

Inforex System 9000

MANAGEMENT SUMMARY

The System 9000 is based on a concept referred to by Inforex as Distributed Information Processing, a technique that provides user departments with the data entry and file management tools necessary for solving business problems. The system includes a Datapoint-developed processor with 256K bytes of memory which supports up to 180 megabytes of disk storage, a 9-track magnetic tape transport unit, a 300-lpm band printer, and up to 24 workstations and matrix character printers.

The Universal Workstation is a multipurpose interactive terminal from which users can perform any system function. It features a movable 55-key alphanumeric keyboard (which functions as an IBM 029-style keyboard during UDE data entry), an 11-key-calculator-style numeric pad, and 10 programmable function and control keys.

Users can add processors and peripherals in a modular fashion through a local networking system, ULTRANET. ULTRANET Expansion Processors may function as file management, application, or communications processors. As many as 255 processors can be linked by a coaxial cable bus which may extend up to four miles with signal amplification. Users have common access to data files, peripher-

The System 9000 is a distributed processing system that provides software modules for batch and transaction-oriented data entry, file management with the associative index method called CONFIRM, multiuser Cobol, and local networking. It is designed for end-user departments.

MODELS: The two packaged systems are the Model 9300 and the Model 9400.

CONFIGURATION: The basic system consists of a 256K-byte processor, a Multiport Workstation Interface for the attachment of up to eight workstations and peripherals, a 20- or 120-megabyte disk storage system, and an optional 9-track transport unit.

COMPETITION: Four-Phase Systems Series IV, and Nixdorf 600 Series.

PRICE: A basic configuration that includes a 248K-byte processor, 20 megabytes of disk storage, a 160-cps printer, and 8 workstations costs \$52,755.



The System 9000 Distributed Information Processing System allows users to expand a local system or to grow into a local area network by adding a unit at a time. The system components that are shown here, starting from the foreground, are the system processor, Universal Workstation, matrix printer, disk storage systems, tape transport unit, and band printer.

CHARACTERISTICS

VENDOR: Inforex, Inc., 186 Middlesex Turnpike, Burlington, Massachusetts 01803. Telephone (617) 272-6470.

DATE OF ANNOUNCEMENT: May 1981.

DATE OF FIRST DELIVERY: August 1981.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Inforex.

CONFIGURATION

The System 9000 may be customized and expanded according to individual user needs. The basic system includes a 256K-byte processor which supports all utilities and customer applications for attached workstations and peripherals. A Multiport Workstation Interface connects the processor with up to eight workstations. Two additional workstation interfaces may be added. Up to 24 local or remote workstations are available per processor. Disk storage capacity can range from 20 to 180 megabytes per processor. Users may add a 9-track tape transport unit for 800- or 1600-bpi recording. One 160-cps matrix printer can be attached to the system processor and to each workstation. For report generation, a 300-lpm band printer is available. Batch or interactive communications protocols are also provided.

ULTRANET, Inforex's local area networking system, allows users to add application, file management, and communications processors as required. Up to 255 processors can be linked into one large computer system. ULTRANET is fully compatible with Datapoint Corporation's ARCNET.

Inforex offers two packaged systems. The Model 9300 basic configuration consists of a processor, a disk controller, one

Inforex System 9000

als, and communications, and resource sharing is transparent to the user. Since processors are treated as independent units, different tasks can be run concurrently.

COMPETITIVE POSITION

The Inforex 9000 competes with the Four-Phase Systems Series IV (now called the 4000 Series) and the Nixdorf 600 Series Distributed Processing Systems. The Inforex 9000 provides batch and interactive data entry, file management, local processing, data communications, local area networking, mailing list creation, and system maintenance capabilities. The Nixdorf 600 Series can perform data entry, local file processing, local data base inquiry and updating, and batch and interactive communications. The Four-Phase Systems Series IV provides file management, system maintenance, data entry, word processing, diagnostics, and office automation functions. The Inforex system allows different tasks to be run concurrently, while the Nixdorf allows multiple concurrent tasks.

The Inforex 9000 is designed for use by operational end-user departments such as production scheduling, shipping, receiving, purchasing, lease management, order entry, inventory control, and personnel. The Nixdorf 600 Series' three models are aimed at small, remote offices, applications requiring multiple concurrent operations and installations in which large volumes of information must be locally stored, interrogated, and maintained.

ADVANTAGES AND RESTRICTIONS

System 9000 communications software provides a full range of commonly used batch and interactive protocols. A Synchronous Communications Adaptor, compatible with industry-standard modems, is a buffered synchronous interface between any System 9000, workstation, or disk to any synchronous device. Batch and interactive communications to a variety of mainframes including IBM, CDC, Honeywell, UNIVAC, and Burroughs are also possible, including emulation of remote job entry terminals (RJE). Within an ULTRANET system, the adaptor is attached directly to a Communications Processor to allow it to act as an IBM 3271 Communications Controller transmitting up to 9600 baud in 3270 mode. The Communications Processor permits every applications processor to communicate with a remotely located computer or another ULTRANET System. Workstations can act as remote job entry terminals to the central system and can access the central database through user-written programs.

The System 9000 features three software products that are bundled in the system: INFOBASE, an information management system which automatically provides for development use of data file inquiry and updating, and file management and report generation programs; Universal Data Entry (UDE), a batch-oriented data entry package; and Multi-User Cobol, an ANSI-standard language with extended features for interactive or batch programming and application concurrency.

fixed 10-megabyte disk and one removable 10-megabyte disk, and a workstation interface. Optional disk storage expansion units available in 20- or 40-megabyte increments may be added up to a maximum of 160 megabytes. The Model 9400 basic configuration includes the processor, a Large System Storage Unit with disk controller and two 60-megabyte removable disk packs, and a workstation interface. Total storage capacity can be increased to 180 megabytes by adding an optional 60-megabyte expansion unit.

TRANSMISSION SPECIFICATIONS

Inforex furnishes a buffered synchronous interface, the Synchronous Communications Adaptor, for high-speed data transfer between compatible processing devices. The adaptor transmits data from the System 9000, any member workstation, or disk to any synchronous device and can provide batch and interactive communications to a wide variety of vendor mainframes including IBM, Burroughs, UNIVAC, CDC, and Honeywell. It transmits and receives at rates of up to 9600 baud. Compatible with standard synchronous modems, the adaptor also features an Automatic Calling Unit interface for program-controlled origination. The adaptor can be attached to the ULTRANET Expansion or Communications Processor enabling it to operate in a program-controlled, binary synchronous mode as a 3271 communications controller for multipoint or point-to-point 3270 communications.

The Communications Processor manages all 3270 communications for ULTRANET systems with substantial data transmission needs. It permits every applications processor to communicate with a remotely located computer or another ULTRANET system. The processor comes with 120K bytes of user available memory expandable to 248K bytes of user available memory and is connected to the ULTRANET system by a Buslink Interface Module and standard coaxial cable.

It acts as an IBM 3271 Communications Controller transmitting up to 9600 bps in 3270 mode. The communications processor can emulate IBM 3780 terminals over leased or dialed telephone lines to communicate directly with central computer systems. The System 9000 transmits files to the central system, and spools the returning files for processing or printing. It can update a data base stored on the mainframe directly, or can transfer programs to the mainframe for compiling and execution. Workstations can act as remote job entry terminals to the central system or other Inforex systems between System 9000s.

SOFTWARE

UNIVERSAL DATA ENTRY (UDE): The Universal Data Entry Software supports batch-oriented data entry with screen formats, menu-driven applications incorporating basic edits and validation checks, and a data entry procedure language (PRELUDE) for application customization. After operators sign on with the proper identification and password, the users may select functions from a menu or may access data directly according to their levels of experience. Data being entered can go through more than 20 sophisticated editing and verification steps.

The UDE package provides operators with a number of capabilities. Six balance accumulators add or subtract the contents of amount fields to or from a specified accumulator. Operators can view the contents of accumulators, original data in verify mode, current field attributes, transferred file status, available disk space, error records, date and time, and transfer queue entries. The system has the ability to page forward and backward and return back to the next keyable record after a backward search. User files can be updated in the search mode and a search may be specified for a single character or a string of continuous characters.

Inforex System 9000

➤ USER EXPERIENCE

In order to complete this section of this report, attempts were made to obtain customer references from Inforex. Because such references were not received by us before our publication deadline, we were not able to conduct a user survey. □

➤ **PRELUDE**, the procedure editing language for UDE, edits and processes keyed data beyond the basic capabilities in UDE. PRELUDE programs are composed of procedural-type statements using mnemonic verbs like ADD, END, MOV AND WRT to specify actions to be taken on keyed field entries. Once a PRELUDE program is written it is compiled and linked to a specified screen format. Once a procedure has been compiled and assigned to a screen format, PRELUDE instructions are executed automatically whenever data entry operations are performed. PRELUDE adds the ability to perform full arithmetic operations on whole numbers, transfer data, conditional testing, conditional branching and table/range operations. PRELUDE makes available a 32-character, user-defined message area plus 12 and 40 position save areas. The UDE operator statistics file is automatically updated by the system during entry, verify, and modify modes.

Selected data transfer is possible including disk-to-tape, tape-to-disk, disk-to-disk, tape-to-printer, and disk-to-printer concurrent with data entry.

INFOBASE: INFOBASE, the System 9000 file management application module, permits users to create file management application programs, enter access, and manipulate data and generate ad hoc reports without writing a program. It is a data dictionary-based system in which the user defines fields, keys, files, and auxiliary data base documentation for use with groups of files. INFOBASE generates the application code through a four-step process: data field and file definition, screen formats creation, search key definition, and automatic program generation.

In data field and file definition, users define each item by name and characteristics. The user creates or modifies the screen format with field labels, key-in positions, screen titles, miscellaneous screen text, field edits, and verification displays. Up to nine consecutively numbered screens can be used in each program. Up to 40 data fields may be displayed per screen. Each character position in the key-in area is represented by an underscore. The last three lines of the screen are reserved for operator messages. The compiled, edited screen design is stored in the data dictionary to be recalled, modified, and reused as needed. Screen format can be printed as hard copy while the design is going on. After the screen format is defined, INFOBASE automatically generates applications source code which can be modified by the user to further customize the application. Applications programs provide three different message prompts: general prompts to advise the operator of field specifications, error messages, and help prompts whenever a question mark is entered. Each message can have up to 99 lines of 70 characters.

MULTIKEY CONFIRM ACCESS: For file inquiry and review, the user can specify standard ISAM keys or Inforex's CONFIRM access method.

CONFIRM works like a query language applying information that is known or partially described against data files to review and extract information. CONFIRM builds one index for an unlimited number of keys so records may be located by their access key or by multiple keys, class of

items, field content, or partial information. Record fields to be changed are accessed randomly by number on the screen. New data is written over the old only after it has been verified. Full prompting is displayed in modification mode. Any data review screen image may be printed directly on the system printer.

An INFOBASE array definition facilitates creating and updating files containing repeated rows of data. Data edits for each field can be specified in the data dictionary and applied whenever records are entered, added, or modified. Every INFOBASE-generated field maintenance program has a self-contained facility for producing formatted listings of user data files for ad hoc reports. INFOBASE automatically handles formatting, page breaks, headings, column headings, and printer displays for reports. Clearance to review, enter, and modify files and records may be assigned by function, operator, and data element.

COBOL: Inforex's Multi-User Cobol is a subset of the 1968 ANSI Cobol standard with extensions compatible with ANSI 1974 STANDARDS. It will run packaged software programs with minor modifications. Cobol applications can be executed in either a batch mode or interactively, and any combination of jobs can run simultaneously. Extensions provide for interactive screen formatting, including aids for record manipulation, cursor positioning, field attribute definitions, validation of entered data, general prompts, and error messages. Programs contain up to 65,000 bytes of object code with 15,500 bytes of working storage.

COMPONENTS

PROCESSOR: The System 9000 processor is a desktop terminal with a processor, a CRT display, and a typewriter-style keyboard. The 256K-byte processor (248K-byte user available) has a 600-nanosecond memory cycle speed and an enhanced instruction set. It supports up to 180 megabytes of disk storage plus a 9-track magnetic tape transport unit. Up to eight workstations and peripherals can be connected via a Multiport Workstation Interface. Two additional adaptors (able to support eight devices each) may be added. System Processors are equipped with cassette tape drives which may be used for diagnostics and program loading.

The Processor's CRT displays 96 characters on a 7-by-3.5 inch screen and features a 5-by-7 dot matrix for high legibility and a writing rate of up to 50,000 characters per second. The 55-key alphanumeric keyboard comes in a standard typewriter layout with an 11-key numeric pad and five system control keys.

The Ultramet Expansion Processor is identical to the system processor but it does not accommodate cassette tapes. It may function as an applications processor, a file management processor, or a communications processor (128K byte—120K user available). Up to 255 processors plus associated peripherals can be connected in a single ULTRANET system.

WORKSTATION: The Universal Workstation is a desktop terminal with an interactive video display and keyboard. The video display screen measures 5.4 by 8.9 inches and generates 1920 characters from a 7-by-9 dot matrix (enlarging to 9-by-12 to accommodate descenders) against an easy-to-read highcontrast amber phosphor. There are 16 key-controlled increments of screen brightness. The workstation uses a 96-character ASCII set and foreign or special character sets are loaded from the system processor. The screen's refresh rate is 50 or 60 times per second synchronized to line frequency.

The multipurpose keyboard features a standard 55-key alphanumeric typewriter layout with multiple key rollover, an 11-key-calculator-style numeric keyboard, 10 program-

Inforex System 9000

► mable function and control keys, and nine off-line diagnostics. It emulates the IBM 029 keypunch-style keyboard when the UDE software is used.

Any workstation can be used to perform any system function and can either be linked directly to the System 9000 processor or be connected over standard telephone lines.

MULTIPOINT WORKSTATION INTERFACE: The Multipoint Workstation Interface links any System 9000 processor or ULTRANET Expansion Processor with up to eight external devices such as workstations, printers, and modems. Local external devices are connected directly to the interface and remotely located devices are connected via modems and telephone lines. The RS-232-C-compatible interface attaches directly to the processor via an I/O bus and draws power from the processor. Transmit and receive baud rates range from 110 to 9600 and may be set independently. Up to three interfaces may be attached to each processor.

DISK STORAGE: Disk storage can be tailored to any size from a minimum of 20 megabytes up to 180 megabytes per disk controller. The Model 9074 Disk Storage System is for small to medium System 9000 configurations and can be used in standalone batch processing applications or as part of a common system data base. The Model 9090 Large System Storage Unit is a mass storage system intended to be used as part of the common data base for large time-sharing configurations. Expansion units can be attached to the disk controller for incremental growth as required.

The Model 9074 Disk Storage System includes a disk controller and two 10-megabyte disks, one fixed and one removable. Optional 20- and 40-megabyte expansion units can be added up to a maximum of 160 megabytes of storage per processor. The 20-megabyte expansion unit includes both a fixed and removable disk. The 40-megabyte increment incorporates two 20-megabyte expansion units in a single cabinet. Average and maximum access times are 35 and 60 milliseconds, respectively. Buffer memory size is 4K bytes. The disks record 200 tracks per inch and provide a total of 10,027,008 bytes.

The Model 9090 Large System Storage Unit consists of a controller and two 60-megabyte removable disk packs. An optional 60-megabyte expansion unit housed in its own cabinet may be attached to the controller for a maximum of 180 megabytes of storage. The storage unit combines the disk spindle and drive motor in single assembly and features an electronic system for final head positioning and an air-cleaning system. Average access time is 30 milliseconds and maximum access time is 55 milliseconds. The disks contain 60,211,200 bytes, and buffer memory size is 16K bytes.

MAGNETIC TAPE: Optional 9-track tape transport units support 800- and 1600-bpi recording at a speed of 25 inches per second. The tape transport units use standard magnetic tape reels of 10.5 inches in diameter. Storage capacity is 5.7 megabytes.

PRINTERS: For local reports, users may attach one serial matrix printer to each workstation and one parallel matrix printer to the system processor. The 132-column printers use a 9-by-9 dot matrix and a 96-character ASCII set. A 300-lpm band printer is also available. It uses a 64- or 96-character ASCII set and prints up to 132 columns with horizontal spacing of 6 or 8 lines per inch.

ULTRANET: ULTRANET, Inforex's local area networking system, allows users to expand installed System 9000 configurations by adding processors and components a unit at a time. The ULTRANET Expansion Processor provides 248K bytes of user memory and offers the same characteristics as the original system processor. It does not accommodate cassette tapes. Within an ULTRANET configuration, at least one processor acts as a file management processor dedicated to storing and retrieving the common data files of the ULTRANET. That processor supports up to 180 megabytes of disk storage. The other processors act as additional file management processors, or applications processors dedicated to batch or transaction-oriented applications program execution and development, or as communications processors managing concurrent communications for the ULTRANET system. Up to three Multipoint Workstation Interfaces may be attached directly to the applications processor. Any workstation can enter data, execute programs, and communicate from the common ULTRANET system data base or from its designated local database. Workstations and applications processors can be dedicated to specific tasks or programs. Since each processor operates independently, different tasks can be run concurrently.

Processors within the ULTRANET are linked by a high-speed Buslink composed of Buslink Interface Modules, Active Hubs, Passive Hubs, and standard coaxial cable. The Buslink Interface Module attaches directly to the original processor and to each expansion processor. It accepts only messages directed towards that particular processor and is completely transparent to the user. Passive and Active Hubs interconnect processors in a network. The Passive Hub links up to four ULTRANET system members and the Active Hub links up to 16 Buslink Interface Modules or other Active Hubs.

Up to 255 processors plus disks, workstations, and printers can be joined in a single ULTRANET system. The Buslink's coaxial cable can connect processors located as far away as four miles with signal amplification. Different ULTRANET systems can communicate with each other through a telecommunications link.

PRICING

System components are available for purchase or on a one-year lease. Prime shift maintenance for 9 hours/day, 5 days/week is standard; coverage for second and third shifts, six or seven days, and holidays is also available. ►

Inforex System 9000

EQUIPMENT PRICES

	Purchase (\$)	Monthly Rental (\$)	Maint. (\$)
Basic Configuration:			
256K-byte processor and 20-megabyte disk storage	34,000	1,697	341
160-cps printer	2,795	130	42
Eight workstations	15,960	600	144
Beginning ULTRANET System Basic Configuration:			
256K-byte processor and 20-megabyte disk storage; 9700 ULTRANET started package (two expansion processors plus Buslink Interface Module, workstations interface and co- axial cable and connectors, 160-cps printer and eight workstations.	92,085	4,029	765

Inforex 9000



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MANAGEMENT SUMMARY

Inforex introduced the System 9000 as its first new product after the firm's acquisition by Datapoint Corporation in September, 1981. The System 9000 is based on a concept referred to by Inforex as Distributed Information Processing, a technique that provides user departments with the data entry and file management tools necessary for solving business problems.

The System 9000 combines batch and interactive data entry, file management, local processing, data communications, and local area networking capabilities. It is designed for use by operational end-user departments such as production scheduling, shipping, receiving, purchasing, lease management, order entry, inventory control, and personnel. Mailing list creation and maintenance can also be accommodated by the system.

The system includes a Datapoint-developed processor with 256K bytes of memory which supports up to 180 megabytes of disk storage, a 9-track magnetic tape transport unit, a 300-lpm band printer, and up to 24 workstations and matrix character printers.

A distributed processing system that provides software modules for batch and transaction-oriented data entry, file management with the associative index method called CONFIRM, multi-user Cobol, and local networking.

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Inforex offers two packaged systems. The Model 9300 basic configuration consists of a processor, a disk controller, one fixed 10-megabyte disk and one removable 10-megabyte disk, and a workstation interface. Optional disk storage expansion units available in 20- or 40-megabyte increments may be added up to a maximum of 160 megabytes. The Model 9400 basic configuration includes the processor, a Large System Storage Unit with disk controller and two 60-megabyte removable disk packs, and a workstation interface. Total storage capacity can be increased to 180 megabytes by adding an optional 60-megabyte expansion unit.

Inforex 9000

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USER EXPERIENCE

In September 1982, Datapro telephoned four users of the Inforex 9000 system whose names were supplied by the vendor. Their responses represented a total of 31 keystations that had been in operation from three to six months. Three of the respondents had purchased the equipment and one had leased it from the manufacturer.

The Data Processing Manager of a manufacturing company located in the southwest that builds components for jet engines praised several features of the system, particularly the capability of the user "to access the ▷

► TRANSMISSION SPECIFICATIONS

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Inforex 9000

▷ database for a year's worth of manufacturing data" and the on-line technical support in which an Inforex representative from the Dallas offices accesses the system whenever problems arise. He also remarked that the software modifications performed by Inforex "were tailor-made to our application."

He also commented, "In a harsh environment such as ours, the terminals are susceptible to static electricity in-house and from other people's equipment. A user almost has to shield the terminals."

The three other users were EDP officers in the U.S. Navy. Two of the users reported difficulties with the software, and one cited problems in maintaining records of the transfers made from disk to tape. He said, "We don't get hardcopy or a summary report that lets us know positively that everything was transferred from disk to tape."

None of the respondents intended to replace the equipment within the next twelve months and all of them indicated a willingness to recommend the Inforex 9000 System to other potential users. □

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CONFIRM works like a query language applying information that is known or partially described against data files to review and extract information. CONFIRM builds one index for an unlimited number of keys so records may be located by their access key or by multiple keys, class of items, field content, or partial information. Record fields to be changed are accessed randomly by number on the screen. New data is written over the old only after it has been verified. Full prompting is displayed in modification mode. Any data review screen image may be printed directly on the system printer.

An INFOBASE array definition facilitates creating and updating files containing repeated rows of data. Data edits for each field can be specified in the data dictionary and applied whenever records are entered, added or modified. Every INFOBASE-generated field maintenance program has a self-contained facility for producing formatted listings of user data files for ad hoc reports. INFOBASE automatically handles formatting, page breaks, headings, column headings, and printer displays for reports. Clearance to review, enter and modify files and records may be assigned by function, operator and data element.

COBOL: Inforex's Multi-User Cobol is a subset of the 1968 ANSI Cobol standard with extensions compatible with ANSI 1974 STANDARDS. It will run packaged software programs with minor modifications. Cobol applications can be executed in either a batch mode or interactively, and any combination of jobs can run simultaneously. Extensions provide for interactive screen formatting, including aids for record manipulation, cursor positioning, field attribute definitions, validation of entered data, general prompts and error messages. Programs contain up to 65,000 bytes of object code with 15,500 bytes of working storage.

COMPONENTS

PROCESSOR: The System 9000 processor is a desktop terminal with a processor, a CRT display, and a typewriter-style keyboard. The 256K-byte processor (248K-byte user available) has a 600-nanosecond memory cycle speed and an enhanced instruction set. It supports up to 180 megabytes of disk storage plus a 9-track magnetic tape transport unit. Up to eight workstations and peripherals can be connected via a Multiport Workstation Interface. Two additional adaptors (able to support 8 devices each) may be added. System Processors are equipped with cassette tape drives which may be used for diagnostics and program loading.

The Processor's CRT displays 96-characters on a 7 by 3.5-inch screen and features a 5 by 7 dot matrix for high legibility and a writing rate of up to 50,000 characters per second. The 55-key alphanumeric keyboard comes in a standard typewriter layout with an 11-key numeric pad and five system control keys.

The Ultraset Expansion Processor is identical to the system processor but it does not accommodate cassette tapes. It may function as an applications processor, a file management processor, or a communications processor (128K byte—120K user available). Up to 255 processors plus associated peripherals can be connected in a single ULTRANET system.

WORKSTATION: The Universal Workstation is a desktop terminal with an interactive video display and keyboard. The video display screen measures 5.4 by 8.9 inches and generates 1920 characters from a 7 x 9 dot matrix (enlarging to 9 x 12 to accommodate descenders) against an easy-to-read high-contrast amber phosphor. There are 16 key-controlled increments of screen brightness. The workstation uses a 96-character ASCII set and foreign or special character sets are loaded from the system processor. The screen's refresh rate is 50 or 60 times per second synchronized to line frequency. ▶

► The multipurpose keyboard features a standard 55-key alphanumeric typewriter layout with multiple key rollover, an 11-key-calculator-style numeric keyboard, ten programmable function and control keys, and nine off-line diagnostics. It emulates the IBM 029 keypunch-style keyboard when the UDE software is used.

Any workstation can be used to perform any system function and can either be linked directly to the System 9000 processor or be connected over standard telephone lines.

MULTIPOINT WORKSTATION INTERFACE: The Multipoint Workstation Interface links any System 9000 processor or ULTRANET Expansion Processor with up to eight external devices such as workstations, printers, and modems. Local external devices are connected directly to the interface and remotely located devices are connected via modems and telephone lines. The RS-232C-compatible interface attaches directly to the processor via an I/O bus and draws power from the processor. Transmit and receive baud rates range from 110 to 9600 and may be set independently. Up to three interfaces may be attached to each processor.

DISK STORAGE: Disk storage can be tailored to any size from a minimum of 20 megabytes up to 180 megabytes per disk controller. The Model 9074 Disk Storage System is for small to medium System 9000 configurations and can be used in standalone batch processing applications or as part of a common system data base. The Model 9090 Large System Storage Unit is a mass storage system intended to be used as part of the common data base for large time-sharing configurations. Expansion units can be attached to the disk controller for incremental growth as required.

The Model 9074 Disk Storage System includes a disk controller and two 10-megabyte disks, one fixed and one removable. Optional 20- and 40-megabyte expansion units can be added up to a maximum of 160 megabytes of storage per processor. The 20-megabyte expansion unit includes both a fixed and removable disk. The 40-megabyte increment incorporates two 20-megabyte expansion units in a single cabinet. Average and maximum access times are 35 and 60 milliseconds, respectively. Buffer memory size is 4K bytes. The disks record 200 tracks per inch and provide a total of 10,027,008 bytes.

The Model 9090 Large System Storage Unit consists of a controller and two 60-megabyte removable disk packs. An optional 60-megabyte expansion unit housed in its own cabinet may be attached to the controller for a maximum of 180 megabytes of storage. The storage unit combines the disk spindle and drive motor in single assembly and features an electronic system for final head positioning and an air-cleaning system. Average access time is 30 milliseconds and maximum access time is 55 milliseconds. The disks contain 60,211,200 bytes, and buffer memory size is 16K bytes.

MAGNETIC TAPE: Optional 9-track tape transport units support 800- and 1600-bpi recording at a speed of 25 inches per second. The tape transport units use standard magnetic

tape reels of 10.5 inches in diameter. Storage capacity is 5.7 megabytes.

PRINTERS: For local reports, users may attach one serial matrix printer to each workstation and one parallel matrix printer to the system processor. The 132-column printers use a 9 by 9 dot matrix and a 96-character ASCII set. A 300-lpm band printer is also available. It uses a 64- or 96-character ASCII set and prints up to 132 columns with horizontal spacing of 6 or 8 lines per inch.

ULTRANET: ULTRANET, Inforex's local area networking system, allows users to expand installed System 9000 configurations by adding processors and components a unit at a time. The ULTRANET Expansion Processor provides 248K bytes of user memory and offers the same characteristics as the original system processor. It does not accommodate cassette tapes. Within an ULTRANET configuration, at least one processor acts as a file management processor dedicated to storing and retrieving the common data files of the ULTRANET. That processor supports up to 180 megabytes of disk storage. The other processors act as additional file management processors, or applications processors dedicated to batch or transaction-oriented applications program execution and development, or as communications processors managing concurrent communications for the ULTRANET system. Up to three Multipoint Workstation Interfaces may be attached directly to the applications processor. Any workstation can enter data, execute programs, and communicate from the common ULTRANET system data base or from its designated local database. Workstations and applications processors can be dedicated to specific tasks or programs. Since each processor operates independently, different tasks can be run concurrently.

Processors within the ULTRANET are linked by a high-speed Buslink composed of Buslink Interface Modules, Active Hubs, Passive Hubs, and standard coaxial cable. The Buslink Interface Module attaches directly to the original processor and to each expansion processor. It accepts only messages directed towards that particular processor and is completely transparent to the user. Passive and Active Hubs interconnect processors in a network. The Passive Hub links up to four ULTRANET system members and the Active Hub links up to 16 Buslink Interface Modules or other Active Hubs.

Up to 255 processors plus disks, workstations and printers can be joined in a single ULTRANET system. The Buslink's coaxial cable can connect processors located as far away as four miles with signal amplification. Different ULTRANET systems can communicate with each other through a telecommunications link.

PRICING

System components are available for purchase or on a one-year lease. Prime shift maintenance for 9 hours/day, 5 days/week is standard; coverage for second and third shifts, six or seven days, and holidays is also available.

Basic Configuration:

256K-byte processor and 20-megabyte disk storage
 160-cps printer
 8 workstations

	Monthly Rental	Purchase	Maint.
	\$1,697	\$34,000	\$341
	130	2,795	42
	600	15,960	144
	2,427	52,755	527

Beginning ULTRANET System:

Basic Configuration (256K-byte processor and 20-megabyte disk storage)
 9700 ULTRANET starter package (2 expansion processors plus Buslink Interface Module, workstation interface and coaxial cable and connectors)
 160-cps printer
 8 workstations

	1,697	44,630	341
	1,602	28,700	242
	130	2,795	38
	600	15,960	144
	4,029	92,085	765

Inforex 9000

MANAGEMENT SUMMARY

The System 9000, introduced in May 1981, is the first new product brought out by Inforex since it was acquired by Datapoint Corporation last September. The new system is based on a concept Inforex calls Distributed Information Processing which combines distributed data processing, data entry, file management, and sophisticated software capabilities. It is designed for use by operational end user departments, such as production scheduling, shipping, receiving, and inventory control.

The system includes a Datapoint-developed processor with 248K bytes of memory which supports up to 180 megabytes of disk storage, a 9-track magnetic tape transport unit, a 300-lpm band printer, and up to 24 workstations and matrix character printers.

The Universal Workstation is a multipurpose interactive terminal from which users can perform any system function. It features a 55-key alphanumeric keyboard which can also function as an IBM 029-style keyboard for data entry, an 11-key-calculator-style numeric pad, and ten programmable function and control keys. The terminal's CRT has a 24-line by 80-column display and uses a 5 by 7 dot matrix. Each workstation supports a 160-cps serial matrix printer.



The System 9000 Distributed Information Processing System offers its users the capability to expand by adding a unit at a time. System components shown above from foreground to background are the system processor, Universal Workstations, matrix printer, disk storage systems, tape transport unit, and band printer.

A distributed processing system designed for use by end user departments.

The system supports a 248K-byte processor, up to 24 display terminals, up to 25 printers, 20 to 180 megabytes of disk storage, and a 9-track tape unit.

Software is provided for source and volume data entry, file management, multi-user COBOL programming, and local networking.

A basic configuration which includes a 248K-byte processor, 20 megabytes of disk storage, a 160-cps printer, and 8 workstations may be purchased for \$63,455.

CHARACTERISTICS

VENDOR: Inforex, Inc., 186 Middlesex Turnpike, Burlington, Massachusetts 01803. Telephone (617) 272-6470.

DATE OF ANNOUNCEMENT: May 1981.

DATE OF FIRST DELIVERY: August 1981.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Datapoint Corporation.

CONFIGURATION

The System 9000 may be customized and expanded according to individual user needs. The basic system includes a 248K-byte processor which supports all utilities and customer applications for attached workstations and peripherals. A Multiport Workstation Interface connects the processor with up to eight workstations. Two additional workstation interfaces may be added to allow up to 24 local or remote workstations per processor. Disk storage capacity can range from 20 to 180 megabytes per processor. Users may add a 9-track tape transport unit for 800- or 1600-bpi recording. One 160-cps matrix printer can be attached to the system processor and to each workstation for a maximum of 25. For report generation, a 300-lpm band printer is available. Batch or interactive communications protocols are also provided. All software is bundled with the basic configuration.

ULTRANET, Inforex's local networking system, allows users to add application, file management, and communications processors as required. Up to 255 processors can be linked into one large computer system.

Inforex offers two packaged systems. The Model 9300 basic configuration consists of a processor, a disk controller, one fixed 10-megabyte disk and one removable 10-megabyte disk, and a workstation interface. Optional disk storage expansion units available in 20- or 40-megabyte increments may be added up to a maximum of 160 megabytes. The Model 9400 basic configuration includes the processor, a Large System Storage Unit with disk controller and two 60-megabyte removable disk packs, and a workstation interface. Total

Inforex 9000

➤ Inforex gives users the capability to add processors and peripherals in a modular fashion through its local networking system, ULTRANET. ULTRANET Expansion Processors may function as file management, application, or communications processors. As many as 255 processors can be linked by a coaxial cable bus which may extend up to four miles with signal amplification. Users have common access to data files, peripherals, and communications and resource sharing is transparent to the user. Since processors are treated as independent units, different tasks can be run concurrently.

System 9000 communications software provides a full range of commonly used batch and interactive protocols. A Synchronous Communications Adaptor, compatible with industry standard modems, is a buffered synchronous interface between any System 9000, workstation, or disk to any bisynchronous device. Batch and interactive communications to a variety of mainframes are also possible. Within an ULTRANET system, the adaptor attaches directly to a Communications Processor to allow it to act as an IBM 3271 Communications Controller transmitting up to 9600 baud in 3270 mode. The Communications Processor permits every applications processor to communicate with a remotely located computer or another ULTRANET System. Workstations can act as remote job entry terminals to the central system and can access the central database through user-written programs.

The System 9000 features three software products: INFOBASE, an information management system which automatically provides for file inquiry and updating, and file management and report generation programs; Universal Data Entry (UDE), a source and volume data entry package; and Multi-User COBOL, an ANSI-standard language with extended features for interactive or batch programming and application concurrency.

First deliveries of the System 9000 were scheduled for August. □

► storage capacity can be increased to 180 megabytes by adding an optional 60-megabyte expansion unit.

TRANSMISSION SPECIFICATIONS

Inforex furnishes a buffered synchronous interface, the Synchronous Communications Adaptor, for high-speed data transfer between compatible processing devices. The adaptor transmits data from the System 9000, any member workstation, or disk to any bisynchronous device and can provide batch and interactive communications to a wide variety of IBM and other vendor mainframes. It transmits and receives at rates of up to 9600 baud with modem-supplied timing. Compatible with standard synchronous modems, the adaptor also features an Automatic Calling Unit interface for program-controlled origination and answering for calls. The adaptor can be attached to the ULTRANET Expansion or Communications Processor enabling it to operate in a program-controlled, binary synchronous mode as a 3271 communications controller for multipoint or point-to-point 3270 communications.

The Communications Processor manages all 3270 communications for ULTRANET systems with substantial data transmission needs. It permits every applications processor to communicate with a remotely located computer or another ULTRANET system. The processor comes with 120K bytes of memory expandable to 248K bytes and is connected to the ULTRANET system by a Buslink Interface Module and a standard coaxial cable.

It acts as an IBM 3271 Communications Controller transmitting up to 9600 bps in 3270 mode. The communications processor can emulate IBM 3780 terminals over leased or dialed telephone lines to communicate directly with central computer systems. The System 9000 transmits files to the central system, and spools the returning files for processing or printing. It can update a data base stored on the mainframe directly, or can transfer programs to the mainframe for compiling and execution. Workstations can act as remote job entry terminals to the central system or other Inforex systems. The processor uses Infopoll software for communications between System 9000's.

ULTRANET, Inforex's local networking system, allows users to expand installed System 9000 configurations by adding processors and components a unit at a time. The ULTRANET Expansion Processor provides 248K bytes of memory and offers the same characteristics as the original system processor. It does not accommodate cassette tapes. Within an ULTRANET configuration, at least one processor acts as a file management processor dedicated to storing and retrieving the common data files of the ULTRANET. That processor supports up to 180 megabytes of disk storage. The other processors act as either applications processors dedicated to batch or transaction-oriented applications program execution and development or as communications processors managing concurrent communications for the ULTRANET system. Up to three Multipoint Workstation Interfaces may be attached directly to the expansion processor to connect up to 24 external devices. Any workstation can enter data, execute programs, and communicate from the common ULTRANET data base. Workstations and applications processors can be dedicated to specific tasks or programs. Since each processor operates independently, different tasks can be run concurrently.

Processors within the ULTRANET are linked by a high-speed Buslink composed of Buslink Interface Modules, Active Hubs, Passive Hubs, and standard coaxial cable. The Buslink Interface Module attaches directly to the original processor and to each expansion processor to which it assigns a unique address. It accepts only messages directed towards that particular address and is completely transparent to the user. Passive and Active Hubs interconnect processors in a network. The Passive Hub links up to four ULTRANET system members and the Active Hub links up to 16 Buslink Interface Modules or other Active Hubs.

Up to 255 processors plus disks, workstations and printers can be joined in a single ULTRANET system. The Buslink's coaxial cable can connect processors located as far away as four miles with signal amplification. Different ULTRANET systems can communicate with each other through a telecommunications link.

SOFTWARE

COBOL: Inforex's Multi-User COBOL is a subset of the 1968 ANSI COBOL standard with extensions compatible with ANSI 1974 standards. It will run packaged software programs with minor modifications. COBOL applications can be executed in either a batch mode or interactively and any combination of jobs can run simultaneously. Extensions provide for interactive screen formatting, including aids for record manipulation, cursor positioning, field attribute definitions, validation of entered data, general prompts and

Inforex 9000

► error messages. Indexed sequential accessing and the ability to use precompiled programs are additional features. Programs contain up to 65,000 bytes of object code with 15,500 bytes of working storage. A program about 1000 statements long will compile in about five minutes.

UNIVERSAL DATA ENTRY (UDE): The Universal Data Entry software supports both source and volume data entry. After the operator signs on with the proper identification and password, the user may select functions from a menu or may access data directly according to his or her level of experience. Self-explanatory screen layouts guide the operator through individual data entry steps. A screen format generation program provides the capability to create, store, and maintain formats. Eight sub-records can be displayed on each screen. Screen layouts provide 960 characters for user data and a 640-character prompt area.

Data being entered can go through more than 20 sophisticated editing and verification steps. Standard editing functions include Alpha only, numeric only, must enter and must fill. Error checking features include range checking, table look-up and validation, table generation, and check digit validation. Errors can be corrected immediately or flagged for later correction.

The UDE package provides operators with a number of capabilities. Six balance accumulators add or subtract the contents of amount fields to or from a specified accumulator. Operators can view the contents of accumulators, original data in verify mode, current field attributes, transferred file status, available disk space, error records, date and time, and transfer queue entries. The system has the ability to page forward and backward and return back to the next keyable record after a backward search. User files can be updated in the search mode and a search may be specified for a single character or a string of continuous characters. Documents can be keyed left to right, top to bottom, and data can be arranged into the proper sequence for mainframe use. The preformatting function restructures data during transfer operations and the blocking feature groups multiple records into one segment on tape of up to 4096 characters to reduce tape I/O processing time.

The operator statistics file is automatically updated by the system during entry, verify, and modify modes. Information is maintained on file name and number, format name, operator ID, terminal number, function and status, date and time started, elapsed time, document count, record count, keystroke count and error count.

Selected data transfer is possible including disk-to-tape, tape-to-disk, disk-to-disk, tape-to-printer, disk-to-printer concurrent with data entry.

INFOBASE: INFOBASE, the System 9000 information management application module, permits users to enter, format, access, and manipulate data and generate reports without writing a program. It is a data dictionary-based system which defines fields, keys, files and auxiliary data base documentation for use with groups of files. INFOBASE follows a four-step process to create applications for file maintenance, reference and reporting: data field and file definition, screen format creation, search key definition, and automatic program generation.

In data field and file definition, users define each item by name and characteristics. The user creates or modifies the screen format with field labels, key-in positions, screen titles, miscellaneous screen test, field edits and verification displays. Up to nine consecutively numbered screens can be used in

each program. Up to 40 data fields may be displayed per screen. Each character position in the key-in area is represented by an underscore. The last three lines of the screen are reserved for operator messages. The compiled, edited screen design is stored in the data dictionary to be recalled, modified and reused as needed. Screen format can be printed as hard copy while the design is going on.

After defining the screen format, INFOBASE automatically generates applications source code which can be modified by the user. It takes less than five minutes to generate a typical program between 500 and 1,000 lines. Applications programs provide three different message prompts: general prompts to advise the operator of field specifications, error messages, and help prompts whenever a question mark is entered. Each message can have up to 99 lines of 70 characters.

For file inquiry and review, the user selects a key from a menu of key names on multi-key ISAM files. Records may be accessed by full or partial key as well as next key and key previously fetched. Any data review screen image may be printed directly on the system printer.

INFOBASE's CONFIRM (Context-Free Index Retrieval Method) builds only one index file for an unlimited number of keys specified so records may be located by their access key or by multiple keys, class of items, field content, or partial information. Record fields to be changed are accessed randomly by number on the screen. New data is written over the old only after it has been verified. Full prompting is displayed in modification mode.

An INFOBASE array definition facilitates creating and updating files containing repeated rows of data. Data edits for each field can be specified in the data dictionary and applied whenever records are entered, added or modified.

Every INFOBASE-generated file maintenance program has a self-contained facility for producing formatted listings of user data files. Users can select file elements and specify column and page headings. A data file report details all dictionary-resident information for specific files and a field-file cross-reference report shows where each field name is used and its basic attributes. INFOBASE automatically handles formatting, page breaks, headings, column headings, and printer display for reports.

Operators are individually cleared to see data on a screen-by-screen basis. Clearance to review, enter and modify files and records may be assigned by function, operator and data element.

COMPONENTS

PROCESSOR: The System 9000 Processor is a desktop terminal with a processor, a CRT display, and a typewriter-style keyboard. The 248K-byte processor has a 600-nanosecond memory cycle speed and an enhanced instruction set. It supports up to 180 megabytes of disk storage plus a 9-track magnetic tape transport unit. Up to eight workstations and peripherals can be connected via a Multiport Workstation Interface. Two additional adaptors may be added to provide up to 24 available ports. Cassettes are used for program loading and diagnostics.

The CRT displays 960 characters on a 7 by 3.5-inch screen and features a 5 by 7 dot matrix for high legibility and a writing rate of up to 50,000 characters per second. The 55-key alphanumeric keyboard comes in a standard typewriter layout with an 11-key numeric pad and five system control keys.

The Ultranet Expansion Processor is identical to the system processor but it does not accommodate cassette tapes. It may function as an applications processor, a file management ►

Inforex 9000

► processor, or a communications processor. Up to 255 processors plus associated peripherals can be connected in a single ULTRANET system.

WORKSTATION: The Universal Workstation is a desktop terminal with an interactive video display and keyboard. The video display screen measures 5 by 7.9 inches and generates 1920 characters from a 5 by 7 dot matrix using an easy-to-read high-contrast amber phosphor. There are 16 key-controlled increments of screen brightness. Character size is 0.146 x 0.071 inch. The workstation uses a 96-character ASCII set and foreign or special character sets are loaded from the system processor. The screen's refresh rate is 50 or 60 times per second synchronized to line frequency.

The multipurpose keyboard features a standard 55-key alphanumeric typewriter layout with multiple key rollover, an 11-key-calculator-style numeric keyboard, ten programmable function and control keys, and nine off-line diagnostics. It can emulate the IBM 029 keypunch-style keyboard for volume data entry. A character can be displayed 15 times per second by depressing a repeat action key for one-half second. Each workstation can support a 160-cps serial matrix printer and data may be simultaneously printed and displayed.

Any workstation can be used to perform any system function and can either be linked directly to the System 9000 processor or be connected over standard telephone lines.

MULTIPOINT WORKSTATION INTERFACE: The Multipoint Workstation Interface links the System 9000 processor and ULTRANET Expansion Processors with up to eight external devices such as workstations, printers, and modems. Local external devices are connected directly to the interface and remotely located devices are connected via modems and telephone lines. The RS-232C-compatible interface attaches directly to the processor via an I/O bus and draws power from the processor. Transmit and receive baud rates range from 110 to 9600 and may be set independently. Up to three interfaces may be attached to each processor.

DISK STORAGE: Disk storage can be tailored to any size data base of the System 9000 from a minimum of 20 megabytes up to 180 megabytes per disk controller. The Model 9074 Disk Storage System is for small to medium System 9000 configurations and can be used in standalone batch processing applications or as part of a common system data base. The Model 9090 Large System Storage Unit is a mass storage system intended to be used as part of the common data base for large time-sharing configurations.

Expansion units can be attached to the disk controller for incremental growth as required.

The Model 9074 Disk Storage System includes a disk controller and two 10-megabyte disks, one fixed and one removable. Optional 20- and 40-megabyte expansion units can be added up to a maximum of 160 megabytes of storage per processor. The 20-megabyte expansion unit includes both a fixed and removable disk. The 40-megabyte increment incorporates two 20-megabyte disks in a single cabinet. Average and maximum access times are 35 and 60 milliseconds, respectively. Buffer memory size is 4K bytes. The disks record 200 tracks per inch and provide a total of 10,027,008 bytes.

The Model 9090 Large System Storage Unit consists of a controller and two 60-megabyte removable disk packs. An optional 60-megabyte expansion unit housed in its own cabinet may be attached to the controller for a maximum of 180 megabytes of storage. The storage unit combines the disk spindle and drive motor in a single assembly and features an electronic system for final head positioning and an air-cleaning system. Average access time is 30 milliseconds and maximum access time is 55 milliseconds. The disks contain 60,211,200 bytes, and buffer memory size is 16K bytes.

MAGNETIC TAPE: Optional 9-track tape transport units support 800- and 1600-bpi recording at a speed of 25 inches per second. The tape transport unit uses standard magnetic tape reels of 10.5 inches in diameter. Storage capacity is 5.7 megabytes.

PRINTERS: For local reports, users may attach one serial matrix printer to each workstation and one parallel matrix printer to the system processor for a maximum of 25 per processor. The 132-column printers use a 9 by 9 dot matrix and a 96-character ASCII set.

A 300-lpm band printer is also available. It uses a 64- or 96-character ASCII set and prints up to 132 columns with horizontal spacing of 6 or 8 lines per inch.

PRICING

System components are available for purchase or on a one-year lease. Prime shift maintenance for 9 hours/day, 5 days/week is standard; coverage for second and third shifts, six or seven days, and holidays is also available.

	Monthly Rental	Purchase	Maintenance
Basic Configuration:			
248K-byte processor and 20-megabyte disk storage	\$1,697	\$ 44,630	\$341
160-cps printer	130	2,875	38
8 workstations	600	15,960	152
	<u>2,427</u>	<u>63,465</u>	<u>531</u>
Beginning ULTRANET System Basic Configuration: (248K-byte processor and 20-megabyte disk storage)	1,697	44,630	341
9700 ULTRANET starter package (2 expansion processors plus buslink interface module, workstation interface and coaxial cable and connectors)	<u>1,602</u>	<u>41,760</u>	<u>225</u>
	3,299	86,390	566
160-cps printer	<u>130</u>	<u>2,875</u>	<u>38</u>
	3,429	89,265	604
8 workstations	<u>600</u>	<u>15,960</u>	<u>152</u>
	<u>4,029</u>	<u>105,225</u>	<u>756</u>

Inforex System 7000



This view of the Inforex System 7000 CRT terminal shows the various key groupings on the keyboard. Immediately to the right of the alphanumeric keyboard is a full cursor control group. To the right of the cursor group is a numeric pad with plus, minus, and field termination keys. The row of elongated keys closest to the screen consists of user-programmable function keys. The elongated keys immediately above the typewriter keyboard numerics are predefined function keys.

MANAGEMENT SUMMARY

The Inforex System 7000 can be used in centralized data entry operations, but its primary aim is to place terminals directly in the user departments. Employees who work with documents on a day-to-day basis can enter data directly, rather than sending the documents to a central point where a control clerk must highlight or transcribe the data to be entered before it can be given to a keystation operator. The concept makes enormous sense because it places the responsibility for the accuracy of the data entered directly with the originating department, and it eliminates the time and effort required to comply with the extra procedures associated with sending critical documents to the data entry activity (counting, figuring control totals, etc.).

The System 7000 is not a full-blown data processing system. The machine contains a microprocessor and can indeed perform arithmetic functions, file management, and report generation, but the intention is that it communicate with a host computer system. This communication occurs only on a batch basis. The processing capability available within the System 7000 is intended to reduce the computational burden on the host processor and to reduce the line costs associated with communicating with it.

While communication with the host processor is not interactive, there can be considerable local interaction between the terminal operator and the 7000 in the course of the keying operation.

Inforex evidently has given a lot of thought to the terminal itself, which is being built to Inforex specifications by Beehive. The keyboard can be detached from the CRT and placed at the most convenient angle for the

A modular disk or diskette based data entry/data processing terminal system.

Single terminal and multiple terminal configurations of up to seven display/keyboard workstations are provided. Diskette or cartridge disk storage is included. User programming is accomplished via a subset of COBOL enhanced with data entry functions. Operating software permits multiple concurrent tasks in a cluster system.

A basic single-terminal system with twin diskette drives, 64K-byte processor and bisynchronous communications sells for \$15,000 or leases for \$385 per month on a 42-month lease, including maintenance.

A four-terminal system with two 10-megabyte disk drives, 64K-byte processor, bisynchronous communications and a 300 lpm printer sells for \$66,150 or leases for \$1,487 per month on a 42-month lease including maintenance.

CHARACTERISTICS

VENDOR: Inforex Inc., 21 North Avenue, Burlington, Massachusetts 18103. Telephone (617) 272-6470.

DATE OF ANNOUNCEMENT: January 1977.

DATE OF FIRST DELIVERY: Third quarter 1977.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Inforex.

MANUFACTURER: Inforex Inc., 21 North Avenue, Burlington, Massachusetts 18103. Telephone (617) 272-6470.

CONFIGURATION

The System 7000 is available as a single-station remote terminal or as a multi-station cluster system.

The basic *7000 single-terminal* unit consists of a communicating processor with 64K bytes of semiconductor memory, disk or diskette drive and controller, and a keyboard and CRT display. This minimum configuration can be expanded to include a second keyboard and display.

The basic *7000 multiple-terminal* system consists of the communicating processor with 64K bytes of semiconductor memory, disk controller, 10 megabytes of cartridge disk storage, and from one to seven keyboard display terminals. The system can be expanded to accept a serial printer or line printer, one or two magnetic tape units, and one to three additional 10-megabyte disk drives.

User application programs are upward and downward compatible between the single-terminal and multiple-terminal systems.

COMMUNICATIONS

The 7143 Communications Controller utilizes binary synchronous communications (BSC) line protocol and IBM 2780/3780 emulation. The System 7000 provides a batch communications capability only. Transmission speeds up to 9600 bps are available. Communications can take place between the 7000 and a host computer, a 7000 and another System 7000, or a 7000 and another Inforex product (key/disk or file management system).

Inforex System 7000

operator. The keyboard is one of the most powerful we've seen on a shared-processor keystation. It has a full alphanumeric set arranged in typewriter fashion, full cursor control, a numeric keypad, a group of preprogrammed function keys, and 15 user-programmable function keys.

Another interesting characteristic of the System 7000 is the use of COBOL as the user language and the capability for the user to enter, compile, list, and debug programs on the system. It wasn't too long ago that manufacturer-supplied software made the real difference in choosing a data entry system, because the user generally didn't want to learn how to program the system or write the programs once he learned how. The use of COBOL as the system language removes at least the first objection.

Please pay particular attention to the configuration data in the Characteristics section of this report because the terminology, while quite explicit, can be confusing. For example, all System 7000 configurations communicate with *something*. The system is available in a stand-alone configuration or a cluster configuration. However, the stand-alone configuration can have a second CRT terminal attached, and the cluster configuration can include anywhere from one to seven CRT terminals.

USER REACTION

Datapro contacted five users of the Inforex System 7000 during December 1978 and January 1979. These users had a total of 13 keystations installed on a total of 6 systems. The longest period of reported usage was six months. Ratings were supplied by four of these users; the fifth one had just had the equipment installed and felt it was too soon to rate the system. The ratings supplied by the four users are summarized in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	2	0	0	3.3
Ease of operation	2	2	0	0	3.5
Hardware reliability	3	1	0	0	3.8
Maintenance service	4	0	0	0	4.0
Software	2	1	1	0	3.3
Technical support	2	1	1	0	3.3

*Weighted Average on a scale of 4.0 for Excellent.

In one installation, the System 7000 was communicating with a Honeywell 6080 processor, while in another installation the system was communicating with an Inforex 1303 key/disk system. All of the other systems were operating on a stand-alone basis.

One user commented that the system's performance was better than expected, and another stated that he was very pleased with the vendor's support. However, one user reported problems in verbally communicating with Inforex and also indicated dissatisfaction with the System 7000's COBOL compiler because it lacks a cross-reference capability. □

➤ A communications operation on the System 7000 can occur simultaneously with data entry and processing operations.

The System 7000 is equipped with a standard EIA RS-232C interface and can be used over a dialed, leased, or private-line communications facility via an external modem.

The 7132 User Terminal Multiplexer provides the ability to connect up to seven keyboard display terminals to the master terminal. The 7132-to-terminal interface is accomplished via RS-232C for local or remote connection

at up to 19.2K bps or via a local (up to 200 feet) 20-mA current loop interface.

SOFTWARE

The System 7000 operating system is a modular, multi-user, disk-oriented system. It features virtual memory and supports concurrently the functions of data entry, data editing and validation, file management, and data communications. All of these modes can be multiprogrammed and share common facilities.

One of the principal features of the System 7000 software is its support of multi-user, interactive Level II COBOL. It provides the capability for executing multiple COBOL programs concurrently. Multiple terminals can be executing the same program simultaneously.

COBOL programs can also be compiled on the System 7000. Each terminal can be compiling a unique program, or one or more terminals can be engaged in compiling programs while other terminals are performing data entry or other operations.

The virtual memory feature of the System 7000 software is essentially dynamic memory management of non-resident system software and user programs. Up to 200,000 bytes per user are allocated on a demand paging basis.

The supervisor program prevents unauthorized access to programs, file, and data items. It accepts day, date, and time so that system use can be accounted for by user number, job number, task, or any combination thereof.

Password-controlled access is available for read, write, list, copy, and run protection.

Multi-user file directories enable sector and file interlocks for on-line file protection when allocating storage and initializing the system.

The System 7000 utilities include SORT/MERGE via a user-defined procedure that can be executed from a COBOL command or terminal keyboard command.

Input/output routines provide for combination and concurrent I/O transfers between cartridge disk or diskette and magnetic tape units, printer, card reader, or a communications line.

Utility programs are provided to facilitate writing COBOL programs, including provisions for entering (keying), editing, compiling, debugging, and listing programs. Other utilities are provided for maintaining and updating the file directory, sorting disk files, and transferring a file to a different medium.

Two COBOL extensions have been developed by Inforex to adapt the language for data entry. These consist of a Terminal Formatting Package and a Check Digit Package.

The Terminal Formatting Package provides additional COBOL verbs, the capability for defining CRT screen layout and cursor movement, and the ability to define field attributes on a field-by-field basis. Field attributes which can be specified include must enter or must fill, alpha only or numeric only, legal characters, justify, and fill. The user employs these wherever appropriate in setting up the format of each document to be entered.

The Check Digit Package supports modulus 7,10, and 11 checking schemes. The check digit capability can be used to validate a check digit on previously prepared material and also to generate a check digit for a string of characters just keyed.

A single COBOL program can access up to 14 different files. Access to files can be restricted to read only, input/output only, or write and update. Three types of file structures are supported: sequential, direct, and indexed. Indexed files provide for one primary key and up to three secondary keys per record.

Editing and verifying can be performed on a field-by-field or record-by-record basis, or on a file basis. The interactive

Inforex System 7000

► nature of the System 7000 COBOL permits the user flexibility in deciding how and when editing and verifying will be done.

Communications with another System 7000 configuration, a host mainframe, or another Inforex system can occur simultaneously with data entry and verifying operations. Transmission is via binary synchronous communications line protocol and uses IBM 2780/3780 emulation.

SYSTEM OPERATION

Operation of the System 7000 is directed independently from any terminal designated to perform certain or all tasks. On a multiple-terminal system, certain or all terminals can be designated as COBOL development users, processing users, etc. This feature enables centralized control of user activities if so desired. The master and slave terminals are identical in concept and design from an aesthetic standpoint. The master terminal houses the processor, memory, and communications adapter, while the slave terminals, although seemingly identical, contain no processing hardware.

System software initial loading and maintenance are controlled by the master terminal. The single-terminal system incorporates the same master as is found on the multiple-terminal processing system and operates identically.

SYSTEM COMPONENTS

CONTROL PROCESSOR: The same control processor is included in both the stand-alone and cluster versions of the 7000 system. This is a 16-bit, Nova 1200-compatible micro-processor with an instruction execution time of 1.2 microseconds. The semiconductor memory is expandable in 16K-byte increments up to 128K bytes. Memory access time is 750 nanoseconds.

CRT TERMINAL: Each terminal consists of a 1920-character CRT display with attached movable keyboard. The data keys are arranged in typewriter-style layout. Additional key groupings include a cursor control pad, a 10-key numeric pad, 14 predefined function keys, and 15 programmable function keys. The last-named keys permit the programmer to implement an application-dependent function by means of a single keystroke.

The predefined function keys include: print, forward record, backward record, forward document, backward document, forward tab, backward tab, field erase, screen erase (all data fields), screen clear (all data and formats), new line, fill, re-set, and enter.

The 10-key pad includes plus, minus, and field termination keys. All numeric input applications can be confined to this area of the keyboard.

The cursor control pad includes controls for cursor up line, down line, character left and right, home, forward and backward field, and character insert and delete.

DISKETTE STORAGE: Two diskette storage units provide 1,200,000 characters of storage for the stand-alone system. No expansion is permitted. Diskette storage is available only on the single-terminal configurations.

DISK STORAGE UNIT: The 7301 disk storage unit consists of one fixed disk and one 5440-type removable cartridge disk, each with a capacity of five million bytes, for a total of 10 million bytes per drive. Average head positioning time plus rotational delay is 50 milliseconds, and the bit transfer rate is 2.5 million bits per second. Up to four 10-megabyte disk storage units can be connected to a single system.

MAGNETIC TAPE DRIVE: The 7401 magnetic tape drive is a dual-gap, 9-track unit that records at 800 bpi and 45 inches per second using the NRZI recording technique. The drive accepts a 10.5-inch diameter tape reel with a tape capacity of 2400 feet. The 7402 magnetic tape drive is identical in every respect, except that it records at 1600 bpi utilizing the phase encoding technique. The magnetic tape drives are available only on the 7000 multiple-terminal system. A maximum of two tape drives can be connected to a multiple-terminal system.

PRINTERS: Three different models of printers are available on the 7000 system. The single-station configuration of the 7000 can support one serial printer. The multiple-terminal system can support one line printer plus one or more serial printers in place of an equal number of displays, as well as allowing a serial printer to be attached to the master CRT terminal.

The 1410 serial printer is a 150-character-per-second serial printer.

The 1417 line printer is a 300-line-per-minute drum-type impact printer. When the printer is equipped with a 96-character drum, the print rate drops to 240 lines per minute.

The 1418 line printer is a 600-line-per-minute drum-type impact printer. When the printer is equipped with a 96-character drum, the print rate drops to 436 lines per minute.

PRICING

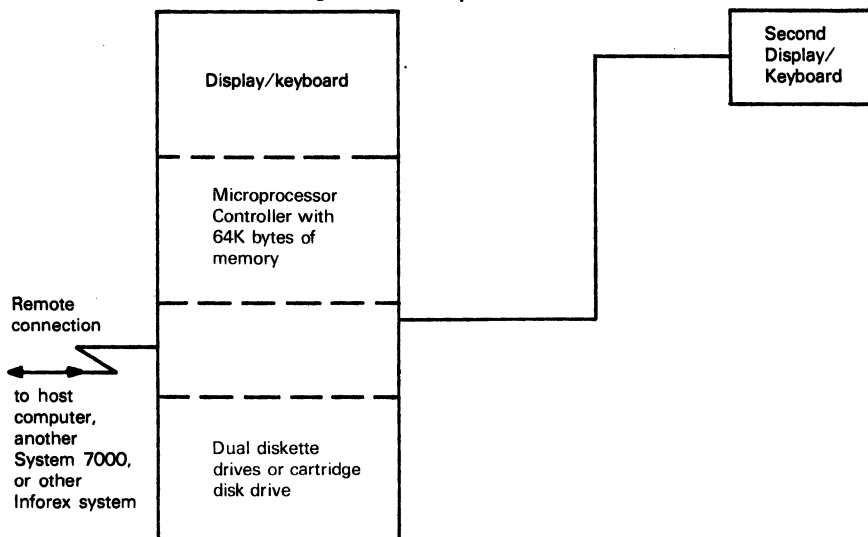
The System 7000 is available for purchase or on a 1-year, 42-month, or 5-year lease, which includes maintenance. A separate maintenance contract is available for purchased units. There is no separate installation charge for the System 7000.

Inforex now offers five basic configurations, which are listed in the table below. Certain peripherals can be purchased or leased separately and added to an appropriate System 7000 configuration. ►

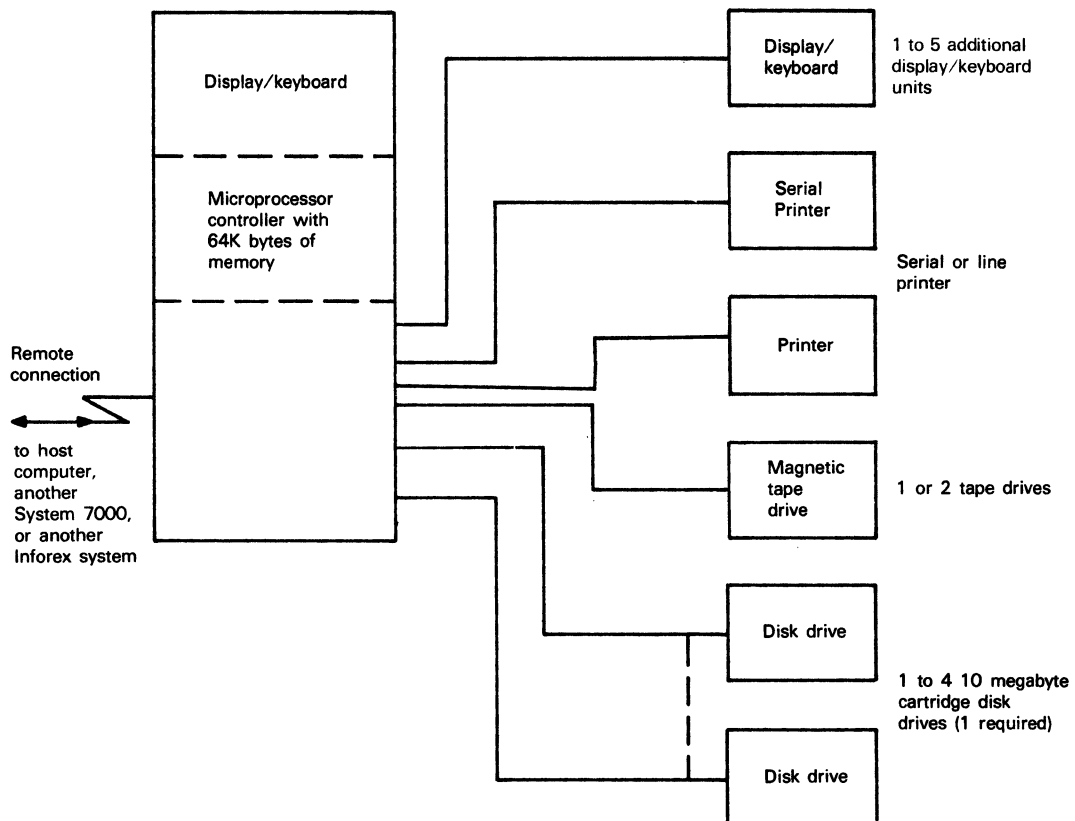
Inforex System 7000

Configurations

7001/7002 Single Terminal System



Multiple Terminal System



Inforex System 7000



		Monthly Rental*			
		1-Year Lease	42-Month Lease	Purchase	Monthly Maint.
7001	Diskette-based Single Terminal System (64K-byte processor, double diskette drive, bisynchronous communications, COBOL compiler, operating system, and utilities library)	\$ 463	\$ 385	\$15,000	\$ 81
7002	Disk-based Single Terminal System (64K-byte processor, 10-megabyte disk drive and controller, terminal stand, software described under 7001)	711	656	30,900	184
7003	Disk-based Four-terminal System (64K-byte processor, 10-megabyte disk drive and controller, 1 master terminal, 3 slave terminals, bisynchronous com- munications, multiplexer, serial printer, software described under 7001)	1,144	1,021	45,950	286
7004	Disk-based Four-terminal System (64K-byte processor, 10-megabyte disk drives and controller, 1 master terminal, 3 slave terminals, bisynchronous com- munications, multiplexer, 300-lpm printer and controller, software described under 7001)	1,732	1,487	66,150	416
7005	Disk-based Four-terminal System (64K-byte processor, three 10-megabyte disk drives and controller, 1 master terminal, 3 slave terminals, terminal stand, 9-track 1600-bpi tape drive and controller, bisynchronous communica- tions, multiplexer, serial printer, 300-lpm printer and controller, software described under 7001)	2,402	2,055	92,300	615
7210	Slave Terminal	83	70	2,500	15
7132	Multiplexer	36	30	1,450	7
7143	Communications Controller	18	15	600	10
7301	10-Megabyte Disk Drive	227	193	8,000	75
7330	Disk Cartridge	—	—	100	—
7904	Primary Diskette Subsystem with Controller	150	120	5,300	21
7908	Secondary Diskette Subsystem without Controller	92	78	2,800	16
7913	Expansion Chassis Cabinet	83	70	3,000	NC
7915	Disk Cabinet	25	21	1,050	NC
7401	Tape Drive (9-track, 800 bpi)	232	195	8,600	58
7402	Tape Drive (9-track, 1600 bpi)	263	222	10,500	77
7421	Tape Controller	75	64	3,200	7
1410	Serial Printer	130	110	5,500	40
1417	Line Printer (300 lpm)	425	362	14,900	88
1418	Line Printer (600 lpm)	578	492	18,700	130
7023	Line Printer Controller	41	35	1,750	7

*Includes maintenance for 8 hours per day, 5 days per week.■

Inforex System 7000

MANAGEMENT SUMMARY

The System 7000 represents the initial Inforex entry into distributed processing. Previous Inforex products were aimed at high-volume, centralized data entry operations. The System 7000 can be employed in such an environment, of course, but the real thrust of this system is to place terminals directly in the user departments. In this way, employees who work with the documents on a day-to-day basis can enter data directly, rather than sending the documents to a central point where a control clerk must highlight or transcribe the data to be entered before it can be given to a keystation operator. The concept makes enormous sense because it places the responsibility for the accuracy of the data entered directly with the originating department, and it eliminates the time and effort required to comply with the extra procedures associated with sending critical documents to the data entry activity (counting, figuring control totals, etc.).

The System 7000 is not a full-blown data processing system. The machine contains a microprocessor and can indeed perform arithmetic functions, file management, and report generation, but the intention is that it communicate with a host computer system. This communication occurs only on a batch basis. The processing capability available within the System 7000 is intended to reduce the computational burden on the host processor and to reduce the line costs associated with communicating with it.

While communication with the host processor is not interactive, there can be considerable local interaction be- ➤

A modular, disk based, data entry/data processing terminal.

Stand-alone or cluster systems of up to seven display/keyboard workstations are provided. Diskette or cartridge disk storage is included. User programming is performed in a subset of COBOL enhanced with data entry functions. Operating software permits multiple, concurrent tasks in a cluster system. File-oriented processing is provided. Cluster system peripherals include magnetic tape drives, card reader, line printer, and up to 40 megabytes of disk storage.

A basic stand-alone terminal with twin diskette drives and a serial printer leases for \$528 per month on a 42-month arrangement including maintenance, and sells for \$20,700.

A typical four-station cluster system with line printer and 20 megabytes of disk storage leases for \$1,996 per month on a 42-month arrangement including maintenance, and sells for \$80,110.

CHARACTERISTICS

VENDOR: Inforex Inc., 21 North Avenue, Burlington, Massachusetts 18103. Telephone (617) 272-6470.

DATE OF ANNOUNCEMENT: January 1977. ➤



This view of the Inforex System 7000 CRT terminal shows the various key groupings on the keyboard. Immediately to the right of the alphanumeric keyboard is a full cursor control group. To the right of the cursor group is a numeric pad with plus, minus, and field termination keys. The row of elongated keys closest to the screen consists of user-programmable function keys. The elongated keys immediately above the typewriter keyboard numerics are pre-defined function keys.

Inforex System 7000

➤ tween the terminal operator and the 7000 in the course of the keying operation.

Inforex evidently has given a lot of thought to the terminal itself, which is being built to Inforex specifications by Beehive. The keyboard can be detached from the CRT and placed at the most convenient angle for the operator. The keyboard is one of the most powerful we've seen on a shared-processor keystation. It has a full alphanumeric set arranged in typewriter fashion, full cursor control, a numeric keypad, a group of preprogrammed function keys, and 14 user-programmable function keys.

Another interesting characteristic of the System 7000 is the use of COBOL as the user language and the capability for the user to enter, compile, list, and debug programs on the system. It wasn't too long ago that manufacturer-supplied software made the real difference in choosing a data entry system, because the user generally didn't want to learn how to program the system or write the programs once he learned how. The use of COBOL as the system language removes at least the first objection.

Please pay particular attention to the configuration data in the Characteristics section of this report because the terminology, while quite explicit, can be confusing. For example, all System 7000 configurations communicate with *something*. The system is available in a stand-alone configuration or a cluster configuration. However, the stand-alone configuration can have a second CRT terminal attached, and the cluster configuration can include anywhere from one to seven CRT terminals.

Inforex stated that volume shipments of the System 7000 will begin in the third quarter of 1977. □

➤ **DATE OF FIRST DELIVERY:** Third quarter 1977.

NUMBER DELIVERED TO DATE: —

SERVICED BY: Inforex.

CONFIGURATION

The System 7000 is available as a single-station remote terminal or as a multi-station cluster system.

The basic 7000 *stand-alone* unit consists of a communicating processor with 32K bytes of semiconductor memory, diskette controller, twin diskette drives, and a keyboard and CRT display. This minimum configuration can be expanded to include a second keyboard and display and a serial printer.

The basic 7000 *cluster system* consists of the communicating processor with 64K bytes of semiconductor memory, disk controller, 10 megabytes of cartridge disk storage, and from one to seven keyboard display terminals. The cluster system can be expanded to accept a serial printer or line printer, one or two magnetic tape units, and one to three additional 10-megabyte disk drives. In addition, serial printers may be substituted for keyboard display terminals on a one-for-one basis.

User application programs are upward and downward compatible between the stand-alone and cluster systems.

COMMUNICATIONS

The 7143 Communications Adapter utilizes binary synchronous communications (BSC) line protocol and IBM 2780/3780 emulation. The System 7000 provides a batch communications capability only. Transmission speeds up to 9600 bps are available. Communications can take place between the 7000 and a host computer, a 7000 and another System 7000, or a 7000 and another Inforex product.

A communications operation on the System 7000 can occur simultaneously with data entry and processing operations.

SOFTWARE

The System 7000 operating system is a modular, multi-user, disk-oriented system. It features virtual memory and supports concurrently the functions of data entry, data editing and validation, file management, and data communications. All of these modes can be multiprogrammed and share common facilities.

One of the principal features of the System 7000 software is its support of multi-user, interactive Level II COBOL. It provides the capability for executing multiple COBOL programs concurrently. Multiple terminals can be executing the same program simultaneously.

COBOL programs can also be compiled on the System 7000. Each terminal can be compiling a unique program, or one or more terminals can be engaged in compiling programs while other terminals are performing data entry or other operations.

The virtual memory feature of the System 7000 software is essentially dynamic memory management of non-reside system software and user programs. Up to 200,000 bytes user are allocated on a demand paying basis.

The supervisor program prevents unauthorized access to programs, files, and data items. It accepts day, date, and time so that system use can be accounted for by user number, job number, task, or any combination thereof. Password-controlled access is available for read, write, list, copy, and run protection.

Multi-user file directories enable sector and file interlocks for on-line file protection when allocating storage and initializing the system.

Input/output routines provide for combination and concurrent I/O transfers between cartridge disk or diskette and magnetic tape units, printer, card reader, or a communications line.

In the event of a power failure, no data is lost. When power is restored, the system resumes operation from the point of interruption without operator-initiated restore sequences.

Utility programs are provided to facilitate writing COBOL programs, including provisions for entering (keying), editing, compiling, debugging, and listing programs. Other utilities are provided for maintaining and updating the file directory, sorting disk files, and transferring a file to a different medium.

Two COBOL extensions have been developed by Inforex to adapt the language for data entry. These consist of a keystation support package and a check digit package.

The keystation support package provides additional COBOL verbs, the capability for defining CRT screen layout and cursor movement, and the ability to define field attributes on a field-by-field basis. Field attributes which can be specified include must enter or must fill, alpha only or numeric only, legal characters, justify, and fill. The user employs these wherever appropriate in setting up the format of each document to be entered. ➤

Inforex System 7000

► The check digit package supports modules 7, 10, and 11 checking schemes. The check digit capability can be used to validate a check digit on previously prepared material and also to generate a check digit for a string of characters just keyed.

A single COBOL program can access up to 14 different files. Access to files can be restricted to read only, input/output only, or write and update. Three types of file structures are supported: sequential, direct, and indexed. Indexed files provide for one primary key and up to three secondary keys per record.

Editing and verifying can be performed on a field-by-field or record-by-record basis, or on a file basis. The interactive nature of the System 7000 COBOL permits the user flexibility in deciding how and when editing and verifying will be done.

Communications with another System 7000 configuration (stand-alone or cluster), a host mainframe, or another Inforex system can occur simultaneously with data entry and verifying operations. Transmission is via binary synchronous communications line protocol and uses IBM 2780/3780 emulation.

SYSTEM COMPONENTS

CONTROL PROCESSOR: The same control processor is included in both the stand-alone and cluster versions of the 7000 system. This is a 16-bit, Nova 1200-compatible micro-processor with an instruction execution time of 1.2 microseconds. The semiconductor memory is expandable in 16K-byte increments up to 128K bytes. Access time is 750 nanoseconds.

CRT TERMINAL: Each 7110 (Master) or 7115 (Stand-alone) terminal consists of a 1920-character CRT display with attached movable 7233 keyboard. The data keys are arranged in typewriter-style layout. Additional key groupings include a cursor control pad, a 10-key numeric pad, 14 predefined function keys, and 14 programmable function keys. The last-named keys permit the programmer to implement an application-dependent function by means of a single keystroke.

The predefined function keys include: print, forward record, backward record, forward document, backward document, forward tab, backward tab, field erase, screen erase (all data fields), screen clear (all data and formats), new line, fill, reset, and enter.

The 10-key pad includes plus, minus, and field termination keys. All numeric input applications can be confined to this area of the keyboard.

The cursor control pad includes controls for cursor up line, down line, character left and right, home, forward and backward field, and character insert and delete.

DISKETTE STORAGE: Two 7532 diskette storage units provide 500,000 characters of storage for the stand-alone system. No expansion is permitted. diskette storage is available only on the stand-alone configuration.

DISK STORAGE UNIT: The 7301 disk storage unit consists of one fixed disk and one 5440-type removable cartridge disk, each with a capacity of five million bytes, for a total of 10 million bytes per drive. Average head positioning time plus rotational delay is 50 milliseconds, and the bit transfer rate is 2.5 million bits per second. The disk storage unit is available only on the 7000 cluster system. Up to four 10-megabyte disk storage units can be connected to a single cluster system.

MAGNETIC TAPE DRIVE: The 7401 magnetic tape drive is a dual-gap, 9-track unit that records at 800 bpi and 37.5 inches per second using the NRZI recording technique. The drive accepts an 8.5-inch diameter tape reel with a tape capacity of 1200 feet. The 7402 magnetic tape drive is identical in every respect, except that it records at 1600 bpi utilizing the phase encoding technique. The magnetic tape drives are available only on the 7000 cluster system. A maximum of two tape drives can be connected to a cluster system.

PRINTERS: Four different models of printers are available on the 7000 system. The single-station configuration of the 7000 can support one serial printer. The cluster system can support one line printer plus one or more serial printers in place of an equal number of displays.

The 1415 serial impact printer is a 45-character-per-second, wheel-type printer that provides correspondence-quality printing.

The 1416 serial printer is a 165-character-per-second impact matrix printer. Effective speed is sixty 80-character lines per minute. Characters are formed by a 9-by-7 matrix.

The 1417 line printer is a 300-line-per-minute drum-type impact printer. When the printer is equipped with a 96-character drum, the print rate drops to 240 lines per minute.

The 1418 line printer is a 600-line-per-minute drum-type impact printer. When the printer is equipped with a 96-character drum, the print rate drops to 436 lines per minute.

A 12-channel vertical format unit is available as an option on either of the line printers.

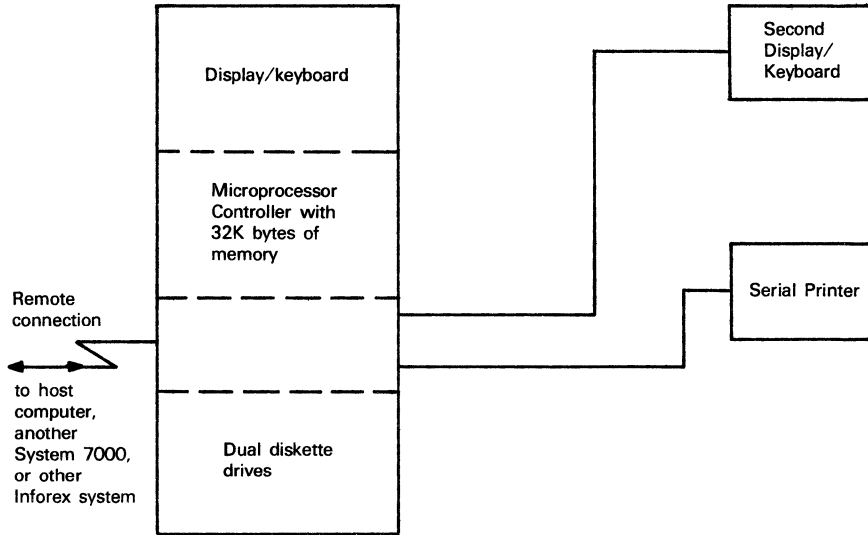
PRICING

The System 7000 is available for purchase or on a 1-year or 42-month lease, which includes maintenance. A separate maintenance contract is available for purchased units. There is no separate installation charge for the System 7000. ►

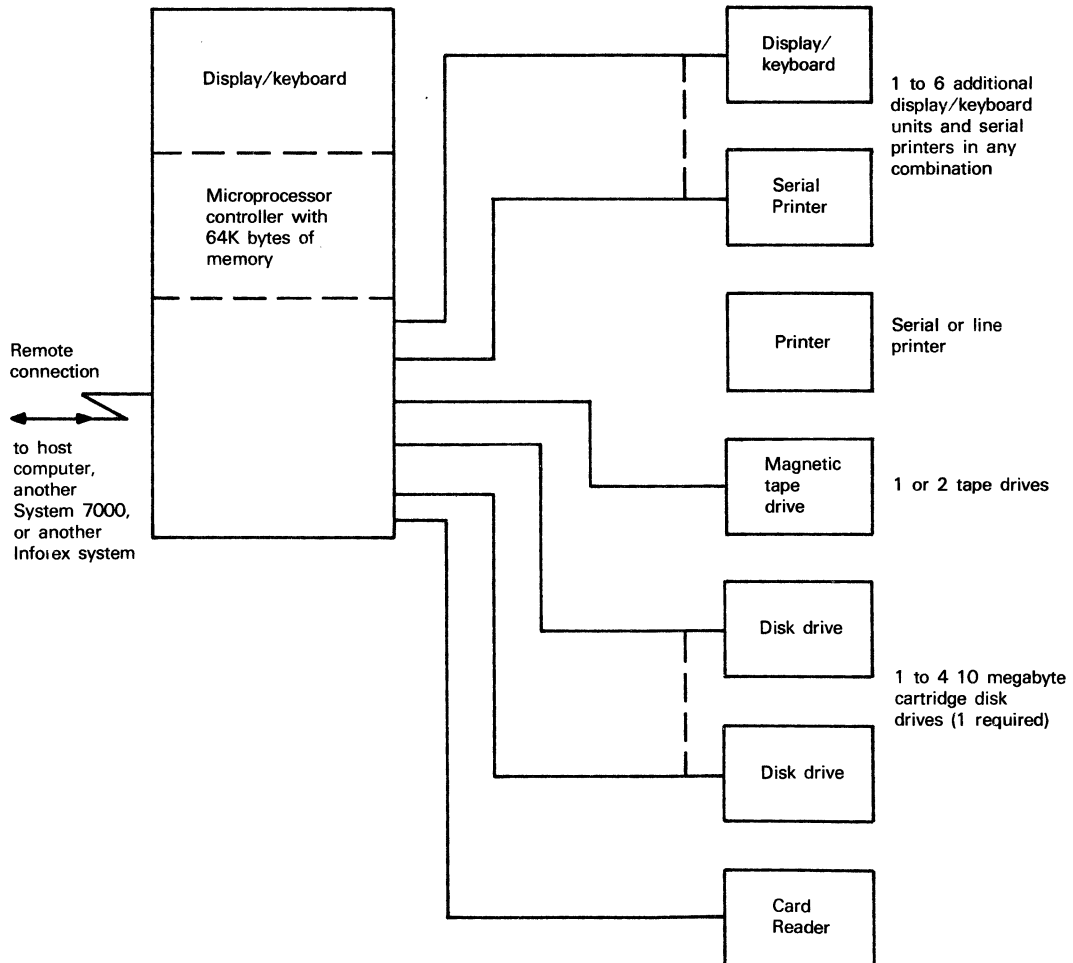
Inforex System 7000

Configurations

7115 Stand-alone Terminal



7110 Master Terminal (cluster system)



Inforex System 7000

		Monthly Rental			
		1-Year Lease*	42-Month Lease*	Purchase	Monthly Maint.*
7110	Master Terminal (for cluster system only)	\$507	\$444	\$17,450	\$ 95
7115	Stand-alone Terminal	250	214	9,100	50
7210	Slave Terminal	115	95	4,000	15
7233	Keyboard for any of above	NC	NC	NC	NC
7123	Memory Increment (16K)	57	50	2,150	7
7131	Multiplexer (8-channel)	35	31	1,200	7
7143	Communications Adapter	15	14	200	10
7301	10-Megabyte Disk Drive	382	335	13,000	75
7321	Disk Controller	69	60	2,650	7
7352	Single Diskette Drive	46	38	1,500	8
7372	Diskette Controller (for 2 drives)	28	23	900	5
7401	Tape Drive (800 bpi)	230	203	7,250	58
7402	Tape Drive (1600 bpi)	280	249	8,600	77
7421	Tape Controller (800 bpi)	120	105	4,900	7
7422	Tape Controller (1600 bpi)	140	122	5,750	7
7510	Card Reader	153	129	4,800	33
7520	Card Reader Adapter	7	6	250	1
1417	Line Printer (300 lpm)	490	450	18,860	88
1418	Line Printer (600 lpm)	677	622	23,150	130
1416	Serial Matrix Printer (165 cps)	225	195	7,250	50
1415	Serial Character Printer (45 cps)	225	195	7,750	40
7020	Printer Controller (300/600 lpm)	48	42	1,750	7
7021	Printer Controller (45 cps)	48	42	1,750	7
7022	Printer Controller (165 cps)	7	6	250	1

*Includes maintenance for 8 hours per day, 5 days per week.■

