Computer Automation SyFA Systems

MANAGEMENT SUMMARY

Originally an OEM-only house supplying computers, memories and interfaces to the OEM market, Computer Automation (CA) announced its first packaged commercial system in May 1976. The SyFA (System For Access) Series was designed and developed by the Commercial Systems Division of Computer Automation. With multi-divisional corporations in mind, SyFA allows divisions with different data processing requirements to have multi-user, time-shared systems at various remote locations.

Computer Automation offers three models in the SyFA Series, the SyFA System 200 at the low end for smaller applications, the SyFA System 300, and the top-of-the-line SyFA System 1000. All three models can be field upgraded to network configurations with the capability of supporting all major communications protocols.

SyFA is an interactive, time-sharing, file-oriented business computer system capable of supporting a maximum of 32 independent users. The SyFA System can also act as a remote batch or interactive terminal to a larger, centralized host computer system, without disturbing any of the 32 interactive users. In addition to handling 32 on-line concurrent users, SyFA can support up to 16 concurrent system utilities, such as sorts or compilations, and perform one remote job entry task and four spool-to-printer tasks.

SyFA is built around a slightly modified version of CA's 2/60 Megabyter. Not many details concerning these modifications have been released, but CA claims that certain existing instructions of the 2/60 Megabyter have been enhanced to yield the performance levels required for use in SyFA systems. ▷

The SyFA systems are built around a modified version of Computer Automation's 2/60 Megabyter, a model in CA's LSI-2 Series that dates back to 1971. In addition to handling 32 concurrent on-line users, a SyFA system can support up to 16 concurrent system utilities and perform one RJE job and four printer spooling tasks. A SyFA Virtual Network can link up to 31 SyFA systems, and multiple Virtual Networks can be interconnected. SyFA prices begin at $29,000.

CHARACTERISTICS

MANUFACTURER: Computer Automation, Inc., 2181 Dupont Drive, 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 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 LSI-2 minicomputer series, the LSI-3 and LSI-4 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. ▶

The SyFA system is an integrated hardware/software complex created specifically for the network communications and distributed processing needs of large businesses. It provides concurrent interactive communications between as many as 32 terminals and the central processor. The basic SyFA system can be augmented with memory extensions to 304K bytes, one or two high-speed printers, a magnetic tape unit, from one to eight 32-, 80-, or 300-megabyte disk drives, and communications hardware to form systems that range in price from $20,000 to over 400,000.

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▷ The SyFA System 200, a smaller, two- to four-terminal system, is designed especially as a small network node in remote locations. The System 200 can be field-upgraded to a larger SyFA System via an upgrade package, without the need to modify existing applications software, according to CA.

As a standalone system, the System 200 could be used on such local applications as data entry and update, file inquiry, report generation, and other applications typically associated with the distributed data processing environment, along with remote batch capability. The System 200 includes a 5-slot chassis, 64K bytes of MOS memory, 22.4 to 89.2 megabytes of disk storage, up to 4 terminal ports, RJE communication with a mainframe or other SyFA product, and a spooled system printer. System software includes the SyCLOPS operating system, SyBOL language, SyFA Utility programs, programming aids, and an IBM 3780 communications emulator.

The SyFA System 300 is the same in all respects to the System 200 with the exception of a 9-slot chassis. All hardware upgrades are completely modular and field installable. The SyFA System 300 can concurrently perform at least 7 individual tasks, including four to eight interactive application programs, one spooled printer job, one synchronous communication task, and/or one to two batch utility programs.

The SyFA System 1000, which CA refers to as a network processor configuration, includes 64K bytes of MOS memory, one asynchronous multiplexer with 8 terminal ports, power supply, 9-slot chassis, the SyCLOPS operating system, the SyBOL language, and SyFA utility programs and programming aids. Memory can be expanded to a maximum of 304K bytes in 64K byte increments. The asynchronous multiplexer and interface can be used with any RS-232C terminals at distances of up to 1000 feet and with any RS-232C modems for remote terminal usage.

The SyFA System 1000 can be configured with three types of disk drives: the DSK-32, DSK-80, and DSK-300. The DSK-32 has a formatted data capacity of 22.4 megabytes, while the larger DSK-80 and DSK-300 drives have a formatted capacity of 56 megabytes and 220 megabytes, respectively. Up to eight drives can be attached to a SyFA System 1000 for a maximum formatted disk storage capacity of 1760 megabytes. The 1000 can also include 9-track magnetic tape units, and serial or line printers as options.

Terminals can be any asynchronous RS-232-type units, although CA recommends the use of its own SyFA Information Station, a 1920 character CRT terminal which 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.

SyFA software includes SyCLOPS, the SyFA Concurrent Logic Operating System. SyCLOPS is a virtual- ▷

▶ DATE OF FIRST DELIVERY: March 1976.

NUMBER INSTALLED TO DATE: 300.

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: Interleaved MOS (Metal Oxide Semiconductor).

CYCLE TIME: 750 nanoseconds.

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 65,536 bytes.

CHECKING: Parity.

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.

CENTRAL PROCESSOR

The SyFA CPU is a modified version of Computer Automation's Model 2/60 Megabyter, a model in CA's LSI-2 ▶

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION	MANUFACTURER
MAGNETIC TAPE EQUIPMENT		
MAG-800	Transport and controller; 9-track, 25 ips, 800 bpi, 10.5-inch reels	Kennedy
MAG-1600	Transport and controller; 9-track, 25 ips, 800/1600 bpi, 10.5-inch reels	Kennedy
PRINTERS		
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		
SyFA Information Station	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

▷ storage, multi-tasking system with 32 variable partitions, four printer spoolers, 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).

Job output for the printer can be sent directly to a printer, if available, or spooled on disk. Despooling occurs in a first-in/first-out basis. Spooling occurs automatically, and despooling occurs 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, a business-oriented programming language, has its roots in COBOL, as the "BOL" suffix implies. It contains some of the more familiar 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.

Emulators for remote job entry systems include IBM 3780, and IBM 360/20 HASP workstations and the ICL 7020. An IBM 3270 terminal emulator and SNA/SDLC communications (IBM 3790 emulation) are also available. These emulators can be executed concurrently with user programs, but only one emulator can execute at a time.

Included with the SyFA software package are 23 system utilities. On a SyFA system with 64K bytes of memory, ▷

▶ series that dates back to 1971. Modifications to the CPU include enhancements to the existing instruction set that make it more useful for business data processing and data communications. New microprocessors, called Micro-Boosters, operate in much the same way as the SyFA CPU by down-line loading a particular data function.

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 re-entrant 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 cycle 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 two-bay SyFA system cabinet is 46.3 inches wide, 40.75 inches deep, 30.7 inches high, and occupies 13.16 square feet of floor space. The PRT-2230 300-lpm printer and the PRT-2260 600-lpm printer each occupy 5.90 square feet of floor space. All other ▶

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▷ 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 304-byte system can support up to 16 concurrent utility programs in addition to the 32 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 consolidating file-space allocations; and LIST, which conditionally lists the contents of selected files, according to parameters supplied by the user.

SyFA also offers a full complement of programming aids, including EDIT—a text editor, PROBE—an interactive debugger, PANEL MASTER—a screen management system, and SyMPLE—a code generator. These programming aids can be used by any number of terminal ports concurrently.

For communications environments, CA offers the SyFA Virtual Network, which allows a user to geographically distribute his data base, yet retain the ability to directly access any data base from any SyFA Information Station in the Network. It eliminates system boundaries in intra-network communications and concurrently supports all major communications protocols. Each SyFA system in the Virtual Network has two concurrent synchronous communications links.

The SyFA Virtual Network consists of a Virtual Network Controller and up to 31 SyFA systems, each containing a microcomputer-based Distributed Data Base Processor. The Network Controller controls the total network and is based on a version of CA's LSI-4/90 minicomputer. The Distributed Data Base Processor serves as an interface between the SyFA CPU and the Virtual Network.

The user may configure SyFA Information Stations and the SyFA processors into the network. It can also interface equipment such as IBM 3270 terminal clusters, Bell System Dataspeed 40/4 clusters, or X.25-compatible processors and devices, as well as provide links to IBM mainframes using either binary synchronous (3780 or HASP model 20 workstation) or SNA/SDLC (3790) protocols.

Each Virtual Network Controller interconnects up to 32 SyFA Network Processors (a SyFA System with a Distributed Data Base Processor added) and 992 SyFA Information Station Terminals to geographically distributed data bases with a capacity of up to 74.4 billion bytes of on-line storage.

Since multiple Virtual Networks can be interconnected, the total number of terminals, processors, and on-line storage capacity that can be configured is essentially unlimited. Should a SyFA Information Station fail, the rest of the network will be unaffected. If a Network ▷

▶ 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	Basic SyFA CPU	700 watts
DSK-10	22.4-megabyte disk drive	696 watts
DSK-80	56-megabyte disk drive	700 watts
DSK-300	220-megabyte disk drive	1020 watts
PRT-503	Serial printer	300 watts
PRT-2230	300-lpm printer	525 watts
PRT-2260	600-lpm printer	680 watts
CRT	CRT display/keyboard	45 watts

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

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

CONFIGURATION RULES

The SyFA System 200 and 300 can support 64K bytes of memory, from 22.4 to 89.2 megabytes of disk storage, and up to 4 workstations. A System 200 includes a 5-slot chassis, while a System 300 includes a 9-slot chassis.

The SyFA System 1000 can support from 64K to 304K bytes of memory, up to 1760 megabytes of disk storage, and up to 32 workstations. Each terminal port can be shared with a printer that connects directly to the SyFA display. One synchronous communications interface can also be added to the system; two if the system is a Virtual Network node.

MASS STORAGE

DSK-32 22.4 MEGABYTE CARTRIDGE DISK SUB-SYSTEM: Includes one DSK-32 disk drive, with one fixed platter and one removable CDC 91204-type cartridge. The disk controller allows up to four disk drives. The formatted capacity of each DSK-32 drive is 22.4 megabytes, using a CDC 91204-type cartridge. Data is recorded on two recording surfaces, one fixed and one removable, in 256 byte sectors with 56 sectors per track, and 823 tracks per surface for a total of 1646 tracks. 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 Model DSK-32 disk drives are manufactured by CDC.

DSK-80 56-MEGABYTE DISK PACK SUBSYSTEM: Includes one DSK-80 disk pack drive and a DSK-80 controller for up to four DSK-80 drives. The formatted capacity of each DSK-80 drive is 56 megabytes, using a ▶

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▷ Processor fails, the other processors and attached peripherals will continue normal operation. Additional reliability can be obtained by installing an optional backup Virtual Network Controller.

Another step in strengthening the Virtual Network is the dual processor version of its Network Processing System. Called the SyFA Cloned-Process System (SyCLONE), it consists of a primary processor, a back-up processor, and a newly developed module called the SyFA Switching Station. It is designed to provide complete processor redundancy for critical applications.

The switching station is used to transfer control of peripheral units to the redundant processor in case of primary processor failure in critical applications, thus eliminating the need for two sets of peripherals. If a problem is detected in the primary processor, the system operator can unlock a master keyswitch and press the appropriate button.

The SyCLONE system is driven by the standard version of the SyFA Concurrent Logic Operating System (SyCLOPS). Memory capacity for each of the dual processors in a SyCLONE system ranges from 64K to 304K bytes. The system can also include up to eight disk drives; 32 CRT's; four line printers; 32 character printers; and 2 concurrent synchronous communications lines.

To further distribute "intelligence" within the SyFA Network Processing System, five front-end microprocessors called MicroBoosters are available for use on all SyFA systems. These provide SyFA users with increased power, throughput speed and capabilities, and offer additional modularity to facilitate the gradual and phased implementation of the Virtual Network. The five MicroBooster consist of the Asynchronous MicroBooster, Line Printer MicroBooster, Bisynchronous MicroBooster, SDLC MicroBooster and the Distributed Data Base MicroBooster. Each of these units contains 16K bytes of RAM memory.

USER REACTION

Datapro was able to contact four SyFA system users with a total of 28 installed systems. The average length of time these systems were in use with 39 months. An average system included 128K bytes of memory, 145 megabytes of disk storage, and 7 terminals. All of these users were writing application programs in SyBOL.

Tabulated below are the results of the SyFA user survey.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	2	2	0	0	3.5
Reliability of mainframe	2	1	1	0	3.3
Reliability of peripherals	0	2	1	1	2.3
Maintenance service:					
Responsiveness	2	2	0	0	3.5
Effectiveness	0	2	2	0 -	2.5
Technical Support	0	1	3	0	2.3
Manufacturer's software:					
Operating system	1	2	1	0	3.0
Compilers & assemblers	1	2	1	0	3.0
Ease of programming	2	2	0	0	3.5
Ease of conversion	0	2	0	1	2.3
Overall satisfaction	1	2	1	0	3.0

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

▶ CDC 9877-type 5-platter disk pack. Data is recorded on five surfaces in 256-byte sectors, 56 sectors per track, on 823 tracks per surface. 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 DSK-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.

DSK-300 220-MEGABYTE DISK PACK SUBSYSTEM: Includes one DSK-300 disk drive and a DSK-300 controller for up to four DSK-300 drives. The formatted capacity of each DSK-300 drive is 220 megabytes, using a CDC 9883-91-type disk pack. Data is recorded on 19 surfaces in 256-byte sectors, 56 sectors per track, on 823 tracks per surface. The Model DSK-300 disk drives are manufactured by CDC.

INPUT/OUTPUT CONTROL

To increase overall processing power and throughput speed, five front-end microprocessors are available: the Asynchronous MicroBooster, Line Printer MicroBooster, Bisynchronous MicroBooster, SDLC MicroBooster, and the Distributed Data Base MicroBooster. Each of these units contains 16K of RAM memory and increase the number of peripheral devices supported by each SyFA System. The Asynchronous MicroBooster increases the number of terminals from 24 to 32. The Line Printer MicroBooster doubles the spooled line printers supported. The Bisynchronous MicroBooster, along with emulation software, makes the system appear to a mainframe as an IBM 3270, IBM 3780, or IBM HASP/20 terminal device. The SDLC MicroBooster provides full SNA/SDLC support in a 3790 communications compatible mode. The Distributed Data Base MicroBooster makes available a second synchronous communications link, serving as the interface between the SyFA Network Processor and Virtual Network.

The concept behind a MicroBooster is to provide the user with the flexibility for large-scale data processing network development. Each Micro-Booster handles a specific communications or peripheral control function and is software driven.

COMMUNICATIONS CONTROL

Three controllers, one asynchronous, one bisynchronous, and one SDLC, have been developed specifically for the SyFA systems.

ASYNCHRONOUS MULTIPLEXER SUBSYSTEM: Includes one control unit for up to eight asynchronous lines. Expansions are optionally available for 16, 24, and 32 lines. User terminals can be any asynchronous RS-232C device. The 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.

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 4800 bps. All data transfers are through the CPU auto-I/O facilities. The unit can interface any medium-speed, synchronous Bell system or equivalent modem.

SDLC COMMUNICATIONS MICROBOOSTER: The SDLC MicroBooster provides SyFA users with full SNA/SDLC support. When used in conjunction with the ▶

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▷ These users were reasonably pleased with the overall performance and capabilities of their SyFA systems. On the positive side, two of the users cited ease of programming as a strongpoint of the system while another felt it was very cost effective. On the negative side one user said there were some "minor incompatibilities with SNA", another was "not impressed" with the performance of the peripherals, while a third expressed dissatisfaction with the remote software support.

➤ SyFA SNA/3790 software emulator, the SDLC processor provides IBM 3790 communications controller emulation. The SDLC processor contains a microprocessor to allow the off-loading of SNA/SDLC overhead functions from the SyFA CPU. This MicroBooster approach to SDLC permits Computer Automation to emulate future SNA products by writing additional emulation software to operate in conjunction with the SDLC MicroBooster. The Micro-Booster performs bit stuffing, CRC checking and message framing functions, with transmission speeds up to 9600 bps in full duplex operation.

DISTRIBUTED DATA BASE MICROBOOSTER: The Distributed Data Base MicroBooster provides a second synchronous communications link, thereby serving as the interface between the SyFA Network Processor and the company's exclusive Virtual Network, utilizing X.25 communications protocol.

SOFTWARE

SyFA is a software/hardware system assembled for multi-divisional 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, inter-active environment.

OPERATING SYSTEM: *SyFA Concurrent Logic Operating System (SyCLOPS)* is a virtual-storage multi-tasking operating system capable of supporting up to 32 variable user partitions. It features demand paging and dynamic allocation of resources, including disk file space. In addition to the 32 user partitions, SyCLOPS can support up to 16 batch utilities, a communications emulator, and two printer spoolers. SyCLOPS requires 52K bytes of memory, leaving 12K bytes of the basic system memory available for user programming. SyCLOPS also requires 43K bytes of disk storage.

User SyBOL 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 32 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. This expanded memory can also be utilized by SyBOL application programs for data division storage.

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 operting 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.

SyCLOPS supports three file access methods: random, indexed, and sequential. Indexed access is considered the 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 (Sy-BOL)* 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 proce- ➤

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dure 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 and terminal emulator packages is available for SyFA systems. The list includes the IBM 2780, IBM 3780, IBM 360/370 HASP workstation, IBM 3270, IBM 3790 (SNA/SDLC), 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.

The 3270 emulation package permits 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 is 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.

The SyFA Virtual Network will concurrently support the SNA/SDLC, X.25 and bisynchronous protocols. One or more host mainframe installations can be interfaced to the Virtual Network at various hierarchical levels. Any mainframe that supports SNA (IBM 3790), X.25, or bisynchronous communications can be interfaced.

UTILITIES: The SyFA software package includes 23 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. Among the programming aids are a text editor, an interactive debugger, a screen management system, and a code generator. These programs are actually SyBOL programs that can execute on any number of ports simultaneously. The system utility and service program requires 2K to 7.4K bytes of memory and 14.3K bytes of disk storage.

PRICING

POLICY: Computer Automation offers a 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. Service is provided by CA's field service organization and coordinated by its Network Control Center (NCC), which gives users a toll free number to call for hardware difficulties.

Support for a 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. The Support Center also distributes the latest software upgrades to all SyFA customers on a no-fee basis.

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.

SyFA SYSTEM 200: A basic SyFA System 200 includes a standard SyFA central processing unit with 64K bytes of memory, 5-slot chassis, 22.4 megabytes of on-line disk storage, 4-port asynchronous multiplexer, an IBM 3780 RJE emulator, two SyFA Information Station video display terminals, and a 165 character-per-second printer. The purchase price is $29,950 and installation and monthly maintenance charges are $750 and $349, respectively.

SyFA SYSTEM 300: Includes a SyFA CPU with 64K bytes of memory, 4-port asynchronous multiplexer, 22.4 megabytes of on-line disk storage, 2 SyFA Information Station video display terminals, one 165 cps character printer, 9-slot chassis, power supply, a 1-bay cabinet, an IBM 3780 RJE emulator software package. Purchase price of this system is $36,000, the monthly maintenance charge is $360, and the installation charge is $750.

EIGHT STATION SyFA SYSTEM 1000: Includes a SyFA CPU with 128K bytes of memory and an 8-port asynchronous multiplexer, two DSK-32 22.4 megabyte cartridge disk drives, eight SyFA Information Stations, one 600-lpm printer, 9-slot chassis, power supplies, a 2-bay cabinet, a synchronous communications controller, and the IBM 3780 RJE emulator software package. Purchase price of this system is $102,500, and the monthly maintenance charge is $840.

THIRTY-TWO STATION SYSTEM 1000: Includes a SyFA CPU with 304K bytes of memory and a 32-port asynchronous MicroBooster, SDLC MicroBooster, four DSK-80 56-megabyte disk drives, 32 SyFA Information Stations, two 600-lpm printers, Printer Micro-Booster, a 9-slot chassis with 5-slot expansion chassis, power supplies, a 2-bay cabinet, a synchronous communications controller, and the IBM 3780 RJE emulator software package. Purchase price of this configuration is $212,750, and the monthly maintenance charge is $1,730.■

EQUIPMENT PRICES

		Purchase Price	Installation Charge	Monthly Maint.
SyFA 200 SERIES				
15991	SyFA 200 Model A; includes processor with 64K bytes of MOS memory, 5-slot chassis and power supply, disk controller, 4-port multiplexer, bisynchronous controller, one DSK-32 disk drive (16M bytes fixed, 16M bytes removable), two CRT's, a 150 cps printer, SyCLOPS operating system, SyBOL language, SyFA utility and programming aids, an IBM 3780 communications emulator, and a one-bay enclosure	$29,950	$ 750	$ 349
15992	SyFA 200 Model B; same as 15991 except with a 600 lpm printer instead of a 150 cps printer	39,950	850	449
16900	Special SyFA Upgrade Package; converts SyFA 200 to full-sized SyFA Network Processing System; includes 9-slot chassis and power supply, additional 4-port multiplexer (8 ports total), an upgraded power distribution system, an upgraded disk controller (supports four drives total); and an additional enclosure bay	25,000	410	155

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EQUIPMENT PRICES

	Purchase Price	Installation Charge	Monthly Maint.

SyFA 300 SERIES

	Purchase Price	Installation Charge	Monthly Maint.
SyFA Model A; includes processor with 64K bytes of MOS memory, 9-slot chassis, 4-port asynchronous multiplexer, disk controller and one 32M bytes drive, two CRT's, a 150 cps printer, and an IBM 3780 emulator	36,000	750	369
SyFA 300 Model B; same as the SyFA 300 Model A except with a 600 lpm printer instead of a 150 cps printer	46,000	850	469

SyFA SYSTEM 300 UPGRADES

	Purchase Price		
8 Port Asynchronous Multiplexer	5,000		
Disk Controller for four 32M byte drives (disk drives not included)	6,000		
Conversion Kit; includes disk controller and 80M byte drive	28,000*		
Conversion Kit; includes disk controller and 300M byte drive	42,500*		

SyFA NETWORK PROCESSOR (SyFA 1000)

		Purchase Price	Installation Charge	Monthly Maint.
15000	SyFA Network Processor Configuration; includes processor with 64K bytes of MOS memory, one disk controller, a 9-slot chassis and power supply, an 8-port multiplexer, the SyCLOPS operating system, the SyBOL language, SyFA utility programs and programming aids	29,000	517	217

PACKAGED SYSTEMS

Each of the following packed systems includes the SyFA Network Processor Configuration (above), from one to eight disk drives with appropriate controller(s), and an appropriate bay enclosure

		Purchase Price	Installation Charge	Monthly Maint.
15001	System with one DSK-32 disk drive and two-bay enclosure	37,500	750	340
15002	System with two DSK-32 disk drives and two-bay enclosure	49,500	900	430
15003	System with three DSK-32 disk drives and three-bay enclosure	62,250	1,100	520
15004	System with four DSK-32 disk drives and three-bay enclosure	74,250	1,250	610
	Upgrade 15001 to 15002	12,000	150	90
	Upgrade 15002 to 15003	12,750	200	90
	Upgrade 15003 to 15004	12,000	150	90
15010	System with one DSK-80 disk drive and two-bay enclosure	58,500	1,000	420
15020	System with two DSK-80 disk drives and two-bay enclosure	76,500	1,225	540
15030	System with three DSK-80 disk drives and three-bay enclosure	95,250	1,500	660
15040	System with four DSK-80 disk drives and three-bay enclosure	113,250	1,725	780
15050	System with five DSK-80 disk drives and four-bay enclosure	136,000	2,150	948
15060	System with six DSK-80 disk drives and four-bay enclosure	154,000	2,375	1,068
15070	System with seven DSK-80 disk drives and five-bay enclosure	172,750	2,650	1,188
15080	System with eight DSK-80 disk drives and five-bay enclosure	190,750	2,875	1,308
	Upgrade 15010 to 15020	18,000	225	120
	Upgrade 15020 to 15030	18,750	275	120
	Upgrade 15030 to 15040	18,000	225	120
	Upgrade 15040 to 15050	22,750	425	168
	Upgrade 15050 to 15060	18,000	225	120
	Upgrade 15060 to 15070	18,750	275	120
	Upgrade 15070 to 15080	18,000	225	120
15100	System with one DSK-300 disk drive and one-bay enclosure	71,000	1,000	457
15200	System with two DSK-300 disk drives and one-bay enclosure	103,500	1,225	615
15300	System with three DSK-300 disk drives and one-bay enclosure	136,000	1,450	773
15400	System with four DSK-300 disk drives and one-bay enclosure	168,500	1,675	931
15500	System with five DSK-300 disk drives and one-bay enclosure	205,000	2,050	1,137
15600	System with six DSK-300 disk drives and one-bay enclosure	237,500	2,275	1,295
15700	System with seven DSK-300 disk drives and one-bay enclosure	270,000	2,500	1,453
15800	System with eight DSK-300 disk drives and one-bay enclosure	302,500	2,725	1,611
	Upgrade 15100 to 15200	32,500	225	158
	Upgrade 15200 to 15300	32,500	225	158
	Upgrade 15300 to 15400	32,500	225	158
	Upgrade 15400 to 15500	36,500	375	206
	Upgrade 15500 to 15600	32,500	225	158
	Upgrade 15600 to 15700	32,500	225	158
	Upgrade 15700 to 15800	32,500	225	158

*These prices include one drive and a controller that can handle any combination of four 32, 80, or 300M byte drives. These prices also require the return of the original controller and 32M byte drive

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EQUIPMENT PRICES

		Purchase Price	Installation Charge	Monthly Maint.

SyFA VIRTUAL NETWORK

SyFA Virtual Network Configuration is controlled by the Virtual Controller which supports up to 31 SyFA systems in 4-system increments; each SyFA system must include a Distributed Data Base MicroBooster; Virtual Network also requires the X.25 communications emulator

		Purchase Price	Installation Charge	Monthly Maint.
17515	Virtual Network Controller; supports 15 systems	31,500	500	210
17519	Virtual Network Controller; supports 19 systems	35,500	565	236
17523	Virtual Network Controller; supports 23 systems	39,500	630	262
17527	Virtual Network Controller; supports 27 systems	43,500	695	288
17531	Virtual Network Controller; supports 31 systems	47,500	760	314
17615	Back-Up Virtual Network Controller; supports 15 systems	20,000	25	N/C
17619	Back-Up Virtual Network Controller; supports 19 systems	22,500	56	N/C
17623	Back-Up Virtual Network Controller; supports 23 systems	25,000	87	N/C
17627	Back-Up Virtual Network Controller; supports 27 systems	27,500	118	N/C
17631	Back-Up Virtual Network Controller; supports 31 systems	30,000	149	N/C
17500	Distributed Data Base MicroBooster	5,000	125	53
	Upgrade of Virutal Network Controller; supports additional 4 systems	4,000	65	26
	Upgrade of Back-Up Virtual Network Controller; supports additional 4 systems	2,500	31	N/C

REDUNDANT PROCESSOR

A Redundant SyFA Network Processor can be configured for applications requiring processor back-up which consists of a mirror image of the Primary SyFA Processor plus a SyFA Switching Station which is used to switch control of a common set of peripherals from one processor to the other; it should be noted that magnetic tapes are the only peripherals which cannot be switched via the Redundant Processor Feature

		Purchase Price	Installation Charge	Monthly Maint.
16001	Redundant Processor and Switching Station for one-drive system	32,500	580	245
16002	Same as 16001 except for two-drive system	35,500	630	265
16003	Same as 16001 except for three-drive system	38,500	680	285
16004	Same as 16001 except for four-drive system	41,500	730	305
16005	Same as 16001 except for five-drive system	48,500	930	370
16006	Same as 16001 except for six-drive system	51,500	980	390
16007	Same as 16001 except for seven-drive system	54,500	1,030	410
16008	Samr as 16001 except for eight-drive system	57,500	1,080	430

MEMORY

		Purchase Price	Installation Charge	Monthly Maint.
	Initial memory expansion beyond 64K bytes to:			
11128	128K bytes	9,900	265	95
11192	192K bytes	16,300	455	163
11256	256K bytes	22,700	645	231
11320	320K bytes	29,100	835	299
	Subsequent memory expansion: 64K byte upgrade	6,400	190	68

MASS STORAGE (field upgrades)

		Purchase Price	Installation Charge	Monthly Maint.
DSK-32	Additional controller	4,000	150	48
	Additional 22.4-megabyte disk drive	17,000	150	90
81204	Disk cartridge for DSK-32 disk drive	380	NA	NA
DSK-80	Additional controller	4,000	150	48
	Additional 56-megabyte disk drive	18,000	225	120
89877	Disk cartridge for DSK-80 disk drive	600	NA	NA
DSK-300	Additional controller	4,000	150	48
	Additional 220-megabyte disk drive	32,500	225	158
89883	Disk cartridge for DSK-300 disk drive	1,450	NA	NA

PRINTERS

		Purchase Price	Installation Charge	Monthly Maint.
12503/4/5*	PRT-503 Serial Printer; 132 positons, 165 cps	8,500	100	58
12230	PRT-2230 Line Printer; 132 positions, 300 lpm	17,000	175	105
12260	PRT-2260 Line Printer; 132 positions, 600 lpm	20,750	200	131
12100	Optional Line Printer MicroBooster	5,000	125	58

*The PRT-503 can be ordered for use as a port printer (12503) connected to a port on the multiplexer, as a shared-port CRT printer (12504) plugged directly into the SyFA Information Station, or as a system printer (12505) eligible for software spooling.

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EQUIPMENT PRICES

		Purchase Price	Installation Charge	Monthly Maint.
TERMINALS				
18000	CRT Display Station; 24 lines x 80 characters; includes detachable keyboard and 50-foot cable	2,750	50	32
COMMUNICATIONS EQUIPMENT				
13016	Expansion of Standard Multiplexer; from 8 to 16 ports	5,500	75	26
13024	Expansion of Standard Multiplexer; from 8 to 24 ports	11,000	150	52
13108	Asynchronous MicroBooster; provides 8 ports	5,000	125	52
13116	Expansion of Asynchronous MicroBooster; from 8 to 16 ports	4,800	75	26
13124	Expansion of Asynchronous MicroBooster; from 8 to 24 ports	9,600	150	52
13132	Expansion of Asynchronous MicroBooster; from 8 to 32 ports	14,400	225	78
17801	SyFA Autodial Feature; provides one line	1,000	10	5
27801	Autodial Expansion Option; provides three additional lines	500	N/C	2
	Upgrade 13016 to 13024	5,500	75	26
	Upgrade 13116 to 13124	4,800	75	26
	Upgrade 13124 to 13132	4,800	75	26
	Upgrade to 13108 from standard 8-port multiplexer	4,500	125	26
	Upgrade 10316 to 13116	6,900	200	52
	Upgrade 13024 to 13124	9,300	275	78
23001	Asynchronous Expansion Redundancy Option	4,000	75	25
27001	Synchronous Communications Redundancy Option	150	N/C	N/C
17016	SDLC MicroBooster	7,500	125	52
17018	Bisynchronous MicroBooster	5,000	125	52
17017	Standard Bisynchronous MicroBooster	4,000	75	32
	Upgrade 17017 to 17018	3,500	125	21
	Upgrade 17017 to 17016	5,500	125	21
	Upgrade 17018 to 17016	4,000	125	N/C
MAGNETIC TAPE UNITS				
14800	MAG-800 Tape Transport and Controller; 9-track, 25 ips, 800 bpi, 10.5-inch reels	10,500	50	26
14160	MAG-1600 Tape Transport and Controller; 9-track, 25 ips, 800/1600 bpi (switchable), 10.5-inch reels	18,000	90	47
CHASSIS AND HARDWARE ACCESSORIES				
25001	Expansion chassis; provides 5 slots; includes power supplies; required if entire SyFA configuration exceeds 9 card slots	3,500	200	30
25009	Terminal Desk; attaches to system enclosure	300	N/C	N/C
22004	Stand for PRT-503 printer	250	N/C	N/C
22005	Paper Rack for PRT-503 printer	85	N/C	N/C
22003	Variable Top-of-Forms Option for PRT-2230 or PRT-2260	250	N/C	N/C

SOFTWARE LICENSE PRICES

		Purchase Price	Installation Charge	Monthly Maint.
93790	IBM SNA-3790 Emulator	7,500	1,000	125
93780	IBM 3780 Emulator	2,000	250	40
93270	IBM 3270 Emulator	5,000	550	100
90360	IBM 360/370 HASP Workstation Emulator	2,500	300	50
97020	ICL 7020 Emulator	3,000	350	60
90025	X.25 Emulator	7,500	1,000	125