BASF 7/65 and 7/68

MANAGEMENT SUMMARY

The chief attraction of the BASF 7/65 and 7/68 is virtually complete compatibility with IBM's 4300 and 370 series at lower cost, in less space, and with lower power consumption. The BASF machines are essentially Hitachi products, using the latest technology and very highly integrated circuits with 64K-bit chips. Excellent reliability is claimed, as all systems are tested at temperature and shock ranges well in excess of those likely to be met in practice.

The organizations most likely to be interested in these Hitachi/BASF products are those looking for an upgrade or replacement for existing IBM 370 or 4300 range systems. The main question in all cases is—is it worth it? Do the cost savings, which can be considerable, especially if non-IBM peripherals are also used, really warrant the risks in dealing with a smaller company with little experience in maintaining mainframes? On a statistical basis, the probability is that the more highly integrated the circuits, the less the likelihood of faults. It is also true that peripherals give more problems than processors and that those of the electro-mechanical type (printers, readers, for example) give more trouble than the units with fewer moving parts, and BASF has considerable experience in maintaining peripherals. On this basis, the risks are lower with BASF than with IBM. As far as the software is concerned, there is no doubt about total compatibility.

COMPARISON WITH THE IBM 4341-2

Throughput using the same software and same program is the only real measure of performance, and BASF quotes extensive test figures using this criterion. But many people are faintly suspicious of such tests. Results are often difficult to interpret and rows of figures don't make interesting reading. The keys to throughput are ▷

The BASF 7/65 and 7/68 are compatible with the IBM 4300 and 370 series at both hardware and software levels. The 7/65 is up to 50 percent faster than the IBM 4341-2 and the 7/68, to which the 7/65 is field upgradeable, is about twice as fast. The systems also cost less than the IBM units. The BASF machines are Hitachi based and can use all IBM's peripherals as well as those from plug-compatible manufacturers such as BASF.

MODELS: BASF 7/65 and 7/68, both based on the Hitachi M240H.
CONFIGURATIONS: The 7/65 has from 2 to 8 megabytes of main memory, one or two byte multiplexer channels and up to 6 block multiplexer channels, all with data streaming capability. The 7/68 has from 4 to 16 megabytes of main memory and the same possible complement of byte and block multiplexer channels.
COMPETITION: Comparable Hitachi based systems from NAS and IBM's 4300 series.
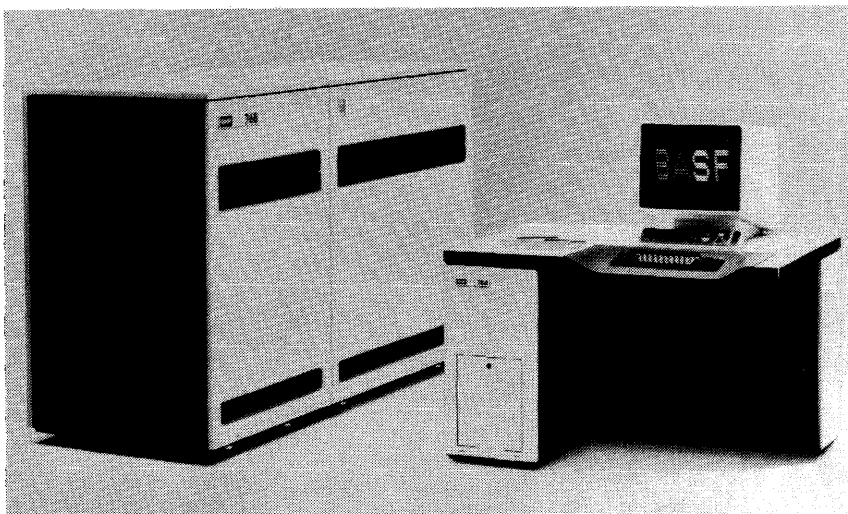PRICE: Purchase price for a 7/65 with 4 megabytes and 5 input/output channels is about DM 840,000. The price for a large 7/68 is about DM 2,000,000.

CHARACTERISTICS

VENDOR: BASF AG, D6700 Ludwigshafen, West Germany. Telephone (621) 601.

MANUFACTURER: Hitachi, Japan.

MODELS: BASF 7/65, 7/68, both based on the Hitachi M240H. ▶

The BASF 7/68, a plug-compatible substitute for the IBM 4341-2, is based on the Hitachi M240H and can support both IBM and BASF peripherals. BASF reports that tests show the 7/68 is about twice as fast as the 4341-2 while taking up less space and generating less heat.

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CHARACTERISTICS OF THE BASF 7/65 and 7/68 PROCESSORS

	BASF 7/65	BASF 7/68
SYSTEM CHARACTERISTICS		
Date of introduction	Spring 1982	Spring 1982
Date of first delivery	September 1982	4th. quarter 1982
Number of CPUs per system	1	1
Principal operating systems	DOS/VSE	DOS/VSE
	OS/VS1 Rel. 7	OS/VS1 Rel. 7
	VM/370 Rel. 6	VM/370 Rel. 6
Purchase price of CPU with minimum storage capacity (DM)	790,000	1,008,000
MAIN STORAGE		
Storage type	NMOS	NMOS
Read cycle time, nanoseconds	600 approx.	600 approx.
Write cycle time, nanoseconds	Not specified	Not specified
Bytes fetched per cycle	8	8
Minimum capacity, bytes	2,097,152	4,194,304
Maximum capacity, bytes	8,388,608	16,777,216
Increment size, bytes	2,097,152	4,194,304
Error correcting memory	standard	standard
BUFFER STORAGE		
Capacity, bytes	65,536	65,536
Cycle time; nanoseconds	18	18
CENTRAL PROCESSOR		
Performance relative to IBM 4341/2	1.3 to 1.5	2.0 to 2.3
Operating modes	ECPS:VSE	ECPS:VSE
	System/370	System/370
Instruction set	S/370 universal except for multiprocessor	
Reloadable control storage, bytes	147,456	147,456
Data path width, bytes	8 per bank (2 banks)	8 per bank (2 banks)
Direct access storage capability	optional	optional
I/O CHANNELS AND ADAPTERS		
No. of byte multiplexer channels	1 std., 2 max.	1 std., 2 max.
No. of block multiplexer channels	4 std., 6 max.	4 std., 6 max.
No. of high speed block multiplexer chnls.	4 std., 6 max.	4 std., 6 max.
Total maximum no. of channels	8	8
Maximum channel data rates, bytes/second:		
byte multiplexer	80,000	100,000
block multiplexer	3,000,000	3,000,000
Channel to channel adapter	Optional	Optional
All other adapters from IBM or PCMs	Can be fitted	Can be fitted

▷ processor power, channel capabilities, and the performance of the peripherals. In processor performance, the 7/65 is between 30 and 50 percent faster than the 4341-2, and the 7/68 is up to twice as fast, the actual speed depending on what options are added. The channel capabilities favor the BASF/Hitachi products.

Both BASF machines can have two byte multiplexer channels, whereas the IBM 4341-2 has only one. And the 7/65 and 7/68 offer up to six bock multiplexer channels with higher throughput capability, since all 6 BASF channels have data streaming. The 4341-2 has a maximum of five block multiplexers. This BASF/Hitachi advantage would be highlighted if one or more channels failed. If this happened on the 4341-2, it is virtually certain that performance would be degraded. The 4341-2 has two 3MB/second channels, whereas the BASF products support this rate on all six channels. ▷

▶ **DATE ANNOUNCED:** Spring 1982.

DATE OF FIRST DELIVERY: September 1982.

DATA FORMATS

BASIC UNIT: 8-bit byte, representing one alphanumeric character, 2 BCD digits or 8 bits. Two consecutive bytes form a half-word of 16 bits and 4 consecutive bytes produce a word of 32 bits.

FIXED-POINT OPERANDS: Operands can range from one 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 one word with 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. ▶

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▷ A further BASF advantage comes in space, power and heat output. In all cases these are less than the corresponding IBM 4341 specifications.

Another important factor is reliability. BASF claims a likely customer figure of 48 months as the mean time between faults. To back this claim up, BASF refers to actual customer installations of previous Hitachi machines, saying that these have achieved a 36 month MTBF figure. As a final advantage, BASF says that its installation and upgrade times are significantly less than IBM's.

SOFTWARE

Software is rapidly assuming a prime position in most management thinking about computers, hardly surprising when the cost ratio has moved so firmly into the software court and away from hardware. It is also an area where most people don't totally believe plug-compatible manufacturers' claims regarding full functionality of the target manufacturer's software on the plug-compatible machine. So it is worth looking at this area in detail.

On any machine of the BASF/Hitachi type, microcode is the key to success. Any operating system is going to run better if it is either directly microcoded or can use a set of microcoded instructions. With the 7/65 and 7/68, optimal performance is achieved with certain operating systems. BASF recommends DOS/VSE, VM/SP, MVS/SP, and OS/VS1. Some frequently used supervisor functions are executed directly in microcode, rather than at the operating system level. Application programs are also claimed to gain from the resulting decrease in overhead. The overall result is that not only will the IBM 4341 software run, but it will run, in most cases, more effectively than on the original machine.□

▶ MAIN STORAGE

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

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

TYPE: NMOS LSI 64K-bit chips formed into packages, each consisting of 10 layers of glass epoxy, 22 by 42 cm. Sheets pre-printed with copper conductors.

The packages are, in turn, inserted in platters which contain gold coated contacts to receive the packages. The basic machine has two platters, each of which measures 46 by 42 cms. Extensive testing is carried out at temperatures far in excess of the recommended environmental limits. The platters are also subjected to shock testing. The result is extremely high reliability, according to BASF.

A 64K cache memory, also attached, uses 4K-bit high speed bipolar chips.

CYCLE TIME: Access time to main memory is 150 nanoseconds. Access time to bipolar cache memory, from which most instructions are fetched, is 18 nanoseconds.

CAPACITY: The cache memory on both the 7/65 and 7/68 is 64K bytes. The minimum main memory size of the 7/65 is 2 megabytes with a maximum of 8 megabytes. The smallest 7/68 has a capacity of 4 megabytes, the largest 16 megabytes.

CHECKING: There are three mechanisms on the 7/65 and 7/68 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 errors are detected.

● A combined check sum and parity check to detect and correct errors in control storage.

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 BASF 7/65 performs at a minimum rate of 1.8 million instructions per second (MIPS) and the 7/68, without the optional High Speed Arithmetic (HSA) feature, performs at 2.2 MIPS and, with HSA, at 2.5 MIPS. The respective cycle times are 60ns on the 7/65 and 50ns on the 7/68.

Both models are IBM 4341 compatible at both hardware and software levels and are heavily microprogrammed. Microprogram storage requires 144 kilobytes divided into 72-bit words. Loading of the microprogram is from two floppy disk drives integrated into the CPU.

The functions of the 7 Series central processor are:

● Executing both central and I/O instructions.

● Controlling and monitoring channel operations and main storage accesses.

● Communicating with the service processor when required.

● Facilitating access by the service processor if there is a hardware malfunction.

Both the 7/65 and 7/68 processors contain all the requisite hardware and microcode to support the unique address structure of the IBM 4300 virtual storage architecture and, in addition, all IBM 370 mode functions.

SERVICE PROCESSOR: The service processor integrated into the CPU on both the 7/65 and 7/68, 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 144K bytes, divided into 16K 72-bit words. 4K-bit bipolar chips are used with an access time of 18 nanoseconds. ▶

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▶ BUFFER STORAGE: The high speed buffer serving as cache memory also uses 4K-bit bipolar chips with an access time of 18 ns. Capacity is 64K bytes, which, BASF claims, will ensure that most instructions will be found in this buffer, rather than main memory.

ADDRESSING: There are three forms of addressing used on the BASF 7 series systems: real, absolute, and logical. In the ECPS/VSE mode, operations take place as if the machine were an IBM 4300 and there is a single level form of address translation. In the System/370 mode, a two-level table look-up feature is applied.

Direct addressing of virtual program segments can take place, eliminating any requirement to operate in VSE mode. There is also a dual-address space facility whereby two locations can be addressed simultaneously.

DYNAMIC ADDRESS TRANSLATION: Address translation is effected in System/370 mode only. There is no need for it in 4300 mode (strictly speaking, ECPS/VSE mode) because of the direct addressing of virtual program segments.

In 370 mode, the translation between virtual and real addresses is made via a two-level table look-up. This process is aided by the provision of a Translation Look-Aside Buffer (TLB) which provides 512 address pairs.

INSTRUCTION REPERTOIRE: There are two operating modes for the 7/65 and 7/68. These are the ECPS: VSE (Extended Control Program Support) mode for 4300 operations and the System/370 mode. In the 4300 mode there are 187 instructions available and in the 370 mode, 183 instructions. The Universal 370 instruction set is included.

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 Look-Aside 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 PSW Key, Set PSW Key from Address, and Clear I/O; and the extended precision floating point instructions.

The only instructions which are not supported in 370 mode are the multiprocessor instructions.

INSTRUCTION TIMES: BASF has carried out extensive benchmark and other tests on the 7/65 and 7/68. These have involved carefully chosen mixes of instructions for system, commercial and scientific applications. In each mix the weight given to each instruction, and whether a branch is taken, is specified. Details of these mixes can be obtained from BASF. The results are that the 7/65 is roughly 1.3 and 1.5 times faster than the IBM 4341-2 and that the 7/68 is 1.7 and 2.1 times faster than the 4341-2.

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.

BASF says that because of buffering on all channels, there are fewer interrupts than on the IBM systems.

SYSTEM CONSOLE: The console consists of a 14-inch, 4-color CRT display with separate keyboard. An option is a hard-copy printer. The keyboard has 87 keys which include 12 program function keys. The CRT display is a standard 80-character by 25-line display with an extra line for showing systems status.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The BASF 7/65 and 7/68 have one byte multiplexer channel as standard; a second is optional. The difference is that the data transfer rate is 80 kilobytes/second on the 7/65 and 100 kilobytes/second on the 7/68. Both machines also have four standard block multiplexer channels and support a maximum of six. The channel transfer rate is 3 megabytes/second. A data streaming facility is standard on all block multiplexer channels, providing a total channel throughput rate of 13 megabytes/second on the 7/65 and 16 megabytes/second on the 7/68. This difference is accounted for by the faster processor rate on the 7/68 and by control factors. In practice, these speeds are not likely to be achieved, but are more useful as indicators.

Each of the byte and block multiplexer channels has 256 subchannels. Each channel also has a 256-byte buffer. Data transfer between channel and main storage is accomplished in blocks of 32 or 64 bytes. The method of attaching controllers and thus peripheral devices is exactly the same as on the IBM 360 and 370 series. Each channel can support up to 8 controllers which can be cluster controllers. Each of the 256 subchannels can be, in effect, a specific device. Any IBM or IBM compatible peripherals may be used, the latter including the wide range of peripherals offered by BASF.

CONFIGURATION RULES

Both the 7/65 and 7/68 are relatively easy to configure and most of the facilities are standard.

MODEL 7/65: The standard configuration comprises a central processor, two megabytes of NMOS main memory, one byte multiplexer channel, and four block multiplexer channels. Integrated in the central processor are two floppy disk drives for microcode loading and a service processor, sometimes referred to as a support processor. The console consists of a VDU with separate keyboard. Options for the 7/65 include an expansion of main memory in 2MB steps up to a maximum capacity of 8MB, a second byte multiplexer channel, and two additional block multiplexer channels.

MODEL 7/68: The standard configuration consists of a central processor, four megabytes of NMOS main memory, one byte multiplexer channel, and four block multiplexer channels. As with the 7/65, twin floppy disk drives and a service processor are incorporated into the central processor. There is a VDU console with keyboard. Main memory can be increased in 4MB steps to 16 megabytes. The number of byte multiplexer channels can be increased to two and the number of block multiplexer channels to six.

Other options for both the 7/65 and 7/68 are:

• 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 the minimum delay. ▶

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➤ • A channel to channel adapter which facilitates the exchange of data between CPUs via byte or block multiplexer channels.

• Additional control units.

• High speed arithmetic (HSA) which increases the speed of the CPU from 2.2 MIPS to 2.5 MIPS. (Available only on the 7/68.)

MASS STORAGE

All IBM mass storage devices for the 360, 370, and 4300 series can be fitted to the BASF 7/65 and 7/68. Comparable peripherals from PCMs, including BASF, may be used. The BASF disk drives are:

BASF 6230: Compatible with IBM 3330/3333, the 6230 can be connected via either an IBM 3830-2 Storage Control or via the comparable BASF 6038 control unit. The 6230 has one or two spindles each with a capacity of 100MB. Access time averages 30 ms, and rotational delay averages 8.3 ms. The transfer rate is 806 KB/second.

BASF 6235: Compatible with IBM 3330-11, the 6235 can be connected via either an IBM 3830-2 Storage Control or via the comparable BASF 6038 control unit. There is microprogram control and optional switching arrangements so that dual CPUs can access each other's drives. The capacity of the 6235 is 200MB per spindle with one or two spindles. Average access time is 30ms and average rotational delay, 8.3ms. Transfer rate is 806KB/second.

BASF 6240, 6240F, 6242: Compatible respectively with the IBM 3340A2, the 3340A2F and 3340B2, these drives can be connected via either the IBM DASD adaptor to the 4331 or via the IBM 3830 or BASF 6038 or 3880 Model 1 storage control to the 4341 or with the IBM 3830 or BASF 6038 to the BASF 7 series. Capacity of the 6240 and 6240F is 35MB per spindle with one or two spindles. Capacity of the 6242 is 70MB per spindle with one or two spindles. Average access time for all three models is 20ms, average rotational delay is 10ms, and the transfer rate is 885KB/second.

BASF 6244: Compatible with the IBM 3244, this drive can be connected via either the IBM DASD adapter to the 4331 or via the IBM 3830, BASF 6038 or IBM 3880 Model 1 storage control to the IBM 4341 or via the BASF 6038 or IBM 3830 to the BASF series machines. Capacity is 280MB per spindle with either one or two spindles. Average access time is 20ms, rotational delay is 10ms, and the transfer rate 885KB/second.

BASF 6250, 6250F, 6252, 6252F, 6253, 6253F: These six drives are compatible, respectively, with the IBM 3350A2, 3350A2F, 3350B2, 3350B2F, 3350C2 and 3350C2F. The main drive is either the 6250 or the 6253. The BASF 6250, a two-drive unit with a capacity of 317.5MB per drive, also provides the logic and power for the attachment of either three 6252s/6252Fs or up to two 6252s/6252Fs and/or one 6253/6253F. The 6253 also is a twin drive unit with a capacity of 317.5MB per drive, but it can function as either a 6250 or a 6252 through setting a manual switch. The 6253F is the same as the 6253 except it has a fixed head which offers immediate access (zero access time) to up to 1,144,140 bytes of data. The 6252, of which either two or three can be connected to a 6250, has a capacity of 317.5MB per drive. The 6252F is exactly the same as the 6252, apart from the availability of 1,144,140 bytes of immediate access storage. The average access time of all these drives is 20ms, the rotational delay averages 8.4ms and the transfer rate is 1,198KB/sec. The controller is either the IBM 3830 Model 2 storage control or the IBM

3880 Model 1 storage control when connected to the 4341 or 4331 and the BASF 6038 or the IBM 3830 Model 2 for connection to the BASF 7 series computers.

BASF 6470/6472: Compatible with the IBM 3370, the 6470 and 6472 units can be connected to IBM systems using the DASD adapter for linkage to the 4331 or the 3880 Model 1 for the IBM 4341. The corresponding controller for connection to either the BASF 7/65 or 7/68 is the BASF 6085 which will not be ready until mid-1983. The disk unit has one spindle with a capacity of 570MB. The average access time is 20ms, and the transfer rate is 1,859KB/second. The two units are specifically compatible with the IBM 3370 AO1 (BASF 6470) and IBM 3370 BO1 (BASF 6472).

INPUT/OUTPUT UNITS

Most of the IBM System 360, 370, 4300 and 303X series peripherals can be linked to the 7/65 and 7/68 together with devices from PCMs, such as BASF, which is already very well established in the peripherals area.

The IBM devices which can be connected include those detailed in the Input/Output Devices section of the report on the IBM 4300 Series (70C-491-08).

The BASF peripheral units which can be linked to either the 7/65 or 7/68 include the following tape units and printer:

BASF 6040/634X MAGNETIC TAPE SUBSYSTEM: The 6040 is the control unit and the 634X the magnetic tape drive. The 6040 control unit can handle up to 8 magnetic tape drives. Up to four such control units, with their up to 8 tape drives each can form a subsystem. In these cases the tape control unit is fitted with a "communicator" and possibly a channel switch (allowing a tape control unit to be connected to two channels) and/or a control switch, which allows one tape controller to access up to 16 tape drives. A feature of the control unit is its so-called "radial interface" which allows independent control of each tape unit so that if one unit goes down or requires maintenance, it can be switched out of the system without affecting its neighbors. The control unit also handles automatic tape threading, thus reducing set-up time, and can also manage both 7-track and 9-track drives on the same control unit. The tape drives used can be either the BASF 6345 or 6347. Each of these is supplied in 1600 bpi PE, 1600/800 bpi PE/NRZ and 800/556 bpi NRZ 7-track versions. Data transfer rates are: 6345 unit—200KB/s (1600 bpi), 100KB/s (800 bpi), 69.5KB/s (800/556 bpi); 6347 unit—320KB/s (1600 bpi), 160KB/s (800 bpi) and 111.2KB/s (800/556 bpi).

BASF 6060/636X 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 also for the unit to be linked to two 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: 500 KB/s for the 6364 at 6250 bpi and 128KB/s at 1600 bpi; 780 KB/s for the 6366 at 6250 bpi and 200KB/s at 1600 bpi.

BASF 6050/635X MAGNETIC TAPE SUBSYSTEM: The 6050 is the controller and the 635X the magnetic tape drive. The drive is compatible with IBM's 3420-6. The magnetic tape drive is either the 6356 or the 6358. The recording density in each case is either 6250 bpi in GCR or 1600 bpi in PE. Data transfer rates are: 780KB/s at 6250 bpi and 200KB/s at 1600 bpi on the 6356; 1250KB/s at 6250 bpi and 320KB/s at 1600 bpi on the 6358. ➤

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▶ The only other peripheral offered for the 7/65 and 7/68 by BASF is a line printer, the 6603.

BASF 6603 LINE PRINTER: This has its own integrated controller. The printer is compatible with the IBM 3203-5 and operates at 1250 lines per minute 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; micro-processor 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 silent because of a cover that encloses the printer and the powered stacker.

COMMUNICATIONS CONTROL

All communications adapters from IBM for the 4300 series and comparable devices from PCMs may be fitted to the BASF 7 series. BASF itself does not offer any devices in this area.

SOFTWARE

COMPATIBILITY: Two operating modes are available for the 7/65 and 7/68:

- ECPS:VSE (Extended Control Program Support/Virtual Storage Extended) mode which permits the usage of DOS/VSE in native mode.

- System/370 mode which allows the use of DOS/VSE, VM/370, MVS/SP-JES2 and MVS/SP-JES3.

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

OPERATING SYSTEMS: Any operating system which complies with IBM 370 or 4300 principles can be run, but for optimum functioning of the 7/65 and 7/68, BASF recommends one of the following, since these use functions which are either directly microcoded in the BASF products or use instructions which are closest to the way the machines are microcoded:

- DOS/VSE

- VM/SP

- MVS/SP

- OS/VS1

DOS/VSE: This extended disk resident operating system provides enhancements over the older DOS/VS in the specific areas of processor support, hardware features, device support, usability improvements and serviceability. It operates with virtual storage, considered a single entity, of up to 16 megabytes.

DOS/VSE supports the System/370 and ECPS/VSE operating modes. When functioning in the ECPS/VSE mode, there is an improvement in efficiency by about 10 percent over other modes. This is effected by the efficacy of the storage management, where there is a single level address translation compared with a two-level table look-up in 370 mode.

More detailed information on this and the following operating systems can be found in the Datapro IBM 4300 series report (70C-491-08).

VM/SP: The Virtual Machine/System Product can be regarded as a super-operating system under which DOS/VSE and MVS/SP can run. The overall effect of having such a super-operating system is to increase the operating efficiency of the sub-operating systems by as much as 80 percent. For example, supervisor calls which would normally take place in DOS/VSE are handled by microcoded functions within VM/SP. In other words, a firmware solution to a software overhead problem. This is not without cost, since it has been estimated that VM/SP will use about 15 percent of a system's resources.

It is also advisable to run under the VSE/AF package, since without the AF (Advanced Functions), VSE itself is inefficient. The Advanced Functions package makes sure that certain operations, which are unique to 4300 storage management (and thus also to the BASF machine management) are given to VM/SP to be performed.

PRICING: The following prices apply in Germany only and are not necessarily indicative of prices outside Germany.

MODEL 7/65 MINIMUM CONFIGURATION: Processor, 2MB of main memory, one byte multiplexer channel, four block multiplexer channels. Purchase, DM 790,000; rental over 24 months minimum period including maintenance, DM 22,500/month. Extra 2MB of main memory, purchase, DM 50,000; maintenance, DM 100/month; rental, DM 1,860/month, including maintenance.

MODEL 7/68 MINIMUM CONFIGURATION: Processor, 4MB of main memory, one byte multiplexer channel four block multiplexer channels. Purchase DM 1,008,000; rental over 24 months minimum period including maintenance, DM 29,500/month. Extra 2MB of main memory, purchase, DM 50,000; maintenance, DM 100/month; rental, DM 1,860/month, including maintenance.

Both the 7/65 and 7/68 can be extended by the addition of the following items, which have the same price for both machines (rental in all cases is for a minimum period of 24 months):

CHANNELS: One byte multiplexer, purchase, DM 12,200; maintenance, DM 90/month; rental including maintenance, DM 420/month. Two block multiplexers, purchase, DM 27,140; maintenance, DM 90/month; rental including maintenance, DM 1045/month. Block multiplexer channels are sold only in pairs.

Channel to channel adapter, purchase, DM 24,000; maintenance, DM 100/month; rental including maintenance, DM 900/month.

Director control, purchase, DM 7130; maintenance, DM 50/month; rental including maintenance, DM 270/month.■