Computer Automation SyFA System

MANAGEMENT SUMMARY

When Computer Automation announced the SyFA system in May 1976, it marked a change in the marketing strategy that had virtually become a trademark of the manufacturer. Computer Automation had always been an OEM-only house, supplying only computers, memories, and interfaces to the rapidly expanding system-builder OEM market. For years, CA price lists carried statements noting that peripherals were carried only as a convenience to users who required single-sourced systems, and that better prices were available by dealing directly with the peripheral manufacturers. That's pretty adamant!

Well, the picture has changed slightly. For one thing, CA has formed the Commercial Systems Division to develop and market the SyFA systems. While breaking with tradition, CA also inaugurated another first, its own-make CRT keyboard/display station, designed specifically for the SyFA systems.

The OEM side of the company is still alive and well, and is now called the Naked Mini Division. And this division is still heavily OEM-oriented.

SyFA is an interactive, time-sharing, file-oriented business computer system capable of supporting up to 24 independent users. Specifically, SyFA has been created for multi-divisional corporations, each with different data processing requirements, that wish to have multi-user time-shared systems at various remote locations and *also* wish to use these systems occasionally as remote batch terminals to a larger centralized host computer system—preferably without disturbing any of the 24 interactive users.

Computer Automation has broken its long-standing tradition as an OEM-only vendor by offering SyFA, its first packaged commercial system. This new multi-user, file-oriented business data processing system can support up to 24 concurrent users and simultaneously function as a remote batch terminal to a larger host computer. The system features SyBOL, a new business-oriented programming language.

CHARACTERISTICS

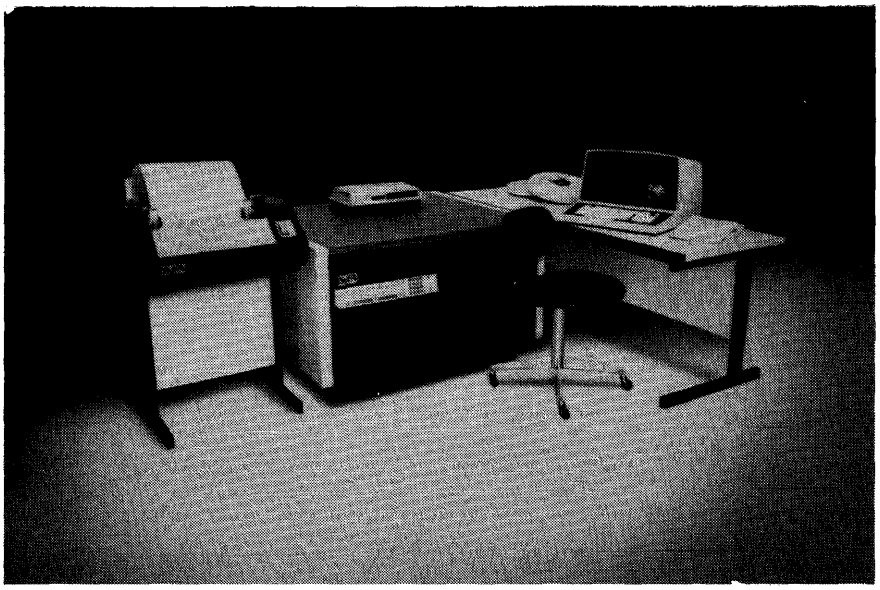
MANUFACTURER: Computer Automation, Inc., 18651 Von Karman, Irvine, California 92713. Telephone (714) 833-8830.

Computer Automation entered the market with the Naked Mini OEM minicomputer in 1971 and remained a strictly-OEM manufacturer until the end of 1975. The company has recently been partitioned into three distinct divisions: the Naked Mini Division, the Industrial Products Division, and the Commercial Systems Division. The Naked Mini Division is responsible for the development and marketing of Computer Automation's mainstay minicomputer products, the LSI-2 series, the LSI-3 microcomputers, and specialty systems based on these computers. The Industrial Products Division markets the CAPABLE line of circuit testers to other manufacturers in the electronics industry. The Commercial Systems Division produces and markets the SyFA system.

MODEL: SyFA.

DATE ANNOUNCED: Officially introduced in May 1976.

DATE OF FIRST DELIVERY: March 1976.



The SyFA system is Computer Automation's first non-OEM commercial product, marking an end to the company's staunch OEM-only policy. SyFA is primarily a multi-tasking file management and inquiry system for up to 24 users. It features a specially developed business-oriented language, SyBOL, designed to provide ease of programming and access to the system's files. The basic configuration shown here includes a 165-cps serial printer, the SyFA CPU and 8.1-megabyte cartridge disk drive mounted in a single cabinet, and a SyFA Information Station (a CRT keyboard/display unit). Purchase price of the system shown is $56,250. The data set on top of the CPU and disk cabinet is not included in the system price.

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In addition to handling the 24 on-line concurrent users, SyFA can also support up to 16 concurrent system utilities, such as sorts or compilations, and perform one remote job entry task and two spool-to-printer tasks.

SyFA is built around a slightly modified version of CA's 2/60 Megabyter, the top of the company's minicomputer line. Not many details concerning these modifications have been released, but CA claims that certain existing instructions of the 2/60 Megabyter (Report M11-168-101) have been enhanced to yield the performance levels required for use in SyFA systems.

The basic-system CPU has a 64K-byte core memory that can be expanded to 1024K bytes in 16K- or 32K-byte increments. However, at present the operating system supports a maximum of 304K bytes of main memory. This is a software limitation only, and may be increased in the future to permit more complete exploitation of the 2/60's capabilities. Other CPU-related enhancements include an asynchronous multiplexer and interface that can be used with any RS-232C terminals for distances up to 3000 feet and with any RS-232C modems for remote terminal usage.

Included in the basic SyFA system is one 10-megabyte cartridge disk drive with a formatted data capacity of 8.1 megabytes. Three additional 8.1-megabyte drives can be added to the controller supplied with the basic system. Storage can be further augmented by substituting 80-megabyte disk pack drives. These large drives have a formatted capacity of 56 megabytes each. Up to eight such drives can be attached to a SyFA system for a total disk subsystem capacity of 448 megabytes.

The basic SyFA system does not include a printer, but CA offers the Centronics 306C 100-cps serial printer, the Centronics 503 165-cps serial printer, or the Dataproducts 2230 300-lpm and 2260 600-lpm line printers as options.

Terminals can be any asynchronous RS-232-type units, although CA strongly recommends the use of its own new SIS-100 SyFA Information Station. This 1920-character CRT terminal features a keyboard that matches the one found on the IBM Selectric typewriter. The CA keyboard not only uses the Selectric key format, but has been engineered to have the same feel as the IBM-manufactured units and to sit on a table top at the same angle. The CRT display unit is detachable and connected to the keyboard by a retractable cord, a nice innovation. At least one of these CA display terminals should be included as the system console. Other display terminals can be used for this function, but system messages will not be properly received on non-CA displays because of differences in the cursor positioning commands.

The SyFA software is new (although another minicomputer manufacturer holds a dissenting opinion, as we will explain later). SyCLOPS, the SyFA Concurrent Logic Operating System, is a virtual-storage, multi-tasking system with 24 variable partitions, two printer spoolers,

NUMBER INSTALLED TO DATE: 25.

DATA FORMATS

BASIC UNIT: 16-bit word or 8-bit byte.

FIXED-POINT OPERANDS: 16-bit words consisting of 15-bit integer and one sign bit. Negative numbers are in two's-complement form. Larger fixed-point operands can be implemented through the use of variable-length byte string instructions.

FLOATING POINT OPERANDS: No hardware facilities; two-word or three-word formats through software subroutines only.

INSTRUCTIONS: One-, two-, or three-word instructions with 11 different formats. Single-word memory reference instructions have a four-bit op code, an eight-bit address field, and three bits to specify address mode. Double-word memory reference instructions have a three-bit op code, a four-bit iteration count, a 15-bit operand address, and indicator bits to specify direct/indirect address mode, etc. Three-word instructions include two 16-bit byte addresses for decimal arithmetic operations and block character moves. Byte-immediate instructions have a four-bit operation code and an eight-bit immediate operand. Conditional jump instructions have a four-bit op code, a six-bit displacement, a five-bit field to indicate test conditions, and one bit to specify jump direction (forward/backward).

Single-register shift and register change instructions have an eight-bit control field that specifies source, operation, and location of results, a three-bit shift count (zero for register change) and a five-bit instruction type indicator. The double-register shift instructions are similar to the single-register shifts except that the shift control count field is four bits and the op code is seven bits. Control instructions have a one-bit instruction type indicator, a seven-bit op code, and an eight-bit halt or instruction counter.

I/O instructions have a two-bit instruction type indicator, a six-bit op code, a five-bit device address, and a three-bit function code. Block I/O instructions are similar to I/O types except for a three-bit instruction type indicator and an additional 15-bit base address field. Automatic I/O instructions use three words; the first has the same format as the I/O instruction, and the next two words hold a 15-bit byte/word count and a 15-bit address pointer.

INTERNAL CODE: ASCII.

MAIN STORAGE

STORAGE TYPE: Core.

CYCLE TIME: 1.2 microseconds. Effective cycle times are substantially less with odd/even interleaving.

CAPACITY: The modified 2/60 Megabyter CPU can address up to 1,048,576 bytes, but the SyFA operating software currently supports a maximum of 311,296 bytes. Memory increments are 16,384 or 32,768 bytes.

CHECKING: None.

STORAGE PROTECTION: None.

RESERVED STORAGE: About 20 of the first 256 words (scratchpad or page 0) are normally reserved for device/interrupt addresses. These reserved words can be moved into page 1.

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION	MANUFACTURER
PRINTERS		
PRT-306	Serial Printer; 80 positions, 9 x 7 dot matrix, 64 ASCII characters, 9.87-inch paper, two-channel VFU, automatic motor control and paper runaway detection; 100 cps	Centronics
PRT-503	Serial Printer; 132 positions, 9 x 7 dot matrix, 64 ASCII characters, 14.87-inch paper, two-channel VFU, automatic motor control and paper runaway detection; 165 cps	Centronics
PRT-2230	Line Printer; 132 positions, drum, 64 ASCII characters; 300 lpm	Dataproducts
PRT-2260	Line Printer; 132 positions, drum, 64 ASCII characters; 600 lpm	Dataproducts
TERMINALS		
SIS-100	CRT Display/Keyboard; 12-inch screen, 1920 characters, 24 lines x 80 characters, 5 x 7 dot matrix, 96 ASCII characters, upper and lower case, keyboard detachable with retracting cord; 75 to 9600 bps	Computer Automation

demand paging, and dynamic resource allocation. SyCLOPS has extensive file access capabilities, including random, sequential, and indexed access methods. The indexed access method is a superset of the familiar indexed sequential access method (ISAM).

Output for the printer can be sent directly to a printer, if available, or spooled on disk. Each user can create a spool file for later output. Despooling occurs on a first-in/first-out basis. Spooling occurs automatically if the printer is not available, and despooling occurs as soon as the printer becomes available. More than one printer can be attached to a SyFA system. With two printers on a system, one is dedicated to despooling while the other is used for both direct printing and despooling.

SyBOL, the new business-oriented programming language, has its roots in COBOL, as the "BOL" suffix implies. It contains nearly all the standard COBOL verbs, such as GO TO, CALL, RETURN, MOVE, ADD, SUBTRACT, MULTIPLY, DIVIDE, DISPLAY, OPEN, CLOSE, READ, and WRITE. However, SyBOL also includes several enhancements, including an extensive set of file-oriented verbs. In addition to the OPEN, CLOSE, READ, and WRITE mentioned previously, SyBOL includes other file-oriented verbs such as PREPARE, READ RANDOM, READ INDEXED, READ SEQUENTIAL, WRITE SEQUENTIAL, WRITE RANDOM, WRITE EOF, LOCK, UNLOCK, DELETE, UPDATE, and INSERT. Other significant features of SyBOL include fixed-point decimal arithmetic (16 places), extensive character string manipulation functions, use of immediate operands, and full video screen controls.

CA also offers both FORTRAN and BASIC compilers for use on the system, but these can be used in single-user mode only. Emulators for remote job entry systems include the IBM 2780, IBM 3780, IBM 360/20 and System/3 HASP workstations, Control Data 200 User Terminal, Univac DCT 2000, and ICL 7020. An IBM 3270 terminal emulator is under development. These emulators can be executed concurrently with user programs, but only one emulator can execute at a time.

CENTRAL PROCESSOR

The SyFA CPU is a modified version of Computer Automation's Model 2/60 Megabyter. Modifications to the CPU include enhancements to the existing instruction set that make it more useful for business data processing and data communications. For more specific details on the SyFA processor, see Report M11-168-101.

INSTRUCTION REPERTOIRE: The SyFA CPU features 224 instructions, including 42 single-word memory reference instructions, 3 double-word memory reference instructions, 10 byte-immediate instructions, 13 conditional jumps, 12 single-register shifts, 4 double-register shifts, 52 register change instructions, 18 control instructions, 27 I/O instructions, 4 automatic I/O instructions, and 2 block I/O instructions.

In addition to the basic set described above, there are 37 specialized instructions, including four additional specialized stack instructions designed to facilitate reentrant subroutines; two additional string manipulation instructions; two decimal string instructions, which permit hardware operations on strings of decimal numbers and facilitate business applications; four bit manipulation instructions that permit setting, resetting, complementing, and testing of any bit in memory; and a hardware cyclic redundancy check character instruction that can generate and check cyclic redundancy and longitudinal redundancy check characters in 15 microseconds.

Included among the 42 single-word memory reference instructions are 15 stack instructions which allow any memory location to serve as a stack control pointer and maintain a stack elsewhere in memory. Any number of routines can maintain any number of stacks anywhere in memory. The stack instructions also make it possible for different stack pointers to access the same stack, which means that data in a single stack can be accessed at the top or bottom, or any point in between, concurrently.

INSTRUCTION TIMINGS: All times are in microseconds, for full-word, fixed-point operands and direct addressing mode.

Load/Store:	**2.4**
Add/Subtract:	**2.4**
Multiply/Divide:	**12.8/15.1**
Compare and Branch:	**1.2**

PHYSICAL SPECIFICATIONS: The basic SyFA system cabinet is 46.6 inches wide, 40.75 inches deep, and 30.5

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Included with the SyFA software package are 10 system utilities. On a SyFA system with 64K bytes of memory, only one utility can be run at a time, although it can execute concurrently with user programs. Additional utilities can be supported with each extra 16K-byte memory expansion. Thus, a maximum 304K-byte system can support up to 16 concurrent utility programs in addition to the 24 concurrent SyBOL programs. The utilities include: INDEX, which builds key files for use with the indexed access method; a SORT program; FILCPY, which copies a disk file from one pack to another; FILPRT, which lists a disk file; VTOC, which prints or displays the volume table of contents for disk files; COMP, which compiles all SyBOL source programs; FORMAT, which prepares disk packs for software access and checks for faulty packs; DSKCPY, which generates a backup copy of an entire disk pack; REORG, which reorganizes disk files by copying them onto another pack and removing gaps between data fields; and LIST, which conditionally lists the contents of selected files according to parameters supplied by the user. A text editor that can be used concurrently by all users is also included in the standard SyFA software.

Although Computer Automation offers SyBOL as a new higher-level language, a competing vendor is objecting strenuously. Datapoint, manufacturer of the Datapoint 1100, 1150, 2200, and 5500 business minicomputer systems, believing that SyBOL looks substantially like its own Datashare higher-level language, has initiated a lawsuit against Computer Automation for alleged misuse of trade secrets. Although the allegations made by Datapoint include several charges, they all seem to center on the similarity of the two languages. Here are the significant facts of the situation: The Datashare language was developed by Datapoint. Key personnel from a Datapoint distributorship later joined Computer Automation and are now in CA's Commercial Systems Division, where SyFA and SyBOL were developed. A comparison of the two languages shows many similarities, but this is hardly surprising since both have COBOL origins. SyBOL, however, includes many features not found in Datashare. Finally, Computer Automation, not pulling any punches, offers a translator package that converts Datashare source code to SyBOL source code.

USER REACTION

Datapro interviewed five SyFA users during September 1976, each with one installed system. Although the system was officially announced in May 1976, deliveries had actually begun as early as March 1976. The average operating life of the five systems was slightly over three months. The user population included a system builder, two chemical companies, a large bank, and a hospital.

None of the five systems had been expanded to full capacity. The largest number of active ports on any of the systems was four, although one user had recently sold 10 time-sharing accounts and was preparing to implement them. None had expanded memory past the initial 64K bytes.

inches high. The ACC-200 and ACC-100 one- and two-bay add-on cabinets are also 40.75 inches deep and 30.5 inches high. The one-bay ACC-200 is 25 inches wide, while the two-bay ACC-100 is 46.6 inches wide. The following list shows the floor areas occupied by various components of the SyFA systems.

CEN-100	Basic SyFA cabinet	13.16 square feet
ACC-100	Two-bay cabinet	13.16 square feet
ACC-200	One-bay cabinet	7.07 square feet
PRT-2230	300-lpm printer	5.90 square feet
PRT-2260	600-lpm printer	5.90 square feet

All other components either mount in cabinets or require table-top space.

Power for SyFA systems is nominally 117 VAC, 60 Hertz. A minimum service of 30 amperes is recommended. The following list shows the power consumption of various SyFA system components.

CPU-100	Basic SyFA CPU	700 watts
DSK-10	8.1-megabyte disk drive	400 watts
DSK-80	56-megabyte disk drive	700 watts
PRT-306	Serial printer	300 watts
PRT-503	Serial printer	300 watts
PRT-2230	300-lpm printer	525 watts
PRT-2260	600-lpm printer	680 watts
SIS-100	CRT display/keyboard	45 watts

Operating environment for SyFA systems is generally 60 to 80 degrees F., at 35 to 80 percent relative humidity (noncondensing), although the serial printers and the CRT display/keyboard units can tolerate 40 to 90 degrees F. and 10 to 80 percent relative humidity.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The MaxiBus supports 5 data transfer methods with 58 parallel lines. The methods are high-speed block I/O, programmed I/O, conditional I/O, automatic I/O, and DMA. The standard block I/O feature allows data transfer over the MaxiBus at 411,000 words per second; with programmed I/O, the maximum data rate is 130,000 words or bytes per second. Programmed I/O direct to memory is also possible at a rate of up to 90,000 words or bytes per second. The automatic I/O provides cycle-stealing data transfer at up to 80,000 words per second under interrupt control. Direct memory access provides up to 1,020,000 words or bytes per second for a single memory bank and up to 1,666,000 with interleaved memories. Up to 128 direct memory channels are provided, and a total of up to 248 devices can be attached.

SIMULTANEOUS OPERATIONS: Memory modules are odd/even interleaved, permitting the initiation of a memory operation to a contiguous memory location while an operation to the first location is still in progress.

SyFA disk controllers are microprocessor-based and can accept and execute separate head-positioning requests for all attached disk drives.

CONFIGURATION RULES

SyFA systems are initially supplied with 64K bytes of memory. Expansions beyond 64K bytes are possible but require the addition of the MEF-100 expansion feature, which provides eight additional memory slots. Using 16K- or 32K-byte modules, up to 256K bytes of additional memory can be installed, although only 240K bytes are available to the user. The first 16K bytes of add-on memory are reserved for system diagnostic purposes. A maximum of 304K bytes of main memory is currently supported by the SyCLOPS operating system.

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Four of the five systems used one 10-megabyte disk drive, while the fifth used two 10-megabyte drives. One user, the one about to expand the system for time-sharing, was planning to convert to the 80-megabyte disk drives. Four of the five systems included the Centronics 306 printer, while the last used an older Centronics 101 from a previous system.

Three of the systems were being used in traditional business applications (i.e., inventory control, accounting, customer records, etc.), while two were being used in a process control environment. The latter two were not directly controlling real-time processes, but rather were monitoring and logging process variables and storing them for the purpose of generating reports.

Tabulated below are the results of the user survey.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	2	0	0	3.6
Reliability of mainframe	2	3	0	0	3.4
Reliability of peripherals	4	1	0	0	3.8
Responsiveness of maintenance service	3	1	0	0	3.8
Effectiveness of maintenance service	3	1	0	0	3.8
Technical support	4	1	0	0	3.8
Operating system	1	4	0	0	3.2
Compiler	3	2	0	0	3.6
Ease of programming	3	2	0	0	3.6
Overall satisfaction	2	3	0	0	3.4

*Weighted average on a scale of 4.0 for Excellent.

Generally, these users were quite satisfied with the SyFA systems, as the ratings indicate. However, the users voiced certain specific criticisms that should be mentioned. The high ratings were given with one qualification: that the system was good *in its intended application.* Two users were very careful to note this point, and two others mentioned that they were giving SyFA higher marks than its performance deserved because they were not using the system totally within its intended application. The latter two users required systems with both extensive file management capabilities and high performance levels for real-time process monitoring. They stated that while SyFA represented the best compromise choice for this mixed application, its real-time performance was only marginally satisfactory.

Reliability problems were generally limited to minor start-up problems, most of which had been resolved.

CA's SyFA Support Center earned special praise from four of the five users. The one holdout simply had not required this service. The SyFA Support Center is a group dedicated to aiding SyFA users in obtaining the most from their systems. The center maintains a "hot line" telephone service that places users in contact with an exceptionally competent and knowledgeable group of support personnel. (Incidentally, Datapro tried out the "hot line" during the preparation of this report and found the service to be both prompt and effective.)

All memory modules must be contiguous and installed adjacent to the CPU. Similarly, all MXE-8 eight-port expansion units must be located contiguously. DMA-10 or DMA-80 disk controllers must be placed adjacent to the memory modules.

Eight terminal ports are provided in the basic system, and two MXE-8 multiplexer extension modules can be added for a total of 24 terminal ports. Each terminal port can be shared with a printer that connects directly to the SyFA display. Any terminal or printer with an asynchronous RS-232C interface can be used with the system. One synchronous communications interface can also be added to the system.

Terminals located up to 1000 feet from the system can be connected directly to the terminal ports. Beyond 1000 feet, a Bell 103 or equivalent modem must be used.

The basic SyFA system includes a controller for DSK-10 cartridge disk drives. Up to four drives can be connected to the controller. A DMA-80 disk controller for DSK-80 disk pack drives can be substituted. The DMA-80 controller can accommodate up to four DSK-80 drives, and two controllers can be included in a SyFA system. DSK-10 and DSK-80 disk drives cannot be intermixed in a system.

Up to two serial or line printers can be connected to a SyFA system.

MASS STORAGE

MODEL 10 8.1-MEGABYTE CARTRIDGE DISK SUBSYSTEM: Includes one DSK-10 cartridge disk drive, with one fixed and one removable IBM 5440-type cartridge, and one DMA-10 controller for up to four DSK-10 drives. The formatted capacity of each DSK-10 drive is 8.1 megabytes, recorded at 256 bytes per sector, 20 sectors per track, on 400 tracks with 6 spares. The disk controller can accept and simultaneously process head-positioning requests for all attached drives. Average rotational delay is 12.5 milliseconds, and average head-positioning time is 40 milliseconds. Data transfer rate is 312K bytes per second. Maximum on-line capacity using DSK-10 drives is 32.5 megabytes. The Model DSK-10 cartridge disk drives are manufactured by Pertec.

MODEL 80 56-MEGABYTE DISK PACK SUBSYSTEM: Includes one DSK-80 disk pack drive and a DMA-80 controller for up to four DSK-80 drives. The formatted capacity of each DSK-80 drive is 56 megabytes, using a CDC 9877-type 5-platter disk pack. Data is recorded on five surfaces in 256-byte sectors, 56 sectors per track, on 800 tracks with 23 spares. The disk controller can accept and simultaneously process head-positioning requests for all attached drives. Average rotational delay is 8.3 milliseconds, and average head-positioning time is 30 milliseconds. Data transfer rate is 1.2 million bytes per second. The SyFA system can accommodate two DMA-80 controllers for a total of eight DSK-80 drives. Maximum on-line capacity using DSK-80 drives is 448 megabytes. The Model DSK-80 disk pack drives are manufactured by CDC.

INPUT/OUTPUT UNITS

In addition to the standard SyFA peripheral devices listed in the Peripherals/Terminals table, users can also add any of those offered for use with Computer Automation LSI-2 Series minicomputers (Naked Mini or Megabyter). These non-standard units are not supported by the SyCLOPS operating system, but utilities included in the system support these units on a stand-alone basis. Readers should consult Report M11-168-101 for detailed specifications and prices of these peripherals.

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One user had changed from a Datapoint system and had used CA's translator to convert Datashare programs to SyBOL. He reported that the transition had been very smooth, with only a few minor problems.□

COMMUNICATIONS CONTROL

Two controllers, one asynchronous and one synchronous, have been developed specifically for the SyFA systems.

MXC-100 ASYNCHRONOUS MULTIPLEXER SUBSYSTEM: Includes one control unit for up to three MXE-8 multiplexer extension modules. Each extension module accommodates up to eight user terminals. User terminals can be any asynchronous RS-232C device. The MXC-100 subsystem transfers data entirely under program control, using four separate vectored interrupts: transmit, receive, carrier, and ring. Transmit and receive rates are individually strap-selectable for each line and can be any standard rate between 37.5 and 9600 bits per second. Word length and number of stop bits are also individually strap-selectable for each line. User terminals can be either directly connected or coupled through standard RS-232C modems.

SCF-100 SYNCHRONOUS COMMUNICATIONS FACILITY: Includes a single-line controller for any RS-232C modem. The synchronous line interface features program-controlled character recognition for up to eight characters; automatic parity insertion, selectable through strapping; full- or half-duplex operation; full modem controls; and strap-selectable data rates to 19.2K bps. All data transfers are through the CPU auto-I/O facilities. The SCF-100 can interface any medium-speed, synchronous Bell system or equivalent modem.

SOFTWARE

SyFA is a software/hardware system assembled for multidivisional organizations that require both distributed processing networks and stand-alone independent processing for such applications as data entry, interactive information retrieval, file updating and reporting, and program development. Two major software packages have been developed by Computer Automation for SyFA: the SyCLOPS multi-tasking operating system and the SyBOL business-oriented language, created for an on-line, interactive environment.

OPERATING SYSTEM: *SyFA Concurrent Logic Operating System (SyCLOPS)* is a virtual-storage multi-tasking operating system capable of supporting up to 24 variable user partitions. It features demand paging and dynamic allocation of resources, including disk file space. In addition to the 24 user partitions, SyCLOPS can support up to 16 batch utilities, a communications emulator, and two printer spoolers. SyCLOPS requires 32K bytes of memory, leaving 32K bytes of the basic system memory available for user programming.

User programs are divided into two components, a procedure division and a data division. Procedure divisions are brought into memory one page at a time, while entire data divisions are maintained in memory. Program pages are equal to one disk sector in size. Procedure divisions can be shared between several users without requiring multiple copies in memory. Data divisions of user programs are overlaid only when the procedure division has terminated execution.

SyCLOPS provides for common data to be shared between programs. In most situations, a new program being brought into memory causes the previous program, including the accompanying data, to be completely written over. Data to be passed on to the incoming new program can be designated COMMON and will remain intact for the new program's use.

When any user program is terminated or overlaid, SyCLOPS automatically closes any open files, including spool files, and releases any line printer being used by the outgoing program.

SyCLOPS also permits the concurrent execution of up to 16 system utility programs, in addition to the 24 possible user programs. This situation can occur if certain users wish to perform a sort or a compilation, or produce a copy of a file, while other users are executing applications programs. On a SyFA system with 64K bytes of memory, only one background utility can be executing at any one time. Each additional 16K-byte memory expansion supports one additional concurrent utility. A maximum 304K-byte system supports up to 16 concurrently executing system utilities. Expanded memory can also be utilized by normal application programs.

Under SyCLOPS, a procedure file can be established that momentarily suspends the requesting user's program and starts the requested utility into execution. Once the utility is under way, the user can return to the suspended application program and continue. Procedure files can be constructed by any SyBOL program and activated as part of the program stream. The suspended program is reactivated through a "rollback" system instruction.

Files and filing play leading roles in the SyFA system. A 254-byte sector is the basic data unit. Data files made up of these sectors can be either contiguous or fragmented into discontinuous groups. The operating system keeps track of noncontiguous groups, and their discontinuity is transparent to the user.

Logical records can cross sector boundaries and require only as much space as they actually occupy. Logical records can begin and end in the middle of physical sectors. The SyCLOPS operating system will automatically and dynamically fit user files into the least possible disk space.

SyCLOPS also permits space compression and record truncation to obtain the most efficient use of disk space. Any sequence of two or more consecutive spaces in string literals, string variables, or hexadecimal literals is replaced by a special marker character followed by a space count. The same action occurs for leading spaces in numeric variables. Decompression for output to a printer or display is automatic.

Truncation can also be performed on space-compressed records. Unbroken sequences of spaces at the end of a record are not written at all. On output, the trailing spaces are automatically made null characters by the system.

When a new disk file is prepared, the system automatically allocates 120 contiguous sectors for that file. Either a specific drive, or any drive, can be requested. When this primary allocation is exhausted, secondary allocations of 240 sectors are added automatically as needed. In the event that no 240-sector block is available, the system looks for the largest block available, decreasing the block size by 20 sectors until a fit is found. Up to 61 secondary allocations of any size can be made to a disk file. However, a new allocation to a contiguous sector is not considered a secondary allocation. Hence, a file can be as large as 8.1 megabytes. Disk space is automatically deallocated and freed for system reassignment when the limits of the file have been determined.

SyCLOPS supports three file access methods: random, indexed, and sequential. Indexed access is considered the ➤

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primary mode, while random and sequential access have been included for users who require the fastest retrieval rates and do not require the complexity of indexing. Under SyCLOPS, indexed files can have any number of key files associated with them. Retrieval by partial key is also permitted.

Files can be flagged "read only" or "do not delete." No other specialized access restrictions can be imposed on *files* through SyCLOPS or the SyBOL language, but there are elaborate security schemes that limit access to *programs* that use the files. Under these provisions, passwords can be defined and limitations established as to which terminal can start specific programs and thereby access specific files.

LANGUAGE: *SyFA's Business-Oriented Language (SyBOL)* is best described as a COBOL-like language modified to support CRT displays and on-line keyboard editing in a real-time multiprogramming environment. COBOL is batch-oriented and has no provisions for these latter features. SyBOL retains the input structure of COBOL, i.e., short statements resembling the English language. These statements are entered in free-form fashion, and the SyBOL editor scans the input and creates the familiar label, verb, operand, and comment fields.

SyBOL source programs have the same general structure as COBOL programs, including the separate data and procedure divisions. Each variable not specified to be a number is considered to be a string variable. Strings are carried in 8-bit ASCII form and can be up to 127 characters long. SyBOL numbers are carried in fixed-point decimal form and can be up to 16 positions long, including the decimal point and negative sign. The system automatically suppresses leading zeroes.

SyBOL is designed to permit most of the file-handling functions possible with COBOL, but without requiring the complex file definition specifications. In addition, SyBOL has verbs specifically for controlling printers and display terminals.

COMMUNICATIONS SOFTWARE: An extensive collection of remote job entry terminal emulator packages is available for SyFA systems. The list includes the IBM 2780, IBM 3780, IBM 360/370 HASP workstation, IBM System/3 HASP workstation, Control Data 200 User Terminal, Univac DCT 2000, and ICL 7020. The emulator packages can be run concurrently with all SyFA applications and utilities, but only one emulator can be in operation at a time.

Alternatively, a special emulator is under development that will permit a SyFA Information Station to be incorporated into an IBM 3270 network, allowing the terminal to communicate with any IBM 360/370 host system. It will be possible to switch these CA-manufactured CRT display units between 3270 mode and normal SyFA mode at any time, with up to 15 stations operating in 3270 mode at a time.

UTILITIES: The SyFA software package includes 14 system utility and service programs. Included in the system utilities are the SyBOL compiler, file search, a volume table of contents (VTOC) utility, a file printout program, a key-file builder, a sort, a disk copy utility, a copy and reallocate utility, and a disk pack formatter. The four service programs include the interactive text editor; a reset, used after an unscheduled system reload; a repair program, used to exercise disk drives during maintenance operations; and a reinstate program, used to recover a disconnected user program. These service programs are actually SyBOL programs that can execute on any number of ports simultaneously.

PRICING

POLICY: Computer Automation offers the SyFA system on a purchase-only basis. Installation and maintenance are separately priced. There is no stipulated warranty period on the SyFA system, and users must execute a maintenance agreement for service. No leasing program has been announced at this time.

Support for the SyFA system includes both preventive and corrective maintenance, regularly scheduled training courses at CA's Irvine, California facilities, and a special "hot line" to the SyFA Support Center. The latter service is intended to aid in solving any technical support or maintenance problem and provides a direct line to a SyFA technical specialist.

EQUIPMENT: The following systems are representative of the low end, midpoint, and high end of the SyFA line. All systems include the SyCLOPS operating system, the SyBOL business-oriented language, and the SyFA system utilities.

SMALL SINGLE-USER SYSTEM: Includes a SyFA CPU with 64K bytes of memory and an asynchronous multiplexer control unit with one 8-port multiplexer extension module, one DSK-10 8.1-megabyte cartridge disk drive, one SIS-100 SyFA Information Station, one 100-cps Centronics 306 serial printer, a 9-slot chassis, power supplies, and a 2-bay cabinet. Purchase price of this configuration is $52,700, and monthly maintenance charges are $400.

MEDIUM-SCALE EIGHT-USER SYSTEM: Includes a SyFA CPU with 64K bytes of memory and an asynchronous multiplexer control with one 8-port multiplexer extension module, two DSK-10 8.1-megabyte cartridge disk drives, eight SIS-100 SyFA Information Stations, one Dataproducts 2260 600-lpm printer, a 9-slot chassis, power supplies, a 2-bay cabinet, and the IBM 2780 RJE emulator software package. Purchase price of this system is $98,500, and monthly maintenance charges are $810.

LARGE-SCALE 24-USER SYSTEM: Includes a SyFA CPU with 64K bytes of memory and an asynchronous multiplexer control with three 8-port multiplexer extension modules; four DSK-80 56-megabyte disk pack drives, 24 SIS-100 SyFA Information Stations, two Dataproducts 2230 300-lpm printers, a 9-slot chassis, power supplies, a 2-bay cabinet, and the IBM 2780 RJE emulator software package. Purchase price of this configuration is $217,600, and monthly maintenance charges are $1,540.■

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Computer Automation SyFA System

EQUIPMENT PRICES

		Purchase Price	Installation Charge	Monthly Maint.
PACKAGED SYSTEMS				
SYS-2410	SyFA 8.1-Megabyte System; includes CPU with 64K bytes of core memory, one 8.1-megabyte cartridge disk drive and controller, one asynchronous multiplexer with 8 terminal ports, power supplies, and a 2-bay cabinet	$45,000	$ 750	$325
SYS-2480	SyFA 56-Megabyte System; similar to SYS-2410 above with one 56-megabyte disk pack drive	56,000	1,000	400
MEMORY				
MEF-100	Memory Expansion Feature, for expansion beyond 64K bytes, maximum of 1 per system	3,500	75	25
CMM 16K	16K bytes of core memory; maximum of 304K bytes per system	2,500	75	25
CMM 32K	32K bytes of core memory; maximum of 304K bytes per system	5,000	150	85
MASS STORAGE				
DSK-10	8.1-Megabyte Disk Drive; one fixed and one removable disk, maximum of 4 per system	10,500	150	85
SUP-DC5	Cartridge for DSK-10 drive (IBM 5440 type)	200	NC	NC
DMA-80	Controller for 56-Megabyte Disk Drives; accommodates 4 drives, maximum of 2 per system (8 drives)	4,000	150	45
DSK-80	56-Megabyte Disk Drive; for use with DMA80 controller above; maximum of 4 per controller and 8 per system	17,500	225	115
PRINTERS				
Note: All printers include PCU-100 printer control unit				
PRT-306	Serial Printer; 80 positions, 100 cps	4,950	80	45
PRT-503	Serial Printer; 132 positions, 165 cps	8,500	100	–
PRT-2230	Line Printer; 132 positions, 300 lpm	16,000	175	100
PRT-2260	Line Printer; 132 positions, 600 lpm	19,500	200	125
TERMINALS				
SIS-100	CRT Display Station; 24 lines x 80 characters; includes detachable keyboard	2,750	50	30
COMMUNICATIONS INTERFACES				
MXE-8	Multiplexer Extension Module; provides 8 additional terminal ports; maximum of 2 per system	4,800	75	25
SCF-100	Synchronous Communication Facility; provides one synchronous interface, RS-232C; maximum of 1 per system	4,000	75	30
CABINETS AND HARDWARE				
ACC-200	Cabinet, 1-bay	750	50	–
EXP-100	Expansion Chassis; provides 9 slots; includes power supplies; maximum of 1 per cabinet bay	3,500	200	30
ACC-300	User Terminal Desk	300	NC	NC
ACC-400	Stand for PRT-306 or PRT-506 printer	250	NC	NC
ACC-500	Paper Rack for PRT-306 or PRT-506 printer	85	NC	NC

SOFTWARE LICENSE PRICES

		Purchase Price	Installation Charge	Monthly Maint.
LAN-FOR	FORTRAN IV	$3,000	$300	$30
LAN-BAS	BASIC	2,000	200	20
RJE-2780	IBM 2780 Emulator	1,500	200	35
RJE-3780	IBM 3780 Emulator	2,000	250	40
RJE-20	IBM 360/20 HASP Workstation Emulator	2,500	300	50
RJE-3	IBM System/3 HASP Workstation Emulator	3,000	350	60
RJE-C200	CDC 200 UT Emulator	2,000	250	40
RJE-42000	Univac DCT 2000 Emulator	2,000	250	60
RJE-17020	ICL 7020 Emulator	3,000	350	60

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