

# AT&T 3B Computer Family

## PRODUCT DESCRIPTION

The 3B Computer family represents AT&T's first offering in the general-purpose computer market. The six models in the family—the high-end 3B20D, 3B20S, and 3B20A superminis, the mid-range 3B5/100 and 3B5/200 superminis, and the low-end 3B2/300 supermicro—all run the AT&T-developed Unix operating system. The 3B systems offer limited upgradability. The 3B20S can be field upgraded to a 3B20A, and a 3B5/100 can be converted into a 3B5/200.

The 3B Computers are targeted toward a range of applications. The company is emphasizing multiuser distributed processing applications, with office automation as the primary target for the mid-range and low-end machines. The low-end 3B2/300 is intended for use as a single-user or multiuser system in office, laboratory, or manufacturing plant environments. The mid-range 3B5/100 and 3B5/200 superminis are directed toward office automation, business information processing, operations support, and communications. The 3B20S and its attached-processor version, the 3B20A, are designed for high-volume applications areas, including office services, software development, and manufacturing. The top-of-the-line 3B20D is a fault-tolerant system for banking, reservations, financial services, and other commercial transaction processing applications; it can also be used in command and control applications.

AT&T's commitment to distributed processing and local area communications is evidenced by the introduction of two networking products along with the 3B systems. The first, 3BNet, is an intelligent, microprocessor-based local area network that provides file transfer facilities for 3B systems within a distance of 540 yards. The second, PC Interface, lets personal computers running under the MS-DOS operating system share 3B2/300 files and peripherals, and permits transfer of files among Unix-based and MS-DOS-based systems.

**PRODUCT ANNOUNCED:** The six-member 3B family of 32-bit computers comprises five superminis and a supermicro. All six run Bell Laboratories' Unix operating system. These systems have been used internally by AT&T, and are now made available as the company's initial offering in the commercial computer market.

**COMPETITION:** DEC VAX-11 Systems, IBM 4300 Series, Data General Eclipse MV/ Family, Hewlett-Packard HP 3000 Series and HP 9000 Series 500, Prime 50 Series, Wang Laboratories VS Systems, Tandem NonStop Systems, and the Stratus/32 Continuous Processing System.

**DATE ANNOUNCED:** March 27, 1984.

**SCHEDULED DELIVERY:** March 1984; volume shipments are scheduled for fourth quarter 1984.

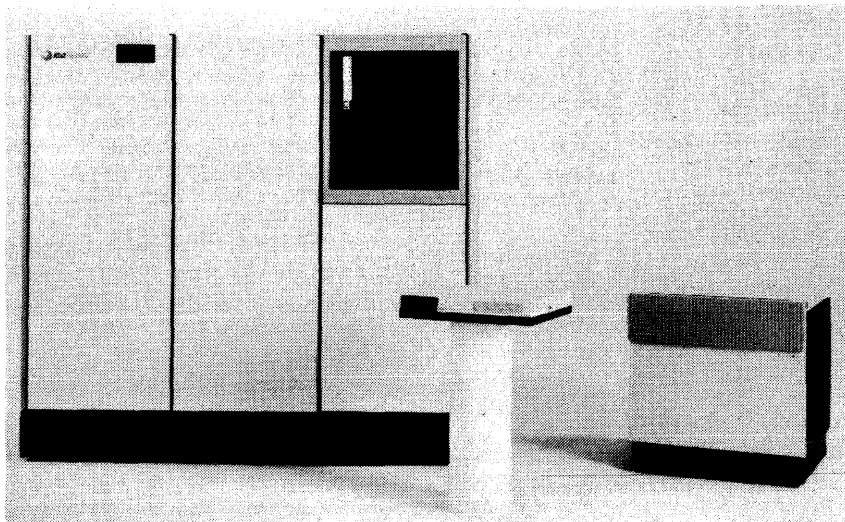
## BASIC SPECIFICATIONS

**VENDOR:** For OEMs and technical Value Added Resellers (VARs): AT&T Technology Systems, Computer Systems Division, 2600 Warrenville Road, Lisle, IL 60532. Telephone (800) 833-9333. For end users and office system VARs: AT&T Information Systems, 1 Speedwell Avenue, Morristown, NJ 07960. Telephone (800) 247-7000.

**MODELS:** 3B2/300, 3B5/100, 3B5/200, 3B20S, 3B20A, 3B20D.

**SYSTEMS:** Details on the 3B Computer systems are provided in the following paragraphs.

The 3B2/300 CPU is based on AT&T's WE 32000 microprocessor. It provides virtual addressing and performs 8-, 16-, and 32-bit operations. The CPU also features a 32KB ROM for self-test, automatic configuration, and bootstrapping. Main memory is dy-



*AT&T's new 3B Computer family of 32-bit systems includes the high-end 3B20S supermini (left), the low-end 3B2/300 supermicro (center), and the mid-range 3B5 (right), which comes in two models, the 3B5/100 and the higher-speed 3B5/200. The family also includes two systems not pictured: the 3B20A, a multiprocessor version of the 3B20S, and the top-of-the-line 3B20D, a fault-tolerant supermini for transaction processing applications. All 3B systems run Bell Laboratories' Unix operating system.*

## AT&T 3B Computer Family

▷ The marketing effort for the 3B Computer line will be divided between two organizations within AT&T Technologies. The Computer Systems Division of the Technology Systems group will sell to OEMs and technical VARs (Value Added Resellers), while AT&T Information Systems will market the products to office systems VARs and end users. Initial marketing efforts are directed more toward OEMs and VARs; sales efforts toward end users will increase as systems become available for volume shipment, scheduled for the fourth quarter of 1984.

### COMPETITIVE POSITION

The major competition for the 3B2/300 comes from DEC's VAX-11/725 and VAX-11/730, IBM's 4321 and 4331, the Prime 2250, and the Hewlett-Packard HP 9000 Series 500. The 3B5/100 and 3B5/200 compete against DEC's VAX-11/750, IBM's 4341 Model Groups 9, 10, and 1, Data General's Eclipse MV/4000, the Prime 250-II, 450-II, and 550-II, the Wang VS85 and VS90, and Hewlett-Packard's HP 3000 Series 39 and 42. The 3B20S goes up against DEC's VAX-11/780 and VAX-11/785, IBM's 4361 Model Groups 4 and 5 and 4341 Model Group 11, Data General's Eclipse MV/8000 C and MV/8000 II, Prime's 750 and 850, Wang's VS100, and Hewlett-Packard's HP 3000 Series 48 and 68. The 3B20A is positioned against DEC's VAX-11/782, IBM's 4381 and 4341 Model Groups 2 and 12, the Data General Eclipse MV/10000, the Prime 9950, and the Wang VS300. The 3B20D competes in the fault-tolerant transaction processing market against the Stratus/32 and low-end configurations of the Tandem Non-Stop TXP.

With the 3B Computer Family, AT&T has entered the market with a full-blown product line that runs the gamut from desktop supermicro to fault-tolerant supermini. The breadth of the company's initial offering could prove to be either a blessing or a curse. Although the company has stressed office automation and distributed processing in discussing its marketing strategy, it has also mentioned a variety of applications that the machines are intended to address. Indeed, the diversity within the 3B line does permit the 3B systems to address a wide range of applications, from small-scale office automation tasks to classic supermini applications like process control to high-volume commercial transaction processing. However, whether AT&T, as a first-time systems vendor, has the marketing organization and expertise to sell and support the machines in those diverse application areas remains to be seen. The company could very well be overextending newly established organizations by selling in too many markets. If AT&T intends to take on IBM and DEC, with their entrenched marketing structures and user bases, its marketing and support organizations must be ready to compete on the same level in all addressed areas immediately; AT&T's ability to do so at this point is highly questionable.

In addition, the technology employed in the 3B Computer family may hamper the line's ability to compete in AT&T's stated target markets. The most significant problem is that the 3B Computers must stand or fall with AT&T's Unix, ▷

▷ **dynamic RAM, and ranges from 512KB to 2MB. The memory is dual-ported, with the CPU connected to one port and the I/O bus to the other, allowing memory fetches to overlap. The processor complex comprises a single system board with plug-in memory. A backplane can be plugged into the system board for expansion.**

AT&T is offering four basic configurations of the 3B2/300, called Solutions Packages. Each has the same core hardware and firmware, including: system board, cabinet, power supply, fan, internal and external cables, connectors, six user-installable Unix System V utilities packages, a backup copy of core Unix software, system and user documentation, a 720KB disk drive, and two RS-232-C cables. Solutions Package A comes with 512KB of main memory and a 10MB hard disk. Package B includes 1MB of main memory, a 32MB hard disk, six serial ports, and one parallel peripheral port; the system can support up to 18 I/O ports. Package C includes 1MB of memory and a 32MB hard disk; it is intended for development applications. Package D includes 512KB of main memory, a 10MB hard disk, console terminal, and dot matrix printer.

The 3B5/100 and 3B5/200 CPUs are also based on the WE 32000 microprocessor. The 3B5/100 operates at 0.63 MIPS; the 3B5/200, a higher-speed version of the CPU, operates at 0.8 MIPS. Main memory on the 3B5/100 ranges from 1MB to 8MB; it ranges from 2MB to 8MB on the 3B5/200. Memory access time for both systems is 500 nanoseconds. Memory on both 3B5 systems features Hamming codes for double-bit error detection and single-bit error correction. Both 3B5 systems include 8KB of cache memory.

The 3B5/100 can be field upgraded to a 3B5/200.

All 3B20 processors employ the bit-slice-based 3B20S processor in various permutations. CPU functions on the 3B20S are handled through the Central Control complex. The Central Control handles logic, control, and arithmetic processes; it is microprogrammed, using both ROM and an 8K writable microstore. The Central Control also includes a data manipulation unit with 16 registers and an address translation mechanism that provides virtual addressing; the data manipulation unit is duplicated, and all arithmetic operations are matched.

Main memory on the 3B20S ranges from 2MB to 12MB; it can be expanded in 1MB increments. The main memory is complemented by an 8KB cache memory. Memory access time is 400 nanoseconds, cache enabled. As on the 3B5 systems, the 3B20S's memory features Hamming codes for double-bit error detection and single-bit error correction. A full memory parity check occurs every 24 seconds.

The 3B20A is a symmetrical multiprocessor version of the 3B20S; it reportedly offers 1.5 to 1.8 times the performance of the single-processor version. The 3B20A comprises the 3B20S processor and an attached processor unit. Both the primary and attached processors perform operating system calls. Both execute scheduling routines from a single job queue. Input/output functions are handled by the primary processor, however, and both processors execute different jobs. Like the primary 3B20S processor, the auxiliary processor features an 8K writable microstore.

Each processing unit on the 3B20A can support from 2MB to 12MB of main memory; each also has 8KB of cache memory. Memory correction and detection schemes are the same as on the 3B20S. The 3B20A is available as a separate system or as a field upgrade from the 3B20S.

The 3B20D is a fault-tolerant, duplex version of the 3B20S. A hot standby is used for each major unit, including the CPU, main memory, disk controllers, disks, and I/O processors; all disk volumes are mirrored. Circuits for all major functional units are replicated, and output from the circuits is continually monitored for disagreement. ▷

## AT&T 3B Computer Family

▷ the only operating system offered for the family. It is understandable, of course, that AT&T would want to rely on a product that has proven successful in the marketplace. The company's pride in the product aside, however, Unix has some significant drawbacks. Unix may not be the most desirable system for office automation; it is not particularly friendly to inexperienced users, who are likely to appear in larger numbers in office environments than in other super-mini application areas. Also, because Unix is really only a secondary operating system for other major vendors, potential 3B users are likely to find a shortage of third-party application packages compatible with the operating system.

Another potential problem is the implementation in the machines of architectural technology that is not especially advanced. The bit-slice architecture of the 3B20 processors is not novel; thus, these machines are expected to compete against DEC's higher-end VAX systems and comparable systems from other entrenched competitors without offering distinctive or more powerful technological features. In addition, the hot-standby concept employed in the 3B20D is hardly state-of-the-art for fault tolerance; this system could have trouble competing against the more architecturally sophisticated Stratus/32 and Tandem NonStop systems. The low-end systems, particularly the 3B2/300, are in a better competitive position technologically, however, for the WE 32000 microprocessor on which they are based is a true 32-bit microprocessor (that is, it employs both a 32-bit data path and a 32-bit address bus); true 32-bit MPUs are not generally employed in other vendors' supermicros.

Despite the shortcomings of the 3B Computers, however, AT&T's prospects as a new competitor in the systems market are not altogether gloomy. First, the company's commitment to Unix implies a willingness to make any improvements necessary to allow the system to compete in all targeted application areas. Second, by introducing 3BNet, AT&T has gotten a leg up on IBM in local area communications. IBM has yet to introduce its long-awaited LAN formally, and in the interim AT&T has an opportunity to eat into IBM's share of the office systems and local area communications markets. Finally, despite the trauma of the recent corporate breakup, AT&T's enormous corporate assets and resources give the company the wherewithal to expand and improve the initial 3B line, and also provide a sizable safety net should the company falter in its first foray into the minicomputer marketplace. □

▶ The 3B20D features dual processors connected through an inter-processor channel; if one fails, the other continues processing while performing a diagnosis of the failed unit. The system's standard microcode can run the complete complement of system software; additional microstore is available for applications requiring emulation or special-purpose instructions.

Each of the 3B20D's replicated main memory units can support up to 16MB of memory; an 8KB cache memory is optional. Each memory unit keeps an identical copy of the system memory image; if one unit fails, the other can begin running immediately. Error codes in each unit correct single-bit failures in main memory; multiple-bit failures in disk memories are also corrected.

**INPUT/OUTPUT CONTROL:** In the 3B2/300, I/O is handled through RS-232-C ports. The 3B2/300 has as standard features two serial RS-232-C asynchronous I/O ports, operating full du-

plex at rates up to 9.6K baud. The 3B2/300 has four feature card slots; I/O expansion cards are available, with each adding four more serial RS-232-C asynchronous ports and a Centronics parallel printer interface.

In both the 3B5/100 and the 3B5/200, input/output control is deloaded from the CPU and handled by Intelligent Input/Output Accelerators (IOAs). Also, Integrated Disk File Controllers offload file handling tasks from the operating system.

The 3B20S employs parallel processing, using microprocessor-controlled Input/Output Processors and Disk File Controllers to transfer data through Direct Memory Access (DMA) to or from main storage, bypassing the CPU. Each I/O Processor and Disk File Controller acts as a front-end processor. The 3B20S and 3B20A (where I/O is handled by the primary 3B20S processor) each have two DMA controllers, featuring two DMA channels per controller and 16 dual serial channels per DMA channel.

The 3B20D has two I/O Processors in standard cabinets, and can support up to 16 with expansion cabinets. I/O Processors for the 3B20D are mirrored for fault tolerance.

**OPERATING ENVIRONMENT:** The 3B2/300 is housed in a cabinet 3.6 inches high, 22 inches wide, and 17 inches deep; it weighs about 30 pounds. It requires standard power of 120 VAC, 15 Amp, 60 Hz.

The 3B5/100 and 3B5/200 are modular and have several cabinets. The basic system cabinet for each is 31¼ inches high, 30 inches wide, and 31¼ inches deep and weighs 400 pounds; a horizontal expansion cabinet is also available with the same dimensions, but weighing 250 pounds. The basic system cabinet takes up 12.6 square feet of floor space; the system and horizontal cabinets combined occupy 21.6 square feet of space. A vertical expansion cabinet for disk drives, which can be placed on top of the system or horizontal cabinet, is 19 inches high, 30 inches wide, and 31¼ inches deep; it weighs 225 pounds. A tape drive cabinet can also be positioned on top of a system or horizontal cabinet; it is 38 inches high, 30 inches wide, and 31¼ inches deep and weighs 225 pounds.

Power requirements for the 3B5/100 and 3B5/200 are 120 VAC, 15 Amp (multiple feeder), 60 Hz. The 3B5 systems operate at temperatures ranging from 40°F to 100°F at 20% to 80% relative humidity. Heat dissipation is 13K BTU per hour.

The basic configuration of the 3B20S occupies 31 square feet of floor space. It requires 208 VAC single- or triple-phase or 120 VAC, single-phase. Operating temperatures range from 32°F to 122°F at 20% to 80% relative humidity. Heat dissipation is 14K BTU per hour. The 3B20A has the same power requirements and range of operating temperatures. However, the 3B20A takes up 36 square feet of floor space and has a heat dissipation rate of 18.5K BTU per hour.

The 3B20D operates at temperatures from 35°F to 120°F at 20% to 80% relative humidity. No water cooling is required, and an uninterruptible power system (UPS) is optionally available.

**PERIPHERALS:** The peripheral support provided by each 3B Computer system is discussed in the following paragraphs.

The 3B2/300 can support Teletype 5410 and 5420 terminals, Teletype 5620 high-resolution graphics terminals, and any other asynchronous RS-232-C commercial terminals. A 3B2/300 system can handle up to 18 terminals. The 3B2/300 has an integral 720KB floppy disk, and can support 10MB and 32MB Winchester disks. The 3B2/300 also supports 120-160 cps dot matrix printers attached through any RS-232-C port and 20 cps letter-quality printers attached either through any RS-232-C port or through a Centronics parallel interface.

The 3B5/100 and 3B5/200 support Teletype and other terminals; the 3B5/100 can support up to 30 terminals, and the 3B5/200 up to 60. Both systems support 48MB fixed/removable drives and

## AT&T 3B Computer Family

► 160MB fixed disk drives; maximum disk capacity for each system is 640MB. The two systems also support a 9-track, 1600 bpi streaming tape drive with a WE 32000-microprocessor-based controller.

The 3B20S supports up to 100 terminals. For mass storage, it supports 300MB removable and 675MB fixed disk drives; the drives are dual-ported. The 3B20S also supports 300 and 600 lpm dot matrix printers, as well as 600, 900, and 1200 lpm band printers. The system also supports 9-track 1600 bpi and 1600/6250 bpi magnetic tape drives.

The 3B20A supports the same disk drives and printers as the 3B20S. The 3B20A also supports 1600 bpi and 6250 bpi 9-track magnetic tape drives.

The 3B20D supports 300MB removable and 340MB fixed disk drives; standard system cabinets contain two disk controllers, and the system can support up to 16 controllers if expansion cabinets are added. Maximum mass storage capacity is 21GB. The 3B20D supports 25 ips, 1600 bpi, 9-track tape drives. The system also supports 220 and 600 lpm printers.

**COMMUNICATIONS:** The 3B2/300 supports full-duplex asynchronous communications at rates up to 9.6K baud through RS-232-C ports.

The 3B2/300 also 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 19.2K bps; Omninet, at 1MB per second; and Ethernet, at 10MB per second.

The 3B5/100 and 3B5/200 systems support the following communications interfaces: Asynchronous Data Link Interface (ADLI), with eight asynchronous RS-232-C ports per board; Automatic Call Unit Interface (ACU) with two RS-366 ports per ADLI; Synchronous Data Link Interface (SDLI), an RJE link with eight synchronous RS-232-C/RS-449 ports per board; and Teletype Teletypewriter Terminal Interface (TTI) with 16 standard serial interface ports per board.

The 3B20S and 3B20A support the following types of communications controllers: asynchronous, with up to eight EIA RS-232-C links at speeds to 9.6K bps; synchronous HDLC, supporting one X.25 Level 2 link through either CCITT V.35 to 9.6K bps or EIA RS-232-C to 56K bps; synchronous HDLC, supporting either one full duplex X.25 Level 2 link through RS-232-C/RS-449 to 9.6K bps or two similar links to 4.8K bps; bisynchronous, supporting up to four links through EIA RS-232-C to 9.6K bps or one link through CCITT V.35 to 56K bps; and an Auto Call Unit with up to eight RS-366 channels controlling up to 96 modems with a sharing arrangement. The two systems also support RJE protocols and UUCP (Unix-to-Unix Communications Protocol), as well as a high-speed network interface.

The 3B20D supports asynchronous data links to 9.6K bps and synchronous links to 56K bps. It can also interface to X.25 packet-switching networks and DDCMP message-switching networks for wide area communications.

All 3B Computer systems can be connected to 3BNet, a high-speed local area network. The 3BNet provides a file-transfer network for 3B systems operating within an area of over 540 yards. The network operates at a transmission rate of 10MB per second over coaxial cable. The network 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 3Bs to computers and peripherals supporting the Ethernet standard. The network

allows users to select packet sizes; 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 3Bs' Unix operating systems, allowing users to move data among machines and set network security.

**SOFTWARE:** All 3B Computers run Bell Laboratories' Unix operating system. The 3B2/300, the two 3B5 machines, the 3B20S, and the 3B20A all run Unix System V; the 3B20D runs Unix RTR (Real-Time-Reliable).

Unix System V is a multiuser, multitasking system that incorporates a hierarchical, tree-like file structure, a shell command language that doubles as a programming language, and a variety of utilities and software development tools.

Unix System V for the 3B2/300 consists of a core package that incorporates shell programming, directory and file management, system administration, user environment, calculation, and editing capabilities. Available as additional options are, among others: C, Basic, and Fortran 77 languages; basic networking capabilities, including support for 3BNet and the PC Interface; interprocess communications; system reconfiguration; a DMD core package that permits the 3B2/300 to host the Teletype 5620 dot mapped display; and a DMD development package that lets the 5620 DMD and the 3B2/300 be used jointly for software development.

Unix System V for the 3B5/100, 3B5/200, 3B20S and 3B20A includes 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; system services, including event-driven scheduling, scheduling/priority control, page/process memory lock, and interprocess communications; and text processing, including editors and formatters.

The two 3B5 systems support the C language and Fortran; the 3B20S and the 3B20A support the C language, Fortran 77, Ratfor, Cobol, Basic, and other languages. Communications and networking facilities supported by the 3B5 computers are Unix-to-Unix Software Copy, 3BNet, remote log-in, Remote Job Entry, and mail services. The 3B20S and 3B20A support the same communications/networking facilities as the two 3B5s, and additionally support high-speed interprocessor communications, virtual protocol machine communications, and Network Systems Corporation's High-Speed Network Interface. Also available for the 3B20S and 3B20A are Workbench application development packages.

The 3B20D's Unix RTR incorporates the basic features of Unix System V, with extensions for real-time, fault-tolerant processing. Unix RTR supports both real-time and time-sharing environments simultaneously, permitting response to critical events, such as interrupts from disks. Support for real-time response is implemented through a layered architecture based on a process hierarchy supported by 16 hardware execution levels. The kernel and the special and kernel processes operate in real-time so that they have first call on the computer's available real time. Real-time allocation is based on execution levels, round-robin scheduling, and preemption by interrupts.

For fault-tolerance, Unix RTR monitors, logs, and tabulates transient hardware errors both internally on the system and externally on the operator's console. If a hardware unit exceeds its critical error threshold, Unix RTR judges the unit to be faulty, removes it from service, and begins hardware diagnosis immediately. The faulty unit is automatically replaced by the standby unit. Switchovers are transparent to application software. In addition, all software processes are isolated and protected from one another. ►

## AT&T 3B Computer Family

► **Unix RTR works in conjunction with a database tool kit called Low-Level Access. Designed for performance-critical applications, Low-Level Access supports hierarchical, network, and relational data models.**

**Software tools supported by Unix RTR on the 3B20D include: the C language and Fortran 77; preprocessors; a linker and system generator; symbolic debuggers; source management tools; and software analysis. Unix RTR also provides support for interfaces to the 3BNet.**

**PRICING: AT&T has apparently not developed a detailed pricing schedule for the new 3B computers; all prices quoted by the company to this point have been approximate. The company has quoted the following prices for basic systems, although details on the components of those configurations have not been forthcoming. AT&T will make available discounts for purchase of multiple systems. The list prices for the basic 3B systems are as follows: 3B2/300, \$9,950; 3B5/100, \$57,000; 3B5/200, \$73,000; 3B20S, \$230,000; 3B20A, \$330,000; 3B20D, \$340,000. ■**