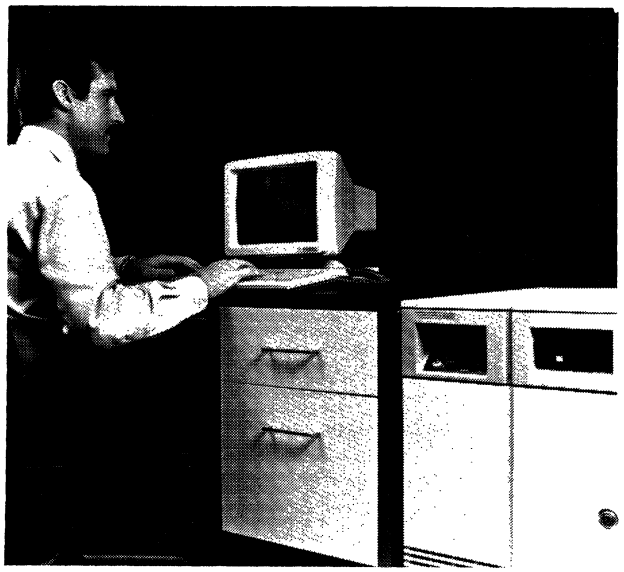
Four-Phase Series 2000, 4000, 5000, and 6000

MANAGEMENT SUMMARY

With the announcement of the Series 6000, Four-Phase joined the growing number of system vendors who are becoming OEM's for Convergent Technologies. The CT Miniframe and Megaframe, based on the Motorola MC68000 family of CPUs and repackaged as the Series 6000, provide Four-Phase's entry into the 32-bit system arena. The Series 6000 is geared toward dedicated word processing and large-scale office automation applications.

Two models of the Series 6000 have been introduced to date. The 6300 compact entry level system, based on Convergent Technologies' Miniframe, can support one to eight users. The processor boards, disk drives, and power supply are housed in a single unit. Other features include a main memory capacity of up to 2MB, removable media storage, and fixed mass storage of up to 37MB. The 6600, based on Convergent Technologies' Megaframe, has a multiprocessor architecture that supports modular expansion. The system can be configured to support up to 128 concurrent users, main memory is expandable to 4MB, and up to 851MB of disk storage can be supported.

Each model of the Series 6000 has its own Unix V-based operating system. Languages supported include C, Basic, Cobol, Pascal, and Sibol. Communications facilities include 2780/3780 bisynchronous batch communications, 3270 bisynchronous interactive communications, and 3270 SNA. Applications provided include Supercomp-Twenty, a spreadsheet-type decision-making tool, and the Oracle data base management system.



The 6000 Series is Four-Phase's new 32-bit office information system. Composed of the System 6300 and System 6600 (shown here), the Series 6000 run under a Unix-derived operating system that is based on and compatible with Unix System V. The Series 6000 provides support for up to 128 workstations.

Four-Phase is a traditional leader in the distributed data processing system market. With the recent addition of the Series 6000, Four-Phase Systems has now entered the arena of 32-bit systems. Designed as a multiuser office information system, the Series 6000 complements the current members of the product line, including the Series 4000, the newly rereleased Series 5000, and the small Series 2000. Four-Phase has enhanced these existing systems by making a number of software packages available for them.

MODELS: Series 6000: 6600 and 6300; Series 5000: 700 and 800; Series 4000: IV/40, IV/50, IV/60, IV/65, IV/70, IV/80, IV/90, and IV/95; Series 2000: 220, 240, and 260.
CONFIGURATION: The Series 2000 provides support for up to 8 workstations; the Series 4000 supports up to 32 workstations. The Series 5000 can be configured with up to 64 workstations. The top-of-the-line Series 6000 provides support for up to 128 workstations. A variety of printers, mass storage devices, and magnetic tape units are also available for various systems.
SOFTWARE: The Series 2000 systems provide either the ISOS II or a virtual memory version of Unix V as the operating system. The Series 4000 and 5000 feature the MFE/IV operating system. The Series 6000 operating systems are derivatives of Unix V.
COMPETITION: The Series 2000, 4000, and 5000 compete with various DDP systems, including the IBM 8100 and Wang VS. The Series 6000 competes with superminicomputers like the Data General Eclipse MV 4000 and Prime 2250.
PRICE: A Series 5000 configuration including 16 workstations, 192K bytes of memory, 40M bytes of disk storage, a line printer, and a bisynchronous communications controller is priced at $69,203.

CHARACTERISTICS

MANUFACTURER: Four-Phase Systems, Inc., 10700 North De Anza Blvd., Cupertino, California 95014. Telephone (408) 255-0900. In Canada: Motorola Information Systems Ltd., 9445 Airport Road, Brampton, Ontario L6S 4J3 Canada. Telephone (416) 793-5700.

DATE OF ANNOUNCEMENT: (Series 4000) IV/70—September 1970; IV/40—March 1973; IV/50—June 1976; IV/90—June 1977; IV/60 and IV/65—April 1979; IV/80 and IV/95—February 1981; (Series 2000) 220 and 240—

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The Series 2000 line of systems, based on Motorola's MC68010 microprocessor, is designed primarily for multiuser applications in communication with an IBM host. Three models are offered in the Series 2000 family. The Model 220 has a maximum main memory of 384KB and can support up to four workstations; the Model 240 provides up to 768KB of main memory, and supports up to eight workstations; and the Model 260 supports eight workstations, and main memory expandable to one megabyte.

The operating system for the Series 2000, called ISOS II, like the Series 6000 operating system, is a derivative of Unix V. A menu-oriented interface provides a user with access to the system's many features, including virtual memory support. Languages provided for the Series 2000 currently include Extended Basic, Cobol, and Mumps. Applications supported include the Q-One word processing system, the Dynacalc electronic spreadsheet, and the ASQ Record Management System. Concurrent 3270 and Concurrent Batch communications are supported.

Four-Phase has also reintroduced the 5000 Series line of clustered terminal processors. Intended to be the high end of the Series 4000 line, the new 5000 Series has a redesigned 24-bit architecture, including such features as pipeline processing to allow some simultaneous processing of applications. Two models currently make up the 5000 Series, the Models 700 and 800. Both have a 1.5MB memory, can provide up to 428MB of disk storage, and support up to 64 workstations. The 800 model also provides cache memory.

The System IV has been renamed and is now called the Series 4000. The eight systems that comprise this series are still called by their old names, retaining the IV prefix. Support for up to 32 workstations is provided. The display/keyboard units can be used to enter/generate data in batch mode as well as interactive mode within the same system. Character printers can be attached to each station to permit the production of hard copy during data entry or word processing operations. Line printers allow the production of reports generated by on-line systems within the Four-Phase network or by the remote host processor. Main memory capacities in this series range from very small, 24KB as the minimum on the IV/40, to a 1536KB maximum on the IV/95. Maximum disk storage ranges from 22.5MB on the IV/40, to 552MB on the IV/95.

The Multifunction Executive (MFE/IV) is a powerful control program which allows multiple software application packages to run concurrently on a single Series 4000 or 5000 processor. Users can run Vision for 3270-style inquiry and retrieval, source data entry, and batch communications, ForeWord for word processing, OMS/IV for office automation functions, COMS/IV for distributed information management throughout a corporate network, GMS/IV for business graphics, Data IV for data entry, Cobol for standalone processing, and utility programs on up to 32 terminals on one system.

Four-Phase supplies bundled software programs needed to operate the Series 4000 as a distributed data processor.

June 1983; (Series 5000) 700 and 800—May 1984; (Series 6000) 6300 and 6600—March 1984.

DATE OF FIRST DELIVERY: (Series 4000) IV/70—February 1971; IV/40—June 1973; IV/50—1976; IV/90—July 1977; IV/60 and IV/65—June 1979; IV/80—August 1981; IV/95—June 1981; (Series 2000) 220 and 240—September 1983; (Series 5000) 700—June 1984; 800—October 1984; (Series 6000) 6300 and 6600—unspecified.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Four-Phase Systems.

CONFIGURATION

The different families of systems in the Four-Phase line cover a wide range of capacity and configurability.

The top-of-the-line Model 6600 of the Series 6000 can support up to 128 workstations. In the Series 4000 family of systems, support for up to 32 workstations can be provided, Series 5000 systems can support up to 64 workstations. The Series 2000 can support up to eight workstations.

Configuration rules require one removable media and one fixed-media drive per system for the 6300, and one removable media and three fixed-media drives for the 6000. The Series 4000 and 5000 systems can support up to four disk drives. The Series 2000 supports up to four Intelligent Disk Controllers per configuration, and each controller can support two drives, so a configuration can support at most eight drives.

The Series 4000 and 5000 systems can support up to four magnetic tape drives. The Series 5000 processors can support up to 32 printers. The Series 2000 allows printers to be attached to the system or directly to a workstation.

Table 1 details the systems that make up the Series 2000, 4000, 5000, and 6000.

TRANSMISSION SPECIFICATIONS

A number of communications control facilities are available for the Series 4000 and 5000. The 8411/4411 Asynchronous Data Set Controller provides a single-line interface for half- or full-duplex communications at 110, 150, 300, 600, 1200, 1800, or 2400 bps. Any 9- to 11-bit code can be accommodated. The controller features automatic answer capability and supports Bell System type 103A, 201A, 201B, 202C, and 202D modems or equivalents, or devices with an EIA RS-232-C interface.

The 8436/4436 Binary Synchronous Data Set Controller provides a single-line interface for half- or full-duplex Bell System 201A, 201B, or equivalent EIA RS-232-C modems operating at up to 9600 bps. Any 7- or 8-bit code is accommodated.

The 8460 Multiline Asynchronous Controller is designed to interface multiple nonstandard input/output devices with a Series 4000 or Series 5000 system capable of running MFE/IV. It contains a 16K-byte microprocessor and supports devices utilizing an EIA RS-232-C interface of 60/20 ma Current Loop interface, and bit transfer rates up to 9600 bps in either half- or full-duplex.

The 8437 Intelligent Communications Controller is designed for use with the System IV/90, the controller contains a 16K-byte processor. The 8437 supports both the Bisync and SDLC protocols.

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TABLE 1. FOUR-PHASE SYSTEM COMPARISON

MODEL	Series 2000 220	Series 2000 240	Series 2000 260	Series 4000 IV 140	Series 4000 IV 150
SYSTEM CHARACTERISTICS					
Operating system	ISOS II	ISOS II	Virtual Memory Version of UNIX V	MFE/IV	MFE/IV
Upgradable from	Not applicable	220	240	Not applicable	Not applicable
Upgradable to	240	260	Not applicable	Not applicable	Not applicable
MEMORY					
Minimum capacity, bytes	192K	192K	512K	24K	24K
Maximum capacity, bytes	384K	768K	1M	96K	96K
Type	MOS	MOS	MOS	MOS/LSI	MOS/LSI
MINIMUM DISK STORAGE	—	20MB	—	2.5MB	2.5MB
MAXIMUM DISK STORAGE	110MB	110MB	369MB	22.5MB	270MB
NUMBER OF WORKSTATIONS	4	8	8	16	24
COMMUNICATIONS PROTOCOLS	SNA, BSC, 2780/3780	SNA, BSC, 2780/3780	SNA, BSC, 2780/3780	Async, Bisync	Async, Bisync

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

TABLE 1. FOUR-PHASE SYSTEM COMPARISON (Continued)

MODEL	Series 4000 IV 160	Series 4000 IV 165	Series 4000 IV 170	Series 4000 IV 180	Series 4000 IV 190
SYSTEM CHARACTERISTICS					
Operating system	MFE/IV	MFE/IV	MFE/IV	MFE/IV	MFE/IV
Upgradable from	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Upgradable to	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
MEMORY					
Minimum capacity, bytes	240K	288K	48K	288K	96K
Maximum capacity, bytes	720K	768K	96K	864K	480K
Type	MOS/LSI	MOS/LSI	MOS/LSI	MOS/LSI	MOS/LSI
MINIMUM DISK STORAGE	5MB	5MB	2.5MB	2.5MB	2.5MB
MAXIMUM DISK STORAGE	80MB	80MB	2.70MB	80MB	552MB
NUMBER OF WORKSTATIONS	16	24	32	32	32
COMMUNICATIONS PROTOCOLS	Async, Bisync, SDLC	Async, Bisync, SDLC	Async, Bisync	Async, Bisync, SDLC	Async, Bisync, SDLC

TABLE 1. FOUR-PHASE SYSTEM COMPARISON (Continued)

MODEL	Series 4000 IV 195	Series 5000 Model 700	Series 5000 Model 800	Series 6000 6300	Series 6000 6600
SYSTEM CHARACTERISTICS					
Operating system	MFE/IV	MFE/IV	MFE/IV	System 6300 Operating System	System 6600 Operating System
Upgradable from	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Upgradable to	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
MEMORY					
Minimum capacity, bytes	480K	—	—	512K	—
Maximum capacity, bytes	1536K	1.5M	1.5M	2M	4M
Type	MOS/LSI	MOS/LSI	MOS/LSI	MOS	MOS/LSI
MINIMUM DISK STORAGE	2.5MB	150MB	150MB	—	—
MAXIMUM DISK STORAGE	552MB	2.2GB	2.2GB	37MB	851MB
NUMBER OF WORKSTATIONS	32	Up to 64	Up to 64	1-8	Up to 128
COMMUNICATIONS PROTOCOLS	Async, Bisync, SDLC	Async, Bisync, SNA/SDLC	Async, Bisync, SNA/SDLC	Bisync, SNA	Bisync, SNA

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

Programs are provided to perform data entry, data editing, on-line inquiry access, screen display formatting, word processing, office automation, business graphics, printing, file maintenance, communications line control, and necessary utilities. An operating system, a multifunction executive, compilers, and assemblers are also offered.

The communications capabilities provided for the Series 4000 and 5000 include asynchronous and bisynchronous communication, SNA/SDLC, HASP, and 2780/3780.

COMPETITIVE POSITION

The wide range of products offered by Four-Phase compete with a variety of different vendors' systems. For example,

The Series 2000 Intelligent Communications Controller has an on-board Motorola MC6809E microprocessor with 64KB of RAM memory to service six serial ports. Four of these ports handle RS-232-C or RS-422 asynchronous interfaces; the other two handle RS-232-C asynchronous or synchronous interfaces, using character or bit-level protocols.

Information on communications control for the Series 6000 is unavailable from Four-Phase.

SOFTWARE

OPERATING SYSTEMS: Each of the Series 6000 models has its own operating system. Both are derivatives of the popular Unix V operating system, under license from AT&T. Unix V is a layered design operating system, made up of a kernel, the shell, and user-level utilities to implement

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the Series 2000, designed for distributed processing with an IBM host, competes with IBM's own 8100 Information System, also geared toward IBM-host communication. The Series 2000 competes specifically with the 8140 processor. With a main memory expandable to 2MB, the 8150 is larger than the Series 2000's 1MB maximum main memory capacity. But the 8140 only supports up to 123MB of disk, much less than the Series 2000's 369MB maximum disk storage.

The Series 4000 and 5000 compete with the traditional mid-size distributed processing systems. For example, some of the models of the 16-bit Wang VS family of systems offer memory capacity and configurability comparable to the Four-Phase systems. The VS 80, the oldest model of the Wang VS family that is still current, offers from 256KB to 512KB of main memory, up to 5.1GB of disk storage, and supports up to 32 workstations. The Series 4000 IV/80, by comparison, can also support 32 workstations and has a larger main memory, offering from 288KB to 864KB, but only provides a maximum of 80MB of disk storage.

As a superminicomputer aimed at providing large-scale office automation, the Series 6000 competes with such products as Data General Corporation's Eclipse MV 4000 and Prime Computer's 2250. The DG MV/4000, with a maximum main memory capacity of 8MB and disk support of up to 5GB, outdistances the Series 6000 in those categories, as the high-end 6600 can only support 4MB of main memory and up to 851MB of disk storage. However, the number of workstations that the 6600 can support is 128, double the 64 workstation support provided by the MV/4000. Prime's 2250 has a similar main memory range, from 512KB to 4MB, and supports significantly more disk storage, 10GB compared to the 6600's 851MB. The 6600 can support more workstations, however—128 compared to a 32-workstation maximum for the 2250.

ADVANTAGES AND RESTRICTIONS

The reintroduction of the Series 5000 has taken care of the problem of limited storage capacity that the Four-Phase product line had formerly faced. By marketing the Series 5000 as the high-end of the Series 4000, and redesigning the architecture to ensure software and peripheral compatibility between the two systems, Four-Phase has designed a migration path for users who find that the main memory and disk storage that are available on the Series 4000 are no longer enough for their needs. Even though the Series 4000 is not upgradable to the Series 5000, all software developed on Series 4000 processors can be run on the Series 5000 without modification, according to Four-Phase.

Lack of upgradability is a problem within the Series 4000. Once you buy a Series 4000 system, you are tied to its size and configurability; there is no way to upgrade to a larger,

the various commands. The kernel is a permanently resident program that provides the software environment for all other programs running on the system. The shell provides the interface to the kernel, acting both as a command language interpreter, taking commands from the user level and sending them to the appropriate kernel process, and a low-level programming language.

Among the Unix V capabilities that both the System 6300 Operating System and the System 6600 Operating system provide are virtual memory with demand paging, a hierarchical, tree-structured file system, transparent file, device, and interprocess I/O, the ability to execute sequential, asynchronous, and background processes, the ability to invoke different command languages for each user, powerful text editors, a high degree of portability, flexible document preparation and text management systems, access to the facilities of other host systems, support of many industry standard programming languages, compiler-compilers, desk calculator packages, a source code control system, network-communications facilities between Unix-based systems, and a system activity package for monitoring CPU and disk utilization.

In addition, the 6600 operating system provides distributed processing capability. This is accomplished by the inclusion of the Real-Time Operating System (RTOS). The capabilities provided by RTOS are transparent to the user; programming and all user interfaces are performed in the Unix environment. RTOS handles all file and I/O processing for the 6600 operating system.

***Multifunction Executive (MFE/IV)* enables multiple Four-Phase software packages to operate concurrently and independently on a System IV/60, IV/65, IV/80, IV/90, or IV/95, and the Series 5000. These packages include Data IV, Vision, ForeWord, Cobol, OMS/IV, COMS/IV, and GMS/IV, making the following distributed processing functions available with a single processor: data entry, word processing, program development, on-line inquiry and retrieval, batch communications, local processing, report generation, executive services, electronic mail document processing, and business graphics. A single station can switch from one function to another easily. MFE/IV supports up to 32 of Four-Phase's 1920-character screens, 552M bytes of disk storage, and up to 768K bytes of memory.**

***NPOS (NP/80 Operating System)* is a modular operating system for the Series 4000 and 5000 which coordinates the services of the NP/80 peripheral processor. The primary function of NPOS is to service I/O requests for large mass storage devices as well as to enable the operation of multiple Series IV processors. Virtual disk capability and buffer pooling is also provided. A Multi-Key Access Method (MKAM) runs under control of NPOS.**

***IDOS* is a disk-oriented operating system for the Series 4000 and 5000 oriented toward executing programs which IDOS provides for the cataloging and updating of source, relocatable, absolute files and command run parameter strings (job streams). The latter permits a single entry from the console to initiate sequential operation of a series of programs. The Code Assembler and Relocatable Loader, Cobol with DISAM, the Sort Package, and the System Relocatable Library are among the programs provided with IDOS. Two types of disk files are available under IDOS: contiguous (chained) and sequential (linked files).**

***ISOS II* is a Unix-type operating system for the Series 2000, providing multitasking and multiprogramming capabilities. A menu-oriented interface enables the user to access any application on the system, or execute system commands and utilities. Hierarchical directories allow the user to organize files and programs by user, application, or type. ISOS**

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more powerful model, short of buying a totally new system. This remains a problem in the Series 5000 and 6000—there is no way to upgrade, for example, from a 6300 to a 6600. The Series 2000, however, provides the capability to field upgrade to the next system in line.

Is Four-Phase's growing inclination toward Unix, as evidenced by the operating systems provided for their new systems, an advantage or a restriction? Many will argue that the exploding popularity of Unix has made it an industry standard, and that Unix capability on a system opens the door to a plethora of off-the-shelf application software. Others say that the major problem with Unix is that there currently is no standard, and that many of the currently available versions, such as Version III, Berkeley's 4.1 and 4.2 BSD versions, Xenix, and Venix, are not compatable with one another. Running a version of Unix V on a Series 2000 or 6000 system does not guarantee that a user will be able to make use of all of the programs that have been developed in a Unix environment.

USER REACTION

A total of 31 users of Series 4000 systems responded to the 1984 Datapro Users' Survey. (Survey results are given on Page M07-100-401.) The average installed time for these systems was 62.6 months. The majority of these users, 61.29 percent, leased their systems from Four-Phase. The principle applications were accounting/billing (67.74 percent), health care/medical (41.94 percent), order processing/inventory control (25.81 percent), purchasing (12.9 percent), mathematics/statistics (9.68 percent), insurance (6.45 percent), education-scheduling/administration (6.45 percent), manufacturing (6.45 percent), construction/architecture (3.23 percent), process control (3.23 percent), and sales/distribution (3.23 percent). Most of the users surveyed said that their primary source of application programs was in-house personnel (70.97 percent). Packaged programs from the manufacturer were the second most common source of application programs (38.71 percent), followed by contract programmers (25.81 percent), independent suppliers (25.81 percent), and manufacturer's personnel (3.23 percent). Ten percent of the users surveyed are currently using a data base management system, and 13.33 percent are currently using a communications monitor. More than half (55.17 percent) use integrated office automation functions, and some (6.9 percent) are planning to do so within the year. Most (66.67 percent) have a disaster recovery plan, and several (6.67 percent) are planning to implement one this year.

In the next 12 months, the users surveyed plan the following enhancements to their existing systems: expansions to present hardware (38.71 percent), expansions to data communications facilities (29.03 percent), additional software from the manufacturer (16.13), distributed processing capabilities (12.9 percent), proprietary software from other suppliers (9.68 percent), power conditioning systems (6.45 percent), and business graphics (3.23 percent).

Results of the respondents' ratings of the Four-Phase systems are contained in the following chart.

II files are protected from unauthorized use by six file protection atributes, as they can be marked for public or private use with read, write, or execute attributes.

DATA BASE MANAGEMENT SYSTEM: The Series 6000 supports *Oracle*, a relational data base management system designed for ease of use. Oracle provides simple two-dimensional data presentation and English-like commands for data base access, as well as on-line help information. Oracle data bases can be accessed by C and Cobol programs. The on-line query function allows a user to extract data from tables and display it on-screen. Then, multiple math functions are provided for use with the data obtained. Versatile formatting of queries is provided, and multiple queries can be linked together. The user is also provided with the capability to obtain hardcopy of a report.

LANGUAGES: On the Series 6000, a two-pass *C* compiler and execution environment are provided as part of the Unix-derived operating systems. Because of this, programs written in C can make optimal use of the operating system's features. Other features of the C programming environment include an extensive set of library functions, a large set of data structures, and a variety of debugging aids, including a preprocessor.

***SMC Thoroughbred Basic*, an enhanced version of Basic supported by the Series 6000, uses English-like statements to provide a programming language that can be learned quickly and is easy to use. Since Basic is interpreted rather than compiled, a program can be debugged, line by line, as it is being entered. The output from the interpreter is compressed pseudocode, optimized for very fast execution. Multiple users are supported, as well as the capability for multiple programs to run simultaneously. A library of utility routines provide the capability to renumber programs, compare programs, initialize the disk environment, transfer programs and files, perform a hexidecimal file dump, do string search and replacement, and display task memory allocation.**

The *Cobol* system supported by the 6000 Series includes a multipass compiler, run-time interface, Oracle relational data base management system interface, and several program debugging aids. The run-time system, accessible directly via the command line or through Uniview menus, has been designed to support multiple users executing multiple programs simultaneously, a capability enhanced by demand-page virtual memory provided on both systems.

The 6000 Series supports an extended version of *Whitesmiths Pascal*, an implementation of ISO Pascal. Provided are a single-pass compiler, access to the Unix-derived operating system, Pascal run-time library, and program debugging aids. The compilation process actually begins when, transparent to the user, Pascal source code is translated into C, and this code is run through the C compiler. The resulting machine code is stored in small modules, which can be linked together at execution time to form an executable program. This makes it possible to assemble files from multiple sources so that common declarations and definitions can be included as needed. Debugging aids include a trace feature that will show which procedures have been accessed after a program has been run, helping the programmer to pinpoint where potential problems can occur.

***Sibol* is a high-level language for commercial application programming available on the Series 6000. Using the same syntax as Digital Equipment Corporation's Dibol (DEC Business Oriented Language), Sibol is designed to make full use of the Unix environment. Unix commands and C language functions can be executed within a Sibol program. The Sibol system which consists of a single pass compiler, a run-time interpreter, a symbolic debugger, a linker, and a library of external utilities.**

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	Excellent	Good	Fair	Poor	WA*
Ease of operation	8	21	1	1	3.23
Reliability of system	9	19	3	0	3.19
Reliability of peripherals	4	21	4	2	2.87
Maintenance service:					
Responsiveness	11	17	3	0	3.26
Effectiveness	8	19	4	0	3.13
Technical support:					
Troubleshooting	5	20	5	1	2.94
Education	3	19	8	1	2.77
Documentation	2	16	11	2	2.58
Manufacturers software:					
Operating system	5	17	4	1	2.96
Compiler & assemblers	3	16	4	1	2.88
Application programs	2	11	5	2	2.65
Ease of programming	6	14	1	2	3.09
Ease of conversion	1	10	9	2	2.45
Overall satisfaction	5	20	3	0	3.07

*Weighted Average on a scale of 4.0 for Excellent.

To further enhance our survey findings, Datapro contacted two of the respondents by telephone. The results of these telephone interviews follow the user ratings chart.

The survey responses from a manufacturing facility in Michigan were very positive. The system in question is a small Series 4000, supporting only five workstations and less than 10MB disk storage. With the exception of the vendor-supplied DOS operating system, all programs at this particular facility are provided by in-house personnel. Principal applications include accounting, billing, and payroll. When asked to discuss the strengths and weaknesses of the system, a representative from the facility said that the maintenance service from Four-Phase is outstanding; they report that "better than nine times out of 10," when someone from the facility calls to report a problem, there is someone dispatched to answer the call within 15 minutes. The only problems the facility has encountered with the system have involved the software developed in-house for it, according to this representative.

A transportation company out west has also had a very positive experience with its Four-Phase system. This particular Series 4000 installation has between 512KB and 1MB of main memory, and between 100MB and 600MB of total disk storage. There are currently between 16 and 30 terminals attached. Principle applications that the system handles include accounting and payroll, as well as construction applications. The person we talked to from this installation also gave very high marks to the maintenance service they had received from Four-Phase. Although no extraordinary problems had been encountered, small ones had been quickly and efficiently taken care of. Also on the positive side was the capability offered at a single terminal, including data entry, word processing, and 3270 emulation. One major disadvantage of the system was noted; that is, that both from a hardware and software standpoint, the system offers very little in the way of compatibility with other vendors. This user has been unable to find any third-party software vendors who produce packages that can run on the MFE operating system, or any independent peripheral suppliers who manufacture or market Four-Phase compatible terminals. □

For program development on the Series 4000 and 5000, Four-Phase offers three versions of Cobol. Cobol is offered in both ANSI Cobol '68 and Cobol '74 versions, with extensions provided for screen handling. Programmers can define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas can be manipulated like any working storage area; thus, the programmer can read and write data to operator displays without using I/O instructions. This allows for dynamic manipulation of screen displays without imposing overhead on the processor or the channel. Cobol and Assembly language subroutines can be executed on-line and can be overlaid to conserve memory. Multitasking allows different activities to be supported at different displays simultaneously. Data management facilities are provided for accessing of up to 270M bytes of local disk storage. Serial and direct files are processed using the Sequential Access and Random Access features of ANSI Cobol. A third access method, MKAM, provides multi-indexed files that may be referenced by a primary key and up to 256 secondary keys. Files created or maintained in on-line operations can also be processed in batch mode using Cobol, RPG, sort/merge, and an extensive selection of utilities.

Cobol with 2780/3780 **is a package which combines ANSI Cobol for local processing with concurrent batch communications using IBM 2780/3780 protocol. Displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. A Series IV CPU can communicate with any system using IBM 2780/3780 discipline, including other Series IVs using RBS or Cobol with 2780/3780, and with IBM System/3s, 360s, and 370s.**

Cobol with HASP **combines Cobol for local processing with a set of subroutines that can be called for the transmission of data to or from another computer using HASP multileaving batch transmission protocol. The other computer can be a 360/370, another Four-Phase processor, or any other system having a bisynchronous HASP multileaving interface. Communications can be over leased or dial-up facilities with either attended or unattended operation. Local transaction processing is accomplished with user routines written in either Assembler or Cobol.**

The Series 2000 supports *Extended Basic* language system that includes an on-line text editor, multipass compiler, run-time interpreter, and interactive debugger. Data structures include atomic data types, arrays of up to three dimensions, and user-defined data types. The capability to optimize code is provided by a Pack statement. When the Pack statement is executed, a second compiler pass removes names, line numbers and comments, resulting in a smaller, faster program.

COMMUNICATIONS: The *IBM 2260 Simulator* for the Series 4000 and 5000 provides all functions of an IBM 2260/2848 Display System through software emulation. This package provides for operation in either local or remote environments, and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units connected to the same Series 4000 or 5000 system, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

The *IBM 3270 Simulator* for the Series 4000 and 5000 provides all the functions of an IBM 3270 Information Display System through software emulation. This package provides for operation in either local or remote environments, and supports 480, 960, and 1920 character display units. The user may select either 3270 SDLC line protocol or Bisynchronous (BSC) line protocol, as well as the ability to use either ASCII or EBCDIC character sets. The Store-

Four-Phase Series 2000, 4000, 5000, and 6000

TABLE 2. WORKSTATIONS

MODEL	TM30	FT40	FT50	7100A	7101A
DISPLAY PARAMETERS					
Max. chars./screen	2320	1920	1920	480	288, 576, or 1152
Buffer capacity	—	—	—	—	—
Screen size (lines x chars.)	29 x 80	24 x 80	24 x 80	12 x 40	6, 12, or 24 x 48
Tilt/swivel screen	Standard	Standard	Standard	—	—
Symbol formation	9 x 12 matrix	10 x 14 matrix	9 x 15 matrix	7 x 9 dot matrix	7 x 9 dot matrix
Character phosphor	Green	Green or amber	Green or amber	Green	Green
Total colors/no. simult. displayed	None	None	None	None	None
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	ASCII	Full ASCII	Full ASCII	120 ASCII	120 ASCII
Detachable	Yes	Yes	Yes	Standard	Standard
Program function keys	—	13-27	13-27	—	—
TERMINAL INTERFACE	RS-233, RS-422	RS-423	RS-423, RS-232-C	—	—
COMMENTS	Series 6000	Series 5000	Series 5000	Series 4000, 5000	Series 4000, 5000

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

TABLE 2. WORKSTATIONS (Continued)

MODEL	7111A	5115/5115A	8115	268	8117
DISPLAY PARAMETERS					
Max. chars./screen	1920	1920	—	2000	1920
Buffer capacity	—	—	—	—	—
Screen size (lines x chars.)	24 x 80	24 x 80	—	25 x 80	24 x 80
Tilt/swivel screen	—	—	—	Optional	Standard
Symbol formation	7 x 9 dot matrix	7 x 9 dot matrix	7 x 9 dot matrix	7 x 9 dot matrix	7 x 9 dot matrix
Character phosphor	Green	Green	Amber or green	Amber or green	Amber or green
Total colors/no. simult. displayed	None	None	None	None	None
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	120 ASCII	120 ASCII	120 ASCII	96 ASCII	120
Detachable	Standard	Standard	Standard	Standard	Standard
Program function keys	—	—	—	12	—
TERMINAL INTERFACE	—	—	—	RS-422	—
Supported by COMMENTS	Series 4000, 5000	Series 4000, 5000	IV 180, IV 195	Series 2000	Touch-sensitive screen

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

and-Forward feature allows selected format images to be entered and recalled from disk, so that data entry may continue in the event host mainframe communications have been interrupted. When communications resume, the completed formats may then be transmitted. The 3270 Simulator includes support for options such as Variable Intensity and Audible Alarm, and additional facility test features that can be used to pinpoint problems in the communications equipment, log line traffic, display format attribute types, write memory checkpoints to screen or disk, and accumulate error statistics. Local screen print capabilities are also available.

Programmable 3270 Simulator **allows 3270 users to add local processing capabilities to an existing 3270 network. The package provides all the capabilities of the 3270 Simulator system plus Cobol programming. Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparison can be programmed into the system to enable local handling of data. Entries may be validated against local files, and filed data can be integrated with keyed data for transmission or with received data for displaying or printing. The Cobol-programmed routines to perform these functions can be added to the system without having to modify existing 3270 application programs, systems software, or network configuration. Cobol routines can be invoked when data is transmitted or received, when the TAB or Program Function keys are pressed, or when entries in designated fields are completed. The subroutines can then access local disks, printers, and displays on the central CPU before returning control to the operator. Cobol processing is performed in the background and can support multiple tasks at multiple displays with concurrent key entry and printing.**

All major Series 4000 and 5000 software packages provide the ability to transmit and receive data in a batch mode. The batch communication protocols in the various packages are: Data IV, Version 1 (2780/3780); Data IV, Version 2/3 (2780/3780/HASP/3770); Vision (2780/3780/HASP); (3770/3270 BISYNC, 3270 SDLC); ForeWord (2780/3780). In addition, two remote job entry packages are available.

RBS with 2780/3780 **is a Remote Batch System that provides a full complement of IBM 2780/3780 features for the Series 4000 and 5000, including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported include 300- and 600-cpm card readers, printers from 300 to 1,000 lines per minute in speed, and a diskette or cartridge disk system for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be read in from a card reader, another job to be written out from disk to a printer, and a third job to be transmitted or received simultaneously. Reports can be transmitted to unattended RBS systems at night without concern for forms changing or device availability, and the spooled data can be printed the next day while other operations are being performed. During transmission, the host CPU creates separate disk files on the remote system for each job. Reports can be generated and local system files updated using user-programmed software.**

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TABLE 3. PRINTERS

MODEL	PT30	PT35	PT31/32	PT34	PT36	8159
Type	Impact	Impact	Dot matrix	Dot matrix	Band	Band
Speed	32/35 cps	50/55 cps	150 cps	50 or 200 cps	600 lpm	1350 lpm
Bidirectional printing	Standard	Standard	Standard	—	No	No
Paper size	Up to 16.53″ wide	4-16″ wide	Up to 10″ wide	3″-12″ wide	3″-16″ wide	4″-18.75″ wide
Character formation	Solid	Solid	9 x 7 dot matrix	200 cps: 7 x 9 dot matrix 50 cps: 15 x 16 dot matrix	Solid	Solid
Horizontal character spacing (chars./inch)	10, 12, or 15	10, 12, or 15	5, 8.18, 10, or 16.36	10, 12, 13.2, 15, or 16.5	10	10
Vertical line spacing (lines/inch)	—	—	6	3, 4, 6, 8, or 12	6 or 8	6 or 8
Character set	96 ASCII	96 ASCII	96 ASCII	96 ASCII	64 or 96 ASCII	64 ASCII
Controller/Interface	RS-232-C Serial Centronics Parallel	RS-232-C Serial	RS-232-C Serial or Centronics Parallel	RS-232-C Serial or Centronics Parallel	Centronics Parallel	8150
No. of printers per controller/interface	—	—	—	—	—	1
Printer dimensions, in. (h x w x d)	8.25 x 22.4 x 18.25	7.3 x 23.5 x 17.9	PT31: 6 x 15 x 14 PT32: 7 x 21 x 15	8.25 x 22.4 x 18.25	44.3 x 34.3 x 29.7	52 x 46 x 27
Graphics capability	No	No	No	No	No	No
Comments						

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

TABLE 3. PRINTERS (Continued)

MODEL	8122	8124	8125	Series 2000 300/600 lpm	Series 2000 35 cps	Series 2000 150 cps
Type	Daisywheel	—	Serial	Band	Rotating wheel	Matrix
Speed	45 cps	35 cps	40 cps	300/600 lpm	35 cps	150 cps
Bidirectional printing	—	—	—	No	Standard	Standard
Paper size	Up to 15″	Up to 15″	Up to 15″	3″ to 16″ wide	Up to 16″ wide	4.5″-15″ wide
Character formation	Solid	—	—	Solid	Solid	9 x 7 dot matrix
Horizontal character spacing (chars./inch)	10	10	10	10	10, 12, or 15	5, 8.18, 10, or 16.36
Vertical line spacing (lines/inch)	—	—	—	6 or 8	—	6
Character set	96 ASCII	96 ASCII	88 ASCII	64 ASCII	96 ASCII	96 ASCII
Controller/Interface	—	—	—	RS-232	RS-232-C	—
No. of printers per controller/interface	—	—	—	1	—	—
Printer dimensions, in. (h x w x d)	—	—	—	15 x 30.3 x 25.2	9.79 x 24.34 x 18.45	6 x 15 x 14 (80 col.) 7 x 21
Graphics capability	—	—	—	No	No	No
Comments			Integrated power power			

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TABLE 3. PRINTERS (Continued)

MODEL	Series 2000 200 cps	8154	8155	8145	8148	8149
Type	Matrix	Chain	Band	Matrix	Drum	Chain
Speed	200 cps	1000 lpm	430 lpm	120 lpm	300 lpm	600 lpm
Bidirectional printing	Standard	—	No	—	No	—
Paper size	3″ to 15″ wide	4″ to 16.75″ wide	3″ to 16″ wide	Up to 14⅞″ wide	4″ to 16.75″	4″ to 16.75″
Character formation	9 x 7 dot matrix	Solid	Solid	7 x 9 dot matrix	Solid	Solid
Horizontal character spacing (chars./inch)	10, 12, 13.2, 15, or 16.2	10	10	10	10	10
Vertical line spacing (lines/inch)	3, 4, 6, 8, or 12	6 or 8	6 or 8	6 or 8	6 or 8	6 or 8
Character set	96 ASCII	96 ASCII	64 ASCII	96 ASCII	64 ASCII	64 ASCII
Controller/Interface	RS-232-C	Integral	8150	Integral	Integral	Integral
No. of printers per controller/interface	—	1	1	1	1	1
Printer dimensions, in. (h x w x d)	8 x 22 x 18	—	44.3 x 34.3 x 29.7	42 x 28 x 24.5	—	—
Graphics capability	No	No	No	—	—	No
Comments						

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TABLE 4. MASS STORAGE

MODEL	8230	8261	8270	8291
Type	Cartridge	Removable	Fixed	Fixed Winchester
Controller model	—	Integral	8270	NP/80
Drives per subsystem/controller	4	4	—	—
Formatted capacity per drive, megabytes	2.5	67.5	10	138
Number of usable surfaces	2	10	8	—
Number of sectors or tracks per surface	200	—	200	—
Bytes per sector or track	768	768	768	20,480
Average seek time	—	—	65	—
Average rotational/relay time	200 ms	30 ms	—	—
Average access time	—	—	—	—
Data transfer rate	184KB/sec.	250KB/sec.	195KB/sec.	1.2MB/sec.
Supported by system models	Series 4000, 5000	Series 4000, 5000	Series 4000, 5000	Series 4000, 5000
Comments				

**A dash (—) in a column indicates that the information is unavailable from the vendor.*

TABLE 4. MASS STORAGE (Continued)

MODEL	DD0101	DD0201	DD0371/DD0372
Type	Winchester	Fixed	—
Controller model	—	—	—
Drives per subsystem/controller	—	—	—
Formatted capacity per drive, megabytes	10	20.97	36.93
Number of usable surfaces	—	4	7
Number of sectors or tracks per surface	—	—	—
Bytes per sector or track	512	512	512/sector
Average seek time	—	—	—
Average rotational/relay time	—	—	—
Average access time	—	—	—
Data transfer rate	5MB/sec.	—	5MB/sec.
Supported by system models	Series 6000	Series 6000	Series 6000
Comments			

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TABLE 5. TAPE STORAGE

MODEL	8501	8502	8503/8513	8504	8507
TYPE	Reel-to-reel	Reel-to-reel	Reel-to-reel	Reel-to-reel	Reel-to-reel
FORMAT					
Number of tracks	9	9	9	9	7
Recording density, bits per inch	800	800	1600	1600	556/800
Recording mode	PE	PE	PE	PE	—
CHARACTERISTICS					
Controller model	Inbuilt	Inbuilt	Inbuilt	Inbuilt	Inbuilt
Drives per controller	Up to 4	Up to 4	Up to 2	1	—
Storage capacity, bytes	—	—	—	—	—
Tape speed, inches per second	12.5	12.5	37.5	37.5	12.5
Data transfer rate, units per second	10KB/sec.	10KB/sec.	60KB/sec.	60KB/sec.	6.95/10KB/sec.
Streaming technology	No	No	No	No	No
Start/stop mode; speed	—	—	—	—	—
Switch selectable	—	—	—	—	—

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RBS with HASP, available for the Series 4000 and 5000, is compatible with the IBM 360/30 HASP workstation used as a remote batch terminal. The package is offered with the System IV/40 and supports 300- to 600-cpm card reader, multiple 300- to 1000-lpm printers, 1920-character video display and operator keyboard. The display and operator keyboard serve as an operator's console and display system status and communications status. The software provides the line discipline to simulate a multileaving HASP workstation.

The Series 2000 supports two communications systems. The *Series 2000 Concurrent 3270 Communications System* runs as an application under the ISOS II operating system. On-line access to host information on an interactive basis is provided, concurrent with local data processing and office applications. Concurrent 3270 emulates both SNA and BSC 3270 protocols, operating at speeds up to 9600 bps. Up to eight Concurrent 3270 devices may be active at once in any combination of workstations and printers.

The *Series 2000 Concurrent Batch Communication System* runs as a batch communications facility in bisynchronous networks. Concurrent Batch allows a Series 2000 computer to communicate with a host CPU, an RJE 2780/3780 workstation or another Series 2000 computer in batch mode. The system can operate as a foreground task or, by use of a procedure file, a background task.

UTILITIES: Uniview is a set of tools provided for the Series 6000 to make it Unix environment more user-friendly. Uniview provides menus and help screens, simplifying the user interface with the operating system.

Utilities for MFE/IV or IDOS are also provided and includes a sort/merge, symbolic editor, relocatable loader, and various media conversion programs. The symbolic editor allows for insertion, deletion, replacement, and interrecord corrections of symbolic text. Media conversion programs include card-to-tape, tape-to-printer, and memory save/restore on disk or magnetic tape.

OFFICE AUTOMATION: The *Q-One Word Processing System* is available for the Series 2000 and 6000. This menu-driven system provides spelling and automatic hyphenation facilities, a record processor for personalized correspondence, automatic index and table of contents generation, and an error recovery function to protect documents from power failures and operational errors. In addition, a calculator-type function allows calculations to be performed on numbers that are already in the document.

The *Office Management System (OMS/IV)* provides office automation capabilities in a distributed processing environment for the Series 4000 and 5000. Composed of three functional units operating under the Multifunction Executive (MFE/IV), OMS/IV integrates word processing, data processing and network communications. Functions which are data processing in structure are provided in Vision; those that require word processing use ForeWord. Communications can be tailored to a customer's needs.

The *Corporate Office Management System (COMS/IV)* is a distributed information management system which operates under the umbrella of MFE/IV-ForeWord-Vision-OMS/IV. COMS/IV includes all of the features available with OMS/IV, adds document tracking to the executive services function, and provides electronic mail, document management, document processing, remote system console, and IBM 3270 pass-through to any multifunction workstation within the COMS/IV network. A processing request is entered via menu-driven interface. Internally, Vision verifies that the request is accurate and complete, and transmits it via 3270 mode to the System 311/312 node controller.

Accessible via the COMS/IV master menu, the *Electronic Mail* function allows any COMS/IV user to send "mail" electronically to any other user in the network. Mail can consist of a simple message, a document, or a package of documents, and can be addressed to a "mailbox," an individual user, a group of users, or a predefined distribution list. Recipients can scan, file, print, or hold their mail, delete mail after viewing, send a reply, or forward the mail to another recipient. A log is automatically maintained and updated for all mail sent by a particular user, allowing mail to be tracked for date and time of delivery. If any of the addressed are unknown, the sender is notified and given a choice of alternative actions: send to all others, correct the address and send, or cancel.

Since document and file access is possible from any workstation in the network, Four-Phase has incorporated security features, based on access codes and document codes, at all levels in the system to permit access only by authorized users. Mailboxes and the central post office are accessed only through the electronic mail facility. Anyone may send mail to a mailbox or the central post office. Only the mailbox owner or those granted access permission can perform any other functions on the mail in the mailbox. Only those granted access to a particular piece of mail in the central post office may access that mail. The owner of a mailbox always has total access.

The Document Management feature of COMS/IV allows document filing and retrieval from multiple Series IV systems. This is similar to "filing" a document in a filing cabinet. The electronic filing cabinet consists of two sections, the files and the file index. For each document filed, several index entries are created and stored in the file index.

The user interface to the Document Management feature is primarily menu-driven and is invoked by the master COMS/IV menu. Once the feature has been selected, the system will lead the operator through the various Document Management options. Document Management requires the Electronic Mail function since it uses the electronic communications interface for the actual transmission of documents between the Series 4000 systems.

The Document Processing feature provides comprehensive text formatting and document construction functions which enable users to address a wide range of applications, including in-house publishing of books, technical manuals, and other documents of complex format. Formats for documents such as correspondence, drafts, and manuscripts can be standardized and shared throughout a corporation, while specialized formats can be developed for individual needs. Text is simply typed without regard for its appearance on the CRT screen. The Document Processor performs all formatting tasks automatically, leaving the operator free to concentrate on content rather than form.

Supported functions include: multiple fonts, bold type, underscoring, revision bars, overstriking, super-/subscripting, string integrity, text alignment and justification, split text, headers and footers, footnotes, figures, lists, multiple columns, and variable line spacing.

ForeWord is a flexible shared-processor text editing system that allows text to be entered, stored, edited, and printed. The Series IV system can handle the editing and test manipulation functions of up to 24 video terminals. The system supports up to eight disk drives with removable disk packs providing an on-line storage capacity ranging from 400 to 50,000 pages of text. Removable disks provide unlimited archival storage. Up to 16 terminal printers are supported. Text is automatically written to the disk as entry progresses. Instant recall of text and rapid scrolling and cursor movement are provided by the editing and cursor

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control keys conveniently located on the keyboard. Operators can store frequently used words, phrases, or keystroke sequences within a special glossary and recall them with only two keystrokes. Automatic entering, discretionary hyphenation, and overstriking speed text entry. Updates and changes are easily done. Using the global search and replace command, the operator can type a correction once, no matter how often it appears in text. Blocks of text can be moved or copied without retyping. ForeWord provides rapid assembly of documents from libraries of stored paragraphs with an option to include fill-in information. When ready to print, the text can be formatted to add page headings and footings, page numbers, and automatic replacement of footnotes. Margins, tabs, line spacing, page and paragraph numbering, and page headings all can be changed at will. ForeWord can also transmit and receive text from other computers with 2780/3780 line protocol.

APPLICATIONS: The Supercomp-Twenty package, offered for the Series 6000, provides an electronic spreadsheet-type decision-making tool. The worksheet organizes the information into cells that may also contain descriptive labels, formulas, or numbers. The cells are organized into a matrix, which can be as large as 1,000 rows by 1,000 columns. Information can then be manipulated, changed, erased, and rearranged, so that calculations can be performed to analyze how changes will effect the model.

DataManager is a toll designed to provide data collection capability for the Series 6000. The package is made up of four main functional models: DataDesigner, which handles data entry screens, DataCollector, which provides for entry of data in a fill-in-the-blank-type format, DataChanger, which allows a user to modify or reformat information, and DataHelper, which enables a user to custom design menus.

Vision and three versions of Data IV provide the software necessary to use the Series 4000 as a shared-processor data entry system (key/disk). They all provide for extensive data editing, and manipulation, for verifying previously entered records, and for searching for specific records. List processing selects data entered through Vision for output either as sorted information records, or for input into word processing documents.

Version 1 of Data IV provides up to six program formats per job. Multiple jobs can run at the same time, with formats shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Arithmetic relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having arithmetic relationships. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

Version 2 of Data IV provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, and support for mixed keypunch and typewriter-style keyboards. Provisions for conditioned logic are included to enable adaptive data validation during key entry. Conditional branches to different editing sequences and operator prompts can be inserted at any point in a format. Single and nested statements of the form IF . . . THEN . . . ELSE can reference previously entered fields, accumulator values, alphanumeric constants, value sets, and arithmetic and logical combinations of these.

Version 3 of Data IV provides all the features of Version 2 plus ISAM-like capabilities. Support for up to 32 video displays is provided for interactive accessing of up to 1,000 indexed sequential files, as well as storage capability for over 270M bytes. Source data can be entered and validated on fully formatted screens displaying up to 1,920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing.

Vision is a transaction-oriented distributed data processing system, combining in one package all computing capabilities needed at remote locations of widespread organizations: source data entry, on-line inquiry and retrieval, batch communications, asynchronous communications, and multistation file processing. Source data entry is accomplished through the display of full records, operator prompts, and error messages on dual-intensity, 1920-character screens. The powerful editing capabilities of Data IV, including conditional logic, are also available with Vision. In addition, the file management capabilities of Data IV, Version 3, are provided. In on-line operation in 3270/mode, Vision supports all IBM display commands and keyboard functions, enabling the full range of 3270 applications software to be used. Both 3270 BISYNC and 3270 SDLC are supported.

The *Graphics Management System (GMS/IV)* is an integrated business graphics capability extended to the multifunction workstation user. Construction of graphs is operator-controlled via a hierarchy of menus linked in a tree structure such that a user may step through each phase of graph creation by selecting from the options presented on the screen. There are no codes or commands to remember. All of the variables have default values so that the operator with little knowledge of graphics will be able to quickly generate clear and useful charts with minimal effort.

The *Operations Control System/IV (OCS/IC)* is an automated field service control system based on interactive workstations, a distributed information computer system, an on-line data base, and proprietary software. The system is designed to streamline field service operations to deliver increased productivity for field engineers, operations staff, and managers by allowing quick response to service problems. The OCS/IV allows users to see the status of operations on a moment-by-moment basis, easily review the trends which affect performance to plan accordingly, reestablish control over geographically dispersed locations, and provide better service to customers.

The *Programmer Workstation (PWS/IV)* is a display-based remote job entry station that helps large programming shops develop and maintain programs for IBM 360s and 370s. The package handles distributed programming functions for as many as 16 display terminals. Each workstation may be used to create, edit, and store source programs locally and then send these programs to a host mainframe for compilation. Local files are maintained on a large 67M-byte disk. System status information is automatically logged on a low-speed character printer, and output from complete host jobs is printed on a high-speed printer.

Applications provided for the Series 2000 include *Dynacalc*, an electronic spreadsheet. Dynacalc provides the capability for multiple users to share and merge spreadsheets. Other features of Dynacalc include the ability to generate bar graphs from numerical data, multiple window display capability, a cell array of up to 256 rows by 256 columns, 16-digit arithmetic capability, and a help key that will step a user through the development of the model.

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Also available for the Series 2000 is the *ASQ Record Management System*. ASQ enables a user to create screen formats so that office records can be entered, stored, maintained or retrieved. In addition, ASQ provides a Report Writer utility that can be used to create reports from data that is contained in an ASQ file.

COMPONENTS

PROCESSORS: Each Series 4000 and 5000 processor is an all-LSI design oriented toward video terminal support. Data is displayed on CRT screens directly from refresh areas of the parallel-accessed LSI memory. This technique eliminates the need for separate buffer areas in each terminal. Provided in the processor are a multilevel priority interrupt system, a memory that is addressable either directly or through single-level indirect addressing and, in the larger processors, a memory mapping capability.

Operation of the Series 4000 systems is directed from the individual video terminals under control of the operating software. The video terminals are similar in concept and design to conventional CRT terminals and include an extensive set of cursor and edit controls, function controls, and an adding-machine capability. All Series 4000 and 5000 processors feature hardware multiply/divide, byte manipulation, and a realtime clock as standard equipment.

The Series 2000 has a multiprocessing architecture based on Motorola's MC68010 microprocessor. A Paging Memory Management Unit provides virtual memory paging, providing fast task switching.

The read-only memory (ROM) of the Series 4000 and 5000 is composed of at least 1,024 words, with words being 48 bits long. The microcode contained in the ROM is utilized by the Microprogram Command Generator for instruction execution. Information on control storage for the Series 2000 and 6000 is unavailable from Four-Phase.

WORKSTATIONS: A variety of workstations are available for use with the Series 2000, 4000, 5000, and 6000. Table 2 provides specifications for these workstations.

PRINTERS: The Series 5000 processors can support up to 32 printers. The Series 2000 allows printers to be attached to the system or directly to a workstations. Table 3 provides specifications for available printers.

MASS STORAGE: A variety of mass storage devices are available for use with the Series 4000, 5000, and 6000. Table 4 provides specifications for these devices.

TAPE STORAGE: The Series 4000 and 5000 support the attachment of up to four magnetic tape drives. Table 5 provides specifications for the available magnetic tape equipment.

PRICING

Four-Phase makes its systems available on either a purchase basis or lease basis. Prices for sample configured systems are detailed in the Equipment Prices table that follows this report. Prices for individual components are unavailable from Four-Phase.

Maintenance is priced separately for purchased systems and included at no additional charge for leased systems. Maintenance is performed between 8 a.m. and 5 p.m., Monday through Friday. Extended maintenance agreements are available for 12, 16, or 24 hours, Monday through Friday for an additional three, five, or seven percent of the one-year lease monthly rental charge. Maintenance at other than covered hours is charged for by the hour with a three-hour portal-to-portal limit. Different rates are charged for three defined periods: Monday to Friday from 8 a.m. to 5 p.m. or 5 p.m. to 8 a.m. and Saturday, Sunday, or holidays. Most of the company's installed equipment is serviced by Four-Phase Field Engineering Service offices in over 175 locations worldwide. A small portion is serviced by third-party companies.

The maintenance rates shown in the following price list are for Zone A (within 50 miles of a service center). A zone maintenance surcharge is billed for all users outside of Zone A. Zone B is 51 to 100 miles; Zone C, 101 to 150 miles; Zone D, 151 to 200 miles; Zone E, over 200 miles; and Zone L, within 20 miles of specified Four-Phase service offices.

Four-Phase provided the following prices for typical Series 2000, 4000, 5000, and 6000 configurations.

EQUIPMENT PRICES

	Purchase Price ($)	1-Year Lease (Per Month) ($)	Monthly Maintenance ($)
Series 6000			
System 6300; includes eight workstations, 37MB of disk storage, 1MB of main memory, and a character printer	24,468	*1,335	—
System 6300; includes two workstations, 20MB of disk storage, 0.5MB of main memory, and a character printer	13,319	*685	—
System 6600; includes eight workstations, 74MB of disk storage, 1MB of main memory, a character printer, and a line printer	69,877	*3,635	—
Series 5000			
System 700; includes 33 Fastrack workstations, 1.5MB of main memory, two 138MB disk drives, a 600 lpm line printer, and ten 35 cps printers	181,904	10,800	2,019
System 800; includes 50 Fastrack workstations, 1.5MB of main memory, two 138MB disk drives, a 600 lpm line printer, and thirteen 35 cps printers	214,373	12,601	2,463
Series 4000			
System IV/40; includes eight displays, 72KB main memory, 2.5MB disk storage, and bisynchronous communications controller	35,713	2,020	385
System IV/50; includes nine displays, 96KB main memory, 12.5MB disk storage, a 55 cps printer, and bisynchronous communications controller	46,934	2,354	473
System IV/60; includes 16 displays, 192KB main memory, 40MB disk storage, a 120 lpm line printer, and bisynchronous communications controller	69,203	2,813	721

Four-Phase Series 2000, 4000, 5000, and 6000

System IV/65; includes 13 displays, 192KB main memory, 80MB disk storage, a 300 lpm line printer, and SDLC communications controller	79,818	3,577	816
System IV/70; includes 17 displays, 96KB main memory, 67.5MB disk storage, 9-track tape, 300 lpm line printer, and bisynchronous communication controller	75,261	4,688	822
System IV/80; includes 15 displays, 480KB main memory, 80MB disk storage, a card reader, a 450 lpm line printer, and SDLC communications controller	95,124	4,404	978
System IV/90; includes 10 displays, 192KB main memory, a 67.5MB and a 2.5MB disk, a 300 lpm line printer, and bisynchronous communications controller	75,957	4,106	831
System IV/95; includes 19 displays, 768KB main memory, 138MB disk storage, a 55 cps line printer, a 600 lpm line printer, and SDLC communications controller	112,039	6,226	1,253

Series 2000

Model 240/3; includes Model 268 workstation, Model 240 processor, 384KB main memory, communications controller, six serial I/O ports, disk controller, 5MB removable and 15MB fixed Winchester disks	8,710	**410	161
Model 260/4; includes four Model 268 workstations, Model 260 processor, communications controller, six serial I/O ports, disk controller, 5MB removable and 52MB fixed Winchester disks	20,550	**855	236

**24 months, customer takes ITC.*
***PLEASE NOTE: Series 2000 lease prices are based on a 3-year lease.* ■

Four-Phase Systems Series IV Intelligent Terminals

MANAGEMENT SUMMARY

Four-Phase actively continues to make major advancements in the Series IV line in terms of the introduction of new processor models and peripherals, new applications, and increased breadth and scope. Major announcements in 1981 added two new models, the IV/80 and the IV/95, to the Series IV line, launched a concept of interactive/batch synergism by introducing the Model 311 and 312 batch processors into the product line, and extended its capabilities to include fully integrated office automation.

Starting with the System IV/70, which was introduced in 1970, the Four-Phase product line has evolved to a current total of nine systems that span a broad range of applications and workload volumes. The systems are designed primarily for environments where multiple, high volume data entry stations are needed and provide sufficient mass storage and memory to perform data entry, data/text editing, and file management. They can also transmit and receive information via batch or on-line inquiry within a distributed processing network. Although all can perform some independent data processing functions, only the IV/60, IV/65, IV/70, IV/80, IV/90, and IV/95 are equipped with sufficient resources and software to enable them to operate in stand-alone environments as small computer systems.

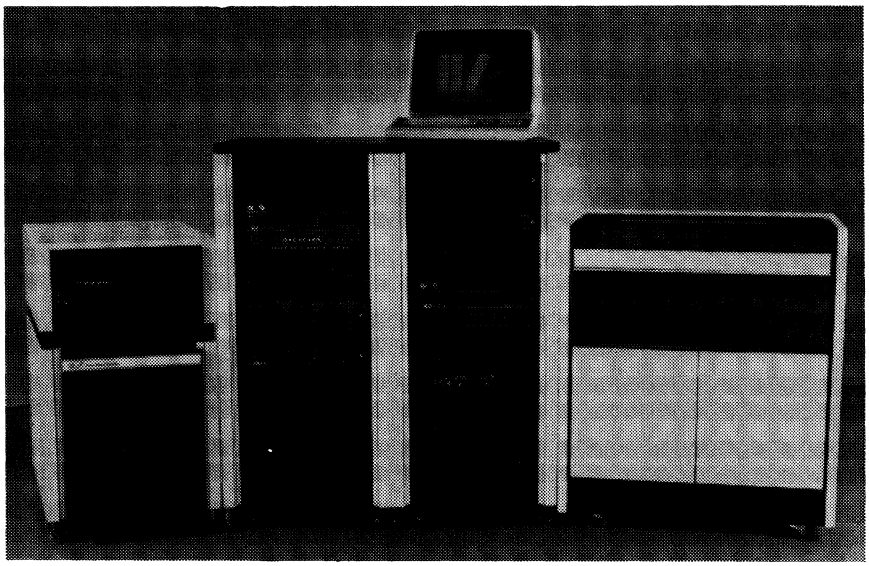
From 1 to 32 Series IV terminals can be controlled by a small general-purpose computer designed and built by Four-Phase utilizing MOS/LSI circuits. The display/keyboard units can be used to enter/generate data in batch mode as well as interactive mode within the same system. The ability to attach a variety of mass storage devices to a Four-Phase processor not only satisfies the needs of batch data entry, but also enables the maintenance of data files with a moderate volume of transactions. Character printers attachable to each station permit the production ▷

A family of programmable, clustered display terminals designed for data entry and validation, word processing, central inquiry/retrieval, and distributed processing.

The system, built around a Four-Phase computer, supports up to 32 display terminals and printers. Other peripherals include diskette and disk, magnetic tape, card reader, line printers, and communications controllers.

Software support includes: a number of operating systems; IBM 2780/3780, HASP workstation, SNA/3770, 2260/2848, and 3270 BSC and 3270 SDLC on-line inquiry concurrent with data entry or stand-alone simulation; Cobol for report generation; three versions of a data entry package; a distributed processing package; and a multifunction executive that allows concurrent data entry, central inquiry, stand-alone processing, and word processing.

The Series IV terminals are available for purchase or on a lease plan that includes maintenance. Prices vary according to the configuration selected. For example, a System IV/40 with 8 displays, 72K-byte processor, 2.5-megabyte disk, and BSC controller rents for $1,510 per month on a one-year lease; and a System IV/95 with 19 displays, 672K-byte processor, 135-megabyte disk, 55 cps character printer, 600 lpm line printer, and SDLC controller rents for $6,015 per month.



Four Phase's newest interactive processing system is the IV/95, which includes (from left to right): a Model 8281 80MB disk drive; the IV/95 processor, with Four Phase's new ergonomically designed terminal sitting on top of it; and the Model 8154 1000-lpm printer.

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of hard copy during data entry or word processing operations. Line printers permit the production of reports generated by on-line systems within the Four-Phase network or by the remote host processor.

The two new Series/IV models, the IV/80 and IV/95, are extensions of the IV/60 and IV/90 lines, respectively, and are intended for high-volume DDP environments. Like other Series IV processors, the IV/80 and IV/95 are based on 24-bit processors; however, they support larger main memories, up to 480K and 768K bytes, respectively, and handle up to 32 full-size (1920 character) workstations. The previous Series/IV high-end model, the IV/90, has a maximum main memory size of 384K bytes and can handle up to 32 96-character terminals or up to 16 1920-character terminals. Peripheral support is the same as the IV/60 and IV/90, respectively, including support of Four-Phase's new 80MB cartridge disk on the IV/60 and IV/80, and up to four of its new 138MB Winchester drives on the IV/90 and IV/95. A new ergonomically designed CRT was also introduced at the same time as and intended for use with the IV/80 and IV/95.

The two batch processors, the System 311 and 312, are the products of Two Pi Corporation, acquired by Four-Phase from U.S. Philips in early 1981, which marketed them as the V31 and V32 minicomputers. The 311 and 312 are 32-bit processors that support 512K to 4M bytes of main memory and 100M to 1600M bytes of disk storage. Both are IBM software- and media-compatible. The 311 is comparable in size and performance to an IBM 4331 Group 1 model; the 312 provides a 32K-byte cache memory and faster instruction execution, and is comparable to an IBM 4331 Group 2 model. Four-Phase supports them as remote "back-end" processors that offload certain batch-oriented applications from the host and perform them at a remote site, acting as "intermediate" or secondary mainframes to connected Four-Phase Series/IV systems. When communication with the host is required, the System 311/312 uses a Four-Phase Series/IV-to-host connection. The resulting configuration is a "string" or hierarchical network, a new capability offered by Four-Phase.

Four-Phase supplies, on a bundled basis, all of the software necessary to operate the Series IV as a distributed data processor. Programs are provided to perform data entry, data editing, on-line inquiry access, screen display formatting, word processing, printing, file maintenance, communications line control, office automation, business graphics, and necessary utilities. Operating systems, including a multifunction executive, compilers, and assembler are offered.

Four Phase's newest software product, COMS/IV, further extends the Series IV into the integrated office automation market. COMS/IV is a sophisticated networking scheme that provides electronic mail, document management, document processing, and executive services to Series/IV terminal users. The COMS/IV package runs on one or more System 311s or

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 10700 North DeAnza Boulevard, Cupertino, California 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: IV/40—March 1973; IV/50—June 1976; IV/60 and IV/65—April 1979; IV/70—September 1970; IV/90—June 1977; IV/10—June 1980; IV/80 and IV/95—February 1981.

DATE OF FIRST DELIVERY: IV/40—July 1973; IV/50—4th quarter 1976; IV/60 and IV/65—June 1979; IV/70—February 1972; IV/90—July 1977; IV/10—January 1981; IV/95—July 1981; IV/80—August 1981.

NUMBER DELIVERED TO DATE: Over 13,000 systems (all models), representing over 100,000 display units.

SERVICED BY: Four Phase Systems, Inc.

CONFIGURATION

The Series IV family of intelligent terminals is centered around a 2-nanosecond, 24-bit-word processor that controls up to 32 display/keyboard units, communications lines, printers, disk units, and tape drives. Nine basic model numbers are used to designate nine configuration packages. Five models, the IV/60, IV/65, IV/80, IV/90, and IV/95, can include memory mapping with an 800-nanosecond extended memory that permits these models to execute instructions at speeds from 2 to 8 times faster than the other basic models. All models provide a communications interface for one or more communications lines operating at speeds up to 9600 bit/second. The Binary Synchronous Communication (BSC) and SDLC protocols are supported. Asynchronous transmission up to 9600 bits/second is also supported.

All nine models support multiple display/keyboard units, plus printers, and mass storage devices. The configuration options for each model follow:

System IV/10 Remote Display Processor is designed to provide intelligent workstation capabilities for sites remote from a host System IV/60, IV/65, IV/80, IV/90 Model 2, or IV/95. In addition to the basic processor and communications interface, it can support up to four keyboard/display units and one 55-cps character printer.

System IV/40 supports:

- **Up to 16 display/keyboard units;**
- **Up to 16 55-cps printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A 300 or 600 cpm card reader; and**
- **A 120 to 1200 lpm line printer.**

System IV/50 supports:

- **Up to 24 display/keyboard units;**
- **Up to 24 55-cps printers or 2 line printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with a 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with 67.5-megabyte capacity each, and**
- **A 300 or 600 cpm card reader.**

System IV/60 supports:

- **Up to 16 display/keyboard units;**
- **Up to 16 40-, 45-, or 55-cps printers or 2 line printers;**
- **432K bytes of memory; and**
- **Disk drive with a capacity of 5, 12.5, 40, or 80 megabytes (40MB disk capacity includes 27MB of fixed storage and 13MB of removable storage; 80MB includes 67MB fixed and 13MB removable).**

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312s, which operate as network "node controllers." Each 311 or 312 can support up to eight Series IV processors, each of which can, in turn, support 32 local or remote workstations. Every node controller in the network can communicate with every other node controller, and there is no maximum limit to the number of node controllers which can be included in the network. Both local and remote node-to-node communications are supported. A host mainframe is supported in the network, but not required.

USER REACTION

Datapro's 1981 survey of computer system users yielded responses from 15 Four-Phase Series IV users who were operating their systems as distributed processing systems. Among these users, a total of 24 systems were installed. A profile of these users follows:

Number of Users	Systems Installed
6	One IV/90
2	One IV/50
1	One IV/40
1	One IV/60
1	One IV/65
1	One IV/70
1	One IV/70 and one IV/90
1	Three IV/90s
1	Three IV/65s, three IV/50s, and one IV/90

Of the 15 companies represented, six were manufacturing firms and four were members of the health care and medical industry; the remainder were involved in other types of businesses. A wide range of applications were represented, the most common being accounting/billing (seven users), payroll/personnel (eight users), order processing/inventory control (seven users), and purchasing (five users).

These users' ratings are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	12	5	1	0	3.6
Ease of operation	12	4	2	0	3.6
Ease of programming	5	8	3	0	3.1
Manufacturer's software	7	9	1	0	3.4
Hardware reliability	9	8	1	0	3.4
Maintenance service	8	6	4	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

(Note that since several users were rating more than one Series IV model, multiple responses per user generated a total of more than 15 responses to the rating categories.)

When asked to complete a checklist of possible significant advantages, all but one of these users had at least one (and generally each had more than one) aspect to the Series IV that they considered a benefit. Among the most frequently checked were: good user response time (nine users); ease of

System IV/65 supports:

- **Up to 24 display/keyboard units;**
- **Up to 24 40-, 45-, or 55-cps printers or 2 line printers;**
- **480K bytes of memory; and**
- **Disk drive with a capacity of 5, 12.5, 40, or 80 megabytes.**

System IV/70 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 55-cps printers or 2 line printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 50 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

System IV/80 supports:

- **Up to 32 1920-character display/keyboard units (amber video display optional);**
- **Up to 32 55-cps printers or 2 line printers;**
- **Either 288K or 480K bytes memory;**
- **Disk drive with a capacity of 2.5, 40, or 80 megabytes; and**
- **A 300 or 600 cpm card reader.**

System IV/90 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 55-cps printers or 2 line printers;**
- **From 96K to 384K bytes of memory;**
- **A cartridge drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 138 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

System IV/95 supports:

- **Up to 32 1920-character display/keyboard units (amber video display optional);**
- **Up to 32 55-cps printers or 2 line printers;**
- **Either 480K or 768K bytes memory;**

A new ergonomically designed keyboard/display was designed for use with Four Phase's Series IV/80 and IV/95 systems. The new unit features a redesigned keyboard, palm rests, tiltable screen with anti-glare filter, optional amber character read-out (green read-out is standard), and a new charcoal and white cabinet.

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expansion/reconfiguration (nine users); and the availability of productivity aids that help to keep their programming cost down (five users).

When asked to complete a comparable checklist of significant problems encountered, only six of the users indicated that they had any complaints. Four reported that Four-Phase had not provided all the software or support that had been promised, two said that the hardware installation had been late, and two others said that the delivery of their software had been late. No other items on the checklist received more than one response.

When asked whether the system had met up to their expectations, and whether they would recommend the Four-Phase Series IV to others, the overwhelming majority (12 users) answered "yes" to both questions. Two users responded with "haven't decided," and one did not respond to these questions; no one answered "no" to either question. □

- A cartridge drive with 2.5 megabyte capacity;
- A diskette drive with 354K byte capacity;
- Up to 4 disk drives with a capacity of 67.5 or 138 megabytes each;
- A 300 or 600 cpm card reader; and
- Up to 4 magnetic tape drives.

TRANSMISSION SPECIFICATIONS

Either of two communications controllers is available for all models. The Asynchronous Data Set Controller operates asynchronously in the half- or full-duplex mode at data rates of 110, 150, 300, 600, 1200, 1800, or 2400 bits/second and can accommodate any 9- or 11-bit code; it features an automatic answer capability. The Binary Synchronous Data Set Controller operates synchronously in the half- or full-duplex mode at user-specified data rates up to 9600 bits/second and can accommodate any 7- or 8-bit code. Both controllers provide an EIA RS-232-C interface.

A third controller, the Model 8437 Intelligent Communications Controller, can be used on the System IV/60, IV/65, and IV/90. This controller includes a 16K-byte processor, and supports both Binary Synchronous and SDLC protocols.

A fourth controller, the 8460 Multiline Asynchronous Controller, is available for use on any Series IV System capable of running MFE/IV, and is designed to interface multiple non-standard input/output devices to the Four-Phase system. It contains a 16K byte microprocessor, and supports devices utilizing an EIA RS-232-C interface or 60/20 mA current loop interface, and bit transfer rates up to 9600 bps in either half- or full-duplex.

SOFTWARE

Four-Phase provides generalized software designed for primary distributed processing activities: data entry, word processing, program development, on-line inquiry and retrieval, batch communications, office automation, business graphics, and report generation. Further, all of these functions can operate simultaneously on one system under software control of the Multifunction Executive.

Operation of a Series IV is directed from the individual display terminals under control of the operating software. Four-Phase provides, at no additional charge, software packages, including Data IV, Vision, and ForeWord, to perform specific functions. Any package will operate on any system with sufficient resources.

OPERATING SYSTEMS: The Multifunction Executive is available for multiple program execution. In addition, Four-Phase offers NPOS and IDOS operating systems for program development and single-program execution.

Multifunction Executive (MFE/IV) enables multiple Four-Phase software packages to operate concurrently and independently on a System IV/60, IV/65, IV/80, IV/90, or IV/95. These packages include Data IV, Vision, ForeWord, OMS/IV, COMS/IV, GMS/IV, and Cobol, making the following distributed processing functions available with a single processor: data entry, word processing, program development, on-line inquiry and retrieval, batch communications, local processing, report generation executive services, electronic mail, document processing, and business graphics. A single station can switch from one function to another easily. MFE/IV supports up to 32 1920-character screens, 552 million bytes of disk storage, and up to 768K bytes of memory.

NPOS (NP/80 Operating System) is a modular operating system which coordinates the services of the NP/80 peripheral processor. The primary function of NPOS is to service I/O requests for large mass storage devices as well as to enable the operation of multiple Series IV processors. Virtual disk capability and buffer pooling is also provided. A Multi-Key Access Method (MKAM) runs under the control of NPOS.

IDOS is a disk-oriented operating system oriented toward executing programs which IDOS provides for the cataloging and updating of source, relocatable, absolute files and command run parameter strings (job streams). The latter permits a single entry from the console to initiate sequential operation of a series of programs. The Code Assembler and Relocatable Loader, Cobol with DISAM, the Sort Package, and the System Relocatable Library are among the programs provided with IDOS. Two types of disk files are available under IDOS: contiguous (chained) and sequential (linked files).

IDOS Utilities is also provided and includes a sort/merge, symbolic editor, relocatable loader, and various media conversion programs. The symbolic editor allows for insertion, deletion, replacement, and inter-record corrections of symbolic text. Media conversion programs include card-to-tape, tape-to-printer, and memory save/restore on disk or magnetic tape.

PROGRAM DEVELOPMENT: For program development, Four-Phase offers three versions of Cobol.

Cobol is offered in both ANSI Cobol '68 and Cobol '74 versions, with extensions provided for screen handling. Programmers can define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas can be manipulated like any working storage area; thus, the programmer can read and write data to operator displays without using I/O instructions. Multitasking allows different activities to be supported at different displays simultaneously. Data management facilities are provided for accessing of up to 270 million bytes of local disk storage.

Cobol with 2780/3780 is a package which combines ANSI Cobol for local processing with concurrent batch communications using IBM 2780/3780 protocol. Displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. A Series IV CPU can communicate with any system using IBM 2780/3780 discipline, including other Series IVs using RBS or Cobol with 2780/3780, and with IBM System/3s, 360s, and 370s.

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Cobol with HASP combines Cobol for local processing with a set of subroutines that can be called for the transmission of data to or from another computer using the HASP multi-leaving batch transmission protocol. The other computer can be a 360/370, another Four-Phase processor, or any other system having a bisynchronous HASP multi-leaving interface. Communications can be over leased or dial-up facilities with either attended or unattended operation. Local transaction processing is accomplished with user routines written in either assembler or Cobol.

DATA ENTRY: The Data IV and Vision software packages provide for data editing and manipulation, for verifying previously entered records, and for searching for specific records.

Version 1 of Data IV provides up to six program formats per job. Multiple jobs can be running at the same time, and formats can be shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters, the maximum tape block size. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Numeric relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having an arithmetic relationship. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

Up to four 2.5-megabyte disk drives are supported to provide a data file storage capacity of up to 80,000 80-character records. Either keypunch-style or typewriter-style keyboards are supported. Data can be printed from the screen or from the disk file. Data can also be transferred to tape from the disk while key entry continues. Output options supported include magnetic tape, direct connection to an IBM System/360 or an IBM System/370, and remote data communications using binary synchronous line discipline.

Version 2 of Data IV provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, conditional logic, and support for mixed keypunch and typewriter-style keyboards. A minimum of 72K bytes of memory is required to run Version 2.

Version 3 of Data IV provides all the features of Version 2 plus ISAM-like capabilities. Support for up to 32 video displays is provided for interactive accessing of up to 1000 indexed sequential files, as well as storage capability for over 270 million bytes. Source data can be entered and validated on fully formatted screens displaying up to 1920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing. A minimum of 72K bytes of memory is required to run Version 3.

In the data entry mode, Data IV Version 3 can validate operator entries against local master files containing up to 50,000 records and extract stored data for automatic entry. Data can be integrated with keyed entry on fully formatted screens. In data retrieval operations, Version 3 enables all system operators to work simultaneously with the same current information. Records up to 750 characters long are retrieved instantly by typing numeric, alphabetic, or alphanumeric key fields. Any file can be accessed by all displays simultaneously, and each display can also access multiple files simultaneously. Version 2/3 supports IBM-compatible bisync communications for transmission at speeds up to 9600 bps. Either dial or leased lines may be used with IBM 2780, 3780, HASP, or SNA 3770 protocol.

Vision is a transaction-oriented distributed data processing system, combining in one package all computing capabilities needed at remote locations of widespread organizations: source data entry, on-line inquiry and retrieval, batch communications, asynchronous communications, and multistation file processing. Source data entry is accomplished through the display of full records, operator prompts, and error messages on dual-intensity, 1920-character screens. The editing capabilities of Data IV, including conditional logic, are also available with Vision. In addition, the file management capabilities of Data IV, Version 3, are provided. In on-line operation in 3270 mode, Vision supports all IBM display commands and keyboard functions, enabling the full range of 3270 applications software to be used. Both 3270 BSC and 3270 SDLC are supported.

ON-LINE INQUIRY: On-line inquiry is provided through direct emulation of IBM display stations plus the ability to add local processing through Cobol programming. On-line inquiry and retrieval is also provided within the Vision system.

The *IBM 2260 Simulator* provides all functions of an IBM 2260/2848 Display System through software emulation. This package provides for operation in either local or remote environments and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units connected to the same Series IV, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

The IBM 3270 Simulator provides all the functions of an IBM 3270 Information Display System through software emulation. This package provides for operation in either local or remote environments, and supports 480, 960, and 1920-character display units. The user may select either 3270 SDLC line protocol or BSC line protocol, as well as the ability to use either ASCII or EBCDIC character sets. The Store-and-Forward feature allows selected format images to be entered and recalled from disk, so that data entry may continue in the event host mainframe communications have been interrupted. When communications are resumed, the completed formats may then be transmitted. The 3270 Simulator includes support for options such as Variable Intensity and Audible Alarm, and additional facility test features that can be used to pinpoint problems in the communications equipment, log line traffic, display format attribute types, write memory check points to screen or disk, and accumulate error statistics. Local screen print capabilities are also provided.

The *Programmable 3270 Simulator* allows 3270 users to add local processing capabilities to an existing 3270 network. The package provides all the capabilities of the 3270 Simulator system plus Cobol programming. Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparison, can be programmed into the system to enable local handling of data.

BATCH COMMUNICATIONS: All major Series IV software packages provide the ability to transmit and receive data in a batch mode. The batch communications protocols used by the various packages are: Data IV, Version 1—2780/3780; Data IV, Version 2/3—2780, 3780, HASP, 3770; Vision—2780, 3770 SDLC, 3780, 3270 BSC or SDLC, HASP; and ForeWord—2780/3780. In addition, two remote job entry packages are available.

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RBS with 2780/3780 is a Remote Batch System that provides a full complement of IBM 2780/3780 features including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported include 300- and 600-cpm card readers, printers from 300 to 1000 lines per minute in speed, and a diskette or cartridge disk system for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be read in from a card reader, another job to be written out from disk to a printer, and a third job to be transmitted or received simultaneously.

RBS with HASP is compatible with the IBM 360/20 HASP workstation used as a remote batch terminal. The package is offered with the System IV/40 and supports 300- to 600-cpm card reader, multiple 300- to 1000-lpm printers, 1920-character video display and operator keyboard. The display and operator keyboard serve as an operator's console and display system status and communication status. The software provides the line discipline to simulate a multi-leaving HASP workstation.

ASYNCHRONOUS COMMUNICATIONS: An interface to the Multiline Asynchronous Controller (8460) is provided with the Vision product to support a wide variety of asynchronous devices.

WORD PROCESSING: ForeWord is a flexible shared-processor text editing system that allows text to be entered, stored, edited, and printed. The system supports up to 24 video terminals, 8 disk drives, and 16 printers. On-line storage capacity ranges from 400 to 50,000 pages of text. ForeWord provides automatic carriage return to enable text to be entered at rough draft speeds, the ability to store frequently used words or phrases in a special glossary, and a global search and replace command that enables the operator to type a correction only once no matter how often it appears in the text. When ready to print, the text can be formatted to add page headings and footings, page numbers, and automatic replacement of footnotes. Margins, tabs, line spacing, page and paragraph numbering, and page headings all can be changed as needed.

OFFICE AUTOMATION: The *Office Management System (OMS/IV)* provides office automation capabilities in a distributed processing environment. Composed of three functional units operating under the Multifunction Executive (MFE/IV), OMS/IV integrates word processing, data processing and network communications. Functions which are data processing in structure are provided in Vision; those that require word processing use ForeWord. Communications can be tailored to a customer's needs.

The integration of data processing into office automation includes executive services, list processing, word processing, and electronic document transmission. OMS/IV Executive Services (which are implemented under Vision) provide an executive scheduler, a tickler service, a corporate directory, telephone message service, and an integrated calculator. List processing, which is also implemented under Vision, provides the OMS/IV user with capabilities for list select, sort, and shared output for subsequent document preparation in word processing. Word processing is implemented using ForeWord software, and provides a full range of basic and advanced word processing features, electronic document transmission, processing, and filing. Electronic document transmission allows an OMS/IV user to send documents to recipients at remote locations.

OMS/IV allows flexible integration of batch and on-line communications while word and data processing continue uninterrupted at other workstations. On-line communication uses 3270 binary synchronous (BSC) or system data link control (SDLC) protocols. Batch remote job entry is supported under IBM 2780, 3780, HASP, and 3770 line protocols. Foreign device interface to low speed asynchronous devices is provided. This system provides complete communications support at all levels of sophistication.

The *Corporate Office Management System (COMS/IV)* is a distributed information management system which operates under the umbrella of MFE/IV-ForeWord-Vision-OMS/IV. COMS/IV includes all of the features available with OMS/IV, adds document tracking to the executive services function, and provides electronic mail, document management, document processing, remote system console, and IBM 3270 pass-through to any multifunction workstation within the COMS/IV network. A processing request is entered via menu-driven interface. Internally, Vision verifies the request is accurate and complete, and transmits it via 3270 mode to a System 311/312 node controller. The System 311/312 then performs the processing requested.

The electronic mail function provides a sophisticated package of capabilities that allow any COMS/IV user to send "mail" electronically to any other user in the network. Mail can consist of a simple message, a document, or a package of documents, and can be addressed to a "mailbox," an individual user, a group of users, or a pre-defined distribution list. Recipients can scan, file, print, or hold their mail, delete mail after viewing, send a reply, or forward the mail to another recipient. The document management feature allows document filing and retrieval from multiple Series IV systems attached to a single System 311 or 312 located anywhere in the COMS/IV network. The document processing feature provides comprehensive text formatting and document construction functions which enable users to address a wide range of applications, including in-house publishing of books, technical manuals, and other documents of complex format.

The remote system console feature provides a capability for central network control. This feature allows an adjacent Series IV workstation to act as the system console for the 311 or 312 to which it is attached. A system console can be similarly designated for each System 311 or 312 in the network. This feature then enables a System IV/10 Remote Terminal which communicates to all of the system consoles, to be located at the host mainframe site and centrally control and maintain all of the System 311s and 312s in the network.

The IBM 3270 pass-through capability allows a Series IV workstation to be attached to an application program running in its own or any System 311/312 node controller in the network. The same pass-through capability applies from the System 311/312 node controller to a host IBM mainframe system. No special code in the IBM host is required. This feature can be used for a wide variety of applications requiring access to a remote data base. For example, 3270 Pass Through enables a Series IV workstation which is attached to a System 311 in Los Angeles to have access to an inventory application program on an IBM host in Chicago. This application program could provide inquiries into inventory status and even allow for selected items on an order to be filled from Chicago if Los Angeles was out of stock.

The *Graphics Management System (GMS/IV)* is an integrated business graphics capability extended to the multifunction workstation user. The graphics user may create line graphs, bar charts (including several overlayed bars), area charts, and point plots. Construction of graphs is operator-controlled via a hierarchy of menus linked in a tree structure. No codes or commands need to be remembered, and all of the variables have default values, so that the operator with little knowledge of graphics will be able to quickly generate clear and useful charts with minimal effort. GMS/IV requires no dedicated equipment, as any Four-Phase character printer will print the graphs.

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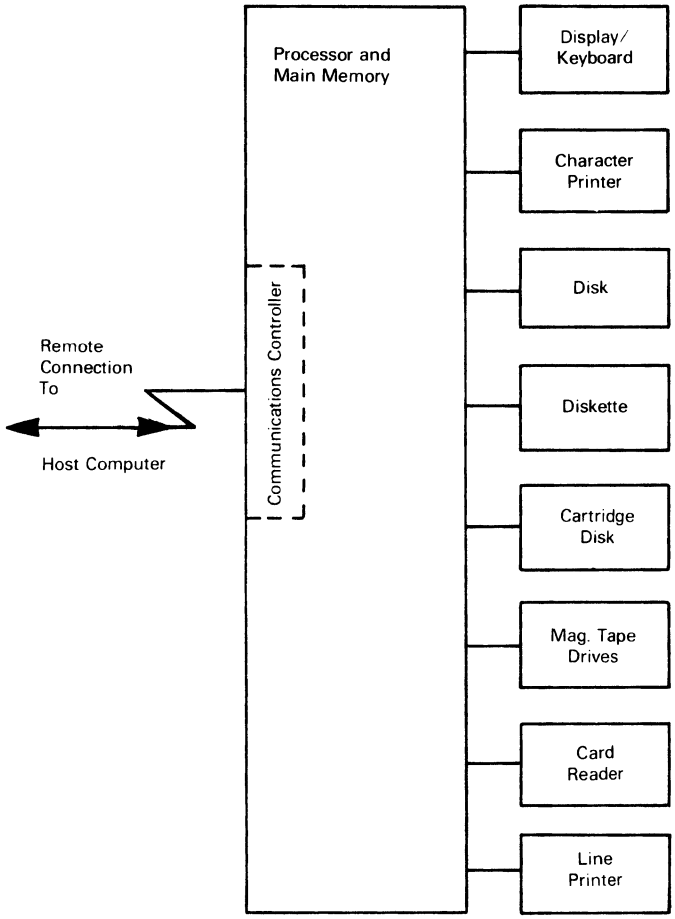
Configuration



Maximum Configuration

	IV/40	IV/50	IV/60, 65	IV/70, 90	IV/80	IV/95
Main Memory Capacity (bytes):	24K to 96K	24K to 96K	432K (IV/60); 480K (IV/65)	24K to 96K (IV/70); 96K to 384K (IV/90)	288K or 480K	480K or 768K
Displays/Keyboards:	16	24	16 (IV/60); 24 (IV/65)	32	32	32
Character Printers:	16	24	16 (IV/60); 24 (IV/65)	32	32	32
Disk Drives:	—	1 to 4 drives; 67.5M bytes	Up to 80M bytes	1 to 4 drives; 50 or 67.5M bytes (IV 70); 67.5M or 138M bytes (IV/90)	Up to 80M bytes	1 to 4 drives; 67.5M or 138M per drive
Diskette Drives:	—	1 drive; 354K bytes	—	1 drive; 354K bytes	—	1 drive; 354K bytes
Cartridge Disk:	1 drive; 2.5M bytes	1 drive; 2.5M bytes	—	1 drive; 2.5M bytes	—	1 drive; 2.5M bytes
Magnetic Tape Drives:	—	—	—	1 to 4 drives	—	1 to 4 drives
Card Reader:	1; 300 or 600 cpm	1; 300 or 600 cpm	—	1; 300 or 600 cpm	1; 300 or 600 cpm	1; 300 or 600 cpm
Line Printers:	1; 120 to 1200 lpm	2; 120 to 1200 lpm	2; 120 to 1200 lpm	2; 120 to 1200 lpm	2; 120 to 1200 lpm	2; 120 to 1200 lpm

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COMPONENTS

KEYSTATIONS: The keystations used in the system contain a video display and keyboard with optional Dual Intensity and Audible Alarm features. Each display has a character set of 120 ASCII symbols, including upper and lower case alphabetics, numerics, and special symbols. Characters are generated by a 7-by-9 dot matrix.

Any of six cursor symbols is available. User-selected cursor parameters allow the cursor to blink or remain steady and to be destructive or nondestructive. Cursor controls, which provide a wraparound capability, can move the cursor right, left, up, down, to the initial line and character position of the screen (home), and to the initial character position of the next line (return). Roll controls roll the displayed text up or down, line by line. Insert and delete controls insert or delete a character or a line in or from the displayed text.

Screen and line erase are also provided. The Tab control produces any of three codes as the result of shifted, unshifted, or control shift operation. Under program control, these cursor and edit controls can be assigned to virtually any display function. A set of 13 function controls can be programmed to implement application-dependent operations to extend the system's range of usefulness. The adding machine capability provides separate numeric and function controls for high-volume numeric operations.

Messages can be highlighted for attention or blanked for security when using the Variable Intensity feature, which permits characters to be displayed at normal or high intensities or blanked (not displayed). Control is provided by non-displayed attribute characters, which can be interspersed within the data stream.

The Audible Alarm feature alerts the operator to special conditions such as errors or end of line.

DISK STORAGE: There are ten disk models available for use with Four-Phase's intelligent terminal systems. The following table shows the basic disk characteristics and their use with the various systems.

Model	Type	Capacity, megabytes	Transfer Rate, bytes/sec.
8230	Cartridge	2.5	184K
8240	Pack	50.0	312K
8250	Diskette	0.354	31K
8260/61	Pack	67.5	250K
8270	Fixed	10.0	195K
6280	Cartridge	40.0	1200K
6281	Cartridge	80.0	1200K
8281	Cartridge	80.0	1200K
8291	Winchester	138.0	1200K

The 8230 Cartridge Disk Drive uses a removable cartridge, similar to the IBM 2315 cartridge, with a capacity of 2.5 million bytes. The disk is organized in 200 active tracks per side, with eight 768-byte sectors per track. The access mechanism carries two heads, one for each disk surface, which results in a cylinder capacity of just over 12K bytes. Head positioning time is 70 milliseconds track to track, average rotational delay is 20 milliseconds, and data transfer rate is 184K bytes per second.

The 8420 Pack Disk Drive uses a removable disk pack equivalent to the packs used on the IBM 2314 disk drives. Each pack provides a storage capacity of 50 million bytes. The packs are recorded in double-density fashion. Each disk surface carries 400 active tracks. The access mechanism links a head for each surface, yielding a cylinder capacity of just over 120K bytes. Only one-half of a cylinder can be transferred in one operation. Tracks are organized in eight 768-byte sectors. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312K bytes per second.

The 8250 Diskette Drive uses a diskette or "floppy" disk cartridge. Data is recorded on one surface only, in 64 tracks of four 1146-byte sectors each. Total capacity of the diskette is 293,376 bytes. Arm movement time is 10 milliseconds per track plus 10 milliseconds head setting time; average rotational delay is 80 milliseconds. Data transfer rate is 31K bytes per second. The controller supports only one drive.

The 8260 and 8261 Pack Disk Drive uses a removable disk pack with a storage capacity of 67.5 million bytes. Average head positioning time is 30 milliseconds, average rotational delay is 8.33 milliseconds, and data transfer rate is 250K bytes per second. The 8260 contains an integral controller that accommodates up to 3 8261 drives. The 8261 utilizes as its controller the NP/80, a 16-bit processor.

The 8270 Fixed Media Disk Drive has a storage capacity of 10 million bytes. The fixed disk has 1600 active tracks, with eight 768-byte sectors per track. The data transfer rate is 195K bytes/second, the average seek time is 65 milliseconds, and the average rotational delay is 20 milliseconds.

The 6280, 6281, and 8281 Cartridge Module Drives are fixed/removable disk drives. The 6280 has a capacity of 40 megabytes (27 fixed, 13 removable); the 6281 and 8281 each have a capacity of 80 megabytes (67 fixed, 13 removable). Average head positioning time is 30 milliseconds, average rotational delay is 8.33 milliseconds, and data transfer rate is 1.2 megabytes per second. The 6280, 6281, and 8281 utilizes the NP/80, a 16-bit processor, as their controller.

The 8291 Fixed Disk Drive is a Winchester technology drive with on-line data capacity of 138 megabytes. Average head positioning time is 27 milliseconds, average rotational delay is 10.12 milliseconds, and data transfer rate is 1.2 megabytes per second. The 8291 utilizes the NP/80 as its controller.

MAGNETIC TAPE: There are five magnetic tape subsystems which can be used with the Four-Phase IV/70 system. The following table reflects the characteristics of the models available:

Model	8501	8502	8503	8504	8507
Tracks:	9	9	9	9	7
Density, bpi:	800	800	1600	1600	556/800
Data rate, Kbs:	10	10	60	60	6.95/10
Tape speed, ips:	12.5	12.5	37.5	37.5	12.5
Rewind speed, ips:	50	50	100	100	50
Reel size, inches:	10.5	8.5	8.5	10.5	8.5

Each tape subsystem includes a controller capable of handling four drives, except for the 8504 and 8507 subsystems, which include only a single-unit controller. The IV/70 system can accommodate only one controller. The 8.5-inch reels accommodate 1200 feet of tape; the 10.5-inch reel, 2400 feet. All recording formats are industry-compatible. Tape tension is supplied by means of tension arms in all models.

PRINTERS: Four-Phase offers ten printer models for use with the Series IV. The basic characteristics of these printers are shown in the table below:

Model	Speed	Number of Characters	Number of Columns
8122	45 cps	96	132
8125	40 cps	88	132
8126	55 cps	96	132
8135	100 or 164 cps	64	80 or 132
8145	120 lpm	96	132
8148	300 lpm	64	132
8149	600 lpm	64	132
8149-96	430 lpm	96	132
8154	1000 lpm	64	132
8155	375 or 450 lpm	64 or 96	132

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The 8122 Printer is a Diablo 45-character-per-second incremental printer. The character disk (type wheel), vertical movement, and horizontal movement are all servo-driven. Vertical increments are 48 per inch, and horizontal increments are 60 per inch, giving very flexible control over output. Sprocketed or unsprocketed forms up to 15 inches wide can be accommodated. The unit prints a 96-character ASCII set. The type wheel can be changed by the operator. At 10 characters per inch, up to 132 columns can be printed. Features include left and right tabulation directly to a selected location, and snap-in ribbon cartridges.

The 8125 Printer is a Diablo 40-character-per-second printer using an 88-character metal print wheel that provides letter-quality output suitable for word processing applications. The 8125 has the same basic features as the 8122. In addition, the 8125 includes an integrated power supply that allows it to be used as a desk top printer.

The 8126 Printer is a Diablo 55-character-per-second printer using a 96-character plastic print wheel. The 8126 provides the same basic features as the 8122 and also contains an integrated power supply that permits desk top positioning.

The 8135 Printer is a character printer, switch-selectable for 80 or 132 columns. It has a moving-head mechanism that forms characters serially from left to right on a 7-by-9 dot matrix. The paper tractors are adjustable to accommodate edge-punched forms up to 9⅜ inches wide from pin to pin. Vertical tab, form feed control, and automatic skipping over peforations are provided by a 2-channel vertical format control unit that uses standard 8-channel opaque paper tape. Printing speed is 100 cps for 80 columns or 165 cps for 132 columns.

The 8145 Line Printer operates at 120 lines per minute and utilizes an oscillating comb mechanism to print characters within a matrix. The printer features a set of 96 characters, including upper and lower case alphabetics. An 8-channel vertical format control unit is included. Vertical spacing is selectable at 6 or 8 lines per inch. The 8145 can print 132 columns on a six-part continuous forms up to 14⅞ inches wide.

The 8148 Line Printer is a drum printer that can print continuously at 300 lines per minute. It can print up to 132 columns on six-part continuous forms up to 16¾ inches wide. The character set includes 64 symbols. Horizontal spacing is 10 characters per inch. Vertical spacing is operator selectable at 6 or 8 lines per inch. High-speed paper advance rate is 20 inches per second. A 12-channel vertical forms control is included.

The 8149 Line Printer is a chain printer rated at 600 lpm with a 64-character set. The printer provides 132 print positions. Horizontal and vertical spacing are 10 char./inch and 6 or 8 lines/inch, respectively. Continuous six-part forms from 4 to 16.75 inches wide can be accommodated. A 12-channel vertical forms control is included.

The 8149-96 Line Printer is a 430-lpm printer using a 96-character word processing set with upper and lower case alphabetics. All other features are identical to those on the 8149.

The 8154 Line Printer is a chain printer rated at 1000 lpm with a 64-character print set. The printer provides 132 print positions. Horizontal spacing is 10 characters/inch, and vertical spacing is 6 or 8 lines/inch. A 12-channel vertical forms control unit is provided. The 8154 accommodates continuous six-part forms from 4 to 16.75 inches.

The 8155 printer is a medium speed, solid font impact band printer which prints 450 LPM using the standard 64-character band, or 375 LPM with an optional 96-character band. Changing from upper case print to a combination of lower and upper case requires no software adjustments. The 8155 is compatible with all Four-Phase Series IV processors. It provides 132 print positions. Print format is 10 characters/inch with vertical line spacing switch selectable to either six or eight lines/inch. A 12-channel vertical forms unit is provided.

CARD READERS: Two desk-top card readers are available. The 8001 reads at 300 cpm, and the 8003 reads at 600 cpm. Each unit includes a controller that performs code translation. A special device, the 8010 Multiple Loading Switch, allows a single card reader to be used for loading up to 8 systems; a separate controller (8011) must be installed in each of the systems.

PROCESSOR: The processor architecture used in the Series IV/40, 50, and 70 models is based on a 2.0-microsecond semiconductor memory and eight 24-bit multifunction registers. The System IV/60, 65, 80, 90, and 95 have a cycle time of 400 nanoseconds. The 24-bit machine provides both direct and single-level indirect addressing. Three registers are available for address modification. The priority interrupt system provides 8 levels of interrupt, each with a unique memory location and each with 64 sublevels. Hardware is used to provide automatic interrupt recognition. The standard instruction repertoire includes 117 discrete commands: 12 word/character manipulation, 5 list processing, 17 load/store, 11 fixed-point, 4 comparison, 8 shift, 19 branch/skip, 12 register-to-register, 6 logical, 7 control, 4 interrupt handling, 6 I/O instructions, and 6 optional decimal commands. Arithmetic operations are provided for addition, subtraction, multiplication, and division.

Basic memory size for the Systems IV/40, 50, and 70 is 24K bytes, expandable to 96K bytes. The IV/60 provides up to 432K bytes; up to 480K bytes are available on the IV/65. The System IV/90 has a basic memory of 192K bytes and is expandable, with additional memory modules, to 480K bytes. The IV/80 provides up to 480K bytes, and up to 768K bytes are available on the System IV/95. A memory mapping addressing scheme utilizing an 800-nanosecond high speed memory is used with the larger memory on the System IV/60, 65, 80, 90, and 95, which can function from 2 to 8 times faster than the other models.

PRICING

Four-Phase declined to supply Datapro with the pricing information for the individual components of its systems, but did provide the following prices for system configurations "representative of what Four-Phase is selling today."

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	One-Year Lease*	Purchase	Monthly Maint.
System IV/40 with 72K-byte memory, 8 displays, 2.5M disk, and bisync communications controller	$1,510	$62,100	$ 269
System IV/50 with 96K-byte memory, 9 dispays, 2.5M disk, 40-cps printer, and bisync communications controller	2,085	94,470	443
System IV/60 with 192K-byte memory, 16 displays, 5MB disk, 120-lpm printer, and bisync communications controller	2,255	109,170	545
System IV/65 with 192K-byte memory, 13 displays, 5MB disk, 300-lpm printer, and SDLC communications controller	2,676	131,480	621
System IV/70 with 96K-byte memory, 17 displays 67.5MB disk, 9-track magnetic tape, 300-lpm printer, bisync communications controller	4,215	149,620	789
System IV/80 with 480K-byte memory, 15 displays, 40MB disk, card reader, 430-lpm printer, SDLC communications controller	4,575	217,175	995
System IV/90 with 192K-byte memory, 10 displays, 67.5MB disk, 2.5MB disk, 300-lpm printer, bisync communications controller	4,095	163,535	830
System IV/95 with 672K-byte memory, 19 displays, 135MB disk, 55-cps printer, 600-lpm printer, SDLC communications controller	6,015	241,075	1,256
System 311 with 2MB memory, byte multiplexer channel, selector channel, integrated disk controller, integrated tape controller, integrated communications controller, console display and keyboard, console printer, 400MB disk, unit record adapter, 800/1600 bpi tape, card reader	5,865	283,500	1,462

*Includes maintenance.■

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Four-Phase's new System IV/60 features high processing speeds and total compatibility with existing Four-Phase software including the new Multifunction Executive Positioned as a mid-range processor, a IV/60 with 192K bytes of main memory can support up to 24 1920-character video terminals, up to 22.5 megabytes of disk storage, and a variety of printers.

MANAGEMENT SUMMARY

Four-Phase Systems' Series IV family of intelligent terminals includes small to medium-sized processors with sufficient mass storage and memory to perform data entry, data/text editing, and file management. They can also transmit and receive information via batch or on-line inquiry within a distributed processing network.

From 1 to 32 Series IV terminals can be controlled by a small general-purpose computer designed and built by Four-Phase utilizing MOS/LSI circuits. The display/keyboard units can be used to enter/generate data in batch mode as well as interactive mode within the same system. The ability to attach a variety of mass storage devices to a Four-Phase processor not only satisfies the needs of batch data entry, but also enables the maintenance of data files with a moderate volume of transactions. Character printers attachable to each station permit the production of hard copy during data entry or word processing operations. Line printers permit the production of reports generated by on-line systems within the Four-Phase network or by the remote host processor.

Four-Phase supplies, on a bundled basis, all of the software necessary to operate the Series IV as a distributed data processor. Programs are provided to perform data entry, data editing, on-line inquiry access, screen display formatting, word processing, printing, file maintenance, communications line control, and necessary utilities. Operating systems, including a multifunction executive, compilers, and assemblers are offered.

Starting with the System IV/70, which was introduced in 1970, the Four-Phase product line has grown to a total of eight systems that span a broad range of applications and workload volumes.

A family of programmable, clustered display terminals designed for data entry and validation, word processing, central inquiry/retrieval, and distributed processing.

The system, built around a Four-Phase computer, supports up to 32 display terminals and printers. Other peripherals include diskette and disk, magnetic tape, card reader, line printers, and communications controllers.

Software support includes: a number of operating systems; IBM 2780/3780, HASP workstation, SNA/3770, 2260/2848, and 3270 on-line inquiry concurrent with data entry or stand-alone simulation; six COBOL packages for distributed processing; four versions of a data entry package; a formatting package for custom program development; and a multifunction executive that allows concurrent data entry, central inquiry, stand-alone processing, and word processing.

The Series IV terminals are available for purchase or on a 42-month lease that includes maintenance. Prices vary according to the configuration selected. For example, a System IV/40 with 4 displays, 24K-byte processor, and 2.5-megabyte disk rents for $604 per month; a System IV/65 with 16 displays, 192K-byte processor, 12.5-megabyte disk, 120-lpm printer, and BSC controller rents for $2,123 per month; and a System IV/90 with 24 displays, 192K-byte processor, 67.5-megabyte disk, 4 character printers, and 1 line printer rents for $3,882 per month.

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 10700 North DeAnza Boulevard, Cupertino, California 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: IV/30—December 1976; IV/40—March 1973; IV/50—June 1976; IV/55—December 1976; IV/60 and IV/65—April 1979; IV/70—September 1970; IV/90—June 1977.

DATE OF FIRST DELIVERY: IV/30—December 1976; IV/40—July 1973; IV/50—4th quarter 1976; IV/55—December 1976; IV/60 and IV/65—June 1979; IV/70—February 1972; IV/90—July 1977.

NUMBER DELIVERED TO DATE: Over 10,000 systems (all models), representing over 80,000 display units.

SERVICED BY: Four-Phase Systems, Inc.

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Systems IV/30 and IV/55 are intended for use in locations requiring only one or two data entry/data display stations. Such stations are typically limited to the data entry and report printing functions, leaving all data processing functions to the remotely located host computer.

Systems IV/40, IV/50, IV/60, IV/65, IV/70, and IV/90 are used when multiple, high volume data entry stations are needed and can perform independent data processing functions, or not, depending upon the user's requirements.

The IV/60, IV65, IV/70, and the IV/90 are equipped with sufficient resources and software to make them, in effect, small computer systems.

USER REACTION

Datapro's 1979 survey of alphanumeric display terminal users yielded responses from six Series IV users who had a total of 216 display units installed. Three of these installations were using a System IV/50; the others included one System IV/40, one System IV/70, and one System IV/90. The users' ratings are summarized in the table below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	5	0	0	3.2
Ease of operation	3	3	0	0	3.5
Display clarity	2	4	0	0	3.3
Keyboard feel & usability	1	5	0	0	3.2
Hardware reliability	2	3	1	0	3.2
Maintenance service	1	1	4	0	2.5
Software & technical support	0	1	4	1	2.0

*Weighted Average on a scale of 4.0 for Excellent.

The following attributes were cited as the key advantages of the Series IV: programmability, mentioned by four users, and cost and physical size, mentioned by five users each.

Recent Datapro surveys on minicomputers and key entry equipment produced a number of responses from Series IV users. The ratings assigned by the users who responded to the minicomputer survey closely parallel the ratings shown above. However, the Series IV earned slightly higher ratings in the key entry equipment survey.□

CONFIGURATION

The Series IV family of intelligent terminals is centered around a 2-nanosecond, 24-bit-word processor that controls up to 32 display/keyboard units, communications lines, printers, disk units, and tape drives. Eight basic model numbers are used to designate eight configuration packages. Three models, the IV/60, IV/65, and IV/90, can include memory mapping with an 800-nanosecond extended memory that permits these models to execute instructions at speeds from 2 to 8 times faster than the other basic models. All models provide a communications interface for one or more communications lines operating at speeds up to 9600 bits/second. The Binary Synchronous Communication (BSC) and SDLC protocols are supported. Asynchronous transmission up to 2400 bits/second is also supported.

Four of the eight basic models support large numbers of display/keyboard units, printers, memory modules, and mass storage devices. The configuration options for these four models are:

System IV/40 supports:

- **Up to 16 display/keyboard units;**
- **Up to 16 55-cps printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity; and**
- **A 300 or 600 cpm card reader.**

System IV/50 supports:

- **Up to 24 display/keyboard units;**
- **Up to 24 55-cps printers or 2 line printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with a 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with 67.5-megabyte capacity each, and**
- **A 300 or 600 cpm card reader.**

System IV/70 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 55-cps printers or 2 line printers;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 50 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

System IV/90 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 55-cps printer or 2 line printers;**
- **From 96K to 384K bytes of memory;**
- **A cartridge drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 50 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

The System IV/60 and IV/65 support the following configurations:

System IV/60 supports:

- **Up to 16 display/keyboard units;**
- **Up to 16 40-, 45-, or 55-cps printers or 2 line printers;**
- **192K bytes of memory; and**
- **Disk drive with a capacity of 5, 12.5, or 22.5 megabytes.**

System IV/65 supports:

- **Up to 24 display/keyboard units;**
- **Up to 24 40-, 45-, or 55-cps printers or 2 line printers;**
- **192K bytes of memory; and**
- **Disk drive with a capacity of 5, 12.5, or 22.5 megabytes.**

The other basic models support up to two display/keyboard units or one display/keyboard unit.

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System IV/30 supports:

- Up to two display/keyboard units (one unit replaceable with a printer);
- 24K bytes of memory; and
- A cartridge disk drive with 2.5-megabyte capacity.

System IV/55 supports:

- Up to two display/keyboard units (one unit replaceable with a printer);
- 24K bytes of memory; and
- A diskette drive with a 354K-byte capacity.

The IV/55, the system with the diskette drive, functions as an IBM 3270 to a remotely attached host. A switch on the unit loads the 3270 Simulator Program from the diskette, performs hardware checks, and readies the system for operation.

TRANSMISSION SPECIFICATIONS

Either of two communications controllers is available for all models. The Asynchronous Data Set Controller operates asynchronously in the half- or full-duplex mode at data rates up to 110, 150, 300, 600, 1200, 1800, or 2400 bits/second and can accommodate any 9- or 11-bit code; it features an automatic answer capability. The Binary Synchronous Data Set Controller operates synchronously in the half- or full-duplex mode at user-specified data rates up to 9600 bits/second and can accommodate any 7- or 8-bit code. Both controllers provide an EIA RS-232C interface.

A third controller, the Model 8437 Intelligent Communications Controller, can be used on the System IV/60, IV/65, and IV/90. This controller includes a 16K-byte processor, and supports both Binary Synchronous and SDLC protocols.

SOFTWARE

Four-Phase provides generalized software designed for primary distributed processing activities: data entry, word processing, program development, on-line inquiry and retrieval, batch communications, and report generation. Further, all of these functions can operate simultaneously on one system under software control of the Multifunction Executive.

Operation of a Series IV is directed from the individual display terminals under control of the operating software. Four-Phase provides, at no additional charge, software packages, including DATA IV, VISION, and ForeWord, to perform specific functions. Any package will operate on any system with sufficient resources.

OPERATING SYSTEMS: The new Multifunction Executive is available for multiple program execution. In addition, Four-Phase offers NPOS, IDOS, and DOS operating systems for program development and single-program execution.

Multifunction Executive (MFE/IV) enables multiple Four-Phase software packages to operate concurrently and independently on a System IV/60, /65, or /90. These packages include DATA IV, VISION, ForeWord, PWS, and COBOL, making the following distributed processing functions available with a single processor: data entry, word processing, program development, on-line inquiry and retrieval, batch communications, local processing, and report generation. A single station can switch from one function to another easily. MFE/IV supports up to 24 1920-character screens, 270 million bytes of disk storage, and up to 384K bytes of memory.

NPOS (NP/80 Operating System) is a modular operating system which coordinates the services of the NP/80 peripheral processor. The primary function of NPOS is to service I/O requests for large mass storage devices as well as to enable the operation of multiple Series IV processors. Virtual disk capability and buffer pooling is also provided.

IDOS is a disk-oriented operating system oriented toward executing programs which IDOS provides for the cataloging and updating of source, relocatable, absolute files and command run parameter strings (job streams). The latter permits a single entry from the console to initiate sequential operation of a series of programs. The Code Assembler and Relocatable Loader, COBOL with DISAM, the Sort Package, and the System Relocatable Library are among the programs provided with IDOS. Two types of disk files are available under IDOS and DOS: contiguous (chained) and sequential (linked files).

IDOS Utilities is also provided and includes a sort/merge, symbolic editor, relocatable loader, and various media conversion programs. The symbolic editor allows for insertion, deletion, replacement, and inter-record corrections of symbolic text. Media conversion programs include card-to-tape, tape-to-printer, and memory save/restore on disk or magnetic tape.

DOS is also available for custom software systems development and execution. It is a disk-resident system with a flexible Job Control Language through which the user can structure the assembly, loading, and execution of programs.

PROGRAM DEVELOPMENT: For program development, Four-Phase offers PWS and three versions of COBOL.

PWS (Programmer Workstation) is a display-based remote job entry station package that helps large programming shops develop and maintain programs for IBM 360's and 370's. Programmers at 16 terminals can key in and edit simultaneously on 1920-character keyboard/display stations. At the beginning of each programming project, the source code files are retrieved from the mainframe. From this time on, files are stored locally on disk for convenient access at each programming session. After a program has been edited, it is placed in a queue to be transmitted to the IBM host for compilation and execution. When the mainframe is ready for the job, PWS transmits the source code files using 2780, 3780, or HASP multileaving protocol. After the program has been executed, the mainframe sends the compiled listings back to the workstation line printer.

COBOL is offered in both ANSI COBOL '68 and COBOL '74 versions, with extensions provided for screen handling. Programmers can define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas can be manipulated like any working storage area; thus, the programmer can read and write data to operator displays without using I/O instructions. Multitasking allows different activities to be supported at different displays simultaneously. Data management facilities are provided for accessing of up to 270 million bytes of local disk storage.

COBOL with 2780/3780 is a package which combines ANSI COBOL for local processing with concurrent batch communications using IBM 2780/3780 protocol. Displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. A Series IV CPU can communicate with any system using IBM 2780/3780 discipline, including other Series IV's using RBS or COBOL with 2780/3780, and with IBM System/3's, 360's, and 370's.

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COBOL with HASP combines COBOL for local processing with a set of subroutines that can be called for the transmission of data to or from another computer using HASP multi-leaving batch transmission protocol. The other computer can be a 360/370, another Four-Phase processor, or any other system having a bisynchronous HASP multi-leaving interface. Communications can be over leased or dial-up facilities with either attended or unattended operation. Local transaction processing is accomplished with user routines written in either assembler or COBOL.

DATA ENTRY: The DATA IV and VISION software packages provide for data editing and manipulation, for verifying previously entered records, and for searching for specific records.

Version 1 of DATA IV provides up to six program formats per job. Multiple jobs can be running at the same time, and formats can be shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters, the maximum tape block size. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Numeric relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having an arithmetic relationship. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

Up to four 2.5-megabyte disk drives are supported to provide a data file storage capacity of up to 80,000 80-character records. Either keypunch-style or typewriter-style keyboards are supported. Data can be printed from the screen or from the disk file. Data can also be transferred to tape from the disk while key entry continues. Output options supported include magnetic tape, direct connection to an IBM System/360 or an IBM System/370, and remote data communications using binary synchronous line discipline.

Version 2 of DATA IV provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, conditional logic, and support for mixed keypunch and typewriter-style keyboards.

Version 3 of DATA IV accommodates concurrent data entry, retrieval, and update; communications functions; and ISAM-like capabilities. Support for up to 16 video displays is provided for interactive accessing of up to 1000 indexed sequential files, as well as storage capability for over 270 million bytes. Source data can be entered and validated on fully formatted screens displaying up to 1920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing.

In the data entry mode, DATA IV Version 3 can validate operator entries against local master files containing up to 50,000 records and extract stored data for automatic entry. Data can be integrated with keyed entry on fully formatted screens. In data retrieval operations, Version 3 enables all system operators to work simultaneously with the same current information. Records up to 750 characters long are retrieved instantly by typing numeric, alphabetic, or alphanumeric key fields. Any file can be accessed by all displays simultaneously, and each display can also access multiple files simultaneously. Version 2/3 supports IBM-compatible bisync communications for transmission at speeds up to 9600 bps. Either dial or leased lines may be used with IBM 2780, 3780, HASP, or SNA 3770 protocol.

VISION is a transaction-oriented distributed data processing system, combining in one package all computing capabilities needed at remote locations of widespread organizations: source data entry, on-line inquiry and retrieval, batch communications, and multistation file processing. Source data entry is accomlished through the display of full records, operator prompts, and error messages on dual-intensity, 1920-character screens. The editing capabilities of DATA IV, including conditional logic, are also available with VISION. In addition, the file management capabilities of DATA IV, Version 3, are provided. In on-line operation in 3270 mode, VISION supports all IBM display commands and keyboard functions, enabling the full range of 3270 applications software to be used.

ON-LINE INQUIRY: On-line inquiry is provided through direct emulation of IBM display stations plus the ability to add local processing through COBOL programming. On-line inquiry and retrieval is also provided within the VISION system.

The *IBM 2260 Simulator* provides all functions of an IBM 2260/2848 Display System through software emulation. This package provides for operation in either local or remote environments and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units connected to the same Series IV, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

The *IBM 3270 Simulator* provides all the functions of an IBM 3270 Information Display System through software emulation. This package provides for operation in either local or remote environments and supports 480- or 1920-character display units. It includes a Format Storage capability that enables selected formats to be displayed instantly from local memory and a Store-and-Forward Mode that enables operators to key in data even when the communications line or central mainframe is down. The 3270 Simulator also contains facilities test features that can be used to pinpoint problems in the communications equipment, log line traffic, display format attribute types, write memory checkpoints to screen or disk, and accumulate error statistics.

The *Programmable 3270 Simulator* allows 3270 users to add local processing capabilities to an existing 3270 network. The package provides all the capabilities of the 3270 Simulator system plus COBOL programming. Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparison, can be programmed into the system to enable local handling of data.

BATCH COMMUNICATIONS: All major Series IV software packages provide the ability to transmit and receive data in a batch mode. The batch communications protocols used by the various packages are: DATA IV, Version 1—2780/3780; DATA IV, Version 2/3—2780, 3780, HASP, 3770; VISION—2780, 3780, 3270, HASP; PWS—2780, 3780, HASP; and ForeWord—2780/3780. In addition, two remote job entry packages are available.

RBS with 2780/3780 is a Remote Batch System that provides a full complement of IBM 2780/3780 features including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported

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include 300- and 600-cpm card readers, printers from 300 to 1000 lines per minute in speed, and a diskette or cartridge disk system for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be read in from a card reader, another job to be written out from disk to a printer, and a third job to be transmitted or received simultaneously.

RBS with HASP is compatible with the IBM 360/20 HASP workstation used as a remote batch terminal. The package is offered with the System IV/40 and supports 300- to 600-cpm card reader, multiple 300- to 1000-lpm printers, 1920-character video display and operator keyboard, and diskette for diagnostics. The display and operator keyboard serve as an operator's console and display system status and communication status. The software provides the line discipline to simulate a multi-leaving HASP workstation.

WORD PROCESSING: *ForeWord* is a flexible shared-processor text editing system that allows text to be entered, stored, edited, and printed. The system supports up to 24 video terminals, 8 disk drives, and 16 printers. On-line storage capacity ranges from 400 to 50,000 pages of text. ForeWord provides automatic carriage return to enable text to be entered at rough draft speeds, the ability to store frequently used words or phrases in a special glossary, and a global search and replace command that enables the operator to type a correction only once no matter how often it appears in the text. When ready to print, the text can be formatted to add page headings and footings, page numbers, and automatic replacement of footnotes. Margins, tabs, line spacing, page and paragraph numbering, and page headings all can be changed as needed.

COMPONENTS

KEYSTATIONS: The keystations used in the system contain a video display and keyboard with optional Dual Intensity and Audible Alarm features. Each display has a character set of 120 ASCII symbols, including upper and lower case alphabetics, numerics, and special symbols. Characters are generated by a 7-by-9 dot matrix.

Any of six cursor symbols is available. User-selected cursor parameters allow the cursor to blink or remain steady and to be destructive or nondestructive. Cursor controls, which provide a wraparound capability, can move the cursor right, left, up, down, to the initial line and character position of the screen (home), and to the initial character position of the next line (return). Roll controls roll the displayed text up or down, line by line. Insert and delete controls insert or delete a character or a line in or from the displayed text.

Screen and line erase are also provided. The Tab control produces any of three codes as the result of shifted, unshifted, or control shift operation. Under program control, these cursor and edit controls can be assigned to virtually any display function. A set of 13 function controls can be programmed to implement application-dependent operations to extend the system's range of usefulness. The adding machine capability provides separate numeric and function controls for high-volume numeric operations.

Messages can be highlighted for attention or blanked for security when using the Variable Intensity feature, which permits characters to be displayed at normal or high intensities or blanked (not displayed). Control is provided by non-displayed attribute characters, which can be interspersed within the data stream.

The Audible Alarm feature alerts the operator to special conditions such as errors or end of line.

DISK STORAGE: There are five disk models available for use with Four-Phase's intelligent terminal systems. The following table shows the basic disk characteristics and their use with the various systems.

Model	Type	Capacity, megabytes	Transfer Rate, bytes/sec.
8230	Cartridge	2.5	184K
8240	Pack	50.0	312K
8250	Diskette	0.354	31K
8260/61	Pack	67.5	250K
8270	Fixed	10.0	195K

The 8230 Cartridge Disk Drive uses a removable cartridge, similar to the IBM 2315 cartridge, with a capacity of 2.5 million bytes. The disk is organized in 200 active tracks per side, with eight 768-byte sectors per track. The access mechanism carries two heads, one for each disk surface, which results in a cylinder capacity of just over 12K bytes. Head positioning time is 70 milliseconds track to track, average rotational delay is 20 milliseconds, and data transfer rate is 184K bytes per second.

The 8420 Pack Disk Drive uses a removable disk pack equivalent to the packs used on the IBM 2314 disk drives. Each pack provides a storage capacity of 50 million bytes. The packs are recorded in double-density fashion. Each disk surface carries 400 active tracks. The access mechanism links a head for each surface, yielding a cylinder capacity of just over 120K bytes. Only one-half of a cylinder can be transferred in one operation. Tracks are organized in eight 768-byte sectors. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312K bytes per second.

The 8250 Diskette Drive uses a diskette or "floppy" disk cartridge. Data is recorded on one surface only, in 64 tracks of four 1146-byte sectors each. Total capacity of the diskette is 293,376 bytes. Arm movement time is 10 milliseconds per track plus 10 milliseconds head settling time; average rotational delay is 80 milliseconds. Data transfer rate is 31K bytes per second. The controller supports only one drive.

The 8260 and 8261 Pack Disk Drive uses a removable disk pack with a storage capacity of 67.5 million bytes. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 250K bytes per second. The 8260 contains an integral controller that accommodates up to 3 8261 drives. The 8261 utilizes as its controller the NP/80, a 16-bit processor.

The 8270 Fixed Media Disk Drive has a storage capacity of 10 million bytes. The fixed disk has 1600 active tracks, with eight 768-byte sectors per track. The data transfer rate is 195K bytes/second, the average seek time is 65 milliseconds, and the average rotational delay is 20 milliseconds.

MAGNETIC TAPE: There are five magnetic tape subsystems which can be used with the Four-Phase IV/70 system. The following table reflects the characteristics of the models available:

Model	8501	8502	8503	8504	8507
Tracks:	9	9	9	9	7
Density, bpi:	800	800	1600	1600	556/800
Data rate, Kbs:	10	10	60	60	6.95/10
Tape speed, ips:	12.5	12.5	37.5	37.5	12.5
Rewind speed, ips:	50	50	100	100	50
Reel size, inches:	10.5	8.5	8.5	10.5	8.5

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Each tape subsystem includes a controller capable of handling four drives, except for the 8504 and 8507 subsystems, which include only a single-unit controller. The IV/70 system can accommodate only one controller. The 8.5-inch reels accommodate 1200 feet of tape; the 10.5-inch reel, 2400 feet. All recording formats are industry-compatible. Tape tension is supplied by means of tension arms in all models.

PRINTERS: Four-Phase offers nine printer models for use with the Series IV. The basic characteristics of these printers are shown in the table below:

Model	Speed	Number of Characters	Number of Columns
8122	45 cps	96	132
8125	40 cps	88	132
8126	55 cps	96	132
8135	100 or 164 cps	64	80 or 132
8145	120 lpm	96	132
8148	300 lpm	64	132
8149	600 lpm	64	132
8149-96	430 lpm	96	132
8154	1000 lpm	64	132

The 8122 Printer is the Diablo 45-character-per-second incremental printer. The character disk (type wheel), vertical movement, and horizontal movement are all servo-driven. Vertical increments are 48 per inch, and horizontal increments are 60 per inch, giving very flexible control over output. Sprocketed or unsprocketed forms up to 15 inches wide can be accommodated. The unit prints a 96-character ASCII set. The type wheel can be changed by the operator. At 10 characters per inch, up to 132 columns can be printed. Features include left and right tabulation directly to a selected location, and snap-in ribbon cartridges.

The 8125 Printer is a Diablo 40-character-per-second printer using an 88-character metal print wheel that provides letter-quality output suitable for word processing applications. The 8125 has the same basic features as the 8122. In addition, the 8125 includes an integrated power supply that allows it to be used as a desk top printer.

The 8126 Printer is a Diablo 55-character-per-second printer using a 96-character plastic print wheel. The 8126 provides the same basic features as the 8122 and also contains an integrated power supply that permits desk top positioning.

The 8135 Printer is a character printer, switch-selectable for 80 or 132 columns. It has a moving-head mechanism that forms characters serially from left to right on a 7-by-9 dot matrix. The paper tractors are adjustable to accommodate edge-punched forms up to 9⅜ inches wide from pin to pin. Vertical tab, form feed control, and automatic skipping over perforations are provided by a 2-channel vertical format control unit that uses standard 8-channel opaque paper tape. Printing speed is 100 cps for 80 columns or 165 cps for 132 columns.

The 8145 Line Printer operates at 120 lines per minute and utilizes an oscillating comb mechanism to print characters within a matrix. The printer features a set of 96 characters, including upper and lower case alphabetics. An 8-channel vertical format control unit is included. Vertical spacing is selectable at 6 or 8 lines per inch. The 8145 can print 132 columns on six-part continuous forms up to 14-7/8 inches wide.

The 8148 Line Printer is a drum printer that can print continuously at 300 lines per minute. It can print up to 132 columns on six-part continuous forms up to 16-3/4 inches wide. The character set includes 64 symbols. Horizontal spacing is 10 characters per inch. Vertical spacing is operator selectable at 6 or 8 lines per inch. High-speed paper advance rate is 20 inches per second. A 12-channel vertical forms control is included.

The 8149 Line Printer is a chain printer rated at 600 lpm with a 64-character set. The printer provides 132 print positions. Horizontal and vertical spacing are 10 char./inch and 6 or 8 lines/inch, respectively. Continuous six-part forms from 4 to 16.75 inches wide can be accommodated. A 12-channel vertical forms control is included.

The 8149-96 Line Printer is a 430-lpm printer using a 96-character word processing set with upper and lower case alphabetics. All other features are identical to those on the 8149.

The 8154 Line Printer is a chain printer rated at 1000 lpm with a 64-character print set. The printer provides 132 print positions. Horizontal spacing is 10 characters/inch, and vertical spacing is 6 or 8 lines/inch. A 12-channel vertical forms control unit is provided. The 8154 accommodates continuous six-part forms from 4 to 16.75 inches.

CARD READERS: Two desk-top card readers are available. The 8001 reads at 300 cpm, and the 8003 reads at 600 cpm. Each unit includes a controller that performs code translation. A special device, the 8010 Multiple Loading Switch, allows a single card reader to be used for loading up to 8 systems; a separate controller (8011) must be installed in each of the systems.

PROCESSOR: The processor architecture used in all Series IV models except the System IV/60, 65, and 90 is based on a 2.0-microsecond semiconductor memory and eight 24-bit multifunction registers. The System IV/60, 65, and 90 have a cycle time of 400 nanoseconds. The 24-bit machine provides both direct and single-level indirect addressing. Three registers are available for address modification. The priority interrupt system provides 8 levels of interrupt, each with a unique memory location and each with 64 sublevels. Hardware is used to provide automatic interrupt recognition. The standard instruction repertoire includes 117 discrete commands: 12 word/character manipulation, 5 list processing, 17 load/store, 11 fixed-point, 4 comparison, 8 shift, 19 branch/skip, 12 register-to-register, 6 logical, 7 control, 4 interrupt handling, 6 I/O instructions, and 6 optional decimal commands. Arithmetic operations are provided for addition, subtraction, multiplication, and division.

Except for the System IV/60, IV/65, and IV/90, basic memory size is 24K bytes. The System IV/30 and 55 are not expandable. The System IV/40, 50, and 70 are expandable to 96K bytes, and the System IV/60 and 65 provide 192K bytes. The System IV/90 has a basic memory of 96K bytes and is expandable with additional memory modules to 384K bytes. A memory mapping addressing scheme utilizing an 800 nanosecond high speed memory is used with the larger memory on the System IV/60, 65, and 90, which can function from 2 to 8 times faster than the other models.

PRICING

Four-Phase refused to supply Datapro with pricing information for the individual components of its systems, but did provide the following prices for system configurations "representative of what Four-Phase is selling today."

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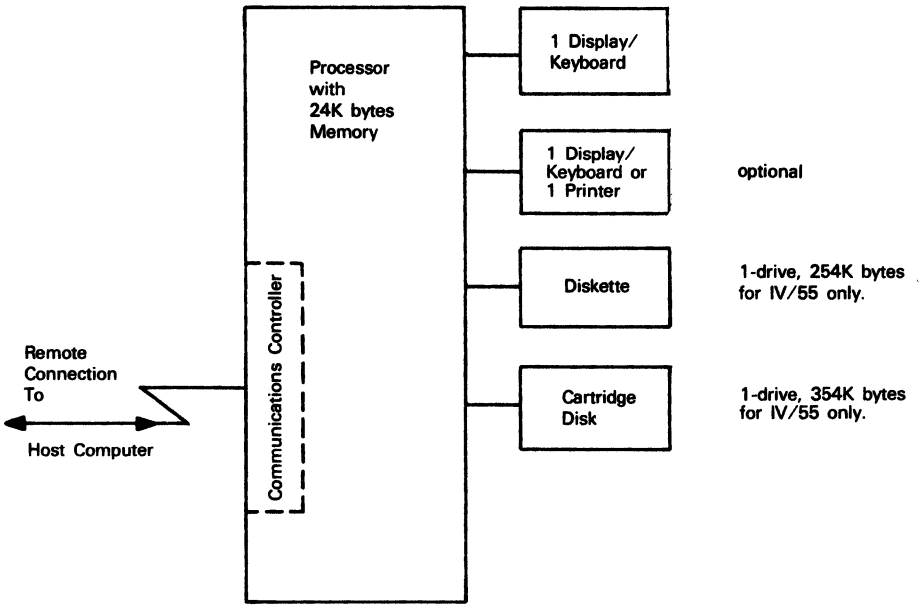
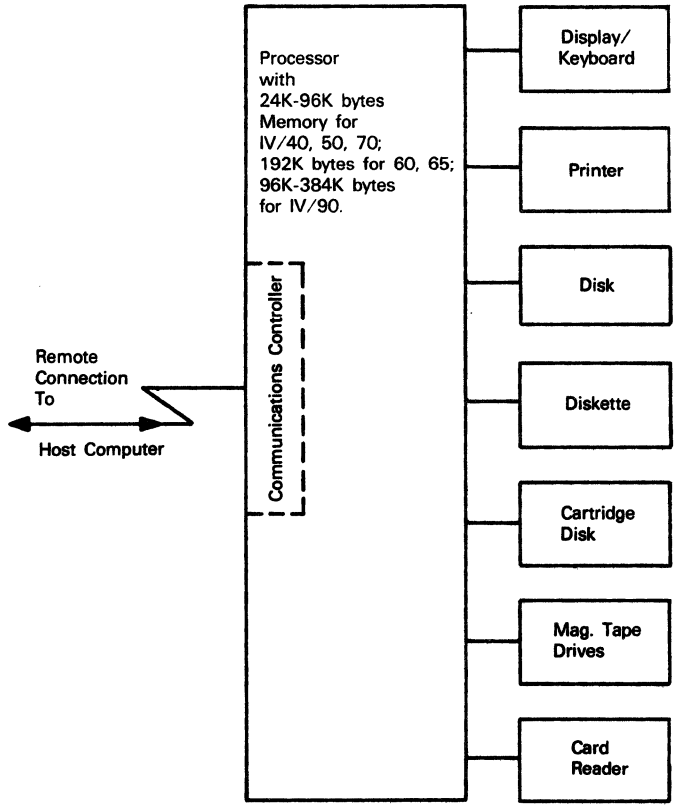
Configuration

IV/30, 55 Controller



IV/40, 50, 60, 65, 70, 90 Controller



Maximum Configuration

	IV/40	IV/50	IV/60, 65	IV/70, 90
Display/ Keyboard	16	24	16 (IV/60); 24 (IV/65)	32
Printer	16	24	16 (IV/60); 24 (IV/65)	32
Disk		1-4 drives; 67.5 M bytes	Up to 22.5M bytes	1-4 drives; 50 or 67.5 M bytes
Diskette	1 drive; 354K bytes	1 drive; 354K bytes	—	1 drive; 354K bytes
Cartridge Disk	1 drive; 2.5M bytes	1 drive; 2.5M bytes	1 drive; 2.5M bytes	1 drive; 2.5M bytes
Mag. Tape Drives	—	—	—	1-4 drives
Card Reader	1; 300 or 600 cpm	1; 300 or 600 cpm	1; 300 or 600 cpm	1; 300 or 600 cpm

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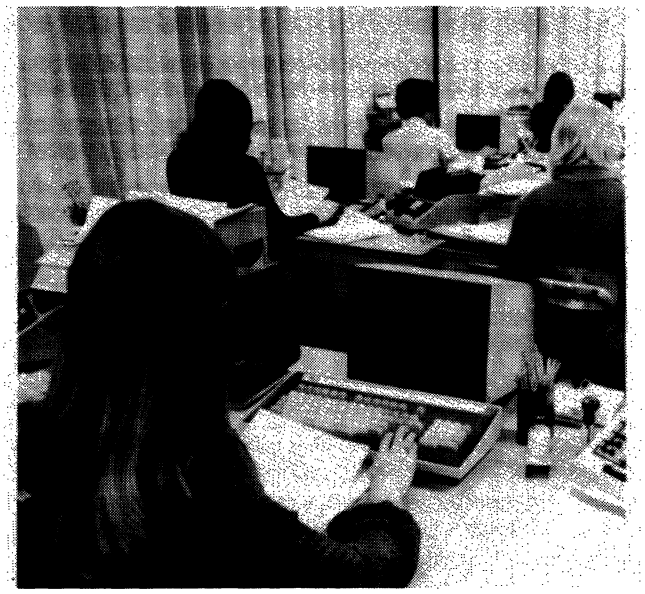
	Monthly Rental*	Purchase	Monthly Maint.
SYSTEM IV/30 CONFIGURATION			
Single-station Data Entry System (Includes one 1920-character Video Display, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	$ 347	$ 25,000	$140
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/40 CONFIGURATIONS			
4-Station Data Entry System (Includes 4 1152-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	611	37,440	166
16-Station Data Entry System (Includes 16 576-character video displays, 72K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	1,283	66,700	321
Remote Batch System (Includes 24K-byte processor with 354K-byte diskette drive, binary synchronous communications controller, one 1152-character Video Control Console, one 300-cpm card reader, and one 300-lpm printer)	777	47,350	253
16-Station IBM 3270 Display System (Includes 16 480-character Dual Intensity Video Displays, a 48K-byte processor with 354K-byte diskette drive, and a binary synchronous communications controller)	1,073	57,490	292
8-Station Transaction Processing System (Includes 8 1152-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and decimal arithmetic, a 300-lpm printer, and a binary synchronous communications controller)	1,334	69,330	349
SYSTEM IV/50 CONFIGURATION			
12-Station Transaction Processing System (Includes 12 Dual Intensity Video Displays, 72K byte processor, 2.5M byte disk, 354K byte diskette, a 30 cps printer, and bisync communications controller)	1,497	93,145	411
SYSTEM IV/55 CONFIGURATION			
Single-station IBM 3270 Simulator (Includes one 1920-character Dual Intensity Video Display, 24K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	234	19,500	95
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/60 CONFIGURATION			
16 Display units, 192K-byte processor, 5-megabyte disk, BSC controller, 120-lpm printer	1,563	106,440	513
SYSTEM IV/65 CONFIGURATION			
16 1920-character dual-intensity display units, 192K-byte processor, 12.5-megabyte disk, BSC controller, 120-lpm printer	2,123	141,570	755
SYSTEM IV/70 CONFIGURATIONS			
12-Station Data Entry System (Includes 12 288-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and 9-track magnetic tape drive)	1,440	68,115	316
22-Station Data Entry System (Includes 22 288-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and 9-track magnetic tape drive)	2,017	95,655	461
32-Station IBM 3270 Simulator (Includes 32 480-character Dual Intensity Video Displays, 48K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	2,091	98,045	486
16-Station Transaction Processing System (Includes 16 1152-character Video Display; 96K-byte processor with decimal arithmetic, 67.5-megabyte disk drive, and 9-track magnetic tape drive; 300 lpm printer; and binary synchronous communications controller)	2,880	138,315	717
SYSTEM IV/90 CONFIGURATION			
12-Station System (Includes 1920-character, Dual-Intensity Video Displays, 192K-byte processor with decimal arithmetic, two 67.5-megabyte disk drives, one 600-lpm printer, and SLDC/BSC controller)	3,387	175,865	930

*For 42-month lease; includes prime-time maintenance.■

Four-Phase Systems
System IV Intelligent Terminals



The System IV with Data IV/70 software, which accommodates concurrent data entry, retrieval, update, and communications with a host computer, is shown above.

A family of programmable, clustered display terminals designed for data entry and validation, inquiry/retrieval and distributed processing.

The versatile system, built around the company's own minicomputer, supports up to 32 display terminals and printers. Other peripherals include diskette or disk, magnetic tape, and card reader.

Extensive software is offered with the system including a number of operating systems; IBM 2780/3780, 2260/2848 and 3270 simulation; six COBOL packages for distributed processing; three versions of a data entry package; and a new formatting package for development of custom-programmed applications.

A System IV/40 with 4 displays, 24K-byte processor and 2.5M byte disk rents for $604 per month on a 42-month lease, including maintenance.

A System IV/50 with 12 displays, 72K-byte processor, 2.5M-byte disk and 354K-byte diskette rents for $1,497 per month on a 42-month lease, including maintenance.

A System IV/70 with 22 displays, 72K-byte processor, 2.5M-byte disk and magnetic tape drive rents for $2,104 per month on a 42-month lease, including maintenance.

Other members of the family include the smaller IV/30 and IV/55, as well as the brand new top-of-line IV/90.

MANAGEMENT SUMMARY

Four-Phase Systems, Inc. was one of the earliest proponents of distributed data processing systems wherein small, limited processors with sufficient mass storage perform data entry, data editing, and some file maintenance, as well as transmit/receive information between the distributed terminal and a host computer. In addition to relieving the host of some of its processing burden, the distributed data processing approach encouraged the industry move toward interactive data entry.

Within this definition of distributed data processing, the System IV family of intelligent terminals ideally satisfies the requirements. From 1 to 32 display/keyboard units can be controlled by a small general-purpose computer designed and built by Four Phase utilizing MOS/LSI circuits. The display/keyboard units can be used to enter data in batch mode as well as interactive mode. The ability to attach a variety of mass storage devices to the Four-Phase processor not only satisfies the needs of batch data entry, but enables the maintenance of data files with a moderate volume of transactions. Character printers attachable to each data entry station permit the production of hard copy during data entry. Line printers permit the production of reports generated by the Four-Phase processor or by the remote host processor.

Four-Phase supplies, on a bundled basis, all of the software necessary to operate the System IV as a distributed data processor. Programs are provided to perform data entry, data editing, screen display formatting, printing, file maintenance, communications line control, and ▷

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 10700 North DeAnza Blvd., Cupertino, California 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: IV/40 — March 1973; IV/50 — June 1976; IV/70 — September 1970; IV/30 and IV/55 — December 1976; IV/90 — June 1977.

DATE OF FIRST DELIVERY: IV/40 — July 1973; IV/50 — 4th quarter 1976; IV/70 — February 1972; IV/30 and IV/55 — December 1976; IV/90 — July 1977.

NUMBER DELIVERED TO DATE: Over 2500 systems (all models).

SERVICED BY: Four-Phase Systems, Inc. ▶

Four-Phase Systems
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necessary utilities. An operating system, compilers, and assemblers are offered.

Two major software packages are the Network Transaction Processing (NTP) and the Data IV/70 packages; each is available in several versions. The NTP package enables the System IV to emulate an IBM 3270 while functioning as either an distributed on-line or batch terminal. Data IV/70 enables the System IV to function as a "prompting" data entry, data editing, and verification system (i.e., a key/disk system).

In June 1977, the firm announced a software package, VISION, that promises to incorporate in one package all of the distributed data processing functions the System IV is capable of performing. The scope of the package is so encompassing and promising that comments on its ramifications must await Four-Phase's publication of sufficient technical information on the package. VISION is scheduled for September 1977 availability.

Systems IV/30 and IV/55 are intended for use in locations requiring only one or two data entry/data display stations. Such station's are typically limited to the data entry and report printing functions, leaving all data processing functions to the remotely located host computer.

Systems IV/40, IV/50, IV/70, and IV/90 are used when multiple, high volume data entry stations are needed and can perform data processing functions, or not, depending upon the user's requirements.

The IV/70 and the IV/90 can be equipped with sufficient resources and software so as to raise the question of whether the configurations are large capacity terminals or small capacity computer systems.

A 1975 announcement introducing the NP/80 as a controller for linking multiple System IV's or for concentrating the communications lines of multiple System IV's onto one high speed line to the host computer is still on the drawing boards. The NP/80, currently, is used to control the 8261 Disk Drive.

Compatibility with IBM communications techniques permits users of IBM System/360's and 370's to employ the System IV without requiring modifications to the host access method software. Part of the recent introduction of the IV/90 is a new controller that will support SDLC protocol. While the effect of the new protocol on transmission throughput should be favorable, the error checking features should certainly improve the quality of data received by the host. Whether the new controller will be attachable to other System IV models is, at present, uncertain.

The legibility of information displayed by the Four-Phase systems is superior to that of many displays now on the market as a result of a more detailed character array. Cursor manipulation is extremely flexible and is a function of the provided display software, which can be

CONFIGURATION

The System IV family of intelligent terminals is centered around a 2-microsecond, 24-bit word processor controlling up to 32 display/keyboard units, a communications line, printers, disk units, and tape drives. Six basic model numbers are used to designate six configuration packages. One model, the IV/90, can include memory mapping with an 800-nanosecond high speed memory that permits the IV/90 to function from 2 to 8 times faster than the other basic models. All models provide a communications interface for one communications line operating at up to 9600 bps. The protocol used is Binary Synchronous Communication (BSC), except for the IV/90 model which will support SDLC as well as bisync. Asynchronous transmissions up to 2400 bps is also supported.

Four of the six basic models support large numbers of display/keyboard units, printers, memory modules, and mass storage units. These four models support a diskette drive with a capacity of 354K bytes, a cartridge disk drive with 2.5 megabyte capability, and a card reader rated either at 300 or 600 cpm. The configuration options for these four models are:

System IV/40 supports:

- **Up to 16 display/keyboard units;**
- **Up to 16 30-cps printers or 2 line printers operating up to 1800 lpm;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity; and**
- **A 300 or 600 cpm card reader.**

System IV/50 supports:

- **Up to 24 display/keyboard units;**
- **Up to 24 30-cps printers or 2 line printers operating at up to 1800 lpm;**
- **From 24K to 96K bytes of memory;**
- **A cartridge disk drive with a 2.5 megabyte-capacity.**
- **A diskette drive with 354K-byte capacity.**
- **Up to four disk drives with 67.5-megabyte capacity each, and**
- **A 300 or 600 cpm card reader.**

System IV/70 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 30-cps printers or 2 line printers operating at up to 1800 lpm;**
- **From 24K bytes to 96K bytes of memory;**
- **A cartridge disk drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 50 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

System IV/90 supports:

- **Up to 32 display/keyboard units;**
- **Up to 32 30-cps printer or 2 line printers operating at up to 1800 lpm;**
- **From 96K to 192K bytes of memory;**
- **A cartridge drive with 2.5-megabyte capacity;**
- **A diskette drive with 354K-byte capacity;**
- **Up to four disk drives with a capacity of either 67.5 megabytes or 50 megabytes each;**
- **A 300 or 600 cpm card reader; and**
- **Up to four magnetic tape drives.**

The other basic models support up to two display/keyboard units or one display/keyboard and one printer.

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tailored to the user's needs. Extensive editing is also provided, along with the capability to "roll and scroll" the displayed text up and down to present additional data stored in the main memory.

Display units are separate from their keyboards and can be located up to 2000 feet from the computer. There are three display models, which provide several display arrangements ranging from 288 to 1920 characters per screen.

USER REACTION

Datapro's March 1977 survey of alphanumeric display terminal users included responses from 16 users of the Four-Phase System IV. These responding users had a total of 1670 display stations installed. The ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	6	8	1	0	3.3
Ease of operation	7	7	1	0	3.4
Display clarity	4	7	3	1	2.9
Keyboard feel and usability	6	5	3	1	3.1
Hardware reliability	7	6	2	0	3.3
Maintenance service	4	6	3	2	2.8
Software & technical support	1	5	8	1	2.4

*Weighted Average on a scale of 4.0 for Excellent.

These ratings are somewhat lower than those reported in last year's survey, but they still reflect general use satisfaction with all aspects of the System IV except for software and technical support. Though four users specifically commented on strong vendor support, seven users (44 percent) mentioned dissatisfaction with support. However, most comments were on the positive side. Users cited low cost (13 responses) programmability (8), applicability (9), flexibility (7), reliability (8), and compact size (5) as key attributes of the System IV. Equipment unreliability, performance limitations, and poor maintainability were cited by a total of 4 users.

In recent Datapro surveys for minicomputers and key entry equipment, there was also a significant number of System IV user responses. The ratings given by users in these two surveys parallel the above results.□

System IV/30 supports:

- **Up to two Display/Keyboard units (one unit replaceable with a printer);**
- **24K bytes of memory; and**
- **A cartridge disk drive with 2.5-megabyte capacity.**

System IV/55 supports:

- **Up to two Display/Keyboard units (one unit replaceable with a printer);**
- **24K bytes of memory; and**
- **A diskette drive with a 354K-byte capacity.**

The IV/55, the system with the diskette drive, functions as an IBM 3270 to a remotely attached host. A switch on the unit loads the 3270 Simulator Program from the diskette, performs hardware checks, and readies the system for operation.

TRANSMISSION SPECIFICATIONS

Either of two communications controllers is available for all models. The Asynchronous Data Set Controller operates asynchronously in the half- or full-duplex mode at data rates up to 110, 150, 300, 600, 1200, 1800, or 2400 bits/second and can accommodate any 9- or 11-bit code; it features an automatic answer capability. The Binary Synchronous Data Set Controller operates synchronously in the half- or full-duplex mode at user-specified data rates up to 9600 bits/second and can accommodate any 7- or 8-bit code. Both controllers provide an EIA RS-232C interface.

A third controller, the Model 8437 Intelligent Communications Controller, can be used on the System IV/90. This controller includes a 16K byte processor, and supports both Binary Synchronous and SDLC protocols.

SOFTWARE

Operation of a System IV systems is directed from the individual display terminals under control of the operating software. Four-Phase provides, at no additional charge, software packages, including NTP, DATA IV/70, STARTER, VISION, and ForeWord, to perform specific functions. Depending upon the package, the user either modifies the package with parameter settings or includes the package as part of his self-developed package. The more signficant packages are discussed below. Any package will operate on any system with sufficient resources.

System IV configurations with sufficient resources can compile and test programs for operation on any System IV. Software for System IV configurations without these resources can be compiled on any IBM System/360 or 370 operating under OS or DOS that has a minimum of 65K bytes of memory. When using a System IV for compilation, a minimum of 48K bytes, a cartridge disk or a disk drive, a card reader and a printer are required. Operation of such configurations is under the control of an operating system, the Interrupt Disc Operating System (IDOS). IDOS, an enhanced version of the originally offered DOS, controls the compilation of source programs to executable code. The executable code does not require IDOS to be resident in memory when operating. IDOS also provides the software module that handles the communications line.

User programming is performed in COBOL IV/70, RPG IV/70, or in IV/70 Code (a two-pass, general-purpose assembly language).

***COBOL IV/70* includes ANSI modules Nucleus 1, Table Handling 2, Sequential Access 1, Random Access 1, and Library. In addition, it provides a linkage section and call verb to permit the use of assembly-language subroutines, plus display-oriented extensions for operating in a video display environment. COBOL IV/70 supports all system peripherals and both random and sequential disk files.**

IDOS provides for the cataloging and updating of source, relocatable, absolute files, and command/run parameter strings (job streams). The latter permits a single entry from the console to trigger sequential operation of a series of programs. Among the programs provided with IDOS is the Code Assembler and Relocatable Loader, COBOL with DISAM, the Sort Package, and the System Relocatable Library.

***Vision* combines data entry, on-line inquiry and retrieval, local data management report and document generation, and batch communications. It accommodates multiple operations, multiple jobs, and multiple functions simultaneously**

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on the same system. A multitasking operating system supports a dialog oriented formatting language and a macro command language for concurrent report and document generation. Vision communicates interactively with host mainframes using IBM 3270 protocol. Information from local files and a central data base can be accessed for display, data validation, or direct record entry, either under operator control or automatically via format commands. Data can be retrieved without knowledge of its network location, since inquiry routing can be made transparent to the user. Data can be exchanged with the host computer via IBM 2780 or 3780 protocol in the batch mode. Downline loading permits centrally-maintained data files, entry formats, output programs, and systems software to be transmitted to Vision systems for synchronization of remote data bases and system functions throughout a network.

Vision performs general calculations on data batches with decimal arithmetic and conditional logic. Results can be transferred to disk or tape storage, printed, or displayed while multistation data entry and communications continue uninterrupted. Up to five files can be accessed concurrently with indexed looping for multi-record operations. Vision is available free of charge with any Four-Phase system, but memory requirements may not permit practical use with restricted configuration models.

Four-Phase's *Network Transaction Processing (NTP)* series is a family of COBOL-programmed software programs used to drive display/keyboards for on-line applications in a distributed processing environment.

The display configurations supported by each of the NTP series software modules are:

Configurations for NTP/100, NTP/130, and NTP/150

Char./ Line	Lines/ Screen	Char./ Screen	Max. No. of Displays IV/40	IV/50	IV/55*	IV/70, 90
40	12	480	16	24	2	32
80	24	1,920	8	12	2	16

*Runs under NTP/100 only.

Configurations for NTP/200, NTP/230, and NTP/250

Chars./ Line	Lines/ Screen	Chars./ Screen	Max. No. of Displays IV/40	IV/50	IV/70, 90
48	6	288	16	24	32
48	12	576	16	24	32
48	24	1,152	8	24	32
80	6	480	16	24	32
80	12	960	16	24	32
80	24	1,920	8	24	32

NTP/100 provides all the functions of an IBM 3270 Display System through software emulation. This package provides for operation in either local or remote environments and handles 480- or 1920-character displays. A Format Storage capability enables selected formats to be displayed instantly from local memory, so there is no waiting for prompts. A Store-and-Forward Mode feature enables operators to key in data even during periods when the communications line or central mainframe is down. When on-line operation resumes, the locally stored records are then transmitted. NTP/100 also contains facilities test features that can be used to pinpoint troubles in the communications equipment, log line traffic, display format attribute bytes, write memory checkpoints to screen or disk, and accumulate error statistics.

NTP/130 is a remote batch system that provides a full complement of IBM 2780/3780 features including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported include 300- and 600-cpm card readers, printers ranging in speeds from 300 to 1800 lines per minute, and a diskette or cartridge disk drive for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be input from the card reader, another job to be output from the disk to the printer, and a third job to be transmitted or received concurrently. Reports can be transmitted to unattended NTP/130 systems at night without concern over forms changing or device availability. The spooled data can then be printed during the day while other operations are being performed. During transmission, the host CPU creates separate disk files on the remote system for each job. Reports can be generated and local system files updated using user-programmed software. Concurrent remote batch and source data entry are available with the DATA IV/70 software package; up to 22 video displays are supported with extensive editing, validation, and conditional logic capability.

NTP/150 provides all the capabilities of the NTP/100 (3270 Simulator) system plus COBOL programming, Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparisons, can be programmed into the system to enable local handling of data. Entries may be validated against local files, and filed data can be integrated with keyed data for transmission or with received data for displaying or printing. Four-Phase claims that the COBOL-programmed routines to perform these functions can be added to the system without having to modify the existing 3270 application programs, systems software, or network configuration. COBOL routines can be invoked when data is transmitted or received, when the TAB or Program Function keys are pressed, or when entries in designated fields are completed. The subroutines can then access local disks, printers, and displays or the central CPU before returning control to the operator. COBOL processing is performed in the background and can support multiple tasks at multiple displays with concurrent key entry and printing.

Operators are notified of errors by an audible alarm and a flashing message. Keyboards can be disabled until corrective action is taken or to restrict access to personnel who fail to enter approved passwords.

NTP/150 can also spool print data from line to disk without the mainframe overhead and formatting normally required for 3270 printing. Under local control, the print files can be output when convenient on multiple printers at maximum speed. Total flexibility is provided for routing, pausing, backspacing, restarting, and repeating.

NTP/200 is a stand-alone, COBOL-programmed display system. The system supports displays for entry, inquiry, processing, and printing. Multi-tasking allows different activities to be supported at different displays simultaneously, and files may be accessed using sequential, direct, or multi-key ISAM accessing methods. NTP/200 uses an extended ANSI COBOL that supports transaction processing with displays and keyboards. Programmers may define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas can be manipulated like any Working Storage area; thus, the programmer can read and write data to operator displays without going through the COBOL file structure. COBOL and Assembly-language subroutines can be executed on-line, and can be overlaid to conserve memory.

Data management facilities are provided for accessing of up to 264 million bytes of local disk storage. Serial and direct files are processed using the Sequential Access and Random Access features of ANSI COBOL. A third access method, DISAM, provides multi-indexed files that may be referenced by a primary key and up to 10 secondary keys. Files created or maintained in on-line operations can also be

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processed in batch mode using COBOL, RPG, Sort/Merge, and an extensive selection of utilities.

NTP/230 operates under ANSI COBOL control and supports concurrent batch communications with IBM 2780/3780 protocol. Displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. Using NTP/230, a System IV can communicate with any system using IBM 2780/3780 discipline, including other System IV's using NTP/130 or NTP/230, and with IBM System/3's, 360's, and 370's. NTP/230 contains standard ANSI COBOL modules for Nucleus, Table Handling, and Sequential Access; plus enhanced Table Handling with three levels of subscripting/indexing, Random Access, and Library. Facilities for Sort and Segmentation are available through the Interrupt Disk Operating System, while report writing is accommodated by RPG. NTP/230 also provides video extensions for interactive support of displays and keyboards.

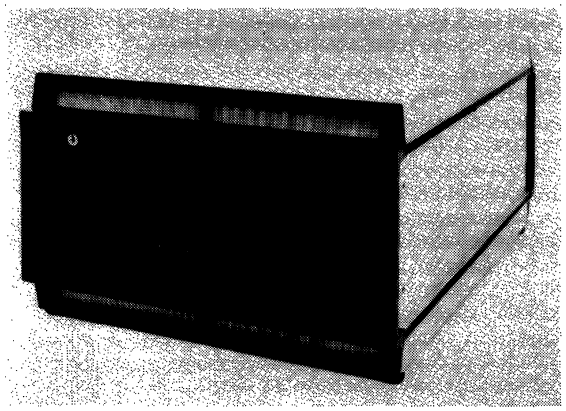
NTP/250 provides COBOL programming capability with concurrent interactive communications using IBM 3270 protocol, while supporting video displays for entry, inquiry, processing, and printing. While fully compatible with IBM 3270 line protocol, NTP/250 eliminates the restrictions of 3270 formatting. Records are transmitted as is, without the mainframe overhead normally required for mapping attribute bytes, display commands, and buffer orders into the data stream. Multi-user applications are developed in ANSI COBOL for data entry, retrieval, and document preparation. Under COBOL control, operator-oriented procedures can be implemented to produce format branches, flips, and overlays; position the cursor to any location; display messages and prompts; and customize display functions with paging and scrolling.

Using NTP/250, the System IV can be treated by the mainframe as any other peripheral-callable with PUTS and GETS like a tape drive or disk. Inquiries may be initiated manually by system operators, or automatically under program control. For more efficient utilization of system resources, dynamic task assignment allows any display to perform any activity, regardless of physical address. Received records can be reformatted using COBOL procedure statements; thus, compressed or scrambled data can be sent unmodified for local expansion and display. Similarly, entire files can be passed to NTP/250 for local manipulation and updating without mainframe loading. Using NTP/250, System IV's can be multidropped on the same line with other System IV's using NTP/250, NTP/100, or NTP/150, or with IBM 3270's.

A variety of powerful *data management facilities* is provided with the Network Transaction Processing software to create, access, and maintain local system files. Three access methods are supported: Sequential Access Method (SAM) for processing serial files, Direct Access Method (DAM) for random or sequential access based on an actual key, and Data Indexed Sequential Access Method (DISAM), a multi-key ISAM optimized for interactive access to dynamically changing data.

DISAM allows accessing files with a unique primary key and up to 10 secondary keys. For example, an inventory file may be accessed by part number, item description, and vendor number. Searches with generic and duplicate keys retrieve all records with common index fields. DISAM supports storage capacities from 2.5 to over 260 million bytes. Records may be read, written, modified, inserted, and deleted randomly or sequentially. Backup is provided by removable packs and multiple drives.

To insure security and privacy, all files can be protected with passwords to preclude unauthorized access.



The System IV processor by itself is "just another box." But, with Four-Phase's software for distributed processing and high volume data entry, the above box supports an extensive array of peripherals and applications.

Software is also available which enables either the System IV/40 or IV/70 to function as an IBM 2260 simulator. All functions of an IBM 2260/2848 Display System are provided through software emulation. This package enables operation in either local or remote environments and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units on the same IV/40 or IV/70, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

DATA IV/70 provides the software support necessary to use the System IV as a shared-processor data entry system (key/disk). There are three versions of DATA IV/70, and in general they all provide for data entry (using a fill-in-the-blanks approach with prompting messages that are not included in the output record), for extensive data editing and manipulation, for verifying previously entered records, and for searching for specific records with or without updating when found. DATA IV/70 can be used on a System IV with at least one cartridge disk or disk pack drive.

Version 1 of DATA IV/70 provides up to six program formats per job. Multiple jobs can be running at the same time, and formats can be shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters, the maximum tape block size. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Numeric relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having an arithmetic relationship. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

Version 1 will run within the basic 24K-byte memory. Up to four 2.5-megabyte disk drives are supported to provide a data file storage capacity of up to 80,000 80-character records. Either keypunch-style or typewriter-style keyboards are supported, but they cannot be mixed in the same system. Data can be printed from the screen or from the disk file. Data can also be transferred to tape from the disk while key entry continues. Output options supported include magnetic tape, direct connection to an IBM System/360 (Model 30 or larger) or an IBM System 370, and remote data communications using binary synchronous line discipline.

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Version 2 of DATA IV/70 provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, and support for mixed keypunch and typewriter-style keyboards. Provisions for conditioned logic are included to enable adaptive data validation during key entry. Conditional branches to different editing sequences and operator prompts can be inserted at any point in a format. Single and nested statements of the form IF . . . THEN . . . ELSE can reference previously entered fields, accumulator values, alphanumeric constants, value sets, and arithmetic and logical combinations of these. DATA IV/70 Version 2 can be utilized only with restricted configurations. In particular, only one disk drive is supported, only a 30-cps printer can be included, and a data communications interface is not provided. A memory size of 72K bytes is required.

Version 3 of DATA IV/70 accommodates concurrent data entry, retrieval, update, and communications functions and has ISAM capability. Support for up to 16 video displays is provided for interactive accessing of up to 1000 indexed sequential files, as well as storage capability for over 260 million bytes. Source data can be entered and validated on fully formatted screens displaying up to 1920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing.

In the data entry mode, DATA IV/70 Version 3 can validate operator entries against local master files containing up to 50,000 records and extract stored data for automatic entry. Data can be integrated with keyed entry on fully formatted screens. In data retrieval operations, Version 3 enables all system operators to work simultaneously with the same current information. Records up to 750 characters long are retrieved instantly by typing numeric, alphabetic, or alphanumeric key fields. Any file can be accessed by all displays simultaneously. Version 3 supports IBM-compatible bisync communications for transmission at speeds up to 9600 bps. Either dial or leased lines may be used with IBM 2780/3780 protocol. A memory size of 72K bytes is required.

STARTER is a package used with COBOL programs that facilitates creating screen formats within the user program.

Fore Word is a shared-logic word processing system supporting up to 16 1920-character video displays, 16 printers, and four disk drives. The system provides online storage capacity ranging from 400 to 40,000 pages of text.

COMPONENTS

KEYSTATIONS: The keystations used in the system contain a video display and keyboard with optional Dual Intensity and Audible Alarm features. Each display has a character set of 120 ASCII symbols, including upper and lower case alphabetics, numerics, and special symbols. Characters are generated by a 7-by-9 dot matrix.

Any of six cursor symbols is available. User-selected cursor parameters allow the cursor to blink or remain steady and to be destructive or nondestructive. Cursor controls, which provide a wraparound capability, can move the cursor right, left, up, down, to the initial line and character position of the screen (home), and to the initial character position of the next line (return). Roll controls roll the displayed text up or down, line by line. Insert and delete controls insert or delete a character or a line in or from the displayed text.

Screen and line erase are also provided. The Tab control produces any of three codes as the result of shifted, unshifted, or control shift operation. Under program control, these cursor and edit controls can be assigned to virtually any display function. A set of 13 function controls can be programmed to implement application-dependent operations to extend the system's range of usefulness. The adding-machine capability provides separate numeric and function controls for high-volume numeric operations.

Messages can be highlighted for attention or blanked for security when using the Variable Intensity feature, which permits characters to be displayed at normal or high intensities or blanked (not displayed). Control is provided by non-displayed attribute characters, which can be interspersed within the data stream.

The Audible Alarm feature alerts the operator to special conditions such as errors or end of line.

DISK STORAGE: There are four disk models available for use with Four-Phase's intelligent terminal systems. The following table shows the basic disk characteristics and their use with the various systems.

Model	Type	Capacity, megabytes	Transfer Rate, bytes/sec.
8230	Cartridge	2.5	184K
8240	Pack	50.	312K
8250	Diskette	0.354	31K
8260/61	Pack	67.5	250K

The 8230 Cartridge Disk Drive uses a removable cartridge, similar to the IBM 2315 cartridge, with a capacity of 2.5 million bytes. The disk is organized in 200 active tracks per side, with eight 768-byte sectors per track. The access mechanism carries two heads, one for each disk surface, which results in a cylinder capacity of just over 12K bytes. Head positioning time is 70 milliseconds track to track, average rotational delay is 20 milliseconds, and data transfer rate is 184K bytes per second.

The 8420 Pack Disk Drive uses a removable disk pack equivalent to the packs used on the IBM 2314 disk drives. Each pack provides a storage capacity of 50 million bytes. The packs are recorded in double-density fashion. Each disk surface carries 400 active tracks. The access mechanism links a head for each surface, yielding a cylinder capacity of just over 120K bytes. Only one-half of a cylinder can be transferred in one operation. Tracks are organized in eight 768-byte sectors. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312K bytes per second.

The 8250 Diskette Drive uses a diskette or "floppy" disk cartridge. Data is recorded on one surface only, in 64 tracks of four 1146-byte sectors each. Total capacity of the diskette is 293,376 bytes. Arm movement time is 10 milliseconds per track plus 10 milliseconds head settling time; average rotational delay is 80 milliseconds. Data transfer rate is 31K bytes per second. The controller supports only one drive.

The 8260 and 8261 Pack Disk Drive uses a removable disk pack with a storage capacity of 67.5 million bytes. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 250K bytes per second. The 8260 contains an integral controller that accommodates up to 3 8261 drives. The 8261 utilizes as its controller, the NP/80, a 16-bit processor.

MAGNETIC TAPE: There are five magnetic tape subsystems which can be used with the Four-Phase IV/70 system. The following table reflects the characteristics of the models available:

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Model	8501	8502	8503	8504	8507
Tracks:	9	9	9	9	7
Density, bpi:	800	800	1600	1600	556/800
Data rate, Kbs:	10	10	60	60	6.95/10
Tape speed, ips:	12.5	12.5	37.5	37.5	12.5
Rewind speed, ips:	50	50	100	100	50
Reel size, inches:	10.5	8.5	8.5	10.5	8.5

Each tape subsystem includes a controller capable of handling four drives, except for the 8504 and 8507 subsystems, which include only a single-unit controller. The IV/70 system can accommodate only one controller. The 8.5-inch reels accommodate 1200 feet of tape; the 10.5-inch reel, 2400 feet. All recording formats are industry-compatible. Tape tension is supplied by means of tension arms in all models.

PRINTERS: Four-Phase offers six printer models for use with its intelligent terminal systems. The basic characteristics of these printers are shown in the table below:

Model	Speed	Number of Characters	Number of Columns
8121	30 cps	96	132
8131	30 cps	64	132
8135	100 or 164 cps	64	80 or 132
8146	145-1110 lpm	64	132
8148	300 lpm	64	132
8149	600 lpm	64	132
8151	700-1800 lpm	64	132

The 8121 Printer is the Diablo 30-character-per-second incremental printer. The character disk (type wheel), vertical movement, and horizontal movement are all servo-driven. Vertical increments are 48 per inch, and horizontal increments are 60 per inch, giving very flexible control over output. Sprocketed or unsprocketed forms up to 15 inches wide can be accommodated. The unit prints a 96-character ASCII set. The type wheel can be changed by the operator. At 10 characters per inch, up to 132 columns can be printed. Features include left and right tabulation directly to a selected location, and snap-in ribbon cartridges.

The 8131 Printer is the familiar UNIVAC 30-character-per-second unit. It uses a rotating helical print wheel with a single hammer actuator, and accommodates six-part continuous forms up to 14⅞ inches wide. Horizontal spacing is 10 characters per inch, and vertical spacing is 6 lines per inch. The unit prints 64 characters in up to 132 columns.

The 8135 Printer is a character printer, switch-selectable for 80 or 132 columns. It has a moving-head mechansim that forms characters serially from left to right on a 7-by-9 dot matrix. The paper tractors are adjustable to accommodate edge-punched forms up to 9⅜ inches wide from pin to pin. Vertical tab, form feed control, and automatic skipping over perforations are provided by a 2-channel vertical format control unit that uses standard 8-channel opaque paper tape. Printing speed is 100 cps for 80 columns or 165 cps for 132 columns.

The 8146 Line Printer uses a 64-character print drum. Print speed varies with the number of columns printed, spanning the range of 245 lpm (132 columns) to 1110 lpm (24 columns). Continuous six-part forms up to 19⅞ inches wide can be accommodated. Vertical spacing is operator-selectable at 6 or 8 lines per inch. An 8-channel vertical format control unit is provided. Paper advance rate is 13 inches per second for long skips.

The 8148 Line Printer is also a drum printer. It can print continuously at 300 lines per minute. It can print up to 132 columns on six-part continuous forms up to 16¾ inches wide. The character set includes 64 symbols. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. High-speed paper advance rate is 20 inches per second. A 12-channel vertical forms control is included.

The 8149 Line Printer is a chain printer rated at 600 lpm with a 64-character set. The printer provides 132 print positions. Horizontal and vertical spacing are 10 char./inch and 6 or 8 lines/inch, respectively. Continuous six-part forms from 4 to 16.75 inches wide can be accommodated. A 12-channel vertical forms control is included.

The 8151 Line Printer provides high-speed output with a 64-character set. The printing speed depends on the number of positions printed. The range is 700 lpm (132 columns) to 1800 lpm (72 columns). Continuous six-part forms up to 19⅞ inches wide can be accommodated. Vertical spacing is 6 or 8 lines per inch, and is operator-selectable. High-speed paper advance rate is 35 inches per second. An 8-channel vertical forms control unit is included.

CARD READERS: Two desk-top card readers are available. The 8001 reads at 300 cpm, and the 8003 reads at 600 cpm. Each unit includes a controller that performs code translation. A special device, the 8010 Multiple Loading Switch, allows a single card reader to be used for loading up to 8 systems; a separate controller (8011) must be installed in each of the systems.

PROCESSOR: The processor architecture used in the System IV is based on a 2.0-microsecond semiconductor memory and eight 24-bit multifunction registers. The 24-bit machine provides both direct and single-level indirect addressing. Three registers are available for address modification. The priority interrupt system provides 8 levels of interrupt, each with a unique memory location and each with 64 sublevels. Hardware is used to provide automatic interrupt recognition. The standard instruction repertoire includes 113 discrete commands: 12 word/character manipulation, 5 list processing, 17 load/store, 11 fixed-point and 5 floating-point arithmetic, 4 comparison, 8 shift, 19 branch/skip, 11 register-to-register, 6 logical, 5 control, 4 interrupt handling, and 6 I/O instructions. Arithmetic operations are provides for addition, subtraction, multiplication, and division.

Except for the System IV/90, basic memory size is 24K bytes. The System IV/30 and 55 are not expandable. The System IV/40, 50, and 70 are expandable to 96K bytes. The System IV/90 has a basic memory of 96K bytes and is expandable with a second memory module to 192K bytes. A memory mapping addressing scheme utilizing an 800 nanosecond high speed memory is used with the larger memory. The IV/90 functions from 2 to 8 times faster than the other models.

PRICING

Four-Phase refused to supply Datapro with pricing information for the individual components of its systems, but did provide the following prices for system configurations "representative of what Four-Phase is selling today."

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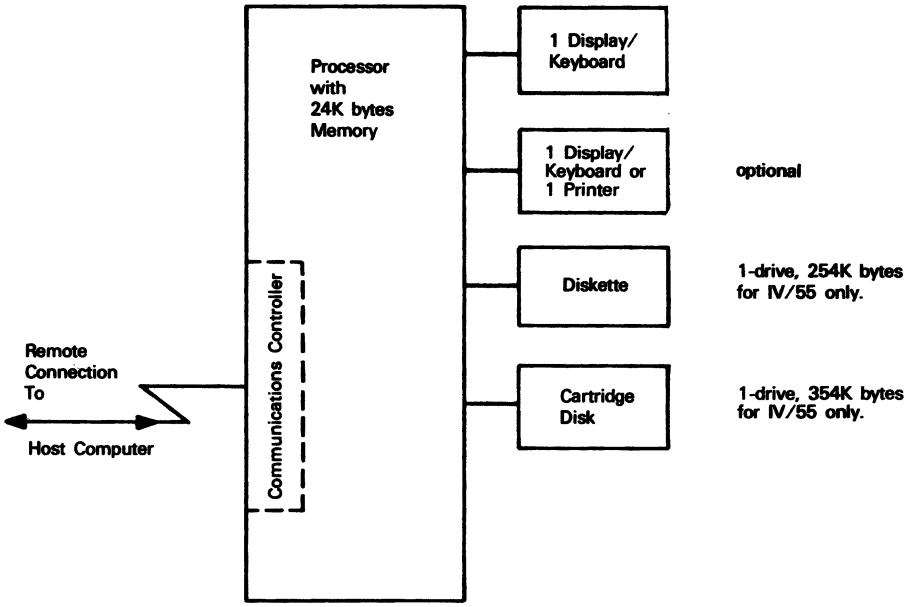
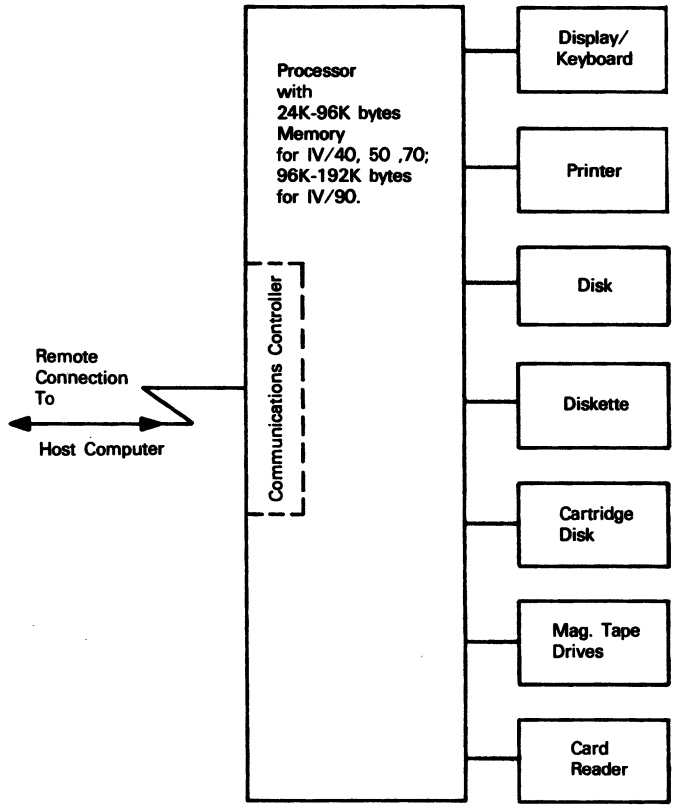
Configuration

IV/30, 55 Controller



IV/40, 50, 70, 90 Controller



Maximum Configuration

	IV/40	IV/50	IV/70, 90
Display/ Keyboard	16	24	32
Printer	16*	24*	32*
Disk	—	1-4 drives; 67.5 M bytes	1-4 drives; 50 or 67.5 M bytes
Diskette	1 drive; 354K bytes	1 drive; 354K bytes	1 drive; 354K bytes
Cartridge Disk	1 drive; 2.5M bytes	1 drive; 2.5M bytes	1 drive; 2.5M bytes
Mag. Tape Drives	—	—	1-4 drives
Card Reader	1; 300 or 600 cpm	1; 300 or 600 cpm	1; 300 or 600 cpm

*Line printers can replace character printers. The number of line printers that can be attached is dependent on speed; at 1800 lines per minute, each model will support up to two line printers.

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SYSTEM IV/30 CONFIGURATION	Monthly Rental*	Purchase	Monthly Maint.
Single-station Data Entry System (Includes one 1920-character Video Display, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	347	25,000	140
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/40 CONFIGURATIONS			
4-Station Data Entry System (Includes 4 1152-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	611	37,440	166
16-Station Data Entry System (Includes 16 576-character video displays, 72K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	1,283	66,700	321
Remote Batch System (Includes 24K-byte processor with 354K-byte diskette drive, binary synchronous communications controller, one 1152-character Video Control Console, one 300-cpm card reader, and one 300-lpm printer)	777	47,350	253
16-Station IBM 3270 Display System (Includes 16 480-character Dual Intensity Video Displays, a 48K-byte processor with 354K-byte diskette drive, and a binary synchronous communications controller)	1,073	57,490	292
8-Station Transaction Processing System (Includes 8 1152-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and decimal arithmetic, a 300-lpm printer, and a binary synchronous communications controller)	1,334	69,330	349
SYSTEM IV/50 CONFIGURATION			
12-Station Transaction Processing System (Includes 12 Dual Intensity Video Displays, 72K byte processor, 2.5M byte disk, 354K byte diskette, a 30 cps printer, and bisync communications controller)	1,497	93,145	411
SYSTEM IV/55 CONFIGURATION			
Single-station IBM 3270 Simulator (Includes one 1920-character Dual Intensity Video Display, 24K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	234	19,500	95
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/70 CONFIGURATIONS			
12-Station Data Entry System (Includes 12 288-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and 9-track magnetic tape drive)	1,440	68,115	316
22-Station Data Entry System (Includes 22 288-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and 9-track magnetic tape drive)	2,017	95,655	461
32-Station IBM 3270 Simulator (Includes 32 480-character Dual Intensity Video Displays, 48K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	2,091	98,045	486
16-Station Transaction Processing System (Includes 16 1152-character Video Displays; 96K-byte processor with decimal arithmetic, 67.5-megabyte disk drive, and 9-track magnetic tape drive; 300 lpm printer; and binary synchronous communications controller)	2,880	138,315	717
SYSTEM IV/90 CONFIGURATION			
12-Station System (Includes 1920-charcter, Dual-Intensity Video Displays, 192K-byte processor with decimal arithmetic, two 67.5-megabyte disk drives, one 600-lpm printer, and SLDC/BSC controller)	3,387	175,865	930

*For 42-month lease; includes prime-time maintenance.■

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MANAGEMENT SUMMARY

In December 1976, Four-Phase announced two new members to its System IV family. Designated as the System IV/30 and System IV/55, the new members are limited-capability, stand-alone terminals for use in existing System IV networks at locations where only one or two terminals are needed. Both terminals support one or two display stations or one display station and a serial printer. System IV/30 is compatible with the IV/40 and IV/70 in a DATA IV/70 environment and is supported by a single 2.5 million byte disk drive. System IV/55 is compatible with the IV/50 in a 3270 environment and is supported by a single diskette drive for loading the 3270 simulator.

Four-Phase Systems introduced the System IV/70 in 1970, and later followed it with a scaled-down version called the System IV/40. In June, 1976, the company announced its newest model, the IV/50. While the basic hardware has not changed to any extent since its introduction, Four-Phase has added I/O devices, a network transaction processor, and extensive software capabilities to the point where the systems are now capable of performing in virtually any type of distributed processing environment.

Want an intelligent terminal, a remote batch terminal, a shared-processor key/disk system, an IBM 360 or 370 peripheral subsystem, interactive COBOL programming capability, or IBM 2780/3780, 2260/2848, or 3270 simulation? Four-Phase has a System IV/40, IV/50, or IV/70 that can satisfy your requirements.

In the beginning, Four-Phase emphasized on-line local or remote display applications, and emulation of IBM's display terminals was important. Introduction of the IV/40 added distributed processing to the system's capabilities. When Four-Phase received a warm response ➢

A family of programmable, clustered display terminals designed for data entry and validation, inquiry/retrieval and distributed processing.

The versatile system, built around the company's own minicomputer, supports up to 32 display terminals and printers. Other peripherals include diskette or disk, magnetic tape, and card reader.

Extensive software is offered with the system including a number of operating systems; IBM 2780/3780, 2260/2848 and 3270 simulation; six COBOL packages for distributed processing; three versions of a data entry package; and a new formatting package for development of custom-programmed applications.

A System IV/40 with 4 displays, 24K-byte processor and 2.5M byte disk rents for $604 per month.

A System IV/50 with 12 displays, 72K-byte processor, 2.5M-byte disk and 354K-byte diskette rents for $1,497 per month.

A System IV/70 with 22 displays, 72K-byte processor, 2.5M-byte disk and magnetic tape drive rents for $2,104 per month.

The above prices are based on a 42-month lease and include monthly maintenance.

New product configurations and software flow continually from Four-Phase. The IV/50, shown here, adds a dimension to the distributed processing/data entry/2260 and 3780 emulation environment Four-Phase has long supported. The IV/50 can emulate an IBM 3270 cluster of up to 24 1920 characters displays. It can also be upgraded to support local processing of batch or transaction-oriented COBOL applications.

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from users wanting shared-processor key/disk systems, the company later shifted its emphasis in this direction, and at one time estimated that over half of the IV/70 system installations were for key/disk data entry. The IV/50, scheduled for delivery in the 4th quarter of 1976, is a medium scale system that offers IBM 3270 emulation (at significant cost savings), as well as distributed processing.

Toward the end of 1975, Four-Phase introduced a new series of software packages for use with the IV/40, IV/50, and IV/70 hardware called the NTP (Network Transaction Processing) Systems. The NTP family is designed to enable a user to establish remote sites with varying degrees of local processing capabilities. NTP systems can be used with IV/40, IV/50, or IV/70 hardware. The low end of the NTP line, NTP/100, simulates the IBM 3270 Information Display System, with all transaction processing performed by the central mainframe. At the other end of the line, NTP/200 supports multi-user COBOL applications with all transaction processing performed by the local display system. Other NTP systems combine COBOL transaction processing with concurrent inquiry or batch communications, providing on-line access to both local system files and the central data base. Four-Phase extended its line of software for Network Transaction Processing in June, 1976 with the announcement of STARTER, a display formatting package designed to aid COBOL programmers in writing customized interactive application packages for the system.

To complement the IV/40, IV/50, and IV/70 terminal hardware, and the NTP software, Four-Phase introduced the NP/80 network processor in November 1975. The NP/80 is a "black box" that either controls a network of local and remote Four-Phase multi-terminal systems or fits between such a network and a remote host processor such as an IBM System/360 or 370. An NP/80 can accommodate up to 270 million bytes of disk storage, one or two local high-speed channels (for local IV/70 terminals), up to five communications lines operating at up to 9600 bps (for remote IV/40's, IV/50's, or IV/70's), and one high-speed communications line operating at up to 50,000 bps (for the remote host processor). In the NP/80 is a multiprogramming operating system that provides network control for all of the attached terminal systems, access to a data base maintained on its own disk storage, and access to the host computing system. Maximum memory size is 256K bytes. The NP/80 is essentially transparent to the user. It is used to enhance the capabilities of the Four-Phase IV/40, IV/50, or IV/70 terminals or Network Transaction Processing multi-CRT systems.

The heart of a System IV is the company's own small general-purpose computer. The computer boasts total MOS/LSI contstruction, including its 2.0-microsecond semiconductor memory. The architecture of the 24-bit processor embodies eight 24-bit registers used for control, address manipulation, and arithmetic operations, a priority interrupt system with 8 levels (and 64 sublevels for each of the 8 levels), 8 I/O channels that can operate

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: IV/40—March 1973; IV/50—June 1976; IV/70—September 1970; IV/30 and IV/55—December 1976.

DATE OF FIRST DELIVERY: IV/40—July 1973; IV/50—4th quarter 1976; IV/70—February 1972; IV/30 and IV/55—December 1976.

NUMBER DELIVERED TO DATE: Over 2,500 systems (all models).

SERVICED BY: Four-Phase Systems, Inc.

CONFIGURATION

System IV/40 supports up to 16 video displays; up to sixteen 30-cps printers or two other printers with speed capabilities up to 1800 lpm; a 24K- to 72K-byte processor, a diskette with a 354K-byte capacity; a cartridge disk with a capacity of 2.5 million bytes; a 10-million byte removable disk and a 300-cpm or 600-cpm card reader.

System IV/50 supports up to 24 video displays; up to twenty-four 30 cps printers or two other printers with speed capabilities up to 1800 lpm; a 24K- to 96K-byte processor; a diskette with 354K-byte capacity, up to 270 million bytes of disk storage; and a 300-cpm or 600-cpm card reader.

System IV/70 supports up to 32 video displays; up to thirty-two 30 cps printers or two other printers with speed capability up to 1800 lpm; a 24K- to 96K-byte processor; up to four 2.5-million-byte cartridge disks, up to four 50-million-byte or 66-million-byte removable disks; one 354K-byte diskette; up to four magnetic tape drives; a 300-cpm or 600-cpm card reader; and a communications channel adapter.

Systems IV/30 and IV/55 are single-station fixed-configuration terminals. Each contains a processor with 24,576 bytes of memory and a bisynchronous communications controller. System IV/30 includes a 2.5 million-byte cartridge disk drive. System IV/55 includes a diskette drive for simulator loading. System IV/30 and IV/55 each support a second display station or a printer. The following printers are supported: 8121, 8135, 8148, and 8149.

TRANSMISSION SPECIFICATIONS

Either of two communications controllers is available. The Asynchronous Data Set Controller operates asynchronously in the half- or full-duplex mode at data rates up to 110, 150, 300, 600, 1200, 1800, or 2400 bits/second and can accommodate any 9- to 11-bit code; it features an automatic answer capability. The Binary Synchronous Data Set Controller operates synchronously in the half- or full-duplex mode at user-specified data rates up to 9600 bits/second and can accommodate any 7- or 8-bit code. Both controllers provide an EIA RS-232C interface.

DEVICE CONTROL

Operation of the System IV systems is directed from the individual video terminals under control of the operating software. The video terminals are similar in concept and design to conventional CRT terminals and include an extensive set or cursor and edit controls, function controls, and an adding-machine capability. Cursor controls, which provide a wraparound capability, can move the cursor right,

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in a multiplexor or burst mode, single-level indirect addressing, and a robust instruction repertoire.

Four-Phase Systems provides complete systems support for its terminal systems. Software support includes a Disk Operating System, a COBOL compiler with extensions for operating in a video display environment, and an assembly language that includes two assemblers so that programs can be assembled either on the IV/70 or on a 65K IBM System/360 or 370 computer.

The NTP (Network Transaction Processing) Series of software packages provides extensive support for a distributed processing environment. NTP/1000 provides all of the functions of an IBM 3270 Display system through software emulation. NTP/150 enables the system to function as a programmable remote batch terminal that can replace IBM 2780 Data Transmission Terminals or 3780 Data Communications Terminals; NTP/150 has all the features of NTP/100 plus COBOL programming capability. NTP/200 allows the system to function as a stand-alone COBOL-programmed display system. NTP/230 adds COBOL programming capability while enabling the system to serve as a remote batch terminal using IBM 2780/3780 protocol. NTP/250 provides COBOL programming and interactive communications using IBM 3270 protocol.

DATA IV/70 is a software application package that transforms a System IV into a multi-station key/disk data preparation system with a remote batch capability. Data is keyed into a displayed format via a "fill-in-the-blanks" technique. Entered data is edited, validated, and intermediately stored in a disk file. Record batches can then be output onto tape, transferred directly to a computer, or transmitted via a data communications link.

The COBOL compiler and Disk Operating System permit the System IV/70 to process data entry files in a stand-alone mode. System IV/70 COBOL, a comprehensive subset of ANSI COBOL, includes terminal-oriented video extensions that enable users to generate COBOL programs for both interactive and batch applications. An Assembler and Video Display Library provide additional user programming flexibility.

STARTER, designed for IV/40, IV/50 and IV/70, is a parameter-driven package that allows users to unite interactive applications themselves. With STARTER, formats are created off-line from the keyboard, and supplemented with basic editing and free-form positioning, development; test and modifications are program-independent.

The instruction repertoire provided with the System IV is truly impressive. You want floating-point multiplication and division? You've got it, not to mention fixed-point multiplication and division, list processing, character manipulation, comprehensive branch instructions, etc. They're all there.

left, up, down, to the initial line and character position of the screen (home), and to the initial character position of the next line (return). Roll controls roll the displayed text up or down, line by line. Insert and delete controls insert or delete a character or a line in or from the displayed text.

Screen and line erase are also provided. The Tab control produces any of three codes as the result of shifted, unshifted, or control shift operation. Under program control, these cursor and edit controls can be assigned to virtually any display function. A set of 13 function controls can be programmed to implement application-dependent operations to extend the system's range of usefulness. The adding-machine capability provides separate numeric and function controls for high-volume numeric operations.

The NP/80 Network Transaction Processor is built around a 16-bit minicomputer. Maximum memory size is 256K bytes. Memory in large configurations is made from 16K-bit, M-channel, silicon gate RAM chips. For smaller configurations, the company has a 4K-bit chip memory unit. Memory cycle time is 500 nanoseconds. An NP/80 can accommodate up to 270 million bytes of disk storage, one or two local high-speed channels, up to five communications lines operating at up to 9600 bps, and one high-speed communications line operating at up to 50,000 bps.

The NP/80 can either control a network of local and/or remote Four-Phase multi-terminal systems or fit between such a network and a remote host processor such as an IBM System/360 or 370.

SOFTWARE

Four-Phase supports its System IV with an extensive array of software capabilities. Aside from the operating system software, Four-Phase offers a family of six COBOL-programmed packages for use in a distributed processing environment, an IBM 2260 Simulator, and three versions of a data entry package.

Programming is performed in COBOL IV/70, RPG IV/70, or in IV/70 Code, a two-pass, general-purpose assembly language. Programs can be compiled on the System IV/70 under the Disk Operating System (DOS) or on a 65K IBM System/360 or 370 under OS or DOS.

COBOL IV/70 includes ANSI modules Nucleus 1, Table Handling 2, Sequential Access 1, Random Access 1, and Library. In addition, it provides a linkage section and call verb to permit the use of assembly-language subroutines, plus display-oriented extensions for operating in a video display environment. COBOL IV/70 requires a Model 7002 processor with 48K bytes, disk, card reader, and printer; it will support all system peripherals and both random and sequential disk files.

Sytem IV/70's *Disk Operating System* permits source files to be kept on disk, edited, and used as input to RPG, the Code Assembler, or COBOL Compiler. The IV/70 DOS consists of an extensive family of programs that includes IV/70 RPG, the Code Assembler, COBOL Compiler, Relocatable Loader, a Video Display Library, a Sort/Merge package, and a System Relocatable Library. DOS operates with either processor model; it requires at least 24K bytes of main memory, a single disk-cartridge drive, card reader, and printer. DOS supports all system peripherals.

Four-Phase's *Network Transaction Processing (NTP)* series is a family of COBOL-programmed display-processing systems for on-line applications in a distributed processing environment.

NTP/100 provides all the functions of an IBM 3270 Display System through software emulation. This package provides

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Display units are separate from their keyboards and can be located up to 2000 feet from the computer. There are three display models, which provide several display arrangements ranging from 288 to 1920 characters per screen.

The legibility of information displayed by the Four-Phase systems is superior to that of many displays now on the market as a result of a more detailed character array. Cursor manipulation is extremely flexible and is a function of the provided display software, which can be tailored to the user's needs. Extensive editing is also provided, along with the capability to "roll and scroll" the displayed text up and down to present additional data stored in the main memory.

The System IV's variety of I/O devices and their communications capability allow it to be configured to suit the needs of many applications. Some of these, suggested by Four-Phase, include text composition and editing, credit authorization, order and inventory management, and customer account service. Although a variety of software, as mentioned, is available with the systems, these specific stand-alone applications are not supported; the application program must be produced and implemented by the user.

The foregoing discussion is a good picture of a flexible system. It does not, however, apply to the "packaged" Model 7008. This key/disk data entry system includes eight 288-character displays, a disk drive, a magnetic tape drive, and a processor with 24K bytes of memory. You have your choice of IBM 29 keypunch-style or typewriter-style keyboards (but not both in the same system) and whether or not you want a 30-cps printer, but those are your only options. And only data entry software is provided. There is no support for custom application programming using COBOL or assembly language nor for data communications.

USER REACTION

Datapro's March 1977 survey of alphanumeric display terminal users included responses from 16 users of the Four-Phase System IV. These responding users had a total of 1670 display stations installed. The ratings are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	6	8	1	0	3.3
Ease of operation	7	7	1	0	3.4
Display clarity	4	7	3	1	2.9
Keyboard feel and usability	6	5	3	1	3.1
Hardware reliability	7	6	2	0	3.3
Maintenance service	4	6	3	2	2.8
Software & technical support	1	5	8	1	2.4

*Weighted Average on a scale of 4.0 for Excellent.

These ratings are somewhat lower than those reported in last year's survey, but they still reflect general user satisfaction with all aspects of the System IV except for software and technical support. Though four users specifically commented on strong vendor support, seven users for operation in either local or remote environments and handles 480- or 1920-character displays. NTP/100 on a System IV/40 supports up to 16 display terminals and either 16 character printers or 2 line printers. A Format Storage capability enables selected formats to be displayed instantly from local memory, so there is no waiting for prompts. A Store-and-Forward Mode feature enables operators to key in data even during periods when the communications line or central mainframe is down. When on-line operation resumes, the locally stored records are then transmitted. NTP/100 also contains facilities test features that can be used to pinpoint troubles in the communications equipment, log line traffic, display format attribute bytes, write memory checkpoints to screen or disk, and accumulate error statistics.

NTP/130 is a remote batch system that provides a full complement of IBM 2780/3780 features including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported inlcude 300- and 600-cpm card readers, printers ranging in speeds from 300 to 1800 lines per minute, and a diskette or cartridge disk drive for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be input from the card reader, another job to be output from the disk to the printer, and a third job to be transmitted or received concurrently. Reports can be transmitted to unattended NTP/130 systems at night without concern over forms changing or device availability. The spooled data can then be printed during the day while other operations are being performed. During transmission, the host CPU creates separate disk files on the remote system for each job. Reports can be generated and local system files updated using user-programmed software. Concurrent remote batch and source data entry are available with the DATA IV/70 software package. Up to 22 video displays are supported with extensive editing, validation, and conditional logic capability.

NTP/150 provides all the capabilities of the NTP/100 (3270 Simulator) system plus COBOL programming. Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparisons, can be programmed into the system to enable local handling of data. Entries may be validated against local files, and filed data can be integrated with keyed data for transmission or with received data for displaying or printing. Four-Phase claims that the COBOL-programmed routines to perform these functions can be added to the system without having to modify the existing 3270 application programs, systems software, or network configuration. COBOL routines can be invoked when data is transmitted or received, when the TAB or Program Function keys are pressed, or when entries in designated fields are completed. The subroutines can then access local disks, printers, and displays or the central CPU before returning control to the operator. COBOL processing is performed in the background and can support multiple tasks at multiple displays with concurrent key entry and printing.

Operators are notified of errors by an audible alarm and a flashing message. Keyboards can be disabled until corrective action is taken or to restrict access to personnel who fail to enter approved passwords.

NTP/150 can also spool print data from line to disk without the mainframe overhead and formatting normally required for 3270 printing. Under local control, the print files can be output when convenient on multiple printers at

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(44 percent) mentioned disatisfaction with support. However, most comments were on the positive side. Users cited low cost (13 responses) programmability (8), applicability (9), flexibility (7), reliability (8), and compact size (5) as key attributes of the System IV. Equipment unreliability, performance limitations, and poor maintainability were cited by a total of 4 users.□

maximum speed. Total flexibility is provided for routing, pausing, backspacing, restarting, and repeating.

NTP/200 is a stand-alone, COBOL-programmed display system. The system supports up to 16 (System IV/40), 24 System IV/50), or 32 (System IV/70) displays for entry, inquiry, processing, and printing. Multi-tasking allows different activities to be supported at different displays simultaneously, and files may be accessed using sequential, direct, or multi-key ISAM accessing methods. NTP/200 uses an extended ANSI COBOL that supports transaction processing with displays and keyboards. Programmers may define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas can be manipulated like any Working Storage area; thus, the programmer can read and write data to operator displays without going through the COBOL file structure. COBOL and Assembly-language subroutines can be executed on-line, and can be overlaid to conserve memory.

Data management facilities are provided for accessing of up to 264 million bytes of local disk storage. Serial and direct files are processed using the Sequential Access and Random Access features of ANSI COBOL. A third access method, DISAM, provides multi-indexed files that may be referenced by a primary key and up to 10 secondary keys. Files created or maintained in on-line operations can also be processed in batch mode using COBOL, RPG, Sort/Merge, and an extensive selection of utilities.

NTP/230 operates under ANSI COBOL control and supports concurrent batch communications with IBM 2780/3780 protocol. Up to 16 (System IV/40), 24 (System IV/50) or 32 (System IV/70) displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. Using NTP/230, IV/40, IV/50 and IV/70 systems can communicate with any system using IBM 2780/3780 discipline, including other System IV/40's and IV/70's using NTP/130 or NTP/230, and with IBM System/3's, 360's, and 370's. NTP/230 contains standard ANSI COBOL modules for Nucleus, Table Handling, and Sequential Access; plus enhanced Table Handling with three levels of subscripting/indexing, Random Access, and Library. Facilities for Sort and Segmentation are available through the Interrupt Disk Operating System, while report writing is accommodated by RPG. NTP/230 also provides video extensions for interactive support of displays and keyboards.

NTP/250 provides COBOL programming capability with concurrent interactive communications using IBM 3270 protocol, while supporting up to 16 (System IV/40), 24 (System IV/50) or 32 (System IV/70) video displays for entry, inquiry, processing, and printing. While fully compatible with IBM 3270 line protocol, NTP/250 eliminates the restrictions of 3270 formatting. Records are transmitted as is, without the mainframe overhead normally required for mapping attribute bytes, display commands, and buffer orders into the data stream. Multi-user applications are developed in ANSI COBOL for data entry, retrieval, and document preparation. Under COBOL control, operator-oriented procedures can be implemented to produce format branches, flips, and overlays; position the cursor to any location; display messages and prompts; and customize display functions with paging and scrolling. Using NTP/250, the System IV/40, IV/50 or IV/70 can be treated by the mainframe as any other peripheral–callable with PUTS and GETS like a tape drive or disk. Inquiries may be initiated manually by system operators, or automatically under program control. For more efficient utilization of system resources, dynamic task assignment allows any display to perform any activity, regardless of physical address. Received records can be reformatted using COBOL procedure statements; thus, compressed or scrambled data can be sent unmodified for local expansion and display. Similarly, entire files can be passed to NTP/250 for local manipulation and updating without mainframe loading. Using NTP/250, System IV/40's, IV/50's, and IV/70's can be multidropped on the same line with other System IV/70's using NTP/250, NTP/100, or NTP/150, or with IBM 3270's.

A variety of powerful *data management facilities* is provided with the Network Transaction Processing software to create, access, and maintain local system files. Three access methods are supported: Sequential Access Method (SAM) for processing serial files, Direct Access Method (DAM) for random or sequential access based on an actual key, and Data Indexed Sequential Access Method (DISAM), a multi-key ISAM optimized for interactive access to dynamically changing data.

DISAM eliminates data duplication by accessing files with a unique primary key and up to 10 secondary keys. For example, an inventory file may be accessed by part number, item description, and vendor number. Searches with generic and duplicate keys retrieve all records with common index fields. DISAM supports storage capacities from 2.5 to over 260 million bytes. Records may be read, written, modified, inserted, and deleted randomly or sequentially. Backup is provided by removable packs and multiple drives.

To insure security and privacy, all files can be protected with passwords to preclude unauthorized access.

NTP programs can be developed on the same systems used to run them. The *Interrupt Disk Operating System* facilitates program entry, editing, compilation or assembly, loading, and initiation. IDOS is completely disk-resident and is not required in memory during program execution. As a result, the Four-Phase systems can devote all available memory to application support.

DATA IV/70 provides the software support necessary to use the System IV/30, IV/40 or IV/70 as a shared-processor data entry system. There are three versions of DATA IV/70, and in general they all provide for data entry (using a fill-in-the-blanks approach with prompting messages that are not included in the output record), for extensive data editing and manipulation, for verifying previously entered records, and for searching for specific records with or without updating when found.

Version 1 of DATA IV/70 provides up to six program formats per job. Multiple jobs can be running at the same time, and formats can be shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters, the maximum tape block size. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Numeric relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having an arithmetic relationship. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

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Up to four 2.5-million-byte disk drives are supported by DATA IV/70 Version 1 to provide a data file storage capacity of up to 80,000 80-character records. Either keypunch-style or typewriter-style keyboards are supported, but they cannot be mixed in the same system. Data can be printed from the screen or from the disk file. Data can also be transferred to tape from the disk while key entry continues. Output options supported include magnetic tape, direct connection to an IBM System/360 (Model 30 or larger) or an IBM System/370, and remote data communications using binary synchronous line discipline.

Version 2 of DATA IV/70 provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, and support for mixed keypunch and typewriter-style keyboards. Provisions for conditioned logic are included to enable adaptive data validation during key entry. Conditional branches to different editing sequences and operator prompts can be inserted at any point in a format. Single and nested statements of the form IF ... THEN ... ELSE can reference previously entered fields, accumulator values, alphanumeric constants, value sets, and arithmetic and logical combinations of these.

When used with the Model 7008, not all the features of DATA IV/70 Version 2 can be utilized because of the restricted configuration of the Model 7008. In particular, only one disk drive is supported, only a 30-cps printer can be included, and a data communications interface is not provided.

Version 3 of DATA IV/70 accommodates concurrent data entry, retrieval, update, and communications functions and has ISAM capability. Support for up to 16 video displays is provided for interactive accessing of up to 1000 indexed sequential files, as well as storage capability for over 260 million bytes. Source data can be entered and validated on fully formatted screens displaying up to 1920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing.

In the data entry mode, DATA IV/70 Version 3 can validate operator entries against local master files containing up to 50,000 records and extract stored data for automatic entry. Data can be integrated with keyed entry on fully formatted screens. In data retrieval operations, Version 3 enables all system operators to work simultaneously with the same current information. Records up to 750 characters long are retrieved instantly by typing numeric, alphabetic, or alphanumeric key fields. Any file can be accessed by all displays simultaneously. Version 3 supports IBM-compatible bisync communications for transmission at speeds up to 9600 bps. Either dial or leased lines may be used with IBM 2780/3780 protocol.

Software is also available which enables either the System IV/40 or IV/70 to function as an IBM 2260 simulator. All functions of an IBM 2260/2848 Display System are provided through software emulation. This package enables operation in either local or remote environments and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units on the same IV/40 or IV/70, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

COMPONENTS

KEYSTATIONS: The keystations used in the system system contain a video display and keyboard with optional Dual Intensity and Audible Alarm features. Each display has a character set of 120 ASCII symbols, including upper and lower case alphabetics, numerics, and special symbols. Characters are generated by a 7-by-9 dot matrix. The video display configurations vary depending on the software being used and the hardware system, as follows:

Configurations for NTP/100 and NTP/150

Char./ Line	Lines/ Screen	Char./ Screen	Max. No. of Displays IV/40	IV/50	IV/55*	IV/70
40	12	480	16	24	2	32
80	24	1,920	8	12	2	16

*Runs under NTP/100 only.

Configurations for NTP/200, NTP/230, and NTP/250

Chars./ Line	Lines/ Screen	Chars./ Screen	Max. No. of Displays IV/40	IV/50	IV/70
48	6	288	16	24	32
48	12	576	16	24	32
48	24	1,152	8	24	32
80	6	480	16	24	32
80	12	960	16	24	32
80	24	1,920	8	24	32

Any of six cursor symbols is available. User-selected cursor parameters allow the cursor to blink or remain steady and to be destructive or nondestructive. Multiple cursors can be programmed to extend display control.

Messages can be highlighted for attention or blanked for security when using the Variable Intensity feature, which permits characters to be displayed at normal or high intensities or blanked (not displayed). Control is provided by non-displayed attribute characters, which can be interspersed within the data stream. Software support is provided by NTP/100 software.

The Audible Alarm feature alerts the operator to special conditions such as errors or end of line. Software support is provided under several operating programs.

DISK STORAGE: There are four disk models available for use with Four-Phases's intelligent terminal systems. The following table shows the basic disk characteristics and their use with the various systems.

Model	Type	Capacity, megabytes	Transfer Rate, bytes/sec.	Number per System IV/40	IV/50	IV/70
8230	Cartridge	2.5	184K	1	2	4
8240	Pack	50	312K	0	0	4
8250	Diskette	0.354	31K	1	1	1
8260/61	Pack	67.5	250K	0	4	4

The 8230 Cartridge Disk Drive uses a removable cartridge, similar to the IBM 2315 cartridge, with a capacity of 2.5 million bytes. The disk is organized in 200 active tracks per side, with eight 768-byte sectors per track. The access mechanism carries two heads, one for each disk surface, which results in a cylinder capacity of just over 12K bytes. Head positioning time is 70 milliseconds track to track, average rotational delay is 20 milliseconds, and data transfer rate is 184K bytes per second.

The 8420 Pack Disk Drive uses a removable disk pack equivalent to the packs used on the IBM 2314 disk drives.

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Each pack provides a storage capacity of 50 million bytes. The packs are recorded in double-density fashion. Each disk surface carries 400 active tracks. The access mechanism links a head for each surface, yielding a cylinder capacity of just over 120K bytes. Only one-half of a cylinder can be transferred in one operation. Tracks are organized in eight 768-byte sectors. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312K bytes per second.

The 8250 Diskette Drive uses a diskette or "floppy" disk cartridge. Data is recorded on one surface only, in 64 tracks of four 1146-byte sectors each. Total capacity of the diskette is 293,376 bytes. Arm movement time is 10 milliseconds per track plus 10 milliseconds head settling time; average rotational delay is 80 milliseconds. Data transfer rate is 31K bytes per second. The controller supports only one drive.

The 8260 and 8261 Pack Disk Drive uses a removable disk pack with a storage capacity of 67.5 million bytes. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 250K bytes per second. The 8260 contains an integral controller that acommodates up to 3 8261 drives.

MAGNETIC TAPE: There are five magnetic tape subsystems which can be used with the Four-Phase IV/70 system. The following table reflects the characteristics of the models available:

Model	8501	8502	8503	8504	8507
Tracks:	9	9	9	9	7
Density, bpi:	800	800	1600	1600	556/800
Data rate, Kbs:	10	10	60	60	6.95/10
Tape speed, ips:	12.5	12.5	37.5	37.5	12.5
Rewind speed, ips:	50	50	100	100	50
Reel size, inches:	10.5	8.5	8.5	10.5	8.5

Each tape subsystem includes a controller capable of handling four drives, except for the 8504 and 8507 subsystems, which include only a single-unit controller. The IV/70 system can accommodate only one controller. The 8.5-inch reels accommodate 1200 feet of tape; the 10.5-inch reel, 2400 feet. All recording formats are industry-compatible. Tape tension is supplied by means of tension arms in all models.

PRINTERS: Four-Phase offers six printer models for use with its intelligent terminal systems. The basic characteristics of these printers and the maximum number of printers which can be used on a IV/40, IV/50, and IV/70 system are shown in the table below:

				Number Per System		
Model	Speed	Number of Characters	Number of Columns	IV/40	IV/50	IV/70
8121	30 cps	96	132	16	24	32
8131	30 cps	64	132	2	2	2
8135	100 or 164 cps	64	80 or 132	2	2	2
8146	145-1110 lpm	64	132	2	2	2
8148	300 lpm	64	132	2	2	2
8149	600 lpm	64	132	2	2	2
8151	700-1800 lpm	64	132	2	2	2

The 8121 Printer is the Diablo 30-character-per-second incremental printer. The character disk (type wheel), vertical movement, and horizontal movement are all servo-driven. Vertical increments are 48 per inch, and horizontal increments are 60 per inch, giving very flexible control over output. Sprocketed or unsprocketed forms up to 15 inches wide can be accommodated. The unit prints a 96-character ASCII set. The type wheel can be changed by the operator. At 10 characters per inch, up to 132 columns can be printed. Features include left and right tabulation directly to a selected location, and snap-in ribbon cartridges.

The 8131 Printer is the familiar UNIVAC 30-character-per-second unit. It uses a rotating helical print wheel with a single hammer actuator, and accommodates six-part continuous forms up to 14-7/8 inches wide. Horizontal spacing is 10 characters per inch, and vertical spacing is 6 lines per inch. The unit prints 64 characters in up to 132 columns.

The 8135 Printer is a character printer, switch-selectable for 80 or 132 columns. It has a moving-head mechanism that forms characters serially from left to right on a 7-by-9 dot matrix. The paper tractors are adjustable to accommodate edge-punched forms up to 9-3/8 inches wide from pin to pin. Vertical tab, form feed control, and automatic skipping over perforations are provided by a 2-channel vertical format control unit that uses standard 8-channel opaque paper tape. Printing speed is 100 cps for 80 columns or 165 cps for 132 columns.

The 8146 Line Printer uses a 64-character print drum. Print speed varies with the number of columns printed, spanning the range of 245 lpm (132 columns) to 1110 lpm (24 columns). Continuous six-part forms up to 19-7/8 inches wide can be accommodated. Vertical spacing is operator-selectable at 6 or 8 lines per inch. An 8-channel vertical format control unit is provided. Paper advance rate is 13 inches per second for long skips.

The 8148 Line Printer is also a drum printer. It can print continuously at 300 lines per minute. It can print up to 132 columns on six-part continuous forms up to 16¾ inches wide. The character set includes 64 symbols. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. High-speed paper advance rate is 20 inches per second. A 12-channel vertical forms control is included.

The 8149 Line Printer is a chain printer rated at 600 lpm with a 64-character set. The printer provides 132 print positions. Horizontal and vertical spacing are 10 char./inch and 6 or 8 lines/inch, respectively. Continuous six-part forms from 4 to 16.75 inches wide can be accommodated. A 12-channel vertical forms control is included.

The 8151 Line Printer provides high-speed output with a 64-character set. The printing speed depends on the number of positions printed. The range is 700 lpm (132 columns) to 1800 lpm (72 columns). Continuous six-part forms up to 19-7/8 inches wide can be accommodated. Vertical spacing is 6 or 8 lines per inch, and is operator-selectable. High-speed paper advance rate is 35 inches per second. An 8-channel vertical forms control unit is included.

CARD READERS: Two desk-top card readers are available. The 8001 reads at 300 cpm, and the 8003 reads at 600 cpm. Each unit includes a controller that performs code translation. A special device, the 8010 Multiple Loading Switch, allows a single card reader to be used for loading up to 8 systems; a separate controller (8011) must be installed in each of the systems.

PROCESSOR: The processor used with the IV/40, IV/50, and IV/70 systems contains a 2.0-microsecond semiconductor memory and eight 24-bit multifunction registers. The 24-bit machine provides both direct and single-level indirect addressing. Three registers are available for address modification. The priority interrupt system provides 8 levels of interrupt, each with a unique memory location and each with 64 sublevels. Hardware is used to provide automatic interrupt recognition. The standard instruction repertoire

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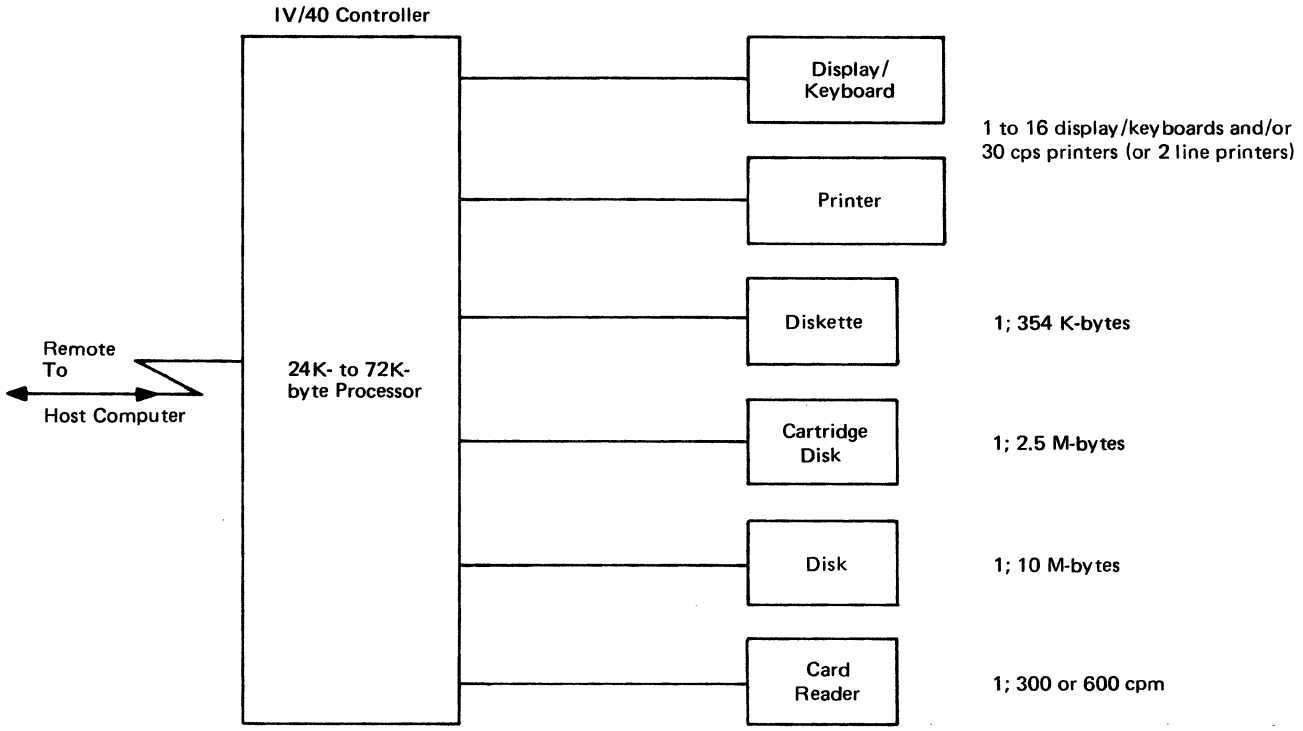
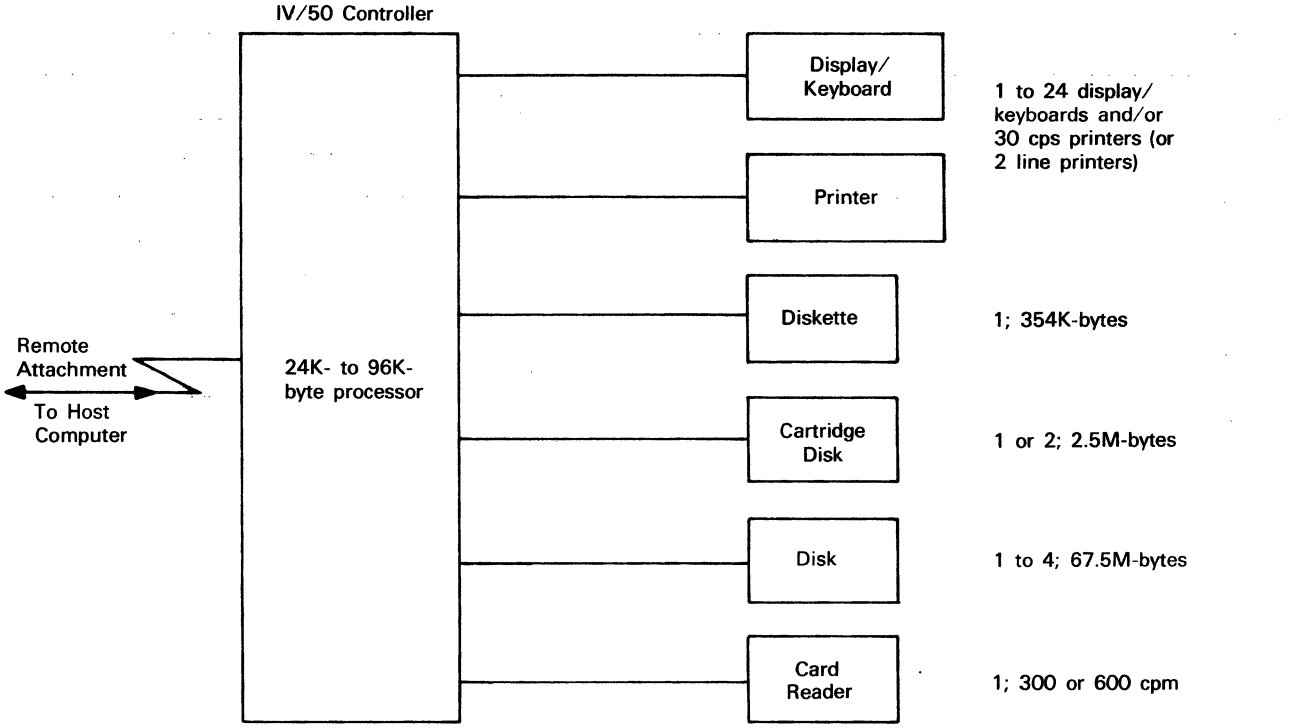
includes 113 discrete commands: 12 word/character manipulation, 5 list processing, 17 load/store, 11 fixed-point and 5 floating-point arithmetic, 4 comparison, 8 shift, 19 branch/skip, 11 register-to-register, 6 logical, 5 control, 4 interrupt handling, and 6 I/O instructions. Arithmetic operations are provided for addition, subtraction, multiplication, and division.

Four-Phase processors are available in a number of models for the IV/40, IV/50, and IV/70 systems; the only differentiation between models is in the memory size and/or disk type supported. The IV/40 system models are designated as the 4000 series, the IV/50 as the 5000 series, and the IV/70 as the 7000 series. The following table shows the models available.

Configuration





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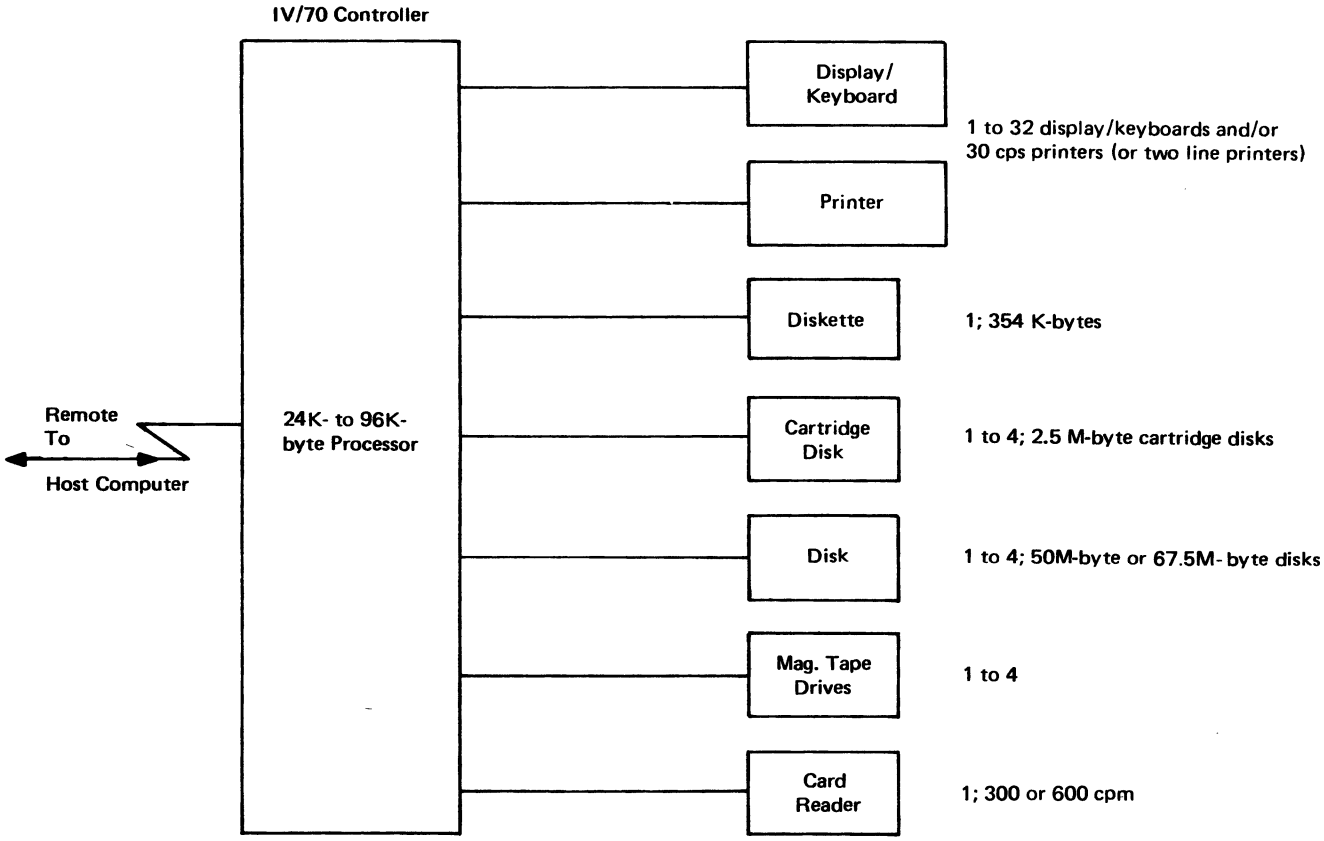

Model No.	Memory Size	Disk Type
4100	24K bytes	354K-byte diskette
4200	24K bytes	2.5-million-byte cartridge
4210	24K bytes	2.5-million-byte cartridge
4300	24K to 72K bytes	354K-byte diskette
4500	24K to 72K bytes	2.5-million-byte cartridge
4700	24K to 72K bytes	2.5-million-byte cartridge
5001	24K to 96K bytes	2.5-million-byte cartridge or 67.5-million-byte disk
7001	12K to 24K bytes	Any
7002	48K to 96K bytes	Any
7008	24K bytes	2.5-million-byte cartridge

PRICING

Four-Phase refused to supply Datapro with pricing information for the individual components of its systems, but did provide the following prices for system configurations "representative of what Four-Phase is selling today."

	Monthly Rental*	Purchase	Monthly Maint.
SYSTEM IV/30 CONFIGURATION			
Single-station Data Entry System (Includes one 1920-character Video Display, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	347	25,000	140
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/40 CONFIGURATIONS			
4-Station Data Entry System (Includes 4 1152-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	611	37,440	166
16-Station Data Entry System (Includes 16 576-character video displays, 72K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	1,283	66,700	321
Remote Batch System (Includes 24K-byte processor with 354K-byte diskette drive, binary synchronous communications controller, one 1152-character Video Control Console, one 300-cpm card reader, and one 300-lpm printer)	777	47,350	253
16-Station IBM 3270 Display System (Includes 16 480-character Dual Intensity Video Displays, a 48K-byte processor with 354K-byte diskette drive, and a binary synchronous communications controller)	1,073	57,490	292
8-Station Transaction Processing System (Includes 8 1152-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and decimal arithmetic, a 300-lpm printer, and a binary synchronous communications controller)	1,334	69,330	349

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	Monthly Rental*	Purchase	Monthly Maint.
SYSTEM IV/50 CONFIGURATION			
12-Station Transaction Processing System (Includes 12 Dual Intensity Video Displays, 72K byte processor, 2.5M byte disc, 354K byte diskette, a 30 cps printer, and bisync communications controller)	1,497	93,145	411
SYSTEM IV/55 CONFIGURATION			
Single-station IBM 3270 Simulator (Includes one 1920-character Dual Intensity Video Display, 24K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	234	19,500	95
Additional 1920-character Video Display	35	1,845	7
SYSTEM IV/70 CONFIGURATIONS			
12-Station Data Entry System (Includes 12 288-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and 9-track magnetic tape drive)	1,440	68,115	316
22-Station Data Entry System (Includes 22 288-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and 9-track magnetic tape drive)	2.017	6	461
32-Station IBM 3270 Simulator (Includes 32 480-character Dual Intensity Video Displays, 48K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	2.091	98,045	486
16-Station Transaction Processing System (Includes 16 1152-character Video Displays; 96K-byte processor with decimal arithmetic, 67.5-megabyte disk drive, and 9-track magnetic tape drive; 300 lpm printer; and binary synchronous communications controller)	2,880	138,315	717

*For 42-month lease; includes prime-time maintenance.■

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New Product Announcement

In June 1977, Four-Phase Systems introduced *System IV 90,* a top-of-the-line member of its prominent System IV family. System IV/90 accommodates up to 32 display stations and is upward-compatible with the other family members. It also accommodates all Four-Phase peripherals, including up to 270 megabytes of cartridge disk storage, and all existing Four-Phase software, so that user application programs can be run without change. System IV/90 features a new, more powerful processor, which is two to eight times as fast as the other Four-Phase processors. The System/90 processor is based on existing architecture and features a repertoire of 126 instructions (13 additional), byte addressing, binary-to-decimal and decimal-to-binary conversion, and an interruptible block move.

The processor is equipped with 96K bytes of memory and can be expanded to 192K bytes via a second 96K-byte memory module. All memory is treated as mapped memory and memory references are created via a mapper.

The Model 8437 Intelligent Communications Controller, also announced with the IV/90, supports both BSC and SDLC protocols at rates up to 9600 bps. The 8437 controller with its own processing unit and 16K bytes of memory, relieves the IV/90 processor of communications overhead by performing all low-level line and record-handling functions. What's more, the System IV/90 with the 8437 supports concurrent communications and I/O operations. The 8437 is composed of two logic cards that mount in the System IV/90 processor.

A typical System IV/90 with 12 1920-character, dual-intensity display stations, a 192K-byte processor with decimal arithmetic, two 67.5-megabyte disk drives, a 600-lpm line printer, and the 8437 controller can be rented for $3,387 per month on a 42-month lease, including maintenance, software, systems engineering support, and systems education services. The same configuration sells for $175,865. Production deliveries of the IV/90 began in July 1977.

Four-Phase Systems also announced *Vision* and *ForeWord,* two software packages for multifunction transaction processing and word processing, respectively.

Vision combines data entry, on-line inquiry and retrieval, local data management report and document generation, and batch communications. Vision accommodates multiple operations, multiple jobs, and multiple functions simultaneously on the same system. A multitasking operating system supports a dialog oriented formatting language and a macro command language for concurrent report and document generation. Vision communicates interactively with host mainframes using IBM 3270 protocol. Information from local files and a central data base can be accessed for display, data validation, or direct record entry, either under operator control or automatically via format commands. Data can be retrieved without knowledge of its network location, since inquiry routing can be made transparent. Data can be exchanged with the host computer via IBM 2780 or 3780 protocol in the batch mode. Downline loading permits centrally-maintained data files, entry formats, output programs, and systems software to be transmitted to Vision systems for synchronization of remote data bases and system functions throughout a network.

Vision performs general calculations on data batches with decimal arithmetic and conditional logic. Results can be transferred to disk or tape storage, printed, or displayed while multistation data entry and communications continue uninterrupted. Up to five files can be accessed concurrently with indexed looping for multi-record operations. Vision is available free of charge with any Four-Phase system and will be made available for September 1977 deliveries.

Foreword is a shared-logic word processing system that supports up to 16 1920-character display stations and 16 printers. ForeWord can be used with any Four-Phase system; it supports up to four disk drives, having an on-line storage capacity of 400 to 40,000 pages of text. ▷

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Long documents can be revised via single-key functions that insert, delete, or move characters, words, sentences, and paragraphs on the display screen. Editing keys control the instant recall and rapid scrolling of text. Additional functions include automatic word wraparound and end-of-line adjustment, discretionary hyphenation, individual glossaries for two-character callout of phrases and paragraphs, and global search and replace. ForeWord also supports text transmission and reception. A 4-station system with two 400-page disks, two printers, and a communications controller rents for $315 per station on a 42-month lease, including maintenance, software, and educational services. A 12-station system with 4 printers, 10,000 pages of on-line storage, and a communications controller rents for $211 per station on a 42-month lease including maintenance, software, and educational services. ForeWord is scheduled for September 1977 delivery. □

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MANAGEMENT SUMMARY

Four-Phase Systems introduced the System IV/70 in 1970, and later followed it with a scaled-down version called the System IV/40. In June, 1976, the company announced its newest model, the IV/50. While the basic hardware has not changed to any extent since its introduction, Four-Phase has added I/O devices, a network transaction processor, and extensive software capabilities to the point where the systems are now capable of performing in virtually any type of distributed processing environment.

Want an intelligent terminal, a remote batch terminal, a shared-processor key/disk system, an IBM 360 or 370 peripheral subsystem, interactive COBOL programming capability, or IBM 2780/3780, 2260/2848, or 3270 simulation? Four-Phase has a System IV/40, IV/50, or IV/70 that can satisfy your requirements.

In the beginning, Four-Phase emphasized on-line local or remote display applications, and emulation of IBM's display terminals was important. Introduction of the IV/40 added distributed processing to the system's capabilities. When Four-Phase received a warm response from users wanting shared-processor key/disk systems, the company later shifted its emphasis in this direction, and at one time estimated that over half of the IV/70 system installations were for key/disk data entry. The IV/50, scheduled for delivery in the 4th quarter of 1976, is a medium scale system that offers IBM 3270 emulation (at significant cost savings), as well as distributed processing.

Toward the end of 1975, Four-Phase introduced a new series of software packages for use with the IV/40, IV/50, and IV/70 hardware called the NTP (Network Transaction Processing) Systems. The NTP family is designed to enable a user to establish remote sites with varying degrees of local processing capabilities. NTP systems can be used ➢

A family of programmable, clustered display terminals designed for data entry and validation, inquiry/retrieval and distributed processing.

The versatile system, built around the company's own minicomputer, supports up to 32 display terminals and printers. Other peripherals include diskette or disk, magnetic tape, and card reader.

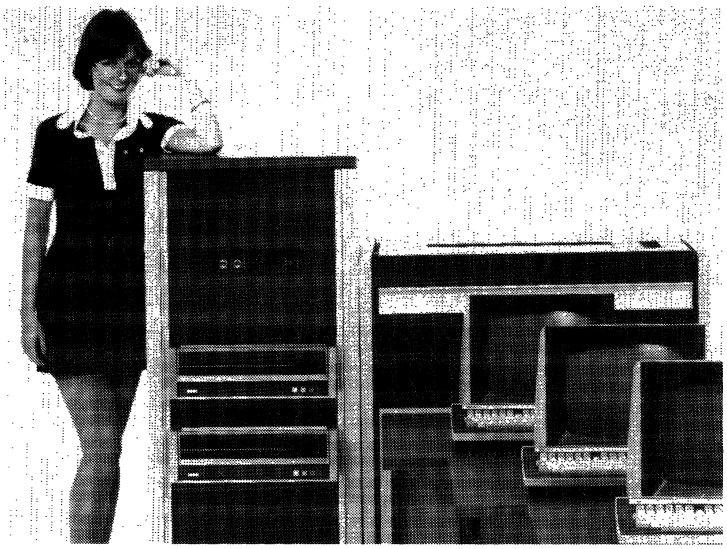
Extensive software is offered with the system including a number of operating systems; IBM 2780/3780, 2260/2848 and 3270 simulation; six COBOL packages for distributed processing; three versions of a data entry package; and a new formatting package for development of custom-programmed applications.

A System IV/40 with 4 displays, 24K-byte processor and 2.5M byte disk rents for $604 per month.

A System IV/50 with 12 displays, 72K-byte processor, 10M-byte disc and 354K-byte diskette rents for $1,335 per month.

A System IV/70 with 22 displays, 72K-byte processor, 2.5M-byte disk and magnetic tape drive rents for $2,104 per month.

The above prices are based on a 42-month lease and include monthly maintenance. ➤



New product configurations and software flow continually from Four-Phase. The IV/50, shown here, adds a new dimension to the distributed processing/data entry/2260 and 3780 emulation environment Four-Phase has long supported. The IV/50 can emulate an IBM 3270 cluster of up to 24 1920 characters displays. It can also be upgraded to support local processing of batch or transaction-oriented COBOL applications.

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with IV/40, IV/50, or IV/70 hardware. The low end of the NTP line, NTP/100, simulates the IBM 3270 Information Display System, with all transaction processing performed by the central mainframe. At the other end of the line, NTP/200 supports multi-user COBOL applications with all transaction processing performed by the local display system. Other NTP systems combine COBOL transaction processing with concurrent inquiry or batch communications, providing on-line access to both local system files and the central data base. Four-Phase extended its line of software for Network Transaction Processing in June, 1976 with the announcement of STARTER, a display formatting package designed to aid COBOL programmers in writing customized interactive application packages for the system.

To complement the IV/40, IV/50, and IV/70 terminal hardware, and the NTP software, Four-Phase introduced the NP/80 network processor in November 1975. The NP/80 is a "black box" that either controls a network of local and remote Four-Phase multi-terminal systems or fits between such a network and a remote host processor such as an IBM System/360 or 370. An NP/80 can accommodate up to 270 million bytes of disk storage, one or two local high-speed channels (for local IV/70 terminals), up to five communications lines operating at up to 9600 bps (for remote IV/40's, IV/50's, or IV/70's), and one high-speed communications line operating at up to 50,000 bps (for the remote host processor). In the NP/80 is a multiprogramming operating system that provides network control for all of the attached terminal systems, access to a data base maintained on its own disk storage, and access to the host computing system. Maximum memory size is 256K bytes. The NP/80 is essentially transparent to the user. It is used to enhance the capabilities of the Four-Phase IV/40, IV/50, or IV/70 terminals or Network Transaction Processing multi-CRT systems.

The heart of a System IV is the company's own small general-purpose computer. The computer boasts total MOS/LSI contstruction, including its 2.0-microsecond semiconductor memory. The architecture of the 24-bit processor embodies eight 24-bit registers used for control, address manipulation, and arithmetic operations, a priority interrupt system with 8 levels (and 64 sublevels for each of the 8 levels), 8 I/O channels that can operate in a multiplexor or burst mode, single-level indirect addressing, and a robust instruction repertoire.

Four-Phase Systems provides complete systems support for its terminal systems. Software support includes a Disk Operating System, a COBOL compiler with extensions for operating in a video display environment, and an assembly language that includes two assemblers so that programs can be assembled either on the IV/70 or on a 65K IBM System/360 or 370 computer.

The NTP (Network Transaction Processing) Series of software packages provides extensive support for a distributed processing environment. NTP/1000 provides

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 19333 Vallco Parkway, Cupertino, California 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: IV/40–March 1973; IV/50–June 1976; IV/70–September 1970.

DATE OF FIRST DELIVERY: IV/40–July 1973; IV/50–Scheduled for 4th quarter 1976; IV/70–February 1972.

NUMBER DELIVERED TO DATE: Over 2,500 systems (all models).

SERVICED BY: Four-Phase Systems, Inc.

CONFIGURATION

System IV/40 supports up to 16 video displays; up to sixteen 30-cps printers or two other printers with speed capabilities up to 1800 lpm; a 24K- to 72K-byte processor, a diskette with a 354K-byte capacity; a cartridge disk with a capacity of 2.5 million bytes; a 10-million byte removable disk and a 300-cpm or 600-cpm card reader.

System IV/50 supports up to 24 video displays; up to twenty-four 30 cps printers or two other printers with speed capabilities up to 1800 lpm; a 24K- to 96K-byte processor; a diskette with 354K-byte capacity, up to 270 million bytes of disk storage; and a 300-cpm or 600-cpm card reader.

System IV/70 supports up to 32 video displays; up to thirty-two 30 cps printers or two other printers with speed capability up to 1800 lpm; a 24K- to 96K-byte processor; up to four 2.5-million-byte cartridge disks, up to four 50-million-byte or 66-million-byte removable disks; one 354K-byte diskette; up to four magnetic tape drives; a 300-cpm or 600-cpm card reader; and a communications channel adapter.

TRANSMISSION SPECIFICATIONS

Either of two communications controllers is available. The Asynchronous Data Set Controller operates asynchronously in the half- or full-duplex mode at data rates up to 110, 150, 300, 600, 1200, 1800, or 2400 bits/second and can accommodate any 9- to 11-bit code; it features an automatic answer capability. The Binary Synchronous Data Set Controller operates synchronously in the half- or full-duplex mode at user-specified data rates up to 9600 bits/second and can accommodate any 7- or 8-bit code. Both controllers provide an EIA RS-232C interface.

DEVICE CONTROL

Operation of the System IV systems is directed from the individual video terminals under control of the operating software. The video terminals are similar in concept and design to conventional CRT terminals and include an extensive set or cursor and edit controls, function controls, and an adding-machine capability. Cursor controls, which provide a wraparound capability, can move the cursor right, left, up, down, to the initial line and character position of the screen (home), and to the initial character position of the next line (return). Roll controls roll the displayed text up or down, line by line. Insert and delete controls insert or delete a character or a line in or from the displayed text.

Screen and line erase are also provided. The Tab control produces any of three codes as the result of shifted, unshifted, or control shift operation. Under program

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all of the functions of an IBM 3270 Display system through software emulation. NTP/150 enables the system to function as a programmable remote batch terminal that can replace IBM 2780 Data Transmission Terminals or 3780 Data Communications Terminals; NTP/150 has all the features of NTP/100 plus COBOL programming capability. NTP/200 allows the system to function as a stand-alone COBOL-programmed display system. NTP/230 adds COBOL programming capability while enabling the system to serve as a remote batch terminal using IBM 2780/3780 protocol. NTP/250 provides COBOL programming and interactive communications using IBM 3270 protocol.

DATA IV/70 is a software application package that transforms a System IV into a multi-station key/disk data preparation system with a remote batch capability. Data is keyed into a displayed format via a "fill-in-the-blanks" technique. Entered data is edited, validated, and intermediately stored in a disk file. Record batches can then be output onto tape, transferred directly to a computer, or transmitted via a data communications link.

The COBOL compiler and Disk Operating System permit the System IV/70 to process data entry files in a stand-alone mode. System IV/70 COBOL, a comprehensive subset of ANSI COBOL, includes terminal-oriented video extensions that enable users to generate COBOL programs for both interactive and batch applications. An Assembler and Video Display Library provide additional user programming flexibility.

STARTER, designed for IV/40, IV/50 and IV/70, is a parameter-driven package that allows users to unite interactive applications themselves. With STARTER, formats are created off-line from the keyboard, and supplemented with basic editing and free-form positioning, development; test and modifications are program-independent.

The instruction repertoire provided with the System IV is truly impressive. You want floating-point multiplication and division? You've got it, not to mention fixed-point multiplication and division, list processing, character manipulation, comprehensive branch instructions, etc. They're all there.

Display units are separate from their keyboards and can be located up to 2000 feet from the computer. There are three display models, which provide several display arrangements ranging from 288 to 1920 characters per screen.

The legibility of information displayed by the Four-Phase systems is superior to that of many displays now on the market as a result of a more detailed character array. Cursor manipulation is extremely flexible and is a function of the provided display software, which can be tailored to the user's needs. Extensive editing is also provided, along with the capability to "roll and scroll" the displayed text up and down to present additional data stored in the main memory.

control, these cursor and edit controls can be assigned to virtually any display function. A set of 13 function controls can be programmed to implement application-dependent operations to extend the system's range of usefulness. The adding-machine capability provides separate numeric and function controls for high-volume numeric operations.

The NP/80 Network Transaction Processor is built around a 16-bit minicomputer. Maximum memory size is 256K bytes. Memory in large configurations is made from 16K-bit, M-channel, silicon gate RAM chips. For smaller configurations, the company has a 4K-bit chip memory unit. Memory cycle time is 500 nanoseconds. An NP/80 can accommodate up to 270 million bytes of disk storage, one or two local high-speed channels, up to five communications lines operating at up to 9600 bps, and one high-speed communications line operating at up to 50,000 bps.

The NP/80 can either control a network of local and/or remote Four-Phase multi-terminal systems or fit between such a network and a remote host processor such as an IBM System/360 or 370.

SOFTWARE

Four-Phase supports its System IV with an extensive array of software capabilities. Aside from the operating system software, Four-Phase offers a family of six COBOL-programmed packages for use in a distributed processing environment, an IBM 2260 Simulator, and three versions of a data entry package.

Programming is performed in COBOL IV/70, RPG IV/70, or in IV/70 Code, a two-pass, general-purpose assembly language. Programs can be compiled on the System IV/70 under the Disk Operating System (DOS) or on a 65K IBM System/360 or 370 under OS or DOS.

COBOL IV/70 includes ANSI modules Nucleus 1, Table Handling 2, Sequential Access 1, Random Access 1, and Library. In addition, it provides a linkage section and call verb to permit the use of assembly-language subroutines, plus display-oriented extensions for operating in a video display environment. COBOL IV/70 requires a Model 7002 processor with 48K bytes, disk, card reader, and printer; it will support all system peripherals and both random and sequential disk files.

Sytem IV/70's *Disk Operating System* permits source files to be kept on disk, edited, and used as input to RPG, the Code Assembler, or COBOL Compiler. The IV/70 DOS consists of an extensive family of programs that includes IV/70 RPG, the Code Assembler, COBOL Compiler, Relocatable Loader, a Video Display Library, a Sort/Merge package, and a System Relocatable Library. DOS operates with either processor model; it requires at least 24K bytes of main memory, a single disk-cartridge drive, card reader, and printer. DOS supports all system peripherals.

Four-Phase's *Network Transaction Processing (NTP)* series is a family of COBOL-programmed display-processing systems for on-line applications in a distributed processing environment.

NTP/100 provides all the functions of an IBM 3270 Display System through software emulation. This package provides for operation in either local or remote environments and handles 480- or 1920-character displays. NTP/100 on a System IV/40 supports up to 16 display terminals and either 16 character printers or 2 line printers. A Format Storage capability enables selected formats to be displayed instantly from local memory, so there is no waiting for prompts. A Store-and-Forward Mode feature enables operators to key in data even during periods when the communications line or central mainframe is down. When

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The System IV's variety of I/O devices and their communications capability allow it to be configured to suit the needs of many applications. Some of these, suggested by Four-Phase, include text composition and editing, credit authorization, order and inventory management, and customer account service. Although a variety of software, as mentioned, is available with the systems, these specific stand-alone applications are not supported; the application program must be produced and implemented by the user.

The foregoing discussion is a good picture of a flexible system. It does not, however, apply to the "packaged" Model 7008. This key/disk data entry system includes eight 288-character displays, a disk drive, a magnetic tape drive, and a processor with 24K bytes of memory. You have your choice of IBM 29 keypunch-style or typewriter-style keyboards (but not both in the same system) and whether or not you want a 30-cps printer, but those are your only options. And only data entry software is provided. There is no support for custom application programming using COBOL or assembly language nor for data communications.

USER REACTION

Datapro's April 1976 survey of alphanumeric display terminals users included responses from 10 users of the Four-Phase System IV. These responding users had a total of 337 terminals installed. The following is a summary of the ratings assigned by the users:

	Excellent	Good	Fair	Poor	WA*
Overall performance	8	2	0	0	3.8
Ease of operation	8	2	0	0	3.8
Display clarity	6	3	1	0	3.5
Keyboard feel and usability	4	5	1	0	3.3
Hardware reliability	5	4	1	0	3.4
Maintenance service	2	6	2	0	3.0
Software and technical support	1	4	4	1	2.5

*Weighted Average on a scale of 4.0 for Excellent.

As can be seen from the above ratings, the users as a group were generally well satisfied with the System IV in all categories with the exception of software and technical support. The most often cited advantage of the users was low cost of the equipment (relative to IBM). Other principal advantages cited included reliability, flexibility, and programmability.

On the negative side a few users complained about software support of the system and one user was unsatisfied with the reliability. However, it appears that the majority of these problems were due to start-up situations and once systems were up and running most problems were eliminated. □

on-line operation resumes, the locally stored records are then transmitted. NTP/100 also contains facilities test features that can be used to pinpoint troubles in the communications equipment, log line traffic, display format attribute bytes, write memory checkpoints to screen or disk, and accumulate error statistics.

NTP/130 is a remote batch system that provides a full complement of IBM 2780/3780 features including point-to-point and multipoint operation as well as transparency, auto-answer, line turnaround, space compression, and spanned record transmission. Peripherals supported inlcude 300- and 600-cpm card readers, printers ranging in speeds from 300 to 1800 lines per minute, and a diskette or cartridge disk drive for program loading. While jobs are running, the video control console displays system status, error messages, line performance statistics, and prompts. A disk spooling capability enables a job to be input from the card reader, another job to be output from the disk to the printer, and a third job to be transmitted or received concurrently. Reports can be transmitted to unattended NTP/130 systems at night without concern over forms changing or device availability. The spooled data can then be printed during the day while other operations are being performed. During transmission, the host CPU creates separate disk files on the remote system for each job. Reports can be generated and local system files updated using user-programmed software. Concurrent remote batch and source data entry are available with the DATA IV/70 software package. Up to 22 video displays are supported with extensive editing, validation, and conditional logic capability.

NTP/150 provides all the capabilities of the NTP/100 (3270 Simulator) system plus COBOL programming. Editing and validation capabilities, including range checks, algebraic relationships, interfield dependencies, conditional logic, and table comparisons, can be programmed into the system to enable local handling of data. Entries may be validated against local files, and filed data can be integrated with keyed data for transmission or with received data for displaying or printing. Four-Phase claims that the COBOL-programmed routines to perform these functions can be added to the system without having to modify the existing 3270 application programs, systems software, or network configuration. COBOL routines can be invoked when data is transmitted or received, when the TAB or Program Function keys are pressed, or when entries in designated fields are completed. The subroutines can then access local disks, printers, and displays or the central CPU before returning control to the operator. COBOL processing is performed in the background and can support multiple tasks at multiple displays with concurrent key entry and printing.

Operators are notified of errors by an audible alarm and a flashing message. Keyboards can be disabled until corrective action is taken or to restrict access to personnel who fail to enter approved passwords.

NTP/150 can also spool print data from line to disk without the mainframe overhead and formatting normally required for 3270 printing. Under local control, the print files can be output when convenient on multiple printers at maximum speed. Total flexibility is provided for routing, pausing, backspacing, restarting, and repeating.

NTP/200 is a stand-alone, COBOL-programmed display system. The system supports up to 16 (System IV/40), 24 System IV/50), or 32 (System IV/70) displays for entry, inquiry, processing, and printing. Multi-tasking allows different activities to be supported at different displays simultaneously, and files may be accessed using sequential, direct, or multi-key ISAM accessing methods. NTP/200 uses an extended ANSI COBOL that supports transaction processing with displays and keyboards. Programmers may define screen formats in the Data Division and accept keyboard data in the Procedure Division. The screen areas

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can be manipulated like any Working Storage area; thus, the programmer can read and write data to operator displays without going through the COBOL file structure. COBOL and Assembly-language subroutines can be executed on-line, and can be overlaid to conserve memory.

Data management facilities are provided for accessing of up to 264 million bytes of local disk storage. Serial and direct files are processed using the Sequential Access and Random Access features of ANSI COBOL. A third access method, DISAM, provides multi-indexed files that may be referenced by a primary key and up to 10 secondary keys. Files created or maintained in on-line operations can also be processed in batch mode using COOBL, RPG, Sort/Merge, and an extensive selection of utilities.

NTP/230 operates under ANSI COBOL control and supports concurrent batch communications with IBM 2780/3780 protocol. Up to 16 (System IV/40), 24 (System IV/50) or 32 (System IV/70) displays are supported for entry, inquiry, processing, and printing. Data is transmitted and received using IBM 2780/3780 protocol in an attended or unattended mode. Using NTP/230, IV/40, IV/50 and IV/70 systems can communicate with any system using IBM 2780/3780 discipline, including other System IV/40's and IV/70's using NTP/130 or NTP/230, and with IBM System/3's, 360's, and 370's. NTP/230 contains standard ANSI COBOL modules for Nucleus, Table Handling, and Sequential Access; plus enhanced Table Handling with three levels of subscripting/indexing, Random Access, and Library. Facilities for Sort and Segmentation are available through the Interrupt Disk Operating System, while report writing is accommodated by RPG. NTP/230 also provides video extensions for interactive support of displays and keyboards.

NTP/250 provides COBOL programming capability with concurrent interactive communications using IBM 3270 protocol, while supporting up to 16 (System IV/40), 24 (System IV/50) or 32 (System IV/70) video displays for entry, inquiry, processing, and printing. While fully compatible with IBM 3270 line protocol, NTP/250 eliminates the restrictions of 3270 formatting. Records are transmitted as is, without the mainframe overhead normally required for mapping attribute bytes, display commands, and buffer orders into the data stream. Multi-user applications are developed in ANSI COBOL for data entry, retrieval, and document preparation. Under COBOL control, operator-oriented procedures can be implemented to produce format branches, flips, and overlays; position the cursor to any location; display messages and prompts; and customize display functions with paging and scrolling.

Using NTP/250, the System IV/40, IV/50 or IV/70 can be treated by the mainframe as any other peripheral—callable with PUTS and GETS like a tape drive or disk. Inquiries may be initiated manually by system operators, or automatically under program control. For more efficient utilization of system resources, dynamic task assignment allows any display to perform any activity, regardless of physical address. Received records can be reformatted using COBOL procedure statements; thus, compressed or scrambled data can be sent unmodified for local expansion and display. Similarly, entire files can be passed to NTP/250 for local manipulation and updating without mainframe loading. Using NTP/250, System IV/40's, IV/50's, and IV/70's can be multidropped on the same line with other System IV/70's using NTP/250, NTP/100, or NTP/150, or with IBM 3270's.

A variety of powerful *data management facilities* is provided with the Network Transaction Processing software to create, access, and maintain local system files. Three access methods are supported: Sequential Access Method (SAM) for processing serial files, Direct Access Method (DAM) for random or sequential access based on an actual key, and Data Indexed Sequential Access Method (DISAM), a multi-key ISAM optimized for interactive access to dynamically changing data.

DISAM eliminates data duplication by accessing files with a unique primary key and up to 10 secondary keys. For example, an inventory file may be accessed by part number, item description, and vendor number. Searches with generic and duplicate keys retrieve all records with common index fields. DISAM supports storage capacities from 2.5 to over 260 million bytes. Records may be read, written, modified, inserted, and deleted randomly or sequentially. Backup is provided by removable packs and multiple drives.

To insure security and privacy, all files can be protected with passwords to preclude unauthorized access.

NTP programs can be developed on the same systems used to run them. The *Interrupt Disk Operating System* facilitates program entry, editing, compilation or assembly, loading, and initiation. IDOS is completely disk-resident and is not required in memory during program execution. As a result, the Four-Phase systems can devote all available memory to application support.

DATA IV/70 provides the software support necessary to use the System IV/40, IV/50 or IV/70 as a shared-processor data entry system. There are three versions of DATA IV/70, and in general they all provide for data entry (using a fill-in-the-blanks approach with prompting messages that are not included in the output record), for extensive data editing and manipulation, for verifying previously entered records, and for searching for specific records with or without updating when found.

Version 1 of DATA IV/70 provides up to six program formats per job. Multiple jobs can be running at the same time, and formats can be shared among several jobs. Six balance accumulators are provided. Record lengths can be defined as up to 750 characters, the maximum tape block size. Conventional keypunch functions are provided along with a large number of other functions, including "generate" and numeric field relationships. The generate function allows a single key to be used to trigger the output of a stored constant field based on the character keyed. Numeric relationships such as equal, not equal, greater than, and less than can be used to check a group of fields having an arithmetic relationship. A field can be defined as "must enter" or "must fill" to prevent a data entry operator from leaving the specified field blank.

Up to four 2.5-million-byte disk drives are supported by DATA IV/70 Version 1 to provide a data file storage capacity of up to 80,000 80-character records. Either keypunch-style or typewriter-style keyboards are supported, but they cannot be mixed in the same system. Data can be printed from the screen or from the disk file. Data can also be transferred to tape from the disk while key entry continues. Output options supported include magnetic tape, direct connection to an IBM System/360 (Model 30 or larger) or an IBM System/370, and remote data communications using binary synchronous line discipline.

Version 2 of DATA IV/70 provides all the features of Version 1 plus 24 balance accumulators, up to 15 program formats per job, audible error alarm, conditional field checking, multiple validation checks on the same field, extended table comparisons, and support for mixed keypunch and typewriter-style keyboards. Provisions for conditioned logic are included to enable adaptive data validation during key entry. Conditional branches to different editing sequences and operator prompts can be inserted at any point in a format. Single and nested statements of the form IF...THEN...ELSE can

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reference previously entered fields, accumulator values, alphanumeric constants, value sets, and arithmetic and logical combinations of these.

When used with the Model 7008, not all the features of DATA IV/70 Version 2 can be utilized because of the restricted configuration of the Model 7008. In particular, only one disk drive is supported, only a 30-cps printer can be included, and a data communications interface is not provided.

Version 3 of DATA IV/70 accommodates concurrent data entry, retrieval, update, and communications functions and has ISAM capability. Support for up to 16 video displays is provided for interactive accessing of up to 1000 indexed sequential files, as well as storage capability for over 260 million bytes. Source data can be entered and validated on fully formatted screens displaying up to 1920 characters; data can be extracted from files for automatic entry; local files can be updated on-line; local reports can be produced; and batches of data can be exchanged with the host computer for updating of central files. Reports can also be received in an unattended mode for local file updating or printing.

In the data entry mode, DATA IV/70 Version 3 can validate operator entries against local master files containing up to 50,000 records and extract stored data for automatic entry. Data can be integrated with keyed entry on fully formatted screens. In data retrieval operations, Version 3 enables all system operators to work simultaneously with the same current information. Records up to 750 characters long are retrieved instantly by typing numeric, alphabetic, or alphanumeric key fields. Any file can be accessed by all displays simultaneously. Version 3 supports IBM-compatible bisync communications for transmission at speeds up to 9600 bps. Either dial or leased lines may be used with IBM 2780/3780 protocol.

Software is also available which enables either the System IV/40 or IV/70 to function as an IBM 2260 simulator. All functions of an IBM 2260/2848 Display System are provided through software emulation. This package enables operation in either local or remote environments and supports all screen sizes. Features include Supervisory Mode, in which a display unit, acting as a supervisory station, can communicate directly with other display units on the same IV/40 or IV/70, and Media Conversion, which supports data transcription operations such as card-to-tape, card-to-printer, and tape-to-printer.

COMPONENTS

KEYSTATIONS: The keystations used in the system system contain a video display and keyboard with optional Dual Intensity and Audible Alarm features. Each display has a character set of 120 ASCII symbols, including upper and lower case alphabetics, numerics, and special symbols. Characters are generated by a 7-by-9 dot matrix. The video display configurations vary depending on the software being used and the hardware system, as follows:

Configurations for NTP/100 and NTP/150

Characters per Line	Lines per Screen	Characters per Screen	Max. No. of Displays IV/40	IV/50	IV/70
40	12	480	16	24	32
80	24	1,920	8	12	16

Configurations for NTP/200, NTP/230, and NTP/250

Characters per Line	Lines per Screen	Characters per Screen	Max. No. of Displays IV/40	IV/50	IV/70
48	6	288	16	24	32
48	12	576	16	24	32
48	24	1,152	8	24	32
80	6	480	16	24	32
80	12	960	16	24	32
80	24	1,920	8	24	32

Any of six cursor symbols is available. User-selected cursor parameters allow the cursor to blink or remain steady and to be destructive or nondestructive. Multiple cursors can be programmed to extend display control.

Messages can be highlighted for attention or blanked for security when using the Variable Intensity feature, which permits characters to be displayed at normal or high intensities or blanked (not displayed). Control is provided by non-displayed attribute characters, which can be interspersed within the data stream. Software support is provided by NTP/100 software.

The Audible Alarm feature alerts the operator to special conditions such as errors or end of line. Software support is provided under several operating programs.

DISK STORAGE: There are four disk models available for use with Four-Phase's intelligent terminal systems. Any of these models can be used with the IV/70 system, but only the 8230 and 8250 can be used on the IV/40 system. The following table shows the basic disk characteristics and their use with the IV/40 and IV/70 systems.

Model	Type	Capacity, bytes	Transfer Rate	Number per System IV/40	IV/70
8230	Cartridge	2.5 million	184K bytes/sec.	1	4
8240	Pack	50 million	312K bytes/sec.	0	4
8250	Diskette	354 thousand	31K bytes/sec.	1	1
8260	Pack	66 million	250K bytes/sec.	0	4

The 8230 Cartridge Disk Drive uses a removable cartridge, similar to the IBM 2315 cartridge, with a capacity of 2.5 million bytes. A maximum of one 8230 may be used with the IV/40 system, and four with the IV/70 system. The disk is organized in 200 active tracks per side, with eight 768-byte sectors per track. The access mechanism carries two heads, one for each disk surface, which results in a cylinder capacity of just over 12K bytes. Head positioning time is 70 milliseconds track to track, average rotational delay is 20 milliseconds, and data transfer rate is 184K bytes per second.

The 8420 Pack Disk Drive uses a removable disk pack equivalent to the packs used on the IBM 2314 disk drives. Each pack provides a storage capacity of 50 million bytes. A maximum of four drives can be attached to the IV/70 system; this drive is not supported by the IV/40 system. The packs are recorded in double-density fashion. Each disk surface carries 400 active tracks. The access mechanism links a head for each surface, yielding a cylinder capacity of just over 120K bytes. Only one-half of a cylinder can be transferred in one operation. Tracks are organized in eight 768-byte sectors. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312K bytes per second.

The 8250 Diskette Drive uses a diskette or "floppy" disk cartridge. Both the IV/40 and the IV/70 systems can support one 8250 drive. Data is recorded on one surface only, in 64 tracks of four 1146-byte sectors each. Total

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capacity of the diskette is 293,376 bytes. Arm movement time is 10 milliseconds per track plus 10 milliseconds head settling time; average rotational delay is 80 milliseconds. Data transfer rate is 31K bytes per second. The controller supports only one drive.

The 8260 Pack Disk Drive uses a removable disk pack with a storage capacity of 66 million bytes. A maximum of four 8260 drives can be used on the IV/70 system, but the 8260 is not supported by the IV/40 system. Average head positioning time is 29 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 250K bytes per second.

MAGNETIC TAPE: There are five magnetic tape subsystems which can be used with the Four-Phase IV/70 system. The following table reflects the characteristics of the models available:

Model	8501	8502	8503	8504	8507
Tracks:	9	9	9	9	7
Density, bpi:	800	800	1600	1600	556/800
Data rate, Kbs:	10	10	60	60	6.95/10
Tape speed, ips:	12.5	12.5	37.5	37.5	12.5
Rewind speed, ips:	50	50	100	100	50
Reel size, inches:	10.5	8.5	8.5	10.5	8.5

Each tape subsystem includes a controller capable of handling four drives, except for the 8504 and 8507 subsystems, which include only a single-unit controller. The IV/70 system can accommodate only one controller. The 8.5-inch reels accommodate 1200 feet of tape; the 10.5-inch reel, 2400 feet. All recording formats are industry-compatible. Tape tension is supplied by means of tension arms in all models.

PRINTERS: Four-Phase offers six printer models for use with its intelligent terminal systems. The basic characteristics of these printers and the maximum number of printers which can be used on a IV/40, IV/50, and IV/70 system are shown in the table below:

Model	Speed	Number of Characters	Number of Columns	Number Per System IV/40	IV/50	IV/70
8121	30 cps	96	132	16	24	32
8131	30 cps	64	132	2	2	2
8135	100 or 164 cps	64	80 or 132	2	2	2
8146	145-1110 lpm	64	132	2	2	2
8148	300 lpm	64	132	2	2	2
8151	700-1800 lpm	64	132	2	2	2

The 8121 Printer is the Diablo 30-character-per-second incremental printer. The character disk (type wheel), vertical movement, and horizontal movement are all servo-driven. Vertical increments are 48 per inch, and horizontal increments are 60 per inch, giving very flexible control over output. Sprocketed or unsprocketed forms up to 15 inches wide can be accommodated. The unit prints a 96-character ASCII set. The type wheel can be changed by the operator. At 10 characters per inch, up to 132 columns can be printed. Features include left and right tabulation directly to a selected location, and snap-in ribbon cartridges.

The 8131 Printer is the familiar UNIVAC 30-character-per-second unit. It uses a rotating helical print wheel with a single hammer actuator, and accommodates six-part continuous forms up to 14-7/8 inches wide. Horizontal spacing is 10 characters per inch, and vertical spacing is 6 lines per inch. The unit prints 64 characters in up to 132 columns.

The 8135 Printer is a character printer, switch-selectable for 80 or 132 columns. It has a moving-head mechanism that forms characters serially from left to right on a 7-by-9 dot matrix. The paper tractors are adjustable to accommodate edge-punched forms up to 9-3/8 inches wide from pin to pin. Vertical tab, form feed control, and automatic skipping over perforations are provided by a 2-channel vertical format control unit that uses standard 8-channel opaque paper tape. Printing speed is 100 cps for 80 columns or 165 cps for 132 columns.

The 8146 Line Printer uses a 64-character print drum. Print speed varies with the number of columns printed, spanning the range of 245 lpm (132 columns) to 1110 lpm (24 columns). Continuous six-part forms up to 19-7/8 inches wide can be accommodated. Vertical spacing is operator-selectable at 6 or 8 lines per inch. An 8-channel vertical format control unit is provided. Paper advance rate is 13 inches per second for long skips.

The 8148 Line Printer is also a drum printer. It can print continuously at 300 lines per minute. It can print up to 132 columns on six-part continuous forms up to 16¾ inches wide. The character set includes 64 symbols. Horizontal spacing is 10 characters per inch. Vertical spacing is operator-selectable at 6 or 8 lines per inch. High-speed paper advance rate is 20 inches per second. A 12-channel vertical forms control is included.

The 8151 Line Printer provides high-speed output with a 64-character set. The printing speed depends on the number of positions printed. The range is 700 lpm (132 columns) to 1800 lpm (72 columns). Continuous six-part forms up to 19-7/8 inches wide can be accommodated. Vertical spacing is 6 or 8 lines per inch, and is operator-selectable. High-speed paper advance rate is 35 inches per second. An 8-channel vertical forms control unit is included.

CARD READERS: Two desk-top card readers are available. The 8001 reads at 300 cpm, and the 8003 reads at 600 cpm. Each unit includes a controller that performs code translation. A special device, the 8010 Multiple Loading Switch, allows a single card reader to be used for loading up to 8 systems; a separate controller (8011) must be installed in each of the systems.

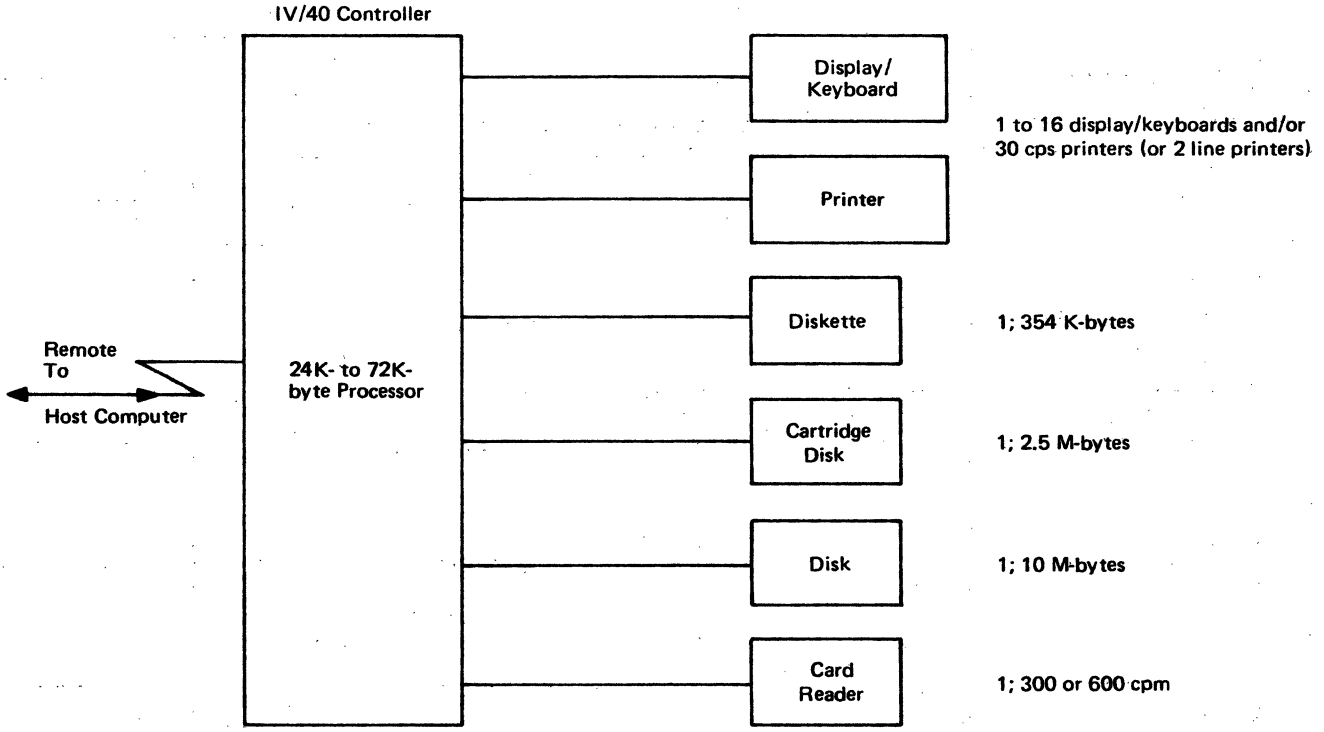
PROCESSOR: The processor used with both the IV/40 and IV/70 systems contains a 2.0-microsecond semiconductor memory and eight 24-bit multifunction registers. The 24-bit machine provides both direct and single-level indirect addressing. Three registers are available for address modification. The priority interrupt system provides 8 levels of interrupt, each with a unique memory location and each with 64 sublevels. Hardware is used to provide automatic interrupt recognition. The standard instruction repertoire includes 113 discrete commands: 12 word/character manipulation, 5 list processing, 17 load/store, 11 fixed-point and 5 floating-point arithmetic, 4 comparison, 8 shift, 19 branch/skip, 11 register-to-register, 6 logical, 5 control, 4 interrupt handling, and 6 I/O instructions. Arithmetic operations are provided for addition, subtraction, multiplication, and division.

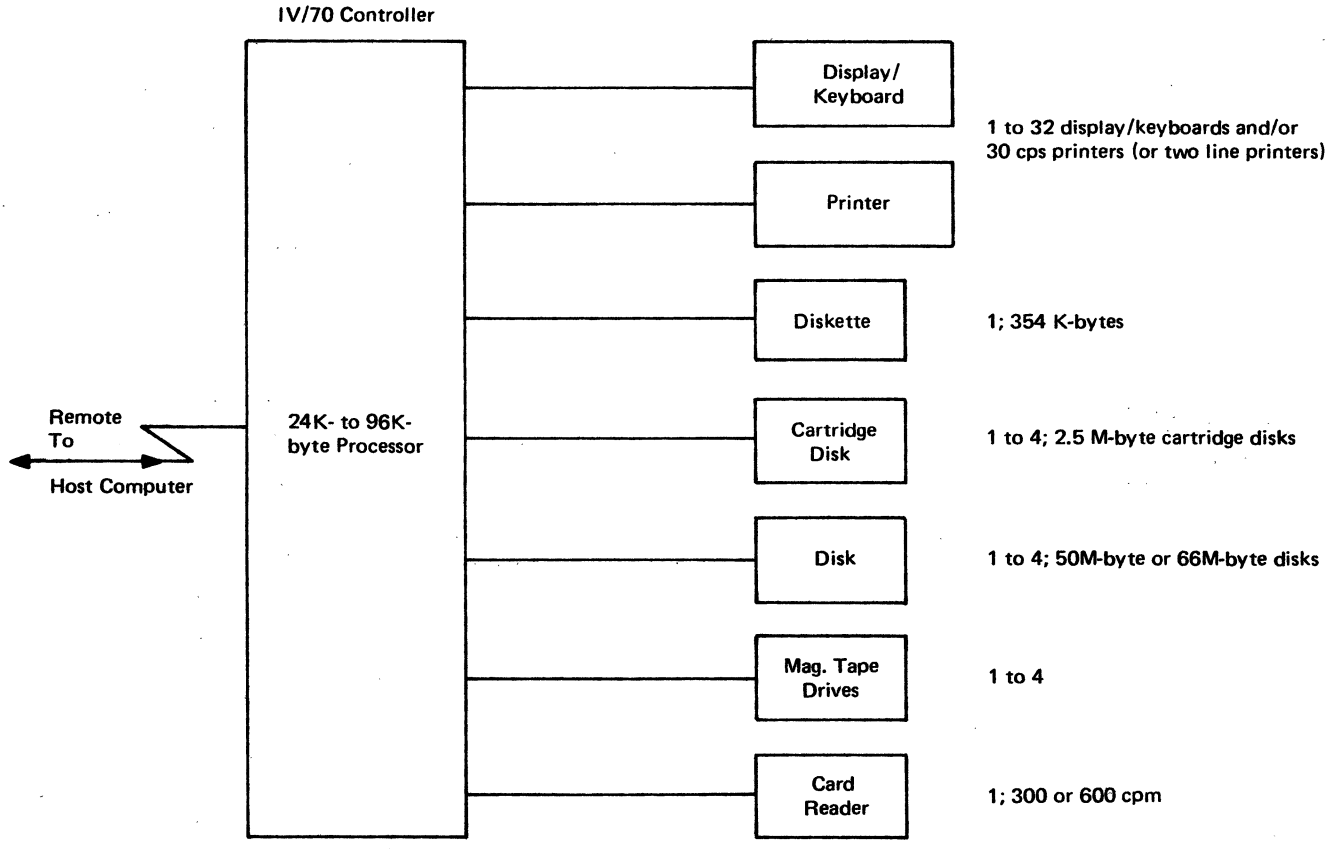
Four-Phase processors are available in a number of models for both the IV/40 and IV/70 systems; the only differentiation between models is in the memory size and/or disk type supported. The IV/40 system models are designated as the 4000 series, and the IV/70 as the 7000 series. The following table shows the models available.

Model No.	Memory Size	Disk Type
4100	24K bytes	354K-byte diskette
4200	24K bytes	2.5-million-byte cartridge
4210	24K bytes	10-million-byte cartridge
4300	24K to 72K bytes	354K-byte diskette
4500	24K to 72K bytes	2.5-million-byte cartridge
4700	24K to 72K bytes	10-million-byte cartridge
7001	12K to 24K bytes	Any
7002	48K to 96K bytes	Any
7008	24K bytes	2.5-million-byte cartridge

Four-Phase Systems
System IV Intelligent Terminals

Configurations





Four-Phase Systems
System IV Intelligent Terminals

➤ PRICING

Four-Phase refused to supply Datapro with pricing information for the individual components of its systems, but did provide the following prices for system configurations "representative of what Four-Phase is selling today."

	Monthly Rental*	Purchase	Monthly Maint.
SYSTEM IV/40 CONFIGURATIONS			
4-Station Data Entry System (Includes 4 1152-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	$ 604	$ 30,315	$215
16-Station Data Entry System (Includes 16 576-character video displays, 72K-byte processor with 2.5-megabyte disk drive, and binary synchronous communications controller)	1,383	66,700	456
Remote Batch System (Includes 24K-byte processor with 354K-byte diskette drive, binary synchronous communications controller, one 1152-character Video Control Console, one 300-cpm card reader, and one 300-lpm printer)	766	39,235	255
16-Station IBM 3270 Display System (Includes 16 480-character Dual Intensity Video Displays, a 48K-byte processor with 354K-byte diskette drive, and a binary synchronous communications controller)	1,113	57,490	387
8-Station Transaction Processing System (Includes 8 1152-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and decimal arithmetic, a 300-lpm printer, and a binary synchronous communications controller)	1,133	53,600	349
SYSTEM IV/50 CONFIGURATION			
12-Station Transaction Processing System (Includes 12 dual intensity Video displays, 72K byte processor, 10M byte disc, 354K byte diskette and bisync communications controller)	1,335	—	—
SYSTEM IV/70 CONFIGURATIONS			
12-Station Data Entry System (Includes 12 288-character Video Displays, 24K-byte processor with 2.5-megabyte disk drive, and 9-track magnetic tape drive)	1,432	68,055	419
22-Station Data Entry System (Includes 22 288-character Video Displays, 72K-byte processor with 2.5-megabyte disk drive and 9-track magnetic tape drive)	2,104	95,655	611
32-Station IBM 3270 Simulator (Includes 32 480-character Dual Intensity Video Displays, 48K-byte processor with 354K-byte diskette drive, and binary synchronous communications controller)	2,168	98,045	646
16-Station Transaction Processing System (Includes 16 1152-character Video Displays; 96K-byte processor with decimal arithmetic, 67.5-megabyte disk drive, and 9-track magnetic tape drive; 300 lpm printer; and binary synchronous communications controller)	2,713	122,645	712

*For 42-month lease; includes prime-time maintenance. ■

Four-Phase Systems Series 5000

MANAGEMENT SUMMARY

The Series 5000, introduced in May 1982 by Four-Phase Systems, is an office automation system designed for use by large multi-site corporations. The Series 5000 family consists of three processors and five models of the company's Fastrak intelligent workstation. Also announced in conjunction with the Series 5000 were a personal computing option, a touch-screen capability for the Fastrak terminals, broadband local area networking, and some architectural enhancements.

The three processors in the Series 5000 include the System 500, System 700, and System 800. The five Fastrak intelligent terminal models (FT40, FT50, FT55, FT60, and FT65) can be used in any combination with all of the processor models.

The System 500 is the low-end system in the Series 5000 line. The System 500 supports from one to four workstations, contains .75MB of memory, and features mass storage of up to 150MB, including one removable and one fixed disk drive. The mid-range System 700 supports from 24 to 96 workstations, has 3MB of memory, features mass storage of up to 1.1 billion bytes, including one to eight fixed or removable disk drives, and accommodates up to four 1600-bpi tape drives. Both the System 500 and System 700 support bit- or character-oriented communications at speeds up to 9600 bps with local or remote network support. Also supported are a variety of printers, including line printers ranging from 600 lpm to 1350 lpm, and character printers ranging from 25 cps to 150 cps.

The top-of-the-line System 800 supports up to 128 workstations, contains 6MB of memory, features mass storage of up to 2.2 billion bytes, including one to 16 fixed

A family of distributed processing systems for use by large multi-site corporations.

The Series 5000 family consists of three members: the System 500, System 700, and System 800. The entry-level System 500 supports up to 4 workstations, and provides .75MB of memory and 150MB of disk storage. The top-of-the-line System 800 provides support for up to 128 workstations, and supplies 6MB of memory and up to 2.2 billion bytes of disk storage. Workstations on all of the Series 5000 systems are the company's Fastrak Intelligent Terminals, which offer programmable screen capacities and detachable keyboards.

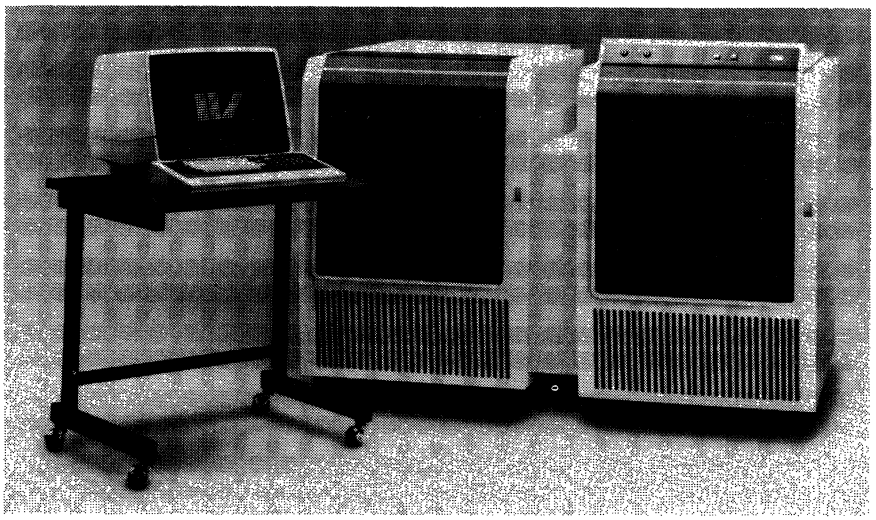
Systems can be interconnected via Four-Phase's Net IV local area network. Applications software runs under the Multi-function Executive operating system. Other capabilities offered with the Series 5000 include a personal computing option and a touch-sensitive display screen.

A representative System 700 consisting of the processor, 3MB of RAM, 200MB of disk storage, a line printer, 16 character printers, 64 workstations, and communications is priced at $475,800.

CHARACTERISTICS

VENDOR: Four-Phase Systems, Inc., 10700 North DeAnza Boulevard, Cupertino, CA 95014. Telephone (408) 255-0900.

DATE OF ANNOUNCEMENT: May 1982.



The Series 5000 family from Four-Phase provides the multi-site user with up to 6MB of RAM memory, up to 2.2 billion bytes of disk storage, and support for up to 128 of the company's Fastrak intelligent workstations with printers. Broadband local area networking capabilities are available to Series 5000 users through Four-Phase's Net IV LAN. A personal computing feature, touch-sensitive display, and voice store and forward capabilities can also be added to the Series 5000.

Four-Phase Systems Series 5000

or removable disk drives, and accommodates up to four 1600-bpi tape drives. In addition to multiline asynchronous communication and single-line bisynchronous communications up to 9600 bps, bit-oriented synchronous communications at speeds up to 50K bps are permitted, with local or remote network support. In addition to the line and character printers supported on the System 500 and System 700, the System 800 also accommodates high-resolution color graphics workstations.

Four-Phase provides users with local area networking capability via Net IV, the company's broadband based LAN. Net IV utilizes standard cable TV (CATV) technology, and provides multiple discrete channels and a CSMA/CD line access method that allows individual devices to communicate with each other over one single standard CATV coaxial cable of up 36 miles in length. Applications which can be accommodated simultaneously by Net IV include electronic mail, voice messaging, video conferencing, data base inquiry, remote printing, and file transfers.

The new Fastrak series of workstations consists of five models, which can be mixed on all Series 5000 systems. Features on all Fastrak terminals include programmable screen sizes, green or amber phosphor characters, a 256-character set, a 99-key detachable keyboard, audible alarm, diagnostics, and indicator lights. Four-Phase offers, as an option, a Personal Computing feature. Personal computing capabilities are added to the Fastrak workstations by integrating a single controller card and personal computing disk drives. A touch-sensitive display option is also available for the Fastrak terminals.

The Series 5000 is software-compatible with the existing Four-Phase Series IV systems. The Multifunction Executive (MFE/IV) operating system, developed for the Series IV, is also used as the operating system on the Series 5000. Any combination of Four-Phase System 311 and 312, Series IV, or Series 5000 systems can be interconnected in a local or remote network.□

DATE OF FIRST DELIVERY: The Series 5000 will be available in a phased introduction, beginning with the System 700 in the first quarter of 1983.

SERVICED BY: Four-Phase Systems.

CONFIGURATION

The Series 5000 is based on three processors (System 500, System 700, and System 800), and five models of the Fastrak Series of Workstations (FT40, FT50/55, FT60/65).

***System 500* is designed for applications requiring a small cluster of workstations. The System 500 provides support for one to four Fastrak workstations. Standard RAM memory is .75MB; mass storage consists of one fixed and one removable disk drive, for a disk storage capacity of up to 150MB. Line printers ranging in speed from 600 lpm to 1350 lpm, and character printers ranging in speed from 25 cps to 150 cps are also supported. One printer, either line or character, may be connected to each workstation.**

***System 700* is the mid-range system in the Series 5000 family. The System 700 provides support for up to 96 workstations. All five models of the Fastrak workstation are supported on the System 700, in any combination. Standard RAM memory is 3MB; mass storage can consist of from one to eight fixed or removable disk drives, for a disk storage capacity of up to 1.1 billion bytes. The System 700 also supports up to four 8- or 10½-inch, 1600 bpi tape drives. One printer, either line or character, may be connected to each workstation. Also supported is a cluster printer controller, allowing interface of higher speed image devices such as laser printers and electronic copiers.**

***System 800* is designed to satisfy large corporate office automation requirements. The System 800 provides support for up to 128 workstations. All five Fastrak models are supported in any combination, as well as high-resolution color graphics workstations.**

Standard RAM memory is 6MB; mass storage can consist of from one to 16 fixed or removable disk drives, for a disk storage capacity of up to 2.2 billion bytes. Like the System 700, the System 800 also supports up to four 8- or 10½-inch, 1600 bpi tape drives. As with both the System 500 and System 700, the System 800 allows one printer, either line or character, to be connected to each workstation. The cluster printer controller allows the System 800 to interface with higher speed imaging devices.

A Fastrak workstation can be configured with personal computing capabilities through the addition of a controller card and personal computing disk drives. The disk drives are housed in a cabinet that can accommodate from one to four 5¼-inch or 8-inch diskettes.

Local area networking capability is featured via Four-Phase's Net IV, a broadband-based LAN utilizing standard cable TV technology. Net IV supplies over 120 discrete channels (each channel can support over 200 individual devices), and utilizes a CSMA/CD line access method enabling users to communicate over a single CATV coaxial cable of up to 36 miles in length. Gateways to additional LANs will also be offered at a future date.

TRANSMISSION SPECIFICATIONS

The Series 5000 supports multi-line asynchronous communications, and single-line Binary Synchronous (BSC) or Synchronous Data Link Control (SDLC) communications. Transmission speeds up to 9600 bps are supported during asynchronous communications. From one to 16 communications lines are supported, with speeds varying with system load, record size, and various parameter values. Transmission over a single line is supported for bit-oriented synchronous (SDLC) communications at up to 50K bps (System 800 only) or for character-oriented bisynchronous (BSC) communications (all systems). Auto dial is standard in all cases.

The Net IV local area network provides connection to up to 120 low-speed channels with input from any device up to 19,200 bps. Either an asynchronous or bisynchronous interface is supported and allows attachment of a Series IV system, Series 5000 system, or a System 311/312. Net IV

Four-Phase Systems Series 5000

will provide gateways to other networks using different protocols, including X.25, Ethernet, satellite earth stations, and remote telephone networks.

SOFTWARE

All applications software on the Series 5000 operates under the Multifunction Executive (MFE/IV) operating system, the same operating system that is utilized on the company's established Series IV systems. The first release of Series 5000 software is intended to be functionally equivalent to the latest Series IV software release. MFE/IV allows multiple applications to share system services and resources through the Inter-Task Communications Manager.

Series 5000 software offerings include the following:

- MFE/IV
- Vision
- GMS/IV
- COMS/IV Executive Services
- ForeWord
- 3270 Simulator
- Electronic Mail
- Cobol '74
- Advanced Maintenance System

MFE/IV provides the following applications: source data entry, local inquiry and update, remote mainframe inquiry and retrieval, word processing, batch communications, batch processing, transaction processing, business graphics, office automation, and corporate networking. Interactive diagnostics is available as a software package under MFE/IV; one or more diagnostic programs may be run concurrently with other application programs under control of MFE/IV. Services able to share common functions between applications include printer services, communications services, terminal/keyboard services, and file services.

Vision provides the Series 5000 with distributed data processing capabilities, including source data entry, mainframe inquiry and retrieval, batch communications, and local file inquiry and update capabilities. Information management capabilities include MKAM and the Query language processor. The Query system allows users to maintain file definitions such as field names and positions, and provides procedures for creating, deleting, modifying, and viewing file definitions. Specific queries can be defined and stored for future execution, modification, deletion, or viewing. The system is menu-driven. The MBAM access method allows a Vision file to be accessed by other MFE/IV partitions.

GMS/IV is the Series 5000's graphics management system. Menu-driven for ease of use, GMS/IV provides entry-level business graphics. GMS/IV provides functions that allow a user to:

- preview graphs on video;
- mix graph types on the same chart;
- vary bar widths and shading options;
- create pie charts;
- support a plotter;
- interface to ForeWord (allowing graphs to be included in text documents);
- output hard copy onto a character printer;
- combine up to four data sets per graph;
- select up to 60 data points per data set.

COMS/IV Executive Services provides the user with administrative support. Executive services provided include: executive scheduling; tickler service; employee directory; office directory; integrated calculator; telephone message service; and document tracking.

ForeWord is the Series 5000 word processing system. Functions available using ForeWord include the ability to: support documents up to 320 characters wide; scroll horizontally; use a math package; merge documents; search and replace, including special characters; support a wide-track printer; interface to GMS/IV; and utilize the AYAM Access Method. AYAM allows other MFE/IV partitions to access ForeWord text areas and documents while ForeWord is running.

The *3270 Simulator* provides the Series 5000 with the functions of the IBM 3271. The 3270 Simulator provides the following: support for 3270 BSC and SDLC line protocol; store and forward capabilities; standard local screen printing; concurrent operation under MFE/IV with Vision, ForeWord, and Cobol; and concurrent operation of two simulators in separate partitions on a single processor.

The *Electronic Mail* application allows computer-based communications between users on a single Series 5000 system, multiple Series 5000 systems, between a Series IV and a Series 5000 system, or between a Series 5000 system and a System 311/312 under COMS/IV. Electronic Mail provides the following features: single or multiple recipients; document routing; document packaging; security for access protection; automatic log of all mail transmitted; menu-driven operation; and mail processing options.

Four-Phase's *Cobol '74* is a business-oriented, high-level language that enables the user to write customized application programs. Extensions have been added to ANSI-1974 Standard Cobol for handling keyboard input, video displays, communications, indexed files, concurrent access to files in a multiple CPU environment, and ForeWord and Vision files.

A diagnostic and maintenance capability is also provided on the Series 5000, called the *Advanced Maintenance System (AMS)*. AMS is tailored around a Service Processor and manages all maintenance activity on the Series 5000. Capabilities provided by AMS include: monitoring of all major system components; automatic logging of system status upon fault detection; logging of environmental conditions; automatic analysis of maintenance log information; display, upon request, of information in the form of an error code indicating the type of failure detected; and remote analysis under local security.

Four-Phase provides Digital Research's CP/M operating system for use with the Personal Computing feature for the Fastrak intelligent terminals. At an additional charge, Four-Phase also offers Digital Research's CBASIC and Pascal languages to run under CP/M, as well as Sorcim Corporation's SuperCalc.

COMPONENTS

PROCESSORS: The Series 5000 family consists of three processors—the System 500, System 700, and System 800.

The System 500 processor supplies support for from one to four workstations. Standard RAM memory is .75MB. Mass storage consists of one removable and one fixed disk, with a capacity of up to 150MB.

The System 700 processor supplies support for up to 96 workstations. Standard RAM memory is 3MB. Mass storage consists of one to eight removable or fixed disks, with a capacity of up to 1.1 billion bytes. The System 700 also supports from one to four 1600 bpi tape drives, plus a cluster printer controller.

Four-Phase Systems Series 5000

The System 800 processor supplies support for up to 128 workstations. Standard RAM memory is 6MB. Mass storage consists of from one to 16 removable or fixed disk drives, with a capacity of up to 2.2 billion bytes. The System 800 also supports from one to four 1600 bpi tape drives, plus a cluster printer controller. Color graphics workstations are also supported.

The processor architecture consists of a processor subsystem and an I/O subsystem. The processor subsystem contains an extended instruction set, is able to operate in a multi-programming environment, and has an inherent memory addressability of up to 48MB to accommodate future enhancements. The I/O subsystem features Direct Memory Access (DMA), microprocessor-based controllers. All major Series IV peripherals are supported by the Series 5000 processors.

WORKSTATIONS: Four-Phase's Fastrak Series of intelligent terminals are supported on the Series 5000 systems. The Fastrak workstations are available in five models: the FT40, FT50, FT55, FT60, and FT65. All models feature a 15-inch (measured diagonally) display and a detached keyboard. Characters are displayed in green or amber phosphor, and formed utilizing a 9-by-16 character matrix. Up to 256 unique characters may be displayed. The keyboard contains 99 keys, including data, function, and cursor control keys. Both audible and tactile feedback are provided. Legends for ForeWord/Vision and ForeWord/Cobol are available, as are custom legends. Other features include indicator lights for diagnostics and status information, power-on diagnostics, and an audible alarm.

The Fastrak workstations feature programmable screen sizes. Available screen sizes include 12, 24, 33, 44, or 64 rows by 48, 81, 96, or 132 columns. (Not all screen sizes are available on all models.)

The FT40 is an entry-level workstation which operates in local and service modes (service mode is used when a workstation is operating as a system console). The FT40 has a display capacity of 1920 characters. Other features available on the FT40 include a subset of display functions such as underlining and reverse video, and an optional serial printer port.

The FT50 and FT55 are the mid-range Fastrak workstations; both models can operate in local, remote, or service modes. The FT50 features a horizontal monitor with a display capacity of 4356 characters; the FT55 features a vertical monitor with a screen capacity of 6144 characters. In addition to the basic features available on all Fastrak workstations, the FT50 and FT55 also include: four loadable character sets; a full set of display features (including subscripts and superscripts); a variable size display; segmentation (split screen); business graphics; serial and/or parallel printer ports; and touch-screen and personal computing options.

The FT60 and FT65 are the top-of-the-line Fastrak workstations; like the FT50/55, both models can operate in local, remote, and service modes. The FT60 features a horizontal monitor with a screen capacity of 4356 characters; the FT65 features a vertical monitor with a display capacity of 6144 characters. The FT60 and FT65 contain all of the basic Fastrak features, plus all of the features available on the FT50 and FT55, with one exception—the FT60 and FT65 feature a total of 16 different character sets.

Each Fastrak workstation has the capability to support one character or line printer. For example, a Series 5000 system with 96 workstations could also contain 96 printers.

PRINTERS: All Series 5000 systems support line printers ranging from 600 lpm to 1350 lpm, and character printers ranging from 25 cps to 150 cps.

DISK STORAGE: The Series 5000 disk subsystem will support any of the following disk drives: a 10MB removable disk; 67MB removable disk; 80MB removable disk; 80MB fixed disk; 138MB fixed disk.

TAPE STORAGE: Supported only on the System 700 and System 800. Tape drives are mounted in a separate cabinet. From one to four tape drives are supported per system, in 8- or 10½-inch reels of 1600 bpi.

PERSONAL COMPUTING: Supported only on the FT50/55 and FT60/65. The option consists of a single controller card and from one to four 5¼- or 8-inch diskettes housed in a separate cabinet.

PRICING

The Series 5000 is available for lease or purchase. Monthly maintenance on all lease and purchase plans is priced separately. All Series 5000 software is available under a separate license agreement.

Four-Phase does not supply component pricing. A sample System 700 configuration, consisting of a processor, 3MB of RAM, 200MB of disk storage, 64 Fastrak workstations, one line printer, 16 character printers, and communications is priced at $475,800, and can be leased for $18,000 per month, including maintenance, on a one-year lease.■