

HP 9000 Series 800 Computer Systems

Product Description

The HP 9000 Model 850S incorporates the latest in VLSI technology with the HP Precision Architecture to deliver a highly reliable, cost-effective solution to the high-end data processing needs of an entire department. Using the HP-UX operating system, the Model 850S is an excellent solution in multi-user, multi-tasking environments that require the power and flexibility of an AT&T System V – compatible UNIX* operating system. The Model 850S is a two-bay system requiring a controlled office environment.

System Features

- HP Precision Architecture
 - 7 MIPS CPU performance
 - Single-chip VLSI CPU, single-board processor
 - High-performance Floating Point Coprocessor
 - 73-nanosecond instruction cycle time
 - 128-Kbyte high-speed CPU cache
 - 48-bit virtual addressing
 - 4096-entry Translation Lookaside Buffer for virtual-to-physical address translations
 - Advanced instruction pipelining techniques
 - 16 Mbytes ECC memory standard, expandable to 128 Mbytes
 - Three-level I/O hierarchy providing high I/O bandwidth
 - Battery backup, auto restart standard
 - Support for up to 102 users and 18.27 Gbytes disc storage for the first release
 - Support for HP discs, tapes and printers
 - HP-UX operating system, a superset of AT&T's system V Interface Definition (Issue 2, Volume 1), SVVS (System V Verification Suite) compliant, with over 200 utilities from AT&T's System V 2 and Berkeley 4.2 BSD enhancements, as well as added enhancements such as Native Language Support (Internationalization), Real-Time features and Powerfail Recovery capabilities.
- Support for:
 - C, FORTRAN 77, and Pascal programming languages with optimizing compilers
 - COBOL application development environment
 - ALLBASE network and relational database management system
 - HPtoday, a fourth-generation language and more, for transaction-oriented and data-management application development
 - Starbase graphics software based on evolving ANSI and international standards
 - AdvanceNet Networking solutions
 - ARPA/Berkeley Network Services
 - X Window System, a network-compatible, configurable window system. (X-Client only supported at first release)
 - Remote console capability for invoking diagnostics and system reset

HP Precision Architecture

The HP 9000 Model 850S uses HP Precision Architecture to achieve high performance and reliability at a low cost. HP Precision Architecture embodies the concepts of Reduced Instruction Set Computers (RISC), a design approach which leads to greatly simplified computers that are optimized to provide the highest performance for a given integrated circuit (IC) technology. In addition to offering higher performance, the inherent simplicity of HP Precision Architecture means lower cost and higher reliability because machines can be manufactured with fewer components.

*UNIX is a registered trademark of AT&T in the U.S. and other countries.

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 central processing unit (CPU). This 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 relatively slow memory access. To further enhance performance, Optimizing Compilers are used to schedule instructions and manage the instruction pipeline. With hardwired control, a Load/Store design, and Optimizing Compilers, instructions are executed on almost every clock cycle. Single-cycle execution accounts for much of the superior performance of HP Precision Architecture compared with traditional architectures.

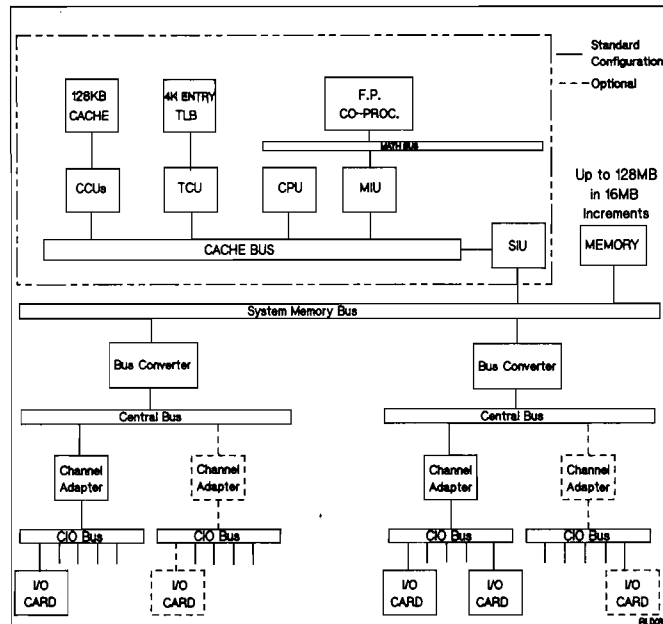
HP Precision Architecture also incorporates many other features unrelated to RISC which greatly enhance its capabilities, such as support for multiprocessors and coprocessors, extended virtual addressing, and a memory-mapped I/O subsystem. These features will be discussed in more detail in this data sheet.

VLSI Technology

The Model 850S is implemented using HP's proprietary NMOS III VLSI technology, allowing the entire Model 850S CPU to be put on a single chip. Furthermore, the entire processor, including the cache, Translation Lookaside Buffer (TLB) and the Floating Point Coprocessor, is on a single printed circuit board.

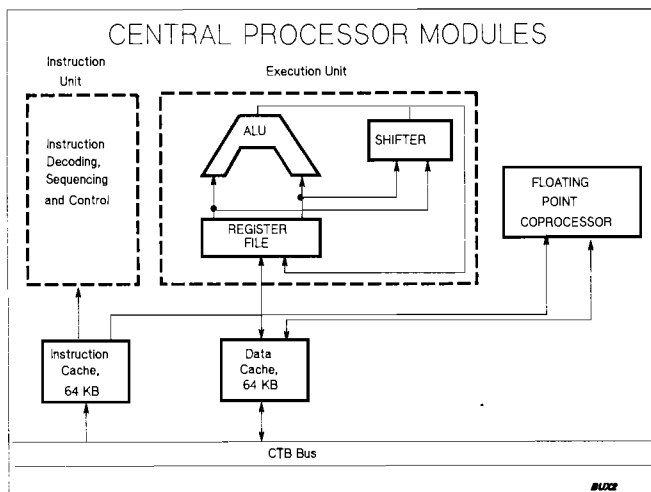
System Organization

The processor communicates with main memory via the System Memory Bus (SMB). The SMB is a very fast bus that provides a 64-bit data path and can support sustained data transfer rates of up to 100 Mbytes/second. The SMB also connects to two Central Buses (CTBs) through separate CTB Adapters. Each CTB supports two Channel I/O (CIO) Buses via separate CIO Adapters. The CIOs support I/O interfaces to peripheral devices and data communication links.



The Model 850S Processor

The entire Model 850S processor is contained on a single board implemented using HP's proprietary NMOS III VLSI technology. The processor module consists of nine 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), a Math Interface Unit (MIU), and three math chips (ADD/SUB, MUL, and DIV). The Floating Point Coprocessor is composed of the MIU chip and the three math chips.



HP Computer Museum
www.hpmuseum.net

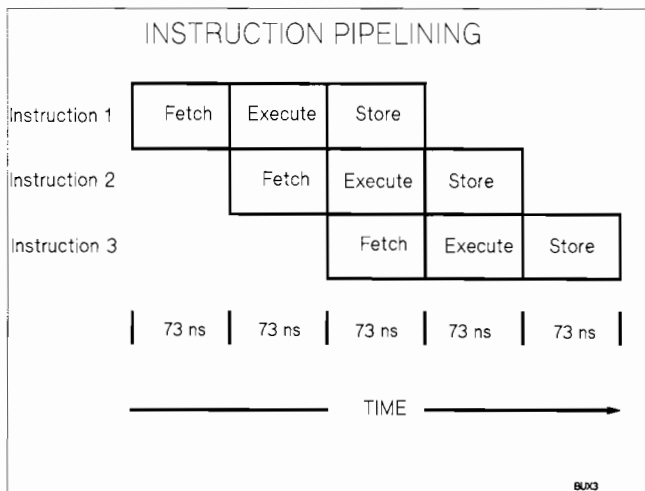
For research and education purposes only.

Caches

A total of 128 Kbytes of high-speed CPU cache is utilized on the Model 850S. The cache is a one-way associative combined instruction and data cache. It is organized into two sets of 64 Kbytes capacity each. Each set has 2048 cachelines, with 32 bytes per line. 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 850S is pipelined at the instruction level such that three instructions can be operated on simultaneously. The instruction pipeline consists of three 73-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. Excepting penalties for cache misses, etc., the net effect is that one instruction completes with every 73-nanosecond CPU cycle.

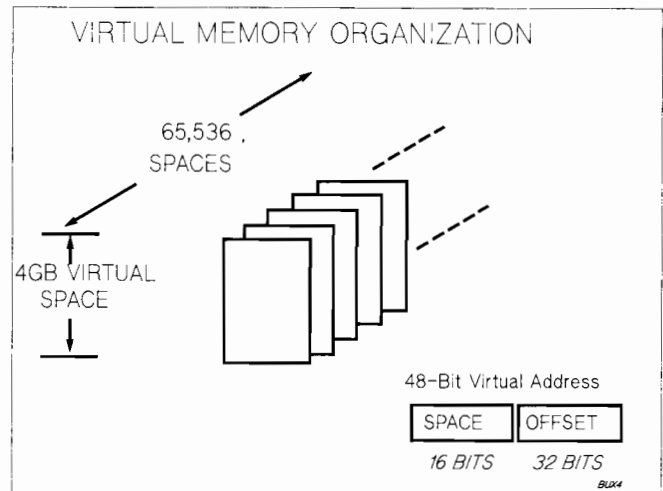


Floating Point Coprocessor

Single-precision 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 850S 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 for Gbytes in length. Spaces are further divided into fixed-length two-Kbyte pages, with a given page holding either data, code, or both. A single data structure can be up to one Gbyte in length, and code can span multiple spaces.



Virtual Address Translation

Virtual-to-Physical address translation is done by Translation Lookaside Buffers (TLBs), which cache recently accessed virtual page translations, and convert the 48-bit virtual address into a 29-bit physical address. The Model 850S TLB holds translations for 4096 virtual pages and is split into a 2048-entry instruction TLB and a 2048-entry data TLB to allow for parallel translation of instruction and data addresses. Page-level access protection is provided on the Model 850S and the TLB hardware supports protection mechanisms to ensure that the currently executing process has sufficient authorization to perform the requested data, code, or I/O access.

Memory Subsystem

The Model 850S includes 16 Mbytes of ECC memory, expandable in several incremental options to 128 Mbytes. The memory subsystem uses 1-Mbit, Nibble-mode dynamic RAMs. Main memory is backed up such that if AC power is lost, and restored within 15 minutes, the operating system is automatically restarted and processing can resume without data loss.

The internal memory word size is 72 bits, with 64 data bits plus eight bits for error detection and correction. Single-bit memory errors are automatically corrected. Double-bit errors are automatically detected, causing an interrupt or a high-priority machine check. Overall, the ECC memory of the Model 850S guarantees high performance and high availability.

I/O Subsystem

I/O Buses

The Model 850S contains two general-purpose Channel I/O (CIO) buses. These 16-bit buses are used for connection of peripheral devices and data communication cards. The standard Model 850S has ten available I/O slots, three of which are used for included HP-IB, multiplexer, and access port card interfaces. Each optional I/O CIO Bus (maximum of two) has five available slots.

The I/O Manager

Each Channel I/O Adapter interfaces the central system bus with the CIO bus, synchronizing their differing speeds and bandwidths. The CIO Adapter manages Direct Memory Access (DMA) transfers between CIO interfaces with their associated peripherals and main memory. The CIO Adapter accomplishes this function with little CPU intervention, interrupting only to signal completion of DMA transfers. This leaves the CPU free to perform other operations during I/O. Large blocks of data can be transferred to and from main memory at rates of up to five Mbytes per second with negligible CPU overhead.

Peripheral Connection

Discs, tapes, printers, and plotters are connected via an HP-IB channel which supports the 8-bit wide, IEEE-488 standard Hewlett-Packard Interface Bus (HP-IB). Each HP-IB channel supports up to four high-speed devices.

Six-channel multiplexers are available for workstations, serial printers, and other serial devices.

System-to-System

Data Communications

The Model 850S connects to other HP 9000 systems via an IEEE 802.3-compatible Local Area Network (LAN) provided in the LAN/9000 Series 800 Link product. Higher-level Network Services are supported by the NS/9000 Series 800 software. Together, these software products support Remote File Access (RFA) between HP-UX-based HP 9000 systems, Network File Transfer (NFT), and the Network Interprocess Communication (NET IPC) within the HP 9000 Series 800 family.

In addition to LAN communication, the Model 850S can communicate with other UNIX-based systems via one or more multiplexer channels and hardwired modem links using the uucp capability of the HP-UX operating system. The uucp capabilities include file transfer, remote command execution (uux), and terminal emulation (cu).

ARPA/Berkeley networking services based on the TCP/IP protocol are also available.

IBM communications are supported via SNA 3270 products using an HP 9000 Series 300 in a LAN as a

gateway. The Series 300 can also emulate IBM batch terminals of type RJE 2780/3780. A Series 800 can utilize a 300 in this mode using the virtual terminal capacity of the ARPA Services ("Telnet").

SPU Environment Specifications

Temperature

Operating: 5° to 40°C (41° to 104°F).

Non-operating: -40° to 70°C (-40° to 158°F)

Relative Humidity

20 % to 80 % at 40°C (104°F), non-condensing.

Altitude

Operating: To 4.6 km (15,000 ft)

Non-operating: To 15.3 km (50,000 ft)

Vibration and Shock

HP 9000 Model 850S Systems are type-tested for normal shipping and handling shock and vibration. Contact the factory for review of any application that requires operation under continuous vibration.

Acoustics

73 dB (A) Sound Power

Physical Characteristics

Dimensions

1000 mm (39.4 in.) high, 1300 mm (51.2 in.) wide, 710 mm (27.9 in.) deep.

Weight

400 kg (880 lb)

Ventilation

Forced air cooling where air flows from top to bottom.

Electrical Specifications

AC Power Input

Voltage/Frequency:

208 VAC (+/- % 10), 3 phase @ 60 Hz (+/- % 2)
380 VAC (+/- % 10), 3 phase @ 50 Hz (+/- % 2)
415 VAC (+/- % 10), 3 phase @ 50 Hz (+/- % 2)

Maximum Power Required: 3500 W.

Maximum Operating Current:

16A @ 208 VAC
8.1A @ 380 VAC
7.4A @ 415 VAC

DC Current available and required for I/O Interfaces and Accessories. The Model 850S system power supply provides enough current and power for any combination of I/O interfaces or other plug-in cards that can be installed in the system's card cage.



Regulatory Compliance Safety

UL Listed, CSA Certified Compliant with IEC 380/415

Electromagnetic Interference

Complies with FCC Rules and Regulations, Part 15, Subpart J, as a Class A computing device. FTZ licensed as a Level A computing device.

System Software

Below are listed software products currently available for the HP 9000 Model 850S. This list will be expanded in the near future as development and testing of additional software products continues.

Operating System

HP-UX: the HP-UX Operating System is fully compatible with AT&T System V, and includes HP Added Value. This Added Value includes the following enhancements:

- Real time features
- The Device I/O Library (DIL)
for instrument control
- Native Language Support (Internationalization)
- Powerfail Recovery capabilities

Data communications

LAN, NS, ARPA and IBM 3270 Gateway/SNALink are all supported on the Model 850S.

Languages

HPtoday: HPtoday is a Fourth Generation Language and much more. HPtoday integrates all of the facilities needed to define, test and maintain applications into a single cohesive language.

COBOL: The LEVEL II COBOL/ET* compiler complies with the ANSI X3.23-1974 COBOL standard and the current X/OPEN definition for COBOL (portability guide issues I and II).

The portable C compiler is the de facto industry standard. Compatibility with the ANSI C standard, which is in the process of being formulated, will be provided soon after the standard is defined.

HP Pascal is a superset of the ANSI/IEEE 770X3.97-1983 and ISO 7185-1983 standards for Pascal.

HP FORTRAN 77 is a superset of the ANSI FORTRAN 77 standard and includes MIL-STD-1753 extensions and other frequently offered extensions.

Information Management

ALLBASE: In a single database management system, ALLBASE provides both a network model HP IMAGE interface and an industry standard, SQL-compatible, relational model interface.

ALLBASE/HPtoday: HPtoday provides a high-productivity, application development environment which can access an HP SQL database.

HP Visor: With HP Visor, users of the HP SQL interface to ALLBASE can quickly and easily perform ad hoc queries and generate reports.

Graphics

The Model 850S supports several graphics packages for development of sophisticated graphics applications based on industry graphics standards. The Starbase Graphics Library provides high performance graphics based on the evolving Computer Graphics Interface standard from ANSI. HP GKS implements the Graphics Kernel System standard from ANSI and ISO. X-Window supports construction of window-based user interfaces across networked systems and is based on a multi-vendor de facto standard. Display List supports hierarchical display lists for modeling of graphics data. For migration of existing applications based on DGL and AGP, a DGL/AGP Library package is provided.

Supported Peripherals

Supported Terminals

HP 2392A Display Terminal**

HP 2393A Graphics Terminal

HP 2394A Data Entry Terminal

HP 2397A Color Graphics Terminal with 35741A Monitor

HP 45711A Portable Plus Computer

HP 45610B Touchscreen Terminal

HP 45850A Touchscreen II Terminal

HP 45851A Touchscreen II Personal Computer

HP 72425A VECTRA PC (req. 35731A or 35741A)

HP 72435A VECTRA PC (req. 35731A or 35741A)

HP 72445A VECTRA PC (req. 35731A or 35741A)

HP 9807A INTEGRAL Personal Computer

HP 98561A Model 310 System Processor Unit (req. 35731A, 35741A, 98791A or 98782A monitor)

HP 98561B Model 320 System Processor Unit (req. 35731A, 35741A, 98791A or 98782A monitor)

HP 98562A Model 320 System Processor Unit (req. 35731A, 35741A, 98791A or 98782A monitor)

HP 98562B Model 350 System Processor Unit (req. 35731A, 35741A, 98791A or 98782A monitor)

* LEVEL II COBOL/ET is a trademark of Micro Focus Limited.

** Supported as system console with option 512.

Supported Discs

HP 7933H 404 MB CS/80 Fixed Disc
HP 7935H 404 MB CS/80 Disc Removable Media
HP 7936H* 307 MB CS/80 Fixed Disc
HP 7937H* 571 MB CS/80 Fixed Disc
HP 7937FX* 571 MB AMUX Fixed Disc
HP 7957A** 81 MB CS/80 Fixed Disc
HP 7958A** 130 MB CS/80 Fixed Disc
HP 7914CT 132 MB CS/80 Fixed Disc with CTU backup
HP 7914P/R 132 MB CS/80 Fixed Disc with CTU backup
HP 7914ST 132 MB CS/80 Fixed Disc and 1600 cpi Mag Tape Unit, cabinet included

Magnetic Tape Units

HP 7974A Magnetic Tape Unit
HP 7978B Magnetic Tape Unit
HP 7979A** Magnetic Tape Unit
HP 7980A** Magnetic Tape Unit
HP 35401A Cartridge Autochanger Tape Subsystem
HP 9144A CS/80 Cartridge Tape Subsystem

Supported Printers

HP 2563B 300 LPM Dot Matrix Line Printer
HP 2564B 600 LPM Dot Matrix Line Printer
HP 2565A 600 LPM Dot Matrix Line Printer
HP 2566B 900 LPM Dot Matrix Line Printer
HP 2567B 1200 LPM Dot Matrix Line Printer
HP 2686A LaserJet Printer
HP 2686A + 300 LaserJet Plus Printer
HP 2684A LaserJet 2000 RS-232C Printer
HP 2934A 200/67/40 cps Office Printer
HP 2932A 200 cps Office Printer
HP 2225D ThinkJet RS-232C Printer
HP 2227A QuietJet RS-232C Printer
HP 2228A QuietJet Plus RS-232C Printer

Supported Plotters

HP 7440A 8-pen ColorPro Plotter
HP 7475A 6-pen Plotter
HP 7550A 8-pen Plotter with auto sheet feed
HP 7586B 8-pen Roll-Feed Drafting Plotter
HP 7595A 8-pen Draftmaster I Plotter
HP 7596A 8-pen Draftmaster II Plotter

Supported Data Communications Devices

HP 37212 Intelligent 300/1200 baud modem
HP 92205A Hayes Smartmodem 1200TM
HP 92223A LAN Repeater Kit

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.

Ordering Information

Product

Number Description

9742A	HP 9000 Model 850S SPU package. Includes a CPU, floating point coprocessor, power supply, 16 Mbytes of ECC memory, 6-channel multiplexer, two bus converters, two CIO channel adapters, 32-user HP-UX license, SPU cabinet, access port (for diagnostics), installation, and manuals.
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Notice: The information contained in this document is subject to change without notice. Consult your HP Sales Representative for the most current information.

* Note that the 7936 and the 7937 are strongly recommended as system discs because of their high capacity and high performance.

** Functionality available at HP-UX Release 1.2. Verify availability with your HP Sales Representative before ordering.

