18
Saturday (until 8 a.m. Sunday)	4	5	7	8	9
Sunday (until 8 a.m. Monday)	4	7	9	11	12

\*Outside of the hours 7 a.m. to 6 p.m.

For users without a maintenance contract, the 4300 Series is maintained under per-call Class 3. Under this class, the per-call charge during regular hours is \$218 per hour, and during off hours the charge is \$250 per hour.

The centralized IBM Support Center provides 24-hour, 7-day customer access by telephone (an 800 number is provided). It utilizes the Software Support Facility data base, which incorporates every problem encountered and resolved

(or unresolved) by the central support group. The customer is assisted in making out any APAR (program problem report) and gets advice on temporary fixes or bypasses. Local programming support charges have been discontinued.

**RETAIN** is a data base which serves as the heart of service support. It is available to 4300 customers as an on-line service. It is scanned for existing solutions to a problem as it occurs. RETAIN is also used as a place to store solutions to new problems so that others will not rediscover the same problems. If the Support Center cannot resolve a problem, the customer is put in touch with the Change Team Support Specialist, who is directly familiar with the section of coding relating to the problem being reported. If, after working with this individual, the user finds that the problem still cannot be resolved, the Program Support Representative (PSR) from the customer's local office is dispatched to assist. Under the support plan, many of the facilities that were previously provided by IBM support personnel at no charge have become billable activities.

**EDUCATION:** IBM offers a range of technically and conceptually oriented training programs covering a variety of subjects, from large-system operating environments to information systems use and management. Educational methods include classroom instruction, self-study, program offerings (computer-based training products running on the 4300 Series and other systems), and technical update videotapes. Courses are usually given at IBM Education Centers nationwide; some are held at IBM branch offices and, by special arrangement, at user sites.

IBM offers a range of systems, applications, and operations courses for DOS/VSE/, OS/VS1, MVS, and VM environments; courses on communications systems, data base management systems, and distributed processing, among other subjects, are also offered. IBM also makes available the 4300 Operator Training Series, a multimedia, self-study curriculum for system operations.

**TYPICAL CONFIGURATIONS:** Sample configurations for IBM 4300 Series systems are shown below. Complete equipment and software prices follow these configurations.

**SMALL CONFIGURATION:**

IBM 4381 M21 single processor with 8 megabytes of main memory and 6 channels	\$225,000
Two 3205 color display consoles	5,790
One 3287 Model 2 console printer	5,530
One 3380 DASD Model AE4 (5.04 gigabytes)	122,480
One 3380 Model BE4	98,140
One 3880 Model 3 Controller	60,270
One A11 Cartridge Tape Controller	49,080
Two B11 Cartridge Tape Units (two drives per unit)	77,620
Four 2511 Automatic Cartridge Loaders	35,600
12 Model 3178 Model C30 display terminals (1920 characters each with 87-key keyboard and numeric pad)	13,140
One 3274-41A Cluster Controller	18,230
One 4245 Model 20 Impact Printer (2000 lpm)	35,000

**TOTAL PURCHASE PRICE:** \$745,880 ►

## IBM 4381 Series

<b>LARGE CONFIGURATION:</b>		<b>Four B22 Cartridge Tape Units (two drives per unit)</b>	<b>172,480</b>
<b>IBM 4381 T24 dual processor with 64 megabytes of main memory and 12 channels</b>	<b>\$1,130,000</b>	<b>Four 2511 Automatic Cartridge Loaders</b>	<b>35,600</b>
<b>Two 3205 color display consoles</b>	<b>5,790</b>	<b>24 Model 3178 Model C30 display terminals (1920 characters each with 87-key keyboard and numeric pad)</b>	<b>26,280</b>
<b>One 3287 Model 2 console printer</b>	<b>5,530</b>	<b>One 3274-41A Cluster Controller</b>	<b>18,230</b>
<b>One 3380 DASD Model AE4 (5.04 gigabytes)</b>	<b>122,480</b>	<b>Two 4245 Model 20 Impact Printers (2000 lpm)</b>	<b>70,000</b>
<b>Three 3380 Model BE4s</b>	<b>294,420</b>		
<b>One 3880 Model 3 Controller</b>	<b>60,270</b>		
<b>One A22 Cartridge Tape Controller</b>	<b>65,430</b>		
		<b>TOTAL PURCHASE PRICE:</b>	<b>\$2,006,510</b>

## EQUIPMENT PRICES

		<u>Purch. Price (\$)</u>	<u>Monthly Maint. (\$)</u>	<u>Monthly Rental (\$)</u>
<b>PROCESSORS</b>				
<b>Model Group 11</b>				
4381 L11	Processor with 4-kilobyte buffer and 4 megabytes of main memory	175,000	450.00	20,650
4381 M11	Same as L11, but with 8 megabytes of main memory	195,000	475.00	23,790
4381 P11	Same as L11, but with 16 megabytes of main memory	235,000	525.00	30,060
<b>Model Group 12</b>				
4381 M12	Processor with 32-kilobyte buffer and 8 megabytes of main memory	300,000	550.00	42,360
4381 P12	Same as M12, but with 16 megabytes of main memory	340,000	600.00	48,630
4381 Q12	Same as M12, but with 24 megabytes of main memory	380,000	650.00	54,900
4381 R12	Same as M12, but with 32 megabytes of main memory	420,000	700.00	61,170
<b>Model Group 13</b>				
4381 M13	Processor with 64-kilobyte buffer and 8 megabytes of main memory	405,000	640.00	48,200
4381 P13	Same as M13, but with 16 megabytes of main memory	445,000	690.00	54,470
4381 Q13	Same as M13, but with 24 megabytes of main memory	485,000	740.00	60,740
4381 R13	Same as M13, but with 32 megabytes of main memory	525,000	790.00	67,010
<b>Model Group 14</b>				
4381 P14	Dual-processor system; 64-kilobyte buffer per processor and 16 megabytes of shared main memory	680,000	740.00	82,630
4381 Q14	Same as P14, but with 24 megabytes of main memory	720,000	790.00	88,900
4381 R14	Same as P14, but with 32 megabytes of main memory	760,000	840.00	86,525
<b>Model Group 21</b>				
4381 M21	Processor with eight megabytes of main memory and eight-kilobyte buffer	225,000	450.00	26,785
4381 P21	Same as M21, but with 16 megabytes of main memory	265,000	462.00	32,485
<b>Model Group 22</b>				
4381 P22	Processor with 16 megabytes of main memory and 32-kilobyte buffer	350,000	550.00	41,665
4381 R22	Same as P22, but with 32 megabytes of main memory	430,000	574.00	53,065
<b>Model Group 23</b>				
4381 P23	Processor with 16 megabytes of main memory and 64-kilobyte buffer	530,000	640.00	63,095
4381 R23	Same as P23, but with 32 megabytes of main memory	610,000	644.00	74,495
4381 S23	Same as P23, but with 48 megabytes of main memory	690,000	688.00	85,895
4381 T23	Same as P23, but with 64 megabytes of main memory	770,000	712.00	97,295
<b>Model Group 24</b>				
4381 P24	Processor with 16 megabytes of shared main memory and a 128-kilobyte buffer	890,000	810.00	105,950
4381 R24	Same as P24, but with 32 megabytes of main memory	970,000	834.00	117,350
4381 S24	Same as P24, but with 48 megabytes of main memory	1,050,000	858.00	128,750
4381 T24	Same as P24, but with 64 megabytes of main memory	1,130,000	882.00	140,150

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

## IBM 4381 Series

		Purch. Price (\$)	Monthly Maint. (\$)	Monthly Rental (\$)
<b>Additional 4381 Features and Options</b>				
3205	Model 1 Console; 1920 characters, 122-key keyboard, 4 colors	2,895	320	—
1850	Channel-to-Channel Adapter	23,150	31.00	1,650
1870	Additional Block Multiplexers Channels for single-processor models	35,580	12.50	2,535
1871	Additional Block Multiplexers Channels for dual-processor models	35,580	12.50	2,535
1872	Second Additional Block Multiplexer Channels for Model Group 24 only	35,580	12.50	2,535
<b>SYSTEM UPGRADES</b>				
<b>Model Group 1 Upgrades</b>				
	4381 L1 to 4381 P22	190,000	NA	NA
	4381 L1 to 4381 R22	270,000	—	—
	4381 M1 to 4381 P22	170,000	—	—
	4381 M1 to 4381 R22	250,000	—	—
	4381 P1 to 4381 P22	130,000	—	—
	4381 P1 to 4381 R22	210,000	—	—
<b>Model Group 2 Upgrades</b>				
	4381 L2 to 4381 P23	310,000	—	—
	4381 L2 to 4381 R23	390,000	—	—
	4381 L2 to 4381 S23	470,000	—	—
	4381 L2 to 4381 T23	550,000	—	—
	4381 M2 to 4381 P23	290,000	—	—
	4381 M2 to 4381 R23	370,000	—	—
	4381 M2 to 4381 S23	450,000	—	—
	4381 M2 to 4381 T23	530,000	—	—
	4381 P2 to 4381 P23	250,000	—	—
	4381 P2 to 4381 R23	330,000	—	—
	4381 P2 to 4381 S23	410,000	—	—
	4391 P2 to 4381 T23	490,000	—	—
	4381 Q2 to 4381 P23	—	—	—
	4381 Q2 to 4381 R23	290,000	—	—
	4381 Q2 to 4381 S23	370,000	—	—
	4381 Q2 to 4381 T23	450,000	—	—
	4381 R2 to 4381 P23	—	—	—
	4381 R2 to 4381 R23	250,000	—	—
	4381 R2 to 4381 S23	330,000	—	—
	4381 R2 to 4381 T23	410,000	—	—
<b>Model Group 3 Upgrades</b>				
	4381 M3 to 4381 P24	525,000	—	—
	4381 M3 to 4381 R24	605,000	—	—
	4381 M3 to 4381 S24	685,000	—	—
	4381 M3 to 4381 T24	765,000	—	—
	4381 P3 to 4381 P24	485,000	—	—
	4381 P3 to 4381 R24	565,000	—	—
	4381 P3 to 4381 S24	645,000	—	—
	4381 P3 to 4381 T24	725,000	—	—
	4381 Q3 to 4381 P24	—	—	—
	4381 Q3 to 4381 R24	525,000	—	—
	4381 Q3 to 4381 S24	605,000	—	—
	4381 Q3 to 4381 T24	685,000	—	—
	4381 R3 to 4381 R24	485,000	—	—
	4381 R3 to 4381 S24	565,000	—	—
	4381 R3 to 4381 T24	645,000	—	—
<b>Model Group 11 Upgrades</b>				
	4381 L11 to 4381 M11	20,000	—	—
	4381 L11 to 4381 P11	60,000	—	—
	4381 L11 to 4381 M12	125,000	—	—
	4381 L11 to 4381 P12	165,000	—	—
	4381 L11 to 4381 Q12	205,000	—	—
	4381 L11 to 4381 R12	245,000	—	—
	4381 L11 to 4381 M21	60,000	—	—
	4381 L11 to 4381 P21	100,000	—	—
	4381 L11 to 4381 P22	175,000	—	—
	4381 L11 to 4381 R22	255,000	—	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

	Purch. Price (\$)	Monthly Maint. (\$)	Monthly Rental (\$)
<b>Model Group 11 Upgrades (Continued)</b>			
4381 M11 to 4381 P11	40,000	—	—
4381 M11 to 4381 M12	105,000	—	—
4381 M11 to 4381 P12	145,000	—	—
4381 M11 to 4381 Q12	185,000	—	—
4381 M11 to 4381 R12	225,000	—	—
4381 M11 to 4381 P21	80,000	—	—
4381 M11 to 4381 P22	155,000	—	—
4381 M11 to 4381 R22	235,000	—	—
4381 P11 to 4381 P12	105,000	—	—
4381 P11 to 4381 Q12	145,000	—	—
4381 P11 to 4381 R12	185,000	—	—
4381 P11 to 4381 P21	40,000	—	—
4381 P11 to 4381 P22	115,000	—	—
4381 P11 to 4381 R22	195,000	—	—
<b>Model Group 12 Upgrades</b>			
4381 M12 to 4381 P12	40,000	—	—
4381 M12 to 4381 Q12	80,000	—	—
4381 M12 to 4381 R12	120,000	—	—
4381 M12 to 4381 M13	105,000	—	—
4381 M12 to 4381 P13	145,000	—	—
4381 M12 to 4381 Q13	185,000	—	—
4381 M12 to 4381 R13	225,000	—	—
4381 M12 to 4381 P23	230,000	—	—
4381 M12 to 4381 R23	310,000	—	—
4381 M12 to 4381 S23	390,000	—	—
4381 M12 to 4381 T23	470,000	—	—
4381 P12 to 4381 Q12	40,000	—	—
4381 P12 to 4381 R12	80,000	—	—
4381 P12 to 4381 P13	105,000	—	—
4381 P12 to 4381 Q13	145,000	—	—
4381 P12 to 4381 R13	185,000	—	—
4381 P12 to 4381 P23	190,000	—	—
4381 P12 to 4381 R23	270,000	—	—
4381 P12 to 4381 S23	350,000	—	—
4381 P12 to 4381 T23	430,000	—	—
4381 Q12 to 4381 R12	40,000	—	—
4381 Q12 to 4381 Q13	105,000	—	—
4381 Q12 to 4381 R13	145,000	—	—
4381 Q12 to 4381 R23	230,000	—	—
4381 Q12 to 4381 S23	310,000	—	—
4381 Q12 to 4381 T23	390,000	—	—
4381 R12 to 4381 R13	105,000	—	—
4381 R12 to 4381 R23	190,000	—	—
4381 R12 to 4381 S23	270,000	—	—
4381 R12 to 4381 T23	350,000	—	—
<b>Model Group 13 Upgrades</b>			
4381 M13 to 4381 P13	40,000	—	—
4381 M13 to 4381 Q13	80,000	—	—
4381 M13 to 4381 R13	120,000	—	—
4381 M13 to 4381 P14 with feature 1870	239,420	—	—
4381 M13 to 4381 P14 without feature 1870	275,000	—	—
4381 M13 to 4381 Q14 with feature 1870	279,420	—	—
4381 M13 to 4381 Q14 without feature 1870	315,000	—	—
4381 M13 to 4381 R14 with feature 1870	319,420	—	—
4381 M13 to 4381 R14 without feature 1870	355,000	—	—
4381 M13 to 4381 P23	180,000	—	—
4381 M13 to 4381 R23	260,000	—	—
4381 M13 to 4381 S23	340,000	—	—
4381 M13 to 4381 T23	420,000	—	—
4381 M13 to 4381 P24 with Feature 1870	449,420	—	—
4381 M13 to 4381 R24 with Feature 1870	529,420	—	—
4381 M13 to 4381 S24 with Feature 1870	609,420	—	—
4381 M13 to 4381 T24 with Feature 1870	689,420	—	—
4381 M13 to 4381 P24 without Feature 1870	485,000	—	—
4381 M13 to 4381 R24 without Feature 1870	565,000	—	—
4381 M13 to 4381 S24 without Feature 1870	645,000	—	—
4381 M13 to 4381 T24 without Feature 1870	725,000	—	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

## IBM 4381 Series

	Purch. Price (\$)	Monthly Maint. (\$)	Monthly Rental (\$)
<b>Model Group 13 Upgrades (Continued)</b>			
4381 P13 to 4381 Q13	40,000	—	—
4381 P13 to 4381 R13	80,000	—	—
4381 P13 to 4381 P14 with feature 1870	199,420	—	—
4381 P13 to 4381 P14 without feature 1870	235,000	—	—
4381 P13 to 4381 Q14 with feature 1870	239,420	—	—
4381 P13 to 4381 Q14 without feature 1870	275,000	—	—
4381 P13 to 4381 R14 with feature 1870	279,420	—	—
4381 P13 to 4381 R14 without feature 1870	315,000	—	—
4381 P13 to 4381 P23	140,000	—	—
4381 P13 to 4381 R23	220,000	—	—
4381 P13 to 4381 S23	300,000	—	—
4381 P13 to 4381 T23	380,000	—	—
4381 P13 to 4381 P24 with Feature 1870	409,420	—	—
4381 P13 to 4381 R24 with Feature 1870	489,420	—	—
4381 P13 to 4381 S24 with Feature 1870	569,420	—	—
4381 P13 to 4381 T24 with Feature 1870	649,420	—	—
4381 P13 to 4381 P24 without Feature 1870	445,000	—	—
4381 P13 to 4381 T24 without Feature 1870	685,000	—	—
4381 Q13 to 4381 R13	40,000	—	—
4381 Q13 to 4381 Q14 with feature 1870	199,420	—	—
4381 Q13 to 4381 Q14 without feature 1870	235,000	—	—
4381 Q13 to 4381 R14 with feature 1870	239,420	—	—
4381 Q13 to 4381 R14 without feature 1870	275,000	—	—
4381 Q13 to 4381 R23	180,000	—	—
4381 Q13 to 4381 S23	260,000	—	—
4381 Q13 to 4381 T23	340,000	—	—
4381 Q13 to 4381 S24 with Feature 1870	529,420	—	—
4381 Q13 to 4381 T24 with Feature 1870	609,420	—	—
4381 Q13 to 4381 R24 without Feature 1870	485,000	—	—
4381 Q13 to 4381 S24 without Feature 1870	565,000	—	—
4381 Q13 to 4381 T24 without Feature 1870	645,000	—	—
4381 Q13 to 4381 R24 with Feature 1870	449,420	—	—
4381 R13 to 4381 R14 with feature 1870	199,420	—	—
4381 R13 to 4381 R14 without feature 1870	235,000	—	—
4381 R13 to 4381 R23	140,000	—	—
4381 R13 to 4381 S23	220,000	—	—
4381 R13 to 4381 T23	300,000	—	—
4381 R13 to 4381 R24 with Feature 1870	409,420	—	—
4381 R13 to 4381 S24 with Feature 1870	489,420	—	—
4381 R13 to 4381 T24 with Feature 1870	569,420	—	—
4381 R13 to 4381 R24 without Feature 1870	445,000	—	—
4381 R13 to 4381 S24 without Feature 1870	525,000	—	—
4381 R13 to 4381 T24 without Feature 1870	605,000	—	—
<b>Model Group 14 Upgrades</b>			
4381 P14 to 4381 P24	260,000	—	—
4381 P14 to 4381 R24	340,000	—	—
4381 P14 to 4381 S24	420,000	—	—
4381 P14 to 4381 T24	500,000	—	—
4381 Q14 to 4381 R24	300,000	—	—
4381 Q14 to 4381 S24	380,000	—	—
4381 Q14 to 4381 T24	460,000	—	—
4381 R14 to 4381 R24	260,000	—	—
4381 R14 to 4381 S24	340,000	—	—
4381 R14 to 4381 T24	420,000	—	—
<b>Model Group 21 Upgrades</b>			
4381 M21 to 4381 P21	40,000	—	—
4381 M21 to 4381 P22	125,000	—	—
4381 M21 to 4381 R22	205,000	—	—
4381 P21 to 4381 P22	85,000	—	—
4381 P21 to 4381 R22	165,000	—	—
<b>Model Group 22 Upgrades</b>			
4381 P22 to 4381 R22	80,000	—	—
4381 P22 to 4381 P23	180,000	—	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

	<u>Purch. Price (\$)</u>	<u>Monthly Maint. (\$)</u>	<u>Monthly Rental (\$)</u>
<b>Model Group 22 Upgrades (Continued)</b>			
4381 P22 to 4381 R23	260,000	—	—
4381 P22 to 4381 S23	340,000	—	—
4381 P22 to 4381 T23	420,000	—	—
4381 R22 to 4381 R23	180,000	—	—
4381 R22 to 4381 S23	260,000	—	—
4381 R22 to 4381 T23	340,000	—	—

**Model Group 23 Upgrades**

4381 P23 to 4381 R23	80,000	—	—
4381 P23 to 4381 S23	160,000	—	—
4381 P23 to 4381 T23	240,000	—	—
4381 R23 to 4381 S23	80,000	—	—
4381 R23 to 4381 T23	160,000	—	—
4381 S23 to 4381 T23	80,000	—	—
4381 P23 to 4381 P24 with Feature 1870	324,420	—	—
4381 P23 to 4381 R24 with Feature 1870	404,420	—	—
4381 P23 to 4381 S24 with Feature 1870	484,420	—	—
4381 P23 to 4381 T24 with Feature 1870	564,420	—	—
4381 R23 to 4381 R24 with Feature 1870	324,420	—	—
4381 R23 to 4381 S24 with Feature 1870	404,420	—	—
4381 R23 to 4381 T24 with Feature 1870	484,420	—	—
4381 S23 to 4381 S24 with Feature 1870	324,420	—	—
4381 S23 to 4381 T24 with Feature 1870	404,420	—	—
4381 T23 to 4381 T24 with Feature 1870	324,420	—	—
4381 P23 to 4381 P24 without Feature 1870	360,000	—	—
4381 P23 to 4381 R24 without Feature 1870	440,000	—	—
4381 P23 to 4381 S24 without Feature 1870	520,000	—	—
4381 P23 to 4381 T24 without Feature 1870	600,000	—	—
4381 R23 to 4381 R24 without Feature 1870	360,000	—	—
4381 R23 to 4381 S24 without Feature 1870	440,000	—	—
4381 R23 to 4381 T24 without Feature 1870	520,000	—	—
4381 S23 to 4381 S24 without Feature 1870	360,000	—	—
4381 S23 to 4381 T24 without Feature 1870	440,000	—	—
4381 T23 to 4381 T24 without Feature 1870	360,000	—	—
4381 P24 to 4381 R24	80,000	—	—
4381 P24 to 4381 S24	160,000	—	—
4381 P24 to 4381 T24	240,000	—	—
4381 R24 to 4381 S24	80,000	—	—
4381 R24 to 4381 T24	160,000	—	—
4381 S24 to 4381 T24	80,000	—	—

	<u>Purchase Price (\$)</u>	<u>Monthly Maint. (\$)</u>	<u>Monthly Rental Charge* (\$)</u>	<u>Monthly Charge (2-Year Lease)* (\$)</u>
<b>MASS STORAGE</b>				
<b>3350</b>	Direct Access Storage; 317.5MB per drive:			
	Model A2; Dual Disk Drive	32,030	190.00	2,491
	Model A2F; Dual Disk Drive with 2MB fixed-head storage	39,970	246.00	3,108
	Model B2; Add-on Dual Disk Drive	25,360	143.00	1,980
	Model B2F; Add-on Dual Disk Drive for 2MB fixed-head storage per drive	33,300	200.00	2,597
	Model C2; Two-drive disk storage and associated control	33,130	200.00	2,597
	Model C2F; Two-drive disk storage and associated control	41,070	257.00	3,208
	1320 Primary Controller Adapter (permits selection of A2/AF controller as on-line controller via manual switch on the C2/C2F)	220	1.50	18
	8150 String Switch for 3350 A2, A2F, C2, C2F	3,690	9.50	304
<b>3370</b>	Direct Access Storage:			
	Model A1; Single Disk Drive; 571.3MB	35,480	173.00	1,851
	Model B1; Add-on Single Disk Drive for attachment to Model A1	26,600	129.00	1,387
	Model A2; 729.8MB; contains logic and power for up to three Model B2 units	35,480	134.00	2,190
	Model B2; connects to a 3370 Model A2	26,600	101.00	1,640
	8150 String Switch for 3370 A1	3,830	1.50	181

NA—Not applicable.  
NC—No charge.  
\*Includes equipment maintenance.  
\*\*Four-year lease.

## IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>MASS STORAGE (Continued)</b>					
3375	Direct Access Storage; 819.7MB per drive:				
	Model A1; contains logic and power for up to three Model B1 units	24,730	144.00	1,851	1,575
	Model B1; connects to a 3375 Model A1	18,700	109.00	1,486	1,265
	Model D1; provides dual controller function in a 3375 string; requires one Model A1 and two Model B1s	23,590	133.00	1,763	1,500
	4951 Model D1 Attachment for Model A1	2,590	6.00	112	95
	4952 Model D1 Attachment for Model B1	NC	NC	NC	NC
	8150 String Switch Feature for 3375 A1	3,795	1.50	199	169
	3375 Model B1 to D1 Upgrade	7,520	—	—	—
3380	Direct Access Storage:				
	Model A4; 2.52 billion bytes of storage; connects to one 3880 storage director	77,680	285.00	5,305	4,515
	Model AA4; 2.52 billion bytes of storage; connects to two 3880 storage directors	88,780	325.00	6,057	5,155
	Model B4; connects to a Model A4 or AA4 unit	64,440	240.00	4,400	3,745
	Model AD4; 2.52 billion bytes per unit; connects to two 3880 storage directors	88,780	295.00	5,105	—
	Model BD4; connects to a Model AD4 or AE4 unit	64,440	215.00	3,715	—
	Model AE4; 5.04 billion bytes per unit; connects to two 3880 storage directors	122,480	295.00	7,590	—
	Model BE4; connects to a Model AE4 or AD4 unit	98,140	215.00	6,190	—
3880	Storage Control; includes two storage directors:				
	Model 1; each storage director can attach up to four 3350 A2/A2F, or 3375 A1 or D1 in any combination	60,270	176.00	4,124	3,510
	Model 2; provides one storage director for 3350 or 3375 storage and one for 3380 storage	60,270	176.00	4,124	3,510
	Model 3; provides two storage directors for 3380 storage	60,270	176.00	4,124	3,510
	Model 4; provides one storage director which can attach up to four 3375 Model A1s	30,000	82.50	2,370	—
	Model E21; same as D21, but with 16 megabytes	165,400	600.00	11,300	—
	Model G21; same as D21, but with 32 megabytes	237,400	650.00	15,970	—
	Model H21; same as D21, but with 48 megabytes	309,400	700.00	20,640	—
	Model J21; same as D21, but with 64 megabytes	381,400	750.00	25,310	—
	Model D23; connects to 3380 to form cache/DASD subsystem; 8 megabytes (requires 8170)	129,400	575.00	8,965	—
	Model E23; same as D23, but with 16 megabytes	165,400	600.00	11,300	—
	Model G23; same as D23, but with 32 megabytes	237,400	650.00	15,970	—
	Model H23; same as D23, but with 48 megabytes	309,400	700.00	20,640	—
	Model J23; same as D23, but with 64 megabytes	381,400	750.00	25,310	—
	<b>3380 Model Upgrades:</b>				
	Model AD4 to AE4	43,660	—	—	—
	Model BD4 to BE4	43,660	—	—	—
	<b>3880 Model Upgrades:</b>				
	Model 1 to Model D21	69,130	—	—	—
	Model 1 to Model E21	105,130	—	—	—
	Model 1 to Model G21	177,130	—	—	—
	Model 1 to Model H21	249,130	—	—	—
	Model 1 to Model J21	321,130	—	—	—
	Model G21 to Model H21	72,000	—	—	—
	Model G21 to Model J21	144,000	—	—	—
	Model H21 to Model J21	72,000	—	—	—
	Model 3 to Model D23	69,130	—	—	—
	Model 3 to Model E23	105,130	—	—	—
	Model 3 to Model G23	177,130	—	—	—
	Model 3 to Model H23	249,130	—	—	—
	Model 3 to Model J23	321,130	—	—	—
	Model E23 to Model G23	72,000	—	—	—
	Model E23 to Model H23	144,000	—	—	—
	Model E23 to Model J23	216,000	—	—	—
	Model G23 to Model H23	72,000	—	—	—
	Model G23 to Model J23	144,000	—	—	—
	Model H23 to Model J23	72,000	—	—	—
	6148 Remote Switch Attachment	NC	NC	NC	NC
	6149 Remote Switch Attachment, Additional	NC	NC	NC	NC
	6150 Remote Switch Attachment for Eight-Channel Switch	NC	NC	NC	NC

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

	Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)	
<b>MASS STORAGE (Continued)</b>					
6550 Speed Matching Buffer for 3380	9,705	40.00	597	508	
6560 Speed Matching Buffer	11,420	40	518	441	
8160 Two Channel Switch	3,580	5	241	—	
8170 Two-Channel Switch Pair	6,225	11.00	421	358	
8171 Two-Channel Switch Pair, Additional	16,610	38.50	1,136	967	
8172 Eight-Channel Switch	22,850	53.50	1,563	1,330	
<b>MAGNETIC TAPE EQUIPMENT</b>					
3420	Magnetic Tape Units:				
	Model 3; 120,000 bytes/sec. at 1600 bpi; 75 ips	11,930	248.00	768	645
	Model 4; 470,000 bytes/sec. at 6250 bpi; 75 ips	15,340	248.00	1,075	903
	Model 5; 200,000 bytes/sec. at 1600 bpi; 125 ips	16,000	272.00	1,035	869
	Model 6; 780,000 bytes/sec. at 6250 bpi; 125 ips	17,920	272.00	1,235	1,037
	Model 7; 320,000 bytes/sec. at 1600 bpi; 200 ips	17,920	326.00	1,225	1,029
	Model 8; 1250 bytes/sec. at 6250 bpi; 200 ips	19,880	401.00	1,465	1,231
	6420 6250 bpi Density Feature (for 3420 Models 4, 6, and 8)	1,600	74.00	103	87
	6425 6250/1600 bpi Density Feature (for 3420 Models 4, 6, and 8)	2,205	99.00	151	127
	6631 Single Density Feature (for Models 3, 5, and 7)	2,870	74.00	177	149
	3550 Dual Density Feature (for Models 3, 5, and 7)	3,705	124.00	231	194
	6407 7-Track Feature (for Models 3, 5, and 7)	2,870	107.00	177	149
3803	Tape Controller:				
	Model 1; for 3420 Model 3, 5, and 7 drives	20,680	158.00	1,335	1,121
	Model 2; for 3420 Model 3 through 8 drives	27,550	218.00	1,945	1,634
	5310 9-Track NRZI Feature (permits connection of 800-bpi drives to 3803-2)	3,080	2.00	186	156
	6320 7-Track NRZI Feature (permits connection of 800-bpi drives to 3803-2; 5310 is prerequisite)	1,515	2.00	92	77
	Multiple Tape Control Switches (for switching up to sixteen 3420 tape drives between up to four 3803 control units):				
	1792 For 2 Tape Controls	6,130	15.00	388	326
	1793 For 3 Tape Controls	7,820	25.00	504	423
	1794 For 4 Tape Controls	9,195	25.00	590	496
	3551 Dual Density Feature (for 3803-1)	2,300	3.50	139	117
	6148 Remote Switch Attachment	910	—	55	46
	6408 7-Track Feature (for 3803-1)	2,300	3.50	139	117
	8100 Two-Channel Switch	4,600	6.50	288	242
3422	Magnetic Tape Subsystem				
	Model A1 Control Unit	36,800	440.00	2,460	—
	Model B1 Magnetic Tape Unit	17,900	181.00	1,165	—
	3005 Two Channel Switch	3,250	4.00	183	—
	3010 Two-Control Unit Switch; primary	7,350	20.00	425	—
	3015 Two-Control Unit Switch, Secondary	5,250	20.00	310	—
	3020 Data Streaming	1,575	35.00	122	—
3430	Magnetic Tape Subsystem				
	Model A1; Tape Unit and Control	33,400	251.00	2,575	—
	Model B1; Tape Unit Only	16,900	176.00	1,365	—
4991	Multi-drive Attachment	600	5.00	46	—
3480	Model A11 Tape Controller				
	Model B11 Tape Unit	49,080	355.00	2,810	—
	Model A22 Tape Controller	38,810	220.00	2,160	—
	Model B22 Magnetic Tape Unit	65,430	423.00	4,605	—
	Model B22 Magnetic Tape Unit	43,120	264.00	3,015	—
	1511 Channel Attachment, First	5,785	21.00	357	—
	1512 Channel Attachment, Second	5,785	21.00	357	—
	1513 Channel Attachment, Third	5,785	21.00	357	—
	2511 Automatic Cartridge Loader	8,900	40	485	—
	3211 A11/A22 Control Unit Coupler	4,045	—	—	—
	3480 Upgrades:				
	Model A11 to Model A22; 3201 required for conversion to Model A22	14,000	—	—	—
	Model B11 to Model B22	11,000	—	—	—

NA—Not applicable.  
NC—No charge.  
\*Includes equipment maintenance.  
\*\*Four-year lease.



## IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>PUNCHED CARD EQUIPMENT</b>					
3505	Card Reader:				
	Model B1; 800 cpm	36,030	328.00	1,600	—
	Model B2; 1200 cpm	37,270	449.00	1,890	—
	3921 51/80-Column Interchange	6,370	130.00	316	—
	5450 Optical Mark Read	10,130	120.00	473	—
	6555 Selective Stacker	2,845	16.00	119	—
	8103 3525 Punch Adapter	6,370	8.00	279	—
	8105 3525 Read/Punch Adapter	7,010	11.00	350	—
	8100 3525 Card Print Control	3,810	11.00	152	—
3525	Card Punch:				
	Model P1; 100 cpm	25,520	222.00	1,135	—
	Model P2; 200 cpm	26,520	301.00	1,435	—
	Model P3; 300 cpm	27,520	376.00	1,725	—
	1533 Card Read Feature	7,645	56.00	335	—
	1421 Basic Card Print	16,750	221.00	737	—
	5273 Multi-Line Card Print	1,365	64.00	196	—
	8339 Two-Line Card Print	874	8.00	29	—
<b>PRINTERS</b>					
3262	Model 3; band printer; 252 to 650 lpm	15,040	202.50	806	686
	Model 5; band printer; 252 to 650 lpm	17,000	202.50	1,117	951
	Model 13; band printer; 325 lpm	12,620	148.00	592	504
	5450 OCR Feature	3,990	42.00	149	127
	1090 Audible Alarm	201	—	6	5
3268	Model 2	7,500	76.00	498	424
	Model 2C	8,990	102.00	677	—
3287	Serial Printer:				
	Model 1; 80 cps	4,830	41.00	348	296
	Model 2; 120 cps	5,150	52.00	426	362
	Model 1C; 4 colors; 80 cps	5,210	46.00	431	367
	Model 2C; 4 colors; 120 cps	5,530	57.00	506	431
	1120 APL/Text	165	0.50	6	5
	3610 Extended Character Set Adapter	429	3.00	25	22
	3880 Extended Print Buffer	198	0.50	7	6
	4110 Friction Feed Paper Handling	151	0.50	6	5
	8330 3271/3272 Attachment for Models 1 and 2	860	2.50	60	51
	8331 3274/3276 Attachment for Models 1 and 2	165	0.50	6	5
	8700 Variable-Width Forms Tractor	151	0.50	6	5
3800	Model 3; high-speed laser printer; prints up to 215 pages per minute (ppm)	330,750	776	16,520	—
	Model 6; High-speed laser printer; prints up to 134 ppm	175,000			
	1010 Accumulator	21,250	138	1,060	—
	1021 Accumulator Expansion	5,445	42	270	—
	1490 Burster-Trimner-Stacker	52,500	372	2,630	2,020
	5401 127 Writable Character Generator Storage Positions (Additional)	4,695	29	174	135
	5410 Raster Pattern Storage (Additional)	8,655	8	431	—
	7810 Tape-to-Printing Subsystem Feature (Model 1)	12,630	57	699	537
	8170 Two-Channel Switch (Model 1)	10,270	23	469	363
	8180 Two-Channel Switch (Model 3)	10,270	23	469	—
3812	Nonimpact tabletop page printer Model 1	8,235	126.00	—	—
	3060 bisync communication feature for VM attachment	250	—	—	—
3820	Model 1; Page Printer; laser-based machine prints up to 20 pages per minute	28,350	310	1,845	—
	3005 Pattern Storage Memory, 256KB	1,050	10	67	—
	3010 Pattern Storage Memory, 512KB	1,700	20	112	—
	3020 Pattern Storage Memory, 1024KB	3,000	40	202	—
	3025 Pattern Storage Memory, 2048KB	6,000	80	404	—
	3030 Pattern Storage Memory, 3072KB	9,000	120	607	—
	3040 EIA Interface Cable 12m	125	—	—	—
	3045 EIA Interface Cable 6m	90	—	—	—
	3050 EIA Interface Attachment	500	10	37	—
	3055 S/370 Channel Interface Attachment	2,600	40	180	—
	3065 Pattern Storage Memory, 4096KB	12,000	160	809	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

## IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>PRINTERS (Continued)</b>					
4245	Model 12/D12 Band printers; 1200 lpm. Model 12 attaches to IBM byte, block, or selector channels. The Model D12 attaches via 3274, or 4700 controllers.	31,000	250	2,050	—
	Model 20/D20 Band printers; 2000 lpm. Model 20 attaches to IBM byte, block, or selector channels. The Model D20 attaches via 3274, or 4700 controllers.	35,000	400	2,340	—
	4245 Upgrades: Model 12/D12/T12 to Model 20/D20/T20	10,000	—	—	—
4248	Model 2; Variable-speed band printer; 2200, 3200, and 4000 lpm	75,000	800	6,205	—
	3751 36 additional print positions; plant installed	10,000	110	615	—
	3753 36 additional print positions; field installed	15,000	110	615	—
<b>TERMINALS</b>					
<b>Cluster Controllers:</b>					
3174	Nonprogrammable Control Unit for 3270 Subsystems; includes one megabyte of control storage, expandable to three megabytes, diskette drive, microcode equivalent of 3274-41A/C/D with Configuration Support D				
	Model 1L Control Unit with Channel Interface; supports 4 to 32 terminals or PCs with appropriate emulation features; attaches to byte or block multiplexer channel, 4381/9370 SOEMI interface, 3814 Switching Management System; supports Token Ring via optional feature	12,950	264.00	—	—
	Model 1R Control Unit with RS-232-C Remote Link Attachment; supports 4 to 32 terminals or PCs with appropriate emulation features; attaches to SNA or X.25 networks; 64K bps data rate	9,950	240.00	—	—
	Model 2R Control Unit with X.21 Remote Link Attachment; supports 4 to 32 terminals or PCs with appropriate emulation features; attaches to SNA or X.25 networks; 64K bps data rate		240.00	—	—
	Model 3R Control Unit with Interface for Token-Ring Attachment; supports 4 to 32 terminals or PCs with appropriate emulation features; standard attachment interface is for IEEE 802.5/802.2 standard baseband Token Ring; can also attach to 3174 1L with 3025 feature	11,450	300.00	—	—
	Model 81R Small Cluster Control Unit with RS-232-C Remote Link Attachment; supports up to eight terminals; for SNA or X.25 networks	3,500	168.00	—	—
	Model 82R Small Cluster Control Unit with X.21 Remote Link Attachment; supports up to eight terminals; for SNA or X.25 networks	3,500	168.00	—	—
1011	Storage Expansion; 512 kilobytes	1,300	40.00	—	—
1012	Storage Expansion; 1 megabyte	2,300	80.00	—	—
1046	Diskette Drive; 1.2 megabytes	650	120.00	—	—
3020	Asynchronous Emulation Adapter (2-way); microprocessor-based; allows attachment of or emulation of IBM 3101, Digital Equipment VT100, other ASCII terminals and ASCII pass-through	2,250	144.00	—	—
3025	Token-Ring Network 3270 Gateway; for 3174 1L, supports up to 140 ring-attached PU Type 2.0 cluster controllers (LUs are transparent); downstream devices can be PCs, 3174 3Rs, or S/36s	5,000	162.00	—	—
3103	Terminal Multiplexer Adapter; 8 ports; maximum of 4 attachable	500	20.00	—	—
3680	Encrypt/Decrypt Adapter	1,780	24.00	—	—
3274					
	Model 21A; local, SNA mode	14,220	77.00	1,038	883
	Model 21B; local, 3272 mode	14,200	80.00	1,038	883
	Model 21C; remote; requires 3701	9,990	59.00	727	619
	Model 21D; local, 3272 mode	14,220	85.00	1,038	883
	Model 31A; local, SNA mode	16,650	97.00	1,216	1,035
	Model 31C; remote; requires 3701	12,420	79.00	907	772
	Model 31D; local, 3272 mode	16,650	105.00	1,216	1,035
	Model 41A; local, SNA mode	18,230	62.00	1,281	1,090
	Model 41C; remote; requires 3701	13,840	43.00	973	828
	Model 41D; local, 3272 mode	18,230	62.00	1,281	1,090
	Model 51C; remote; requires 3701	4,885	40.00	334	284
	Model 61C; remote; requires 3701	7,600	29.00	513	437
1550	CCITT V.35 Interface	525	1.50	25	22
1800	Extended Function Storage, D2 CSE	2,430	20.00	166	141
1801	Control Storage Expansion	790	4.00	59	50
3101	Internal Disk Drive Enhancement	1,620	15.00	117	100
3622	Extended Function Storage, Ty C1	950	8.50	97	83

NA—Not applicable.  
 NC—No charge.  
 \*Includes equipment maintenance.  
 \*\*Four-year lease.

## IBM 4381 Series

TERMINALS (Continued)		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>Cluster Controllers: (Continued)</b>					
3623	Extended Function Storage, Ty C2	1,265	10.50	127	108
3625	Extended Function Storage, Ty C3	950	8.50	97	83
3627	Extended Function Storage, Ty D1	950	8.50	97	83
3631	Extended Function Storage, Ty D3	820	7.00	59	50
3650	Extended Function Storage, Ty C1	1,640	15.00	117	100
3660	Extended Function Storage, DS	1,550	2.00	100	85
3680	Encrypt/Decrypt; -1C, 3274 -21C, -31C, -41C, -51C, and -61C only	1,780	2.00	99	84
3701	External Modem Interface; requires 6302 or 6303	337	3.00	18	16
5101	Internal Disk Drive Enhancement	1,530	14.00	109	93
5550	Power Expansion	341	1.50	18	16
5650	Dataphone Digital Service; point-to-point; -21C, -31C, -41C, -51C, and -61C only	840	1.50	41	36
5651	Dataphone Digital Service; multipoint; -21C, -31C, or -51C only	840	1.50	41	36
5655	X.21 Adapter; nonswitched networks; -41C or -61C only	800	1.50	38	33
5656	X.21 Adapter; switched networks; -41C or -61C only	800	2.00	47	40
	Terminal Adapters (for Models -21X, -31X, and -51C only)—				
6901	Type A1; devices 9 through 16	918	2.00	60	51
6902	Type A2; devices 17 through 24	918	2.00	60	51
6903	Type A3; devices 25 through 32	918	2.00	60	51
7801	Type B; requires 5550	986	4.00	71	60
7802	Type B1; devices 1 through 4	986	4.00	71	60
7803	Type B2; devices 5 through 8	831	2.50	60	51
7804	Type B3; devices 9 through 12	831	2.50	60	51
7805	Type B4; devices 13 through 16	831	2.50	60	51
6302	Common Communications Adapter; SDLC or BSC; up to 9600 bps with Type A only Terminal Adapters and up to 7200 bps with Type B or mix; -21C, -31C, -41C, -51C, and -61C only	365	2.00	15	13
6303	High Performance Communications Adapter; SDLC or BSC; 9600 bps with Type B Terminal Adapters or mix; -21, -31C, -41C, -51C, and -61C only	1,010	8.50	67	57
8801	Watertight Power Connector; -21A/B/D, -31A/D, and -41A/D	NC	NC	NC	NC

Note: IBM no longer accepts lease/rental orders for any model of the 3274 Control Unit. Listed lease/rental prices apply to hardware installed prior to 8/24/84.

## Display Stations

## Model 316X Display Stations:

3161	Model 1 ASCII Display Station; 1920 characters, emulates 3101-881; emulates additional non-IBM models through added features	695	35	—	—
8001	Additional Read Command	15	—	—	—
8501	Extended Emulation, including ADDS Viewpoint, Hazeltine 1500, TeleVideo 910, and Lear Siegler ADM-3A and ADM-5	35	—	—	—
8901	Five TeleVideo Emulation, includes 910, 912, 920, 925, and 925E	35	—	—	—
3162	Model 110 Microcoded Display; full keyboard, green, RS-232-C interface	610	35	—	—
	Model 120 Microcoded Display; full keyboard, green, RS-232-C and RS-422-A interfaces	724	35	—	—
	Model 210 Microcoded Display; full keyboard, amber, RS-232-C interface	645	35	—	—
	Model 220 Microcoded Display; full keyboard, amber, RS-232-C and RS-422-A interfaces	724	35	—	—
	Model 310 Microcoded Display; short keyboard, green, RS-232-C interface	645	35	—	—
	Model 320 Microcoded Display; short keyboard, green, RS-232-C and RS-422-A interfaces	724	35	—	—
	Model 410 Microcoded Display; short keyboard, amber, RS-232-C interface	645	35	—	—
	Model 420 Microcoded Display; short keyboard, green, RS-232-C and RS-422-A interfaces	724	35	—	—
8222	Digital Equipment VT220 Emulation	—	—	—	—
8232	Digital Equipment VT220 Emulation with hot key/3708	—	—	—	—
8502	TeleVideo 950 Emulation	—	—	—	—
8922	10 ASCII Terminal Emulation	—	—	—	—
3163	Model 1 Standard Microcoded Display	895	45	—	—
860	ALA Display; displays diacritic characters in separate position	976	45	—	—
861	ALA Display; displays diacritic characters combined with letters	985	45	—	—
8103	Digital Equipment VT100/52 Emulation	50	—	—	—
8953	TeleVideo 950 Emulation	38	—	—	—
3164	Model 1 Standard Microcoded Display	1,295	55	—	—
860	ALA Display; displays diacritic characters in separate position	1,376	75	—	—
861	ALA Display; displays diacritic characters combined with letters	1,385	75	—	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>TERMINALS (Continued)</b>					
3180	Monochrome Display for 3270 Subsystems; attaches to 3174, 3274, or 3276				
	Model 110 Display with 4 user selectable screen formats; up to 3564 characters	2,095	95	—	—
	Model 120 Display with 4 user selectable screen formats; up to 3564 characters	2,095	95	—	—
	Model 130 APL Display with 4 user selectable screen formats; up to 3564 characters	2,095	95	—	—
8191	Switch Control Unit; permits switching operation between two control units	168	—	—	—
3191	Monochrome Display for 3270 Subsystems; attaches to 3174, 3274, or 3276				
	Model A10 Display with 122-key typewriter keyboard; 1920 characters; green	1,295	40	—	—
	Model A20 Display with 102-key enhanced keyboard; 1920 characters; green	1,295	40	—	—
	Model A30 Display with 104-key typewriter keyboard; 1920 characters; green	1,295	40	—	—
	Model B10 Display with 122-key keyboard; 1920 characters; amber	1,295	40	—	—
	Model B20 Display with 102-key keyboard; 1920 characters; amber	1,295	40	—	—
	Model B30 Display; with 104-key typewriter keyboard; 1920 characters; amber	1,295	40	—	—
3192	Color Display for 3270 Subsystem; attaches to 3174, 3274, or 3276				
	Model C10 Display with 122-key typewriter keyboard; 1920 or 2560 characters	1,895	85	—	—
	Model C20 Display with 102-key enhanced keyboard; 1920 or 2560 characters	1,895	85	—	—
	Model C30 Display with 104-key typewriter keyboard; 1920 characters; 7 colors	1,895	85	—	—
	Model CDO Display with 122-key typewriter keyboard; 1920 or 2560 characters; 7 colors; 3-year guarantee	2,045	85	—	—
	Model CEO Display with 102-key enhanced keyboard; 1920 or 2560 characters; 7 colors; 3-year warranty	2,045	85	—	—
	Model CFO Display with 104-key typewriter keyboard; 1920 or 2560 characters; 3-year warranty				
	Model D10 Display with 122-key typewriter keyboard; 1920, 2560, 3440, or 3560 characters; 7 colors	1,795	60	—	—
	Model D20 Display with 102-key enhanced keyboard; 1920, 2560, 3440, or 3564 characters; 7 colors	1,795	60	—	—
	Model D30 Display with 104-key typewriter keyboard; 1920, 2560, 3440, or 3564 characters; 7 colors	1,795	60	—	—
	Model DDO Display with 122-key typewriter keyboard; 1920, 2560, 3440, or 3564 characters; 7 colors; 3-year warranty	1,895	60	—	—
	Model DEO Display with 102-key enhanced keyboard; 1920, 2560, 3440, or 3564 characters; 7 colors; 3-year warranty	1,895	60	—	—
	Model DFO Display with 104-key typewriter keyboard; 1920, 2560, 3440, or 3564 characters; 7 colors; 3-year warranty	1,895	60	—	—
	Model G10 Color Graphics Display with 122-key typewriter keyboard; 1920 or 2560 characters, 8 colors	2,795	110	—	—
	Model G20 Color Graphics Display with 122-key/APL typewriter keyboard; 89 colors; 2560 characters	2,795	110	—	—
	Model G30 Color Graphics Display with 104-key enhanced keyboard; 1920 or 2560 characters; 8 colors	2,795	110	—	—
	Model G40 Color Graphics Display with 104-key/APL enhanced keyboard; 2560 characters; 8 colors	2,795	110	—	—
	Model GDO Color Graphics Display with 122-key typewriter keyboard; 2560 characters; 8 colors; 3-year warranty	2,995	110	—	—
	Model GEO Color Graphics Display with 122-key/APL typewriter keyboard; 1920 or 2560 characters; 8 colors; 3-year warranty	2,995	110	—	—
	Model GFO Color Graphics Display with 104-key enhanced keyboard; 1920 or 2560 characters; 8 colors	2,995	110	—	—
	Model GGO Color Graphics Display with 104-key/APL typewriter keyboard; 1920 or 2560 characters, 8 colors; 3-year warranty	2,995	110	—	—
3193	Advanced Monochrome Displays for 3270 Subsystems; attaches to 3174, 3274, 8 partitions, 2 logical terminals, combines characters and images; 880 x 1200 dots				
	Model 10 Display with 122-key keyboard; 3840 characters; 100 pels	2,495	75	—	—
	Model 10 Display with 102-key enhanced keyboard; 3840 characters; 100 pels	2,495	75	—	—
3194	Color Display for 3270 Subsystems; attaches to 3174, or 3274				
	Model 10 Display with 122-key keyboard; 1920 characters; 7 colors	2,895	—	—	—
	Model 20 Display with 102-key keyboard; 1920 characters; 7 colors	2,895	—	—	—

NA—Not applicable.  
NC—No charge.  
\*Includes equipment maintenance.  
\*\*Four-year lease.

## IBM 4381 Series

TERMINALS (Continued)		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
3178	Model C10; 1920 char., w/75-key Data Entry keyboard	1,040	—	—	—
	Model C20; 1920 char., w/87-key Typewriter keyboard	1,095	—	—	—
	Model C30; 1920 char., w/87-key Typewriter keyboard and numeric pad	1,095	—	—	—
	Model C40; 1920 char., w/87-key Typewriter keyboard and numeric pad	1,095	—	—	—
3276	Integrated Display/Control Unit; can support additional 3270-type displays				
	Model 1; 960-character display; for BSC transmissions	5,380	36.00	348	296
	Model 2; 1920-character display; for BSC transmissions	5,535	37.00	356	303
	Model 3; 2560-character display; for BSC transmissions	5,680	38.00	361	307
	Model 4; 3440-character display; for BSC transmissions	5,830	39.00	377	321
	Model 11; 960-character display; for SNA/SDLC transmissions	5,380	32.00	348	296
	Model 12; 1920-character display; for SNA/SDLC transmissions	5,535	33.00	356	303
	Model 13; 2560-character display; for SNA/SDLC transmissions	5,680	34.00	361	307
	Model 14; 3440-character display; for SNA/SDLC transmissions	5,830	34.00	377	321
1009	Address Keylock	56	—	62	—
1067	APL/Text Control	950	1.00	55	47
1068	Extended Function Base; allows attachment of features 1067, 5656, or 1950	190	1.00	6	5
1950	Color Display Attachment	758	0.50	46	39
3255	Terminal Adapter 1; allows attachment of 2 terminals	530	1.50	26	23
3256	Terminal Adapter 2; allows attachment of 2 terminals above 3255	530	1.50	26	23
3257	Terminal Adapter 3; allows attachment of 2 terminals above 3256	530	1.50	26	23
3620	Character Set Extension; allows display of APL/Text 222-character set, which includes the 94-character EBCDIC set	644	3.00	29	25
3680	Encrypt/Decrypt	1,600	2.00	94	80
3701	External Modem Interface	337	3.00	18	16
4621	75-Key EBCDIC Typewriter Keyboard	463	2.00	22	19
4622	75-key EBCDIC Data Entry Keyboard	463	3.00	22	19
4623	75-Key EBCDIC Data Entry Keyboard; keypunch layout	463	3.00	22	19
4624	75-Key ASCII Typewriter Keyboard	463	2.00	22	19
4626	87-Key EBCDIC Typewriter/APL Keyboard	632	2.50	27	24
4627	87-Key EBCDIC Typewriter Keyboard	632	2.50	27	24
4628	87-Key ASCII Typewriter Keyboard	632	2.50	27	24
4629	87-Key EBCDIC Typewriter/Text Keyboard	632	2.50	27	24
4999	Magnetic Reader Control	379	3.50	17	15
5500	Integrated 1200 bps Modem; nonswitched	535	5.50	34	29
5501	Integrated 1200 bps Modem; switched, auto answer	714	2.50	46	39
5502	Integrated 1200 bps Modem; manual answer	535	3.00	34	29
5507	Integrated 1200 bps Modem; nonswitched with SNBU	766	5.50	49	42
5508	Integrated 1200 bps Modem; nonswitched with SNBU and auto answer	855	3.00	55	47
5650	DDS Adapter for point-to-point operations	840	1.50	41	36
5651	DDS Adapter; multipoint operation	840	1.50	41	36
5655	X.21 Adapter; for nonswitched networks	800	1.50	38	33
5656	X.21 Adapter; for switched networks	884	2.00	47	40
6302	Communications Adapter without clock	365	2.00	15	13
6315	SDLC/BSC Switch	682	3.00	36	31
6360	Light Pen	548	0.50	24	20
3278	Model 1; 960 char.	1,484	10.00	115	98
	Model 2; 1920 char.	1,572	10.00	119	102
	Model 3; 2560 char.	1,716	10.50	146	124
	Model 4; 3440 char.	1,804	11.50	149	127
	Model 5; 3564 char.	2,060	13.00	175	149
3610	Extended Character Set Adapter	—	—	17	15
3620	Character Set Extension	464	2.50	30	26
4621	Keyboard; 75 Key EBCDIC Ty	334	2.00	22	19
4622	Keyboard; 75 Key EBCDIC De	334	3.00	22	19
4623	Keyboard; 75 Key EBCDIC De/Kp	334	3.00	22	19
4624	Keyboard; 75 Key ASCII Ty	334	2.00	22	19
4626	Keyboard; 87 Key EBCDIC Typ/APL	455	2.50	27	24
4627	Keyboard; 87 Key EBCDIC Ty	455	2.50	27	24
4628	Keyboard; 87 Key ASCII Ty	455	2.50	27	24
4629	Keyboard; 87 Key EBCDIC Typ/Text	455	2.50	27	24
3620	Character Set Extension	464	2.50	30	26
6360	Selector Light Pen	394	0.50	24	20
4999	Magnetic Reader Control	273	3.50	17	15

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

TERMINALS (Continued)		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
3279	Model S2A; base color; 1920 char.	2,190	19.00	201	171
	Model S2B; extended color; 1920 char.	2,415	19.00	204	174
	Model S3G; extended color; 2560 char.	3,115	25.00	310	264
	Model 2X; base/extended color; 1920 char.	2,190	19.00	206	176
	Model 3X; base/extended color; 2560 char.	2,235	19.00	227	193
3850	Extended Function (Model 2X or 3X)	210	2.00	15	13
4621	75-Key EBCDIC Typewriter	417	1.50	22	19
4622	75-Key EBCDIC Data Entry	417	2.50	22	19
4623	75-Key EBCDIC Data Entry, keypunch layout	417	2.50	22	19
4624	75-Key ASCII Typewriter	417	1.50	22	19
4626	87-Key EBCDIC Typewriter/Text; 3278 only	569	2.00	27	24
4627	87-Key EBCDIC Typewriter; 3278/3274 only	569	2.00	27	24
4628	87-Key ASCII Typewriter; 3278/3274 only	569	2.00	27	24
4629	87-Key EBCDIC Typewriter/Text; 3278 only	569	2.00	27	24
4640	87-Key EBCDIC Typewriter Overlay	569	2.00	27	24
4651	87-Key EBCDIC Attribute Select Typewriter	569	2.00	27	24
4652	87-Key EBCDIC Attribute Select Typewriter/APL	569	2.00	27	24
3290	Information Panel Display For 3270 Subsystems; plasma panel technology				
	Model 220 Slim Profile Display; 9920 characters; data/typewriter keyboards; multiple screens/windows, optional 5300 large character format	6,500	288	—	—
	Model 230 Slim Profile Display; 9920 characters; modifiable data/typewriter keyboard with integrated numeric pad; similar to 3179; 3180; multiple screens/windows, optional 5300 large character format	6,500	288	—	—
	Model T30 TEMPEST Specification Display; similar to 230, but not modifiable	9,300	360	—	—
8775	Display Terminal with control logic for standalone remote operation; highly compatible with 3270 cluster datastreams				
	Model 11 Display; 960, 1920, or 2560 characters in 9 x 16 format	3,070	27.00	147	125
	Model 12 Display; 3440 characters in 9 x 12 format as well as 960, 1920, or 2560 characters in 9 x 16 format	3,450	27.00	165	140
1009	Setup Keylock	63	—	63	—
1090	Audible Alarm	93	—	2	2
1488	Business Machine Clock	234	1.50	6	5
3623	Extended Feature Storage; needed for 3624, 3626, 5110, or IDIF	848	4.00	44	35
3701	External Modem Interface	374	3.50	17	15
3905	Feature Adapter; provides logic to perform 3624, 3626, or IDPF	424	2.00	17	15
4621	75-Key EBCDIC Typewriter Keyboard	417	2.00	21	18
4622	75-Key EBCDIC Data Entry Keyboard	417	3.00	21	18
4623	75-Key EBCDIC Data Entry Keyboard; keypunch layout	417	3.00	21	18
4626	87-Key EBCDIC Typewriter/APL Keyboard	569	2.50	26	23
4627	87-Key EBCDIC Typewriter Keyboard	569	2.50	26	23
4640	87-Key EBCDIC Typewriter Overlay Keyboard	569	2.50	26	23
4670	87-Key EBCDIC Typewriter/Text Entry and Edit Keyboard	632	3.50	25	22
4999	Magnetic Reader Control	364	2.00	17	15
5500	Integrated 1200 bps Modem	563	6.50	30	26
5580	Printer Adapter	1,440	4.50	56	48
5650	DDS Adapter; for point-to-point operations	840	1.50	39	34
5651	DDS Adapter; multipoint operation	840	1.50	36	31
5655	X.21 Adapter; for nonswitched networks	800	1.50	35	30
5781	Programmed Symbols; two 190-symbol sets	202	1.50	6	5
5782	Programmed Symbols; adds four 190-symbol sets to 5781	324	2.50	16	14
6340	Security Keylock	40	—	40	—

SYSTEM MANAGEMENT

IBM 3814 Switching Management System, Models:

A1	Controller Unit (4 x 4)	47,480	159	2,630	**2,105
A2	Controller Unit (4 x 8)	60,420	207	3,350	**2,680
A3	Controller Unit (8 x 4)	64,740	203	3,595	**2,875
A4	Controller Unit (two 4 x 4s)	69,570	223	3,875	**3,095
B1	Remote Unit (4 x 4)	39,710	107	2,205	**1,765

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

## IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
<b>SYSTEM MANAGEMENT (Continued)</b>					
<b>IBM 3814 Switching Management System, Models: (Continued)</b>					
B2	Remote Unit (4 x 8)	52,660	157	2,920	**2,335
B3	Remote Unit (8 x 4)	56,970	151	3,165	**2,530
B4	Remote Unit (two 4 x 4s)	61,800	171	3,435	**2,745
C1	Expansion Unit (4 x 4)	37,980	104	2,105	**1,680
C2	Expansion Unit (4 x 8)	50,930	152	2,820	**2,255
C3	Expansion Unit (8 x 4)	55,240	147	3,065	**2,450
C4	Expansion Unit (two 4 x 4s)	60,070	168	3,340	**2,670
<b>Additional Hardware and Options</b>					
Upgrades	Model A1 to A4, Model B1 to B4, or Model C1 to C4	22,090	—	—	—
3178-C20	Display Station	1,095	—	—	—
3278-2	Display Station	1,572	10.00	119	102
3287-1	Hard Copy Printer	4,830	41.00	348	296
3287-2	Hard Copy Printer	5,150	52.00	426	362
1410	Expanded Storage Unit	4,800	23.00	246	**196
1420	Printer and Display Station Attachment	1,990	3.00	103	**83
1430	Alternate Controller	1,990	3.00	103	**83
1440	System Attachment Feature	5,700	16.00	307	**248
1520	Internal Channel Expansion; four controller unit interfaces	1,550	1.00	86	**69
1521	Internal Channel Expansion; eight controller unit interfaces	3,100	1.00	168	**135
1531	External Channel Expansion; first 4 x 4 interface	5,350	1.00	294	**235
1532	External Channel Expansion; second 4 x 4 interface	5,350	1.00	294	**235
1811	Control Unit Power Sequencing; provides sequencing for first group of control units	518	1.00	27	**21
1812	Control Unit Power Sequencing; provides sequencing for second group of control units	518	1.00	27	**21
1813	Control Unit Power Sequencing; provides sequencing for third group of control units	518	1.00	27	**21
1814	Control Unit Power Sequencing; provides sequencing for fourth group of control units	518	1.00	27	**21
6350	Additional System Power Sequencing	207	—	8	**6
6010	Remote Two-Channel Switch Control—Basic	5,180	21.00	284	**226
6011	Additional Remote Two-Channel Switch Control	2,415	15.00	133	**106
6012	Second Additional Remote Two-Channel Switch Control	2,415	15.00	133	**106
6013	Third Additional Remote Two-Channel Switch Control	2,415	15.00	133	**106
<b>CHANNEL EXTENSION</b>					
3044-C01	Fiber-Optic Channel Extender Link; channel unit	8,500	27	—	—
3044-D01	Fiber-Optic Channel Extender Link; downstream unit	8,500	27	—	—
<b>COMMUNICATIONS EQUIPMENT</b>					
3720	Communications Controller:				
	Model 1 Communications Controller; local base	36,500	175.00	2,605	
	Model 2 Communications Controller; remote base	26,000	142.00	1,855	
	Model 11 Communications Controller	42,500	178.00	3,035	
	Model 12 Communications Controller	33,000	146.00	2,285	
3725	Communications Controller:				
	Model 1; up to six channel adapters and from 512K to 1024K bytes of main storage capacity	75,000	232.00	4,420	—
	Model 2; up to two channel adapters and 512K bytes of main storage capacity (Model 2 to Model 1 Upgrade charge is \$16,000)	60,500	208.00	3,330	—
	1561 Channel Adapter	6,750	8.50	399	—
	4666 Internal Clock Control	1,500	2.00	85	—
	4771 Line Attachment Base Type A	19,000	17.00	1,115	—
	4772 Line Attachment Base Type B	26,400	30.00	1,560	—
	4911 Line Interface Coupler Type 1	2,600	2.00	155	—
	4921 Line Interface Coupler Type 2	3,000	2.00	174	—
	4931 Line Interface Coupler Type 3	3,000	2.00	174	—
	4941 Line Interface Coupler Type 4A	2,600	2.00	155	—
	4942 Line Interface Coupler Type 4B	3,000	2.00	174	—

NA—Not applicable.

NC—No charge.

\*Includes equipment maintenance.

\*\*Four-year lease.

IBM 4381 Series

		Purchase Price (\$)	Monthly Maint. (\$)	Monthly Rental Charge* (\$)	Monthly Charge (2-Year Lease)* (\$)
7100 Storage Increment 256K		4,375	20.00	257	—
8320 Two Processor Switch		4,000	3.00	237	—
3726	Communications Controller Expansion	32,000	43.00	1,880	—
3727	Operator Console	2,390	28.00	215	—

NA—Not applicable.  
NC—No charge.  
\*Includes equipment maintenance.  
\*\*Four-year lease.

SOFTWARE PRICES

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated One-Time Charge (\$)	Licensed Program Support Charge (\$)
<b>Operating Systems</b>					
5662-257	OS/VS1/BPE Release 4 with 5652-VS1 OS/VS1 Release 7 SCP	NA	259	NA	48
5664-167	VM/SP Releases 3 through 5 and up	NA	500	13,540	69
	Graduated Charge: Processor Group 20	NA	500	19,345	69
	Graduated Charge: Processor Group 30	11,220	4,110	NA	623
5664-169	VM/XA Systems Facility Release 1 and up				
5664-308	VM/XA System Product Release 1; available March 1988; Multiple Preferred Guest component will be available Third Quarter 1988	NA	4,500	NA	—
	Graduated Charge: Processor Group 20	NA	4,500	112,500	—
	Graduated Charge: Processor Group 30	NA	4,500	NA	—
5664-308	VM/XA System Product Release 2	NA	4,500	NA	—
	Graduated Charge: Processor Group 20	NA	4,500	112,500	—
	Graduated Charge: Processor Group 30	NA	4,500	112,500	—
5664-173	VM/SP HPO High Performance Option Releases 3.2 through 5.0 and up; optional on 4381, but really needed if VM/SP is to fully utilize 4381 characteristics	5,325	1,775	NA	136
	Graduated Charge: Processor Group 20	5,325	1,775	57,665	136
	Graduated Charge: Processor Group 30	NA	850	NA	NA
5664-197	MUSIC/SP System Product; this version of MUSIC requires VM/SP	NA	850	NA	NA
5664-301	VM/IS BASE Release 4 and up	NA	2,000	23,765	NA
	Graduated Charge: Processor Group 20	NA	2,000	33,100	NA
	Graduated Charge: Processor Group 30	NA	2,000	33,100	NA
5665-291	MVS/SP Version 2 Releases 1.2 through 1.7 and up (MVS/XA with JES3)	14,430	4,810	177,165	1,335
	Graduated Charge: Processor Group 20	14,430	4,810	177,165	1,335
	Graduated Charge: Processor Group 30	14,430	4,810	177,165	1,335
5665-432	SRTOS Special Realtime Operating System Version 2; Version 2 requires MVS/SP or MVS/XA	NA	NA	40,000	NA
	Graduated Charge: Processor Group 20	NA	NA	40,000	NA
	Graduated Charge: Processor Group 30	NA	NA	40,000	NA
5666-301	VSE/AF Version 2 Release 1 and up	NA	438	8,000	108
	Graduated Charge: Processor Group 20	NA	438	11,430	108
	Graduated Charge: Processor Group 30	NA	438	11,430	108
5666-316	VSE/SP Version 2 Release 1.6	NA	2,160	40,440	433
	Graduated Charge: Processor Group 20	NA	2,160	57,805	433
	Graduated Charge: Processor Group 30	NA	2,160	57,805	433
5666-345	VSE/SP Version 3 Release 1.0 and up	NA	2,608	51,305	NA
	Graduated Charge: Processor Group 20	NA	2,608	51,305	NA
	Graduated Charge: Processor Group 30	NA	2,608	51,305	NA
5667-126	IX/370 Interactive Executive Version 1 Release 1.3 requires VM/SP Release 3.0 or up				
	4506 pricing feature for IX/370: asset assignment, to 16 CSTUs	NA	NA	10,000	495
	Graduated Charge: Processor Group 20	NA	NA	10,000	495
	Graduated Charge: Processor Group 30	NA	NA	10,000	495
	4507 pricing feature for IX/370: supports up to 32 currently signed-on terminal users (CSTUs); requires 4506	NA	NA	10,000	NA
	Graduated Charge: Processor Group 20	NA	NA	10,000	NA
	Graduated Charge: Processor Group 30	NA	NA	10,000	NA
	4508 pricing feature for IX/370: supports up to 64 CSTUs; requires 4506 and 4507	NA	NA	20,000	NA
	Graduated Charge: Processor Group 20	NA	NA	20,000	NA
	Graduated Charge: Processor Group 30	NA	NA	20,000	NA
	4509 pricing feature for IX/370: supports more than 65 CSTUs; requires 4506, 4507, and 4508	NA	NA	35,000	NA
	Graduated Charge: Processor Group 20	NA	NA	35,000	NA
	Graduated Charge: Processor Group 30	NA	NA	35,000	NA



## IBM 4381 Series

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated One-Time Charge (\$)	Licensed Program Support Charge (\$)
<b>Operating Systems (Continued)</b>					
5740-XC6	MVS/SP Version 2 Releases 1.2 through 1.7, Release 2.0 and up (MVS/XA with JES2)	12,840	4,280	NA	673
5740-XYN	MVS/SP Version 1 Releases 3 through 6 and up (MVS/370 with JES3)	NA	2,150	NA	117
5740-XYS	MVS/SP Version 1 Releases 3 through 6 and up (MVS/370 with JES2)	NA	2,150	NA	240
5748-T12	TPF2.3 Transaction Processing Facility Version 2 Release 3; Version 2 requires MVS/SP or MVS/XA for batch facilities	32,100	13,540	NA	NA
<b>Utilities, Installation Management, Performance Analysis</b>					
5664-179	VMPPF Performance Planning Facility; for VM/SP Graduated Charge: Processor Group 20	NA	2,000	30,000	NA
	Graduated Charge: Processor Group 30	NA	2,000	30,000	NA
5664-191	VMMAP Performance Monitor Analysis Program Release 1.1; for VM/SP Graduated Charge: Processor Group 20	NA	270	2,800	NA
	Graduated Charge: Processor Group 30	NA	270	4,000	NA
5664-301F	VM/IS Performance Reporting Feature ("UMMAP") Graduated Charge: Processor Group 20	NA	270	2,800	NA
	Graduated Charge: Processor Group 30	NA	270	4,000	NA
5664-301F	VM/IS Shared User Files Feature ("FSF") Graduated Charge: Processor Group 20	NA	44	770	NA
	Graduated Charge: Processor Group 30	NA	44	1,100	NA
5664-301F	VM/IS Performance Monitor Feature ("Real Time Monitor") Graduated Charge: Processor Group 20	NA	50	700	NA
	Graduated Charge: Processor Group 30	NA	50	1,000	NA
5664-301F	VM/IS Background Execution Feature ("Batch") Graduated Charge: Processor Group 20	NA	44	770	NA
	Graduated Charge: Processor Group 30	NA	44	1,100	NA
5664-301F	VM/IS Graphics Support Feature ("GDDM/PGF") Graduated Charge: Processor Group 20	NA	413	8,670	NA
	Graduated Charge: Processor Group 30	NA	413	12,390	NA
5664-301F	VM/IS Text Formatter Feature ("DCF/FEF") Graduated Charge: Processor Group 20	NA	417	8,735	NA
	Graduated Charge: Processor Group 30	NA	417	12,480	NA
5664-301F	VM/IS General Language Support Routines ("PL/1") Graduated Charge: Processor Group 20	NA	37	775	NA
	Graduated Charge: Processor Group 30	NA	37	1,100	NA
5664-322	INFO/Mgt Information/Management Version 3; for VM/SP Graduated Charge: Processor Group 20	NA	500	7,700	44
	Graduated Charge: Processor Group 30	NA	500	11,000	44
5664-323	INFO/Sys Information/System Version 3; for VM/SP Graduated Charge: Processor Group 20	NA	450	7,000	52
	Graduated Charge: Processor Group 30	NA	450	10,000	52
5664-364	VM Batch Facility Graduated Charge: Processor Group 20	NA	150	3,150	NA
	Graduated Charge: Processor Group 30	NA	150	4,500	NA
5665-XA2	Data Facility Product Version 2 Release 3; for MVS/XA Graduated Charge: Processor Group 20	NA	1,025	30,750	342
	Graduated Charge: Processor Group 30	NA	1,025	30,750	342
5665-266	INFO/Access Information Access Version 3; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	800	24,000	NA
	Graduated Charge: Processor Group 30	NA	800	24,000	NA
5665-274	RMF Resource Measurement Facility Version 3 Release 5; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	2,250	750	24,375	67
	Graduated Charge: Processor Group 30	2,250	750	24,375	67
5665-294	Library/MVS; for MVS/370, MVS/XA	399	146	NA	NA
5665-295	DFP Data Facilities Product Version 1 Release 1.0; for MVS/370, MVS/XA	1,590	600	NA	186
5665-371	OPC/A Operations Planning and Control/Advanced Event Manager Subsystem Version 1; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	820	18,000	NA
	Graduated Charge: Processor Group 30	NA	820	18,000	NA
5665-372	OPC/A Operations Planning and Control/Advanced Production Control System Version 1; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	2,270	50,000	NA
	Graduated Charge: Processor Group 30	NA	2,270	50,000	NA
5665-373	OPC/A Operations Planning and Control/Advanced Network Event Communicator Version 1; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	980	21,600	NA
	Graduated Charge: Processor Group 30	NA	980	21,600	NA
5665-383	INFO/Mgt Information/Management Version 3; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	500	11,000	58
	Graduated Charge: Processor Group 30	NA	500	11,000	58
5665-384	INFO/Sys Information/System Version 3; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	450	10,000	49
	Graduated Charge: Processor Group 30	NA	450	10,000	49

IBM 4381 Series

Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated One-Time Charge (\$)	Licensed Program Support Charge (\$)
---	---	---	--

Utilities, Installation Management, Performance Analysis (Continued)

5665-397	Service Level Reporter Version 3; for MVS/370, MVS/XA Graduated Charge: Processor Group 20	2,000	100	3,265	120
	Graduated Charge: Processor Group 30	2,000	100	3,265	120
5665-950	INFO/Access; for MVS/370, MVS/XA	3,300	362	NA	28
5666-273	VSE/POWER Version 2 Release 3; for VSE Graduated Charge: Processor Group 20	498	166	2,710	33
	Graduated Charge: Processor Group 30	498	166	3,875	33
5668-002	DASD Migration Aid Release 1.1; for MVS/370, MVS/XA, VS1 Graduated Charge: Processor Group 20	NA	NA	1,450	19
	Graduated Charge: Processor Group 30	NA	NA	1,450	19
5668-006	Downstream Load Utility/8775; for VSE, VS1, MVS/370, MVS/XA	NA	124	NA	7
5668-722	DITTO Data Interfile Transfer, Testing, and Operations Utility Version 2 Release 1; for VSE, VM/SP Graduated Charge: Processor Group 20	NA	82	1,720	NA
	Graduated Charge: Processor Group 30	NA	82	1,720	NA
5668-897	INFO Center/1 Release 1.1; for VM/SP, MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	1,390	15,400	NA
	Graduated Charge: Processor Group 30	NA	1,390	22,000	NA
5668-917	DITTO Data Interfile Transfer Test and Operations Utility; for VSE, VM/SP Graduated Charge: Processor Group 20	231	94	935	7
	Graduated Charge: Processor Group 30	231	94	1,340	7
5668-919	INFO/VM-VSE Information/MVS; for VM/SP, MVS/370, MVS/XA, VSE	NA	150	NA	91
5668-949	SMP/E System Modification Program/Extended; for VS1, MVS/370, MVS/XA	1,920	380	NA	97
5668-966	SLR Service Level Reporter; for VS1, MVS/370, MVS/XA Graduated Charge: Processor Group 20	2,130	815	NA	99
	Graduated Charge: Processor Group 30	2,130	815	99	99
5668-997	CDPF Composed Document Printing Facility; for VM/SP, MVS/370, MVS/XA, VSE Graduated Charge: Processor Group 20	NA	342	NA	49
	Graduated Charge: Processor Group 30	NA	342	49	49
5740-SM1	DF SORT Data Facility Sort; for MVS/370, MVS/XA, VS1	NA	247	NA	19
5740-XT9	OPC Installation Management/Operations Planning and Control; for MVS/370, MVS/XA, VS1 Graduated Charge: Processor Group 20	NA	1,745	38,390	NA
	Graduated Charge: Processor Group 30	NA	1,745	38,390	NA
5740-XXH	RACF Resource Access Control Facility Version 1 Release 7; for MVS/370, MVS/ XA, VM/SP (with 5767 VM/RACF PRPQ) Graduated Charge: Processor Group 20	NA	841	25,230	43
	Graduated Charge: Processor Group 30	NA	841	25,230	43
5740-XXH	RACF Resource Access Control Facility Version 1 Release 7; for VM only Graduated Charge: Processor Group 20	—	—	14,595	—
	Graduated Charge: Processor Group 30	—	—	20,850	—
5740-XY4	RMF Resource Measurement Facility Version 2 Release 4; for MVS/370	NA	406	NA	17
5746-SM2	Sort/Merge Version 2 Release 5; for VSE, VM/SP	NA	108	NA	14
5746-XE7	VSE/Access Control Logging and Reporting; for VSE Graduated Charge: Processor Group 20	NA	63	2,360	24
	Graduated Charge: Processor Group 30	NA	63	2,360	24
5787-MVS	MVS Migration System (from VSE); for MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	NA	65,000	NA
	Graduated Charge: Processor Group 30	NA	NA	65,000	NA
5796-PLQ	VSE/PT Performance Tool; for VSE Graduated Charge: Processor Group 20	NA	285	6,300	NA
	Graduated Charge: Processor Group 30	NA	285	6,300	NA
5796-PNA	VM/RTM Real Time Monitor; for VM/SP Graduated Charge: Processor Group 20	NA	50	700	NA
	Graduated Charge: Processor Group 30	NA	50	1,000	NA
5798-BDW	CMS SORT and Extensions; for VM/SP Graduated Charge: Processor Group 20	NA	NA	1,025	NA
	Graduated Charge: Processor Group 30	NA	NA	1,025	NA
5798-CQQ	GTFPARS Generalized Trace Facility/Performance Analysis; for VS1, MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	94	2,310	NA
	Graduated Charge: Processor Group 30	NA	94	2,310	NA
5798-DAA	DOS/GPAR Generalized Performance Analysis Reporting; for VSE Graduated Charge: Processor Group 20	NA	66	1,365	NA
	Graduated Charge: Processor Group 30	NA	66	1,365	NA
5798-DPH	JCL Conversion Aid; for VSE, MVS/370, MVS/XA Graduated Charge: Processor Group 20	NA	500	11,000	NA
	Graduated Charge: Processor Group 30	NA	500	11,000	NA
5798-DWD	VM/XA RTM/SF Realtime Monitor/Systems Facility Version 2; for VM/XA Graduated Charge: Processor Group 20	NA	NA	7,500	NA
	Graduated Charge: Processor Group 30	NA	NA	7,500	NA

## IBM 4381 Series

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Licensed Program Support Charge (\$)
<b>Languages and Language-Specific Programming Aids</b>				
5665-433	Algorithm Generation Language Version 2; for MVS/370, SRTOS			
	Graduated Charge: Processor Group 20	NA	NA	11,000
	Graduated Charge: Processor Group 30	NA	NA	11,000
5665-948	BASIC; for MVS/370, MVS/XA	4,170	695	NA
5668-786	COBOL Structuring Facility; for MVS/370, MVS/XA, VS1, VM/SP			
	Graduated Charge: Processor Group 20	NA	12,500	125,000
	Graduated Charge: Processor Group 30	NA	12,500	125,000
5668-805	FORTRAN (VS) Library only Version 2 Release 2; for MVS/370, MVS/XA, VM/XA, VM/SP			
	Graduated Charge: Processor Group 20	NA	200	4,200
	Graduated Charge: Processor Group 30	NA	200	6,000
5668-806	FORTRAN (VS) Compiler, Library and Debug Version 2 Release 2; for MVS/370, MVS/XA, VM/SP, VM/XA			
	Graduated Charge: Processor Group 20	NA	750	15,750
	Graduated Charge: Processor Group 30	NA	750	22,500
5668-864	FORTRAN Language Conversion Program; for MVS/370, MVS/XA, VM/SP, VM/XA			
	Graduated Charge: Processor Group 20	NA	NA	28,000
	Graduated Charge: Processor Group 30	NA	NA	28,000
5668-899	APL2 Release 2.0; for MVS/370, VS1, MVS/XA, VM/IS, VM/SP			
	Graduated Charge: Processor Group 20	4,170	695	9,800
	Graduated Charge: Processor Group 30	4,170	695	14,000
5668-903	FORTRAN IAD Interactive Debug Release 2; for VM/IS, VM/SP, VM/XA, MVS/370, MVS/XA			
	Graduated Charge: Processor Group 20	1,920	320	7,835
	Graduated Charge: Processor Group 30	1,920	320	11,195
5668-940	COBOL II (VS) Library only Version 1 Release 2; for MVS/370, MVS/XA, VS1, VM/SP, VM/XA			
	Graduated Charge: Processor Group 20	2,550	425	10,410
	Graduated Charge: Processor Group 30	2,550	425	14,870
5668-958	COBOL II (VS) Compiler and Library Version 1 Release 2; for MVS/370, VS1, MVS/XA, VM/SP, VM/XA			
	Graduated Charge: Processor Group 20	6,420	1,070	26,210
	Graduated Charge: Processor Group 30	6,420	1,070	37,445
5668-962	Assembler H Version 2 Release 1; for VM/SP, VM/XA, VS1, MVS/370, MVS/XA, TPF2	465	155	NA
5668-996	BASIC/VM Release 2; for VM/IS, VM/SP			
	Graduated Charge: Processor Group 20	1,125	375	4,900
	Graduated Charge: Processor Group 30	1,125	375	7,000
5713-AAG	C for System/370; for MVS/370, MVS/XA			
	Graduated Charge: Processor Group 20	NA	313	5,000
	Graduated Charge: Processor Group 30	NA	313	5,000
5713-AAH	C for System/370; for VM/SP, VM/XA			
	Graduated Charge: Processor Group 20	NA	313	5,000
	Graduated Charge: Processor Group 30	NA	313	5,000
5713-AAR	Development System for the Ada Language; for MVS/370, MVS/XA			
	Graduated Charge: Processor Group 20	NA	1,875	30,000
	Graduated Charge: Processor Group 30	NA	1,875	30,000
5713-AAT	Development System for the Ada Language; for VM/SP			
	Graduated Charge: Processor Group 20	NA	1,565	25,000
	Graduated Charge: Processor Group 30	NA	1,565	25,000
5734-CB4	COBOL Interactive Debug; for MVS/370, MVS/XA, VS1, VM/SP			
	Graduated Charge: Processor Group 20	NA	375	7,875
	Graduated Charge: Processor Group 30	NA	375	11,250
5734-CP1	COBOL Prompter (TSO); for MVS/370, MVS/XA, TSO			
	Graduated Charge: Processor Group 20	NA	38	NA
5734-CP2	Assembler Prompter (TSO); for MVS/370, MVS/XA, TSO			
	Graduated Charge: Processor Group 20	NA	29	1,200
	Graduated Charge: Processor Group 30	NA	29	1,200
5734-CP3	FORTRAN Prompter (TSO); for MVS/370, TSO, MVS/XA			
	Graduated Charge: Processor Group 20	NA	32	1,200
	Graduated Charge: Processor Group 30	NA	32	1,200
5734-LM4	PL/I Resident Library Only Release 5.1; for VM/IS, VM/SP, VM/XA, MVS/370, VS1, MVS/XA			
	Graduated Charge: Processor Group 20	NA	64	1,340
	Graduated Charge: Processor Group 30	NA	64	1,920
5734-LM5	PL/I Transient Library Only Release 5.1; for VM/SP, VM/XA, MVS/370, VS1, MVS/XA			
	Graduated Charge: Processor Group 20	NA	37	775
	Graduated Charge: Processor Group 30	NA	37	1,110
5734-PL1	PL/I Optimizing Compiler and Libraries, R.5.1; for VM/SP, VM/XA, MVS/370, VS1, MVS/XA			
	Graduated Charge: Processor Group 20	NA	296	6,215
	Graduated Charge: Processor Group 30	NA	296	8,880
5734-PL2	PL/I Checkout Compiler; for VM/SP, VS1, MVS/370			
	Graduated Charge: Processor Group 20	NA	575	NA
	Graduated Charge: Processor Group 30	NA	575	NA

IBM 4381 Series

Languages and Language-Specific Programming Aids (Continued)

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated One-Time Charge (\$)	Licensed Program Support Charge (\$)
5734-PL3	PL/I Optimizing Compiler Only R.5.1; for VM/SP, VM/XA, MVS/370, VS1, MVS/XA, TPF2	NA	398	8,355	53
	Graduated Charge: Processor Group 20	NA	398	11,940	53
	Graduated Charge: Processor Group 30	NA			
5736-LM4	PL/I Resident Library Only Release 5.1; for VM/SP, VSE	NA	58	1,215	7
	Graduated Charge: Processor Group 20	NA	58	1,740	7
	Graduated Charge: Processor Group 30	NA			
5736-LM5	PL/I Transient Library Only Release 5.1; for VM/SP, VSE	NA	34	710	7
	Graduated Charge: Processor Group 20	NA	34	1,020	7
	Graduated Charge: Processor Group 30	NA			
5736-PL1	PL/I Optimizing Compiler and Libraries; for VM/SP, VSE	NA	251	5,270	39
	Graduated Charge: Processor Group 20	NA	251	7,530	39
	Graduated Charge: Processor Group 30	NA			
5736-PL3	PL/I Optimizing Compiler Only; for VM/SP, VSE	NA	344	7,220	53
	Graduated Charge: Processor Group 20	NA	344	10,320	53
	Graduated Charge: Processor Group 30	NA			
5740-CB1	COBOL (VS) Compiler and Library; for MVS/370, MVS/XA, VS1, VM/SP	NA	365	7,665	15
	Graduated Charge: Processor Group 20	NA	365	10,950	15
	Graduated Charge: Processor Group 30	NA			
5740-LM1	COBOL (VS) Library Only; for MVS/370, MVS/XA, VS1, VM/SP	NA	118	2,475	7
	Graduated Charge: Processor Group 20	NA	118	3,540	7
	Graduated Charge: Processor Group 30	NA			
5740-RG1	RPG II Report Program Generator; for MVS/370, VS1	663	221	NA	13
5746-CB1	COBOL (DOS/VS) Compiler and Library; for VSE, VM/SP	NA	184	3,860	15
	Graduated Charge: Processor Group 20	NA	184	5,520	15
	Graduated Charge: Processor Group 30	NA			
5746-LM4	COBOL (DOS/VS) Library Only; for VSE, VM/SP	NA	33	690	7
	Graduated Charge: Processor Group 20	NA	33	990	7
	Graduated Charge: Processor Group 30	NA			
5746-RG1	RPG II Report Program Generator; for VSE	NA	160	3,360	7
	Graduated Charge: Processor Group 20	NA	160	4,800	7
	Graduated Charge: Processor Group 30	NA			
5748-F03	FORTRAN (VS) Compiler, Library Release 4.1; for VSE, VS1, MVS/370, MVS/XA, VM/IS, VM/SP	747	249	5,660	18
	Graduated Charge: Processor Group 20	747	249	8,090	18
	Graduated Charge: Processor Group 30	NA			
5785-ABH	PROLOG Programming In Logic; for VM/SP	NA	NA	8,000	NA
	Graduated Charge: Processor Group 20	NA	NA	8,000	NA
	Graduated Charge: Processor Group 30	NA			
5785-ABJ	COBOL/CICS/VS to COBOL II Command Level Conversion Aid; for MVS/370, MVS/XA	NA	350	7,000	NA
	Graduated Charge: Processor Group 20	NA	350	7,000	NA
	Graduated Charge: Processor Group 30	NA			
5796-PNQ	Pascal/VS Release 2.2; for VM/IS, VM/SP, MVS/370, VS1	NA	247	4,410	NA
	Graduated Charge: Processor Group 20	NA	247	6,300	NA
	Graduated Charge: Processor Group 30	NA			
5796-PWA	INTELLECT for DOS/CICS-SQL/DS; for VSE	NA	2,245	42,000	NA
	Graduated Charge: Processor Group 20	NA	2,245	42,000	NA
	Graduated Charge: Processor Group 30	NA			
5796-PWC	INTELLECT for MVS/VSAM; for MVS/370, MVS/XA	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 20	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 30	NA			
5796-PWE	INTELLECT for VM-VSAM; for VM/SP	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 20	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 30	NA			
5796-PWJ	General CICS/VS ADA	NA	NA	12,100	NA
	Graduated Charge: Processor Group 20	NA	NA	12,100	NA
	Graduated Charge: Processor Group 30	NA			
5796-PYH	INTELLECT for VM-SQL/DS; for VM/SP	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 20	NA	3,050	57,000	NA
	Graduated Charge: Processor Group 30	NA			
5798-DFH	FORTRAN Utilities Version 2.2.; for VM/IS, VM/SP, VM/XA	NA	NA	1,100	NA
	Graduated Charge: Processor Group 20	NA	NA	1,575	NA
	Graduated Charge: Processor Group 30	NA			
5798-DQZ	LISP/VM List Processing; for VM/SP	NA	325	7,150	NA
	Graduated Charge: Processor Group 20	NA	325	7,150	NA
	Graduated Charge: Processor Group 30	NA			
5798-DXJ	FORTRAN (VS) Execution Analyzer; for MVS/370, MVS/XA, VM/SP	NA	NA	12,500	NA
	Graduated Charge: Processor Group 20	NA	NA	12,500	NA
	Graduated Charge: Processor Group 30	NA			
5798-RWP	Expert System Consultation Environment/VM; for VM/SP	NA	1,250	25,000	NA
	Graduated Charge: Processor Group 20	NA	1,250	25,000	NA
	Graduated Charge: Processor Group 30	NA			
5798-RWQ	Expert System Development Environment/VM; for VM/SP	NA	1,750	35,000	NA
	Graduated Charge: Processor Group 20	NA	1,750	35,000	NA
	Graduated Charge: Processor Group 30	NA			



## IBM 4381 Series

		Initial Basic License Charge (\$)	Monthly Basic License Charge (\$)	Graduated One-Time Charge (\$)	Licensed Program Support Charge (\$)
<b>Data Base Management and File Handling (Continued)</b>					
5798-DLL	Data Base Edit Facility; for VM/IS, VM/SP, MVS/370, MVS/XA	NA	NA	4,235	NA
	Graduated Charge: Processor Group 20	NA	NA	6,050	NA
	Graduated Charge: Processor Group 30				
5798-DQL	Relational Design Tool; for VM/SP, VSE	NA	NA	4,400	NA
	Graduated Charge: Processor Group 20	NA	NA	4,400	NA
	Graduated Charge: Processor Group 30				
5798-DZP	DXTA Data Extract Assist Tool	NA	NA	7,000	NA
	Graduated Charge: Processor Group 20	NA	NA	7,000	NA
	Graduated Charge: Processor Group 30				
<b>Data Communications, Time Sharing, Transaction Processing, Terminal Control</b>					
5662-262	TPNS Teleprocessing Network Simulator Version 2 Release 3.0; for VM/SP, MVS/XA, MVS/370	NA	1,875	NA	NA
5664-175	NCCF Network Comm. Control Facility Version 2; for VM/SP	1,920	320	NA	33
5664-183	3270 Display Option; for VM/XA	2,400	800	NA	42
5664-188	RSCS Networking Version 2 Release 2; for VM/IS, VM/SP				
	Graduated Charge: Processor Group 20	NA	337	6,300	38
	Graduated Charge: Processor Group 30	NA	337	6,300	38
5664-190	NPDA Network Problem Determination Application Version 3 Release 2.0; for VM/SP	1,350	225	NA	20
5664-202	NETDA Network Design and Analysis; for VM/SP				
	Graduated Charge: Processor Group 20	NA	750	15,000	NA
	Graduated Charge: Processor Group 30	NA	750	15,000	NA
5664-204	NetView; for VM/SP				
	Graduated Charge: Processor Group 20	NA	940	19,740	90
	Graduated Charge: Processor Group 30	NA	940	28,200	90
5664-280	ACF/VTAM Virtual Telecomm. Access Method Version 3 Release 1.1; for VM/SP				
	Graduated Charge: Processor Group 20	3,535	1,175	19,660	247
	Graduated Charge: Processor Group 30	3,535	1,175	28,090	247
5664-281	3270 PC File Transfer Version 1.0 for VM/IS, VM/SP				
	Graduated Charge: Processor Group 20	NA	NA	600	NA <sup>§</sup>
	Graduated Charge: Processor Group 30	NA	NA	600	NA
5664-289	ACF/SSP System Support Program Version 3 Release 1.0; for VM/IS, VM/SP	960	320	NA	44
5664-298	PC Bond: PC Connectivity to VM, Release 2.0; for VM/IS, VM/SP				
	Graduated Charge: Processor Group 20	NA	107	2,000	NA
	Graduated Charge: Processor Group 30	NA	107	NA	NA
5664-315	FTP File Transfer Program Version 2 Release 2.0; for VM/SP only				
	Graduated Charge: Processor Group 20	NA	450	7,875	NA
	Graduated Charge: Processor Group 30	NA	450	11,250	NA
5664-319	VM/PC Host Server for VM/IS, VM/SP				
	Graduated Charge: Processor Group 20	NA	135	2,000	NA
	Graduated Charge: Processor Group 30	NA	135	2,000	NA
5665-279	BTAM/SP Basic Telecommunications Access Method/System Product; for MVS/XA, MVS/370				
	Graduated Charge: Processor Group 20	NA	NA	5,950	13
	Graduated Charge: Processor Group 30	NA	NA	5,950	13
5665-285	TSO/E TSO Extensions Release 3				
	For MVS/370				
	Graduated Charge: Processor Group 20	1,500	500	17,900	87
	Graduated Charge: Processor Group 30	1,500	500	17,900	87
	For MVS/XA				
	Graduated Charge: Processor Group 20	1,500	555	17,900	108
	Graduated Charge: Processor Group 30	1,500	555	17,900	108
5665-288	OCCF/MVS Operator Console Communications Facility; for MVS/370, MVS/XA	1,050	350	NA	8
5665-289	ACF/VTAM Virtual Telecomm. Access Method Version 3 Release 1.1; for MVS/XA				
	Graduated Charge: Processor Group 20	6,255	2,085	67,760	302
	Graduated Charge: Processor Group 30	6,255	2,085	67,760	302
5665-313	ACF/VTAM Virtual Telecomm. Access Method Version 3 Release 1.1; for MVS/370	5,130	1,710	NA	275
5665-314	ACF/TCAM Telecommunications Access Method Version 3; for MVS/370, MVS/XA only	8,025	2,675	NA	330
5665-316	NCCF Network Comm. Control Facility Version 2 Release 2.0; for MVS/XA (31-bit mode)	2,730	455	NA	66
5665-321	NPDA Network Problem Determination Application Version 3 Release 2; for MVS/XA (31-bit)	2,040	340	NA	30
5665-333	NPM NetView Performance Monitor; for MVS/370, MVS/XA	3,210	615	NA	57
5665-338	ACF/SSP System Support Program Version 3 Release 3.0; for MVS/370, MVS/XA	1,605	535	NA	71
5665-345	SAMON SNA Applications Monitor; for MVS/370, MVS/XA				
	Graduated Charge: Processor Group 20	NA	NA	9,000	NA
	Graduated Charge: Processor Group 30	NA	NA	9,000	NA
5665-361	NetView; for MVS/370	NA	1,060	NA	124