Burroughs XE550

PRODUCT DESCRIPTION

Burroughs has thrown its hat into the Unix ring with the introduction of the XE550 minicomputer. The XE550 runs the Burroughs Centix operating system, an enhanced version of AT&T's Unix System V. In addition to supporting Unix applications, the XE550 supports BTOS (B Twenty Operating System), the operating system used in the Burroughs B20 line of microcomputers. In conjunction the the XE550 announcement, Burroughs brought its PT 1500 Programmable Terminal to the market; the PT 1500 will be used with the XE550.

The XE550, based on Convergent Technologies' Megaframe, is a multiprocessor-based system which includes multiple 16-/32-bit Motorola MC68010 and multiple 16-bit Intel 80186 microprocessors. The XE550 is configured with a combination of five different processors. The MC68010-based Application Processor (AP) executes the Centix operating system and applications software. The File Processor (FP), Cluster Processor (CP), Storage Processor (SP), and Terminal Processor (TP), all based on the Intel 80186 microprocessor, assist the Application Processor by off-loading I/O processing functions. These four 80186-based processors execute the BTOS (B Twenty Operating System), which runs in tandem with Centix.

The File Processor handles file processing and controls the integral disk. The FP also executes ISAM and the Centix file system from the Application Processor.

PRODUCT ANNOUNCED: The XE550 is Burroughs' first Unix-based system. The primary operating system in Centix, based on AT&T's Unix System V. The XE550 also runs the BTOS operating system used on Burroughs' B20 microcomputers. The XE550, which supports up to 32 users, can run a number of Unix-compatible programs.

COMPETITION: AT&T 3B5/100 and 3B5/200; Four Phase/Motorola 6300 and 6600; NCR Tower 1632 and 1632 XP.

DATE ANNOUNCED: October 9, 1984.

SCHEDULED DELIVERY: Late October 1984.

BASIC SPECIFICATIONS

MANUFACTURER: Burroughs Corporation, Business Machines Group, Burroughs Place, Detroit, Michigan 48232. Telephone (313) 972-7000.

SYSTEM COMPONENTS: The XE550 is a multiprocessor system based on the Motorola MC68010 and the Intel 80186 microprocessors. The XE550 distributes its workload over dedicated functional processors, each with its own memory. The work is assigned to the processor most suited for the job. Application processing is handled by the Application Processor; file processing is performed by the File Processor or Storage Processor; and communication is the function of the Cluster Processor and the ▷ Terminal Processor. ▶

The XE550 marks Burroughs' entry into the Unix-based computer market. Based on Centix, an enhanced version of Unix System V, the XE550 can reportedly run under currently available Unix System V applications. The XE550, built around a multiprocessor architecture, supports up to 4MB of memory, up to 1.3GB of disk storage, and up to 32 users.

Burroughs XE550

▷ The Cluster Processor supports RS-422 and RS-232 communications. PT 1500 terminals and B20/25 workstations are supported by the CP. The XE550 can, through the B20 workstation connection, support BTOS-, MS-DOS-, and CP/M-based applications (MS-DOS and CP/M are available as B20 options).

The Storage Processor is responsible for supporting magnetic tape devices. The Storage Processor, accompanied by a Storage Module Device (SMD), provides the interface for an external disk.

The Terminal Processor off-loads terminal processing from the Applications Processor. The TP includes 10 RS-232 ports; each port can support one ASCII terminal. In addition, the TP runs the communications service protocols, such as SNA and X.25. Both the CP and the TP contain one Centronics-compatible interface for 1000 lpm printer support.

The XE550 can either directly or indirectly support peripherals used by the B20 microcomputers. In the cases when a peripheral cannot be directly connected to the XE550, it can be supported through the B20 cluster arrangement.

The entry-level XE550 model features one Application Processor, one File Processor, and one Cluster Processor. System configurations are built according to the user's needs. At full capacity, the XE550 will hold up to 18 cards. The available space is taken up by processor, memory, and external disk cards. Depending upon the configuration, typical systems will include more than 8 but fewer than 18 cards.

Each AP supports from 512KB to 4MB of memory. In theory the XE550 can be configured with one to four APs, depending upon the amount of memory on each AP. For example, the XE550 will support three APs, each configured with 4MB of memory, or four APs that contain less than 4MB of memory each. Realistically, the maximum amount of memory supported by the XE550 is in the 10MB to 12MB range. Each of the 80186-based processors supports from 256KB to 768KB of memory. The disk storage capacity of the XE550 ranges from 75MB to 1.3GB.

Burroughs has also introduced centreSphere, a group of XE550 software packages and productivity tools built around the Centix operating system. The various centreSphere modules offer word processing, spreadsheet, applications development, database management, and networking applications.

Burroughs is targeting the XE550 at small to medium-sized business and office installations for educational institutions, state and federal governments, and distributed data processing environments. The size and operating requirements of the XE550 allow it to be user-installed, without special electrical prerequisites. The XE550 is the size of a two-drawer filing cabinet.

▷ An entry-level XE550 is configured with: Application Processor, File Processor, and Cluster Processor; 2.5MB of memory, including 1.5MB of application memory; and 75MB of disk storage. The XE550 can support from 10MB to 12MB of memory and up to 1.3GB of disk storage. The systems are configured according to customer requirements.

The Application Processor (AP), a 32-bit VLSI processor, executes the Centix operating system and applications software. The XE550 supports multiple APs, with each AP running its own Centix Kernel and providing support for up 16 users (depending upon the application). The AP board contains a 10MHz MC68000 CPU with 512KB of error-correcting (ECC) memory, expandable to 4MB. The first 512KB of memory is contained on the AP board. Additional memory is stored on 512KB and 1MB memory expansion boards; the off-board memory is addressed through a private bus. The AP contains a Memory Management Unit (MMU) which provides high-speed (no-wait) status and a two-level demand paging scheme with 3.5MB of Virtual Address Space per user. The MMU protects the user memory.

The File Processor (FP) contains an 8MHz Intel 80186 processor with 256KB to 768KB of ECC memory. An LSI Winchester disk controller is also included with the FP. Like the AP, the FP uses a private bus to address its off-board memory. The FP's responsibilities include file processing and controlling the integral disk. The FP off-loads file-oriented data management processing such as ISAM and the Centix file system, from the Application Processor. The XE550's integral removable disk cartridge and up to 37.5MB of fixed disk storage are also controlled by the FP. An FP in the expansion enclosure will accommodate up to four fixed disks. To perform the processing and control tasks, the FP executes a copy of the BTOS (B Twenty Operating System) operating system.

Tape support is accomplished through the Storage Processor (SP), which also contains an Intel 80186 microprocessor and 256KB to 768KB of ECC memory. The memory and computing power for the Burroughs Storage Module Device (SMD) Controller is provided by the SP. When used with the SMD, the SP provides the interface for the Burroughs MD 3 external disk.

The Cluster Processor (CP) is designed around the Intel 80186 and supports from 256KB to 768KB of memory. The CP contains two RS-422 ports, each capable of supporting up to eight workstations. Depending upon the workstation, the line speeds are either 307K bps or 1.8M bps. Additional communications are provided through the CP's three RS-232 ports, which off-load data from the Application Processor to the terminals. The CP supports up to 16 Burroughs PT 1500 terminals. Much of the PT 1500 I/O processing is off-loaded from the Application Processor to the CP. One parallel printer port is included with the CP; it provides the connection for a line printer.

The Terminal Processor (TP) is also built around the Intel 80186 processor and features 256KB to 768KB of memory. The TP executes the BTOS operating system and provides a virtual terminal interface for nonintelligent terminals. Like the CP, the TP off-loads terminal I/O processing from the AP. The TP contains 10 RS-232 ports, which, depending upon the service, can operate at speeds of up to 9.6K bps. The TP's Centronics-compatible parallel printer port will support a 1000 lpm printer.

Memory expansion is provided via a 512KB memory expansion board, supported by all processors, and a 1MB board, which is compatible with the AP only. The boards attach to their respective processors through a private bus. This bus allows each processor to access its off-board memory without interrupting the System Bus.

The System Bus is an asynchronous interconnection for the individual processors. It provides the throughput necessary to ensure that each of the processors on the system can communicate and process in parallel. The data width of the bus is 32 bits, and the transfer rate reaches a maximum of 11MB per second. The bus repeater provides the interconnection of the system bus between ▷ enclosures. ▶

Burroughs XE550

▷ **RELATIONSHIP TO CURRENT PRODUCT LINE:** With the introduction of the XE550, Burroughs provides a growth path for B20 microcomputer users. By supporting the BTOS operating system and providing B20 workstation compatibility, the XE550 protects the B20 user's software and peripheral investment. Via a B20 cluster connection, the XE550 has the ability to run BTOS applications, as well as MS-DOS and CP/M-based software. In most cases, the XE550 will support the same peripherals used by the B20 line. If a peripheral device cannot be directly connected to the XE550, indirect support is allowed through the clustered environment.

The XE520 Shared Resource Processor System, the cluster processor for B21, B22, and B25 workstations, can be upgraded to the XE550. The XE520 contains the same 80186-based File and Cluster Processors that are found in the XE550. By adding one MC68000-based Applications Processor, the XE520 becomes an entry-level XE550.

At present, the upgrade path for the XE550 ends with an XE550 system configured with 8MB of memory, 1.3GB of disk storage, and support for 32 users. The entry-level model can be upgraded to a middle- or large-size system at the customer's site. Burroughs does plan to protect the XE550 user's investment with future product announcements Burroughs plans to continually release enhancements that will differentiate the XE550 from other Convergent Technologies-based systems currently available from rival vendors.

COMPETITIVE POSITION

There are two main reasons behind the XE550 introduction: 1) to become involved in the Unix environment and 2) to add distributed data processing environment to Burroughs' target market which has been general business up to this point. Up to this point, Burroughs systems has run only under proprietary operating systems. By running a commercially available operating system, the XE550 offers its users the ability to run a greater number of software packages. Unix System V-based software development has increased since the operating system was initially introduced; as a result of this increase in Unix activity manufacturers like Burroughs have a library of software available for their systems. Moreover, AT&T's interest in Unix System V will undoubtedly spur development of further System V applications.

The XE550 can reportedly use many of the currently available Unix System V software packages; this could prove to be a major advantage for Burroughs in terms of sales and market compatibility.

The XE550's multiprocessor architecture is advantageous for both the XE550 and B20 user. Through the Intel 80186 processor, the XE550 provides B20 and BTOS compatibility. The MC68000 offers 16-/32-bit processing power and provides the Unix environment.

The XE550 is competitively positioned against the AT&T Unix System V-based 3B5/100 and 3B5/200 systems. The ▷

▶ The XE550, when configured as a three-cabinet system, can accommodate up to 18 cards. The card slots hold the processor, memory, and external disk control boards. Users can configure an XE550 system according to specific processor, memory, and disk storage needs.

The XE550 includes the E-5437D 5¼-inch Winchester disk with 37.5MB of formatted storage. The base enclosure can contain three disks; the expansion enclosure contains up to four disks.

One 5MB Winchester removable disk is included in the XE550 base enclosure. This cartridge has a data transfer rate of 30 seconds.

OPERATING ENVIRONMENT: The XE550 is the size of a two-drawer filing cabinet. The system unit measures 29 inches (74 cm) high by 16 inches (40 cm) wide by 28 inches (72 cm) deep. The unit weighs between 150 and 200 pounds (68.1-90.8 kg), dependng upon the configuration. The expansion unit weighs 110 pounds.

The AC power required for the XE550 is 115 VAC at 50 to 60 Hz, 7 amps or 220 VAC at 50 to 60 Hz, 3.5 amps.

The ideal operating environment for the XE550 consists of an ambient temperature of 50 to 104 degrees Fahrenheit (10 to 40 degrees Centigrade) during operation, and -40 to 140 degrees Fahrenheit (-40 to 60 degrees Centigrade) during nonoperating hours. The relative humidity is 10 to 80 percent during operation and 5 to 95 percent during nonoperation. The operating altitude is 0 to 10,000 feet (0 to 3,050 m); the nonoperating altitude is 0 to 30,000 feet (0 to 9,150 m).

PERIPHERALS: The 37.5MB E-5437D 5¼-inch Winchester disk and 5MB Winchester removable disk, described above, are the standard peripherals included with the XE550.

MD 3 is an external disk storage device that is housed in a unit the size of a two-drawer filing cabinet. The MD 3 is designed to integrate with the XE550 enclosure. Three versions are available: MD 3-1, MD 3-2, and MD 3-3. MD 3-1 offers 135MB of formatted storage. The MD 3-2 unit features 270MB of formatted storage. The formatted storage capacity of the MD 3-3 is 405MB. The Storage Processor, along with the SMD Controller, provides the interface for the MD 3 disk.

The Burroughs B 9498 Tape Streamer interfaces to the XE550 through the Storage Processor. The B 9498 is used for backup storage and software portability.

The PT 1500 Programmable Terminal includes a 16-bit Intel 8088 microprocessor and features 64KB of display memory to assist in downloading additional ASCII terminal functions, text, forms, or keyboard operations and to minimize data communications functions. The 12-inch green monochrome screen displays 29 lines of 80 characters each. The terminal features a tilt and swivel capability that tilts from 10 to 30 degrees above the horizontal plane and rotates +/- 30 degrees. The terminal includes antiglare and brightness control attributes.

The keyboard included with the PT 1500 features a 98-key typewriter-style layout; it contains a 14-key numeric pad, an 8-key status/control function pad, a 6-key cursor control, a 4-key page control, and 10 user-definable keys. Software-controllable LED indicators are provided on eight keys. The HELP key gives interactive direction to assist in completing word processing and spreadsheet tasks. The detachable keyboard connects to the terminal via a five-foot coiled cable. Through the Cluster Processor, the XE550 supports up to 16 PT 1500s at speeds up to 307 bits per second (bps). International character sets are available for the keyboard.

The XE550 supports 300, 600, or 1000 lpm printers through the parallel port on the Cluster Processor or Terminal Processor.

COMMUNICATIONS: The Cluster Processor supports communication services, such as SNA and bisynchronous communica- ▷ ▶

Burroughs XE550

▷ 3B5/100 is powered by the proprietary 7.2MHz WE32000 microprocessor, which supports 8-, 16-, and full 32-bit operations. The 3B5/100 offers up to 8MB of memory and up to 1.1GB of storage. These characteristics compare to the XE550's maximum memory capacity range or 10MB to 12MB and maximum disk storage of 1.3GB. The Motorola MC68010 microprocessor, which the XE550 is built around, is a 16-/32-bit chip that operates at 10MHz. The CPU speed is faster in the XE550; however, the MC68010 does support full 32-bit operations like the WE32000 does.

The 3B5/200 is based on a WE32000 microprocessor. Like the XE550's processor, the 3B5/200 processor operates at a 10MHz speed. The XE550's ability to support multiple Application Processors, which are powered by MC68010 processors, allow the system to be configured with as many as four 10MHz MC68010s. Both the XE550 and 3B5/200 support up to 8MB of memory; the 3B5/200 accommodates up to 2.2GB of storage compared to the XE550's 1.3GB.

The XE550 has the capability to support up to 32 workstations. This compares to the 40-workstation 3B5/100 and the 60-workstation 3B5/200. However, AT&T offers two LAN schemes that permit connection of multiple 3B5s to other 3B systems. At this time Burroughs does not offer a local area network option for the XE550.

The base 3B5/100 costs about $10,000 more than the entry-level XE550. The base 3B5/100 system with one WE32000 processor 1MB of memory, cache memory, and 48MB of disk storage costs $57,000; the XE550 configured with one Motorola MC68010 and two Intel 80186 processors, 2.5MB of memory, and 75MB of disk storage costs $43,300. The base price for a 3B5/200 is $73,000; the systems includes one WE32000 processor, 2MB of memory, cache memory, and one 48MB hard disk.

Four Phase/Motorola and the NCR and are two other major competitors offering CT Megaframe-based computer systems. Four Phase/Motorola markets the 6600 and NCR provides the Tower 1632 and 1632 XP. □

▶ tions, through its RS-232 ports. Two CP serial ports support both synchronous and asynchronous commmunications; the third RS-232 interface is used only for asynchronous communication. Depending upon the service, the RS-232 ports operate at speeds up to 9.6K bps.

The 10 RS-232 ports included with the Terminal Processor consist of six asynchronous ports and four ports that can operate either synchronously or asynchronously. The serial ports support maximum communication speeds of 9.6K bps, depending upon the service. The TP runs communication protocols such as SNA and X.25.

SOFTWARE: The *Burroughs Ingres Relational Database Management System* allows users to organize, share, and manipulate database information. The Ingres interfaces include forms-based query/update functions, screen-based forms and report editing, and application integration. Ingres features include:

• an integrated data dictionary

• data query and table update facilities

• C and Cobol host language interfaces

• data security and security checking

• transaction-level recovery

• page-level locking

• data access performance

• Terminal Monitor (interactive interface to QUEL (an English-like data language), with retrieved data formatted as tables)

• embedded Quel

• visual programming

• Query-by-Forms (to create default forms, visual forms editor-modifiable forms)

• ability to create default reports, customized forms

• Application-by-Forms (integrates all tools into production)

The XE550 runs Burroughs' *Centix Operating System*, an enhanced version of AT&T's Unix System V. Centix features include standard Unix functions along with characteristics that are Centix-specific. The Unix features included with Centix are:

• hierarchical file system

• file protection

• capability for sequential, asynchronous, and background processes

• intersystem communications through both direct-connnect and dial-up facilities

• over 200 Unix utilities

• flexible command language

Centix adds multiprocessing implementation (off-loading I/O functions to specific processors) and virtual memory to its characteristics. The XE550 uses the virtual memory capabilities of the Application Processor to implement a demand paged memory system. The MMU provides a high-speed, two-level paging scheme. The virtual memory address space is 3.5MB per process and the page size is 4KB. Up to 16 contexts (copies of the virtual map) are kept in memory at any one time.

The Centix operating system is the heart of a layered software system called *centreSphere*. The centreSphere software offerings include applications for database management, administrative functions, applications development, and networking. Various centreSphere modules permit the XE550 to access other data processing environments, perform word processing, generate spreadsheets, display up to four windows on the PT 1500 screen, get on-line help in using the system, and develop customized prompt screens that can be called up with function keys. Individual packages are explained below.

The centrCom SNA Transport Adaptor provides XE550 users with the ability to coexist with IBM computers in an SNA environment. For distributed SNA environments, SNA Transport Adaptor supports an application program interface for program-to-program communication with IBM hosts. It can also be used with other XE550 SNA products to support emulation of SNA 3270 and SNA RJE logical units.

The Transport Adapter/Interface is designed to operate in the SNA network as a Physical Unit Type 2. The adapter implements a Type 2 node containing SNA functional layers of NAU (Network Addressable Unit) Services, Data Flow Control, Transmission ▶

Burroughs XE550

▶ Control, and Path Control. An SDLC Link level protocol is also provided, supporting half- and full-duplex operation on either switched or leased communication lines.

The *centreCom SNA 3270 Emulator* package also offers users the ability to coexist in an IBM SNA computer environment. The SNA 3270 Emulator appears to the host computer as an IBM 3274 cluster controller with attached 3278 display terminals and 3287 printers. The emulator operates in conjunction with the adapter to provide emulation of an SNA Physical Unit Type 2 node, supporting logical unit types 1, 2, and 3.

The *centreScreen Forms Facility* is an interactive design and test facility for creating screen formats. This facility consists of two major components:

- the interactive centreScreen Editor for designing and testing forms

- a runtime module that, when linked to an application program, displays forms and accepts data supplied by the user

The *XE550 Index Sequential Access Method (ISAM)* is a software facility that randomly accesses fixed-length records in data sets. It is available to any XE550 programming language. ISAM offers: multiuser support; random access to data identified by multiple or duplicate keys; shared or exclusive access to the data set with transaction, record, or data set locking; and 12 key types for different representations of character and numeric data. ISAM processing is distributed to the File Processor to relieve the Application Processor of its overhead.

The *Sort/Merge* facility sorts records by one or more key fields and merges sorted records. Sort/Merge is called directly or indirectly from an application program written in any of the available programming languages. Features of this facility include the ability to sort variable-length records or fixed-length keys; sort records of several different data types; sort in ascending or descending order; sort records using a single key or multiple keys; sort and merge records from more than one source; and respond to calls from any application program.

The *centreEase Interface* is a menu driven administrative facility which assists the user in performing many of the supervisory functions of Centix. The facility helps the user initialize and set up the system configuration and operational parameters. It also provides access to Unix administrative functions.

centreWindow provides the ability to view up to four applications on the PT 1500 screen. The applications, which are contained within windows, can be controlled both interactively and programmatically. The program offers different views of the same application, as well as integration between multiple applications.

The *centre-O/A* (Office Automation) Interface provides the user with the most recently accessed objects. Additional objects are presented in different windows on the screen.

Spreadsheet and word processing packages are offered under the umbrella title of centreOffice Office Productivity Tools. The *centrePlan* spreadsheet is a financial modeling and planning facility based upon Supercomp-20 from Access Technology. The word processing package, *centreWord*, allows the user to integrate word processing documents with centrePlan spreadsheets. centreWord can display and edit up to four documents simultaneously, and can copy data between and within documents. Single and multiple users can create and edit text at the same time.

The Centix operating system allows programmers to use Cobol 74, Fortran 77, Basic, Pascal, and C.

The *Cobol 74* is based on Cobol ANSI X3.23 1974. It features screen handling, symbolic debug, access to the Burroughs Ingres database, ISAM, Sort/Merge utility, and the centreScreen facility.

Fortran 77 implements the following features: Fortran 77 ANSI X3.9-78 capabilities; 3.5MB of virtual address space; five data types (Integer 1, 2, 4; Real 4, 8; Complex; Logical 1, 2, 4; Character) a cross-reference listing; IEEE standard representation of real data; access to ISAM, the Sort/Merge utility, and the centre-Screen facility.

The *XE550 Basic Interpreter* conforms to the ANSI X3.60-78 standard; has 3.5MB of virtual address space; provides screen formatting with the PRINT USING command; offers access to external subprograms written in C and Assembler; and has access to ISAM, the Sort/Merge utility, and the centreScreen facility.

XE550 Pascal generally conforms to the ISO 1980 draft standard. It also provides 3.5MB of virtual address space; IEEE standard representation of floating point; and access to Burroughs Ingres, ISAM, Sort/Merge, and centreScreen.

XE550 C complies with the C programming language standards; it features standard Unix extensions and access to Burroughs Ingres, ISAM, the Sort/Merge utility, and the centreScreen facility.

PRICING: The entry-level XE550 with three processors 2.5MB of memory, and 75MB of disk storage is priced at $43,000. An example of a medium-sized XE550 including two Application Processors, two Cluster Processors, and one File Processor; 4.3MB of memory; and 12MB of disk storage costs $75,755. The large model could be configured with three Application Processors, three Cluster Processors, one Storage Processor, and one File Processor; 8MB of memory, and 345MB of disk storage. This configuration carries a $102,855 price tag. The PT 1500 terminal costs $1,695. The monthly license fees for centreSphere software ranges from $130 to $1,600 (for applications development tools, office automation products, distributed data communications programs, and compilers). ■