CYBER 2000 Computer Systems

The fastest central processor in the supermainframe class

The CYBER 2000 air-cooled supermainframe offers premium multipurpose performance in a multiuser environment, and gives NOS/VE users access to UNIX through EXPRESS Link.

Control Data CYBER 2000 supermainframes are high-end, general purpose systems that are part of the high-performance CYBER family. Unique architecture, hardware implementation, software operating environment, and configuration capabilities, make the CYBER 2000 supermainframe a superb platform for advanced technical computing, complex database management, and advanced file serving.

While compatible with all other CYBER 180 NOS/VE systems the CYBER 2000 can also be configured in conjunction with the Control Data 4000 line of RISC-based, open system computers via EXPRESS Link, Control Data's high-speed data link.

This approach gives the NOS/VE user access to the UNIX environment and allows the user to capitalize on the unique strengths of both the CYBER 2000 and the Control Data 4000 platforms.

Superb price/performance, versatility, maintainability, and installability define the CYBER 2000 air-cooled supermainframe. Outstanding performance, particularly in multiprogramming environments, is the result of the architecture's inherent design. High-performance CPUs, coupled with high bandwidth IOUs and large real central memories augmented with virtual memory, make the CYBER 2000 an ideal platform for a wide range of applications that require concurrent interactive and batch processing capabilities.

Features

- Vector peak performance of 210 MFLOPS on a single CYBER 2000U or 2000V CPU
- Computational power of 32 MFLOPS on a single CYBER 2000V CPU, based on standard full-precision 100 × 100 Linpack
- Horizontal expansion capability with system clustering via Stornet, a high-speed memory-to-memory link allowing clusters of up to 16 CPUs or 8 mainframes (a cluster of 16 CYBER 2000V CPUs creates a complex, with a Linpack potential of 3,360 MFLOPS)
- Single and dual CPU configurations, augmented by up to 40 I/O processors
- 64-bit word based on eight 8-bit (ASCII) bytes
- Advanced circuit technology employing 1 Mbit DRAM for the 2000S and 2000U; 256 Kbit BiMOS arrays for the 2000V; and high-speed 14,000 gate ECL arrays for logic in the 2000S, 2000U, and 2000V
- 9.4 nanosecond clock cycle
- Scan registers in the gate arrays improve logic fault isolation and provide system maintenance capabilities
- Operates unattended; alerts site personnel and/or Control Data support personnel of a critical error
- System automatically restarts without operator intervention after site power failure

Features

- Large real central memory ranging from 128 Mbytes to 512 Mbytes, employing central memory operations using SECDED on stored data, and parity protection on address and control circuitry
- Extremely large virtual memory, with addressing space of up to 8,800 Gbytes per task
- Operates under NOS/VE
- Binary compatible software on all NOS/VE CYBER systems
- Single or dual independent IOUs – each with a maximum of 20 I/O processors that off-load I/O operations from the CPUs, and provide powerful and flexible I/O channel configurations of up to 18 DMA channels
- Four DMA I/O channel types that can feature up to 25 Mbytes/sec transfer rate
- Hardware produced by a world class factory employing the latest manufacturing techniques in automation and robotics
- Switching power supplies that eliminate the need for motor generator (MG) sets
- Modular mainframe components that enable quick and easy system installation
- Ambient air cooling system
- Adherence to current environmental and safety industry standards, including UL, FCC, CSA, IEC, and VDE

The CYBER 2000 employs 14,000 gate emitter coupled logic (ECL) arrays, which allows the CYBER 2000 to surpass the performance of many minisupercomputers and approach the speed of many supercomputers, while using ambient air cooling. Additionally, the high-density logic circuits reduce the overall number of discrete components. This, combined with the use of printed circuit board backpanels, drastically reduces the number of component connections – for exceptional reliability.

Open systems coexistence

A CYBER 2000 supermainframe configured with EXPRESS Link permits high-speed data exchange with the Control Data 4000 line of RISC-based, open systems platforms. Applications such as EZview, available on both CYBER 2000 systems and Control Data 4000 computers, enable the user to transparently share the resources of both platforms via an easy-to-use, icon-driven user interface. This synergistic approach facilitates an effective coexistence with open system computers, while maintaining all the features of a CYBER system operating under NOS/VE.

System performance

The CYBER 2000 is offered with three discrete levels of processing power: the 2000S, 2000U, and 2000V. While each model offers an architecture that delivers scalar processing capabilities, the 2000U and 2000V also provide an integrated vector instruction set. Furthermore, use of exceptionally fast BiMOS memory in the 2000V delivers superior performance in intense vector processing environments.

The CYBER 2000S caters to large information management environments (such as file serving and database management), while the CYBER 2000U and 2000V are ideally suited for numerically intense applications (such as advanced technical computing, aerospace applications, research, and manufacturing-related technical computing).

All systems are based upon a common design point, thereby permitting progressive field upgrades from a 2000S to a 2000U, and from a 2000U to a 2000V. All models can also be upgraded with a field installable second central processor for additional computing power. In this manner, customers can match their current computing needs and easily adapt to future requirements. Investments in supporting hardware, peripherals, communications devices, software, and applications are all protected by the compatibility offered by these systems, as well as the entire CYBER mainframe family.

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CYBER 2000

PERFORMANCE SURPASSES THAT OF MANY MINISUPERCOMPUTERS AND APPROACHES THE SPEED OF SUPERCOMPUTERS

Central processor

Each central processor is an independent micro-coded CPU that features a 9.4 nanosecond basic clock; a 64-bit word size; a full instruction set including integer, single/double precision floating point, decimal, and byte manipulation instructions as

Applications such as EZview, available on both CYBER 2000 systems and Control Data 4000 Series computers, enable the user to transparently share the resources of both platforms via an easy-to-use ICON-driven user interface.

standard. A 128 Kbyte cache for instruction and data, and specialized hardware functional units are utilized to increase performance. A five-stage pipeline holds multiple instructions and addresses during CPU operation. Instructions are issued in a serial manner, but with the pipeline architecture, several instructions can be in various stages of execution simultaneously. Controlstore for the microcode consists of 64 Kbytes.

The CYBER 2000 uses two discrete types of central processors: a scalar processor (2000S) and a combination scalar/vector processor (2000U and 2000V). Progressive enhancements of a CYBER 2000 are accomplished with field installable upgrade options that include the following:

- Upgrade of 2000S to a 2000U (upgrades scalar processor to scalar/vector processor)
- Upgrade of 2000U to a 2000V (replaces DRAM memory with BiMOS memory)
- Upgrade of single processor 2000S, 2000U, or 2000V to a dual processor 2000S, 2000U, or 2000V, respectively (adds second central processor option)

The CYBER 2000U and 2000V also incorporate an integrated vector instruction set that is typically associated with supercomputers. These instructions (indexed gather, indexed scatter, dot product, and four triad instructions) represent a significant advancement in the numeric processing capabilities of a CYBER mainframe.

Central memory

The central memory of CYBER 2000S and 2000U systems is based on 1 Mbit DRAMs, a central memory cycle time of 80 nanoseconds, and a bandwidth ranging from 0.6 to 2.7 Gbytes/sec, depending on memory size. The base central memory size is 128 Mbytes, and is expandable with field installable options to 256 Mbytes or 512 Mbytes.

The central memory of CYBER 2000V systems is based on 256 Kbit BiMOS memory, a central memory cycle time of 15 nanoseconds, and a bandwidth of 3.55 Gbytes/sec. The base central memory size is 128 Mbytes, and is expandable with field installable options to 2,512 Mbytes.

CYBER 2000 central memory speeds and large memory bandwidths ensure that the system components (central processors, peripherals, and networks) are all serviced at full speed, resulting in high system throughput.

Input/output unit

CYBER 2000 systems use one or two separate independent input/output units (IOUs) to perform I/O functions for the system. This design relieves the central processor(s) from interruptions for I/O activity and allows continuous computational processing. Each IOU contains up to 20 I/O processors specifically designed to perform I/O processing, and up to 20 external channel interfaces – of which up to 18 are direct memory access (DMA) channels.

The basic 2000S, 2000U, and 2000V system includes a primary IOU with 10 I/O processors, 8 external DMA channel interfaces, and 2 external non-DMA channel interfaces. The primary IOU is expandable to a total of 20 I/O processors, 18 external DMA channels, and 2 external non-DMA channels. All CYBER 2000 models also allow the addition of a secondary IOU, which provides expansion of I/O facilities to a total of 40 I/O processors, 36 external DMA channels, and 4 external non-DMA channels.

The external DMA channels are high-performance bidirectional channels that are designed to support the streaming of data directly between the peripherals and central memory at data rates of up to 25 Mbytes/sec.

The channel interface design allows the choice of five external channel types:

- IPI/DMA 16-bit channel, rated at 10 Mbytes/sec
- IPI/DMA 16-bit channel, rated at 25 Mbytes/sec
- ISI/DMA 16-bit channel, rated at 12 Mbytes/sec
- 170/DMA 12-bit channel, rated at either 3 Mbytes/sec for data storage devices or 15 Mbytes/sec for data exchange devices
- 170/non-DMA 12-bit channel, rated at 3 Mbytes/sec for data storage devices

Any combination of the external channel types is supported. Specific choice of channel types is determined by the channel interface requirements of the selected peripheral equipment.

Service processor unit

The service processor unit is a self-contained microprocessor within the CYBER 2000 that initializes the system and initiates many system maintenance tasks. The service processor unit has a 4 Mbyte memory, a 373 Mbyte hard drive, and a cartridge tape drive. The service processor interfaces with the central processors (CPs) and central memory control (CMC) via a data channel to the maintenance access control (MAC) units in the CP and CMC areas of the mainframe, respectively. It also interfaces with the input/output units (IOUs) through an RS-232 channel and with the environment/power monitor (EPM) through a VME bus.

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CYBER 2000 CENTRAL MEMORY SPEEDS AND LARGE MEMORY BANDWIDTHS ENSURE THAT SYSTEM COMPONENTS ARE SERVICED AT FULL SPEED, RESULTING IN HIGH SYSTEM THROUGHPUT

The CYBER Initialization Package (CIP) for the CYBER 2000 is delivered on cartridge tape and is loaded and initialized via the service processor. Other functions the service processor provides include:

- Ability to remotely power-on the mainframe (if enabled by a switch)
- Ability to automatically restart the system without operator intervention after a site power failure
- Ability to alert site personnel and/or Control Data support personnel of a critical error via phone or modem
- Ability to degrade the system automatically
- Controls the system console interface
- Supports concurrent maintenance on redundant system elements (for example, maintenance on second CPU while primary CPU continues to process the workload)
- Provides the environment/power monitor (EPM) interface for monitoring system temperatures, voltages, and clock margins
- Supports remote technical assistance (RTA) interface for fast problem resolution
- Supplies time of day and calendar clock
- Serves as the system deadstart device, thereby eliminating the need for an external device

Operating system software

The CYBER 2000 operates under control of the Network Operating System/Virtual Environment (NOS/VE) software. The multitasking architecture of NOS/VE fully exploits the capabilities of the system, while offering excellent performance and a broad range of user capabilities.

NOS/VE has an extremely large virtual address space of up to 8,800 Gbytes per task. Each task may be divided into as many as 4,096 segments of instructions and/or data with each segment containing up to 2,147 Mbytes. The techniques used by NOS/VE provide the advantages of re-entrant programs and the ability for applications programmers to utilize implicit I/O, thereby achieving high performance while conserving system resource utilization.

The key elements of NOS/VE and its companion products include:

- C2 security
- High-speed data sharing with open systems computers via EXPRESS Link

- Wide range of compatible language processors, including COBOL, APL, C, PROLOG, LISP, BASIC, FORTRAN, SORT/MERGE, and CYBIL
- Technical computing applications such as MSC NASTRAN, ANSYS, ABACUS, PATRAN, IMSL, NAG, and BLAS
- Information management products that feature BASISplus, ORACLE, and Advanced Access Methods (AAM)
- Flexible System Command Language (SCL), a consistent and user friendly interface to NOS/VE and its associated products
- A set of Professional Programming Environments, enabling the management of applications development by multiprogrammer teams
- CDCNET, an Open Systems Interconnect (OSI) compliant distributed, Ethernet-based communications network
- MAIL/VE, a multihost electronic mail system that operates under NOS/VE
- Archive/VE, a software package that complements the NOS/VE permanent file utilities and supports archiving mass storage files to low-cost storage devices

Environmental

CYBER 2000 systems are cooled by computer room ambient air, thereby eliminating the need for special water cooling equipment. CYBER 2000 systems also use switching power supplies, thereby eliminating the need for motor generator (MG) sets.

Comparison by model

	CYBER 2000S	CYBER 2000U	CYBER 2000V
ECL gates per chip	14,000	14,000	14,000
Clock cycle	9.4 ns	9.4 ns	9.4 ns
Data cache			
Size	128 KB	128 KB	128 KB
Speed	5 ns	5 ns	5 ns
Instruction cache			
Size	192 words	192 words	192 words
Speed	5 ns	5 ns	5 ns
Performance ratings			
Theoretical vector peak (single processor)	Not applicable to scalar processing	210 MFLOPS	210 MFLOPS
Linpack 100 × 100 (single processor)	13 MFLOPS	24-29 MFLOPS	32 MFLOPS
MIPS performance (single processor)	51 equivalent VAX mips (scalar)	51 equivalent VAX mips (vector)	81 equivalent VAX mips (vector)
Central memory			
Technology	1 Mbit DRAM chips	1 Mbit DRAM chips	256 Kbit BiMOS chips
Capacity	128 to 512 MB	128 to 512 MB	128 to 256 MB
Cycle time	80 ns	80 ns	15 ns
Memory bandwidth	0.6 to 2.7 GB	0.6 to 2.7 GB	3.55 GB
I/O handling			
Fastest I/O Channel	25 MB/sec	25 MB/sec	25 MB/sec
Maximum Channels	36 DMA channels	36 DMA channels	36 DMA channels
I/O processors, minimum	10	10	10
I/O processors, maximum	40	40	40
Attributes			
Cooling	Air	Air	Air
Operating System	NOS/VE	NOS/VE	NOS/VE
Number of CPUs	1 or 2	1 or 2	1 or 2
Number of IOUs	1 or 2	1 or 2	1 or 2

Service and support you can count on

When you work with Control Data, you deal with a worldwide organization that provides a full range of computer system solutions and services, including technical support, training, applications software, and equipment maintenance. Our engineers, systems analysts, networking specialists, programmers, and other professionals help you maximize your computing resources and improve user productivity. Our sales and support personnel ensure fast startup, reliable ongoing operations, and quick response to your questions and new requirements.

The result? High-performance technology and outstanding customer service that can help your organization achieve its key objectives and maintain a competitive advantage.

CYBER 2000 SYNERGY: EFFECTIVE COEXISTENCE WITH OPEN SYSTEMS COMPUTERS, PLUS ALL THE FEATURES OF A CYBER OPERATING UNDER NOS/VE

For more information

To learn more about the CYBER 2000 supermainframe or other Control Data products and services, contact your local Control Data sales office or write:

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1-800-345-6628 (Customer Support)

Specifications

Central processor	
Number of operating registers	33
Word size	64 bits
Floating point arithmetic	16 bit exponent, 48 bit coefficient in single precision 16 bit exponent, 96 bit coefficient in double precision
Error detection	Parity on 8 bit Byte basis, all address and data paths, instruction level retry on errors
Interrupts	Precise on instruction
Number of independent CPUs	1 or 2
Central memory	
Word size	64 data bits
Number of banks	16 minimum, 64 maximum
Error detection	SECDED on stored data, parity on address and control circuitry
Virtual memory limits	Up to 8.8 GB/task Up to 4,096 segments/task Up to 2,147 MB/segment
Input/output unit	
Number of units	1 minimum, 2 maximum
Number of independent I/O processors per unit	10 minimum, 20 maximum
I/O processor cycle time	50 ns
I/O processor memory	16 KB
Error detection/correction	SECDED
Number of independent I/O channels per IOU	10 minimum, 20 maximum
Direct Memory Access (DMA) channels per IOU	18 maximum
External I/O channel types: 5	IPI/DMA 16 bit channel, rated at 10 MB/sec IPI/DMA 16 bit channel, rated at 25 MB/sec ISI/DMA 16 bit channel, rated at 12 MB/sec 170/DMA 12 bit channel, rated at 3.0 MB/sec or 15 MB/sec 170/non-DMA 12 bit channel, rated at 3.0 MB/sec
Channel error detection	Parity

Input power	**50 Hz**	**60 Hz**
Voltage	380/145	208
Phase	3	3

Environment	
Operating temperature range	15°C to 32°C, 60°F to 90°F
Operating relative humidity range	20% to 80%
Dewpoint	24°C, 75°F

Dimensions	**Width**		**Depth**		**Height**		**Weight**	
	cm	**in**	**cm**	**in**	**cm**	**in**	**kg**	**lb**
Mainframe without IOU	380.0	149.6	76.2	30.0	193.0	76.0	2,200	4,850
IOU, primary unit with power unit	197.6	77.8	76.2	30.0	193.0	76.0	1,134	2,500
IOU, secondary unit	104.1	41.0	68.6	27.0	193.0	76.0	454	1,000
IOU, primary or secondary expansion unit	104.1	41.0	68.6	27.0	193.0	76.0	454	1,000

Specifications subject to change without notice.

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