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Datapro Reports on
Minicomputers

M09-115-**101**

Supermicrocomputer
Systems

Bull
DPX/2 Systems

In this report:

Product Summary

Editor's Note
With the new DPX/2 product line and its three families, Bull has created a framework for an impressive UNIX line. In the near future, Bull is expected to offer more upgrade options.

Description
Bull's new DPX/2 series is built around three product families. The entry-level DPX/2 100 family currently consists of the Micral 600/ix, a desktop system based on the Intel 80386 chip. The DPX/2 200 family consists of the DPX/2 210 model which is based on the Motorola M68030 microprocessor. At the top of the product line, the DPX/2 300 family consists of the multiprocessor DPX/2 320 and 340 models.

Strengths
Bull's new DPX/2 product line offers aggressively priced, standards-compliant computers targeted at specific markets.

Limitations
The DPX/2 series offers a full line of communications products with the notable exception of LAN management software.

Competition
Bull DPX/2 systems compete against systems from AT&T, NCR, Unisys, Digital, and Hewlett-Packard.

Vendor
Bull
Technology Park
Billerica, MA 01821-4199
(508) 671-6000

Price
Basic system prices range from $7,375 to $24,800.

GSA Schedule
Yes.

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Analysis

Product Strategy

In October 1989, Bull introduced a new UNIX-based product line. The UNIX System V DPX/2 series comprises three product families. The entry-level DPX/2 100 family currently consists of the Micral 600/ix CPU with the UNIX operating system. The DPX/2 200 family contains the DPX/2 210 model. The DPX/2 300 family comprises two multiprocessor machines: the DPX/2 310 with one or two processors and the DPX/2 340 with up to four processors.

The new DPX/2 product line is an excellent framework from which Bull can build a highly competitive UNIX series of machines. In the future, Bull is expected to expand the DPX/2 series with more upgrade options and new machines to plug existing gaps in performance.

Throughout the product line, upgradability is somewhat disjointed. The DPX/2 100 system, based on the Intel 80386 chip, cannot be upgraded to the DPX/2 210 Motorola 68030-based systems.
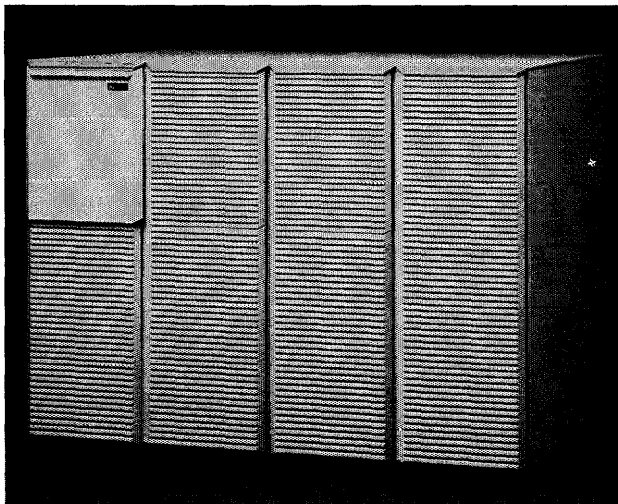
Bull's DPX/2 340 is a UNIX supermicrocomputer system that conforms to industry standards and protocols, based on the Motorola 68030 chip, and supports up to 256 active users.

The DPX/2 100 is actually Bull's Micral 600/ix with the UNIX operating system. While on the surface using the 386-based machine may seem to fragment Bull's DPX/2 offerings, the Micral 600/ix offers MS-DOS support essential to LAN-based and office automation applications systems.

The midrange DPX/2 200 family will have to be expanded to create a smoother growth path, as well. The DPX/2 210 is a single-processor, compact, departmental processor or workgroup server for small- and midsized companies. For a more powerful machine, customers must move to the DPX/2 300 family where the dual-processor DPX/2 320 and the quad-processor DPX/2 340 offer performance capabilities needed in large departments, midsized companies, and multiple sites within large organizations.

At present, customers cannot upgrade from one family within the series to another. Each boost in performance requires migration. Bull, however, has ensured that all products within the three DPX/2 families are source code compatible.

The new DPX/2 200 and 300 families are also binary compatible with Bull's older UNIX product line, the XPS-100 Series. Bull is committed to XPS-100/DPX/2 compatibility. In fact, Bull intends to replace the older XPS-100 line with the DPX/2 systems.

The DPX/2 Market

As a LAN server, the new DPX/2 systems can support small-to-medium sized companies or departments. For larger organizations, DPX/2 systems can be used to communicate with systems from Bull and other vendors through public or private networks. Bull assures customers that the DPX/2 supports existing industry standards and telecommunication protocols and will take full advantage of open, nonproprietary environments.

Targeted markets include the following:

- Discrete manufacturing, including the automotive, aerospace, defense, electronic and electrical, and appliance industries.

- Accounting and financial.

- Distribution and wholesale businesses.

- Employment and recruiting.

- Federal government and military organizations.

- Health care industries.

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Company Profile
Bull

Corporate Headquarters
Groupe Bull
Technology Park
Billerica, MA 01821-4199
(508) 671-6000

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Bull HN Ltd.
155 Gordon Baker Road
North York, ON M2H 3P9
(416) 499-2855

Officers
President and CEO: Roland Pampel
Chief Fin. Officer: Richard Versoi
Exec. V.P. for U.S. Marketing, Sales, and Service: Gerald Vennard
Exec. V.P. for R&D: Dominic Chan
Exec. V.P. Strategy and Business Management: Ward McKenzie

Company Background
Bull has evolved as an international partnership. In 1962, Honeywell and NEC began a long-term technology agreement. A 1987 buy-in by Groupe Bull made it an equal partner with Honeywell in a globe-encircling French-U.S.-Japanese partnership. In 1988, Honeywell reduced its role in the

company by selling shares to Groupe Bull. Honeywell Bull was then renamed to reflect its new majority owner, Groupe Bull.

On October 2, 1989 Groupe Bull agreed to acquire Zenith Data Systems (the leading U.S. manufacturer of laptop computers) from Zenith Electronics Corporation. As a result of that acquisition, Groupe Bull has again reorganized.

The new company, Compagnie des Machines Bull (CMB), is the legal entity of the Groupe. Four operating groups have been set up under the CMB umbrella: Bull SA France, Bull International SA, Bull Zenith, and Bull HN. The first three operating groups are all wholly owned by CMB and are divided into geographical operating territories. While Compagnie des Machines Bull (69 percent) holds the majority of Bull HN, NEC (15 percent) and Honeywell (15.6 percent) retain shares in the company. Each operating group is responsible for

development, manufacturing, and sales.

The U.S.-based organization is called Bull HN, with HN alluding to Honeywell and NEC's minority stakes in the partnership. However, Bull HN has launched an extensive advertising campaign endorsing "Bull" as its proper name with ad slogans such as KnowBULL, UnflappaBULL, Connect-aBULL, and Dependa-BULL.

The holding company, Compagnie des Machines Bull (CMB), is 92 percent owned by the French national government. Only the remaining 8 percent is publicly traded on European stock exchanges.

Products of the combined companies range from CP8 Smart Cards to mainframes to large networks. Combined annual R&D investment of the partnership is 11.5 percent of total revenues (exceeding $600 million).

Financials
The U.S.-based Bull remains a sizable company with over 19,000 employees worldwide and operations in more than 28 countries. Bull HN's annual revenues—from the U.K., Italy, Asia, Australia, Mexico, and Canada, as well as the U.S.—exceed $2 billion.

Compagnie des Machines Bull overall has more than 45,000 employees and operations in more than 90 countries and over 11,000 employees in the U.S. With consolidated revenues exceeding $5.3 billion (1988), CMB is the leading European-based supplier of information systems.

After accounting for CMB's increased stake in Bull HN, consolidated 1988 net earnings of CMB were $51 million, almost 35 percent over 1987. These profits continue the steady growth of the prior three years of "renewed profitability" (averaging $34 million)—a dramatic recovery after several years of substantial net losses ($187 million in 1983-84).

Bull HN is not publicly traded, so quarterly earnings figures for 1989 are not available. 1988 annual revenues for Bull HN were $2.2 billion: 46 percent from North America, 31 percent from Italy, 17 percent from the U.K., and 6 percent from other countries.

Bull HN accounted for 41.6 percent of CMB's total worldwide revenues in 1988.

- Hospitality industries, including hotels and restaurants.

- Insurance agencies.

- Real estate businesses.

- Retail establishments.

- State and local governments.

Product Goals
In Europe, Bull has effectively penetrated the UNIX market. In the U.S., however, Bull will have to be very aggressive to capture significant market

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Table 1. System Comparison

Model	DPX/2 100 (Micral 600/ix)	DPX/2 200 Model 210	DPX/2 300 Model 320	DPX/2 300 Model 340
System Characteristics				
Date of introduction	October 1989	October 1989	October 1989	October 1989
Date of first delivery	January 1990	January 1990	January 1990	January 1990
Microprocessor type	Intel 80386	Motorola 68030	Motorola 68030	Motorola 68030
Microprocessor cycle time	25MHz	25MHz	25MHz	33MHz
Operating system	BOS/386	BOS/68K	BOS/68K	BOS/68K
Upgradable from	Not applicable	Not applicable	Not applicable	DPX/320
Upgradable to	Not applicable	Not applicable	DPX/2 340	Not applicable
Number of serial/parallel I/O ports	2-18 serial; 1 parallel	8-88 serial	8-192 serial	16-384 serial
Memory				
Minimum capacity (bytes)	4M	8M	8M	8M
Maximum capacity (bytes)	24M	16M	144M	288M
Disk Storage				
Minimum capacity (bytes)	100M	720K/1.2M	720K/1.2M	720K/1.2M
Maximum capacity (bytes)	600M	2.0G	7.4G	15.0G
Number of active users (max.)	8	32	96	256
Communications Protocols	IEEE 802.3 TCP/IP Ethernet	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, SNA/SDLC 3270/3770, X.25, Kermit, VIP PC	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, SNA/SDLC 3270/3770, X.25, Kermit, VIP PC	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, SNA/SDLC 3270/3770, X.25, Kermit, VIP PC
Purchase Price (basic entry system) ($)	9,145	7,375	17,660	24,800
Comments	An Intel 80387 math co-processor may be added to the system but is not included in the basic system.	A MC68882 floating-point co-processor is standard.	Can be configured with one or two processors. A MC68882 floating-point co-processor on each CPU is standard.	Can be configured with up to four CPUs. A MC68882 floating-point unit is standard.

share. As a result, Bull has launched a major marketing campaign for its new UNIX product line.

Bull distributes its DPX/2 systems through several channels, including its direct sales force, which has particular expertise in selling systems to discrete manufacturing, telecommunications, finance, trade, service, and state and local government organizations. Three of Bull's four operating companies sell the DPX/2 series in the U.S. and abroad.

Value-added resellers (VARs) also distribute DPX/2 computers. Over 250 VARs sell DPX/2 systems into small and midsized businesses within the discrete manufacturing, trade, health care, and service industries. By selling through VARs, Bull increases the market visibility of its DPX/2 systems to customers who cannot be reached directly.

To protect its target markets, Bull makes DPX/2 applications software readily available. The major source of applications software is alliances with independent software houses and VARs. To attract and retain independent software suppliers,

Bull provides marketing, technical, and business support. The alliances give DPX/2 customers access to the services of the independent software suppliers. After learning a customer's applications needs, Bull will help the customer establish contact with the appropriate data system suppliers.

Competitive Position

The DPX/2 series addresses the highly competitive small business and departmental computing markets. It competes against numerous general-purpose small-scale and midrange systems running AT&T's UNIX System V operating system. Formidable opponents include the Unisys 5000 Series models, NCR Tower 32 systems, Altos Computer Multiuser Systems series, AT&T 3B2 and 3B5 computers, Prime EXL supermicro, and the Digital Equipment Corporation MicroVAX supermicros, running under the ULTRIX-32 operating system. In addition, many small and midrange proprietary architecture-based systems compete in these markets, including the Hewlett-Packard Micro3000

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Table 2. Mass Storage Devices

Model	DDU1961	DDU1941	MSU1964	MSU1965	MSU1966
Type	Diskette	Diskette	Fixed	Fixed	Fixed
Size (inches)	5¼	3½	5¼	5¼	5¼
Formatted capacity per drive (bytes)	1.2M	1.44M	100M	140M	300M
Interface/controller	FDI	FDI	AT interface	EDSI interface	EDSI interface
Number of drives per interface/ controller	—	2	2	2	2
Average access time (ms.)	91	94	25	16	18
Data transfer rate (bits per second)	500KB	500KB	10MB	10MB	10MB
Supported by system models	DPX/2 100 model	DPX/2 100 model	DPX/2 100 model	DPX/2 100 model	DPX/2 100 model
Number of surfaces	2	2	4	7	15
Sectors/tracks	15 sectors; 80 tracks per surface	18 sectors; 80 tracks per surface	33 sectors; 776 tracks per surface	35 sectors; 1,248 tracks per surface	35 sectors; 1,224 tracks per surface
Bytes per sector	512	512	512	512	512
Purchase price ($)	255	275	1,795	2,095	4,095

supermicrocomputers and the low-end and midrange RISC-based HP 3000 HPPA systems, the Data General Eclipse MV systems, IBM AS/400 computers, and the Digital MicroVAXs with the VMS operating system.

Bull's DPX/2 supermicros boast no dramatic technological advances over competitors' systems, but they are functionally equal to other vendors' products and allow Bull to compete effectively in the business and government sectors. Nonetheless, these markets have already been targeted and largely captured by other high-profile open systems.

Despite the intense competition, Bull predicts great success with the DPX/2, largely based on its marketing approach. Bull's strategy is to make high-volume sales to large corporations, government agencies, and public and private institutions. In such environments, DPX/2 systems function as either standalone or distributed departmental processors that communicate with other networked departmental systems or host mainframe-class systems. Bull also sells DPX/2 systems to smaller organizations for supporting business operations and professional and clerical automation at the departmental, distributed branch, and central processing level.

Decision Points

By far the greatest advantage of the DPX/2 series is its open systems architecture. By building the DPX/2 with off-the-shelf components and de facto industry-standard facilities (the Motorola 68030

microprocessor, VME Bus, SCSI, Ethernet networking, the UNIX System V operating system, and standard relational database systems such as Oracle and Unify), Bull reduces the user's cost of migrating from or to another vendor's system that employs such facilities. In addition, these commonly available facilities enable Bull to provide DPX/2 customers with access to a broad range of low-cost peripherals and an increasingly large applications base.

Bull is committed to maintaining industry-standard computing. For example, its DPX/2 Operating System complies with the AT&T UNIX System V Interface Definition (SVID) specification. It retains source code compatibility with any implementation of UNIX conforming to SVID. Bull is a member of the Open Software Foundation (OSF), therefore guaranteeing a future UNIX operating system that will remain compatible with UNIX operating systems from many other vendors. Bull has also added the Informix, Ingres, and Unify relational database systems to its repertoire of database system solutions, thus creating a more "open" database processing environment. Bull also supports the International Organization for Standardization's Reference Model for Open Systems Interconnection (ISO/OSI) for network services.

Communications

Because DPX/2 computers are designed for distributed data processing environments, their communications and networking scheme is particularly important. The data communications tools used on

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Table 2. Mass Storage Devices (continued)

Model	DIU3602	MSU3601	MSU3602	MSU3603
Type	Diskette	Fixed	Fixed	Fixed
Size (inches)	5¼	5¼	5¼	5¼
Formatted capacity per drive, (bytes)	720K/1.2M; selected by software	155M	338M	675M
Interface/controller	FDI	Integrated SCSI controller	Integrated SCSI controller	Integrated SCSI controller
Number of drives per interface/ controller	1	6	6	6
Average access time	95 ms. at 250KB data transfer/91 ms. at 500KB	18 ms.	18 ms.	18 ms.
Data transfer rate (bits per second)	250K in 720MBmode/500K in 1.2MB mode	1.25M	4.0M	4.0M
Supported by system models	DPX/2 200 and 300 models	DPX/2 200 and 300 models	DPX/2 200 and 300 models	DPX/2 200 and 300 models
Number of surfaces	2	10	16	16
Sectors/Tracks	9 sectors; 80 tracks per surface	—	—	—
Bytes per sector	512	512+	512+	512+
Purchase price ($)	390	3,630	4,900	7,540

the computers provide flexibility in creating networking and distributed processing environments within a Bull shop and provide the open connectivity required in departmental processing. The DPX/2 systems support many data communications languages, interfaces, and protocols, making them capable of communicating with a wide variety of computers from Bull and other vendors.

Compatibility

Compatibility across the DPX/2 product line is another important factor. The DPX/2 100 is source code compatible with both the DPX/2 210 and DPX/2 300 systems. Potential DPX/2 customers are assured of source code compatibility within the DPX/2 product line, as it exists now and in the future. Bull maintains that it will not jeopardize the customer's investment by offering additions to the product line that will not support existing applications. In addition, Bull has not abandoned existing XPS-100 customers. The DPX/2 200 and DPX/2 300 families are binary compatible with Bull's XPS-100 systems. Therefore, all applications currently running on XPS-100 systems will run on DPX/2 200 and DPX/2 300 family computers without modification.

Future Directions

Bull is committed to enhancing its DPX/2 product line to accommodate the customer's growing requirements for power, functionality, and system expansion. For example, Bull plans to introduce more powerful versions of the DPX/2 200 and 300 families. The DPX/2 computers will be upgradable to the Motorola 68040 when the chip is introduced for commercial applications.

As a result of an agreement with MIPS Computer Systems, Inc., Bull will also market a new RISC-based system that incorporates chip technology developed by MIPS. Under the plan, MIPS will supply microprocessor technology, compiler software, the MIPS version of UNIX, and RISC-based systems to Bull. The new machine will become the top of the DPX/2 line.

Cross-Reference

For more information on DBMSs, see full product reports in Volume 3 of *Datapro Reports on Minicomputers.*

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Table 3. Display Terminals

Model	HDS 7101	HDS 7102	HDS 7403	HDS 7404
Display Parameters				
Max. chars./screen	2,000	2,000	2,000 or 3,300	2,000 or 3,300
Screen size (lines x chars.)	25 x 80	25 x 80	25 x 80 or 25 x 132	25 x 80 or 25 x 132
Tilt/swivel screen	Optional	Optional	Standard	Standard
Symbol formation	7 x 12 in a 10 x 14 matrix character cell	7 x 12 in a 10 x 14 matrix character cell	7 x 10 in a 9 x 10 matrix character cell or 7 x 10 in a 10 x 10 cell	7 x 10 in a 9 x 10 matrix character cell or 7 x 10 in a 10 x 10 cell
Character phosphor	Green	Amber	Green	Amber
Keyboard Parameters				
Style	Low-profile typewriter with numeric keypad	Low-profile typewriter with numeric keypad	Low-profile typewriter with numeric keypad	Low-profile typewriter with numeric keypad
Character/code set	ASCII	ASCII	ANSI 3.64 and ASCII	ANSI 3.64 and ASCII
Detachable	Yes	Yes	Yes	Yes
Program function keys	10	10	15 in ANSI 3.64 mode; 16 in ASCII mode	15 in ANSI 3.64 mode; 16 in ASCII mode
Terminal Interface	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A
Purchase price ($)	595	595	750	750
Comments	Has a printer port. Can emulate a VIP7201 and can support various ASCII terminal emulations.	Has a printer port. Can emulate a VIP7201 and can support various ASCII terminal emulations.	Has a printer port can support ANSI and ASCII terminal emulations.	Has a printer port can support ANSI and ASCII terminal emulations.

Characteristics

System Overview

Bull's new UNIX product line, the DPX/2 series, is divided into three families. The entry-level DPX/2 100 family currently consists of the Micral 600/ix, a desktop system based on the Intel 80386 chip and capable of supporting UNIX, Xenix, and MS-DOS applications. The DPX/2 200 family currently consists of the entry-level DPX/2 210 which is based on the 32-bit Motorola 68030 microprocessor and supports Multibus II and VME buses. The high-end DPX/2 300 family consists of two multiprocessor, multiuser systems based on the Motorola 68030 microprocessor. The DPX/2 320 unit can be configured with two CPUs, and the DPX/2 340 unit can be configured with up to four CPUs. Both DPX/2 300 models are equipped with a Motorola 68882 floating-point unit on each CPU for single- and double-precision operations.

System Specifications

Data Formats

Basic Format: 32-bit word.

Memory

Main Memory: The DPX/2 100 (also known as the Micral 600/ix) offers 4 megabytes of random access memory (RAM) that can be expanded up to 24 megabytes in 2- and 4-megabyte increments.

The DPX/2 200 comes with 4 megabytes of error correcting memory that can be expanded to 16M bytes by adding 4- or 8-megabyte memory boards.

The DPX/2 300 provides 8 megabytes of error correcting memory and can be expanded to 72M bytes per CPU for a total system capacity of 144M bytes on 320 models and 288M bytes on 340 models.

Cache Memory: Cache memory is standard on all models except the DPX/2 200, where cache is optional. The DPX/2 100 offers 32K bytes of cache as standard. The DPX/2 200 and DPX/2 300 units support 64K bytes of cache per central processing unit.

Central Processor
The DPX/2 100 processor features a CPU with an Intel 80386 microprocessor running at 25MHz and a 32K-byte cache memory controlled by a dedicated Intel

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Table 4. Printers

Model	Model 4/40	Model 4/41	Model 4/66	Model 4/68	Model 75
Type	Serial dot matrix	Serial dot matrix	Serial dot matrix	Serail dot matrix	Laser
Speed	300 cps/draft; 180 cps/near letter quality; 70 cps/letter quality	300 cps/draft; 180 cps/near letter quality; 70 cps/letter quality	480 cps/draft; 180 cps/near letter quality; 75 cps/letter quality	600 cps/draft; 225 cps/near letter quality; 150 cps/letter quality	6 ppm
Bidirectional printing	Yes	Yes	Yes	Yes	Not applicable
Paper size	—	—	—	—	—
Character formation	—	—	—	—	—
Horizontal character spacing (char./inch)	10, 12, 15, 17.1, 20	10, 12, 15, 17.1, 20	—	—	—
Vertical line spacing (char./inch)	—	—	—	—	—
Character set	—	—	—	—	—
Controller/Interface	Centronics interface/RS-232-C interface	Centronics interface/RS-232-C interface	RS-232-C interface	Centronics interface	Centronics interface/RS-232-C interface
No. of printers per controller/ interface	1 Centronics/RS-232-C variable	1 Centronics/RS-232-C variable	1 Centronics	1 Centronics	1 Centronics
Printer dimensions, in. (h x w x d)	25 x 5.2 x 14	25 x 5.2 x 14	—	25.28 x 7.2 x 16.4	—
Graphics capability	—	—	—	—	—
Purchase price ($)	1,245/1,395	1,545/1,695	2,795/2,995	2,995	2,695
Comments					Supports HP LaserJet Plus emulation. Includes 1MB memory. Does not include Centronics cable.

82385 processor. An optional 80387 math co-processor, also running at 25MHz, can be added for compute-intensive applications.

All DPX/2 200 single processors and 320 symmetrical multiprocessors feature a Motorola 68030 microprocessor running at 25MHz (33MHz on the 340), an integrated memory board and memory controller, a Motorola 68882 floating-point unit running at 25MHz (33MHz on the 340), and 64K bytes of cache. In addition, these units support BOS/68K, Bull's enhanced adaptation of UNIX System V.

Peripherals

Disk Storage
See Table 2 for information on available disk and diskette devices.

Workstations
Information on DPX/2 display terminals is presented in Table 3. The DPX/2 terminals listed are the same terminal models that support the older XPS 100 product line.

Printers
A variety of printers is available for the DPX/2 series. Several printers, such as the Model 4/40, 4/41, and 4/68, have been carried over from the old XPS 100 product line.

Three new band printers support the DPX/2 200 and DPX/2 300 product families. The PRU0880, PRU0881, and PRU0882 can be purchased with either a 64-character uppercase band or 96-character upperand lowercase band. Models with the 64-character set operate at speeds of 325 and 650 lines per minute (lpm). Models with the 96-character set operate at speeds of 260 and 490 lines per minute.

For ease of operation, a number of paper handling devices including powered paper stackers, automatic sheet feeders, and paper pullers are available.

For detailed specifications on DPX/2 supported printers, see Table 4.

Magnetic Tape Units
See Table 5 for information on tape units.

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Table 4. Printers (Continued)

Model	Model 85	PRU0881	PRU0882	PRU0880
Type	Laser	Band	Band	Band
Speed	15 ppm	325 lpm	650 lpm	650 lpm
Bidirectional printing	Not applicable	Not applicable	Not applicable	Not applicable
Paper size	Supports letter-, A4, and legal-size sheets	—	—	—
Character formation	—	Full	Full	Full
Horizontal character spacing (char./inch)	—	—	—	—
Vertical line spacing (char./inch)	—	6/8	6/8	6/8
Character set	—	64-character up-percase band/96-charac-ter upper- & low-ercase band	64-character up-percase band/96-charac-ter upper- & low-ercase band	64-character up-percase band/96-charac-ter upper- & low-ercase band
Interface	Centronics	Centronics	Centronics	Centronics
No. of printers per controller/interface	—	—	—	—
Printer dimensions, in. (h x w x d)	—	—	—	—
Graphics capability	—	Not applicable	Not applicable	Not applicable
Purchase price ($)	6,950	8,200	10,800	9,500
Comments	Includes Diablo 630, HP Laser-Jet Plus emula-tion, Bull command set, and four resi-dent fonts. Ac-cepts Model 80 font cartridges. Includes model connection.		Includes paper puller. Powered paper stacker available.	Includes paper puller. Powered paper stacker available.

Software

Operating System

Bull Open Software/386: The DPX/2 100 (Micral 600/ix) supports the Bull Open Software/386 (BOS/386) operating system. Based on AT&T's UNIX System V, BOS/386 offers a combination of UNIX and Xenix features. In addition to UNIX System V standard functions, BOS/386 includes:

- Software tools such as the Fast File System (FFS) and virtual memory management.

- System management utilities.

- Support for virtual terminal functions.

BOS/386 features UNIX and MS-DOS integration. Through utilities built into the operating system, MS-DOS and UNIX files can be transferred to disks and MS-DOS software can run under UNIX. To improve MS-DOS and UNIX integration, DPX/2 100 includes VP/ix, a multitasking, multiuser MS-DOS environment running under the UNIX operating system. VP/ix permits several users to work simultaneously on MS-DOS applications and UNIX tasks. BOS/386 conforms with 386-ABI (Application Binary Interface).

The BOS/386 family of software products is packaged as four separate modules: the BOS/386 operating system, the Software Development System, the Network Connection Facilities, and the Document Processing Systems. Users may install only those subsets that are needed. Other add-on packages may be installed later.

Windowing: The standard windowing system used on DPX/2 100 systems is BOS/386 X.11, the latest version of X.Window from MIT. The X.11 windowing system uses a network-based architecture that replaces traditional call procedures or kernel interface calls with UNIX System V Streams facility-based interprocess communications to support a networked client-to-server link. Client-user application connections to X.11 display server are network transparent, and programs do not have to be on the same machine on which the server is located. The X.Window facility includes a Berkeley 4.3-compatible socket library to permit porting of existing Berkeley X applications.

Bull Open Software/68K: Bull's enhanced version of AT&T's UNIX System V, BOS/68K is supported by DPX/2 200 and 300 systems. BOS/68K includes the following features:

- Conforms to X/Open, POSIX, and SVID standards.

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Table 5. Magnetic Tape Equipment

Model	CTU1963	MTU3610	MTU3602	MTU3609
Type	Streamer	GCR/PE	Streamer	Streamer
Format	Cartridge	Reel-to-reel	Cartridge	Cartridge
Recording density, bits per inch	10K	1600 PE/6250 GE	10K	—
Characteristics				
Storage capacity, bytes	150M	146M	150M	300M
Tape speed, inches per second	30	90	90	120/90
Data transfer rate, bytes per second	31.8M	469K	105K	310K
Purchase price ($)	1,295	14,100	1,910	4,400

- Supports major communications and networking protocols, including TCP/IP, ISO, BSC, SNA, and X.25.

- Supports Oracle, Unify, and Informix relational database systems.

- Provides automatic reassignment of processing in multiprocessor environments, for optimum performance.

- Permits upward compatibility for applications running under existing Bull UNIX systems, without recompiling.

- Provides integrated instructional and operational tools for UNIX command and access functions.

Optional security modules may be tailored to special data protection needs and allow C-2 or B-1 levels of security as prescribed by the U.S. Department of Defense. The modules provide system and information access, password management, and hierarchical authorization.

Compatibility
The current DPX/2 200 and 300 models are binary code compatible with the older Bull, UNIX System V.3-based, XPS-100 models. DPX/2 100 models are source code compatible with DPX/2 200 and 300 models.

Database Management
DPX/2 systems can be configured with several de facto industry-standard database management systems (DBMSs) including *Oracle*, *Ingres*, *Informix*, and *Unify*.

Languages
DPX/2 computers can support the following high-level programming languages:

- SVS C—conforms to ANSI X3J11 standard. Subroutines written in Fortran and Pascal can be linked to C programs.

- RM/Cobol-85—is an advanced ANSI 1974/1985 compiler. Programs can be compiled under either standard, even if both standards are included in the same application.

- Micro Focus Level II Cobol—supports a variety of Cobol dialects, including Microsoft and Ryan-MacFarland Cobol. Packaged as both a development system and a runtime-only system for execution of compiled object code.

- Green Hills Fortran—supports ANSI Standard Fortran-77 plus extensions. Procedures written in Fortran can be linked with C and Pascal programs.

- Green Hills Pascal—complies with ISO/BSI level 1 and ANSI/IEEE standards.

- SVS Basic-Plus—uses a quasi-compilation technique to produce intermediate code. The SVS Basic interpreter includes bidimensional arrays with specific statements, sequential and random access files, and virtual matrix manipulation.

- RPG II/36—a Bull software porting tool based on Software Ireland's UNIBOL/RPG II. RPG II/36 provides an interface to the UNIX shell to permit users to transfer RPG II applications written for IBM System/34 or System/36 to a DPX/2 system.

Communications
DPX/2 systems support a number of different data communications protocols, thus enabling them to communicate with a variety of Bull HN and other vendors' computers.

TCP/IP
TCP/IP allows DPX/2 machines to communicate with other machines that support the Transmission Control Protocol/Internet Protocol (TCP/IP). TCP/IP supports both local and wide area (LAN/WAN) communications. When used in conjunction with an Extended Communications Processor, TCP/IP supports Ethernet LAN and X.25 WAN communications. For users of non-ECP systems, using a basic Ethernet controller will allow the TCP/IP package to support FTP file transfer, SMTP electronic mail local/remote login, remote command execution, electronic mail, and file transfer. In addition, it offers a programmer's interface for creating customized networking applications in a client-server form and contains utilities for network testing and management.

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386/ix TCP/IP: 386/ix TCP/IP is a networking facility that supports data transfer and remote access to other systems on the network.

Network File System

Network File System is a distributed file system that allows data exchange between machines from multiple vendors over a local area network. Dialog is supported through Ethernet using Ethernet connections. Users can access remote files without having to know their exact location. The Network File System is based on the Remote Procedure Call (RPC) and External Data Representation (XDR) protocols.

386/ix NFS: Supported by DPX/2 100 systems, 386/ix NFS is a network file system that provides file sharing among networked UNIX and non-UNIX systems.

386/ix PC Interface

This provides DOS PC users with the ability to store files and share files with one or more Micral 600/ix hosts.

SNA Communications

UNIX/SNA Document Exchange: The SNA Document Interchange Architecture Facility (DIA) is a software product that enables the DPX/2 to act in a Source/Recipient Node (SRN) within an IBM Office Systems Network. As an SNR, the DIA Facility implements protocols defined by IBM's Document Interchange Architecture. The DIA Facility uses Logical Unit 6.2 Basic Conversions to exchange documents/files within an IBM or compatible system. The DIA will communicate with any IBM or compatible system that acts as an Office System Node including a System 370 mainframe using DISOSS, a System/38 using Personal Services/38, and an AS/400.

The DIA Facility can be used in two ways:

- The end user can use the Bull Document Storage and Retrieval (DSTAR) transaction program to send documents to and/or receive them from another system. (DSTAR makes the DPX/2 system appear as an IBM Personal Services/36 device to the SNA network.)

- The end user can write a unique application to access the network through the Application Program Interface (API).

3270 Emulation: The 3270 Emulator resides on the DPX/2 system and provides user-developed application programs with 3270 interface support and 3270 file transfer capabilities. With the 3270 Emulator, DPX/2 systems can communicate interactively with the IBM host. The 3270 emulation capabilities allow the DPX/2 system to operate as an IBM 3274 or 3276 Control Unit

with relevant display and print devices attached. DPX/2-attached terminals appear as IBM 3270 interactive terminals, and the printers appear as IBM 3270 printers to the host system.

3770 Emulation: The 3770 emulation function enables a DPX/2 system to function as an IBM 3770 RJE terminal so the DPX/2 can transmit to and receive files from a host, send jobs to the host for processing, and collect the output for remote batch processing or remote job entry. The 3770 Facility emulates IBM 3776 and 3777 controllers. Standard ASCII DPX/2 devices are supported.

IBM Binary Synchronous Communications (BSC)

DPX/2 computers can also participate in an IBM Binary Synchronous Communications (BSC) network. The *BSC 3270 Emulator* and the *BSC 2780/3780 Emulator* are the software facilities that permit the DPX/2 system to communicate with host systems using the BSC communication protocol.

BSC 3270 Emulation: The BSC 3270 Emulation Facility allows terminals attached to the DPX/2 to emulate an IBM 3271 or 3275 cluster controller.

BSC 2780/3780 Emulation: The BSC 2780/3780 allows the DPX/2 to function as an IBM Remote Job Entry (RJE) 2780/3780 system.

Bull Communications

The DPX/2 communicates with a Bull DPS minicomputer or mainframe system via the *VIP7800 Emulator*, *VIP7800 Pass-Through*, or *TTY Pass-Through* software package.

VIP7800 Emulation: The VIP7800 Emulator enables asynchronous and synchronous terminals connected to a DPX/2 system to access applications on a Bull HN DPS host interactively. The VIP7800 Emulator package makes DPX/2-connected terminals look like VIP7800 interactive terminals. As a result, DPX/2 terminals have direct access to the host. The VIP7800 Emulator also supports file transfers to the host.

VIP7800 Pass-Through: VIP7800 Pass-Through provides support for the connection of Bull VIP terminals to Bull DPS systems through the DPX/2. Essentially, the DPX/2 system acts as a terminal cluster to the host through VIP protocol. This package contains a VIP protocol driver, a pass-through capability, and a configurator.

TTY Connect: TTY Connect is available to connect DPX/2 systems to Bull hosts. It allows standard asynchronous, character mode terminals to communicate directly with the host using the TTY protocol. The package features multiple host connections and multiple asynchronous communications.

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Kermit File Transfer

Kermit File Transfer is available on DPX/2 systems. This product allows file transfer between DPX/2 systems and PCs or between DPX/2 systems and other systems that support the Kermit protocol. Kermit File Transfer handles a variety of file types (binary, ASCII, etc.) and provides data integrity through packets, checksums, and retransmissions.

Kermit Pass-Through:

Kermit Pass-Through is designed for DPX/2 systems attached to both PCs and other hosts. The Kermit Pass-Through allows PCs to interact with the host as if they were directly connected. It also allows the direct exchange of files between the microcomputers and the host. Files are exchanged using the Kermit protocol.

System Tools/Utilities

DPX/2 systems feature an operating system that contains UNIX System V utilities for programming, professional support, and system administration. Two of the most significant features are:

- Document Processing System—Based on the Documenter's workbench that is used with the older XPS-100 systems, the Document Processing System provides a full set of text processing, formatting, and typesetting facilities and controls for document and publication creation.

- Network File System—Designed by Sun Microsystems, this utility provides the capability to integrate DPX/2 systems into a multivendor environment.

Several types of add-on system utilities are supported on DPX/2 machines. The following list represents some of the most significant products.

- EasyLife—an online help facility that includes a system administrator to tailor menus for specific user needs. It shows software actions, functions, and objects through windows and menus. This facility provides a "user-friendly" interface to the operating system. It also allows workstations with different characteristics to reside on the same system.

- EasyTune—provides the system administrator with a set of configuration tools for tuning the system to improve performance. EasyTune executes as a separate process and continually samples system resource use. It provides a statistical report on the values of tunable parameters and suggests how these values could be changed to improve system performance.

- EasyLearn—an online teaching aid directed at unskilled UNIX system users. It helps the user learn how to find and work with the commands within the DPX/2 operating system.

- EasySpool—a menu-driven facility that manages all print operations in a multiuser environment. This facility features forms alignment, job priority, job recovery, and print queue management.

Office Automation

Office processing capabilities are provided by *Uniplex-II Integrated Office Processing* or *Q-Office*.

Uniplex-II: contains a word processor with a spelling checker; a database module with a query language, transaction processing features, data entry validation, and an integrated data dictionary; an electronic spreadsheet; a graphics processor for charting; an electronic mail service; a calendar management feature; a screen builder module to add features tailored to specific needs and to create an interface to the operating system; and a report writer for the generation of reports based on information from the database or word processing documents. Uniplex-II supports asynchronous terminals as well as personal computers. Its windowing facilities permit the user to work on several documents or tasks at once. A menu-driven interface and context-sensitive help simplify user interaction with the office system.

Q-Office: contains a word processor, calendar manager, electronic notepad, telephone directory, and an office-oriented mathematics program. In addition, it provides an electronic mail service. A forms generator is included for building forms. A menu generator enables users to build customized interfaces. The products that make up Q-Office are packaged in three groups:

- Q-One is a standalone, menu-driven, function key-oriented word processor that is designed to operate in a variety of environments.

- Q-Office is a set of integrated modules that includes:

    - Q-Form: Form design and maintenance.

    - Q-Menu: Multilevel menu facility.

    - Q-Data: Calendar and schedule of people and resources.

    - Q-Call: Telephone directory database.

    - Q-Mail: Electronic mail facility.

    - Q-Note: Notepad/Index Facility.

    - Q-Math: Calculator with memory.

- Q-Plan is a spreadsheet package, and Q-Chart is a chart drawing program.

Applications

Departmental and organizational applications systems are available from independent software houses that specialize in developing and marketing AT&T UNIX System V- and SVID-compatible applications. Applications systems also can be obtained from authorized value-added resellers that develop and market packages specifically for the DPX/2 computers. Applications cover data processing, business system automation and control, transaction processing, record and forms management, information retrieval, database processing, decision support, and professional automation.

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Communications

Through an extension to the 32-bit 68030 internal bus, DPX/2 200 and 300 systems can support the following controller boards for asynchronous, LAN, and Multibus II communications:

- An eight-port asynchronous controller (SAS)—allows additional local or remote terminals, printers, and other peripheral attachments. Three of these controllers can be configured into a DPX/2 system supporting up to 32 users.

- An Ethernet Local Area Network controller (BETH)—communicates with other systems or PCs, on a peer-to-peer or server basis. Only one LAN controller is supported on the local bus.

- The Multibus II Gateway (PBS)—provides access to three additional Multibus II slots that can be used with any DPX/2 Multibus II controller or any commercially available Multibus II board with the appropriate driver. Any of these slots can be configured with a VME adapter to allow the attachment of a standard VME controller to the bus.

Multibus II Controllers

Three Multibus II controllers are available for DPX/2 200 and DPX/2 300 series systems:

- A 16-port asynchronous controller (ACP)—supports additional local or remote terminals, printers, and other asynchronous devices.

- A 32-port terminal concentrator processor (TCP)—supports a total of four separate asynchronous LANs through a terminal concentrator module. Each eight-port module can be up to 1,000 meters from the system. Only one of the eight ports, however, can support a remote device.

- A Local/Remote communications controller (ECP)—supports two asynchronous/synchronous lines at up to 19.2K bits per second and one Local Area Network interface that can communicate with an Ethernet LAN at up to 10M bits per second.

Operating Environment

Configuration Rules

DPX/2 100: The basic DPX/2 100 system contains four megabytes of memory. Memory modules can be added in 2- and 4-megabyte increments for a total of 8 megabytes of memory on the motherboard and up to 16 megabytes of memory on the memory expansion board.

Each DPX/2 100 has five half-height storage bays for peripheral devices. Depending upon the initial configuration, up to three of the five storage bays can be equipped with additional magnetic storage devices. A basic DPX/2 100 system contains a 3½-inch diskette drive for software. Up to two hard disk drives and an optional SCSI cartridge tape unit with a SCSI controller

(controller uses one 16-bit slot) can be added. If two hard disks are installed, the SCSI tape unit must be installed externally.

A 14-inch VGA display is a required option on the DPX/2 100 system. A 101-key keyboard and VGA controller are included in the basic system package.

DPX/2 200: A basic DPX/2 200 system is built around a main processing board that supports the standard four megabytes of memory, a 68882 floating-point unit, a clock/calendar chip, eight lines for local or remote RS-232-C or RS-422-A asynchronous communication, two lines for synchronous/asynchronous communication, one Centronics printer interface, a 5¼-inch diskette device, and a SCSI peripheral controller.

Up to two 16-port ACP controllers can be attached to the DPX/2 210 for local or remote terminal and printer device attachments. The DPX/2 210 can support one terminal concentrator processor (TCP) and up to three ECP boards. Three Multibus II slots are available.

The DPX/2 210 supports a 150M-byte ¼-streamer tape that is capable of reading 60M-byte cartridges from the older XPS 100 systems and is the standard medium for distribution of software. Also supported are 155M-, 338M-, and 675M-byte disks. The DPX/2 210 supports a 3½-inch diskette drive and a ½-inch tape drive. An optional internal battery backup system is also available.

DPX/2 320: The DXP/2 320 system is available in single- and dual-processor configurations. The DPX/2 320 contains a 10-slot Multibus II card cage. The basic, single-processor configuration contains one 68030 processor, a system controller board, and a SCSI peripheral, leaving seven slots for options. These slots may hold up to six ACP and/or TCP controllers and up to three ECP boards. In addition, up to four of the VME adapters can be installed to support a controller designed for the VMEBus. This allows the DPX/2 320 to be configured with up to 192 users connected (only 96 users can be active in the dual-processor system).

The DPX/2 320 has four slots for SCSI storage devices and one for the preconfigured 720K-/1.2M-byte diskette. The three remaining slots may be used for hard disks. Up to 2G bytes of storage can be installed in a single-cabinet system. An auxiliary disk cabinet is available and can house up to eight disks or seven disks and a second streamer for a maximum formatted capacity of 7.5G bytes. An optional internal battery backup system can be installed in each cabinet.

DPX/2 340: The DPX/2 340 can be configured with up to four 68030 processors. A basic single-cabinet system contains one 68030 processor board, a system controller board, and a SCSI controller. This leaves seven available slots for Multibus II controllers (ACP, TCP, and/or ECP boards) and a second CPU.

A two-cabinet system can contain up to four 68030 CPUs, 12 ACP and/or TCP controllers, six ECP boards, and up to eight VME adapters. The quad-processor configuration allows up to 384 users to be

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connected to the system, with 256 users active. The two-cabinet system allows eight slots for SCSI storage devices and one for a preconfigured 720K-/1.2M-byte diskette drive. Up to two slots may be used for the cartridge streamer, while the remaining six or seven slots are used for hard disks. A maximum of 4.7G bytes of storage can be housed in the dual-cabinet configuration. Up to 16 additional disks or 14 disks and two streamers can be housed in two auxiliary cabinets for a total formatted capacity of 15 gigabytes. An optional battery backup unit can be integrated into each cabinet.

Specifications

Physical Specifications				
Model	Height (in.)	Width (in.)	Depth (in.)	Weight (lb.)
DPX/2 100	6.32	20.86	16.5	44
DPX/2 210	26.38	9.45	27.0	165
DPX/2 320	26.38	17.13	27.0	286
DPX/2 340	26.38	17.13	27.0	286

Environmental Specifications		
Model	Operating Temp. (°F)	Operating Humidity (%)
DPX/2 100	50-89	20-80
DPX/2 210	50-100	20-80
DPX/2 320	50-100	20-80
DPX/2 340	50-100	20-80

Electrical Specifications			
Model	Voltage	Frequency (Hz)	Max. Power Consumption (VA)
DPX/2 100	115/230	60/50	—
DPX/2 210	120/220	60/50	1440
DPX/2 320	120/220	60/50	1440
DPX/2 340	120/220	60/50	1440

Pricing and Support

Education and Documentation
Bull provides a series of lectures and hands-on exercises. Self-study materials are also available. The education programs address individual job functions as they relate to the computer system management and applications development functions. Education can also be obtained for individuals with job functions outside of the computer system management and applications development area.

Service and Support

Warranty
Most customer-installable products are under warranty for factory service for one year. A warranty upgrade option is available and provides customers with standard on-site or dispatch maintenance services.

Maintenance Services
Bull provides postwarranty maintenance and product support under a standard service contract. Hardware and software support is provided through the Bull Total-Care program, which services the entire system.

- *Standard On-site Maintenance* provides on-call remedial hardware maintenance to contracted customers for a basic monthly or annual charge. Service is provided for up to 70 hours per week during the "principal period of maintenance" from 8 a.m. to 6 p.m., Monday through Friday, excluding Bull locally observed holidays.;MC

- *Scheduled Extended Maintenance Service* provides on-call remedial maintenance service under the Standard Maintenance agreement and allows requests for hardware maintenance outside the principal period of maintenance, either unscheduled or scheduled.

  –Unscheduled maintenance fees are based on a per-hour charge.

  –Scheduled maintenance fees outside the principal period of maintenance are based on a basic maintenance charge and a percentage of the applicable charge (10 to 24 percent).

  –Scheduled Extended Maintenance Service contracts provide coverage up to 24 hours per day, 7 days per week. Customers with the Standard Maintenance Service contract can purchase the Scheduled Extended Maintenance Service. Otherwise, they are subject to on-call labor charges for services performed outside the principal period of maintenance. Labor charges are based on hourly rates.

Remote Diagnostics
Remote diagnostic service is available to customers with Standard On-site Maintenance. Only DPX/2 200 and DPX/2 300 machines are equipped with software tools to allow remote access by Bull Customer Service for problem resolution and troubleshooting. While it is the customer's responsibility to install a dedicated telephone line for remote diagnosis, Bull will provide a high speed modem at no charge. Remote Diagnostic service is not available for the DPX/2 100 systems.

Accelerated Response Time
Customers who have on-site coverage for DPX/2 equipment during the warranty period and require faster response to warranty service requests may elect the optional *Accelerated Response Time Service*. This service reduces the response time from the standard four

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hours to two hours; it is limited to installations within 30 miles of an authorized service location that has sufficient resources. The cost during the warranty period is the same as if elected during a maintenance contract term. Accelerated Response Time Service coverage is available during the principal period of maintenance for a surcharge of 30 percent over the sum of the basic and extended charges.

Accelerated Response Time Service is not available for DPX/2 100 systems.

Off-Site Maintenance
Off-site hardware maintenance service is also available. Under these contracts, customers send units and computer components to a service depot for repair or replacement.

Customers without an on-site service contract with Bull can still obtain vendor maintenance service. Those customers, however, are subject to charges for labor, travel, and parts and materials.

Installation
All DPX/2 systems are customer installable. An optional installation package is available, however. For initial installations, Bull will install the hardware after the customer's cable installation is complete. Bull will conduct system tests and install peripherals as well. Fees for this service range from $225 to $620 depending on the system unit.

Bull will handle multiple system installations, subsequent add-ons, moves, and deinstallations. For fees and a detailed description of these procedures, contact the vendor.

Site Planning
Basic site planning is available and includes on-site inspection by a site planner, report findings, and phone support during site preparation. Extended site planning assistance includes basic planning services plus a recommended layout and detailed site report. The basic service costs roughly, $450 and extended service costs about $765.

Software Support
Software product support for the DPX/2 is available for the core system software as well as system-level applications. The support service provides telephone access to the Bull Technical Assistance Center, which provides troubleshooting assistance and problem resolution. It also includes a software update subscription service as well as a software installation service.

Pricing
DPX/2 Series systems are available for purchase only. Basic system software is not bundled with the hardware and must be purchased separately. Quantity discounts for hardware equipment and software offerings are available.

Bull DPX/2 customers can opt for one of two software pricing programs. Level 1 customers receive licensed software and one set of user documentation. These customers are also eligible for support services. Level 2 customers receive licensed software only and may purchase documentation on an "as needed" basis.

Level 1 prices are listed in the pricing section of this report. Level 2 pricing is, in general, 10 percent lower than Level 1 pricing.

Equipment Prices

		Purchase Price ($)	Annual On-Site Maint. Charge ($)
Base Systems			
DPX/2 100			
CPU1969	Basic system with 4MB main memory, 64KB ROM, 32KB cache memory, disk and diskette controller with one 3½" diskette unit and 100MB hard disk unit, an AT interface, 5 AT bus slots, 2 RS-232-C serial ports, one printer (Centronics) port, VGA controller, and keyboard	9,145	311
DPX/2 200			
UNIX3601-AOA	DPX/2 210 with 4MB memory and two expansion slots for additional memory and one for additional cache memory, SCSI controller, floating-point processor, controller with 5¼" diskette drive, 8 async. local/remote lines, 2 async./sync. lines, 1 printer connection, and 3 local bus expansion slots	7,375	425
DPX/2 300			
UNS3601-AOA	DPX/2 320 with 8MB of memory and 8 expansion slots for additional memory modules, 64KB cache, SCSI controller, diskette controller with 5¼" diskette drive, local-/remote console port, floating-point processor, and 7 Multibus II expansion slots	17,660	1,180

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		Purchase Price ($)	Annual On-Site Maint. Charge ($)
UNS3602-AOA	DPX/2 340 with 8MB of memory and 8 expansion slots for additional memory modules, 64KB cache, SCSI controller, diskette controller with 5¼" diskette drive, local-/remote console port, floating-point processor, and 7 Multibus II expansion slots	24,800	1,325

DPX/2 Memory Expansion Options

CMM1971	Expansion memory board for DPX/2 100 model only includes 4MB memory module, expandable to 16MB	2,495	32
CMK1972	2MB expansion memory module for DXP/2 100 model only, motherboard only	1,395	16
UNM3612	4MB memory module for DPX/2 210 model only	2,750	80
UNM3602	8MB memory module for DPX/2 210 model only	5,500	160
UNF3601	64KB cache memory for DPX/2 210 model only	2,200	126
UNM3612	8MB memory module for DPX/2 300 systems	5,500	160

Processor Options

DCP3601	Communication processor with eight asynchronous local/remote serial lines for RS-232-C/RS-422A/MIL-STD 188-114A (9 pin) support. Attaches to DPX/2 100 model only.	1,200	70
DCC3602	Cocentrator with eight asynchronous local/remote serial lines for RS-232-C/RS-422A/MIL-STD 188-114A (9 pin) support. Attaches to DPX/2 200 and DPX/2 300 models.	1,090	65
DCP3602	Communications processor with 16 asynchronous local/remote serial lines for RS-232-C/RS-422A/MIL-STD 188-114A (9 pin) and 1 printer port. Attaches to DPX/2 200 and DPX/2 300 models.	2,590	150
CPF1972	Math co-processor (Intel 80387 running at 25MHz) for DPX/2 100 models only	1,195	NC
DCP3605	Dual-port SCSI processor to connect up to 6 dual-port devices (disks or tapes). Attaches to DPX/2 300 models.	3,630	210
CPU3601	Additional Model 320 CPU running at 25MHz with 8MB memory, 64KB cache, and 68882 floating-point processor	14,190	950
CPU3602	Additional Model 340 CPU running at 33MHz with 8MB memory, 64KB cache, and 68882 floating-point processor	16,340	1,095

Peripheral Device Controllers

DCM1981	Communications controller with eight (25-pin) RS-232-C local/remote lines. Attaches to DPX/2 100 model only.	900	90
DCM1978	Ethernet controller for DPX/2 100 model	610	35
CPF1932	SCSI controller for 150MB cartridge tape unit, internal or external. Attaches to DPX/2 100 model.	495	NC
DDC3601	Ethernet controller for DPX/2 200 model	1,250	72

Mass Storage Devices

DDU1961	1.2MB, 5¼" diskette kit for DPX/2 100 model	255	80
DDU1941	1.44MB, 3½" diskette kit for all models	275	25
MSU1964	100MB hard disk unit for DPX/2 100 model	1,795	70
MSU1965	140MB ESDI fixed disk unit for DPX/2 100 model	2,095	75
MSU1966	300MB ESDI fixed disk unit for DPX/2 100 model	4,095	130
DIU3602	3½" floppy disk drive with 720KB/1.2MB formatted capacity. Available for DPX/2 200 and 300 models.	390	30
MSU3601	5¼" 155MB disk drive with SCSI interface. Available for DPX/2 200 and 300 models.	3,630	277
MSU3602	5¼" 338MB disk drive with SCSI interface. Available for DPX/2 200 and 300 models.	4,900	374
MSU3603	5¼" 675MB disk drive with SCSI interface. Available for DPX/2 200 and 300 models.	7,540	576

Magnetic Tape Devices

CTU1963	150MB internal streamer tape unit for DPX/2 100 model	1,295	65
MTU3610	GCR/PE 1600/6250 bpi magnetic tape unit for DPX/2 200 and 300 models	14,100	1,350
MTU3602	5¼" 150MB ¼" streamer tape unit for DPX/2 200 and 300 models	1,910	200
MTU3609	5¼" 300MB ¼" streamer tape unit for DPX/2 200 and 300 models	4,400	300

Printers

PRT4402/PRT4403	Model 4/40; 100-column printer with Centronics (4402) or RS-232-C (4403) interface	1,245/1,395	195
PRT4412/PRT4413	Model 4/41; 136-column printer with Centronics (4412) or RS-232-C (4413) interface	1,545/1,695	225
PRT4662/PRT4663	Model 4/66; 136-column printer with Centronics (4662) or RS-232-C (4663) interface	2,795/2,995	350
PRT4668	Model 4/68; 136-column printer with Centronics interface	2,995	450
PRT7500	Model 75; laser printer with Centronics and RS-232-C interfaces	2,695	400
PRU7265	Model 85; laser printer with Centronics interface	6,950	1,000
PRU0881	Band printer. For DPX/2 200 and 300 models.	8,200	1,100
PRU0882	Band printer. For DPX/2 200 and 300 models.	10,800	1,450
PRU0880	Band printer. For DPX/2 200 and 300 models.	9,500	1,350

NC—No charge.

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		Purchase Price ($)	Annual On-Site Maint. Charge ($)
Terminals			
HDS7101	HDS 1 monitor and keyboard unit, green phosphor	595	85
HDS7102	HDS 1 monitor and keyboard unit, amber phosphor	595	85
HDS7403	HDS 3 monitor and keyboard unit, green phosphor	750	95
HDS7404	HDS 3 monitor and keyboard unit, amber phosphor	750	95

NC—No charge.

Software Prices

		Initial Licence Fee ($)	On-Site Basic Support ($)
Operating Systems			
DPX/2 100			
SXS3030-L1AT	BOS/386 operating systems including runtime, DOS file facilities, and virtual terminal support for up to two users.	500	60
SXS3032-L1AT	BOS/386 operating systems including runtime, DOS file facilities, and virtual terminal support for unlimited users.	695	85
SXS3035-L1AT	VP/ix extension to the BOS/386 operating system; allows MS-DOS to run under UNIX. Supports two to unlimited users.	795	95
SXS3039-L7AT	Interactive Architect Series Extender for Workstations; Open Pack 2 for unlimited users; includes BOS/386 operating system, 386/ix TCP/IP, 386/ix NFS, 386/ix X11, and VP/ix.	2,460	295
SXS3037-L7AT	Interactive Architect Series Extender for Networks; Open Pack 2 for unlimited users; includes BOS/386 operating system, 386/ix TCP/IP, 386/ix NFS, 386/ix X11, and VP/ix.	2,200	260
DPX/2 200			
SXS3001-L7AT	BOS/68K operating system includes development system and C compiler for up to 16 users. Level 1 customer.	1,300	160
SXS3002-L6	BOS/68K operating system includes development system and C compiler; upgrade for 16+ users.	1,200	145
SXS3021-L7AT	BOS/68K operating system includes runtime system for up to 16 users.	700	85
DPX/2 300			
SXS3004-L7AT	BOS/68K operating system includes development system and C compiler for up to 32 users.	4,000	480
SXS3007-L6	BOS/68K operating system includes development system and C compiler; upgrade from 128 to 128+ users.	3,400	400
SXS3013-L6	BOS/68K operating system includes runtime system for up to 32 users.	2,150	260
SXS3025-L6	BOS/68K operating system includes runtime system from 128 to 128+ users.	1,800	210
Utilities			
SXU3001-L6A	EasyLife Utilities	200	25
SXU3002-L6A	EasyLearn operating system teaching aid	200	25
SXU3003-L6A	EasyTune tools for system administrators	500	60
SXU3601-L6A	EasySpool	500	60

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Languages		Initial Licence Fee ($)	On-Site Basic Support ($)
DPX/2 100			
SXL3070-L1AT	Green Hills C compiler	680	80
SXL3071-L1AT	Green Hills Pascal compiler	900	110
SXL3072-L1AT	Green Hills Fortran Compiler	900	110
SXL3077-L1AT	Micro Focus Cobol/2 compiler	2,500	300
DPX/2 200			
SXL3033-L6AT	RM Cobol 85 compiler	2,500	300
SXL3002-L6AT	Green Hills Pascal compiler	2,000	240
SXL3001-L6AT	Green Hills Fortran Compiler	2,000	240
SXL3017-L6AT	SVS Basic Interpreter	800	100
SXL3230-L6AT	Micro Focus Cobol/2 compiler	2,500	300
SXL3501-L6AT	RPG II/36 Runtime includes EasySpool print spool utility	1,995	240
DPX/2 300			
SXL3035-L6AT	RM Cobol 85 compiler (for single-processor systems)	2,800	340
SXL3002-L6AT	Green Hills Pascal compiler	2,000	240
SXL3001-L6AT	Green Hills Fortran Compiler	2,000	240
SXL3020-L6AT	SVS Basic Interpreter (single-processor systems)	800	100
SXL3192-L6AT	Micro Focus Cobol/2 compiler (up to 32 users)	3,125	375
SXL3504-L6AT	RPG II/36 Runtime includes EasySpool print spool utility	3,495	420
User Interfaces			
SXU3050-L1AT	386/ix X11.3 Windowing System Runtime version for DPX/2 100 family	495	100
SXU3056-L1AT	DOS bridge module for PC interface for DPX/2 100 family	500	60
SXU3031-L7A	X Window V 11.3 Window Manager, utilities, terminal emulation, X-Lib programmable interface, and X-Tool kit for programming help. For DPX/2 200 and 300 families	600	75
Database Management Systems			
DPX/2 100			
SXD3482-L1AT	Informix-4GL Application Development Language	1,500	180
SXD3480-L1AT	Informix-SQL Relational Data Base Management System, runtime version	800	100
SXD3481-L1AT	Informix-ESQL/C	600	70
SXD3701-L1AT	Oracle Version 6 (for multiple users)	3,000	360
SXD3708-L1AT	Oracle SQL ReportWriter (for multiple users)	900	108
SXD3710-L1AT	Oracle SQL Forms (for multiple users)	900	108
SXD3711-L1AT	Oracle SQL Plus (for multiple users)	750	90
SXD3712-L1AT	Oracle Pro C (for multiple users)	450	54
SXD3713-L1AT	Oracle Pro Cobol (for multiple users)	450	54
DPX/2 200			
SXD3078-L6AT	Informix-4GL Application Development Language, runtime system, supports up to 16 users	1,450	175
SXD3076-L6AT	Informix-SQL Relational Data Base Management System, runtime version, supports up to 16 users	800	100
SXD3080-L6AT	Informix-ESQL/C	600	70
SXD3701-L1AT	Oracle Version 6 (for multiple users)	6,900	828
SXD3421-L6AT	Oracle SQL ReportWriter (for multiple users)	2,070	248
SXD3422-L6AT	Oracle SQL Forms (for multiple users)	2,070	248
SXD3423-L6AT	Oracle SQL Plus (for multiple users)	1,725	207
SXD3424-L6AT	Oracle SQL Calc (for multiple users)	1,380	166
SXD4252-L6AT	Oracle Pro C (for multiple users)	1,035	124
SXD3426-L6AT	Oracle Pro Cobol (for multiple users)	1,035	124
SXD3427-L6AT	Oracle Pro Fortran (for multiple users)	1,035	124
DPX/2 300			
SXD3482-L6AT	Informix-4GL Application Development Language (for 25MHz single- and dual-processor, and 33MHz single-processor systems), development version	4,950	595
SXD3136-L6AT	Informix-4GL Application Development Language (for 25MHz single- and dual-processor, and 33MHz single-processor systems), runtime version	2,470	300
SXD3144-L6AT	Informix-ESQL/C; (for 25MHz single- and dual-processor, and 33MHz single-processor systems), runtime version	1,850	225
SXD3176-L6AT	Informix TURBO for 25MHz single- and dual-processor, and 33MHz single-processor systems	3,700	445

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		Initial Licence Fee ($)	On-Site Basic Support ($)
SXD3300-L7AT	Oracle Version 6 (supports up to 16 users)	12,650	1,518
SXD3301-L6AT	Oracle SQL ReportWriter (supports up to 16 users)	3,795	455
SXD3302-L6AT	Oracle SQL Forms (supports up to 16 users)	3,795	455
SXD3303-L6AT	Oracle SQL Plus (supports up to 16 users)	3,163	380
SXD3305-L6AT	Oracle SQL Calc (supports up to 16 users)	2,530	304
SXD3306-L6AT	Oracle Pro C (supports up to 16 users)	1,898	228
SXD3151-L7AT	UNIFY RDBMS Release 4. 0; full system for single-processor systems	3,600	430
SXD3156-L7AT	ACCEL from UNIFY IDS Release 1.4, full system for single-processor systems	7,560	910

Office Automation

DPX/2 100

SXU3053-L1AT	Document Processing System based on Documenter's Workbench (for multiple users)	345	42
SXU3054-L1AT	Uniplex-II Plus Release 6.1; basic system including screen builder, word processing, spreadsheet, business graphics, and print composer. Supports up to 8 users.	1,260	150
SXU3055-L1AT	Uniplex-II Plus Advanced Office Systems (AOS) including electronic mail, time manager/personal organizer, report writer, and card index. Supports up to 8 users.	370	45

DPX/2 200

SXU3122-L7AT	Uniplex-II Plus Release 6.1; base system including screen builder, word processing, spreadsheet, business graphics, print composer, and embedded database with database management. Supports up to 8 users.	3,440	415
SXU3131-L6AT	Uniplex-II Plus Advanced Office Systems (AOS) including electronic mail, time manager/personal organizer, report writer, and card index. Supports up to 8 users.	1,610	195
SXU3100-L7AT	Q-Office & Q-One	5,400	650
SXU3101-L6AT	Q-Plan	1,250	150
SXU3102-L6AT	Q-One	1,400	170
SXU3242-L6AT	Q-Chart	1,250	150

DPX/2 300

SXU3107-L7AT	Uniplex-II Plus Release 6.1; base system including screen builder, word processing, spreadsheet, business graphics, print composer, and embedded database with database management. Supports up to 32 users.	6,300	420
SXU3322-L6AT	Uniplex-II Plus Advanced Office Systems (AOS) including electronic mail, time manager/personal organizer, report writer, and card index. Supports up to 32 users.	2,220	270
SXU3103-L7AT	Q-Office & Q-One	9,820	1,180
SXU3104-L6AT	Q-Plan	2,720	330
SXU3105-L6AT	Q-One	1,820	220
SXU3150-L6AT	Q-Chart	2,500	300

Communications

DPX/2 100

SXC3054-L1AT	386/ix TCP/IP includes file tranfer protocol, electronic mail, virtual terminal management Telenet, remote commands, and socket interface.	395	50
SXC3052-L1AT	386/ix Network File System includes remote procedure call, external data presentation, and status monitor. Supports multiple users.	595	70

DPX/2 200

SXC3002-L7AT	TCP/IP Internet Package including FTP file transfer protocol, SMTP electronic mail, Telenet virtual terminal management, remote commands, and socket interface with TCP/IP protocol	1,000	120
SXC3003-L6AT	Network File System includes remote procedure call, external data presentation, and status monitor. Supports multiple users.	1,000	120
SXC3039-L6AT	UNIX/SNA Document Exchange (DIA/DSTAR) including LU 6.2 API, SDLC protocol, and X.25 support	2,250	270
SXC3097-L6AT	VIP7800 Emulator, providing DPX/2 standard asynchronous UNIX terminals with connection to other Bull systems	500	60
SXC3006-L6AT	BSC 3270 Emulator	1,200	145
SXC3036-L6AT	SNA 3270 Terminal Emulator	1,550	190
SXC3093-L6A	DPX/2 to Host via Kermit F/T	500	60
SXC3096-L6A	Kermit Pass-Through for PC to Bull Host	100	60
SXC3098-L6A	TTY Connect	500	60

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		Initial Licence Fee ($)	On-Site Basic Support ($)
DPX/2 300			
SXC3001-L7AT	TCP/IP Internet Package including FTP file transfer protocol, SMTP electronic mail, Telenet virtual terminal management, remote commands, and socket interface with TCP/IP protocol (single-processor systems)	1,500	180
SXC3004-L6AT	Network File System includes remote procedure call, external data presentation, and status monitor (single-processor systems)	1,600	195
SXC3039-L6AT	UNIX/SNA Document Exchange (DIA/DSTAR) including LU 6.2 API, SDLC protocol, and X.25 support (single-processor systems)	4,700	565
SXC3097-L6A	VIP7800 Emulator, providing DPX/2 standard asynchronous UNIX terminals with connection to other Bull systems	500	60
SXC3081-L6AT	SNA 3770 Emulator	2,200	240
SXC3080-L6AT	SNA 3270 Terminal Emulator	2,050	250
SXC3093-L6A	DPX/2 to Host via Kermit F/T	500	60
SXC3096-L6A	Kermit Pass-Through for PC to Bull Host	100	60
SXC3098-L6A	TTY Connect	500	60

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