AT&T 3B2 Family

MANAGEMENT SUMMARY

UPDATE: *Since our last report, AT&T has added the 3B2/700 and the 3B2/500 Solution Package B to the 3B2 supermicrocomputer product line. The vendor has also introduced optional processor upgrades for the 3B2/500 and /600, new SCSI-based disk and tape drives, and enhancements to the UNIX System V operating system.*

AT&T's strategy for marketing its computers is to build upon its presence as a telephone provider within large organizations and to offer departmental computing and networking solutions which integrate voice and data communications. Although Digital Equipment Corporation pioneered, and now dominates, the departmental computing market, AT&T is the first vendor to integrate voice and data in the departmental arena.

AT&T focuses on five basic workgroups: the PC Workgroup, the Departmental Workgroup, the Production Workgroup; the Campus Workgroup; and the Corporate Workgroup. AT&T intends its 3B2, as well as the 3B superminis, 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.

The 3B2 supermicro line includes the 3B2/310, /400, /500, /600, and the new /700. The 3B2 systems support maxi-

The 3B2 Family models are desktop multiuser supermicros suitable for use as departmental processors in large corporate computing environments. The systems run the UNIX System V operating system developed by AT&T. A variety of networking products is available to provide communications among 3B2 systems and other vendors' systems which do and do not run the UNIX operating system.

MODELS: 3B2/310, 3B2/400, 3B2/500, 3B2/600, and 3B2/700.
MEMORY: 1 megabyte to 64 megabytes.
DISK CAPACITY: 30 megabytes to 15.9 gigabytes.
WORKSTATIONS: Up to 80 active.
PRICE: $9,500 to $69,000 (base system prices).

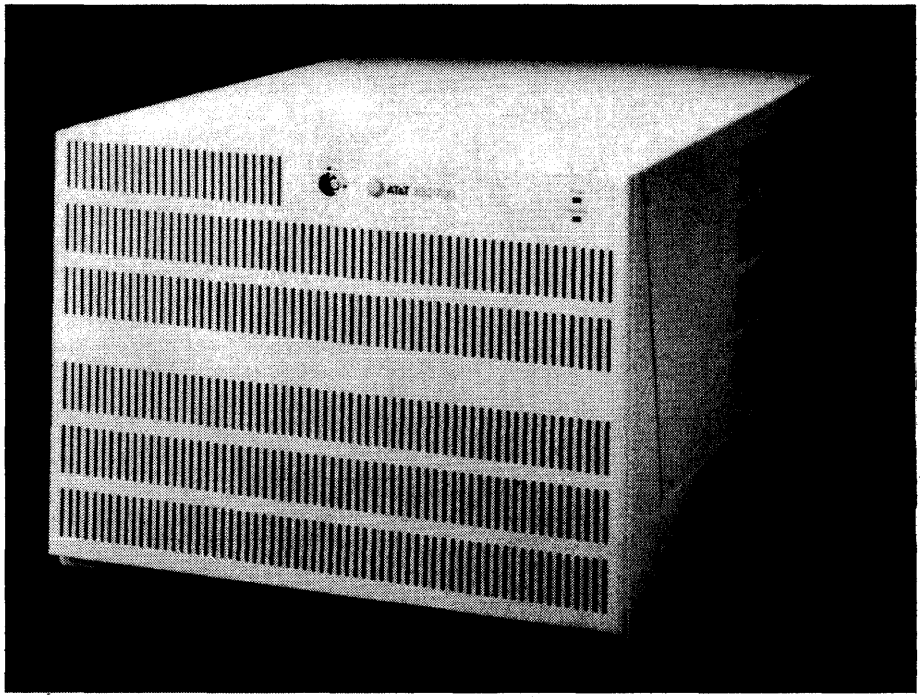
CHARACTERISTICS

VENDOR: 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, Canada M3B 3K4. Telephone (416) 449-4300.

DATA FORMAT

BASIC UNIT: 32-bit word. Data types include bytes (8 bit) and halfwords (16 bits).



The AT&T 3B2/700 is the most powerful model of the 3B2 product line. With optional enhancements, it operates at speeds of up to 9 million instructions per second and can serve up to 80 typical users simultaneously.

AT&T 3B2 Family

CHART A. SYSTEM COMPARISON

MODEL	3B2/310	3B2/400	3B2/500	3B2/600	3B2/700
SYSTEM CHARACTERISTICS					
Date of introduction	October 1985	June 1985	September 1987	March 1987	May 1988
Date of first delivery	—	June 1985	—	—	May 1988
Microprocessor type	WE 32100	WE 32100	WE 32100	WE 32100	WE 32200
Microprocessor cycle time	10MHz	10MHz	18MHz	18MHz	22MHz
Operating system	UNIX System V Release 2.0.5, 3.1, or 3.2	UNIX System V Release 2.0.5, 3.1, or 3.2	UNIX System V Release 3.1.1 or 3.2.1	UNIX System V Release 3.1.1 or 3.2.1	UNIX System V Release 3.2.1
Upgradable from	3B2/300	Not applicable	Not applicable	Not applicable	Not applicable
Upgradable to	Not applicable	Not applicable	22MHz WE 32200 processor	22MHz WE 32200 processor	Not applicable
Number of serial/parallel I/O ports	18/4 or 34 serial	46/11 or 90 serial	22/5 or 50 serial	46/11 or 90 serial	46/11 or 90 serial
Number of expansion slots	4	11 available	5 available	11 available	11 available
MEMORY					
Minimum capacity (bytes)	1M	1M	4M	4M	8M
Maximum capacity (bytes)	4M	4M	8M; 32M w/upgrade	16M; 64M w/upgrade	64M
DISK STORAGE					
Minimum capacity (bytes)	30M	30M	147M	294M	600M
Maximum capacity (bytes)	72M internal; 14.4G external	144M internal; 14.4G external	300M internal; 15.9G external	294M internal; 15.9G external	600M internal; 15.9G external
NUMBER OF WORKSTATIONS	Up to 34 (14 active)	90 (25 active)	50 (25-40 active)	90 (25-64 active)	90 (64 to 80 active)
COMMUNICATIONS PROTOCOLS	Async, 3BNet, Ethernet, TTY, ISN, PC Interface, StarLAN, SNA/3270, BSC/3270, X.25, TCP/IP, BSC 2780/3780, LU6.2	Async, 3BNet, Ethernet, TTY, ISN, PC Interface, StarLAN, SNA/3270, BSC/3270, X.25, TCP/IP, BSC 2780/3780, LU6.2	Async, 3BNet, Ethernet, TTY, ISN, PC Interface, StarLAN, SNA/3270, BSC/3270, X.25, TCP/IP, BSC 2780/3780, LU6.2	Async, 3BNet, Ethernet, TTY, ISN, PC Interface, StarLAN, SNA/3270, BSC/3270, X.25, TCP/IP, BSC 2780/3780, LU6.2	Async, 3BNet, Ethernet, TTY, ISN, PC Interface, StarLAN, SNA/3270, BSC/3270, X.25, TCP/IP, BSC 2780/3780, LU6.2
BASE PRICE	$9,500	$13,400	$24,000	$46,500	$69,000

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

mum memory capacities of 4 megabytes on the 3B2/310 and /400 and up to 64 megabytes on the 3B2/700. Maximum storage capacities are over 14 gigabytes on the 3B2/310 and /400 and up to 15.9 gigabytes on the other 3B2 systems. User support capacities range from 14 active users on the 3B2/310 to 80 active users on the 3B2/700. 3B2 performance capacities range from 1.5 MIPS on the 3B2/310 to 9.0 MIPS on a 3B2/700 configured with Multiprocessor Enhancement (MPE) boards.

The new 3B2/700 replaces the 3B5, the previous entry-level system of the 3B supermini product line, which now consists of the 3B15, 3B20, and 3B4000. The 3B product line features maximum memory capacities of 16 megabytes on the 3B15 and 3B20 and 240 megabytes on the 3B4000. Maximum disk storage capacities range from 4.65 gigabytes on the 3B15 to 27.2 gigabytes on the 3B4000. User support ranges from 60 active users on the 3B15 to 300 active users on the 3B4000. MIPS performance ratings range from from 1.0 MIPS on the 3B20 to 46.4 MIPS on a fully configured 3B4000. The 3B systems are described in the "AT&T 3B Superminis" report in *Datapro Reports on Minicomputers.*

AT&T's New 3B2 Products

AT&T has kept its promise to make two major product announcements per year. In the fall of 1987, the vendor introduced the high-end, 3B4000, based on UNIX. At its spring 1988 announcement, AT&T turned its focus to the low end of its UNIX product line, introducing systems and peripheral devices which increase performance and contribute to the 3B2 systems' functionality as departmental processors.

INTERNAL CODE: ASCII.

MAIN STORAGE

Main memory on the 3B2 Family is dual ported, allowing the CPU to use one port, while the I/O bus and the DMA controller share the other port. The CPU and I/O may access memory simultaneously, improving system performance. The Dual Port Memory (DPRAM) Controller arbitrates between main memory requests from the CPU and I/O.

Main memory utilizes 256-kilobit and 1-megabit DRAM chips, which are surface mounted on memory array boards that plug into I/O slots on the system backplane. The 3B2/310 and /400 have two dedicated memory slots that accommodate 1-megabyte or 2-megabyte memory boards, for a maximum of 4 megabytes of main memory. The 3B2/500 has two dedicated memory slots that accommodate 2-megabyte or 4-megabyte memory boards for a maximum of 8 megabytes of main memory. The 3B2/600 has 4 dedicated memory slots (in addition to the 12 I/O slots) that accommodate 2-megabyte or 4-megabyte memory boards, for a maximum of 16 megabytes of main memory. Adding the 22MHz processor upgrade to the 3B2/500 and /600 enables these systems to support 16-megabyte memory boards for a total of 32 and 64 megabytes, respectively. The 3B2/700 has 4 dedicated memory slots (in addition to 12 I/O slots) that accommodate 2-, 4, and 16-megabyte memory boards, for a maximum or 64 megabytes of main memory.

Memory boards for the 3B2/310 and /400 provide byte parity for memory protection; errors are detected but not corrected. Memory boards for the 3B2/500, /600, and /700 provide Error Correction Code (ECC), which detects and corrects single-bit errors. Double-bit errors are logged into the system error log file.

Minimum memory required for the UNIX System V Kernel and drivers on the 3B2 Family is about 300 kilobytes.

AT&T 3B2 Family

The 3B2/700 extends the high-end capabilities of the 3B2 line beyond those of the former top-of-the-line 3B2/600 supermicro. The 3B2/700 provides more processing power and supports more memory and internal disk storage than the 3B2/600. In specific comparison, the 3B2/700 provides up to 5.0 MIPS of processing capacity (without MPEs) and supports up to 64 megabytes of main memory and 600 megabytes of internal disk storage, while the 3B2/600 performs at up to 4.0 MIPS (without MPEs) and supports up to 16 megabytes of main memory and 294 megabytes of internal disk storage.

AT&T has also introduced a second 3B2/500 model, the Solution Package B, which provides more internal disk storage space and a higher capacity tape drive than the previously offered Solution Package A. The additional mass storage capacity boosts functionality for departmental computing environments, yet the system is priced about 40 percent lower than the 3B2/600, which offers similar mass storage capacities.

All 3B2 systems, as well as the 3B15 and 3B4000, now support SCSI peripherals, protecting users' investments in peripherals when upgrading to larger systems in the AT&T product line. The new differential SCSI bus also enables the 3B2 systems to share peripherals, a popular way to cut costs within departmental computing environments. AT&T has also introduced high-capacity disk and tape drives which provide large amounts of mass storage to departmental environments. Although AT&T previously offered a 300-megabyte SCSI-based disk drive, the drive could not be housed internally on any of the 3B2 systems. The 3B2/500 Package B and the 3B2/700 both house the 300-megabyte drive, and a 300-megabyte disk is now available for use on the differential SCSI bus. AT&T's SCSI-based tape drive capacity has been extended to 145 megabytes of backup storage, from 49 megabytes.

Since both the 3B2/700 and 3B4000 support SCSI peripherals, the 3B2/700 provides a smoother upgrade path to the 3B4000 than the 3B5 system which it replaces. AT&T also plans to expand the processing capacity of the 3B4000 by using the 3B2/700, as well as the currently implemented 3B2/600, as 3B4000 Adjunct Communications Processors (ACPs).

AT&T now offers a 22MHz Upgrade Kit, which can be used on both the 3B2/500 and /600 to extend processing capabilities to that of the 3B2/700. This upgrade kit provides a direct hardware upgrade path previously lacking in the 3B2 product line and builds in the type of upgrade capacity that users look for in a departmental computing solution.

In the future, users should expect the introduction of new entry-level 3B2s, as well as systems which fill the price/performance gap between the 3B2/700 and 3B4000 and replace the 3B15. The entry-level 3B2/310 and /400, introduced in 1985, are based on an older and slower I/O bus; SCSI support is optional on these systems; and there is a relatively wide gap in processing performance between the

PROCESSING COMPONENTS

All 3B2 models but the 3B2/700 utilize the CMOS-based, AT&T proprietary WE 32100 microprocessor as the CPU. The 3B2/700 utilizes the WE 32200 microprocessor as the CPU. The 22MHz Upgrade Kit available for the 3B2/500 and /600 is also based on the WE 32200.

Both the WE 32100 and WE 32200 include a 32-bit internal data path and 32-bit address bus. Operations are 8, 16, or 32 bits. The fetch controller includes an 8-byte instruction queue and 32-bit-wide Address Arithmetic Unit (AAU). The CPU includes nine all-user-accessible, general-purpose registers. Seven all-user-accessible registers are dedicated to the CPU. The CPU support 15 interrupt levels and 18 addressing modes.

All 3B2 models but the 3B2/700 include an AT&T WE 32106 Math Acceleration Unit (MAU) for floating-point operations. The 3B2/700 and 22MHz Upgrade Kit include the AT&T WE 32206 MAU. The MAU features single 32-bit, double 64-bit, and double-extended 80-bit precision. Operations performed by the MAU include add, subtract, multiply, divide, modulo, negate, absolute, square root, compare, move, round, and convert.

The Memory Management Unit (MMU), based on the AT&T WE 32101, translates virtual addresses into physical addresses, and vice versa, off-loading this function from the CPU. Standard memory management on the 3B2/310 and /400 is swapping; demand paging is optional. The 3B2/500, /600, and /700 support demand paging. All 3B2 models support 4 gigabytes of both virtual and physical address space.

All 3B2 CPUs include 256 bytes of 64-by-32 bit instruction cache memory. The 3B2/500, /600, and /700 are also equipped with 6 kilobytes of Virtual Cache (VCache), which improves system performance by reducing data and instruction retrieval time. VCache is composed of 2 kilobytes of data cache and 4 kilobytes of instruction cache.

3B2 22MHZ UPGRADE KIT: The 22MHz Upgrade Kit is available to upgrade the 18MHz processor board on the 3B2/500 and /600. This upgrade enables the systems to support 16-megabyte memory boards, quadrupling main memory capacity. The processor board must be installed by an AT&T service technician.

MULTIPROCESSOR ENHANCEMENT (MPE): The 3B2/500, /600, and /700 support an optional multiprocessor enhancement (MPE), which consists of a CPU (WE 32100), MMU (WE 32101), and MAU (WE 32106), each with the same features as the system's resident components. The 3B2/500 and /600 support one MPE for performance improvement of up to 50 percent. When the 22MHz Upgrade Kit is added, the 3B2/500 supports an additional MPE, yielding 20 percent more performance over the first MPE.

A 3B2/600 configured with the 22MHz Upgrade Kit supports up to three additional MPE boards, yielding performance improvements of 50, 20, and 10 percent, respectively, for each additional board. The 3B2/700 supports up to four MPE boards which yield performance improvements of 50, 20, and 10 percent, respectively, for each additional board. The fourth MPE yields improvements in specialized applications.

CPU clock speed is 10MHz on the 3B2/310 and /400, 18MHz on the 3B2/500 and /600, and 22MHz on the 3B2/700. AT&T Bell Labs rates the 3B2/310 and /400 at 1.5 MIPS, the 3B2/500 at 3.1 MIPS, the 3B2/600 at 4.0

AT&T 3B2 Family

CHART B. DISK/DISKETTE DEVICES

MODEL	73216/73238	73217/73240	73215	DM/147E (36203)
Type	Winchester	Winchester	Diskette-96	SCSI
Size (inches)	5¼	5¼	5¼	5¼
Number of surfaces	3	5	2	5
Formatted capacity per drive (bytes)	30M	72M	1M	147M
Interface/controller	ST-506	ST-506	Integral (TM-100)	ESDI
Number of drives per interface/controller	2	2	1	4
Average access time	45 ms	35 ms	90 ms	—
Data transfer rate	5M bps	5M bps	250K bps	10M bits/sec
Sectors/tracks per surface	18	18	80	36 sectors
Bytes per sector/track	512/sector	512/sector	6K	512/sector
Comments	Supported on 3B2/310 and /400	Supported on 3B2/310 and /400	Supported on all models	Supported on 3B2/500A and /600
Price	$2,950	$3,940	$660	$5,900

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

3B2/400 and /500 (1.5 MIPS compared to 3.1 MIPS). The 3B15 performs at up to 2.7 MIPS, compared to 5.0 MIPS on the 3B2/700. The 3B4000 performs at up to 46.4 MIPS when fully configured. It is likely that future additions to AT&T's product line will be built upon the Sun Microsystems, Inc. SPARC processor, based on a Reduced Instruction Set Computing (RISC) architecture; RISC provides much higher performance than conventional CPU architectures.

COMPETITIVE POSITION

Supermicrocomputers form one of the most competitive market segments of the computer industry. Corporate users seeking to decentralize their computing operations are attracted by the price/performance capabilities of supermicros—compared to those of superminis and mainframes—as well as their capability to function as low-cost file, storage, and communications servers in a PC-based, departmental computing environment.

AT&T's 3B2 supermicros, including the new 3B2/700, offer no dramatic technological advances over competitors' supermicros. The systems are functionally equal to other vendors' products and allow AT&T to compete in commercial and governmental markets. The 3B2s arrived late on the scene, however, and have been introduced into a market already targeted and largely captured by Digital Equipment and IBM. In addition, personal computer vendors have extended their reach into this market with high-performance PCs capable of many of the departmental resource functions traditionally handled by supermicro- and supermini-class machines.

Due to this intense competition and AT&T's internal organizational problems, the vendor has had a difficult time selling its systems; a large part of its installed base is internal. In an effort to boost its position in the computer industry, AT&T has formed an alliance with workstation leader Sun Microsystems. AT&T's technology sharing with Sun Microsystems, Inc. will eventually result in high-performance RISC-based systems that will outshine competitors' products—if AT&T can bring them to market before competitors introduce more powerful systems. Until these RISC-based systems are available, AT&T continues to build systems around current technologies.

MIPS, and the 3B2/700 at 5.0 MIPS. When configured with MPEs, the 3B2/500 and /600 perform up to 6.0 MIPS, and the 3B2/700 performs up to 9.0 MIPS.

INPUT/OUTPUT CONTROL

The I/O bus controls all peripheral interfaces on the 3B2 systems. The 3B2/310 and /400 utilize the Common I/O (CIO), and the 3B2/500, /600, and /700 utilize the Enhanced I/O (EIO). CIO transmits data at 1 to 2 megabytes per second; the EIO transmits data at 3 to 5 megabytes per second. Both the CIO and EIO provide a 16-bit data path and a 24-bit address path. The I/O bus supports both 8-bit and 16-bit programmed and intelligent peripherals.

I/O access to main memory is monitored by the DPDRAM controller, which also monitors CPU access to main memory. The DPDRAM controller supports four basic modes, listed here in order of their priority (assigned by the bus arbiter): refresh; I/O access of main memory by a feature card or by the integral DMA controller; CPU access of main memory; and CPU access of I/O in which the CPU reaches across the main memory to communicate directly with feature cards or with the system board-resident DMA controller.

The DMA controller features four independent DMA channels and provides service for the disk and diskette controllers and the transmit ports of the dual asynchronous serial RS-232-C ports. To support the integral controllers and ports, the DMA controller accepts DMA requests, acquires the bus, and generates a DPDRAM address and appropriate peripheral bus signals to accomplish the transfer. All data transfers between the DMA controller and main memory or the CPU are eight bits wide.

Each 3B2 model's system board includes two integral serial ports, which, for optimum system performance, should be used for the console terminal and a dial-in line or device that is not often used. These ports run through the main DMA controller, which causes a CPU interrupt for every character entered on the port.

The 3B2/310 has four available I/O slots for expansion options. Using I/O Ports cards, the /310 supports up to 18 serial and 4 parallel devices. Using Enhanced Ports Boards (EPORTS), the /310 supports a total of 34 serial connections.

The 3B2/400 has 11 available I/O slots for expansion options. Using I/O Ports cards, the /400 supports up to 46 serial and 11 parallel devices. Using EPORTS, the system supports up to 90 serial devices.

AT&T 3B2 Family

CHART B. DISK/DISKETTE DEVICES (Continued)

MODEL	DM/300E (36204)	DM/300S (36205)	DM/300DS (36206)
Type	SCSI	SCSI	SCSI
Size (inches)	5¼	—	—
Number of surfaces	8	—	—
Formatted capacity per drive (bytes)	300M	300M	300M
Interface/controller	ESDI	—	—
Number of drives per interface/controller	4	—	—
Average access time	—	—	—
Data transfer rate	10M bits/sec	12M bits/sec (asynchronous)	16M bits/sec (synchronous)
Sectors/tracks per surface	35 sectors	32 sectors	32 sectors
Bytes per sector/track	512/sector	512/sector	512/sector
Comments	Supported on 3B2/500B and /700	Supported on all models; provides single-ended, asynchronous bus	Supported on 3B2/500, /600, and /700; provides differential, synchronous bus
Price	$9,750	$10,500	$10,500

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

AT&T persists in its hope of penetrating the computer field; it has extended the deadline for the Data Systems Group (DSG) to become profitable to 1989. By then, its RISC-based systems should be available. If the DSG does not become profitable by 1989, AT&T might then spin off its computer business and concentrate on more profitable products, such as the UNIX System V operating system.

Having targeted the departmental computing market, AT&T faces formidable competition from Digital Equipment's MicroVAX systems, IBM's 9370 systems, and NCR's Tower 32 systems based on UNIX. Each of these vendors has a good reputation, a large installed customer base, a wide range of computer products, and successful long-term experience in selling computers.

The 3B2/700 offers some advantages over its direct competitor, the Digital MicroVAX 3600. The 3B2/700 performs at up to 5 million instructions per second (MIPS) and up to 9 MIPS with the addition of Multiprocessor Enhancement (MPE) cards, while the maximum performance for the MicroVAX 3600 is 4.6 MIPS, with no processor enhancements available. The 3B2/700 supports up to 64 megabytes of memory compared to 32 megabytes on the MicroVAX 3600. In addition, the 3B2/700 attaches more terminals than the MicroVAX 3600, with support for up to 90 terminals (with 64 to 80 users concurrently active), compared to support for 40 to 60 active users on the MicroVAX 3600. While internal disk storage capacity is comparable—about 600 megabytes on each system—the 3B2/700 supports far more external disk storage (15.9 gigabytes) than the MicroVAX 3600 (2.5 gigabytes). Furthermore, the 3B2/700 supports industry-standard SCSI-based disks, allowing users to obtain disk storage from a wider range of third-party disk suppliers. The MicroVAX 3600 supports proprietary Q-bus-based disks.

A 3B2/700 configured with 32 megabytes of memory, 600 megabytes of disk storage, a 720-megabyte diskette drive, a 120-megabyte tape drive, the UNIX System V operating system, forty 605 BCT terminals, and the 3BNet network adapter costs about $119,700, which translates to $29,925 per user or $23,940 per MIPS. A comparably configured

The 3B2/500 has five available I/O slots. Using I/O ports, the /500 supports up to 22 serial and 5 parallel ports. Using EPORTS, the system supports up to 50 serial ports.

Both the 3B2/600 and /700 have 11 available I/O slots. Using I/O ports, the systems support up to 46 serial and 11 parallel devices. Using EPORTS, the systems support up to 90 serial devices.

I/O Ports cards offer four serial ports and one parallel port. The built-in Intel 80186 microprocessor off-loads character processing from the CPU and supports transmission speeds of 19.2 kilobits per second. EPORTS support eight synchronous serial ports conforming to the RS-232-C standard, data transmission and reception up to 38.4 kilobits per second, and X-on/X-off software flow control. EPORTS are also based on the 80186 microprocessor and support all serial devices currently supported by I/O Ports cards. Each feature card requires one slot on the I/O backplane.

The 3B2/310 and /400 support up to two single ended SCSI host adapters. The 3B2/500 supports a combination of up to seven, and the 3B2/600 and /700 support a combination of up to eight single-ended or differential SCSI host adapters. Each SCSI host adapter provides an SCSI bus which supports up to eight SCSI controllers. One of these controllers is on the host adapter and provides the interface between the SCSI bus and the system. The seven remaining controller taps are available to support up to seven SCSI-based storage peripherals.

Two types of SCSI host adapters are available: single-ended and differential. The single-ended bus is an asynchronous bus that transfers data at a rate of 1.5 megabits per second. The differential bus is a synchronous bus that transfers data at a rate of 4 megabits per second. The differential bus also allows systems to share peripherals, providing continued availability of data in the event that one of the systems goes down.

The 3B2/500, /600, /700, and some configurations of the 3B2/400 come equipped with one host adapter. On the 3B2/500, /600, and /700, two of the controller taps are taken up by the adapter and the internal disk and tape controllers. The SCSI host adapter is optional on the 3B2/310 and on certain configurations of the 3B2/400.

CONFIGURATION RULES

The 3B2/310 is available in three packaged configurations: 3B2/310 Solution Packages A2, B2, and F2. Each configuration includes a WE 32100 system board and cabinet, a

AT&T 3B2 Family

CHART C. WORKSTATIONS

MODEL	Dataspeed 4418	510 A/D	605 BCT	610 BCT
DISPLAY PARAMETERS				
Max. chars./screen	1,920 x 3,168	1,920 (A); 3,168 (D)	1,920 (80 col.); 3,168 (132 col.)	1,920 or 3,168
Buffer capacity	1 page	1 page (A); 2 pages (D)	1 page	1 page
Screen size (lines x chars.)	24 x 80 or 132	24 x 80 (A & D); 24 x 132 (D)	24 x 80 or 132	24 x 80 or 132
Tilt/swivel screen	Tilt standard	—	Tilt/swivel	Tilt/swivel
Symbol formation	5 x 7 or 7 x 9 dot matrix	7 x 9 in/9 x 11 (A); 6 x 10 in/8 x 12 (D)	7 x 9/9 x 12 or 5 x 7/7 x 13	5 x 7 or 7 x 9
Character phosphor	Amber, white, or green	Green	Amber, green	Green, amber
Total colors/no. simult. displayed	Not applicable	Not applicable	—	Not applicable
KEYBOARD PARAMETERS				
Style	IBM 3278	72-key Qwerty	102-key	98-key or 103-key UNIX PC
Character/code set	128 ASCII	—	5	5 ASCII/ANSI 3.64
Detachable	Yes	Yes	Yes	Yes
Program function keys	24 fixed	96 w/cartridge (A); 24 (D)	16 programmable, 6 fixed	16 programmable, 6 fixed
TERMINAL INTERFACE	RS-232-C	RS-232-C (A & D); parallel or DCP (D)	Serial	Serial
COMMENTS	Optional integrated auto dial modem	Integrated voice/data, handset, speaker-phone, modem; 510A for analog, 510D for digital	PC mode for use as remote MS-DOS terminal	Supports optional integrated auto dialer and modems, emulation cartridge for VT220 and 513 BCI
PRICE	$1,065	$1,095	$595 for controller, monitor, and keyboard	$505 for controller; $230 for monitor; $140 for 98-key keyboard

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

MicroVAX 3600 costs about $123,860, which translates to $30,965 per user or $26,926 per MIPS.

In addition to competing in the departmental computing market, AT&T also targets VARs, Regional Bell Holding Companies, software developers, and UNIX system users. These markets offer additional, but less lucrative, sales opportunities to the vendor.

AT&T vs the Open Software Foundation

AT&T has put a tremendous effort into the unification and marketing of the UNIX System V operating system, already recognized as the most open computing platform in the industry, although in need of further standardization. The vendor hopes to gain a competitive edge in the UNIX systems market by first developing a unified UNIX for its own systems, and then making it available to other UNIX vendors in the market.

Recognizing the threat that a unified UNIX poses to their installed bases of proprietary-systems customers, as well as the strength of the AT&T/Sun technological alliance, IBM, Digital Equipment, Hewlett-Packard, and Apollo Computer—as well as European vendors Siemens, Nixdorf, and Groupe Bull—formed the Open Software Foundation (OSF). The OSF is dedicated to developing a common operating system, that, though based on UNIX, will be an alternative to the version that AT&T will offer.

After the formation of OSF, the industry attempted to determine whether vendors of systems based on UNIX

WE 32106 MAU, a 720-kilobyte diskette drive, four available expansion slots, and four 14-inch shielded cables/connectors. The configurations also include 1 megabyte or 2 megabytes of memory, a 30-megabyte or 72-megabyte disk drive, and an I/O Ports or EPORTS card.

The 3B2/400 is available in five packaged configurations: 3B2/400 Solution Packages A2, C2, D2, R2, and Q2. Each configuration includes a WE 32100 system board, cabinet, WE 32106 MAU, a 720-kilobyte diskette drive, 11 available expansion slots, and six 14-inch shielded cables/connectors. The configurations also include 1 megabyte or 2 megabytes of memory, a 30-megabyte or 72-megabyte disk drive, a 23-megabyte or 60-megabyte cartridge tape drive, and one I/O Ports or EPORTS card. Packages Q2 and R2 also include the SCSI host adapter card.

The 3B2/310 and /400 are also available as preconfigured StarLAN PC Servers, allowing the systems to act as resource servers for file and peripheral sharing in an AT&T STARLAN NETWORK.

The 310 StarLAN PC Server, based on the 3B2/310 F2, includes 2 megabytes of memory; a 72-megabyte disk drive; one EPORTS card; UNIX System V Release 3; a 3B2 Network Access Unit (NAU); the 3B2 DOS Server Program; the 3B2 Network Program Package; and the 3B2 Network Support Utilities, Release 1.

The 400 StarLAN PC Server, based on the 3B2/400 R2, is similar to the 310 StarLAN PC Server except that it includes 4 megabytes of memory, two 72-megabyte disk drives, a 60-megabyte cartridge tape drive, and a SCSI host adapter.

The 3B2/500 in available in two configurations. Solution Package A includes the WE 32100 system board and cabinet, the WE 32106 MAU, 4 megabytes of memory, one

AT&T 3B2 Family

CHART C. WORKSTATIONS (Continued)

MODEL	615 MT	620 MTG	630 MTG
DISPLAY PARAMETERS			
Max. chars./screen	1,920 x 3,168	1,920 or 3,168	1,024 x 1,024 pixels
Buffer capacity	1 page/window	1 page/window	5 pages/window
Screen size (lines x chars.)	24 x 80 or 132	24 x 80 or 132	69 x 89/109/140
Tilt/swivel screen	Tilt/swivel	Tilt/swivel	Tilt/swivel
Symbol formation	5 x 7 or 7 x 9	6 x 12 in 8 x 17 (bit-mapped)	7 x 14, 11 x 14, 11 x 16
Character phosphor	Green or amber, white	Green or amber	Green or amber
Total colors/no. simult. displayed	Not applicable	Not applicable	—
KEYBOARD PARAMETERS			
Style	98-key or 103-key UNIX PC	98-key or 103-key UNIC PC	98- or 122-key
Character/code set	5 ANSI 3.64	5 ANSI 3.64	1
Detachable	Yes	Yes	Yes
Program function keys	36 programmable	36 programmable	8 std., 6 fixed (12 w/shift key)
TERMINAL INTERFACE	Serial	Serial	Two serial
COMMENTS	Multitasking terminal capability with up to 3 terminals; emulates DEC VT220; optional integrated auto dialer and modems, and emulation cartridges (incl. 4425)	Supports up to 6 windows; emulates Tektronix 4014 protcols; supports Graph station graphics software, optional mouse, and modem	Supports multitasking windows, dual-host access, downloadability, 14 windows (7 per host) standard mouse
PRICE	$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

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

would support AT&T or OSF—or both. The vendors, of course, must respond to the demands of their customers. In the weeks after the announcement of OSF, many users have expressed dismay at the confusion that the OSF has brought to the quest for a standard operating system and the applications to go with it. The formation of OSF encourages AT&T to speed the development of its standard version of UNIX to capture sales from users who can't wait for the OSF product.

ADVANTAGES AND RESTRICTIONS

Though the 3B2 product line is technologically unextraordinary, the systems do offer many of the advantages—such as support for SCSI-based peripherals and connectivity to IBM mainframe environments—offered by other vendors' supermicros. Though these features don't give the 3B2s an extreme edge over the competition, the omission of such features would put the systems at a disadvantage.

Support for the SCSI host adapter enables the 3B2 systems to connect industry-standard peripheral devices from other vendors, increasing customers' options in selecting add-on storage devices. The use of SCSI-based peripherals by supermicros and minis has become very common. The SCSI host adapter is a standard feature on the 3B2/500, /600, /700, and on some configurations of the 3B2/400. On remaining configurations of the 3B2/400 and the 3B2/310, the interface is optional. The interface supports an external disk capacity of over 15 gigabytes on any of the 3B2 systems, dramatically expanding the relatively small internal disk capacities of the 3B2/310 and /400. AT&T offers its own SCSI-based disk and tape drives of various capacities.

720-megabyte diskette drive, a 147-megabyte disk drive, one 60-megabyte cartridge tape drive, one EPORTS card, one SCSI host adapter card, and various cables. Solution B is similar to Solution A but includes a 300-megabyte disk drive and a 120-megabyte cartridge tape drive.

The 3B2/600 is available in one configuration, the Solution Package A, which includes the WE 32100 system board and cabinet, the WE 32106 MAU, 4 megabytes of memory, one 720-megabyte diskette drive, two 147-megabyte disk drives, one 60-megabyte cartridge tape drive, three EPORTS cards, one SCSI host adapter card, two 7-foot cables, two 14-foot cables, two 25-foot cables, two 50-foot cables, and 10 connectors.

The 3B2/700 is available in two configurations. The Solution Package A includes the WE 32200 system board and cabinet, the WE 32206 MAU, two 4-megabyte memory boards, two 300-megabyte disk drives, one 720-megabyte diskette drive, one 120-megabyte cartridge tape drives, four EPORTS cards, one SCSI host adapter, and various cables. Solution B is similar to Solution A, but includes one 16-megabyte memory board.

INPUT/OUTPUT UNITS

See Chart B for disk and diskette devices, Chart C for workstations, and Chart D for printers.

The most significant disk drives available are the Disk Module DM/147E, DM/300E, DM/300S, and DM/300DS disk drives because they are supported by the SCSI host adapter. The DM/147E and DM/300E are connected via the DCM/4E disk module controller which supports up to four devices each. As many as seven DCM/4Es can be supported per SCSI. The DM/300S and /300DS have embedded controllers and do not require the DCM/4E.

The 3B2/310 and /400 support up to 14 DCM/4Es per system (7 per the two possible SCSI buses). Two of the

AT&T 3B2 Family

CHART D. PRINTERS

MODEL	455	475	476	477
Type	Daisywheel	Dot matrix	Dot matrix	Dot matrix
Speed	55 cps	120 cps	120 cps	96/288 cps
Bidirectional printing	Yes	Yes	Yes	Yes
Paper size	Up to 15 in	4.5 to 10 in	4.5 to 15.5 in	4 to 16 in
Character formation	Full	9 x 7 dot matrix	9 x 7 dot matrix	12 x 24, 18 x 24, 36 x 24
Horizontal character spacing (char./inch)	10, 12, 15	5-17	5-17	10 to 20, proportional
Vertical line spacing (char./inch)	6/8	6/8	6/8	3, 4, 6, 8, programmable
Character set	ASCII 96	ASCII 128	ASCII 128	ASCII
Controller/Interface	RS-232-C, Centronics or IBM parallel	RS-232-C	RS-232-C	Centronics parallel, RS-232-C
No. of printers per controller/ interface	1	1	1	1
Printer dimensions, in. (h x w x d)	7.13 x 24.5 x 15.5	5.4 x 15 x 11.3	5.8 x 21.8 x 11.8	6.4 x 22.4 x 15.3
Graphics capability	No	Yes	Yes	Yes
Price	$1,870	$595	$845	$1,695

Two types of SCSI adapters are available: one provides a single-ended bus, the other a differential bus. The differential bus can be used for peripheral sharing between systems, allowing users to spread the cost of peripherals between systems. The single-ended implementation supports peripherals only on the system upon which it is installed.

AT&T is also providing for higher data availability, offering both disk mirroring and the Enhanced Data Availability (EDA) feature. Disk mirroring enables users to protect against data loss by keeping two copies of critical data on separate disk drives. Disk mirroring utilities are included with the new SCSI disk drives, the DM/300S and DM/300DS, and the DCM/4E disk controller. The Disk Mirroring Upgrade package can be purchased for existing systems that do not implement these disk drives.

The EDA feature allows two 3B2 systems to share the same disk drives via a SCSI differential bus. If one of the systems fails, the disks are still accessible from the system that remains in operation.

With the 22MHz Upgrade Kit, users can upgrade existing 3B2/500 and /600 systems to the same performance and memory capacity as the 3B2/700, providing an upgrade path previously lacking in the 3B2 product line. A Migration Package is available for upgrading the 3B2/300 (no longer marketed) to the 3B2/310, allowing users to increase the system's processing capacity while protecting their investment in the system hardware. There is still no direct hardware upgrade from the entry-level 3B2/310 or /400 to the larger 3B2 systems, nor is there a direct hardware upgrade path to the 3B superminicomputers. The 3B2 systems do offer object code compatibility with the 3B15 and 3B4000 computers, which also run UNIX System V; hence all systems run the same applications software, easing software migration to larger systems in the AT&T product line.

In addition to the 22MHz Upgrade Kit, processing performance can be increased on the 3B2/500 and /600, as well

fourteen controllers are devoted to supporting tape drives, leaving twelve to support four disk drives each, for a maximum external storage capacity of 14.4 gigabytes when attaching DM/300E disk drives. This is in addition to internal disk capacity of 72 megabytes on the 3B2/310 and 144 megabytes on the 3B2/400.

The 3B/500, /600, and /700 support up to fifty-three 300-megabyte SCSI disks for a total of 15.9 gigabytes of external storage. This is in addition to the internal 147 megabytes and 300 megabytes on the 3B2/500, the internal 294 megabytes on the 3B2/600, and the internal 600 megabytes on the 3B2/700.

The TM/60S and TM/120S are the SCSI-based tape drives supported by the 3B2. Both tape drives use ¼-inch, nine-track tape cartridges with a 60-megabyte and 120-megabyte storage capacity, respectively. The tape drives record in NR2 serial serpentine mode, in QIC-24 format, at 90 inches per second in streaming mode. The data transfer rate is 90K bps. The TM/120S can read tapes that have been recorded on the TM/60S.

The SCSI-based, nine-track, single-ended tape drive accommodates tape reels of various sizes. This drive has a 40-megabyte capacity and records in PE mode (1600 bpi) at 100 inches per second while streaming. The data transfer rate is 160K bps, or 40 megabytes in seven minutes.

Also available are SCSI-based, nine-track, single-ended and differential tape drives which record in both PE (1600 bpi) and GCR (6250 bpi) modes. Both drives accommodate reels of various sizes and provide backup capacities of 145 megabytes in GCR mode. Data transfer rates are 186 kilobytes per second in PE mode and 684 kilobytes per second in GCR mode. Tape speed is 100 inches per second (ips) streaming in PE mode and 75 ips streaming in GCR mode.

Expansion modules are also available for adding storage to the 3B2s. Three expansion modules are available: the SCSI-based XM/900S, the XM Solution Package A, and XM Solution Package C. Up to three 5¼-inch peripherals may be housed in each XM; a maximum of two may be removable.

The XM/900S houses a bridge controller and three 300-megabyte disk drives for a total of 900 megabytes of disk storage. Seven such units can be installed per SCSI host

AT&T 3B2 Family

CHART D. PRINTERS (Continued)

MODEL	495	5310	5320	442/444/446
Type	Laser	Dot matrix	Dot matrix	Band
Speed	10 ppm	200 cps	200 cps	400/650/1,000 lpm
Bidirectional printing	No	Yes	Yes	Not applicable
Paper size	8.5 x 14 and 8.5 x 11 in	3 to 9.5 in	3 to 15 in	3 to 16 in wide
Character formation	300 x 300 dpi	7 x 9 dot matrix	7 x 9 dot matrix	Full
Horizontal character spacing (char./inch)	10, 12, 16.7, proportional	5 to 16.5	5 to 16.5	10
Vertical line spacing (char./inch)	3, 4, 6, 8, programmable	2, 3, 4, 6, 8, 10, 12	2, 3, 4, 6, 8, 10, 12	6, 8, 12
Character set	ASCII	ASCII	ASCII	66, 98, 128
Controller/Interface	IBM/Centronics parallel, RS-232-C	Serial RS-232-C	Serial RS-232-C	Triple RS-232-C, Centronics, SSI; DPLL opt.
No. of printers per controller/ interface	1	1	1	1
Printer dimensions, in. (h x w x d)	15.2 x 17.7 x 19.1	5.5 x 16 x 14.4	5.5 x 21.2 x 20.1	44.5 x 30.75 x 26.25
Graphics capability	Yes	Yes	Yes	No
Price	$2,995	$1,349	$1,659	$7,225 (442); $7,795 (444); $12,995 (446)

as the /700, by adding the Multiprocessor Enhancement (MPE) card, which is based on the same chip set as the system's existing microprocessor. This enhancement allows users to increase system performance by a sizable increment and still use the same system box and peripherals.

AT&T continues an immense effort to tailor the UNIX operating system for corporate commercial environments. To make UNIX more user friendly, the vendor has introduced new user interface utilities: the Framed Access Command Environment (FACE) and Form and Menu Language Interpreter (FMLI). The Open Look Graphical Interface, which will employ icons and commonsense graphic symbols instead of written commands, will soon be available to help users work more efficiently with UNIX. UNIX has also been enhanced with line printer spooling utilities, additional security features, and programming tools such as shared libraries, Streams, and the Transport Level Interface (TLI) which aids programmers in developing software to run under UNIX.

Efforts to integrate UNIX System V with its most popular derivatives, Microsoft's Xenix and Berkeley Version 4.2, are also well under way. The unification of UNIX and the development of a friendlier user interface has attracted software houses to write more applications software for UNIX, which will bring more users into the UNIX marketplace. With more available software, more users will select UNIX solutions. AT&T has enlisted several software houses to port popular applications software to 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. The 3B2 systems already run such popular DBMS packages as Oracle Corporation's Oracle and Relational Technology, Inc.'s Ingres.

The 3B2 Family supports many networking and connectivity products, substantiating AT&T's efforts to market

adapter and can be used in combination with the DCM/4E and DM/147E, as well as the 60-megabyte and 120-megabyte tape drive.

The basic XM Solution Packages A and C include the XM cabinet, internal power supply, internal cabling, an integral 23-megabyte formatted tape drive, and a dual device controller which supports one tape drive and one diskette drive. A 30-megabyte or 72-megabyte disk drive can be added to Solution Package A. Solution Package C includes an installed 72-megabyte fixed disk drive in addition to the basic package.

COMMUNICATIONS

3B2 networking and communications hardware enable the 3B2 to serve as a gateway to mainframes, MS-DOS-based PCs, and other departmental processors and to provide services over local area networks (LANs), public packet networks, and IBM systems.

The *Intelligent Serial Controller (ISC)* card provides gateway communications to an IBM host environment or to X.25 networks. The integrated Intel 80186 processor, in conjunction with downloaded software, supports BSC, SNA/SDLC, or 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 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.

The *3BNet Network Interface Card* enables the 3B2 computers to connect to Ethernet LANs. 3BNet is a high-speed, Ethernet-based LAN that employs Carrier-Sense Multiple Access/Collision Detection (CSMA/CD). The network media supports data transfers up to 10M bps over coaxial cable. The 3BNet Interface supports higher level protocols such as Transmission Control Protocol/Internet Protocol (TCP/IP) with applications protocols for users who require high-level networking services such as electronic mail, remote login, and file transfer between AT&T's and other vendors' PCs, workstations, minicomputers, and mainframes. 3BNet hardware kits include the Network Interface card, cables, transceivers, and the Network Interface media driver which provides data-link services.

AT&T 3B2 Family

the systems as departmental and workgroup processors which can coexist in IBM and Digital Equipment environments. These connectivity products enable a 3B2 to serve as a gateway to mainframes, to act as a resource processor for networked PCs, and to communicate with other departmental systems within a corporate-wide network. The systems support both de facto and established communications protocols, specifically IBM SNA/SDLC and BSC protocols. RJE emulators enable batch mode file transfers to and from IBM hosts. Through terminal emulation, the 3B2 provides a gateway to the host so that 3B2 users can access IBM host system data for use in their own applications.

AT&T's STARLAN NETWORK interconnects from 2 to 50 simultaneously active workstations, allowing users to communicate freely with one another and to share peripherals and data. Furthermore, AT&T offers 3B2 models preconfigured to function as servers in a STARLAN NETWORK, removing the burden of configuration from the user.

AT&T's voice and LAN products are based on the Premises Distribution System (PDS), which provides a complete corporate wiring scheme using a fiber optic backbone, twisted pair distribution, and cross-connect hardware. AT&T's Information Systems Network (ISN), integrated with PDS, provides the backbone network for terminal-to-host and host-to-host connectivity in buildings and large campuses. ISN can bridge STARLAN NETWORKs located in different areas of the organization—spanning up to several miles—providing all workstations with access to ISN host systems and systems in other networks. ISN also supports the upper layers of Digital Equipment's DECnet protocols, allowing 3B2s to route and interconnect with Digital Equipment's Ethernet LANs. The capability to connect with Digital Equipment's systems will help AT&T to infiltrate corporate environments where Digital Equipment's systems have already been implemented as departmental processors. ISN provides communications support in a multivendor environment, taking advantage of a customers' investments in computer hardware and peripherals.

Ethernet is not part of AT&T's strategic wiring scheme, since it uses coaxial cable rather than fiber or twisted pair. However, AT&T's communications strategy supports Ethernet to allow the 3B2s to participate in Ethernet environments; this support protects customers' investments in existing equipment and provides for high-volume file transfers among a number of systems. AT&T's Ethernet-supported products include 3BNet, PC Interface, and TCP/IP.

3BNet provides local area networking of groups of 3B2 systems and AT&T 6300 Work Group Systems (WGSs) and IBM PC compatibles within corporate departments and workgroups. PC Interface allows the 3B2 to be networked with, and act as a server to, MS-DOS-based PCs interconnected via an Ethernet LAN, thus protecting users' investments in already installed Ethernet cable. TCP/

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.

The *StarLAN Network Network Access Unit (NAU)* is the circuit card which enables a 3B2 function in a STARLAN NETWORK. The NAU is standard on preconfigured /310 and /400 StarLAN PC Servers (see the "Configuration Rules" section of this report). Other STARLAN components include the *Network Interface Unit (NIU)* and the *Network Extension Unit (NEU)*. The NIU interfaces two asynchronous serial devices, such as printers, terminals (at speeds up to 19.2K bps), modems, and host computers to the network. The NEU interconnects daisychained workstations and/or individually connected workstations as far as 800 feet away. The *Network Repeater Unit (NRU)* expands the distances between devices connected to a STARLAN NETWORK. It can increase the distance between NEUs from 10 to 800 feet. NRUs can also be used to connect multiple NEUs, increasing the diameter of the entire network up to 8,000 feet. The NRU can be used to improve signal quality in an electrically noisy environment.

The *General Purpose Interface Bus (GPIB)-3B2* is a single-width IEEE-488 intelligent feature card manufactured, marketed, and sold through National Instruments Company of Austin, Texas. This card includes an 80186 processor and 128 kilobytes of memory and transfers data at 790 kilobytes per second. It provides the 3B2 with realtime testing, measurement, and control capabilities for laboratory and factory automation environments.

The *AT&T Dataphone II 740 Acculink Multiplexer* integrates data, voice, and other high-speed inputs for high-volume transmission over Accunet T.1.5 services or other communications facilities. The 740 combines 128 input channels into a single digital stream. Each data channel can be programmed for a wide variety of data rates, starting at 300 bps and reaching as high as 1.31M bps.

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* (Releases 2.0.5, 3.1, 3.1.1, 3.2, and 3.2.1), the operating system for the 3B2 Family, is a general-purpose, multiuser, multitasking, interactive operating system. UNIX System V for the 3B2 Family consists of a core package that includes the system kernel; standard device drivers; and basic commands for shell programming, directory and file management, system administration, and user environment.

As indicated above, UNIX System V is available in various releases. The following table indicates which key features are supported by the various releases.

UNIX System V Release (SVR) 2.0.5, supported by the 3B2/310 and /400, is the maintenance release for earlier

AT&T 3B2 Family

IP provides higher level capabilities such as electronic mail, remote command execution, and file transfer. Support for TCP/IP allows the 3B2s to participate in many government and university networks.

By supporting X.25, which has been accepted as an industry standard, the 3B2s can communicate over a public packet network with other X.25 network systems, including systems from other vendors. Support for X.25 provides wide area network connectivity and makes the 3B2s suitable for use in international computing environments, one of AT&T's target markets.

All 3B2 models also support the AT&T LU6.2 Facility, AT&T's implementation of IBM Advanced Program-to-Program Communications, an enhancement of IBM Systems Network Architecture (SNA). The LU6.2 Facility allows applications programs on the 3B2 to communicate with partner programs on an LU6.2 peer or host system. LU6.2 systems can communicate directly with each other without host intervention, which is easier and more economical than the host controlling communications between systems. Support for LU6.2 makes the 3B2s suitable for use in SNA-based departmental environments.

The High-Level Language Application Program Interface (HLLAPI) feature makes it feasible to upgrade from a single-user, equipment-dependent environment to the multiuser, UNIX environment without extensive reprogramming. The 3270 Emulator+ and Escort programming software provides a scripting language for establishing multiple concurrent sessions with host applications. Escort automates complex tasks, such as multiple host updates and host login procedures.

The AT&T Application Program Interface (API) allows programmers to write C programs that emulate a 3270 host session to an IBM host, thus increasing the ability to implement the 3B2 as a departmental processor in an IBM mainframe environment.

The UNIX-to-UNIX Copy (uucp) facility in each computer's UNIX operating system permits communications with both AT&T UNIX System V and non-AT&T UNIX operating systems (for example, those running a version of UNIX based on the University of California at Berkeley implementation). This facility gives users access to applications written for either version of UNIX.

AT&T also offers Mail Exchange (formerly known as Document Exchange), which provides system gateways to IBM DISOSS and PROFS, Wang OIS/VS, MS-DOS-based PCs, and AT&T's own electronic mail systems. This package allows the 3B2s to be integrated into an existing IBM, Wang, AT&T, or multivendor environment, while providing for the 3B2 users' choice of a preferred word processing or office automation system. In addition, DISOSS and PROFS support is especially important in competing with the widely installed IBM System/36 in departmental

swapped-base versions of 3B2 software, including software written for and under all Release 2 versions of UNIX, except Release 2.1. Under swapping, a computer must load an entire software program into its memory before running it. When running more than one program at a time, the computer often has to swap the programs back and forth between its memory and the virtual memory on the disk.

SVR 3.1 and 3.2, supported by the 3B2/310 and /400, improve upon previous versions by offering Mandatory and Advisory File, Record Locking, and shared libraries. SVR 3.1 and 3.2 are designed for customers who want to run demand paging versions of UNIX software and for customers committed to networking. 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 gigabytes) than the computer's memory.

SVR 3.2 also includes includes the AT&T Windowing Utilities (optional on earlier releases) which provide the xt packet protocol and the layers window manager which provide multiple virtual terminal capability for the 615 MT, 620 MTG, and 630 MTG terminals.

UNIX System V Release 3.2.1, which includes all features available in Release 3.2, is designed for use with the 3B2/500, /600, and /700 and is capable of supporting these models' unique hardware features such as VCache, main memory ECC, and the CPU's 22MHz clock. Release 3.2.1 includes SCSI utilities and is available on cartridge tape.

SVR 3.2 and 3.2.1 core packages also include Framed Access Command Environment (FACE), a menu-driven, user-friendly interface used to create, manage, and move files. Several security enhancements have been added, including an enhanced shell, login tracking, and password shadowing. The line printer spooling utilities have been enhanced for use in a server environment requiring high printer functionality.

UNIX SVR 3.2 and 3.2.1 add-on software products are also available, including Remote File Sharing (RFS), the 2K File System, and Networking Support Utilities (NSU). RFS provides users with the ability to share both peripherals and files with other 3B2 computers connected to the same network. The 2K File System provides for the creation of a 2-kilobyte block file system, improving the performance of the DOS Server and improving I/O by minimizing the number of I/O operations.

NSU includes the Transport Level Interface (TLI) and the Streams option. TLI provides programmers 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. 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 without having to rewrite the entire program.

AT&T 3B2 Family

and office environments; the System/36 has facilities available to it for downloading DISOSS and PROFS from a mainframe host.

As part of its marketing push for the UNIX operating system and its computer systems, AT&T provides extensive training for AT&T employees, users, and licensees of the UNIX System V operating system. Management courses are also available. Training is available in the form of classroom seminars, hands-on classes, and self-paced videotape and interactive videodisk courses. AT&T's approach is to develop training programs concurrently with product development so that installation and maintenance courses are ready when the products are announced. There are 5 national training centers, 14 regional training centers, and over 10 satellite training centers. AT&T's dedication to user and employee training in UNIX System V and the C programming language is evidence of AT&T's commitment to marketing UNIX System V to the end user. The company is relying on the continued success of the operating system as much as it is hoping for the eventual success of the 3B2 systems.

Datapro previously cited AT&T's limited capability to sell and support its products as a restriction of the product line. The company has recognized its weaknesses in support, maintenance, and education and has taken steps to better educate its staff. The DSG (elevated from division status) has been armed with a 1,000-person sales and service force dedicated to selling and servicing computers, enabling AT&T to compete more effectively with vendors like IBM and Digital Equipment that are already highly regarded as service providers.

USER REACTION

Because AT&T would not provide names of 3B2 users for Datapro to interview, Datapro spoke to 3B2 users who responded to the 1987 Datapro computer users survey.

Site One: A contact lens manufacturer located in Illinois is using a 3B2/310 to run its order entry, inventory, accounts receivable, accounts payable, general ledger, word processing, spreadsheet, and database applications. The user chose the 3B2/310 because of its expandability and upgrade path. IBM mid-range systems were also considered, but not selected, because upgrades between product lines—for example from the System/36 to the System/38—required that too much equipment be discarded.

The user said that the system was very reliable and that most of the problems they had experienced were due to the VAR's software package. The only major downtime occurred when the building was struck by lightning—and AT&T supported this site through its recovery. AT&T brought in a crew of eight technicians who stayed from morning till midnight repairing the equipment. The user also found AT&T's toll-free phone support line to be very helpful. This user would recommend the 3B2/310 to a prospective buyer primarily based on the good support received from AT&T.

For more details on UNIX System V, refer to the "Operating Systems" section of the "AT&T 3B Computer Family" report and to the "AT&T Information Systems UNIX System V" report in *Datapro Reports on Minicomputers.*

DATABASE MANAGEMENT SYSTEM (DBMS): Several DBMS products are available from AT&T for 3B2 computers, including standard and relational packages.

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 other 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.**

Third-party vendor packages include *dBASE II*, developed by Ashton-Tate, Inc.; *Ingres 6.0*, from Relational Technology, Inc.; *Informix*, from Informix Corporation; *Oracle*, from Oracle Corp.; *Unify*, from Unify Corp.; and *Focus* from Information Builders.

LANGUAGES: Languages available for the 3B2 Family include the C language; Basic; Fortran 77; RM/Cobol; RM/Cobol Runtime; Pascal; UX Software, Inc.'s UX-Basic+; Micro Focus Level II Cobol and Level II Cobol/Enhanced Technology (ET); and Software Ireland Ltd.'s Unibol. AT&T Integrated Compiler Products (ICP) is a collection of language processors that are driven by a front end centered around a common code generator. The processors share common routine libraries and develop and maintain programs through the use of a common debugger. ICP includes compilers for Basic, Fortran, Cobol, and Pascal.

Several programming tools and utilities are available, including AT&T Advanced Programming Utilities (APU), AT&T C Programming Language Utilities (CPLU), and AT&T C Programmer's Productivity Tools (CPPT); Micro Focus Animator, Forms-2, Runtime ET, and ET Sourcewriter; and VISUAL Menu.

The 630 MTG Software Development Package provides programmer tools for writing applications software for the 630 MTG. Included in the package are debuggers, LAN support, a screen editor, icon development programs, and alternate fonts.

COMMUNICATIONS: Communications software products focus on supporting existing industry protocols for connectivity to both PCs and mainframes, as well as to other 3B2 and 3B superminicomputers. Communications software products include both emulation and networking packages.

***SNA/3270 Emulator+* provides interactive communications between the 3B2 and any IBM host system supporting**

AT&T 3B2 Family

The user finds the 3B2 line to offer an adequate growth path, and the company is considering upgrade options because of slow order entry response time and the need for more memory. The user indicated that she would like AT&T to provide a better monitor for system activity.

Site Two: A legal firm in Phoenix, Arizona is using a 3B2/400 to run legal time and billing, general ledger, accounts payable, database, word processing, and office automation applications. The system was purchased to replace a Digital Equipment DECmate. The user also considered the purchase of an IBM System/36 and networked PCs but chose the 3B2 instead because the cost of software was much lower for the 3B2/400 than it would be for each PC in a network.

The user likes the UNIX operating system and the ability to run all his applications at the same time. He also likes the reliability of the systems and reported no more than a day of downtime in the last year and a half. He finds the quality of AT&T's service and support to be average. He would like to see more support for graphics on the UNIX operating system but sees that coming. He would also like AT&T to make it easier for a novice user to operate the systems by adding better on-screen system administration instructions (for example, on how to back up the system). □

SNA/SDLC protocol. This package emulates the 3274-51C cluster controller and the IBM 3287 printer. Terminal emulation includes the IBM 3278 SNA/SDLC Display Station (Models 2 and 5).

***BSC/3270 Emulator+* provides interactive communications between a 3B2 and any IBM host system supporting bisynchronous communications protocols. It provides the ability to emulate BSC terminals, printers, and cluster controllers.**

***SNA/RJE Emulator+* provides the ability to emulate IBM's SNA batch workstations, the 3776 or 3777 Models 3 and 4. *BSC/RJE Emulator* allows a 3B2 to emulate BSC batch workstations: the IBM 2780 data transmissions terminals, 3780 data communications terminals, and HASP workstations.**

The *3270 Application Program Interface (API)* consists of a library of access routines that allow a C language program to interface directly to an IBM host computer. The program appears to the host as if someone were sitting at a 3278 Display Station and keying in responses. Large volumes of data can be processed via computer programs without operator intervention. API supports both SNA/3270 Emulator+ and BSC/3270 Emulator+.

The *3270 High Level Language Application Program Interface (HLLAPI)* feature provides functions compatible with the IBM 3270 Personal Computer HLLAPI. The product provides enhanced interface capabilities between C language programs, nest applications, and local UNIX System V applications. The HLLAPI library of C language-compatible functions is used to emulate manual terminal operation, automating such routine tasks as host login procedures and providing simultaneous interaction with multiple host applications. HLLAPI supports both SNA/3270 Emulator+ and BSC/3270 Emulator+.

The *3270 ESCORT* feature provides a powerful structured programming language with English-like commands that enhance applications development and facilitate the design of data entry screens. Escort users can access multiple host applications under synchronous or asynchronous communications by simulating an IBM 3278 terminal or a Digital Equipment VT100 terminal. Escort supports both SNA/3270 Emulator and BSC/3270 Emulator.

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. It is packaged with each 3B2 computer and may be ordered by users who do not already have it.

The 3B2 Family also supports *PC Interface*, a hardware/software link that interconnects 3B2 computers to PCs running the MS-DOS operating system. The PC Interface allows multiple PCs to share files and peripherals on a central 3B2 running UNIX System V. Files can be transferred back and forth from PCs to 3B2 systems. The PC Interface supports two types of media to interconnect PCs and 3B2s: 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 3B2s 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.

CHART E. FEATURES OF THE UNIX SYSTEM V RELEASES 2.0.5, 3.1.1, 3.2, AND 3.2.1

Release	2.0.5	3.1/3.1.1	3.2	3.2.1
Networking				
StarLAN		X	X	X
TCP/IP	X	X	X	X
X.25*	X	X	X	X
3BNet*	X	X	X	X
PC Interface	X	X	X	X
Memory Management				
Demand Paging		X	X	X
Virtual Swapping	X			
Mass Storage				
SCSI-based peripherals	X	X	X	X
XM expansion modules	X	X	X	
Features				
User Interface			X	X
Remote Management		X	X	X
Shared Libraries		X	X	X
File and Record Locking:				
Mandatory		X	X	X
Advisory	X	X	X	X
Windowing	**X	X/**3.1	X	X
Increased Security			X	X
3B2 Models supported				
3B2/310	X	3.1	X	
3B2/400	X	3.1	X	
3B2/500		3.1.1		X
3B2/600		3.1.1		X
3B2/700				X

**Supports Streams option under all Release 3 versions of UNIX System V.*
***With optional windowing driver software.*

AT&T 3B2 Family

The *LU6.2 Facility* is a software development tool based on UNIX System V that provides direct communication between any 3B2 and LU6.2-compatible systems in an SNA environment. This facility is AT&T's implementation of LU6.2 and PU2.1, which IBM also calls Advanced Program-to-Program Communications (APPC). It enables both peer-to-peer, i.e., nonhost-directed, and application-to-application communications in multivendor environments.

3BNet provides a user-level command interface to an Ethernet network. 3BNet requires the 3BNet Network Interface card and standard Ethernet transceiver and drop cable.

Adhering to CCITT and ISO standards, *X.25 Network Interface 3B2 Software* provides a packet layer interface to an X.25 network. Processor-to-processor communications are supported through a public packet network or direct connection. This package is authorized for use with AT&T ACCUNET Packet Service USA and GTE's TELENET public data networks.

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 represents the standard protocol set specified by the U.S. Department of Defense for use over all federal government computers. The AT&T version was ported to the 3B computer line by the Wollongong Group.

OFFICE AUTOMATION: AT&T provides both office productivity and office communications software for the 3B2 systems. The *Smart Software System* is an integrated office system (IOS) designed for businesses and corporate departments which 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 may be shared between MS-DOS and UNIX operating environments and between computers over the STARLAN NETWORK.

Also available for the 3B2 systems is Uniplex Integration Systems, Inc. *Uniplex II* integrated office system; Syntactics Corporation's *Crystal Document Manager System* word processing software; Access Technology, Inc.'s *20/20* spreadsheet package and *20/20 Database Connection-Informix*; Samna Corporation's *Samna Word IV* and *Samna Plus IV* word processing; and Ficor, Inc.'s *AutoGraph* graphics software. AT&T also integrates these existing third-party office application packages to build integrated office systems.

Office communications software packages are also available. *AT&T Mail Service* is a public electronic mail service that allows subscribers to exchange messages and data by dialing an "800" number from a PC, UNIX computer, or telephone. *AT&T Mail Access* software provides PC users with a user-friendly interface to the AT&T Mail Service. The software notifies users of incoming mail and includes a background mail feature which sends and receives mail at preset times. Two versions of AT&T Mail Access are available: *Access Plus* for MS-DOS computers, and *Access III* for the Apple Computer Macintosh. The *AT&T Mail PMX* (Private Message Exchange) software family creates premise-based UNIX and MS-DOS electronic mail networks for terminals connected to a 3B2 or 3B computer, individual PC users, and PC users in a STARLAN NETWORK. A PMX system can also access AT&T Mail Service to send mail to other AT&T Mail users who are not part of the local system.

AT&T Mail Exchange provides an electronic mail network which allows user to transparently send and receive revisable- and final-form mail and interpersonal mail. It supports gateways to IBM, Digital, Hewlett-Packard, Wang, and MS-DOS environments.

AT&T Office TeleSystem (OTS) integrates voice and data communications functionality within a menu-driven interface that provides electronic messaging, telephone management, calendaring, PC file transfer, and the ability to provide that same menu interface for both MS-DOS and UNIX applications. Both Mail Exchange and OTS are completely compatible with the entire AT&T family of mail products.

APPLICATIONS: Both proprietary and third-party applications are available for the 3B2 Family, including general business, data management, spreadsheets, word processing, and office automation and productivity. Vertical industry packages for doctors and hospitals are also available. The *AT&T Computer Software Guide* lists available software for the AT&T 3B2, as well as the 3B superminis and AT&T's PCs.

OPERATING ENVIRONMENT

The 3B2/310 system cabinet is 3.6 inches high, 22.0 inches wide, and 17.0 inches deep; basic configurations weigh about 30.0 pounds. The 3B2/310 can be positioned either horizontally or vertically; when horizontally positioned, it can support an external load up to 60 pounds.

The 3B2/400 is 7.2 inches high, 22.0 inches wide, and 17.0 inches deep. The 3B2/400 weighs 60 pounds.

The 3B2/310 and /400 require standard power of 115 V AC/220/240 V, 4 Amp/2 Amp, at 60 Hz. Power consumption is less than 230 watts on the 3B2/310 and less than 400 watts on the 3B2/400. Operating temperatures range from 40 to 100 degrees Fahrenheit at 20 percent to 80 percent relative humidity, noncondensing. Heat dissipation is less than 200 watts on the 3B2/310 and less than 370 watts on the 3B2/400.

The 3B2/500 is 7.6 inches high, 18.0 inches wide, and 22.0 inches deep. It weighs 70 pounds. Power requirements are 100/120 V, 15 Amp to 200/245 V, 8 Amp, at 50 to 60 Hz. Power consumption is 500 watts. Operating temperatures range from 40 to 100 degrees Fahrenheit at 20 to 80 percent relative humidity; heat dissipation is 1,620 Btu.

Both the 3B2/600 and /700 are 12.6 inches high, 16.9 inches wide, and 24.6 inches deep. Each system weighs 82 pounds. Both systems require standard power ranging from 100/120 V, 15 Amp to 200/240 V, 8 Amp, at 50 to 60 Hz. Power consumption on both systems is 900 watts; heat dissipation is 3,000 Btu per hour, 900 watts.

SUPPORT SERVICES

DOCUMENTATION: Standard user documentation includes the *3B2 Computer Model 310, Model 400, Model 500, Model 600,* or *Model 700. Owner/Operator Manual*; the *3B2 Computer Model 310, Model 400, Model 500,*

AT&T 3B2 Family

Model 600, or *Model 700 UNIX System V User Guide and Essential Utilities Reference Manual*; and an *Update Manual.* Also, *Documentation Roadmap*, *Release Notes*, *User Reference Manual*, *System Administration Reference Manual*, *Programmer Reference Manual*, and *Security Administration Utilities Guide* are all standard. Other available documentation includes *AT&T Information Systems Architecture Manual* and the *AT&T Computer Software Guide.*

TRAINING/EDUCATION: AT&T provides hardware and software training at national and regional education centers. The company also provides on-premises training in complex software packages. Videotaped courses are also available.

MAINTENANCE: AT&T offers tailored maintenance agreements for 3B2 computer systems. The agreements include combinations of toll-free hot line assistance for hardware and software and on-site service by field service technicians.

In some cases, hot line service can include remote diagnostics services. 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. Response time is four hours if the user is experiencing a major failure with a totally inoperable system or loss of more than 25 percent of the system's peripherals. A 24-hour response time is guaranteed for minor failures.
- Around-the-clock service, which extends coverage to 24 hours a day, 7 days a week, including holidays. Response times are the same as for business day service contracts.
- 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. Coverage is for 24 hours a day, 7 days a week. Response times are on a best-efforts basis, but targeted toward 4 hours for major failure and 24 hours for minor failure. Per-occurrence customers have lower dispatch priority than maintenance contract customers.

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 AT&T 3B2 Remote Management Package allows administrations and maintenance operations to be performed from a remote location. This package includes software utilities and four features grouped together in the Alarm Interface Circuit (AIC) card. An AT&T Auto Dial Modem Package is required to utilize the remote console. A commercial alarm system is required to generate remote alarm signals.

The 3B2 system has a 1-year warranty for the 3B2/500, /600, and /700, and a 90-day warranty for the 3B2/310 and /400 and software. During that period, customers receive business day service and hot line assistance.

PRICING

POLICY: The 3B2 Family is available for purchase or lease. Financing is also available from AT&T Credit Corporation. A volume discount for the system is also available. List prices for the system are quoted in the EQUIPMENT PRICES information following. The price for software is a onetime use license fee. Maintenance fees for both purchase and lease options are available on either a month-to-month or annual contract basis. Separate price schedules for spares and growth, software licensing, and fee schedules are also available.

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint. ($)
3B2/310 Packages			
7323-A2A	3B2/310 Solution Package A2 includes 3B2/310 CPU, MAU, two RS-232 serial ports, one I/O expansion ports card (4 RS-232-C serial, 1 parallel ports), 1MB memory, 30MB disk, 720KB diskette, Unix System V Release 3.2, and four RS-232-C terminal cables and connectors	9,500	86.25
7323-A2B	3B2/310 Solution Package B2 includes 3B2/310 CPU, MAU, two RS-232-C serial ports, one expansion ports card (4 RS-232-C serial, 1 parallel), 1MB memory board, 720MB diskette, 72MB disk, Unix System V Release 3.2, and four RS-232-C terminal cables and connectors	9,800	88.50
7323-A2F	Same as 3B2/310-B2 but includes 2MB memory board and one EPORTS board (with eight serial ports and no parallel ports)	11,200	101.50
3B2/400 Packages			
7324-A2A	3B2/400 Solution Package A2 includes 3B2/400 CPU, MAU, I/O expansion ports card, 1MB memory board, 30MB disk drive, 720KB diskette drive, 23MB cartridge tape drive, six RS-232-C cables and connectors, and Unix System V Release 3.2	13,400	105.00

A dash (—) in a column indicates that information was unavailable from vendor.

AT&T 3B2 Family

		Purchase Price ($)	Monthly Maint. ($)
7324-A2C	3B2/400 Solution Package C2 includes 3B2/400 CPU, MAU, one EPORTS card, 2MB memory board, a 72MB disk drive, a 720KB diskette drive, a 23MB cartridge tape drive, six RS-232-C cables and connectors, and Unix System V Release 3.2	17,200	110.00
7324-A2D	3B2/400 Solution Package D2 same as 7324-A2C but includes two 72MB disks	20,300	163.50
7324-A2Q	3B2/400 Solution Package Q2 includes 3B2/400 CPU, MAU, EPORTS card, 2MB memory board, 72MB disk, 720MB diskette, 60MB cartridge tape drive, SCSI host adapter, six RS-232-C cables and connectors, and UNIX System V Release 3.2	17,000	110.00
7324-A2R	3B2/400 Solution Package R2 same as 7324-A2Q but includes two 72MB disks	19,200	163.00
3B2/500 Packages			
7325-AMA	3B2/500 Solution Package A includes 3B2/500 CPU, MAU, 4MB of memory, 720MB diskette drive, a 147MB disk drive, one EPORTS cards, 60MB tape drive, SCSI host adapter, Unix System V Release 3.1.1 or 3.2.1, 8 cables and 10 connectors	24,000	185.00
7325-AMB	3B2/500 Solution Package B same as 7325-AMA but with a 300MB disk and 120MB cartridge tape drive	28,000	208.00
3B2/600 Packages			
7326-AMA	3B2/600 Solution Package A includes 3B2/600 CPU, MAU, 4MB of memory, 720KB diskette drive, two 147MB disk drives, three EPORTS cards, 60MB tape drive, SCSI host adapter, 8 cables and 10 connectors, Unix System V 3.1.1 or 3.2.1	46,500	230.00
3B2/700 Packages			
7327-AMA	3B2/700 Solution Package A includes CPU, MAU, VCache, four EPORTS cards, two 4MB memory cards, two 300MB disk drives, one 720KB diskette drive, SCSI host adapter, one 120MB cartridge tape drive, 8 cables, 10 connectors, and UNIX System V Release 3.2.1	69,000	425.00
7327-AMB	3B2/700 Solution Package B same as 7327-AMA but with 16MB memory	74,000	—
STARLAN PC SERVERS			
7323-A2FP	Model 310 based on 3B2/310 F2, includes 2MB of memory, a 72MB disk drive, one IPORTS card, Unix System V, NAU, DOS Server Program, Network Program Package, Network Support Utilities	10,683	101.50
7324-A2RP	Model 400 based on 3B2/400 R2, similar to 310 StarLan PC Server but includes 4MB of memory, two 72MB disk drives, a 60MB cartridge tape drive, and an SCSI host adapter	18,410	163.50
CPU OPTIONS			
73230	MAU upgrade kit	2,200	—
73254	3B2/300 to 310 Migration Kit without MAU	2,190	NA
73255	3B2/300 to 310 Migration Kit with MAU	3,790	NA
73276	3B2 22MHz Upgrade Kit for 3B2/500 and 600	10,000	NA
73278	Multiprocessor Enhancement	4,500	—
—	Virtual Cache (VCache)	1,500	—
MEMORY OPTIONS			
73201	1MB expansion memory	1,600	4.25
73260	2MB half-height ECC memory for 3B2/310 and 400	2,400	11.25
73272	2MB expansion ECC memory for 3B2/500, 600, and 700	3,000	15.75
73273	4MB expansion ECC memory for 3B2/500, 600, and 700	5,000	25.00
73281	16MB memory for 3B2/700 and the 3B2/500 and 600 with the 22MHz Upgrade Kit	20,000	—
INPUT/OUTPUT OPTIONS			
73202	I/O expansion card	660	NA
73271	EPORTS card	1,320	8.00
MASS STORAGE			
73211	XM Solution Package A includes 23MB cartridge tape drive	3,795	24.00
73213	XM Package C includes 72MB disk drive and 23MB tape drive	7,500	58.00
73215	1MB diskette drive	660	—
73216	XM 30MB disk drive for XM package on 3B2/310	2,950	—
73217	XM 72MB disk drive may be added to XM package on 3B2/310	3,950	42.00
73238	30MB disk drive for 3B2/400 internal use	2,950	—
73240	72MB disk drive for 3B2/400 internal use	3,950	42.00
73258	23MB tape drive	2,595	—
73263	SCSI Host Adapter	2,000	8.25
73282	3B2 Differential Host Adapter	3,000	—

A dash (—) in a column indicates that information was unavailable from vendor.

AT&T 3B2 Family

		Purchase Price ($)	Monthly Maint. ($)
73283	Peripheral Power Control Unit	2,000	—
36203	DM/147E 147MB SCSI-based disk drive	5,900	41.00
36204	DM/300E 300MB SCSI-based disk drive	9,750	66.00
36205	DM/300S 300MB SCSI-based single-ended disk	10,500	—
36206	DM/300DS 300MB SCSI-based differential disk	10,500	—
3620-010	DCM/4E disk controller module that controls up to four disk modules	1,300	16.50
3621-011	XM/900S Expansion module	27,700	198.00
3630-010	49MB 9-track 1600 bpi SCSI-based tape drive	12,000	104.00
3630-011	9-track 6250 bpi tape drive	21,500	191.00
3630-012	9-track 1600/6250 single-ended tape drive	21,500	—
3630-013	9-track 1600/6250 differential tape drive	21,500	—
3631-010	TM/60S 60MB streaming cartridge tape drive	2,500	27.50
3631-011	TM/120S 120MB streaming cartridge tape drive	3,250	27.00
PRINTERS			
3330-455	Model 455 daisywheel; 55 cps, 132 columns, 4 maximum paper parts; for departmental word processing applications	1,870	29.00
3330-475	Model 475 impact dot matrix; 120 cps, 80 columns, 4 maximum paper parts; for personal printer applications	595	7.00
3330-476	Model 476 impact dot matrix; 120 cps, 132 columns, 4 maximum paper parts; for personal printer applications	845	7.00
3330-477	Model 477 impact dot matrix printer; 96-288 cps, 132 columns, 5 paper parts, colors	1,695	30.00
3331-495	495 laser printer, 10ppm, 300 x 300 dpi	2,995	70.00
3353-010	Model 5310 impact dot matrix; 200 cps, 80 columns, 6 maximum paper parts; business printer/forms tear off	1,349	25.00
3353-020	Model 5320 impact dot matrix; 200 cps, 132 columns, 6 maximum paper parts; business printer/integrated, modem available	1,659	25.00
3330-435	435 plotter (six-pen plotter only); 1 maximum paper part; six-color quality charts and graphics	1,895	22.00
3330-201	460 high-speed dot matrix printer; 200 lpm, 132 columns, 6 maximum paper parts; medium-duty wide platen	4,115	48.00
3330-447	447 line printer; high-volume computer output	10,995	185.00
3322-442	400 lpm band printer	7,225	—
3322-444	650 lpm band printer	7,795	—
3322-446	1,000 lpm band printer	12,995	—
WORKSTATIONS			
3701-010	510A terminal	1,095	18.00
3344-180	Dataspeed 4418 terminal	1,065	18.75
3344-605-	605 BCT includes controller, monitor, and 102-key keyboard	595	6.00
3344-610	610 BCT controller/base	505	4.00
33415	610 BCT 14-inch monitor (green or amber)	230	4.25
3344-615	615 MT controller/base	575	5.00
33415	615 MT 14-inch monitor (amber or green)	230	4.25
3344-620	620 MTG controller/base	800	10.25
33411	620 MTG 14-inch monitor	355	4.40
3344-630	630 MTG controller/base	1,225	6.00
33534	630 MTG 16-inch monitor	1,080	12.00
33401	98-key keyboard for 610 BCT, 615 MT, 620 MTG, and 630 MGT	140	0.75
33402	103-key keyboard for 610 BCT, 615 MT, and 620 MGT	140	0.75
33422	512K RAM expansion card	345	4.00
33450	Mouse for 620 MTG	165	1.00
33536	Mouse for 630 MTG	150	2.25
33537	122-key keyboard for 630 MTG	150	1.00
33456	VT220 emulation cartridge	125	0.75
33403	VT220 emulation keyboard	175	1.00
33430	300/1200 dialer modem card	325	3.25
33465	Limited distance modem card	100	0.75
33460	Autodialer card	285	2.75
COMMUNICATIONS/NETWORKING OPTIONS			
73220	3B2 ISC	1,475	—
73223	3B2/300 3BNet Network Interface feature. Includes network interface card, network interface label, ground clip, three screws, block label, nylon cable clamp, and media interface driver	1,900	15.00
73224	Same as 73223, plus 10-meter drop cable and transceiver	2,400	20.00
73225	Same as 73223, but with 30-meter cable and transceiver	2,555	20.00
73226	Same as 73223, but with 50-meter cable and transceiver	2,740	20.00
73210	Autodial modem	695	15.00
—	Network Repeater Unit (NRU)	895	—
—	Dataphone II 740 Acculink Multiplexer, lowest price	15,000	—
—	Dataphone II 740 Acculing Multiplexer, average price	52,000	—
—	Information Systems Network (ISN) remote concentrator	7,500	—
—	ISN fiber extenders	7,000	—
2614-300P	3B2 Network Access Unit	995	11.00

A dash (—) in a column indicates that information was unavailable from vendor.

AT&T 3B2 Family

SOFTWARE PRICES

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.

		List Price ($)
OPERATING SYSTEMS		
The UNIX System V Release 3.2 is bundled with the 3B2/310 and 400. Release 3.2.1 is bundled with, and can only be ordered for, the 3B2/500, 600, and 700.		
1041-205	UNIX System V Rel. 2.0.5 upgrade for 3B2/300; right-to-use, not purchase	500
1041-206	UNIX System V Rel. 2.0.5 upgrade for 310/400; right-to-use, not purchase	500
1041-500	UNIX System V Rel. 3.2	1,000
1041-501	UNIX System V Rel. 3.2 upgrade	500
—	UNIX System V Rel. 3.2.1	1,500
1041-507	UNIX System V Rel. 3.2.1 upgrade	800
UTILITIES		
1041-000	Line printer spooling utilities package	95
1041-001	Screen Management	95
1041-008	System Performance Analysis Utilities package	195
1041-502	Networking Support Utilities	200
1041-503	Remote File Sharing Utilities	500
1041-504	2K File System Utilities	95
1041-505	User Interface Utilities package	295
1041-506	Extended Terminal Interface Libraries Package	295
DATABASE MANAGEMENT SYSTEMS		
1041-L00	dBASE II	1,200
1041-L01	Ingres/CS	2,000
1041-L02	dBASE III	1,200
1041-L06	Unify	1,995
1041-L07	Unify R/T	1,000
1041-L10	Informix 3.3	1,600
1041-L17	Informix-SQL	2,200
1041-L18	Informix ESQL/C	1,650
1041-L19	Informix ESQL/Cobol	1,650
1041-L20	Informix 4GL	3,400
1041-L29	Informix Turbo	1,650
1041-L31	Informix C-Isam	630
LANGUAGES		
1041-A01	Unix C programming language	495
1041-C02	Unix Fortran	275
1041-B00	Unix Basic Language	300
1041-B10	UX-Basic+	975
1041-D00	RM/Cobol	1,500
1041-D01	RM/Cobol RT	300
1041-D03	Pascal	340
1041-D11	Level II Cobol R/T	400
1041-D21	Micro Focus Level II E/T	2000
1041-A02	AT&T Advanced Programming Utilities	500
—	C Programming Language Utilities for 3B2/310 and 400	750
—	C Programming Language Utilities for 3B2/600	1,300
1041-565	630 MTG Software Development Package	500
COMMUNICATIONS		
1040-010	3B2 PC Interface	100
1040-018	BSC/RJE Emulator+	2,000
1040-019	SNA/RJE Emulator+	2,000
1040-021	3270 Emulator+	2,500
1040-029	LU6.2 Facility	3,000
1040-X25	X.25	3,400
1040-DKI	3B2 Datakit interface	850
1040-100	3B2 ISN Fiber Interface	850
1041-032	3B2 Networking Support Utilities	200
—	3B2 Remote Management Package	900
—	ISN Starkeeper I Network Management System	12,000
—	ISN connectivity software for DECnet upper layer protocols	5,000
—	ISN software driver for DEC VAX/VMS hosts	2,500
—	ISN HDLC protocols software on the Synchronous Interface Module	1,200

A dash (—) in a column indicates that information was unavailable from vendor.
Prices are subject to change and vary with market conditions

AT&T 3B2 Family

		List Price ($)
1040-TE1	Enhanced TCP/IP WIN/3B Interface, binary code	4,995
1040-TE2	Enhanced TCP/IP WIN/3B Interface	4,995
1040-TEU	TCP/IP upgrade	4,995
1040-S02	3B2 DOS Server Program	695
1040-S01	3B2 Network Program Package	395
OFFICE AUTOMATION		
1042-OTS	Office TeleSystem (OTS)	3,000
1040-030	Mail Exchange Base System	6,000
1040-035	Mail Exchange Utilities	3,000
—	Mail Exchange bridges and translators	3,000-5,000
1042-055	Smart Integrated Office System (IOS) for the 3B2/310 and 400	2,895
—	Smart IOS for the 3B2/500, 600, 700	3,845
1042-019	Crystal DMS for the 3B2/400	1,695
—	Crystal DMS for the 3B2/500, 600, and 700	2,795
—	Samna Plus IV for the 3B2/400	2,395
—	Samna Plus IV for the 3B2/500, 600, and 700	4,395
—	20/20 for the 3B2/310 and 400	1,200
—	20/20 for the 3B2/600 and 700	1,800
—	20/20 Database Connection-Informix for the 3B2/310 and 400	1,680
—	20/20 Database Connection-Informix for the 3B2/600 and 700	2,520
—	Autographics for the 3B2/310 and 400	995
—	Autographics for the 3B2/600 and 700	1,595
—	3B2 Uniplex II Plus	3,795
—	3B2/600 Uniplex II Plus	6,295
—	3B2 Uniplex Advanced Graphics	1,095
—	3B2/600 Uniplex Advanced Graphics	1,895

A dash (—) in a column indicates that information was unavailable from vendor.
Prices are subject to change and vary with market conditions. ■