

Nixdorf 600 Series Distributed Processing Systems

MANAGEMENT SUMMARY

To date, Nixdorf's 600 Series of distributed processing systems have been very well received by their users. There are three models in this series—the 600/35, 600/45, and 600/55, and each offer expansion capability. The Nixdorf systems have been designed to provide not only communications capability, but those operating features needed for business-oriented data processing in a decentralized environment. Each 600 Series model is a minicomputer which supports up to eight megabytes of virtual memory for up to 32 concurrent users, and up to 264 megabytes of on-line disk storage. Each model supports a full range of peripheral devices. In addition to DPEX, which is the Nixdorf operating system, there is also optional software available.

Each system in the 600 Series can perform data entry, local file processing, local data base inquiry and updating, and batch and interactive communications. A 600 Series system can also communicate with a local or remote Nixdorf 8840 Word Processing System via Nixdorf's LINK Software Package. All three 600 models are software-compatible, and all are field-upgradable.

The 600 Series operates under the control of DPEX (Distributed Processing Executive), a multi-tasking, virtual memory operating system. The system's virtual memory architecture supports multiple concurrent tasks.

The 600/35 is intended for small, remote offices that require concurrent operations at low monthly cost. The system supports up to nine terminals, two diskette units, two fixed disk units or one removable disk, and a magnetic tape drive. The 600/35 can perform up to nine concurrent tasks.



A family of distributed data processing systems offering both communications and business-oriented data processing.

The 600 Series includes three models: the 600/35, 600/45, and 600/55. The 600 Series systems support up to 128K bytes of real memory, and a maximum of 32 keystations, 2 diskette units, 4 tape units, and 264 megabytes of disk storage, as well as optional printers and a card reader. In addition to batch and interactive communications, the 600 Series can also be used for data entry, local data base inquiry and updating, and local file processing. The systems also have the ability to interface with Nixdorf's 8840/5 word processing systems.

Typical 600 Series configurations range in purchase price from \$45,250 to \$109,050.

CHARACTERISTICS

VENDOR: Nixdorf Computer Corporation, 300 Third Avenue, Waltham, Massachusetts 02154. Telephone (617) 890-3600. In Canada: Nixdorf Canada Ltd., 505 Consumers Rd., Suite 102, Willowdale, Ontario M2P 1K6. Telephone (416) 498-7200.

DATE OF ANNOUNCEMENT: 600/X5 Series—August 1979.

DATE OF FIRST DELIVERY: 600/X5 Series—January 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Nixdorf Computer Corporation.

The 600/55 is the top of the Nixdorf line of Distributed Processing Systems. It can support four disks allowing up to 264 megabytes of on-line storage for operations where large volumes of information must be stored, interrogated and maintained. It is the most powerful of the Nixdorf 600 family and can support up to 32 workstations or tasks concurrently. Available for the system, in addition, are tape units, system printer, terminal printers, card reader and diskettes. As shown here, the system is compact with one cabinet housing the main processor and its associated real memory, the peripheral and communications interface controllers, a magnetic tape transport and controller, the system's power supply and a battery back-up unit. A second cabinet contains the 33/66 megabyte disk which is standard.

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➤ The 600/45 features greater processing power and configuration flexibility for applications requiring multiple concurrent operations. The 600/45 can perform up to 16 concurrent tasks and supports up to 16 terminals, 2 diskette units, 2 magnetic tape units, and up to 132 megabytes of disk storage.

At the top of the 600 Series line, the 600/55 supports up to 32 terminals, 32 concurrent tasks, two diskette units, up to 4 magnetic tape units, and up to 264 megabytes of disk storage. The 600/55 is designed for installations in which large volumes of information must be locally stored, interrogated, and maintained.

The microprocessor-controlled Data Terminal used with the 600 Series can function as a local or remote keystation. The terminal features a 1920-character display and a typewriter- or keypunch-style keyboard. There is also an optional 480-character display terminal available. Each Data Terminal can control a 45-character-per-second, 150 character-per-second, or 300-line-per-minute printer. Nixdorf also offers printers that operate at 600 and 900 lines per minute. All printers, except the 45-cps model, can operate as system printers under the control of the 600 Series Control Group.

Volume deliveries of the 600 Series systems began in January 1980.

COMPETITIVE POSITION

The Nixdorf 600 Series are being marketed as distributed data processing systems in the marketplace. The Series competes with Four-Phase Series IV, IBM Series 1, 5280, and 8100, Inforex 9000, Mohawk Series 21, Pertec XL20 and XL40, and Sperry 1900 CADE.

The Nixdorf 600/35 is priced less than the Four-Phase IV, Inforex System, and the lower end Pertec system but is more than the IBM 5280 and 8100 System.

The 600/55 competes directly with the IBM 8100. The 600/55, Nixdorf's top of the line, supports up to 264 megabytes of disk storage (4 disk drives) and 2 diskettes, while IBM's 8100 supports up to 123 megabytes of disk storage.

ADVANTAGES AND RESTRICTIONS

The Nixdorf 600 Series affords several advantages to users of its distributed data processing systems. For one, the company offers an easy-to-use terminal with a choice of keyboard styles which can be mixed, either keypunch style or typewriter style, whichever suits the application best. There are fewer control keys, with the most frequently used keys specially designed. For example, the release key is raised slightly for easier location by the user, while the home row keys have deep finger depression surfaces, also for easier location. An important feature is the HELP! key. ➤

MODELS

Three 600 Series models are available: Systems 600/25, 600/35, 600/45, and 600/55. The Control Group for each system consists of a single cabinet that houses the main processor, the peripheral and communications interface controllers, the system's power supply, and diskette, disk, or tape storage.

CONFIGURATION

SYSTEM 600/35: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and 4.8, 9.6, or 66 megabytes of disk storage. The 600/35 supports up to nine keystations, up to two diskette drives, and an additional 4.8 megabytes of disk storage.

SYSTEM 600/45: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 4.8 or 33-megabyte disk drive (that is housed in a separate cabinet.) The 600/45 supports an additional tape drive, two diskette drives, an additional 4.8 megabytes on up to 132 megabytes of disk storage, and up to 16 keystations.

SYSTEM 600/55: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 33-megabyte disk drive housed in a separate cabinet. The 600/55 supports up to 32 keystations, one or two diskette drives, up to three additional tape units, and up to 264 megabytes of disk storage.

Optional peripherals available with all systems include communications controllers: 300-, 600-, or 900-lpm line printers; a 150-cps needle matrix printer; and a 300-cpm card reader.

TRANSMISSION SPECIFICATIONS

Data captured and processed by a 600 Series system can be transmitted at rates up to 19,200 bits per second to another 600 Series system or to virtually any terminal or mainframe supporting the Binary Synchronous Communications protocol. Batch communications protocols supported include IBM 2780, 3780, 3741, and HASP Multi-leaving. IBM 3270, 3271, and 3275 emulation is also provided for interactive communications.

The HASP Workstation Emulator provides hardware and software emulation of IBM 360/20, 360/25, or 360/30 remote workstations. The HASP Workstation Emulator supports multistream operation of up to eight receive and four transmit streams simultaneously. Emulation can operate concurrently with other system functions, including terminal I/O, data entry, and local processing. The DPEX operating system, a communications controller, and a Nixdorf Data Terminal and terminal printer are required for the use of the HASP Workstation Emulator.

The Nixdorf Remote Terminal Concentrator is a four-channel (Model 624) or eight-channel (Model 628) data concentrator that enables up to eight Data Terminals to share a single telephone line. The Concentrator interfaces with standard 4800- or 9600-bps synchronous modems. Features include dynamic line allocation, error detection and recovery, dynamic internal buffering to accommodate keyboard/display peak demands, and built-in loopback diagnostic features for line problem isolation.

SOFTWARE

All 600 Series systems operate under the control of the DPEX (Distributed Processing Executive) operating system. DPEX provides concurrency of multiple tasks, such as ➤

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➤ Pressing this key allows the system to automatically interrupt its current task and to display a menu which provides a way to proceed, terminate the activity, or restore it to where it was before the interruption developed.

Another advantage of the 600 Series lies in its Editor application package called LINK. LINK permits the interfacing of the Nixdorf word processing systems with the 600 Series DDP systems, a desirable feature for many applications. Nixdorf has also provided a migration path within its family for its users.

However, one disadvantage seen in the Series is for the larger user whose growth might require a more powerful system. The user is presently limited to 32 workstations or concurrent tasks. There is also a maximum of four disk units allowed. For the user of the 600/55 to expand beyond the limits of the system, it is currently necessary to add an additional system or systems to accommodate growth.

USER REACTION

Seven users of Nixdorf 600 equipment responded to Datapro's Survey of Key Entry Equipment which was conducted in November 1982. These respondents had installed 29 Nixdorf 600 systems with 425 keystations in operation. All systems were used in volume operations, and users found their equipment reliable. Responses regarding the Nixdorf 600 equipment are summarized, and their combined ratings are listed in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	5	2	0	0	3.7
Ease of operation	5	2	0	0	3.7
Hardware reliability	4	3	0	0	3.6
Maintenance service	4	3	0	0	3.6
Software	3	2	1	0	3.3
Technical support	5	2	0	0	3.7

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

To qualify our findings, several users were telephoned to solicit their comments and observations on their Nixdorf 600 equipment. One retail organization in the Northeast contacted was extremely pleased with their equipment. They found the Nixdorf equipment "most versatile and upward compatible." They had already upgraded twice. It was stated that response of the system was "incredibly fast." This organization said that Nixdorf provides excellent support and that they felt the equipment performed as promised. The spokesman for this company had a caution for potential users of the system. Because the system is so flexible and easy to use, there might be a tendency to overburden the system by trying to do too much.

Comments were also solicited from a packaged and frozen food company in the midwest. We spoke to a systems programmer in the Data Processing Department who said the Nixdorf 600 offered flexibility for a range of applications. Their system was primarily used in production reporting, order processing, and data base maintenance type of functions. Their operation used 31 terminals, some of ➤

➤ data entry, file inquiry, and communications, up to the limit of each 600 Series model. Nine concurrent tasks are supported on the 600/35, 16 on the 600/45, and 32 on the 600/55.

DPEX features a data entry formatting utility that provides multiple error detection checks, error correction messages, and the ability to invoke user-specified subroutines. Data can be entered from up to 32 local or remote terminals. A Data Base Management facility allows in-place updating of active indexed files and supports multiple indices on a single file and single index on multiple files.

Editor, a high-level, COBOL-like language is included for program development. The language contains the basic operational capabilities of COBOL, including data manipulation, arithmetic, logic, input/output, and data entry, updating, inquiry, and retrieval. A sort/merge package and debugging aids are also provided.

Two new releases of DPEX software, DPEX II and DPEX III, have extended system control even further by incorporating additional peripheral control on the Editor level, enhancing system security, and increasing Data Base processing flexibility.

The DPEX LINK software package permits the 600 Series to communicate locally or remotely with Nixdorf 8840 Word Processing Systems. Through LINK, the word processor can use information stored on the 600 Series CPU for letters, reports, and all other items typed on a daily basis. In addition, tape back-up is provided for word processing files on the 600 Series systems. Communication between the two systems is concurrent with other system functions.

The DPEX Security software provides multiple levels of security to protect both data files, programs, and system operations through the use of terminal identification, passwords, and operator IDs.

DPEX Communications software supports simultaneous batch and interactive communications. A real-time binary synchronous analyzer monitors communications activity and isolates network problems. DPEX supports IBM 2780, 3780, 3741, HASP Multi-leaving, 3270, 3271, and 3275 protocols, as well as communications capability with Automated Clearing House (ACH).

COMPONENTS

SYSTEM PROCESSOR: The central processor in the 600/35 has a cycle time of 1100 nanoseconds. The 600/45 processor provides a 700-nanosecond cycle time, and the 600/55, a 450-nanosecond cycle time. The maximum main memory is 128K bytes of real memory for the 600/35, 600/45, and 600/55. However, all models in the 600 Series are designed as virtual memory systems. The 600/35 provides up to eight megabytes of virtual memory as well as the 600/45 and 600/55.

KEYSTATIONS: The Model 172 Data Terminal consists of a display unit with a 12-inch (diagonal measurement) screen and a movable keyboard. The screen displays up to 24 lines of 80 characters each, for a total display capacity of 1920 characters plus scrolling. Characters are formed within a 7-by-9 dot matrix. Two keyboards are available and can be mixed on one system: an IBM 029 keypunch-style keyboard and a typewriter-style keyboard with upper and lower case alphabets and a 13-key numeric pad. Special function keys provide cursor control, character and record insertion and deletion, record format selection, and the ability to display "HELP" lists that are used to guide the operator from operation to operation. ➤

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➤ which are remote, and the response time was felt to be satisfactory. He felt the system was very flexible and very adaptable to different mainframes with a language that is easy to learn by even non-programming personnel. The comment was also made that Nixdorf has reliable field engineers.

Another company contacted by telephone was a manufacturer of steel office equipment located in the midwest. The Manager of Data Processing for that company stated that the equipment was used by his company primarily for both data entry and a forms management and inventory control system. He said they did an extensive survey of equipment before securing their Nixdorf 600/35. They examined equipment of 11 vendors and would recommend to anyone contemplating securing such equipment to take their applications to the prospective vendors for demonstration of how the equipment handles their application. This is what this company did, and they are very pleased with their system. They feel the Nixdorf 600/35 has an easy to use keyboard, and they like the menu and special HELP key provided. The DP Manager feels they selected the best data entry system for their applications and have increased their productivity 50 percent as a result of having this equipment. He felt the equipment was very reliable indicating it had not really been down in one and a half years. □

➤ The Model 172 can be cable-connected at distances up to 4000 feet from the central processor or remotely connected through a switched network or leased communications lines.

The optional Model 171 Data Terminal display provides a 480-character screen arrangement of 12 lines with 40 characters per line also with scrolling capability.

The optional Model 515 Terminal Printer is a compact servo printer specifically designed to be attached to a Model 171 or 172 Data Terminal. The Terminal Printer operates at a speed of 45 characters per second and prints up to 132 characters per line. Vertical spacing is six lines per inch. The standard font is a 96-character, 10-pitch pica font. Interchangeable daisywheel fonts, including elite, courier, legal, and OCR-A, are also available. The Model 515 accommodates single-sheet paper of continuous forms up to 15 inches wide. A platen for single sheets and an adjustable forms tractor are standard.

If higher-volume output is needed at the keystation, the 150 cps serial printer or 300-lpm line printer described under System Printers can be attached to the Data Terminal in place of the Model 515 Terminal Printer. The printer can be attached to each Data Terminal.

DISK UNITS: The Model 224 and Model 225 disk units include a single-spindle disk drive, five-platter removable disk pack, and control electronics. The Model 224 provides 33 megabytes of storage and a recording density of 6038 bits per inch. The Model 225 provides 66 megabytes of storage and a recording density of 12,076 bits per inch. Both models have a data transfer rate of 1.2 megabytes per second.

Average access time is 30 milliseconds, and the average rotational delay is 8.3 milliseconds.

Disk space is allocated dynamically. A complete record address is stored within each sector. Error detection and correction features include read-after-write checks and cyclic redundancy character checks.

DISKETTE UNIT: The Model 371 diskette drive records on flexible disks with a capacity of 315K bytes of formatted data. The data transfer rate is 31,250 bytes per second. Average access time is 260 milliseconds, and average rotational delay is 83 milliseconds.

A read-after-write check and a cyclic redundancy check are performed to ensure data integrity. A write-protect feature prevents data from being recorded on a protected diskette.

MAGNETIC TAPE UNITS: Two models are available. Their basic characteristics are shown in the following table.

Model	Tape Format	Speed inches/sec.	Density, bits/inch	Transfer Rate bytes/sec.
416	9-track	45	1600	Up to 72K
418	9-track	45	800	Up to 36K

The recording technique is NRZI on Model 418 and phase-encoded on Model 416. The 45-ips models accept 10.5-inch reels containing 2400 feet of tape. Rewind speed is 150 inches/second on Models 416 and 418. Both perform parity checks, longitudinal redundancy checks, and cyclic redundancy checks to ensure data integrity.

The initial tape drive is housed in the cabinet with the 600 Series processor. Each additional drive is housed in a separate cabinet.

SYSTEM PRINTERS: Four models are available. The Model 520 is a 150-character-per-second needle matrix printer. Models 543, 546, and 549 are band printers that operate at 300, 600, and 900 lines per minute, respectively. All models print 132 characters per line, 10 characters per inch, and 6 or 8 lines per inch. The printers use a 64-character or 96-character print set. Paper width can range from 4 to 16¾-inches on the line printers and from 4 to 14½-inches on the serial printer. The needle matrix printer accommodates five-part forms, while the line printers accommodate six-part forms. The Model 520 needle matrix printer and the Model 543 line printer can be directly attached to a Model 172 Data Terminal as a local or remote Terminal Printer.

Needle matrix or line printer duplex switches permit switching between two control groups; each switch includes a second printer controller and associated cabling.

PRICING

The 600 Series systems can be purchased or leased on a one-, three-, four-, or five-year lease. The table below list prices for a *typical* configuration for each model in the 600 Series and for software. ➤

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Configuration	Monthly Rental* 5-Year Lease	Purchase	Monthly Maint.
System 600/35 With 5 Data Terminals, 4.8-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 150-cps system printer, communications, and DPEX Base and Sort software	\$ 915	\$45,250	\$401
System 600/45 With 8 Data Terminals, 33-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 300-lpm system printer, communications, and DPEX Base and Sort software	1,728	85,315	640
System 600/55 With 12 Data Terminals, 66-megabyte disk unit, 9-track, 1600-bpi magnetic tape unit, 300-lpm system printer, communications, and DPEX Base and Sort software	2,197	109,050	823
Software**			
DPEX II Base and Sort	70	3,500	—
DPEX III Base and Sort	150	7,500	—
DPEX Security	20	1,000	—
DPEX Extended 3270 Emulation	30	1,500	—
DPEX Log Book	20	1,000	—
LINK***	75	—	—
Automated Clearing House (ACH)	20	1,000	—

*Excludes maintenance.

**DPEX monthly charges are independent of term, whether system is leased or purchased.

***Requires DPEX software and bisynchronous communications. ■

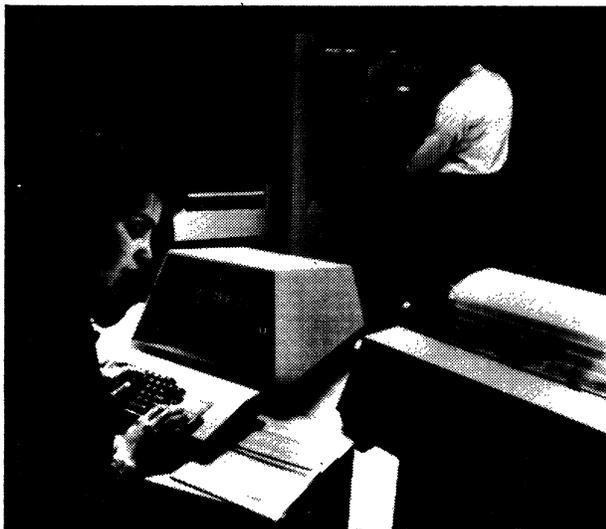
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MANAGEMENT SUMMARY

Nixdorf's second generation of 600 Series distributed processing systems, the 600/25, 600/35, 600/45, and 600/55, provide more processing power and more concurrent functions than the earlier 600/20, 600/30, 600/40, and 600/50 systems. The 600/25 adds a processor with 96K bytes of memory to the 630K-byte floppy disk memory provided by the 600/20 and increases the number of keystations supported from one to six. The 600/35 doubles the memory capacity of the 600/30 processor from 64K bytes to 128K bytes and supports up to nine keystations and up to 66 megabytes of disk storage compared to eight terminals and a maximum of 4.8 megabytes of disk storage for the 600/30. The 600/45 features 128K bytes of memory with a 700-nanosecond processor instead of the 96K-byte, 1200-nanosecond processor provided with the 600/40, while the 600/55 supports concurrent operations up to 32 terminals, eight more than the 600/50. The new 600 Series also adds a 900-line-per-minute printer and HASP Workstation Emulator.

Each system in the 600 Series can perform data entry, local file processing, local data base inquiry and updating, and batch and interactive communications. A 600 Series system can also communicate with a local or remote Nixdorf 8840 Word Processing System via Nixdorf's LINK II Software Package. All four models are software-compatible, and with the exception of the 600/25, all are field-upgradable.

The 600 Series operates under the control of DPEX (Distributed Processing Executive), a multi-tasking, ▷



The System 600/55, the top-of-the-line model in the 600 Series of distributed processing systems, supports up to 32 keystations, 2 diskette units, 4 magnetic tape units, and up to 264 megabytes of disk storage. Each keystation can control either a serial or line printer.

The Nixdorf 600 Series can be used for data entry, local file processing, local data base inquiry and updating, and batch and interactive communications. The systems can also be linked to Nixdorf's 8840 Word Processing Systems.

The 600 Series supports up to 128K bytes of real memory, and a maximum of 32 keystations, 2 diskette units, 4 tape units, and 264 megabytes of disk storage, plus optional line or serial printers and a card reader.

Typical system configurations range in purchase price from \$37,901 to \$99,680.

CHARACTERISTICS

VENDOR: Nixdorf Computer Corporation, 300 Third Avenue, Waltham, Massachusetts 02154. Telephone (617) 890-3600.

DATE OF ANNOUNCEMENT: 600/X5 Series—August 1979.

DATE OF FIRST DELIVERY: 600/X5 Series—January 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Nixdorf Computer Corporation.

MODELS

Four 600 Series models are available: Systems 600/25, 600/35, 600/45, and 600/55. The Control Group for each system consists of a single cabinet that houses the main processor, the peripheral and communications interface controllers, the system's power supply, and diskette, disk, or tape storage.

CONFIGURATION

SYSTEM 600/25: The Control Group includes a processor with 96K bytes of memory, a 315K-byte diskette drive, and a 4.8-megabyte disk drive. Up to six keystations are supported.

SYSTEM 600/35: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and 4.8, 9.6, or 66 megabytes of disk storage. The 600/35 supports up to nine keystations, up to two diskette drives, and an additional 4.8 megabytes of disk storage.

SYSTEM 600/45: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 4.8 or 33-megabyte disk drive (that is housed in a separate cabinet.) The 600/45 supports an additional tape drive, two diskette drives, an additional 4.8 megabytes on up to 132 megabytes of disk storage, and up to 16 keystations.

SYSTEM 600/55: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 33-megabyte disk drive housed in a separate cabinet. The 600/55 supports up to 32 keystations, one or two diskette drives, up to three additional tape units, and up to 264 megabytes of disk storage. ▷

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▷ virtual memory operating system. The system's virtual memory architecture supports multiple concurrent tasks.

The 600/25 is designed as a remote terminal system for the 600/35, 600/45, and 600/55 systems. The 600/25 supports up to six terminals, two diskette units, and a fixed disk unit. Up to six concurrent tasks are supported.

The 600/35 is intended for small, remote offices that require concurrent operations at low monthly cost. The system supports up to nine terminals, two diskette units, two fixed disk units or one removable disk, and a magnetic tape drive. The 600/35 can perform up to nine concurrent tasks.

The 600/45 features greater processing power and configuration flexibility for applications requiring multiple concurrent operations. The 600/45 can perform up to 16 concurrent tasks and supports up to 16 terminals, 2 diskette units, 2 magnetic tape units, and up to 132 megabytes of disk storage.

At the top of the 600 Series line, the 600/55 supports up to 32 terminals, 32 concurrent tasks, two diskette units, up to 4 magnetic tape units, and up to 264 megabytes of disk storage. The 600/55 is designed for installations in which large volumes of information must be locally stored, interrogated, and maintained.

The microprocessor-controlled Data Terminal used with the 600 Series can function as a local or remote keystation. The terminal features a 1920-character display and a typewriter- or keypunch-style keyboard. There is also an optional 480-character display terminal available. Each Data Terminal can control a 45-character-per-second, 165-character-per-second, or 300-line-per-minute printer. Nixdorf also offers printers that operate at 600 and 900 lines per minute. All printers, except the 45-cps model, can operate as system printers under the control of the 600 Series Control Group.

Volume deliveries of the new 600 Series systems began in January 1980.

USER REACTION

Our 1981 survey of key entry equipment users drew responses from 10 users of the Nixdorf 600 Series. During October 1981, we conducted telephone interviews with another five users whose names were selected from a list of users supplied by Nixdorf. These 15 users had a total of 22 systems installed with approximately 419 keystations in operation. Their combined ratings are listed in the following table:

	Excellent	Good	Fair	Poor	WA*
Overall performance	11	4	0	0	3.7
Ease of operation	13	1	1	0	3.8
Hardware reliability	7	6	2	0	3.3
Maintenance service	6	7	2	0	3.3
Software	5	9	1	0	3.3
Technical support	3	10	2	0	3.1

*Weighted Average on a scale of 4.0 for Excellent.

▷ Optional peripherals available with all systems include communications controllers; 300-, 600-, or 900-lpm line printers; a 165-cps serial matrix printer; and a 300-cpm card reader.

TRANSMISSION SPECIFICATIONS

Data captured and processed by a 600 Series system can be transmitted at rates up to 19,200 bits per second to another 600 Series system or to virtually any terminal or mainframe supporting the Binary Synchronous Communications protocol. Batch communications protocols supported include IBM 2780, 3780, 3741, and HASP Multi-leaving. IBM 3270, 3271, and 3275 emulation is also provided for interactive communications.

The HASP Workstation Emulator provides hardware and software emulation of IBM 360/20, 360/25, or 360/30 remote workstations. The HASP Workstation Emulator supports multistream operation of up to eight receive and four transmit streams simultaneously. Emulation can operate concurrently with other system functions, including terminal I/O, data entry, and local processing. The DPEX operating system, a communications controller, and a Nixdorf Data Terminal and terminal printer are required for the use of the HASP Workstation Emulator.

The Nixdorf Remote Terminal Concentrator is a four-channel (Model 624) or eight-channel (Model 628) data concentrator that enables up to eight Data Terminals to share a single telephone line. The Concentrator interfaces with standard 4800- or 9600-bps synchronous modems. Features include dynamic line allocation, error detection and recovery, dynamic internal buffering to accommodate keyboard/display peak demands, and built-in loopback diagnostic features for line problem isolation.

SOFTWARE

All 600 Series systems operate under the control of the DPEX (Distributed Processing Executive) operating system. DPEX provides concurrency of multiple tasks, such as data entry, file inquiry, and communications, up to the limit of each 600 Series model. Six concurrent tasks are supported on the 600/25, 9 on the 600/35, 16 on the 600/45, and 32 on the 600/55.

DPEX features a data entry formatting utility that provides multiple error detection checks, error correction messages, and the ability to invoke user-specified subroutines. Data can be entered from up to 32 local or remote terminals. A Data Base Management facility allows in-place updating of active indexed files and supports multiple indices on a single file and single indices on multiple files.

Editor, a high-level, COBOL-like language is included for program development. The language contains the basic operational capabilities of COBOL, including data manipulation, arithmetic, logic, input/output, and data entry, updating, inquiry, and retrieval. A sort/merge package and debugging aids are also provided.

The DPEX LINK II software package permits the 600 Series to communicate locally or remotely with Nixdorf 8840 Word Processing Systems. Through LINK, the word processor can use information stored on the 600 Series CPU for letters, reports, and all other items typed on a daily basis. In addition, tape back-up is provided for word processing files on the 600 Series systems. Communication between the two systems is concurrent with other system functions.

The DPEX Security software provides multiple levels of security to protect both data files and programs through the use of terminal identification and passwords.

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➤ As the ratings indicate, the users were well pleased with the overall performance and ease of operation of the 600 Series. The five users with whom we spoke told us that the system's reliability and versatility were its major selling points. One user, who worked for a service bureau which handled all the data processing for a large corporation as well as outside contracts, said the 600 system offered unlimited software capabilities and operating options. Her company's 600/55 system was being used to perform value and range checking, batch balancing, and to compile daily and monthly statistics. The system also supported a Tab 501 card reader.

Another user with a 600/55 system cited the equipment's ability to perform sorts and to provide supervisory functions as good features. This user was especially happy with the system's asterisk convention which speeds the processing of batch files. A third user whose five 600 Series systems were being employed in order entry and tracking, said the systems offered configuration flexibility since they could operate as either stand-alone systems or remote job entry stations.

One user did complain that local software support personnel were not knowledgeable about the operating system, and another user told us she had experienced a minor problem with the system skipping leading zeroes. □

➤ DPEX Communications software supports simultaneous batch and interactive communications. A real-time binary synchronous analyzer monitors communications activity and isolates network problems. DPEX supports IBM 2780, 3780, 3741, HASP Multi-leaving, 3270, 3271, and 3275 protocols.

COMPONENTS

SYSTEM PROCESSOR: The central processors in the 600/25 and 600/35 have a cycle time of 1100 nanoseconds. The 600/45 processor provides a 700-nanosecond cycle time, and the 600/55, a 450-nanosecond cycle time. The maximum main memory is 96K bytes of real memory for the 600/25 and 128K bytes of real memory for the 600/35, 600/45, and 600/55. However, all models in the 600 Series are designed as virtual memory systems. The 600/25 provides up to one megabyte of virtual memory; the 600/35, up to two megabytes; and the 600/45 and 600/55, up to eight megabytes.

KEYSTATIONS: The Model 162 Data Terminal consists of a display unit with a 12-inch (diagonal measurement) screen and a movable keyboard. The screen displays up to 24 lines of 80 characters each, for a total display capacity of 1920 characters. Characters are formed within a 7-by-9 dot matrix. Two keyboards are available: an IBM 029 keypunch-style keyboard and a typewriter-style keyboard with upper and lower case alphabets and a 13-key numeric pad. Special function keys provide cursor control, character and record insertion and deletion, record format selection, and the ability to display "HELP" lists that are used to guide the operator from operation to operation.

The Model 162 can be cable-connected at distances up to 4000 feet from the central processor or remotely connected through a switched network or leased communications lines.

The optional Model 161 Data Terminal display provides a 480-character screen arrangement of 12 lines with 40 characters per line.

The optional Model 515 Terminal Printer is a compact servo printer specifically designed to be attached to a Model 161 or

162 Data Terminal. The Terminal Printer operates at a speed of 45 characters per second and prints up to 132 characters per line. Vertical spacing is six lines per inch. The standard font is a 96-character, 10-pitch pica font. Interchangeable daisywheel fonts, including elite, courier, legal, and OCR-A, are also available. The Model 515 accommodates single-sheet paper or continuous forms up to 15 inches wide. A platen for single sheets and an adjustable forms tractor are standard.

If higher-volume output is needed at the keystation, the 165-cps serial printer or 300-lpm line printer described under System Printers can be attached to the Data Terminal in place of the Model 515 Terminal Printer. One printer can be attached to each Data Terminal.

DISK UNITS: The Model 224 and Model 225 disk units include a single-spindle disk drive, five-platter removable disk pack, and control electronics. The Model 224 provides 33 megabytes of storage and a recording density of 6038 bits per inch. The Model 225 provides 66 megabytes of storage and a recording density of 12,076 bits per inch. Both models have a data transfer rate of 1.2 megabytes per second. Average access time is 30 milliseconds, and the average rotational delay is 8.3 milliseconds.

Disk space is allocated dynamically. A complete record address is stored within each sector. Error detection and correction features include read-after-write checks and cyclic redundancy character checks.

DISKETTE UNIT: The Model 371 diskette drive records on flexible disks with a capacity of 315K bytes of formatted data. The data transfer rate is 31,250 bytes per second. Average access time is 260 milliseconds, and average rotational delay is 83 milliseconds.

A read-after-write check and a cyclic redundancy check are performed to ensure data integrity. A write-protect feature prevents data from being recorded on a protected diskette.

MAGNETIC TAPE UNITS: Three models are available. Their basic characteristics are shown in the following table.

Model	Tape Format	Speed, inches/sec.	Density, bits/inch	Transfer Rate, bytes/sec.
416	9-track	45	1600	Up to 72K
417	7-track	45	556/800	Up to 36K
418	9-track	45	800	Up to 36K

The recording technique is NRZI on Models 417 and 418 and phase-encoded on Model 416. The 45-ips models accept 10.5-inch reels containing 2400 feet of tape. Rewind speed is 150 inches/second on Models 416, 417, and 418. All models perform parity checks, longitudinal redundancy checks, and cyclic redundancy checks to ensure data integrity.

The initial tape drive is housed in the cabinet with the 600 Series processor. Each additional drive is housed in a separate cabinet.

SYSTEM PRINTERS: Four models are available. The Model 510 is a 165-character-per-second serial matrix printer. Models 533, 536, and 539 are line printers that operate at 300, 600, and 900 lines per minute, respectively. All models print 132 characters per line, 10 characters per inch, and 6 or 8 lines per inch. The printers use a 64-character print set. Paper width can range from 4 to 16¼-inches on the line printers and from 4 to 14½-inches on the serial printer. The serial printer accommodates five-part forms, while the line printers accommodate six-part forms. The Model 510 serial printer and the Model 533 line printer can be directly attached to a Model 162 Data Terminal as a local or remote Terminal Printer.

Serial or line printer duplex switches permit switching between two control groups; each switch includes a second printer controller and associated cabling. ➤

Nixdorf 600 Series Distributed Processing Systems

► **PRICING**

The 600 Series systems can be purchased or leased on a one-, three-, four-, or five-year lease. The table below lists prices for

a *typical* configuration for each model in the 600 Series and for software.

	<u>5-Year Lease*</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
System 600/25 With 3 Data Terminals, 4.8-megabyte disk unit, 315K-byte diskette unit, 165-cps system printer, 45-cps terminal printer, communications, and DPEX Base and Sort software	\$ 772	\$37,901	\$327
System 600/35 With 5 Data Terminals, 4.8-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 165-cps system printer, communications, and DPEX Base and Sort software	1,024	47,992	497
System 600/45 With 8 Data Terminals, 33-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 300-lpm system printer, communications, and DPEX Base and Sort software	1,830	83,137	699
System 600/55 With 12 Data Terminals, 66-megabyte disk unit, 9-track, 1600-bpi magnetic tape unit, 300-lpm system printer, communications, and DPEX Base and Sort software	2,164	99,680	879
Software**			
DPEX Base and Sort	70	—	—
DPEX Security	20	—	—
DPEX Extended 3270 Emulation	30	—	—
DPEX Log Book	20	—	—
DPEX HASP Multi-leaving	50	—	—
LINK II***	75	—	—

*Excludes maintenance.

**DPEX monthly charges are independent of term, whether system is leased or purchased.

***Requires DPEX software and bisynchronous communications.■

Nixdorf 600 Series Distributed Processing Systems

MANAGEMENT SUMMARY

In August 1979, Nixdorf Computer Corporation announced a second generation of its 600 Series family of distributed processing systems. The new 600 Series consists of five models, the 600/15, 600/25, 600/35, 600/45, and 600/55 systems, which will eventually replace the earlier 600/20, 600/30, 600/40, and 600/50 systems. The new systems provide more processing power, greater configuration flexibility, and more concurrent functions than previously available.

Each system in the 600 Series can perform data entry, local file processing, word processing, local data base inquiry and updating, and batch and interactive communications. All five models are software-compatible, and, with the exception of the 600/25, all are field-upgradable.

The 600 Series operates under the control of DPEX (Distributed Processing Executive), a multi-tasking, virtual memory operating system. The system's virtual memory architecture supports multiple concurrent tasks.

The 600/15 is a diskette-based system designed for applications requiring small volumes of data to be entered and processed locally before transmission to another system in a network. The system supports two terminals and two diskette units. Two tasks can be performed concurrently.

The 600/25 is designed as a remote terminal system for the 600/35, 600/45, and 600/55 systems. The 600/25 supports up to six terminals, two diskette units, and a fixed disk unit. Up to six concurrent tasks are supported. ➤

The Nixdorf 600 Series is a family of upward-compatible distributed processing systems featuring configuration flexibility, binary synchronous communications, a virtual memory operating system, and a COBOL-like programming language. The systems can support up to 32 keystations and 32 concurrent tasks.

A system with two data terminals, 630K bytes of diskette storage, 165 cps printer, and communications can be purchased for \$31,450 and rented for \$761/month on a five-year lease.

A system with 16 data terminals, 66-mega-byte disk, 9-track, 800 bpi tape, 900 lpm printer, two terminal printers and dual communications can be purchased for \$159,050 or rented for \$3,953/month on a five-year lease.

CHARACTERISTICS

VENDOR: Nixdorf Computer Corporation, 168 Middlesex Turnpike, Burlington, Massachusetts 01803. Telephone (617) 273-0480.

DATE OF ANNOUNCEMENT: 600/20, 600/30, 600/50—1975; 600/40—1977; 600/X5 (new series)—August 1979. ➤



The 600 Series is available in a variety of different configurations. The system shown here includes three Data Terminals, a line printer (left rear), the control unit (center rear), a disk unit (right of the control unit), and two serial printers (right foreground and background).

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➤ The 600/35 is intended for small, remote offices that require concurrent operations at low monthly cost. The system supports up to eight terminals, two diskette units, two fixed disk units, and a magnetic tape drive. The 600/35 can perform up to eight concurrent tasks.

The 600/45 features greater processing power and configuration flexibility for applications requiring multiple concurrent operations. The 600/45 can perform up to 16 concurrent tasks and supports up to 16 terminals, 2 diskette units, magnetic tape, and up to 132 megabytes of disk storage.

At the top of the 600 Series line, the 600/55 supports up to 32 terminals, 32 concurrent tasks, two diskette units, magnetic tape, and up to 264 megabytes of disk storage. The 600/55 is designed for installations in which large volumes of information must be locally stored, interrogated, and maintained.

The new 600 Series is intended to compete with the IBM 8100 Information System (Report 70C-491-11) and similar distributed processing systems. Deliveries are scheduled to begin in October 1979. □

➤ **FIRST DELIVERY:** 600/20 & 600/30—November 1976; 600/50—June 1976; 600/40—February 1978; 600/X5 series—October 1979.

NUMBER OF SYSTEMS INSTALLED: Total all models: Approximately 580.

CONFIGURATION

SYSTEM 600/15: The Control Group includes a 64K-byte processor and two 315K-byte diskette units. The 600/15 supports a maximum of two keystations.

SYSTEM 600/25: The Control Group includes a processor with 64K bytes of memory, a 315K-byte diskette drive, and a 4.8-megabyte disk drive. Up to six keystations are supported.

SYSTEM 600/35: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and 4.8 megabytes of disk storage. The 600/35 supports up to eight keystations, up to two diskette drives, and an additional 4.8 megabytes of disk storage.

SYSTEM 600/45: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 33-megabyte disk drive that is housed in a separate cabinet. The 600/45 supports an additional tape drive, two diskette drives, up to 132 megabytes of disk storage, and up to 16 keystations.

SYSTEM 600/55: The Control Group includes a processor with up to 128K bytes of memory, a magnetic tape drive, and a 33-megabyte disk drive housed in a separate cabinet. The 600/55 supports up to 32 keystations, one or two diskette drives, up to three additional tape units, and up to 264 megabytes of disk storage.

Optional peripherals available with all systems include communications controllers; 300-, 600-, or 900-lpm line printers; a 165-cps serial matrix printer; and a 300-cpm card reader.

TRANSMISSION SPECIFICATIONS

Data captured and processed by a 600 Series system can be transmitted at rates up to 19,200 bits per second to another 600 Series system or to virtually any terminal or mainframe

supporting the Binary Synchronous Communications protocol. Batch communications protocols supported include IBM 2780, 3780, 3741, and HASP Multi-leaving. IBM 3270, 3271, and 3275 emulation is also provided for interactive communications.

The HASP Workstation Emulator provides hardware and software emulation of IBM 360/20, 360/25, or 360/30 remote workstations. The HASP Workstation Emulator supports multistream operation of up to eight receive and four transmit streams simultaneously. Emulation can operate concurrently with other system functions, including terminal I/O, data entry, and local processing. The DPEX operating system, a communications controller, and a Nixdorf Data Terminal are required for the use of the HASP Workstation Emulator.

The Nixdorf Remote Terminal Concentrator is a four-channel (Model 624) or eight-channel (Model 628) data concentrator that enables up to eight Data Terminals to share a single telephone line. The Concentrator interfaces with standard 4800- or 9600-bps synchronous modems. Features include dynamic line allocation, error detection and recovery, dynamic internal buffering to accommodate keyboard/display peak demands, and built-in loopback diagnostic features for line problem isolation.

COMPONENTS

SYSTEM PROCESSOR: The central processors in the 600/15, 600/25, and 600/35 have a cycle time of 1100 nanoseconds. The 600/45 processor provides a 700-nanosecond cycle time, and the 600/55, a 450-nanosecond cycle time. The maximum main memory is 64K bytes of real memory for the 600/15 and 600/25 and 128K bytes of real memory for the 600/35, 600/45, and 600/55. However, all models in the 600 Series are designed as virtual memory systems. The 600/15 provides up to 300K bytes of virtual memory; the 600/25, up to one megabyte; the 600/35, up to two megabytes; and the 600/45 and 600/55, up to eight megabytes.

KEYSTATIONS: The Model 162 Data Terminal consists of a display unit with a 12-inch (diagonal measurement) screen and a movable keyboard. The screen displays up to 24 lines of 80 characters each, for a total display capacity of 1920 characters. Characters are formed within a 7-by-9 dot matrix. Two keyboards are available: an IBM 029 keypunch-style keyboard and a typewriter-style keyboard with upper and lower case alphabets and a 13-key numeric pad. Special function keys provide cursor control, character and record insertion and deletion, record format selection, and the ability to display "HELP" lists that are used to guide the operator from operation to operation.

The Model 162 can be cable-connected at distances up to 4000 feet from the central processor or remotely connected through a switched network or leased communications lines.

The optional Model 515 Terminal Printer is a compact servo printer specifically designed to be attached to a Model 162 Data Terminal. The Terminal Printer operates at a speed of 45 characters per second and prints up to 132 characters per line. Vertical spacing is six lines per inch. The standard font is a 96-character, 10-pitch pica font. Interchangeable daisy-wheel fonts, including elite, courier, legal, and OCR-A, are also available. The Model 515 accommodates single-sheet paper or continuous forms up to 15 inches wide. A platen for single sheets and an adjustable forms tractor are standard.

If higher-volume output is needed at the keystation, the 165-cps serial printer or 300-lpm line printer described under System Printers can be attached to the Data Terminal in place of the Model 515 Terminal Printer. One printer can be attached to each Data Terminal.

DISK UNITS: The Model 224 and Model 225 disk units include a single-spindle disk drive, five-platter removable

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► disk pack, and control electronics. The Model 224 provides 33 megabytes of storage and a recording density of 6038 bits per inch. The Model 225 provides 66 megabytes of storage and a recording density of 12,076 bits per inch. Both models have a data transfer rate of 1.2 megabytes per second. Average access time is 30 milliseconds, and the average rotational delay is 8.3 milliseconds.

Disk space is allocated dynamically. A complete record address is stored within each sector. Error detection and correction features include read-after-write checks and cyclic redundancy character checks.

DISKETTE UNIT: The Model 371 diskette drive records on flexible disks with a capacity of 315K bytes of formatted data. The data transfer rate is 31,250 bytes per second. Average access time is 260 milliseconds, and average rotational delay is 83 milliseconds.

A read-after-write check and a cyclic redundancy check are performed to ensure data integrity. A write-protect feature prevents data from being recorded on a protected diskette.

MAGNETIC TAPE UNITS: Five models are available. Their basic characteristics are shown in the following table.

Model	Tape Format	Speed, inches/sec.	Density, bits/inch	Transfer Rate, bytes/sec.
386	9-track	25	1600	Up to 40K
388	9-track	25	800	Up to 20K
416	9-track	45	1600	Up to 72K
417	7-track	45	556/800	Up to 36K
418	9-track	45	800	Up to 36K

The recording technique is NRZI on Models 388, 417, and 418 and phase-encoded on Models 386 and 416. The 25-ips models accept 8.5-inch tape reels containing 1200 feet of tape, while the 45-ips models accept 10.5-inch reels containing 2400 feet of tape. Rewind speed is 100 inches/second on Models 386 and 388 and 150 inches/second on Models 416, 417, and 418. All models perform parity checks, longitudinal redundancy checks, and cyclic redundancy checks to ensure data integrity.

The initial tape drive is housed in the cabinet with the 600 Series processor. Each additional drive is housed in a separate cabinet.

SYSTEM PRINTERS: Four models are available. The Model 510 is a 165-character-per-second serial matrix printer. Models 533, 536, and 539 are line printers that operate at 300, 600, and 900 lines per minute, respectively. All models print 132 characters per line, 10 characters per inch, and 6 or 8 lines per inch. The printers use a 64-character print set. Paper width can range from 4 to 16¼-inches on the line printers and from 4 to 14½-inches on the serial printer. The serial printer accommodates five-part

forms, while the line printers accommodate six-part forms. The Model 510 serial printer and the Model 533 line printer can be directly attached to a Model 162 Data Terminal as a local or remote Terminal Printer.

SOFTWARE

All 600 Series systems operate under the control of the DPEX (Distributed Processing Executive) operating system. DPEX provides concurrency of multiple tasks, such as data entry, file inquiry, and communications, up to the limit of each 600 Series model. Two concurrent tasks are supported on the 600/15, 6 on the 600/25, 8 on the 600/35, 16 on the 600/45, and 32 on the 600/55.

DPEX features a data entry formatting utility that provides multiple error detection checks, error correction messages, and the ability to invoke user-specified subroutines. Data can be entered from up to 32 local or remote terminals. A Data Base Management facility allows in-place updating of active indexed files and supports multiple indices on a single file and single indices on multiple files.

A high-level, COBOL-like language is included for program development. The language contains the basic operational capabilities of COBOL, including data manipulation, arithmetic, logic, input/output, and data entry, updating, inquiry, and retrieval. A sort/merge package and debugging aids are also provided.

DPEX Word Processing enables users to enter, store, correct, manipulate, and output text. Features include variable margins, right justification of printed text, and automatic centering, indentation, repeat keys, page headings, and page footings. Multiple search capabilities and multi-media storage and output are also provided.

The DPEX Security software provides multiple levels of security to protect both data files and programs through the use of terminal identification and passwords.

DPEX Communications software supports simultaneous batch and interactive communications. A real-time binary synchronous analyzer monitors communications activity and isolates network problems. DPEX supports IBM 2780, 3780, 3741, HASP Multi-leaving, 3270, 3271, and 3275 protocols.

PRICING

The 600 Series systems can be purchased or leased on a one-, three-, four-, or five-year lease. The table below lists prices for a *typical* configuration for each model in the 600 Series and for selected peripheral devices. Maintenance charges have been included in the lease prices, but a separate contract must be arranged for purchased items.

Configurations	Monthly Rental*	Purchase	Monthly
	5-Year Lease		Maint.
System 600/15 With 2 Data Terminals, 630K bytes of diskette storage, 165-cps printer, communications, and software	\$ 761	\$ 31,450	\$ 164
System 600/25 With 4 Data Terminals, 4.8-megabyte disk unit, 315K-byte diskette unit, 165-cps printer, 45-cps terminal printer, communications, and software (includes Word Processing)	1,173	45,070	278
System 600/35 With 6 Data Terminals, 4.8-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 300-lpm printer, 45-cps terminal printer, communications (HASP), and software (includes Word Processing)	1,787	69,670	440

*Includes maintenance.

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	<u>Monthly Rental*</u> <u>5-Year Lease</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
► Configurations (Continued)			
System 600/45 With 10 Data Terminals, 33-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 600-lpm printer, two 45-cps terminal printers, communications (Extended 3270), and software (includes Word Processing)	2,849	117,040	679
System 600/55 With 16 Data Terminals, 66-megabyte disk unit, 9-track, 800-bpi magnetic tape unit, 900-lpm printer, two 45-cps terminal printers, dual communications (Extended 3270 and HASP), and all software, including Word Processing	3,953	159,050	1,000
<u>Data Terminals</u>			
Model 162A, 1920-character display	67	2,040	26
Model 162L, 1920-character display with keylock	69	2,120	26
Keyboard—Keypunch or typewriter style	8	480	NC
Desk	7	250	NC
Power supply mounting bracket (required if no desk is ordered)	NA	20	NC
Model 515C Terminal Printer, 45 cps	136	4,880	42
Model 510C Terminal Printer, 165 cps	182	7,760	32
Model 533C Terminal Printer, 300 lpm	407	16,420	92
<u>Peripheral Devices</u>			
Disk Units—			
System 600/35:			
Additional 4.8-megabyte disk unit (one permitted)	210	8,000	53
System 600/45 (A maximum of 2 disk units providing up to 132 megabytes are permitted; models may not be mixed on one control group):			
Additional 33-megabyte disk drive	478	20,400	85
33-megabyte to 66-megabyte disk upgrade (must replace 33-megabyte disk)	140	6,080	22
Additional 66-megabyte disk unit	618	26,480	107
System 660/55 (A maximum of 4 disk units providing up to 264 megabytes are permitted; models may not be mixed on one Control Group):			
Additional 33-megabyte disk unit	478	20,400	85
33-megabyte to 66-megabyte disk unit upgrade (must replace 33-megabyte disk)	140	6,080	22
Additional 66-megabyte disk unit	618	26,480	107
System Printers (one per Control Group)—			
Model 510 Serial Printer, 165 cps	182	7,760	32
Model 533 Line Printer, 300 lpm	407	16,420	92
Model 536 Line Printer, 600 lpm	574	24,280	110
Model 539 Line Printer, 900 lpm	746	31,200	146
Printer Duplexer Switch (includes second printer controller and cabling)	42	1,760	9
Card Reader, 300 cpm	194	8,000	40
Card Reader Duplexer Switch (includes second card reader cabling)	42	1,760	9
Binary Synchronous Communications Controller	90	3,040	32
<u>Software**</u>			
DPEX/Base (required on all systems)	50	—	—
DPEX/Security	15	—	—
DPEX/Sort (required on all systems)	15	—	—
DPEX/Extended 3270 Emulation	15	—	—
DPEX/Log Book	15	—	—
DPEX/Word Processing	50	—	—
DPEX/HASP Multi-leaving	25	—	—

NA—Not available.

NC—No Charge.

*Includes maintenance.

**DPEX monthly charges are independent of term, whether system is leased or purchased.■