PRODUCT DATA SHEET

2200 MVP

- **Multiuser/Multiprocessing Capabilities**
- **Memory Expansion to 512K Bytes**
- **Available with Business Graphics Terminals**
- **Wang Enhanced BASIC-2 Language**
- **BASIC-3 and COBOL Languages**
- **Advanced Communications Capabilities**

SYSTEM OVERVIEW

The Model 2200MVP Central Processing Unit (CPU) is a high-performance processor that can support up to 13 terminals and up to 16 jobs concurrently, in a multiprogramming environment. The system offers data communications capabilities, and an extremely low overhead operating system. Designed for simplicity of operation and flexibility in system configuration, the 2200MVP can easily be adapted to meet each user's unique processing requirements.

The Model 2200MVP is available in two versions: the Model 2200MVP and the Model 2200MVPC. The 2200MVP is programmable in the popular BASIC-2 language and accomodates memory expansion to 256K bytes. The 2200MVPC, which incorporates all features of the 2200MVP, also supports the 2200 BASIC-3 and COBOL languages plus new volume and file management capabilities. In addition, memory on the 2200MVPC is expandable to 512K bytes. Refer to the table, "Summary of Differences Between the 2200MVP and the 2200MVPC" for further details.

The 2200MVP utilizes a user-defined, fixed-partition memory configuration and an extremely fast and efficient central processor to extend multiprogramming capabilities to system users. In a fixed-partition memory scheme, user memory is divided into a number of distinct areas called *partitions*, each of which can contain a separate program. The central processor allocates intervals of processing time to each partition in turn; thus the program in an individual partition executes for a brief time slice before the CPU services the next partition. Response time is extremely fast for all users, regardless of the number of partitions or types of programs being executed.

A Typical 2200 MVP System Configured with Optional Peripherals

WANG

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SUMMARY OF DIFFERENCES BETWEEN THE 2200MVP AND THE 2200MVPC

MVP	MVPC
BASIC-2 Multiuser Operating System: BASIC-2 Language	BASIC-2 Multiuser Operating System: BASIC-2 Language BASIC-3/COBOL Multiuser Operating System: BASIC-3 and COBOL Languages
Available with 32K, 64K, 128K, and 256K bytes of user memory	Available with 64K, 128K, 256K, 384K, and 512K bytes of user memory
9 I/O slots	7 I/O slots
Multiuser task control	Multiuser task control and disk management system

System users can communicate directly with the 2200MVP by using a Model 2236DE or 2236DW Terminal with business graphics capabilities. Each terminal consists of a large, easy to read, 24 by 80 (24 lines, 80 characters per line) CRT screen display and a typewriter-style keyboard. The system performs automatic data compression on information transmitted to each terminal, in order to accelerate communication and increase response time. Since each terminal can also support its own local Wang printer, screen dumps can be output and all standard printing operations can be performed. Both terminals generate extensive bar and line graphics using standard program statements, to provide the user with valuable displays for business applications. The 2236DW Integrated Terminal supports an optional 2200 Word Processing Software Package that enables users to perform both word processing and data processing applications at the same terminal.

Terminals can be attached to the CPU either locally, at distances up to 2,000 feet (609.6 meters), or remotely, through the use of modems and telephone lines. Optionally, the 2200MVP can be equipped with communications controllers so that remote devices can be attached directly to the CPU and accessed by a user at the terminal. Asynchronous, synchronous, and advanced bit-oriented protocols are supported by the 2200MVP processor.

Additionally, the 2200MVP supports a wide range of other peripheral devices. These devices include a selection of flexible and hard disk drives, and an extensive array of printers and plotters. To support these peripherals, the 2200MVP chassis contains nine input/output (I/O) slots; the 2200MVPC chassis contains seven I/O slots. Each I/O slot can contain a controller, capable of controlling one or more peripherals.

Model 2236DE Terminal

HIGH-SPEED PERFORMANCE

The 2200MVP central processor is a high-performance, custom-designed MSI processor built from fast and reliable components. CPU memory cycle time, usually sufficient to execute and retrieve a control memory instruction, as well as to read 2 bytes of user memory, is 600 nanoseconds. When combined with the extremely low overhead operating system and the incremental compiler, the 2200MVP provides exceptional response time for all system users. To illustrate the speed of the CPU, a representative selection of BASIC floating-point arithmetic operations is listed in the following table, along with the times required for each computation. These times represent average execution times and assume full 13-digit precision for each operation.

Operation	Central Processing Time
Addition (+)	0.11 msec
Subtraction (-)	0.11 msec
Multiplication (*)	0.39 msec
Division (/)	0.79 msec
Exponentiation (↑)	6.40 msec
LOG	3.30 msec
LGT	2.90 msec
EXP	3.40 msec
SQR	1.80 msec
SIN	4.60 msec
COS	4.70 msec
TAN	8.00 msec
ARCSIN	12.90 msec
ARCCOS	13.00 msec
ARCTAN	10.20 msec
RND	0.28 msec
MOD	1.10 msec
ROUND	0.12 msec
Matrix Inversion (10 x 10)	0.57 sec
Matrix Inversion (20 x 20)	4.30 sec

The 2200MVP also provides high-speed, alphanumeric-string processing capabilities. For example, the following times were measured when the specified BASIC operations were performed upon an alpha array consisting of 1000 eight-character elements.

Operation	Central Processing Time
Search for a specified value	0.02 sec (maximum)
Memory sort of random data	1.68 sec

EASY OPERATION

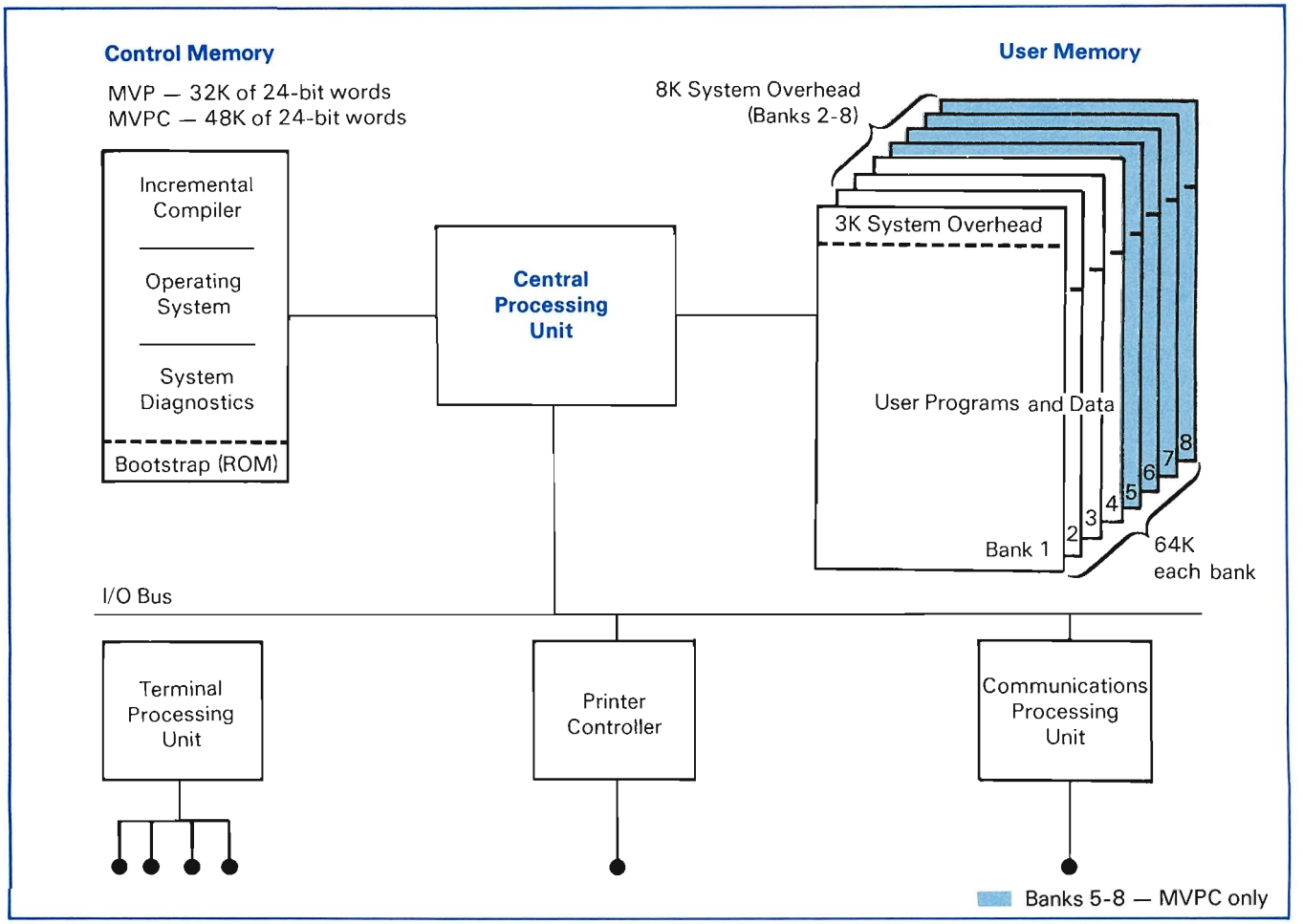
The 2200MVP is simple to operate and easy to program. There are no special job control languages or elaborate operating procedures. System resources are allocated through a supplied partition generation program that guides the user through the process of configuring user memory. By running this program, the user creates partitions and assigns them to terminals. Each terminal can control one or more partitions.

Once the system has been configured, each partition functions independently. Within each partition, a user can develop and execute a program as if the partition were alone on a single-user system.

Because each user communicates with the system interactively, information needed by the program can be requested with clear, nontechnical prompts. For the programmer, interactive operation greatly simplifies program development and maintenance. Programs can be entered, edited, and run directly from the terminal keyboard. In addition, the 2200MVP processor performs a range of error checks to detect and identify various types of errors, and provides an extensive set of edit functions to facilitate error correction.

FUNCTIONAL ORGANIZATION

The 2200MVP consists of a microprogrammed MSI processor coupled with a number of special purpose LSI I/O processors and controllers. The operating system and incremental compilers reside in a control storage memory that is independent from user data memory. The microprogram, comprised of the operating system and incremental compiler, directs the execution of the CPU and coordinates communication with the I/O processors. The independent I/O processors permit the overlap of CPU and I/O processing; thus the CPU is relieved of responsibility for controlling peripherals that would otherwise require frequent or dedicated CPU attention. Refer to the figure, "Logical Organization of the 2200MVP" for an illustration of the 2200MVP architecture.



Logical Organization of the 2200MVP

MEMORY ORGANIZATION

Among the most significant features of the 2200MVP are those that contribute to its highly efficient use of memory. These features include the use of a dedicated control memory for storage of the incremental compilers and the operating system, and the "atomization" technique employed in storing program text.

The 2200MVP contains 32K of 24-bit words of control memory; the 2200MVPC contains 48K of 24-bit words of control memory. When the system is powered on, the system programs are loaded into control memory from the system platter and remain resident in memory until the system is either powered off or reinitialized. Since the contents of control memory are inaccessible to the user or the user's programs, system programs are always protected against accidental interference or destruction.

User memory is the area of memory available to the user's programs and data. User memory on the MVP can be incrementally increased from 32K bytes to 256K bytes; user memory on the MVPC ranges from 64K bytes to 512K bytes. All user memory, except for a small portion used for system control, is available for user programs and data.

User memory is divided into areas, or *banks*, of 64K bytes each. The 2200MVP can contain a maximum of 4 banks of user memory, while the 2200MVPC can be organized into a maximum of 8 banks. The user can subdivide each bank into a number of partitions of fixed size, each of which is capable of executing a separate program. Partitions cannot span bank boundaries. Within each bank, a fixed amount of memory is reserved for system control information. The operating system and incremental compilers require 3K bytes of

user memory in the first bank for storage of control information; the system utilizes 8K bytes of user memory in each subsequent bank. Thus, a total of 61K bytes in Bank 1 and 56K bytes in Banks 2 through 8 is available for partitioning. In addition, the system reserves 1K bytes of memory in each user partition for tracking the state of the partition, e.g., which files the partition has open. When the BASIC-3/COBOL Operating System is running, the disk management system requires a minimum of 5K bytes of user memory. All remaining memory is available for user programs and data.

The 2200MVP utilizes a unique "atomization" technique to automatically condense each program line. The condensed format conserves the memory needed for program storage and, additionally, contributes to fast program execution.

OPERATING SYSTEMS

The BASIC-2 Multiuser Operating System supports the BASIC-2 language and runs on both the 2200MVP and the 2200MVPC. The BASIC-3/COBOL Multiuser Operating System supports the BASIC-3 and COBOL languages and runs on the 2200MVPC. Since each language provides unique features for performing certain types of jobs, functional portions of a system can be implemented in the language best suited to the specific problem.

Both the BASIC-2 and BASIC-3/COBOL Multiuser Operating Systems provide facilities for program coordination and the sharing of system resources. The operating systems protect multiple users from disk and printer contention problems through BASIC language features that enable a program to seize temporary control of a device and subsequently release it.

Users can prevent unauthorized access of important files and unauthorized execution of critical programs by selecting Disabled Programming mode. In Disabled Programming mode, a terminal functions exclusively under program control; an operator is prevented from entering or modifying program text, as well as from directly accessing disk files from the specified terminal.

The BASIC-2 Multiuser Operating System includes a set of BASIC-2 instructions for handling disk operations. These instructions allow the programmer to choose between Automatic File Cataloging mode, in which the system automatically performs the tasks associated with disk maintenance , and Absolute Sector Addressing mode, in which the programmer can directly access any sector on the disk.

The BASIC-3/COBOL Multiuser Operating System includes a disk management system that provides efficient volume and file management. A shared disk management system facilitates the language-independent sharing of data files created by BASIC-3 and COBOL. Other disk management features of the operating system include dynamic space allocation, file access modes, indexed file organization, variable length records, print spooling, and file recovery procedures.

FOREGROUND/BACKGROUND OPERATION

Since each terminal on the system can be assigned more than one memory partition, each terminal is capable of running several jobs concurrently. The job that is in the process of communicating with the terminal at a given time is said to be running in the *foreground*. The job or jobs associated with the terminal, but not communicating with it, are said to be running in the *background*. The terminal's attention can be transferred from one partition to another, to shift the current foreground job into the background, and a particular background job into the foreground. Thus, the operator can interact with each program as needed. A typical example of foreground/background operation would involve running a batch-type job requiring minimal operator interaction (such as payroll processing) in the background, while an interactive job (such as word processing) runs in the foreground.

SINGLE USER OPERATION

The 2200MVP can be configured as a single-user, stand-alone system with the same features and language capabilities as the multiuser arrangement. Unlike most single-user systems, the 2200MVP enables a single terminal to control several programs executing concurrently, while maintaining fast execution speeds. Thus, the 2200MVP is an excellent choice for the first-time user because it combines high-performance computing with the capacity for expansion from a single-user system to a multiuser system.

COMMUNICATIONS CAPABILITIES

The 2200MVP supports a full range of communications capabilities between remote terminals and the CPU, and between the 2200MVP and other computer systems. Wang Laboratories, Inc., also offers a number of software packages to emulate common communications protocols.

Each terminal is connected to the 2200MVP by a Wang Model 22C32 Triple Controller, or a Model 2236MXD Terminal Processor. These devices control I/O operations between the CPU and the terminals. Line handling between the CPU and each terminal is asynchronous and full-duplex, with selectable line speeds ranging from 300 to 19,200 bits per second (bps). For remote connection, two RS-232-C compatible modems, e.g. Wang WA3451, are required to provide the communications link. Remote terminals, located miles from the CPU, can function exactly like local terminals, communicating directly with the system to perform operations within their assigned partitions. Both remote and local terminals can have their own local printers to produce hard copy output at the terminal site. Refer to the illustration, "Typical Communications Configuration".

For communicating with other computer systems, the 2200MVP can be configured with Wang communications controllers, Models 2227B, 2228B, 2228C, or 2228D. The Model 2227B supports asynchronous-only communications in half- or full-duplex, at line speeds ranging from 300 to 9600 bps. The Models 2228B and 2228C offer a choice of synchronous or asynchronous communications at speeds ranging from 300 to 4800 bps. Additionally, the Model 2228C supports 3275 Emulation. The Model 2228D offers synchronous communications at speeds ranging from 300 to 19,200 bps and supports the following protocols.

- MAILWAY®
- 2780/3780
- 3274 SNA
- VS Remote Cluster Facility (VS/RCF)
- X.25 Packet Network Access
- 3274 BSC (3271)
- ASYNC — Teletypewriter Emulation
- TELETEX

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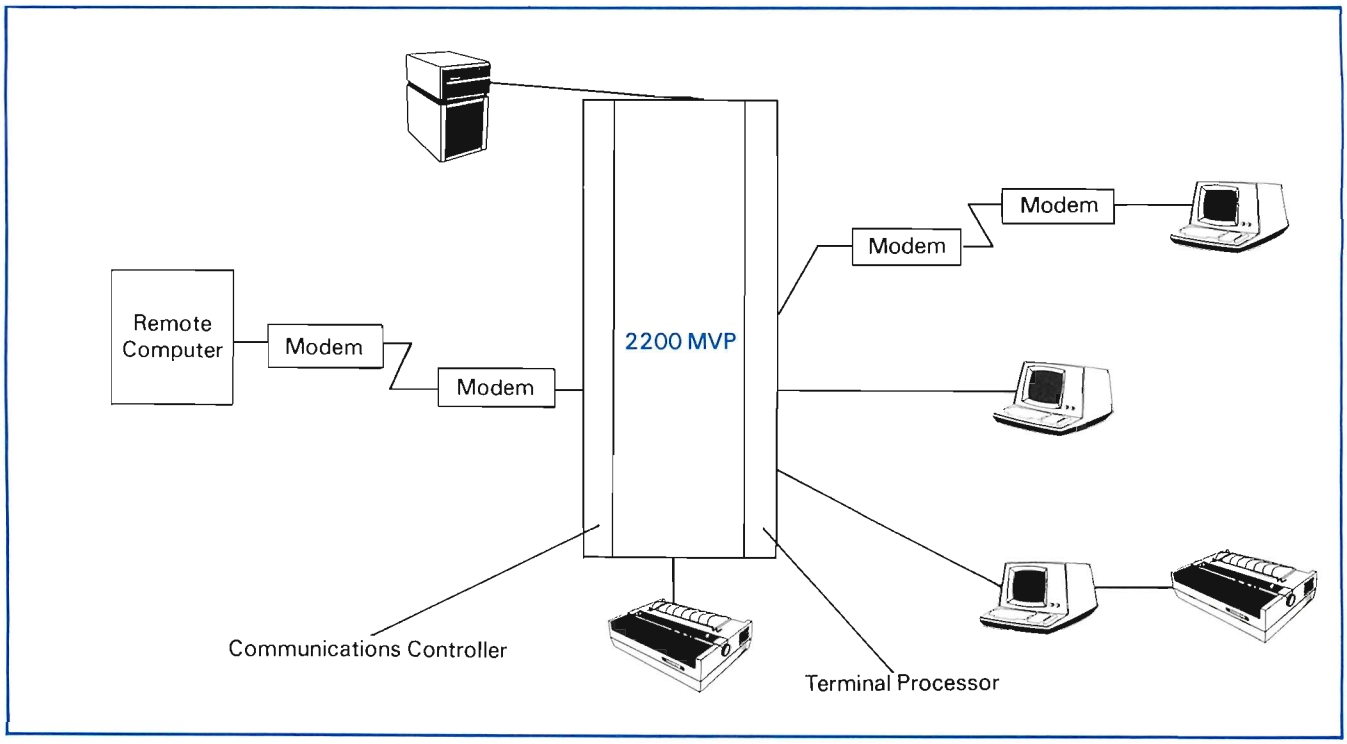

Typical Communications Configuration

BASIC-2

The BASIC-2 language, available with the BASIC-2 Multiuser Operating System on both the MVP and the MVPC, is a high-level programming language designed for interactive programming. BASIC-2 is easily learned by beginning programmers. Wang Laboratories, Inc., has developed a variety of extensions and enhancements that have been added to BASIC to facilitate writing, documenting, and debugging programs, and to provide flexible language capabilities for a wide range of applications.

The BASIC-2 instruction set is comprehensive and extremely powerful. The math package includes numerous system-defined mathematical and trigonometric functions; the results obtained are accurate to 13 digits and can be either rounded or truncated. Alphanumeric data can be compared, analyzed, and modified with a variety of data manipulation statements. These statements permit the programmer to manipulate characters at the bit and byte levels and to perform various Boolean and binary arithmetic operations. System commands allow each user to control system operations in each partition from the terminal keyboard; these commands also serve as useful debugging tools.

In addition to the standard general-purpose BASIC statements, BASIC-2 provides several groups of special-purpose statements that perform such specialized operations as code conversion, sorting, matrix arithmetic, and customized I/O control. Language enhancements within BASIC-2 also include statements that enable the user to share program text, manage shared resources, and define system configurations. BASIC-2 cannot run concurrently with BASIC-3 and COBOL, since BASIC-3 and COBOL require the BASIC-3/COBOL Multiuser Operating System.

BASIC-3

Wang BASIC-3, a greatly enhanced version of the popular Wang BASIC-2 language, includes most features of BASIC-2 plus a variety of extensions and unique capabilities. BASIC-3 offers multicharacter variable names and program labels, extended loop control, descriptive error messages, indexed files, and shared files. These enhancements improve program readability and documentation, facilitate program development and debugging, and provide access to new file management services. Thus, BASIC-3 is extremely versatile and well suited for both technical and commercial applications. BASIC-3 can be run concurrently with COBOL using the BASIC-3/COBOL Multiuser Operating System.

2200 COBOL

Wang 2200 COBOL is an interactive version of the COBOL language that includes most nucleus features of ANSI (X3.23-1974) Level 1 COBOL, as well as many features of Level 2. COBOL is a standardized programming language that is extremely popular in business settings, due to the ease with which it handles complex hierarchical data structures for such applications as inventory, billing, and payroll. COBOL is ideal for tasks requiring large-file handling and output formatting with typical business calculations, such as price extensions, discounting, and commissions. Wang 2200 COBOL, with its interactive extensions, provides special programming capabilities not available with most standard versions of the language.

COMPATIBILITY WITH OTHER 2200 SYSTEMS

Software compatibility is an important consideration in the selection of a new system. The 2200MVP has been designed to preserve maximum compatibility with single-user and other multiuser 2200 Series systems. Since the 2200MVP is compatible with the 2200LVP, multiuser software written for the 2200LVP will function correctly on the 2200MVP.

The BASIC-2 language supported on the 2200MVP and MVPC is identical to the BASIC-2 language on the 2200VP, SVP, LVP, and LVPC. Additionally, the BASIC-3 and COBOL languages supported on the 2200MVPC are identical to the BASIC-3 and COBOL languages on the 2200LVPC. The 2200MVP also supports Wang BASIC syntax, providing a significant degree of compatibility with all earlier Wang 2200 systems. Since each interactive terminal functions as a single-user 2200 system for program development purposes, language compatibility ensures that programmers familiar with other 2200 systems can quickly become productive on the 2200MVP.

The 2200MVP offers several features that enable the programmer to use the memory available for multiuser programs with maximum efficiency. If a programmer must adapt a single-user program for multiuser operations on a 2200MVP, the programmer may want to modify the program to capitalize on these multiprogramming features. In general, such modification is not extensive. When memory space is not a problem, however, the program can be loaded and run in each partition with little or no modification.

SYSTEM UPGRADES

Any existing 2200MVP can be upgraded to a 2200MVPC. Additionally, the 2200VP can be upgraded to either a 2200MVP or a 2200MVPC.

2200MVP CPU SPECIFICATIONS

Size
Height: 14.5 in. (36.8 cm)
Width: 25.0 in. (63.5 cm)
Depth: 10.0 in. (25.4 cm)

Weight
47 lbs (21.15 kg)

User Memory Size
2200MVP: 32K bytes (standard), expandable to 64K, 128K, and 256K bytes

2200MVPC: 64K bytes (standard), expandable to 128K, 256K, 384K and 512K bytes

Control Memory Size
MVP: 32K bytes of 24-bit words
MVPC: 48K bytes of 24-bit words

I/O Slots
MVP: 9
MVPC: 7

Memory Cycle Time
600 nsec

Power Requirements
115 VAC ± 10%, 60Hz ± 1 Hz
230 VAC ± 10%, 50Hz ± 1 Hz
230 W

Fuses
3.0 amps (SB) for 115 V/60 Hz
1.5 amps (SB) for 230 V/50 Hz

Heat Output
745 Btu/hr

Operating Environment
Temperature
50° F to 90° F (10° C to 32° C)
Relative Humidity, noncondensing
35% to 65% recommended
20% to 80% allowable

Operating System Specifications
Memory Available for Partitions
29K (29,696) bytes for 32K machines
61K (62,464) bytes for 64K machines
117K (119,808) bytes for 128K machines
229K (234,496) bytes for 256K machines
341K (349,184) bytes for 384K machines
483K (463,872) bytes for 512K machines

Overhead per Partition: 1K (1,024) bytes
Maximum Number of Partitions: 16
Minimum Partition Size: 1.25K (1,280) bytes
Maximum Partition Size
Bank 1: 61K (62,464) bytes
Banks 2 - 8: 56K (57,344) bytes

Maximum Number of Terminals: 13

ORDERING SPECIFICATIONS

The interactive multiuser Central Processing Unit must include the BASIC-2 incremental compiler, a multiuser operating system, and extensive system diagnostics. The CPU must contain approximately 32K of 24-bit words of control memory and nine I/O slots. The CPU must be provided with 32K bytes of user memory and must be expandable to 256K bytes. User memory must be divisible into a maximum of 16 separate partitions. The multiuser operating system and the BASIC-2 incremental compiler must reside in a separate control memory. The memory cycle time must be 600 nanoseconds nominal. Full memory parity must be provided throughout both user and control memory. The CPU must be capable of supporting up to 13 interactive terminals concurrently. The system must support the BASIC-2 language, provide a complete set of I/O instructions to control system peripherals, and include both automatic cataloging and direct addressing instructions for disk I/O operations. Both synchronous and asynchronous communications hardware, on a single board, must be available for installation directly within the processor.

The Central Processing Unit must be available in an option that includes 48K bytes of 24-bit words of control memory and seven I/O slots. This option should support the BASIC-2, BASIC-3 and COBOL languages, a disk management system, and memory expansion to 512K bytes.

Standard Warranty Applies

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Printed in U.S.A.
700-4656G
10-82-10M