AT&T 3B Superminis

MANAGEMENT SUMMARY

UPDATE: *Since our last report, AT&T has introduced the multiprocessor 3B4000; enhanced the 3B15 systems with optional co-processor and SCSI peripheral support; introduced the 600 family of terminals; initiated efforts to standardize the UNIX operating system; and continued to pursue its voice and data networking strategy with new networking and communications products. The 3B5 systems are no longer actively marketed; however, the high-end 3B2/500, 3B2/600, and 3B2/700 supermicros are price/performance alternatives. The 3B20 systems are essentially unchanged.*

The AT&T Data Systems Division (DSD) has come a long way since its entry into the computer business in 1984. At that time, the vendor was still largely focused on telecommunications and did not yet have its organization in place to sell computers. The DSD suffered tremendous losses, and industry analysts predicted that AT&T would dispose of the division. Backed by the resources of the rest of the company, however, and intent on becoming successful, AT&T has extended the time line for the DSD to become profitable beyond 1989.

To achieve profitability, the vendor continues to introduce new computer products to the commercial market, at the pace of two major announcements a year. AT&T has also elevated the DSD to group status, renamed it the Data Systems Group (DSG), and armed the group with a 1,000-person sales and service force dedicated to selling and supporting computer products.

The 3B4000

AT&T introduced the multiprocessor 3B4000 to extend the upward migration path of its 3B2 and 3B15 computer

AT&T targets the 3B15 and 3B4000 superminicomputers at transaction processing and departmental computing in large corporate computing environments. Although the 3B20 systems are not actively marketed, AT&T continues to offer these systems to its installed base of 3B20 users. All the 3B systems run the AT&T UNIX System V operating system. The 3B15 is hardware and software compatible with the 3B4000.

MODELS: 3B15/301 and 401; 3B20S and 3B20A; 3B4000.
MEMORY: 2 megabytes to 240 megabytes.
DISK CAPACITY: 134 megabytes to 27.2 gigabytes.
WORKSTATIONS: Up to 440 physically connected; up to 300 concurrent users.
PRICE: $51,000 to $146,000 (core system prices).

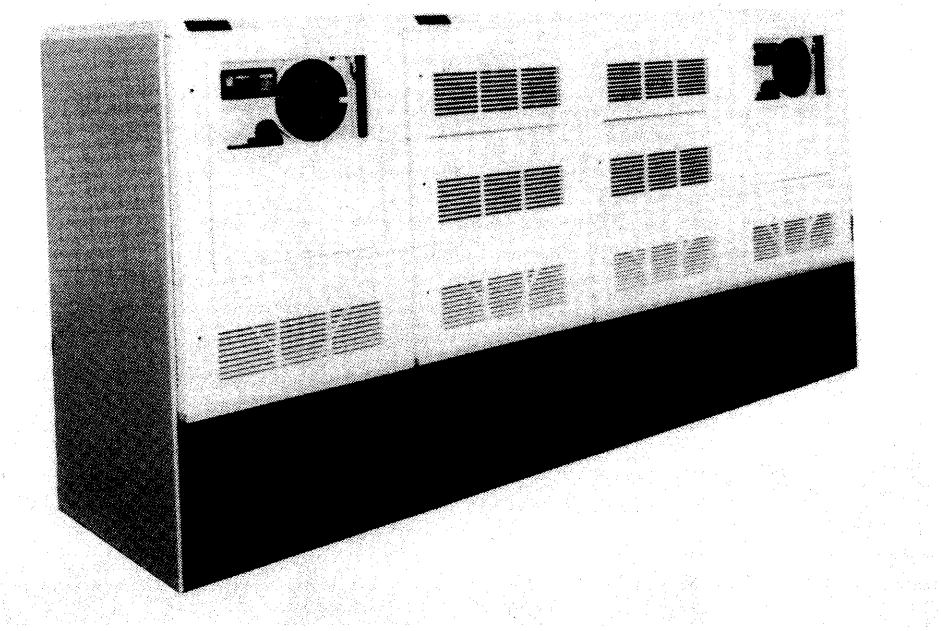
CHARACTERISTICS

MANUFACTURER: AT&T Data Systems Group, 295 N. Maple Ave., Basking Ridge, New Jersey 07920. Telephone (201) 221-2000.

CANADIAN ADDRESS: AT&T Canada, Inc., 1500 Don Mills Road, Suite 500, Don Mills, Ontario M3B 3K4. Telephone (416) 449-4300.

DATA FORMATS

BASIC UNIT: 32-bit word.



Based on a modular architecture, AT&T's 3B4000 can be expanded from a 3-cabinet core system to a 24-cabinet system that provides over 40 MIPS of processing power. The systems are marketed as departmental computers in large companies.

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CHART A. SYSTEM COMPARISON

MODEL	3B15/301	3B15/401	3B20S	3B20A	3B4000
SYSTEM CHARACTERISTICS					
Date of introduction	June 1985	1986	March 1984	March 1984	September 1987
Date of first delivery	December 1985	1986	March 1984	March 1984	March 1988
Operating system	UNIX System V	UNIX System V	UNIX System V	UNIX System V	UNIX System V
Upgradable from	—	—	Not applicable	3B20S	Not applicable
Upgradable to	3B4000/15	3B4000/15	3B20A	Not applicable	Not applicable
MIPS	1.6-2.7	1.6-2.7	1.0	1.5-1.8	46.4, fully configured
Relative performance (based on a rating of the 3B20S at 1.0)	0.91	0.91	1.0	1.5-1.8	46.4
MEMORY					
Minimum capacity, bytes	2M	2M	2M	2M (each CPU)	8M (MP); 16M (EADP); 8M (ACP)
Maximum capacity, bytes	16M	16M	16M	16M (each CPU)	240MB fully configured
Type	DRAM	DRAM	DRAM	DRAM	—
Cache memory	16KB	16KB	16KB	16KB (each CPU)	16KB
Cycle time, nanoseconds	245	245	400	400	—
Bytes fetched per cycle	—	—	4	4	—
INPUT/OUTPUT CONTROL					
Number of channels	16	16	—	—	—
High-speed buses	3	3	—	—	1 ABUS
Low-speed buses	None	None	—	—	8 SCSI
MINIMUM DISK STORAGE	134MB	40MB	256MB	256MB	300MB
MAXIMUM DISK STORAGE	3.6GB	4.65GB	8.8GB	8.8GB	27.2GB
NUMBER OF WORKSTATIONS	128 (25-60 concurrently active)	128 (25-60 concurrently active)	256 (100-150 concurrently active)	256 (100-150 concurrently active)	440 (300 concurrently active)
COMMUNICATIONS PROTOCOLS	Async, sync, BSC/3270, SNA/3270, TTY, RJE, 3BNet, Ethernet, ISN, X.25, uucp, Datakit, TCP, LU6.2,	Async, sync, BSC/3270, SNA/3270, TTY, RJE, 3BNet, Ethernet, ISN, X.25, uucp, Datakit, TCP, LU6.2	Async, sync, X.25, HDLC, RJE, 3BNet, Hyperchannel, Ethernet, ISN, DDCMP	Async, sync, X.25, HDLC, RJE, 3BNet, Hyperchannel, Ethernet, ISN, DDCMP	Same as 3B15 systems
CORE SYSTEM PRICE	$51,000	$44,000	$139,000	$194,000	$146,000

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

systems, thus making the product line more competitive in the departmental computing market. The 3B4000 is based on a modular architecture that enables system processing power, user support, and storage capacity to be increased in small, affordable increments. This architecture allows the system to be tailored to meet the processing needs of individual departments within an organization. In addition, because the system can be expanded to near-mainframe processing and storage capacity, it can function as a host system for a number of distributed 3B2 and 3B15 systems.

AT&T also targets the 3B4000 at the transaction processing marketplace with its support for the AT&T Tuxedo transaction processing system. The Tuxedo system includes transaction processing applications, database management tools, a structured query language, and a fourth-generation language for applications development. The 3B4000 also runs several industry-standard DBMS packages, including the full line of Informix Software Inc.'s Informix data base products, Oracle Corporation's Oracle, Relational Technology, Inc.'s Ingres, and Unify Corporation's Unify.

The 3B4000 core system includes the Master Processor, which performs at 1.6 million instructions per second (MIPS), runs the complete UNIX operating system, and dynamically allocates processes to adjunct processors. The core system also includes an ABUS cabinet, which houses the ABUS backplane, and a Data Communications Cabinet, which houses Adjunct Communications Processors (ACPs), which perform at 2.7 MIPS.

FIXED-POINT OPERANDS: The 3B15 systems read and write data in word (32 bit), halfword (16 bit), or byte (8 bit) lengths. Bytes and halfwords are automatically expanded to 32-bit words for processing. The 3B20 systems handle 8-, 16-, 32-, and 64-bit integers. All have the same format; the high-order bit is used as the sign.

FLOATING-POINT OPERANDS: The WE 32106 Math Accelerator Unit (MAU) provides floating-point capabilities on the 3B15 systems. The WE 32106 MAU provides single (32 bit), double (64 bit), and double-extended (80 bit) precision and the following functions: add, subtract, multiply, divide, remainder, negate, absolute value, square root, compare, move, and rounding to integral value.

The WE 32206 MAU is standard on the 3B4000. The MAU provides four additional registers; built-in trigonometric functions; and performance of 2.8 MWhet at 24MHz and 3.5 MWhet at 30MHz. In math-intensive applications, the MAU transfers math functions from software to hardware, relieving the CPU of the additional processing and improving performance.

The 3B20 systems accommodate both single-precision (four byte) and double-precision (eight byte) formats; in both formats, the high-order bit is the sign. Single-precision fractions are 23 bits long and the exponent is 8 bits long; double-precision fractions are 52 bits in length, with the exponent 11 bits long. The MAU is optional on the 3B20S and 3B20A computers.

INSTRUCTIONS: The 3B15 instructions are divided into the following functional groups:

- **Data Transfer instructions, which copy data to and from registers and memory.**

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The core system is expanded by adding up to nine Enhanced Adjunct Data Processors (EADPs), each providing up to 3.5 MIPS of processing power and two Small Computer System Interface (SCSI) buses. Four of the EADPs can be used to connect storage devices, for a total of 27.2 gigabytes of disk storage and four tape drives. The 3B4000 also supports up to five ACPs; each ACP connects up to 88 terminals, for a total of 440 physical connections. Depending on the application, up to 300 users are supported concurrently.

COMPETITIVE POSITION

AT&T's global strategy is to sustain its core business of long-distance networking, extending it from voice to data, and to continue in the design, manufacture, and sales of telephone equipment. AT&T's strategy for marketing its computers is to build upon its presence as a telecommunications provider within large organization and to offer networking solutions that integrate its computers to provide voice and data communications. AT&T calls this strategy data networking, but it is more generally known throughout the industry as departmental computing. Although Digital Equipment Corporation pioneered, and now dominates, this computing methodology, AT&T is the first vendor to integrate voice and data in the departmental arena.

AT&T's strategy focuses on five basic workgroups, extending from the PC LANs at the low end to more elaborate configurations at the high end. The five workgroups are the PC workgroup; the Departmental workgroup; the Production workgroup; the Campus workgroup; and the Corporate workgroup. AT&T intends its 3B2 and mid-range 3B systems to be implemented at the Departmental workgroup level as network processors for PC workgroups and as gateways to corporate mainframes. Through AT&T's networking and communications products, the Departmental workgroup becomes a part of the larger, more complex Production, Campus, and Corporate networks. Target market segments include departmental computing environments within large corporations, the AT&T installed base of 3B2 and 3B systems, VARs, Regional Bell Holding Companies, software developers, and UNIX system users.

AT&T hopes that by providing integrated computer and networking structures, it can encourage users to plan computer and network purchases at the same time and place multiple orders for AT&T systems. This strategy may be somewhat successful in certain applications markets, for example, telemarketing. But for general-purpose data processing, acceptance will be more limited for several reasons. First, DP users typically install departmental systems on a piecemeal basis to meet processing needs as they arise. The systems are usually integrated into existing networks, or the networks are installed later when intersystem communications becomes necessary. Second, the departmental computing market is already dominated by Digital Equipment and IBM. Furthermore, the departmental mid-range systems have been losing market share

- **Arithmetic instructions, which perform arithmetic operations on one, two, or three operands.**
- **Logical instructions, which perform a logical operation on one, two, or three rotate and logical shift (left or right).**

INTERNAL CODE: ASCII for text-oriented data; binary for calculations.

MAIN STORAGE

TYPE: Dynamic Random Access Memory (DRAM).

CYCLE TIME: Refer to Chart A for the cycle times on the various 3B models.

CAPACITY: Main memory capacities on the 3B computers range from 2 megabytes on the 3B15 to 240 megabytes on the fully configured 3B4000. Refer to Chart A for the memory capacities of specific models.

Each processor unit in a 3B4000 configuration is equipped with memory. The Master Processor (MP) includes 8 megabytes, expandable to 16 megabytes in 2-megabyte increments. The Enhanced Adjunct Data Processor (EADP) includes the maximum of 16 megabytes. The Adjunct Communications Processor (ACP) includes 8 megabytes, expandable to 16 megabytes in 4-megabyte increments.

CHECKING: The memory for all 3B systems features double-bit error detection and single-bit error correction.

STORAGE PROTECTION: The 3B15 provides demand paged memory management through the WE 32101 Memory Management Unit (MMU), a 32-bit bus-structured device providing logical-to-physical address translation, memory organization, control, and access protection. The MMU maps virtual memory addresses to physical memory addresses, allowing up to 4 gigabytes each of virtual and physical address space. The MMU also accommodates demand segmented virtual memory systems. The MMU offers four types of access protection—execute only, read/execute, read/write/execute, and no access—at each of four execution levels (kernel, executive, supervisor, and user).

Each 3B4000 processor unit is equipped with an MMU that performs logical-to-physical address translation and access protection. The MP and ACP use the WE 32101, and the EADP uses the WE 32201. The 3B4000 also supports demand paging and up to 4 gigabytes of virtual address space.

RESERVED STORAGE: The minimum reserved storage in 3B15 systems is 512 kilobytes for the UNIX kernel and drivers; disk buffer cache requires an additional 512 kilobytes to 1 megabyte.

CACHE MEMORY: The 3B15 includes 16 kilobytes of cache memory. The 3B4000 MP includes 16 kilobytes of cache memory.

The 16-kilobyte cache on the 3B20 computers is divided into two 8-kilobyte units: one for standard memory cache and the other for a subroutine return stack. (UNIX applications typically consist of many subroutine calls, so the 3B20 cache is optimized for the UNIX environment.)

CENTRAL PROCESSOR

GENERAL: The 3B15 is based on the 14MHz WE 32100. The processor performs address and data calculations independently. The 32-bit CBUS carries the results of data

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CHART B. MASS STORAGE

MODEL	73634	74280/81	73635	74286/87	73543	73524
Type	Fixed	Removable	Fixed	Fixed	Fixed	Fixed
Controller model	IDFC/SMDC	DFC	IDFC/SMDC (3B5 & 3B15); DFC (3B20)	DFC	SCSI	SCSI
Drives per subsystem/controller	2 per SMDC, 4 per IDFC	8	2 per SMDC, 4 per IDFC; 8 per DFC	8	6	6
Formatted capacity per drive, megabytes	134	256	279	550	300	570
Number of usable surfaces	10	19	12	20	12	13
Number of sectors or tracks per surface	—	823 tracks	711 tracks	823 tracks	—	—
Bytes per sector or track	512/sector	512/sector	512/sector	512/sector	256/sector	256/sector
Average seek time	30 ms	30 ms	20 ms	25 ms	19 ms	19 ms
Average rotational/relay time	8.3 ms	8.3 ms	8.3 ms	8.3 ms	—	—
Average access time	38.3 ms	38.3 ms	28.3 ms	33.3 ms	—	—
Data transfer rate	1.2MB/sec.	1.2MB/sec.	1.2MB/sec.	1.2MB/sec.	7MB/sec.	18.8MB/sec.
Supported by system models	3B15	3B20S/3B20A	3B15/3B20	3B20S/3B20A	3B15/3B4000	3B4000, 3B15 Model 401
Price	$12,000	$21,000 (single-port); $23,000 dual-port	$15,250	$26,000 (single-port); $28,000 (dual-port)	$13,000	$25,000

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

to high-performance PCs and PC LANs implemented as departmental systems. Finally, AT&T's systems must first achieve credibility as standalone units before they will be accepted as part of a data network.

Emphasis on total AT&T solutions—rather than on sales of individual 3Bs for specialized applications processing within existing networks and multivendor environments—may even be hindering sales of the systems. Large corporate users are accustomed to looking to IBM and, more recently, Digital Equipment as total systems providers, but AT&T has not yet achieved such a status.

New Market Alliances

AT&T has formed alliances with other computer vendors that have developed the technology it needs to become competitive. AT&T can now invest development resources outside the company, financing and fostering expertise in organizations that have already established leadership positions in the market.

AT&T has developed a technology-sharing alliance with Sun Microsystems Inc., and its agreement in principle to purchase up to 20 percent of Sun has attracted a great deal of attention in the marketplace. The two vendors are working together to develop a merged version of the UNIX operating system, and AT&T has licensed Sun's RISC Scalable Processor Architecture (SPARC) chip for use in new AT&T mid-range systems. AT&T will benefit from the high-performance technology already available from Sun, from the work Sun has already done in merging UNIX, and by association, from Sun's image as a leading edge vendor. Sun will benefit from the financial resources provided by AT&T and from AT&T's plans to first implement the merged UNIX operating system on its own SPARC-based mid-range computer systems. AT&T's use of the chip in general-purpose computers will give Sun some of the market leverage it needs to have its chip accepted as an industry-standard architecture. Furthermore, because unified UNIX will first be available on the

manipulation, while the 32-bit ABUS handles instruction stream and memory board operand accesses. Data is passed between the ABUS and the CBUS over a 32-bit bidirectional bus multiplexer. The CPU's address bus can access 4 gigabytes of virtual memory to address main memory or feature cards. In addition to the address and data buses, the processor also has an 18-bit status bus.

The 3B15 can also be equipped with the Demand Paging Central Control (DPCC) co-processor that, according to AT&T, increases system performance up to 40 percent and increases concurrent user support capacity from 60 users to 80 users. When added to the 3B15, the DPCC becomes the slave processor in a tightly coupled master/slave multiprocessing architecture. The MP controls all requests, interrupts, I/O processing, system overhead, and any processes that require kernel processing. The slave processor executes compute-bound processes only and transfers all system processing to the MP. If there are no compute-bound processes to be performed, the slave remains idle. In the event of a buildup, the MP will perform processes awaiting execution by the slave.

The DPCC co-processor consists of a WE 32100 CPU; two WE 32101 MMUs; a WE 32106 MAU; a small amount of on-board memory; and a write-through cache that supports full, direct memory access invalidation.

Each 3B4000 processor unit is equipped with a CPU. The MP, which can function as a standalone processing unit, manages the overall processing of the system and allocates processes to the adjunct processors. The MP runs the kernel of the UNIX operating system, maintains the root file system, and supports the system console and some networking and printing capabilities. The MP communicates with adjunct processors via the ABUS.

Each of the adjunct processors runs a portion of the UNIX operating system; provides additional computational power; and performs specific system functions, including communications processing, data storage, and tape backup support. The adjunct processors require the support of the MP for centralized service. The EADP is a single-board computer that fits into slots in the ABUS cabinet and provides access to disk and tape storage via integrated SCSI buses. The ACP, a modified 3B2/600, supports terminals, some networking connectivity, and serial printers.

The MP CPU, which processes up to 1.6 million instructions per second (MIPS), is based on the 14MHz

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CHART C. WORKSTATIONS

MODEL	4418	605 BCT	610 BCT	615 MT	620 MTG	630 MTG
DISPLAY PARAMETERS						
Max. chars./screen	1,920 or 3,168	1,920 or 3,168	1,920 or 3,168	1,920 or 3,168	1,920 or 3,168	1,024 x 1,024 pixels
Buffer capacity	1 page	1 page	1 page	1 page	1 page	1 page/window
Screen size (lines x chars.)	24 x 80 or 132	24 x 80 or 132	24 x 80 or 132	24 x 80 or 132	24 x 80 or 132	24 x 80/109/132
Tilt/swivel screen	Tilt standard	Yes	Tilt/swivel	Tilt/swivel	Tilt/swivel	Tilt/swivel
Symbol formation	7 x 9 or 5 x 7 dot matrix	7 x 9 or 5 x 7	7 x 9 or 5 x 7	5 x 7/7 x 9	6 x 8 in 8 x 17 (bit-mapping)	7 x 14, 11 x 14, 11 x 16
Character phosphor	Green, amber, white	Green or amber	Green or amber	Green or amber	Green or amber	Amber
Total colors/no. simult. displayed	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	—
KEYBOARD PARAMETERS						
Style	Typewriter	98-key typewriter or 103-key UNIX PC style	98-key typewriter or 103-key UNIX PC style	98-key typewriter or 103-key UNIX PC style	98-key typewriter or 103-key UNIX PC style	98-key async or 122-key synchronous
Character/code set	128 ASCII, line-drawing/ graphics, others	ANSI 3.64	5 sets	ANSI 3.64	ANSI 3.64	1
Detachable	Yes	Yes	Yes	Yes	Yes	Yes
Program function keys	24 fixed	8 programmable	16 prog., 6 fixed	36 prog.	36 prog.	6 fixed, 12 w/shift, 8 prog.
TERMINAL INTERFACE	RS-232-C	RS-232-C	RS-232-C	—	—	RS-232-C
PRICE	$1,065	$595 for controller, monitor, and keyboard	$505 for controller; $230 for monitor; $140 for 98-key keyboard	$575 for controller; $230 for monitor; $140 for 98-key keyboard	$800 for controller; $355 for monitor; $140 for 98-key keyboard	$1,225 for controller; $1,080 for monitor; $150 for 122-key keyboard
Comments	Integrated auto dial modem available; 3278-like keyboard	PC mode for MS-DOS compatibility	ANSI 3.64 compatible; opt. integrated auto dialer and modem; emulator cartridge for VT220 and 513 BCT	Multitasking terminal capability w/up to 3 terminals; emulates Digital VT220	Supports up to 6 windows; emulates Tektroniks 4010 and 4014	Features multitasking, graphics; includes 640K bytes of RAM; supports mouse, dual-host connectivity

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

SPARC processor, Sun's SPARC-based technical workstations will gain an advantage in a market where UNIX is the most widely used operating system.

AT&T and Sun are working together to create UNIX System V Release 4 (SVR 4)—a standard version of the operating system that can run across different vendors' architectures. Through this active quest for standards and promises of the Open Look Graphical Interface, which will make UNIX easier to use, AT&T has earned the support of well-known software companies. Their support is building a base of commercial applications software for UNIX. For example, Lotus Development Corporation will port its popular Lotus 1-2-3 spreadsheet package to the unified version of UNIX, and Ashton-Tate will develop a version of dBASE to run under unified UNIX. Analysts predict that AT&T may also purchase a software development company dedicated to writing UNIX applications software.

AT&T is also actively recruiting software development vendors to take part in its Open Application Operating Environment (AOE) strategy—similar to IBM's Systems Applications Architecture (SAA)—for providing a consistent applications platform across its own computer line, from the desktop to the 3B4000. AOE consists of standard operating systems (UNIX, MS-DOS, and OS/2), development tools, user interfaces, data management, and networking. Compliance with each of the AOE elements will enable software developers to write applications that run across various hardware platforms and under three different operating systems.

WE 32100. The ACP CPU, which processes up to 2.7 MIPS, is based on the 18MHz WE 32100. The EADP CPU, which processes up to 3.5 MIPS, is based on the 24MHz WE 32200.

The WE 32100 microprocessor features 32-bit data and address buses; sixteen 32-bit registers; an Address Arithmetic Unit (AAU); a 33-bit Arithmetic Logic Unit (ALU); a 32-bit barrel switch; 170 opcodes implemented in on-chip Programmable Logic Array (PLA), a procedure linkage facility, built-in system call instructions, process switch instructions for UNIX and C operations, and a macro ROM for executing operating system instructions and microsequences; a 12-byte instruction queue; a Program Counter (PC) and internal registers; a Process Status Word (PSW); and a parity tree. The WE 32106 MAU is standard on all WE 32100-based CPUs.

The WE 32200 CPU features a 256-byte instruction cache; thirty-two 32-bit registers; a 15-level interrupt hierarchy; start-of-instruction and halt pins; and BCD arithmetic instructions. The CPU provides direct support for the operating system and high-level languages; hardware support for process switching; arbitrary byte alignment for data and instructions; addressing modes to support array access; enhanced quick interrupt; loop control; and enhanced semaphore support.

REGISTERS: The 3B15 CPU has nine general-purpose and seven special-purpose 32-bit registers. On the 3B4000, the MP and ACP CPUs each include nine general-purpose and seven special-purpose 32-bit registers. The EADP CPU includes 17 general-purpose and 7 special-purpose 32-bit registers. The 3B20 computers employ 16 general-purpose registers.

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CHART D. PRINTERS

MODEL	5310	5320	470	475	471/476	447
Type	Dot matrix	Dot matrix	Dot matrix	Dot matrix	Dot matrix	Band
Speed	200 cps	200 cps	120 cps	120 cps	120 cps	600 lpm
Bidirectional printing	Yes	Yes	Yes	Yes	Yes	Not applicable
Paper size	Up to 9.5 in. wide	Up to 15 in. wide	Up to 11 in. wide	Up to 10 in. wide	4.25 to 15.5 in.	Up to 16 in.
Character formation	7 x 9 dot matrix	7 x 9 dot matrix	8 x 9 dot matrix	9 x 9 dot matrix	9 x 9 dot matrix	Full
Horizontal character spacing (char./inch)	5 to 16.5	5 to 16.5	5 to 17	Variable	5 to 17	Variable
Vertical line spacing (char./inch)	2 to 12	2 to 12	6/8	Variable	6/8	Variable
Character set	96 ASCII plus APL	96 ASCII plus APL	ASCII 128 plus AT&T proprietary	ASCII or AT&T proprietary	ASCII 128 or AT&T proprietary	Full ASCII
Controller/Interface	RS-232-C, EIA CCITT	RS-232-C, EIA CCITT	Centronics parallel	RS-232-C	Centronics parallel (471); RS-232-C (476)	Dataproducts L.C. or RS-232-C
No. of printers per controller/interface	1	1	1	1	2	—
Printer dimensions, in. (h x w x d)	5.5 x 16 x 14.4	5.5 x 21.2 x 14.4	5.4 x 15.7 x 11.3	5.4 x 15.7 x 11.3	5.35 x 19.8 x 11.22	15 x 30.3 x 25.2
Graphics capability	Yes	Yes	Yes	Yes	Yes	No
Price	$1,349	$1,659	$545	$595	$525/$845	$10,995
Comments	Variable sub-models available	Various sub-models available				

Through its communications expertise, AT&T is also expanding its networking reach into markets that may eventually become a source of revenue to the DSG. AT&T and NCR Corporation have agreed to jointly develop a voice and data communications architecture to connect NCR's point-of-sale (POS) terminals with AT&T PBXs and NCR Tower minicomputers over AT&T's networks and Premises Distribution System (PDS). NCR brings its expertise and leadership in the retail market to this alliance, while AT&T contributes its networking experience. AT&T may eventually gain enough experience and exposure in the retail market to attract new users to its mid-range systems.

AT&T has also signed an agreement with Tandem Computers to develop Integrated Services Digital Network (ISDN) interfaces for Tandem's NonStop computer systems and AT&T's 5ESS digital central office switch. Tandem markets its fault-tolerant NonStop systems primarily for transaction processing environments, which require high availability of resources. AT&T also targets the transaction market with the 3B4000, which offers a high degree of availability through its multiprocessor architecture, disk mirroring, and UNIX System V 3.1.1 enhanced maintenance features. AT&T also hopes that the 3B4000s standard operating environment, office functionality, and communications functions will make it attractive to users seeking to integrate their transaction processing applications with the rest of the organization. Establishing an alliance with Tandem and a presence within transaction processing environments gives AT&T the additional expertise and visibility it needs to compete in this market.

AT&T is also assisting Amdahl—the most active mainframe vendor in the UNIX market—in enhancing its UNIX-based UTS operating system with connectivity and communications capabilities. AT&T uses a large number of Amdahl mainframes, so by assisting with the enhancements, AT&T derives a more functional mainframe operating environment for its internal use. AT&T is also creating greater compatibility between the 3B systems and

ADDRESSING: 3B15 processors recognize commonly used address modes—absolute, displacement (or offset) from a register's contents, immediate, and register—as well as a special (expanded operand type) mode. The 3B20 computers use eight address modes: six memory modes, immediate mode, and register mode.

INTERRUPTS: The 3B15 computers recognize 15 interrupt levels. Each 3B4000 processing unit recognizes 15 interrupt levels. The 3B20 computers recognize 32 interrupt levels.

OPERATING ENVIRONMENT: The 3B15 Model 301 is housed in a cabinet 67.5 inches high, 31.74 inches wide, and 28 inches deep, weighing 750 pounds. A 550-pound growth cabinet of the same dimensions can be added.

The 3B15 Model 401 is housed in a cabinet 61 inches high, 30 inches wide, and 36 inches deep, weighing 750 pounds.

Power requirements for the 3B15 computers are 120 V AC, 15 amp, 60 Hz; typical system power consumption is 2.4 kilowatts. The 3B15 systems operate at temperatures ranging from 40 to 100 degrees Fahrenheit at 20 percent to 80 percent relative humidity, noncondensing. Heat dissipation for typical 3B15 configurations is 4.65K Btu per hour.

The 3B4000 Basic Cabinet, which houses the MP, measures 61 inches high, 31 inches wide, and 36 inches deep. The ABUS cabinet, which houses the ABUS and EADPs, has the same dimensions as the Basic Cabinet; each cabinet weighs 750 pounds. The Data Communications Cabinet (DCC), which houses up to three ACPs, has the same dimensions as the Basic and ABUS Cabinets, but weighs 550 pounds. The SCSI Peripheral Cabinet, which houses SCSI disk and tape units, has the same dimensions as the the other cabinets and weighs 550 pounds. A minimum configuration consists of 3 cabinets; a maximum configuration consists of 20 cabinets.

Operating temperatures for the 3B4000 are 40 to 100 degrees Fahrenheit (4 to 38 degrees Celsius) without tape drives and 40 to 92 degrees Fahrenheit (4 to 33 degrees Celsius) with tape drives. Relative humidity is 20 to 80 percent.

The 3B20 computers are enclosed in modular cabinets, each 76 inches (193 cm.) high, 26 inches (66 cm.) wide, and 30 inches (76 cm.) deep. Each cabinet is equipped with hinged locking front and rear doors (older versions have

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CHART D. PRINTERS (Continued)

MODEL	455	477	478	479	495	442/444/446
Type	Daisywheel	Dot matrix	Dot matrix	Dot matrix	Laser	Band
Speed	55 cps	288 cps draft	50/200	50/200	10 ppm	400/650/1000 lpm
Bidirectional printing	Yes	Yes	Yes	Yes	No	Not applicable
Paper size	Up to 15 in.	4 to 16 in.	3 to 9.5 in.	3 to 15 in.	8.5 x 14 and 8.5 x 11 in.	3 to 16 in. wide
Character formation	Full	12 x 24, 18 x 24, 36 x 24	Up to 145	Up to 240	300 x 300 dpi	Full
Horizontal character spacing (char./inch)	10, 12, 15	10 to 20, proportional	5 to 18.2	5 to 18.2	10, 12, 16.7, proportional	10
Vertical line spacing (char./inch)	6/8	3, 4, 6, 8, programmable	2, 3, 4, 6, 8, 12	2, 3, 4, 6, 8, 12	3, 4, 6, 8, programmable	6, 8, 12
Character set	ASCII 96	ASCII	ASCII	ASCII	Variable	66, 98, 128
Controller/Interface	RS-232-C, Centronics parallel	Centronics parallel, RS-232-C	Centronics parallel	Centronics parallel	IBM/Centronics parallel, RS-232-C	Triple RS-232-C, Centronics, SSI; DPLL opt.
No. of printers per controller/interface	1	1	1	1	1	—
Printer dimensions, in. (h x w x d)	7.13 x 24.5 x 15.5	6.4 x 22.4 x 15.3	5.5 x 16 x 14.4	5.5. x 21 x 14.4	15.2 x 17.7 x 19.1	44.5 x 30.75 x 26.25
Graphics capability	Yes	Yes	Yes	Yes	Yes	No
Price	$1,870	$1,695	$1,034	$1,244	$2,995	$7,225 (442); $7,795 (444); $12,995 (446)
Comments						

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

the Amdahl mainframes, thus enhancing the marketability of its mid-range systems as departmental processors in Amdahl mainframe environments.

AT&T vs the Open Software Foundation

AT&T had hoped to gain a competitive edge in the UNIX systems market by first developing a unified UNIX for its own systems, and then make it available to other UNIX vendors in the market. Although many of those vendors have appreciated AT&T's leadership role in the unification and standardization efforts, they have also expressed concern about AT&T's tight-knit relationship with Sun, fearing that the two vendors would attempt to monopolize the UNIX commercial market, and that Sun would become even more dominant in the technical workstation market.

IBM, Digital Equipment, Hewlett-Packard, and Apollo Computer—as well as European vendors Siemens, Nixdorf, and Groupe Bull—have recognized the potential strength of the AT&T/Sun alliance. These vendors have taken advantage of this market paranoia and joined forces to create the Open Software Foundation (OSF), a consortium of vendors dedicated to developing an alternative to AT&T's UNIX. The OSF vendors have invited other vendors, including AT&T, to join them and invest money and personnel to develop the alternative operating system, which will be based on IBM's AIX, itself based on UNIX System V.

It is still unclear just how much the OSF will affect the UNIX development effort and how many UNIX vendors will remain allied with AT&T and Sun or go over to the OSF side (Sun itself is reportedly vacillating). Datapro's research indicates for the most part that UNIX vendors and software houses currently allied with AT&T and Sun have not changed camps and are proceeding with caution. These vendors recognize that OSF is under the control of

locking rear doors only), allowing access to circuit packs, wiring, and cabling. Each cabinet has a floor cabling duct at the bottom rear. Filtered air is circulated through the cabinets and is exhausted through the top.

Operating temperatures for the 3B20 are 65 to 80 degrees Fahrenheit (18.3 to 30 degrees Celsius). Relative humidity is 45 to 55 percent.

INPUT/OUTPUT CONTROL

On 3B15 systems, the local bus provides the interconnection for the various subsystems. During local bus transactions, one device acts as the bus "master" and another device as the "slave." The central control provides centralized arbitration so that multiple "masters" can exist. Possible masters include the Central Control, the memory controller, a disk or tape controller, or an Input/Output Accelerator (IOA). Once a master is granted permission by the arbiter, it can address any board on the bus as a slave. The master can then write or read data to or from the internal locations on the slave. The local bus supports byte, halfword, and word data transactions; parity is carried over all local bus addresses and data.

Input/output activities are accelerated through IOAs. The IOA is a WE 32000 microprocessor-based intelligent peripheral controller that features 256 kilobytes of RAM and 96 kilobytes of CPROM. It is designed to control a number of peripheral interfaces, including the Asynchronous Data Link Interface (ADLI), Synchronous Data Link Interface (SDLI), Synchronous/Asynchronous Data Link Interface (SADLI), and Teletype Terminal Interface (TTI).

The ABUS, AT&T's proprietary, high-speed, parallel communications bus, handles all communications between the MP and the adjunct processors. The ABUS transfers data at a rate of 20 megabytes per second. The Dual Bus Interface Board provides the connection between the ABUS and the processors.

Disk and tape storage on the 3B4000 is handled via the two Small Computer Systems Interface buses on EADPs. Each SCSI bus supports up to seven I/O devices: six disk drives and one tape drive. A maximum of four EADPs can be used as file processors for access to SCSI peripherals.

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CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	73661	73665	74220	74223/24	73515
TYPE	Reel-to-Reel	—	Reel-to-Reel	Streaming	Streaming
FORMAT					
Number of tracks	9	9	9	9	9
Recording density, bits per inch	1600	1600/6250	1600	1600/6250	1600/6250
Recording mode	PE	PE/GCR	PE	PE/GCR	PE/GCR
CHARACTERISTICS					
Controller model	Local bus adapter	ITC	UN52 C.P.	UN138, UN139 C.P	SCSI
Drives per controller	4	4	4	2	1
Storage capacity, bytes	40M	109M at 6250 bpi on 2400-ft. tape	38M-40M	100M	28M (1600); 109M (6250)
Tape speed, inches per second	25	75	125	25/75	100/75
Data transfer rate, units per second	—	24KB (1600); 96.5KB (6250)	200KB	420KB	24KB/96.5KB
Streaming technology	Yes	Yes	No	Yes	Yes
Start/stop mode; speed	Not applicable	Yes	Not applicable	Yes	Yes, 25 ips
Switch selectable	No	—	—	—	—
Price	$12,000	$21,000	$24,250	$35,750	$17,500

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

proprietary system vendors—that have little interest in a standard operating system gaining more market share at their expense. Hence, it is unclear just how open the OSF product will be.

It is clear, however, that the OSF will create a distraction in the industry-wide effort to preen UNIX for the commercial market; the vendors involved in OSF have enough money to make it a long-term distraction while their own product is developed. Essentially, the OSF will preserve the current balance of power—with IBM and Digital in command—in the corporate computing market. IBM and Digital users will wait for their current providers' solutions, rather than switch to AT&T and Sun's solutions.

AT&T's best bet is to speed its UNIX development efforts and pursue niche markets where UNIX is already strong. If the vendor is still prepared to compete at the corporate commercial level, it must also elicit additional support from software houses to provide a base of commercial software far in advance of the availability of an OSF product. Such a strategy may not result in the huge market shares predicted for AT&T's UNIX in the early 1990s, but it may inhibit OSF from dramatically cutting into gains AT&T has made so far.

ADVANTAGES AND RESTRICTIONS

The 3B4000 is based on a modular architecture that provides extensive growth in processing power, from the 4.3 MIPS of the core system to 46.4 MIPS on the maximum configuration. Its modularity allows users to target bottlenecks and apply increased processing performance right where it is needed: in applications, in I/O, or in user support. This modularity also enables system components to be added or removed without disturbing overall system processing. Some 3B4000 system components are compatible with the 3B15 architecture and can be added to an existing 3B15 to upgrade it to a 3B4000/15. The 3B15 serves as the MP and supports the ABUS cabinet and adjunct processors to provide additional user support and storage capacity equal to that of a 3B4000.

A co-processor is available for 3B15s that, according to AT&T, boosts system processing performance by 40

The 3B4000 can also be configured for greater data protection with Enhanced Data Availability (EDA). EDA allows two EADPs used as file servers on different 3B4000 systems to be connected to the same SCSI bus and provides administrative software that locks a specific disk to be used by a specific processor.

CONFIGURATION RULES

GENERAL: The 3B15 core systems includes a CPU and 2 megabytes of memory expandable to 16 megabytes. The system supports up to twelve 12 built-in 300-megabyte disk drives, or eight 570-megabyte disk drives, for maximum of 4.6 gigabytes of disk storage.

With the 3B4000/15 migration package, the 3B15 can be upgraded to a 3B4000/15. The 3B15 functions as the MP and continues to support currently attached terminals and peripheral devices. An ABUS and ACPs are added to increase user support up to 300 active users.

The 3B4000 system core consists of a Basic Cabinet, which houses the MP with 8 megabytes of memory; the ABUS cabinet, which houses the ABUS backplane, a 300-megabyte disk drive used as a boot device, and a 120-megabyte cartridge tape drive for loading software; and a Data Communications Cabinet (DCC), which houses one ACP with 8 megabytes of memory. In addition, a tape drive can be housed in the Basic Cabinet and a 300-megabyte disk drive can be housed in the DCC.

To expand system capacity, adjunct processors, memory, peripherals, and cabinets can be added. The maximum configuration of the 3B4000 supports one MP, one ABUS, up to nine EADPs, up to five ACPs, up to 27.2 gigabytes of disk storage, and four tape drives. The MP supports 8 to 16 megabytes of memory; each EADP supports 16 megabytes of memory; and each ACP supports from 8 to 16 megabytes of memory. A maximum 3B4000 configuration will support up to 240 megabytes of memory.

The EADPs reside in the ABUS Cabinet. The ACPs reside in the Data Communications Cabinets, which house up to three ACPs each. Disk and tape drives are housed in SCSI Peripheral Cabinets. A maximum configuration requires 20 cabinets.

Only four EADPs are supported as file processors accessing disk and tape storage. An EADP is equipped with two SCSI buses. Each SCSI bus supports attachment of six disk drives and one tape drive. Five additional processors can be added to increase system processing capacity.

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percent—or from 1.6 to approximately 2.2 MIPS. The co-processor operates in a master-slave relationship with the original CPU and executes only compute-bound processes; therefore, only compute-intensive applications benefit from the additional processor.

AT&T has continued to enhance the UNIX operating system. The 3B4000 runs UNIX System V Release (SVR) 3.1.1, in which the System V Interface Definition (SVID) of UNIX SVR 3.1.1 has been extended to allow the UNIX system kernels to run across the MP and adjunct processors; it still presents a single-system interface to the user. The 3B15 also supports SVR 3.1.1, which allows it to be upgraded to a 3B4000/15. If the upgrade is configured with adjunct processors, the operating system runs across all the processors, yet continues to present a single-system image to the user. In addition to enhancing UNIX for the 3B4000's multiprocessor architecture, AT&T has also improved the functionality of the operating system with new programming, networking, and ease-of-use features.

Both the 3B15 and 3B4000 support SCSIs, enabling the systems to connect industry-standard peripheral devices. This support increases users' options in selecting add-on storage devices. SCSIs are standard on the 3B4000 EADPs. On the 3B15, they are optional controller boards.

The 3B15 and 3B4000 also support disk mirroring, which provides for storage of identical data on two different disks. If one of the disks fails, the data is still accessible from the duplicate disk. The 3B4000 can be configured for higher data availability by using Enhanced Data Availability (EDA). EDA allows an SCSI bus to connect disks on two 3B4000s. If one of the 3B4000 systems goes down, the data can still be accessed by the other system.

The 3B15 and 3B4000 support many of the same peripherals, enabling users to maintain their investments in terminals and storage devices when migrating upward.

UNIX source-code compatibility allows the 3B systems to run many of the same applications. UNIX System V also provides object-code compatibility among the 3B2 supermicros and 3B superminis, requiring little conversion to migrate applications from a 3B2 to mid-range 3B system. The 3B15 and 3B4000 are source-code compatible, but not object-code compatible with the 3B20 systems; conversion to and from the 3B20 is therefore more complex. AT&T is, however, developing tools to ease this migration and thus generate a growth path from the 3B20 to other systems in the 3B product line.

The 3B family supports extensive networking and connectivity products, substantiating AT&T's efforts to market the systems as departmental and workgroup processors that can integrate with other AT&T products, as well as coexist in IBM and Digital Equipment environments. Emulation software is available that allows the 3Bs to emulate a variety of IBM terminal devices and transfer files to

WORKSTATIONS: The 3B15s connect up to 128 workstations; up to 60 users can be concurrently active, and up to 80 users can be concurrently active if the 3B15 is equipped with a DPCC processor. The 3B4000 connects up to 440 workstations, 300 of which can be concurrently active. 3B20 computers connect up to 256 workstations; 100 to 150 can be concurrently active, depending upon the application.

DISK STORAGE: The 3B15 Model 301 supports up to 3.6 gigabytes of disk storage; the 3B15 Model 401 supports up to 4.6 gigabytes. 3B15 disk storage is handled via the SCSI Local Interface Controller (SLIC), which has host adapters for two SCSI buses. Each SCSI bus supports six 300-megabyte disks (or four 570-megabyte disks on the Model 401) and one tape drive. The 3B15 Model 401 also supports mirrored disk storage.

The 3B4000 supports up to four EADPs configured as file processors. Each EADP provides two SCSI buses, for support of up to 12 such disks. Hence, a system configured with four EADPS will support up to 48 570-megabyte disks for the maximum storage capacity of 27.2 gigabytes.

The 3B4000 also supports mirrored disk capabilities, allowing data to be written to two disks on independent buses. The 3B4000 supports up to 13.6 gigabytes of mirrored disk storage.

MAGNETIC TAPE: Each 3B15 model accommodates up to four nine-track SCSI tape drives. Two types of drives are available: single-density 1600 bpi or dual-density 1600/6250 bpi. The 3B4000 supports up to four SCSI-base tape drives via SCSI buses on the EADPs attached to the system.

MASS STORAGE

For information on available mass storage devices, refer to Chart B.

INPUT/OUTPUT UNITS

See Chart C for workstations, Chart D for printers, and Chart E for magnetic tape equipment.

The 3B15 and 3B4000 also support the AT&T 435 Plotter, designed for color graphics. Using the HPGL graphics protocol, the 435 has a six-pen carousel that can plot on 8½-by-11 inch or 11-by-17 inch paper or on 8½-by-11 inch glossy presentation paper and transparency film. The plotter employs an RS-232-C interface and is compatible with software from Graphics Software Systems.

COMMUNICATIONS CONTROL

GENERAL: The 3B15 and 3B4000 data networking capabilities enable the systems to be integrated into AT&T, UNIX, IBM SNA, and standard protocol-based multivendor networked environments. The 3B4000 supports the Intelligent Serial Controller (ISC) boards, and both systems support the 3BNet Interface, the Information Systems Network (ISN) Interface, and the Datakit Virtual Circuit Switch (VCS) Interface.

The *Intelligent Serial Controller (ISC)* card provides gateway communications to an IBM host environment and to X.25 networks. The integrated Intel 80186 processor, in conjunction with downloaded software, supports BSC, SNA/SDLC, and X.25 protocols. Running in conjunction with AT&T Emulator+ software packages, the ISC also offers BSC/RJE, SNA/3270, and BSC/3270 connectivity for two to four simultaneous users. The ISC provides two serial

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and from IBM hosts. The 3B systems also support industry-standard communications, including Ethernet, TCP/IP, LU6.2, and X.25.

Providing connectivity into office automation and departmental computing environments, AT&T's Mail Gateway400 allows AT&T Mail users to send electronic mail to public and private messaging systems that also use the CCITT X.400 recommendation for message handling. Gateway400 links to Digital's Mailbus system, allowing AT&T Mail users to exchange messages with Digital ALL-IN-1 systems using Digital's Message Router X.400. The 3B systems also support AT&T's Document Exchange system, which provides for electronic messaging between IBM, Wang, Digital Equipment, and AT&T office systems.

The 3B15 can also participate in an AT&T STARLAN PC NETWORK; through the PC Interface software and hardware, it can function as a server for MS-DOS PCs in STARLAN. □

ports (one operates up to 19.2K bps, the other up to 9.6K bps), 128 kilobytes of RAM, and NRZ/NRZI data encode/decode; it supports a maximum of 20 sessions with data transfer rates up to 19.2K bps. The ISC works with X.25 Network Interface Software's ancillary Packet Assembler/Disassembler (PAD), which executes as firmware on the ISC board.

The *3BNet Network Interface Card* provides Ethernet protocol processing for the 3BNet LAN, the Ethernet version of PC Interface, and the TCP/IP interface. 3BNet is a high-speed, Ethernet-based LAN that employs Carrier-Sense Multiple Access/Collision Detection (CSMA/CD). It transfers data at 10M bps over coaxial cable and uses an 80186 microprocessor-based interface to accept all protocol, flow control, and maintenance overhead downloaded from the attached computers. 3BNet provides for file transfers between computers, remote execution of commands and programs, and electronic mail. 3BNet also provides the ability to write applications that use Ethernet as a network communications facility to provide interprocess communications; to select packet sizes up to 1500 bytes on the system; and to monitor and configure the network from a single terminal. 3BNet kits include the Network Interface card, cables, and transceivers; they are available for installing 3BNet over varying cable distances. The 3B20 systems are also supported on 3BNet.

The *Information Systems Network (ISN)* is AT&T's proprietary LAN for building complexes and campuses. It permits networking of 3B superminis and 3B2 systems with computers from other manufacturers. ISN is based on a short, centralized bus structure incorporating attributes of star networks, distributed buses, and distributed token rings. ISN components include a packet controller, a control console for system initialization and administration, and concentrators. ISN can use both fiber optic and four twisted-pair copper wire distribution cables. It can also be interconnected with AT&T's Systems 75 and 85 PBXs. ISN can be integrated with single STARLAN NETWORKs or bridge together multiple STARLAN NETWORKs, providing access to ISN services.

SOFTWARE

AT&T offers a range of software products, both proprietary and developed by third parties. Products developed by other vendors and discussed in the following section are all available directly from AT&T.

OPERATING SYSTEM: *UNIX System V*, the operating system for the 3B computer family, is a general-purpose, multiuser, multitasking, interactive operating system. The two major components of UNIX System V are the file system and the shell, or command language.

The file system consists of a uniform set of directories and files arranged in a tree-like structure. Some features of the file structure are:

- **Consistent naming conventions; file names can be fully qualified or relative to any directory in the file system hierarchy.**
- **Mountable and demountable file systems and volumes.**
- **File linking across directories.**
- **Automatic file space allocation and deallocation transparent to users.**
- **Flexible directory and file protection modes that allow all combinations of read, write, and execute access.**
- **Facilities for uniformly creating, accessing, moving, and processing files, directories, or sets thereof.**
- **Uniform device input/output handling among terminals, disk files, and main memory. Each physical input/output device, from interactive terminals to main memory, is treated like a file.**

UNIX System V supports file systems with 512- or 2048-byte blocks and 512- or 2048-byte buffers for enhanced file system throughput in operations requiring a large number of reads and writes.

The shell is the user/system interface program that interprets command links input by the user from a terminal. The UNIX system shell is not only an interactive command language, but also a full programming language. It can be used to create scripts that establish the operating environment by defining the variables and the conditional and interactive constructs under which commands and shell programs are executed. Through the shell, users can add to and change the environment according to specific individual and group requirements, adapting the operating system to varied and unique applications without resorting to compiled programs. The UNIX Operating System typically runs unattended.

Other features of UNIX System V include support for the C language; protection for disk file systems; access to the facilities of other (host) computer systems; and tools for development, diagnostics, system administration, system services, and text processing.

The 3B15 and 3B4000 run UNIX SVR 3.1.1, which provides all features of previous versions, as well as new features such as demand paging, Remote File Sharing (RFS), Streams, mandatory and advisory file and record locking, Transport Level Interface (TLI) and Transport Provider Interface (TPI), Media Independent UNIX-to-UNIX Copy (uucp), shared libraries, Internationalization, and Assist Software. Under demand paging, the computer loads only a portion (called a page) of the program into memory. As a result, the computer memory can accommodate more programs in memory at a single time. Users experience faster response times and can run programs larger (up to 1.99

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gigabytes) than the computer's memory. RFS allows users on SVR 3.1.1-based 3B systems to share files with SVR 3.1.1-based systems over a STARLAN NETWORK.

SVR 3.1.1 has also been enhanced to take advantage of the 3B4000's modular architecture. The System V Interface Definition (SVID), AT&T's operating system interface, has been extended to allow kernels on the MP and adjunct processors cooperate with each other to provide a single virtual machine interface to the user.

The Streams option allows users to share applications software among different points of the network without regard to network protocol or hardware. On most operating systems, a program must be produced for each network supported. Problems arise when changes occur in any of the several layers of protocol translations; changes in one layer may require the rewriting of network software. Streams breaks this process down into a series of small, reusable modules, one for each step in the protocol translation process. Networks are connected by putting these modules together like building blocks. When a protocol changes, one module is exchanged for another module rather than rewriting the entire program.

TLI and TPI provide applications writers with a standard interface to protocol services, eliminating problems of incompatibility between applications software and networking products and ensuring that programs can take advantage of Streams. Media Independent uucp enables uucp, the basic UNIX system networking facility, to use any network compatible with TLI/TPI.

Shared libraries allow precompiled library routines to be brought in during a compile program's execution rather than during the source program's compilation. This results in more disk and memory space, since object code is more compact than source code. It also streamlines system libraries, since each library is maintained in one form—source code. A change made to a shared library globally serves all executing programs.

Internationalization supports international implementation of UNIX. A full eight-byte bit is made available for character descriptions, enabling use of non-ASCII-based international languages. In addition, ed and vi text editors have been modified so that encryption, previously available only to domestic customers, is now handled externally. The Assist software is a menu-driven interface that makes UNIX easier to use and learn.

SVR 3.1.1 also supports a set of enhanced maintenance features that help to reduce downtime, maintain data integrity in the event of failure, and ease maintenance and administration functions. Enhanced maintenance features include firmware check of system sanity, power up/auto restart, an uninterruptible power system (UPS), fan-fail alert, remote (dual) console, remote alarming, and console printer.

The 3B20 systems run UNIX System V Release 3.1 Version 4, which provides all features of previous UNIX versions. This release is available in binary and source code format on the demand paging version.

AT&T is currently working on Release 4 of UNIX System V (SVR 4), which will incorporate features of Berkeley UNIX 4.2 and 4.3, Sun Microsystems' SunOS, and Microsoft Corporation's Xenix operating systems. AT&T also plans to include new features such as realtime capabilities, improvements to system administration, enhanced networking, and features designed for international markets. AT&T has also announced the Open Look Graphical Interface for the UNIX operating system. Open Look is a user interface that employs icons and commonsense graphics symbols instead of written commands, to help users work more efficiently with UNIX.

DATA BASE MANAGEMENT SYSTEM: Available for use on the 3B15 and 3B4000, the *Tuxedo Transaction Processing System* is AT&T's system for building large, sophisticated transaction processing applications. The Tuxedo system includes *Tuxedo System/D*, a transaction processing-type DBMS that can be used alone or with the Tuxedo system products described below. System/D offers optional relational access based on the ANSI standard.

Tuxedo System/T provides the basic architecture for transaction processing applications, along with a set of development and run-time tools. Its two major components are a distributed teleprocessing monitor and a data entry system for defining forms-based applications interfaces. Tuxedo System/T supports scheduling, load balancing, tuning, and monitoring of the system.

Tuxedo/ESQL allows applications programmers to embed high-level Structured Query Language (SQL) statements in C language programs, enabling access to the Tuxedo System database. *Tuxedo/4GL* is a high-level language that provides a nonprocedural interface for database creation and access.

Several third-party, industry-standard relational DBMS products are available for the 3B product line. These include Informix Software Inc.'s line of *Informix 3.3* DBMS products: Informix-SQL 2.1, Informix-4GL 1.0, Informix-Turbo 1.1, Informix-ESQL/C, Informix-ESQL/Cobol, and Informix C-ISAM 3.0. Also available are Oracle Corporation's *Oracle*, Relational Technology, Inc.'s *Ingres*, and Unify Corporation's *Unify*. Unify's 4GL *Accell* also runs on the 3B product line.

AT&T's *Focus*, available for the 3B15, is a user-oriented 4GL and DBMS that supports both relational and hierarchical structures. Focus applications are portable across a range of computer systems, including the IBM 3270, Digital Equipment Corporation VAX systems, Wang Laboratories VS systems, and MS-DOS- and OS/2-based PCs. It also provides bidirectional data transfer between the UNIX system and mainframe systems using either an asynchronous 3270 Emulator+ card or AT&T's SNA 3270 Emulator+ card. Focus can be used in departmental computing environments to distribute applications development across a three-tiered (PC-minicomputer-mainframe) applications development environment, thus conserving mainframe resources.

LANGUAGES: Languages available for the 3B15 and 3B4000 include C language and C Programming Language Utilities (CPLU), Micro Focus Cobol 2, VS Cobol, and RM/Cobol. The 3B15 also supports Basic and Pascal.

The *AT&T RPG II Environment Development System* is compatible with language and support utilities supplied for use with IBM System/34 and /36 computers. It allows applications written for the IBM systems to be migrated to the UNIX environment. RPG II can also be used to develop new applications.

COMMUNICATIONS: For the 3B15 and 3B4000, AT&T offers host connectivity software products for AT&T/IBM networking. Host connectivity software includes the 3270 Emulator+, BSC/RJE Emulator+, SNA/RJE Emulator+, SNA/3270 Emulator+, BSC/3270 Emulator+, and 3270 Application Program Interface.

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AT&T 3270 Emulator+ provides interactive communications between ASCII terminals connected to the 3B15 or 3B4000 computers and remote IBM mainframe systems that support IBM binary synchronous communications (BSC) and SNA protocols. *3270 Emulator+ with Escort* is a structured language that runs in conjunction with the 3270 emulation software to provide access to up to 10 concurrent host application sessions under synchronous and asynchronous communications. Also working in conjunction with the 3270 emulation software, *3270 Emulator+ HLLAPI* is a High-Level Language Application Program Interface that allows for the migration of IBM 3270 PC HLLAPI-supported programs to the multiuser 3B environment.

The *BSC/RJE Emulator+* bridges 3B user files to a host or an RJE-type device that uses the BSC protocol for distributed processing and file transfers. BSC/RJE also allows the 3B15 and 3B4000 to emulate the IBM 2780 data transmissions terminal, the 3780 data communications terminal, and the HASP workstations.

The *SNA/RJE Emulator+* allows the 3B15 and 3B4000 to emulate an IBM 3770 SNA RJE workstation designed to send and receive large volumes of data over a communications line. Transmissions can take place between a workstation and a host system or between two workstations.

AT&T SNA/3270 Emulator+ allows an ASCII terminal user to access an SNA network and use the resources available to a 3278 display station user. The package emulates a remote 3274 cluster controller Model 51C, 3278 information display station Model 2, and 3287 printers.

AT&T BSC/3270 Emulator+ is functionally the same as the SNA/3270 emulator, except it emulates bisynchronous protocol for the same devices in the 3270 family. Both emulators use the interface between the IOA and SDLI on 3B15 computers.

AT&T 3270 Application Program Interface (API) provides virtual terminal facilities, allowing ASCII terminal users to access 3270 applications on a mainframe through a C language-callable interface. The API appears to the mainframe as a 3278 display station. The 3270 API does not interface at the protocol level, so there is no SNA or BSC protocol-specific code; thus, the API can be used with both the SNA/3270 and BSC/3270 Emulator+ products.

AT&T also provides the *Unified Messaging Products*, including the Unified Messaging Manager and the Unified Messaging Link. These products provide the foundation for tying together telecommunications switches (such as AT&T System 75, System 85, and Dimension systems); text services and applications that reside on AT&T's processors; services that reside on computers using UNIX System V, Release 2; and the AT&T Mail Network Service.

The *X.25 Network Interface* is a data transport package. It allows a host processor to connect to a public packet switched network (for example, AT&T's Accunet Packet Service USA or Telenet Communications Corporation's Telenet public data networks) or another processor through a point-to-point, dial-up, or dedicated connection.

The *AT&T Enhanced Transmission Control Protocol/ Internet Protocol (TCP/IP) WIN/3B Interface* provides applications protocols including mail, remote login, and file transfer. An Ethernet LAN and X.25 implementation are available and can be internetworked. TCP/IP WIN/3B Interface is available for the 3B15, 3B20, and 3B4000.

The *LU6.2* facility, available for the 3B4000, is AT&T's implementation of IBM's enhancement of SNA for peer-to-peer and peer-to-host data communications and distributed processing, also known as Advanced Program-to-Program Communication (APPC). Programs written using this product can communicate directly with partner applications programs running on other 3B2 computers and non-AT&T computers within SNA. The partner programs must also use an implementation of LU6.2 and related protocols called PU2.1 (peers), 4.0 (front-end processors), or 5.0 (hosts).

The UNIX System V *Basic Networking Utility* with the *UNIX-to-UNIX Copy Facility (cu/uucp)* provides remote login and file transfer capabilities among 3B2 and 3B superminicomputers, as well as computers from other vendors.

The 3B15 family also supports *PC Interface*, a hardware/ software link that interconnects 3B2 and 3B15 computers to PCs running the MS-DOS operating system. The PC Interface allows multiple PCs to share files and peripherals on a central 3B15 running UNIX System V. Files can be transferred back and forth from PCs to 3B15 systems. The connections are made via RS-232 media operating at speeds up to 9.6K bps and Ethernet at 10M bps. PC Interface software provides transparent sharing of files resident on 3B15s by personal computers running MS-DOS; transparent printer spooling, through which a PC user can obtain output from a printer on the 3B2; and, in conjunction with UNIX System V, control over user access privileges.

UTILITIES: UNIX System V utilities are bundled with the core system. The following types of standard utilities are provided:

- System administration—for file system maintenance, measurement, and scheduling.
- Shell programming—to aid users in creating shell programs using UNIX system commands, especially programs that run in multiple UNIX machine environments (for example, a shell program that allows the user to perform specific functions based on the type of processor in the system).
- Directory and file management—to provide single-step file and directory manipulation capabilities.
- User environment—to enhance the user interface to the UNIX system environment and provide access to commands for controlling command priority and changing environmental variables, among others.
- Editing—providing both screen and text editors based on a consistent set of commands designed for use by both inexperienced and expert users.
- Calculator—to let the user employ the mathematical capabilities of the UNIX operating system. The principal feature is an interactive processor for a language that resembles the C language but provides precision arithmetic.

Also available for the 3B15 computers is the *Software Generation System (SGS)*, a package of tools used to create and test programs for WE 32100 series microprocessors. The SGS includes 11 utilities that can perform the following functions, among others: check the contents of an object file; convert WE 32100 processor object files from one host machine format to another; compress object files by removing duplicate structure and union descriptors; disassemble

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object files to allow assembly-level debugging; dump selected parts of the named object files; generate an ordered listing of object files suitable for link editing in one pass; and perform symbolic debugging on C language code. Because the SGS operates under UNIX System V, it can use features of the UNIX system shell.

Also available for the 3B15 computers are two special development packages. *C Programming Language Utilities, Issue 4.1* comprises a C compiler and associated programming tools for producing and debugging code. It provides IEEE P754 Draft 10 floating-point support, automatically making use of the WE 32106 MAU. *CFP+ Programming Language Utilities, Issue 1*, also made up of a C compiler and tools, works with the MAU to increase floating-point performance to a reported maximum of 225K Whetstones per second.

System V Verification Suite (SVVS) is a set of test programs allowing hardware and software vendors to verify that System V ports conform to the AT&T System V Interface Definition (SVID). SVID is the specification for an operating system environment allowing applications software to be written independent of any particular computer hardware.

OFFICE AUTOMATION: AT&T provides both office productivity and office communications software for the 3B systems. The *Smart Software System* is an integrated office productivity package designed for businesses and corporate departments that need to create and maintain records and documents and to track and organize budget and other information for reports. Smart includes a word processor with a spell-checker, a spreadsheet with business graphics, a DBMS, a personal calendar, communications tools, and an application programming language. Smart project processing allows users to schedule the production of periodically required reports and documents and automatically produce them when scheduled. Smart also includes record- and file-locking capabilities, goal seeking, and a mail-merge feature. Smart applications can be shared between computers over the STARLAN NETWORK.

Also available for the 3B4000 is Syntactics Corporation's *Crystal Document Manager System*, Access Technology, Inc.'s *20/20* spreadsheet package, and two general office automation packages: *Smart* and *Uniplex*.

Office communications software packages include *AT&T Mail*, an electronic messaging service that uses both public and private networks. Subscribers can send and receive messages using a PC, data terminal, or word processor anywhere in the U.S. and via telex anywhere in the world. Subscribers access messages at their PCs and terminals with any touch-tone phone. Messages can also be sent to users who do not subscribe to AT&T Mail; the messages are entered electronically but delivered in hard copy form through the U.S. Postal Service or airborne express, or through telex or other X.400 mail service.

AT&T Mail includes *Private Message Exchange (PMX) Software*, which creates messaging networks of PCs, terminals, and STARLAN NETWORK users and transparently links these subnetworks to the public AT&T Mail network. International gateways include X.400 and X.25 connection. IBM gateways include IBM PROFS and 3780 interfaces. AT&T Mail *ACCESS Plus* provides additional services such as a personal-user directory, notification of mail received, and improved file management capabilities. The shared folder feature provides bulletin board capabilities.

AT&T Mail Exchange is an electronic mail system that facilitates communications between IBM's DISOSS and PROFS; Wang's OIS and VS systems and Wang Office software; Digital Equipment ALL-IN-1 and VMS Mail; and AT&T electronic mail. AT&T Mail Exchange also facilitates communications between IBM Document Content Architecture (DCA) and Document Composition Format (DCF), Wang standard WP, Software Systems' MultiMate, final form ASCII, and UNIX NROFF.

AT&T Office TeleSystem (OTS) integrates voice and data communications into a system that provides messaging, electronic mail, AT&T Mail Communications, PC file transfer, terminal independence, application registration, and access to external databases such as Dow Jones News Service.

AT&T is also offering an integrated, high-performance telemarketing system on the 3B4000. The system can handle large numbers of users performing telemarketing and/or office automation functions.

APPLICATIONS: Among the applications offered directly by AT&T are those for academic instruction, courseware development, communications management control, service operation management, time clock data collection and reporting, retail management, and electronic publishing. A variety of commercial applications from third-party vendors are offered through AT&T's Independent Software Vendor program. Details on available software products are provided in the *AT&T Computer Software Guide*, published twice a year.

PRICING

POLICY: The 3B15 and 3B4000 are available for purchase or lease. The 3B20 systems are available for purchase only. Volume discounts for all systems are available. List prices for all systems are quoted in the following EQUIPMENT PRICES section. The purchase price for software includes a onetime use license fee. Maintenance fees are provided on a monthly basis. Separate price schedules for spares and growth, software licensing, and fee schedules are also available.

Financing for the AT&T systems is also available through the AT&T Credit Corporation. Several financial options are available.

SUPPORT: AT&T offers tailored maintenance agreements for 3B computer systems. The agreements include combinations of toll-free hot line assistance for hardware and software and on-site service by field service technicians.

Hot line service can include remote diagnostics services in some cases. Calls will be accepted from any of a customer's employees; for those problems that cannot be resolved by telephone, a systems technician will be dispatched to the user's site.

On-site service options include:

- Business day service (AT&T's standard maintenance agreement), which provides coverage from 8 a.m. to 5 p.m., Monday through Friday.
- Around-the-clock service, which extends coverage to 24 hours a day, seven days a week, including holidays.
- Dedicated service, which allows customers to have technicians on-site for one, two, or three shifts a day for five, six, or seven days a week.
- Per-occurrence service on a time-and-materials basis.

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AT&T also offers software-only services. Options include:

- Hot line assistance, 8 a.m. to 5 p.m., Monday through Friday in all time zones.
- Hot line assistance plus on-site visits by technicians, 8 a.m. to 5 p.m., Monday through Friday.
- Hot line assistance plus on-site visits by technicians, 24 hours a day, 7 days a week, including holidays.
- Hot line assistance plus on-site technicians' visits charged on a noncontract, per-occurrence, time-and-materials basis.

The 3B systems have 90-day warranties; during that period, customers receive Business day service and hot line assistance.

TRAINING: AT&T provides hardware and software training at national and regional centers. The company also provides on-premises training in complex software packages. These training courses are in areas that include data communications, data base management, PC training, programming tools, screen management, and spreadsheet.

TYPICAL CONFIGURATIONS: The following tables show typical pricing configurations for the AT&T 3B15 and 3B4000 systems.

AT&T 3B15/301:

3B15/301 Core System; includes: 14MHz WE 32100 CPU with WE 32106 MAU, 16 kilobytes cache memory Dual maintenance ports Two RS-232-C ports for maintenance and console Main memory controller 2-megabyte main memory board Integrated Disk File Controller Storage Module Drive Controller UNIX System V operating system Basic processor cabinet Basic Control Unit Vertical growth cabinet Growth Control Unit	$ 51,000
2-megabyte add-on memory board	7,000
Two 340-megabyte fixed disk drives	26,000
High-speed 1600 bpi tape drive and controller	14,000
Three Model 475 120 cps dot matrix printers	1,785
Input/Output Accelerator	5,000
Three 8-channel asynchronous interfaces	6,750
24 605 BCT terminals	14,280
TOTAL PURCHASE PRICE:	$125,815

AT&T 3B4000:

3B4000 Core System; includes: MP with 16 kilobytes cache memory, 8 megabytes main memory; ABUS Cabinet with ABUS backplane, 300-megabyte disk drive, 120-megabyte cartridge tape, and one Dual Bus Interface Board; and a Data Communications cabinet equipped with one ACP with 8 megabytes of memory	$146,000
Two 2-megabyte add-on memory boards	14,000
One EADP with 16 megabytes of memory and two SCSI buses	30,000
SCSI Peripheral Cabinet	3,000
Five 300-megabyte disk drives	65,000
Two additional ACPs	93,000
20 8-port ACP Eports cards	26,400
150 605 BCT terminals	89,250
Two 1600/6250 SCSI tape drives	35,000
Two 1,000-lpm band printers	25,990
Miscellaneous cables, power, hardware	10,000
TOTAL PURCHASE PRICE:	$537,640

CORE SYSTEMS

3B15

		Purchase Price ($)	Monthly Maint. ($)
7355-301	3B15/301 core system; includes CPU with Math Acceleration Unit, 16KB cache, dual maintenance port function, two RS-232-C ports for console and maintenance, main memory controller, one 2MB or two 1MB main memory boards, Integrated Disk File Controller, Storage Module Drive Controller, basic processor cabinet, basic control unit, growth control unit, cooling fans, and UNIX System V	51,000	208.00
7355-401	3B15/401 core system; includes CPU with Math Acceleration Unit, 16KB cache, two RS-232-C ports for system console and maintenance, Central and Control Support, main memory controller, one 2MB memory board, Integrated Disk File Controller, Storage Module Drive Controller, Basic Control Unit, basic cabinet, UNIX System V	44,000	208.00

NA—Not applicable.

AT&T 3B Superminis

		Purchase Price ($)	Monthly Maint. ($)
3B20			
7420-240	3B20S core system; includes two CPUs, 2MB main memory, I/O processor and channel, disk controller, operator console and read-only console printer, and UNIX System V	139,000	875.00
7420-260	3B20S preattached processor core system; same as 7420-240, but includes only one processor and expansion cabinet for second processor	159,000	917.00
7420-280	3B20A core system; includes CPU, 2MB main memory, I/O processor and channel, disk controller, operator console and read-only console printer, and UNIX System V	194,000	1,000.00
3B4000			
7358-300	3B4000 core system; includes Basic Cabinet, which houses the MP with 8MB memory; the ABUS Cabinet with ABUS backplane, 300MB boot disk device, 120MB cartridge tape, and one DBIB; the Data Communications Cabinet with ACP and 8MB memory; and UNIX System V	146,000	750.00
MIGRATION KITS			
7358-310	3B4000/15 upgrade core for upgrading 3B15 to 3B4000; includes UNIX System V Release 3.1.1, ABUS Cabinet and one DBIB	32,000	162.50
CPU OPTIONS			
3B15			
73686	8KB Cache pack	4,800	NA
73722	Demand Paging Central Control (DPCC) co-processor for the 3B15	15,000	87.50
3B20S/A			
74203	Floating-point unit (UN140)	9,500	51.00
74204	DMA-1 controller (UN46)	5,500	7.00
74205	Dual serial channel pack (UN9)	2,900	9.00
74206	Power module (495FA)	1,000	2.00
74210	Attached processor upgrade with cabinet	95,000	125.00
74211	Attached processor upgrade, CPU only	80,000	83.00
3B4000			
73501	Adjunct Data Processor (ADP) with WE 32100 chip set which includes the CPU, 4MB of memory, a clock, MAU, DMA, dynamic access memory controller, and one SCSI bus	16,000	80.00
73526	Adjunct Communications Processor (ACP) conversion kit for converting a 3B/600 into an ACP for a 3B4000; includes mounting hardware, Xbus, XBI, and MAP cables. AT&T recommends professional installation	4,000	34.00
73538	Adjunct Communications Processor (ACP) with 8MB or memory, an XBI card, and a 147MB disk drive for paging capability	46,500	387.50
73546	Enhanced Adjunct Data Processor (EADP); a single-board computer with WE 32200 chip set with CPU, 16MB of memory, MMU, clock, dynamic random access memory controller, DMA controller, MAU, and two SCSI buses	29,000	148.00
73547	EADP/C; same as EADP but includes a 3.5-inch paging disk	30,000	152.50
MEMORY OPTIONS			
3B15			
73604	1MB add-on memory pack	4,900	19.00
73605	2MB add-on memory pack	7,000	31.00
73684	Main store control for 2MB memory board (growth units)	2,385	NA
73685	First 2MB memory board (growth units)	7,500	NA
3B20S/A			
74202	1MB memory board (TN28)	4,900	19.00
73605	2MB memory board (TN56)	7,000	31.00

NA—Not applicable.

AT&T 3B Superminis

		Purchase Price ($)	Monthly Maint. ($)
INPUT/OUTPUT OPTIONS			
The 3B20S and 3B20A have optional Input/Output Processors (IOPs) that provide common interfaces for peripheral and disk file controllers. The IOP comprises a basic section (BIOP) and a growth section (GIOP). The growth section supports an additional Disk File Controller (DFC). Options vary from package to package. The 3B15 systems have optional I/O Accelerators (IOAs).			
3B15			
73504	SCSI Local Interface Controller (SLIC)	7,000	39.50
73536	SCSI bus terminator	180	NA
73545	SCSI bus patch panel	300	NA
73548	SCSI bus cables	300	NA
73610	I/O Accelerator	5,000	14.00
73611	Asynchronous port for I/O Accelerator	310	NA
73624	Extended Local Bus unit for growth	9,000	29.00
3B20S/A			
74260	Basic IOP (TAG, SEC) and DSCH cable	18,000	96.00
74261	Basic IOP (PIOC-1)	18,000	96.00
74262	Growth IOP (TAG, SEC)	3,500	36.00
74263	Growth IOP (PIOC-1)	3,500	36.00
74264	Growth IOP controller and power unit	4,000	36.00
3B4000			
73503	Dual Bus Interface Board (DBIB) which provides the connection between the ABUS and processing elements	8,000	29.00
73525	SCSI bus cables	300	NA
73536	SCSI bus terminator	180	NA
73539	ACP Eports I/O card; provides eight RS-232-C serial ports	1,320	8.00
73545	SCSI bus patch panel; resides on the ABUS cabinet and provides four ports for attaching adjuncts and peripherals; one is standard on 3B4000; second needed to support more than SCSI buses on the system	300	NA
MASS STORAGE			
SCSI Disks for 3B15 and 3B4000			
73524	A 9-inch 570MB Hewlett-Packard disk drive with embedded SCSI controller	25,000	225.00
73542	Two 5.25-inch 300MB disk drives in compact housing with internal cabling, mounting hardware, and power supplies	26,000	150.00
73543	One 5.25-inch 300MB disk drive in compact housing with internal cabling, mounting hardware, and power supplies	13,000	75.00
73544	One 5.25-inch 300MB disk drive for addition to existing housing	13,000	75.00
73532	Disk mounting shelf to install SCSI drives in SCSI cabinet	540	NA
3B15			
73633	Disk File Controller and two Storage Module Drive Controllers	7,000	40.00
73632	Disk File Controller and one Storage Module Drive Controller	5,000	27.50
73631	Storage Module Drive Controller	2,000	12.50
73635	340MB disk drive (279MB formatted)	15,250	175.00
73634	160MB disk drive (134MB formatted)	12,000	93.00
3B20S/A			
74265	Enhanced Disk File Controller and DSCH cable	13,000	110.00
74266	Disk File Controller (TN68-based) and DSCH cable	14,500	110.00
74267	Enhanced Disk File Controller upgrade kit	8,200	NA
74280	300MB disk drive, single port	21,000	275.00
74281	300MB disk drive, dual port	23,000	275.00
74282	300MB dual-port upgrade kit	2,500	NA
74283	Interlock kit for 300MB drive	295	NA
74285	Disk pack for 300MB drive	1,200	NA
74286	675MB disk drive, single port	26,000	250.00
74287	675MB disk drive, dual port	28,000	250.00
74288	675MB dual-port upgrade kit	2,500	NA

NA—Not applicable.

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		Purchase Price ($)	Monthly Maint. ($)
74300/74302	340MB AC/DC disk drive, single port	15,250	113.00
74301/74303	340MB AC/DC disk drive, dual port	17,250	113.00
74304	340MB dual-port upgrade kit	2,500	NA
74305	Rack mounting for AC drives	1,950	NA
74306	Rack mounting for DC drives	1,650	NA
74316/74318	Disk package, four 340MB AC drives	59,000	450.00
74317	Disk package, four 340MB DC drives	59,000	450.00

MAGNETIC TAPE EQUIPMENT

SCSI Tape Drives for 3B15 and 3B4000

73515	1600/6250 SCSI tape drive	17,500	150.00

3B15

73651	High-performance Integrated Tape Controller	4,500	21.00
73661	1600 bpi tape drive and standard controller	12,000	125.00
73662	Additional 1600 bpi tape drive	8,500	104.00
73663	1600 bpi tape drive with high-speed controller	12,000	138.00
73665	First high-speed 6250 bpi tape drive	21,000	196.00
73666	Additional 6250 bpi tape drive	17,500	158.00

3B20S/A

74220	1600 bpi primary tape system	24,250	132.00
74221	1600 bpi add-on tape drive with formatter	18,250	125.00
74222	1600 bpi add-on tape drive without formatter	13,250	125.00
74223	1600/6250 bpi primary tape system (3B20S)	35,750	242.00
74224	1600/6250 bpi primary tape system (3B20A)	35,750	242.00
74227	1600/6250 bpi add-on tape drive	17,500	171.00
74229	1600 bpi tape controller	5,000	3.00

PRINTERS

3330-447	Model 447 600-lpm band printer	10,995	185.00
3330-455	Model 455 55 cps daisywheel printer	1,870	29.00
3330-470	Model 470 120 cps dot matrix printer	545	7.00
333o-475	Model 475 120 cps dot matrix printer	595	7.00
3330-476	Model 476 120 cps dot matrix printer	845	7.00
3330-477	Model 477 288 cps, color dot matrix printer	1,695	30.00
3330-478	Model 478 50 to 200 cps dot matrix printer	1,034	25.00
3330-479	Model 479 50 to 200 cps dot matrix printer	1,244	25.00
3331-495	Model 495 laser printer	2,995	70.00
3332-442	Model 442 400-lpm band printer	7,225	—
3332-444	Model 444 650-lpm band printer	7,795	—
3332-446	Model 446 1,000-lpm band printer	12,995	—
3353-010	Model 5310 200 cps dot matrix printer	1,349	25.00
3353-020	Model 5320 200 cps dot matrix printer	1,659	25.00

GRAPHICS PLOTTER

3330-435	Model 435 plotter	1,895	22.00

WORKSTATIONS

3344-180	4418 terminal	1,065	18.75
3344-605	605 BCT terminal with controller, monitor, and 102-key keyboard	595	6.00
3344-610	610 BCT terminal controller/base; must add monitor and keyboard	505	4.00
3344-615	615 MT terminal controller/base; must add monitor and keyboard	575	5.00
3344-620	620 MTG terminal controller/base; must add monitor, keyboard, and mouse	800	10.25
3344-630	630 MTG terminal controller/base; must add 16-inch monitor, keyboard, mouse, 512KB RAM expansion card	1,225	6.00

NA—Not applicable.

AT&T 3B Superminis

		Purchase Price ($)	Monthly Maint. ($)
33401	98-key keyboard for all 600 terminals	140	0.75
33402	103-key UNIX PC keyboard for 605 BCT, 610 BCT, 615 MT, and 620 MTG terminals	140	0.75
33537	122-key keyboard for 630 MTG terminal	150	1.00
33415-COL01	14-inch green phosphor monitor for 610 BCT and 615 MT	230	4.25
33415-COL19	14-inch amber phosphor monitor for 610 BCT and 615 MT	230	4.25
33411-COL19	14-inch green phosphor monitor for 620 MTG	355	4.40
33411-COL01	14-inch amber phosphor monitor for 620 MTG	355	4.40
33534	16-inch monitor for the 630 MTG	1,080	12.00
33450	Mouse for the 620 MTG	165	1.00
33536	Mouse for the 630 MTG	150	2.25
33422	512KB RAM expansion card for 630 MTG	345	4.00

COMMUNICATIONS/NETWORKING OPTIONS

3B15

—	PC Interface	1,000	—
73612	8-channel asynchronous interface	2,250	7.00
73613	2-channel auto call interface	260	NA
73615	Additional 4-channel synchronous interface	335	NA
73616	4-channel Teletype Terminal Interface	5,400	27.00
73617	Additional 4-channel Teletype Terminal Interface	240	NA
73623	Additional 4-port synchronous/asynchronous interface	310	NA
73624	Extended local bus with 12 I/O slots	9,000	29.00
73625	8-port Teletype Terminal Interface pack	5,640	33.00
73626	Additional 8 ports for Teletype Terminal Interface pack	480	NA
73618	3BNet interface	6,500	35.50
73619	3BNet transceiver and 10-m. cable	500	2.25
73620	3BNet transceiver and 30-m. cable	655	2.25
73621	3BNet transceiver and 50-m. cable	840	2.25

3B20S/A

74241	8-channel asynchronous controller (TN4)	4,000	8.00
74242	2-channel asynchronous controller (TN74)	3,700	8.00
74243	8-channel automatic call unit (UN56)	2,750	10.00
74244	2-channel synchronous controller, RS-232-C (TN75)	4,100	8.00
74245	2-channel synchronous controller, RS-449 (TN75)	4,100	8.00
74246	1-channel X.25 controller, RS-232-C (TN82)	5,000	5.00
74247	1-channel X.25 controller, RS-422 (TN82)	5,000	5.00
74248	8-channel X.25 controller (UN141)	6,500	9.00
74249	4-channel bisynchronous controller (TN82/UN53)	7,500	8.00
74215	Interface to NSC Hyperchannel Network	4,300	13.00
74216	3BNet interface	6,500	58.00
73619	3BNet transceiver and 10-m. cable	500	2.25
73620	3BNet transceiver and 30-m. cable	655	4.00
73621	3BNet transceiver and 50-m. cable	840	2.25
74217	Datakit interface	18,000	50.00
—	6544 Multifunction Communication Controller for the 6500 Communications System	7,800	—
—	Synchronous Host Add-on Expansion Module for the 6500 Communications System	2,400	—
—	Synchronous Device Interface Module for the 6500 Communications System	3,920	—
—	6550 Asynchronous Host/Protocol Conversion Module	2,215	—
—	6550 X.25 Interface Module	3,510	—

3B4000

—	3B Fiber Interface hardware for Master Processor	16,500	—
—	3B Fiber Interface hardware for Adjunct Communications Processor	4,000	—
73656	Datakit and ISN Fiber multiplexed interfaces	16,500	—

HARDWARE OPTIONS

3B15

73606	Expansion rack for extended local bus	8,000	29.00
73672	Vertical growth cabinet for two 48MB disk drives (Models 101 and 201)	2,500	NA
73673	Vertical growth cabinet for one 48MB disk drive and one fixed disk drive (Models 101 and 201)	2,500	NA

AT&T 3B Superminis

		Purchase Price ($)	Monthly Maint. ($)
73674	Vertical growth cabinet for two fixed disk drives (Models 101 and 201)	2,500	NA
73675	Horizontal growth cabinet	3,000	NA
73601	Growth cabinet for Model 301	3,000	NA
73607	Model 301 growth cabinet with door	1,245	NA
73608	Model 301 growth cabinet with door	4,245	NA
73695	Growth control unit	7,000	6.50
3B20S/A			
74239	Half-door	1,050	NA
74270	Expansion cabinet for I/O Processor or Disk File Controller	3,135	NA
74271	Fan and fuse unit (SEC-0)	7,500	21.00
74272	Fan and fuse unit (TAG-3)	7,500	21.00
74273	Fan and fuse unit (TAG-3/SEC-4)	7,500	21.00
74274	Fan and fuse unit (SEC-5)	7,500	21.00
74310	Expansion cabinet for 340MB disk drives	3,135	NA
74390	Earthquake bracing, 3-cabinet system	500	NA
74391	Earthquake bracing, additional cabinet	150	NA
3B4000			
73531	SCSI Peripheral Cabinet	3,000	NA
73537	Data Communications Cabinet	3,000	NA

NA—Not applicable.

SOFTWARE PRICES

		List Price ($)

The list price for software includes a onetime license fee. A dash (—) in the order number column indicates that the order number has not been supplied by the vendor.

OPERATING SYSTEMS

The UNIX System V operating system is bundled with 3B systems.

COMMUNICATIONS

1050-004	3BNet Software Release 2.3.0 (3B15)	2,000
—	BSC/RJE Emulator+ for 3B4000 MP	5,000
—	BSC/RJE Emulator+ for 3B4000 ACP	7,000
—	SNA/RJE Emulator+ for 3B4000 MP	5,000
—	SNA/RJE Emulator+ for 3B4000 ACP	7,000
—	SNA/RJE Emulator+ for 3B15	5,000
—	3270 Emulator+ Release 2.0 for 3B4000 MP	7,000
—	3270 Emulator+ Release 2.0 for 3B4000 ACP	9,500
—	3270 Emulator+ Release 2.0 for 3B15	7,000
—	LU6.2 Facility for 3B4000	9,000
—	Datakit and ISN Fiber Multiplexed Interfaces software for 3B4000	2,400
—	Enhanced TCP/IP WIN/3B Interface Release 2.1 right-to-use fee for binary code (3B15, 3B20, 3B4000)	12,000
—	Enhanced TCP/IP WIN/3B Interface Release 2.1 right-to-use fee for source code (3B15, 3B20, 3B4000)	25,000
—	3270 Emulator+ with Escort and HLLAPI for the 3B15	7,000
—	3270 Emulator+ with Escort and HLLAPI for the 3B4000 ACP	9,500

DATABASE MANAGEMENT SYSTEMS

—	Tuxedo System/T for 3B4000	25,000
—	Tuxedo System/D for 3B4000	50,000
—	Tuxedo System/ESQL for 3B4000	10,000
—	Tuxedo System/4GL for 3B4000	22,500
—	3B4000 Informix 3.3	6,000
1311-L17	3B4000 Informix SQL	27,600
1311-L18	3B4000 Informix ESQL/C	20,700
1311-L19	3B4000 Informix ESQL/Cobol	20,700
1311-L20	3B4000 Informix 4GL	41,400
1311-L29	3B4000 Informix Turbo	20,700
1311-L31	3B4000 Informix C-ISAM	4,100

AT&T 3B Superminis

		List Price ($)
OFFICE PRODUCTIVITY SOFTWARE		
—	20/20 Version 2.2 for 3B15	4,800
—	20/20 Version 2.2 for 3B4000	5,800
—	The Smart Software System for the 3B15	4,990
—	Crystal Document Management System for 3B15	4,195
—	Crystal Document Management System for 3B4000	6,995
—	Office Telesystem (OTS) Release 2.1 for 3B15	13,000
—	OTS Release for 3B4000	23,000 ■