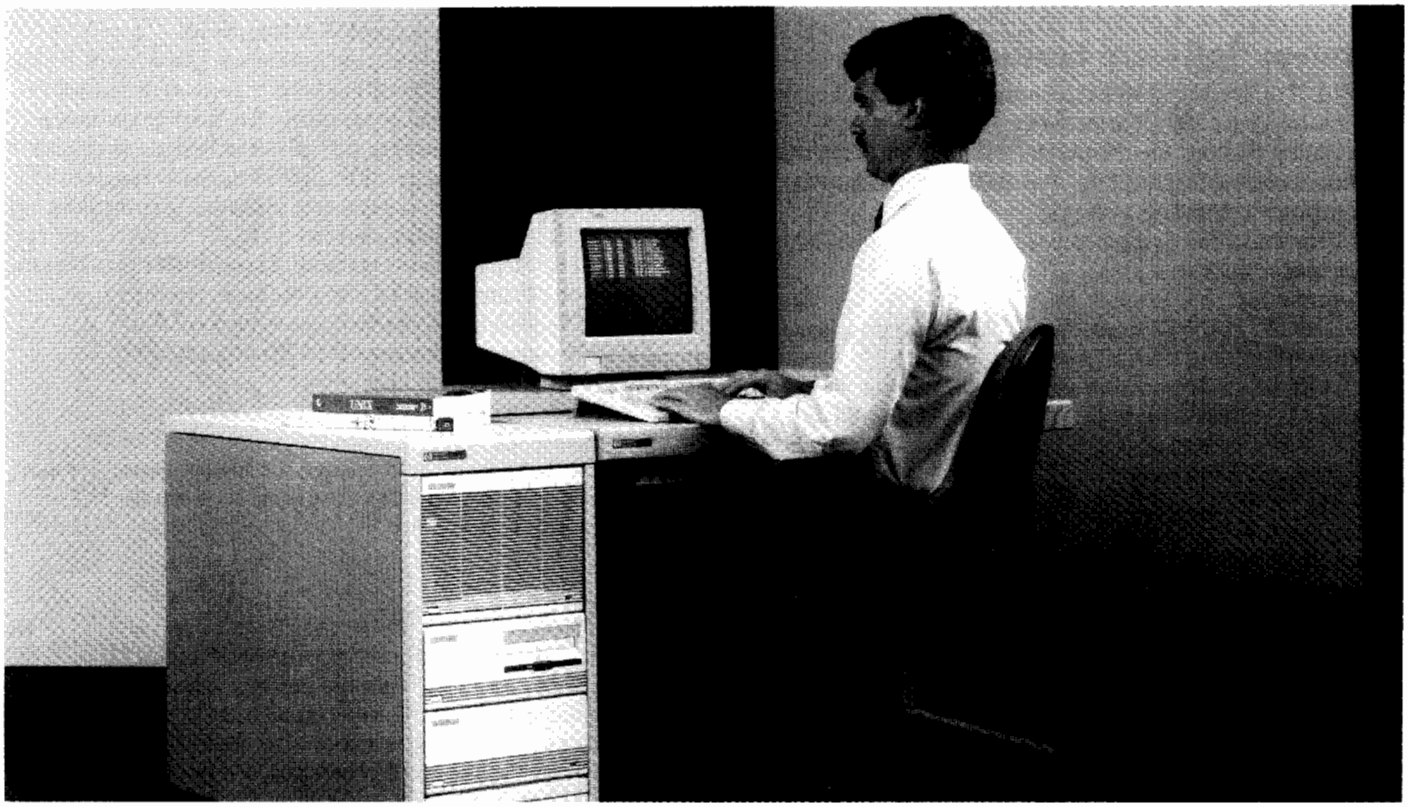
HP 9000 Series 800
Model 825S

Hardware Technical Data

Computer Museum

Effective: September, 1988*



Product Description

The HP 9000 Model 825S provides a highly reliable, cost effective solution to mid-range computational and data processing needs. Hewlett-Packard has combined Very Large Scale Integrated (VLSI) technology with HP Precision Architecture to deliver the system processing power needed in a multi-user, multi-tasking environment.

The Model 825S is well-suited for applications requiring mid-range performance for relatively small departments whose applications include scientific computation, data acquisition, and database management. The Model 825S also has optional features that include:

- Seven additional I/O ports to connect up to 72 terminals through an I/O Expander
- Eight or 16 Mbyte increments of memory up to 112 Mbytes Error Checking and Correcting (ECC) RAM
- A powerfail recovery system to prevent data loss

These features provide an easy growth path that makes the Model 825S suitable for applications requiring growing numbers of users.

The Model 825S's deskside design for use in an office or lab environment means this model does not require special flooring or air conditioning.

Like the other Series 800 systems, the Model 825S runs the standards-based HP-UX operating system. HP-UX provides an excellent environment for computation, database, graphics, program development, and real-time applications requiring a powerful and flexible operating system.

System Hardware Features

- HP Precision Architecture
- 3 MIPS multi-user performance
- Single-chip VLSI, Central Processing Unit (CPU)
- High performance Floating Point Coprocessor
- 80-nanosecond instruction cycle time
- 16 Kbyte high-speed CPU cache
- 48-bit virtual addressing

**Data subject to change without notice.*

- 2048-entry Translation Lookaside Buffer for virtual to physical address translations
- Advanced instruction pipelining techniques
- 8 Mbytes ECC memory standard, expandable to 112 Mb in 8 or 16 Mb increments
- Two-level I/O heirarchy providing high I/O bandwidth
- Optional I/O Expander
- Battery Backup, auto restart optional
- Field upgradable to the Models 835S and 835SE
- Support for up to 64 users
- 6.85 Gbytes disc storage with HP-IB; support for 9.14 Gbytes with HP-FL
- Support for HP discs, tapes and printers

System Software Features

- HP-UX operating system, compliant with AT&T's SVID; contains over 200 utilities from AT&T's System V.2 and Berkeley System Distribution (BSD) 4.2 enhancements
- Object code compatibility with HP 9000 Series 800 computer operating systems
- Source code compatibility with HP 9000 Series 300 computer systems
- Support for:
  - C, FORTRAN 77, and Pascal programming languages with optimizing compilers
  - COBOL,an application development environment
  - ALLBASE DBMS, a database management system offering both network (HP IMAGE) and relational (HP SQL) model interfaces
  - ALLBASE/QUERY†, an end-user query and report writing tool
  - ALLBASE/4GL‡, a fourth generation language for transaction-oriented and data-management application development offering a choice of data storage with ISAM or ALLBASE/SQL
  - Starbase Graphics Library, based on ANSI Computer Graphics Interface (CGI) standards, enhanced to implement advanced 2D and 3D techniques
  - HP GKS, a high-level, industry-standard 2D graphics library HP Network Services
  - ARPA Network Services
  - NFS Networking Services
  - X Window System*, a network-compatible, industry-standard configurable window system

HP Precision Architecture

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

HP Precision Architecture 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 HP Precision Architecture means fewer components and higher reliability at lower cost.

At the core of HP Precision Architecture is an instruction set containing 140 carefully selected, fixed-format instructions. Because the instruction set is simple, instructions can be hardwired directly in the CPU. Hardwiring eliminates the need for microcode and the necessity to decode complex instructions.

HP Precision Architecture utilizes a Load/Store design and register-to-register operations to reduce the number of relatively slow 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, one instruction can be executed on virtually every clock cycle. Single cycle instruction execution accounts for much of the superior performance of HP Precision Architecture.

HP Precision Architecture goes beyond RISC to incorporate other features that greatly enhance its performance and functionality.

For example:

- Support for coprocessors
- Extended virtual addressing for future expandability
- Memory-mapped I/O subsystem to simplify I/O communication

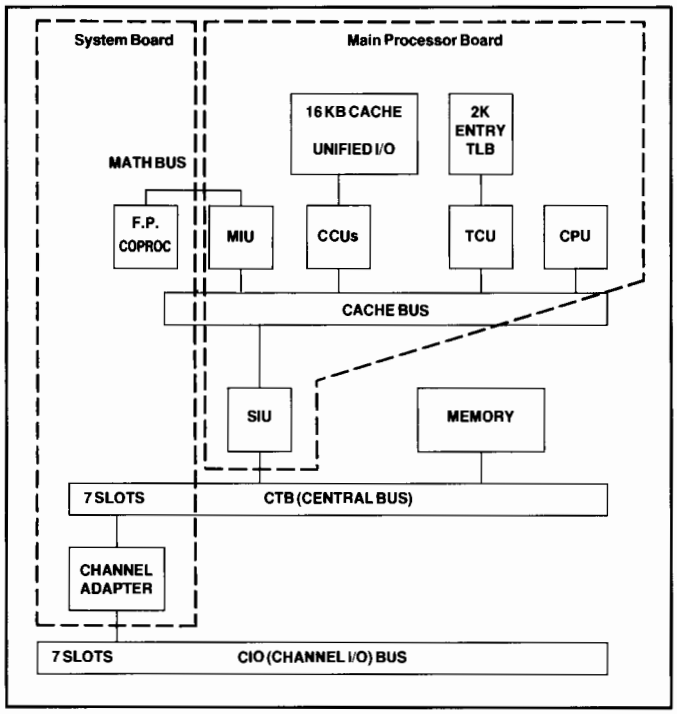
VLSI Technology

The Model 825S uses the powerful design of HP's NMOS III VLSI technology. This technology allows the entire Model 825S CPU to be integrated onto a single chip. Furthermore, the entire processor, including cache, the Translation Lookaside Buffer and the floating point coprocessor, is on two printed circuit boards.

† *Formerly HP Visor*
‡ *Formerly HP Today*
* *The X Window System is a trademark of the Massachusetts Institute of Technology*

System Organization

The processor communicates with memory and I/O via the Central Bus (CTB). The CTB provides a 32-bit data path and can support sustained data transfer rates of up to 18.6 Mbytes/second. It is interfaced with a 16-bit wide Channel I/O Bus via a CIO Adapter. The Channel I/O Bus supports I/O interfaces to peripheral devices and data communication links.



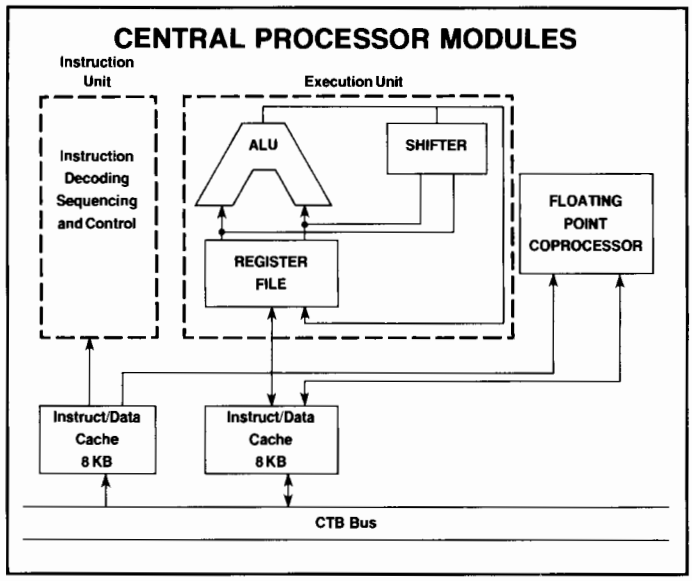
SPU Organization

The Model 825S Processor

The entire Model 825S processor is contained on two boards that are implemented using HP's proprietary NMOS III VLSI technology. The main processor board consists of six VLSI chips, including a Central Processor Unit (CPU), a Translation Lookaside Buffer Control Unit (TCU), two Cache Control Units (CCUs), a System Interface Unit (SIU), and a Math Interface Unit (MIU). The system board contains the Floating Point Coprocessor and the CIO Channel Adapter.

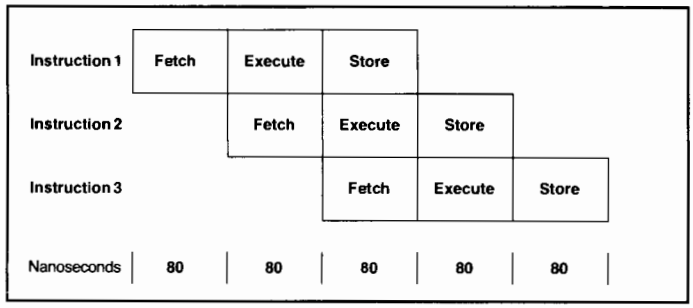
Caches

A total of 16 Kbytes of high-speed CPU cache is utilized on the Model 825S. The cache is two-way associative direct mapped. Modified data in the cache is written to main memory only when the processor requires other data to be in that cache location, when a Direct Memory Access (DMA) operation is performed within that data area, or upon a power fail.



Instruction Pipelining

The Model 825S is pipelined at the instruction level such that three instructions can be operated on simultaneously. The instruction pipeline consists of three 80 nanosecond stages. During the first stage the instruction is fetched from the cache and decoded. The specified function or calculation is performed during the second stage, and in the third stage the result of the calculation is saved to a CPU general purpose register.



Instruction Pipelining

Floating Point Coprocessor

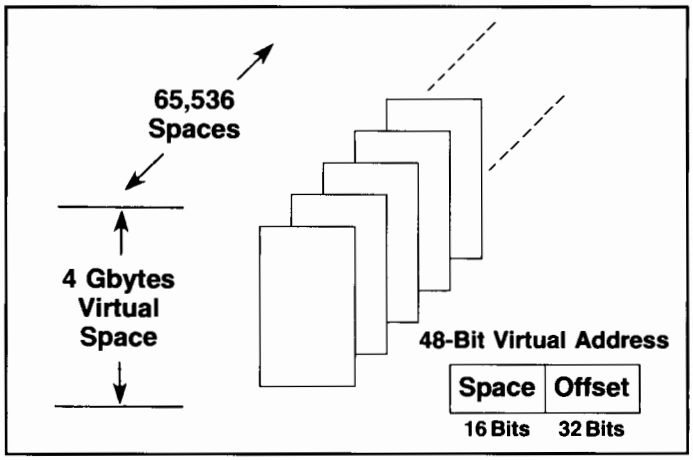
Single and double precision floating point calculations are performed by the Floating Point Coprocessor. The coprocessor significantly decreases the time required to perform floating point calculations. The Floating Point Coprocessor and the CPU can operate in parallel, thus allowing for increased performance in applications which are computation-intensive.

Virtual Memory Management

Virtual Addresses on the Model 825S are 48 bits in length, ensuring sufficient expandability to meet growing software needs. Virtual Memory is divided into a set of 65,536 spaces, with each space 4 Gbytes in length. Spaces are further divided into fixed length 2-Kbyte pages, with a given page holding data, code, or both. The single data structure can be up to one Gbyte in length and code can span multiple spaces.

The Translation Lookaside Buffer (TLB) performs translations from virtual 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 2048 virtual pages. 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.

The Model 825S provides 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 uses parity checking which signals the CPU when errors are found.



Virtual Memory Organization

Memory Subsystem

The Model 825S includes 8 Mbytes of Error Checking and Correcting (ECC) memory. The ECC memory is expandable in 8 and 16 Mbyte increments to 112 Mbytes. The memory subsystem uses 1 Mbit (for 8 Mbyte boards), Nibble-mode dynamic RAMs.

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

I/O Subsystem

Channel I/O Bus

The Model 825S SPU and the optional I/O Expander each contain one general purpose Channel I/O (CIO) Bus. These 16-bit buses are used to connect peripheral devices and data communication cards. The SPU CIO has seven available I/O slots, two of which are used for included HP-IB and multiplexer interfaces. The I/O Expander provides seven additional I/O slots.

Channel I/O Adapter

Channel I/O Adapters manage I/O by interfacing the central bus with the Channel I/O Bus, synchronizing the differing speeds and bandwidths. Channel I/O Adapters also manage Direct Memory Access (DMA) transfers between system memory and Channel I/O interfaces with their associated peripherals. The Channel I/O Adapter accomplishes this function with little CPU intervention, interrupting only to signal completion of DMA transfer. Large blocks of data can be transferred to and from the system memory at rates of up to 5 Mbytes per second per channel with negligible CPU overhead.

Peripheral Connection

Disc drives, tape drives, printers and plotters connect to the Model 825S via an HP-IB card which supports the 8-bit wide, IEEE 488 standard. Each HP-IB card interfaces with up to four high speed devices or 14 low-speed devices.

The HP 7936FL and HP7937 disc drives are connected via the HP-FL. Each HP-FL channel supports eight drives at up to 5 Mbytes per second per channel.

Six-channel multiplexers are available to connect workstations, terminals, modems, serial printers, and other serial devices. Local Area Network (LAN) interfaces allow connection to other systems.

System to System Data Communications

The HP 9000 Series 800 systems communicate with other HP systems and other vendors' systems via an IEEE 802.3 LAN using the LAN/ 9000 Series 800 link. Higher level networking services are provided by NS/9000, ARPA Services and NFS Services.

The HP 10Mbps-10Mbps LAN bridge provides interconnectivity and extendability between two LANs allowing the establishment of larger IEEE 802.3 and Ethernet networks. To conserve network bandwidth, the bridge provides address filtering capabilities to isolate traffic and add security between two work groups.

In addition to LAN communication, Series 800 systems can communicate with other systems based on the UNIX operating system via one or more multiplexer channels and hardwired modem links. The multiplexer channels and modem links use HP-UX [uucp] capability for file transfer, remote control execution [uux] and terminal emulation [cu].

IBM communications are supported via SNA 3270 and 3770 products using a LAN-attached HP 9000 Series 300 as a non-dedicated gateway. Since the Series 300 also supports IBM BSC RJE communications, a Series 800 computer can also use ARPA and Berkeley networking services by using Series 300 to submit and receive batch jobs.

System Software

HP-UX Operating System

The HP-UX operating system complies with AT&T's UNIX System V Interface Definition Issue 2, Volume 1 and has passed the System V Verification Suite 2 (SVVS2). HP-UX includes the following HP enhancements:

- More than 200 utilities from AT&T's System V.2 and BSD enhancements
- Real time features include predictable response and full functionality
- Device I/O Library (DIL) for instrument control
- Native Language Support for creating applications and operating environments for end users in their local language
- Powerfail recovery capabilities

Data Communications

- LAN/9000 Series 800
  Provides: all the necessary hardware and software to interface between an HP Series 800 and an IEEE 802.3 or Ethernet LAN and also provides interprocess communications through Berkeley sockets or Network Interprocess Communications (NET-IPC)
- ARPA Services
  Provides: multi-vendor communications to other computers supporting the standard ARPA and Berkeley networking services; ARPA services FTP (file transfer), Telnet (terminal login access), and SMTP (mail); Berkeley [rcp] (file transfer), [rlogin] (terminal login access), [rsh] (remote command execution), [rwho] and [ruptime]
- Network File System Services
  Provides: multi-vendor remote file access to other computers supporting the standard Network File System (NFS) services, and; NFS-specific Remote Procedure Call (RPC) and Yellow Page (YP) network administration services
- Network Services/9000
  Provides: Network File Transfer (NFT) to transfer files to and from other HP 9000, HP 1000, HP 3000, HP Vectra (IBM PC-compatible) and DEC VAX/VMS computers, and; Remote File Access (RFA) between HP 9000 HP-UX computers
- HP-UX Gateway SNA/3270 and HP-UX Gateway SNA/3770 Allows interactive and batch communications between an HP 9000 Series 800 and an IBM System/370-compatible mainframe using SNA 3270 or 3770 protocols

Languages

- ALLBASE/4GL
  A fourth-generation language that integrates all the facilities needed to define, test and maintain applications into a single cohesive language that is integrated with ALLBASE/SQL
- COBOL/HP-UX
  The COBOL/2™ compiler complies with the ANSI X3.23-1985 HIGH COBOL standard and the current X/OPEN definition for COBOL (Portability Guide Issues I and II)
- C/HP-UX
  The portable C compiler complies with the de facto industry standard
- Pascal/HP-UX
  A superset of the ANSI IEEE 770X3.97-1983 and ISO 7185-1983 standards for Pascal
- FORTRAN 77/HP-UX
  A superset of the ANSI FORTRAN 77 standard that includes MIL-STD-1753 extensions and DEC FORTRAN extensions
- Ada*
  Compliant with MIL-STD-1815A

Information Management

- ALLBASE DBMS
  Provides both a network model interface (HP IMAGE) and an industry-standard, SQL-compatible relational model interface (HP SQL) in a single database management system
- ALLBASE/4GL
  Provides a high-productivity application development environment which can access an HP SQL database when used with ALLBASE/HP-UX
- ALLBASE/QUERY
  Allows users of the HP SQL interface in ALLBASE to quickly and easily perform ad hoc queries and generate customized reports

Graphics

The HP 9000 Series 800 systems support several graphics software libraries for development and support of applications. These software libraries are based on industry graphics standards.

- Starbase/HP-UX Graphics Library
  Provides high-performance graphics and includes functionality based on the evolving Computer Graphics Interface (CGI) standard from ANSI
- HP GKS/HP-UX
  Provides high-level, industry standard, 2D Graphics Kernel System (GKS) software
- Starbase/HP-UX Display List
  Supports hierarchical display lists for modeling graphics data
- DGL/AGP/HP-UX Graphics Library
  For migration of existing applications based on Device-independent Graphics Library (DGL) and Advanced Graphics Package (AGP)
- X Window System
  Model 825S provides XLIB support for X Window client applications

COBOL/2 is a trademark of Micro Focus Limited.

* *Available from a value-added software supplier.*

Application Software

A variety of application software packages are available for Series 800 systems. Contact your HP Sales Representative for information regarding specific applications.

SPU Technical Specifications

Electrical Specifications

Line Voltage	Voltage Tolerance	Line Frequency	Maximum Current
100 V	90-108 VAC	48-66 Hz	9.5 A
120 V	108-132 VAC	48-66 Hz	8.0 A
240 V	180-264 VAC	48-66 Hz	5.3 A

Power Consumption . . . . . 600 Watts, 2034 BTU/hr

Environment Characteristics

Temperature
Operating . . . . . 0° to 55°C
Non-operating . . . . . -40° to 75°C

Relative Humidity
15% to 95% at 40°C, non-condensing

Maximum Altitude
Operating . . . . . 4570 m (15,000 ft.)
Non-operating . . . . . 15,240 m (50,000 ft.)

Regulatory Compliance

Electromagnetic Interference

- Complies with FCC Rules and Regulations, Part 15, Subpart J, as a Class A computing device
- Manufacturer's declaration verifies VDE level B

Safety

- UL Listed, CSA Certified
- Complies with IEC 380 and IEC 415

Physical Characteristics

Dimensions	
Height	234 mm (9.21 in.)
Width	325 mm (12.8 in.)
Depth	500 mm (19.7 in.)
Weight	23 kg (51 lb.)

Vibration and Shock

HP 9000 Series 800 systems are type-tested for normal shipping and handling shock and vibration. Contact your HP Sales Representative for review of any application that requires operation under continuous vibration.

Acoustics

5.0 Bels (A) Sound Power

Ventilation

Forced air cooling; air flows from front to back

Supported Peripherals

The following list contains peripherals supported by Series 800 multi-user computers 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.

Terminals

HP A1020H . . . . . CHX graphics Display Controller*
HP C1001A/G/W . . . . Model 700/92 Block-mode Display Terminal†
HP C1002A/G/W . . . . . Model 700/94 High-performance Block-mode Terminal
HP C1003A/G . . Model 700/41 Entry-level ASCII Terminal‡
HP C1004A/G/W . . . . . Model 700/22 ANSI DEC VT220-compatible Terminal‡
HP C1006A/G/W . . . . . Model 700/43 Fully Featured ASCII Terminal
HP 2392A . . . . . Display Terminal†
HP 2393A . . . . . Monochromatic Graphics Terminal
HP 2394A . . . . . Data Entry Terminal
HP 2397A . . . . . Color Graphics Terminal
HP 3081A . . . . . Industrial Data Entry Terminal
HP 45610B . . . . . *Touchscreen* Terminal
HP 45711A . . . . . *Portable Plus* computer
HP 45850A/B . . . . . *Touchscreen II* Terminal
HP 724x5A . . . . . *Vectra PC*
HP 9666A . . . . . Industrial 2397A Terminal
HP 9807A . . . . . *Integral PC*
HP 98720A . . . . . SRX graphics Display Controller*

NOTE: HP 9000 Series 300 Computers may also be used as terminals on Series 800 systems.

Disc Drives

HP 7907A . . . . . 20 Mbyte Fixed/20 Mbyte Removable Media
HP 7936FL . . . . . 307 Mbyte CS/80 Fixed Disc (HP-FL)
HP 7936H . . . . . 307 Mbyte CS/80 Fixed Disc (HP-IB)§
HP 7937FL . . . . 571 Mbyte CS/80 Fixed Disc (HP-FL)§
HP 7937H . . . . . 571 Mbyte CS/80 Fixed Disc (HP-IB)§
HP 7957A/B . . . . . 81 Mbyte CS/80 Fixed Disc
HP 7958A/B . . . . . 131 Mbyte CS/80 Fixed Disc
HP 7959B . . . . . 304 Mbyte CS/80 Fixed Disc
HP 7963B . . . . . 304 Mbyte CS/80 Fixed Disc
HP 9122D/S . . . . 270-788 Kbyte 3 1/2-inch Flexible Disc
HP 9127A . . . . . 270-380 Kbyte 5 1/4-inch Flexible Disc

Magnetic Tape Drives

HP 7974A . . . . . 1/2-inch 1600 characters per inch (cpi) Tape Drive
HP 7979A . . . . . 1/2-inch 1600 cpi Tape Drive
HP 7980A . . . . . 1/2-inch 6250/1600 cpi Tape Drive
HP 9144A . . . . . 1/4-inch CS/80 Cartridge Tape Drive
HP 35401A . . . . . CS/80 Cartridge Tape Autochanger

* *Supported only on Model 825 and Model 835.*
† *Supported as system console.*
‡ *Supported as applications terminals only. Verify compatibility with application.*

§ *Supported as system discs.*
* *HP-IB not supported as a graphics device.*
† *Not supported as a graphics device.*

Printers

HP C1200A . . . . . Asian System printer
HP 2225D . . . . . *ThinkJet* RS-232C printer
HP 2227A . . . . . *QuietJet Plus* RS-232C printer
HP 2228A . . . . . *QuietJet* RS-232C printer
HP 2235B/D . . . . . *RuggedWriter* printer*
HP 2276A . . . . . *DeskJet* RS-232C printer†
HP 2563B . . . . . 300 lines per minute (lpm) dot-matrix impact printer
HP 2564B . . . . . 600 lpm dot-matrix impact printer
HP 2566B . . . . . 900 lpm dot-matrix impact printer
HP 2567B . . . . . 1200 lpm dot-matrix impact printer
HP 2684A/D/P . . . . . *LaserJet 2000* RS-232C printer†
HP 2932A . . . . . 200 characters per second (cps) dot-matrix impact printer
HP 2934A . . . . . 200 cps "Office" printer
HP 33440A . . . . . *LaserJet Series II* RS-232C printer
HP 3630A . . . . . *PaintJet* RS-232C color printer
HP 41063A . . . . . Asian printer

Plotters

HP 7440A . . . . . A-size, 8-pen *ColorPro* plotter
HP 7475A . . . . . B-size, 6-pen plotter
HP 7550A . . B-size, 8-pen plotter with auto sheet feed
HP 7570A . . . . . C/D-size, 8-pen *DraftPro* plotter
HP 7595A . . . . . E-size, 8-pen *Draftmaster I* plotter
HP 7596A . . . . . E-size, 8-pen *Draftmaster II* plotter with roll-feed

Data Communications Devices

HP 2334A . . . . . X.25 Multiplexer
HP 27140A . . . . . 6-channel Multiplexer
HP 37212A . . . . . 300/1200-baud Intelligent Modem
HP 92205A/C . . . . . *Hayes Smartmodem 1200*™
HP 92223A . . . . . LAN Repeater Kit
HP 98194A/91786A/91788A . . LAN/9000 Series 800 Link

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. These terms are specified in HP Pub. No. 5954-1617(D) for the United States and in similar documents for other countries.

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