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# HP 9000 Series 800 Systems Model 822S/832S



## Technical Data

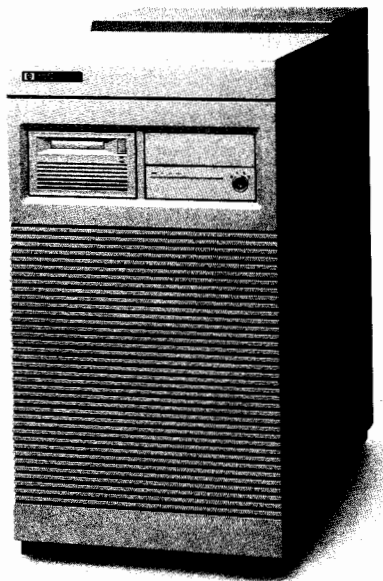
The HP 9000 Series 800 Models 822S & 832S are entry members of the broad family of HP 9000 business computers. These systems offer a highly reliable, cost-effective solution to computational and data processing needs. Hewlett-Packard has combined HP Precision Architecture RISC (PA-RISC) with HP's Very Large Scale Integrated (VLSI) circuit technology to deliver the powerful uniprocessor performance needed in a multiuser, multi-tasking environment.

The Model 822S/832S's space saving footprint is ideal for office environments. This fully integrated system combines the powerful RISC-based processor with high performance, reliable disk and tape drives in a compact desk-side cabinet. Cost-effective, high capacity backup comes standard with the unique Digital Audio Tape (DAT) drive using the DDS® (Digital Data Storage) format. Since the Model 822S/832S has been designed for the office environment, no special flooring or air conditioning is required.

Like all other HP 9000 Series 800 systems, the Model 822S/832S runs the standards-based HP-UX

operating system, a superset of AT&T's UNIX® System V Interface Definition (SVID). HP-UX provides an excellent environment for both compute intensive and transaction-based processing. Since these systems are compatible with other HP 9000 Series 800 systems, a multitude of business solutions are available making it an ideal computing system for the small to medium sized businesses, departments, and remote office locations.

**Figure 1. HP 9000 Series  
Model 822S/832S**



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## HP 9000 Series 800 Integrated Systems

### Features

- compact desktape package with integrated disk and tape drives
- Single-chip VLSI central processing unit (CPU) utilizing HP Precision Architecture RISC
- high-performance floating-point coprocessor
- high-speed HP Precision Bus
- up to 2.68 Gbytes of internal disk storage and up to 8.0 Gbytes of total disk storage
- high-capacity backup with integrated 1.3 Gbyte Digital Audio Tape drive
- 16-user, HP-UX operating system preinstalled on disk
- automatic restart after power failure\*
- standard office power and cooling requirements
- support for HP disks, tapes, and RS-232C printers

\*AutoRestart after power failure is not supported on tape drive devices.

**Table 1. HP 9000 Series 822S/832S systems at-a-glance**

|                      | 822S                       | 832S                       |
|----------------------|----------------------------|----------------------------|
| Rel TPS performance* | 1                          | 1.9                        |
| Performance (MIPS)   | 10                         | 15                         |
| IC technology        | NMOS                       | NMOS                       |
| Clock frequency      | 25 MHz                     | 30 MHz                     |
| Cache size           | 32 Kbytes                  | 128 Kbytes                 |
| Memory               | 8 - 64 Mbytes              | 16 - 64 Mbytes             |
| Internal storage     | 304 Mbytes -<br>2.6 Gbytes | 304 Mbytes -<br>2.6 Gbytes |
| Maximum disk storage | 8.0 Gbytes                 | 8.0 Gbytes                 |
| Max. I/O bandwidth   | 21 Mbytes/Sec              | 21 Mbytes/Sec              |
| Available slots      | 11                         | 10                         |

\*Based on HP internal benchmarks

## HP Precision Architecture RISC

The HP 9000 Series 800 computer systems use HP Precision Architecture RISC to provide high performance and reliability at a low cost.

PA-RISC is built upon Reduced Instruction Set Computing (RISC), a design approach that delivers greatly simplified computers that are optimized to provide the highest performance for a given integrated circuit technology. The inherent simplicity of PA-RISC means machines can be implemented with fewer components to achieve higher reliability.

At the core of PA-RISC is an instruction set containing 140 carefully selected, fixed format instructions. Because the instruction set is simplified, instructions can be hardwired directly into the CPU. Hardwiring eliminates microcode and the necessity to decode complex instructions.

PA-RISC utilizes a Load/Store design and register-to-register operations to reduce the number of memory accesses. To further enhance performance, optimizing compilers schedule instructions

and manage the instruction pipeline. With hardwired control, a Load/Store design, and optimizing compilers, instructions can be executed on virtually every clock cycle. Single cycle instruction execution accounts for much of the superior performance of PA-RISC.

## VLSI technology

PA-RISC was designed to provide user benefits independent of the particular semiconductor technology implementation. HP's use of NMOS III VLSI technology for the Model 822S/832S processor allows the entire CPU to be integrated onto a single chip. This high performance HP technology has allowed the entire processor including the cache, Translation Lookaside Buffer (TLB), and floating-point coprocessor to be implemented on a single printed circuit board. HP's reduced complexity means fewer components and higher reliability to you, all at a lower cost.

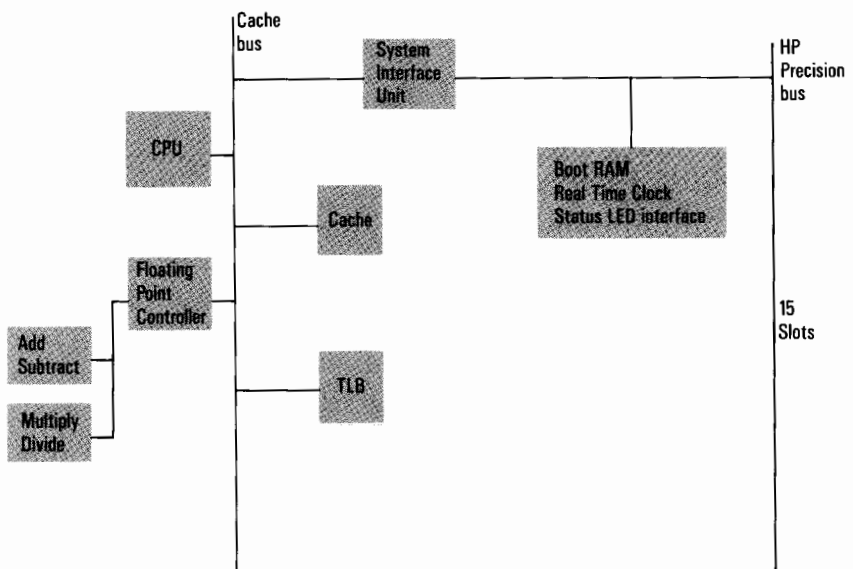
## System organization

The processor communicates with memory and I/O via the HP Precision Bus (HP-PB). The HP-PB synchronously transfers processor, memory, and I/O data over a 32-bit data path. Data is transferred at a maximum sustained throughput speed of 21 Mbytes/sec. Communication between the HP-PB and the processor is handled by the System Interface Unit (SIU). The HP-PB backplane has 16 slots and interconnects the processor, memory, and I/O slots.

## System processor

The processors for the HP 9000 Model 832S & Model 822S reside entirely on one printed circuit board. The processor module contains several VLSI chips including the CPU, the control unit for the Translation Lookaside Buffer (TLB); two control units for the cache; the System Interface Unit (SIU); and a Floating-Point Coprocessor (FPC), which comes standard. The processor module also contains the TLB,

**Figure 2. HP 9000 Model 822S/832S SPU organization**



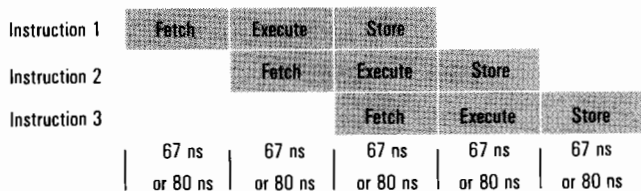
which provides virtual memory capability, and the cache, which minimizes the need to access system memory.

**Caches**

The use of a cache enhances system performance by minimizing CPU requests for instructions or data stored in memory. By storing frequently used instructions and/or data in a high speed cache memory instead of relying on system memory, the CPU can execute instructions or process data without using the System Interface Unit (SIU) and the Precision Bus (PB). Both Model 822S and the Model 832S use a two-way set associative, combined instruction and data cache. The Model 822S has a total of 32 Kbytes of high-speed CPU cache memory. The Model 832S has a total of 128 Kbytes of high-speed CPU cache memory.

The cache efficiently operates in a write-back mode, which means that the cache writes modified data to system memory only when the processor needs the cache location for other data. The operating system flushes the cache location due to a direct memory access operation and in the event of a power failure. Parity checking protects the cache, and a parity error triggers a recovery algorithm that resolves most failures. This efficient cache operation maximizes system throughput.

**Figure 3. Models 822S and 832S pipelining diagram**



**Instruction pipelining**

Instruction pipelining is a technique that overlaps instruction processing so that one instruction can begin to execute before the previous one has finished. The efficient use of pipelining can greatly increase system performance.

Both the Model 832S and the Model 822S use staged instruction pipelining that allows operation on three instructions simultaneously. The net effect is that one instruction completes essentially every instruction clock cycle. For the Model 832S the instruction cycle is 66.7 nanoseconds. The instruction cycle for the Model 822S is 80 nanoseconds.

**Floating-point coprocessor**

Single and double precision floating-point calculations are performed by the floating-

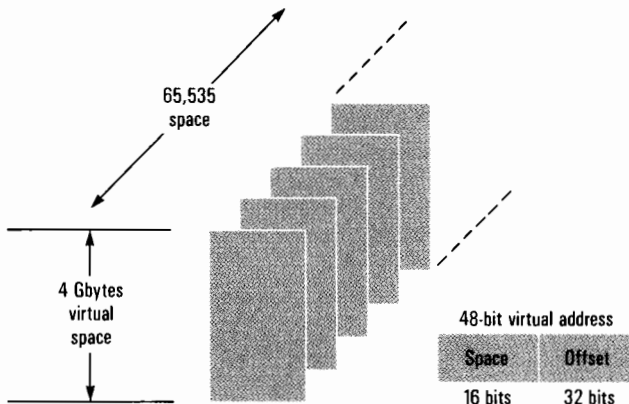
point coprocessor. The coprocessor significantly decreases the time required to perform floating-point calculations. The Floating-Point Control (FPC) unit allows floating-point operations to overlap with CPU operations, as long as there is no interlocking data. This ability to operate in parallel allows for increased performance in applications that are compute-intensive.

The FPC comes standard on the Model 832S and the Model 822S.

**Virtual memory**

Virtual addresses are 48 bits in length, ensuring ample expandability to meet growing software needs. Virtual memory is divided into 65,535 spaces with each space 4-Gbytes in length. Spaces are further divided into fixed-length 2-Kbyte pages, with a page holding code or data. A single data structure can be up to 1-Gbyte in length. The

**Figure 4. Virtual memory organization**



virtual memory scheme can accommodate memory of more than 260,000 Gbytes. The Translation Lookaside Buffer (TLB) performs translations from virtual addresses to physical addresses. The TLB stores recently accessed virtual page translations and converts the 48-bit virtual address into a 29-bit physical address. The TLB holds translations for 4096 virtual pages (enough room to map 8-Mbytes of system memory). The memory for the virtual pages is split into two parts, half for an instruction TLB and half for a data TLB. This split allows parallel translation of instruction and data addresses.

All Series 800 high-end systems provide page-level access protection. The TLB hardware supports protection mechanisms to ensure the currently executing process has sufficient authorization to perform the requested data, code, or I/O access. The TLB also uses parity checking which signals the CPU when errors are found.

**Memory subsystem**

The Model 822S includes 8-Mbytes of main memory as standard. The Model 832S includes 16-Mbytes of main memory as standard. Memory on both systems is expandable up to 64-Mbytes in 8-Mbyte increments. The memory subsystems use 1 Mbit, fast page mode dynamic RAMs.

The internal memory word size is 72-bits, with 64-bits for data and 8-bits for error detection and correction. Rare double bit errors are automatically detected causing an interrupt that is a high priority machine check. Single bit errors are automatically corrected. The ECC (Error Checking and Correcting) memory assures high memory performance and availability.

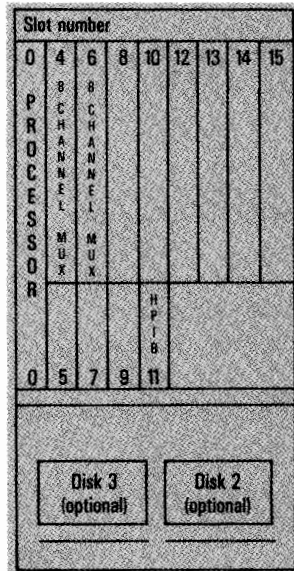
In the event of a power loss, the powerfail battery backup protects the system. If AC power is lost, the state of the processor is secured in memory for at least 15 minutes. Maximum storage time

depends on the amount of memory in the system. If power is restored within this limit, the system restores itself and resumes processing.

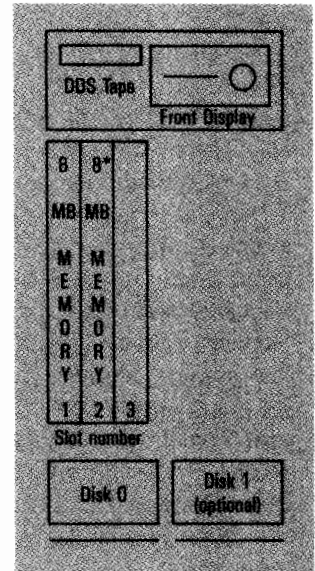
**Compact deskside packaging**

The Model 822S and 832S are the first HP9000 Series 800 systems available in an integrated package. These compact systems include a processor with one to four embedded disk drives and one Digital Audio Tape (DAT) drive. This package, which measures 75 cm high, 37.5 cm wide, and 71 cm deep, has been uniquely designed to hold an entire modular system in a very small amount of space, maximizing the efficiency of office or computer room space.

Figure 5. HP9000 Model 822S/832S card cage



Rearview



Frontview

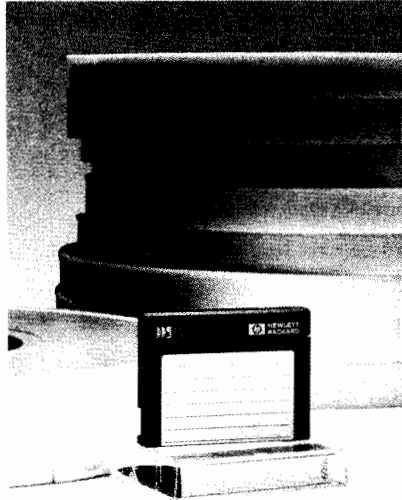
\*Not included on Model 822S

## Digital data storage

Cost-effective backup for the Model 822S and Model 832S is provided with HP's Digital Audio Tape (DAT) unit which uses the Digital Data Storage (DDS) format. DAT is the latest development in the use of helical-scan recording technology similar to that used in analog Video Cassette Recorders (VCRs) but enhanced to provide digitally encoded, high quality data storage. The DAT stores data on tape using the Digital Data Storage (DDS) format. The DDS backup unit integrated in the Model 832S system stores up to 1.3-Gbytes of data on a single DAT cassette, measuring only  $7.3 \times 5.4 \times 1.05$  cm. This large capacity storage on a single DAT cassette eliminates the need for operator intervention and offers a convenient and compact storage medium. High data reliability is achieved through read-after-write, additional third-level error detection, and correction circuitry. The DDS tape drive also offers:

- 1.3-Gbyte capacity on a 120-minute (60m) tape
- typical transfer rate of 11-Mbytes/minute
- a large 512-Kbyte data buffer to maintain host transfer rate
- automatic error detection and correction
- three levels of Error Correcting Code (ECC)
- standard 5.25-inch form factor

Figure 6. Digital Audio Tape cassette



## Disk storage

The Model 822S/832S package takes advantage of the state-of-the-art disk storage devices by integrating up to four disk drive units into the compact package. These internal storage devices offer reliable, high capacity, high performance mass storage.

Excellent performance and superior reliability is accomplished with the use of a sample servo system in each drive that provides fast head positioning with the precise accuracy required by high track densities. This type of mechanical control system coupled with one of HP's sophisticated controllers provides a high degree of data integrity. This also improves reliability by making the drive less susceptible to the effects of environmental stress. The MTBF of the internal disk mechanisms is 150,000 hours.

The 304-Mbyte 5.25-inch and the new 670 Mbyte 5.25 disk drive mechanism are supported in

the Model 822S/832S package. Maximum disk capacity of 8.0-Gbytes is achieved by augmenting the internal storage with external standalone disk subsystems.

## I/O subsystem

The HP 9000 Model 822S/832S backplane has 16 HP Precision Bus slots available for the processor, memory, and I/O cards. One slot is utilized by the processor card, leaving 15 slots for memory and I/O cards.

In compliance to the Eurocard form factor, the HP-PB was designed to accommodate single-high (3U) and double-high (6U) I/O cards. The package for the Model 822S/832S has 4 single-high and 11 double-high card slots. Each double-high card slot can support one double-high card or one single-high card.

As shown in Figure 5, the Model 832S base system comes with two 8-channel mux cards, one HPIB interface card, and two 8-Mbyte memory cards, leaving 10 available slots. The Model 822S base system also comes with two 8-channel mux cards, one HPIB interface card, but only one 8-Mbyte memory card, leaving 11 available slots.

The single-high cards that require a single-high slot include the 8-channel mux, HP-IB, GPIO, 8-Mbyte memory cards, and the X.25/9000 Link.

The double-high card that requires a double-high slot is the LAN/9000 Link.

## Peripheral connections

Disks, tapes, and plotters are connected via an HP-IB channel card which supports the 8-bit wide IEEE-488. Each HP-IB channel card supports up to four high speed peripheral devices or 14 low speed devices.

Eight-channel multiplexers are available to connect workstations, terminals, modems, serial printers, and other serial devices.

LAN/9000 Link provides all the necessary hardware and software to interface an 822S or 832S to a Local Area Network (LAN).

Local Area Network (LAN) interfaces allow connections to other systems, as well as support for distributed terminal controllers (DTCs). DTCs are available to connect serial devices to the system. DTCs are distributed over an IEEE 802.3 standard local area network (LAN) and can support up to 48 directly-connected ports. Both RS-232 and RS-422 interfaces are supported.

X.25/HP 9000 Link provides all the necessary hardware and software to interface between an HP 9000 Series 800 and an X.25 public data network.

## System software features

All HP 9000 Series 800 and Series 600 computers are based on the standards-based multiuser, multi-tasking HP-UX. HP-UX provides object code compatibility among these computers and source code compatibility with Series 300 systems. The operating system is based on AT&T's UNIX® System V Release 3.0, and passes AT&T's System V Interface Definition

(SVID 2). It also incorporates selected features from U.C. Berkeley Software Distribution 4.3 (BSD). In addition, HP-UX conforms to \*X/Open™'s Portability Guide Issue 3 (XPG3), the IEEE's POSIX 1003.1, and the Federal Processing Specification (FIPS) 151-1. Compliance with these standards facilitates portability of applications developed on other standards-based operating systems.

HP-UX supports a diskless computing environment, which significantly reduces costs and increases the information shared by different users over the LAN.

HP's standards-based operating system also contains features intended to fulfill the Department of Defense C2 Trusted System Requirements. Finally, HP-UX supports all the popular languages in the computing world and a rich assortment of tools for Computer-Aided Software Engineering (CASE), Networking Database Management, and Graphics. For detailed information on the HP-UX operating system, please see the HP-UX Technical Data Sheet.

**Table 2. Technical specifications**

| <b>Electrical specifications</b>    |   |                      |               |
|-------------------------------------|---|----------------------|---------------|
| AC power input voltage/frequency    | Nominal   | Range                | Rated current |
|                                     | 100-120V, 50/60 Hz  | 90-132 VAC/47-63 Hz  | 12A           |
|                                     | 200-240V, 50/60 Hz  | 180-264 VAC/47-63 Hz | 6.3A          |
| Power dissipation                   | 1790 BTU/hr (typical), 3410 BTU/hr (maximum)  |                      |               |
| <b>Environmental specifications</b> |   |                      |               |
| Temperature                         | Operating: +5° to +40°C (41° to 104°F)<br>Non-operating: -40° to +65°C (-40° to 149°F)<br>Non-operating: -40° to +45°C (-40° to 113°F) for tape media                     |                      |               |
| Maximum rate of temperature change  | 20°C (36°F)/hour without DDS<br>10°C (18°F)/hour with DDS   |                      |               |
| Relative humidity                   | Operating: 20% to 80%, non-condensing<br>Non-operating: 5% to 80%, non-condensing   |                      |               |
| Maximum rate of humidity change     | 30% RH/hour   |                      |               |
| Altitude                            | Operating: To 3.0 km (10,000 ft)<br>Non-operating: To 15.0 km (50,000 ft)   |                      |               |
| <b>Regulatory compliance</b>        |   |                      |               |
| Electromagnetic interference        | Complies with FCC Rules and Regulations, Part 15, Subpart J, as a Class A computing device. Manufacturer's Declaration to German FTZ 1046. Registered with Japanese VCCI. |                      |               |
| Safety                              | UL listed, CSA certified, compliant with IEC EN 60950 with Nordic deviation   |                      |               |
| <b>Physical characteristics</b>     |   |                      |               |
| Dimensions                          | Height: 750 mm (29.5 in)<br>Width: 375 mm (14.8 in)<br>Depth: 710 mm (27.9 in)  |                      |               |
| Weight                              | 110 kg (243 lbs)  |                      |               |
| Acoustics                           | 5.8 bels (A) sound power below 30°C   |                      |               |
| ESC, power transients, vibrations   | Designed for office and factory floor environments  |                      |               |


**Table 3. Supported peripherals**

| Terminals      | Disk drives       | Magnetic tape drives | Printers       | Plotters  | Data communication devices |
|----------------|-------------------|----------------------|----------------|-----------|----------------------------|
| HP C1001A/G/W* | HP 7936H          | HP 7979A             | HP 2225D       | HP 7440A  | HP 2334A                   |
| HP C1002A/G/W  | HP 7937H          | - Opt. 800           | HP 2227A       | HP 7475A  | HP 28650A                  |
| HP C1003A/G    | HP 7957B          | HP 7980A             | HP 2228A       | HP 7550A  | HP 28651A                  |
| HP C1004A/G/W  | HP 7958B          | - Opt. 800           | HP 2235A/B/C/D | HP 7570A  | HP 36944A                  |
| HP C1006A/G/W  | HP 7959B          | HP 7980XC            | HP 2276A       | HP 7595A  | HP 37212B                  |
| HP C1007A/G/W  | HP 7962B          | HP 9144A             | HP 2562C       | HP 7596A  | HP 40299A                  |
| HP 2393A       | HP 7963B          | HP 9145A             | - Opt. 049     | HP C1600A | HP 92205A/C                |
| HP 2397A       | HP 9122C          | HP 35401A            | HP 2563B       | HP C1601A | HP 98189A                  |
| HP 3082B       | HP 9127A          |                      | - Opt. 049     | HP 17440A |                            |
| HP 700/32      | HP 9153C Opt. 040 |                      | HP 2564B       | HP 7575   |                            |
| HP 700/X       | HP 9262B          |                      | - Opt. 049     | HP 7576   |                            |
| HP C1010T      | HP 9263B          |                      | HP 2566B       |           |                            |
| HP C1010C      | HP 97902B         |                      | - Opt. 049     |           |                            |
| HP C1010J      | HP 97903B         |                      | HP 2567B       |           |                            |
|                | HP 97962B         |                      | - Opt. 049     |           |                            |
|                | HP 97963B         |                      | HP 2684A/D/P   |           |                            |
|                | HP C2203A         |                      | HP 2934A       |           |                            |
|                | HP C2200A         |                      | HP 33440A      |           |                            |
|                | HP 50710A         |                      | HP 3630A       |           |                            |
|                |                   |                      | - Opt. 001     |           |                            |
|                |                   |                      | HP 2277A       |           |                            |
|                |                   |                      | HP 2562C       |           |                            |
|                |                   |                      | HP 41063       |           |                            |
|                |                   |                      | HP 33447A      |           |                            |
|                |                   |                      | HP C1200A      |           |                            |
|                |                   |                      | HP C1602A      |           |                            |

Note: HP 9000 Series 300 computers and HP Vectra personal computers may also be used as terminals on Series 800 systems.

\*Supported as System Console

### Application software

Over 1000 application software packages are available for Series 800 and Series 600 systems. Contact your HP sales representative for information regarding specific applications.

### Supported peripherals

Table 3 contains peripherals supported by the HP 9000 Models 822S and 832S multiuser systems at the time of publication.

The list of supported peripherals changes as new peripherals are introduced and other peripherals are discontinued. Contact your HP sales representative for more information on currently supported peripherals.

### Support services

A wide range of hardware and software support services is available worldwide for all HP 9000 products. Contact your HP sales representative for details on available support services.

### Warranty information

The warranty covering your specific system is determined by the HP Warranty and Installation Terms in effect at the time of purchase. Please contact your HP sales representative for a copy.

For more information, call your local HP sales office listed in your telephone directory or an HP regional office listed below for the location of your nearest sales office.

**United States:**

Hewlett-Packard Company  
4 Choke Cherry Road  
Rockville, MD 20850  
(301) 670-4300

Hewlett-Packard Company  
5201 Tollview Drive  
Rolling Meadows, IL 60008  
(312) 255-9800

Hewlett-Packard Company  
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(818) 505-5600

Hewlett-Packard Company  
2015 South Park Place  
Atlanta, GA 30339  
(404) 955-1500

**Canada:**

Hewlett-Packard Ltd.  
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(416) 678-9430

**Japan:**

Yokogawa-Hewlett-Packard Ltd.  
29-21, Takaido-Higashi 3-chome  
Suginami-ku, Tokyo 168  
(03) 331 6111

**Latin America:**

Hewlett-Packard  
Latin American Region Headquarters  
Monte Pelvoux No. 111  
Lomas de Chapultepec  
11000 Mexico, D.F. Mexico  
(905) 202-0155

**Australia/New Zealand:**

Hewlett-Packard Australia Ltd.  
31-41 Joseph Street  
Blackburn, Victoria 3130  
Melbourne, Australia  
(03) 895 2895

**Far East:**

Hewlett-Packard Asia Ltd.  
22/F Bond Centre  
West Tower  
89 Queensway  
Central, Hong Kong  
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**Finland:**

(0) 88 721

**France:**

(1) 60 77 42 52

**Germany:**

(06172) 400 0

**Greece:**

(01) 68 28 11

**Iceland:**

(01) 67 000

**Ireland:**

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**Italy:**

(02) 92 36 91

**Netherlands:**

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**Norway:**

(02) 24 60 90

**Spain:**

900 123 123

**Sweden:**

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