# AT&T 3B2/300

MANAGEMENT SUMMARY

In 1984 AT&T entered the market for general-purpose computer systems with the Unix-based 3B computer family, including the 32-bit 3B2/300 desktop supermicro. The 3B2/300 runs AT&T's Unix System V operating system. It is designed for single-user and multiuser applications. The 3B2/300 is one of seven members of the 3B family, with an emphasis on custom applications and distributed processing.

Drawing upon its experience in communications, the company also introduced several networking products—both hardware and software—that permit interconnection among 3B systems and those from other manufacturers. Prior to being made available on the open market, the 3B2/300 system had been used internally at AT&T.

The 3B2/300 is the low-end system in AT&T's 3B computer family. It is based on AT&T's WE 32000 microprocessor, the same microprocessor used in larger 3B5 computers, and is intended for use in office, laboratory, and manufacturing plant environments. It features a single-board CPU and can support from 512KB to 2MB of plug-in memory. The system board includes two asynchronous RS-232-C serial I/O ports; four feature card slots in the 3B2/300 allow configuration of up to four I/O expansion cards, each of which adds four more RS-232-C ports and a parallel peripheral port. The 3B2/300 can be used as either a single-user or multiuser system; it can support up to six concurrently active users (although up to 18 workstations can be configured). The 3B2/300 supports either a 10MB or a 32MB Winchester disk drive.

The 3B2/300 is offered in three configurations. Each has the same core hardware and firmware, including cabinetry, cabling, system board, Unix System V core software and standard utilities, system and user documentation, and a 720KB floppy disk drive. The basic configuration comes ▷
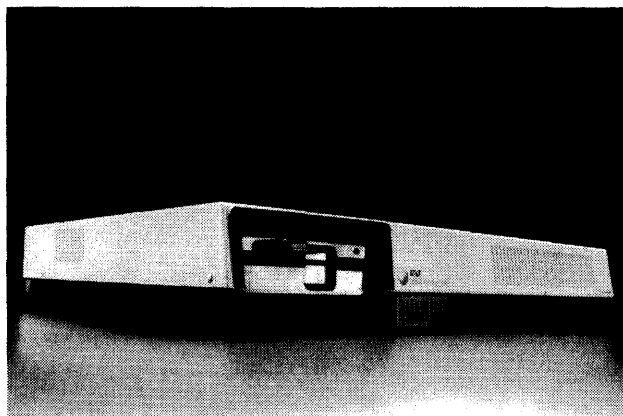
AT&T's 3B2/300 is a 32-bit, Unix-based desktop supermicro for single-user and multiuser applications. It can support up to 18 workstations. The 3B2/300 is based on AT&T's WE 32000 series of microprocessors.

The 3B2/300 is a desktop multiuser super-micro. The system is targeted toward a range of applications, especially custom applications and distributed processing. It runs AT&T's Unix System V. A variety of networking products provide communications among both the 3B2/300 system and Unix-based and non-Unix-based computers from other vendors.

MODEL: 3B2/300
MEMORY: 512KB to 2MB
DISK CAPACITY: 10MB to 32MB
WORKSTATIONS: Up to 18
PRICE: $9,950 (base system price).

CHARACTERISTICS

VENDOR: AT&T Information Systems, 1 Speedwell Avenue, Morristown, New Jersey 07690. Telephone (201) 898-2000.

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

DATA FORMAT

BASIC UNIT: 32-bit word.

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

MAIN STORAGE

Dual Port DRAM (DPDRAM) is the main storage type for the 3B2/300. Cycle time is 560 nanoseconds for the system. In the 3B2/300 system, each 32-bit word in main storage is divided into four 8-bit bytes; each byte has an associated parity bit. During memory read operations, the main store controller uses this code to check for and correct all single-bit errors and to identify double and detectable multibit errors. During each memory refresh cycle (every 8 microseconds), the main store is checked for bad parity. If bad parity is detected, an error signal is generated to the central processor.

Memory protection in the 3B2/300 is achieved through per-byte parity. The system's address bus provides up to 4GB of virtual address space. Minimum memory required for the Unix kernel and drivers on the 3B2/300 is about 300KB.

PROCESSING COMPONENTS

The processor used in the 3B2/300 computer is based on the WE 32000 microprocessor. It has a 32-bit data and address bus. The 3B2/300 CPU, located on the system board, has a clock rate of 7.2MHz.

The WE 32000-based CPU includes the following components: ▶

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CHART A. SYSTEM COMPARISON

MODEL	3B2/300
SYSTEM CHARACTERISTICS	
Date of introduction	March 1984
Date of first delivery	March 1984
Microprocessor Type	WE 32000
Microprocessor Cycle Time	7.2MHz-clock speed
Operating System	Unix V Version 2
Upgradable From	Not applicable
Upgradable To	Not applicable
Number of Users	—
Number of serial/parallel I/O ports	4
Number of expansion slots	18
MEMORY	
Minimum capacity, bytes	512KB
Maximum capacity, bytes	2MB
DISK STORAGE	
Minimum capacity, bytes	10MB
Maximum capacity, bytes	32MB
NUMBER OF WORKSTATIONS	Up to 18
COMMUNICATIONS PROTOCOLS	Async, 3BNet, Omninet, Ethernet, TTY, ISN

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

▷ with 512KB of main memory and a 10MB Winchester disk. The standard configuration includes 1MB of memory and a 32MB Winchester disk. The expanded standard configuration includes 1MB of main memory, a 32MB Winchester disk, and an expansion I/O feature card that provides four additional serial ports and a parallel peripheral port. Main memory, I/O, terminal, and printer options can be added to the core configurations.

To connect the 3B2/300 to both AT&T systems and those from other vendors, AT&T offers three principal networking products: 3BNet, Information Systems Network (ISN), and PC Interface.

3BNet is a high-speed local area network that provides file-transfer facilities for the 3B2/300 system, operating within an area of over 540 yards (500 meters). The network operates at a transmission rate of 10M bits per second over coaxial cable and is intelligent, using WE 32000-microprocessor-based interfaces to deload all protocol, flow control, and maintenance overhead from attached host computers. The 3BNet is Ethernet-compatible, permitting connection of the 3B2/300 to computers and peripherals supporting the Ethernet standard. 3BNet employs the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) communications scheme. The 3BNet network allows configuration of up to 100 nodes.

Information Systems Network (ISN) is AT&T Information Systems' proprietary local area network for building complexes and campuses; it permits networking of 3B family systems (including the 3B2/300) and computers from other manufacturers. ISN is based on a short, centralized bus architecture incorporating attributes of star networks, distributed buses, and distributed token rings.

The components of ISN include: a packet controller, a control console for system initialization and administra- ▷

▶ • Sixteen 32-bit registers for processor and programmer use.

• An Address Arithmetic Unit (AAU) that computes addresses and extracts data from instructions.

• A 33-bit Arithmetic Logic Unit (ALU) that performs arithmetic and logic operations.

• A 32-bit barrel switch that performs shift, rotate, and mask operations.

• 170 opcodes implemented in on-chip Programmable Logic Array (PLA), a procedure linkage facility, built-in system call instructions, process switch instructions for Unix and C operations, and a macro ROM for executing operating system instructions and microsequences.

• A 12-byte instruction queue for storing prefetched bytes from the instruction stream.

• A Program Counter (PC) and internal registers that identify the instructions currently being executed and the contents of the queue.

• A Process Status Word (PSW) that provides information on the status of the processor and the current process.

• A parity tree that provides a signal for validating redundant-processor operation.

The processor in each 3B2/300 system performs address and data calculations independently. The 32-bit CBUS carries the results of data manipulation, while the 32-bit ABUS handles instruction stream and memory board operand accesses. Data is passed between the ABUS and the CBUS over a 32-bit bidirectional bus multiplexer. The CPU's address bus can access 4GB of virtual memory to address main memory or feature cards. In addition to the address and data buses, the processor also has an 18-bit status bus that performs status monitoring activities, reporting read or write activity, data length, execution level, and operating system status.

The 3B2/300 system board features three programmable timers: time-of-day, periodic, and bus. A 3.6-volt lithium battery provides power to all I/O expansion board connector slots, the time-of-day clock, and the NVRAM to retain some nonvolatile storage during periods in which external power has been removed.

The WE 32000 microprocessor also contains features to support the process-oriented operating system environments afforded by Unix System V and its associated C language. The address space of every process is large enough to include space for the operating system. There are four levels of execution privilege: kernel, executive, supervisor, and user. The four levels separate users' programs from elements of the operating system by limiting access to certain code. Execution control can be transferred among privilege levels. The CPU also supports explicit process switching through a scheduler; implicit switching of processes is supported through the interrupt structure. The processor also provides a layered exception handling structure, with different mechanisms for different exceptions.

INPUT/OUTPUT CONTROL

On the 3B2/300, peripheral interfaces are controlled by the asynchronous, multiplexed I/O bus. The I/O bus has a 16-bit data path and a 24-bit address, and can support direct addressability up to 16MB. The I/O bus supports both 8-bit and 16-bit peripherals, as well as single- and multiple-data transfers per cycle. ▶

CHART B. MASS STORAGE

MODEL	10MB, 32 MB
Type	
	Winchester
Size (inches)	5¼
Number of surfaces	4; 5
Formatted capacity per drive (bytes)	10; 32
Drives per Interface/Controller	2
Average access time (nanoseconds)	85ms; 35ms
Data transfer rate	5M bps
Sectors/Tracks per Surface	1,224; 697 (tracks)
Bytes per sector/track	512/sector
Comments	

▷ tion, and concentrators. ISN can use both fiber optic and four-twisted-pair copper wire distribution cables. It can also be interconnected to AT&T's System 75 and System 85 PBXs.

PC Interface, a software product supported by the 3B2/300, is a hardware/software link that interconnects the 3B2/300 to personal computers running the MS-DOS operating system. PC Interface allows multiple PCs to share files and peripherals on a central 3B2/300 running Unix System V. Files can be transferred back and forth from PCs to 3B2/300 systems; all necessary translations are performed by the Interface unit. The PC Interface supports three types of media to interconnect PCs and 3B2/300s: RS-232 media operating at speeds up to 9.6K bps; Omninet, at 1M bps; and Ethernet, at 10M bps.

Starlan (available in late 1985) is an AT&T local area network. Starlan is compatible with SNA, Ethernet, and AT&T's Information Systems Architecture and Information Systems Network. Starlan can be expanded to include 1,200 physical connections and offers a growth path to larger network configurations.

As previously mentioned, the 3B2/300 runs AT&T's Unix System V, a general-purpose, multiuser, multitasking, interactive operating system. The two major components of Unix System V are the file system and the shell, or command language.

The Unix System V file system consists of a uniform set of directories and files arranged in a tree-like structure. The Unix System V shell is the user/system interface program that interprets command links input by the user from a terminal. The shell is not only an interactive command language, but also a full programming language.

Another feature of Unix System V is support for C, the high-level programming language in which the operating system and most of its subsystems are written. Unix System V also provides support for development, diagnostics support, system administration, system services, and text processing tools.

Languages available for the 3B2/300 include the C language, Basic, Fortran 77, and RM/Cobol (Ryan-McFarland ▷

▶ The I/O bus supports both programmed and intelligent peripherals. Programmed peripherals communicate with the CPU on the system board through interrupts and on-board registers. The microprocessor- or integrated-circuit-based intelligent peripherals operate autonomously, receiving interrupts through a read or write of specific memory mapped I/O addresses within the address spectrum of the CPU; they communicate with the CPU through request and completion queues in main memory.

Along with normal peripheral read of main memory, peripheral write to main memory, and CPU read/write of a peripheral, the I/O bus supports the following two special transfer cycles:

- Peripheral interlock with main memory—an uninterruptible sequence, within a single bus cycle, of a read of main memory by a peripheral, a modification of the data read, and a write back to the same location in main memory.

- Multiple bus accesses—through which more than one data transfer by the same peripheral can be accomplished in a single bus cycle. These accesses occur without bus arbitration overhead; a maximum of 4 transfers per arbitration is permitted.

The arbitration circuit on the system board controls I/O bus mastership. Any peripheral can become the bus master. When a peripheral publicly sends a peripheral bus request signal (shared by all peripherals), the arbiter grants the bus to the peripheral by asserting a peripheral bus acknowledge signal daisy chained through all peripherals. At the end of the cycle, the arbiter is free to grant the next bus mastership.

Access by the I/O bus and CPU to main memory is controlled by the DPDRAM controller, which supports four basic modes:

- Refresh—the request generator asserts a fresh request approximately every 16 microseconds. The request is passed to the arbiter, where it receives the highest priority.

- I/O access of main memory—a feature card or the integral DMA controller makes a memory request by asserting a bus request signal. The request signal is passed to the arbiter, where it is assigned the second highest priority.

- CPU access of main memory—to increase system performance, read cycles are treated differently from write cycles. Read requests are passed directly to the arbiter, while a write request is blocked until the CPU is completely ready for the access sequence. CPU accesses of main memory are assigned third priority by the arbiter.

- CPU access of I/O—the CPU can reach across the main memory to communicate directly with feature cards or with the system-board-resident DMA controller. The direct access is made possible by the Dual Port Memory Address Bypass Circuit and the Byte Rotation Unit (BRU); the BRU formats data from the 8- and 16-bit feature cards so that the cards can access the 32-bit main memory. I/O requests from the CPU receive fourth (lowest) priority from the arbiter.

The DMA controller features four independent DMA channels and provides service for the hard disk controller, the floppy disk controller, and the transmit ports of the dual asynchronous serial RS-232-C ports, which all attach to the I/O bus and follow the same bus protocol as feature cards. To support the integral controllers and ports, the DMA controller accepts DMA requests, acquires the bus, and generates both 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 8 bits wide. ▶

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▷ Corporation's implementation of ANSI 74 standard Cobol). To date, AT&T has developed little proprietary application and database management software for the system. Most of the software the company currently offers has been developed by third-party vendors, although it is available through AT&T's auspices.

COMPETITIVE POSITION

AT&T is focusing in general on the custom applications market for the 3B2/300, attempting to provide users with complete systems for addressing specific application requirements. The company aims to deliver complete systems that offer a simple migration path to protect the customer's software investment, while offering strong communications capabilities. From the 3B2/300 system, users can follow a migration path upwards to AT&T's larger 3B5 and 3B20 systems. The Unix-based 3B2/300s, 3B5s, and 3B20s can also be linked into a uniform work environment.

Because the amount of software currently available for the 3B2/300 is limited, AT&T has to target the system toward Fortune 1000 corporations and companies large enough to develop their own applications. In addressing the marketplace for custom applications, the 3B2/300 must compete primarily against IBM and DEC. The system also faces off against Hewlett-Packard.

Specifically, the 3B2/300 competes against DEC's MicroVAX II. Both systems have full 32-bit microprocessors. The AT&T system supports less memory (2MB) and disk storage (32MB) than the MicroVax II. The MicroVax II supports 9MB of memory and has a 213MB disk capacity. The 3B2/300, however, supports attachment of more workstations (18) than the DEC system. DEC says the that the maximum number of stations the MicroVax II supports is application dependent, but one configuration offered supports up to 16 users. In addition, the MicroVax II does 0.9 MIPS versus 0.5 MIPS for the 3B2/300. The MicroVax II also offers advanced floating-point capabilities that could permit it to outgun the 3B2/300 in technical applications.

IBM's major competitor for the 3B2/300 is the low-end System/36 model, the 5362. The IBM system supports less memory (512KB) than the AT&T model but more disk (32MB for the 3B2/300 versus 120MB for the S/36). The low-end S/36 allows a maximum of 22 local and 64 remote workstations, as compared with up to 18 local workstations on the 3B2/300.

The 3B2/300 also competes with the Series 37, the low-end model in the Hewlett-Packard 3000 Series, marketed for a distributed processing environment. The low end of the HP 3000 Series equals the 3B2/300 in memory size but outdistances it in disk storage capacity, with 2.1GB. The number of local workstations attached to the Series 37 is 28.

Technologically, the 3B2/300 exhibits both competitive strengths and weaknesses. The 3B2/300 is well positioned, from a technological standpoint, to compete with other supermicros. The WE 32000 microprocessor on which it is ▷

▶ CONFIGURATION RULES

AT&T Information Systems offers three configurations of the 3B2/300: basic, standard, and expanded standard. Each has the same core hardware and firmware, including: system board, cabinet, power supply, fan, internal and external cables, connectors, Unix System V core software and six user-installable Unix System V utilities packages, a backup copy of core Unix software, system and user documentation, a 720KB floppy disk drive, and two RS-232-C cables. The basic configuration comes with 512KB of main memory and a 10MB hard disk. The standard configuration includes 1MB of memory and a 32MB hard disk. The expanded standard configuration includes 1MB of main memory, a 32MB hard disk, and an expanded I/O feature card that provides four additional serial ports and a parallel peripheral port; the system can support up to 18 I/O ports. The 3B2/300 can support up to 2MB of main memory. Various main memory, I/O, terminal, and printer options can be added to the core configurations.

On the 3B2/300, four I/O expansion slots are available to support feature cards; up to four I/O expansion cards can be added, for a maximum of 18 serial RS-232-C ports and four parallel ports.

In configuring the 3B2/300, the following rules must be observed:

• A maximum of two 256KB or two 1MB memory cards can be used; 256KB and 1MB cards cannot be mixed.

• Double-width feature cards can be used; they occupy two feature card slots.

• The sum of RS-232-C baud rates cannot exceed 38.4K baud per I/O expansion feature card; no individual baud rate can exceed 19.2K.

• Only one computer network feature card need be configured per 3B2/300. (This card uses one feature card slot on the backplane.)

• A terminal must be connected to the integral RS-232-C console port.

• Parallel printers should not be located further than 10 feet from the computer.

• To operate at a maximum of 19.2K baud, all asynchronous serial EIA peripherals must be located within 50 feet of the computer; greater distance will reduce operating speed.

AT&T recommends that when multiple terminals are to be attached or a Teletype Dot-Mapped Display (DMD) terminal is to be used, the system configuration should include a 32MB disk and at least 1MB of memory.

INPUT/OUTPUT UNITS

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

COMMUNICATIONS

On the 3B2/300, the system board provides two standard serial RS-232-C asynchronus I/O ports, operating full duplex at rates up to 9.6K baud. Each channel provides transmit and receive data, as well as one data set control signal in each direction. The two serial channels feature: full-duplex asynchronous communications; quad buffered receiver data registers; programmable data format; programmable baud rates from 50 to 19.2K baud; false start bit detection; and programmable channel mode. When receiving, the ports can be operated under either interrupt-driven ▶

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CHART C. WORKSTATIONS

MODEL	Dataspeed 4410/ Teletype 5410	Dataspeed 4415/ Teletype 5420	Dataspeed 4420	Teletype 5620	BCT 513
DISPLAY PARAMETERS					
Max. chars./screen	1920 or 3168	1920 or 3168	1920	800 x 1024 resolution	3168
Buffer capacity	1 page	3 pages	3 pages	256 KB or 1 MB	3 pages
Screen size (lines x chars.)	24 x 80 or 132	24 x 80 or 132	24 x 80	70 x 88	24 x 80 or 132
Tilt/swivel screen	Tilt standard	Tilt standard	Tilt standard	Not applicable	Tilt standard
Symbol formation	5x7/7x9 dot matrix	5x7/7x9 dot matrix	5x7/7x9 dot matrix	Not applicable	5x7/7x9 dot matrix
Character phosphor	White, green, or amber	White	White	Green	White
Total colors/no. simult. displayed	Not applicable	Not applicable	Not applicable	—	Not applicable
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	128 ASCII	128 ASCII	128 ASCII	ANSI 3.64	128 ASCII
Detachable	Yes	Yes	Yes	Yes	Yes
Program function keys	8 standard	8 standard (16 functions)	None	8 standard	15 fixed character sequence keys standard
TERMINAL INTERFACE	RS-232-C	RS-232-C	RS-232-C	RS-232-C	RS-232-C
COMMENTS	Integrated autodial modem available	Dot-mapped		Dot-mapped display (DMD) terminal	

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

based is a true 32-bit microprocessor (that is, it employs both a 32-bit data path and a 32-bit address bus); with a few exceptions, such as the MicroVAX II, true 32-bit MPUs are not generally employed in other vendors' supermicros.

ADVANTAGES AND RESTRICTIONS

The 3B2/300 has both advantages and disadvantages. Although application software for the system is in relatively short supply, AT&T is actively developing application products both internally and in conjunction with third-party suppliers; some products are already available through AT&T Information Systems. Unix System V is becoming a standard for Unix, at least insofar as it incorporates features that the bulk of users appear to want. Moreover, AT&T has promulgated a System V Interface Definition, which spells out the requirements that allow various versions of Unix to achieve compatibility with AT&T's system. These occurrences are likely to spur further development of System V-compatible applications.

Although there is no direct hardware upgrade, the 3B2/300 offers software compatibility with other 3B computers. Because all 3B Computers use Unix-based operating systems, all offer software compatibility at the source code level; software is only object-code-compatible, however, between the 3B2/300 and 3B5 systems.

The 3B2/300 exhibits significant strengths for networking and distributed processing, implemented in a variety of ways. The UUCP (Unix to Unix Copy) facility in each computer's Unix operating system permits communications with both AT&T Unix and non-AT&T Unix systems (for example, those running a version of Unix based on the University of California at Berkeley implementation). With PC Interface, the 3B2/300 can be networked with MS-DOS-based personal computers. The Information Systems Network links 3B computer systems to non-AT&T systems (DEC VAX systems, for example) running Unix System V; it also supports protocol converters for SNA/SDLC communications. The 3BNet LAN and Star-

or polled programmed I/O. When transmitting, they can be operated under programmed I/O, whether interrupt-driven or not: they can also be DMA-driven.

The 3B2/300 also allows configuration of up to four I/O expansion cards that each add four serial RS-232-C asynchronous ports (along with a Centronics parallel printer interface). An *Autodial Modem* feature, along with a basic networking utility, allows the 3B2/300 to be connected to other Unix systems over a standard telephone network. The Autodial Modem unit is externally attached to the computer through a standard RS-232-C port. (No expansion port feature card is required.) Automatic dial/answer facilities are provided at data rates from 300 to 1200 baud.

The 3B2/300 can also be connected to *3BNet*, a high-speed local area network that provides a file-transfer network for systems operating within an area of over 540 yards (500 meters). The network operates at a transmission rate of 10M bits per second over coaxial cable. The network is intelligent, using an 80186-microprocessor-based interface to deload all protocol, flow control, and maintenance overhead from attached host computers. The 3BNet is Ethernet-compatible, permitting connection of the 3B2/300 to computers and peripherals supporting the Ethernet standard. The network allows users to select packet sizes up to 1500 bytes on the 3B2/300. It also provides centralized administration with automatic backup, so users can monitor and configure the network from a single terminal. The 3BNet operates in conjunction with a package of network services contained in the Unix operating system, allowing users to move data among machines and set network security.

The 3BNet protocol is a higher level Ethernet protocol that automatically constructs and processes packet header information. 3BNet hardware comprises the interconnect medium (IM), network interface (NI), transceiver, and transceiver power supply. Each host computer or peripheral device connects to the network through a network interface. The network interface is an intelligent link between the interconnect medium and the associated peripheral/computer device. The interconnect medium is a coaxial cable interconnecting all network interfaces through transceivers. A transceiver is placed in the coaxial cable at each point of connection to a network interface. Transceiver power is supplied through the host computer/peripheral device from a feature card on the 3B2/300.

A maximum of 100 transceivers can be handled on the network, allowing up to 100 nodes for interconnection of

▷ lan both provide local interconnection for groups of 3B systems and AT&T PCs. In local networking, in fact, AT&T has an advantage over IBM, which, although it has developed a net for the PC AT, has yet to deliver its long-awaited general-purpose LAN.

One strength of the 3B2/300 system is the service offered. AT&T has traditionally been strong in customer service, and has implemented a strong support program for the 3B2/300.

USER REACTION

AT&T Information Systems will not divulge installed base figures as matter of policy. AT&T-IS was thus unable to provide us with a list of users from whom we could obtain assessments of the 3B2/300. □

▶ Unix-based host computers or Ethernet-compatible peripheral devices. Up to 30 nodes can be 3B20S, 3B20A, or 3B5 systems; the rest can be 3B2/300s. (A 3B2/300 cannot function as a master node.)

The 3BNet LAN also includes a software component that provides a user-level interface to the network, maintenance capabilities, network administration, and security features.

Information Systems Network (ISN) is AT&T Information Systems' proprietary local area network for building complexes and campuses; it permits networking of 3B family systems and computers from other manufacturers. ISN is based on a short, centralized bus architecture incorporating attributes of star networks, distributed buses, and distributed token rings.

The components of ISN include: a packet controller that contains a high-speed, hardware-based packet switch for virtual circuit data transport, features an 8.64M bps bus transmission speed, and serves up to 1,920 ports; a control console for system initialization and administration; and concentrators that statistically multiplex up to 40 EIA device ports to the packet controller through an optical fiber pair with an 8.64M bps transmission rate.

The ISN can use both fiber-optic and four-twisted-pair copper wire distribution cables. The copper wires link terminals or host computers, AT&T personal computers, and similar devices directly to the packet controller or to concentrators. The optical fibers form the backbone of the system, carrying multiplexed data between packet controllers and host computers, between packet controllers and concentrators, and among multiple packet controllers. ISN supports multiplexed fiber-optic interfaces to DEC VAX-11 systems running under Unix System V. It can also be interconnected to AT&T's System 75 and System 85 PBXs.

SOFTWARE

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

OPERATING SYSTEM: *Unix System V*, the operating system for the 3B2/300 computer, is a general-purpose, multiuser, multitasking, interactive operating system. The two major components of Unix System V are the file system and the shell, or command language.

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

• Consistent naming conventions; file names can be fully qualified or relative to any directory in the file system hierarchy.

• Mountable and demountable file systems and volumes.

• File linking across directories.

• Automatic file space allocation and deallocation transparent to users.

• A set of flexible directory and file protection modes that allows all combinations of read, write, and execute access. Protection modes can be set independently for the owner of each file or directory, for a specified group of users (all members of a project, for example), and for all other users. File protection modes can be set dynamically.

• Facilities for creating, accessing, moving, and processing files, directories, or sets thereof in a uniform way.

• Uniform device input/output handling among terminals, disk files, and main memory. Each physical input/output device, from interactive terminals to main memory, is treated like a file.

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

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

Other features of Unix System V include:

• Support for C, the high-level programming language in which the operating system and most of its subsystems are written. According to AT&T, the C language endows Unix System V with portability not only across the line of 3B computers running under the system, but also among systems from microcomputers to mainframes developed by other manufacturers.

• Protection for disk file systems to prevent corruption through system crashes.

• Access to the facilities of other (host) computer systems.

Unix System V also provides support for the following types of tools:

• Development, including compilers, debuggers, optimizers, and program version administration.

• Diagnostics support, including automatic error logging, off-line diagnostics, and self-configuring hardware and software.

• System administration, including monitoring facilities, maintenance utilities, recovery tools, user accounting, and security controls. ▶

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CHART D. PRINTERS

MODEL	455	470	475	DQP-10	LQP-40
Type	Daisywheel	Dot-matrix	Dot-matrix	Dot-matrix	Letter-quality
Speed	55-cps	120-cps	120-cps	160-cps	18-cps
Bidirectional printing	Yes	Yes	Yes	Yes	Yes
Paper size	Up to 15" wide	4.5 to 11" wide	4.5 to 11" wide	Up to 10" wide	Up to 16" wide
Character formation	Full	9x9 Dot-matrix	9x9 Dot-matrix	Dot-matrix	Daisywheel
Horizontal character spacing (lines/inch)	10 or 12	Variable	Variable	Variable	Variable
Vertical line spacing (lines/inch)	Variable	Variable	Variable	6 or 8	6 or 8
Character set	ASCII	ASCII or AT&T Proprietary	ASCII or AT&T Proprietary	96 ASCII	96 ASCII
Controller/Interface	RS-232-C, IBM and Centronics parallel	Parallel	RS-232-C	RS-232-C	RS-232-C or Centronics parallel
No. of printers per controller/ interface	—	—	—	1 per interface	1 per interface
Printer dimensions, in. (h x w x d)	7.13 x 24.5 x 15.5	5.35 x 15.6 x 11.22	5.35 x 15.6 x 11.22	15.7 x 4.7 x 11.2	23.8 x 14.7 x 6.7
Graphics capability	No	Yes	Yes	Yes	No
Comments					

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

▶ • System services, including event-driven scheduling, scheduling/priority control, page/process memory lock, and interprocess communications.

• Text processing, including editors and formatters.

Unix System V provides the following types of standard utilities:

• System administration.

• Shell programming.

• Directory and file management.

• User environment.

• Screen and text editing.

• Calculator for precision arithmetic.

Unix System V for the 3B2/300 consists of a core package that incorporates the system kernel; standard device drivers; and basic commands for shell programming, directory and file management, system administration, user environment, status request, and special-purpose functions (comparing, searching, sorting, and counting data). Utilities on Unix System V for the 3B2/300 are unbundled from the core software and are available separately.

Also available for the 3B2/300 computer is the *Software Generation System (SGS)*, a package of tools used to create and test programs for WE 32000 series microprocessors. SGS includes 11 utilities that can examine and manipulate object files, performing such functions as format conversion on WE 32000 object files and symbolic debugging on C language code. Because the SGS operates under Unix System V, it can use features of the Unix system shell.

DATABASE MANAGEMENT SYSTEM: Several DBMS products are available from AT&T for 3B2/300 computers.

dBase II, developed by Ashton-Tate, Inc., is a relational data management tool for constructing and manipulating numeric and character information files. It features an English-style program building language and capabilities for sorting, editing, and displaying the data base directly from the keyboard. It can also be used to write menus and programs to support specific applications.

AT&T Ingres/CS (a compatible subset of the Ingres DBMS originally developed by Relational Technology, Inc.) is an integrated relational database management system for end-users and application developers.

Informix, a multiuser relational DBMS from Relational Database Systems, Inc., combines screen generation, report writing, and query language modules. It also features menu creation facilities and a C language interface.

File-it! is an Informix-compatible file manager for personal record keeping; databases created by one system can be accessed by the other. The system also features interactive database construction and screen design and update capabilities.

LANGUAGES: Languages available for the 3B2/300 include the C language, Basic, Fortran 77, and RM/Cobol.

The *C* language is a general-purpose programming language featuring control flow and data structures and an extensive set of operators. The C compiler includes the standard C library, Unix System V math, object file access, and plotter libraries. The compiler permits source-code compatibility among the 3B2/300 and AT&T's 3B5 and 3B20 computers, and object-code compatibility between the 3B2/300 and 3B5 systems.

Fortran 77 is compatible with the American National Standards Institute (ANSI) standard. The compiler is portable and generates code compatible with calling sequences produced by compilers for the C language.

Basic is an interpreter-based language specifically designed to run under the Unix operating system. The interpreter is ANSI-standard compatible. Features of Unix system Basic include debugging, editing capabilities, and Unix system environment extensions.

RM/Cobol, from Ryan-McFarland Corporation, is based on ANSI 74 standard Cobol. It includes commonly used Cobol features for application development, including: level 2 sequential, relative, and indexed file access methods, including alternate and duplicate key handling; interactive debugging at the source statement level; and a single-pass compiler that generates ready-to-execute pseudocode. RM/Cobol is available with or without a run-time component that allows the execution on 3B systems of RM/Cobol programs compiled on other machines.

COMMUNICATIONS: All 3B Computers support *Unix-to-Unix Copy (UUCP)*, a software-to-software copy facility that provides the capability to copy and send files from a resident 3B2/300 system to a remote Unix system. ▶

AT&T 3B2/300

▶ The 3B2/300 supports *PC Interface*, a hardware/software link that interconnects the 3B2/300 to personal computers running the MS-DOS operating system. The PC Interface allows multiple PCs to share files and peripherals on a central 3B2/300 running Unix System V. Files can also be transferred back and forth from PCs to 3B2/300 systems; all necessary translations are performed by the Interface unit. The PC Interface supports three types of media to interconnect PCs and 3B2/300s: RS-232 media operating at speeds up to 9.6K bps; Omninet, at 1M bps; and Ethernet, at 10M bps.

PC Interface software provides: transparent sharing of files resident on the 3B2/300 by personal computers running MS-DOS Version 2.0; transparent printer spooling, through which a PC user can obtain output from a printer on the 3B2/300; and, in conjunction with Unix System V, control over user access privileges.

APPLICATIONS: Both proprietary and third-party applications are available for the 3B2/300, including general business, data management, spreadsheets, word processing, and office automation.

OPERATING ENVIRONMENT

The 3B2/300 is housed in a cabinet 3.6 inches high, 22 inches wide, and 17 inches deep; a basic configuration weighs about 30 pounds. The 3B2/300 computer can be positioned either horizontally or vertically; when horizontally positioned, it can support an external load up to 60 pounds. The 3B2/300 requires standard power of 120 VAC, 15 amp, 60 Hz. Operating temperatures range from 40 degrees Fahrenheit to 100 degrees Fahrenheit at 8 percent to 80 percent relative humidity, noncondensing. Heat dissipation is less than 700 Btu per hour.

SUPPORT SERVICES

DOCUMENTATION: Standard user documentation includes: 3B2 Computer Model 300 Owner/Operator Manual; 3B2 Computer Model 300 Unix System V User Guide and Essential Utilities Reference Manual and Update Manual; and 3B2 Computer Model 300 Unix System V Utilities Manual. Other 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 centers. The company also provides on-premises training in complex software packages.

MAINTENANCE: AT&T offers tailored maintenance agreements for 3B2/300 computer system. The agreements include combinations of toll-free hotline assistance for hardware and software and on-site service by field service technicians.

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

On-site service options include:

* Business day service, AT&T's standard maintenance agreement, which provides coverage from 8 a.m. to 5 p.m. Monday through Friday.

* Around-the-clock service, which extends coverage to 24 hours a day, seven days a week, including holidays.

* Dedicated service, which allows customers to have technicians on-site for one, two, or three shifts a day for five, six, or seven days a week.

* Per-occurrence service on a time-and-materials basis.

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

* Hotline assistance, 8 a.m. to 5 p.m. Monday through Friday in all time zones.

* Hotline assistance plus on-site visits by technicians, 8 a.m. to 5 p.m. Monday through Friday.

* Hotline assistance plus on-site visits by technicians 24 hours a day, seven days a week, including holidays.

* Hotline assistance plus on-site technicians' visits charged on a noncontract, per-occurrence, time-and-materials basis.

The 3B2/300 system has a 90-day warranty; during that period, customers receive Business day service and hotline assistance.

PRICING

POLICY: The 3B2/300 is available for purchase or lease. A volume discount for the system is also available. List prices for the system are quoted in the EQUIPMENT PRICES information following. The purchase price for software includes a one-time use license fee. Maintenance fees are provided on a monthly basis. Separate price schedules for spares and growth, software licensing, and fee schedules are also available.

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint.* ($)
3B2/300 SYSTEM PACKAGES			
Basic Configuration			
7320-300	3B2/300 Computer system, including: WE 32000 microprocessor; 512KB main memory; two integral RS-232-C ports; two RS-232-C cables and connectors; low-profile cabinet; 720KB minifloppy; 10MB Winchester disk; Unix System V operating system and standard utilities; three-volume set of user documentation; also includes 90-day hardware warranty and software information and update service.	9,950	*****

NA—Not applicable.
* National average; price will vary depending on geographic location.
** The Unix operating system carries a monthly maintenance charge of $350.
*** Indicates that the order number or price was not supplied by AT&T.
**** The maintenance charge is an annual one, at 12 percent of the list price.
***** The maintenance charge is an annual one, at 15 percent of the list price.

▶

AT&T 3B2/300

		Purchase Price ($)	Monthly Maint.* ($)

► **3B2/300 SYSTEM PACKAGES (Continued)**

Standard Configuration

		Purchase Price ($)	Monthly Maint.* ($)
7320-301	3B2/300 Computer system, including: WE 32000 microprocessor; 1MB main memory; two integral RS-232-C ports; two RS-232-C cables and connectors; low-profile cabinet; 720KB minifloppy; 32MB Winchester disk; Unix System V operating system and standard utilities; three-volume set of user documentation; also includes 90-day hardware warranty and software information and update service.	15,125	*****

Expanded Standard Configuration

7320-302	3B2/300 Computer system, including: WE 32000 microprocessor; 1MB main memory; two integral RS-232-C ports; two RS-232-C cables and connectors; low-profile cabinet; 720KB minifloppy; 32MB Winchester disk; I/O expansion card (includes four RS-232-C ports and a Centronics parallel printer port); Unix System V operating system and standard utilities; three-volume set of user documentation; also includes 90-day hardware warranty and software information and update service.	15,510	*****

MEMORY OPTIONS

3B2/300

73201	1MB expansion memory	2,200	*****

INPUT/OUTPUT OPTIONS

The 3B2/300 has optional I/O expansion cards.

3B2/300

73202	I/O expansion card	660	*****

PRINTERS

3B2/300

***	Model 455	1,870	23.00
***	Model 470	695	8.00
***	Model 475	745	8.00
103924122	Model DQP-10 160-cps dot-matrix printer	1,200	*****
103924130	Model LQP-40 18-cps letter-quality printer	2,100	*****

WORKSTATIONS

500041371	Teletype 5410 terminal	902	***
403579667	Teletype 5420 terminal	1,439	***
500052154	Teletype 5620 terminal	6,129	***
***	Dataspeed 4410 terminal	1,145	15.25
***	Dataspeed 4415 terminal	1,895	21.00
***	BCT 513 terminal	2,760	29.00
***	BCT 89-key keyboard	220	3.00
***	BCT 103-key keyboard	235	3.00
J3B203SA1 L42	Additional color video terminal (3B20D only)	4,500	***

COMMUNICATIONS/NETWORKING OPTIONS

3B2/300

73203	3B2/300 3BNet Network Interface feature. Includes: network interface card; network interface label; ground clip; three screws; block label; nylon cable clamp	1,500	*****
73204	Same as 73203, plus 10-meter drop cable and transceiver	2,000	*****
73205	Same as 73204, but with 30-meter cable	2,155	*****
73206	Same as 73204, but with 50-meter cable	2,340	*****
73210	Autodial modem	695	*****

NA—Not applicable.
* National average; price will vary depending on geographic location.
** The Unix operating system carries a monthly maintenance charge of $350.
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**** The maintenance charge is an annual one, at 12 percent of the list price.
***** The maintenance charge is an annual one, at 15 percent of the list price.

►

AT&T 3B2/300

SOFTWARE PRICES

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

OPERATING SYSTEMS

The Unix System V operating system is bundled with the 3B2/300 system.

DATABASE MANAGEMENT SYSTEMS

—	dBase II	1,200
—	AT&T Ingres/CS	2,000
—	3B2/300	1,600

File-it!

—	3B2/300	495

LANGUAGES

103924304	C programming language	340
103924312	Fortran compiler	275
103924320	Basic interpreter ISS 2	300

RM/Cobol

—	Basic package	1,500
—	Run-time component	300

COMMUNICATIONS

1040-001	3B2/300 (object code)	400
—	PC Interface	100

OFFICE AUTOMATION

Handle, total package

—	3B2/300	2,500

Handle Writer/Spell/List

—	3B2/300	1,500

Handle Graph/Calc

—	3B2/300	1,100

APPLICATIONS

—	AT&T Gift Registry System	3,000

AT&T Business Accounting System (BAC), total package

—	3B2/300	5,000

AT&T BAC, A/R module

—	3B2/300	1,000

AT&T BAC, A/P module

—	3B2/300	1,000

AT&T BAC, Payroll module

—	3B2/300	1,300

AT&T BAC, Order and Inventory module

—	3B2/300	1,300

AT&T BAC, G/L module

—	3B2/300	1,000 ➤

AT&T 3B2/300

APPLICATIONS (Continued)

C-Isam

—	3B2/300	450

Microsoft Word

—	3B2/300	650

Multiplan

—	3B2/300	500 ■

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