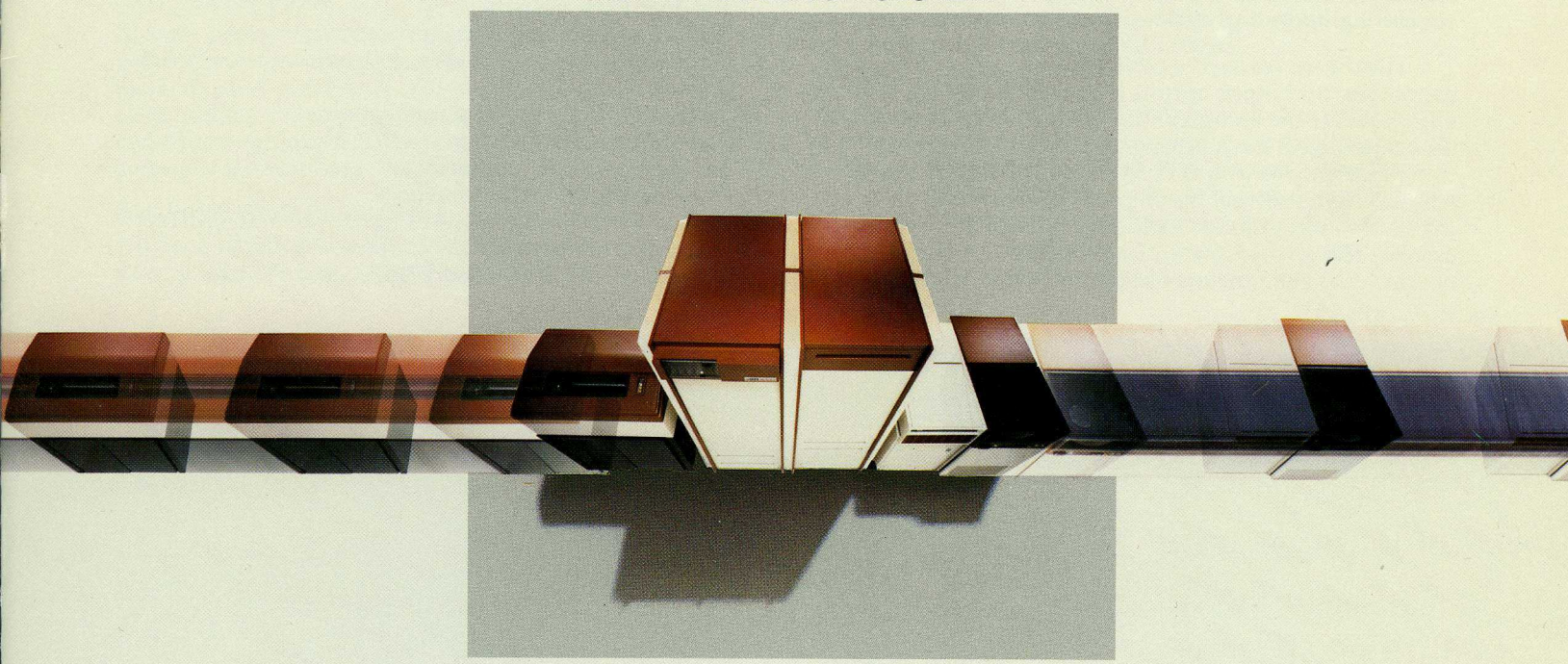
BTI 8000

32 BIT
MULTIPROCESSOR SYSTEM



Variable Resource Architecture

Growth in processing power when it's needed

The BTI 8000 32-bit multiprocessor system introduces a unique computer design known as VARIABLE RESOURCE ARCHITECTURE.

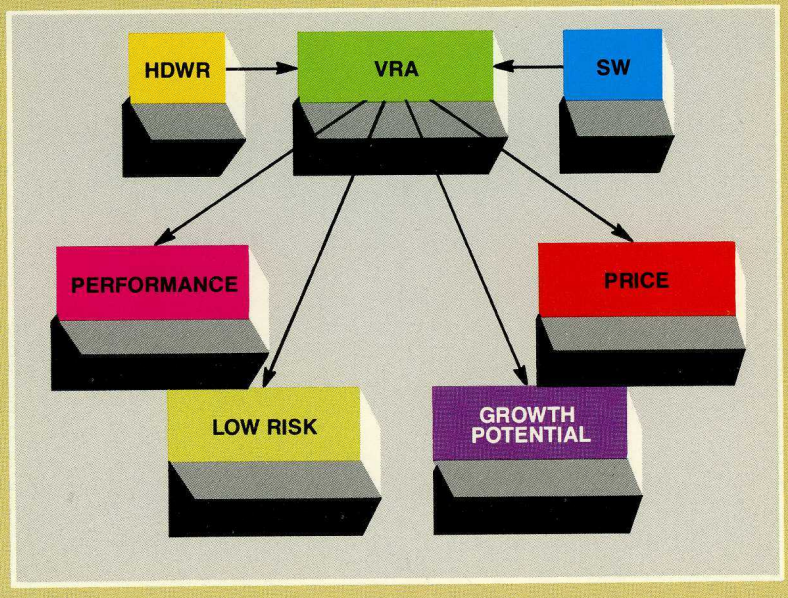
The fundamental innovation of VRA is a flexible mix of hardware resources controlled by a single self-regulating operating system.

Hardware resources consist of multiple processors, memories, and input-output channels operating in parallel without the complex internal networking normally associated with such arrangements.

Performance of a BTI 8000 can be varied *over a ten-fold range* merely by incrementally adding or deleting hardware modules, including full scale 32-bit processors. The virtual machine environment created by the operating system makes the resource mix transparent to the job mix. Differences in configuration are invisible to user software, and no reprogramming or recompilation is required.

Key features of the BTI 8000 are:

- ☐ From 1 to 8 CPU's controlled and coordinated by one operating system.
- ☐ Up to 8 megabytes of main memory.
- ☐ Up to 200 interactive users and multi-stream batch processes.
- ☐ From 4 to 32 input-output channels.
- ☐ Fail-soft architecture.
- ☐ Secure multi-user operations.
- ☐ Demand-paged virtual memory.
- ☐ Task oriented assignment of hardware and software.
- ☐ Simultaneous use of ANS COBOL 74, ANS FORTRAN 77, Extended BASIC, and Pascal.



Cost Effective Data Processing

A checklist for the professional manager

High Performance at the Right Price

The CPU's use 32-bit architecture throughout, with 32- or 64-bit integer arithmetic and 64-bit floating point arithmetic. Virtual memory support is built into the CPU's, with address translation performed in 67 nanoseconds. All transfers between modules take place at the rate of 60 megabytes per second. A powerful instruction set directly supports the linked-list, stack, and array structures generated by modern compilers.

Optimize for Today

Each system can be configured to a specific workload requirement, whether it be for a large number of interactive users, a heavy batch processing load, or a large disk data base.

No Growing Pains

System performance can be increased in any or all of four areas — processing power, main memory, storage capacity, and number of I/O channels — by incrementally adding resource modules. Respond to changing conditions with full protection for your hardware and software investments.

Maximum Staff Productivity

No need to maintain or modify the operating system — now or ever. The data processing staff can focus efforts on applications rather than on the system itself. Just as important, programmers can develop and test all applications, including batch jobs, interactively.

Maximum Up Time

In a multiple resource configuration, the sytem is fail-soft. Self-tests at the module level isolate faults rapidly. Once a faulty module has been removed, system start-up and operating system reconfiguration take about 8 seconds.

In addition, the BTI system of computer-to-computer diagnostics can be called upon to identify more difficult problems within minutes.

Built-In Data Protection

Program re-runs and application failures resulting from disk read errors are minimized. Unique hardware support provides automatic reconstruction of data blocks in a majority of read error situations.

Security and Privacy

The operating system is isolated from all user programs, communicating only on a request-for-service basis. The system is thus protected from inadvertent or deliberate violations of integrity. Further, each user operates in a private virtual machine environment, secure from other users. All data, programs, and access privileges are private unless explicitly shared.

Variable Resource Architecture

A unique combination of hardware and software design

Hardware Architecture

The basis of the BTI 8000's hardware architecture is a high speed, distributed logic bus with a 32-bit wide data path. Up to 16 hardware resource modules may be attached to this bus. Transfers between modules take place at the rate of 60 megabytes per second.

Four types of resource modules are used:

Computational Processing Unit	CPU
Memory Control Unit	MCU
Peripheral Processing Unit	PPU
System Services Unit	SSU

One module of each type is required for a minimum system configuration. More CPU's, MCU's, and PPU's may be added in the appropriate mix to meet application needs. Only one SSU is required, although a second (inactive) may be installed to provide redundancy.

Processors

One, or more, identical 32-bit CPU's, operating in parallel and asynchronously, perform the processing. The CPU's are instruction processors only, with no private memory. They execute both user programs and operating system tasks on an as-available basis: when a CPU becomes free due to an I/O roadblock or time slice interrupt, it executes the operating system code which dispatches it to the next task, also updating the central dispatch table.

Since all CPU's share the workload equally, the addition of a CPU is a simple and direct means of increasing system throughput. Conversely, removing a CPU does not disable the operating system or any class of user jobs.

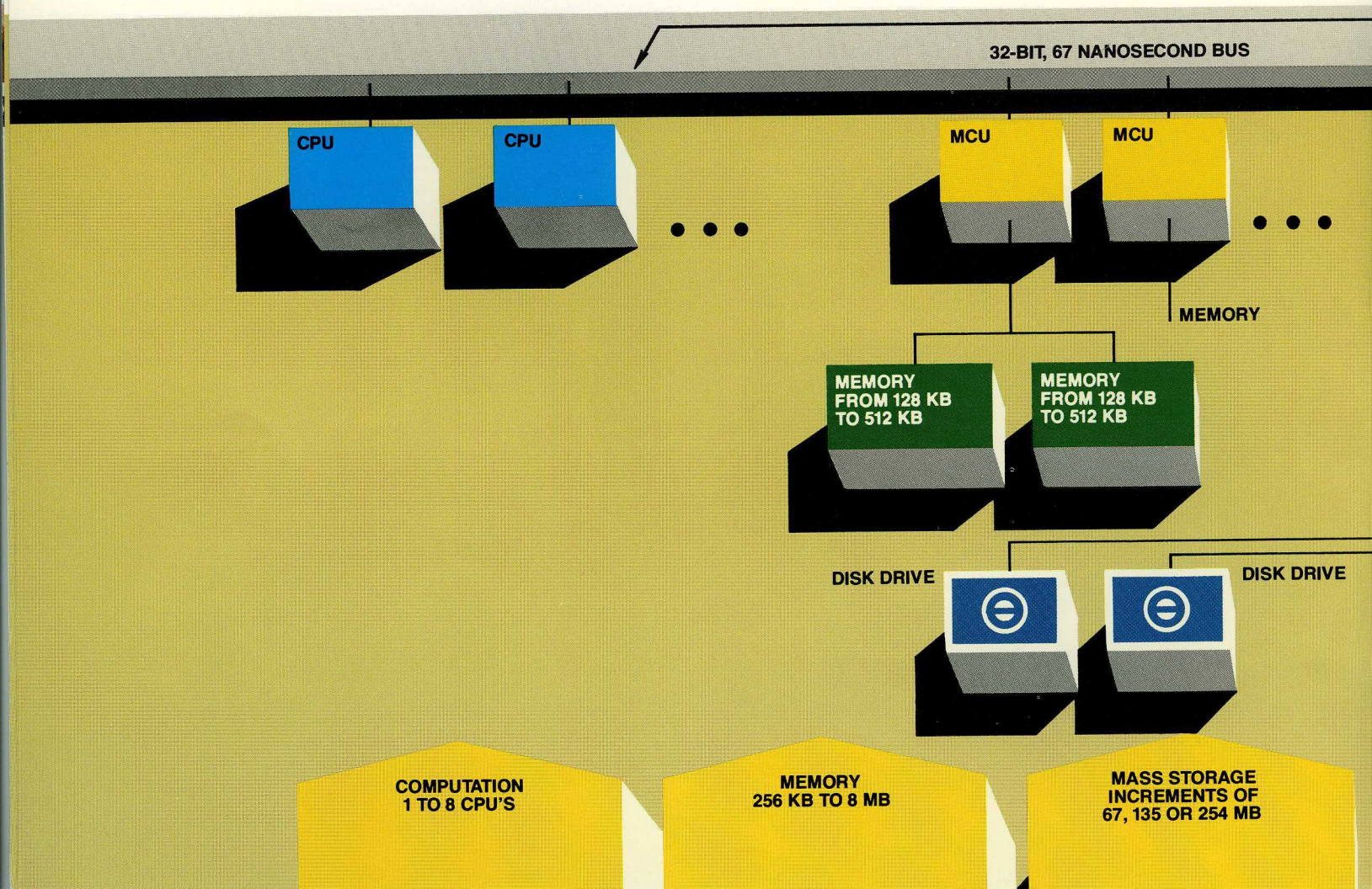
Main Memory

Up to 8 megabytes of main memory can be interfaced to the system via Memory Control Units, with a single MCU controlling from 128 Kbytes to one megabyte of memory. All main memory is treated as a single entity, even if interfaced via more than one MCU. Multiple units operate in parallel, decreasing overall effective memory cycle time.

Peripheral Processing Units

Peripheral Processing Units are special purpose processors which relieve CPU's of channel management overhead. Each manages up to four independent I/O channel activities initiated by CPU's, handling data transfers between memory and peripheral devices without further CPU involvement.

PPU's also provide buffering, blocking, and deblocking services. Their channels can be connected to controllers for the following: disk drives, 9-track magnetic tape drives, magnetic tape cartridge drives, line printers with rates from 300 to 900 lines per minute, and user communications.



Disk Drives Disk drives can be interfaced in any mix of sizes through multiple-drive controllers. Access times are minimized through overlapping seek capability in the disk controllers.

All drives are high density storage units, and are available in formatted capacities of 67, 135, and 254 Mbytes. A practical system configuration can have over 3 billion bytes of storage.

User Communications

Terminals and modems are interfaced through micro-programmed Asynchronous Communications Controllers (ACC's). System port capacity can be configured in 8-port increments up to a practical maximum of 200 ports. Expansion is accomplished simply by adding port modules and ACC's. Full-screen block mode transfers at rates up to 19.2 kilobaud are possible at all ports.

User programs may have control over interface pins, terminating character selection, and input/output buffers, allowing use of non-standard asynchronous devices.

System Services Unit

The System Services Unit provides a variety of functions designed to enhance system automation, reliability, and security. A control panel provides alpha-numeric displays and eight switches for simplified off-line operations.

Automatic System Generation is initiated by the SSU. At start-up, the hardware resource modules present are checked. If the configuration has been changed since the previous start-up, the operating system automatically reconfigures itself to match the resources in use.

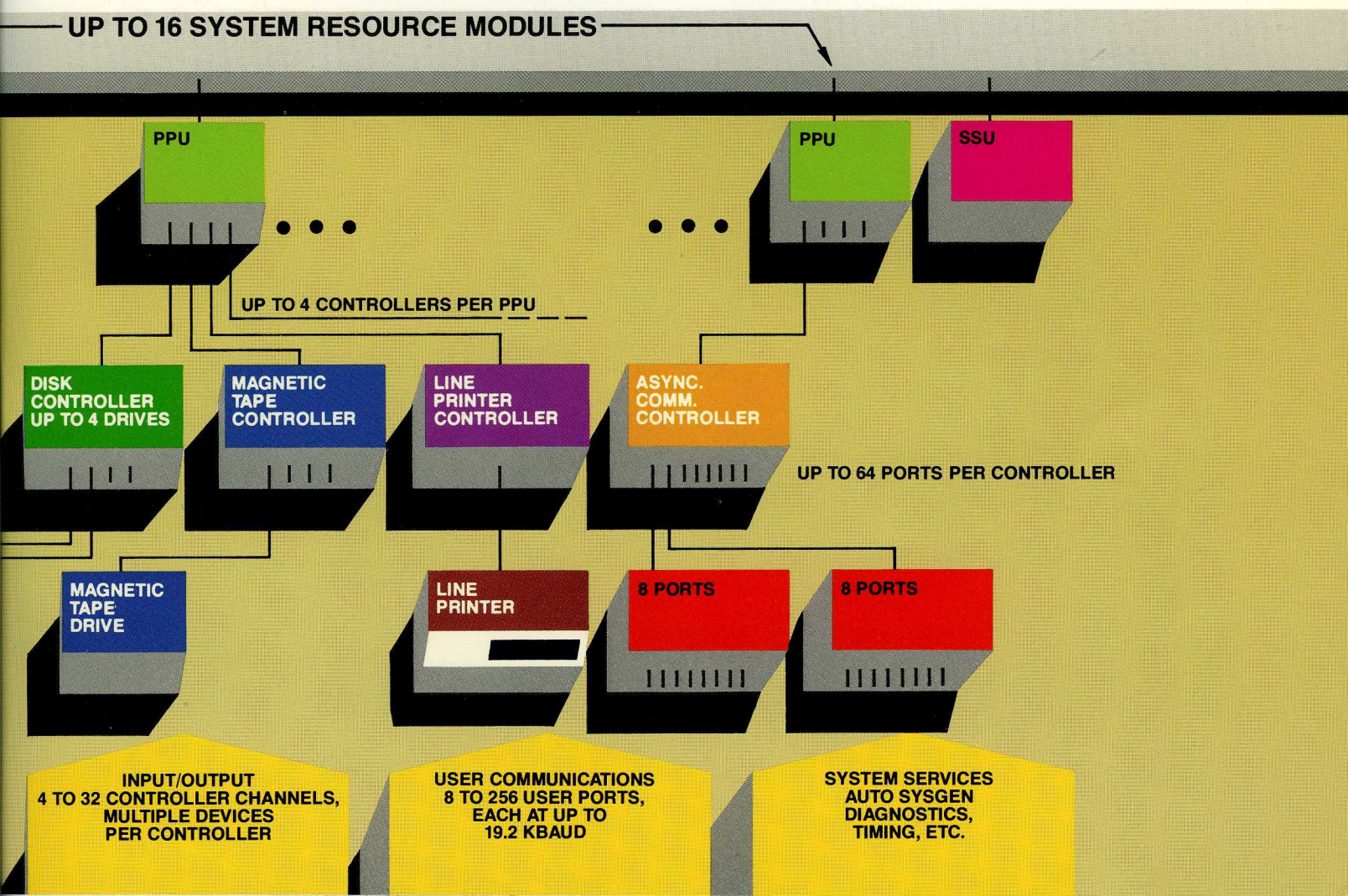
Diagnostic Self-Tests are run by each hardware resource module at start-up. Any module not in working order is identified on the control panel display. Modules that fail during operation will cause the system to stop and will be identified on the control panel display. In a multiple module system, the failed module may be removed and the system restarted without it.

Remote Diagnostic Service provided by BTI's central maintenance facility is interfaced through the SSU. Via a telephone link, both on and off-line diagnostics can be conducted, even if no system operator is present.

A System ID Number is stored in the SSU. It is program-accessible, allowing software suppliers to build ID checks into their packages, and thus, prevent unauthorized installations of their software.

Power-Fail/Auto Restart capability provides for automatic unattended restart without loss of processing continuity.

The System Clock is backed up by a rechargeable battery in case of power outages or disconnections.



Virtual Machine Multiprocessing

Operating System Principles

The BTI 8000 operating system is the central mechanism that ties the hardware elements into a powerful, applications-oriented computer system. Using these elements as a pool of resources, it creates the user-environment structures that provide hardware independence, program capabilities, security, and control.

Hardware-Independent Application Design

The operating system creates a private virtual machine environment for each distinct process on the system, and can run up to 200 processes simultaneously.

Each virtual machine provides the same standard, fixed program environment. Since the operating system shields all users and all programs from actual hardware, programs may be designed without concern for present or future configurations.

Program Capabilities

The virtual machine includes a user address space of 512 Kbytes (one-half megabyte), exclusive of buffer space for data record blocking and deblocking. This virtual memory is always available for each process, regardless of the amount of physical memory present or the number of other processes sharing that memory.

Device-Independent Programming

Each virtual machine is also furnished with 200 logical data channels which may be linked to system-provided logical I/O devices, for device-independent I/O. The same unchanged program may be alternately used to output to a terminal, a spooled printer, a disk file, a magnetic tape, or even an inter-process communications path. Since the system command language is the same for both interactive and batch processing, batch jobs may be developed and even tested interactively, with the terminal substituting for batch input and output units.

Non-Interference and System Integrity

Unless they communicate explicitly, virtual machines are also functionally independent of one another. Jobs cannot interfere with each other, and even a fatal error in a virtual machine does not affect the integrity of the operating system.

Low Overhead Resource Management

Multiprocessor (and multiprocessing) management is an efficient, low-overhead activity, aided by CPU design. Whichever CPU is currently free runs the system code that dispatches it to the next eligible task. When a CPU runs a process, all memory addressing is automatically mapped through a hardware translation table in only 67 nanoseconds.

Memory and Paging Optimization

Process scheduling and memory management are handled together, to optimize resource usage. Memory is organized into pages of 4 Kbytes; a sophisticated demand-paging technique minimizes disk access by keeping lists of all currently resident pages. No disk access will be made if a requested page is currently resident and sharable, even if that page belongs to a foreign process. Under extreme load, the system temporarily removes the most memory-intensive processes from contention, ensuring that thrashing does not occur.

Designed-In Security

Security protection, accounting, and control of data, programs and user access are fundamental in the BTI 8000. Every process on the system, both interactive and batch, must begin by logging into an account with a private password.

The uniquely identified accounts, which remain on the system through logon and logoff, provide for independent ownership and use of programs and data. Every program and data file on the system belongs to some account, which also possesses individual access and control privileges, and an individual user-assigned password.

Automatic Access Protection

The system is passively secure. Except for special public library accounts, the programs and data files within an account library are not accessible or even visible outside that account unless explicitly declared "shared" with other specific accounts or groups of accounts. This automatic security specifically applies to system operator accounts, as well as to other users.

Flexible Control

Accounts are created in a four-level hierarchy. The system manager account creates and controls subordinate manager accounts, as well as operator accounts; these managers in turn create and control their subordinates' accounts. There is no limit to the number of user accounts. At any level, a manager may "encapsulate" his account group, preventing any data from leaving its boundaries even if a subordinate has shared access outside the group.

Turnkey Applications and Programmer Convenience

Any account may have an individual or shared INITIAL program, which runs automatically when the account is entered. These programs can be part of a fully controlled interactive environment, menu-driven and BREAK-protected for turnkey end-user access. Alternatively, programmer accounts may use INITIAL programs for individual logon services, such as declaring a private set of tailored system commands as an alternative to the system-defined command set.

Comprehensive System Software

Interactive system software provided with the BTI 8000 is designed for programmer efficiency, ease of use, and data protection.

Control Mode

The BTI 8000 command and response language is the same for both interactive and batch processing. It uses a simple verb-noun structure, and furnishes two levels of on-line assistance. DO-files and user-defined variables allow command-language programming, including conditional branching.

File System

The file system provides common data management services for all languages. Supported data organizations include multi-key indexed, relative record, and sequential.

Utilities

The utility package includes the editor, linking loader, universal copy program, sort/merge, and symbolic debugger. Executable code files include symbolic information furnished by the compilers; debugging can be done through source-program variable names and statement labels. Special compilation is unnecessary, and the debugger can even auto-step through a program one or more source lines at a time.

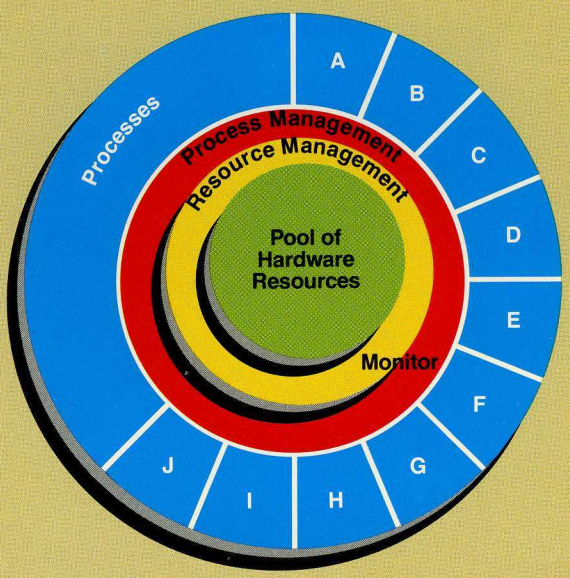
Programming Languages

COBOL: A "high intermediate" implementation of ANS COBOL 74 with full Indexed I/O and SORT. Other extensions include interactive debugging, and full formatted screen handling with the ACCEPT and DISPLAY verbs.

BASIC: A powerful, comprehensive language specifically designed to accommodate easy conversion of programs written in other popular versions of BASIC.

FORTRAN: A full, optimized, implementaton of ANS FORTRAN 77, plus extensions.

Pascal: An extended version of this programmer efficient, structured language.



VIRTUAL MACHINE MULTIPROCESSING

Computerized On-line Service

BTI is successfully servicing over 2500 computers throughout the United States and Canada using computerized on-line service.

Fast Service is provided by a national service center manned round-the-clock 7 days a week. Skilled service engineers respond to telephone calls for service—usually within five minutes. A centralized diagnostic computer connected by telephone to the customer's site is the heart of the system.

Every BTI computer system is specifically designed to permit remote diagnostic service, with or without the presence of a system operator. Further, diagnostics can be run while the system is in operation with user activities. If the system is down, remote diagnostic routines can quickly identify the problem.

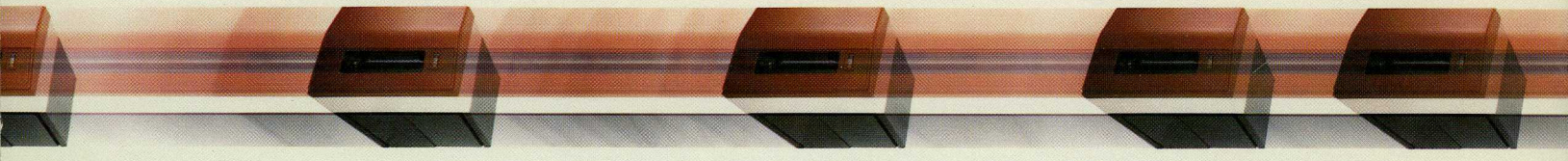
Service Costs are held to a minimum by the use of such remote diagnostics rather than initial on-site service calls. A decade of experience has demonstrated that over 90% of all problems—hardware or software—can be identified in this manner. In most cases, the system owner can replace faulty hardware modules himself. Factory software support can be provided via telephone using the central service computer.

Regional parts depots ship replacements for faulty modules by the fastest method. If the problem does require on-site assistance, the national service center will dispatch the service engineer closest to the customer's site.

ABOUT BTI

Starting as a commercial timesharing service in 1968, BTI moved rapidly into the development and manufacture of interactive computer systems. Since 1971, BTI has delivered over 2500 Model 3000/4000/5000 Series 16-bit interactive systems. There are installations in 48 states of the U.S., in Canada, and in Europe. The BTI 8000 is a planned outgrowth of BTI's special experience in the manufacture and support of interactive computer systems.

BTI occupies a modern facility in Sunnyvale, California, with over 100,000 square feet of space. The facility houses nearly 400 employees in research and development, marketing, manufacturing, service, and administrative functions.



Corporate Headquarters:
870 West Maude Avenue
Sunnyvale, California 94086
(408) 733-1122

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East
225 Old New Brunswick Road
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(201) 457-0600

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2401 Plum Grove Road
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1545 West Mockingbird Lane
Dallas, Texas 75235
(214) 630-2431

West
870 West Maude Avenue
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(408) 733-1122

Sales offices in major U.S. cities.

BTI
COMPUTER
SYSTEMS

BTI 8000
Multiprocessor System

Price List
October 1978
U.S. Domestic Prices

INTRODUCTION

The BTI 8000 32-Bit Multiprocessor System is completely modular in configuration. System configurations and prices are built upon a "base system", adding (or deleting) modules and peripherals as required to arrive at the desired system configuration. This price list includes the configuration and price of the base system, prices for all add-on items, and several examples of expanded system configurations. For further guidance on determining a system configuration to satisfy a specific application, please consult a BTI sales representative.

BASE SYSTEM

This system configuration is complete, requiring only the attachment of modems and terminals. The base system includes one CPU, 64 Kwords (256 Kbytes) of core memory, 33 megabytes of online disk storage (with removable disk pack), magnetic tape cartridge drive for software backup and recovery, 8 user ports and a system cabinet with operator control panel. (Terminals must be ASCII, asynchronous, RS-232-C compatible.) System software includes the Monitor, Control Mode, PASCAL-X language facility, and utilities package.

BASE SYSTEM CONFIGURATION

8110	Computational Processing Unit
8130	Memory Control Unit
8133	Memory Module, 64 Kwords (256 Kbytes) of core memory
8151	Memory Power Supply
8170	Peripheral Processing Unit
8205	Disk Controller
8210	33 Megabyte Storage Module Drive with one removable 8212 Disk Pack
8305	Magnetic Tape Controller
8310	Single Magnetic Tape Cartridge Drive with four 8317 Tape Cartridges. (One cartridge stores 10 Mbytes)
8510	Asynchronous Communications Controller
8515	8-Port Interface (EIA RS-232-C compatible, rates to 19.2 Kbaud)
8190	System Services Unit
8810	System Cabinet (Double bay; includes bus backplane, operator control panel, system power supply)

Price for complete base system $ 86,850

Base system includes license to use the following BTI-furnished software: integrated monitor, Control Mode, PASCAL-X compiler, and a utilities package which includes: editor, sort/merge, copy, debug, masters' and operators' programs.

SYSTEM EXPANSION

SYSTEM RESOURCE MODULES

8110	Computational Processing Unit (CPU)	$ 12,000
8130	Memory Control Unit (MCU). Supports up to 16 Mbytes of memory.	3,000
8170	Peripheral Processing Unit (PPU). Supports up to 4 peripheral device controllers.	8,000
8190	System Services Unit (SSU)	4,000

MEMORY

8132	Memory Module, 32 Kwords (128 Kbytes) of core memory	9,000
8133	Memory Module, 64 Kwords (256 Kbytes) of core memory	16,000
8151	Memory Power Supply (supports up to 64 Kwords on one MCU)	2,500
8152	Memory Power Supply (supports up to 128 Kwords on one MCU)	3,500

DISK STORAGE

8205	Disk Controller (for 8210, 8215, 8220, 8225 Drives; supports up to 8 drives, in any combination.)	10,000
8210	33 Mbyte Storage Module Drive with one removable 8212 Disk Pack	9,850
8215	66 Mbyte Storage Module Drive with one removable 8217 Disk Pack	12,500
8220	126 Mbyte Storage Module Drive with one removable 8222 Disk Pack	18,000
8225	252 Mbyte Storage Module Drive with one removable 8227 Disk Pack	30,000

MAGNETIC TAPE

8305	Magnetic Tape Controller for 8310, 8315 Drives (controls up to 4 drives)	4,000
8310	Single Magnetic Tape Cartridge Drive, with four 8317 Magnetic Tape Cartridges. (8310 module accommodates up to three additional 8315 drive units)	3,000
8315	Additional Magnetic Tape Cartridge Drive; installs in 8310 module. Up to three 8315 units may be added for total of four drives.	2,500
8320	Magnetic Tape Controller for 8330 Drive (supports up to 4 drives)	5,000
8330	9-Track Magnetic Tape Drive, IBM/ANSI-compatible (800/1600 bpi, switch selectable); includes 8815 Single Bay Cabinet Extension	9,000

LINE PRINTERS

8405	Line Printer Controller for 8410 Printer. Supports up to four printers.	5,000
8410	Line Printer, 300 lpm (132 col., 96 char., medium duty)	3,950
8415	Line Printer Controller for 8420, 8425, 8430 Printers	5,000
8420	Line Printer, 300 lpm (136 col., 64 char., heavy duty)	10,000
	Quietized cabinet, add	800
	96-character set, add	1,500
8425	Line Printer, 600 lpm (136 col., 64 char., heavy duty)	13,500
	Quietized cabinet, add	800
	96-character set, add	1,500
8430	Line Printer, 900 lpm (136 col., 64 char., heavy duty. Includes quietized cabinet)	18,700
	96-character set, add	1,500

COMMUNICATIONS

8510	Asynchronous Communications Controller (supports up to eight 8515 8-Port Interfaces)	$ 8,000
8515	8-Port Interface (EIA RS-232-C, at rates to 19.2 Kbaud for any or all ports)	2,000

CABINETS

8815	Cabinet Extension. Extends 8810 cabinet to triple bay configuration. Further 8815 extensions may be added as required. (Includes blank front panels, but not side covers.)	2,000
8816	Side Cover. (Fits 8810 Cabinet, 8815 Extension, either side.) Each	150
8850	System Power Supply (one included in 8810 cabinet furnished with base system)	3,000

ACCESSORIES

8212	Disk Pack, for 8210 33 Mbyte Drive	400
8217	Disk Pack, for 8215 66 Mbyte Drive	550
8222	Disk Pack, for 8220 126 Mbyte Drive	1,250
8227	Disk Pack, for 8225 252 Mbyte Drive	1,250
8317	Magnetic Tape Cartridge, for 8310, 8315 Drives	50
8332	Magnetic Tape Reel, for 8330 Drive (2400 feet)	25

SOFTWARE

BTI software is licensed for use on one system. Discounts are offered for multiple installations by one customer. BTI-furnished software is maintained free of charge for one year. Continuing maintenance is available on a yearly contract basis. Upgrades of BTI software are offered to customers using the existing software for a modest handling charge.

	License Fee
Integrated monitor; Control Mode; utilities, including editor, sort/merge, copy, debug; masters' and operator's programs	*
PASCAL-X (Extended PASCAL)	*
FORTRAN (1977 ANSI FORTRAN with extensions)	2,000
BASIC-X (Extended BASIC)	2,000
RPG II	3,000
COBOL (1974 ANSI COBOL with extensions)	4,000
DBMS-X (CODASYL-compliant Data Base Management System)	4,500
Assembler	4,000

*Included in base system price

TRAINING

System Familiarization

System overview, management and operator training; 2-week course at BTI factory. Price of base system includes two people for this course. Additional places, per person	1,000

DBMS-X

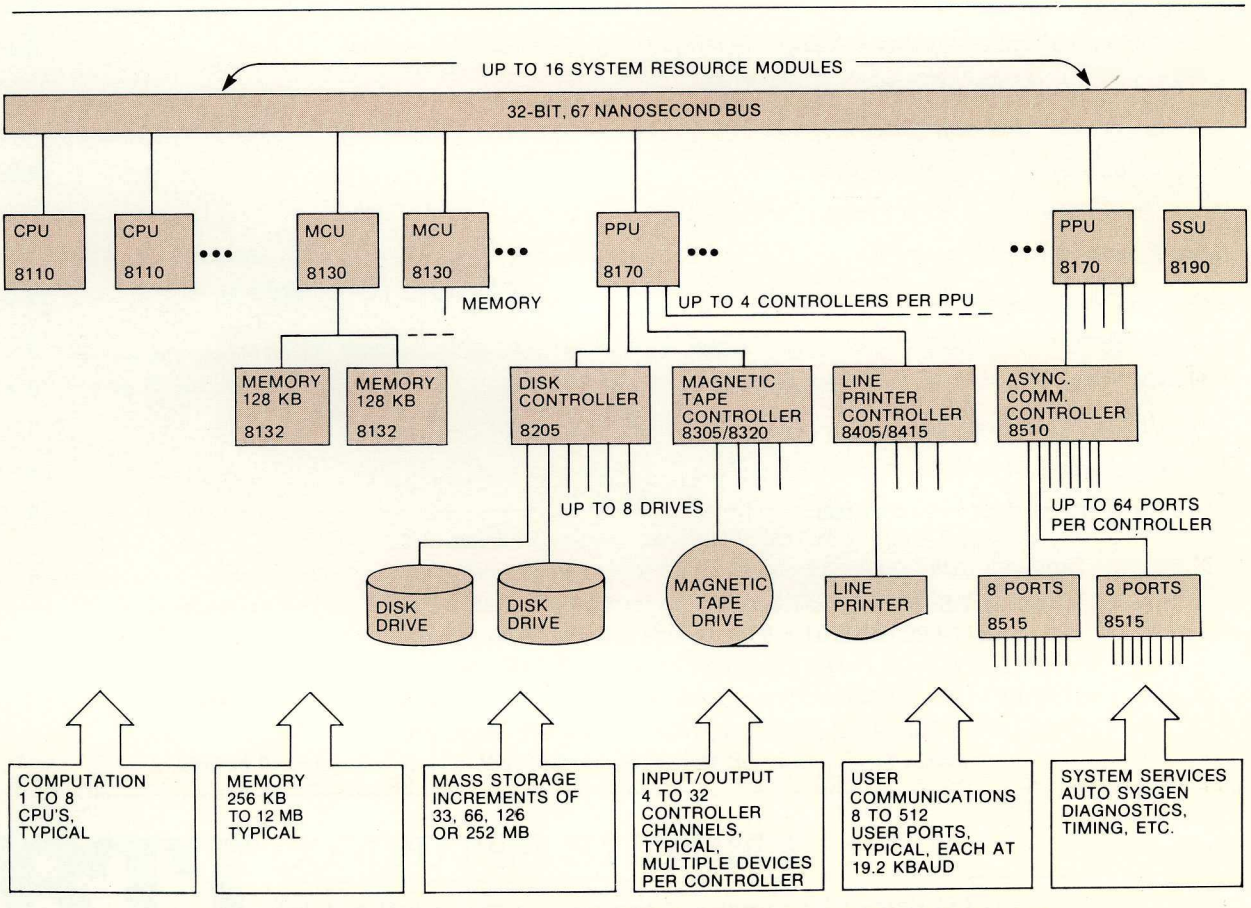
Training in the use of the Data Base Management System; 1-week course at BTI factory.
Price of DBMS-X includes one person for this course. Additional places, per person $ 500

EXAMPLES OF EXPANDED SYSTEM CONFIGURATIONS

The system bus accepts up to 16 resource modules: 8110 CPU, 8130 MCU, 8170 PPU, 8190 SSU. The base system includes one each CPU, MCU, PPU, SSU. The system may be expanded by adding memory and device controllers to the existing MCU and PPU, and by adding further CPU's, MCU's and PPU's up to the maximum of 16 modules. (Only one SSU is required.) The mix of resource modules in an expanded system will depend on the specific application, and the reader is cautioned that the assistance of a BTI system analyst should be enlisted in configuring a system for a given application.

Some guidelines follow. The maximum practical number of one type of module (i.e., CPU, MCU or PPU) is eight. One MCU will support up to 4Mwords; however, if bus space is available, the use of one MCU for each 64 Kwords (256 Kbytes) of memory is recommended. Typically 64 or 128 Kwords of memory should be installed per CPU. One PPU has four channels for device controllers. Two channels are standard bandwidth, to support magnetic tape, line printers, and user ports. The other two channels are double bandwidth, for disk storage. Controllers for standard bandwidth devices may be connected to double bandwidth channels. Additional PPU's are necessary only when all four channels on existing PPU's are in use.

Hardware redundancy can be considered in configuring a system. Loss of a CPU or memory, after restart, merely results in a slower system. Loss of a PPU merely requires reconnection of device controllers, if channels are available on remaining PPU's.



SYSTEM RESOURCE MODULES—FOR COMPUTATION, MEMORY AND I/O—ARE AUTOMATICALLY POOLED FOR EFFICIENT SUPPORT OF INTERACTIVE USERS AND MULTI-STREAM BATCH

EXAMPLES OF EXPANDED SYSTEM CONFIGURATIONS (continued)

Example 1: System with one CPU, two MCU's each with 64 Kwords of memory (512 Kbytes total), two 33 Mbyte disk drives (disk-to-disk backup), and 32 ports.

Base System	$ 86,850
Add 8130 Memory Control Unit	3,000
Add 8133 Memory Module, 64 Kwords	16,000
Add 8151 Memory Power Supply (supports up to 64 Kwords)	2,500
Add 8210 33 Mbyte Storage Module Drive	9,850
Delete 8305 Magnetic Tape Controller	(4,000)
Delete 8310 Single Magnetic Tape Cartridge Drive	(2,000)
Add 8515 8-Port Interface, three at $2,000	6,000
	$118,200

Example 2: System with two CPU's, three MCU's each with 64 Kwords memory (768 Kb total), three 66 Mbyte disk drives (198 Mbyte total) in place of 33 Mbyte drive, 9-track magnetic tape in place of tape cartridge, 900 lpm line printer, and 64 ports.

Base System	$ 86,850
Add 8110 Computational Processing Unit	12,000
Add 8130 Memory Control Unit, two at $3,000	6,000
Add 8133 Memory Module, 64 Kwords, two at $16,000	32,000
Add 8151 Memory Power Supply, two at $2,500	5,000
Delete 8210 33 Mbyte Storage Module Drive	(9,850)
Add 8215 66 Mbyte Storage Module Drive, three at $12,500	37,500
Delete 8305 Magnetic Tape Controller	(3,000)
Delete 8310 Single Magnetic Tape Cartridge Drive	(3,000)
Add 8320 Magnetic Tape Controller	5,000
Add 8330 9-Track Magnetic Tape Drive (includes 8815 Cabinet Extension)	9,000
Add 8415 Line Printer Controller	5,000
Add 8430 900 lpm Line Printer	18,700
Add 8515 8-Port, Interface, seven at $2,000	14,000
	$215,200

Example 3: System with three CPU's, six MCU's each with 64 Kwords of memory (1½ Mbytes total), four 126 Mbyte disk drives (504 Mbytes total) in place of 33 Mbyte drive, 9-track magnetic tape in place of tape cartridge, two PPU's, 900 lpm line printer, and 128 ports.

Base System	$ 86,850
Add 8110 Computational Processing Unit, two at $12,000	24,000
Add 8130 Memory Control Unit, five at $3,000	15,000
Add 8133 Memory Module, 64 Kwords, five at $16,000	80,000
Add 8151 Memory Power Supply, five at $2,500	12,500
Delete 8210 33 Mbyte Storage Module Drive	(9,850)
Add 8220 126 Mbyte Storage Module Drive, four at $18,000	72,000
Delete 8305 Magnetic Tape Controller	(3,000)
Delete 8310 Single Magnetic Tape Cartridge Drive	(3,000)
Add 8320 Magnetic Tape Controller	5,000
Add 8330 9-Track Magnetic Tape Drive (includes 8815 Cabinet Extension)	9,000
Add 8415 Line Printer Controller	5,000
Add 8430 900 lpm Line Printer	18,700
Add 8170 Peripheral Processing Unit	8,000
Add 8510 Asynchronous Communications Controller	8,000
Add 8515 8-Port Interface, fifteen at $2,000	30,000
Add 8850 System Power Supply	3,000
	$361,200

Prices are F.O.B. Sunnyvale, California and do not include travel and freight expenses for on-site installation or applicable state and local taxes. Prices and specifications are subject to change without notice.

For additional information on BTI 8000 system modules, refer to "BTI 8000 Multiprocessor System Specifications", available from any BTI Sales Office listed below.

Regional Sales Offices

East:	3 Executive Campus, Cherry Hill, NJ 08002 (609) 662-1122
South:	1545 West Mockingbird Lane, Dallas, TX 75235 (214) 630-2431
Midwest:	3001 Metro Drive, Minneapolis, MN 55420 (612) 854-1122
	2700 River Road, Des Plaines, IL 60018 (312) 298-1177
	111 West Port Plaza, Saint Louis, MO 63141 (314) 878-8110
West:	870 West Maude Avenue, Sunnyvale, CA 94086 (408) 733-1122
	300 South Harbor Boulevard, Anaheim, CA 92805 (714) 533-7161
United Kingdom:	Brunel Way, Slough SL1 1XN Berkshire, 0753 70044

BTI COMPUTER SYSTEMS

870 West Maude Avenue, Sunnyvale, California 94086 (408) 733-1122

1101-R1078

Printed in U.S.A.

BTI 8000
Multiprocessor System Specifications

HARDWARE ARCHITECTURE

System resources for computation, memory and I/O are provided by plug-in modules, operating in parallel. Quantity and mix of resource modules can be configured as required to satisfy system application. Resources are automatically allocated to active processes by monitor software.

RESOURCE MODULES

Four Types:

Computational Processing Unit (CPU)
Memory Control Unit (MCU)
Peripheral Processing Unit (PPU)
System Services Unit (SSU)

SYSTEM CONFIGURATION

Minimum: 1 each CPU, MCU, PPU, SSU. Additional CPU's, MCU's, PPU's as required, up to total of 16 modules. (Only 1 SSU necessary; practical maximum of any other type of module is 8.)

BUS STRUCTURE

Distributed logic, based on passive bus with 32-bit wide data path (plus address, control and parity lines). Bus accepts up to 16 resource modules. All data transfers between resource modules occur at rate of 60 megabytes per second (67 nanoseconds per 32-bit word) synchronized by master clock in SSU.

COMPUTATION

Performed by one or more CPU's, operating in parallel. CPU is 32-bit processor with eight 32-bit, general-purpose, program-accessible registers. Additional registers for monitor status, process status and program counter.

Arithmetic: 32- and 64-bit integer; 64-bit floating point. System software provides double-precision (128-bit) floating point arithmetic.

Instructions: 174 user-mode instructions (1 word long).

Addressing: 54 addressing modes which reference operands in registers, in memory, and the instructions themselves. Operand can be a single or double word, a character, or a field from 1 to 32 bits. Addressing modes directly support compiler data structures, including stack, queue, and linked-list, with arbitrary size data elements. All hardware memory mapping: virtual to physical memory address conversion performed in two bus cycles (134 nanoseconds), in parallel with instruction execution.

MEMORY

Controlled by one or more MCU's, operating in parallel. MCU is microprogrammed processor, controls up to 16 Mbytes of memory (22-bit word address).

Memory: Core, 750-nanosecond full-cycle time (including MCU operation). Read access time under 400 nanoseconds. Includes parity checking by byte. Average (system wide) cycle time is 750 nanoseconds divided approx. by number of active MCU's.

Configuration: Furnished in 32 Kword (128 Kbyte) increments. Minimum memory 64 Kwords; typical maximum 2 or 4 Mwords. (System will support over 100 Mbytes of memory, using multiple MCU's.) System treats all memory as single entity, organized in pages of 1024 words (4096 bytes). System 'strikes out' malfunctioning area of memory on page basis and reconfigures available memory.

INPUT/OUTPUT

Controlled by one or more PPU's, operating in parallel. PPU is microprogrammed processor, with four channels for peripheral device controllers. Transfers between PPU and controllers are via two 8-bit paths, one for data, the other for control, status, and parity. Three channels of PPU are standard bandwidth of 5 megabits/sec., for magnetic tape, line printers and user communications. One channel is double bandwidth of 10 megabits/sec., for disk storage.

System I/O Capacity: Minimum 4 channels; maximum (8 PPU's) 32 channels.

MASS STORAGE

Disk drives are storage module type, offered in formatted capacities of 34, 67, 135 and 254 Mbytes. Disk controller supports up to eight drives, in any mix, with overlapped seeks. Maximum file size is equal to physical capacity of drive.

Drive Specifications: Average seek time 30 milliseconds; average rotational latency 8.3 milliseconds; transfer rate (bit rate) 10 MHz; rotation speed 3600 rpm.

Storage Technique: Mass storage data transfers effected on page basis, stored as one block on disk. Unique multiple segment storage technique permits reconstruction of page even if a segment becomes totally unreadable. System reassigns block placements if bad disk areas encountered.

PERIPHERALS

Peripherals available include IBM/ANSI compatible 9-track (800/1600 bpi) magnetic tape and 3M-type cartridge magnetic tape (10 Mbytes per cartridge, at 6400 bpi). Also choice of line printers from 300 to 900 lpm.

USER COMMUNICATIONS

Controlled by Asynchronous Communications Controller (ACC) operating from PPU. ACC controls up to eight 8-port (RS-232-C) interfaces, 64 ports total. PPU can control four ACC's, 256 ports total. Multiple PPU configuration will support still more interactive users, up to practical maximum of approximately 500.

Maximum rate for any or all ports is 19.2 Kbaud. ACC includes internal buffering to accommodate full-screen (1920 characters) block-mode interactive terminals. User programs have control over interface pins and terminating character selection to allow programming of any asynchronous protocol.

SYSTEM SERVICES

Provided by SSU (only one SSU is necessary). SSU is microprogrammed processor providing following functions:

1) Operator control panel with system control pushbuttons, including one-button sysgen, and 10-character display of system status and diagnostic test results;

2) Master clock, drives bus at 67 nanosecond cycle;

3) Program-accessible time-of-day clock, increments in milliseconds, includes 7-day battery backup;

4) Internal interrupt timer;

5) Program-accessible permanent system ID number;

6) Remote (dial-up) diagnostic facility, for access by factory diagnostic computer. (Facility may be disabled by operator.)

7) Intelligent bootstraps (see auto sysgen, below);

8) Automatic power fail restart;

9) Thermal overload detection.

SYSGEN

All resource modules automatically carry out self-test at start up (initiated by one button). On completion of its self test, SSU initiates sysgen. If all modules are operative, monitor is automatically configured to match resources present.

FAIL-SOFT

Faulty resource module is identified by front panel display. In multi-module configuration, faulty module can be removed and system restarted (one-button sysgen).

SOFTWARE ARCHITECTURE

All users operate in virtual machine environment. Programs (source and object) are independent of hardware configuration. User workspace 128 Kwords (512 Kbytes). Address space for I/O services for user's process is separate from workspace.

Demand Paging: Real memory pages are allocated to user processes' virtual memory requests as governed by most valuable, least valuable algorithm. Entire page of 1024 words (4096 bytes) is available to programmer.

System will support up to approx. 500 concurrent processes (interactive and multi-stream batch) depending on amount of memory installed. User processes can generate and communicate with other processes (not necessarily associated with any port) to handle heavy workloads in parallel.

SYSTEM SOFTWARE

Compilers: PASCAL-X (extended PASCAL); FORTRAN (1977 ANSI plus extensions); BASIC-X (extended BASIC); RPG II; COBOL (1974 ANSI plus extensions).

DBMS-X: CODASYL-compliant data base management system. DBMS-X links to COBOL, FORTRAN, PASCAL-X, and RPG II.

Assembler: Single-pass assembler. Object modules share standard interfaces with BTI compilers.

Utilities: Linking loader; editor; sort/merge; copy/format; backup; universal symbolic debugger.

Specifications are subject to change without notice.

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