

BENCHMARK REPORT /

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In This Issue:

The HEWLETT-PACKARD 250

(Note: This is the multiple-user configuration; not to be confused with the ACU's Benchmark Report Vol. 3.0, No. 12 covering the single user configuration.)

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HEWLETT PACKARD 250: BENCHMARK REPORT

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Preface

The fifth system to be evaluated in this series of reports covering multi-user systems in the \$25,000 to \$50,000 price range is the Hewlett-Packard 250. The comparative information provided by this series of reports will aid users in selecting from among the many alternative computing systems available--a service which is simply unavailable from any other independent source.

We have found that the technical specifications applied by manufacturers are difficult to interpret, and often misleading in terms of how systems behave in an application environment. Potential users need to know how well equipment performs in specific applications and how that performance compares among alternative systems.

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

The Hewlett-Packard 250 used in our benchmark tests consisted of the processor with 256 kilobytes of central memory, a workstation with CRT and keyboard, a 1.2 megabyte floppy disk, a 12.1 megabyte hard disk, a 5-port Asynchronous Serial Interface, a 180 character per second printer, and the system software which includes HP's Business BASIC. Total price of the system as tested is \$30,350 (four additional remote workstations would bring the price to \$49,250).

- The HP 250 performed extremely well in our benchmark tests, recording the fastest times to date. Though the 250's upper limit of 5 additional terminals could prove to be a drawback, its performance in our tests certainly shows it to be a fine multi-terminal system.
- We were especially impressed with the "human engineering" of the 250. The design of the HP 250 workstation, with features such as an adjustable CRT on a swivel, keyboard at "typist" height, and "softkeys" on the bottom of the screen unit, combined with other features of the HP system show the special care HP has taken to provide comfortable human interaction with the 250.
- Our order-entry benchmark program was written in HP Business BASIC. We found this version of BASIC to be highly enhanced and very suitable for business application programming. Employing a "semi-compiled" design in an interactive environment, HP BASIC is easy to program, with full-screen editing capabilities and line-by-line syntax error checking. Excellent documentation fills out this "easy-to-program" impression of the HP 250.
- The HP 250 comes as a fully "bundled" system; that is, a full complement of software is included in the price. This software package includes all operating system routines, utilities, BASIC, HP's database management system (IMAGE/250), a forms generator and more.
- The users we contacted in our survey were nearly all first-time computer users. Despite this lack of experience, the users characterized the 250 as "friendly" and "user-oriented." Though most users expressed satisfaction with their 250, citing the general software design as its best feature, those who expressed dissatisfaction did so generally as a result of a poor working relationship with their O.E.M.

As we finished our benchmark testing of the HP 250, we were left with the feeling that "here's a machine we'd like to program." Its combination of hardware dependability and "user-orientation" make the HP 250 a good choice for experienced and inexperienced users alike.

BENCHMARK REPORT

SYSTEM: Hewlett-Packard 250

PRICE AS TESTED: \$30,350

SPEED TESTS

Benchmark Number		CPU INTENSIVE
A-4	N = 3000	24.7 seconds
		I/O INTENSIVE
B-4	N = 3000	10.0 seconds

"REAL LIFE" PROBLEMS

Benchmark Number		ORDER ENTRY
D-1	2 terminals	2.1 seconds
D-2	4 terminals	2.2 seconds
D-3	6 terminals	*
D-4	8 terminals	*

SIMULTANEOUS ORDER ENTRY AND CPU-INTENSIVE

		CPU-Intensive Program	Order Entry Program
E-1	2 terminals . .	48.2 seconds	2.2 seconds
E-2	4 terminals . .	47.6 seconds	2.3 seconds
E-3	6 terminals . .	*	*
E-4	8 terminals . .	*	*

*Five is the maximum number of remote terminals that can be run on the HP 250.

THE BENCHMARK PROCESS

To begin the benchmark process, we contacted Hewlett-Packard and requested their assistance in benchmarking a multi-user version of their HP 250 computer. 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.

HP provided us with a 250 at their facility in Cupertino, California. The system consisted of a processor with 256K bytes of central memory (96K for the user), the workstation with CRT and keyboard, a 1.2 megabyte floppy disk, a 12.1 megabyte hard disk, a 5-port Asynchronous Serial Interface, a 180 character per second printer, and the system software which includes HP Business BASIC. This system was priced at \$30,350. HP also provided 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, a North Star Horizon, and a driver program written by our staff. The RTE appears to the test computer (the HP 250) 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 a 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.

All I/O-Intensive and CPU-Intensive program timings were made using a stopwatch (as in our Series 1 and 2 reports).

Benchmarking the HP 250

One day was all that was required to benchmark the HP 250. Upon arrival, our equipment was set up and communications were easily established between the RTE and the 250. With the assistance of HP personnel, a couple of minor problems with the order-entry program were corrected, and within an hour, the benchmark testing began. No further problems were encountered and the benchmark testing was easily completed.

Our Observations

As our readers have no doubt noticed by now, we are of the belief that one of the most important aspects of a computer system is its "human engineering" or interfacing. It is in this area that the HP 250 definitely excels. From the physical design of the workstation to the ease of programming in the interactive BASIC environment, the HP makes the user feel "comfortable."

The workstation consists of a desk with cabinets for the processor and other circuit boards, space for the diskette and the 12.1 megabyte hard disk drive, a built-in keyboard which is located at an easy-to-reach height, and a swivel-attached movable CRT. This package provides an attractive and comfortable area for data-entry or programming.

Similar to other machines we've tested at the Business Research Division, the 250 is what might be called a "totally interactive" system. That is, there is no operating system/programming environment dichotomy present, like that found on many other machines. All interaction with the 250 is done via an application or utility program, or in the BASIC programming environment. As a consequence, users need not learn both an operating system language (a JCL) and a programming language, but need to know the names of utility programs to RUN, or the BASIC statements needed to accomplish the task.

In our short time with the HP 250, we quickly grew to enjoy the ease with which the computer can be programmed. As we've emphasized before, we feel that a menu-driven approach is the best way we've seen to provide for easy human/computer communications. We found that programming menu-driven applications on the HP 250 would be an easy, almost enjoyable, task. Through the use of "softkeys" (eight programmable function keys located on the bottom of the CRT screen), the programmer can design a menu-driven application to make even the most inexperienced computer user feel comfortable.

HP's Business BASIC is a highly enhanced version of BASIC that we found to be extremely powerful and easy to use. Employing what might be called a semi-compiled design (see LANGUAGES Detail page), each line is checked for syntax errors as it is entered. Editing is easy with full-screen cursor control and scrolling capabilities.

System generation is accomplished with a program called CONFIG. Using an interactive menu-driven approach, this program allows the user to review and change the system software configuration, memory assignments, I/O configurations, and autostart. When this process is completed, the new system can then be booted. During the "boot-up" process, the 250 does a hardware self-test and reports any hardware malfunction. If the operating system configuration is incorrect, the system will automatically provide a configuration adequate to operate the system console, so that the user may re-run CONFIG and correct the error. During our benchmark tests, we found this sysgen process to be easy and quick.

One feature we particularly liked on the HP 250 is the excellent documentation. In fact, we're not sure we've seen better documentation anywhere! Information is nicely organized and well indexed with numerous examples provided.

The structure of the order-entry program written for us by HP personnel was unique in our series of benchmark tests. Instead of using multiple copies of the order-entry program (one for each terminal) or using re-entrant code which is shared by each terminal (with separate partitions or data areas for each), this program took advantage of some of the unique characteristics of the 250. This version consisted of one program which treated each terminal as simply an I/O device and, in effect, "polled" each terminal to see if it had input information. If so, this information was processed, and then the polling function resumed. This approach is made possible by a buffered terminal I/O interface which generates interrupts when a whole line has been received from a terminal, thus freeing the CPU from character-by-character processing. Using statements in HP BASIC designed for this purpose, input can be easily recognized, processed, and polling then resumed. It is this program structure that is responsible, in part, for the fast times we observed in the order-entry benchmark.

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 used 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	24.7 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 1,276 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	10.0 seconds
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"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.

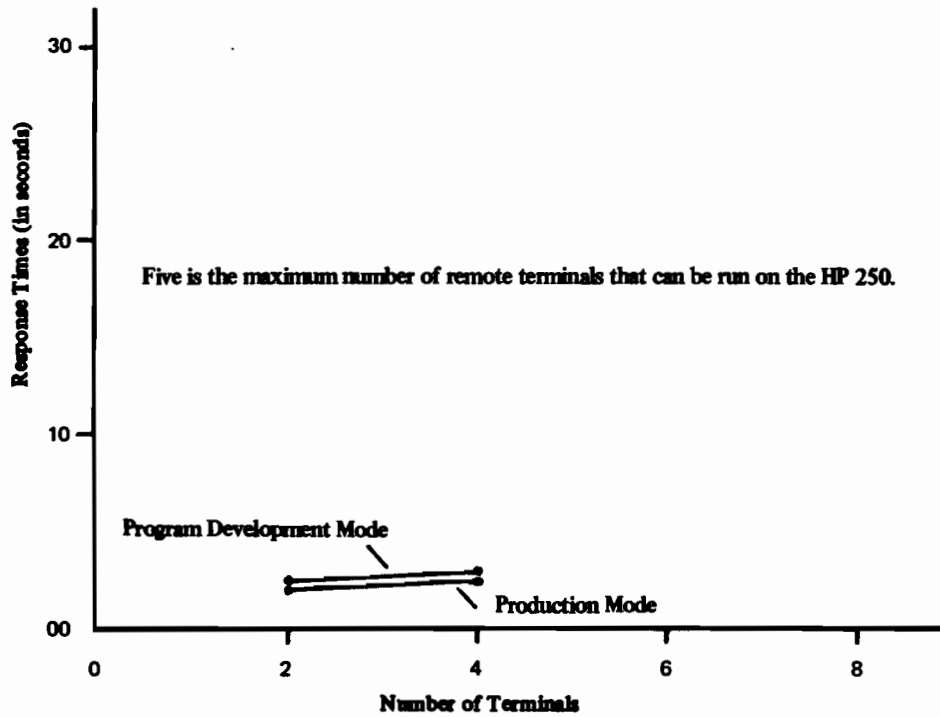
Order Entry Run in Production Mode

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.

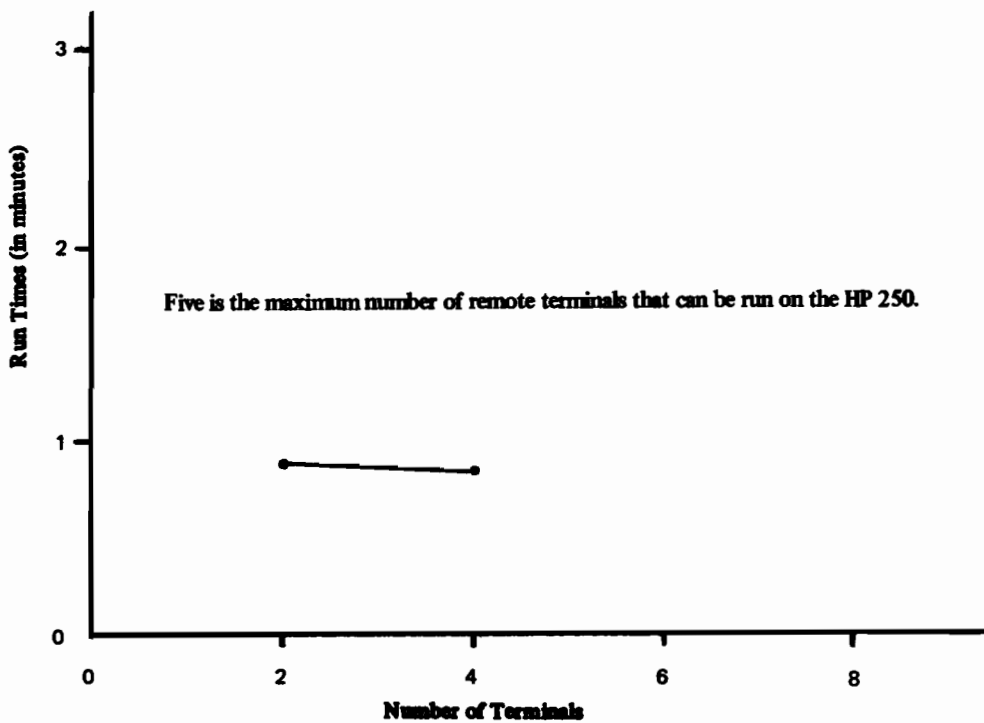
D-1	Results:	2 terminals	2.1 seconds
D-2		4 terminals	2.2 seconds
D-3		6 terminals	*
D-4		8 terminals	*

**Comment: Five is the maximum number of remote terminals that can be run on the HP 250. A 5-terminal test yielded a time of 2.2 seconds.*

Order Entry Program Response Times Versus Number of Application Terminals



CPU-Intensive Program Run Times Versus Number of Application Terminals



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, with the order-entry program 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	48.2	2.2
E-2	4 terminals	47.6	2.3
E-3	6 terminals	*	*
E-4	8 terminals	*	*

**Comment: Five is the maximum number of remote terminals that can be run on the HP 250. A 5-terminal test yielded 47.5/2.4 times.*

Analysis of "Real Life" Problem Results

The 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 and 5 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 for the CPU-intensive job.

The times for the 6 and 8 terminal runs (D-3, D-4 and E-3, E-4) are not reported due to the HP 250's limit of five additional terminals. The times which are reported indicate the HP performs very well in a multi-terminal environment. The curious result of the CPU-intensive times decreasing as terminals are added is explained by the structure of the order-entry program. It employed a program with a loop which was constantly polling for input from the terminals. This polling loop would "compete" with the CPU-intensive program for the CPU's time. As more terminals are added, the polling loop is interrupted for terminal and disk I/O more often, thus "freeing up" the processor to spend more time on the CPU-intensive program. This resulted then, in the times for the CPU-intensive program actually getting faster as the number of terminals increased.

Costs

HP 250 System	\$17,000
<ul style="list-style-type: none"> ● Processor with 160K bytes of memory (128k system, 32K user) ● Workstation with display screen and keyboard ● 1.2 megabyte floppy disk drive ● Printer interface ● System software ● Documentation 	
Replace 32K user memory with 128K	\$ 1,600
12.1 megabyte hard disk	\$ 6,000
5-port Asynchronous Serial Interface	\$ 2,100
180 character-per-second printer	\$ 3,650
Total System	\$30,350

Our Observations

Additional terminals could be either of two non-intelligent terminals, the 2621A or the 2645A (\$1,495 and \$3,500 respectively), or a workstation terminal, the REMOTE/250 (\$4,250). The REMOTE/250 may be used for data-entry and programming, while the two non-intelligent terminals can only be used for data-entry. Each additional REMOTE/250 requires 32K of additional memory as well.

<u>Configuration</u>	<u>Total Price with REMOTE/250's</u>	<u>Total Price with 2621A's</u>
Single user system (console only)	\$26,650	\$26,650
System with two terminals	\$34,900	\$31,845
System with four terminals	\$44,000	\$34,835
System with six terminals	\$54,400	\$37,825

The multi-terminal prices given above include the ASI board, terminals, and additional memory if needed. Included in the number of terminals is the console.

CENTRAL UNIT

Summary of Equipment and Features

- The HP 250 processor is a 16-bit processor with 12 significant digit floating point precision. The processor is housed in the HP 250 desk in a 16 slot motherboard.
- The operating system, which is memory resident, requires a minimum of 128K bytes of central memory. A single user configuration adds 32K or 64K for user memory (5K of user memory is required for console overhead--display screen, memory buffers, etc.). Multiple user configurations require at least 160K for the operating system (or 192K if desired), and an additional 32K for each REMOTE terminal (and the console). Each user memory area can be increased to a maximum of 64K. Nonintelligent data-entry terminals do not require additional memory (other than that required by the program which monitors them). Add-on memory boards come in 32K, 64K, and 128K increments at prices of \$1,250, \$1,900, and \$2,500 respectively.

Our Observations

To extend the addressing capabilities of the processor, and thus allow a multitask system, the HP 250 employs block switching to select desired memory blocks. Sixteen memory blocks of 64K bytes each can be addressed. However, in actual operation the total addressing capability is not used due to the limited number of memory board slots and power supply limitations. Block switching permits the 250 to support up to 5 additional consoles (REMOTE/250's) in a time-shared manner. Each memory block is provided a CPU "time-slice" so that it may use the processor, system disk or printer.

In our benchmark tests, we were impressed with the HP processor and central unit configuration. Its timings in our order-entry test were extremely fast, and showed little degradation as terminals were added. Given this good performance, though, we were disappointed that only five additional terminals could be added to the 250. We felt that this limitation might inhibit some potential users who plan on expanding their system to over six total consoles (yet want to start out at a "small-system" price).

The users we talked to praised the hardware reliability of the HP 250 with most commenting that they had few if any problems with their system. A couple of users did report, contrary to our benchmark results, that their system experienced significant response degradation as terminals were added to the system. We were unable, however, to ascertain whether this problem was a function of HP hardware/software or the user's own application program.

User Comments

- *Never been down for a hardware problem since we've had it.*
- *It's slow when all our terminals are up and working.*
- *We never turn it off . . . it even prints reports on the weekend.*

STORAGE DEVICES

Summary of Equipment and Features

- The standard HP 250 package comes with one floppy disk drive located below the drawer on the workstation. This drive employs double-sided media recorded in double-density format to yield a 1.2 megabyte capacity.
- A 12.1 megabyte hard disk is available (and used in our benchmark tests). This drive features Winchester-technology and medium, and resides in the main system console just below the floppy disk drive.
- The HP 7906 drive is also available. This 19.6 megabyte drive is located in a stand-alone "lowboy" cabinet and features a 9.8 megabyte fixed disk and a 9.8 megabyte front-loading removable cartridge disk. Priced at \$13,000, up to two 7906 drives may reside on a system.
- Total secondary storage for the HP 250 adds up to 33 megabytes and consists of one floppy, one Winchester, and two 7906 drives. Tape storage is not available for the 250, although the 2645A non-intelligent terminals feature cassette tape storage for off-line data-entry.

Our Observations



Our tests using the 12.1 megabyte hard disk revealed it to be quite suitable for business applications. This small, "drawer-sized" disk performed very well in our tests. In fact, some additional timings we ran indicated that, in our order-entry application, the 12.1 megabyte disk was only about 5% slower than the larger 19.6 megabyte disk.

One feature we found to be useful in a multi-terminal environment is the DOOR LOCK/UNLOCK statements available in HP BASIC. These statements allow a user to lock the diskette door in order to avoid accidental removal of an active diskette. Other BASIC statements help to provide file security in a multi-user situation by assigning file passwords and controlling multi-user file access.

The users we contacted in our survey were generally happy with the storage capacity of their system. There were a few negative comments about the storage access speeds, primarily regarding the floppy disk drives.

User Comments

- . *Data storage is more than adequate.*
- . *The weak link is the diskette drive.*

INPUT/OUTPUT DEVICES

Summary of Equipment and Features

- The system console on the HP 250 is a desk which contains the CRT, keyboard, processor, and disk drives. The CRT is an adjustable display screen on a swivel with an 80 x 24 character display. The display memory allows scrolling through the use of the up and down cursor keys. Other screen features include half-bright, underline, blinking or reverse video, and a blinking cursor. On the bottom of the screen are 8 "softkeys," which are programmable function keys. The console keyboard features a typewriter block, a separate numeric pad, and 16 more function keys.
- Terminals for the HP 250 include the REMOTE/250 intelligent terminal and the 2645 and 2621 non-intelligent terminals. The REMOTE/250 (priced at \$4,250) is a full workstation with all the functions of the system console (except for softkeys on the bottom of the screen). Programming and remote data-entry can be done from a REMOTE/250, while the non-intelligent 2621 and 2645 (\$1,495 and \$3,500) allow only data-entry under program control. The 2645 also includes a cassette tape storage unit which allows off-line data-entry.
- The Asynchronous Serial Interface (\$2,100) provides a 5-port intelligent interface for REMOTE/250 consoles or standard RS232C terminals and printers. The ASI, when combined with the LK3000 utility, also offers asynchronous serial communications with the larger HP 3000.
- An Intelligent Network Processor (INP/250) provides communications with IBM-compatible mainframes using IBM bisync protocol. RJE/250 is the program that tailors the INP/250 board for remote job entry. Cost of the emulator is \$3,225.
- Printers for the 250 include a 180 character-per-second serial printer, a 400 line-per-minute line printer, and a 30 cps character impact printer (\$3,650, \$10,175, and \$3,600 respectively).

Our Observations

HP's design of their console and terminals shows their concern with providing a comfortable human/computer interface. Things like locating the keyboard at a "typist" height, a movable CRT on a swivel, and easy access to the floppy disk drive help to make the HP 250 a more "easy-to-run," more "fail-proof" machine.

Users generally raved about the HP terminals, especially the softkeys. When used in menu-dirven applications, their location at the bottom of the CRT helps to minimize errors by having the operator "point" to a choice when pressing the key.

User Comments

- . *The softkeys are great!*
- . *The softkeys are nice on the main console, but on the REMOTE/250's they're on the keyboard and not so easy to line up with the screen.*

OPERATING SYSTEM AND UTILITIES

Summary of Features

- HP 250 system software consists of the BASIC interpreter and extensions to the language called "DROMs." A DROM (Dynamic ROM) is a group of assembly language routines that enhance the capability of BASIC. DROMs typically contain:
 - the database management system
 - mass storage device drivers
 - printer and other peripheral drivers
 - additional BASIC statements and functions
 - other miscellaneous control functions

- All HP system software is included in the price of the system.

Our Observations

The HP 250 could be called a BASIC language machine. All statements in BASIC and system commands are executed on the same level, either in a program or directly from the keyboard. This structure eliminates the more typically found job control language/programming language dichotomy, but as a consequence the user must be familiar with all the commands and functions available. There is no menu-driven approach to the operating system, unless the user (or O.E.M.) programs one. Fortunately, programming menu-driven applications on the 250 is easy and efficient with the use of the softkeys and other BASIC enhancements.

One feature of the operating system we particularly liked was the system self-test. Upon power-up, the system initiates a test of the processor, block switch, I/O channel and memory. The results are then displayed on the CRT. In addition, if the user system configuration does not match the available hardware, error messages will be displayed. In fact, if the system as configured by the user is totally incorrect, the 250 will always bring up a minimum configuration for the system console so that corrections may be made.

The system software includes:

- HP Business BASIC - (see next section for a description)

- IMAGE/250 - a database management system. A true DBMS, IMAGE allows logically related data to be placed in an integrated database which can then access data according to its defined structure without regard to its physical placement. Components of IMAGE/250 include schema processor utilities, access procedures, database utilities, and QUERY/250, a database query facility.

- SORT/250 - a sorting package which can sort simple data sets and sort across multiple data sets.
- QUERY/250 - an inquiry facility for IMAGE/250 databases. This facility allows ad hoc inquiries with no programming required and also features a forms-driven command input for the novice user.
- PACK/250 - used in transferring string and numeric data to and from a string variable.
- FORMS/250 - allows creation and use of forms for data entry and display.
- REPORT WRITER/250 - a set of BASIC commands which aid in writing programs to produce reports.
- Additional utilities - includes CONFIG (allows user to configure system), ROUTIL (copy routines), XREF (cross reference program), TEST (series of hardware tests), and INIT (disk initialization routine). All of these utilities are written in BASIC.

Optional DROMs which may be configured in the system allow for communication with REMOTE/250s (RIO) or remote RS232C devices (TIO), HP3000 communications and a SPOOLer.

The users we surveyed were very satisfied with this aspect of the HP 250. Almost unanimously they applauded the "friendliness" of the system and had special praise for the DBMS.

User Comments

- . *Its best feature is its friendliness . . . it's just a very friendly system to work with.*
- . *We got the 250 for two reasons: HP's reputation and QUERY.*
- . *It's easy to make the 250 friendly for users.*
- . *The reason we got the HP 250 is simple . . . the database and QUERY.*
- . *We felt they had the software that fit our needs: IMAGE/250.*

LANGUAGES AND APPLICATIONS PACKAGES

Summary of Features

- HP Business BASIC is the only language offered on the 250. A highly enhanced version of BASIC, some of its features include:
 - full-screen editing of program text and line-by-line syntax error checking; debug, trace and "step-through" for program debugging
 - structured programming statements, "softkeys," COMMON storage, a matrix package
- The following packages are offered by HP to O.E.M.s for modification and distribution. HP is not staffed to support individual users of these packages.
 - FIN/250 includes payables, receivables, and general ledger (\$7,500)
 - OM/250 includes order-entry, finished goods inventory control, receivables, and sales analysis (\$10,000)
 - MFG/250 includes bill of materials, product costing, and raw materials inventory control (\$7,500)

Our Observations

HP 250 BASIC is an interpretive language, so a program can be listed at any time in its original form. However, this version of BASIC is different from most in that it does a line-by-line syntax check and what might be termed a "semi-compilation." Most versions of BASIC store the program in its character form and subsequently check syntax each time a statement is executed. HP BASIC stores the program as pointers to the proper execution micro-code for each operation, as pointers to a symbol table for variables and constants, or as pointers to a scratchpad location for temporary result storage. This type of internal form (sometimes called pseudocode) helps increase execution speed by operating on pointers rather than character form.

Users we contacted were very happy with HP BASIC, often comparing it to other high-level languages such as FORTRAN, COBOL, or Pascal. Feelings on application programs were much more mixed, with a number of very dissatisfied users (see Support Services section for comments).

User Comments

- . HP BASIC is extremely flexible.
- . HP BASIC is superior, very close to Pascal when it's full blown.
- . After using HP BASIC, I'll never use FORTRAN again.
- . HP BASIC is the best I've seen.

SUPPORT SERVICES

Summary of Features

- Hewlett-Packard offers three different maintenance contracts for hardware service. These run from a basic agreement (8 to 5, Monday through Friday) to extended coverage (24 hours a day, 7 days a week).
- HP Customer Support Service (\$150 per month) offers the user all updates/improvements to the system, phone and on-site consultations.
- HP also offers training and consultation including:
 - a consulting service, eight hours at the customer site (\$500 per day)
 - five days for one student at a HP training center (\$625)
 - on-site comprehensive introduction for ten students for five days (\$6,000)

Our Observations

HP documentation on the 250 is, in a word, outstanding. We found it to be very easy to read, informative, well-indexed, and chock full of examples.

The HP users we talked with agreed the documentation is great. They were also uniformly pleased with the hardware service they had received. Unfortunately, this was not always the case with the application software. As the following user comments show, overall satisfaction definitely depended on the service/support they received from their O.E.M.

User Comments

- . *The documentation is easy to follow and well laid out with examples.*
- . *The documentation is the best . . . superb!*
- . *Excellent service, they were here within two hours after we called.*
- . *Service from our software house has been fantastic.*
- . *Terrible service from our OEM . . . they didn't follow through.*
- . *Service from our software house is very poor.*
- . *Very quick service, the service reps knew what they were doing.*
- . *Service from our O.E.M. has been extremely good.*
- . *The machine itself is good, but it's difficult to look at it objectively since the software service from our O.E.M. has been so poor.*

SUMMARY OF USER COMMENTS

Using names supplied by Hewlett-Packard, we contacted 15 firms which were using the HP-250 in a multi-user capacity. These firms consisted of manufacturers, medical billing firms, and a consulting engineering firm. In all cases, the 250 was being used for standard business applications including payables, receivables, and inventory. A few firms also used their HP 250 for mathematical and engineering applications as well.

The standard hardware configuration for the HP 250 consists of the processor with 160K memory, a 1.2 megabyte floppy, and the console terminal with softkeys. In addition to this standard configuration, most users had the 19.6 megabyte fixed/removable disk, the 180 cps printer, and from one to three REMOTE/250 terminals. Generally the users liked the printer and the terminals; however, some commented that the placement of the softkeys on the keyboard (on the REMOTE/250s) made visual alignment with the screen a little awkward. The users were also generally pleased with the amount of central memory and hard disk storage.

Nearly all of the firms we contacted had purchased the HP 250 as their "first" computer system. Users' experience with their 250 ranged from 2 years to less than a year. At least five different individuals in each firm were using the 250, most of whom were quite new to computer systems. Despite user inexperience, however, the 250 was getting heavy usage, which supports such comments as the "friendliness" of the computer and "it's very user oriented."

The users we talked to had evaluated many of the better known computers including Wang, NCR, DEC, IBM, Burroughs, Univac, Honeywell, TI and Data General before buying the 250. The reason most often given for choosing the HP 250 was "the software." Some users were more specific and gave "Query" as their reason. A common remark was, "The reason we got the HP 250 is simple: The data base and Query." The owner of a billing firm said, "We went into business based on what we knew the 250 could do."

All of the users were extremely pleased with hardware reliability, and any problems encountered were considered "minor." The users were also very happy with the "excellent" service they got from Hewlett Packard.

The users were equally pleased with the software packages and the HP BASIC language. One user, probably more realistic about what to expect from computers than others, said, "We expected a lot of bugs in the packages but there just weren't any." And a comment about the BASIC was, "HP BASIC is superior, very close to Pascal when it's full blown."

Users were divided, however, on the quality of software support they received from O.E.M.s. Two users made comments completely opposite to each other: one said, "Service from our software house has been fantastic," while the other remarked, "Terrible service from our software house--they didn't follow through." All felt that HP's documentation is "very exceptional," and "superb."

Users' perceptions of the operating system and its overall efficiency were positive, but some felt it slowed down or became essentially a single-user system when the volume of data or complexity of the programs increased. When questioned about the cause of this degradation, most users found it impossible to determine whether the system software or their own application was at fault. One user commented, "When running some of our programs other terminals can't access the main disk until the program is finished, which then creates a backlog." Another user said, "Speed is good with one terminal but with two it slows down noticeably." There were other users, however, who felt the system was "relatively quick," which was more in line with our findings in the Benchmark process.

The general design of the software packages, the language, and the unique features of the hardware such as the softkeys seemed to contribute to users' overall satisfaction with the system and with what they called its "great human engineering." Their overall assessment of the HP 250 has to be viewed from two perspectives, though. Those users who had a good working relationship with their O.E.M. were quite pleased, while those who were struggling with the O.E.M. for support expressed a less positive viewpoint. But somewhere in between there were a lot of happy users of the HP 250. Several comments were, "By golly, it's got so much on it," and "Almost everything you want to do you can do."

CONCLUSIONS

The Hewlett Packard 250 reviewed in this report, originally designed as a single user system, proved to be an excellent performer up to its five remote terminal limit. Based on an operating system which is fully integrated with an enhanced BASIC language, we found the HP 250 to be an easy machine to program and operate.

The main workstation, with its computer, keyboard, CRT, and disk drives, was designed with the operator in mind. The swival CRT has programmable "softkeys" which allow single keystrokes as a response to the programmed prompt. Workstation design, along with ease of operation and programming indicate the extent to which HP is concerned with the human interface.

The enhanced BASIC is interactive, with full screen editing, syntax checking as each line is entered, and structured programming statements. Additionally, it is very easy to write "menu driven" applications, and is well designed for business programming. Documentation on the system is excellent.

The HP 250 produced the fastest times to date on our order-entry benchmark program. This was mainly due to the unique way in which the program was designed and implemented by Hewlett Packard personnel, taking full advantage of the BASIC language statements as well as the buffered input/output capabilities of the hardware.

Users were generally enthusiastic about the HP 250, especially the BASIC language and software such as the data management system. As usual, dissatisfaction with the system occurred when the user was unhappy with the O.E.M. who supplied the system and applications packages. The system was generally classified as very "friendly" and "user oriented."

The major limiting factor for a growing business might be the five remote terminal (plus console) maximum configuration. If expansion is a factor, HP would probably recommend the low end of the 3000 series as a starter system rather than the HP 250.

While the HP 250 is relatively expensive, its integrated system, along with the human engineering, make it a very usable computer capable of supporting the computing needs of many small and medium sized businesses.

BENCHMARK REPORT

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