

Northrop Data Systems BDS Series 500, 1000, and 2000

MANAGEMENT SUMMARY

Northrop Data Systems, Inc. began operations in the spring of 1972 with the stated purpose of developing turnkey minicomputer business systems for selected industry areas. The formation of the company represented a desire by Northrop to capitalize on its long-term background in aerospace digital data processing, extending back to the late 1940's.

Although Northrop has been and continues to be a major supplier of specialized digital computing hardware for aerospace applications, it was specified that the new company would purchase processors and peripherals from other vendors able to meet Northrop's specifications. This allows Northrop Data Systems to place primary emphasis on analysis of user requirements within selected industry areas and develop applications software to truly satisfy these requirements.

During the period from 1972 to early 1976, Northrop Data Systems operated as part of Berkeley Scientific Laboratories, Inc., a wholly owned subsidiary of the Northrop Corporation. When Berkeley changed its name to BSL Northrop, the new and still-young turnkey company became known as the Business Data Systems Division of BSL Northrop. As part of its activities, BSL Northrop supplied minicomputer test result reporting systems to hospitals and independent laboratories. The Business Data Systems Division, taking advantage of this fact, delivered its first business turnkey system to a clinical laboratory in June 1972.

To fully reflect the emphasis on business data processing and independent laboratory systems, the company name was changed to Northrop Data Systems, Inc. in March. ➤

The BDS Series systems are turnkey business data processing systems aimed at the medical and furniture manufacturing industries. Utilizing the Microdata 1600 processor, peripherals from several other manufacturers, and Northrop-developed software, the BDS Series systems can support up to 64K bytes of memory and 16 local and/or remote CRT's.

CHARACTERISTICS

MANUFACTURER: Northrop Data Systems, Inc., 1160 Sandhill Avenue, Carson, California, 90746. Telephone (213) 637-1533.

Northrop Data Systems, formerly known as BSL Northrop, Business Data Systems Division, is a wholly owned subsidiary of the Northrop Corporation, a Fortune 500 company with annual sales approaching two billion dollars. Northrop manufactures products for the aircraft industry, inertial navigation systems, electro-optical systems, and advanced weaponry and space products.

MODELS: BDS Series 500, BDS Series 1000, and BDS Series 2000.

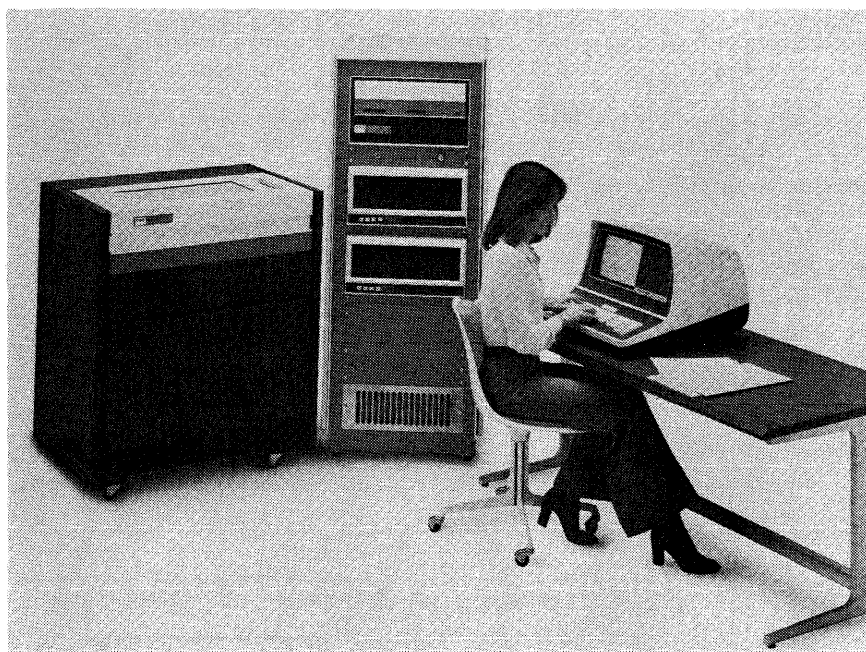
DATE ANNOUNCED: BDS Series 1000, spring 1972; BDS Series 2000, spring 1973; BDS Series 500, fall 1977.

DATE OF FIRST DELIVERY: BDS 1000, June 1972; BDS 2000, spring 1973; BDS Series 500, spring 1978.

NUMBER INSTALLED TO DATE: Over 200.

DATA FORMATS

The BDS Series 500, 1000, and 2000 systems are based on ➤



The BDS Series 2000 basic system includes a processor with 32K bytes of memory, two 10-megabyte disk drives, an 8-channel I/O interface, one CRT, and a 300-lpm line printer. The purchase price is \$63,089.

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➤ 1976. By that time the product line had been expanded to include turnkey systems not only for independent clinical laboratories, but also for multi-specialty medical group practices and clinics, and for specialty group practices such as radiologists and anesthesiologists. Applications software furnished in the medical area included complete patient billing and accounting as well as optional packages handling general ledger, accounts payable, and payroll.

Northrop Data Systems has further expanded its product base with the introduction of a new business data system addressing the needs of the small hospital market. This system, with applications programmed in extended BASIC, handles both inpatients and outpatients and addresses ADT (admission, discharge, and transfer) and registration, charge processing, billing and insurance claims, and accounts receivable processing.

The company also developed and continues to develop extensive packages for manufacturing firms, and has to date achieved major penetration among furniture manufacturers. Applications provided to manufacturers include order entry, inventory and production control, and production scheduling, as well as optional accounting packages.

The original emphasis was on upholstered furniture manufacturers and was later expanded to include case goods manufacturers. To properly address this market, Northrop developed two new systems. One is strictly a production system, totally dedicated to the mill operation, which can be used effectively by a company that already has a data processing system for financial applications. The other is a fully-featured manufacturing system which includes bill of material processing and material requirements planning, as well as the interactive financial applications.

Although software is modified to the specific requirements of each installation, Northrop Data Systems prefers to hold software changes to a minimum. Normally this can be achieved because of the claimed flexibility of applications programs and the desire of users to minimize costs. Special and unique applications software modifications naturally increase the cost to the end user. Applications software packages are priced separately and range from \$2,000 for a single accounting package to \$25,000 for a complete manufacturing system.

Northrop Data Systems is convinced that long-term success in turnkey data processing systems requires that sales and installation support be provided on a local basis. Therefore, geographic expansion has been pursued gradually in order to insure adequacy of support by company branch offices, assisted in some areas by sales representatives. Operations were limited to the West Coast until a solid base of system installations had been achieved. Starting in late 1974, Northrop Data Systems expanded into the Southeast with the initial goal of achieving major penetration of the highly con-

➤ the 8-bit Microdata 1600 processor. However, the user does not normally work with the system at the machine level, but rather at the application program level. Under Northrop's older TS/OS time-sharing operating system, users could not develop or modify programs. New customers will be using MP/OS, an operating system that includes extended BASIC as a programming language. Users will therefore be able to develop or modify programs as desired. Also under this operating system, the compression and expansion to and from disc storage is done by code in firmware PROM's. The data formats for I/O are controlled by field descriptors. At CRT input time, complete format checking is done to insure that only valid data such as dates, dollars, fractions, and alphabetic inputs are entered. The information presented below reflects the facilities of extended BASIC as available to the user.

FIXED-POINT OPERANDS: Integer arithmetic requires a variable amount of storage depending on the size of the integers. Each value is stored in one to five 8-bit bytes, with a maximum value of 10 raised to the 13th power (10^{13}).

FLOATING-POINT OPERANDS: None.

INSTRUCTIONS: The BASIC statements are of normal form, with a 1- to 5-digit statement (line) number followed by an English word or abbreviation and an expression or parameter list. Generally, the maximum statement size is limited to one display line or 64 characters. The statements are stored in the system in an intermediate object language, with spaces deleted. The system BASIC interpreter accesses, decodes, and executes these statements directly in statement order, modified by any branching or looping directives in the program itself.

INTERNAL CODE: ASCII.

MAIN STORAGE

TYPE: Magnetic core main memory, plus read-only (ROM) control memory.

CYCLE TIME: 1.0 microsecond per 8-bit byte.

CAPACITY: 16K to 128K 8-bit bytes, in 8K increments for all models.

CHECKING: None.

STORAGE PROTECTION: Northrop's new operating system features storage protect. All user memory access is monitored by a firmware routine. Any attempt to store or execute outside a user region is intercepted and an error displayed.

RESERVED STORAGE: 256 bytes of memory are reserved for interrupt and I/O constants.

CENTRAL PROCESSOR

The BDS Series 500, 1000, 2000 systems are built around the Microdata 1600 minicomputer with an enhanced firmware set, power fail/auto restart, and real-time clock. The microprograms added to the Microdata firmware set provide data compression/expansion, several customized operation codes such as Supervisor Calls, and support for the operating system, including a multi-user debug package. The microinstruction execution rate is 200 nanoseconds per instruction.

Details of the Microdata 1600 processor can be found in Report M11-633-101. Because Northrop does not allow the user to become involved at the machine level, details of the processor are not repeated here.

➤ The system design used by Northrop Data Systems con-

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PERIPHERALS/TERMINALS

MODEL	DESCRIPTION & SPEED	MANUFACTURER
MAGNETIC TAPE EQUIPMENT		
M501	9-track drive; 45 ips, 800 cpi, NRZI, 10.5-inch reels	Kennedy
PRINTERS		
P200	Line impact printer; 132 print positions, chain-train, 64-character set, 6 lines per inch; 300 lpm	Data Products
P202	Line impact printer; 132 print positions, chain-train, 64-character set, 6 lines per inch; 600 lpm	Data Products
P209	Line impact printer; 132 print positions, 44-hammer bank, 96-character set, 6 lines per inch; 300 lpm	Printronix
P210	Line impact printer; 132 print positions, 22-hammer bank, 96-character set, 6 lines per inch; 150 lpm	Printronix
P323	Serial non-impact printer; 80 print positions, 5 x 7 dot matrix, electrothermal, 96-character set, CRT printer; 30 cps	Texas Instruments
P325	Serial impact printer; 80 print positions, 5 x 7 dot matrix, 80-character set, 6 lines per inch; 120 cps	Centronics
P326	Thermal printer; receive only	Centronics
CARD EQUIPMENT		
R502	Reader, 80-column; 1000 cpm	True Data
TERMINALS		
T301	CRT display with separate keyboard; 1998 characters, 27 lines of 74 characters, 64-character set, numeric keypad; data rates to 9600 bps	ADDS
T302	CRT display/keyboard; 1920 characters, 24 lines of 80 characters, 64-character set, reverse video, numeric keyboard; data rates to 9600 bps	Hazeltine

➤ concentrated furniture manufacturing industry. This has now been accomplished, as has initial penetration of the Southeast medical market.

To date, branch and sales offices have been established in Los Angeles, Kansas City, San Antonio, San Diego, San Francisco, Portland, Dallas, Charlotte, Atlanta, Orlando, Philadelphia, Chicago, Pittsburgh, Cincinnati, Milwaukee, and Boston. Each branch office is staffed with a complement of salesmen, analysts, programmers, systems installers, and hardware service personnel. To support its expanding field organization and growing customer base, Northrop Data Systems moved in the fall of 1978 to a new 20,000-square-foot home office facility in Carson, California.

In the past, all programming was done by Northrop Data Systems in a macro assembly language. However, the company completed development of a new operating system and BASIC compiler in 1976, and all applications are now being written in extended BASIC. Thus, it is now practical for users to program their own systems. Northrop claims that because of specialized proprietary firmware and BASIC extensions unique to Northrop Data Systems, the company has been able to move to the higher-order language with no loss in system efficiency.

The Northrop business data systems employ the Microdata 1600 processor in combination with Northrop Data Systems proprietary firmware. System configuration includes 16K to 128K bytes of main memory, one to four ➤

➤ considers the operator to be a non-DP person. The CRT screen is used to instruct the operator in the necessary steps to accomplish the task. The screen formats are usually programmed to be similar to documents currently in use by the customer.

INSTRUCTION TIMINGS: Information on BASIC statement execution times was not supplied by Northrop Data Systems.

INTERRUPTS: A priority interrupt facility handles internal processor interrupts, I/O peripheral device interrupts, and individual external interrupts. Each such interrupt has its own unique memory address and priority assignment. External interrupts occur at device controllers or interrupt modules on the Byte I/O bus. This system of external interrupts contains a signal line, a priority line, and a select line. Internal interrupts have priority over external ones and are dedicated to console interruption, power fail/restart, real-time clock, and user-selectable, optional interrupts.

PHYSICAL SPECIFICATIONS: The BDS system processor is cabinet-mounted and is 25.5 inches wide, 36 inches deep, and 49.5 inches high (60.5 inches high for the Series 2000) in a free-standing cabinet. Power requirements are 115 or 230 VAC at 50 or 60 Hertz, 20 to 30 amps. The system outputs 1000 to 1200 BTU's of heat per hour. Operating temperatures are between 65 and 80 degrees F., and humidity tolerance is 30 to 70 percent, noncondensing. BDS systems do not normally require air conditioning above normal office levels.

INPUT/OUTPUT CONTROL

INPUT/OUTPUT CHANNELS: Printers and CRT display terminals operate through programmed I/O transfers over the parallel I/O bus at data transfer rates up to 40,000 ➤

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➤ disc drives with a maximum storage capacity of 200 million bytes, up to 16 local and/or remote CRT data terminals, and other peripherals, such as magnetic tape drives, card readers, etc.

Northrop Data Systems performs its own hardware maintenance through a national network of company-trained personnel. Heavy emphasis is placed on system uptime. Customer service personnel are located in all cities in which branch and sales offices are located.

USER REACTION

Summarized below are the results of Datapro's interviews with 12 Northrop users. Our sample consisted of five users with BDS 1000 systems and seven with BDS 2000 systems. Of the 12 users, 9 were in the medical field and 3 were furniture manufacturers. The average system had a memory capacity of 26K bytes, utilized 5 terminals, and had been in use for 22 months.

Eleven of the systems were being used for typical accounting applications such as accounts receivable, accounts payable, and payroll. Most of the users in the medical field were also using the system for patient billing, and all of the furniture manufacturers were using Northrop's manufacturing applications.

The users we contacted in the survey, while knowledgeable in accounting, were definitely not sophisticated in data processing. Because of this, and the turnkey nature of Northrop's business, some of our standard questions were omitted from the survey. Tabulated below are the ratings these users assigned to the Northrop BDS systems.

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Ease of operation	9	3	0	0	3.8
Reliability of mainframe	5	7	0	0	3.4
Reliability of peripherals	4	7	1	0	3.3
Maintenance service:					
Responsiveness	9	3	0	0	3.8
Effectiveness	7	5	0	0	3.6
Technical support	5	4	3	0	3.2
Application programs	7	5	0	0	3.6
Overall satisfaction	7	5	0	0	3.6

*Weighted Average on a scale of 4.0 for Excellent.

Northrop's scores were high overall. Six of the users were particularly pleased with the company's application programs, commenting on how well they fit their requirements. The terms "flexible," "versatile," and "easy to use" were most often used when describing the strong points of the BDS systems. Northrop's maintenance service also won praise, the general consensus being that the company's service personnel were very responsive and kept the system down-time to a minimum.

The only negative comment came from two users who felt that it takes Northrop too long to comply with their requests for application program modifications. The problem, as one user put it, is that he "must go through Northrop's red tape to modify programs." ➤

➤ bytes per second. Disc transfers are through the DMA channel at data rates up to 1 million bytes per second.

SIMULTANEOUS OPERATIONS: All peripheral and processing activities are overlapped within the capability of the memory and processor cycling rates.

CONFIGURATION RULES

The BDS Series 500 includes a Microdata 1600 processor with a minimum of 16K bytes of main memory, to which one 5- or 10-megabyte cartridge disc drive, 1 or 2 CRT's, and one 150-lpm matrix printer can be attached.

The BDS Series 1000 includes a Microdata 1600 processor with a minimum of 24K bytes of main memory, to which one 10-megabyte cartridge disc drive, up to 4 CRT's, and one 300-lpm printer can be attached.

The BDS Series 2000 includes a Microdata 1600 processor with a minimum of 32K bytes of main memory, to which may be added up to four 10- or 50-megabyte cartridge disc drives with controller, one magnetic tape drive, up to 16 local and/or remote CRT's and serial printers in any combination, and one or two 300- or 600-lpm line printers.

MASS STORAGE

D403 DISC STORAGE: Provides 10 million bytes of direct-access storage on a top-loading drive with one fixed and one removable IBM 5440-type cartridge with a rotational speed of 2400 rpm. Up to four drives can be accommodated on one controller. Data is recorded on four surfaces with 406 tracks per surface. The average rotational delay is 12.5 milliseconds, and the average head positioning time is 35 milliseconds. The data transfer rate is 312K bytes per second. The manufacturer is Western Dynex.

D404 DISC STORAGE: Provides 54.7 million bytes of storage on an IBM 3336-11-type disk pack. Data is recorded on 5 surfaces with 815 tracks per surface. Track density is 370 tracks per inch. The drive revolves at 3600 rpm with an average rotational delay of 8.3 milliseconds. Head positioning times are 6 milliseconds track-to-track and 30 milliseconds average. Data transfer rate is 806K bytes per second. The manufacturer is California Computer Products, Inc. (Model T-50).

INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

COMMUNICATIONS CONTROL

The BDS systems can operate with local or remote CRT and printer stations via modems. Transmission speed is 300 to 2400 bps. The remote operator has access to the system in the same manner as a local operator.

A special communications mode for remote sites, provided in all new installations, allows each Northrop branch office facility to communicate with the customer's system to perform diagnostic tests. A 1200-bps dial-up link via modems establishes the communications.

SOFTWARE

Software support for the BDS systems consists of two proprietary operating systems developed by Northrop Data Systems and application packages for specific market areas written in either macro assembler or extended BASIC. New software application packages are developed on a continuing basis. These include enhancements to existing packages as well as totally new but allied applications. All application software is provided on a non-exclusive license basis to the end user. ➤

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➤ The combination of specialized software with a good mix of hardware appears to be working well for Northrop and its customers. As long as the firm concentrates its efforts on its targeted market segments, there is no reason to believe that this success will not continue. □

➤ **OPERATING SYSTEM:** Two types of operating systems are available.

The *TS/OS* operating system is a time-sharing type of system under which users' tasks are rolled out of memory during terminal activity and restored as required. This system allows subtasking of functions not requiring a CRT terminal, thereby allowing further use of the terminal for data entry or inquiry after starting a print job or sort. This operating system, including all access methods, occupies about 12K bytes. The user region, including buffers, is about 4K bytes. The CRT terminals also require from slightly less than 1K bytes to a maximum of 8K bytes, for a total memory requirement of 24K bytes. This operating system supports a macro assembler for use by Northrop Data Systems only. BDS systems using the *TS/OS* operating system are not user-programmable.

MP/OS is the second and newer operating system. It utilizes special firmware to produce up to seven virtual 4K-byte CPU's within a single system. As long as there are 4K-byte sections of memory available, no roll-in/roll-out occurs for up to seven resident users. The system requires 24K bytes of memory plus at least 4K bytes for one user area, but up to 52K bytes could be utilized by the system and seven resident users. This operating system supports extended BASIC.

Both operating systems use access methods for random (hashed), indexed, and sequential files. All of the file handling, disc I/O, CRT edit checking, and background printing are done within the operating systems.

LANGUAGES: All of the BDS Series systems are designed to utilize a *macro assembly language*. This language consists of macros for functions such as disc searches, CRT display and reply, report writing, sorts, and data formatting.

Northrop Data Systems does not make the macro assembly language available to the user. The *MP/OS* operating system does, however, support extended BASIC, a language which can be directly utilized by the end user.

Extended BASIC is available for BDS Series systems operating under the *MP/OS* operating system. This language offers extensions for handling business-type programming both through data handling and formatting extensions. Specifically, it includes these features: definition of mixed-mode arrays and common storage; alphanumeric string manipulation capability; dynamic core allocation/deallocation; about 15 built-in functions; error trapping facilities; access to the entire data management system, including shared-sequential, random-access, linked, and independent key files; program overlay capability; formatting capabilities for business-type data including fill, CR, right/left justification, blank fill, decimal placement, etc.; and initiation of subtasking commands with time-slicing capabilities. The run-time support routines are included in the operating system area.

UTILITIES: Many utilities of several types are available, including disc mapping for both data and program space, and editors for closing reports and special job functions. Generalized file display/modify/print utilities allow security-controlled access to all system files separate from data base sizing, hashing, and inspection utilities. Hardware diagnostic utilities are also available.

APPLICATION SOFTWARE: Northrop Data Systems, Inc. currently offers five special packages for the medical industry and three for manufacturers. Standard accounting packages are also provided in support of the industry packages. All packages are modular and can be run on any series of BDS equipment.

Medical Industry Packages are comprehensive packages for each medical specialty: Multispecialty Group Practice/Clinic; Radiology; Clinical Laboratory; Anesthesiology; and Small Hospitals. Each package provides automatic patient billing, cash receipts processing, accounts receivable aging, third party billing, insurance form processing, RVS activity reports, practice management reports, and all daily journals. The systems allow real-time inquiry via CRT's into patient accounts, business transaction summaries, physician activity, and other related information. Most reports are available on demand, except for critical daily and monthly reports which are printed during closings. These include reports for aging and service usage. Accounts are aged, set to zero balance, and "dropped" based on length of time in the system in a given balance status (credit, debit, zero). Activity against accounts includes charges, receipts, refunds, and adjustments, each of which creates a specific type of transaction line linked to a unique account.

The specialty packages also offer features that are unique to the business for which they are created. For example, the Radiology package provides for instantaneous flash card printing and cross referencing of patients and film numbers. The Clinical Lab System provides for test results reporting, cytology reporting, multi-test diagnostics panel, and test reporting for insurance purposes. The Anesthesiology System provides for service prices and reporting by surgical procedure base plus time units. Management reports include procedure analysis by hospital and anesthesiologist. All industry packages tie directly into the general ledger system.

The Small Hospital System is programmed in the extended BASIC language and provides an admission, discharge, and transfer system (ADT) which supports such features as census reporting and Physician Service Review Organization (PSRO) reports. Also included are billing and accounts receivable processing, with insurance claims processing and follow-up for a hospital of up to 250 beds. In addition, outpatient clinic processing for 200 to 300 patients per day can be included.

Manufacturing Packages are currently customized to meet the needs of furniture manufacturers. The three now available are Standard Upholstered Furniture Manufacturers System, Interactive Production (Mill) System, and Interactive Furniture Manufacturers System.

The package for upholstered furniture manufacturers encompasses every phase of the furniture manufacturing cycle: order entry with management control; inventory control of total requirements, discontinued inventory, and finished goods; and multiple price lists. The production phase handles scheduling, shop loading, committing inventory against production, and feedback. The inquiry phase allows the user to extract up-to-date information about orders, including exceptions and production status, and inventory levels for all materials and fabrics. An additional strong point of the system is an automatic style costing mechanism.

The other two packages are designed for case goods furniture manufacturing. One is just what its name implies: a production (mill) system that is designed solely to control the shop floor. It includes among its features a multi-level bill of material processor and scheduling. The other is a fully featured system that includes sales order processing, materials processing, and materials requirement planning. Northrop plans to introduce similar manufacturing packages for other categories of manufacturers, beginning in the first quarter of 1979. ➤

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► **FINANCIAL/ACCOUNTING PACKAGES:** In addition to the specialized industry application packages, Northrop Data Systems offers a complete payroll package for salaried and hourly employees. Also available is a full interactive financial management system. Some unique features of the accounts payable routines are: application support of multiple bank accounts and maintenance of a check register for each bank; system support of all types of liabilities including notes payable or any other payable; partial payments to an invoice to handle installment-type obligations or invoices with disputed balances; automatic check reconciliation; and the ability to void both handwritten and machine-written checks any time prior to check reconciliation. The general ledger provides consolidations at any level, such as company level, division level, or responsibility level, and this is totally definable by the user. This information is always updated and is available on demand at any given time. These packages are applicable to general business, but are normally sold as optional software with the industry packages described above.

PRICING

POLICY: The Northrop BDS systems are generally available

for purchase or on third-party leases, with separate charges for maintenance. A rental program is also available to customers desiring to rent on a renewable one-year contract. Maintenance is included in the system rental price.

The system purchase price includes operating system software, hardware installation, and checkout at the customer's site. The application software prices include 40 hours of a programmer/analyst's time for requirements analysis and software generation. Also included are 40 hours of on-site operator training.

APPLICATION SOFTWARE: Contact Northrop directly for prices of all applications software.

SUPPORT: Maintenance is provided by company-trained representatives located in branch offices and service sites across the United States. Maintenance contracts are written for one-year terms. In addition to on-call maintenance, the contract covers scheduled preventive maintenance service.

EQUIPMENT: The system prices that follow include all costs to provide the customer with operational equipment at his site.■

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>
PACKAGED SYSTEMS			
BDS Series 500	Includes CPU with 16K bytes of memory, one I/O channel, 5-megabyte disk drive, 150-lpm printer, one CRT, equipment desk, system software	\$29,500	\$250
BDS Series 1000	Includes CPU with 24K bytes of memory, 4-channel I/O interface, 10-megabyte disk drive, 300-lpm printer, one CRT, equipment cabinet, system software	45,526	283
BDS Series 2000	Includes CPU with 32K bytes of memory, 8-channel I/O interface, two 10-megabyte disk drives, 300-lpm printer, one CRT, equipment cabinet, system software	63,089	373
OPTIONAL PERIPHERALS			
BDS Series 500:			
P325	120-cps printer	2,500	33
P209	300-lpm printer, 96-character set (when ordered with system in place of Model P210)	1,995	34
P200	300-lpm printer, 64-character set (when ordered with system in place of Model P210)	5,995	16
BDS Series 1000:			
T302	CRT; 1920 characters	3,495	29
P200	300-lpm printer, 64-character set (when ordered in place of Model P209)	3,995	15
P325	Terminal printer; 120 cps (only 1 per CRT)	2,500	33
P326	Thermal printer	4,456	60
P210	150-lpm printer (when ordered with system in place of Model P209)	-1,995	-10
BDS Series 2000:			
T302	CRT; 1920 characters	3,495	29
P202	600-lpm printer; 64-character set (when ordered with system in place of Model P200)	2,825	9
P325	Terminal printer; 120 cps (only 1 per CRT)	2,500	33
P326	Thermal Printer	4,456	60
P209	300-lpm printer (when ordered with system in place of Model P200)	-3,995	-15
—	Substitute 4 I/O channel interface for 8 I/O channel interface	-840	-10