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# HP 3000 Series 918LX/RX, 928LX/RX, 968LX/RX, 978LX/RX

## Technical Data

## HP 3000 Computer Systems

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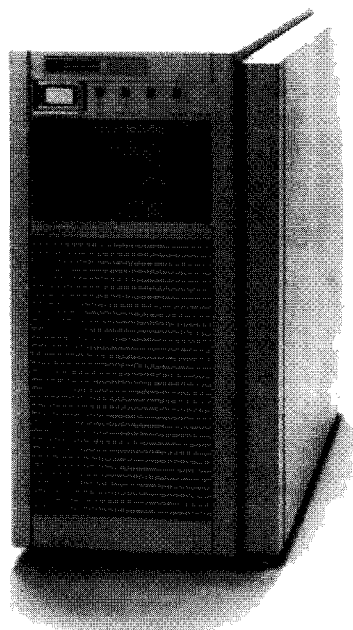
The HP 3000 Series 9x8LX/RX systems are high performance entry level members of the HP 3000 family of business computers and are available in two packages — the two I/O slot 9x8LX package and the four I/O slot 9x8RX package. These systems take advantage of HP Precision Architecture- RISC (PA-RISC) and powerful VLSI technology to set new standards for cost effective, high perfor-

mance. Offering a range of processor performance, packaging, and user license options, these systems allow you to purchase for your needs today yet grow easily. Your investment is protected by the ability to increase computing power through simple processor board upgrades or increase your I/O capacity via an easy I/O back-plane upgrade.

Since these systems are compatible with other HP 3000 systems, a multitude of business solutions are available making them ideal computing systems for small to medium sized businesses, departments and remote office locations.

These systems are driven by a robust operating system, MPE/iX, designed to handle a variety of business-critical on-line transaction processing and client-server applications. MPE/iX offers powerful system management utilities, high-availability options, tools for performance monitoring and management and many built-in features to ensure data integrity.

### New Series 9x8



The entire system processing unit (SPU) including the central processing unit (CPU), memory, disk, tape backup, and operating system comes preconfigured from the factory in a compact, integrated package which fits into an office environment. A standalone 600 VA HP Power-Trust uninterruptible power system (UPS) also comes standard with the system. The SPU,

along with external peripherals, can be rack-mounted in a compact 1.1 or 1.6 meter cabinet.

By using state of the art technologies, these systems provide a low cost of ownership. A high speed, high capacity integrated Digital Data Storage (DDS) tape drive provides the performance of half-inch magnetic tape backup at a much lower cost. The DDS backup unit allows many system configurations to be backed up on a single cassette, eliminating the need for an operator to be present during backup operations. The systems also support from 1.0 Gbyte to 4 Gbytes of next-generation high capacity disk drives inside the system package.

All HP 3000 systems are complemented by a full range of high quality HP peripherals, industry standard networking, a rich set of application development facilities, several high performance database management solutions, and advanced PC and Desktop integration products.

## Features

- Single-chip CMOS CPU with integrated high performance floating point and instruction pipelining for fast instruction execution on virtually every clock cycle
- ECC memory expandable to 512 Mbytes
- Up to 140 Gbytes of mass storage with external disk drives
- Integrated Digital Data Storage tape backup unit with up to 8.0 Gbytes per cassette

- Standard power protection via an HP PowerTrust Uninterruptable Power System to prevent data loss after power failures
- Standard office power and cooling requirements
- The HP 3000 Operating System and HP subsystem software preloaded on all models
- Support for thousands of applications to meet your business needs.

## HP Precision Architecture-RISC

All HP 3000 900 Series systems use HP Precision Architecture-RISC (PA-RISC) to achieve high performance and reliability at a low cost. PA-RISC is based on the concept of reduced instruction set computing (RISC), a design approach that leads to greatly simplified computers optimized to provide the highest performance for a given integrated circuit technology. The inherent simplicity of PA-RISC implies that computer systems can be implemented with fewer components to achieve lower manufacturing costs and vastly superior reliability when compared to older Complex Instruction Set Computer (CISC) systems.

At the core of PA-RISC is an instruction set containing 140 carefully selected, fixed-format instructions. Because the instruction set is simple, instructions are hardwired directly into the central processing unit (CPU). This eliminates the need for microcode and the necessity to decode complex instructions. PA-RISC utilizes a load/store design to reduce the number of relatively slow memory accesses, as most operations are performed register-to-register. 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, one instruction is executed with virtually every clock cycle. Single-cycle execution provides much of the performance benefit of PA-RISC over traditional architectures. PA-RISC also incorporates many other extensions to RISC which greatly enhance its functionality such as extended addressing and memory-mapped I/O.

As one of the first major vendors to deliver a RISC-based system, Hewlett-Packard is one of the leading manufacturers of RISC-based computers today.

## System Packaging

The systems are available in a compact, attractive cabinet measuring 0.4 meters high and 0.2 meters wide. The cabinet has been uniquely designed to hold an entire modular system in the space of a desktop personal computer maximizing the efficiency of office or computer room space. It is capable of holding the CPU, a multi-function I/O card, memory, a digital data storage device, an optional CD-ROM device or a second digital data storage device, and up to two disk drives.

Series 9x8LX systems offer the ability to add up to two additional I/O slots for connecting external peripherals and networks. Series 9x8RX systems provide added connectivity by providing up to four additional I/O slots.

For power protection, the 9x8LX/RX systems come with a standard deskside 600 VA HP PowerTrust Uninterruptable Power System. If AC power is lost, the CPU board, all internal peripherals, the system console, and state of the processor secured in memory are protected for up to 15 minutes with no loss of data.

1.1 and 1.6 meter cabinets are also available in which the system, additional external disk storage, tape backup, and a Datacommunications and Terminal Controller (DTC) may be racked to house an entire system configuration.

## Field Upgrades

Simple processor and I/O backplane upgrades are available to allow you to grow from one system to another. Through an easy processor board or I/O backplane swap, you can increase your system performance, expandability, or both, thus protecting your initial investment.

## Memory Subsystem

The memory subsystem uses either 4 Mbit, or 16 Mbit fast-page mode dynamic RAMs mounted on industry standard SIMMs and is expandable in 16, 64, or 128 Mbyte increments. Refer to the specification table below for standard and maximum memory sizes.

**Table of Specifications**

|                              | <b>S918LX</b> | <b>S918RX</b> | <b>S928LX</b> | <b>S928RX</b> |
|------------------------------|---------------|---------------|---------------|---------------|
| Processor Type               | CMOS          | CMOS          | CMOS          | CMOS          |
| Relative Performance         | 1             | 1             | 1.4           | 1.4           |
| CPU Clock Cycle (ns)         | 29.4*         | 29.4*         | 20.8          | 20.8          |
| Typical logged-on users      | 24-64         | 24-64         | 64-160        | 64-160        |
| Maximum Logged-on users      | 64            | 64            | 400           | 400           |
| I/O expansion slots          | 2             | 4             | 2             | 4             |
| Floating Point Co-processor  | Standard      | Standard      | Standard      | Standard      |
| Standard/Maximum memory (MB) | 32/512        | 32/512        | 32/512        | 32/512        |
| Cache (KB)                   | 64            | 64            | 64            | 64            |
| Standard /Maximum disk (GB)  | 1/76          | 1/140         | 1/76          | 1/140         |
| Maximum embedded disk (GB)   | 4             | 4             | 4             | 4             |
|                              | <b>S968LX</b> | <b>S968RX</b> | <b>S978LX</b> | <b>S978RX</b> |
| Processor Type               | CMOS          | CMOS          | CMOS          | CMOS          |
| Relative Performance         | 2.1           | 2.1           | 2.6           | 2.6           |
| CPU Clock Cycle (ns)         | 15.6          | 15.6          | 12.5          | 12.5          |
| Typical logged-on users      | 100-256       | 100-256       | 100-380       | 100-380       |
| Maximum Logged-on users      | 600           | 600           | >900          | >900          |
| I/O expansion slots          | 2             | 4             | 2             | 4             |
| Floating Point Co-processor  | Standard      | Standard      | Standard      | Standard      |
| Standard/Maximum memory (MB) | 64/512        | 64/512        | 64/512        | 64/512        |
| Cache (KB)                   | 256           | 256           | 256           | 256           |
| Standard /Maximum disk (GB)  | 1/76          | 1/140         | 1/76          | 1/140         |
| Maximum embedded disk (GB)   | 4             | 4             | 4             | 4             |

*\*Effective with software*

**HP Computer Museum**  
**[www.hpmuseum.net](http://www.hpmuseum.net)**

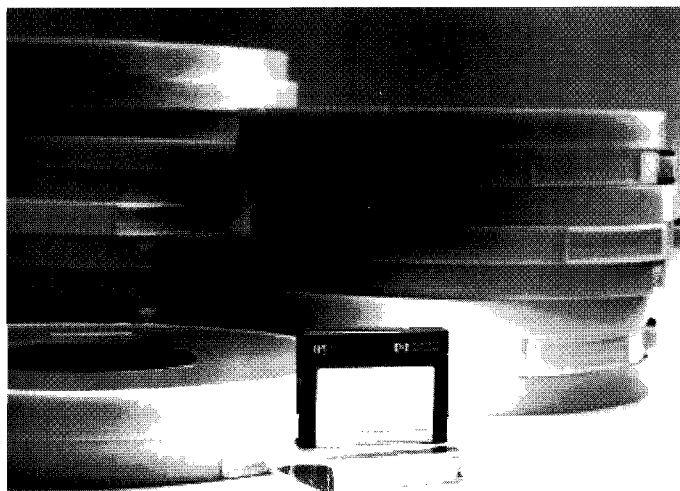
**For research and education purposes only.**

### Digital Data Storage

The Digital Data Storage tape backup unit integrated with each system provides high capacity storage on a standard DDS DAT cassette, measuring only 73 by 54 by 10.5 mm. With data compression, up to 8 Gbytes can be stored on a single cassette. This large capacity storage on a single DAT cassette eliminates the need for operator intervention during backup and offers a convenient and compact storage medium.

The standard DDS tape drive offers these features:

- 2.0 Gbyte capacity on a 120-minute (90m) tape
- Typical transfer rate of 11 Mbytes/minute
- A 512 Kbyte data buffer to maintain host transfer rate
- Automatic error detection and correction
- Three levels of Error Correcting Code (ECC)
- Standard 3.5-inch form factor



**DDS Tape allows unattended backup**

### Disk Storage

Series 9x8LX/RX systems take advantage of state-of-the-art disk storage devices by integrating up to two 3.5-inch disk drive units into the system and supporting up to 140 Gbytes with external disk storage devices. The storage devices offer reliable, high capacity, high performance, random access mass storage. This is accomplished by the use of advanced electronics which reduce the component count and improve reliability. Key features of the integrated disk drives include:

- High reliability (MTBF over 300,000 hours)
- 1.0 or 2.0 Gbyte formatted disk
- Extensive use of HP's state-of-the-art VLSI processes

### System Organization

#### System Processors

The Series 9x8LX/RX system processors use a one-board set containing the CPU chip, cache and memory SIMMs. The CPU chip is implemented with advanced VLSI logic functions and since it uses hardwired control, it is capable of executing one instruction with every clock cycle. Separate instruction and execution units facilitate pipelining and allow for efficient, parallel use of processor resources.

The cache is a high-speed buffer for the CPU that minimizes the number of relatively slow transactions with main memory. The systems use a high-speed, combined instruction and data



cache which uses a direct mapped access scheme. Data modified in the cache is written to main memory only when the processor requires other data to be in that cache location or when a direct memory access operation is performed within that data area.

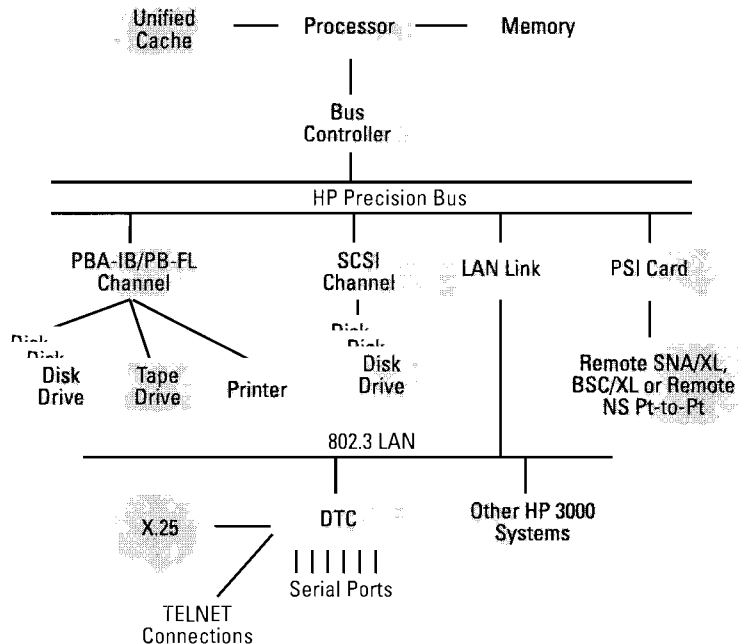
### Instruction Pipelining

These systems are pipelined at the instruction level such that multiple instructions can be operated on simultaneously. Excluding penalties for cache misses, and branch instructions, the net effect is that one instruction is completed with every clock cycle.

### Floating Point Operation

Single and double precision floating point calculations are performed by an on-CPU chip floating point coprocessor (FPC). The coprocessor significantly decreases the time required to perform floating point calculations. Superscalar operation is a technique that allows floating point operations to be executed concurrently with other non-floating point operations in the same instruction cycle. The next effect of superscalar operations is greater systems performance for floating point applications.

### System Structure



### I/O Subsystem

#### HP Precision Bus

The 32-bit HP Precision Bus supports I/O expansion cards for interfacing to peripheral devices and providing data communications and networking functions.

#### Peripheral and Networking Connections

Disks, tapes, and system printers are connected via an industry standard Small Computer Systems Interconnect (SCSI)

channel card. One SCSI adapter is integrated into the system to provide connection for up to seven peripheral devices. Each additional SCSI channel card supports up to seven peripheral devices. External disks can also be connected via either HP Fiber Optic Link interfaces (HP-FL), HP fast/wide SCSI (with MPE/iX Release 5.0) or HP IEEE-488 Interface Bus (HP-IB). HP-FL interfaces support up to eight external disks, fast/wide SCSI interfaces support up to fifteen

### Instruction Pipelining

|               |       |        |         |           |           |           |           |           |
|---------------|-------|--------|---------|-----------|-----------|-----------|-----------|-----------|
| Instruction 1 | Fetch | Decode | Execute | Condition | Store     |           |           |           |
| Instruction 2 |       | Fetch  | Decode  | Execute   | Condition | Store     |           |           |
| Instruction 3 |       |        | Fetch   | Decode    | Execute   | Condition | Store     |           |
| Instruction 4 |       |        |         | Fetch     | Decode    | Execute   | Condition | Store     |
| Instruction 5 |       |        |         |           | Fetch     | Decode    | Execute   | Condition |

Time



external disks and HP-IB interfaces support up to six external devices.

In addition to peripheral interface cards, the HP Precision Bus supports Programmable Serial Interface (PSI) cards, 802.3 Local Area Network Interface cards, 802.5 Token Ring Local Area Network Interface cards and FDDI Interface cards (with MPE/iX Release 5.0) for networking and system-to-system datacommunications.

### **Workstation and Serial Printer Connections**

Connections for workstations, serial printers, and other serial devices are provided via Datacommunications and Terminal Controllers (DTCs) that are distributed over an IEEE 802.3 standard Local Area Network (LAN). This flexible connection scheme allows DTCs to be situated in the department that they service, saving the cost and effort of running cables from the system processing unit to each workstation. The DTC72MX can support up to 72 direct or modem connected ports while the DTC16iX can support up to 16 direct or modem connected ports.

PCs can also be connected to the HP 3000 through HP LAN Manager and Novell Netware LANs. Physical connections can be via HP EtherTwist which is a local area networking scheme using unshielded twisted pair (or phone wire). Both workstations connected via a DTC, and PCs connected via LAN can communicate with HP 3000 systems and servers sharing the same LAN.

## **Systems Management**

Series 9x8LX/RX systems have a robust, integrated set of functionality for managing the systems and network environments. Available from Hewlett-Packard and its third parties are a wide variety of systems management solutions in the areas of performance management, network management, system accounting and configuration, security, availability, operations control and storage management.

### **Open Systems Functionality**

All HP 3000 900 systems provide OLTP performance and functionality while supporting industry and de facto standards. The HP 3000 provides interoperability networking (ARPA, OSI and IBM SNA services) and application portability through standard application programming interfaces (POSIX, industry and de facto standard languages and relational database management systems).

### **Industry Standard Networking**

HP networking solutions are based on de facto and industry standards. These standards include: Open Systems Interconnect (OSI); Transmission Control Protocol/Internet Protocol (TCP/IP); Systems Network Architecture (SNA), and the Open Software Foundation's Distributed Computing Environment (OSF/DCE). A networking solution based on standards enables effective communication

between a variety of computer systems. In addition, it protects your current computer equipment investment and gives you the flexibility to choose the best technologies and applications for your future needs.

## **System-to-System**

For system-to-system communications, the HP 3000 has a complete offering of local and wide-area networking services. ARPA Services, NFS, and NCS allow for transparent file access, file transfer, and sharing of resources in a TCP/IP environment. In OSI networks, FTAM allows users to transfer files between different vendor computers. In addition, the HP 3000's X.400 product, based on the industry standard OSI model, lets users send and receive electronic mail messages across a multivendor environment. For HP 3000 to HP 3000 communication, HP Network services provides virtual terminal and file transfer capabilities.

## **Desktop Integration**

The HP 3000's family of Desktop Networking products, Novell Netware, LAN Manager and AppleTalk (available with MPE/iX Release 5.0), enable desktop users to access enterprise-wide information and computing resources. This provides users with the best of both worlds: access to desktop applications plus access to the power and resources of the HP 3000.



### Environmental specifications

|                                                      |                                                                                                                                                                     |                                             |               |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------|
| Regulatory Compliance:                               | UL Listed, ETL Listed, CSA Certified, compliant with EN 60950. Contact local HP Sales representative for European Datacom license numbers.                          |                                             |               |
| Electromagnetic Regulations, Interference Computing: | Complies with FCC Rules and Regulations, Part 15, Subpart J, as a Class A computing device. Manufacturer's Declaration to EN55022 Level A. VCCI Registered, Class 4 |                                             |               |
| AC Power Input Voltage/Frequency:                    | Nominal                                                                                                                                                             | Range                                       | Rated Current |
|                                                      | 100-120V, 50/60Hz<br>220-240V, 50/60Hz                                                                                                                              | 90-132 VAC/47-63 Hz<br>180-264 VAC/47-63 Hz | 6.5A<br>3.5A  |
| Power Dissipation:                                   | 1383 BTU/hr                                                                                                                                                         |                                             |               |
| Physical Dimensions:                                 | Height:                                                                                                                                                             | 430 mm (16.9 in.)                           |               |
|                                                      | Width:                                                                                                                                                              | 222 mm (8.7 in.)                            |               |
|                                                      | Depth:                                                                                                                                                              | 533 mm (21 in.)                             |               |
|                                                      | Weight:                                                                                                                                                             | 32 kg (72.5 lbs)                            |               |
| Temperature:                                         | Operating: +5° to +40° C (41° to 104° F)                                                                                                                            |                                             |               |
|                                                      | Non-operating: -40° to +65° C (-40° to 149° F)                                                                                                                      |                                             |               |
|                                                      | Non-operating (with tape media): -40° to +45° C (-40° to 113° F)                                                                                                    |                                             |               |
| Relative Humidity:                                   | Operating: 20% to 80%, non-condensing                                                                                                                               |                                             |               |
|                                                      | Non-operating: 5% to 80%, non-condensing, maximum wet bulb = 26°C                                                                                                   |                                             |               |
| Altitude (operating):                                | To 3.0 km (10,000 feet) above sea level                                                                                                                             |                                             |               |
| UPS Backup Time, Minimum:                            | 15 minutes                                                                                                                                                          |                                             |               |
| Acoustics:                                           | 5.5 bels (A) sound power below 37° C, racked in cabinet                                                                                                             |                                             |               |
|                                                      | 6.0 bels (A) sound power above 37° C, racked in cabinet                                                                                                             |                                             |               |

### Networking Foundation

HP 3000 System-to-System and Desktop Networking products are supported over industry standard links: 802.3/Ethernet, 802.5 Token Ring and FDDI (with MPE/iX Release 5.0) for local-area communication and X.25 for wide-area connection. NS Point-to-Point is also supported for a direct connection between HP 3000 systems.

### IBM Coexistence

For seamless integration into an IBM computing environment, the HP 3000 offers a complete array of SNA and BSC connectivity products, including: interactive communication products SNA IMF for 3270 emulation and SNA DHCF for IBM 3270 access to the HP 3000; batch communication products SNA/RJE and BSC RJE; LU 6.2/PU 2.1 API for program-to-program communications; and

electronic mail communications through either SNADs or X.400. SNA/SDLC Link, SNA/Token Ring, BSC Link and SNA/X.25 provide the link for HP-to-IBM communication in SNA and Bisync environments.

### Information Management

The HP 3000 has four database management products for information storage. HP ALLBASE/SQL is HP's strategic relational database management system (DBMS) for HP 3000 900 systems. It provides key benefits for customers requiring a mainframe class DBMS: high availability support for large databases (>50 Gbytes), large numbers of concurrent users (>500), and support of key standards and client-server features. HP IMAGE/SQL is HP's TurboIMAGE DBMS which has been enhanced to include an SQL interface and key client-

server features. Third party DBMSs, ASK/Ingres and Oracle, are also supported on the HP 3000 systems.

Software developers are provided with a rich selection of programming languages and CASE tools that support these databases. Reporting and presentation tools are available to allow access to the stored data without programming.

### Learning Products

Series 9x8LX systems ship with a streamlined manual set covering installation and basic system operation and maintenance. Series 9x8RX systems are shipped with an expanded set of manuals covering a wider range of system operation and management tasks to aid in efficient operation of the system.

Additional manual sets covering more advanced system management functions, administration tasks, HP 3000 programming environments, and other topics are available and must be ordered separately.

### Supported Peripherals

For a list of supported peripherals, refer to the "HP 3000 900 Series Computer Systems Configuration Guide".

### Support Services

A wide range of hardware and software support services are available worldwide for all HP 3000 products. Contact your HP sales representative for details on available support services.

## Ordering Information

Series 9x8LX/RX systems include 32 or 64 Mbytes of main memory, one 1.0 Gbyte embedded disk drive, one 2.0 Gbyte DDS embedded tape drive, one HP 700/96 console with cable, one integrated SCSI/LAN/Console interface card, one 600 VA HP PowerTrust UPS, one blank DDS cassette tape, and one cleaning tape. Systems are available with a variety of database choices: Preconfigured (with IMAGE/SQL and ALLBASE/SQL), IMAGE/SQL only, and the operating system only. The HP 3000 operating system and any HP subsystem software or database management product that is ordered will be installed on the integrated disk prior to shipment. Return credit product numbers are available when upgrading from other HP 3000 systems to these systems.

Installation is included on all 9x8LX/RX systems.

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  
5161 Lankershim Blvd.  
No. Hollywood, CA 91601  
(818) 505-5600

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

### Canada:

Hewlett-Packard Ltd.  
6877 Goreway Drive  
Mississauga, Ontario L4V 1M8  
(416) 678-9430

### Japan:

Yokogawa-Hewlett-Packard Ltd.  
15-7, Nishi Shinjuku 4 Chome  
Shinjuku-ku  
Tokyo 160, Japan  
(03) 5371 1351

### Latin America:

Hewlett-Packard  
Latin American Region Headquarters  
Monte Pelvoux No. 111  
Lomas de Chapultepec  
11000 Mexico, D.F. Mexico  
(525) 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  
8487777

In Europe, please call your local HP sales office or representative:

### Austria, East Central Europe, and Yugoslavia:

43/222 2500 0

### Belgium and Luxembourg:

Customer Information Center  
32/2 7783111

### Denmark:

45/45 991000

### Finland:

358/0 88721

### France:

33/1 69826060

### Germany:

49/6172 16 0

### Greece:

30/1 6828811

### Hungary:

38/61 558472

### Iceland:

354/1 671000

### Ireland:

253/12 883399

### Sweden:

47/8 7502000

### Switzerland:

41/57 313111 (Head Office)  
41/22 7804111 (Suisse Romande)

### Turkey:

901/1 1752970

### United Kingdom:

44/344 360000

### European Multicountry:

41/22 780 8111

### Middle East and Africa:

Geneva, Switzerland  
41/22 780 7111

### European Headquarters:

Hewlett-Packard S.A.  
150, Route du Nant d'Avril  
1217 Meyrin 2  
Geneva, Switzerland  
41/22 780 8111

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Printed in USA RO0194

5962-6178E

