Hewlett-Packard HP 9000 Multiuser Systems

In this report:

Product Summary

Editor's Note
This updated report includes Series 800 models that were detailed in the June 1990 Product Enhancement as well as HP's latest offerings—the 842S, 852S, and 865S—which significantly improve the upgrade path of the entire line. Recent price cuts further improve price performance in many of the Series 800 product line.

Description
The HP 9000 Series 800 superminicomputer uses the RISC-based HP Precision Architecture and de facto and industry-standard system software facilities and data communications tools. It is used in technical and realtime computing in manufacturing industries and general-purpose computing in government and education.

Strengths
Adherence to de facto industry standards, including a UNIX operating system based on AT&T's UNIX System V.

Limitations
Connections to IBM mainframes and SNA networks are difficult to implement. Upgrade options for moving from one Series 800 model to another are also somewhat limited. The latest models offer some improvement.

Competition
Competition includes the Digital VAX 6000 Models and DECsystem 5500, 5810, and 5820; Unisys Series 6000, IBM RISC System/6000, and NCR 3000 Series computers.

Vendor
Hewlett-Packard Co.
Business Computing Systems
19091 Pruneridge Avenue
Cupertino, CA 95014
(800) 752-0900

Price
$16,000 to $645,000.

GSA Schedule
Yes.

—By Dale Peacock
Senior Associate Editor

Analysis

Product Strategy

Since our last report, Hewlett-Packard has enhanced the HP 9000 Series 800 superminicomputer line with three new offerings: Model 842S, Model 852S, and Model 865S. These new midrange and high-end models expand the capabilities of the product line. They make entry into large-scale computing easier, and provide more room for growth once an HP 9000 Series 800 model is purchased. The Series 800 family now comprises Models 808S, 815S, 822S, 832S, 835S, 835SE, 842S, 845S, 845SE, 850S, 852S, 855S, 860S, 865S, 870S/100, and 870S/200.

HP has also added a Series 1200 to the HP 9000 line. Currently the 1200 Series consists of a single model—the 1240 which is the result of an original equipment manufacturer (OEM) agreement between HP and Sequoia Computer Systems. HP has repackaged the Sequoia Series 300 fault-tolerant system. In return, Sequoia received a sizable equity investment, access to HP's RISC technology for future product development, and HP's marketing of the product in the telecommunications industry.

High End

The 870S/200, the top-of-the-line model, is HP's UNIX-based, RISC-architecture Series 800 superminicomputer. It provides more resources to accommodate heavy computing demands and larger user communities, and also effectively meets the growth requirements of users of the large-scale Model 850 or midrange Model 835 while preserving compatibility.

Low End

At the low end, Models 808S and 815S are the lowest priced multiuser systems offered in the HP 9000 Series 800 line. A field upgrade from the Model 815S to the Model 835SE is available, providing a growth path for expanding businesses.

Vertical Markets

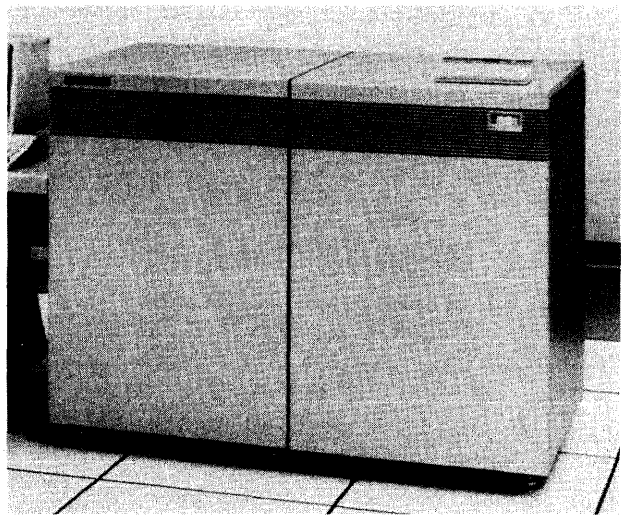
Hewlett-Packard is busy trying to recapture the superminicomputer market share it lost to Digital Equipment Corp. within the manufacturing automation, engineering, scientific, and process control and monitoring application areas. At the same time, Hewlett-Packard is becoming more forceful within those vertical markets demanding solutions based on UNIX for their general-purpose computing requirements.

Hewlett-Packard has created a more attractive, expanded line of superminicomputers for technical computing and realtime processing and for general-purpose UNIX processing within the private business and public service sectors.

Industry Standards

HP's adherence to industry standards is a strong marketing tool being used to sell the new and enhanced HP 9000 multiuser computer systems.

The Series 800 operating environment includes a UNIX operating system based on AT&T's UNIX System V and University of California at Berkeley's 4.2 Berkeley Software Distribution (4.2



Since our last report, Hewlett-Packard increased the performance, capacities, and cost-effectiveness of the Series 800 by introducing Models 842S, 852S, and 865S. These adjustments are an attempt to meet growing processing requirements and to make the product line more attractive to potential customers. Pictured here is the HP 9000 Series 800 Model 850, a 7-MIPS system that accommodates up to 300 local terminal I/O devices.

Company Profile Hewlett-Packard Co.

Corporate Headquarters:
Hewlett-Packard Co.
Business Computing Systems
19091 Pruneridge Avenue
Cupertino, CA 95014
(800) 752-0900

In Canada:
Hewlett-Packard Ltd.
6877 Goreway Drive
Mississauga, ON
L4V 1M8
(416) 678-9430
European Operations Headquarters in Geneva, Switzerland.

Apollo Division:
Apollo Computer, Inc.
A subsidiary of Hewlett-Packard
300 Apollo Drive
Chelmsford, MA 01824
(508) 256-6600

Officers:
Chairman: David Packard
President and CEO: John Young
CFO: Robert Wayman
General Manager of Apollo Division: David Perozek

Company Background
Year Founded: 1939
No. Employees: 94,000 (includes Apollo employees)
No. Workstations Installed: Approximately 220,000 (includes Apollo workstations)

Hewlett-Packard, is one of the largest industrial corporations in America. Headquartered in Palo Alto, CA, Hewlett-Packard plants are located in 25 U.S. cities, most of which are in California, Colorado, the Northeast, and Pacific Northeast; international facilities are strategically located throughout the world. The company has over 300 sales and support offices in 100 countries worldwide.

Business Overview
HP acquired Apollo Computer in April 1989, which made HP the market leader in technical workstations for a brief period. The lead has been recaptured by Sun Microsystems because of HP's difficulty in reconciling two different workstation product lines; however, Hewlett-Packard is moving rapidly to correct that situation. The announcement of the 9000 Series 400 in June of 1990 was the first step in that direction. The acquisition of Apollo underscores the importance of the technical workstation market and HP's commitment to it. The company has been a leader in promoting open systems, and standards in both hardware and software.

Hewlett-Packard combined its traditional computer organization with the workstation end of the business last fall into the Computer Systems Organization. Other organizational changes also were made to give the responsible managers more direct control over technologies and sales activities. Hewlett-Packard has a reputation second to none for quality products and service. Over half of its revenues for the last five years have come from international operations.

Financial Profile
Revenue in fiscal year 1990 reached $13.2 billion. Earnings were $739 million, a decline of 11 percent from fiscal year 1989.

Management Statement
"Our goal remains to improve our overall financial performance while building for the longer term. We will continue to focus on increasing our revenues and reducing expenses as a percentage of net revenue in fiscal 1991. While economic indicators aren't positive, particularly for the U.S., we were encouraged by signs of order strength during the last quarter of 1990. We believe that HP's strong global presence, combined with our leadership in standards-based computing, technical strength in all areas of its activity, and new management structure, put the company in an excellent position to improve its overall performance in 1991 and in the years ahead."

BSD) enhancements; standard programming languages; the SQL database language; Graphics Kernel System (GKS) graphics; and IEEE 802.3 and 803.3 Ethernet communications.

Applications

Although the Series 800 is primarily oriented toward technical and realtime computing, it is marketed and used for a variety of applications. When UNIX systems are required, the Series 800 is also sold to industry, government, and educational institutions.

Applications Software
To compete in its target markets, Hewlett-Packard ensures that applications software for the Series 800 systems is readily available. Independent software developers are the major source.

Table 1. System Comparison

Model	808S/815S	822S	832S	835S/835SE	842S
System Characteristics					
Date of introduction	June 1989	May 1990	January 1990	April 1988	December 1990
Date of first delivery	3rd quarter 1989	May 1990	March 1990	3rd quarter 1988	December 1990
Operating system	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)
Upgradable from	Not applicable	Not applicable	Not applicable	808S/815S, 825S, 835S	Not applicable
Upgradable to	—/835SE	835S, 835SE	842S	835SE/Not applicable	852S
MIPS	—	11	15	6	29
Relative performance (based on a rating of the 825S at 1.0)	0.85	1.0	1.7	2.1	4.4
Memory					
Minimum capacity (bytes)	8M	8M	16M	8M/24M	32M
Maximum capacity (bytes)	32M/56M	96M	64M	112M	256M
Cache memory (bytes)	—	32K	128K	128K	512K
Input/Output Control					
Number of channels	—	1 to 12	1 to 12	1/1 or 2	1 to 11
Maximum Disk Storage (bytes)	6.8G	24.1G	24.1G	9.1G	45.6G
Number of Workstations	10/50	96	160	30/70	400
Communications Protocols	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS
Purchase Price (basic) ($)	16,000/ 17,500	19,950	32,250	37,000/ 80,000	85,000

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

To attract and retain independent software providers, Hewlett-Packard maintains the marketing, technical, and business aspects of these alliances. The alliances give Series 800 customers access to the services of the independent software vendors (ISVs). After discovering a customer's application need, Hewlett-Packard helps the customer establish contact with the appropriate data system suppliers. In some cases, Hewlett-Packard will provide the customer with third-party packages directly.

Competitive Position

Although the Series 800 superminicomputer product line has a multitude of competitors, its prime competition comes from the Digital VAX 6000 and DECsystem 5500, 5810, and 5820. Digital has the largest percentage of installations within discrete and process manufacturing industries and research and development facilities, HP's primary target market. Other competitors include the Unisys Series 6000 and the NCR 3000.

The HP 9000 Series 800 models are competitive in price, performance, and capabilities with other systems. In order to be price-competitive with Digital, Hewlett-Packard cut prices on some Series 800 peripherals and most of the system units.

While they compare favorably in price/performance with the Digital VAX 6000 Models, the Series 800 models are at a disadvantage in configurability and system expandability. Generally, the VAX 6000 systems offer greater mass storage and terminal I/O device connectivity than the Series 800.

Table 1. System Comparison (Continued)

Model	845S/845SE	850S	852S	855S	860S
System Characteristics					
Date of introduction	January 1990	May 1987	December 1990	April 1989	August 1990
Date of first delivery	January 1990	December 1987	December 1990	May 1989	October 1990
Operating system	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)	HP-UX (a superset of UNIX System V.3)
Upgradable from	835S	Not applicable	842S	850S	850S, 855S
Upgradable to	Not applicable	855S, 860S, 865S, 870/100	Not applicable	865S, 870S/100	865S, 870S/100
MIPS	23	7	52	12	23
Relative performance (based on a rating of the 825S at 1.0)	—	2.3	6.1	3.5	2.1
Memory					
Minimum capacity (bytes)	16M/32M	64M	32M	32M	128M
Maximum capacity (bytes)	128M	128M	256M	128M	768M
Cache memory (bytes)	256K	128K	512K	256K	1024K
Input/Output Control					
Number of channels	2 to 8	2 to 12	2 to 12	2 to 12	2 to 12
Maximum Disk Storage (bytes)	21.4G	18.3G	45.6G	18.3G	85.78G
Number of Workstations	56/100	300	400	400	400
Communications Protocols	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS
Purchase Price (basic) ($)	59,500/ 130,000	125,000	143,000	190,000	230,000

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

The other primary competition with the HP 9000 Series 800 systems comes from Unisys Series 6000 and NCR's 3000 Series microprocessor-based multiuser computers. These vendors are the most active within the UNIX data processing, information system, professional automation, and office automation markets. Generally, when compared to the UNIX offerings from vendors such as Unisys, Texas Instruments, and NCR, the Series 800 systems remain competitive.

Although the Series 800 superminicomputers offer competitive price/performance and capacities, they are not likely to replace competitors' systems. Customers rarely change vendors or computer architectures because of the high cost of the migration. The Series 800 computers do, however, give Hewlett-Packard a better chance to compete with Digital Equipment, Unisys, and NCR for new corporate accounts or for first-time automation sales.

Sales and Distribution

Hewlett-Packard has increased the size of its direct and indirect sales channels to increase the market visibility of the Series 800. The addition of distributors, dealers, and value-added resellers to its network of existing resellers gives HP access to the potential customers it cannot reach through a direct sales force.

In addition to the traditional marketplaces, which still offer significant sales opportunities, HP focuses on a wide range of target markets.

Table 1. System Comparison (Continued)

Model	865S	870S/100, 870S/200	1240
System Characteristics			
Date of Introduction	December 1990	January 1990	March 1990
Date of First Delivery	2Q91	December 1990	April 1990
Operating System	HP-UX	HP-UX	HP-FX
Upgradable from	860S	850S,855S; 870/100	Not applicable
Upgradable to	870S/100	870/200; Not applicable	Not applicable
MIPS	53	53/100	4.0
Relative Performance (based on a rating of the 825S at 1.0)	3.0	4.0/6.4	—
Memory			
Minimum Capacity (bytes)	64M	96M/128M	32M
Maximum Capacity (bytes)	512M	768M	2G
Cache Memory (bytes)	768K	1024K	256K
Input/Output Control			
Number of Channels	2 to 12	2 to 12	—
Maximum Disk Storage (bytes)	85.76G	85.76G	19.5G
Number of Workstations	600	800/1000	100/3,000
Communications Protocols	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS	IEEE 802 Ethernet, NS/9000 (NFT), TCP/IP, ARPA/Berkeley, NFS, uucp, SNA/3770, SNA/3270, NS/DEC VAX/VMS
Purchase Price (basic) ($)	275,000	350,000/645,000	684,900

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Decision Points

Strengths

One of the primary strengths of the HP 9000 Series 800 line is its adherence to de facto and industry standards.

Open Computing Environment

By using common operating environment facilities for the Series 800, Hewlett-Packard creates an "open computing environment." Customers want industry-standard solutions to reduce system and applications porting costs when migrating to another hardware platform, increase applications accessibility, standardize computing across the organization, and provide a degree of compatibility between systems in a multivendor or multiple-system-architecture computing environment.

The Series 800 superminicomputers implement an "open network computing" philosophy to attract customers with a multivendor or multiple-architecture computer infrastructure. The scheme provides the openness required in a departmental and distributed processing environment.

The Series 800 systems can also communicate with IBM System/370-390 architecture mainframe and supermini host systems running MVS or VM operating systems and can directly interface with DECnet-connected Digital computers.

Communications

The Series 800 communications and networking scheme also provides an advantage. The data communications tools used on the Series 800 provide flexibility in creating networking and distributed processing environments and provide the open connectivity required in departmental processing.

The Network Services/9000 software package links the Series 800 systems to HP 9000 workstations, older HP 9000 Series 500 multiuser computers, HP 1000 computers, HP 3000 Series minicomputers, and Vectra PC microcomputers for bidirectional file transfer and remote file access. The UNIX-to-UNIX Copy (*uucp*), Connect to UNIX (*cu*), and UNIX-to-UNIX Execute (*uux*) commands provide for file transfers, electronic mail, remote logins, and remote command executions between the Series 800 and other computers with UNIX implementations.

ARPA Services/9000 Series 800 provides communications among professional workstations and multiuser computers that implement the Department of Defense Advanced Research Projects Agency (ARPA) or Berkeley 4.2 BSD networking

Table 2. Mass Storage

Model	HP 7957B	HP 7958B	HP 7959B
Type	Fixed	Fixed	Fixed
Controller model	Integrated	Integrated	Integrated
Drives per subsystem/controller	1/controller	1/controller	1/controller
Formatted capacity per drive (bytes)	81M	152M	304M
Average seek time (ms.)	29.0	29.0	—
Average rotational/relay time (ms.)	8.3	8.3	—
Average access time (ms.)	37.3	37.3	17.0
Data transfer rate (bytes/second)	1.25M	1.25M	1.25M
Supported by system models	All models	All models	Micro 3000LX, and Micro 3000RX
Purchase price (basic) ($)	3,225	3,875	5,675
Comments	Has a 5.25-inch form factor. Can be rack-mounted. Requires the HP-IB to communicate with the host.	Has a 5.25-inch form factor. Requires the HP-IB for connectivity	Has a 5.25-inch form factor. Requires the HP-IB for connectivity.

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Table 2. Mass Storage (Continued)

Model	C2200A	C2203A, C2201A	C2202A	C2204A
Type	Fixed	Fixed	Fixed	Fixed
Controller model	Integrated	Integrated	Integrated	Integrated
Drives per subsystem/controller	1/controller	1/controller	1/controller	1/controller
Formatted capacity per drive (bytes)	335M	670M	670M	1.34G
Average seek time (ms.)	17.0	17.0	17.0	17.0
Average rotational/relay time (ms.)	7.5	7.5	7.5	7.5
Average access time (ms.)	26.6	26.6	13.5	26.6
Data transfer rate (bytes/second)	2.5M	2.5M	2.5M	2.5M
Supported by system models	All models	All models	All models	All models
Purchase price (basic) ($)	5,325	8,875/8,875	10,050	17,275
Comments	Attaches to host via HP-IB interface.	FL Model features fiber optic controller.	Features a cache HP-IB interface.	Attaches to host via HP-FL interface.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

standards—i.e., the Transmission Control Protocol/Internet Protocol (TCP/IP) communications model for data transportation and system interfacing and the FTP, Telenet, and SMTP or *rcp*, *r*login, and *rsh* protocols for file transfer, terminal login access, electronic mail, and remote command execution.

The Network File System Services/9000 Series 800 provides multivendor remote file access to other computers supporting the de facto industry-standard Network File System (NFS) services. The SNA communications tools permit Series 800 superminicomputers to communicate with IBM System/370-architecture mainframe and supermini host systems with MVS or VM operating systems. The DECnet communications facilities permit the Series 800 computers to interact with DECnet-connected Digital systems with the VAX/VMS operating system.

Common Communications Channel: The most important component of the Series 800's open system approach to networking and distributed processing is the IEEE 802.3 Ethernet local area network. IEEE 802.3 is one of the most popular for interconnecting information systems and workstations—especially at the departmental level. By employing Ethernet, the Series 800 superminicomputers have a common communications channel for interacting with other Hewlett-Packard multiuser computers and workstations and other vendors' supermini-class systems and professional

Table 3. Workstations

Model	HP C1001	HP C1002	HP 2393A	HP 2397A	HP 3081A	Touch-screen II Terminal
Display Parameters						
Screen size	14 inches	14 inches	—	12 inches	—	—
Screen format	80 or 132 columns per line	80 or 132 columns per line	80 or 132 columns per line	—	—	24 lines, 80 columns per line
Screen type	Monochrome	Monochrome	Monochrome	Color	—	—
Keyboard Parameters						
Style	Detachable, low-profile, QWERTY	Detachable, low-profile, QWERTY	Detachable, low-profile, QWERTY	Detachable, low-profile, QWERTY	Detachable, low-profile, QWERTY	Detachable, low-profile, QWERTY
Terminal Interface	RS-232-C	RS-232-C	RS-232-C or RS-422	RS-232-C or RS-422	RS-232-C	RS-232-C
Purchase Price (basic) ($)	895	1,150	2,500	3,925	935	2,868
Comments	A block-mode alphanumeric display terminal. Has an 8-page display memory.	A high-performance block-mode alphanumeric display terminal.	Graphics resolution is 512 x 390 or 640 x 400 pixels.	A graphics terminal with bit-mapped and line drawing graphics.	A data entry terminal packaged for the factory floor environment.	An intelligent workstation with advanced touch-screen technology.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

workstations. With IEEE 802.3 Ethernet, costs for system interconnection are reduced, and data transfer speeds are increased.

Emulators

The SNA and DECnet emulators are also very important. Such facilities are needed in environments where departmental systems frequently access data, files, and application services residing in IBM MVS or VM environments or Digital VAX/VMS environments.

Software Applications

Through HP Plus, Hewlett-Packard's third-party vendor program, customers have access to an abundance of packaged software. The program provides software for both commercial and technical computing, including accounting, manufacturing resource planning, office automation, mechanical engineering, factory floor automation, artificial intelligence, and scientific laboratory automation.

Compatibility

The Series 800 multiuser computers are object-code compatible. Applications developed on one Series 800 multiuser model can be moved to another Series 800 multiuser model without being modified or recompiled. Such compatibility preserves software investments, thus prompting system migration and bottom-to-top and top-to-bottom application development.

The Series 800 models remain program, file, and data compatible with the older, conventionally designed HP 9000 Series 500 multiuser computers, despite their RISC-based HP Precision Architecture. The HP-UX operating system, which runs across the HP 9000 line of conventional and RISC technology-based superminicomputers, provides protection for software investments and a measure of bottom-to-top software development and execution.

Limitations

Although the Series 800 superminicomputers can access IBM mainframes and SNA networks, the connections are difficult to implement. Missing

Table 4. Printers

Model	HP 2563C	HP 2564C	HP 2566C	HP 2567C	HP C1602A
Type	Matrix line	Matrix line	Matrix line	Matrix line	Ink jet
Speed	300 lpm	600 lpm	900 lpm	1,200 lpm	167cps
Character formation	7 of 19 x 18 and 14 of 38 x 18 dot matrix	7 of 19 x 18 and 14 of 38 x 18 dot matrix	7 of 19 x 18 and 14 of 38 x 18 dot matrix	7 of 19 x 18 and 14 of 38 x 18 dot matrix	180 x 180 dpi
Horizontal character spacing (char./inch)	5.0, 10.0, 12.0, 13.3,15.0, 16.7	5.0, 10.0, 12.0, 13.3,15.0, 16.7	5.0, 10.0, 12.0, 13.3,15.0, 16.7	5.0, 10.0, 12.0, 13.3,15.0, 16.7	—
Controller/Interface	RS-232-C, RS-422, or HP-IB interface	RS-232-C, RS-422, or HP-IB interface	RS-232-C, RS-422, or HP-IB interface	RS-232-C, RS-422, or HP-IB interface	RS-232-C, RS-422, or HP-IB interface
Graphics capability	Yes	Yes	Yes	Yes	Yes
Purchase price (basic) ($)	8,490	13,490	26,950	34,000	2,495
Comments	Prints text and alphanumerics in draft or NLQ mode. Can do OCR and bar code printing. Supports 22 sets of typestyles and fonts and 4 types of graphics.	Used as a data center or departmental printer. It prints draft- and NLQ-mode alphanumerics, OCR, bar code, and 4 types of graphics printing.	Used to accommodate high-volume printing at the data center or within the department. Features bar code and OCR printing capabilities.	A heavy-duty printer for high-volume printing. Has OCR and bar code printing capabilities.	Used as a workstation printer

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within the Series 800-to-IBM mainframe communications channel is the popular Advanced Peer-to-Peer Communications (APPC)/LU6.2 protocol. If the Series 800 employed the APPC/LU6.2 protocol and communications interface set, they could establish sessions with applications on IBM mainframes without running the multiple layers of emulation that are now required. Running APPC/LU6.2 reduces the complications and performance degradations caused by file format limitations and emulation overhead.

Compatibility

Programs developed on a Series 500 model cannot run on a Series 800 superminicomputer until the source code has been modified.

The Series 800 multiuser models are compatible with Series 800 superworkstations and conventionally designed HP 9000 workstations for applications development. But applications developed on an HP Precision Architecture-based Series 800 workstation can be moved to the Series 800 superminicomputer without modification, only when the application has been developed to run in a multiuser, multitasking environment. Programs moved between the Series 800 superminicomputers and the conventionally designed HP 9000 Series 200 and Series 300 workstations must be rewritten and recompiled.

Upgrade Options

In-place upgrade options for moving from one Series 800 model to another have been greatly improved, but are still somewhat limited. All but two models, the 835SE and 855S, come with upgrade options. In most cases, replacing the entire main unit requires more effort and expense than performing an upgrade by simply replacing or adding a few circuit boards, as in a file upgrade.

Moving from the Series 500 to a Series 800 is a fairly expensive venture. The move requires the replacement of the main processing cabinet. Only some of the terminals, printers, and magnetic tape units used on the Series 500 can be moved over to the Series 800.

Moving from the aging HP 1000 realtime and compute-intensive timesharing computers to the Series 800 is also very expensive. Besides replacing the basic processing complexes, many peripherals will have to be replaced as well. In addition, much

Table 4. Printers (Continued)

Model	HP 2934	HP 2225	HP 2227A	HP 2228A
Type	Matrix serial	Ink jet	Ink jet	Ink jet
Speed	200 cps	150 cps	192 cps	192 cps
Character formation	9 x 12 and 36 x 24 dot matrix	11 x 12 dot matrix	19 x 12 and 19 x 24 dot matrix	19 x 12 and 19 x 24 dot matrix
Horizontal character spacing (char./inch)	5.0, 10.0, 16.3	6.0, 10.7, 12.0, 21.3	5.0, 6.0, 10.0, 10.6, 12.0, 21.3	5.0, 6.0, 10.0, 10.6, 12.0, 21.3
Controller/Interface	RS-232-C, RS-422, or HP-IB interface	RS-232-C or HP-IB interface	RS-232-C or HP-IB interface	RS-232-C interface
Graphics capability	Yes; at 90 x 90 dpi	Yes; at 96 or 192 x 96 or 192 dpi	Yes; at 96 or 192 x 96 or 192 dpi	Yes; at 96 or 192 x 96 or 192 dpi
Purchase price (basic) ($)	2,795	595	849	649
Comments	Used as either a departmental or workstation printer. Features a draft and NLQ mode. Also can do bar coding.	Used as a workstation printer. Features a draft and NLQ mode.	Used as a workstation printer. Features a draft and NLQ mode.	Used as a workstation printer. Features a draft and NLQ mode.

of the software investment is lost. Applications on the HP 1000 will have to be modified to accommodate the HP 9000 Series 800 architecture, because the HP 1000 architecture and HP 9000 Series 800 architecture are incompatible. This is a time-consuming and personnel-intensive task.

To ease application migration efforts during an HP 1000-to-HP 9000 Series 800 move, Hewlett-Packard offers a migration tool called the Port/HP-UX, which allows the migration of existing HP 1000 programs running under the RTE operating system to be upgraded to the HP 9000 running under the HP-UX operating system. This tool reduces the complexity of the migration, thus lowering expenses, not only in the cost of the application porting itself, but in training costs as well.

Characteristics

System Overview

The HP 9000 Series 800 superminicomputer is based on the RISC-based HP Precision Architecture and uses de facto industry-standard system software facilities and data communications tools. It is oriented toward technical and realtime computing in manufacturing industries and towards general-purpose computing in government and education markets.

The Series 800 line comprises Models 808S, 815S, 822S, 832S, 835S, 835SE, 842S, 845S, 845SE, 850S, 852S, 855S, 860S, 865S, 870S/100, and 870S/200. Memory ranges from 8M to 768M bytes, and disk capacity ranges from 6.8G to 85.76G bytes.

HP's fault tolerant line, the Series 1200, currently consists of only one model—the 1240. Memory ranges from 32M to 2G bytes, and disk capacity ranges from 1.2G to 19.5G bytes. Model 1240's fault tolerance is built into the tightly coupled hardware design; the central processor, memory, and input/output (I/O) are duplicated, and a dual, segmented system bus provides communications among these components.

The Model 1240 supports an open architecture and can be integrated into current user operations. All HP peripherals, service, and support carry over to the new fault-tolerant line. Communications software includes support for standard protocols such as X.25 and Ethernet, IBM-compatible standards such as 3270 SNA, and UNIX-standard software including uucp and remote logon.

See Table 1 for system specifications

Specifications

Data Formats

Basic Format: 32-bit word.

Fixed-Point Operand: The HP 9000 Series 800 superminicomputers, implementing the HP Precision Architecture, support 16-bit and 32-bit integers, either signed or unsigned. Signed integers are in 2's complement

Table 4. Printers (Continued)

Model	HP 3630A	HP 33440	HP 2684A	HP 2680A
Type	Ink jet	Laser	Laser	Laser
Speed	167 cps	8 ppm	20 ppm	45 ppm
Character formation	—	300 x 300 dpi	300 x 300 dpi	180 x 180 dpi
Horizontal character spacing (char./inch)	—	10.0, 16.7	10.0, 16.7	—
Controller/Interface	RS-232-C or HP-IB interface	RS-232-C or RS-422 interface	RS-232-C or RS-422 interface	HP-IB interface
Graphics capability	Yes; at 180 x 180 dpi	Yes; at 300 x 300 dpi	Yes; at 300 x 300 dpi	Yes
Purchase price (basic) ($)	1,395	2,695	19,995	95,470
Comments	Used as a workstation printer.	Used as a departmental printer.	Used for departmental printing. Has 34 built-in fonts, 3 font cartridge slots, and font downloading capabilities.	A heavy-duty printer for high-volume printing. Supports up to 60 print styles. Can do multicopy, continuous form, single-sheet, and label printing.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

form. To help minimize processor complexity, halfword (16-bit) integers must be aligned at even byte addresses, and 32-bit integers must be aligned on a word boundary.

Both packed and unpacked decimal data representations are supported. Packed decimal data is aligned on a word boundary and consists of 7, 15, 23, or 31 Binary Coded Decimal digits.

Floating-Point Operand: The Series 800 computers support single- (32 bit), double- (64 bit), and quadruple- (128 bit) precision arithmetic operations. Single-precision floating-point numbers must be aligned on word boundaries, and double- and quadruple-precision numbers must be aligned on double-word boundaries.

The floating-point instructions can either be executed directly in hardware by a co-processor or emulated in software. A floating-point co-processor performs calculations while the CPU continues to execute in parallel. The Series 800 floating-point format conforms to ANSI/IEEE 754-1985 standard floating-point format.

Instructions: The HP Precision Architecture of the Series 800 defines 140 instructions. Each instruction is 32 bits long and has a fixed format. The instruction set directly implements only simple functions to minimize processor complexity.

Data stored in memory is referenced via Load and Store instructions. This accessing technique, coupled with support for a relatively large number of central processor registers, allows for frequently required operands to be held in the central processor. Minimizing the number of accesses to cache and main memory increases performance.

The arithmetic and logical functions are limited to relatively simple functions with appropriate primitives provided for common operations. More complicated arithmetic and logical functions are implemented by executing a sequence of simple instructions.

Internal Code: ASCII.

Main Storage

Capacity: The Series 800 computers are virtual memory machines. Using 48-bit virtual addresses, the HP-Precision Architecture-based computers provide virtual address spaces of significant size. The virtual memory is organized as a set of 65,536 linear spaces. Each space is 4G bytes long. Spaces are further divided into fixed-length 2K-byte pages, each of which can hold either code, data, or both. A single data structure can be up to 4G bytes long.

Main storage consists of memory array boards having either 2M, 8M, 16M, or 32M bytes of storage implemented in 256K- or 1M-bit dynamic random access memory (DRAM) chips. Each board also has a memory controller. The Series 800 supports from 8M to 128M bytes of main storage. Table 1 provides the main storage capacities for each model.

Checking: The memory controllers perform bit error detection/correction. Seven bits store a Hamming code, enabling each memory controller to correct all single-bit errors automatically and detect all multibit errors.

Storage Protection: Virtual memory access is protected by the translation lookaside buffer hardware in the central processor. The translation lookaside buffer supports protection mechanisms to ensure that the currently executing process can perform only the code, data, or I/O accesses for which it is authorized. Included in the access checking mechanisms are four privilege

Table 5. Cartridge and Magnetic Tape Equipment

Model	7979A	7980XC	9144A	35401A	C1511A	9145A
Type	0.5 inch reel-to-reel	0.5 inch reel-to-reel	0.25 inch cartridge	0.25 inch cartridge auto changer	Digital Data Storage (DDS) format tape	0.25 inch cartridge
Format						
Number of tracks	—	—	16	16	32	C1511A
Recording density	1600 bpi	1600/6250 bpi	—	—	—	256 bytes per frame
Recording mode	PE	PE/GCR	DC 600 HC	DC 600 HC	—	HCD 75
Characteristics						
Controller model	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Storage capacity (bytes)	40M	40/140M	67.1M	67.1M (on each cartridge)	1.3G	133M
Tape speed (inches/second)	125	125	60	60	—	120
Data transfer rate (bytes/second)	200K	781K	35K	35K	183K	31K
Supported by system models	All models	All models	All models	All models	All models	All Models
Purchase Price (basic) ($)	13,400	29,000	2,860	8,150	7,500	4,460
Comments	Requires an HP-IB for connectivity.		Requires a HP-IB for connectivity.	Has an auto changer that accesses up to 8 cartridges from a removable magazine. An HP-IB interface is required to communicate with the host.	Requires a HP-IB for connectivity.	Requires a HP-IB for connectivity.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

levels. Protection parameters are associated with each page, and these parameters define the required privilege level to access that page, as well as what types of accesses are permitted. For each requested access, these privilege parameters are checked against the privilege level of the currently executing process to ensure the user has sufficient authorization to perform a particular access.

Main storage is backed up in such a way that if AC power is lost and restored within 15 minutes, the operating system is automatically restarted and processing can resume without data loss. Batteries power memory only for 15 minutes.

Cache Memory: All the Series 800 computers have a cache. By using a cache, the central processors have high-speed access to frequently used data and instructions. This improves systems performance, because fetching instructions and data from cache memory is faster than accessing instructions and data in main memory. The use of cache memory overcomes the discrepancy between the memory cycle speed and the faster data-access rate of the central processor.

Series 800 computers have up to 256K bytes of cache memory. Separate instruction and data caches (each 64K bytes in size) promote parallel operation. Both the instruction cache and the data cache are one-way associative (direct mapped) and are organized as sets of 4,096 cache lines, with 16 bytes per cache line. The instruction cache is read-only. A write-to cache management scheme is used with the data cache.

To minimize machine cycle time, the I/O subsystems do not interface to the cache. Furthermore, it is the responsibility of the software to update main storage contents with any modified cache contents before launching a direct memory access (DMA) I/O operation.

Central Processor

General: The Series 800 processor implements HP-Precision Architecture, which embodies the basic principles of Reduced Instruction Set Computers (RISC).

The Series 800 processor is hardwired and pipelined at the instruction level so that three to five instructions can be processed at the same time. Instructions are executed directly in hardware and typically execute in only one clock cycle. Branch instructions and Load/Store instructions may require more than one cycle, but they are implemented and scheduled to achieve effective execution rates approaching one cycle per instruction.

The central processor of all Series 800 models includes a CPU with instruction unit and execution unit, cache controller and cache, and the translation lookaside buffer.

Control Storage: The HP 9000 Series 800 does not provide any control storage, as it is not microprogrammed.

Registers: The HP Precision Architecture specifies register-intensive operation. Calculations are performed only between high-speed registers, or between a register and a constant held in the instruction. There are 32 available 32-bit-wide, general-purpose registers for holding operands and results. There are also 32 control and status registers used for interrupt processing, virtual memory access protection, and other system functions. Eight space registers specify up to eight possibly different 4G-byte virtual spaces that can be used for a given operation; these registers can hold 16-bit or 32-bit space identifiers. Five of these space registers can be used directly by application programs. Two registers are used to point to the next instruction to be executed.

Register-intensive operation increases processor performance. Since data is not processed in memory, the number of references to memory are reduced. Memory references require machine cycles. By reducing the number of memory references, the time to execute an instruction is reduced. Furthermore, the circuitry within the register file is faster than the circuitry in memory; data in a register can be processed quicker than in memory, thus promoting faster processor speed.

Addressing: As stated previously, the HP Precision Architecture supports 48-bit virtual addressing. This 48-bit addressing offers 4G bytes of virtual memory for each of the 65,536 linear spaces. The virtual-to-physical address translation is performed by the translation lookaside buffer. The translation lookaside buffer converts the 48-bit virtual address to a 28-bit physical address, to cache recently accessed virtual page translations, and to implement page-level access protection.

In addition to virtual addressing, HP Precision Architecture provides direct access to physical memory locations. Low-cost systems have the option of providing only physical addressing if appropriate. The smallest addressable quantity is a byte.

Peripherals

Input/Output Control

The Models 808S and 815S use an HP Precision Bus (HP-PB) for direct I/O connection, while the other Series 800 Models use the channel I/O bus. The HP-PB transfers I/O data at a sustained throughput speed of 21M bytes per second. A backplane interconnects the CPU and I/O card slots.

The channel I/O bus requires a channel I/O adapter, which interfaces the channel I/O bus to the central bus, synchronizing differing speeds and bandwidths. It also manages direct memory access transfers between main storage and channel I/O interfaces with their associated peripherals. The channel I/O adapter accomplishes this function with little central processor intervention, interrupting only to signal completion of DMA transfers. Large blocks of data can be transferred to and from main storage at rates up to 5M bytes per second with negligible central processor overhead.

Disk storage devices, magnetic tape drives, printers, plotters, and instrumentation connect to a channel I/O bus via a Hewlett-Packard Interface Bus (HP-IB). This eight-bit-wide, IEEE-488 standard interface supports up to 14 slow-speed or four high-speed devices.

The HP-IB interface is managed by the HP-IB card, which puts peripheral communications onto the channel I/O bus and pulls communications from the channel I/O bus. The HP-IB card consumes one I/O slot on the channel I/O bus.

The Hewlett-Packard Fiber Optic Link (HP-FL) provides connectivity for up to eight Winchester disk storage devices. The interface supports transfer rates of 5M bytes per second. Additionally, the HP-FL interface allows Winchester disk storage devices to be placed up to 500 meters away from the host, surpassing the 15-meter capability of the HP-IB interface. The HP-FL interface is supported by the HP-FL card. Each HP-FL card consumes one I/O slot on the channel I/O bus.

Asynchronous six-channel multiplexers connect workstations, modems, serial printers, and other serial devices. Each multiplexer provides six asynchronous ports with full-duplex modem control capability for the connection of RS-232-C devices. Each port supports one device and sends and receives data 19.2K bits per second (bps).

The multiplexers connect to the channel I/O bus via multiplexer interfaces. Each multiplexer interface requires one I/O slot.

A parallel asynchronous first-in, first-out (FIFO) interface is used to connect factory floor, scientific devices, and automation control devices to the Series 800 host. It provides multipurpose 8- or 16-bit parallel communications capabilities between external devices and the Series 800 host.

The parallel asynchronous FIFO interface card hosts the parallel asynchronous FIFO interface. The interface card requires one I/O slot on the channel I/O bus.

Software

Operating Systems

The Series 800 computers operate under the HP-UX operating system.

HP-UX is a superset of the AT&T UNIX System V.3 operating system. Complying with the AT&T UNIX System V Interface Definition and System V Verification Suite (SVVS) specifications for compatibility, HP-UX includes all the non-hardware-dependent utilities from UNIX System V.3. In addition, the HP-UX operating system contains University of California at Berkeley Release 4.2 Berkeley Software Distribution (BSD) commands and utilities and HP-developed enhancements. Significant Hewlett-Packard enhancements include realtime processing extensions, native-language support, and power failure recovery capabilities.

HP-UX realtime processing tools include the following:

- Realtime process scheduling. The HP-UX process scheduler differentiates between realtime and time-shared processes. The scheduler will always dispatch a process with realtime priority before a process with a time-shared priority.
- Kernel preemption. In traditional UNIX systems, a process executing in its own "user" code can be preempted immediately, but if the kernel is executing in behalf of a process, such as when the user process makes a system call, that process surrenders the central processor only voluntarily. Thus, the kernel can execute for a significant period of time before giving the central processor another process. This period of time is called "preemption latency" and is unacceptable in a realtime system. Hewlett-Packard, therefore, placed facilities within HP-UX that allow a realtime process to preempt the kernel.
- Process locking. This feature prevents paging or swapping of a process, so it can be guaranteed immediate execution when it becomes runnable.
- File locking. A region of a file or the entire file can be locked.
- File space preallocation. In standard UNIX systems, file system blocks are allocated dynamically for every write operation. HP-UX can preallocate file system space for realtime applications to avoid this overhead during activities such as high-speed continuous data collection.

Other HP-UX Features: The native-language support feature provides for localization—the process of adapting a software application for use in different countries. The native-language support tools permit installations to develop applications that are localizable with software modification.

The power failure recovery feature ensures transaction and data integrity when power is lost. When HP-UX detects a power failure, the central processor state and cache data are flushed out to battery backed-up memory. If power is restored within 15 minutes, I/O devices are reset, I/O transactions going on at the time of failure are restored, and a signal is sent to every process informing it of the power failure.

Concurrent Processing: With HP-UX, over 500 user processes can run concurrently. To support this capability, HP-UX implements UNIX System V's "pipes," FIFO files, and System V IPC (messages, semaphores, and shared memory). The pipes and FIFO features allow interprocess communications, in which data can be passed asynchronously between two tasks using a high-level language's read and write commands. IPC facilities allow interprocess communications and synchronization using system calls unique to each IPC subsystem. In addition, HP-UX intrinsics permit synchronization to control the initiation and resumption of task execution.

Memory: HP-UX virtual memory consists of 4G-byte spaces which are divided into 2K-byte pages. Pages can hold code, data, or a combination of both. Codes can span spaces and a single data structure can be up to 4G bytes in length. Using HP-UX' demand loading feature, the user can choose between having an entire program loaded into memory before execution and loading program segments only when they are required for execution.

File System: HP-UX implements the UNIX hierarchical file system, which allows users to organize files in a logical fashion. Permission for each file to read, write, and execute can be assigned on an individual, group, or community basis.

Utilities: To exchange data with other HP computers, HP-UX supports utilities that selectively convert and copy HP-UX files to Logical Interchange Format (LIF), a vehicle for transporting ASCII files on removable mass storage media. Standard UNIX commands are supported to transport files between HP-UX and other UNIX systems.

Database Management System

Database management is provided by *Allbase/HP-UX*, a database management system (DBMS). Allbase/HP-UX offers data independence so that changes can be made to the database structure without affecting application programs. Concurrent access allows multiple users to access data simultaneously. Automatic locking and automatic (rollback) recovery ensure data integrity.

Both a relational and a network data model interface are offered with Allbase/HP-UX. HP SQL is selected when the application requires a relational model interface, and HP IMAGE is chosen when a network model interface is needed. HP SQL maintains compatibility with IBM's Structured Query Language (SQL) product. HP-IMAGE is upwardly compatible with existing Image/9000 databases—the databases running on HP 9000 technical workstations and the defunct 500 multiuser computers.

HP Visor/HP-UX is available to users of the HP-SQL interface in Allbase/HP-UX. It gives HP SQL users menu-driven tools to perform ad hoc queries and generate customized reports.

Languages

HP-UX supports the following high-level programming languages: Fortran-77, Pascal, C, and Cobol. These languages are provided with optimization and full symbolic support. They can be linked at the object level. Programs written in any of HP-UX supported languages can access all HP-UX system intrinsics and other libraries.

Communications

Low-level networking is performed by LAN/9000 Series 800 Link software and software for X.25 network connectivity. Application-level networking is performed by packages such as Network Services/9000 Series 800, ARPA Services/9000 Series 800, Network File System Services/9000 Series 800, and Network Services/DEC VAX/VMS (NS/DEC VAX/VMS).

The ***LAN/9000 Series 800 Link software*** provides IEEE 802.2 and 802.3 Ethernet link control and media access control functions and contains the transport and interface programs required to connect a Series 800 to a IEEE 802.2 or 802.3 Ethernet network. It corresponds to layers 1 through 5 of the International Organization for Standardization's (ISO's) Open Systems Interconnection (OSI) networking model. The transport-level protocols are based on the de facto industry-standard Transmission Control Protocol/Internet Protocol (TCP/IP) communications set. The set of node management programs provide for online configuration, diagnostics, and logging.

A ***X.25 host packet assembler/disassembler software package*** allows the Series 800 computers to communicate over a X.25 packet-switching public or private data network (PDN). Its primary functions are to provide login functions for terminals connected to the Series 800 and to allow protocols to run across the network.

The ***Network Services/9000 Series 800*** enables the Series 800 to transfer files to and from HP 9000, HP 1000, HP 3000, and HP Vectra (IBM PC-compatible) computers using the Network File Transfer (NFT) protocol. It also provides for remote file access between HP 9000 computers using the Remote File Access (RFA) protocol and network interprocess communications among Series 800 computers using the Network Interprocess Communication (NET IPC) protocol.

ARPA Services/9000 Series 800 allows communications among professional workstations and multiuser computers that implement the Department of Defense Advanced Research Projects Agency (ARPA) and Berkeley 4.2 BSD networking standards. The ARPA services include FTP for file transfer, Telenet for terminal login access, and SMTP for electronic mail. The Berkeley 4.2 BSD networking services include *RCP* for file transfer, *r*login for terminal login access, and *RSH* for remote command execution.

Network File System Services/9000 Series 800 provides multivendor remote file access to other computers supporting the standard Network File System (NFS) services. It also provides NFS-specific Remote Procedure Call (RPC) and Yellow Pages (YP) network administration services.

Network Services/DEC VAX/VMS (NS/DEC VAX/VMS) integrates Digital Equipment's VAX/VMS computers into the Series 800 environment. It permits files to be transferred between Series 800 and Digital Equipment VAX/VMS computers and allows bidirectional virtual services between Series 800 and VAX/VMS computers.

The ***UNIX UUCP, UUX, CU, and mail commands*** within HP-UX are useful when communicating with other UNIX or HP-UX-based systems. The *UUCP* command performs file transfers and works in conjunction with the mail command to allow electronic mail to be sent to a user on another computer. The *UUX* command allows remote command execution, and the *CU* command permits terminal emulation.

IBM communications are supported via the *HP-UX Gateway SNA/3270 for HP 9000 Series 800* and the *HP-UX Gateway SNA/3770 for HP 9000 Series 800* communications packages. These packages allow for interactive and batch communications between a Series 800 and an IBM System/370-compatible mainframe using SNA 3270 and SNA 3770 protocols.

Both HP-UX Gateway SNA/3270 for HP 9000 Series 800 and the HP-UX Gateway SNA/3770 for HP 9000 Series 800 run on a LAN 9000-attached HP 9000 Model 300 workstation. The workstation functions as a gateway server, providing a cluster of Series 800 computers with access to IBM 3270 and 3770 communications—interactive access, remote command execution, and file transfer.

Communications

Communications Control

The Series 800 computers communicate with each other, with other Hewlett-Packard computers, and with other vendors' systems via the Hewlett-Packard LAN/9000 local area network. The LAN/9000 is an Ethernet LAN supporting IEEE 802.2- or IEEE 802.3-recommended media and protocols. It has a bandwidth of 10M bps and allows file transfer, remote file access, process start and terminate, and communications between processes running anywhere on the network.

The Series 800 systems are connected to the network through an intelligent controller known as the *LAN/9000 Series 800 Link*. The LAN/9000 Series 800 Link contains the hardware and transport and interface software required to connect a Series 800 computer to an IEEE 802.2 or IEEE 802.3 cable. Hardware components of the LAN/9000 Series 800 Link include the following:

- Local Area Network Interface Controller (LANIC)—a microprocessor-based communications controller that plugs into the Series 800

backplane. It handles buffering, IEEE 802.2 and 802.3 protocols, and error checking; it also tracks network statistics.

- Attachment Unit Interface (AUI) Cable—the interface cable plus a 2-meter internal LANIC cable connect the LANIC to the Medium Attachment Unit (MAU).
- Medium Attachment Unit (MAU)—provides the physical and electrical connection by connecting the AUI cabling to the network coaxial cable. The MAU is powered by the LANIC through the AUI cable. The MAU receives signals from, and sends signals to, the coax cable; it also detects collisions resulting from two nodes transmitting simultaneously.

LAN/9000 Series 800 Link software is described in the "Communications" subsection of the "SOFTWARE" section.

The Series 800 systems can also communicate with other computer systems using one or more multiplexer channels and hardwired modem links. The asynchronous six-channel multiplexer accommodates up to six communications links for remote communications using RS-232-C communications lines. The X.25 multiplexer provides for attachment to a X.25 packet-switching network.

IBM communications are supported via SNA 3270 and 3370 products using a LAN-attached HP 9000 Series 300 workstation as a nondedicated gateway. The gateway allows a cluster of Series 800 computers to have access to resources on an IBM System/370-compatible mainframe running under MVS or VM operating systems.

Operating Environment

Specifications

The following tables highlight the physical and environmental specifications of the HP 9000 Series 800 computers.

Physical Specifications

Model	Height	Width	Depth	Weight
808S	12.3″	12.8″	17.1″	59 lb.
815S	12.3″	12.8″	17.1″	45 lb.
822S	29.5″	14.8″	27.9″	243 lb.
832S	29.5″	14.8″	27.9″	243 lb.
835S	9.2″	12.8″	19.7″	51 lb.
835SE	18.4″	12.8″	19.7″	86 lb.
842S	29.5″	14.8″	27.9″	243 lb.
845S	9.2″	12.8″	19.7″	51 lb.
845SE	18.4″	12.8″	19.7″	86 lb.
850S	39.4″	51.2″	27.9″	880 lb.
852S	29.5″	14.8″	27.9″	243 lb.
855S	39.4″	51.2″	27.9″	880 lb.

Physical Specifications

Model	Height	Width	Depth	Weight
860S	39.4″	51.2″	27.9″	880 lb.
865S	39.4″	51.2″	27.9″	880 lb.
870S/100	39.4″	51.2″	27.9″	880 lb.
870S/200	39.4″	51.2″	27.9″	880 lb.
1204	70.0″	23.0″	42.0″	730 lb.

Environmental Specifications

Model	Operating Temp. (°F)	Operating Humidity (%)	Heat Dissipation (Btus/Hr.)
808S	32-131	15-95	1,368
815S	32-131	15-95	1,368
822S	41-104	20-80	2,190-3,410
832S	32-131	20-80	1,790
835S	32-132	15-96	2,050
835SE	32-132	15-96	2,050
842S	41-104	20-80	2,190-3,410
845S	32-131	15-95	2,034
845SE	32-131	15-95	2,034
850S	41-104	15-80	3,458-6,068
852S	41-104	20-80	2,190-3,410
855S	41-104	15-80	3,835-7,016
860S	41-104	15-80	3,835-7,016
865S	41-104	15-80	3,578-8,768
870S/100	41-104	15-80	3,578-8,768
870S/200	41-104	15-80	3,578-8,768

Configuration Rules

See pricing chart for standard Series 800 bundled configurations.

Mass Storage

See Table 2 for specifications on mass storage equipment.

Workstations

See Table 3 for specifications on workstations for the HP 9000 Series 800.

Printers

See Table 4 for printer specifications.

Magnetic Tape

See Table 5 for specifications on magnetic tape equipment.

Other

Several types of plotters can be attached to the Series 800 computers. The HP 7550A is an eight-pen plotter supporting A- and B-size media. The HP 7570 is an eight-pen plotter that uses C- and D-sized media. The HP 7595 and HP 7596 are eight-pen plotters that accommodate A- and E-size media.

Pricing and Support

Policy

The Series 800s are sold primarily through Hewlett-Packard's direct sales force and are available on a purchase-only basis. Series 800s are offered as preconfigured systems; the HP-UX operating system, device I/O libraries, the C programming language, a symbolic debugger, and an assembler are included as part of the basic system.

Documentation

CD-ROM Subscription Service

HP LaserROM, a new information service, speeds referencing and simplifies technical publication use. LaserROM uses compact disk read-only memory (CD-ROM) technology coupled with information retrieval software to deliver manuals, bulletins, catalogs, and other technical publications. Each HP LaserROM disk contains up to 200,000 pages of support information. The full-text retrieval software instantly pinpoints requested information. Customers have direct access to information and do not need numerous physical manuals and publications.

Service/Support

Hardware Support

Several types of monthly maintenance contracts are available for the computer systems hardware. The Basic Monthly Maintenance hardware support agreement provides on-site servicing with next-day response. Under the agreement, service is available from 8 a.m. to 5 p.m., or up to 24 hours a day, five days a week. The Standard Monthly Maintenance hardware support agreement provides on-site servicing with a four-hour response time. The coverage period is from 8 a.m. to 9 p.m., or up to 24 hours a day, five to seven days a week. Customers who prefer to employ Hewlett-Packard service on a time-and-materials basis can take advantage of the Per-Call service. A Hewlett-Packard representative can tailor a maintenance plan to meet their needs.

Support Programs: SuccessLine, HP's hardare service program, has been available for about one year. SuccessLine features four levels of support, an expansion of the previous two levels.

Priority Plus Support offers maximum coverage 24 hours a day for critical applications.

Priority Support offers maximum coverage during normal business hours.

Next Day Support offers next-day response during normal business hours.

Scheduled Support is the lowest cost support level and offers scheduled weekly visits to your location.

For additional information on the SuccessLine services, contact your HP representative.

Software Support

HP increased the level of software service and support for the HP 9000 Series 800 superminicomputers with the release of its HP TeamLine, HP ResponseLine, and HP BasicLine. These new software support services effectively replace existing support services, adding more problem resolution, software maintenance, and usage assistance.

Custom Support

The Custom Support Plan (CSP) is an extension to the Account Management Support plan for users requiring additional personalized assistance. It allows the incorporation of any software support service Hewlett-Packard offers into an annual plan developed by the user and the Hewlett-Packard account support representative.

Training

Training courses are available at an educational center or at the customer site. A full range of courses is offered to meet the need to manage, operate, and develop applications. Typical topics include system introduction, management, operations, application and systems programming, database administration, and data communications.

Equipment Prices

		Purchase Price ($)	Next Day Maint. Charge ($)	Priority Maint. Charge ($)
Series 800 Base Systems				
A1625A	Model 808S system with a system processing unit containing an HP-PA CPU, 8MB memory, 2 serial ports, 6-slot I/O box, 8 additional serial ports, 152MB disk, 67MB tape, and an 8-user HP-UX	16,000	77	102
A1071A	Model 815S system bundle including a system processor containing an HP-PA CPU, 8MB of main storage, 2 serial ports, and a 12-slot box; aan 8-user HP-UX; an HP-IB, 8 additional serial ports, a 335M-byte disk, 67M-byte ¼-inch tape drive, battery backup unit, and Design Plus Cabinet	17,500	79	105
A1410A	Model 815S system with a system processing unit containing an HP-PA CPU, 8MB of main storage, 2 serial ports, a 12-slot box, and an 8-user HP-UX	14,900	46	55
A1716A	Model 822S system with an HP-PA system processing unit, floating-point co-processor, 8MB memory, an 8-channel multiplexer, 335MB disk, 1.3GB DDS cartridge tape drive, an HP-IB interface, C1001G console, and an 8-user HP-UX	19,950	152	190
A1044A	Model 832S system with an HP-PA system processing unit, floating-point co-processor, 16MB memory, an 8-channel serial multiplexer, 335MB disk drive, 1.3GB DDS cartridge tape drive, an HP-IB, C1001G console, and an 8-user HP-UX	32,250	235	293
A1035A	Model 835S system with a system processor containing a floating-point co-processor, 8M bytes of main storage, a channel I/O bus, an HP-IB, and a 6-channel multiplexer; a system processor cabinet; an 8-user HP-UX; a C compiler; a symbolic debugger; an assembler; and an I/O device library	37,000	207	276
A1040A	Model 835SE system with a system processor containing a floating-point co-processor, 24M bytes of main storage, 2 channel I/O buses, an I/O extender, an HP-IB, a 6-channel multiplexer; a system processor cabinet; an 8-user HP-UX, a C compiler and debugger; an assembler; and an I/O library HP-UX, a C compiler and debugger; an assembler; and an I/O device library	80,000	321	427
A1154A	Model 842S system with an HP-PA system processing unit, 32MB memory, an 8-channel multiplexer, 670MB disk drive, 1.3GB DDS cartridge tape drive, an HP-IB, C1001G console, and an 8-user HP-UX	85,000	477	382
A1608A	Model 845S system with an HP-PA system processing unit, floating-point co-processor, 16MB memory, a 6-channel multiplexer, an HP-IB, and an 8-user HP-UX	59,500	323	406
A1609A	Model 845SE system with an HP-PA system processing unit, floating-point co-processor, second integrated channel, I/O adapter and 8-slot I/O expander, 32MB memory, a 6-channel multiplexer, an HP-IB, and an 8-user HP-UX	130,000	532	666
9742A	Model 850S system with a system processor containing a floating-point co-processor, 48M bytes of main storage, 2 channel I/O buses, an HP-IB, and a 6-channel multiplexer; a system processor cabinet; an 8-user HP-UX; a C compiler; a symbolic debugger; an assembler; and an I/O device library	125,000	562	704
A1155A	Model 852S system with an HP-PA system processing unit, 64MB memory, a 8-channel serial multiplexer, 670MB disk drive, 1.3GB DDS cartridge tape drive, an HP-IB, C1001G console, and an 8-user HP-UX	143,000	542	677
A1114A	Model 855S system with a system processor containing a floating-point co-processor, 48M bytes of main storage, 2 channel I/O buses, an HP-IB, and a 6-channel multiplexer; a system processor cabinet; an 8-user HP-UX; a C compiler; a symbolic debugger; an assembler; and an I/O device library	190,000	667	835
A1843A	Model 860S system with an HP-PA system processing unit, floating-point co-processor, 48MB memory, 2 channel I/O adapters, a 6-channel multiplexer, an HP-IB, and an 8-user HP-UX	230,000	667	835
A1845A	Model 865S system with an HP-PA system processing unit, floating-point co-processor, 64MB memory, two 16MB/64MB memory controller cards, 2 channel I/O adapters, a 6-channel multiplexer, an HP-IB, and an 8-user	275,000	1,224	1,530

		Purchase Price ($)	Next Day Maint. Charge ($)	Priority Maint. Charge ($)
Series 800 Base Systems (Continued)				
	HP-UX			
A1135A	Model 870S/100 system with an HP-PA system processing unit, floating-point co-processor, 96MB memory, two 16MB/64MB memory controller cards, 2 channel I/O adapters, a 6-channel multiplexer, an HP-IB, and an 8-user HP-UX	350,000	1,360	1,700
A1146A	Model 870S/200 system with 2 HP-PA processing units, floating-point co-processor, 128MB memory, two 16MB/64MB memory controller cards, 2 channel I/O adapters, a 6-channel multiplexer, an HP-IB, and an 8-user HP-UX	645,000	2,000	2,500
Series 1200 Base Systems				
	Model 1240 system with 2 central processors, 256KB of cache memory, floating-point co-processor, 2 16MB memory modules, and 32 asynchronous I/O ports	684,900	—	—
Field Upgrades				
A1036A	Model 825S to 835S central processor upgrade package	19,500	NA	NA
A1038A	Model 825S to 835SE multiuser computer system upgrade package	65,000	NA	NA
A1610A	Model 825S to 845S central processor upgrade package	40,000	161	202
A1611A	Model 825S to 845SE central processor upgrade package	110,000	370	462
A1744A	Model 832S to 842S central processor upgrade package	65,500	140	175
A1745A	Model 832S to 852S central processor upgrade package	125,000	300	375
A1039A	Model 835S to 835SE multiuser computer system upgrade	45,000	NA	NA
A1612A	Model 835S to 845S central processor upgrade package	30,000	116	130
A1615A	Model 835S to 845SE central processor upgrade and expansion package	90,000	325	390
A1613A	Model 835S to 845SE central processor upgrade package	55,000	211	239
A1746A	Model 842S to 852S central processor upgrade package	79,500	160	200
A1614A	Model 845S to 845SE central processor upgrade and expansion package	70,000	209	260
A1118A	Model 850S to 855S central processor upgrade package	93,500	106	132
A1844A	Model 850S to 860S central processor upgrade package	128,000	240	300
A1846A-723	Model 850S to 865S central processor upgrade package	163,750	677	845
A1141A-723	Model 850S to 870S/100 central processor upgrade package	242,500	NA	NA
A1808A	Model 855S to 860S central processor upgrade package	74,500	NA	NA
A1846A-724	Model 855S to 865S central processor upgrade package	112,500	557	695
A1141A-724	Model 855S to 870S/100 central processor upgrade package	177,500	NA	NA
A1846A-725	Model 860S to 865S central processor upgrade package	86,250	557	695
A1141A-725	Model 860S to 870S/100 central processor upgrade package	155,000	1,386	1,730
A1141A-727	Model 865S to 870S/100 central processor upgrade package	127,500	NA	NA
A1142A	Model 870S to 870S/100 central processor upgrade package	295,000	640	800
Series 800 Accessories				
A1404A	8M-byte error correcting memory for Models 808, 815S, 822, 832, 842, and 852	8,000	NC	NC
A1436A	16M-byte error correcting memory for Models 822, 832, 842, and 852	20,000	NC	NC
A1437A	32M-byte error correcting memory for Models 822, 832, 842, and 852	40,000	NC	NC
A1010A	8M-byte memory board for Models 825, 835, and 845	10,000	NC	NC
A1037A	16M-byte memory board for Models 825, 835, and 845	20,000	NC	NC
A1623A	32M-byte error correcting memory for Models 825, 835, and 845	40,000	NC	NC
A1103A	16M-byte memory controller	12,000	NA	NA
A1152A	64M-byte memory board for Models 865S and 870S	95,600	NC	NC
A1104A	16M-byte memory board for Models 850S and 855S	23,900	NC	NC
A1013A	I/O expander with channel I/O adapter for Model 835SE	16,000	17	23
A1101A	Channel I/O adapter for Models 850S and 855S	15,750	12	15
A1122A	Channel I/O terminal expander for Models 850S and 855S	26,250	41	51
A1123A	Expansion kit for A1122A	21,000	41	52
A1124A	Add-on expander for A1122A	24,375	39	49
27110B	HP-IB interface	2,000	3	4
27114A	A parallel asynchronous FIFO interface	1,780	2	3
27111A	Fiber optic peripheral interface CIO card	5,970	4	5
98190A	Asynchronous 16-channel CIO multiplexer	5,760	10	14
98196A	Asynchronous 6-channel CIO multiplexer	2,675	5	6
A1014A	A powerfail battery backup system	5,000	—	—

		Purchase Price ($)	Next Day Maint. Charge ($)	Priority Maint. Charge ($)
Mass Storage				
C2200A	335M-byte fixed disk subsystem with an HP-IB controller	5,325	13	16
C2201A	670M-byte fixed disk subsystem with an HP-FL controller	8,875	20	25
C2202A	670M-byte fixed disk subsystem with an HP-IB controller cache	10,050	19	25
C2203A	670M-byte fixed disk subsystem with an HP-IB controller	8,875	20	25
C2204A	1.34G-byte fixed disk subsystem with an HP-FL controller	17,275	30	37
C2281A	335M-byte embedded disk drive for Models 822S and 832S	5,050	NA	NA
C2282A	670M-byte embedded disk drive for Models 822S, 832S, 842S, and 852S	6,850	NA	NA
7957B	81M-byte Winchester disk drive with integral controller and an HP-IB interface	3,225	19	24
7958B	152M-byte Winchester disk drive with integral controller and an HP-IB interface	3,875	21	26
7959B	304M-byte Winchester disk drive with integral controller and an HP-IB interface	5,675	23	29
Magnetic Tape Equipment				
7979A	Magnetic tape drive with a 1600 bpi read/write mode and a tape speed of 125 ips	13,400	38	47
7980A	Magnetic tape drive with a 1600/6250 bpi read/write mode and a tape speed of 125 ips	23,200	38	57
7980XC	Magnetic tape drive with a 1600/6250/6250C bpi	29,000	38	47
9144A	Cartridge tape drive capable of storing 67M bytes of data on tape cartridges	2,860	11	21
9145A	Cartridge tape drive capable of storing 133M bytes of data	4,460	11	21
35401A	Cartridge tape drive with an auto changer that accommodates 8 tape cartridges	8,150	35	42
C1511A	DDS-format tape drive with an HP-IB (Series 6400 Model 1300H)	7,500	30	38
Printers and Plotters				
C1602A	PaintJet XL	2,495	6	12
C2106A	DeskJet 500	729	NA	NA
2562C	Matrix line printer, 300/420 lpm	5,500	46	58
2563C	Matrix line printer that runs at up to 300 lpm	8,490	50	64
2564C	600-lpm matrix line printer	13,490	81	102
2566C	900-lpm matrix line printer	26,950	190	237
2567C	1,200-lpm matrix line printer	34,000	201	252
2934A	200-cps dot matrix impact printer	2,795	16	31
2235B	RuggedWriter matrix serial printer running at up to 480 cps	2,095	12	23
2225A	150-cps inkjet printer	595	4	7
2227A	A 192-cps inkjet printer that accommodates paper with a width ranging up to 14 inches	849	4	7
2228A	A 192-cps inkjet printer that accommodates 8.5-by-11-inch paper	649	4	7
3630A	Inkjet printer running at up to 167 cps	1,395	5	10
33440A	8-ppm laser printer	2,695	30	54
33459A	LaserJet III D, 8-ppm	3,595	23	41
2684A	20-ppm laser printer	19,995	240	300
7550A	A- and B-size, 8-pen plotter with sheet feeder	3,995	23	40
7570A	C- and D-size, 8-pen plotter	3,995	11	19
7595A	8-pen plotter with A- and E-size media	8,495	23	40
7596B	8-pen roll-feed plotter with A- and E-sized media	9,995	23	40
Terminals and Workstations				
C1001A	HP 700/92 alphanumeric display terminal	895	4	7
C1002A	HP 700/94 alphanumeric display terminal	1,150	4	7
C1006A	HP 700/43 alphanumeric display terminal	499	4	7
C2301B	700/X-X Window terminal base unit	2,695	4	7
C2304B	700/X High resolution color X Window terminal	4,995	9	17
2393A	HP 2393A graphics terminal	2,500	6	11
2397A	HP 2397A color graphics terminal	3,925	7	14

		Purchase Price ($)	Next Day Maint. Charge ($)	Priority Maint. Charge ($)
Data Communications				
2334A	X.25 multiplexer	2,560	18	22
98196A	LAN/9000 Series 800 Link hardware for Models 825S, 835S, and 835SE	—	13	18
98196A	LAN/9000 Series 800 Link for Models 825S, 835S, and 835SE; includes the LAN controller, media link, and link control, interface, and transport software	4,120	13	18
98196A	LAN/9000 Series 800 Link for Model 840S; includes the LAN controller, media link, and link control, interface, and transport software	5,660	13	18
98196A	LAN/9000 Series 800 Link for Model 850S; includes the LAN controller, media link, and link control, interface, and transport software	5,600	13	18

Software Prices

		License Fee ($)
Operating System		
92675L	1- to 8-user version of HP-UX Operating System	2,450
92452L	1- to 16-user version of HP-UX Operating System	4,450
92453L	1- to 32-user version of HP-UX Operating System	7,450
92454L	1- to 64-user version of HP-UX Operating System	11,450
92512L	1- to 128-user version of HP-UX Operating System	14,450
92513L	1- to 256-user version of HP-UX Operating System	17,450
92455L	HP-UX unlimited license	20,450
Programming and Application Development Tools		
92610A	1- to 8-user, Ada/800 Development System for Models 815, 822, 825, 832, 835, 840, 842, 845, 850, 855, and 870	22,450
92670L	10-seat, Ada/SoftBench for Models 815, 822, 825, 832, 835, 840, 842, 845, 850, 855, and 870	24,000
B2404A	10-seat, C++ Compiler for Models 815, 822, 825, 832, 840, 842, 845, 850, 855, and 870	—
	C++ Language	
92500A	Graduated Charge: Models 815 and 822	1,700
92543A	Graduated Charge: Model 870	17,000
	Cobol/HP-UX Compiler	
92629A	Graduated Charge: Models 815 and 822	5,350
30685A	Graduated Charge: Model 870	29,960
	Fortran-77/HP-UX Compiler	
92627A	Graduated Charge: Models 815 and 822	1,500
30679A	Graduated Charge: Model 870	11,000
	Common Lisp Development Environment	
30693A	Graduated Charge: Models 825 and 832	3,500
30692A	Graduated Charge: Model 870	11,200
	Pascal/HP-UX Compiler	
92628A	Graduated Charge: Models 815 and 822	1,500
30682A	Graduated Charge: Model 870	13,200
Productivity Tools and Data Management Software		
	ALLBASE/SQL/4GL/Query Developer Pack	
30671A	Graduated Charge: Model 808	9,920
30673A	Graduated Charge: Model 870	110,000
	ALLBASE/SQL	
30653A	Graduated Charge: Model 808	4,800
30655A	Graduated Charge: Model 870	53,760
	ALLBASE/4GL Developer Pack	
30662A	Graduated Charge: Model 808	5,050
39664A	Graduated Charge: Model 870	56,050
	ALLBASE/Query	
30668A	Graduated Charge: Model 808	1,750
30670A	Graduated Charge: Model 870	19,250

		License Fee ($)
Data Communications/Networking Tools		
	LAN/9000 Software only	
36967A	Graduated Charge: Model 808	550
36967A	Graduated Charge: Model 870	8,550
	NS/9000	
B1029A	Graduated Charge: Model 808	750
B1029A	Graduated Charge: Model 870	12,000
	APRA/9000	
B1030A	Graduated Charge: Model 808	650
B1030A	Graduated Charge: Model 870	11,000
	NFS/9000	
B1031A	Graduated Charge: Model 808	500
B1031A	Graduated Charge: Model 870	9,000
	HP-UX Gateway SNALink	
98174A	Graduated Charge: Model 808	5,000
98174A	Graduated Charge: Model 870	14,000
	HP-UX LUG.6 API	
98164A	Graduated Charge: Model 808	6,500
98164A	Graduated Charge: Model 870	14,000
	HP-UX .25/9000	
36960A	Graduated Charge: Model 808	4,000
36960A	Graduated Charge: Model 870	16,600
	X.400/9000	
32032A	Graduated Charge: Model 808	7,000
32032A	Graduated Charge: Model 870	16,600
	OSI Transport Services/9000	
32070A	Graduated Charge: Model 808	3,000
32070A	Graduated Charge: Model 870	31,750

NC—No charge.
NA—Not applicable. ■