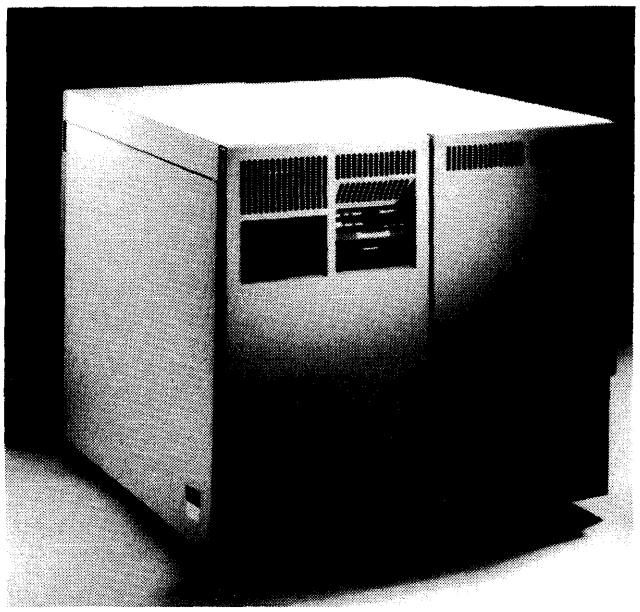
Bull HN Information Systems, Inc. XPS-100 Series

MANAGEMENT SUMMARY

UPDATE: *On January 31, 1989, Honeywell Bull Inc. changed its name to Bull HN Information Systems Inc. to reflect the 65.1 percent ownership of the U.S.-based company by Groupe Bull of Paris. The "H" refers to the 19.9 percent interest held by Honeywell Inc. of the U.S., and the "N" reflects the 15 percent interest held by NEC Corporation of Japan. The information which follows is being reissued, using the new name, as a service to our subscribers.*

The XPS-100 Series represents Bull HN's entry into the open system, or nonproprietary architecture-based, computer market. The XPS-100 models include components from a variety of suppliers—featuring de facto industry-standard facilities—such as the Motorola MC68020 microprocessor, the 32-bit VME Bus, ESDI- and QIC02-compatible peripheral storage devices, AT&T's UNIX System V Release 3 operating system, and the Oracle, Informix, or Unify relational data base.

Bull HN created the XPS-100 to compete in the growing market for open architecture systems centered on UNIX. The market for UNIX and generic supermicros and minicomputers is growing 35 to 40 percent per year, and similar growth is expected to continue. By the mid-1990s, annual UNIX computer system shipments are expected to account for 25 percent of the aggregate market; currently, they comprise 15 percent of all computer systems sales.



The XPS-100 Series is Bull HN's first line of computers targeted toward the UNIX, open architecture computer marketplace. The computers run at 1.7 to 3.7 MIPS, support from 72M to 1.8G bytes of online storage, and offer connectivity for 32 to 96 workstations. (Pictured here is the X-42, the top-of-the-line XPS-100 model.)

The Bull HN XPS-100 Series is a compatible family of commercially oriented computers that feature an open system architecture. They run an implementation of AT&T's UNIX System V; accommodate a variety of DBMSs, programming languages, and data communications links; and function as servers for personal computers.

MODELS: XPS-100 Models X-15, X-22, and X-42.
MEMORY: From 2M to 32M bytes.
DISK CAPACITY: From 72M to 1.8G bytes.
WORKSTATIONS: Up to 96 (hard wired) workstations.
PRICE: From $11,245 to 41,495 for a basic entry-level system.

CHARACTERISTICS

VENDOR: Bull HN Information Systems, Inc. 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 895-6000.

CANADIAN ADDRESS: 155 Gordon Baker Road, North York, Ontario M2H 3N7. Telephone (416) 499-6111.

DATA FORMAT

BASIC UNIT: 32-bit word.

INTERNAL CODE: ASCII.

MAIN STORAGE

The XPS-100 Models 15, 22, and 42 are virtual memory machines. Up to 64 contexts are supported on the XPS-100, each addressing up to 16M bytes of virtual memory. Each virtual memory space is divided into segments containing application code, subroutines, and data arrays. As many as 256 segments, up to 64K bytes in size, can comprise a virtual memory space. Each segment is composed of up to 16 virtual memory pages. Each page measures up to 4K bytes in size.

The virtual memory pages are moved to and from main storage on an as-needed basis. Virtual memory pages are brought into and out of main storage under the control of the virtual memory manager within the XPS-100 Operating System.

The main storage (physical memory) capacities of individual XPS-100 computers are listed in Chart A. Physical memory is expanded using 1M-, 2M-, 4M-, and 8M-byte memory expansion options. The Model 15 supports one or two expansion modules, while the Models 22 and 42 can add up to three memory modules to the base memory.

The base and expansion memory modules are dual ported to the 32-bit VME bus—the central system bus—and a

Bull HN Information Systems, Inc.
XPS-100 Series

CHART A. SYSTEM COMPARISON

MODEL	XPS-100 Model X-15	XPS-100 Model X-22	XPS-100 Model X-42
SYSTEM CHARACTERISTICS			
Date of introduction	May 1988	May 1988	May 1988
Date of first delivery	April 1988	July 1988	July 1988
Microprocessor type	MC68020	MC68020	MC68020
Microprocessor cycle time	16.67MHx	16.67MHz	16.67MHz
Operating system	XPS-100 Operating System (UNIX System V.3)	XPS-100 Operating System (UNIX System V.3)	XPS-100 Operating System (UNIX System V.3)
Upgradable from	Not applicable	Model X-15	Model X-22
Upgradable to	Model X-22	Model X-42	Not applicable
Number of serial/parallel I/O ports	32 serial; 4 parallel	48 serial; 6 parallel	96 serial; 12 parallel
MEMORY			
Minimum capacity (bytes)	2M	4M	8M
Maximum capacity (bytes)	16M	16M	32M
DISK STORAGE			
Minimum capacity (bytes)	72M	157M	157M
Maximum capacity (bytes)	216M	807M	1.8G
NUMBER OF WORKSTATIONS	32 (hard-wired, point to point)	48 (hard-wired, point to point)	96 (hard-wired, point to point)
COMMUNICATIONS PROTOCOLS	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, BSC 2780/3780, SNA/SDLC 3270/3770, X.25/X.29, X.3/X.28, Kermit, VIP PC	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, BSC 2780/3780, SNA/SDLC 3270/3770, X.25/X.29, X.3/X.28, Kermit, VIP PC	IEEE 802.3 TCP/IP Ethernet, VIP, TTY, BSC 3270, BSC 2780/3780, SNA/SDLC 3270/3770, X.25/X.29, X.3/X.28, Kermit, VIP PC
PURCHASE PRICE (basic entry system)	$11,245	$20,495	$41,495
COMMENTS	A MC68881 floating-point co-processor is included in the basic configuration. A 16K-byte cache is optional	A MC68881 floating-point co-processor is standard. The 16K-byte cache is optional	Comes with two MC68020 microprocessors. Each MC68020 supports one MC68881 co-processor and one 16K-byte cache. The cache memories are options

Meanwhile, the market for proprietary architecture, general-purpose minicomputers grows only 10 to 15 percent, with lower rates expected in the future.

Customers increasingly demand industry-standard solutions:

- to reduce system migration and application porting costs when moving to or from another hardware platform;
- to increase application accessibility;
- to enable the user to standardize computing across the organization; and
- to provide the user with a degree of compatibility between systems in a multivendor or multiple-architecture computing environment.

The XPS-100 systems present Bull HN with the means to pursue potential customers who require a UNIX machine and to strike back at competitors that are selling distributed UNIX systems into Bull HN environments. Before the introduction of the XPS-100, Bull HN did not offer cost-effective, small to midsize, multiuser computer systems using commodity hardware and UNIX software for those organizations requiring them— e.g., government agencies and small businesses. Bull HN could bid in contracts involving UNIX systems only by using another vendor's product. Obviously, this put Bull HN at a disad-

processor-memory bus. The VME bus provides I/O controllers with direct access to memory. The processor-memory interconnect provides for high-speed data transfer and communications between the central processor, cache, and memory.

All physical memory boards have error detection and correction (EDAC) logic.

PROCESSING COMPONENTS

The XPS-100 computers contain central processors based on Motorola microprocessors.

The Models 15 and 22 are single-processor machines. The central processor on the Models 15 and 22 features the following:

- **A 32-bit Motorola MC68020 microprocessor with a 16.67MHz clock.**
- **An optional Motorola MC68881 co-processor—enhances floating-point arithmetic operations.**
- **An optional 16K-byte cache—provides the MC68020 chip with high-speed data access to the most frequently referenced data and instructions.**
- **A memory management unit—provides full memory management and addressing. It divides physical memory space into partitions for multiprogramming, maps virtual memory pages into physical memory, moves pages to and from disk storage, controls the central processor and I/O controller accesses to main storage, executes reads and writes, implements page protection schemes, and performs parity checking and error correction.**

Bull HN Information Systems, Inc.
XPS-100 Series

vantage. The XPS-100, however, positions the company to acquire more UNIX installations, by mitigating the cost barrier.

Beyond the UNIX application base, the XPS-100 delivers high-performance, low-cost computing for small businesses, corporate departments, or branch offices. The XPS-100 offers 32-bit performance at a cost below that of many 32-bit minicomputer systems. For instance, the basic XPS-100 Model 15 departmental system, running at 1.7 to 2.1 MIPS, costs $8,095 to $10,000 per MIPS. In contrast, the basic 1-MIPS DPS 6 Plus Model 220, a comparable Bull HN proprietary system oriented towards the small business or corporate department, performs 42 to 52 percent less efficiently and costs twice as much as the XPS-100 Model 15. (The Model 220, however, offers more configurability and expansion options than the Model 15 and provides for greater networking capabilities among Bull HN DPS minicomputers and mainframes.)

Although the XPS-100 offers greater price/performance than the low-end Bull HN DPS 6 Plus models, it does not replace them. Bull HN gambles that its XPS-100 and DPS 6 Plus Series product lines can coexist without competing against each other.

The XPS-100 targets application environments requiring standard industry solutions. For example, the XPS-100 offers UNIX System V computing and IEEE 802.3 Ethernet networking, which allows it to function as either a resource server to workstations or a distributed node in a departmental computing scenario. DPS 6 Plus models, on the other hand, are installed where DPS 6 application compatibility is needed or where customers anticipate the need to expand processing beyond DPS 6 capabilities.

The first XPS-100 models appeared in 1986. The Model 10 was the entry XPS-100 model. It ran applications at 0.5 MIPS, operated with 40M to 120M bytes of online (fixed disk) storage, and supported up to 16 hard-wired workstations. The Model 20 served as the midrange system. It runs at 1.7 to 2.1 MIPS, provides 72M to 435M bytes of online storage, and handles 32 workstations. The Model 40 was the top-of-the-line XPS-100. It executes applications at 3.7 MIPS, uses 72M to 870M bytes of online storage, and accommodates up to 64 workstations.

In order to expand upon the capabilities offered by the first XPS-100 computers and to offer better cost-effectiveness, Bull HN added the Models 15, 22, and 42 to the XPS-100 product line in May 1988.

The Model 15, a 1.7-to-2.1-MIPS machine, delivers approximately two to four times more price/performance than a comparable 0.5-MIPS Model 10. The Model 15 runs applications 3.4 to 4.2 times faster than Model 10 and accommodates 1.8 times more online storage and twice as many workstations. It effectively replaces the Model 10.

- **A programmable read-only-memory—contains diagnostics and start-up routines.**

The Model 42 features a dual-processor architecture. Each central processor contains the following:

- **A 32-bit Motorola MC68020 microprocessor with a 16.67MHz clock.**
- **An optional Motorola MC68881 co-processor.**
- **An optional 16K-byte cache.**
- **A memory management unit.**
- **Interprocessor communications—coordinates and synchronizes the component central processors.**
- **A programmable read-only-memory with diagnostics and start-up routines.**

INPUT/OUTPUT CONTROL

All the XPS-100 computers off-load I/O device control from the central processor(s) to microprocessor-based I/O controllers. The I/O controllers link to the central processor or processors and main storage via the 32-bit *VME Bus*. All data transfers between the I/O controllers and main storage are direct memory access (DMA) transfers.

The XPS-100 performs disk device and magnetic tape equipment control with the *MDC0651*, *MDC0661*, and *MTC0651*.

The *MDC0651* is featured on the Model 15. The integrated peripheral controller, built around the Signetics 68454 microprocessor, provides an ST506 interface for one to three 72M-byte fixed disk units. It also offers an SA400 interface for a 720K-byte diskette unit and a QIC02 interface for a 60M-byte streaming cartridge tape unit.

The *MDC0661* is used by the Models 22 and 42. The integrated peripheral controller is built around an Intel 8051 microco-processor and provides interfaces for the following:

- **A 720K- or 1.2M-byte diskette unit.**
- **A 60M-byte streaming cartridge tape unit.**
- **One to three 157M- and 325M-byte ESDI interface-compatible fixed disk drives.**

The *MTC0651* is featured on all the XPS-100 computers. It interfaces up to four 0.5-inch reel-to-reel tape drives to the host processor. Tape drives with either the 6250 bits-per-inch (bpi) GCR or 1600 bpi PE recording modes physically attach to the XPS-100 via a Pertec interface.

Each XPS-100 model uses the *DCP0651, DCP0652, DCP0655, DCP06563,* and *DCC0657* controllers for local and remote workstation connectivity and for system-to-system and system-to-network communications. A complete description of these communications-oriented I/O controllers are found in this report's "Communications Control" section.

CONFIGURATION RULES

A basic XPS-100 Model 15 contains one central processor with a MC68020 chip and a MC68881 floating-point co-processor; 2M bytes of main storage; and an integrated peripheral controller with a 720K-byte diskette drive, one

Bull HN Information Systems, Inc.
XPS-100 Series

CHART B. DISK/DISKETTE DEVICES

MODEL	MSU0515	MSU0566	MSU0567	DIU0601	DIU0651
Type	Fixed	Fixed	Fixed	Diskette	Diskette
Size (inches)	5.25	5.25	5.25	5.25	5.25
Formatted capacity per drive (bytes)	72M	157M	325M	720K	720K or 1.2M
Interface/controller	MDC0651 controller with the ST506 interface	MDC0661 controller with the ESDI interface	MDC0661 controller with the ESDI interface	MDC0651 controller with the SA400 interface	MDC0661
Number of drives per interface/controller	1 to 3 per controller	1 to 3 per controller	1 to 3 per controller	1 per controller	1 per controller
Average access time (milliseconds)	36.3	24.8	26.3	95	95 when programmed for a 720K-byte capacity; 91 with a 1.2M-byte capacity
Data transfer rate (bits per second)	5M	10M	10M	250K	250K when programmed for a 720K-byte capacity; 500K with a 1.2M-byte capacity
Number of surfaces	9	9 plus a servo	15 plus a servo	2 per diskette (a double-sided diskette)	2 per diskette (a double-sided diskette)
Sectors/tracks per surface	924 tracks per surface; 17 sectors per track	952 tracks per surface; 34 sectors per track	1,224 tracks per surface; 36 sectors per track	80 tracks per surface; 9 sectors per track	80 tracks per surface in 720K-byte capacity mode; 77 tracks in 1.2M-byte mode
Bytes per sector/track	512 per sector	512 per sector	512 per sector	512 per sector	512 per sector
Purchase Price	$3,850 without controller	$6,000 without controller	$9,700 without controller	$450	$530
Comments	Supported on the Model 15	Used on the Model 22 and the Model 42	Supported on Model 22 and Model 42	Employed by the Model 15	Used by the Model 22 and Model 42

The Model 22 is the new midrange XPS-100 model. Although this midrange system executes applications at the same rate as the 1.7-to-2.1-MIPS Model 20, it offers greater cost-effectiveness. For example, a Model 22 with one MC68020-based, 16K-byte cache central processor, 4M bytes of main storage, a 157M-byte fixed disk, a 60M-byte streamer tape, eight workstation ports, one printer, four terminals, the operating system, an interface tool, and the C language costs $24,895. In contrast, a Model 20 with a comparable configuration costs 13.7 percent more. The Model 22 also offers greater growth potential than the Model 20: the Model 22 accommodates 1.8 times more online storage and twice as many terminals.

The Model 42 replaces the Model 40 as the high-end XPS-100. The 3.7-MIPS Model 42 offers greater expandability than the Model 40. The Model 42 accommodates 2.2 times more online storage and 1.5 times more workstations than the Model 40. The Model 42 also performs more economically. For instance, a Model 42 with two MC68020-based central processors, two 16K-byte caches, 8M bytes of main storage, two 157M-byte fixed disks, a 60M-byte streamer tape, 16 workstation ports, two printers, eight terminals, the operating system, an interface tool, and the C language costs at approximately $55,095. In contrast, a Model 40 with a comparable configuration costs 9.5 percent more.

COMPETITIVE POSITION

The XPS-100 encounters 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 Com-

72M-byte fixed disk drive, and one streamer tape port. One terminal and one workstation/communications line controller are required. A 16K-byte cache is optional. A fully configured Model 15 can accommodate the following:

- **A maximum of 16M bytes of main storage. The standard 2M-byte memory can be expanded by adding 1M-, 2M-, and 4M-byte memory expansion options.**
- **A maximum (formatted) fixed disk storage capacity of 216M bytes. The Model 15 can be configured with up to three 72M-byte fixed disk drives.**
- **One streaming cartridge tape drive or reel-to-reel tape units.**
- **Up to 32 workstation and remote communications ports. Each port supports one workstation device—a terminal, printer, or personal computer—or a single communications line for system-to-system communications.**
- **One Ethernet local area network (LAN) interface.**

The basic XPS-100 Model 22 contains one central processor with a MC68020 chip and a MC68881 floating-point co-processor; 4M bytes of main storage; and an integrated peripheral controller with a 720K-/1.2M-byte diskette drive, one 157M-byte fixed disk drive, and one streamer tape port. One terminal and one workstation/communications line controller are required. A 16K-byte cache is optional. A fully configured Model 22 features the following:

- **A maximum of 16M bytes of main storage. The standard 4M-byte memory can be expanded by adding 1M-, 2M-, and 4M-byte memory expansion options.**
- **A maximum (formatted) fixed disk storage capacity of 807M bytes. The Model 22 can support two additional fixed disk drives in addition to the standard 157M-byte fixed disk drive. Fixed disk storage is expanded with 157M- and 325M-byte fixed disk drives.**
- **One streaming cartridge tape drive or reel-to-reel tape units.**

Bull HN Information Systems, Inc.
XPS-100 Series

puter Multiuser Systems series, Texas Instruments System 1000 models, AT&T 3B2 and 3B5 computers, Motorola Series 8000, Prime EXL316 supermicro, IBM RT PC and PS/2 Model 80 (with the AIX/386 operating system based on UNIX System V), 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 supermicrocomputers and the low-end and midrange HP 3000 and RISC-based HP 3000 HPPA systems, the Data General Eclipse MV systems, IBM System/36 and AS/400 computers, and the Digital Equipment MicroVAXs with the VMS operating system.

Bull HN's XPS-100 supermicros boast no dramatic technological advances over competitors' systems. They are functionally equal to other vendors' products and allow Bull HN to compete effectively in the business and government sectors. Nonetheless, these markets have been already targeted and largely captured by high-profile open systems such as the Unisys 5000 models, NCR Tower 32 series, and Altos Multiuser System line and popular proprietary systems such as the Digital Equipment MicroVAX with Ultrix-32 and the IBM System/36.

Despite the intense competition, Bull HN has obtained some success with the XPS-100, largely attributable to its marketing approach. Primarily, its strategy aims at high-volume sales to large corporations, government agencies, and public and private institutions. In such environments, the XPS-100s function as either standalone or distributed departmental processors that communicate with other networked departmental systems or host mainframe-class systems. Bull HN also sells XPS-100 systems to smaller organizations for supporting business operations and professional and clerical automation at the departmental, distributed branch, and central processing level.

Bull HN concentrates on those market sectors that accept UNIX systems more readily than the computer automation marketplace as a whole, such as the U.S. federal government, telecommunications companies, automobile manufacturers, and the insurance industry. Bull HN also directs the XPS-100 into market niches that traditionally invest more in computer automation than most other lines of businesses, such as discrete manufacturing, trade, health care and pharmaceutical, and professional services.

Bull HN also offers XPS-100 systems to its existing customers as low-cost departmental and branch office systems within the DPS minicomputer and mainframe environment. Communications tools such as the Bull HN VIP terminal emulators enable the XPS-100 systems to interact with Bull HN DPS hosts.

Bull HN distributes its XPS-100 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. Honeywell Federal Sys-

- **Up to 48 workstation and remote communications ports. Each port supports one workstation device or a single system-to-system communications line.**
- **One Ethernet local area network (LAN) interface.**

The basic XPS-100 Model 42 contains two central processors each with a MC68020 chip, a MC68881 floating-point co-processor, and a 16K-byte cache; two 4M-byte main storage modules; and an integrated peripheral controller with a 720K-/1.2M-byte diskette drive, one 157M-byte fixed disk drive, and one streamer tape port; and one workstation/communications line controller with eight RS-232-C lines and one Centronics parallel interface port. One terminal is required. A fully configured Model 42 can accommodate the following:

- **A maximum of 32M bytes of main storage. The standard 8M bytes of memory can be expanded by adding 1M-, 2M-, and 4M-byte memory expansion options.**
- **A maximum (formatted) fixed disk storage capacity of 1.8G bytes. The Model 42 can support five additional fixed disk drives in addition to the standard 157M-byte fixed disk drive. Fixed disk storage is expanded with 157M- and 325M-byte fixed disk drives.**
- **One streaming cartridge tape drive or reel-to-reel tape units.**
- **Up to 96 workstation and remote communications ports. Each port supports one workstation device or a single system-to-system communications line.**
- **One Ethernet local area network (LAN) interface.**

All the XPS-100 models can be configured with the *Bull HN UPS0005*. The UPS0005 is an uninterruptible power supply (UPS) designed to protect the XPS-100 against all types of electrical power disturbances, including noise, voltage fluctuations, and power outages. In a prolonged failure situation, the UPS unit is capable of supplying power for up to 8 minutes under full load and up to 21 minutes under half load.

INPUT/OUTPUT UNITS

Chart B lists the characteristics and features of the disk units that reside on the XPS-100 computers. Chart C describes the display terminals that can be configured on a XPS-100. Chart D details the printers that function on a XPS-100 computer.

IBM PC-compatible MS-DOS-based microcomputers and IBM PC-DOS-based microcomputers can be used as XPS-100 workstations. The personal computers communicate with the XPS-100 computers through terminal emulation and file transfer facilities.

The XPS-100 computers use streaming cartridge tape drives and reel-to-reel tape drive units as well as diskette drives for fixed disk backup, archival storage, software loading, and data exchange. The *MTU0651* streaming cartridge tape drive reads from and writes on 0.25-inch tape and stores up to 60M bytes of data on each removable tape cartridge using a 8000 bpi recording format. It reads and writes at 90 inches per second (ips). The *MTU0661* reel-to-reel tape drive reads from and writes on nine-track tape at 25 ips in the start/stop mode and 25 or 75 ips in the streaming mode. It records data in the 1600 bpi PE or 6250 bpi format.

Bull HN Information Systems, Inc.
XPS-100 Series

CHART C. 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	$525	$525	$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. Support ANSI and ASCII terminal emulations	Has a printer port. Support ANSI and ASCII terminal emulations

tems, Inc.—a wholly owned subsidiary of Honeywell, Inc.—sells XPS-100 systems to the U.S. federal government and prime contractors of the federal government. Bull HN Italia and Bull HN, Ltd. distribute XPS-100 systems on the international market.

Value-added resellers (VARs) also distribute XPS-100 computers. Over 250 VARs sell XPS-100 systems into small and midsized businesses within the discrete manufacturing, trade, health care, and service industries. By selling through VARs, Bull HN increases the market visibility of its XPS-100 systems to customers who cannot be reached directly.

To protect its target markets, Bull HN makes XPS-100 applications software readily available. The major source of applications software is alliances with independent software houses and value-added resellers (VARs).

To attract and retain independent software suppliers, Bull HN maintains the marketing, technical, and business aspects of these alliances. The alliances give XPS-100 customers access to the services of the independent software suppliers. Upon discovering its applications needs, Bull HN will help the customer establish contact with the appropriate data system suppliers.

ADVANTAGES AND RESTRICTIONS

The foremost advantage of the XPS-100 is its flexible operating environment. The XPS-100 supports several types of data base management systems, (DBMSs), a variety of industry-standard-compatible high-level programming languages, and a few office processing systems. The DBMSs can be configured with several productivity tool

COMMUNICATIONS

The XPS-100 communications options provide asynchronous, synchronous, and IEEE 802.3 local area network communications capabilities. The asynchronous lines carry communications between the host and host-attached workstations and handle select system-to-system communications tasks such as virtual asynchronous terminal and asynchronous-to-asynchronous file transfer. The synchronous options and IEEE 802.3 Ethernet are primarily used for system-to-system communications.

Asynchronous and synchronous communications on the Model 15 are provided by the DCP0651, DCP0652, DCP0655, and DCP0656 controllers. The Models 22 and 42 employ the DCP0651, DCP0652, and DCP0655 controllers for asynchronous and synchronous communications.

DCP0651 **is used for asynchronous communications tasks. It runs applications using a 12.5MHz Motorola 68000 microprocessor, 64K bytes of local memory, and 32K bytes of shared memory. It supports eight RS-232-C or RS-422-A lines with direct-connect attachments. In addition, the DCP0651 offers a Centronics parallel interface. This Centronics interface supports a Centronics-compatible printer.**

The ***DCP0652*** **executes asynchronous and synchronous communications tasks. It runs applications using two Motorola MC68000 microprocessors. The second microprocessor handles direct memory access (DMA) for high-speed lines.**

The DCP0652 contains six communications ports. Of the six ports, two are configured with asynchronous RS-232-C or RS-422-A lines, another two are configured with synchronous or asynchronous RS-422-A lines, and the other two are configured with synchronous or asynchronous RS-232-C lines or asynchronous RS-422-A lines. In addition, DCP0652 provides one parallel interface for the attachment of a printer with a Centronics interface.

Bull HN Information Systems, Inc.
XPS-100 Series

CHART D. PRINTERS

MODEL	PRT4204	PRT4214	PRT4203	PRT4213
Type	Serial dot matrix	Serial dot matrix	Serial dot matrix	Serial dot matrix
Speed	200 cps in data mode; 40 cps in letter-quality mode	200 cps in data mode; 40 cps in letter-quality mode	200 cps in data mode; 40 cps in letter-quality mode	200 cps in data mode; 40 cps in letter-quality mode
Print methods	Bidirectional printing and logic seeking	Bidirectional printing and logic seeking	Bidirectional printing and logic seeking	Bidirectional printing and logic seeking
Paper size	3 to 11 inches wide	3 to 17 inches wide	3 to 11 inches wide	3 to 17 inhes wide
Character formation	11 x 9 matrix for data mode; 36 x 18 matrix for letter-quality mode	11 x 9 matrix for data mode; 36 x 18 matrix for letter-quality mode	11 x 9 matrix for data mode; 36 x 18 matrix for letter-quality mode	11 x 9 matrix for data mode; 36 x 18 matrix for letter-quality mode
Horizontal character spacing (char./inch)	10, 12, and 17.1	10, 12, and 17.1	10, 12, and 17.1	10, 12, and 17.1
Vertical line spacing (char./inch)	6 or 8 and programmable	6 or 8 and programmable	6 or 8 and programmable	6 or 8 and programmable
Controller/Interface	Centronics interface	Centronics interface	RS-232-C inteface	RS-232-C interface
Printer dimensions, in. (h x w x d)	4 x 17.2 x 14	4 x 24 x 14	4 x 17.2 x 14	4 x 24 x 14
Graphics capability	Line, block, and dot graphics	Line, block, and dot graphics	Line, block, and dot graphics	Line, block, and dot graphics
Purchase Price	$645	$899	$745	$999
Comments	Graphics resolution is 60, 72, 80, 90, 120, or 240 horizontal x 72 vertical dots per inch (dpi)	Graphics resolution is 60, 72, 80, 90, 120, or 240 horizontal x 72 vertical dots per inch (dpi)	Graphics resolution is 60, 72, 80, 90, 120, or 240 horizontal x 72 vertical dots per inch (dpi)	Graphics resolution is 60, 72, 80, 90, 120, or 240 horizontal x 72 vertical dots per inch (dpi)

CHART D. PRINTERS

MODEL	PRT4662	PRT4663	PRU1034
Type	Serial dot matrix	Serial dot matrix	Serial dot matrix
Speed	400 cps in data mode; 180 cps in near leter quality mode; 40 cps in letter- quality mode	400 cps in data mode; 180 cps in near letter quality mode; 40 cps in letter- quality mode	270 cps in draft-mode; 60 in letter-quality mode
Print methods	Bidirectional printing and logic seeking	Bidirectional printing and logic seeking	Bidirectional printing and logic seeking
Paper size	3 to 21 inches wide	3 to 21 inches wide	3 to 15 inches wide
Character formation	11 x 9 matrix for data mode; 36 x 9 matrix for near letter quality mode; 36 x 18 matrix for letter-quality mode	11 x 9 matrix for data mode; 36 x 9 matrix for near letter quality mode; 36 x 18 matrix for letter-quality mode	9 x 11 matrix for data mode; 18 x 60 matrix for letter-quality mode
Horizontal character spacing (char./inch)	10, 12, 15, 17.1, and 20	10, 12, 15, 17.1, and 20	5 to 17.5
Vertical line spacing (char./inch)	6 or 8	6 or 8	6 or 8
Controller/Interface	Centronics interface	Centronics or RS-232-C interface	Centronics, RS-232-C, or RS-422-A inteface
Printer dimensions, in. (h x w x d)	7.1 x 24.9 x 17.5	7.1 x 24.9 x 17.5	8 x 23 x 15
Graphics capability	Line, block, and dot graphics; 60, 72, 80, 90, 120, 144 or 240 horizontal x 72 vertical dpi resolution	Line, block, and dot graphics; 60, 72, 80, 90, 120, 144 or 240 horizontal x 72 vertical dpi resolution	Line, dot, and mosaic graphics; 60, 72, 80, 90, 120, or 240 horizontal x 72 vertical dpi resolution
Purchase Price	$2,795	$2,995	$1,795
Comments	Supports up to 20 different plug-in font cartridges; fonts can also be downloaded. Handles bar codes. Prints in up to 8 colors	Supports up to 20 different plug-in font cartridges; fonts can also be downloaded. Handles bar codes. Prints in up to 8 colors	Features bidirectional and logic-seeking printing. Has 132 or 136 print positions per line

options and applications development aids. Several programming languages—e.g., Cobol, Fortran, and Basic—are offered in different versions. Cobol, for example, is available as RM-Cobol-85, Philon Fast Cobol, and Microfocus Level II Cobol. The office automation systems can be configured with a variety of standard and optional office automation and desktop functions. End users select the DBMS, DBMS options, programming languages, and office system packages and options that best suit their application and task handling needs.

The *DCP0655* runs asynchronous communications using a 12.5MHz Motorola 68000 microprocessor, 64K bytes of local memory, and 32K bytes of shared memory. It supports eight RS-232-C lines. Each line can be configured with a point-to-point direct-connect or modem-controlled interface. In addition to the RS-232-C lines, the DCP0655 offers a Centronics parallel interface for the attachment of a Centronics-compatible printer.

The *DCP0656* contains four asynchronous communication ports and a Centronics interface. Each communications port supports one modemless or modem-controlled commu-

Bull HN Information Systems, Inc.
XPS-100 Series

Another advantage of the XPS-100 Series is its open systems architecture. By building the XPS-100 with off-the-shelf components and de facto industry-standard facilities (the Motorola 68020 microprocessor, VME Bus, ESDI and QIC02 storage device interfaces, Ethernet networking, the UNIX System V operating system, and standard relational data bases such as Oracle and Unify), Bull HN 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 HN to provide XPS-100 customers with access to a broad range of low-cost peripherals and an increasingly large applications base.

Because the XPS-100 computers are designed for distributed data processing environments, their communications and networking scheme is particularly important. The data communications tools used on the computers provide flexibility in creating networking and distributed processing environments within a Bull HN shop and provide the open connectivity required in departmental processing.

PC integration tools—PC/Terminal Emulator, Kermit File Transfer, and Kermit Pass-Through—enable Bull HN MS-DOS-based IBM PC-compatible microcomputers, IBM PCs, and other compatibles located throughout a department or organization to access XPS-100 applications and files and to use the XPS-100 as a gateway to other computer systems. The UNIX-to-UNIX Copy (uucp) facility in the operating system permits the XPS-100 to communicate with other systems based on UNIX. The Remote File Sharing (RFS) program provides the XPS-100 with the capability to share files and devices (for example, printers and tape drives) with other XPS-100 systems and non-XPS-100 systems that run the RFS protocol and utility. The RCP, RLOGIN, RSH, and Mail utilities within the Ethernet LAN TCP/IP peer-to-peer local area network software package provide the XPS-100 systems with capabilities to conduct file transfers, virtual terminal/remote login, remote command execution, and electronic mail communications with other XPS-100 systems and with computers that implement the University of California at Berkeley-developed RCP, RLOGIN, RSH, and Mail tools.

The Bull HN VIP terminal emulators give XPS-100 systems interactive and batch access to Bull HN DPS minicomputer and mainframe hosts. The X.25/X.29 Network Support and X.3/X.28 PAD Emulator products enable XPS-100 computers to connect to and participate in an X.25 packet-switching network. The IBM network node emulation tools permit XPS-100 computers to communicate with IBM System/370-architecture mainframe and supermini host systems in an IBM Systems Network Architecture (SNA) and binary synchronous (BSC) network.

Bull HN also fits its XPS-100 computers with system integration services for systems networking. These services establish the solution for a networking requirement that cannot be provided through readily available Bull nications link. The Centronics interface connects one Centronics-compatible printer to the XPS-100.

The XPS-100 computers are connected to an IEEE 802.3-recommended Ethernet LAN through an Intel 80186-based controller known as *DCC0657*. DCC0657 contains the hardware and transport and interface programs required to connect an XPS-100 to an IEEE 802.3 Ethernet network. It uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD) for media access; features a 10M-bit-per-second (bps) data transmission rate; and implements the Transmission Control Protocol/Interconnect Protocol (TCP/IP), the International Organization for Standardization (ISO's) Open Systems Interconnection (OSI) communications standard for data transport.

SOFTWARE

GENERAL: The XPS-100 Series computers run under the direction of the *XPS-100 Operating System*, available in three versions. The X-15 Operating System runs on the XPS-100 Model 15. The X-22 Operating System is employed by the Model 22. The XPS-100 Model 42 supports the X-42 Operating System.

OPERATING SYSTEM: Both the *X-15 Operating System* and the *X-22 Operating System* are implementations of the AT&T UNIX System V Release 3 (UNIX System V.3) operating system. The X-15 Operating System and the X-22 Operating System each contain the kernel, command shell, and file manipulation, communications, text processing system, programmer workbench, and system administration utilities of System V.3. In addition to the UNIX System V procedures and utilities, both house UNIX extensions and enhancements developed by Bull HN. Features of X-15 Operating System and X-22 Operating System include the following:

- Support for the MC68020/MC68010/MC68000 instruction set.
- Support for intelligent I/O and a distributed-intelligence architecture.
- A demand paging, virtual memory management scheme that supports up to 64 contexts, each with a 16M-byte virtual memory address space.
- Interprocess communications.
- Shared libraries—allows programs to share routines, thereby simplifying maintenance and sharply reducing memory and disk space requirements.
- Record and file locking—prevents simultaneous updating of the same record by multiple users. It also allows a process to lock a record, a file, or a contiguous region of a file for its exclusive use.
- File system hardening—protects critical data during failures such as crash, power-down, or diskette removal during update.
- Enhanced error recovery and reporting.
- Enhanced file maintenance and backup facilities.
- Interface structures for both novices and experienced users.
- Menu-oriented interfaces to UNIX commands and utilities.
- Multilingual interfaces.

Bull HN Information Systems, Inc.
XPS-100 Series

HN products. The systems integration services design, develop, and install the interfaces or arrange for the acquisition of third-party products that allow interactions between incompatible computers.

Of special significance within the XPS-100's distributed processing scheme is IEEE 802.3 Ethernet LAN support. Ethernet provides the XPS-100 with a common communications channel for interacting with other XPS-100 computers and with other Bull HN and non-Bull HN computers that are communications compatible with the XPS-100. Besides reducing the cost of system interconnection, Ethernet also increases the data transfer speeds between computer systems relative to hard-wired communications schemes.

The SNA and BSC emulators are important to the XPS-100 systems' approach to networking and distributed processing. Those facilities are needed in departmental or distributed processing environments that frequently access files and application services residing in IBM mainframe MVS, ACT/VTAM, ACF/NCF, and CICS environments.

The XPS-100 meets the requirement for simplified operator/end-user interaction by offering a menu-driven interface to the operating system; online help and reference material; and a menu-driven interface for system management and administration functions. Furthermore, the XPS-100 offers system operator, system administrator, programmer, and application view ports and native-language support.

Another important item is the degree of compatibility between different XPS-100 models. The XPS-100 Series computers maintain horizontal and vertical compatibility throughout the product line, preserving users' software investments, which prompts system migration and bottom-to-top and top-to-bottom applications development.

The current XPS-100 models are mutually object-code compatible. Applications developed on one XPS-100 can be moved to another XPS-100 model without modification.

The current XPS-100 models also are object- and source-code compatible with the older, obsoleted XPS-100 models. Software moved upward to a newer XPS-100 maintains object-code compatibility. The UNIX System V.3 operating system on the current XPS-100 allows applications from an older XPS-100 model with the UNIX System V Release 2 (System V.2) XPS-100 Operating System to run on the more powerful computer without modifications. To achieve the best performance and functionality possible for the application, however, the user must optimize the application to take full advantage of the particular hardware and software architecture.

The current XPS-100 models provide a logical growth path. In-place upgrade options are available for moving

• **Online help facilities.**

The *X-42 Operating System* also derives from AT&T UNIX System V Release 3. The X-42 Operating System contains all of the basic System V.3 functions and utilities, as well as UNIX extensions and enhancements developed by Bull HN.

The X-42 Operating System and X-22 Operating System supports the dual-processor architecture of the Model X-42. The operating system performs multiprogramming and multitasking for the dual-central processor system. A single copy of the operating system controls both central processors. The operating system tightly couples all of the multiple processors into a peer-to-peer relationship in which the central processors share main memory as well as the processing work loads.

The X-42 Operating System also has been built to support the intelligent I/O processing and the distributed-intelligence architecture on the Model X-42.

Other features of the X-42 Operating System duplicate the list presented above for the X15/X22 beginning with "Interprocess Communications."

Each XPS-100 Operating System version complies with the *AT&T System V Interface Definition (SVID)* specification. Thus, each maintains source-code compatibility with any implementation of UNIX conforming to the SVID definition.

Furthermore, although different versions of the operating system run across the current XPS-100 Series product line, object-code compatibility is maintained between members—i.e., the Model 15, Model 22, and the Model 42. Applications developed on one current XPS-100 model can run on any other current XPS-100 model without modification.

The current XPS-100 models also are object- and source-code compatible with the older, obsoleted XPS-100 models. Software moved upward to a newer XPS-100 maintains object-code compatibility. The UNIX System V.3-based operating system on the current XPS-100 allows applications from an older XPS-100 model with the UNIX System V Release 2 (System V.2)-based XPS-100 Operating System to run on the more powerful computer without modifications. Nonetheless, in order to achieve the best performance and functionality possible for the application, the user should modify the application for the particular hardware and software architecture.

Software being moved down to an older XPS-100 system from a UNIX System V.3-based XPS-100 is only source-code compatible. The software will run on the lower performance XPS-100, but users must modify and recompile it.

DATA BASE MANAGEMENT: The XPS-100 systems can be configured with several de facto industry-standard data base management systems (DBMSs). The XPS-100 systems support *Oracle Corporation's Oracle*, *Relational Technology's Ingres*, *Informix Software's Informix*, and *Unify Corporation's Unify* data base management system (DBMS).

The Oracle, Ingres, Informix, and Unify DBMSs all feature relational data base technology. They maintain data as a series of relations or tables that permits users to work with data without being confronted with file organizations or data structures. Users do not have to define explicit relationships between sets of data. Relationships are determined concurrently with the data base inquiries. Any selected data from any number of relations can be joined to answer user inquiries into the data base. Furthermore, us-

from one XPS-100 to another. By simply exchanging and adding I/O processors and mass storage devices, the Model 15 can be transformed into a Model 22. A Model 22 can be turned into a Model 42 by adding an expansion cabinet, an additional central processor, and memory options. Field upgrades are less expensive than a "box swap," which requires a reinvestment in the entire main unit.

Bull HN remains committed to maintaining industry-standard computing. For example, its XPS-100 Operating System based on UNIX complies with the AT&T System V Interface Definition (SVID) specification. Thus, it retains source-code compatibility with any implementation of UNIX conforming to the SVID definition. Bull HN also 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. Furthermore, Bull HN recently added the Informix, Ingres, and Unify relational data base systems to its repertoire of data base system solutions; this creates a more "open" data base processing environment. Bull HN has also announced support for the International Organization for Standardization's Reference Model for Open Systems Interconnection (ISO/OSI) for network services. The addition of the ISO/OSI network applications to the X.25 communications base will increase the degree of "openness" in XPS-100 networking by enabling the XPS-100 to communicate with a greater number of computer systems and to support a greater number of applications capabilities.

Bull HN is committed to enhancing its XPS-100 product line to accommodate the customer's growing requirements for power, functionality, and system expansion. For example, Bull HN plans to introduce more powerful versions of the XPS-100 Models 22 and 42 computers, which will have 25MHz MC68020-based central processors instead of the 16.67MHz MC68020 central processors. The new computers will also have more workstation ports and fixed disk capacity than the current Model 22 and Model 42. The new computers will be announced by the end of 1988. The next generation of XPS-100 systems will feature the popular Motorola MC68030 chip—a high-powered microprocessor that outperforms the MC68020 chip family.

USER REACTION

In September 1988, we spoke with two XPS-100 users whose names had been provided by Bull HN. Although the users' systems were older models, current architectures evolved from those earlier XPS-100s.

The first user manages data processing for the heavy truck manufacturing division of a major automotive company. He works at a facility in the upper South. His organization uses a one-year-old Model 20 with standard memory (2M bytes) and disk facilities (72M bytes); the system is employed primarily for remote job entry (RJE) functions,

ers can redefine record sequences, subset records by select/omit criteria, and subset and concatenate fields to create new fields.

Oracle, Ingres, Informix, and Unify offer concurrency control to support the simultaneous processing of multiple reads and updates. Security features, data set locking, and journaling/audit trails, and transaction and data recovery facilities ensure data integrity. Furthermore, as relational DBMSs, Oracle, Ingres, Informix, and Unify provide for data independence. The programs that use a logical view of the data are unaware of changes in the physical data. File access paths remain unchanged when a change to data occurs.

Oracle is designed for decision support and application development. It features an electronic spreadsheet for data analysis and forecasting, graphics utilities for creating presentation graphics, and fourth-generation applications development tools.

Oracle uses the de facto industry-standard SQL data base language for creating and maintaining data bases—i.e., for dynamic data definition, data manipulation, and data control—query processing, and report writing. Oracle's SQL Plus provides advanced query processing, data set manipulation, data editing, data access, and data control capabilities. SQL Report, a report writer, simplifies report writing under SQL. SQL Forms, an interactive applications development aid, supports screens development within interactive applications. The data loader and import/extract facilities are provided within Oracle to load data from production and information resource data bases into the Oracle data bases. SQL Net enables the data base to gain access to data bases and applications on other computers.

Ingres is designed so that nonprogrammers can create, manage, and output data. Featured are an interactive query language, a visual forms editor, a query-by-forms data base update and retrieval program, a report writer, and an application generator. Furthermore, online Help facilities and system guides are presented to the user throughout the data base process—from data base creation through information access.

Informix contains an applications development system and networking support facilities. A menu creation facility, an interactive schema editor, a report writer, a forms generator, and a fourth-generation applications building language are featured. The networking support facility enables MS-DOS IBM PC and compatible microcomputers/personal computers to have full access to the data base. The SQL language is used for data base definition, manipulation, and queries. Screen-oriented data entry, query-by-forms, ad hoc queries, and full-featured report writing are available with Informix.

Unify is designed for transaction-oriented environments. It contains multiple data access methods for fast data access and transaction response, referential integrity and transaction logging for data integrity, raw I/O processing, and multilevel security. In addition, it provides menu- and prompt-driven utilities for schema definition, menu design, security setup, and data entry, query, and file maintenance screen creation; C language and Cobol subroutines for writing special algorithms for data manipulation, screens, and reports; interactive, full-screen data editing; and pop-up windows for assistance with data entry. Like Oracle, it uses SQL to process queries. The Data Manipulation Language (DML) segment of SQL is used for updating the data base. A query-by-forms facility simplifies queries by query entry. A sophisticated report writer allows users with various skill levels to write simple or complex report generation applications.

Bull HN Information Systems, Inc.
XPS-100 Series

forwarding files to IBM and Bull HN DPS 8000 systems at the plant and to multiple IBM systems in Detroit. The XPS-100 also monitors incoming document traffic and routes it to one of two mainframe-attached Unisys (Burroughs) 9270 laser printers (soon to be replaced by Bull HN 4180D and 4240D laser devices).

The Model 20 replaced a Wang VS 100, which handled office automation functions in addition to the RJE and document routing duties. The user says that, although the Wang system was "a fine machine" and "doing its job OK," his organization wanted to phase out the OA activities and get "something a little bit better" for RJE control. The user settled on the XPS-100 after looking at a comparable Unisys U 5000 system and a Wang VS 85 (a downgrade from the VS 100, but considered because of the cessation of OA activities).

The conversion from the Wang VS to the UNIX environment went smoothly, he says. Because the obsolete OA applications did not need to be ported, the major conversion effort was directed toward the RJE programs, and that, he says, was "simple."

The choice of a system based on UNIX was motivated half by economic and logistical factors and half by an interest in UNIX as a computing vehicle. On the first score, he says, the machine seemed as if it would provide the required functionality at the right price. In addition, the user's organization had dealt with Bull HN for a long time and felt that the vendor would deliver the same good support for the XPS-100 that it had always provided for the facility's DPS 8000 mainframe.

Economically, the user feels that he made a wise choice. Postinstallation tests conducted by Bull HN field engineers indicated that the XPS-100 yields a 10 to 15 percent performance improvement over the Wang VS 100 in the RJE application. The manager characterizes the support he receives as "outstanding" and comparable to that provided for the DPS 8000, even though a different group supports the XPS-100. Although he has experienced no major equipment problems during the year that the XPS-100 has been installed, the user says that Bull HN field engineers stop by routinely to monitor system operations and forestall possible problems.

Regarding his specific choice of a UNIX system, the user says that he viewed UNIX as useful for the future. He says that his programmers find its intrinsic facilities easy to work with; they are already programming in the C language and find it easy. He also says that UNIX provides a promising basis for networking. He anticipates acquiring an XPS-100 Model 40, which will replace but not completely displace the Model 20. The smaller system, he says, will probably be moved to another site and networked to the Model 40. He adds that other systems may be acquired in the future and networked to the XPS-100s.

The second user we interviewed is director of product marketing for one of Bull HN's value-added resellers (VARs). With offices throughout the United States, this

C-ISAM **is a file management system. It provides functions for processing and manipulating indexed file systems under the XPS-100 Operating System. C-ISAM performs all of the required index file maintenance and manipulation tasks, data access and retrieval, and file protection. It permits files to grow dynamically. Concurrency control is provided through file and record locking. The audit trail capability within C-ISAM helps protect against data loss while performing transactions.**

LANGUAGES: The XPS-100 computers can support the following high-level programming languages:

- **SVS C.**
- **RM/Cobol-74.**
- **RM/Cobol-85.**
- **Micro Focus Level II Cobol/ET.**
- **Philon Fast Cobol.**
- **Philon Fast Fortran.**
- **SVS Fortran-77.**
- **SVS Pascal.**
- **Philon Fast Pascal.**
- **SVS Basic-Plus.**
- **Philon Fast Basic-M.**
- **Niakwa Basic-2C.**
- **Concept Omega Thoroughbred Basic.**
- **Micronetics Standard MUMPS.**
- **Digital Information Systems DBL.**
- **Software Ireland Unibol/RPG II.**
- **Subject, Wills, and Co. DB/C.**
- **Basis Inc. BB.**

COMMUNICATIONS: The XPS-100 systems are fluent in several different data communications languages, thus enabling them to communicate with a variety of Bull HN and other vendors' computers.

Ethernet LAN TCP/IP **provides peer-level local area networking functions for the XPS-100 family over the 10M bps Ethernet. It supplies the code for IEEE 802.3 Ethernet link control and media access control function furnishes the code for virtual terminal/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.**

The Ethernet LAN TCP/IP software package contains the Transmission Control Program/Internet Protocol (TCP/IP) protocol. TCP/IP provides the data transportation function; it performs data packaging, node addressing, transmission control, error monitoring, and error recovery facilities. The protocols and communications utilities with Layers 5 and 6 of the ISO OSI communications platform are used for session management and data presentation. Network application services are provided by the University of California at Berkeley's UNIX Remote Copy Protocol (RCP), Remote Login Protocol (RLOGIN), Remote

Bull HN Information Systems, Inc.
XPS-100 Series

VAR develops patient accounting, practice management, and appointment scheduling software for medical practices, clinics, and hospitals, bundling it with Bull HN hardware. The VAR sells XPS-100-based turnkey systems to practices comprising 5 to 20 physicians. In addition, the VAR markets Bull HN DPS 6-based systems to larger practices consisting of up to 500 members.

The company decided to use XPS-100 hardware for its turnkey systems for the same reasons mentioned in our first user interview: economic and technological benefits. This company's migration to the XPS-100 also involved conversion from a Wang system; the company's original product ran on a Wang 2200. That line, as the marketeer puts it, eventually "ran out of gas"; to get as many as 13 terminals onto the Wang system, he says, users have to multiplex CPUs—an unnecessarily complex and expensive process. He said that the company decided not to migrate its products to Wang's more powerful VS Series, because the 2200 applications, in his opinion, "cannot, will not, and never will" run under VS/OS.

Initially, his company decided to start marketing a UNIX system because it offered the best way to deliver the sort of price/performance required by the small-practice market. The company felt that it could charge no more than about $18,000 or $19,000 per CPU (compared to the $75,000 or $80,000 per-CPU charge for the DPS 6 systems it markets to large practices). Because the company had a long-standing relationship with Bull HN—having sold DPS 6-based systems for some time—it examined the XPS-100 in relation to comparable UNIX systems from Convergent Technologies, NCR, and Altos.

The company ultimately chose the XPS-100 over competitive machines because management decided that the Bull HN system best combined desirable price/performance with smooth field upgradability. The latter feature, the user says, is critical when selling to small practices that are likely to grow in the near future and require concomitant increases in computing power. Such cost-effective upgradability simply cannot be provided through proprietary systems, he feels; only UNIX machines, with their generic hardware components, can yield a desirable balance between increased power and the higher costs it entails.

In addition to selling turnkey XPS-100s, the user's facility is itself an XPS-100 installation running two systems: a Model 40 for software development and a Model 20 to provide remote diagnostics, bug fixes, and other customer services. The user particularly praises the breadth and quality of the XPS-100's software development facilities; he says that Bull HN provides "more compilers than we really need" and characterizes the RM/Cobol and C compilers as very efficient. He also calls Bull HN's hardware support "extraordinary."

He adds that the conversion of his company's software from the Wang 2200 to the UNIX environment on the Bull HN system was fairly easily achieved. His company contracted a third party to develop a compiler that converted Basic II interpretive code to compiled code. □

Shell (RSH), and Mail utilities. RCP performs file transfers; RLOGIN handles virtual terminal/remote logins; RSH executes remote commands; and Mail represents the electronic mail facility.

The *UNIX-to-UNIX Copy (uucp)* communications module in the XPS-100 Operating System supports virtual terminal, electronic mail, and file transfer facilities in a UNIX environment. With the uucp module, store-and-forward, point-to-point networking of systems based on UNIX can be accomplished with RS-232-C-based communications lines.

***Remote File Sharing (RFS)*, part of the XPS-100 Operating System software package, provides resource sharing transparently across a network. Files and devices (for example, printers and tape drives) can be shared with XPS-100 systems and non-XPS-100 systems that run the RFS communications package.**

***Streams*, a media-independent networking interface found within the XPS-100 Operating System package, allows users to share applications software among different points of the network without regard to network protocol or network hardware. Changes in communications protocol, for example, are accommodated merely by substituting Streams modules—no modification of the applications software or the operating system is required.**

The XPS-100 communicates with a Bull HN DPS minicomputer or mainframe system via the *VIP7800 Emulator*, *VIP7800 Pass-Through*, or *TTY Pass-Through* software package.

***VIP7800 Emulator* enables asynchronous and synchronous terminals connected to an XPS-100 to access applications on a Bull HN DPS host interactively. The VIP7800 Emulator package makes XPS-100-connected terminals look like VIP7800 interactive terminals to give XPS-100 terminals direct access to the host.**

The VIP7800 Emulator also supports file transfers to the host. Files are transferred under VIP7800 terminal emulation.

***VIP7800 Pass-Through* is employed when VIP7800 terminals are attached to the XPS-100 and when the XPS-100 maintains a synchronous connection to a Bull HN DPS system. It allows the XPS-100-connected VIP7800 terminals to work interactively with a DPS system or to transfer files to the system for batch execution.**

The VIP7800 Pass-Through package also allows files to be transferred to the host. Files are transferred under VIP7800 terminal emulation.

***TTY Pass-Through* is employed when industry-standard, asynchronous, character-mode terminals are connected to XPS-100 and when the XPS-100 maintains an asynchronous connection to a Bull HN DPS host. The package permits the asynchronous terminals to communicate directly with the host using the TTY protocol.**

The PC/Terminal Emulator enables Bull HN IBM PC-compatible microcomputers, other MS-DOS-based IBM PC-compatible microcomputers, and IBM PC models to access XPS-100 applications and resources. The microcomputers access the XPS-100 applications and resources via interactive terminal emulation. XPS-100-attached microcomputers appear as VIP7300 interactive terminals when accessing the XPS-100.

PC/Terminal Emulator also permits the XPS-100 and MS-DOS-based and IBM PC-compatible microcomputers to

Bull HN Information Systems, Inc.
XPS-100 Series

share information. PC/Terminal Emulator contains the Kermit protocol for file transfer between the host and attached microcomputers.

Kermit Pass-Through is employed when IBM PC-like microcomputers are attached to the XPS-100 and when the XPS-100 is connected to a Bull HN DPS host via a synchronous or asynchronous link. It enables the XPS-100-attached microcomputers to interact with the DPS system as though they were directly connected terminals. It also allows the direct exchange of files between the microcomputers and the host. Files are exchanged using the Kermit protocol.

Kermit File Transfer allows file transfer between IBM PC-like microcomputers and the XPS-100, or between XPS-100 systems and other systems that use the Kermit protocol as specified by the Columbia University Center for Computing Activities. Kermit File Transfer handles a variety of file types (binary, ASCII, etc.) and provides data integrity through packets, checksums, and retransmissions.

The *X.25/X.29 Network Support* package enables XPS-100 models to directly connect to packet switched data networks or to a host with X.25 capabilities. Included within X.25/X.29 Network Support are capabilities for process-to-process communications and remote terminal login.

X.3/X.28 PAD Emulation package allows XPS-100 models with industry-standard asynchronous terminals to access remote systems through an X.25 network or in a point-to-point connection as asynchronous terminals. It interfaces with X.25/X.29 Network Support for transmission and reception in "packet" mode and for the placement of outgoing calls, the reception of incoming calls, and the exchange of data over an X.25 network or point-to-point connection.

The *SNA 3270/3770 Terminal Emulator* enables XPS-100 to participate with remote systems in an IBM Systems Network Architecture (SNA) network. With the SNA 3270/3770 Terminal Emulator, XPS-100 accesses IBM mainframes and compatible systems with the SDLC protocol. Communications occur in either the interactive or batch mode. The 3270 emulation function of the SNA 3270/3770 Terminal Emulator enables the XPS-100 computer to communicate interactively with the IBM host. The 3270 emulation capabilities allow the XPS-100 to operate as an IBM 3274 or 3276 Control Unit with relevant display and print devices attached. XPS-100-attached terminals appear as IBM 3270 interactive terminals, and the printers appear as IBM 3270 printers to the host system. The 3770 emulation function enables XPS-100 to function as an IBM 3770 RJE terminal so the XPS-100 can transmit 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 XPS-100 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 XPS-100 computers to communicate with host systems using the BSC communication protocol.

The *BSC 3270 Emulator* facility provides for interactive communications between XPS-100 computers and IBM mainframes or compatible systems. It enables the U Series computer to function as an IBM 3271 or 3275 Control Unit with relevant display and print devices attached. XPS-100's interactive terminals appear as IBM 3270 interactive terminals with the BSC protocol, and XPS-100-attached printers appear as IBM BSC-configured 3270 printers to the host system.

The *BSC 2780/3780 Emulator* facility supports batch transmission between XPS-100 computers and IBM mainframes and compatible systems with the IBM 2780/3780 BSC protocol. It allows a job to be entered from an XPS-100 computer and transmitted to a host system for processing. After processing at the host, the results can be transmitted back to the XPS-100. The BSC 2780/3780 Emulator also provides for bidirectional file transfer between the XPS-100 computer and a host with the 2780/3780 BSC protocol.

SYSTEM TOOLS/UTILITIES: As stated previously, the XPS-100 Operating System contains UNIX System V utilities for programming, professional support, and system administration. Featured are the following:

- *Documenter's Workbench*—provides a full set of text processing, formatting, and typesetting facilities and controls for document and publication creation.
- *Source Code Control System (SCCS)*—provides a means for controlling changes to a program's source code or text file, and it documents the progress of a project as versions are created and modified throughout the development process. It stores, updates, and retrieves source-code modules; allows modules to be manipulated by version number or date; keeps track of the changes; protects versions from unauthorized changes; and allows generations to be combined, modified, and compared.
- *Resource Accounting System*—collects resource utilization data to record user connect time and monitor CPU disk use for the purpose of charging fees to individual users and fine-tuning the system.
- *Graphics facilities*—Interactive and noninteractive editors for the construction of data plots, pie charts, bar charts, and histograms and free-form graphics images.
- *Electronic mail.*
- *Professional support tools*—examples include an electronic systems news service, automatic reminder services, and a desk calculator.

XPS-100 Operating System also contains Bull HN-developed utility programs in addition to the UNIX System V utilities for programming, professional support, and system administration. Featured are diagnostics programs, additional file maintenance routines, and a menu manager. The menu manager permits developers to build and implement customized end-user interfaces.

Several types of add-on system utilities can be placed on the XPS-100. Available add-on utilities include facilities such as *Easylearn*, *Easyconfig*, *Easytune*, *Animator*, and *Forms2*.

Easylearn is 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 XPS-100 Operating System.

Easyconfig is used for configuring the system operating environment. It allows the system administrator to add or remove UNIX basic, advanced, administrator, and software development utilities to or from the XPS-100 Operating 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

Bull HN Information Systems, Inc.
XPS-100 Series

statistical report on the values of tunable parameters and suggests how these values may be changed to improve system performance.

Animator is an interactive symbolic debugging tool. It allows programmers to observe the logical path of program execution, statement by statement.

Forms-2 is a visual programming tool for speeding the creation of interactive screen handling programs. It allows programmers to design forms or menus directly on the screen as they will appear to users at runtime, then it automatically generates the Cobol source code to handle the screen.

OFFICE AUTOMATION: Office processing capabilities are provided by *Uniplex-II Integrated Office Processing, Alis*, or *Q-Office*.

Uniplex-II contains a word processor with a spelling checker; a data base 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 data base 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 prompts simplify user interaction with the office system.

Alis provides users with a document composer, free-style and business graphics editor, desktop calculator, intelligent spreadsheet, calendar, electronic mail, and a personal data base. These tools can create compound documents featuring text, statistics, and free-style or business graphics.

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.

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 XPS-100 computers. Applications cover data processing, business system automation and control, transaction processing, record and forms management, information retrieval, data base processing, decision support, and professional automation. Targeted markets include the following:

- Discrete manufacturing, including the automotive, aerospace, defense, electronic and electrical, and appliance industries.
- Pharmaceutical industries.
- Health care industries.
- Insurance agencies.
- Real estate businesses.
- Federal government and military organizations.
- State and local governments.
- Telecommunications industries.
- Distribution and wholesale businesses.
- Retail establishments.
- Hospitality industries, including hotels and restaurants.

OPERATING ENVIRONMENT

The XPS-100 Models 15 and 22 each contain a central system cabinet at its core. This cabinet houses the central processing components, device controllers, networking options, and compact peripheral storage devices. It measures 28.3 inches high, 15.0 inches wide, and 28.0 inches deep. When fully configured, the Model 15 and Model 22 central system cabinets each weigh 187 pounds.

The XPS-100 Model 42 configuration includes a tightly coupled central system cabinet and an expansion cabinet. The cabinets house the central processing components, device controllers, networking options, and compact peripheral storage devices. Both the central system cabinet and the expansion cabinet measure 28.3 inches high, 15.0 inches wide, and 28.0 inches deep. When fully configured, the central system cabinet and expansion cabinet have an aggregate weight of 874 pounds.

The electrical power requirements for the XPS-100 models are 120 volt, 12 Amp at 60 Hz. Operating temperatures for the XPS-100 range from 50 to 100 degrees Fahrenheit at 20 percent to 80 percent relative humidity.

SUPPORT SERVICES

TRAINING/EDUCATION: Bull HN 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.

SUPPORT: Bull HN provides postwarranty maintenance and product support under a standard service contract. Hardware and software support is provided through Bull HN TotalCare program. This is offered through Bull HN Customer Service Division, which services the entire system.

Standard Maintenance provides on-call remedial hardware maintenance to contracted customers for a basic monthly or annual charge. Service is provided during the principal period of maintenance—10 hours per day from 8 a.m. to 6 p.m., Monday through Friday, excluding Bull HN locally observed holidays.

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. Scheduled Extended Maintenance Service contracts provide coverage up to 24 hours per day, 7 days per week. Customers with Scheduled Extended Maintenance Service are billed annually or monthly.

Bull HN Information Systems, Inc.
XPS-100 Series

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.

Customers who have on-site coverage for XPS-100 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 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.

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

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

Software product support for the XPS-100 is available for the core system software as well as system-level applications. The support service provides telephone access to Bull HN Technical Assistance Center, which provides trouble-shooting assistance and problem resolution. It also includes a software update subscription service as well as a software installation service.

PRICING

POLICY: The XPS-100 Series systems are available for purchase only. Basic system software is bundled with the hardware; upper-level system software subsystems are packaged separately. Quantity discounts for hardware equipment and software offerings are available. Systems are provided with 90 days of maintenance service at no charge.

EQUIPMENT PRICES

		Purchase Price ($)	Annual On-site Maint. Charge ($)
CENTRAL SYSTEMS			
Model X-15			
CPX0629	Model X-15 with 2MB memory, MMU, floating-point unit, integrated peripheral controller with one 720KB diskette unit, one ST506 72MB fixed disk unit and streamer tape port, cabinet, first power supply, SNS0662T X-15 runtime operating system for up to 4 users, and Easylife	11,245	1,125
Model X-22			
CPX0670	Model X-22 with 4MB memory, MMU, floating-point unit, integrated peripheral controller with one 720KB/1.2MB diskette unit, one ESDI 157MB fixed disk unit, one 60MB streamer tape unit, cabinet, two power supplies, SNS0688T X-22 runtime operating system for up to 16 users, and Easylife	20,495	1,650
Model X-42			
CPX0668	Model X-42 16.7MHZ Dual-Processor CPUs with two 4MB memories, MMU, two floating-point units, two 16KB cache memories, one local/remote workstation controller with eight RS-232-C ports and one Centronics printer port, integrated peripheral controller with one 720KB/1.2MB diskette unit, one ESDI 157MB fixed disk unit, one 60MB streamer tape unit, two cabinets, four power supplies, X-42 SNS0689T runtime operating system for up to 32 users, and Easylife	41,495	2,500
Upgrade Options for Models X-15 and X-22			
CAB0651	Expansion cabinet with one power supply	2,800	130
CPU0651	Additional CPU without memory	8,000	225
CPF0651	16KB cache memory	2,000	100
Memory Options			
CMM0651	1MB add-on memory module	1,400	185
CMM0652	2MB add-on memory module	2,800	140
CMM0654	4MB add-on memory module	5,500	275
CMM0658	8MB add-on memory module	8,000	400
Workstation Controllers			
DCP0651	Local workstation controller with eight 9-pin RS-232-C/RS-422-A ports and one Centronics printer port	1,200	130
DCP0652	Local/remote workstation controller with six ports (two 9-pin RS-232-C/RS-422-A async ports, two 15-pin RS-232-A sync/async ports, or RS-422-A async ports) and one Centronics printer port	2,680	215
DCP0655	Local/remote workstation controller with eight 9-pin RS-232-C (ring indicator modem control) async ports and one Centronics printer port	1,500	120
DCP0656	Local/remote workstation controller with four 9-pin RS-232-C (ring indicator modem control) async ports and one Centronics printer port for X-15 systems only	830	65

Bull HN Information Systems, Inc.
XPS-100 Series

		Purchase Price ($)	Annual On-site Maint. Charge ($)
Peripheral Device Controllers			
MDC0651	Integrated controller with ST506 interface for three 5¼-in fixed disk units	2,050	165
MDC0661	Integrated controller for streamer tape unit, diskette unit, and three 5¼-in fixed disk units with ESDI interface	3,000	240
DCC0657	Controller for Ethernet LAN using Transmission Control Protocol/Internet Protocol (TCP/IP)	4,500	360
MTC0651	GCR/PE controller for four magnetic tape units with Pertec interface	5,280	420
PERIPHERALS			
MSU0515	72MB ST506 fixed disk unit	3,850	570
MSU0566	157MB ESDI fixed disk unit	6,000	500
MSU0567	324.5MB ESDI fixed disk unit	9,700	750
MTU0651	60MB streamer tape unit	1,780	300
MTU0661	GCR/PE 1600/6250-bpi magnetic tape unit	14,100	1,350
CPA0653	Cable to connect first MTU0661	190	NA
CPA0654	Cable to connect second and subsequent MTU0661s	190	NA
PSS0641	Power supply	1,200	65
REPLACEMENT UNITS			
DIU0601	72KB diskette unit	450	45
DIU0651	720KB/1.2MB diskette unit	530	45
CPF0612	Standard operating panel	100	8
CAB0606	First cabinet fans unit	340	30
CPF0613	System control board	1,000	80
CPF0614	Bus terminator	100	8
DOT MATRIX PRINTERS			
PRT4204	200 cps data-quality, 40 cps letter-quality printer mode, 80-column printer with Centronics interface	645	99
PRT4203	200 cps data-quality, 40 cps letter-quality printer mode, 80-column printer with RS-232-C serial interface	745	99
PRF4201	Single-bin automatic sheet feeder for PRT4203 and PRT4204	245	50
PRT4214	200 cps data-quality, 40 cps letter-quality printer mode, 136-column printer with Centronics interface	899	119
PRT4213	200 cps data-quality, 40 cps letter-quality printer mode, 136-column printer with RS-232-C serial interface	999	119
PRF4211	Single-bin automatic sheet feeder for PRT4213 and PRT4214	299	60
PRT4662	480/400 cps data-quality, 180 cps near letter quality, 75 cps letter-quality printer mode, 136-column printer with Centronics interface	2,795	350
PRT4663	480/400 cps data-quality, 180 cps near letter quality, 75 cps letter-quality printer mode, 136-column printer with Centronics interface and RS-232-C/RS-422-A interfaces	2,995	350
PRF4601	Single-bin automatic sheet feeder for PRT4662 and PRT4663	795	150
PRU1034	270 cps data-quality, 60 cps letter-quality printer mode, 132-column printer with Centronics interface and RS-232-C/RS-422-A interfaces	1,795	260
PRF1022	Dual-bin automatic sheet feeder for PRU1034	995	180
UNINTERRUPTIBLE POWER SUPPLY (UPS)			
UPS0005	XPS-100 1.3 kVA UPS unit	2,750	NA
CPF0658	Cable to connect one UPS unit to a mono processor with a single cabinet	85	NA
CPF0659	Cable ("Y") to connect two UPS units to a mono processor with an expansion cabinet or to a dual processor	85	NA
KIT2510	Field expansion kit	1,000	NA
TERMINALS			
HDS7101	HDS 1 monitor and keyboard unit, green phosphor	525	85
HDS7102	HDS 1 monitor and keyboard unit, amber phosphor	525	85
HDS7403	HDS 3 monitor and keyboard unit, green phosphor	750	95
HDS7404	HDS 3 monitor and keyboard unit, amber phosphor	750	95

Bull HN Information Systems, Inc.
XPS-100 Series

SOFTWARE PRICES

		Initial License Fee ($)	On-site Basic Support ($)
OPERATING SYSTEMS			
Model X-15			
SNS0662T	X-15 Mono Processor Runtime Operating System; up to 4 users (on diskettes); includes Easylife	NSC	250
Model X-22			
SNS0688T	X-22 Mono Processor Runtime Operating System; up to 16 users (on diskettes); includes Easylife	NSC	450
Model X-42			
SNS0689T	X-42 Dual Processor Runtime Operating System; up to 32 users (on diskettes); includes Easylife	NSC	450
Operating System Replacements			
Model X-15			
SNS0660T	X-15 Mono Processor Runtime Operating System; up to 4 users (on diskettes); includes Easylife	700	250
Model X-22			
SNS0684T	X-22 Mono Processor Runtime Operating System; up to 16 users (on diskettes); includes Easylife	1,050	450
Model X-42			
SNS0696T	X-42 Dual Processor Runtime Operating System; up to 32 users (on diskettes); includes Easylife	4,200	450
Expansion and Upgrade Options			
Model X-15			
SNS0659T	X-15 Runtime Expansion Kit; from 4 to 16 users	300	200
SNS0666T	X-15 Runtime to Full Development System Upgrade, supports up to 4 users; includes C Language	350	200
SNS0665T	X-15 Full Development Expansion Kit; from 4 to 16 users	550	NA
SNS0664T	X-15 Runtime to Full Development System Upgrade, supports up to 16 users; includes C Language	550	NA
SNS0686T	Mono Processor Runtime Expansion Kit; from 16 to 32 users	1,050	NA
SNS0683T	Mono Processor Full Development Expansion Kit; from 16 to 32 users	1,600	550
Model X-22			
SNS0686T	Mono Processor Runtime Expansion Kit; from 16 to 32 users	1,050	NA
SNS0676T	Mono Processor Runtime to Full Development System Upgrade, supports up to 16 users; includes C Language	550	NA
SNS0602T	Mono Processor Runtime Expansion Kit; from 32 to 64 users	2,100	550
SNS0675T	Mono Processor Runtime to Full Development System Upgrade, supports up to 32 users; includes C Language	1,100	550
SNS0683T	Mono Processor Full Development System Expansion Kit; from 16 to 32 users	1,600	550
SNS0607T	Mono Processor Runtime to Full Development System Upgrade, supports up to 64 users; includes C Language	2,200	NA
SNS0603T	Mono Processor Full Development System Expansion Kit; from 32 to 64 users	3,200	NA
SNS0606T	Mono to Dual Processor Upgrade Runtime System, supports up to 64 users	8,100	NA
SNS0608T	Mono to Dual Processor Upgrade Full Development System, supports up to 64 users	12,400	NA
Model X-42			
SNS0699T	Dual Processor Runtime Expansion Kit; 32 to 64 users	8,100	550
SNS0604T	Dual Processor Runtime Expansion Kit; more than 64 users	2,500	NA
SNS0609T	Dual Processor Runtime to Full Development System Upgrade, supports more than 64 users; includes C Language	10,000	NA
SNS0668T	Dual Processor Runtime to Full Development System Upgrade, supports up to 32 users; includes C Language	2,200	550
SNS0694T	Dual Processor Full Development Expansion Kit; 32 to 64 users	12,400	NA
SNS0672T	Dual Processor Runtime to Full Development System Upgrade, supports up to 64 users; includes C Language	6,500	NA
SNS0605T	Dual Processor Full Development Expansion Kit; more than 64 users	6,000	NA

NA—Not applicable.

Bull HN Information Systems, Inc.
XPS-100 Series

		Initial License Fee ($)	On-site Basic Support ($)
Mono and Dual Processors			
SNS0671	Easylearn operating system teaching aid	200	NA
SNS0661	Easytune software tool for system administrators	200	NA
LANGUAGES FOR MONO PROCESSOR			
SNL0682T	SVS BASIC-Plus Interpreter	495	60
SNL0686T	SVS FORTRAN 77	650	80
SNL0687T	SVS Pascal	700	85
SNL0688T	SVS C Language	650	80
SNL0635T	RPG II/36 Development System	2,495	300
SNL0637T	RPG II/36 Runtime System	1,995	240
LANGUAGES FOR DUAL PROCESSOR			
SNL0689T	SVS BASIC-Plus Interpreter	990	120
SNL0650H	SVS FORTRAN 77	2,500	300
SNL0651T	SVS Pascal	2,500	300
SNL0652T	SVS C Language	2,500	300
SNL0636T	RPG II/36 Development System	3,995	480
SNL0638T	RPG II/36 Runtime System	3,495	420
LANGUAGES FOR MONO OR DUAL PROCESSOR			
SNV0601T	RPG II/36 Migration Toolkit	495	NA
SNL0606T	RM/COBOL-74 Development System	1,250	150
SNL0607T	RM/COBOL-74 Runtime System	350	40
SNL0698T	RM/COBOL-85 Development System	1,500	180
SNL0699T	RM/COBOL-85 Runtime System	400	50
SNL0655T	Micronetics Standard MUMPS (MSM) Programming Language	4,995	600
SNL0661T	MICRO FOCUS LEVEL II COBOL/ET Compiler; up to 16 users	3,750	450
SNL0690T	MICRO FOCUS LEVEL II COBOL/ET Compiler Upgrade Kit; from 16 to 32 users	1,250	150
SNL0694T	MICRO FOCUS LEVEL II COBOL/ET Compiler Upgrade Kit; from 32 to 64 users	2,000	240
SNL0663T	ANIMATOR; up to 16 users	2,250	270
SNL0692T	ANIMATOR Upgrade Kit; from 16 to 32 users	750	90
SNL0696T	ANIMATOR Upgrade Kit; from 32 to 64 users	750	90
SNL0664T	FORMS-2; up to 16 users	560	70
SNL0693T	FORMS-2 Upgrade Kit; from 16 to 32 users	190	20
SNL0697T	FORMS-2 Upgrade Kit; from 32 to 64 users	190	20
SNL0662T	MICRO FOCUS LEVEL II COBOL/ET Runtime System; up to 16 users	750	90
SNL0691T	MICRO FOCUS LEVEL II COBOL/ET Runtime Upgrade Kit; from 16 to 32 users	250	30
SNL0695T	MICRO FOCUS LEVEL II COBOL/ET Runtime Upgrade Kit; from 32 to 64 users	700	85
SNL0649T	DBL Full Development System	2,495	300
SNL0650T	DBL Runtime System	995	120
DATA BASE MANAGEMENT			
Mono or Dual Processor			
SND0691T	INFORMIX-SQL Relational Data Base Management System; up to 16 users	1,600	190
SND0650T	INFORMIX-SQL Relational Data Base Management System; up to 32 users	2,200	290
SND0651T	INFORMIX-SQL Relational Data Base Management System; up to 64 users	3,000	360
SND0693T	INFORMIX-SQL Upgrade Kit; from 16 to 32 users	600	70
SND0699T	INFORMIX-SQL Upgrade Kit; from 32 to 64 users	800	95
SND0694T	INFORMIX-4GL Application Development Language; up to 16 users	2,400	290
SND0652T	INFORMIX-4GL Application Development Language; up to 32 users	3,400	410
SND0653T	INFORMIX-4GL Application Development Language; up to 64 users	4,500	540
SND0695T	INFORMIX-4GL Upgrade Kit; from 16 to 32 users	1,000	120
SND0696T	INFORMIX-4GL Upgrade Kit; from 32 to 64 users	1,100	130
SND0697T	INFORMIX-ESQL/C; up to 16 users	1,200	145
SND0654T	INFORMIX-ESQL/C; up to 32 users	1,650	200
SND0655T	INFORMIX-ESQL/C; up to 64 users	2,250	270
SND0640T	INFORMIX-ESQL/C Upgrade Kit; from 16 to 32 users	450	55
SND0641T	INFORMIX-ESQL/C Upgrade Kit; from 32 to 64 users	600	70
SND0642T	INFORMIX-ESQL/MICRO FOCUS COBOL LEVEL II; up to 16 users	1,200	145
SND0656T	INFORMIX-ESQL/MICRO FOCUS COBOL LEVEL II; up to 32 users	1,650	200
SND0657T	INFORMIX-ESQL/MICRO FOCUS COBOL LEVEL II; up to 64 users	2,250	270
SND0643T	INFORMIX-ESQL/MICRO FOCUS COBOL LEVEL II Upgrade Kit; from 16 to 32 users	450	55
SND0644T	INFORMIX-ESQL/MICRO FOCUS COBOL LEVEL II Upgrade Kit; from 32 to 64 users	600	70

NA—Not applicable.

Bull HN Information Systems, Inc.
XPS-100 Series

		Initial License Fee ($)	On-site Basic Support ($)
Mono Processor			
SND0231T	ORACLE RDBMS and SQL*REPORT V5.1	6,000	720
SND0232T	ORACLE SQL*Plus command-driven interface	1,200	145
SND0233T	ORACLE SQL*Forms	1,500	180
SND0234T	ORACLE SQL*Net with Asynchronous Protocol	2,100	250
SND0235T	ORACLE SQL*Net with TCP/IP Protocol	2,100	250
SND0236T	ORACLE PRO*C Compiler	900	110
SND0237T	ORACLE PRO*MF COBOL LEVEL II	900	110
Dual Processor			
SND0670T	UNIFY Data Base and Utilities R3.2 Full Development Version, supports up to 16 users	3,400	410
SND0660T	UNIFY Data Base and Utilities R3.2 Upgrade Kit; from 16 to 64 users for Full Development Version	3,300	395
SND0671T	UNIFY Data Base and Utilities R3.2 Runtime System; up to 16 users	1,125	135
SND0685T	UNIFY Data Base and Utilities R3.2 Upgrade Kit; from 16 to 64 users for Runtime System	1,075	130
SND0668T	UNIFY Data Base and Utilities R4.0 Full Development Version, supports up to 16 users	3,400	410
SND0673T	UNIFY Data Base and Utilities R4.0 Full Development Version, supports up to 64 users	6,700	805
SND0667T	UNIFY Data Base and Utilities R4.0 Full Development Version; expansion from 16 to 64 users	3,300	395
SND0669T	UNIFY Data Base and Utilities R4.0 Runtime Version, supports up to 16 users	1,700	250
SND0674T	UNIFY Data Base and Utilities R4.0 Runtime Version, supports up to 64 users	3,350	400
SND0678T	UNIFY Data Base and Utilities R4.0 Runtime Version; expansion from 16 to 64 users	1,650	200
SND0679T	UNIFY Data Base and Utilities R4.0 Upgrade Kit; from Runtime to Full Development System, supports up to 16 users	1,700	205
SND0686T	UNIFY Data Base and Utilities R4.0 Upgrade Kit; from Runtime to Full Development System, supports up to 64 users	3,500	400
SND0661T	UNIFY/ACCELL 4GL Full Development System Release 1.3; up to 16 users	8,250	990
SND0663T	UNIFY/ACCELL 4GL Runtime System Release 1.3; up to 16 users	4,100	490
SND0662T	UNIFY/ACCELL 4GL Full System Upgrade Kit Release 1.3; from 16 to 64 users	4,100	490
SND0664T	UNIFY/ACCELL 4GL Runtime System Upgrade Kit Release 1.3; from 16 to 64 users	2,100	250
SND0665T	UNIFY/ACCELL 4GL Upgrade Kit—from Runtime to Full System; up to 16 users	4,150	500
SND0666T	UNIFY/ACCELL 4GL Upgrade Kit—from Runtime to Full System; up to 64 users	6,150	740
SND0684T	C-ISAM; up to 16 users	450	55
SND0687T	C-ISAM Upgrade Kit; up to 32 users	900	110
SND0688T	C-ISAM Upgrade Kit; up to 64 users	1,350	160
OFFICE PROCESSING			
Mono or Dual Processor			
SNU0670T	Uniplex-II Plus Basic System; up to 16 users	1,995	240
SNU0671T	Uniplex-II Plus Report Writer; up to 16 users	395	50
SNU0672T	Uniplex-II Plus E-Mail and Calendar; up to 16 users	395	50
SNU0660T	Uniplex-II Plus Upgrade Kit; from 16 to 32 users	1,000	120
SNU0655T	Uniplex-II Report Writer Upgrade Kit; from 16 to 32 users	200	25
SNU0662T	Uniplex-II E-Mail and Calendar Upgrade Kit; from 16 to 32 users	200	25
SNU0663T	Uniplex-II Plus Upgrade Kit; from 32 to 64 users	1,000	120
SNU0654T	Uniplex-II Plus Report Writer Upgrade Kit; from 32 to 64 users	200	25
SNU0653T	Uniplex-II Plus E-Mail and Calendar Upgrade Kit; from 32 to 64 users	200	25
COMMUNICATIONS			
Mono Processor			
SNC0688	VIP 7800 Emulator	500	60
Dual Processor			
SNC0638	VIP 7800 Emulator Upgrade to Dual Processor	400	50
Mono or Dual Processor			
SNC0680T	BSC 3270 Emulator	750	90
SNC0681T	BSC 2780/3780 Emulator	500	60
SNC0682T	BSC 3270/3770 Emulator	1,250	150
SNC0685	VIP 7800 Pass-Through to Bull HN Host	100	NA
SNC0684	XPS-100 to Host via Kermit F/T	500	60
SNM0709	PC VIP Emulation	400	50
SNC0686	XPS-100 to IBM-Compatible PC via Kermit F/T	500	60
SNC0687	Kermit Pass-Through for PC to Bull HN Host via XPS-100	100	NA
SNC0690	TTY Pass-Through	250	30
SNC0691T	X.25/X.29 Network Support	1,000	120
SNC0692T	X.3/X.28 PAD Emulator	200	25
SNC0693T	LAN TCP/IP	990	120

NA—Not applicable. ■