

BASF 7/7X Series

MANAGEMENT SUMMARY

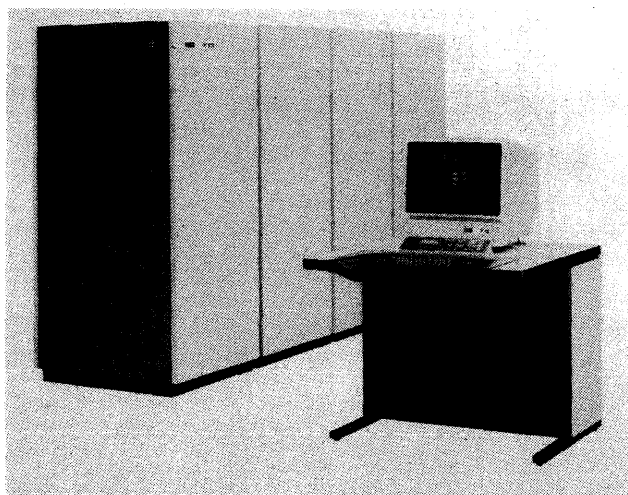
The BASF 7/7X Series was introduced in 1982 and has been expanded so that it currently contains 5 single processor models, the 7/71, 7/72, 7/73, 7/75, and 7/78. The two most recent models are the 7/71 and 7/72 which bring into the series cheaper entry-level systems. The 7/78 is additionally available in a dual-processor version termed the 7/78 MP. The complete range is field-upgradeable.

The 7/7X Series contains the middle systems within BASF's total range of IBM-compatible machines. The less powerful models form the BASF 7/6X Series, while the top-end models belong to the 7/8X Series. All models are based on Hitachi processors.

All models use the Hitachi M260H central processor, and are a demonstration of BASF's continuing close cooperation with Hitachi. The 7/7X Series is fully compatible with the IBM 308X and earlier 3033 Series. BASF's strategy is to offer savings of 50 percent on the corresponding machine price. Performance figures for the 7/7X Series range from 3.3 MIPS (Million Instructions Per Second) to 15.5 MIPS (see Table 2 for comparison to IBM machines).

The standard system for all 5 models includes a central processor, 16M bytes of main memory, an integrated input/output processor with adapter, 2 byte multiplexer channels, each with a transfer rate of 100K bytes per second, and 6 high-speed block multiplexer channels, each with a transfer rate of 3M bytes per second. Also included in the standard system are a console, containing a VDU, keyboard, printer adapter, and remote link, and a power and service processor.

All models use advanced chip technology, incorporating 256K-bit main memory chips, and BASF claims high reliability. ➤



The BASF 7/73, a 4.5 mips cpu offering high speed buffer storage of 32KB and maximum main memory of 16MB. Based on the Hitachi M260H processor, the 7/73 is equivalent to the IBM 3083 E.

The 5 models forming the 7/7X Series from BASF are based on Hitachi's M260H processor and are fully hardware- and software-compatible with comparable IBM systems. BASF aims to provide improved price/performance over the IBM models.

MODELS: BASF 7/71, 7/72, 7/73, 7/75, 7/78.

CONFIGURATION: 1 or 2 (7/78 only) CPUs, from 16MB to 32MB main memory, and 1 to 3 input/output processors.

COMPETITION: IBM 308X.

PRICE: Purchase prices range from approximately DM 1.600.000 for a basic 7/71, to over DM 4.000.000 for a 7/78 configuration.

CHARACTERISTICS

VENDOR: BASF AG, D6700 Ludwigshafen, West Germany. Telephone (0621) 601.

COMPANY LOCATIONS: *Argentina:* BASF Argentina SA, Av. Corrientes 327, 1000 Buenos Aires. Telephone (01) 312 949196; *Austria:* BASF Osterreich GmbH, Heitzinger Hauptstr. 119, A-1131 Vienna. Telephone (0222) 82 94310; *Belgium:* BASF Chimi SA, Avenue Hamoir-Iaan 14, B-1180 Brussels. Telephone (02) 375 2400; *Brazil:* BASF Brasileira SA, Industrias Quimicas, Avenida Sao Luiz 86, 01046 Sao-Paulo-Sp. Telephone (011) 257 0011; *Finland:* O.Y. Mercantile AB, Viljatie 2, SF-00701 Helsinki. Telephone (0) 354122; *France:* Compagnie Française BASF SA, 140 rue Jules Guesde, 92303 Levallois. Telephone (01) 730 5500; *Netherlands:* BASF Nederland b.v., Kadestraat 1, 6811 Arnhem. Telephone (085) 717171; *Spain:* BASF Espanola SA, Paseo de Gracia 99, E-08008 Barcelona. Telephone (03) 215 1354; *Sweden:* BASF Svenska AB, Vretenvaegen 10, S-17154 Solna. Telephone (08) 980840; *Switzerland:* BASF (Schweiz) AG, Appital, CH-8820 Wädenswil/Au. Telephone (017) 839111; *United Kingdom:* BASF United Kingdom Ltd., 4/5 Fitzroy Square, London W1P 6ER. Telephone (01) 388 4200.

MANUFACTURER: Hitachi, Japan.

MODELS: BASF 7/71, 7/72, 7/73, 7/75, and 7/78, based on the Hitachi M260H. The 7/78 is available as the 7/78 MP.

DATE ANNOUNCED: 7/73, 7/75, 7/78—Autumn 1982.

DATE OF FIRST DELIVERY: 7/73, 7/75, 7/78—December 1982.

NUMBER INSTALLED TO DATE: —

DATA FORMATS

BASIC UNITS: 8-bit byte, 16-bit half-word, 32-bit word. A byte represents one alphanumeric character, 2 BCD digits, or 8 bits. ➤

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TABLE 1. BASF 7/7X SERIES CHARACTERISTICS

MODEL	7/71	7/72	7/73	7/75	7/78	7/78 MP
SYSTEM CHARACTERISTICS						
Date of introduction	NA	NA	Autumn 82	Autumn 82	Autumn 82	NA
Date of first delivery	NA	NA	Dec. 82	Dec. 82	Dec. 82	NA
Number of CPUs per system	1	1	1	1	1	2
Performance, MIPS	3.3	3.8	4.9	6.6	8.5	15.5
Principal operating systems	VM/370 or VM/SP or MVS/ SP or MVS/XA	VM/370 or VM/SP or MVS/ SP or MVS/XA	VM/370 or VM/SP or MVS/ SP or MVS/XA	VM/370 or VM/SP or MVS/ SP or MVS/XA	VM/370 or VM/SP or MVS/ SP or MVS/XA	VM/370 or VM/SP or MVS/ SP or MVS/XA
MAIN STORAGE						
Storage type	NMOS	NMOS	NMOS	NMOS	NMOS	NMOS
Read cycle time, nanoseconds	NA	NA	NA	NA	NA	NA
Bytes fetched per cycle	8	8	8	8	8	8
Minimum capacity, MB	16	16	16	16	16	16
Maximum capacity, MB	32	32	32	32	32	32
Increment size, MB	16	16	16	16	16	16
Error correcting memory	Standard	Standard	Standard	Standard	Standard	Standard
CACHE STORAGE						
Capacity, KB	32	32	32	64	64	64
Cycle time, nanoseconds	13	13	13	13	13	13
I/O CHANNELS AND ADAPTORS						
No. of BYMUXs	0-6	0-6	0-6	0-6	0-6	0-6
No. of BLMUXs	6-24	6-24	6-24	6-24	6-24	6-24
Total maximum no. of channels	24	24	24	24	24	24
Maximum channel data rates						
byte multiplexer, KB/sec	100	100	100	100	100	100
block multiplexer, MB/sec	3	3	3	3	3	3
Channel to channel adapter	Optional	Optional	Optional	Optional	Optional	Optional
Other adapters from IBM or PCMs	Can be fitted	Can be fitted	Can be fitted	Can be fitted	Can be fitted	Can be fitted

BYMUX—byte multiplexer channel
BLMUX—block multiplexer channel

NA—not available.

ability. The service processor comes into operation if a failure occurs, enabling the system to be used in spite of the malfunction. The service processor keeps downtime to a minimum by initiating recovery procedures.

Expansion possibilities on all models include main memory increase to 16M bytes, an additional two input/output processors, and a second system console.

An optional feature on each central processor is High-Speed Arithmetic which speeds up arithmetic operations.

The BASF 7/7X machines offer total software compatibility with the IBM operating systems: MVS/SP, MVS/XA, VM/370, and VM/SP. These operating systems are all available with the IBM 308X Series.

COMPETITIVE POSITION

The BASF 7/7X Series is hardware- and software-compatible with the IBM 308X Series. Specifically, the approximately equivalent BASF and IBM machines are as follows: BASF 7/71 with IBM 3083 CX; 7/72 with 3083 EX; the 7/73, 7/75, and 7/78 encompass the 3083 BX and JX; and the 7/78 MP with the dual-processor IBM 3081 KX.

Other PCMs which also compete with the IBM 308X Series include National Advanced Systems AS/8000 and AS/9000 models, and the Amdahl 580 Series. In common with BASF, both Amdahl and NAS aim to provide price/performance improvements over IBM systems.

FIXED-POINT OPERANDS: Operands can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode, and one half-word (16 bits) or one word (32 bits) in binary mode.

FLOATING-POINT OPERANDS: In "short" format, an operand consists of 1 word with a 24-bit fractional part and 7-bit hexadecimal exponent. For extended precision format, 2 words are used, comprising a 56-bit fraction and 7-bit hexadecimal exponent.

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

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

MAIN STORAGE

TYPE: 256K-bit NMOS chips.

CYCLE TIME: Access time to main memory is 150 nanoseconds.

CAPACITY: 7/71, 7/72, 7/73, 7/75, 7/78: 16MB to 32MB in one increment of 16MB.

CHECKING: There are 3 mechanisms for error detection. These are:

- Parity checking on all data paths within the central processor and on all the channels.
- A Hamming-code check on all operations in main storage. This automatically ensures that all single-bit errors are corrected, and that all multiple-bit errors are detected.
- A combined check sum and parity check to detect and correct errors in control storage.

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▷ ADVANTAGES AND RESTRICTIONS

BASF emphasizes the reliability of its systems, and this claim is supported in the User Reaction section of the report where users gave a very high rating for mainframe reliability. BASF's maintenance service was also rated strongly.

The 7/7X forms a part of BASF's full IBM-compatible line which also comprises the 7/6X and 7/8X Series. All systems are based on Hitachi processors, and provide a wide performance range offering users the possibility of retaining peripherals and some software when upgrading to a more powerful system.

USER REACTION

In 1985 Datapro Survey of German Users of Computer Systems brought responses from users of seven BASF 7/XX systems. Information on 7/6X, 7/7X, and 7/8X machines is all included within the one table. The average life of the systems was approximately 33 months. Major application areas included accounting/billing, order processing/inventory control, payroll/personnel, manufacturing, sales distribution, and purchasing.

A data base management system was installed on six machines, a communications monitor ran on all seven systems, and two systems supported integrated word processing functions.

All seven users intended to expand their data communications facilities within the next 12 months, while six users hoped to expand their hardware, and six intended to acquire proprietary software from suppliers other than BASF.

The seven users were obviously well satisfied with the BASF machines, as shown when all replied "Yes" to both of the following question: "Did the system do what you expected it to do?" and "Would you recommend the system to another user?"

Users were asked to evaluate the different aspects of their systems under the headings: Excellent, Good, Fair, and Poor. The system ratings are summarized in the following table.

Ease of operation	3.29
Reliability of mainframe	3.86
Reliability of peripherals	3.43
Maintenance service:	
Responsiveness	3.43
Effectiveness	3.57
Technical support:	
Troubleshooting	3.00
Education	3.00
Documentation	3.00
Manufacturer's software:	
Operating system	2.71
Compilers & assemblers	2.71
Applications programs	2.40
Ease of programming	2.33
Ease of conversion	2.40
Overall satisfaction	2.67

Weighted averages on a scale of 4.0 for Excellent.

▶ **STORAGE PROTECTION:** Protection is facilitated by the use of 2K pages or multiples thereof. There is also separate protection for the lowest address space in memory. These features prevent unauthorized access to programs and data.

CENTRAL PROCESSORS: The MIPS (Million Instructions Per Second) ratings for the BASF 7/7X systems are as follows: 7/71: 3.3; 7/72: 3.8; 7/73: 4.9; 7/75: 6.6; 7/78: 8.5; 7/78 MP: 15.5. Central processor cycle times are 40 nanoseconds for the /71, /72, /73, and /75, and 35 nanoseconds for the 7/78.

The functions of the central processor are:

- Executing both central and I/O instructions
- Controlling and monitoring channel operations and main storage access
- Communicating with the service processor when required
- Facilitating access by the service processor if there is a hardware malfunction.

SERVICE PROCESSOR: The service processor is integrated into the CPU and has the following functions:

- Continuous monitoring of all attached environmental sensors (power, cooling, and humidity)
- Monitoring communication between console and CPU
- Error analysis, gathering, and recording data on hardware malfunction, and initiating recovery procedures
- Controlling the execution of diagnostic programs
- Initiating and controlling remote (telephone) system support functions.

CONTROL STORAGE: Consists of 252KB, divided into 16K 126-bit words.

CACHE STORAGE: Access time to cache memory, from which most instructions are fetched, is 13 nanoseconds on all models. Capacity is 32KB on the 7/71, 7/72, and 7/73, and 64KB on the 7/75 and 7/78.

ADDRESSING: Real, absolute, and logical addressing modes are used. Direct addressing of virtual program segments can take place. There is also a dual-address space facility whereby 2 locations can be addressed simultaneously.

DYNAMIC ADDRESS TRANSLATION: The translation between virtual and real addresses is made via a 2-level table lookup. This process is aided by the provision of a Translation Look-Aside Buffer (TLB) which provides 512 address pairs.

INSTRUCTION REPERTOIRE: The System/370 mode contains 183 instructions, including 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 Look-Aside Buffer, Store Then AND System Mask, and Store Then OR System

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➤ Users also gave the following additional ratings:

Ease of conversion/reconfiguration	3.00
Compatibility of terminals and peripherals	3.29
Compatibility of programs/data from other systems	3.43
Power/energy efficiency	3.43
Productivity aids keep program costs down	2.20
Software and support promised by vendor	2.20
Timely delivery/installation of equipment	3.00
Timely delivery of required software	3.00
Keeping up with and implementing vendor changes to hardware/software	3.33

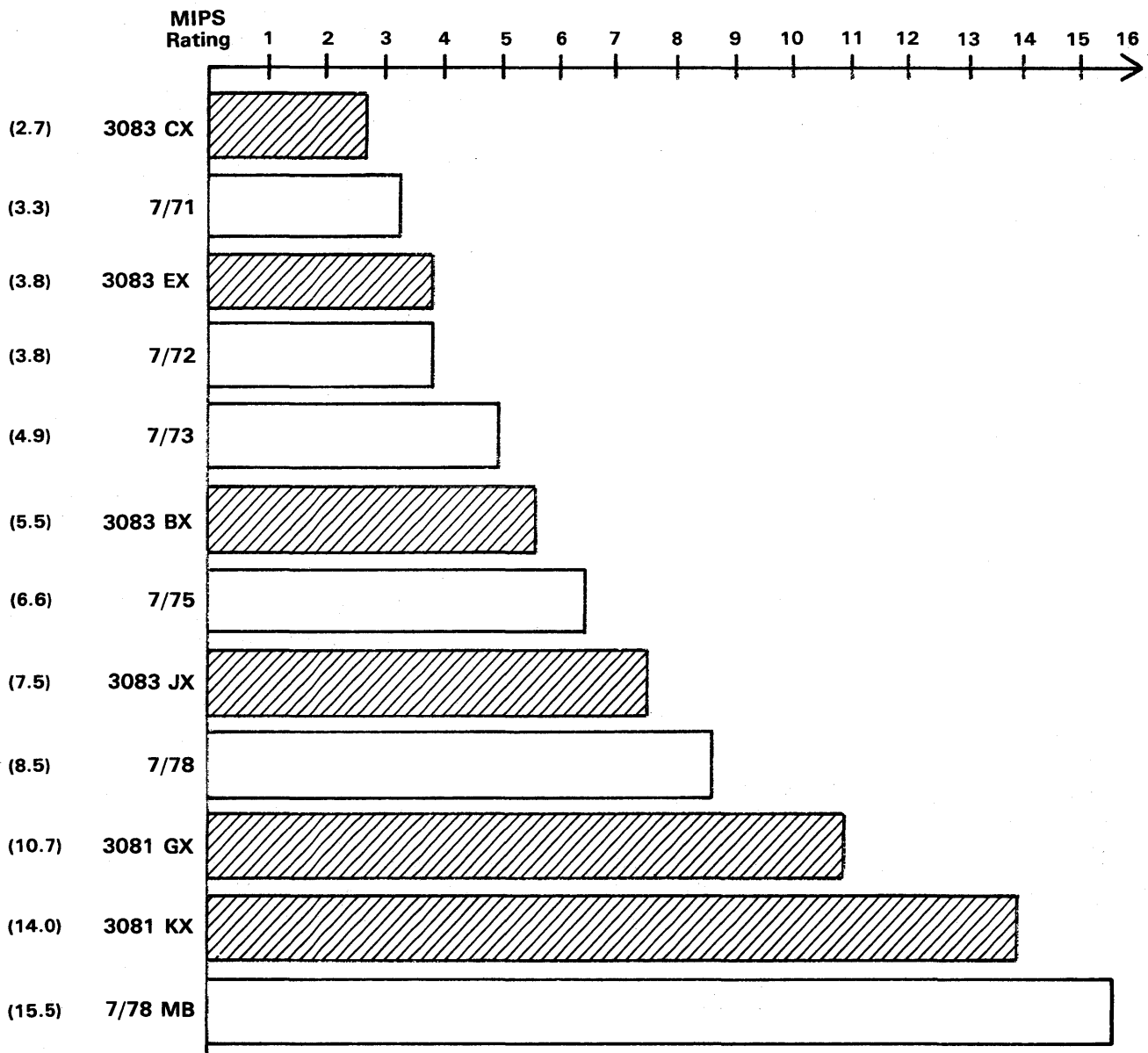
Weighted averages on a scale of 4.0 for Excellent. □

➤ **Mask;** the VTAM support instructions of Compare and Swap, and Compare Double and Swap; the extended precision floating-point instructions; and Multiply/Add.

INTERRUPTS: 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 program status word (PSW) is stored and from which the new PSW is fetched.

SYSTEM CONSOLE: A display and separate keyboard with an optional hard copy printer. The 7-color display has a screen diagonal of 14 inches and holds 25 lines of 80 characters, with an extra line for system status. The keyboard has 87 keys including 12 program function keys. All models are equipped with one system console as standard, and a second is optional. The system console can be sited up to 33 meters from the central processor. ➤

Table 2. BASF 7/7X and IBM 308X System Comparison



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► PHYSICAL SPECIFICATIONS

The central processor for each model, containing 16MB of main memory and 1 input/output processor, weighs approximately 1310 kg.

INPUT/OUTPUT CONTROL

All models include in the standard configuration one I/O Processor (IOP), and can optionally support an additional 2 IOPs. Each IOP has a maximum of 8 channels, including up to 2 byte multiplexer channels (BYMUXs) and between 6 and 8 block multiplexer channels (BLMUXs). The total number of channels per central processor is therefore 24.

The data rate on a BYMUX is 100KB per second, and is 3MB per second on a BLMUX. A data streaming facility is standard on all BLMUXs. The total channel throughput per central processor is 55.9M bps on the 7/71, 7/72, 7/73, and 7/75, and 60M bps on the 7/78.

Each BYMUX and BLMUX has 256 subchannels which can be, in effect, a specific device. Any IBM or IBM-compatible peripherals may be used, including the wide range of BASF peripherals.

CONFIGURATION RULES

The major difference between the 5 models, 7/71, 7/72, 7/73, 7/75, and 7/78, is in central processor power. Each system comprises a basic 16MB of main memory, expandable to 32MB, cache memory, from 1 to 3 input/output processors, and 1 system console. Cache memory consists of 32KB on the 7/71, 7/72, and 7/73, and 64KB on the 7/75 and 7/78 (see Table 1 for full specifications).

Options for all models include:

- A second system console
- A console printer
- The so-called direct control feature which interfaces directly with another compatible central processor or peripheral to enable data exchange to take place with minimum delay
- High-speed arithmetic (HSA) which accelerates execution of floating-point and fixed-point arithmetic instructions with a performance improvement of up to 15 percent
- A channel-to-channel adapter which facilitates the exchange of data between CPUs via byte or block multiplexer channels.

An optional feature which is only available on the 7/78 is the Multiprocessor (MP). This is a coupled processor which uses the same operating system and main memory as the basic processor, but has its own I/O channels. The MP option offers additional channel groups to increase channel throughput and load balancing, and BASF states that the 7/78 MP has a MIPS rating of 15.5.

MASS STORAGE

All IBM mass storage devices for the 360, 370, 4300 and 308X Series can be fitted to the BASF 7/7X Series. Compatible peripherals from PCMs, including BASF, may be used. The BASF disk drives are:

BASF 6470/6472: Compatible with the IBM 3370, the 6470 and 6472 units can be attached to BASF 7/7X and 7/6X Series, and IBM 4341, 4361, and 4381 systems using the IBM 3880 Model 1, 2, or 4. Connection to the IBM 4331 and 4361 is also possible through the DASD

adapter. The disk unit has 1 spindle with a capacity of 570MB. The average access time is 20 ms, and the transfer rate is 1859K bps. The 2 units are specifically compatible with the IBM 3370 A01 (BASF 6470) and IBM 3370 B01 (BASF 6472).

BASF 6470-2/7472-2/6473-2: Compatible with IBM 3370-2. Connection to BASF and IBM systems is as for BASF 6470/6472. The disk unit has 1 spindle with a capacity of 730MB. The average access time is 19 ms, and the transfer rate is 1859KB/second. The units are specifically compatible with IBM 3370 A02 (BASF 6470-2), and IBM 3370 B02 (BASF 6472-2). The BASF 6473-2 has no IBM equivalent and allows, as the last unit in a string, increased performance by using the "Cross Call" feature.

BASF 6475/6476/6477: Compatible with the IBM 3375, the units can be attached to BASF 7/7X and 7/6X Series, and IBM 4341, 4361, and 4381 systems using the BASF 6085-1 or IBM 3880 model 1, 2, or 4 disk controllers. The disk unit has 1 spindle with a capacity of 820MB. The average access time is 19 ms, and the transfer rate is 1859K bps. The units are specifically compatible with IBM 3375 A01 (6475), IBM 3375 B01 (6476), and IBM 3375 D01 (6477).

BASF 6480/6481: Compatible with the IBM 3380. This model attaches to BASF 7/6X, 7/7X, and 7/8X, and IBM 4341, 4361, 4381, 303X, or 308X systems via the BASF 6085-7 control unit. The 6480/6481 has 2 drives per unit, each with a capacity of 1260MB. Average access time is 25 ms. The transfer rate is 3MB/second.

INPUT/OUTPUT UNITS

Most IBM System 360 and 370, and 4300 and 308X Series peripherals can be connected to the BASF 7/7X Series, as can peripherals from PCMs including BASF. The BASF units are detailed below.

BASF 6060/636X COMPACT MAGNETIC TAPE SUBSYSTEM: The 6060 is the controller and the 636X, the magnetic tape drive. The drive is compatible with IBM's 3420 models 4 and 6. The 6060 control unit can have switching to enable it to access up to 16 tape drives, and for the unit to be linked to 2 channels automatic threading is standard. The 636X tape drive is either the 6364 or the 6366 unit. The recording density in each case is either 6250 bpi in Group Coded Recording (GCR) or 1600 bpi in PE. Data transfer rates are: 500K bps for the 6364 at 6250 bpi and 128K bps at 1600 bpi; and 780K bps for the 6366 at 6250 bpi and 200K bps at 1600 bpi.

BASF 6050/6358 MAGNETIC TAPE SUBSYSTEM: The 6050 is the controller and the 6358, the magnetic tape drive. The drive is compatible with IBM's 3420-8. The recording density is either 6250 bpi in GCR or 1600 bpi in PE. Data transfer rates are 1250K bps at 6250 bpi and 320K bps at 1600 bpi.

Other peripherals offered by BASF for the 7/7X Series include 2 line printers.

BASF 6603 LINE PRINTER: This has its own integrated controller. The printer is compatible with the IBM 3203-5 and operates at 1250 lpm with a 48-character set. The unit uses a print band which is mounted as a separate device to facilitate changing. Among the advantages of this printer are: microprogrammed self-diagnostics; microprocessor management of the printing process, paper feed, ribbon feed buffer, and transfer of data between channel and printer; and paper feed under program control. Paper particles and dust are removed continuously during printing by a vacuum system. A major advantage claimed is that the printer is ►

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► silent because of a cover that encloses the printer and the powered stacker. Using an OCR print band, the printout is OCR readable.

BASF 6606 LINE PRINTER: Compatible with the IBM 3203-5. It prints 2000 lines per minute using a 48-character set, 1640 lpm with a 64-character set, 1200 lpm with a 96-character set, and 950 lpm with a 128-character set. Its features are the same as for the 6603, including OCR capability. The 6606 uses the same print bands and print ribbons as the 6603.

COMMUNICATIONS CONTROL

Communications adapters from IBM for the 308X Series, and similar devices from PCMs may be fitted to the BASF 7/7X Series. BASF itself does not offer any devices in this area.

SOFTWARE

OPERATING SYSTEMS: The 7/7X machines can run under the following operating systems:

- VM/370
- VM/SP
- MVS/SP
- MVS/XA.

VM/370, VM/SP, and MVS/SP use functions which are either directly microcoded in the BASF systems, or use instructions which are closest to the way in which the machines are microcoded.

All IBM program products as well as compatible programs from other suppliers may be used.

VM/370 (Virtual Machine/370): A system control program which manages a machine's resources such as central processor, storage, and I/O devices, so that all are available to many users at the same time. It provides virtual machines with the ability to run multiple operating systems concurrently and with a conversational time-sharing system. VM/370 is designed to run on systems with the Dynamic Translation Feature operating in System/370 mode, and can therefore be used on all BASF 7/7X machines.

VM/SP (Virtual Machine/System Product): VM/SP is a program product which extends the capabilities of VM/370. MVS/SP can also run under VM/SP. The overall effect is to increase the operating efficiency of the sub-operating systems by as much as 80 percent. It is estimated, however, that VM/SP will use about 15 percent of a system's resources.

MVS/SP (Multiple Virtual Storage/System Product): MVS/SP is IBM's large-scale operating system.

MVS/XA (Multiple Virtual Storage/Extended Architecture): MVS/XA is designed to support the System/370 Extended Architecture. It comprises MVS/SP and the Data Facility Product, which provides data management, device support, program library management, and utility functions.

PRICING: The following prices apply in Germany only, and are not necessarily indicative of prices outside Germany. The prices listed include 16MB main memory and one IOP for each model.

	Purchase Price (DM)
MODEL 7/71	1.599.000
MODEL 7/72	1.952.000
MODEL 7/73	2.657.000
MODEL 7/75	3.505.000
MODEL 7/78	4.329.000