

Siemens System 7.000

MANAGEMENT SUMMARY

Currently consisting of eleven central processor models, the Siemens System 7.000 series spans the performance range of the high-end IBM System/3 models to the System/370 Model 158-3. The small- to large-scale West German-built systems, offered at prices considerably lower than those of their IBM counterparts, feature a full complement of conventional and high-performance peripheral support, including a laser printer capable of printing up to 20,000 lines per minute. Comprehensive software support including sophisticated on-line and data base facilities is also available.

In 1978, Siemens enhanced the System 7.000 series with the addition of two low-end models, the 7.708 and 7.718. These two new systems feature mainframe performance without the traditional space and environmental requirements associated with large-scale computers. Monthly charges under a three-year lease begin at DM 10, 640 for the 7.708 and DM 14,590 for the 7.718. According to Siemens, the new models are destined to fill the performance gap between the IBM System/3 and /370. They are expected to replace the Model 7.722 Versions 1 and 2.

The Siemens 7.000 family is the European successor to the Unidata partnership between Siemens (West Germany), CII (France), and Philips (Netherlands) that was formed in July 1973 and which ended in December 1975. Since that time, Philips has limited its major data processing activities to the small business computer market where it has had traditional strength; CII has merged with Honeywell-Bull (July 1, 1976) and has focused upon the U.S.-developed Honeywell product line and upon resolving product proliferation incompatibilities between its own IRIS systems and the various Honeywell products. ➤

Recently expanded with the introduction of two low-end central processors, the Siemens System 7.000 mainframe series features a wide performance range and comprehensive software and peripheral support. Incorporating state-of-the-art technology developed by the leading West German manufacturer of electrical and electronics products, the System 7.000 models are potentially very attractive alternatives to their IBM counterparts.

CHARACTERISTICS

MANUFACTURER: Siemens Aktiengesellschaft, Bereich Datenverarbeitung, Hofmannstrasse 51, Postfach 70 00 78, D-8000 Munchen 70, West Germany. Telephone: (089) 722-1. Telex: 5 288-0.

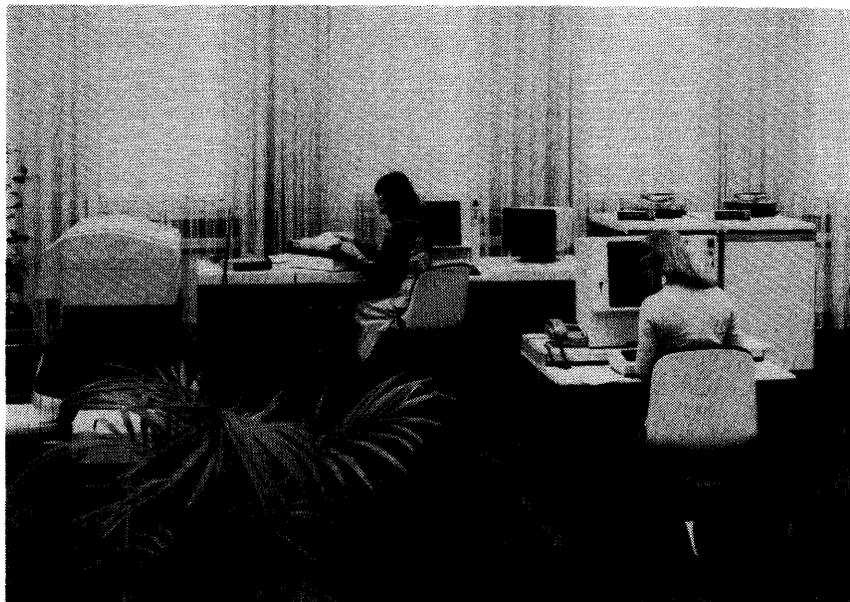
MODELS: Siemens System 7.000 Models 7.708, 7.718, 7.722 versions 1 and 2, 7.730 versions 1 and 2, 7.738, 7.740, 7.748, 7.755, and 7.760.

DATA FORMATS

BASIC UNIT: An 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. 2 bytes represent a 16-bit half-word; 4 bytes represent a 32-bit word, and 8 bytes represent a 64-bit double word.

FIXED POINT OPERANDS: A 16-bit half-word can represent a 15-bit signed integer; while a 32-bit word can represent a 31-bit signed integer or a 32-bit unsigned binary value.

FLOATING POINT OPERANDS: A 32-bit word is used to represent a signed, short floating point number with a 7-bit characteristic and a 24-bit mantissa. A signed, long floating point number can be represented in a 64-bit double ➤



Siemens may have beaten IBM to the punch with the introduction of the Models 7.708 and 7.718. The "compact jumbos" are considered by many to be the company's answer to IBM's highly speculative E Series.

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TABLE I. CPU CHARACTERISTICS OF SYSTEM 7.000 MODELS

CHARACTERISTICS	Model 7.708	Model 7.718	Model 7.722	Model 7.730
AVAILABILITY				
Date of announcement	May 1978	May 1978	Version 1—1972; Version 2—Jan. 1976	Version 1—Sept. 1974; Version 2—Jan. 1976
Date of first delivery	—	—	Version 1—July 1976; Version 2—April 1976	Version 1—March 1975; Version 2—July 1976
OPERATING SYSTEM				
BS 1000	No	No	Yes	Yes
BS 2000	Yes	Yes	No	Yes
MAIN MEMORY				
MOS chip size, bits	16K	16K	1K and 4K	1K and 4K
Read cycle time	—/—	—/—	615 ns/8 bytes	615 ns/8 bytes
Write cycle time	—/—	—/—	785 ns/8 bytes	785 ns/8 bytes
Capacity, bytes	HG 393,216 I 524,288 IG 655,360 IH 786,432 IJ 917,504 J 1,048,576	I 524,288 IG 655,360 IH 786,432 IJ 917,504 J 1,048,576 JH 1,310,720 JI 1,572,864	FE 98,304 G 131,072 GE 163,840 GF 196,608 GFE 229,376 H 262,144 HF 327,680 HFE 360,448 HG 393,216	FE 98,304 G 131,072 GE 163,840 GF 196,608 GFE 229,376 H 262,144 HF 327,680 HFE 360,448 HG 393,216 I 524,288
CACHE MEMORY				
Capacity, bytes	None	None	None	None
Cycle time	—	—	—	—
CONTROL MEMORY				
Capacity, bytes	12,288	12,288	32,768	32,768
VIRTUAL MEMORY				
Address space, bytes	8,388,608	8,388,608	None	16,777,216
FEATURES				
Fixed point arithmetic	Standard	Standard	Standard	Standard
Floating point arithmetic	Standard	Standard	Standard	Standard
Decimal arithmetic	Standard	Standard	Standard	Standard
Interval timer	Standard	Standard	Standard	Standard
Time of day (TOD) clock	Standard	Standard	Standard	Standard
Program timers	3 standard	3 standard	3 standard	3 standard
Real-time clock	Standard	Standard	Standard	Standard
Memory protect feature	Standard	Standard	Standard	Standard
Auto instruction retry	Standard	Standard	Standard	No
Dynamic address translation	Standard	Standard	No	Standard
Error detection and correction in memory	Standard	Standard	Standard	Standard
CHANNELS				
Selector channel	Standard	Standard	Version 1—std.; Version 2—no	No
Byte-multiplexor channel	Std.; extension optional	Std.; extension optional	Std.; extension optional	Std.; extension optional
Block-multiplexor channel	No	No	Version 1—no; Version 2—std., extension opt.	Std.; extension optional

*Announced originally as the 4004/220

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TABLE I. CPU CHARACTERISTICS OF SYSTEM 7.000 MODELS (Continued)

CHARACTERISTICS	Model 7.738	Model 7.740	Model 7.748	Model 7.755	Model 7.760
AVAILABILITY					
Date of announcement	July 1976	September 1974	July 1976	November 1975	October 1976
Date of first delivery	October 1976	May 1975	October 1976	March 1976	July 1978
OPERATING SYSTEM					
BS 1000	Yes	Yes	Yes	Yes	No
BS 2000	Yes	Yes	Yes	Yes	Yes
MAIN MEMORY					
MOS chip size, bits	4K	1K and 4K	4K	1K and 4K	16K
Read cycle time	615 ns/16 bytes	615 ns/16 bytes	615 ns/16 bytes	615 ns/16 bytes	1200 ns/32 bytes
Write cycle time	785 ns/8 bytes	785 ns/8 bytes	785 ns/8 bytes	785 ns/8 bytes	600 ns/8 bytes
Capacity, bytes	I 524,288 IH 786,432 J 1,048,576	G 131,072 GF 196,608 H 262,144 HG 393,216 I 524,288 IG 655,360 IH 786,432 J 1,048,576	J 1,048,576 JI 1,572,864 K 2,097,152	I 524,288 IH 786,432 J 1,048,576 JI 1,572,864 K 2,097,152 KI 2,621,440 KJ 3,145,728 KJI 3,670,016 L 4,194,304	J 1,048,576 JI 1,572,864 K 2,097,152 KJ 3,145,728 KJI 3,670,016 L 4,194,304 LJ 5,242,880 LKJ 6,291,456 LKL 7,340,032 M 8,388,608
CACHE MEMORY					
Capacity, bytes	2,048	2,048	4,096	8,192	32,768
Cycle time	375 ns/4 bytes	375 ns/4 bytes	360 ns/4 bytes	360 ns/4 bytes	200 ns/8 bytes
CONTROL MEMORY					
Capacity, bytes	49,152	49,152	49,152	49,152	61,440
VIRTUAL MEMORY					
Address space, bytes	16,777,216	16,777,216	16,777,216	16,777,216	16,777,216
FEATURES					
Fixed point arithmetic	Standard	Standard	Standard	Standard	Standard
Floating point arithmetic	Standard	Standard	Standard	Standard	Standard
Decimal arithmetic	Standard	Standard	Standard	Standard	Standard
Interval timer	Standard	Standard	Standard	Standard	Standard
Time of day (TOD) clock	Standard	Standard	Standard	Standard	Standard
Program timers	3 standard	3 standard	3 standard	3 standard	3 standard
Real-time clock	Standard	Standard	Standard	Standard	Standard
Memory protect feature	Standard	Standard	Standard	Standard	Standard
Auto instruction retry	No	No	No	No	No
Dynamic address translation	Standard	Standard	Standard	Standard	Standard
Error detection and correction in memory	Standard	Standard	Standard	Standard	Standard
CHANNELS					
Selector channel	No	No	No	No	No
Byte-multiplexor channel	Standard	Standard	Standard	Standard	Standard
Block-multiplexor channel	Std.; extension optional	Std.; extension optional	Std.; extension optional	Std.; extension optional	Std.; extension optional

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➤ Siemens, now the sole indigenous continental mainframe supplier, has moved vigorously to expand the System 7.000 following the demise of Unidata with the release of new processors and a variety of high performance peripherals—the 3352 laser printer, the 3470 420-million-byte Fixed Disk Module, and the 3557 and 3559 6250-bit-per-inch magnetic tape drives. The CODASYL-compatible Universal Data Base System (UDS) released in mid 1976 and enhanced in 1978 is intended to bolster the appeal of the System 7.000 in the rapidly growing data base/data communications marketplace in Europe, especially in West Germany.

Siemens has also enhanced the System 7.000 with the release of particularly strong technology. The 7.760, released in October 1976, was the first computer from a large mainframe manufacturer to incorporate 16K-bit RAM chips. The two new 7.000 models—the 7.708 and 7.718—also use the 16K-bit chip.

The 16,384-bit chip represents a considerable increase in the degree of integration compared to the 4,096-bit chips used in other Siemens System 7.000 machines. The physical size of the memories and the number of components have been reduced to a quarter, and the internal power dissipation to a third of what the systems would otherwise require. Future System 7.000 models may feature an even higher degree of integration through the use of the 64K-bit chip that Siemens is currently developing.

At the low end of the System 7.000 line, the two new central processor models, the 7.708 and 7.718, are built into desk enclosures equipped with a system keyboard/display, a second display for applications processing, and a floppy disk drive. Emphasis has been placed upon ease of use: the version of the BS 2000 virtual memory operating system for the new models includes facilities to allow simplified operation by non-EDP professionals. Only about 25 commands are required for system operation. First deliveries for the 7.708 and 7.718 are scheduled for May 1979.

The 7.708 has a basic main memory capacity of 384K bytes, and can be expanded to 1024K bytes. The 7.718 starts with 512K bytes and has a maximum capacity of 1536K bytes. Both models feature fixed point, floating point, and decimal arithmetic; an interval timer; a time-of-day clock; three program timers; a real-time clock; memory protection; auto instruction retry; dynamic address translation; and error detection and correction in main memory. Most of these features are standard on all 7.000 models.

A byte multiplexor channel with one trunk for a printer is standard with the 7.708 and 7.718. The 7.708 can optionally be equipped with four additional trunks, the 7.718 with five. Two selector channels for mass storage devices are also standard with both models. Up to two and four additional selector channels are optional with the 7.708 and 7.718, respectively.

The current top-of-the-line System 7.000 model, the 7.760, has a basic main memory capacity of 1024K bytes, and a ➤

➤ word with a 7-bit characteristic and a 56-bit mantissa. For extended floating point representation, a signed double precision format is available through the use of two 64-bit double words: 7-bits of the first double word are used to represent the characteristic and the remaining 56 bits of that double word plus 56 bits of the following double word are used to represent a 112-bit mantissa (28 hexadecimal or 34 decimal digits).

INSTRUCTIONS: 2, 4, or 6 bytes in length. See the table below.

Instruction Formats

First Halfword										Second Halfword										Third Halfword																															
RR Format																																																			
Register																																																			
OP CODE		R ₁					R ₂																																												
0	7	8	11	12	15																								31																						
RX Format																																																			
Register															Memory address																																				
OP CODE		R ₁					X ₂					B ₂					D ₂																																		
0	7	8	11	12	15	16	19	20																						31																					
RS Format																																																			
Register															Memory address																																				
OP CODE		R ₁					R ₂					B ₂					D ₂																																		
0	7	8	11	12	15	16	19	20																						31																					
SI Format																																																			
Immediate operand															Memory address																																				
OP CODE		I ₂					B ₂					D ₂																																							
0	7	8													15	16	19	20																						31											
SS Format																																																			
Operand length															Memory address															Memory address																					
OP CODE		L					B ₂					D ₂					B ₂					D ₂																													
0	7	8	11	12	15	16	19	20												31	32	35	36												47																

INTERNAL CODE: EBCDIC.

MAIN STORAGE

STORAGE TYPE: N-MOS semiconductor memory is employed in all of the System 7.000 models. See Table I for memory capacity per chip for each model.

CAPACITY: See Table I.

CYCLE TIME: See Table I.

CHECKING: Memory protection, error detection, and single-bit-error correction in main memory are standard on all models. Microprograms continuously perform checking. ➤

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With the 7.760, Siemens has extended the top end of its 7.000 computer series. This machine uses 16K-bit MOS memory chips for main memory, and has a 32K-byte bipolar cache memory to contain the most frequently referenced data and the most active program sections. Over 95% of the 7.760's main memory requests can be satisfied by the cache, which has an access time of 200 nanoseconds per 8 bytes. Eleven configuration levels are currently provided, with a maximum system capacity of eight megabytes.

▷ maximum capacity of 8192K bytes. A byte multiplexor channel with eight trunks is standard with this system, and eight additional trunks are optional. Two block multiplexor channels, each with three trunks, are also standard. Five additional block multiplexor channels are optional.

The 7.760 is distinguished from the next lower models of the 7.000 Series through the expanded use of memory hierarchies whereby the bipolar cache, which serves to adapt the speed of the semiconductor (MOS) main memory facilities to that of the central processor, now has a capacity of 32K. Because the cache contains the most frequently referenced data and the most active program sections, Siemens claims that over 95% of memory requests can be satisfied by the cache, which has an access time of 200 nanoseconds per 8 bytes.

Another significant innovation in the 7.760 is the functional splitting of the central processor into two parallel processors, a division which considerably accelerates operations in the central unit. An integrated "instruction processor" performs instruction fetch and operand address calculation while an "execution processor" concurrently performs the actual execution of the previously fetched instruction.

All operations in the central processor and the channels are controlled by microprograms in a writable control memory that is loaded from a floppy disk. This control memory has a capacity of 4096 108-bit double words and also contains all the service and maintenance routines required for comprehensive hardware diagnoses. Individual 512K sections of main memory can be switched manually between two 7.760 Central Units, thus providing greater configuration flexibility to the user.

Because it is a common German data processing buying preference to obtain additional capacity by acquiring multiple processors rather than by upgrading to a larger

▷ An automatic instruction retry is also included. The control memory, the registers and all data paths are subject to parity checking. All data read in main memory are checked by an error correction code (8-bit Hamming code). One-bit errors are corrected while 2-bit errors and many multiple-bit errors are detected.

Error recovery routines are built into the BS 1000 and BS 2000 operating systems. Software routines for machine error recovery are aided by detailed information (four error words) concerning the machine errors detected and the internal machine status at the time the error was detected. This information is generated automatically by the hardware and stored in main memory.

STORAGE PROTECTION: A main memory access control provides both read and write protection and prevents unauthorized access to main memory or modification of the main memory contents. Storage protection is implemented by dividing main memory into 2K-byte blocks and assigning a 5-bit storage key to each block. Four of these bits specify the actual protection key for a specific block. The fifth bit controls whether the memory block is to be protected only against write accesses or against read and write accesses from other programs. Program authorization to access main memory takes the form of a 4-bit user key that enables protection of up to 15 concurrent programs.

In the virtual memory mode (for all processors except the 7.722), memory protection is implemented by 4-level ring protection. Each ring is assigned one 2-bit number for read accesses and another for write accesses; these numbers define the address space to which the ring belongs. A 2-bit ring state indicator indicates the ring levels which can be accessed.

CENTRAL PROCESSORS

There are nine current CPU models in the 7.000 series; two of these processors, the 7.722 and 7.730, have two sub-models each. All of the CPU's have fixed-point, floating-point, and decimal arithmetic facilities. Each has a time-of-day clock, a real-time clock, an internal timer, and three program timers. Memory protection, error detection and correction in main memory, and a byte-multiplexer channel are all standard.

The two new CPU's, the 7.708 and 7.718, are built into desks equipped with an operator console and workstation

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TABLE II. REGISTER-TO-REGISTER INSTRUCTION TIMES FOR SYSTEM 7.000 (MS)

Instruction	Type	Models								
		7.722-1	7.722-2	7.730-1	7.730-2	7.738	7.740	7.748	7.755	7.760
Add (A)	RX	11.06	8.36	7.40	4.97	3.421	2.796	1.517	1.157	0.572
Subtract (S)	RX	11.06	8.36	7.40	4.97	3.421	2.796	1.513	1.153	0.572
Multiply Short to Long (ME)	RX	96.46	77.16	45.84	45.83	9.415	8.790	7.021	6.661	5.666
Divide Short (DE)	RX	207.12	103.06	57.24	57.23	15.058	14.433	12.691	12.331	10.339
Add Normalized Long (AD)	RX	46.53	28.58	25.28	25.27	6.810	6.185	4.738	4.378	2.831
Subtract Normalized Long (SD)	RX	47.71	30.72	27.18	27.18	6.561	5.936	4.498	4.138	3.041
Multiply Long (MD)	RX	219.02	149.13	69.93	69.90	20.703	20.078	18.082	17.722	13.489
Divide Long (DD)	RX	538.17	206.65	121.54	121.50	35.851	35.226	32.628	32.268	27.979
Add Decimal (AP)	SS	31.92	27.43	24.26	24.25	7.012	6.387	4.618	4.258	1.937
Compare Decimal (CP)	SS	65.14	46.83	35.78	16.14	7.084	6.459	4.903	4.543	1.412
Pack (PACK)	SS	48.47	33.65	27.55	12.84	7.085	6.460	4.910	4.550	4.550
Branch on Condition (BC)	RX	5.37	6.41	4.08	3.07	2.957	2.350	0.995	0.995	0.624
Load (L)	RX	8.83	6.44	5.70	4.49	3.416	2.791	1.513	1.153	0.572
Store (ST)	RX	8.72	6.35	5.62	4.41	3.331	2.706	1.589	1.229	0.446
Load Multiple (LM)	RS	28.49	22.13	14.85	11.36	5.489	4.864	3.337	2.977	1.618
Move (MVC)	SS	27.00	23.20	20.52	20.52	9.212	8.587	7.156	6.796	2.567
Compare Logical (CLC)	SS	66.01	50.98	25.73	19.86	9.403	8.778	6.973	6.613	1.727

Instruction times were not available for Models 7.708 and 7.718.

➤ single CPU, the memory module switching capability should prove helpful in the German marketplace in particular.

The technological strengths in the 7.760 can better be viewed in the perspective of Siemens' System 7.000 activity that occurred at the end of July 1976. At that time, Siemens introduced models 7.738 and 7.748 as direct competitors to the IBM 370/138 and 148. These systems contained 4K-bit memory chips rather than the 1K chips used in earlier System 7.000 models. At the same time, Siemens announced improved performance characteristics for the 7.730, 7.740, and 7.755. In addition, upper memory ranges were increased on the 7.722 from 256K bytes to 384K; and the 7.730 memory limit increased from 384K to 512K.

Two operating systems are available for use with the System 7.000 computers: the real-memory-oriented BS 1000 and the virtual-memory-oriented BS 2000. BS 1000 is supported on all 7.000 systems except the 7.708, 7.718, and 7.760. BS 2000 can run on Models 7.708 and 7.718 as well as any systems from the 7.730 up. Both operating systems include batch, remote batch, and transaction processing capabilities.

Marketing of the System 7.000 today by Siemens is concentrated primarily in Europe, with emphasis upon West Germany, Switzerland, Austria, Denmark, Sweden, Spain, Italy, the Netherlands, and Eastern Europe. No large-scale marketing efforts are being made in France, the United Kingdom, the United States, South America (Siemens sold its installed base in Brazil to Univac at the beginning of 1975), or the Far East.

For the fiscal year ending September 30, 1977, Siemens' corporate revenues totaled about DM 25,000 million—about \$12,500 million—with EDP revenues accounting for 5 percent of this total. The EDP division currently operates unprofitably, with an estimated net loss of about \$75 million in the last fiscal year.

➤ facilities; the other CPU's each have one central operator console and positions to attach up to three additional service consoles. All of the processors have the same 169-instruction repertoire. Except for the 7.722, each has virtual addressing capabilities with dynamic address translation for a working space of 8,388,608 bytes for the 7.708 and 7.718 and 16,777,216 bytes for the other models. Other features of the individual CPU's are detailed in Table I.

REGISTERS: There are no index registers; but there are 43 4-byte general purpose registers that can be used for base and index register functions in address computations, for transferring addresses, or for holding operands in binary and logical operations. In addition, a number of special purpose registers are provided.

Processor State	No. of General Registers Usable
P1	16
P2	16
P3	6
P4	5

In P1 and P2, the complete set of general and control registers is available. In P3 and P4, the number of general registers is limited to 6 and 5, respectively; and several program-related control registers are not available. A set of floating point registers is shared by all processor states.

For some instructions, two adjacent 4-byte general registers are combined to form an 8-byte field. Other instructions can reference up to 16 general registers at one time.

Four 8-byte registers for floating point calculations are also provided. These registers can hold either a short 4-byte or a long 8-byte floating point number. The short floating point number is contained in the four high-order bytes of the register; in order to accommodate extended floating point numbers, two registers can be paired to form a 16-byte field.

Three 32-bit control registers are used to contain processor control information: the Program Counter Register (PCR); the Interrupt Status Register (ISR), and the Interrupt Mask Register (IMR). These registers can only be altered by privileged instructions in the system state.

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▷ Re-structured in 1976 under Dr. Anton Peisl, formerly head of Siemens' successful telecommunications group, the Munich headquarters of Siemens computer activity is now called the Data and Information Systems Group and consists of a Systems Division and a Peripheral and Terminal Division with most manufacturing done in Augsburg and Munich.

Among the major competitive factors that Siemens currently faces in West Germany are the U.S.-based firms, including IBM, Univac, etc.; and the emerging trend toward decentralized networks that makes it possible for DEC and other minicomputer manufacturers to compete strongly for computer systems business that only a few years ago was exclusively the province of the mainframe vendors. Against this competitive array, Siemens has done very well in West Germany, even though the firm has been aided less by the inevitable nationalistic factors than have other home-grown European computer manufacturers in their respective countries. Examples of assisted firms include CII-Honeywell-Bull in France and ICL in the U.K. Much of Siemens' EDP success is due in part to the strength of the Siemens parent (4th largest electronics company in the world and No. 1 in Germany), and also, in part, to the vigorous R&D EDP efforts undertaken by Siemens.

In fact, while official West German governmental policy is to support specific, well-defined R&D efforts on the part of Siemens and other West German firms, there is no federal "buy German" procurement policy, and federal agencies exercise local authority to select their data processing equipment in a competitive process.

The System 7.000 was officially introduced in January 1974 with the release of the 7.720 (originally developed by Philips), and the 7.730 and 7.740, both developed by Siemens. Since that time, a total of 12 models and sub-models have been announced by Siemens with over 1,000 systems of all types shipped to date plus over 500 on order.

All of the members of the Siemens 7.000 family offer source code and operating system compatibility, as well as the ability to grow using the same peripherals. It is also possible for Siemens System 4004 users to run existing programs and data on the 7.000's without modifications. In addition, Siemens' SIM—BS1000 simulator allows the BS 1000 operating system, developed for System 4004, to run without modifications under the BS 2000 operating system in a System 7.000 machine.

Siemens' development strategy for the 7.000 consists of plans to strengthen the on-line and data base capabilities of the system, offer further high-performance peripherals, and focus on industry-specific terminals such as those tailored to banking and other service industry applications.

A major development activity based in Erlangen, Germany, is focusing upon minicomputers (System 300). It is to be expected that the availability of these small ▷

▶ **INDIRECT ADDRESSING:** Yes.

INSTRUCTION REPERTOIRE: There are 93 fixed-point instructions consisting of 21 data transfer instructions; 8 branch instructions; 13 logical instructions; 11 decimal instructions; 14 unsigned binary instructions; 22 signed binary instructions; and 4 edit instructions. There are 51 floating-point instructions consisting of 14 shift instructions; 33 arithmetic instructions; and 4 compare instructions. There are also 13 privileged instructions (including I/O and control instructions); 3 stack instructions; and 9 miscellaneous instructions.

INSTRUCTION TIMES: Register-to-register instruction times for a series of System 7.000 operations are shown in Table II.

CACHE MEMORY: Between the real memory and the processor is a high-speed cache memory that buffers instructions and data prior to processing. The cache is based on the memory system's 16-byte width of access. Models 7.738 and 7.740 have one 2K-byte bank of entries consisting of 128 rows of 16-byte blocks. Model 7.748 has two banks; and Model 7.755 has four banks. Model 7.760 has four 8K cache banks each consisting of 256 rows of 32-byte blocks. The entries are handled using a FIFO procedure. The processor communicates with the cache over 4-byte data paths except for the 7.760 which has an 8-byte data path. See Table I for the cache memory capacity for each 7.000 model.

CONTROL MEMORY: On the Models 7.708, 7.718, 7.722, and 7.730, the control memory contains the microprograms for controlling the CPU and the I/O processor as well as the buffers for the channels and function registers. The control memory is loaded automatically without operator intervention during initial program loading from the system disk. It is inaccessible to the user. On the 7.760, a writable control memory containing 4096 120-bit double words is loaded from a floppy disk. In addition, a read-only 3072-byte microprogram memory is also provided for the 7.760.

Models 7.738 through 7.755 also have a Writable Control Memory (WCM) which is used for diagnostic and maintenance purposes. See Table I for the control memory capacity for each 7.000 model.

DYNAMIC ADDRESS TRANSLATION: For Models 7.708, 7.718, and 7.730-7.760, virtual address for active pages are converted during processing into corresponding real addresses by the DAT facility that uses the segment and page tables for this purpose. The segment table defines each user's virtual memory allocation and contains one entry for each segment. The segment entries refer to the real memory addresses in the page tables, which in turn indicate which pages are currently located in real memory. Each segment has an associated page table.

A special hardware facility, the Content Addressable Memory (CAM) with 8 entries, is provided to increase the translation speed on the 7.730. On the 7.738 and larger models, an Address Translation Memory (ATM) has 128 entries to ensure a first-level hit in the search for a page in 90-95% of all cases under normal program conditions.

To perform address translation in Models 7.738 and larger, a row in the ATM is selected by means of parts of the segment and page portions of the virtual address (7 bits). The entries in the ATM can be addressed by these bits since the pages have fixed locations. After an entry has been selected, a comparison is made between portions of the virtual address and the entry in the ATM. When the two match, or hit, the result is the real page number which, together with the displacement from the virtual address, forms the real address. If there is no hit, the DAT facility makes use of the segment and page tables. ▶

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▷ computers will be a significant factor in the development of data networks, and Siemens can be expected to move more strongly into this area as the market demand increases.

In fact, Siemens' move into networks (or "integrated communications systems") has been spurred by a large contract from the German railway (to the tune of more than DM 115 million) to develop a network called the Integrated Transport System that makes operating data available on-line to large-scale data bases.

This kind of market activity by Siemens continues to require a high concentration of efforts upon "modular" terminals that retain compatibility with other Siemens products for the purpose of achieving manufacturing economies. Thus, a major Siemens product development strategy is seen to be the creation of modular terminal components that are based upon a set of uniform interface specifications, but which can be configured to meet specific user requirements.

As evidenced by the recent high-performance peripherals and low-end central processor announcements, Siemens is continuing to enhance both the lower and upper ends of the System 7.000 series. A Model 7.770 was described by the firm during Unidata days as the next step in the 7.000 family after the 7.760, and although the 7.708 and 7.718 have made their debut before the expected 7.770, it has recently been restated by Siemens that plans for this system are still very much alive—albeit in radically different form, according to industry sources.

It has been unofficially stated by some Siemens insiders that the original plans for an in-house developed 7.770 have been scrapped, and that future top-end 7.000 systems will be Fujitsu M 180 II and M 200 computers. Other members of the firm, however, have stated, again unofficially, that a Siemens-developed machine surpassing the current top-end 7.760 in performance is not out of the question. Such a 7.000 model would probably fall between the 7.760 and the Fujitsu computers, which feature performance ranging from the IBM 3032 to the 3033 plus 40 percent. The M 180 II, in the \$1.8 million price bracket, can execute 2.1 million instructions per second; the M 200, for about \$5 million, can handle 7.0 million instructions per second. In comparison, the Siemens 7.760 sells for about \$1.3 million and can process 1.3 million instructions per second. The Fujitsu computers are IBM software-compatible, and it has been rumored that Siemens is currently working on program bridges to establish compatibility among IBM's MVS, Fujitsu's OS IV F4, and the System 7.000 BS 2000 operating systems. An official announcement from Siemens concerning System 7.000 developments at the top end is expected this year.

It should be noted that Siemens continues to provide a strong level of support for its OEM customers. The laser printer, for example, had been available from Siemens to OEM buyers as the ND-2 (announced at the April 1976 Hanover Fair) before its end-user availability announcement; the 420-megabyte Fixed Disk Module is ▷

▶ Since the channels contain no address translation hardware, virtual addresses incorporated in channel commands must be translated before I/O operations are performed.

For 2K pages and a virtual address space of 16 megabytes, the DAT facility is designed for 2-level operation. For 4K pages and an address space of 8 megabytes, the DAT facility is designed for 3-level operation (also employed in the System 4004/151 CPU).

OPERATIONAL MODES: There are four processor states:

- P1 = Processing State
- P2 = Interrupt Response State
- P3 = Interrupt Control State
- P4 = Machine Condition State

In P1 and P2, user programs and program interrupts are processed; and in P3 and P4, program interrupts are analyzed. Each processor state has its own set of general and control registers that function independently of other processor states. All the timers run in P1 and P2; the interval timer and the program timers are deactivated for P3 and P4.

COMPATIBILITY FEATURES: The System 7.000 includes all of the System 4004 instructions, making the systems source code compatible. Because of the high degree of compatibility between the 4004 and the IBM 360/370, a relatively simple conversion is possible at the source language level between these IBM systems and the 7.000 Series. Compatibility is also excellent when converting from the Univac Series 90 (nee RCA Spectra 70).

SIMULTANEITY: Memory is interleaved in Models 7.738 through 7.760 so that 8 bytes (Models 7.738 through 7.755) or 16 bytes (7.760) are fetched from alternate memory banks resulting in 16 bytes (Models 7.738 through 7.755) or 32 bytes (Model 7.760) being fetched during a single memory read cycle. Instruction execution is also overlapped on the 7.760 by dividing the processor into an Instruction Preprocessor and an Instruction Execution Processor whereby 32-byte segments of instructions/data are fetched from main memory to cache memory. Instructions are decoded by the preprocessor prior to execution.

INPUT/OUTPUT CONTROL

CONSOLE I/O: A variety of console control equipment is available for attachment to the Series 7.000 CPUs. The 3020 Central Control Console includes a CRT, keyboard, tabulator and control panel, attachments for up to three 3020-10 or 3023-10 sub-consoles, and an attachment for one auxiliary console printer. The sub-consoles may be located up to 10 kilometers from the CPU, and can be connected to models 7.772 through 7.760. The screen can display 16 lines of 80 characters each and the optional console printer operates at 180 characters per second.

The two new 7.000 CPU's, the 7.708 and 7.718, are each built into a desk/workstation with an integral system keyboard/display, a second display for interactive processing, and a floppy disk drive. The system display has twelve 80-character lines; the second display has twenty-four 80-character lines. The floppy disk drive is Transdata 920- and IBM 3740-compatible.

3023 CENTRAL CONTROL CONSOLE: This console includes a 180 character per second page printer capable of printing 80 characters per line, a keyboard and control panel, and attachments for up to three 3020-10 or 3023-10 sub-consoles which can be located up to 10 kilometers from the CPU. The 3023 can be connected to models 7.722 through 7.760. ▶

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▷ available in a 500-megabyte capacity to the OEM market; and the 6250-bpi tape drive is also available on an OEM basis. Statements made by Siemens in October 1976, when these three peripherals were made available to end-users, bear out this OEM emphasis.

Because of the availability of Siemens' new high performance peripherals under its standard BS 2000 operating system, even the smaller Siemens 7.000 processors (from the 7.730 upward) can be configured with extraordinarily powerful data handling devices. This peripheral availability, combined with a strongly enhanced functional and price-performance advantage over comparable IBM peripherals, makes the Siemens 7.000 line an especially attractive alternative to current small-scale System/360 and 370 users, especially those presently running under DOS or DOS/VS. In addition, current large-scale System/3 users planning to upgrade may find the bottom-of-the-line Models 7.708 and 7.718 more attractive than IBM's System/370 offerings—especially when one considers the compatibility problems for users going from a System/3 to a 370.

USER REACTION

Datapro conducted a survey of Siemens computer users during the first quarter of 1978, and received responses from seven System 7.000 users who had a total of 12 systems installed. The survey sample was comprised of two 7.730's, two 7.740's, four 7.748's, one 7.750, and three 7.755's.

The user population included a number of universities, research institutes, and government agencies. System usage was strongly oriented toward scientific/engineering applications, with 11 systems being used in this area. Program development and business data processing were being performed on eight and seven of the systems, respectively. Of the 12 systems rated, nine were being rented and three were purchased outright from Siemens. ▷

▶ **3020-10 AUXILIARY CONSOLE:** This console consists of a 16 line by 80 character CRT, a keyboard, a tabulator, and an attachment for a 180 cps console printer. The 3020-10 can be connected to either the 3020 or 3023 Central Control Consoles.

3023-10 AUXILIARY CONSOLE: This console consists of an 80-position, 180 cps page printer that can be attached to either a 3020 or 3023 Central Control Console.

3033-01 CONSOLE PRINTER: This unit is available for attachment to the 3020 Central Control Console or to the 3020-10 Auxiliary Console. The 3033-01 can print an 80-position line at up to 180 characters per second.

I/O CONTROL: Salient characteristics for all the System 7.000 models are summarized in Table III. Details are presented below.

On the 7.708 and 7.718, a byte multiplexor channel with one trunk for a printer is standard. Up to four and five additional trunks are optional on the 7.708 and 7.718, respectively. Each of the byte multiplexor channel trunks can operate in selector mode at 320 kilobytes per second or in multiplexor mode at 100 kilobytes per second. The maximum data transfer rate for a byte multiplexor channel is 1 million bytes per second. Two selector channels for mass storage devices, each with a data transfer rate of 806 kilobytes, are also standard on both models. Up to two and four additional selector channels are optional on the 7.708 and 7.718, respectively.

On the 7.722 version 1, a byte multiplexor channel with 5 trunks, each with a 60 kilobytes per second transfer rate, is standard: one of these trunks is reserved for the operator console. Up to 256 devices can be addressed by the byte multiplexor channel for concurrent operation in the time-division multiplex mode. The byte multiplexor channel can be extended by 2 fast trunks (options 72226 and 72227 Byte Multiplexor Channel Extensions) for an additional 300 kilobytes per second. A selector channel, capable of connecting one I/O controller with a transfer rate of 450 kilobytes per second, is also standard. The maximum I/O data transfer rate is 750 kilobytes per second; for the 7.722 version 2 the rate is 1400 kilobytes per second. The version 2 enables block multiplex operation, and a 72228 Block Multiplexor Channel Extension expands the block multiplexor channel to 2 trunks. ▶



Each of the Siemens 7.000 models offers a wide variety of operator console configurations. Shown here is a 3030 Central Console with a CRT, keyboard, tabulator, control panel, and a 180-cps hardcopy page printer (Model 3030). Up to three auxiliary consoles (3020-10 or 3023-10) can be located up to 10 kilometers from the CPU and can be attached to any Series 7.000 model.

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➤ Installed system life varied from five to 24 months, with the average being 16 months.

Memory sizes for the systems in the survey ranged from 224K bytes on a 7.730 to 2048K bytes on two 7.748's and three 7.755's. Disk mass storage capacities ranged from 165 million bytes for a 7.730 to 6988 million bytes for a 7.755. The survey average was 1353 million bytes. The number of magnetic tape drives varied from none for a 7.740 to 19 for a 7.755, with the average being seven. Five remote batch terminals were used with a 7.748, three with a 7.755, and two with a 7.730 as well as a 7.748. The remaining eight system configurations did not include remote batch terminals. The number of interactive terminals ranged from none on two smaller systems to 140 on a 7.755. The survey average was 32.

Four of the systems were running under the BS 1000 operating system, six under BS 2000, and two under both. It is interesting to note that the four systems running under BS 1000 were larger 7.000 machines that can also run under the BS 2000 virtual memory operating system. The most popular programming language in the survey was COBOL, with eight users, seven of which were, not surprisingly, those performing business data processing. FORTRAN was a close runner-up with seven users.

Ratings of the 12 systems provided by the seven users in the Datapro survey are summarized below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	0	8	4	0	2.7
Reliability of mainframe	2	8	2	0	3.0
Reliability of peripherals	0	10	2	0	2.8
Maintenance service:					
Responsiveness	4	7	1	0	3.3
Effectiveness	1	10	1	0	3.0
Technical support	1	7	4	0	2.8
Manufacturer's software:					
Operating system	0	9	3	0	2.8
Compilers and assemblers	0	7	4	1	2.5
Applications programs**	0	2	3	0	2.4
Ease of programming	1	9	2	0	2.9
Ease of conversion	0	8	4	0	2.7
Overall satisfaction	0	10	2	0	2.8

*Weighted Average on a scale of 4.0 for Excellent.

**Not all respondents were using applications programs from the manufacturer. ➤

➤ On the 7.730, a byte multiplexor channel with 6 trunks is standard: one of these trunks is reserved for the operator console. Up to 256 devices can be addressed by the byte multiplexor channel for concurrent operations in the time-division multiplex mode. The byte multiplexor channel can be extended by 2 fast trunks (options 73027 and 73028 Byte Multiplexor Channel Extensions). A block multiplexor channel with 2 trunks is also standard. The system can be expanded to a maximum of 2 block multiplexor channels (option 73042 Second Block Multiplexor Channel), each connecting 2 I/O controllers. The maximum transfer rate of a block multiplexor channel is 1250 kilobytes per second in the 1-byte mode, and 2400 kilobytes per second with the 2 byte features (73040). The maximum I/O data transfer rate of the 7.730 is 3000 kilobytes per second.

On the 7.738, a byte multiplexor channel with 8 trunks is standard with a maximum channel data transfer rate of 140 kilobytes per second: one of these trunks is reserved for the operator console. Up to 256 devices can be addressed by the byte multiplexor channel for concurrent operation in the time-division multiplex mode. Two block multiplexor channels that allow addressing of up to 256 devices each and that can operate in both block multiplex and selector modes are also standard. Each block multiplexor channel has 3 trunks. The system can be expanded to a maximum of 4 block multiplexor channels via the 73843 and 73844 additional block multiplexor channel options. The maximum transfer rate per block multiplexor channel is 1500 kilobytes per second using the 1-byte interface, and 2400 kilobytes per second using the 73840 2-byte feature. The maximum I/O data transfer rate for the 7.738 is 4500 kilobytes per second.

For the 7.740, the I/O channel characteristic and configuration rules are identical to those of the 7.738 except that only 1 block multiplexor channel with 2 trunks is standard. The 2-byte feature for the block multiplexor(s) is the 74040; the additional block multiplexors are the 74045, 74047, and 74048; and the 74046 is used to extend a single block multiplexor channel to 3 trunks. The byte multiplexor channel can be extended by the 74025 Byte Multiplexor Channel Extension with 8 additional trunks.

On the 7.748, 7.755, and 7.760 systems, a byte multiplexor channel with 8 trunks capable of supporting a maximum data transfer rate of 200 kilobytes per second is standard: one of these trunks is reserved for the operator console. Up to 256 devices can be addressed by the byte multiplexor channel for concurrent operation in the time-division multiplex mode. The byte multiplexor channel can be extended by the 74825 Byte Multiplexor Channel Extension with 8 additional trunks for the 7.748 (option 75525 for ➤

TABLE III. SALIENT I/O CONTROL CHARACTERISTICS

I/O CONTROL CHARACTERISTIC	MODEL									
	7.708	7.718	7.722-1	7.722-2	7.730	7.738	7.740	7.748	7.755	7.760
Max. Channel Throughput (kilobytes per second)	806	806	750	1400	3000	4500	4500	6000	6000	6000
Number of Byte Multiplexor Channels	4	6	1	1	1	1	1	1	1	1
Throughput Multiplex Mode (kilobytes per second)	100	100	60	60	60	140	140	200	200	200
Throughput Burst Mode (kilobytes per second)	320	320	300	300	300	233	233	238	238	238
Number of Block Multiplexor Channels	1	1	1*	1	1-2	2-4	1-4	2-6	2-6	2-6
Throughput Mux-1-Byte (kilobytes per second)	806**	806***	450	1000	1250	1500	1500	1660	1660	1660
Throughput Mux-2-Byte (kilobytes per second)	—	—	—	—	2400	2400	2400	3330	3330	3330

* Selector Channel

** Throughput for Integrated File Adapter with four trunks

***Throughput for Integrated File Adapter with six trunks

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▷ The above survey results seem to indicate a relatively high degree of user satisfaction, especially in the areas of main-frame reliability and maintenance service. One user commented that his CPU was "extremely reliable." Another strong point of the System 7.000 computers as reflected by comments from many of the users in the survey is the "interactive, multi-user capability." As noted, one user had 140 interactive terminals on-line.

A slight degree of dissatisfaction seems to arise in the area of software, especially assemblers and compilers, which were rated relatively low. In addition, one user complained of the "inconsistencies in the user interface." On the positive side, the program development facilities and interactive debugging aids were praised by several users. □

▶ the 7.755 and option 77625 for the 7.760). Two block multiplexor channels are standard with 3 trunks each that allow addressing of up to 256 devices each in either block multiplex or selector modes. The system can be expanded to a maximum of 6 block multiplexor channels via the 74843, -4, -5, and -6 Additional Block Multiplexor Channel Options for the 7.748 (75543, -4, -5, and -6 for the 7.755; or 77643, -4, -5, and -6 for the 7.760). The maximum transfer rate per channel is 1660 kilobytes per second using the 1-byte interface and 3330 kilobytes per second using the 74840 2-byte feature for the 7.748 (75540 for the 7.755; and 77640 for the 7.760). The maximum I/O data transfer rate for the 7.748, 7.755 or 7.760 is 6000 kilobytes per second.

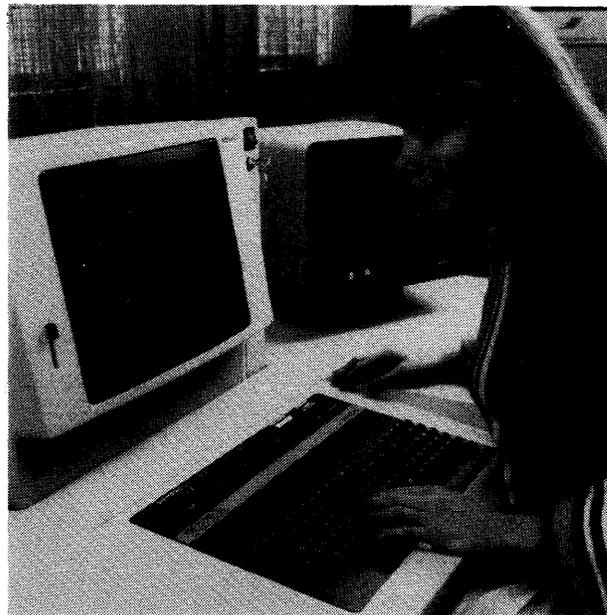
MASS STORAGE

There are seven mass storage devices available, with capacities from 55 to 420 million bytes, for use on the System 7.000 models. All but the 3440 disk can be connected to a 3416 controller, and various mass storage units can be mixed in a 3416 subsystem for a maximum configuration of 16 drives with an overall capacity of 6720 megabytes.

3440 DISK DRIVE: This removable-disk drive has 19 recording surfaces with 400 tracks each and a capacity per track of 7214 bytes for an overall capacity per spindle of 54,826,400 bytes. The data transfer rate is 312 kilobytes per second, the average access time is 35 ms, and rotational speed is 2400 rpm. The 3440 connects to a 3413 controller for attachment to the System 7.000 Models 7.722 through 7.760.

3450 DISK DRIVE: This removable-disk drive has 19 recording surfaces with 404 tracks each, and a capacity per track of 13,030 bytes for an overall capacity per spindle of 100,018,280 bytes. The data transfer rate is 806 kilobytes per second, the average access time is 30 ms, and rotational speed is 3600 rpm. The 3450 connects to a 3414-01, 3416-01, or 3416-11 controller for attachment to System 7.000 Models 7.722-2 through 7.760. The Siemens 3450 is IBM 3330-01 compatible.

3455 DISK DRIVE: This removable-disk drive has nine recording surfaces with 404 tracks each, and a capacity per track of 19,750 bytes for an overall capacity per spindle of 71,811,000 bytes. The data transfer rate is 806 kilobytes per second, the average access time is 25 ms, and rotational speed is 2400 rpm. The 3455 connects directly to Models 7.708 and 7.718 via the processors' Integrated File Adapter (disk controller); or to a 3414-03, 3416-03, or 3416-13 controller for attachment to any other System 7.000 model with the exception of Model 7.722 Version 1; or for mixed installation with the 3460's to a 3416-02 or 3416-12 controller for attachment to any System 7.000 Models 7.730 through 7.760.



The new entry-level offerings in the System 7.000 line, the Models 7.708 and 7.718, are built into desk-like enclosures with operator console and workstation facilities. Their compact size is due in part to the use of 16K-bit memory chips developed by Siemens.

3460 DISK DRIVE: This removable-disk drive has 19 recording surfaces with 808 tracks each, and a capacity per track of 13,030 bytes for an overall capacity per spindle of 200,036,560 bytes. The data transfer rate is 806 kilobytes per second, the average access time is 30 ms, and rotational speed is 3600 rpm. The 3460 connects to a 3414-02, 3416-02, or 3416-12 controller for attachment to the System 7.000 Models 7.730 through 7.760. The 3460 is IBM 3330-11 compatible.

3465 DISK DRIVE: This removable-disk drive has nine recording surfaces with 808 tracks each, and a capacity per track of 19,750 bytes for an overall capacity per spindle of 143,622,000 bytes. The data transfer rate is 806 kilobytes per second, the average access time is 25 ms, and rotational speed is 2400 rpm. The 3465 connects directly to Models 7.708 and 7.718 via the processors' Integrated File Adapter (disk controller); to a 3414-04, 3416-04, or 3416-14 controller for attachment to any other System 7.000 model with the exception of Model 7.722 Version 1; or for mixed installation with 3460's to a 3416-02 or 3416-12 controller for attachment to Models 7.730 through 7.760.

3468 DISK DRIVE: This removable-disk drive has 19 recording surfaces with 808 (plus 15 reserved) tracks each, and a capacity per track of 19,750 bytes for an overall capacity per spindle of 303,202,000 bytes. The data transfer rate is 806 kilobytes per second. The average head positioning time of 28 ms plus the average rotational delay of 12.5 ms yields an average access time of 40.5 ms. The rotational speed is 2,400 rpm. The 3468 connects directly to Models 7.708 and 7.718 via the processors' Integrated File Adapter (disk controller); or to a 3414-04, 3416-04, or 3416-14 controller for attachment to any other System 7.000 model with the exception of Model 7.722 Version 1. For mixed installation with 3470 drives, the 3468 can be connected to a 3416-05 or 3416-15 controller; or with 3465 drives, to a 3416-04 or 3416-14 controller, for attachment to Models 7.730 through 7.760.

3470 FIXED-DISK DRIVE: This device has 19 recording surfaces with 1350 tracks each, including spares, and a ▶

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► capacity per track of 16,384 bytes for an overall capacity of 420,249,600 bytes. The data transfer rate is 806 kilobytes per second, the average access time is 20 ms, and rotational speed is 2400 rpm. Average bit density is approximately 6000 bpi (roughly 240 bits per mm). The 3470 connects directly to Models 7.708 and 7.718 via the processors' Integrated File Adapter (disk controller). Up to eight 3470's can be connected to a 3416-05, or up to sixteen 3470's to a 3416-15 controller for attachment to Models 7.730 through 7.760. The 3470 operates under BS 2000. A maximum subsystem can consist of 16 drives per channel for an overall capacity of 6720 megabytes.

3170 FLOPPY DISK I/O UNIT: This unit is a peripheral device for the Siemens System 4004 (Models /35 to /151) and System 7.000. Connected via a byte multiplexor channel or selector channel, it enables the computer to read and write floppy disks.

Apart from the standard disk initialization, as used in the TRANSDATA 920 Floppy Disk Data Entry System, floppy disks can also be initialized and processed with variable formats on the 3170. Thus it is possible via the 3170 Floppy Disk I/O Unit to read data stored by various systems on floppy disks into a Siemens System 4004 or 7.000 computer.

The basic 3170 consists of one I/O station. This unit can be field upgraded with an expansion feature to include a second I/O station. The 3170 has a channel adapter with a controller which operates in the time-division multiplex mode in the dual configuration. Each I/O station has two 128-byte buffers for data storage as standard and a stacker with a capacity of 20 floppy disks. Feed, alignment and stacking of the floppy disks are fully automatic.

The controller is microprogrammed and consists of a fast bipolar LSI microprocessor. The data medium has a standard storage capacity of 1898 records of up to 128 bytes each. A single floppy disk can store a maximum of 19 independent files. A variable block length feature enables records to be written in multiple lengths of 128 bytes, up to a maximum of 4096 bytes, corresponding to a number of 26 down to 1 sector per track.

The maximum reading rate is 4680 records per minute (standard format), and the maximum writing rate is 3120 records per minute (standard format).

Rotational speed of the 3170 is 360 rpm, with a recording density of 3200 bpi, and an average access time of 242 ms. Data is organized into 77 tracks consisting of 74 data tracks plus 3 spares. In standard format, there are 26 sectors per track and 128 bytes per sector to give a maximum disk capacity of 246,272 bytes. In variable format there can be 26, 15, 8, 4, 2, or 1 sectors per track and 128, 256, 512, 1024, 2048, or 4096 bytes per sector to give a maximum disk capacity of about 245K to 303K bytes.

Options for the 3170 include the 31701 Floppy Disk Initialization feature to enable program controlled initialization of floppy disks in accordance with the ECMA proposed standard; the 31702 Variable Block Length feature to enable processing of variable block lengths with simultaneous buffering of 4096 data bytes (up to one complete track); and the 31703 Dual I/O Station Expansion feature that enables overlapped reading and writing on two I/O stations connected to one channel.

MAGNETIC TAPE EQUIPMENT

There are eleven different magnetic tape units available for use with the System 7.000 models. All are 9-track units.

3521 MAGNETIC TAPE UNIT: This is a 9-track device that has recording densities of 320 bytes per cm (800 bpi)

and 640 bytes per cm (1600 bpi), read/write speeds of 20 and 40 kilobytes per second, a rewind speed of 3.65 meters per second, and a forward tape speed of 0.635 meters per second. A 3511 magnetic tape controller with circuitry for four drives can optionally be incorporated into the 3521 housing. The 3521 is for use with all System 7.000 models.

3523 MAGNETIC TAPE UNIT: This drive is identical to the 3521 except that it has read/write speeds of 40 and 80 kilobytes per second and a forward tape speed of 1.27 meters per second.

3570 MAGNETIC TAPE UNIT: This is a 9-track device that has a recording density of 640 bytes per cm (1600 bpi), a read/write speed of 30 kilobytes per second, a rewind speed of 7.6 meters per second, and a forward tape speed of 0.48 meters per second. The 3570 MTU consists of two magnetic tape drives, the MT-controller, and the power supply. The 3570 connects directly to Models 7.708 through 7.760 and has control circuitry for four additional 3530 tape drives.

3571 MAGNETIC TAPE UNIT: This is a 9-track drive that has a recording density of 640 bytes per cm (1600 bpi), a read/write speed of 60 kilobytes per second, a rewind speed of 7.6 meters per second, and a forward tape speed of 0.95 meters per second. The 3751 MTU consists of two magnetic tape drives, the MT-controller, and the power supply. The 3751 connects directly to Models 7.708 through 7.760 and has control circuitry for four additional 3531 tape drives.

3530 MAGNETIC TAPE DEVICE: This drive is identical in characteristics to the 3570 except that it has no control circuitry. This device connects to the 3570 and uses its control circuitry and power supply.

3531 MAGNETIC TAPE DEVICE: This drive is identical in characteristics to the 3571 except that it has no control circuitry. This device connects to the 3571 and uses its control circuitry and power supply.

3540 MAGNETIC TAPE DEVICE: This is a 9-track unit that has a recording density of 320 (NRZ), or 640 (PE) bytes per cm (800 or 1600 bpi, respectively), a read/write speed of 60 (NRZ) or 120 (PE) kilobytes per second, a rewind speed of 5.7 meters per second, and a forward tape speed of 1.9 meters per second. The 3540 connects to a 3510-01, -02, -03, or -04 controller on the System 7.000 Models 7.708 through 7.760.

3550 MAGNETIC TAPE DEVICE: This is a 9-track unit that has a recording density of 320 (NRZ) or 640 (PE) bytes per cm (800 or 1600 bpi, respectively), a read/write speed of 120 (NRZ) or 240 (PE) kilobytes per second, a rewind speed of 10.4 meters per second, and a forward tape speed of 3.8 meters per second. The 3550 connects to a 3510-01, -02, -03, or -04 controller on the System 7.000 Models 7.708 through 7.760.

3554 MAGNETIC TAPE DEVICE: This is a 9-track unit that has a recording density of 320 (NRZ) or 640 (PE) bytes per cm (800 or 1600 bpi, respectively), a read/write speed of 160 (NRZ) or 320 (PE) kilobytes per second, a rewind speed of 14.5 meters per second, and a forward tape speed of 5.1 meters per second. The 3554 connects to a 3512-01, -02, -03, or -04 controller on the System 7.000 Models 7.730 through 7.760.

3557 HIGH DENSITY MAGNETIC TAPE DEVICE: This 9-track unit has a recording density of 640 (PE) or 2460 (GCR) bytes per cm (1600 or 6250 bpi, respectively), a read/write speed of 200 (PE) or 780 (GCR) kilobytes per second, a rewind speed of 12.2 meters per second, and a forward tape speed of 3.18 meters per second. Up to eight 3557's connect to a 3513 controller on the System 7.000 Models 7.730 through 7.760. ►

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► **3559 HIGH DENSITY MAGNETIC TAPE DEVICE:** This 9-track unit has a recording density of 640 (PE) or 2460 (GCR) bytes per cm (1600 or 6250 bpi, respectively), a read/write speed of 320 (PE) or 1250 (GCR) kilobytes per second, a rewind speed of 16.2 meters per second, and a forward speed of 5.1 meters per second. Up to eight 3559's connect to a 3513 controller on the System 7.000 Models 7.730 through 7.760.

HIGH SPEED PRINTERS

There are four line printers available for the System 7.000 models. They operate at speeds of 436 to 600 lines per minute for the drum printer; 960 to 2000 lines per minute for the chain printers; and up to 21,000 lines per minute for the ultra-fast 3352 laser printer. All of the printers except the laser printer can be attached to Models 7.708 through 7.760; the laser printer can be attached only to Models 7.730 through 7.760 operating under BS 2000. All of the printers are fully buffered.

3336 PRINTER: This device uses a print drum and can print 136 characters per line, using a character set of 64, 81, 82, or 96 characters plus the blank or space. Using the 64-character drum, the print speed is 600 lines per minute; with the 81- or 82-character drum, the print speed is 533 lines per minute; and with the 96-character drum, the print speed is 436 lines per minute. Horizontal spacing is 10 characters per inch, and vertical spacing is 6 or 8 lines per inch. The 3336 accepts standard rim-punched forms 102 mm (4 inches) to 425 mm (16.75 inches) in width. A paper tape vertical formatting unit is optional.

3340 PRINTER: This device is a chain-driven unit that can print either 136 or 160 characters per line, using a character set of 48, 64 or 106 characters plus the blank or space. Using the 48-character chain, the print speed is 1170 lines per minute; with the 64-character chain, the print speed is 960 lines per minute. Horizontal spacing is 10 characters per inch, and vertical spacing is 6 or 8 lines per inch. Powered forms stacking and a form feed are available as optional features 33401 and 33410, respectively. Forms feed is standard on sub-models -12 and -14.

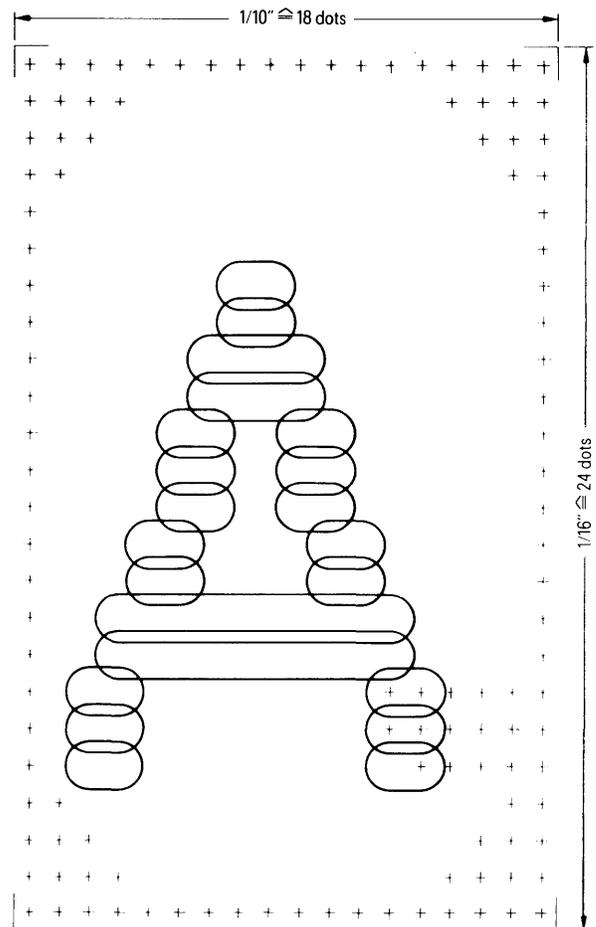
Sub-models 3340-11 and -12 have one forms feed and can accept forms from 52 to 555mm in width. Sub-models 3340-13 and -14 have two forms feeds and can accept forms from 52 to 471 mm in width on the first feed and 104 to 523 mm in width on the second feed. All of the printer sub-models can format pages from 8 to 16 inches in length.

3343 PRINTER: This device is a chain-driven unit that can print either 132 or 136 characters per line, using a 48, 64, or 96-character set plus the blank or space. Using the 48-character chain, the print speed is 2000 lines per minute; with the 64-character chain, the print speed is 1630 lines per minute. Horizontal spacing (print density) is 10 characters per inch, and vertical spacing is 6 or 8 lines per inch. Powered forms stacking and a forms feeder are standard. The 3343 can accept forms from 102-508 mm in width, and can format pages from 8-14 inches in length.

3352 LASER PRINTER: This device is a laser-beam unit that can print 136, 163, or 204 characters per line, using a 128 (standard) or 255 (option 33522) character set plus the blank or space. Horizontal spacing (print density) is 10, 12, or 15 characters per inch; and vertical spacing is 6, 8, or 12 lines per inch. Print speed for both character sets is 10,500 lines per minute with a vertical spacing of 6 lines per inch; 14,000 lines per minute with a vertical spacing of 8 lines per inch; and 21,000 lines per minute with a vertical spacing of 12 lines per inch.

On a character basis the 3352 can print up to 70,000 characters per second. Powered forms stacking and a forms feeder are standard.

Print field resolution (dots) for 10 char./in. and 6 lines/in.



The 3352 Laser Printer produces characters with aid of a laser beam, providing printing speeds of up to 1.2 million lines per hour, or around 70,000 characters per second. Illustrated above, a character frame 1/10 inch wide and 1/16 inch high with an 18-by-24 dot matrix, used for characters printed at 10 characters/inch and 6 lines/inch. Individual light points of 0.25 millimeter in diameter are packed at a density of about 7 dots/millimeter so that continuous lines are in effect formed. The light beam remains on when several consecutive points are to be exposed, resulting in the exposure of strips instead of dots on the photo-conductor drum.

The 3352 can accept forms from 165-400 mm in width and can format pages from 8-14 inches in length. Line advance is performed at a rate of 0.74 ms per line no matter how many lines are advanced at once.

PUNCHED CARD EQUIPMENT

There are three models of 80-column card reader and one 80-column card punch available for the System 7.000. All attach to any model from the 7.708 through the 7.760.

3150-01 CARD READER: This unit operates at 1000 cpm. The card input hopper can hold 1200 cards, and two 1200 card output stackers are used. Attachments for the 3150-01 include the 31501 Binary Read feature, the 31502 Ticket/Stub Card feature, the 31503 Mark Read feature, the 31504 Automatic-End-of-File feature, and the 31505 90-column feature.

3150-02 CARD READER: This unit differs from the 3150-01 only in having a 3000 card capacity input hopper. ►

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► **3150-03 CARD READER:** This unit operates at 660 cpm. The card input hopper can hold 1200 cards, and two 1200 card output stackers are used. Attachments include all of the optional features available for the 3150-01 or 3150-02 except the 31503 Mark Read feature.

3160 CARD PUNCH: This unit operates at 100-290 cpm, and has a 1200-card input hopper and two 1100-card output stackers. A 31601 binary punching feature is available as an option.

PUNCHED PAPER TAPE EQUIPMENT

There are four paper tape readers and two paper tape punches available for use with any System 7.000 Model 7.708 through 7.760.

4223 PAPER TAPE READER: This device can read up to 1200 characters per second in a forward direction, and accepts 5, 6, 7, or 8-channel tape or Olivetti-LS code-on tapes 17.4, 25.4, 22.2, or 20.5 mm wide. Attachments include a tape collection bin, a manual rewinder, and an unwinder (standard). A 4222 or 4220 controller is required.

4229 PAPER TAPE READER: This device can read up to 1500 characters per second in a forward direction, and accepts 5, 6, 7, or 8-channel tape in widths of 17.4, 22.2, or 25.4 mm. Attachments include a tape collection bin and an unwinder. A 4222 or 4220 controller is required.

4229-S PAPER TAPE READER: This device can read up to 1500 characters per second in either forward or reverse direction, and accepts 6-channel typesetting tapes with a width of 22.2 mm. Attachments include a tape collection bin, and an unwinder. A 4222 or 4220 controller is required.

4229-O PAPER TAPE READER: This device can read up to 1270 characters per second in either forward or reverse direction, and accepts 6-channel rectangular Olivetti code-on tapes with a width of 20.5 mm. Attachments include a tape collection bin, and an unwinder. A 4222 or 4220 controller is required.

4228 PAPER TAPE PUNCH: This device can punch up to 150 characters per second in 5, 6, 7, or 8-channel code-on 17.4 or 25.4 mm tape. An unwinder is standard and a 45294 Take-Up Winder is available as an option. A 4221 or 4220 controller is required.

4228-S PAPER TAPE PUNCH: This device can punch up to 150 characters per second in 6-channel typesetting tape with a width of 22.2 mm. Attachments include a standard unwinder, and an optional 45294 Take-Up Winder. A 4221 or 4220 controller is required.

DOCUMENT READERS

Two document readers are available for attachment to Models 7.708 through 7.760. Both can read either pencil marks or high-speed printer characters from documents with a thickness of 0.10-0.18 mm, a width of 95-200 mm, and a length of 145-305 mm. The acceptable document format allows for a maximum of 65 columns; each with 24 positions. Each reader has one document input bin capable of holding 500 documents, one output bin capable of holding 500 documents, and a reject pocket holding 150 documents.

The 3262-01 Document Reader operates at 100-150 documents per minute; and the 3262-02 Document Reader operates at 50-75 documents per minute.

DISPLAY TERMINALS

8150 DATA DISPLAY STATION: This unit consists of a controller, a keyboard, and a fully-buffered CRT. The screen

provides for a 20-line display with up to 54 characters per line. The 64-character set is used. Asynchronous, half-duplex data communications lines with rates of 1200 or 2400 bps are handled. The 8150 accepts ISO 7-bit code.

8151 DATA DISPLAY STATION: This unit has characteristics identical to those of the 8150 except that either asynchronous or synchronous, half-duplex lines of 1200, 2400, 4800 or 7200 bps are handled.

8152 DATA DISPLAY STATION: This unit consists of a controller, a keyboard, and a fully buffered CRT capable of graphics representations. The screen provides for a 16-line display with up to 81 characters per line. Either a 64 or 95-character set is supported. Either asynchronous or synchronous half-duplex lines of 1200, 2400, 4800, or 9600 bps are handled. The 8152 accepts ISO 7-bit code.

8153 DATA DISPLAY STATION: This unit consists of a controller, a keyboard, and a fully buffered CRT. The screen provides for a 6-line display with up to 40 characters per line. The 64-character set is used. Asynchronous half-duplex lines with rates of 600, 1200, or 2400 bps are handled. The 8153 accepts ISO 7-bit code.

8161 DATA DISPLAY STATION: This unit consists of a CRT with an integrated controller and a keyboard. The screen provides for a 24 line display and 54, 64, or 80 characters per line. Either a 64 or 95-character set is supported with 12 special characters. Synchronous half-duplex lines with rates from 600 to 9600 bps are handled. The 8161 accepts ISO 7-bit code.

3976 CRT TERMINAL: This unit is a graphic display, 7-color terminal capable of displaying 2048 alphanumeric characters. Data transmission rate is 9600 bps.

PRINTER TERMINALS

8101 KEYBOARD-PRINTER TERMINAL: This unit can print 6-10 characters per second using a print bar mechanism; or can transmit data at 50, 75, or 100 bps. The 8101 provides a 32-character set and can print up to 104 characters per line on continuous forms.

8103 KEYBOARD-PRINTER TERMINAL: This unit can print 18.67 characters per second using a print bar mechanism, or can transmit data at 200 bps. The 8103 provides either a 64 or 95-character set, and can print up to 143 characters per line on continuous forms.

8110 KEYBOARD-PRINTER TERMINAL: This unit includes a buffered keyboard and can print 120-180 characters per second using a print bar mechanism; or can transmit data at up to 4800 bps. The 8110 provides either a 64 or 95-character set, and can print up to 143 characters per line on continuous forms.

8100 HARDCOPY PRINTER: This unit is a print-only terminal that can print at a rate of 22 characters per second using a print bar mechanism. The 8100 provides either a 64 or 95-character set, and can print up to 80 characters per line on continuous forms.

8111 REMOTE PRINTER TERMINAL: This unit can print 180 characters per second using a 7 x 7 dot matrix and receive data over a communications line at up to 7200 bps. The 8111 provides a 68-character set, and can print up to 132 characters per line on either of two continuous forms feeds. An auxiliary 8120 printer can be attached.

8120 PRINTER: This unit can print 180 characters per second using a 7 x 7 dot matrix. The 8120 provides a 68-character set and can print up to 132 characters per line on either of two continuous-form feeds or a single sheet feed. The 8120 can be attached to either the 8111 Remote Printer Terminal or the 815X Display Station. ►

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► **8121 PRINTER:** This unit is similar to the 8120 Printer except that it has a 69-character print set and connects to either the 8112 Printer Controller or the 8161 Display Station.

8415 BATCH PRINTER STATION: This unit includes a printer and controller and can print up to 900 lines per minute. The 8415 provides a 46, 64, or 94-character set, and can print up to 104 characters per line. The 8415 connects to a DUST 3630 or a TRANSDATA 960 and accepts 6-bit BCD-Transcode, 7-bit CCITT No. 5, or 8-bit EBCDIC over a 9600 bps line.

8418 BATCH PRINTER/CARD INPUT STATION: This subsystem includes a printer, a punched card reader, and a controller. The 8418 is identical to the 8415 except that the 8418 has the ability to read standard 80-column cards at up to 667 cpm.

TERMINAL SUBSYSTEMS

TRANSDATA 9660, MODEL DUET 9661: This subsystem for banking and financial institutions has from 128K to 256K of programmable memory, and includes a floppy disk and, optionally, a printer. Up to 10 data lines can be connected to a 9661 subsystem consisting of a 9760 Dialog Station, 8151 or 8161 Display Terminals, or a 8415 Printer Terminal. Network support is provided for point-to-point, star, or ring configurations. Data transfer rates of 600-9600 bps are supported.

9760 DIALOG STATION: This unit is available for use with the DUET 9661, and consists of a keyboard, a visual

display screen, and a printer. The keyboard can be either numeric, alphanumeric, or function driven. The visual display is a plasma-type unit with one display line of up to 32 characters or 8 lines of up to 32 characters each. The printer is a journal-type unit capable of printing 100 characters per second. An external Book and Page printer is available that can print up to 100 characters per second. The 9760 is suitable for use as a universal interactive terminal, a counter terminal, or for use in an off-line mode of operation.

TRANSDATA 920: This subsystem is a Floppy Disk Data Entry System for centralized and decentralized data entry. The TRANSDATA 920 consists of a 9210 Data Entry Station, a 9212 Dual Data Entry Station, a 9230 Data Converter, and a 3170 Floppy Disk I/O Unit.

The machine-readable data medium employed by the TRANSDATA 920 is a floppy disk with a maximum capacity of 1,898 records (246,272 bytes). A record corresponds to a sector and direct access is possible to any sector.

Files may extend over several floppy disks, and a disk may contain data and/or programs, as required.

The operator keyboard is identical to that of a punch/verifier.

For centralized data entry, the 9212 Dual Data Entry Station is used. A display for each of two operators at this dual workstation is used for visually checking keyed data and the current device status, and provides support when updating and verifying. The 9212 display unit provides for ►

TABLE IV. TRANSDATA 960 DATA COMMUNICATIONS PROCESSORS

CHARACTERISTICS	TRANSDATA 960 MODELS					
	9683	9684	9685	9687	9674	9675
Memory Range (bytes)	—	32,768 49,152 65,536 81,920 98,304	32,768 49,152 65,536 81,920 98,304 114,688 131,072 147,456	32,768 to 557,056 (in increments of 32,768)	32,768 49,152 65,536 81,920 98,304 114,688 131,072	32,768 to 557,056 (in increments of 32,768)
Maximum Data Throughput (kilobytes per second)	5	16	25*	25*	16	25*
Programmable Controller	yes	yes	yes	yes	no	no
Front-End Processor	no	yes	yes	yes	no	no
Programmable Network	no	no	no	no	yes	yes
Maximum Lines	22	42	180	180	60	180
Operations Time						
Register Instruction	1667 ns	833 ns	500 ns	500 ns	833 ns	500 ns
Memory Instruction	3335 ns	1667 ns	833/1333 ns	833/1333 ns	1667 ns	833/1333 ns
Operating System	BS 1000 with TCS	BS 1000 with TCS; or BS 2000 with TCS or PCAM	BS 1000 with TCS; or BS 2000 with TCS or PCAM	BS 1000 with TCS; or BS 2000 with TCS or PCAM	BS 1000 with TCS; or BS 2000 with TCS or PCAM	BS 1000 with TCS; or BS 2000 with TCS or PCAM
Connects to CPU Model:	7.708 thru 7.740	7.708 thru 7.760	7.708 thru 7.760	7.708 thru 7.760	Over a communications line to the 9684, 9685, or 9687 via the Front-End Processor	

*A further increase of the data throughput can be achieved by the use of more sophisticated line-buffers.

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- viewing of three 40-character lines per operator on a 5.5 x 2.3 inch screen.

For decentralized data entry, the 9210 Data Entry Station is used. The 9210 has a larger screen than the 9212 and provides program-controlled operator guidance. The 9210 can be tailored to meet specific customer requirements by doubling the storage capacity with a second floppy disk drive, by connecting a printer, and by using a communication adapter feature. Both point-to-point circuits and multi-point networks may be configured. The station can also send and receive data in unmanned operation. The 9210 display unit provides for viewing of six 40-character lines on a 5.5 x 3.7 inch screen. Transmission speed is 600, 1200 or 2400 bps in synchronous half-duplex mode using EBCDIC format.

For indirect data transfer to the computer, the 9230 Data Converter is used.

Data written on floppy disks by the data entry stations is read in batches by the 9230 Data Converter and transferred to a computer-compatible magnetic tape. Conversely, the contents of a tape recorded by a computer can be transferred to floppy disk. The autoloader can hold 20 floppy disks. The conversion speed to tape is 1000 records per minute and from tape is 600 records per minute.

During conversion, records may be blocked, unblocked, or reformatted with simultaneous checking for errors.

The prepared tapes can be transported physically to the computer location and read, or, when a communication adapter feature is used, data can be transmitted via a point-to-point circuit to a remote computer. Connection to another 9230 Data Converter or to a 9210 Data Entry Station is also possible. The tape drive handles 10.5-inch reels of magnetic tape recorded at 800 bpi (NRZ) or 1600 bpi (PE).

When fitted with an autocall feature, the data converter can fetch data entered during the day on 9210 Data Entry Stations equipped for data communication.

The 9230 Data Converter can be connected to the TRANSDATA 960 Communication Unit (DUET), the 4666 Communication Controller (DUST), or the TRANSDATA 9210 Data Entry Station.

Transmission speed is 600, 1200 or 2400 bps in synchronous, half-duplex mode using EBCDIC format.

For direct data transfer to the computer, the 3170 Floppy Disk I/O Unit is used (see Mass Storage section in this report).

DATA COMMUNICATIONS

3630 DATA COMMUNICATIONS CONTROLLER: This controller can transfer data to the computer at up to 25,600 characters per second and can handle up to 30 lines at 4800 bps, 16 lines at 9600 bps, or 8 lines at 19,200 bps. Of the limit of 30 lines that can be attached to the 3630, 8 can be used for audio-response units. Data rates of 50 to 19,200 bps are standard and the 3630 can be equipped with an option to accommodate a 50,000 bps line. The 3630 can be connected directly to any System 7.000 Models 7.722 through 7.760.

8170 and 8171 MULTIPURPOSE CONTROLLERS: The 8170 and 8171 can connect the 8161 CRT, the 8112 printer terminal, or the 8121 printer to a Siemens 7.000 or 4004 via a multiplexor channel. The 8170 can be connected directly to the channel and data transfer between the terminal subsystem and the channel takes place at up to 230,400 bps. The 8171 is connected via a half-duplex communications line, and can transfer data at 9600-19,200 bps. For either system, up to 32 data stations can be connected.

TRANSDATA 960 DATA COMMUNICATIONS PROCESSORS: Siemens offers a series of six TRANSDATA 960 programmed communications processors that attach to Models 7.708 through 7.760 and range in memory size from 32K to 512K and can handle from 22 to 180 lines ranging in overall throughput speeds from 5 to 25 kilobytes per second. All of the TRANSDATA 960 models have 54 instructions, use 16-bit words, and can accommodate line speeds of 50-50,000 bps. Models 9683-9687 are front-end processors, while Models 9674 and 9675 are used as remote processors. The characteristics of the individual models of the TRANSDATA 960 are detailed in Table IV.

SOFTWARE

Software for the System 7.000 includes the real-memory operating system BS 1000, the virtual-memory operating system BS 2000, nine language processors, utilities, a data base management system, and a variety of applications packages.

BS 1000 OPERATING SYSTEM: This operating system is a real-memory, batch, remote batch, and transaction-processing system control program that is supported on all 7.000 systems except the 7.708, 7.718, and 7.760, and all 4004 models from the 4004/35 upward. BS 1000 was made available for use on the 7.000 series in April, 1975 as Version 1.3. Since then, two other versions have been released—Version 1.4 and Version 1.44. BS 1000 had previously been available on the 4004 as early as November, 1973. Each of up to 14 independent programs may be loaded at any location in main memory for simultaneous execution. Each program must reside in a single block of contiguous memory, and each program is assigned a priority that can be changed during execution. Depending upon the user's requirements, a BS 1000 system can be generated with a minimum resident main memory requirement of 12K bytes.

The principal control system components of the BS 1000 include:

- Executive (EXEC)
- Job Management System
 - Monitor (MONTR)
 - SPOOL 1 System
 - SPOOL 2 System
 - Job Control System 1 (JCS1)
 - Resource Management System (RMS)
 - Job Control System 2 (JCS2)
 - Data Set Catalog System (DACS)
 - Job Accounting System (MESACNT)
- File Control Processor (FCP)
- Telecommunications System (TCS)
- Real Time Control Programs (ASMUS, DIACUP)
- Voice Output System

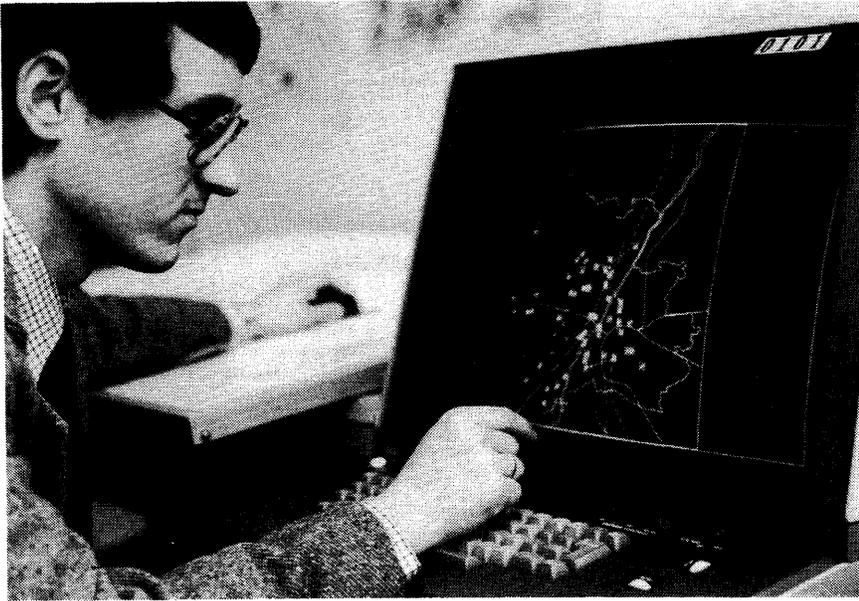
The main functions of the EXEC are to manage main memory, analyze and service interrupts, schedule I/O, and communicate with the operator through the system console(s). EXEC occupies 12K bytes of main memory as a minimum. An optional System Overlay feature of the EXEC permits system disk overlays to be made resident in main memory in an area that can be 4K to 50K bytes in size.

The Job Management System (JMS) comprises the systems for automatic job execution.

In order to reduce the workload on the operator, the MONTR allows a "job" consisting of several programs to be processed in a job stream. MONTR is always overlaid by the next program to be started so that it does not occupy any memory space during program processing.

SPOOL 1 is used for small-to-medium configurations and supports systems with available main memory of at least 64K bytes. SPOOL 2 is for large configurations and sup-

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Siemens' interactive graphic system, IGS, is available for System 7.000 models running under BS 2000. The optional software package allows two-dimensional figures to be created and manipulated on a graphic terminal with the help of over 100 instructions.

► ports systems with available main memory of 128K bytes or larger. Both spoolers support input of jobs and files from local peripherals and intermediate storage and output of print and punch files via local peripherals. In addition, SPOOL 2 also accepts input from remote terminals, supports intermediate storage and output to remote terminals, and reads/writes temporary files via a virtual magnetic tape interface.

SPOOL 2 also offers an extensive function catalog and can support dual systems with the multi-channel switch and two-channel disk controller.

JCS 1 is an integral part of SPOOL 1 and supports FIFO automatic job execution under a 64-class job classification system that assigns any of 3 priorities to an individual job. JCS 2 is intended for use with SPOOL 2 and runs as an internal process that does not require its own time slot. JCS 2 supports up to 10 priority levels.

DACS catalogs and manages data sets by generation dates, assigns proper data sets to user programs, and initializes storage space for disk output, as well as permitting temporary or permanent storage of job variables for interchange between programs.

FCP controls I/O data communications between the CPU and the peripherals.

TCS is analogous to FCP except that it controls communication between the CPU and remote terminals connected to a communications controller as well as the interconnection of 2 or more CPU's via a data exchange controller. TCS runs in conjunction with SPOOL 2.

Two TCS access methods are available under BS 1000:

- TCS for non-programmable communications controllers (3630),
- TCS-NEA for programmable communication controllers (TRANSDATA 960) and communications front-end processors. TCS-NEA supports communication network configurations.

TCS and TCS-NEA consist of a communication control program and up to 8 user programs.

ASMUS, a real-time control program that runs under BS 1000, supports overlapped (re-entrant) operation of several interactive data terminals and/or remote batch peripherals. ASMUS supports overlapped execution of several active programs by providing segment-reentrant control. User programs with ASMUS can be written in Assembler or COBOL.

DIACUP is an interactive program that supports the writing of up to 137 communication user programs that can be run as subroutines in the same program slot as DIACUP. DIACUP requires a minimum of 4096 bytes of main memory.

The minimum configuration required to run the BS 1000 operating system consists of any System 7.000 CPU with at least 64K bytes of main memory, 1 console, 1 disk storage device connected via a selector channel, 1 card reader, and 1 printer.

BS 2000 OPERATING SYSTEM: This is a virtual memory operating system that provides significant functional enhancements over BS 1000. BS 2000 was introduced for the 7.000 as Version 2 in December, 1975. Version 3 was introduced in March, 1977, and included improvements in file handling facilities. Version 4, released in August, 1978, includes the Transdata DCM communications access system for simplified programming of time-sharing and batch operations in data networks. This latest version of BS 2000 also provides improved data/program security, on-line maintenance routines, a more efficient system/user interface, and "eventing routines" that permit concurrently running programs to be synchronized so that data can easily be exchanged among them.

BS 2000 can be run on any medium-to-large scale System 7.000 from the model 7.730 up; as well as Models 7.708 and 7.718 and the System 4004/151. The essential features of BS 2000 include dynamic memory management for a virtual address space of up to 16 million bytes; concurrent support of local or remote batch processing, multiprocessing of up to 120 tasks, and interactive processing (time-sharing) for more than 100 users under control of a batch-oriented task management system; and real-time operation. BS 2000 treats all programs as either Class I (memory resident) or Class II (pageable). A Class II program can be up to 5 million bytes in length. Users are classified as system administrators, operators, or user/programmers. ►

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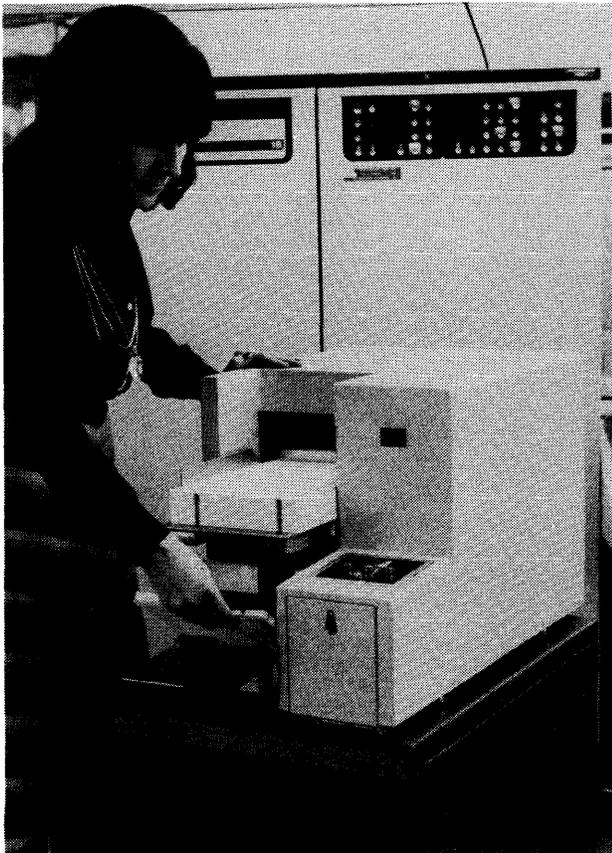
► There are two main types of programs under BS 2000: privileged and non-privileged routines. The Control System is privileged and consists of the Executive, the Data Management System, the Teleprocessing System, and System Services. Non-privileged routines consist of language processors, utility routines, and user programs.

The Executive performs the following functions:

- Handling console I/O
- Processing user command language
- System accounting, spooling
- Interrupt handling.

The Data Management System handles I/O operations except for data terminals and the console(s), including file management and the shareability of files. Access methods supported by the Data Management System include SAM (Sequential Access Method), ISAM (Indexed Sequential Access Method), PAM (Primary Access Method), and BTAM (Basic Tape Access Method). PAM can only access 2048-byte pages.

The Teleprocessing System supports remote access to the computer system including facilities for resource management, logon/logoff, support of logical or virtual terminals, data transfer, and error handling.



The Siemens 3262 Mark Sheet Reader can read up to 9000 documents per hour containing up to 1560 marks per document in any combination of hand printed or mechanically produced formats. Sheets to be read are taken out of the input magazine individually by a picker, carried past the read station, and deposited in the receiving tray. If a sheet is very dirty or damaged, it lands in a reject pocket. The 3262 is available in two versions with different speeds.

System Services include an Interactive Debugging Aid, a Desk Calculator function, a Dynamic Linking Loader, and an Audit Mode for generation of branch address tables.

For execution, tasks are classified as either interactive or background (batch). Interactive tasks are initiated via the keyboard of a data terminal. Batch tasks can be assigned any of 9 priorities.

Operating system components (except the Executive), user programs and application programs are stored in virtual memory and relocated into real memory during execution. Virtual memory space is reallocated to the programs during loading. Virtual memory for Models 7.730 and above is divided into consecutive 64K-byte segments each containing 32 pages.

Real memory under BS 2000 is divided into two sections: one is reserved for the Executive and the real-memory resident programs, and the other is divided into 2K page frames. All paging is done on demand only.

Virtual memory is subdivided into 6 classes. Classes 1-4 are reserved for the system, while Classes 5 and 6 are available to the user. Class 6 memory is available for user-written programs and begins at the low-order end of the available memory area. Class 5 memory comprises the high-order 64K and is used for tables and buffer areas that have to be set up for user tasks.

Dynamic Address Translation is handled via a special Address Translation Memory (ATM) that holds 128 entries. Each ATM entry contains a Segment and Page reference that is combined with a virtual address displacement to result in a real address. A hit will result in 90-95% of all address references using this multi-level address translation scheme. When an address cannot be determined on the first pass through the ATM, a fall back to Segment/Page tables with an additional 256 entries is required. A maximum of 2-levels are required for 2K-page addressing, and 3-levels are required for 4K-page addressing schemes (4004/151).

In order to allow users to upgrade from BS 1000 to BS 2000 more easily, Siemens has developed the SIM-BS1000 simulator, which enables BS 1000 to run without modifications under simulated 4004 hardware characteristics in a BS 2000 machine.

LANGUAGE PROCESSORS: A variety of language processors are supported on the System 7.000 under the BS 1000 and BS 2000 operating systems:

Language	BS 1000 (Memory Requirement)	BS 2000
Assembler	yes (34K)	no
Assembler	yes (70K)	yes**
RPG 2	yes (Min. 26K)	no
ALGOL 60	yes (66K)	yes
ANS COBOL	yes (24 or 46K)	yes
FORTRAN IV	yes (56 or 92K)	yes
PL/I	yes (86K)	yes
BASIC	no	yes**
BASICL*	no	yes**
APL	no	yes

*Double-precision version.

**Shareable.

Two versions of the ANS COBOL compiler are available under BS 1000: a basic version that requires 24K of resident main memory; and an enhanced version that requires 46K bytes.

The PL/I compiler offers capabilities that are midway between the IBM D-level and the ECMA level. The Assembler contains an extensive macro capability. ►

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► All language processors available under BS 2000 are pageable. All but BASIC and BASICL produce pageable object modules.

UTILITY ROUTINES: A full set of utilities is available for BS 1000 and BS 2000, including a Sort/Merge program, library maintenance routines, a linkage editor, system service routines, diagnostic routines, debugging aids, test data generators, and peripheral/media conversion routines.

UNIVERSAL DATA BASE MANAGEMENT SYSTEM (UDS): UDS is available for the System 7.000 and System 4004 computers. Minimum requirements are a 128K main memory, a card reader, a printer, and two disk drives. For smaller systems, Siemens offers UDS Variant A, which requires a minimum of 46K of real memory. UDS runs under BS 1000, with BS 2000 support scheduled to become available in 1978. UDS interacts with ASMUS for real-time operations when used in conjunction with TCS. The system follows the recommendations of the April 1971 Report of the CODASYL DBTG, the CODASYL COBOL Data Base Facility Proposal of March 1973, and the COBOL JOD for 1975. UDS is functionally upward compatible with Siemens other data base systems: SESAM and PRISMA.

A second version of UDS, introduced in 1978, provides improvements in data access methods, language facilities, and data protection and security provisions. With UDS Version 2, it is possible to directly access records to be read or updated, eliminating the need to read through long record chains to reach a target record. The new version also includes a CALL interface that permits user programs operating with UDS to be written in any programming language (UDS Version 1 supported only COBOL). For rapid system recovery following a breakdown, an on-line transaction security facility has been added to the existing data protection features. For data privacy/security, UDS Version 2 uses a password system.

The major components of UDS are:

- Data Definition Language (DDL)
- Storage Structure Language (SSL)
- Data Base Handler (DBH)
- Data Manipulation Language (DML)
- Interactive Query Language (IQL)
- Service Programs.

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5-level access codes are used to ensure data access security. Under BS 2000, GOLEM is a pageable program.

APPLICATION PACKAGES

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EQUIPMENT PRICES*

CONFIGURATION		Approx. Purchase (DM)	Approx. Monthly Rental** (1-year lease) (DM)	Approx. Monthly Rental** (3-year lease) (DM)	Approx. Monthly Rental** (5-year lease) (DM)	Approx. Monthly Maint. (DM)
SIEMENS 7.708 ENTRY LEVEL SYSTEM						
7.708-HG	7.708 Processor with 384K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Selector Channel, and Main Cabinet Peripherals including System Keyboard/Display, 2nd Display for Applications Processing, Floppy Disk Drive					
3336	Line Printer, 6 or 8 Lines/Inch, 436/600 lpm, 136 Print Positions					
3455	Mass Storage Drives (2), 72 MB/Disk Pack					
TOTAL PRICE*		675,000	18,000	16,500	15,800	2,150

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Siemens System 7.000

EQUIPMENT PRICES*

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SIEMENS 7.718 MEDIUM-TO-LARGE SCALE SYSTEM						
7.718-J	7.718 Processor with 1024K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Selector Channel, and Main Cabinet Peripherals including System Keyboard/Display, 2nd Display for Applications Processing, Floppy Disk Drive					
71824	2nd Byte Multiplexor Channel					
71825	3rd Byte Multiplexor Channel					
71826	4th Byte Multiplexor Channel					
71896-20	Integrated Communications Processor					
70812	2nd Integrated Floppy Disk Drive					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3336	Line Printer, 6 or 8 Lines/Inch, 436/600 lpm, 136 Print Positions					
3571	Dual Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3468	Mass Storage Drives (4), 300 MB/Disk Pack					
TOTAL PRICE*		1,825,000	49,000	45,000	43,000	5,800
SIEMENS 7.722 ENTRY LEVEL SYSTEM						
7.722-FE1	7.722 Version 1 Processor With 96K Bytes of Memory, 1 Byte Multiplexor Channel and 1 Selector Channel					
3023	Central Operator Console					
3150-01	Card Reader, 1000 cpm					
3340-11	Line Printer, Single Form, 6 Lines/Inch, 960/1170 lpm, 132 Print Positions					
3540	Magnetic Tape Drives (2) 9-Track, 800 bpi, 60/120 KBS					
3510-01	Magnetic Tape Control Unit					
TOTAL PRICE*		770,000	21,500	19,000	18,500	3,000
SIEMENS 7.722 MEDIUM-TO-LARGE SCALE SYSTEM						
7.722-H2	7.722 Version 2 Processor With 256K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Block Multiplexor Channel and 1 Selector Channel					
72228-02	Block Multiplexor Channel Extension					
72226-02	Byte Multiplexor Channel Extension					
3020	Central Operator Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3340-11	Line Printer, Dual Form, 6 or 8 Lines/Inch, 96/1170 lpm, 160 Print Positions					
3571	Dual Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3465	Mass Storage Drives (4), 144 MB/Disk Pack					
3416-14	Mass Storage Controller					
TOTAL PRICE*		1,200,000	44,000	39,000	37,500	4,000

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Siemens System 7.000

EQUIPMENT PRICES*

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SIEMENS 7.730 SMALL-TO-MEDIUM-SCALE SYSTEM						
7.730-GE1	7.730 Version 1 Processor With 160K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Block Multiplexor Channel					
73027	Byte Multiplexor Channel Extension					
3023	Central Operator Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3340-12	Line Printer, Single Form, 6 or 8 Lines/Inch, 960/1170 lpm, 132 Print Positions					
3571	Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3455	Mass Storage Drives (6), 72 MB/Disk Pack					
3416-03	Mass Storage Controller					
	TOTAL PRICE*	1,150,000	32,000	29,500	28,000	3,500
SIEMENS 7.730 LARGE-SCALE SYSTEM						
7.730-12	7.730 Version 2 Processor with 512K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Block Multiplexor Channel					
73027, 73028	Byte Multiplexor Channel Extensions (2)					
73040	2-byte Feature					
73042	Second Block Multiplexor Channel					
3023	Central Operator Console					
3023-10	Sub-console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3340-11	Line Printers (2), Single Form, 6 Lines/Inch, 960/1170 lpm, 132 Print Positions					
3554	Magnetic Tape Drives (4), 9-Track, 800/1600 bpi, 160/320 KBS					
3512-02	Magnetic Tape Controller					
3455	Mass Storage Drives (8), 72 MB/Disk Pack					
3416-03	Mass Storage Controller					
	TOTAL PRICE*	2,400,000	65,800	59,000	56,000	7,700
SIEMENS 7.738 MEDIUM-TO-LARGE SCALE SYSTEM						
7.738-IH	7.738 Processor With 768K Bytes of Memory, 1 Byte Multiplexor Channel, 2 Block Multiplexor Channels					
73840	2-Byte Feature					
73843	3rd Block Multiplexor Channel					
3023	Operator Console					
3023-10	Sub-Console					
3160	Card Punch, 100-290 cpm					

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Siemens System 7.000

EQUIPMENT PRICES*

CONFIGURATION		Approx. Purchase (DM)	Approx. Monthly Rental** (1-year lease) (DM)	Approx. Monthly Rental** (3-year lease) (DM)	Approx. Monthly Rental** (5-year lease) (DM)	Approx. Monthly Maint. (DM)
SIEMENS 7.738 MEDIUM-TO-LARGE SCALE SYSTEM (continued)						
3150-01	Card Reader, 1000 cpm					
3343	Line Printer, 1630/2000 lpm					
3262-02	Document Reader, 50-75 Documents/Minute					
3571	Dual Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3455	Mass Storage Drives (6) 72 MB/Disk Pack					
3416-03	Mass Storage Controller					
TOTAL PRICE*		2,400,000	65,500	59,000	56,000	9,000
SIEMENS 7.740 MEDIUM-SCALE SYSTEM						
7.740-IG1	7.740 Processor With 640K Bytes of Memory, 1 Byte Multiplexor Channel, 1 Block Multiplexor Channel					
74040	2-Byte Feature					
74045	2nd Block Multiplexor Channel					
3023	Operator Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3343	Line Printer, 1630/2000 lpm					
3571	Dual Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3455	Mass Storage Drives (2), 72 MB Disk Pack					
3416-03	Mass Storage Controller					
TOTAL PRICE*		2,800,000	70,500	65,000	62,000	8,500
SIEMENS 7.748 MEDIUM-SCALE SYSTEM						
7.748-J1	7.748 Processor With 1,536K Bytes of Memory, 1 Byte Multiplexor Channel, 2 Block Multiplexor Channels					
74825	Byte Multiplexor Channel Extension					
74840	2-Byte Feature					
74843	3rd Block Multiplexor Channel					
3023	Operator Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3343	Line Printer, 1630/2000 lpm					
3571	Dual Magnetic Tape Drive, 9-Track, 1600 bpi, 60 KBS					
3531	Magnetic Tape Drives (2) (Add-on to 3571)					
3455	Mass Storage Drives (8), 72 MB Disk Pack					
3416-03	Mass Storage Controller					
TOTAL PRICE*		3,700,000	102,000	92,500	88,000	13,000

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SIEMENS 7.748 LARGE-SCALE SYSTEM						
7.748-K	7.748 Processor With 2048K Bytes of Memory, 1 Byte Multiplexor Channel, 2 Block Multiplexor Channels					
74825	Byte Multiplexor Channel Extension					
74840	2-Byte Feature					
74843	3rd Block Multiplexor Channel					
74844	4th Block Multiplexor Channel					
74845	5th Block Multiplexor Channel					
3023	Operator Console					
3023-10	Sub-Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3352-01	Laser Printer, 20,000 lpm					
3343	Line Printer, 1630/2000 lpm					
3557	Magnetic Tape Drives (6) 9-Track, 1600/3200 bpi, 780 KBS					
3513	Magnetic Tape Controller for 3557's					
3550	Magnetic Tape Drive, 9-Track, 800/1600 bpi, 120/240 KBS					
3510-01	Magnetic Tape Controller for 3550					
3455	Mass Storage Drives (12), 72 MB/Disk Pack					
3416-14	Mass Storage Controller					
TOTAL PRICE*		5,500,000	150,000	139,000	132,000	18,000
SIEMENS 7.755 MEDIUM-SCALE SYSTEM						
7.755-K	7.755 Processor With 2048K Bytes of Memory, 1 Byte Multiplexor, 2 Block Multiplexors					
75525	Byte Multiplexor Channel Extension					
75540	2-Byte Feature					
75543	3rd Block Multiplexor Channel					
3023	Operator Console					
3023-10	Sub-Console					
3160	Card Punch, 100-290 cpm					
3150-01	Card Reader, 1000 cpm					
3343	Line Printer, 1630/2000 lpm					
3340-11	Line Printer, Dual Form, 6 or 8 Lines/Inch, 960/1170 Lines/Minute, 160 Print Positions					
3557	Magnetic Tape Drives (6), 9-Track, 1600/3200 bpi, 780 KBS					
3513	Magnetic Tape Controller					
3465	Mass Storage Drives (8) 144 MB/Disk Pack					
3416-14	Mass Storage Controller					
TOTAL PRICE*		5,900,000	152,000	143,500	134,000	19,000

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SIEMENS 7.760 LARGE-SCALE SYSTEM						
7.760-LJ	7.760 Processor With 5,120K Bytes of Memory, 1 Byte Multiplexor, 2 Block Multiplexor Channels					
76025	Byte Multiplexor Extension					
76040	2-Byte Feature					
76043	3rd Block Multiplexor Channel					
76044	4th Block Multiplexor Channel					
76045	5th Block Multiplexor Channel					
3023	Operator Console					
3023-10	Sub-Console					
3150-01	Card Reader, 1000 cpm					
3352-01	Laser Printer, 20,000 lpm					
3343	Line Printers (2), 1630/2000 lpm					
3559	Magnetic Tape Drives (6), 9-Track, 1600/3200 bpi, 1,250 KBS					
3513	Magnetic Tape Controller for 3559's					
3468	Mass Storage Drives (12), 300 MB/Disk Pack					
3416-14	Mass Storage Controller					
	TOTAL PRICE*	9,000,000	233,000	215,000	206,500	20,000

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Siemens System 7.000

► All language processors available under BS 2000 are pageable. All but BASIC and BASICL produce pageable object modules.

UTILITY ROUTINES: A full set of utilities is available for BS 1000 and BS 2000, including a Sort/Merge program, library maintenance routines, a linkage editor, system service routines, diagnostic routines, debugging aids, test data generators, and peripheral/media conversion routines.

UNIVERSAL DATA BASE MANAGEMENT SYSTEM (UDS): UDS is available for the System 7.000 and System 4004 computers. Minimum requirements are a 128K main memory, a card reader, a printer, and two disk drives. For smaller systems, Siemens offers UDS Variant A, which requires a minimum of 46K of real memory. UDS runs under BS 1000, with BS 2000 support scheduled to become available in 1978. UDS interacts with ASMUS for real-time operations when used in conjunction with TCS. The system follows the recommendations of the April 1971 Report of the CODASYL DBTG, the CODASYL COBOL Data Base Facility Proposal of March 1973, and the COBOL JOD for 1975. UDS is functionally upward compatible with Siemens other data base systems: SESAM and PRISMA.

A second version of UDS, introduced in 1978, provides improvements in data access methods, language facilities, and data protection and security provisions. With UDS Version 2, it is possible to directly access records to be read or updated, eliminating the need to read through long record chains to reach a target record. The new version also includes a CALL interface that permits user programs operating with UDS to be written in any programming language (UDS Version 1 supported only COBOL). For rapid system recovery following a breakdown, an on-line transaction security facility has been added to the existing data protection features. For data privacy/security, UDS Version 2 uses a password system.

The major components of UDS are:

- Data Definition Language (DDL)
- Storage Structure Language (SSL)
- Data Base Handler (DBH)
- Data Manipulation Language (DML)
- Interactive Query Language (IQL)
- Service Programs.

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IGS: This interactive system allows two-dimensional graphics to be created, manipulated, and stored. Designed for use with a graphic CRT terminal, IGS includes over 100 instructions and runs under BS 2000.

PRICING

Purchase, rental, and maintenance prices for processors with minimum to maximum main memory, main memory extensions, input/output channel options, and main cabinet peripherals (for Models 7.708 and 7.718) are included under the processor model headings in the following Equipment Prices chart. Console I/O, peripherals/terminals, mass storage, and data communications equipment prices are listed under separate headings. Software prices are not included in the chart.

Equipment prices are Datapro estimates based upon publicly available information on the West German market and have not been approved by Siemens. All prices are in Deutsche Marks (DM). ■

Siemens System 7.000

EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
SIEMENS 7.708						
708	Model 7.708 Basic Configuration, 384K Bytes of Main Memory	410,610	11,731	10,640	—	1,505
70802	Main Memory Extension from 384K to 512K Bytes	28,500	1,047	950	—	72
70803	Main Memory Extension from 512K to 640K Bytes	28,500	1,047	950	—	72
70804	Main Memory Extension from 640K to 768K Bytes	28,500	1,047	950	—	72
70805	Main Memory Extension from 768K to 896K Bytes	28,500	1,047	950	—	72
70806	Main Memory Extension from 896K to 1024K Bytes	28,500	1,047	950	—	72
70824	Byte Multiplexor Channel Extension	4,770	154	140	—	15
70825	Second Byte Multiplexor Channel Extension	4,770	154	140	—	15
70826	Third Byte Multiplexor Channel Extension	4,770	154	140	—	15
70827	Fourth Byte Multiplexor Channel Extension	4,770	154	140	—	15
70843	Integrated File Adapter Extension	2,870	88	80	—	10
70844	Second Integrated File Adapter Extension	2,870	88	80	—	10
70881	Integrated Multi-Terminal Controller	3,040	88	80	—	6
70896-20	Integrated Data Communications Front-End Processor, 128K Bytes of Memory	36,100	1,047	950	—	75
70896-30	Memory Extension from 128K to 192K Bytes for 70896-20 Front-End	21,600	720	653	—	36
SIEMENS 7.718						
718	Model 7.718 Basic Configuration, 512K Bytes of Main Memory	563,250	16,088	14,590	—	1,880
71803	Main Memory Extension from 512K to 640K Bytes	28,500	1,047	950	—	72
71804	Main Memory Extension from 640K to 768K Bytes	28,500	1,047	950	—	72
71805	Main Memory Extension from 768K to 896K Bytes	28,500	1,047	950	—	72
71806	Main Memory Extension from 896K to 1024K Bytes	28,500	1,047	950	—	72
71807	Main Memory Extension from 1024K to 1280K Bytes	57,000	2,094	1,900	—	144
71808	Main Memory Extension from 1280K to 1536K Bytes	57,000	2,094	1,900	—	144
71824	Byte Multiplexor Channel Extension	4,770	154	140	—	15
71825	Second Byte Multiplexor Channel Extension	4,770	154	140	—	15
71826	Third Byte Multiplexor Channel Extension	4,770	154	140	—	15
71827	Fourth Byte Multiplexor Channel Extension	4,770	154	140	—	15
71828	Fifth Byte Multiplexor Channel Extension	4,770	154	140	—	15
71843	Integrated File Adapter Extension	2,870	88	80	—	10
71844	Second Integrated File Adapter Extension	2,870	88	80	—	10
71845	Third Integrated File Adapter Extension	2,870	88	80	—	10
71846	Fourth Integrated File Adapter Extension	2,870	88	80	—	10
70812	Second Integrated Floppy Disk Drive	10,500	330	300	—	55
71881	Integrated Multi-Terminal Controller	3,040	88	80	—	6
70801	Console Printer, 90 cps, 80 Print Positions	18,000	610	553	—	70
71896-20	Integrated Data Communications Front-End Processor, 128K Bytes of Memory	36,100	1,047	950	—	75
71896-30	Memory Extension from 128K to 192K Bytes for 71896-20 Front-End	21,600	720	653	—	36
70820	High-Speed Printer Adapter	37,000	1,257	1,056	—	115
SIEMENS 7.722 VERSION 1						
722-FE1	Model 7.722-1 Central Processor, 96K Bytes of Main Memory	183,150	5,550	5,550	5,034	742
722-G1	Model 7.722-1 Central Processor, 128K Bytes of Main Memory	193,950	5,910	5,910	5,361	762
722-GE1	Model 7.722-1 Central Processor, 160K Bytes of Main Memory	204,750	6,270	6,270	5,688	782
722-GF1	Model 7.722-1 Central Processor, 192K Bytes of Main Memory	215,550	6,630	6,630	6,015	802
722-GFE1	Model 7.722-1 Central Processor, 224K Bytes of Main Memory	226,350	6,990	6,990	6,342	822
722-H1	Model 7.722-1 Central Processor, 256K Bytes of Main Memory	237,150	7,350	7,350	6,669	842
722-HF1	Model 7.722-1 Central Processor, 320K Bytes of Main Memory	258,750	8,070	8,070	7,322	882
722-HFE1	Model 7.722-1 Central Processor, 352K Bytes of Main Memory	269,550	8,430	8,430	7,649	902
722-HG1	Model 7.722-1 Central Processor, 384K Bytes of Main Memory	280,350	8,790	8,790	7,976	922
72201-01	Main Memory Extension from 64K to 96K Bytes	10,800	360	360	327	20
72202-01	Main Memory Extension from 96K to 128K Bytes	10,800	360	360	327	20
72203-01	Main Memory Extension from 128K to 160K Bytes	10,800	360	360	327	20
72204-01	Main Memory Extension from 160K to 192K Bytes	10,800	360	360	327	20
72205-01	Main Memory Extension from 192K to 224K Bytes	10,800	360	360	327	20
72206-01	Main Memory Extension from 224K to 256K Bytes	10,800	360	360	327	20

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Siemens System 7.000

EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
SIEMENS 7.722 VERSION 1 (Continued)						
72207-01	Main Memory Extension from 256K to 320K Bytes	21,600	720	720	653	40
72208-01	Main Memory Extension from 320K to 352K Bytes	10,800	360	360	327	20
72209-01	Main Memory Extension from 352K to 384K Bytes	10,800	360	360	327	20
72226-01	Byte Multiplexor Channel Extension	3,998	85	85	77	5
72227-01	Second Byte Multiplexor Channel Extension	3,998	85	85	77	5
SIEMENS 7.722 VERSION 2						
722-FE2	Model 7.722-2 Central Processor, 96K Bytes of Main Memory	287,298	8,706	8,706	7,896	849
722-G2	Model 7.722-2 Central Processor, 128K Bytes of Main Memory	298,098	9,066	9,066	8,223	867
722-GE2	Model 7.722-2 Central Processor, 160K Bytes of Main Memory	308,898	9,426	9,426	8,550	885
722-GF2	Model 7.722-2 Central Processor, 192K Bytes of Main Memory	319,698	9,786	9,786	8,877	903
722-GFE2	Model 7.722-2 Central Processor, 224K Bytes of Main Memory	330,498	10,146	10,146	9,204	921
722-H2	Model 7.722-2 Central Processor, 256K Bytes of Main Memory	341,298	10,506	10,506	9,531	939
722-HF2	Model 7.722-2 Central Processor, 320K Bytes of Main Memory	362,898	11,226	11,226	10,184	975
722-HFE2	Model 7.722-2 Central Processor, 352K Bytes of Main Memory	373,698	11,586	11,586	10,511	993
722-HG2	Model 7.722-2 Central Processor, 384K Bytes of Main Memory	384,498	11,946	11,946	10,838	1,011
72201-02	Main Memory Extension from 64K to 96K Bytes	10,800	360	360	327	18
72202-02	Main Memory Extension from 96K to 128K Bytes	10,800	360	360	327	18
72203-02	Main Memory Extension from 128K to 160K Bytes	10,800	360	360	327	18
72204-02	Main Memory Extension from 160K to 192K Bytes	10,800	360	360	327	18
72205-02	Main Memory Extension from 192K to 224K Bytes	10,800	360	360	327	18
72206-02	Main Memory Extension from 224K to 256K Bytes	10,800	360	360	327	18
72207-02	Main Memory Extension from 256K to 320K Bytes	21,600	720	720	653	36
72208-02	Main Memory Extension from 320K to 352K Bytes	10,800	360	360	327	18
72209-02	Main Memory Extension from 352K to 384K Bytes	10,800	360	360	327	18
72226-02	Byte Multiplexor Channel Extension	3,998	85	85	77	5
72227-02	Second Byte Multiplexor Channel Extension	3,998	85	85	77	5
72228-02	Block Multiplexor Channel Extension	3,998	85	85	77	5
SIEMENS 7.730 VERSION 1						
730-FE1	Model 7.730-1 Central Processor, 96K Bytes of Main Memory	422,928	12,816	12,816	11,624	910
730-G1	Model 7.730-1 Central Processor, 128K Bytes of Main Memory	433,728	13,176	13,176	11,951	931
730-GE1	Model 7.730-1 Central Processor, 160K Bytes of Main Memory	444,528	13,536	13,536	12,278	952
730-GF1	Model 7.730-1 Central Processor, 192K Bytes of Main Memory	455,328	13,896	13,896	12,605	973
730-GFE1	Model 7.730-1 Central Processor, 224K Bytes of Main Memory	466,128	14,256	14,256	12,932	994
730-H1	Model 7.730-1 Central Processor, 256K Bytes of Main Memory	476,928	14,616	14,616	13,259	1,015
730-HF1	Model 7.730-1 Central Processor, 320K Bytes of Main Memory	498,528	15,336	15,336	13,912	1,057
730-HFE1	Model 7.730-1 Central Processor, 352K Bytes of Main Memory	509,328	15,696	15,696	14,239	1,078
730-HG1	Model 7.730-1 Central Processor, 384K Bytes of Main Memory	520,128	16,056	16,056	14,566	1,099
730-I1	Model 7.730-1 Central Processor, 512K Bytes of Main Memory	563,328	17,496	17,496	15,872	1,183
73002-01	Main Memory Extension from 96K to 128K Bytes	10,800	360	360	327	21
73003-01	Main Memory Extension from 128K to 160K Bytes	10,800	360	360	327	21
73004-01	Main Memory Extension from 160K to 192K Bytes	10,800	360	360	327	21
73005-01	Main Memory Extension from 192K to 224K Bytes	10,800	360	360	327	21
73006-01	Main Memory Extension from 224K to 256K Bytes	10,800	360	360	327	21
73007-01	Main Memory Extension from 256K to 320K Bytes	21,600	720	720	653	42
73008-01	Main Memory Extension from 320K to 352K Bytes	10,800	360	360	327	21
73009-01	Main Memory Extension from 352K to 384K Bytes	10,800	360	360	327	21
73013-01	Main Memory Extension from 384K to 512K Bytes	43,200	1,440	1,440	1,306	84
73042	Second Block Multiplexor Channel	34,594	738	738	669	27
73027	Byte Multiplexor Channel Extension	3,998	85	85	77	5
73028	Second Byte Multiplexor Channel Extension	3,998	85	85	77	5
73040	Two-Byte Feature	5,843	127	127	115	11

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**Prices include maintenance.

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EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
SIEMENS 7.730 VERSION 2						
730-FE2	Model 7.730-2 Central Processor, 96K Bytes of Main Memory	444,180	13,460	13,460	12,208	1,089
730-G2	Model 7.730-2 Central Processor, 128K Bytes of Main Memory	454,980	13,820	13,820	12,535	1,107
730-GE2	Model 7.730-2 Central Processor, 160K Bytes of Main Memory	465,780	14,180	14,180	12,862	1,125
730-GF2	Model 7.730-2 Central Processor, 192K Bytes of Main Memory	476,580	14,540	14,540	13,189	1,143
730-GFE2	Model 7.730-2 Central Processor, 224K Bytes of Main Memory	487,380	14,900	14,900	13,516	1,161
730-H2	Model 7.730-2 Central Processor, 256K Bytes of Main Memory	498,180	15,260	15,260	13,843	1,179
730-HF2	Model 7.730-2 Central Processor, 320K Bytes of Main Memory	519,780	15,980	15,980	14,496	1,215
730-HFE2	Model 7.730-2 Central Processor, 352K Bytes of Main Memory	530,580	16,340	16,340	14,823	1,233
730-HG2	Model 7.730-2 Central Processor, 384K Bytes of Main Memory	541,380	16,700	16,700	15,150	1,251
730-I2	Model 7.730-2 Central Processor, 512K Bytes of Main Memory	584,580	18,140	18,140	16,456	1,323
73002-02	Main Memory Extension from 96K to 128K Bytes	10,800	360	360	327	18
73003-02	Main Memory Extension from 128K to 160K Bytes	10,800	360	360	327	18
73004-02	Main Memory Extension from 160K to 192K Bytes	10,800	360	360	327	18
73005-02	Main Memory Extension from 192K to 224K Bytes	10,800	360	360	327	18
73006-02	Main Memory Extension from 224K to 256K Bytes	10,800	360	360	327	18
73007-02	Main Memory Extension from 256K to 320K Bytes	21,600	720	720	653	36
73008-02	Main Memory Extension from 320K to 352K Bytes	10,800	360	360	327	18
73009-02	Main Memory Extension from 352K to 384K Bytes	10,800	360	360	327	18
73013-02	Main Memory Extension from 384K to 512K Bytes	43,200	1,440	1,440	1,306	72
SIEMENS 7.738						
738-I	Model 7.738 Central Processor, 512K Bytes of Main Memory	609,800	23,035	23,035	20,893	3,300
738-IH	Model 7.738 Central Processor, 768K Bytes of Main Memory	696,200	25,915	25,915	23,505	3,415
738-J	Model 7.738 Central Processor, 1024K Bytes of Main Memory	782,600	28,795	28,795	26,117	3,530
73805	Main Memory Extension from 512K to 768K Bytes	86,400	2,880	2,880	2,612	115
73808	Main Memory Extension from 768K to 1024K Bytes	86,400	2,880	2,880	2,612	115
73840	Two-Byte Feature	5,843	127	127	115	11
73843	Third Block Multiplexor Channel	33,313	710	710	644	21
73844	Fourth Block Multiplexor Channel	33,313	710	710	644	21
SIEMENS 7.740 VERSIONS 1 & 2						
740-G1	Model 7.740-1 Central Processor, 128K Bytes of Main Memory	1,182,800	25,239	25,239	22,892	2,023
740-GF1	Model 7.740-1 Central Processor, 192K Bytes of Main Memory	1,204,400	28,207	28,207	25,584	2,259
740-H1	Model 7.740-1 Central Processor, 256K Bytes of Main Memory	1,226,000	31,175	31,175	28,276	2,495
740-HG1	Model 7.740-1 Central Processor, 384K Bytes of Main Memory	1,269,200	36,263	36,263	32,891	2,901
740-I1	Model 7.740-1 Central Processor, 512K Bytes of Main Memory	1,312,400	37,703	37,703	34,197	3,076
740-IG1	Model 7.740-1 Central Processor, 640K Bytes of Main Memory	1,355,600	39,143	39,143	35,503	3,251
740-IH1	Model 7.740-1 Central Processor, 768K Bytes of Main Memory	1,398,800	40,583	40,583	36,809	3,426
740-J1	Model 7.740-1 Central Processor, 1024K Bytes of Main Memory	1,485,200	43,463	43,463	39,421	3,776
740-G2	Model 7.740-2 Central Processor, 128K Bytes of Main Memory	1,182,800	25,239	25,239	22,892	2,023
740-H2	Model 7.740-2 Central Processor, 256K Bytes of Main Memory	1,226,000	31,175	31,175	28,276	2,495
740-HG2	Model 7.740-2 Central Processor, 384K Bytes of Main Memory	1,269,200	36,263	36,263	32,891	2,901
740-I2	Model 7.740-2 Central Processor, 512K Bytes of Main Memory	1,312,400	37,703	37,703	34,197	3,076
740-IG2	Model 7.740-2 Central Processor, 640K Bytes of Main Memory	1,355,600	39,143	39,143	35,503	3,251
740-IH2	Model 7.740-2 Central Processor, 768K Bytes of Main Memory	1,398,800	40,583	40,583	36,809	3,426

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EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
SIEMENS 7.740 VERSIONS 1 & 2 (Continued)						
740-J2	Model 7.740-2 Central Processor, 1024K Bytes of Main Memory	1,485,200	43,463	43,463	39,421	3,776
74015	Main Memory Extension from 128K to 192K Bytes	21,600	2,968	2,968	2,692	236
74019	Main Memory Extension from 128K to 256K Bytes	43,200	5,936	5,936	5,384	472
74016	Main Memory Extension from 192K to 256K Bytes	21,600	2,968	2,968	2,692	236
74017	Main Memory Extension from 256K to 384K Bytes	43,200	5,088	5,088	4,615	406
74018	Main Memory Extension from 384K to 512K Bytes	43,200	1,440	1,440	1,306	175
74010	Main Memory Extension from 512K to 640K Bytes	43,200	1,440	1,440	1,306	175
74011	Main Memory Extension from 640K to 768K Bytes	43,200	1,440	1,440	1,306	175
74012	Main Memory Extension from 768K to 1024K Bytes	86,400	2,880	2,880	2,612	350
74025	Byte Multiplexor Channel Extension	39,770	848	848	769	32
74040	Two-Byte Feature	5,843	127	127	115	11
74045	Second Block Multiplexor Channel	33,313	710	710	644	21
74047	Third Block Multiplexor Channel	33,313	710	710	644	21
74048	Fourth Block Multiplexor Channel	33,313	710	710	644	21
74046	Block Multiplexor Channel Extension	23,575	502	502	455	15
SIEMENS 7.748						
748-J	Model 7.748 Central Processor, 1024K Bytes of Main Memory	1,463,800	52,280	52,280	47,418	6,340
748-JI	Model 7.748 Central Processor, 1536K Bytes of Main Memory	1,636,600	58,040	58,040	52,642	6,570
748-K	Model 7.748 Central Processor, 2048K Bytes of Main Memory	1,809,400	63,800	63,800	57,866	6,800
74805	Main Memory Extension from 1024K to 1536K Bytes	172,800	5,760	5,760	5,224	230
74808	Main Memory Extension from 1536K to 2048K Bytes	172,800	5,760	5,760	5,224	230
74825	Byte Multiplexor Channel Extension	39,770	848	848	769	32
74840	Two-Byte Feature	5,843	127	127	115	11
74843	Third Block Multiplexor Channel	42,153	965	965	875	75
74844	Fourth Block Multiplexor Channel	42,153	965	965	875	75
74845	Fifth Block Multiplexor Channel	42,153	965	965	875	75
74846	Sixth Block Multiplexor Channel	42,153	965	965	875	75
SIEMENS 7.750***						
750-G	Model 7.750 Central Processor, 128K Bytes of Main Memory	1,437,636	47,916	47,916	43,460	3,788
750-H	Model 7.750 Central Processor, 256K Bytes of Main Memory	1,480,836	52,792	52,792	47,883	4,184
750-HG	Model 7.750 Central Processor, 384K Bytes of Main Memory	1,524,036	57,668	57,668	52,305	4,580
750-I	Model 7.750 Central Processor, 512K Bytes of Main Memory	1,567,236	62,544	62,544	56,727	4,976
750-IG	Model 7.750 Central Processor, 640K Bytes of Main Memory	1,610,436	66,869	66,869	60,650	5,329
750-IH	Model 7.750 Central Processor, 768K Bytes of Main Memory	1,653,636	71,194	71,194	64,573	5,630
750-IHG	Model 7.750 Central Processor, 896K Bytes of Main Memory	1,696,836	72,634	72,634	65,879	5,860
750-J	Model 7.750 Central Processor, 1024K Bytes of Main Memory	1,740,036	74,074	74,074	67,185	6,040
750-JH	Model 7.750 Central Processor, 1280K Bytes of Main Memory	1,826,436	76,954	76,954	69,797	6,400
750-JI	Model 7.750 Central Processor, 1536K Bytes of Main Memory	1,912,836	79,834	79,834	72,409	6,760
750-JIH	Model 7.750 Central Processor, 1792K Bytes of Main Memory	1,999,236	82,714	82,714	75,022	7,120
750-K	Model 7.750 Central Processor, 2048K Bytes of Main Memory	2,085,636	85,594	85,594	77,634	7,480
75001	Main Memory Extension from 128K to 256K Bytes	43,200	4,876	4,876	4,423	396
75002	Main Memory Extension from 256K to 384K Bytes	43,200	4,876	4,876	4,423	396
75003	Main Memory Extension from 384K to 512K Bytes	43,200	4,876	4,876	4,423	396
75004	Main Memory Extension from 512K to 640K Bytes	43,200	4,325	4,325	3,923	353
75005	Main Memory Extension from 640K to 768K Bytes	43,200	4,325	4,325	3,923	351
75006	Main Memory Extension from 768K to 896K Bytes	43,200	1,440	1,440	1,306	180
75007	Main Memory Extension from 896K to 1024K Bytes	43,200	1,440	1,440	1,306	180
75008	Main Memory Extension from 1024K to 1280K Bytes	86,400	2,880	2,880	2,612	360
75009	Main Memory Extension from 1280K to 1536K Bytes	86,400	2,880	2,880	2,612	360
75010	Main Memory Extension from 1536K to 1792K Bytes	86,400	2,880	2,880	2,612	360
75011	Main Memory Extension from 1792K to 2048K Bytes	86,400	2,880	2,880	2,612	360
75025	Byte Multiplexor Channel Extension	39,770	848	848	769	32
75043	Third Block Multiplexor Channel	42,153	965	965	75	75

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***Withdrawn from new production in August 1976.

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EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
SIEMENS 7.750 (Continued)						
75044	Fourth Block Multiplexor Channel	42,153	965	965	875	75
75045	Fifth Block Multiplexor Channel	42,153	965	965	875	75
75046	Sixth Block Multiplexor Channel	42,153	965	965	875	75
75040	Two-Byte Feature	5,843	127	127	115	11
SIEMENS 7.755						
755-I	Model 7.755 Central Processor, 512K Bytes of Main Memory	2,405,400	62,544	62,544	56,727	4,976
755-IH	Model 7.755 Central Processor, 768K Bytes of Main Memory	2,491,800	71,194	71,194	64,573	5,680
755-J	Model 7.755 Central Processor, 1024K Bytes of Main Memory	2,578,200	74,074	74,074	67,185	6,040
755-JI	Model 7.755 Central Processor, 1536K Bytes of Main Memory	2,751,000	79,834	79,834	72,409	6,760
755-K	Model 7.755 Central Processor, 2048K Bytes of Main Memory	2,923,800	85,594	85,594	77,634	7,480
755-KI	Model 7.755 Central Processor, 2560K Bytes of Main Memory	3,096,600	91,354	91,354	82,858	8,200
755-KJ	Model 7.755 Central Processor, 3072K Bytes of Main Memory	3,269,400	97,114	97,114	88,082	8,920
755-KJI	Model 7.755 Central Processor, 3584K Bytes of Main Memory	3,442,200	102,874	102,874	93,307	9,640
755-L	Model 7.755 Central Processor, 4096K Bytes of Main Memory	3,615,000	108,634	108,634	98,531	10,360
75501	Main Memory Extension from 512K to 768K Bytes	86,400	8,650	8,650	7,846	704
75502	Main Memory Extension from 768K to 1024K Bytes	86,400	2,880	2,880	2,612	360
75503	Main Memory Extension from 1024K to 1536K Bytes	172,800	5,760	5,760	5,224	720
75504	Main Memory Extension from 1536K to 2048K Bytes	172,800	5,760	5,760	5,224	720
75505	Main Memory Extension from 2048K to 2560K Bytes	172,800	5,760	5,760	5,224	720
75506	Main Memory Extension from 2560K to 3072K Bytes	172,800	5,760	5,760	5,224	720
75507	Main Memory Extension from 3072K to 3584K Bytes	172,800	5,760	5,760	5,224	720
75508	Main Memory Extension from 3584K to 4096K Bytes	172,800	5,760	5,760	5,224	720
75525	Byte Multiplexor Channel Extension	39,770	848	848	769	32
75543	Third Block Multiplexor Channel	42,153	965	965	875	75
75544	Fourth Block Multiplexor Channel	42,153	965	965	875	75
75545	Fifth Block Multiplexor Channel	42,153	965	965	875	75
75546	Sixth Block Multiplexor Channel	42,153	965	965	875	75
75540	Two-Byte Feature	5,843	127	127	115	11
SIEMENS 7.760						
760-K	Model 7.760 Central Processor, 2048K Bytes of Main Memory	2,330,950	78,594	78,594	71,284	8,400
760-KI	Model 7.760 Central Processor, 2560K Bytes of Main Memory	2,503,750	84,354	84,354	76,508	8,650
760-KJ	Model 7.760 Central Processor, 3072K Bytes of Main Memory	2,676,550	90,114	90,114	81,732	8,900
760-KJI	Model 7.760 Central Processor, 3584K Bytes of Main Memory	2,849,350	95,874	95,874	86,956	9,150
760-L	Model 7.760 Central Processor, 4096K Bytes of Main Memory	3,022,150	101,634	101,634	92,180	9,400
760-LJ	Model 7.760 Central Processor, 5120K Bytes of Main Memory	3,367,750	113,154	113,154	102,628	9,900
760-LK	Model 7.760 Central Processor, 6144K Bytes of Main Memory	3,713,350	124,674	124,674	113,076	10,400
760-LKJ	Model 7.760 Central Processor, 7168K Bytes of Main Memory	4,058,950	136,194	136,194	123,524	10,900
760-M	Model 7.760 Central Processor, 8192K Bytes of Main Memory	4,404,550	147,714	147,714	133,972	11,400
76003	Main Memory Extension from 2048K to 2560K Bytes	172,800	5,760	5,760	5,224	250
76004	Main Memory Extension from 2560K to 3072K Bytes	172,800	5,760	5,760	5,224	250
76005	Main Memory Extension from 3072K to 3584K Bytes	172,800	5,760	5,760	5,224	250
76006	Main Memory Extension from 3584K to 4096K Bytes	172,800	5,760	5,760	5,224	250
76008	Main Memory Extension from 4096K to 5120K Bytes	345,600	11,520	11,520	10,449	500
76010	Main Memory Extension from 5120K to 6144K Bytes	345,600	11,520	11,520	10,449	500
76012	Main Memory Extension from 6144K to 7168K Bytes	345,600	11,520	11,520	10,449	500
76014	Main Memory Extension from 7168K to 8192K Bytes	345,600	11,520	11,520	10,449	500
76025	Byte Multiplexor Channel Extension	49,200	1,230	1,230	1,116	98
76030	Memory Switch Feature	38,000	950	950	862	76
76035	M&D Feature	25,000	660	660	599	55
76040	Two-Byte Feature	6,800	170	170	154	14
76043	Third Block Multiplexor Channel	47,000	1,400	1,400	1,270	95
76044	Fourth Block Multiplexor Channel	47,000	1,400	1,400	1,270	95
76045	Fifth Block Multiplexor Channel	47,000	1,400	1,400	1,270	95
76046	Sixth Block Multiplexor Channel	47,000	1,400	1,400	1,270	95

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EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
CONSOLE I/O						
3020	Central Operator Console with Display	53,915	1,378	1,378	1,250	128
3021	Central Operator Console with Teletype	46,740	1,272	1,272	1,154	193
3020-10	Sub-Console with Display	28,700	742	742	673	86
3021-10	Sub-Console with Teletype	23,063	636	636	577	150
30220	Operator's Chair	390	—	—	—	—
3030	Console Printer	21,156	530	530	481	139
3023	Central Operator Console with Printer	54,284	1,484	1,484	1,346	203
30230	Floppy Disk Drive for 3023 Operator Console	19,250	550	550	499	55
3023-10	Sub-Console with Printer	30,607	848	848	769	161
3033-01	Console Printer	28,700	742	742	673	150
3024	Central Operator Console	74,770	1,782	1,782	1,616	355
3024-10	Sub-Console	51,400	1,277	1,277	1,158	202
30243	First Floppy Disk Drive for 3024 Operator Console	19,250	550	550	499	55
3025	Central Operator Console	48,000	1,132	1,132	1,027	145
3025-10	Sub-Console	22,700	535	535	485	52
30241	Printer Controller for 3024 Operator Console	6,000	207	207	188	34
PERIPHERALS/TERMINALS						
3160	Card Punch, 100-290 cpm	63,448	1,641	1,378	—	300
31601	Binary Punching Feature for 3160 Card Punch	523	16	13	—	5
3150-01	Card Reader, 1000 cpm, 1200-card Hopper	60,988	1,571	1,320	—	262
3150-02	Card Reader, 1000 cpm, 3000-card Hopper	66,215	1,710	1,436	—	284
3150-03	Card Reader, 660 cpm, 1200-card Hopper	46,176	1,235	1,037	—	235
31501	Binary Read Feature for 3150-03 Card Reader	1,324	36	30	—	5
31502	Ticket/Stub Card Feature for all Card Readers	993	25	21	—	5
31503	Mark Read Feature for 3150-01 and 02 Card Readers	8,538	214	180	—	32
31504	Automatic-End-of-File Feature for all Card Readers	579	16	13	—	5
31505	90-Column Card Feature for all Card Readers	1,194	32	27	—	5
3170	Floppy Disk I/O Unit	70,500	1,845	1,550	—	95
31701	Floppy Disk Initialization Feature for 3170 Unit	1,125	30	25	—	5
31702	Variable Block Length Feature for 3170 Unit	4,275	113	95	—	10
31703	Dual I/O Station Expansion Feature for 3170 Unit	34,600	917	770	—	40
3336	Drum Printer, 436-600 lpm	76,700	2,609	2,191	—	438
3340-11	Chain Printer, 960-1170 lpm, Single Forms Feed	157,600	4,739	3,981	—	923
33410	Powered Forms Feed Feature for 3340-11 Printer	2,870	82	69	—	11
3340-12	Chain Printer, 960-1170 lpm, Single Forms Feed	159,400	4,792	4,025	—	933
3340-13	Chain Printer, 960-1170 lpm, Dual Forms Feed	186,900	5,545	4,658	—	1,067
33411	Powered Forms Feed Feature for 3340-12 and 13 Printers	4,613	126	106	—	21
3340-14	Chain Printer, 960-1170 lpm, Dual Forms Feed	189,400	5,621	4,722	—	1,089
33401	Powered Forms Feed Feature for 3340-14 Printer	6,600	179	150	—	35
3343	Chain Printer, 1630-2000 lpm	337,358	8,644	7,261	—	1,883
3352-01	Laser Printer	635,800	17,202	14,450	—	1,600
33520	CPU-Channel Switch Feature for 3352 Laser Printer	24,200	655	550	—	60
33521	Forms Overlay Feature for 3352 Laser Printer	44,000	1,190	1,000	—	120
33522	Extended Character Set for 3352 Laser Printer	8,800	238	200	—	25
33523	Page Memory Extension for 3352 Laser Printer	24,200	655	550	—	60
33525	Stack-Assembly Feature for 3352 Laser Printer	1,250	43	36	—	6
3262-01	Document Reader, 100-150 documents/minute	136,440	3,768	3,165	—	268
3262-02	Document Reader, 50-75 documents/minute	86,250	2,003	1,683	—	182
3570	Magnetic Tape Unit, 2 Drives, 6-Drive Controller, 30KBS	108,297	3,424	2,876	—	449
3571	Magnetic Tape Unit, 2 Drives, 6-Drive Controller, 60KBS	128,336	4,070	3,419	—	546
3530	Magnetic Tape Device, 2 Drives, connects to 3570 MTU	30,668	940	790	—	134
3531	Magnetic Tape Device, 2 Drives, connects to 3571 MTU	38,074	1,206	1,013	—	161
3570-03	Channel Extension for 3570 MTU	77,280	2,438	2,048	—	316
3571-03	Channel Extension for 3571 MTU	90,610	2,873	2,413	—	385
3540	Magnetic Tape Device, 60/120KBS	57,380	1,830	1,537	—	342
3550	Magnetic Tape Device, 120/240KBS	77,767	2,391	2,008	—	375
3554	Magnetic Tape Device, 160/320KBS	84,335	2,560	2,150	—	375
3510-01	Magnetic Tape Controller	88,232	2,940	2,470	—	193
3510-02	Magnetic Tape Controller	205,615	6,094	5,119	—	257
3510-03	Magnetic Tape Controller	176,464	5,880	4,939	—	289
3510-04	Magnetic Tape Controller	239,194	7,000	5,880	—	439
3512-01	Magnetic Tape Controller	88,232	2,940	2,470	—	193
3512-02	Magnetic Tape Controller	205,615	6,094	5,119	—	257
3512-03	Magnetic Tape Controller	176,464	5,880	4,939	—	289
3512-04	Magnetic Tape Controller	239,194	7,000	5,880	—	439
3513	Magnetic Tape Controller	114,599	3,857	3,240	—	445
35103	Two-Byte Feature	5,246	172	145	—	20
35112	Channel Switch	17,366	571	480	—	20
35111	Buffer Extension	1,990	65	55	—	10

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**Prices include maintenance.

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EQUIPMENT PRICES*

		Purchase Price DM	Rental** (1-year lease) DM	Rental** (3-year lease) DM	Rental** (4-year lease) DM	Monthly Maint. DM
35116	Controller Coupler I	23,517	773	650	—	45
35117	Controller Coupler II	45,225	1,488	1,250	—	85
3557	High-Density Magnetic Tape Device, 1600/6250 bpi, 200/780KBS	77,306	2,494	2,095	—	280
3559	High-Density Magnetic Tape Device, 1600/6250 bpi, 320/1250KBS	91,328	2,946	2,475	—	365
35506	1600-bpi Recording Density Feature	3,240	107	90	—	20
3511	Magnetic Tape Controller	47,500	1,488	1,250	—	130
3521	Magnetic Tape Unit, 800/1600 bpi, 20/40KBS	27,740	869	730	—	100
3523	Magnetic Tape Unit, 800/1600 bpi, 40/80KBS	32,300	1,012	850	—	126
34104	Two-Channel Switch	31,285	818	687	—	41
34105	Two-Channel Switch	31,285	818	687	—	41
34608	Two-Controller Feature	12,300	378	318	—	11
34505	Two-Controller Feature	12,300	378	318	—	11

MASS STORAGE

3440	Disk Drive, 55 megabytes	47,253	1,287	1,081	—	375
3413	Disk Controller	132,225	3,370	2,831	—	257
34102	Two-Channel Switch	20,823	623	523	—	75
3455	Disk Drive, 72 megabytes	39,865	1,405	1,180	—	110
34515	Double Density Conversion Feature	26,075	643	540	—	40
3414-03	Disk Controller	169,250	4,480	3,763	—	321
3416-03	Disk Controller	147,359	4,194	3,523	—	301
3416-13	Disk Controller	178,360	5,099	4,283	—	370
3465	Disk Drive, 144 megabytes	52,440	2,048	1,720	—	150
3414-04	Disk Controller	179,500	5,000	4,200	—	321
34114	Mixed Drive Feature	11,245	298	250	—	21
3416-04	Disk Controller	157,393	4,714	3,960	—	301
34116-08	Mixed Drive Feature	11,245	298	250	—	21
34108-08	Mixed Drive Feature	11,245	298	250	—	21
3416-14	Disk Controller	188,394	5,619	4,720	—	370
34116-16	Mixed Drive Feature	14,394	381	320	—	26
34108-16	Mixed Drive Feature	14,394	381	320	—	26
3468	Disk Drive, 300 megabytes	94,484	3,101	2,605	—	190
3470	Fixed-Disk Drive, 420 megabytes	97,980	3,167	2,660	—	364
3416-05	Disk Controller	246,053	7,381	6,200	—	301
34117-08	Mixed Drive Feature	24,700	655	550	—	40
34123-08	Mixed Drive Feature	24,700	655	550	—	40
34127-08	Mixed Drive Feature	24,700	655	550	—	40
3416-15	Disk Controller	277,054	8,286	6,960	—	370
34117-16	Mixed Drive Feature	27,849	738	620	—	45
34123-16	Mixed Drive Feature	27,849	738	620	—	45
34127-16	Mixed Drive Feature	27,849	738	620	—	45
34700	Two-Controller Feature	2,320	71	60	—	5
3450	Disk Drive, 100 megabytes	88,458	2,082	1,749	—	407
34500	Two-Controller Feature	12,300	378	318	—	11
3414-01	Disk Controller	185,935	4,922	4,134	—	321
3416-01	Disk Controller	175,135	4,636	3,894	—	301
3416-11	Disk Controller	209,325	5,540	4,654	—	370
3460	Disk Drive, 200 megabytes	117,875	3,092	2,597	—	407
34600	Two-Channel Switch	12,300	378	318	—	11
3414-02	Disk Controller	209,715	5,552	4,664	—	321
3416-02	Disk Controller	198,915	5,267	4,424	—	301
34106-08	Mixed Drive Feature	11,245	298	250	—	21
34107-08	Mixed Drive Feature	11,245	298	250	—	21
3416-12	Disk Controller	233,105	6,171	5,184	—	370
34106-16	Mixed Drive Feature	14,394	381	320	—	26
34107-16	Mixed Drive Feature	14,394	381	320	—	26

DATA COMMUNICATIONS

3630	Data Communications Controller	64,165	1,375	1,375	—	102
3630-80	Expansion Cabinet	15,990	334	334	—	16
36301	Control Character Expansion Feature	14,760	307	307	—	16
36313-01	Telegraph Buffers	6,458	138	138	—	11
36313-02	Telegraph Buffers	6,458	138	138	—	11
36323-02	Telegraph Buffer Connection Module	—	—	—	—	—
36313-03	Telegraph Buffers	7,524	160	160	—	11
36323	Telegraph Buffer Frame	—	—	—	—	—
36315-01	Asynchronous Telephone Line Buffers	14,043	295	295	—	16
36315-02	Asynchronous Telephone Line Buffers	15,478	323	323	—	16
36325	Asynchronous Telephone Line Buffer Connection Module	—	—	—	—	—

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EQUIPMENT PRICES*

		<u>Purchase Price DM</u>	<u>Rental** (1-year lease) DM</u>	<u>Rental** (3-year lease) DM</u>	<u>Rental** (4-year lease) DM</u>	<u>Monthly Maint. DM</u>
DATA COMMUNICATIONS (Continued)						
36317-01	Synchronous Telephone Line Buffers	24,088	506	506	—	27
36317-02	Synchronous Telephone Line Buffers	24,805	519	519	—	27
36317-03	Synchronous Telephone Line Buffers	24,088	506	506	—	27
36317-04	Synchronous Telephone Line Buffers	24,805	519	519	—	27
36327	Synchronous Telephone Line Buffer Connection Module	—	—	—	—	—

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