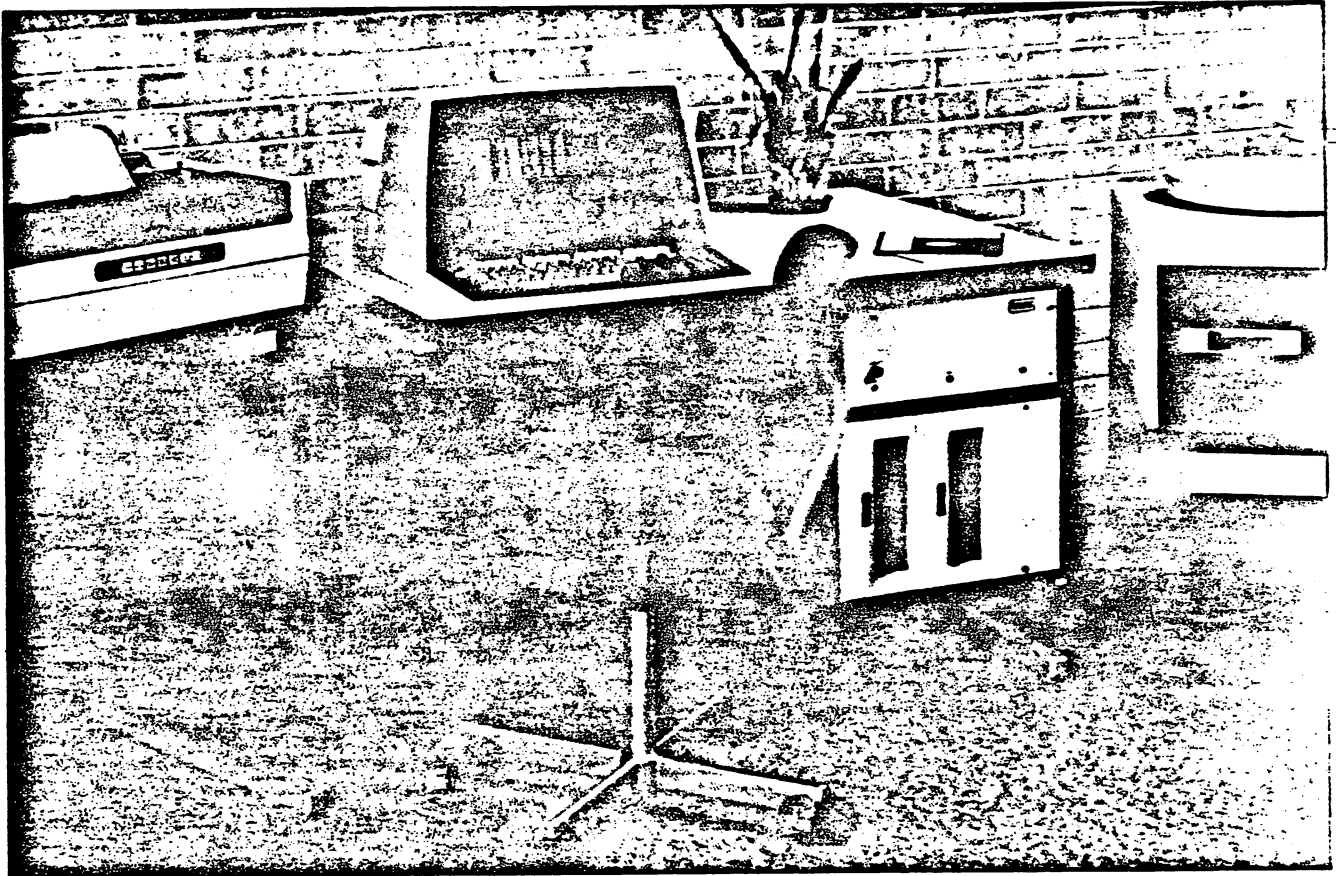


BENCHMARK REPORT

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In This Issue:

The WANG 2200MVP

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WANG 2200MVP: BENCHMARK REPORT

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PREFACE

The Wang 2200MVP is the second computer to be evaluated in this series of reports covering multi-user computing systems in the \$25,000 to \$50,000 price range. The goal of this series is to provide users with comparative information on a number of systems for use in selecting from among the many alternatives available--information which is simply unavailable from any other independent source.

In evaluating computing systems, the technical specifications supplied by manufacturers are often difficult to interpret and are seldom comparable across different computers. The potential buyer needs to know how well the equipment performs in specific applications, and how that performance compares with other computing systems. Additionally, subjective factors such as ease of use, versatility, and support services must be considered as a part of the choice process.

The measurement of performance is a difficult task since there are no generally accepted measures of "amount of work" that can be performed by a computing system. What we must do is define a "standard work load," a benchmark, and measure how well various systems perform this standardized task. We have developed a set of three benchmark programs to be run on each of the systems covered in this series. Two of the programs are identical to those found in the Series 1 and Series 2 reports, and provide comparability with the single user systems under \$25,000 covered in those reports. The third program is a multi-terminal order-entry system specifically designed to measure degradation in response time as terminals are added to the system. The heart of this series of reports is the comparative results of running these three programs, in various combinations, on each of the systems under study. Differences in performance among systems can then be attributed to differences in computing capabilities.

In addition to the benchmark results, these reports contain information on the alternative configurations which can be assembled, storage capacities, input and output capabilities, languages available, operating system, utility and application programs, and overall ease of use. This information will be based on our own observations made during the benchmark process, discussions with vendors, and comments taken from our survey of users.

EXECUTIVE SUMMARY

Wang Labs 2200 Series MVP computer used in our benchmark tests was configured with the 2200MVP central processor, 128K bytes of central memory, 5.0 megabytes of hard disk storage, two 4-port terminal controllers, a 200 character per second matrix printer, and a Wang Interactive Terminal. The price of this system is \$34,500 (5 additional terminals would bring the price up to \$48,000).

- The 2200MVP is fast. The timing on the CPU Intensive test for the 2200MVP is only one second slower than that of Wang's single user 2200VP tested in our Series 2 reports (15.2 versus 14.2 seconds), and the 2200VP was the fastest machine tested in that series!
- The Series 2200MVP does not have what most users would consider an operating system. That is, there is no "job control language," no operating system mode versus program development mode, and none of the other operating system/program mode dichotomies many of us are used to. All commands, utilities, etc. are part of Wang's BASIC-2 language.
- Wang's BASIC-2 programming language is a highly enhanced version of BASIC. Designed with the business environment in mind, BASIC-2 users feel the interpretive language/interactive environment facilitates program development. As one user put it, "There's no better way."
- Between third-party software houses and Wang itself, there is a staggering array of software available for the 2200MVP. Wang maintains an extensive network of "Wang-approved vendors" (software firms, approved by Wang, who sell packages for Wang hardware), offering numerous business and engineering packages for a variety of businesses and industries.
- The only negative comments about Wang were in the user/company interface, where several thought that information from the company was weak or non-existent, particularly in the early stages of trying to get the machine running and understanding its operation.

Overall, we were very impressed with the operation of the Wang 2200MVP, and would feel very comfortable programming in its environment. We particularly like the memory partitioning on the 2200MVP, and the global data areas which can be used for inter-program communication. It is easy to see why program development time could be significantly reduced in the 2200MVP interpretive BASIC system.

BENCHMARK REPORT

SYSTEM: Wang 2200MVP

PRICE AS TESTED: \$34,500

SPEED TESTS

Benchmark Number	CPU INTENSIVE
A-4	N = 3000 15.2 seconds
I/O INTENSIVE	
B-4	N = 3000 11.2 seconds

"REAL LIFE" PROBLEMS

Benchmark Number	ORDER ENTRY
D-1	2 terminals 2.8 seconds
D-2	4 terminals 3.0 seconds
D-3	6 terminals 3.3 seconds
D-4	8 terminals 3.5 seconds

SIMULTANEOUS ORDER ENTRY AND CPU-INTENSIVE

	CPU-Intensive Program	Order Entry Program
E-1	2 terminals . . 15.5 seconds	3.5 seconds
E-2	4 terminals . . 15.8 seconds	3.8 seconds
E-3	6 terminals . . 16.0 seconds	4.1 seconds
E-4	8 terminals . . 16.4 seconds	4.6 seconds

Note: Order Entry Program times represent average processing time per order entry transaction, each composed of approximately 12 lines of actual input. Thus, the average "terminal response time" per line would be approximately 1/12 the time shown.

THE BENCHMARK PROCESS

To begin the benchmark process, we contacted Wang Laboratories, Inc. and requested their assistance in benchmarking the Series 2200MVP computer system. We requested that the total system be priced in the \$25,000-\$50,000 price range, and that this price include as many terminals as possible up to a maximum of eight. If the additional terminals caused the price to exceed the \$50,000 limit (as it would in this case), we advised Wang that we would report the cost over-run, but would continue to benchmark the computer using up to eight terminals.

Wang provided us with a Series 2200MVP at their office in Denver, Colorado. The system consisted of a 2200MVP processor with 128 Kilobytes of central memory, a 5.0 megabyte hard disk storage device, two 4-port terminal controllers, a Wang Interactive Terminal, and a 200 cps matrix printer, at a price of \$34,500. Five additional Wang Interactive Terminals (at a cost of \$13,500) could be purchased for a total cost under \$50,000. Wang also supplied us with programming and other on-site technical support for our benchmark.

The Remote Terminal Emulator

Execution of the order-entry system program and all response-time measurements are controlled by our Remote Terminal Emulator (RTE). The RTE system is composed of a driver computer, the North Star Horizon, and a driver program written by our staff. The RTE appears to the test computer (the 2200MVP) as up to eight people sitting at eight standard terminals, all of whom are individually interacting with the order-entry program on the test computer. Our use of one computer to interact with the test computer is designed to eliminate the variability inherent in human operators, a variability which may often have exceeded the differences in processing speeds we are attempting to measure.

In addition to "conversing" with the test computer, the RTE also measures the time each terminal spends receiving input and sending output. These two times, subtracted from the total time each terminal is in use, yield the response or processing time of the test computer.

Benchmarking the 2200MVP

One visit was all that was required to benchmark the MVP. Upon arrival, our

equipment was set up and communications between our Remote Terminal Emulator system and the 2200MVP were quickly established. After working out a couple of minor program "bugs" with the help of Wang personnel, the benchmarks were then easily performed with no further problems.

Our Observations

Perhaps one of the more noticeable features when you examine the 2200MVP is its small size, particularly the processor. Unlike many manufacturers who find it necessary to package their processor in mostly "air-filled" cabinets, the 2200MVP processor and I/O slots come in a metal case no larger than a standard-sized suitcase. In fact, the processor we used was brought to Denver by Wang personnel on a plane, as carry-on luggage. This processor case sits in the back of a desk provided by Wang (see cover photo). The desk, in addition to holding the processor, provides a recess for a terminal and space for the optional diskette drives.

The next thing you might notice is that (to paraphrase), "fast things come in small packages." This Wang machine is fast. Though Wang discloses little technical information concerning the architecture of their processor, our discussions with Wang personnel regarding the technical aspects of the machine revealed, in our opinion, a well thought-out approach to hardware design.

From a programmer's point of view, Wang again takes a unique approach. In most minicomputer systems we've come in contact with, there is a distinction between the operating system and the programming environment. The operating system has its own "job-control language" (JCL) which allows the user to perform various utilities, compile and execute programs, and so on; there is usually an editor or program development mode which is distinct from the operating system, though some JCL may be allowed in this mode. This typical arrangement is not the case on the MVP. Instead, there is no clear difference between operating system and program development modes. The operating system, without what you could call a JCL, is basically transparent to the user.

Once the system is up and running (essentially after a system generation), the user is free to write a program, execute a program, use utilities, or edit corrections, all without changing "modes." All commands on the MVP are either BASIC-2 functions, BASIC-2 system commands (LIST, REMEMBER, SAVE), or RUN commands to execute user-written (or Wang-written) programs or utilities.

Configuring the system on the MVP consists essentially of dividing the system resources (memory, printers, and so on) among the users. This is accomplished using a utility program supplied by Wang (@GENPART) which allows the user to create, save, and execute system configurations. When the system is turned on, @GENPART is automatically run. The user then may interactively create a system configuration. Alternatively, @GENPART can automatically execute a previously created system configuration and/or allow other user programs to be loaded and executed, with no further operator intervention. During our benchmark testing, we found this system configuration procedure to be easy and fast. At one point, it became necessary to "re-allocate" central memory. This was accomplished in less than a minute, with little difficulty.

The multi-terminal order-entry system which we used in our benchmark test was programmed in BASIC-2 by Wang personnel. To run eight terminals, 14 partitions were created, one of which could be considered the console or "control" terminal (terminal #1). Of the 13 remaining, 8 partitions (analogous to 8 terminals) contained "calling" programs that used common routines contained in the remaining 5 partitions. This ability for two or more partitions to simultaneously execute the same statement(s) in shared sub-routines helps to conserve and efficiently use the central memory available for a multi-user task.

Because it is necessary to allocate all of the central memory among the partitions, any "left-over" or unused memory is not immediately obvious. Our order-entry system did fit "comfortably" in the 128K of user memory available, with some unused memory available for re-allocation if necessary.

Printed output from the order-entry program was all generated after the terminals had stopped their entries.

OVERVIEW OF PROGRAMS AND RESULTS

The benchmark program set consists of:

Speed Tests

- A CPU-intensive job
- An I/O-intensive job

"Real Life" Problems

- An Order Entry program run with varying number of terminals
- An Order Entry program run with varying number of terminals and background execution of the CPU-intensive speed test

Speed Tests: CPU-Intensive and I/O-Intensive Jobs

Both the CPU-Intensive and the I/O-Intensive benchmarks were designed to test the speed of specific computing tasks that use repeated, short, individual operations. These tests are identical to those in the Series 1 and Series 2 reports, and provide comparability with those single-user systems.

CPU-Intensive Job

This short program executes a variety of calculations including addition, multiplication, division, square root, and exponentiation. The program runs through an iterative process and, to compare with the Series 1 and Series 2 benchmarks, we report the average time to complete 3,000 iterations. The average run-time on this test for the systems in our Series 2 (single-user machines in the \$15,000 to \$25,000 price range) was 3 minutes, 37.9 seconds, with a low of 14.2 seconds and a high of 7 minutes, 33.0 seconds.

A-4

Results:	N = 3000	15.2 seconds
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I/O-Intensive Job

This program stores numbers from 1 to 3000 on the disk, and retrieves the first 50 of them in a factorial fashion (for example, a total of 1,275 reads following 3,000 writes). To compare with the Series 1 and Series 2 benchmarks, we report the average time to complete 3,000 writes and 1,276 reads. The average run-time

on this test for the systems in our Series 2 reports was 3 minutes, 22.5 seconds, with a low of 40.8 seconds and a high of 6 minutes, 59.9 seconds.

B-4

Results: N = 3000

11.2 seconds

Comment: In Wang's version of BASIC, output to the disk is always in blocks of 256 bytes, regardless of the number of bytes contained in the data list of the output statement, and the I/O program would have used 3000 sectors of disk space. Wang personnel re-wrote this job using program data blocks of 28 numbers. Thus, the job actually performed only 108 write accesses and 74 read accesses to the disk. Results of this program are not directly comparable with other I/O times reported in this series. (See Series 2 report on the Wang 2200VP)

"Real Life" Problems

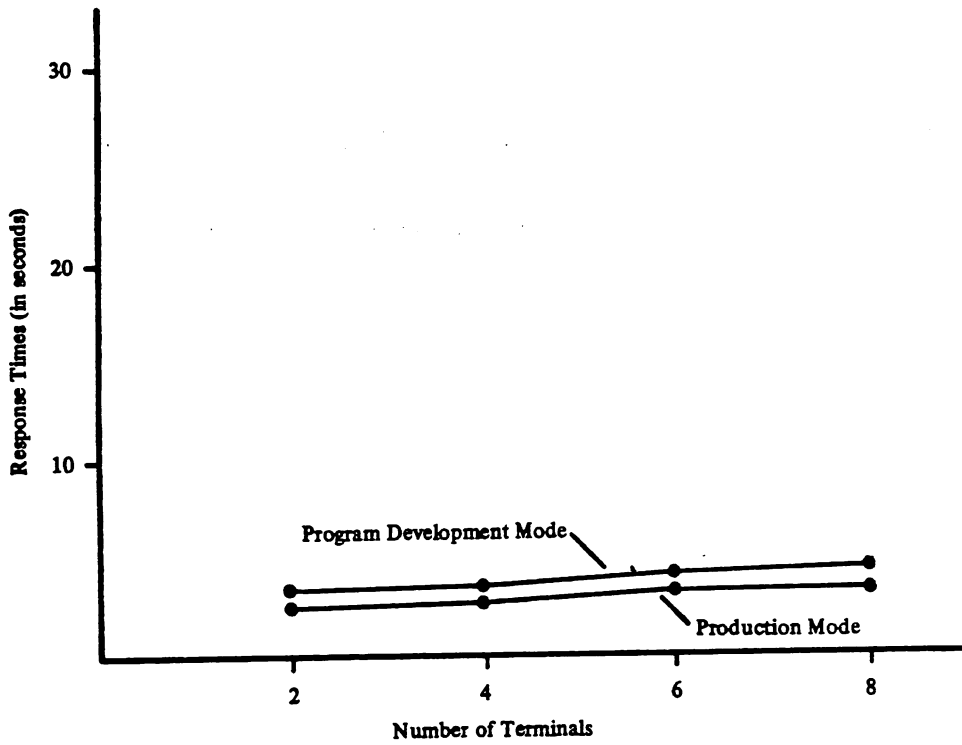
This program is based upon an order entry system designed for the Association of Computer Users. There are three types of processes: new members, renewals of membership, and payments. Upon joining the Association, member information is input by the operator and stored in a member file, and a packing slip is prepared indicating the items to be shipped. For renewals, the old member record is retrieved and updated as appropriate, and a packing slip is prepared. In both cases, if the individual has not included payment, an invoice document is prepared and the billing information stored in an accounts receivable file. When a payment is made, the receivables record is retrieved and updated with the payment.

The time between an operator pressing a carriage return to end a response and receipt of the next computer prompt is called terminal response time. It is in this interval that the computer is processing information and manipulating files, and we can equate response time to system processing time. We are reporting here "transaction response time," the total accumulated processing time divided by the total number of transactions. Note that each transaction consists of approximately twelve separate input lines.

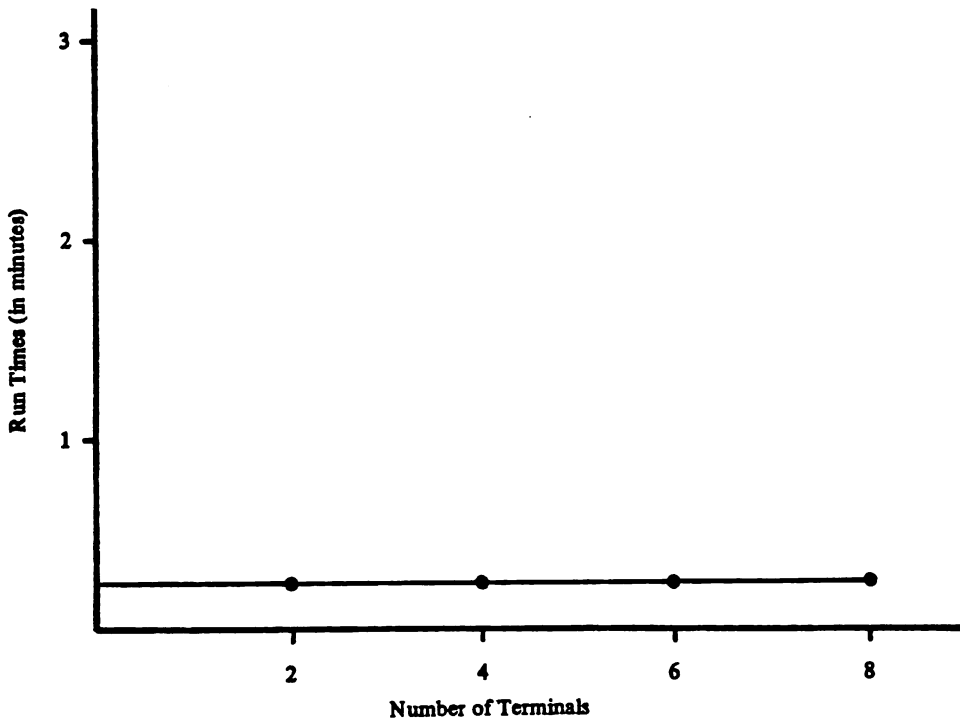
Order Entry Run in Production Mode

The order entry program was run with 2, 4, 6, and 8 terminals and no other programs running on the system. This would be a typical production mode application.

Order Entry Program Response Times Versus Number of Application Terminals



CPU-Intensive Program Run Times Versus Number of Application Terminals



D-1	Results:	2 terminals	2.8 seconds
D-2		4 terminals	3.0 seconds
D-3		6 terminals	3.3 seconds
D-4		8 terminals	3.5 seconds

Order Entry Run With Background Program Development

In a "typical" working environment, a programmer may be developing or testing a new program while the other users of the system are performing their normal activities. To simulate this situation, this test executes the CPU-intensive program continuously, while the order-entry program with multiple terminals (2, 4, 6, and 8) is running at the same time. Again, the measured times for the order-entry program are the average processing times per transaction. The measured times for the CPU-intensive program are the average times to complete 3,000 iterations of the computational loop.

			<u>CPU-Intensive Program</u>	<u>Order-Entry Program</u>
E-1	Results:	2 terminals	15.5 seconds	3.5 seconds
E-2		4 terminals	15.8 seconds	3.8 seconds
E-3		6 terminals	16.0 seconds	4.1 seconds
E-4		8 terminals	16.4 seconds	4.6 seconds

Analysis of "Real Life" Problem Results

The two graphs on the previous page illustrate the run times for the "real life" problem. The first shows the time for the order-entry program for 2, 4, 6, and 8 terminals, both without the background program running (production mode) and with the background program running (program development mode). The second graph shows the effects of running additional terminals on the times of the CPU-intensive job.

Note that in all cases, adding terminals slows response times. In production mode, moving from 2 to 8 terminals causes a 20% increase in the processing time for a transaction. Adding the background CPU-intensive program increases the average processing time about 20-30% with a 30% increase in time as the number of terminals goes from 2 to 8. In an absolute rather than a relative comparison, the degradation displayed by the order-entry is quite small.

SYSTEM AS TESTED: WANG 2200MVP

Costs

The configuration of the Wang Series 2200MVP used in this report is:

● 2200MVP-32 central processing unit, 9 I/O slots, with extended configuration chassis, 128Kb of central memory	\$15,000
● 2260C-1/2 5.0 megabyte hard disk drive (2.5 fixed/2.5 removable) with 22C12 disk controller and 2297 stand)	9,200
● (2) 2236MXD 4-port terminal multiplexer (\$1,200 each)	2,400
● 2236DE Interactive Terminal	2,700
● 2221W Matrix Printer (132 column, 200 characters/second)	5,000
● 22C02 printer/drum plotter controller	200
Total System	\$34,500

Our Observations

Additional 2236DE Interactive Terminals are priced at \$2,700 each. Keeping total cost under \$50,000, five additional terminals could be purchased.

<u>Configuration</u>	<u>Total Price</u>
System with one terminal	\$34,500
System with two terminals	\$37,200
System with four terminals	\$42,600
System with six terminals	\$48,000
System with eight terminals	\$53,400

Included in these prices is the operating system and Wang's BASIC-2 language.

CENTRAL UNIT

Summary of Equipment and Features

- The Wang Series 2200MVP uses the 2200MVP central processor. This processor comes with from 32K to 256K bytes of central memory and contains nine I/O slots used to mount I/O controller boards. Because some I/O controller boards control multiple devices (such as the 4-port terminal controller), the system is not actually limited to just nine peripheral devices. The processor with 32K memory costs \$9,000, processor with 64K memory costs \$12,000, with 128K costs \$15,000, with 192K costs \$18,000 and with 256K costs \$21,000.
- Central memory can be upgraded, with the cost determined by the amount of memory to be added and the amount originally installed. For example, to upgrade from 32K to 128K costs \$8,000 while upgrading from 64K to 256K costs \$13,000.

Our Observations

The 2200 MVP utilizes a fixed-partition memory scheme. In a fixed partition system, user memory is divided into a number of sections or "partitions," each of which can contain a separate program. Up to 16 partitions can be assigned on the MVP.

The CPU services partitions in a "round-robin" fashion, allowing each program to execute for a brief period before moving on to the next partition. If a program is performing an I/O operation, it will be "ignored" by the CPU until the I/O is completed, allowing more CPU time for the other partitions. This overlap method helps to keep the CPU constantly active (i.e. it is not waiting for the much slower I/O operations to be completed) and helps provide fast multi-user response times.

Unlike many multi-user systems, the 2200MVP does not store its system programs (operating system and languages) in user memory. A separate "control memory" of approximately 60K bytes is used to store the system. This control memory is a separate, protected memory area which cannot be accessed by the user or the user's programs. This helps to protect the system from accidental interference or destruction by a user program.

User Comments

- *The package is very good . . . a black box with handles, cables, and everything you need.*
- *With Wang you get more CPU for the money, though peripherals cost you more.*

STORAGE DEVICES

Summary of Equipment and Features

- Wang offers a good assortment of hard disk devices for the MVP. The 2260C series offers 2.5 megabytes (1.25 Fixed/1.25 Removable) for \$7,200, 5.0 megabytes (2.5 F/2.5 R) for \$9,200, 10.0 megabytes (5.0 F/5.0 R) for \$11,200, and 20.0 megabytes (10 F/10 R) for \$18,400. For an additional \$800 on the cost of the drive, the 2260BC series offers the same capacities as well as multiplexing capabilities. The 2280 Series offers 26.8 megabytes (13.4 F/13.4 R) for \$19,000, 53.6 megabytes (40.2 F/13.4 R) for \$20,000, and 80.8 megabytes (673 F/13.4 R) for \$21,000. All prices given include the disk controller and the disk processing unit in the case of the 2280 series.
- 8-inch diskette drives are available as well. Costs run \$3,800 for 250K bytes of storage, \$5,300 for 500K, and \$6,800 for 750K.
- The total amount of disk storage available is very large. The numbers of 2260 series 20 megabyte drives that can be attached is limited only by the number of I/O slots (of the 9 total) the user has available. In the case of the 2280 series, up to 6 drives could be attached for total on-line storage of 484 megabytes.
- Wang also offers a 1600 bpi, 9-track tape drive with controller for \$15,000.

Our Observations

The multiplexing capability available on the 2260BC series allows several independent systems (i.e. different processors) to share a single disk unit. The participating systems may have a specified portion of the disk for dedicated use or may share a common data base.

Most users were using the 5 or 10 megabyte disk units, and were happy with the storage capabilities. Two users also had floppy disk storage available on their systems.

User Comments

- *Wang's electronics is very good, but I've had a lot of mechanical problems with the 10 megabyte drive.*
- *Quite a few problems with the 10 megabyte disks, but the 80 megabyte drives are very good.*
- *Wang is very good. I've just had a couple of minor mechanical problems.*

INPUT/OUTPUT DEVICES

Summary of Equipment and Features

- The Wang printers available include a matrix printer (132 columns, 120 character per second) for \$3,400, a line printer (600 lines per minute, 64 character set) for \$16,200, and a band printer (600 lpm) for \$12,200. In addition, a flatbed plotter (31" by 48") is available for \$8,000.
- Wang terminals include their Interactive Terminal (\$2,700) and a graphic CRT (\$3,600).
- A punched card reader is available for \$6,500.
- Wang offers a buffered asynchronous telecommunications controller (\$750), a bisynchronous controller (\$1,500) and a bisynchronous controller for IBM 3275 emulation (\$1,700).

Our Observations

The Wang Interactive Terminal consists of an 80 column by 24 line CRT and attached keyboard. The CRT can display up to 1920 upper/lower case characters. Some CRT features are programmable underscore, cursor positioning, character attributes and box graphics. The keyboard is the standard typewriter layout with a 10-key numeric pad and 32 user-definable function keys.

User Comments

- *The function keys are very useful.*
- *The keyboard is very good and the users like it. Viewing is excellent and you don't get tired, even after using it all day.*
- *The touch on the Wang is much better than the IBM.*

OPERATING SYSTEM AND UTILITIES

Summary of Features

- The 2200MVP comes with an operating system, Wang's BASIC-2 language, and system diagnostics. Unlike many multi-user systems, there is no distinction (to the user) between the operating system and program development/execution mode. They essentially appear as one and the same. There is no job control language per se. All commands are either executable BASIC-2 functions or commands to execute a BASIC-2 program that will accomplish the necessary task or utility.
- Wang provides a utility (which is a BASIC-2 program) called @GENPART, a system generation (or configuration) routine. In addition, Wang sells ISS (Integrated Support System), which contains a full line of utilities used for programming support and disk related activities.

Our Observations

As mentioned on the Central Unit detail page, the 2200MVP operating system supports multi-user operations by using a fixed-partition memory approach. User memory consists of from one to four "banks," each of which may contain up to 64K bytes. Each bank may be divided up into partitions (minimum size of 1.25K bytes), with each partition capable of running a separate program. A total of 16 partitions are allowed, supporting up to 12 terminals (thus, any given terminal may control more than one partition).

Within each bank, some memory is required for operating system overhead (3K bytes the first bank, 8K bytes in each subsequent bank). In addition, each partition within a bank requires about 1K bytes of overhead for program control and buffering.

The number of partitions in a system and the size and characteristics of each are established in a process called "partition generation." Wang provides a utility program called @GENPART which accomplishes this. The user can create a number of system configurations, save them on disk, and access them whenever needed. Optionally, the user can designate a particular "default" configuration which will be automatically loaded and executed whenever the system is powered up.

We found the 2200MVP to offer some interesting features that were designed to ease the task of programming for a multi-user environment. These features include:

- Global Partition -- Any partition may dynamically declare itself "global," thus making its subroutines and any specially labeled global variables accessible to other partitions in its bank of memory. The BASIC-2 program text in a global partition is "re-entrant," that is, two or more partitions may simultaneously execute the same statement in a shared subroutine. Global variables can be interrogated and modified by several users, providing a mechanism

for interpartition communication. In addition, there is a 5K byte area in the first bank of memory that can be divided into "universal global partitions." These universal partitions can be accessed by all other partitions on the system (in any bank).

- Seize/Release -- This capability allows any given program running on the system to temporarily "seize" a peripheral device such as a disk or printer. This allows a program to use a shared device, and while in use, prevent other programs from interfering (especially useful for printers).
- Inter-terminal Messages -- This facility allows the operator at terminal #1 to define a message which will be displayed at all other terminals whenever the READY system message is displayed.
- Disabled Programming Mode -- This option allows the user to define given partitions (terminals) as "disabled". That is, the partition is totally under program control. The operator cannot enter or modify program text from that terminal, nor directly access any disk files.

ISS, Wang's Integrated Support System, offers support software for the 2200MVP. The major components of the package are:

ISS Utilities -- a variety of operator controlled utilities including copy/verify, list/cross reference, file status, and so on.

Screen/Disk Subroutines -- a set of subroutines that perform potentially complicated functions which the user may include in application programs.

SORT-4 Subsystem -- a sort subsystem that may be incorporated by the user into an application program.

Key File Access Method (KFAM) -- an indexed, disk file access method that includes utilities, subroutines, and a subsystem.

User Comments

- *The operating system is a relief . . . it is very nice to operate within.*
- *The interactive usage is great. You just stop the program, make corrections, and re-start. Its very nice to use.*
- *Software development is very nice, particularly the ease of editing and the use of 'breakpoints' in debugging programs.*

LANGUAGES AND APPLICATIONS PACKAGES

Summary of Features

- The only language available on the 2200MVP is Wang's own BASIC-2.
- Wang offers a powerful program development tool called IDEAS (Inquiry Data Entry Access System). IDEAS can be used to create and maintain data files, generate screen formats and menus, solicit and validate operator-entered data, and produce reports. IDEAS creates the BASIC-2 code which accomplishes these tasks. The code can be used as is, or can be modified or further customized by the user.
- An enormous amount of application software is available for the MVP. Wang offers a number of packages, the most significant of which is GBS (General Business System). GBS is a general package that includes invoicing, accounts receivable, sales analysis, order entry, inventory, general ledger, accounts payable and payroll. Though available from Wang, GBS is typically installed by software vendors. Wang "approved vendors" install Wang software and offer a large assortment of their own business and engineering packages.

Our Observations

Wang's BASIC-2 is a highly enhanced version of BASIC. A very powerful language, it provides the programmer with a variety of features including:

- Logical operations and data manipulation at the bit and byte level.
- 13 Digit accuracy from a full array of math and trig functions.
- Groups of special-purpose statements to perform operations such as code conversion, sorting, and matrix arithmetic.

We found that BASIC-2, like any powerful higher-level language, can be complex, with a multiplicity of statements and procedures. But being an enhanced BASIC, it was a relatively familiar language which we felt we could "ease into" comfortably.

User Comments

- . *It's a very good version of BASIC . . . better than most.*
- . *It's very easy to write friendly programs for the user but, because of the short variable names, it is more difficult to document and maintain the programs.*
- . *The 'global' facility makes it very easy to pass information among programs. However, it's a bit complicated so you have to be careful.*
- . *Wang has a very nice implementation of BASIC.*

SUPPORT SERVICES

Summary of Features

- Wang provides contract maintenance on the hardware it sells.
- System software support (BASIC-2 and the operating system) is provided by Wang. All modifications and updates to the system are provided free of charge. In addition, there is a toll-free line to Wang technical reps when the user has questions.
- Application software is almost exclusively installed and maintained by Wang approved vendors.

Our Observations

Though Wang has developed their own application software (like GBS), their approach is to sell the hardware and leave the software to their approved vendors. Wang's approach is not like some other manufacturers, though, who sell the hardware and leave the user to solve his own software problems. Typically, when a user purchases Wang equipment, the Wang salesman (and a Wang technical analyst, if needed) will help the user determine their software needs. The salesman, who has at his disposal a lengthy list of the packages offered by Wang approved vendors, will then help the user find a vendor (or vendors) who offers the package which suits the user's needs. Unfortunately, users seemed less than satisfied with the service they received.

User Comments

- *Wang's technical service is great, but the sales-service and follow-up is very poor. There was no information available on software.*
- *Wang is lax on training. It's up to the programmers to learn the system.*
- *I went to Wang's four-day programming school and was very impressed.*
- *Wang gave us no training . . . we just had to look it all up. The technical representative never even showed up when the equipment was installed.*
- *Hardware documentation is very good. However, the software documentation is incomplete and not too good. It may be six months to a year behind the actual version of the system which is up and running.*
- *Wang's documentation is clear and complete. It's good for learning and as a reference. Very well documented.*

SUMMARY OF USER COMMENTS

Using names supplied by the Association of Computer Users, we interviewed ten users of the Wang 2200MVP system. The majority of these users had systems configured with 64 kilobytes of user memory, but one had 128K and one had 256K of memory. Five users owned the 10 megabyte disk storage unit, two had 5 megabyte units, and three had 80 megabyte drives. A variety of printers were being used, although four users had but a single printer in the 180 character per second (cps) range, and the remaining users had two printers, generally a low speed unit at 120 cps, and a high speed unit at 200 lines per minute (lpm). All were using a version of the 2236 CRT terminal, with anywhere from two to seven terminals on the system. Three of the users had dial-up capability and were using this facility for some applications. One user had graphics capability.

The systems in the survey were being used by three to six people, although two users had up to twenty people accessing the system. The systems were typically being used 6 to 8 hours per day, but one firm was on a 24-hour shift 5 days per week with dial-up access.

The majority of applications were in the business management area. Only one user was involved with engineering modeling and computations. Five users had accounting applications and three had order entry. The 2200MVP is apparently being used extensively in the insurance industry with applications such as pension plan administration, actuarial computations, insurance plan costing, etc. Additional uses included job costing in a manufacturing environment, financial modeling, salesman and phone call logging, and time and billing for a personal service firm.

Users were generally very happy with the 2200MVP BASIC language imbedded within the operating system. Some particular features mentioned were matrix operations, formatting of output, and global memory areas for passing information among programs. From a programmer's standpoint, it was perceived as a very friendly system to program, and very efficient in its use of a programmer's time. If you are running a program and there is an error, all you do is simply correct the error and re-run the program. This interactive approach is in sharp contrast to the standard operating system where you must go through the time consuming process of editing, compiling, linking,

loading, and executing. Several users commented about this feature, and one even suggested a ten-fold reduction in program development time over standard operating system approaches.

Most users rate the Wang hardware as very good, but indicated the usual number of mechanical problems. However, many were particularly impressed with the CRT terminal supplied by Wang, indicating that it was trouble free and well liked by operators.

Most were happy with the BASIC/Operating System combination. One user indicated that they were so tightly coupled, that new releases of system software by Wang presented no problems in implementing (as do system changes made by many other manufacturers). As one user put it, "Wang is so far ahead that the real problem is finding a programmer who can fully utilize the system's features."

Only four of the users interviewed had used other major computing equipment within their firms before using the Wang 2200MVP. When looking at computer equipment, the most frequently mentioned competition for the Wang were DEC and IBM (with five mentions each) followed by a variety of others including HP, DG, and NCR. Users of Wang felt that the major criteria for choosing a computing system were cost, service, ease of use, and availability of packages, followed by reliability, manufacturer's reputation, speed, and expandability.

The major negative comments about Wang dealt with the manufacturer/user interface, including service, documentation, and training. While the hardware support seems good, there were several comments that the sales and software service from Wang was deficient, including lack of initial training on how to use the system, and some unhappiness with system documentation. However, two users had attended the programming course offered by Wang and were very happy with it.

As usual, though some users were unhappy with various aspects of the Wang system, virtually all were, overall, very satisfied with the Wang 2200MVP. Typical comments included "Wang is a very good machine for the price," and "I've worked with the others and I still like Wang the best."

CONCLUSIONS

The Wang 2200MVP reviewed in this report is based upon the same 2200 series processor reviewed as the 2200VP in our Series 2 reports.

The benchmark timings indicate that the 2200MVP is a very fast computer. With up to eight terminals running there was an insignificant increase in response times, and the addition of a ninth terminal running a CPU intensive job made very little change in response. Also, the use of the multi-user MVP system did not seem to add system overhead when compared with the VP operating system.

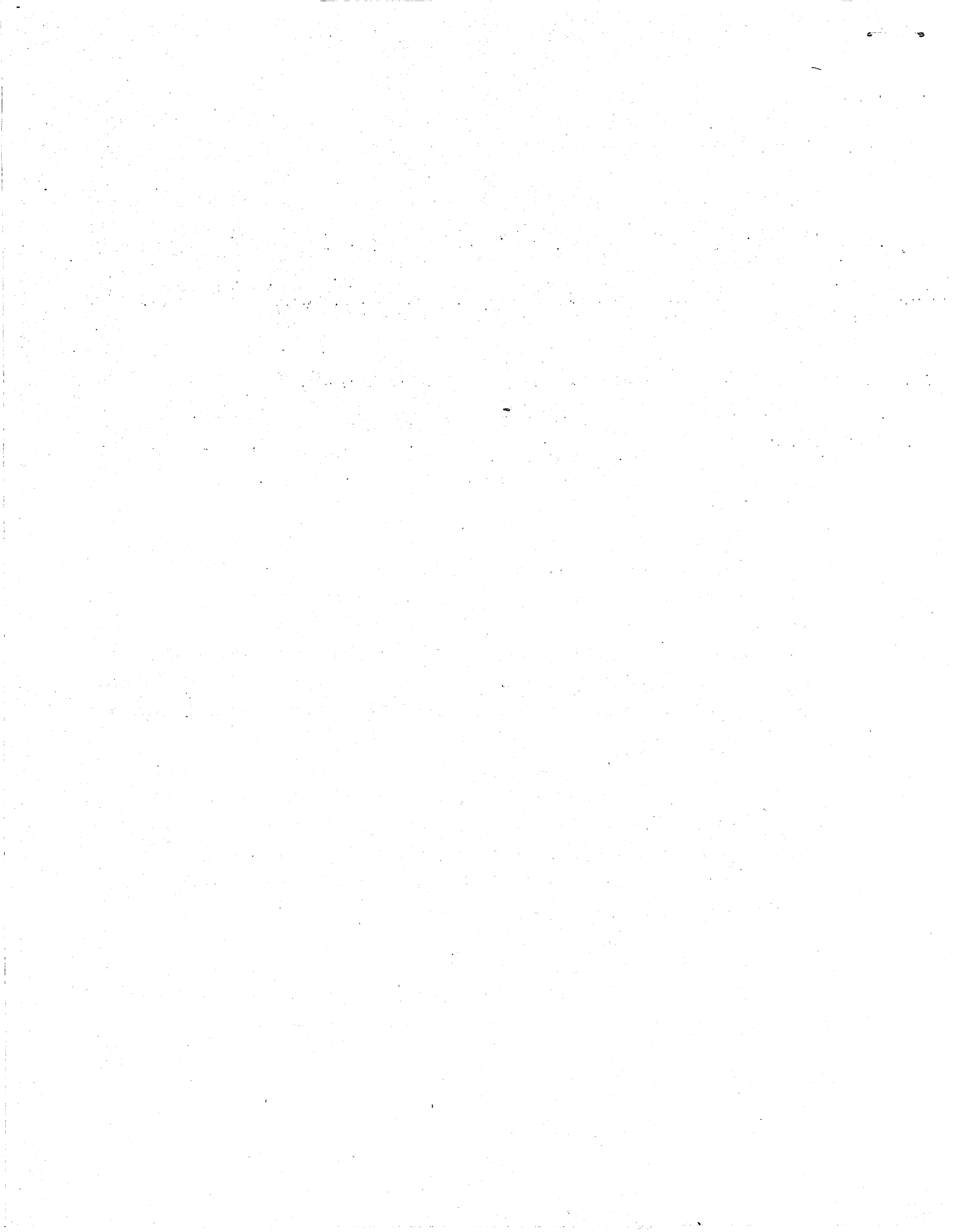
Users were very satisfied with the hardware, particularly the 2236 series interactive terminal. Other than occasional mechanical problems with disks and printers, the major negative user comments concerned a lack of communication and support across the company/user interface. However, this problem seems to be abating as Wang catches up with the rapid growth of the past two years.

A unique aspect of the Wang 2200MVP is the interactive BASIC programming environment. Because program corrections can be easily made and the program re-run immediately, de-bugging is simplified and there is some indication that program development time is significantly reduced. Additionally, the interface between the programmer (or user) and the operating system consists of BASIC utility programs in the system library. Thus, there is little distinction between applications and system programming since both are imbedded within the same operating environment.

The majority of users surveyed were utilizing the 2200MVP for business applications. While third-party packages were being used, most users were doing some in-house programming and were very familiar with the system. They liked Wang's version of BASIC, and utilized the 2200's capability of using a "global" area of memory to pass information among programs.

In summary, the Wang 2200MVP utilizes a somewhat different approach in both its architecture and operating system. This, along with reliable equipment, makes it an easy-to-operate machine which appears to be very versatile.

NEXT ISSUE: IBM Series/1.





BENCHMARK REPORT

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