SYSTEM OVERVIEW

The Wang Model 2200SVP is a compact, high-performance processor that meets the most demanding requirements of both first-time and long-time computer users. Employing a user-defined, fixed-partition memory configuration, the 2200SVP features economic and efficient memory organization plus extremely fast multiprocessing capabilities. Among the many applications of a fully-configured 2200SVP system are program development, data processing, word processing, data communications, and background processing.

The 2200SVP's fixed-partition configuration allows the operator to divide user memory into a number of distinct partitions, each containing a separate program or task. The Central Processing Unit (CPU) allocates intervals of processing time to each partition in turn, permitting a program in an individual partition to execute briefly before servicing the next partition.

The basic 2200SVP CPU contains 32K bytes of user memory, as well as connector ports for an interactive terminal and a printer. An expanded user memory capacity of up to 128K bytes and a second terminal connector are available options. Because the 2200SVP uses a discrete control memory area to store system software, all user memory, except for a small portion needed for system overhead, can be devoted to user programs and data.

Moreover, the 2200SVP extends the capacity of the available user memory by condensing program lines into a form that uses significantly less storage space than the original form.

Effective management of memory resources, combined with speed and easy operation, makes the 2200SVP unique among small systems. Extremely fast execution speeds provide an overall throughput capacity that enables the 2200SVP to perform a variety of data processing jobs previously requiring much larger systems. The interactive programming and debugging capabilities of Wang's high-level BASIC-2 language make program development on the 2200SVP an easy task for programmers and reduce training time for new users.

Because it can be configured in a variety of ways, the 2200SVP can fill most processing needs and be expanded as user needs increase.

Optionally, the 2200SVP can be configured with additional user memory, one or two disk storage devices, a system printer, and one or two Wang terminals. In addition, optional data communications capabilities supporting asynchronous and synchronous protocols enhance the capacity of the 2200SVP system.

Two types of disk drives are available on the 2200SVP: a dual-sided, double-density diskette drive and an optional, fixed, Winchester-style drive. Both storage devices share the same cabinet with the 2200SVP processor and represent the latest technology in cost-effective, high-speed, mass storage peripherals. The expanded capacity diskette greatly increases program storage capability for a single-user system. The fixed disk provides fast data access in a compact space without the mechanical or environmental problems associated with removable drives.

System users communicate directly with the 2200SVP by using a Model 2236D, 2236DE, 2236DW, or 2336DW Terminal. Each terminal consists of a large, easy-to-read, 24 row by 80 column Cathode Ray Tube (CRT) screen display with business graphics capabilities and a typewriter-style keyboard. Each terminal can also support its own printer, providing additional and convenient printing power to the system. The Model 2236DW or 2336DW Terminal is required for the 2200 Word Processing software system.

OPTION-W

The Option-W terminal processor, when installed in a 2200SVP, supports a second terminal. A time-of-day clock and selectable data transmission rates are among the other features of Option-W. Bootstrap and power-on diagnostics are contained in the Programmable Read Only Memory (PROM) of the controller. Because the 2200SVP CPU loads software into the Random Access Memory (RAM) of the Option-W controller, the controller can perform a variety of tasks and accommodate many future enhancements.

Option-W requires the issue of BASIC-2 software labelled Release 2.4, or a subsequent issue. Through the BASIC-2 language and the Option-W controller, the user can access the time-of-day clock, transmit screen images to a disk or printer, and detect the connection or disconnection of a terminal. The terminal disconnect detection facility enables procedures to be run that monitor system use.

HIGH-SPEED PERFORMANCE

The 2200SVP central processor is a fast, custom-designed MSI processor built from reliable, high-performance components. The CPU memory cycle time, 600 nanoseconds, is usually sufficient to execute and retrieve a control memory instruction and to read 2 bytes of user memory. Combined with an extremely low overhead operating system and BASIC-2 incremental compiler, the 2200SVP provides exceptional response time for all system users. To illustrate the speed of the central processor, a representative selection of floating-point arithmetic operations is listed in the following table, along with the times required for each completion. 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 ($\uparrow$)	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 2200SVP also provides high-speed, alphanumeric-string processing capabilities. For example, the following times were measured when the specified operations were performed on 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 2200SVP is simple to operate and easy to program. There are neither special job control languages, elaborate operating procedures, nor complex programming considerations. System resources are allocated through a supplied partition generation program that guides the user through the process of configuring user memory. By running the partition generation utility program, the user can create partitions of the proper size to execute specific tasks. Once user memory has been configured, a user can develop BASIC programs or execute previously designed software in each partition.

The operator can create one or many system configurations, each tailored to a specific set of processing requirements. All configurations can be named and then saved on disk in a system file for later accessing. Optionally, the operator can designate a particular predefined configuration to be automatically loaded and executed whenever the system is powered on.

Because the user communicates with the system interactively, information needed by a program can be requested with clear, non-technical prompts. For the programmer, interactive operation greatly simplifies the tasks of program development and maintenance. Programs can be entered, edited, and run directly from the terminal keyboard. In addition, the 2200SVP processor provides not only a range of error checks that detect and identify many types of errors, but also an extensive set of edit functions that facilitate error correction.

FUNCTIONAL ORGANIZATION

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

MEMORY ORGANIZATION

The 2200SVP stores its system programs and user programs (including application software) in two separate memory areas. The operating system, BASIC-2 incremental compiler, and system diagnostics are contained in a discrete memory area (32K of 24-bit words) called *control memory.* When powering on the system, the operator loads the system programs from a platter into control memory, where system programs reside in control memory until the operator powers off or reinitializes the system. Because control memory is a separate, protected memory area that cannot be accessed by the user or the user programs, system programs are protected against accidental interference or destruction by a user program.

The memory area available to the user's programs and data is called *user memory.* The standard 2200SVP contains 32K bytes of user memory; optionally, user memory can be expanded to 64K and 128K bytes. Each 64K-byte portion of memory is called a *bank.* Thus, the 2200SVP can contain two banks of user memory.

When system configuration is complete, the system can support up to 16 partitions of varying sizes. The number and size of the partitions are determined by the user.

Within each bank, a fixed amount of memory is reserved for system overhead and cannot be accessed by the user. The first bank requires 3K bytes and the second bank 8K bytes. These amounts of memory are fixed for 2200SVP systems containing one or two banks, regardless of the total memory contained in each bank. The operator can divide the remainder of each bank into a number of partitions of fixed size; a total of 61K bytes in Bank 1 and 56K bytes in Bank 2 are available for user partitions. No partition can overlap banks. In addition, each partition in each bank requires approximately 1K bytes of partition overhead. All remaining memory in a single partition is available for user programs and data.

The 2200SVP permits the user to economize on the use of memory by defining one or more global partitions within each memory bank. The variables stored in a global partition are accessible to other partitions within that bank. Though a global partition in Bank 1 cannot be accessed by partitions in Bank 2, and vice versa, a 5K-byte area of Bank 1 can be reserved as a *universal* global partition area. A universal global partition, located entirely within this 5K-byte area, can be employed to store control variables used by any partition in either Bank 1 or 2. Refer to the figure "Logical Organization of the 2200SVP" for a depiction of memory organization.
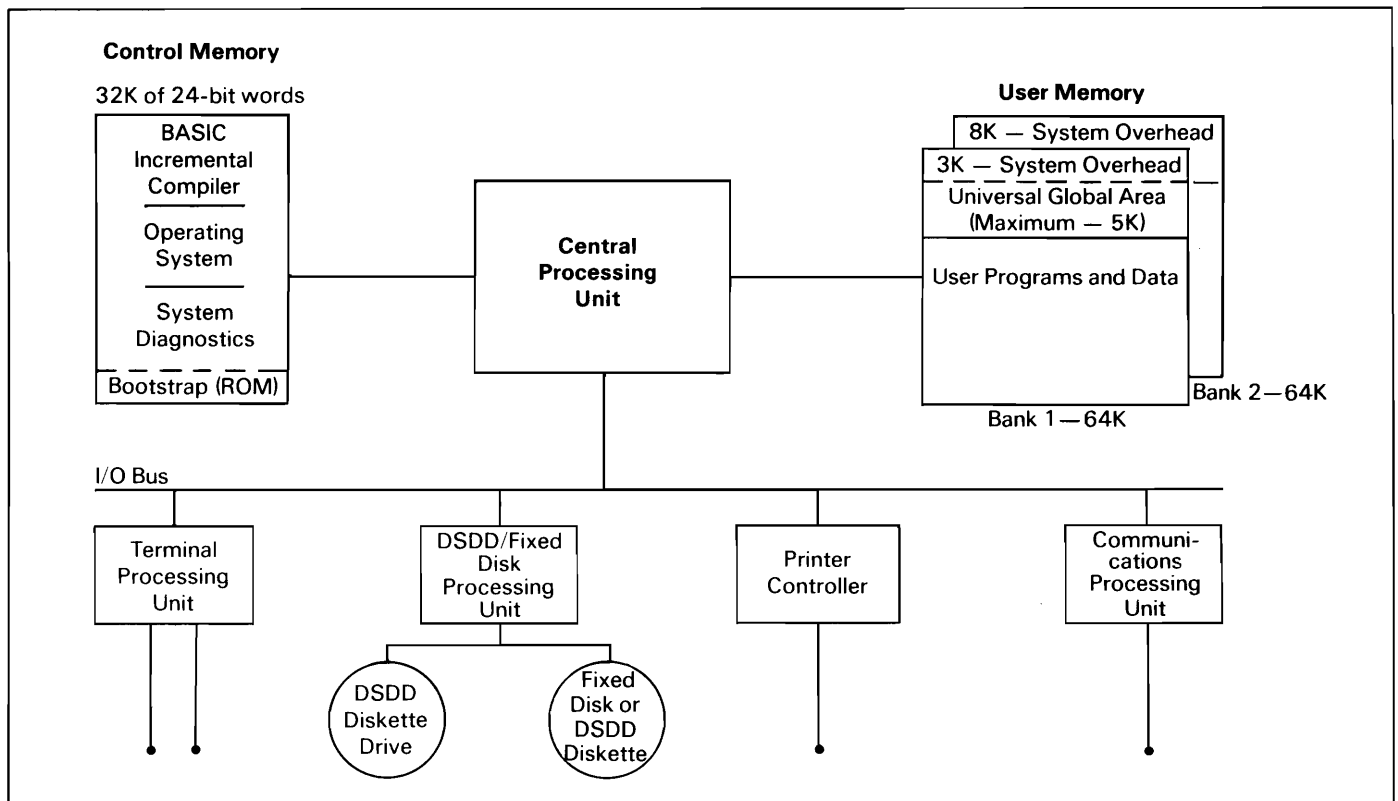
Logical Organization of the 2200SVP

FOREGROUND/ BACKGROUND OPERATION

Though the terminal can communicate with only one job at a time, it can run up to 16 jobs concurrently, depending upon the system configuration. The job currently communicating with the terminal is said to be running in the *foreground.* The job or jobs associated with a terminal but not currently communicating with the terminal are said to be running in the *background.* A terminal can be switched from one partition to another in order to shift the current foreground job into the background and a particular background job into the foreground, to permit operator communication with that program.

Foreground/background operation allows a user to run several jobs requiring varying degrees of operator attention from a single terminal. Communications applications may require the simultaneous execution of several background tasks and the frequent switching of foreground and background tasks. Another application might involve running a batch-type job requiring minimal operator interaction (such as payroll processing) in the background, while a more interactive job (such as word processing) runs in the foreground.

MULTIPROGRAMMING FEATURES

A multiprogramming environment requires coordination of the activities of different programs, as well as communication between programs executing simultaneously. Coordination and communication aid the programmer in the efficient use of shared resources and in the prevention of potentially damaging conflicts between programs using common resources. The 2200SVP supplies a variety of special features that address these needs, including global subroutines and variables, plus a temporary seize/release capability for programs using shared devices.

The 2200SVP enables a programmer to make common routines and variables accessible to a number of different programs. For instance, if several programs must share a common disk file, all access to the disk file can be controlled by a single routine, contained in a global partition. Whenever a program attempts to access the file, the program branches to the global routine, and the routine actually performs the access. Additionally, global variables can be contained in the same global partition as the routine. Programs running in separate partitions can interrogate and modify global variables, using them as flags to indicate the status of the disk file and to transfer control information.

In this way, a central routine controls the use of a resource shared by several programs, oversees the operations of these programs, and resolves potential conflicts among them.

The 2200SVP provides special language features enabling a program to seize temporary control of a device and subsequently release it. These features are important for operations requiring shared devices that do not lend themselves to interleaved use by several programs, and for special disk operations where one program must have exclusive access to the disk temporarily. For example, a program can temporarily seize a shared printer, complete all necessary printing, and then release the printer so that another partition can use it.

THE BASIC-2 LANGUAGE

BASIC-2, a greatly enriched version of the BASIC language designed for interactive programming, is provided for use on the 2200SVP. A variety of extensions and enhancements, developed at Wang Laboratories, Inc., have been added to BASIC-2 to facilitate writing, documenting, and debugging programs, and to provide more powerful and flexible language capabilities for a wide range of applications.

The BASIC-2 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 an impressive array 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.

In addition to the standard, general-purpose BASIC statements, BASIC-2 provides many special-purpose statements designed to perform such specialized operations as code conversion, sorting, matrix arithmetic, and customized I/O control. System commands enable a user to control system operations in each partition from the terminal keyboard, and initiate extensive debugging features. A number of special statements control peripherals and define system resources.

DISK STORAGE

The 2200SVP employs two disk units that feature the latest advances in hardware design. Both the dual-sided, double-density (DSDD) diskette drive and the Winchester-style fixed disk drive offer the user an exceptional cost/unit storage value, while surpassing many fixed/removable drives in performance. When combined with the

2200SVP processor, these disk units create a cost-effective, disk-based system for small business system users.

Dual-Sided, Double-Density Diskette Drive

Standard equipment on the 2200SVP is a dual-sided, double-density diskette drive that can store approximately 1 megabyte of data. By doubling the density at which data is recorded and utilizing both sides of the diskettes, the normal storage capacity of 1/4 megabyte for diskettes is increased fourfold.

Either a second DSDD diskette drive or a fixed disk drive (described in the following paragraphs) is also available as optional equipment. When used with the fixed drive, the DSDD provides an effective backup medium. In addition to its backup capabilities, the DSDD diskette also serves as the medium for transferring system software and application packages obtained on DSDD diskettes. The DSDD diskette drive is compatible with standard industry format, and has an exceptionally fast data transfer rate for a flexible disk unit.

Fixed Disk Drive

The 8-inch fixed, rigid disk drive provides a fast, yet economical, method of data access. Because the fixed disk is housed in a sealed environment, not only is the disk immune to environmental problems but the disk drive heads also can fly close to the disk surface. The

resulting decreased air gap permits a greater data density than was previously possible, enabling the user to access data faster and store more data in the same space. Additionally, the Winchester technology of the fixed disk drive allows a decrease in head-loading force and lubricated disk surfaces, permitting the head to "take off" and "land" on the platter surface during power-up and power-down procedures. This technology greatly reduces the possibility of a head crash, thereby ensuring the integrity of the data. The combination of all these features has created a compact disk drive that retains the high performance and reliability of other disk models. The fixed disk drives are available as system options in 2-, 4-, or 8-megabyte capacities.

Both the DSDD diskette drive and the optional drive (fixed disk or second DSDD diskette) are mounted directly within the compact, office-style cabinet. The cabinet also contains the central processor, thus saving the space that separate drives would customarily occupy.

The following list summarizes the disk storage options available for configuration with the 2200SVP.

● One DSDD diskette drive (standard)

● Two DSDD diskette drives (dual-diskette system)

● One DSDD diskette drive and a fixed Winchester-style disk drive (optional 2, 4, or 8 megabytes)

COMMUNICATIONS CAPABILITIES

The standard transmission rate between the terminal and the 2200SVP processor is set at 19,200 bits per second (bps). Option-W allows transmission rates of 110, 134.5, 150, 200, 300, 600, 1200, 2400, 4800, 9600, or 19,200 bps.

The 2200SVP can exchange documents with any other Wang system and can send files to other 2200 or VS computers. Additionally, the 2200SVP can act as a distribution point on a MAILWAY® switched network. The 2200SVP processor and the 2236DE/DW terminal can act as a terminal to another 2200 system through remote terminal emulation or other Wang systems through Remote WangNet Facility. Additionally, the 2200SVP can act as either a batch or interactive terminal to many mainframe computers.

The 2200SVP also supports a full range of communications capabilities between the 2200SVP and other computer systems. Wang Laboratories, Inc., also offers a number of software packages to emulate other terminals. For communicating with other computer systems, the 2200SVP can be equipped with any of the following communication controllers: Option 27B, Option 28B, Option 28C, or Option 28D.

The Option 27B Communications Controller supports asynchronous-only communications in half- or full-duplex, at line speeds ranging from 300 to 9600 bits per second (bps).

The Option 28B and Option 28C Communications Controllers offer a choice of synchronous or asynchronous communications, at speeds ranging from 300 to 4,800 bps. Additionally, Option 28C supports 3275 Emulation.

The Option 28D Communications Controller offers synchronous communications, at speeds ranging from 300 to 19,200 bps and supports the following protocols:

- MAILWAY

- 2780/3780

- 3274 SNA

- Remote WangNet Facility

- 3274 BSC (3271)

- ASYNC - Teletypewriter Emulation

- X.25 Packet Network Access

COMPATIBILITY WITH OTHER 2200 SYSTEMS

Software compatibility is an important consideration in the selection of a new system. The 2200SVP has been designed to preserve maximum compatibility with Wang single-user and multiuser systems.

The BASIC-2 language supported on the 2200SVP is identical to BASIC-2 on the 2200VP, MVP, and LVP. Additionally, the 2200SVP supports earlier Wang BASIC syntax, providing a significant degree of compatibility with systems that use Wang BASIC. Because each 2200SVP system functions as a single-user 2200 system for program development purposes, programmers familiar with other 2200 systems can quickly become productive on the 2200SVP.

Since the 2200SVP supports all standard Wang printers, a user can select from a wide variety of printers, ranging from high quality daisy printers to high-speed chain printers.

SPECIFICATIONS

Size
Height:
   12.0 in. (30.5 cm)
Width:
   21.5 in. (54.6 cm)
Depth:
   26.0 in. (66.0 cm)

Weight
75 lb (34.1 kg)

User Memory Size
32K bytes (standard)
Expandable to 64K and 128K bytes

Control Memory Size
32K bytes of 24-bit words

I/O Ports
Standard:
   1 printer, 1 terminal
Optional:
   1 communications (Option
      27B, 28B, 28C, or 28D)
   1 second terminal (Option-W)

Memory Cycle Time
600 nsec

Power Requirements
115 VAC ± 10%, 60 Hz ± 1 Hz
230 VAC ± 10%, 50 Hz ± 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
1,050 Btu/hr

Operating System Specifications
Memory Available for User
Partitions:
   29K (29,696) bytes for 32K
      machines
   61K (62,464) bytes for 64K
      machines
   117K (119,808) bytes for 128K
      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
   Bank 2: 56K (57,344) bytes

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

Disk Specifications

	1-Megabyte DSDD Diskette Drive (Option A)	2-Megabyte Fixed Disk Drive (Option B)	4-Megabyte Fixed Disk Drive (Option C)	8-Megabyte Fixed Disk Drive (Option D)
Tracks	149	254	510	1,020
Sectors/Track	26	32	32	32
Total Sectors	3,874	8,128	16,320	32,640
Bytes/Sector	256	256	256	256
Total Bytes	991,744	2,080,768	4,177,920	8,335,840
Average Access Time	91 msec	70 msec	70 msec	70 msec
Average Latency Time	83.3 msec	9.6 msec	9.6 msec	9.6 msec
Speed	360 rpm	3,125 rpm	3,125 rpm	3,125 rpm
Transfer Rate	0.5 megabit/sec	4 megabits/sec	4 megabits/sec	4 megabits/sec

ORDERING SPECIFICATIONS

The Central Processing Unit (CPU) must contain the BASIC-2 incremental compiler, operating system, and system diagnostics. System software must be loaded into and reside in a control memory that is separate from user memory. The memory cycle time must be 600 nanoseconds, and full memory parity must be provided for both user and control memory. The standard CPU must have 32K bytes of user memory and be expandable to 128K bytes. User memory must be divisible into 16 partitions that enable foreground and background processing. The standard system must include a 1-megabyte capacity dual-sided, double-density diskette drive; a 2-, 4-, or 8-megabyte fixed disk drive or a second 1-megabyte DSDD drive must be available options. Both asynchronous and synchronous communications hardware must be available on a single board for installation directly within the processor. The system must respond to an enriched version of the BASIC language supporting extensive built-in editing and debugging features, a programmable error control capability, a programmable interrupt feature, extensive alphanumeric and binary data manipulation capabilities, and built-in internal data conversion, sort, math matrix, and general I/O features. The math package must include a complete set of system-defined mathematical and trigonometric functions and must provide 13-digit accuracy for most operations.

Standard Warranty Applies

WANG

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