

# HP1000 Computer Systems

HEWLETT  PACKARD

For computation, instrumentation  
and operations management applications  
that demand high performance.

## Technical Data



## Introduction

HP 1000 Computer Systems are a powerful series of fully-integrated computer systems designed to serve computation, instrumentation and operations management applications that demand high performance. A choice of powerful, fully microprogrammable central processing units is available, including the new HP 1000 F-Series Computer with high speed floating point capabilities. New disc-based HP 1000 systems, including one that incorporates the new computer, feature HP's new RTE-IV operating system, which provides for processing of very large data arrays. The HP 1000 Computer Systems are offered principally to OEM system houses and to manufacturers with computer applications experience.

### Content and organization of this data book

This data book contains individual system data sheets and data sheets that describe the computers, memory systems, computer accessories, system consoles, and system disc memories. For most convenient reference, product support, environmental specifications, physical characteristics, and ac power requirements for HP 1000 Computer Systems, options, and accessories are covered in summary product support and site planning data sheets in the rear of this data book, not in the individual data sheets.

For fast, easy location of a particular category of information in this book, use the Quick reference index (facing). The more detailed Technical data index by model number on page C (rear of the Quick reference index) is provided for reference to coverage of specific products.

### Other related publications

The following additional publications provide supplementary technical data, pricing, and configuration information.

**HP 1000 Computers and Systems Distributed Systems and Communications Data book.** Provides data sheets on:

- DS/1000 software-firmware and interfaces
- RJE/1000 communications package
- CRT and printing terminals and related terminal per I/O channel software
- Multipoint software and interface
- Other data communications interfaces

**HP 1000 Computers and Systems Peripherals Data book.** Provides data sheets on:

- CRT, printing and data capture terminals
- Disc memories
- Magnetic tape units
- Line printers
- Card readers
- Punched tape I/O subsystems
- Graphics display and plotting devices and interfaces
- Instrumentation interfaces and subsystems
- Cabinets
- Environmental and physical characteristics and power requirements

**HP 1000 Computers and Systems Active Software Data book.** Provides data sheets on:

- Software support
- User training services for active software
- RTE-M and RTE-IV operating systems
- Program languages, including BASIC subsystems and the RTE Microprogramming package
- Libraries and support packages, including the Diagnostics library and the new GRAPHICS/1000 Graphics plotting software
- Data management software

**HP 1000 Computers and Systems Mature Software Data book.** Provides data sheets on:

- Software support
- User training services for mature software and subsystems supported by mature software operating systems
- RTE-II, BCS, RTE-B, and RTE-C operating systems
- Program languages
- Supporting libraries, including the 92066A RTE Measurement and Control Software package
- Distributed systems software supported by the mature software operating systems

**HP Computer Systems Configuration and Site Preparation Guide.** Provides configuration, price, prerequisite, and site preparation information for HP 1000 Computer Systems, options, accessories, and support services.

**HP 1000 Computers Hardware Data book.** Provides data sheets on:

- HP 1000 F-, E-, and M-Series Computers and M- and E-Series Board Computers
- Memory systems
- Mainframe plug-ins
- Firmware products
- User microprogramming accessories
- Power fail recovery systems
- Input/output and memory extenders
- General purpose I/O interfaces
- Environmental specifications and product support information
- Power specifications and applicability summary

**HP 1000 Computers Selection and Configuration Guide.** Provides selection, configuration, price, and prerequisite information for HP 1000 Computers, options, accessories, and compatible interfaces, peripherals, software, and support services.

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## Other peripheral devices (terminals, disc memories, magnetic tape units, line printers, card readers, punched tape I/O, graphics display and plotting, and instrumentation interfaces and subsystems)

See HP 1000 Computers and Systems Peripherals and Interfaces Data book

## Distributed systems network communications (DS/1000 and RJE/1000)

See HP 1000 Computers and Systems Distributed Systems and Communications Data book

## Software operating systems, program languages, supporting libraries and subsystems

See HP 1000 Computers and Systems Active Software Data book for information on RTE-M, RTE-IV, and all RTE subsystems; HP 1000 Computers and Systems Mature Software Data book for information on RTE-II.



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## The HP 1000 Concept: computation, instrumentation, and operations management

### Computation: a choice of two levels of computing power

HP 1000 Systems now offer a choice of two levels of computing power. For many applications, the HP 1000 E-Series Computer will provide excellent capability. Users who need maximum speed and accuracy in computer-aided design, simulation, graphics, and other scientific and engineering computation applications require the exceptional processing speed and power of HP's new HP 1000 F-Series Computer.

The HP 1000 E-Series Computer standard instruction set features firmware floating point, integer multiply and divide, byte move and scan, and word, byte, and bit manipulation capabilities. I/O data transfers are performed at rates up to 2.28 million bytes per second. The E-Series Computer is in successful use in more than one thousand HP 1000 Computer Systems throughout the world.

The new HP 1000 F-Series Computer includes all the features of the E-Series Computer, plus a hardware implemented Floating Point Processor that runs single precision and extended precision calculations up to 6 times faster than the E-Series Computer. A new Scientific Instruction Set works with the Floating Point Processor to provide 6-to-24-fold improvement in execution speeds for nine different transcendental functions. Finally, the F-Series Computer includes a set of routines that accelerate the performance of FORTRAN programs. Commonly-used FORTRAN routines, such as parameter passing and array address calculation are speeded up by a factor of 2 to 20.

User microprogrammability can be used to gain even further performance increases in either computer, by microprogramming frequently-used software subroutines for specific applications. HP's optional microprogram development support software helps users to develop tailored, microprogrammed subroutines using an easy-to-learn assembly-like language.

**Memory flexibility.** To further speed program execution, high performance memory with 350 ns cycle time provides up to 30% performance increase over standard performance memory.

Extensive memory management instructions can provide flexible access to more than 2 million bytes of main memory by processor and I/O channels alike, a capability fully supported by the RTE-M RTE-IV operating systems used in the HP 1000. Fault control is available for maximizing the reliability of large-memory systems up to 1.8M bytes, or for systems that require fault-secure operation.

**HP 1000 System memory capacity.** HP 1000 Computer Systems that operate under RTE-M and RTE-IV can all be equipped with up to 1.28 megabytes of memory (1.024 megabytes with fault control). The upright cabinet configurations of the HP 1000 Model 20 and 40 Computer Systems can be equipped with the 12990B Memory extender, which extends maximum memory capacity to 2 megabytes (1.8 million bytes with fault control).

**Large data space** can be provided for user's computational applications in HP 1000 Systems operating under HP's powerful, new, disc-based RTE-IV operating system in maximum-memory systems. The new Extended Memory Area (EMA) design of RTE-IV can be used to provide up to nearly 2 megabytes of physical memory space for data arrays. HP 1000 Systems operating under RTE-IV can thus tackle problems (large array sorts and scans, matrix inversions, etc.) that formerly could be handled only by far more costly systems.

### Instrumentation

**HP-IB\* instrument clusters:** The HP 1000 Computer System can be equipped to control and interact with Hewlett-Packard Interface Bus (HP-IB)\* instruments and devices, including the powerful HP 2240A Measurement and Control Processor. Up to 14 HP-IB devices can connect to a single interface. Multiple automatic test or measurement stations can be controlled by the HP 1000 via multiple HP-IB interfaces.

**Measurement and Control Subsystems.** HP 1000 Systems can also perform measurement and control functions via the HP 2313B Analog I/O Subsystem, which can be extended to sample up to 528 differential analog inputs. For smaller analog input needs, HP 1000 Systems can also use the 91000A Plug-in Analog-to-Digital Interface card, which has a capacity of 16 single-ended or 8 differential analog inputs.

### Multi-user accessibility

HP 1000 Computer System operations are managed by the user's choice of memory-based RTE-M or disc-based RTE-II or RTE-IV real-time multiprogramming executive operating systems. A multi-terminal monitor gives multiple users interactive access to system resources for program development, data entry and retrieval, data processing, automatic test or measurement system control, and report generation. Because several users can be served concurrently, the real-time operating system makes the HP 1000 Computer System effectively function as several systems in one.

\*The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard's implementation of IEEE Standard 488-1975, "Digital Interface for programmable instrumentation" and identical ANSI Standard MC1.1. The term HP-IB is also used to identify instruments conforming to IEEE Standard 488-1975, of which more than 200 different test and measurement instruments and devices are now available from Hewlett-Packard and 22 other manufacturers.

In the disc-based HP 1000 Computer Systems, the disc provides extensive, fast-access data storage capacity. To help keep track of data, a real-time file manager is provided with disc-based HP 1000 Systems. This file manager makes it easy to open and access automatically-extendable, named files, from multiple terminals, simultaneously.

### Operations management

For more data intensive operations management applications involving order entry, bill of material processing, inventory control, or material requirements planning, the full data base management capability of the IMAGE/1000 System can be added to the disc-based HP 1000 Computer systems. This system provides all necessary tools for building, maintaining, and restructuring a true data base of the information required for operations management. Once established, the IMAGE/1000 data base can be accessed by multiple users with QUERY, an English-like inquiry language that simplifies information retrieval and report generation.

### Multi-terminal operator communications

HP 1000 Computer Systems include a CRT terminal with dual Mini cartridge tape read/write capability as the system console, which also functions as the standard input/output unit at display speeds to 960 char/sec. Additional CRT terminals and/or printing terminals with data rates to 180 char/sec can also be used locally, or for communicating from remote sites via modem links. HP's new multipoint interface can be used to connect multiple CRT terminals to the system via a single I/O channel and a single multipoint line. Modem connection can be used for remotely-located clusters of CRT terminals, thereby minimizing line costs. In addition to keyboard terminals, HP 1000 Systems can be equipped with punched or mark-sense card readers or a punched tape reader for program or data input from tab cards or punched tape.

### Data reporting and storage

In addition to the Mini cartridge tapes in the system console, HP 1000 Systems can be provided with a choice of line printers, magnetic tape units, flexible disc drive, and/or a tape punch for recording program listings and data outputs on any of the principal recording media.

### Data communications and networkability

HP 1000 systems can be equipped to function as RTE-M (memory based) or RTE-IV (disc-based) network nodes in a DS/1000 network. Star, ring, and string network configurations, or combinations of them are supported. DS/1000 software supports program-to-program data exchange, distributed data file management, and remote HP 1000 I/O and job scheduling between HP 1000 systems and between HP 1000 systems and HP 3000 Series II systems. Any RTE-IV network node with at least 128k bytes of memory can support other nodes with program development, storage for programs and data on disc or flexible disc files, and data processing assistance. For batched remote job entry, HP 3000 Series II and disc-based HP 1000 systems can be equipped to communicate with IBM 360/370 systems.

## Multiple program languages

The HP 1000 is a multi-lingual system, with the disc-based versions capable of processing and executing programs written in easy-to-use real-time BASIC (optional), FORTRAN IV, or Assembly language. The memory-based version can process and execute programs written in real-time BASIC and, when the system is equipped with flexible disc, in FORTRAN IV and Assembly language as well. This multilingual capability lets you choose the language most familiar to you, or the one best suited to your job.

## Auto boot-up

After the system has been installed, it automatically brings itself up each time it is turned on, so the operator doesn't have to perform a manual boot-up procedure. This saves time, makes the system easier to use.

## A choice of models, physical configurations, and capabilities

**The Model 20** is a memory-based Computer System intended primarily for instrumentation control and computational and data processing support in scientific and industrial applications. It incorporates the E-Series Computer and is offered in both desk and upright cabinet configurations. The base system supports development and execution of programs in real-time BASIC. It also supports execution of programs in FORTRAN IV and Assembly language that have been developed on other HP 1000 Computer Systems. Addition of an optional flexible disc subsystem equips the Model 20 with 512k bytes of low-cost, on-line mass storage, expandable to 1024k bytes with an additional drive. The flexible disc option also adds disc file management, interactive editing, and FORTRAN IV and Assembly language program development capability.

The Model 20 System can be extended to add HP-IB or measurement and control interfaces for control of automatic test or measurement systems and/or DS/1000 software-firmware for network communications. Flexible disc can be added to provide the additional capabilities discussed above. And memory capacity is expandable up to 2 megabytes in the upright cabinet version, up to 1.28 megabytes in the desk cabinet version, to accommodate up to 64 programs in the system at the same time, making it possible to serve multiple users concurrently.

**The Model 25** System is similar to the Model 20 System, but uses the new F-Series Computer to provide maximum power for floating point and transcendental function calculations for scientific and engineering applications. 350 nanosecond high performance memory is expandable to 1.28 megabytes in both desk and upright cabinet versions.

**The Model 40** is a general-purpose disc-based Computer System for computation, program development support, and instrumentation control. In both desk and upright cabinet configurations, it incorporates the HP 2113B (E-Series) Computer and the powerful new RTE-IV operating system. It can be extended to provide IMAGE/1000 based operations management and/or GRAPHICS/1000 Graphics Plotting Software to assist with graphical presentation of data. It can also be extended to add DS/1000 software-firmware for network communications. Memory capacity of the Model 40 can be expanded from 128k bytes up to 2 megabytes in the upright cabinet version, 1.28 megabytes in the desk cabinet version, to accommodate the needs of many multiple users at the same time and/or to provide megabyte sized space for data processed by the system. Disc memory can be expanded from 19.6M bytes up to 370M bytes, from 50 to 400M bytes with the top loading disc option.

**The Model 45** System is similar to the Model 40 System, but uses the new F-Series Computer to provide maximum power for floating point and trigonometric and logarithmic calculations for scientific and engineering applications. Memory is expandable to 1.28M bytes (1.024M bytes with fault control) in both desk and upright cabinet versions.

The 350 ns high performance memory is standard, further augmenting the computational power of the Model 45's F-Series computer. And the system console is a 2648A Graphics Terminal, supported by HP's new GRAPHICS/1000 Graphics Plotting Software for easy graphic display of data, which is also standard in the Model 45.

**The Model 30** is a lower-priced disc-based System that operates under HP's RTE-II system 64k bytes of memory. It incorporates the HP 2113B (E-Series) Computer in both desk and upright cabinet versions. The Model 30 is available with 4.9M byte or 19.6M byte Cartridge Disc in the upright cabinet version, 19.6M byte disc only in the desk cabinet version. Although IMAGE/1000 can be used to provide operations management capability, memory size is limited to 64k bytes and, for that reason, capabilities supported by both the Model 20/25 and 40/45 Systems are not supported on the Model 30. Capabilities not supported by the Model 30 includes DS/1000 networking, DATACAP/1000, and multipoint terminal communications. Because of its relatively limited scope, the Model 30 should be selected only for those applications in which system price is a more important consideration than performance, capacity, or expandability.

## Accessories for HP 1000 Computer Systems

The base computer systems of the HP 1000 Computer Systems, and accessories and their usability in the various HP 1000 Models are listed in Table 1-1, starting on page 1-4. Also included is the status of the 115V version of the various accessories with respect to UL (Underwriters Laboratory) listing and CSA (Canadian Standards Association) certification of safety.



Table 1-1. HP 1000 Computer systems and accessories

NOTE: New additions to accessories (peripherals, software, and data communications interfaces and software support) may have been made since the publication of this data book, and would not appear in Table 1-1. For the most current information on HP 1000 Computer System accessories, ask your Hewlett-Packard Representative for data books on the HP 1000 Computers and Systems Peripherals, Distributed Systems and Communications, and Active Software.

HP 1000					Computer system or accessory	UL Status	CSA Status
MODEL 30	MODEL 20	MODEL 25	MODEL 40	MODEL 45			
					<b>Computer systems and options</b>		
A					2170A Computer System w/4.9M byte disc in upright cabinet	L	C
A					2171A Computer System w/19.6M byte disc in upright cabinet	L	P
A					2172A Computer System, desk style w/19.6M byte disc in minirack	L	P
A					2174A Computer System in upright cabinet	L	C
A					2174B Computer System in desk cabinet	L	C
	A				2175A Computer System in upright cabinet	P	P
	A				2175B Computer System in desk cabinet	P	P
		A			2176A Computer System w/19.6M byte disc in upright cabinet	L	P
		A			2176B Computer System, desk style w/19.6M byte disc in minirack	L	P
			A		2177A Computer System w/19.6M byte disc in upright cabinet	P	P
			A		2177B Computer System, desk style w/19.6M byte disc in minirack	P	P
U			U	U	2170A, 2171A, 2176A, or 2177A Option 002: Adds second upright cabinet bay to the system cabinet to receive a magnetic tape unit and/or an additional disc drive	R	
D		D	D	D	2172A, 2176B, or 2177B Option 002: Replaces disc drive in minirack with disc drive in upright cabinet with additional space available for magnetic tape unit	L	P
X	X	X	X	I	Option 008: Provides 2648A Graphics Terminal as system console, replacing 2645A Display Station	L	C
X	X	X	X	X	Option 014: Deletes memory package and 12892B memory protect supplied with the base system to permit replacement with a different memory package, which will be required for operation	*	*
				U	2176A Option 030: Replaces 19.6M byte disc with 4.9M byte disc	L	C
	X	X			2174A/B or 2175A/B Option 032: Adds 514k byte Flexible Disc Subsystem, additional file management and program development capabilities, and Dual-Channel Port Controller	L	C
			X	X	2176A/B or 2177A/B Option 033: Replaces 19.6M byte disc with 50M byte disc	L	C
X	X	X	X	X	Option 015: 230V operation		
					<b>Computer memory packages and accessories</b>		
	X	X	X	X	12786A/B/C/D 128k/256k/512k/1024k byte Standard performance memory package (665 ns cycle time) (requires option 014).	*	*
	X	X	X	X	12787A/B/C/D 128k/256k/512k/1024k byte Standard performance fault control memory package (700 ns cycle time) (requires option 014)	*	*

Table 1-1. HP 1000 Computer systems and accessories, cont'd

HP 1000					Computer system or accessory	UL Status	CSA Status
MODEL 30	MODEL 20	MODEL 25	MODEL 40	MODEL 45			
	X	X	X	X	12788A/B/C/D 128k/256k/512k/1024k byte High performance memory package (420 ns cycle time) (requires option 014)	*	*
	X	X	X	X	12789A/B/C/D 128k/256k/512k/1204k byte High performance fault control memory package (455 ns cycle time) (requires option 014)	*	*
X	X	I			2102E High performance memory controller (requires option 014, 2 x 12741A, and 12892B)	*	*
X	X	I			12741A 32k byte High performance memory module (max. of two)	*	*
	I	I			2102B Standard performance memory controller (requires option 014, 2 x 13187B and 12892B)	*	*
					13187B 32k byte Standard performance memory module (max. of two)	*	*
X	X				2102C Standard performance fault control memory controller (requires option 014, 2 x 13187B, 12779A, and 12892B)	*	*
X	X	X			2102H High performance fault control memory controller (requires option 014, 2 x 12741A, 12779H, and 12892B)	*	*
X	X	X			12892B Memory protect (required with memory ordered as components after option 014 deletion of standard memory).	*	*
	X		X		12747A 128k byte Standard performance memory module.	*	*
X	X		U		12779A 256k byte Standard performance fault control check bit array board	*	*
		U	U		12780A 512k byte Standard performance fault control check bit array board	*	*
	X	X	X	X	12747H 128k byte High performance memory module	*	*
X	X	X	U		12779H 256k byte High performance fault control check bit array board	*	*
	U		U		12780H 512k byte High performance fault control check bit array board	*	*
X	X	I	X	I	13306A Fast FORTRAN Processor giving 2 to 20 times faster execution of frequently-used FORTRAN-callable subroutines	*	*
U	U	U	U	U	12979B Dual port I/O Extender (adds 16 I/O channels; max. of one)	L	C
U	U	U	U	U	12898A Dual Channel Port Controller for 12979B	*	*
I	X	X	I	I	12897B Dual Channel Port Controller for Model 20/25 system without flexible disc option 032	*	*
	U		U		12990B Memory Extender (adds nine memory module slots for more capacity in system)	R	C
	U		U		12991B Power fail recovery system for 12990B Memory Extender	*	*
X	B	B	X	X	13197A 1k Writable Control Store for micro-code instructions developed on a Model 30, 40, or 45 System, using the 92061A RTE Microprogramming Package	*	*
X	B	B	X	X	13047A 2k User Control Store for PROMs (permanent instructions developed on a Model 30, 40, or 45 System, using the 92061A RTE Microprogramming Package and tested with WCS before being burned into PROMs)	*	*
X	X	X	X	X	12620A Breadboard interface for privileged interrupt control	*	*



Table 1-1. HP 1000 Computer systems and accessories, cont'd.

HP 1000					Computer system or accessory	UL Status	CSA Status
MODEL 30	MODEL 20	MODEL 25	MODEL 40	MODEL 45			
	X	X	X	X	<b>CRT Terminals and accessories</b> Multiple 2645A and/or 2648A CRT Terminals with option 030, 13234A 4k byte terminal memory module, 13260C/D multipoint communications card, and appropriate cables connected to the system via the 12790A Multipoint Terminal Interface for local or modem communication at line rate to 9600 bps (requires 91730A Multipoint software package)	L	C
X	X	X	X	X	2645A+030 Display Station with 13260B and 12966A+001/002 block mode interface for local/modem communication at rates to 960 char/sec	L	C
X	X	X	X	X	2648A+030 Graphics Terminal with 13260B +003 and 12966A +001/002 block mode interface for local/modem communication at rates to 960 char/sec, graphics display up to 190 vectors/sec	L	C
X	X	X	X	X	2645A/2648A Option 007: Adds Minicartridge I/O to 2645A/48A, up to 350 char/sec	L	C
X	X	X	X	X	13426A/B (9866A/B) auxiliary Printer (80 col x 240 LPM) for system console or other 2645A/2648A+007 CRT Terminal	L	C
X	X	X	X	X	13349A (9871A+122) auxiliary Printer (132 col x 30 char/sec) for system console or other 2645A/2648A+007 CRT Terminal	L	C
X	X	X	X	X	2631A+240 auxiliary Printer (136 col x 180 char/sec) for system console or other 2645A/2648A+007 CRT Terminal	L	C
X	X	X	X	X	2640B CRT Terminal with 12880A+001/12531D+002 interface for local/modem communication at rates to 240 char/sec	L	C
X	X	X	X	X	<b>Printing terminal</b> 2635A+051 Printing Terminal with 12966A+001 interface for local or 2635A with 12966A+002 interface for modem communication at rates to 180 char/sec	L	C
			X	X	<b>Data capture terminal</b> 92900B Data capture terminal subsystem (1 to 56 HP 3070B Data capture terminals)	P	P
S	S	S	S	S	<b>Magnetic tape subsystems</b> 7970B+236 9-track, 800 bpi, 45 ips Magnetic tape subsystem (up to 36,000 bytes/sec, up to four drives)	R	C
S	S	S	S	S	7970E+236 9-track, 1600 bpi, 45 ips Magnetic tape subsystem (up to 72,000 bytes/sec, up to four drives)	R	C
X	X	X	X	X	<b>Line printer subsystems</b> 12987A Line Printer Subsystem (132 col x 200 LPM)	L	C
X		X	X	X	2613A+100 Line Printer Subsystem (136 col x 300 LPM)	L	C
X		X	X	X	2617A+100 Line Printer Subsystem (136 col x 600 LPM)	L	C
X		X	X	X	2618A+100 Line Printer Subsystem (132 col x 1250 LPM)	L	C
X	X	X	X	X	2631A+210 Line Printer Subsystem (136 col x 180 char/sec)	L	C
X	X	X	X	X	12996A Page Printer Subsystem (80 col x 240 LPM)	L	C

Table 1-1. HP 1000 Computer systems and accessories, cont'd.

HP 1000					Computer system or accessory	UL Status	CSA Status
MODEL 30	MODEL 20	MODEL 25	MODEL 40	MODEL 45			
U				U	<b>Disc memories</b> 12960A+010 add-on "slave" 4.9M byte Cartridge disc drive for 2170A or 2176A+030 System (requires option 002; max. of one)	R	C
X	O	O	X	X	12732A Flexible Disc Subsystem (514k bytes)	L	C
X	X	X	X	X	12733A additional "slave" Flexible Disc Drive (514k bytes; max. of one)	L	C
S			S	S	7906SR+020 add-on "slave" 19.6M byte Cartridge Disc Drive for rack mounting in upright cabinet; requires 20M byte master disc and additional upright cabinet (max. of seven)	R	P
X			X	X	7906S add-on "slave" 19.6M byte Cartridge Disc Drive in minirack; requires 19.6M byte master disc (max. of seven)	L	P
X			X	X	7920S add-on "slave" 50M byte Disc Drive; requires 19.6M byte or 50M byte master disc (max. of seven)	L	C
X	X	X	X	X	<b>Measurement and control interfaces and subsystems</b> 59310B HP-IB interface (interfaces up to 14 HP-IB devices via single I/O channel)	*	*
S	S	S	S	S	2240A Measurement and Control Processor (connects to HP 1000 using 59310B interface; supports function cards for up to 128 analog and/or digital I/O points; 2241A Extender adds capacity for 128 additional I/O points)	L	C
S	S	S	S	S	2313B+001 Analog I/O Subsystem (supports function cards for up to 144 differential analog inputs in the mainframe, plus up to 192 more in each of two extenders)	P	P
X	X	X	X	X	91000A Analog-Digital Interface Subsystem (16 single-ended or 8 differential analog inputs)	*	*
U	U	U	U	U	<b>Punched tape subsystems</b> 12925A Punched Tape Reader Subsystem (up to 500 bytes/sec)	R	C
U	U	U			12926A Tape Punch Subsystem (75 bytes/sec); available only in 2170A, 2174A, or 2175A	L	C

**HP 1000 Model and Accessory Selection Notes**

A = Alternate computer system choice.

B = Microprogramming support in HP 1000 Model 20 and 25 Computer Systems is limited to the WCS loader and WCS driver DVR36 of the 92061A RTE Microprogramming Package; microprograms for Model 20 and 25 Systems must be developed on a Model 30, 40, or 45 System.

D = Available only for desk cabinet version.

I = Included in this Model

Q = ISA FORTRAN Extension Package will not be factory-configured in HP Model 20 or 25 Computer System

S = Accessory that will require additional upright cabinet rack space.

U = Available only for upright cabinet version.

X = System, option, or accessory available in all versions of this Model.

**UL and CSA Status Notes**

L = UL Listed system or peripheral device.

C = CSA Certified system or peripheral device.

P = System or peripheral device for which UL and/or CSA listing, recognition, or certification request is Pending at the time of publication of this data book. Check with your Hewlett-Packard Sales Representative to determine current status if such approval is important in your application.

R = UL Recognized system component

\* = Product covered by the UL listing or recognition or CSA certification of the computer system or extender in which they are installed, not individually

Table 1-1. HP 1000 Computer systems and accessories, cont'd.

HP 1000					Computer system or accessory	UL Status	CSA Status
MODEL 30	MODEL 20	MODEL 25	MODEL 40	MODEL 45			
					<b>Card reader subsystems</b>		
X			X	X	12985A Card Reader Subsystem (600 punched cards/min)	L	
X			X	X	12986A Optical Mark Reader Subsystem (300 mark-sense or punched cards/min)	L	C
					<b>Plotting and display capabilities</b>		
X	X	X	X	X	91200B Video display monitor interface (interfaces data to TV monitors; B&W requires one interface, color requires three interfaces)	*	
X	X	X	X	X	9872A four color Graphics Plotter (connects to HP 1000 via 59310B HP-IB interface)	L	
X	X	X	X	X	7245A Plotter/Printer connects to HP 1000 via 59310B HP-IB interface)	P	
					<b>Optional software packages</b>		
X	B	B	X	X	92061A+020 RTE Microprogramming Package on Mini cartridge		
X			X	X	92063A+020 IMAGE/1000 Data Base Management System on Mini cartridges		
	X	X	X	X	91730A+020 Multipoint Terminal Subsystem Software on Mini cartridges		
X			X	X	92101A+020 BASIC/1000D		
X	X	X	X	X	92400A+020 Sensor-based DAS Utility Library on Mini cartridges		
	X	X	X	X	92840A+020 Graphics Plotting Software on Mini cartridges		
					<b>Distributed Systems Networking Products</b>		
	X	X	X	X	91740B+020 DS/1000 Network software-firmware on Mini cartridges. Requires 12771A or 12773A interface(s)		
	X	X	X	X	12771A Computer Serial Interface (two interface cards, one for each end of the system-to-system connection, used with 91740B for hardwired HP 1000-to-HP 1000 connection)	*	*
	X	X	X	X	12773A Computer Modem Interface (one interface card used with 91740B for HP 1000-to-HP 1000 connection via user-furnished modems and telephone lines; one 12773A is required in each system)	*	*
	X	X	X	X	91741A+020 DS/1000 Software Enhancement on Mini cartridge for HP 1000-to-HP 3000 Communication. Requires 91740B+020 and 12889A		
	X	X	X	X	12889A Hardwired Serial Interface (one interface card used with 91741A for hardwired HP 1000-to-HP 3000 connection)	*	*
X			X	X	91780A+020 RJE/1000 communications package for communication with certain IBM 360/370 systems (includes send and receive synchronous modem interface cards and software on Mini cartridges)	*	*
					<b>Cabinets</b>		
X	X	X	X	X	29402B Upright cabinet (single-bay rack that provides 142 cm (56 in) of vertical rack space)	R	C

**HP 1000 Model and Accessory Selection Notes**

A = Alternate computer system choice.

B = Microprogramming support in HP 1000 Model 20 and 25 Computer Systems is limited to the WCS loader and WCS driver DVR36 of the 92061A RTE Microprogramming Package; microprograms for Model 20 and 25 Systems must be developed on a Model 30, 40, or 45 System.

D = Available only for desk cabinet version.

I = Included in this Model

Q = ISA FORTRAN Extension Package will not be factory-configured in HP Model 20 or 25 Computer System

S = Accessory that will require additional upright cabinet rack space.

U = Available only for upright cabinet version.

X = System, option, or accessory available in all versions of this Model.

**UL and CSA Status Notes**

L = UL Listed system or peripheral device.

C = CSA Certified system or peripheral device.

P = System or peripheral device for which UL and/or CSA listing, recognition, or certification request is Pending at the time of publication of this data book. Check with your Hewlett-Packard Sales Representative to determine current status if such approval is important in your application.

R = UL Recognized system component

\* = Product covered by the UL listing or recognition or CSA certification of the computer system or extender in which they are installed, not individually



## HP 1000 Model 20 computer system

Product numbers 2174A and 2174B

The HP 1000 Model 20 is a memory-based Computer System intended primarily for instrumentation control and computational and data processing support in scientific and industrial applications. It is available in either 2174B desk or 2174A upright cabinet configuration (shown). The base Model 20 System supports development and execution of Real-Time BASIC programs and execution only of FORTRAN IV and/or Assembly language programs prepared on another HP 1000 System.

Addition of an optional Flexible Disc Subsystem equips the Model 20 System with 514k bytes of low cost, on-line mass storage, expandable to 1028k bytes with an additional drive. The flexible disc option also adds disc file management, interactive editing and on-line program development in FORTRAN IV and Assembly language.

The desk configuration provides a convenient, wide workspace for the system console, HP-IB instruments, flexible disc drives, manuals, and working papers. However, the upright cabinet configuration offers more capacity for expansion; it can house a memory extender (not compatible with the desk configuration), I/O extender, punched tape reader, tape punch, and/or one or two flexible disc drives.

### Features

- E-Series Computer
- Choice of upright or desk cabinet configuration
- Highly-flexible memory based real-time executive operating system
- Flexible disc subsystem option for 514k to 1028k bytes of low-cost, on-line mass storage
- Programming in easy-to-use Real-Time BASIC is standard; software for development of FORTRAN IV and Assembly language programs is provided with optional flexible disc subsystem
- Optional DS/1000 software and interfaces for access to the greater resources and power of DS/1000 networks
- 64k byte main memory, expandable to 2.048M bytes in 2174A, 1.28M bytes in 2174B.
- Fault control memory is optional, offering significant MTBF improvement for large-memory systems up to 1.792M bytes in 2174A, 1.024M bytes in 2174B.
- Auto boot-up for easier use with flexible disc
- On-line generation of operating system
- Interactive multi-user access to system resources with 128k bytes or more memory
- Software compatible with other HP 1000 Models
- System console with integral dual Mini cartridge input/output



2174A System (chair and system console table not included); 2174B Desk cabinet version is similar to 2175B System, which is shown in the HP 1000 Model 25 data sheet

### Functional specifications

#### Computer memory

64k bytes of standard performance memory, which is optionally replaceable with up to 2.048M bytes (1.792M bytes with fault control) of standard or high performance memory in the 2174A System with 12990B Memory Extender, 1.28M bytes (1.024M bytes with fault control) in the 2174B System.

#### Available I/O channels

12 in computer mainframe, expandable to 28 with 12979B Dual-Port I/O Extender in 2174A.

#### Flexible disc memory (optional)

514k bytes with flexible disc option 032, expandable to 1028k bytes with an additional 12733A "slave" Flexible Disc Drive (uses two I/O channels).

## Ordering information

### 2174A Computer system

The 2174A Computer System consists of:

1. 2113 Computer with 128 base set instructions, 14 I/O channels, space for ten memory modules, and ROM loaders for disc and punched tape reader, and also equipped with:
  - a. 2102B Standard Performance Memory Controller and 65,536 bytes (64k bytes) of semiconductor memory (two 13187B Standard Performance Memory Modules).
  - b. 12892B Memory Protect.
  - c. 12991B Power Fail Recovery System.
  - d. 12992C Terminal Loader ROM
  - e. 12539C Time Base Generator.
  - f. 13304A Firmware Accessory Board.
  - g. Auto boot-up capability (requires option 032).
2. 29402B+200 Cabinet with front door and front and side stabilizer.
3. 2645A+001, 007, 013, 030 Display Station with 13260B Extended Asynchronous Communications plus 12966A+001 Buffered Asynchronous Communications Interface as system console with dual Mini cartridge drives serving as standard input and output units.
4. 92064A+020 RTE-M operating system on Mini cartridges, including:
  - a. RTE-MI, MII, and MIII operating systems with multi-terminal monitor, auto restart program, relocating loader, and on-line and offline generators.
  - b. Mini cartridge file manager.
  - c. Mini cartridge absolute program loader.
  - d. System libraries.
  - e. RTE drivers package providing RTE drivers for data processing peripherals and HP-IB interface.
5. 92065A+020 BASIC/1000M Real-Time BASIC program development and execution system on Mini cartridges.
6. 92066A+020 RTE Measurement and Control Package, including drivers for 91000A and 2313B Analog I/O Subsystems and 91063A Digital I/O Subsystem and the 92413A ISA FORTRAN Extensions Package.\*
7. Diagnostics Package (24998-14001) on Mini cartridge tapes.
8. System hardware and software manuals.
9. Factory integration and test\* with configured system on Mini cartridge tapes (or flexible disc if system order includes flexible disc option 032).
10. On-site installation and checkout with system console.
11. Site prep consultation.
12. Three month's Comprehensive Software Support after installation.

\*ISA FORTRAN will not be configured into the 2174A/B System at the factory.

### 2174B Computer system

The 2174B Computer System consists of:

1. Same as item 1 for the 2174A Computer System.
2. 29421A Desk cabinet.
- 3-12. Same as items 3 through 12 for the 2174A Computer System.

### 2174A/B options

- 008:** Replaces 2645A Display Station with 2648A Graphics Terminal as system console (all system console options and accessories are same as for 2645A).
- 014:** Deletes 2102B Memory Controller, two 13187B Memory modules, and 12892B Memory protect to permit their replacement with one of the following combinations of memory components, which must be ordered separately:
- Any of memory packages 12786A/B/C/D, 12787A/B/C/D, 12788A/B/C/D, or 12789A/B/C/D.
  - 2102E High performance memory controller, two 12741A 32k byte Memory modules, and 12892B Memory protect
  - 2102C Standard performance fault control memory controller, two 13187B 32k byte memory modules, 12779A 256k byte Check bit array board, and 12892B Memory protect
  - 2102H High performance fault control memory controller, two 12741A 32k byte memory modules, 12779H 256k byte Check bit array board, and 12892B Memory protect
- 032:** Flexible disc subsystem; adds 12732A Flexible Disc Subsystem (including flexible disc loader ROM) and 12897B Dual-Channel Port Controller, and replaces standard RTE-M and BASIC/1000M items 4 and 5, above, with the more extensive flexible disc based RTE-M (92064A+040), which supports program development in FORTRAN IV and Assembly language, and the flexible disc based BASIC/1000M subsystem (92065A+040).
- 015:** 230V/50 Hz operation.

### 2174A/B accessories

2174A/B (HP 1000 Model 20) Accessories are listed in Table 1-1, pages 1-4 through 1-6, described in their respective data sheets in this and other data books, and listed in the HP 1000 Computer systems Configuration and Site Preparation Guide.



## HP 1000 Model 25 computer system

Product numbers 2175A and 2175B

The HP 1000 Model 25 is a memory-based Computer System with the new F-Series Computer to provide maximum power for floating point and trigonometric, logarithmic, and other transcendental calculations for scientific and engineering applications. It is available in either upright cabinet configuration (2175A) or desk (2175B) cabinet (shown). The base Model 25 System supports development and execution of Real-Time BASIC programs and execution only of FORTRAN IV and/or Assembly language programs prepared on another HP 1000 System.

Addition of an optional Flexible Disc Subsystem equips the Model 25 System with 514k bytes of low cost, on-line mass storage, expandable to 1028k bytes with an additional drive. The flexible disc option also adds disc file management, interactive editing and on-line program development in FORTRAN IV and Assembly language.

The desk configuration provides a convenient, wide workspace for the system console, HP-IB instruments, flexible disc drives, manuals, and working papers. However, the upright cabinet configuration offers more capacity for expansion; it can house an I/O extender, punched tape reader, tape punch, and/or one or two flexible disc drives.



2175B System, (chair not included); 2175A upright cabinet version is similar to 2174A System, which is shown in the HP 1000 Model 20 data sheet.

### Features

- New F-Series computer for 2.5 to 6 times faster floating point calculations than 2174A/B, and 6 to 24 times faster execution of transcendental functions
- Choice of upright or desk cabinet configuration
- Highly-flexible memory based real-time executive operating system
- Flexible disc subsystem option for 514k to 1028k bytes of low-cost, on-line mass storage
- Programming in easy-to-use Real-Time BASIC is standard; software for development of FORTRAN IV and Assembly language programs is provided with optional flexible disc subsystem
- Optional DS/1000 software and interfaces for access to the greater resources and power of DS/1000 networks
- 64k byte high performance main memory, expandable to 1.28M bytes.
- Fault control memory is optional, offering significant MTBF improvement for large-memory systems up to 1.024M bytes.
- Auto boot-up for easier use with flexible disc.
- On-line generation of operating system
- Interactive multi-user access to system resources with 128k bytes or more memory
- Software compatible with other HP 1000 Models
- System console with integral dual Mini cartridge input/output

### Functional specifications

#### Computer memory

64k bytes of high performance memory, which is optionally replaceable with up to 1.28M bytes (1.024M bytes with fault control) of high performance memory.

#### Available I/O channels

12 in computer mainframe, expandable to 28 with 12979B Dual-Port I/O Extender in 2175A.

#### Flexible disc memory (optional)

514k bytes with flexible disc option 032, expandable to 1028k bytes with an additional 12733A "slave" Flexible Disc Drive (uses two I/O channels).



## Ordering information

### 2175A Computer system

The 2175A Computer System consists of:

1. 2117 Computer with Floating Point Processor, Scientific Instruction Set, and Fast FORTRAN Processor, plus 128 base set instructions, 14 I/O channels, space for ten memory modules, and ROM loaders for disc and punched tape reader, and also equipped with:
  - a. 2102E High Performance Memory Controller and 65,536 bytes (64k bytes) of semiconductor memory (two 12741A High Performance Memory Modules).
  - b. 12892B Memory Protect.
  - c. 12991B Power Fail Recovery System.
  - d. 12992C Terminal Loader ROM
  - e. 12539C Time Base Generator.
  - f. Auto boot-up capability (requires option 032).
2. 29402B+200 Cabinet with front door and front and side stabilizer.
3. 2645A+001, 007, 013, 030 Display Station with 13260B Extended Asynchronous Communications plus 12966A+001 Buffered Asynchronous Communications Interface as system console with dual Mini cartridge drives serving as standard input and output units.
4. 92064A+020 RTE-M operating system on Mini cartridges, including:
  - a. RTE-MI, MII, and MIII operating systems with multi-terminal monitor, auto restart program, relocating loader, and on-line and offline generators.
  - b. Mini cartridge file manager.
  - c. Mini cartridge absolute program loader.
  - d. System libraries.
  - e. RTE drivers package providing RTE drivers for data processing peripherals and HP-IB interface.
5. 92065A+020 BASIC/1000M Real-Time BASIC program development and execution system on Mini cartridges.
6. 92066A+020 RTE Measurement and Control Package, including drivers for 91000A and 2313B Analog I/O Subsystems and 91063A Digital I/O Subsystem and the 92413A ISA FORTRAN Extensions Package.\*
7. Diagnostics Package (24998-14001) on Mini cartridge tapes.
8. System hardware and software manuals.
9. Factory integration and test\* with configured system on Mini cartridge tapes (or flexible disc if system order includes flexible disc option 032).
10. On-site installation and checkout with system console.
11. Site prep consultation.
12. Three month's Comprehensive Software Support after installation.

\*ISA FORTRAN will not be configured into the 2175A/B System at the factory.

### 2175B Computer system

The 2175B Computer System consists of:

1. Same as item 1 for the 2175A Computer System.
2. 29421A Desk cabinet.
- 3-12. Same as items 3 through 12 for the 2175A Computer System.

### 2175A/B options

- 008:** Replaces 2645A Display Station with 2648A Graphics Terminal as system console (all system console options and accessories are same as for 2645A).
- 014:** Deletes 2102E Memory Controller, two 12741A Memory modules, and 12892B Memory protect to permit their replacement with one of the following combinations of memory components, which must be ordered separately:
- Any of memory packages 12788A/B/C/D or 12789A/B/C/D.
  - 2102H High performance fault control memory controller, two 12741A 32k byte memory modules, 12779H 256k byte Check bit array board, and 12892B Memory protect
- 032:** Flexible disc subsystem; adds 12732A Flexible Disc Subsystem (including flexible disc loader ROM) and 12897B Dual-Channel Port Controller, and replaces standard RTE-M and BASIC/1000M items 4 and 5, above, with the more extensive flexible disc based RTE-M (92064A+040), which supports program development in FORTRAN IV and Assembly language, and the flexible disc based BASIC/1000M subsystem (92065A+040).
- 015:** 230V/50 Hz operation.

### 2175A/B accessories

2175A/B (HP 1000 Model 25) Accessories are listed in Table 1-1, pages 1-4 through 1-6, described in their respective data sheets in this and other data books, and listed in the HP 1000 Computer systems Configuration and Site Preparation Guide.



## HP 1000 Model 40 computer system

Product numbers 2176A and 2176B

The HP 1000 Model 40 is a general-purpose disc-based Computer System for computation, program development support, and instrumentation control. It is available in either desk (2176B) or upright (2176A) cabinet configuration (shown). It incorporates the powerful new RTE-IV operating system that can manage up to 64 disc-resident partitions in up to 2.048 million bytes of memory, providing up to 54k bytes of user program and data space in one or more partitions. RTE-IV can also manage very large user data spaces in an Extended memory Area (EMA). Its EMA capability makes it possible for the user to process arrays requiring up to nearly 2 million bytes of memory. Thus, the Model 40 system can tackle big problems (large array sorts and scans, matrix inversions, etc.) that formerly could be handled only by far more costly systems.

Because of the large capacity of the RTE-IV operating system, the Model 40 can be extended in many ways: to add IMAGE/1000 for operations management and/or GRAPHICS/1000 Graphics Plotting Software to assist with graphic presentation of data. It can also be extended to add DS/1000 software-firmware for network communications.

The Model 40 System includes a 19.6 megabyte cartridge disc whose capacity can be expanded with the addition of up to seven 19.6 megabyte or 50 megabyte disc drives, (up to 400 megabytes can be provided). Users of the upright cabinet version who do not require much disc capacity can substitute a 4.9 megabyte cartridge disc at a lower system price.

Multi-terminal accessibility plus batch processing capability makes the system's powerful computational and data management resources available to several users simultaneously, avoiding the service delays usually experienced by the user who depends exclusively on a large central EDP facility. The Model 40 puts computational and data management power as close as your fingertips.

### Features

- E-Series Computer
- New RTE-IV operating system which can offer flexible access to almost 2 million bytes of memory for user's data or multi-user access to as many as 64 disc resident partitions with less space for data
- Choice of upright or desk cabinet configuration
- Interactive real-time multi-terminal access to system resources
- Random and sequential file access and I/O spooling
- Concurrent batch processing
- Multilingual programming: Real-Time BASIC (optional), FORTRAN IV, and Assembly language
- Optional DS/1000 software and interfaces for access to the greater resources of DS/1000 networks
- 128k byte main memory, expandable to 2.048M bytes in upright cabinet, to 1.28M bytes in desk cabinet
- Fault control memory is optional, offering significant MTBF improvement for large-memory systems up to 1.792M bytes in upright cabinet, 1.024M bytes in desk cabinet
- 19.6M bytes of disc storage, expandable to 370M bytes (50M bytes, expandable to 400M bytes is optional)
- Optional IMAGE/1000 Data Base Management System
- Optional GRAPHICS/1000 Graphics Plotting Software
- Optional RTE Microprogramming package for on-line development of faster-executing microprogrammed sub-routines by the user
- Auto boot-up for easier use
- On-line generation of operating system
- Partition and I/O reconfigurability at boot-up
- Software compatible with other HP 1000 Models
- System console with integral dual Mini cartridge tape input/output



2176A System (chair and system console table not included); 2176B Desk cabinet version is similar to 2177B System, which is shown in the HP 1000 Model 45 data sheet.

## Functional specifications

### Computer memory

128k bytes of standard performance memory, which is optionally replaceable with up to 2.048M bytes (1.792M bytes with fault control) of standard or high performance memory in the 2176A System with 12990B Memory Extender, 1.28M bytes (1.024M bytes with fault control) in the 2176B system.

### Disc Memory

19.6M bytes, expandable to 370M bytes with addition of seven 50M byte disc drives. 50M bytes, expandable to 400M bytes is optional (option 033) for both systems. 4.9M bytes is optional (option 030) for the 2176A system only.

### Available I/O channels

11 in computer mainframe, expandable to 27 with 12979B Dual-Port I/O Extender in 2176A

## Ordering information

### 2176A Computer system

The 2176A Computer System consists of:

1. 2113 Computer with 128 base set instructions, 14 I/O channels, space for ten memory modules, and ROM loaders for disc and punched tape reader, and also equipped with:
  - a. 12786A 128k byte Standard performance memory package, including dynamic mapping system, memory controller, and 128k bytes of memory.
  - b. 12991B Power Fail Recovery System.
  - c. 12992C CRT Terminal Loader ROM.
  - d. 12539C Time Base Generator.
  - e. 13304A Firmware Accessory Board
  - f. Auto boot-up capability.
2. 7906MR+020 (19.6M byte) Master Disc Drive and 13175A interface.
3. 29402B+200 Cabinet with front door.
4. 2645A+001, 007, 013, 030 Display Station with 13260B Extended Synchronous Communications plus 12966A+001 Buffered Asynchronous Communications Interface as system console with dual Mini cartridge drives serving as standard input and output units.
5. 92067A+031 Real-Time Executive IV (RTE-IV) operating system on a 12940A disc cartridge, including:
  - a. 92067-80001 through 80003 EMA Firmware ROMs.
  - b. RTE-IV operating system.
  - c. On-line system generator, system switch, and boot-up reconfigurator.
  - d. Multi-Terminal Monitor.
  - e. RTE FORTRAN IV compiler, RTE-IV Assembler, Cross-Reference Table Generator, Interactive DBUGR utility, Interactive RTE Editor, Relocating Loader, Relocatable Library, and Decimal Arithmetic Library.
  - f. Batch-Spool Monitor
  - g. RTE Drivers Package software
  - h. Update and backup utilities.
6. Diagnostics Package (24998-14001) on Mini cartridge tapes.
7. System hardware and software manuals.
8. On-site installation and diagnostic checkout of all peripherals and checkout of primary system
9. Site prep consultation.
10. Three month's Comprehensive Software Support after installation.

### 2176B Computer System

The 2176B Computer System consists of:

1. Same as item 1 for the 2176A Computer System.
2. 7906M (19.6M byte) Master Disc with controller in Minirack and 13175A interface.
3. 29421A Desk cabinet.
- 4-10. Same as items 4 through 10 for the 2176A Computer System.

### 2176A/B options

- 002: Upright cabinet to house magnetic tape drive and system disc or additional disc. In 2176A, provides additional 29402B+400 cabinet bay with front door. In 2176B, replaces 7906M disc in minirack with 7906MR+020 disc in 29402B+200 master upright cabinet.
- 008: Replaces 2645A Display Station with 2648A Graphics Terminal as system console (all system console options and accessories are same as for 2645A).
- 014: Deletes 12786A 128k byte Standard performance memory package to permit its replacement with larger-capacity standard or high performance memory package, with or without fault control. The replacement memory package must be ordered separately.
- 030: Replaces 7906MR+020 (19.6M byte) Disc Drive and 13175B interface with 12960B (4.9M byte) Cartridge Disc Subsystem in 2176A Computer System only. (Also changes media option of 92067A RTE-IV system from 031 to 030, thereby supplying the RTE-IV software on a 12869A disc cartridge for compatibility with the 12960A subsystem.)
- 033: Replaces 7906 (19.6M byte) Disc in 2176A or 2176B System with 7920M (50M byte) Disc and changes media option of 92067A RTE-IV system from 031 to 032, thereby supplying the RTE-IV software on a 13394A disc pack for compatibility with the 7920M Disc Drive.)

*NOTE: Option 033 requires a 7920S additional 50M byte disc drive or a 7970B/E+236 9-track 800/1600 bpi Magnetic Tape Subsystem to provide backup and copy capability for the 7920M system disc.*

- 015: 230V operation.

### 2176A/B accessories

2176A/B (HP 1000 Model 40) Accessories are listed in Table 1-1, pages 1-4 through 1-6, described in their respective data sheets in this and other data books, and listed in the HP 1000 Computer Systems Configuration and Site Preparation Guide.





## HP 1000 Model 45 computer system

Product numbers 2177A and 2177B

The HP 1000 Model 45 is a general-purpose disc-based Computer System with the new F-Series Computer to provide maximum power for floating point and trigonometric, logarithmic, and other transcendental calculations for scientific and engineering applications. It is thus powerfully equipped for computation, program development support, and instrumentation control. It is available in either upright cabinet configuration (2177A) or desk cabinet (2177B, shown). It incorporates the powerful new RTE-IV operating system that can manage up to 64 disc-resident partitions in up to 1.28 million bytes\* of memory in the 2177A/B, providing up to 54k bytes of user program and data space in one or more partitions. RTE-IV can also manage very large user data spaces in an Extended memory Area (EMA). Its EMA capability makes it possible for the user to process arrays requiring up to nearly 1 million bytes\* of memory. Thus, the Model 45 system can tackle big problems (large array sorts and scans, matrix inversions, etc.) that formerly could be handled only by far more costly systems.

The Model 45 System incorporates the 2648A Graphics Terminal as system console along with the new GRAPHICS/1000 Graphics Plotting Software for easy development of user's graphics output application programs.

Because of the large capacity of the RTE-IV operating system, the Model 45 can be extended to add IMAGE/1000 for operations management and/or DS/1000 software-firmware for network communications.

The Model 45 System includes a 19.6 megabyte cartridge disc whose capacity can be expanded with the addition of up to seven 19.6 megabyte or 50 megabyte disc drives (up to 400 megabytes).

Multi-terminal accessibility plus batch processing capability makes the system's powerful computational and data management resources available to several users simultaneously, avoiding the service delays usually experienced by the user who depends exclusively on a large central EDP facility. The Model 45 puts computational and data management power as close as your fingertips.

*\*Physical memory limit is 1.28M bytes in Model 45; 1.024M bytes with fault control, although RTE-IV can manage up to 2.048k bytes.*

### Features

- New F-Series computer for 2.5 to 6 times faster floating point calculations than 2176A/B, and 6 to 24 times faster execution of trigonometric and logarithmic functions
- New RTE-IV operating system which can offer flexible access to almost 2 million bytes of memory for user's data or multi-user access to as many as 64 disc resident partitions with less space for data
- System console with integral dual Mini cartridge tape input/output and graphics display capability
- GRAPHICS/1000 Graphics Plotting Software to facilitate development of graphics output application programs
- Choice of upright or desk cabinet configuration
- Interactive real-time multi-terminal access to system resources
- Random and sequential file access and I/O spooling
- Concurrent batch processing
- Multilingual programming: Real-Time BASIC (optional), FORTRAN IV, and Assembly language
- Optional DS/1000 software and interfaces for access to the greater resources of DS/1000 networks
- 128k byte high performance (420ns) main memory, expandable to 1.28M bytes.
- Fault control is optional, offering significant MTBF improvement for large-memory systems up to 1.024M bytes.
- 19.6M bytes of disc storage, expandable to 370M bytes (50M bytes, expandable to 400M bytes is optional)
- Optional IMAGE/1000 Data Base Management System
- Optional RTE Microprogramming package for on-line development of faster-executing microprogrammed sub-routines by the user
- Auto boot-up for easier use
- On-line generation of operating system
- Partition and I/O reconfigurability at boot-up
- Software compatible with other HP 1000 Models



2177B System (chair not included); 2177A upright cabinet version is similar to 2176A System, which is shown in the HP 1000 Model 40 data sheet.

## Functional specifications

### Computer memory

128k bytes of high performance memory, which is optionally replaceable with up to 1.28M bytes (1.024M bytes with fault control) of high performance memory.

### Disc Memory

19.6M bytes, expandable to 370M bytes with addition of seven 50M byte disc drives. 50M bytes, expandable to 400M bytes is optional (option 033) for both systems.

### Available I/O channels

11 in computer mainframe, expandable to 27 with 12979B Dual-Port I/O Extender in 2177A

## Ordering information

### 2177A Computer system

The 2177A Computer System consists of:

1. 2117B Computer with Floating Point Processor, Scientific Instruction Set, and Fast FORTRAN Processor, plus 128 base set instructions, 14 I/O channels, space for ten memory modules, and ROM loaders for disc and punched tape reader, and also equipped with:
  - a. 12788A 128k byte high performance memory package, including dynamic mapping system, memory controller, and 128k bytes of memory.
  - b. 12991B Power Fail Recovery System.
  - c. 12992C CRT Terminal Loader ROM.
  - d. 12539C Time Base Generator.
  - e. Auto boot-up capability.
2. 7906MR+020 (19.6M byte) Disc Drive and 13175A interface.
3. 29402B+200 Cabinet with front door.
4. 2648A+007, 013, 030 Graphics Terminal with 13260B+003 Extended Synchronous Communications plus 12966A+001 Buffered Asynchronous Communications Interface as system console with dual Mini cartridge drives serving as standard input and output units.
5. 92067A+031 Real-Time Executive IV (RTE-IV) operating system on a 12940A disc cartridge, including:
  - a. 92067-80001 through 80003 EMA Firmware ROMs.
  - b. RTE-IV operating system.
  - c. On-line system generator, system switch, and boot-up reconfigurator.
  - d. Multi-Terminal Monitor.
  - e. RTE FORTRAN IV compiler, RTE-IV Assembler, Cross-Reference Table Generator, Interactive DBUGR utility, Interactive RTE Editor, Relocating Loader, Relocatable Library, and Decimal Arithmetic Library.
  - f. Batch-Spool Monitor
  - g. RTE Drivers Package software
  - h. Update and backup utilities.
6. 92840A+020 GRAPHICS/1000 Graphics Plotting Software on Mini cartridges.
7. Diagnostics Package (24998-14001) on Mini cartridge tapes.
8. System hardware and software manuals.
9. On-site installation and diagnostic checkout of all peripherals and checkout of primary system
10. Site prep consultation.
11. Three month's Comprehensive Software Support after installation.

### 2177B Computer System

The 2177B Computer System consists of:

1. Same as item 1 for the 2177A Computer System.
2. 7906M (19.6M byte) Master Disc with controller in Minirack and 13175A interface.
3. 29421A Desk cabinet.
- 4-11. Same as items 4 through 11 for the 2177A Computer System.

### 2177A/B options

- 002:** Upright cabinet to house magnetic tape drive and system disc or additional disc. In 2177A, provides additional 29402B+400 cabinet bay with front door. In 2177B, replaces 7906M disc in minirack with 7906MR+020 disc in 29402B+200 master upright cabinet.
- 014:** Deletes 12788A 128k byte High performance memory package to permit its replacement with larger-capacity high performance memory package, with or without fault control. The replacement memory package must be ordered separately.
- 033:** Replaces 7906 (19.6M byte) Disc in 2177A or 2177B System with 7920M (50M byte) Disc and changes media option of 92067A RTE-IV system from 031 to 032, thereby supplying the RTE-IV software on a 13394A disc pack for compatibility with the 7920M Disc Drive.)
- NOTE: Option 033 requires a 7920S additional 50M byte disc drive or a 7970B/E+236 9-track 800/1600 bpi Magnetic Tape Subsystem to provide backup and copy capability for the 7920M system disc.*
- 015:** 230V operation.

### 2177A/B accessories

2177A/B (HP 1000 Model 45) Accessories are listed in Table 1-1, pages 1-4 through 1-6, described in their respective data sheets in this and other data books, and listed in the HP 1000 Computer Systems Configuration and Site Preparation Guide.

Product numbers 2170A, 2171A, and 2172A

The HP 1000 Model 30 is the lowest-priced disc-based HP 1000 Computer System. It operates under HP's RTE-II system in 64k bytes of memory. It is available in the upright cabinet version with either 4.9M byte (2170A) or 19.6M byte (2171A) Cartridge disc memory. The 2172A desk cabinet version offers only the 19.6M byte disc. Although IMAGE/1000 can be used to provide operations management capability, memory size is limited to 64k bytes and, for that reason, capabilities supported by the other HP 1000 Models are not supportable on the Model 30. Capabilities not supported include DS/1000 networking, GRAPHICS/1000; and multipoint terminal communications. Because of its relatively limited scope, the Model 30 System should be selected only for those applications in which system price is a more important consideration than response, throughput, capacity, or expandability.

## Features

- E-Series Computer
- Lowest priced disc-based HP 1000 System (with RTE-II operating system)
- Interactive real-time access to system resources
- Random and sequential file access and I/O spooling
- Multilingual programming: Real-Time BASIC (optional), FORTRAN IV, HP ALGOL, and Assembly language
- Choice of desk or upright cabinet configuration
- Choice of 4.9M byte or 19.6M byte disc in upright cabinet
- 19.6M byte disc expandability to 370M bytes with additional 50M byte slave drives
- Auto boot-up for easier use
- On-line program development
- On-line generation of operating system
- Optional RTE Microprogramming package for on-line development of faster-executing microprogrammed sub-routines by the user
- Optional IMAGE/1000 Data Base Management System
- Program compatibility compatible with other HP 1000 Models
- System console with integral dual Mini cartridge tape input/output

## Functional specifications

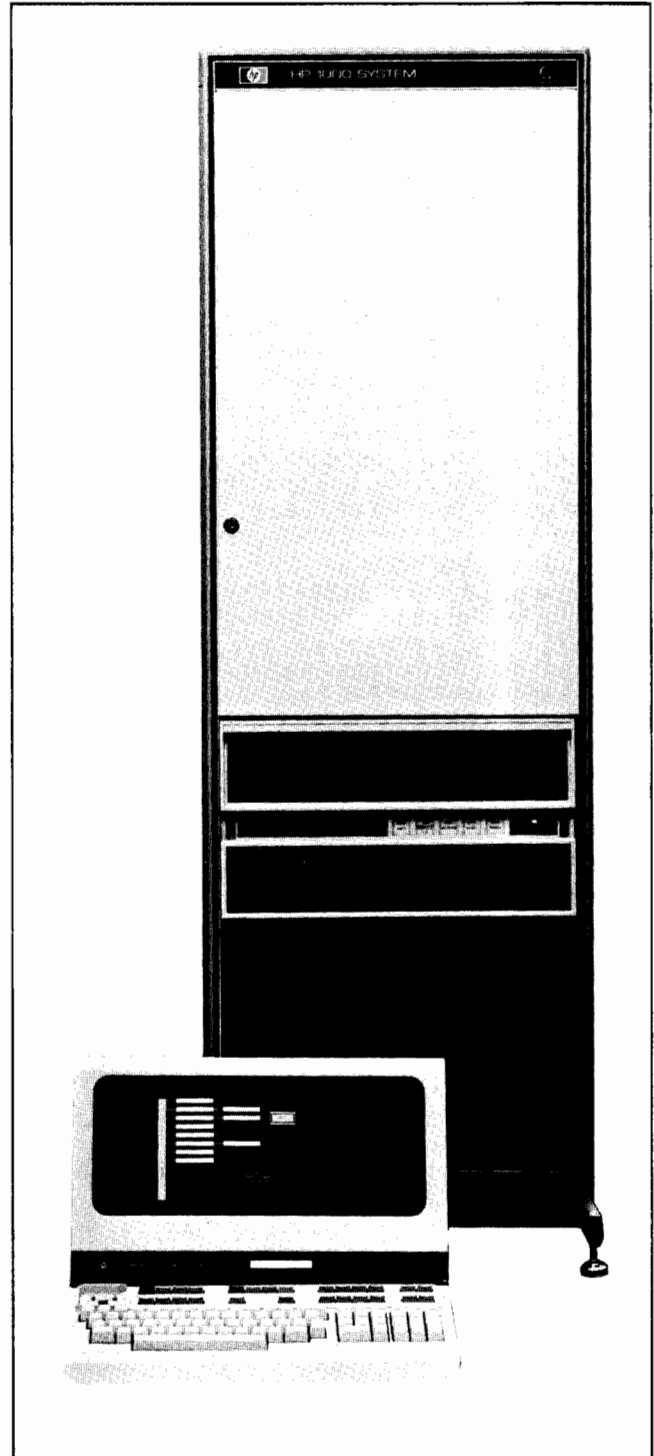
### Computer memory

64k bytes of standard performance memory, which optionally can be replaced with 64k bytes of high performance memory, with or without fault control.

### Disc memory

**2170A:** 4.9M bytes, expandable to 9.8M bytes with addition of one disc drive and option 002 additional cabinet bay.

**2171A/2172A:** 19.6M bytes, expandable to 370M bytes with addition of seven 7920M 50M byte disc drives



*2170A (4.9M byte disc) System; the other Model 30 Systems (2171A and 2172A) are similar in appearance to the 2176A and 2177B Systems, which are shown in the HP 1000 Model 40 and 45 data sheets*

## Available I/O channels

**2170A:** Ten in computer mainframe, expandable to 26 with addition of 12979B Dual-Port I/O Extender.

**2171A/2172A:** Eleven in computer mainframe, expandable in 2171A to 27 with addition of 12979B Dual-Port I/O Extender.

## Ordering information

### 2170A computer system

The 2170A Computer System consists of:

1. 2113 Computer with 128 base set instructions, 14 I/O channels, space for ten memory modules, and ROM loaders for disc and punched tape reader, and also equipped with:
  - a. 2102B Memory Controller and 65,536 bytes (32k words) of semiconductor memory (two 13187B Memory Modules.)
  - b. 12897B Dual-Channel Port Controller.
  - c. 12892B Memory Protect.
  - d. 12991B Power Fail Recovery System.
  - e. 12992C CRT Terminal Loader ROM.
  - f. 12539C Time Base Generator.
  - g. 13304A Firmware Accessory Board.
  - h. Auto boot-up capability.
2. 12960A 4.9M byte Cartridge Disc Subsystem.
3. 29402B+200 Cabinet with front door.
4. 2645A+001, 007, 013, 030 Display Station with 13260B Extended Asynchronous Communications plus 12966A+001 Buffered Asynchronous Communications Interface as system console with dual Mini cartridge drives serving as standard input and output unit.
5. 92001B+030 Real-Time Executive II (RTE-II) operating system on a 12869A disc cartridge, including:
  - a. Real-Time Executive II with Multi-Terminal Monitor, auto restart program, and on-line and off-line system generators.
  - b. Batch-Spool Monitor, including file manager and on-line interactive editor.
  - c. FORTRAN IV Compiler.
  - d. FORTRAN II Compiler.
  - e. HP ALGOL Compiler.
  - f. RTE Assembler.
  - g. Relocatable library, including FORTRAN IV Formatter.
  - h. Relocating loader.
  - i. RTE Drivers Package providing drivers for data processing peripherals and the HP-IB interface.
6. Diagnostics Package 24998-14001 on Mini cartridge tapes.
7. 92066A+020 RTE Measurement and Control Package, including drivers for 91000A and 2313B Analog I/O Subsystems and 91063A Digital I/O Subsystem and the 92413A ISA Fortran Extensions Package.
8. System hardware and software manuals.
9. Factory integration and test with configured system on the disc cartridge that is included with the 12960A Cartridge Disc Subsystem.
10. On-site installation and checkout with system console.
11. Site prep consultation.
12. Three month's Comprehensive Software Support.

### 2171A computer system

The 2171A Computer System consists of:

1. Same as item 1 of the 2170A Computer System.
2. 7906MR+020 Master 19.6M byte Cartridge Disc Drive and 13175A interface.
- 3-12. Same as items 3 through 12 of the 2170A Computer System, except that 92001B media option 031 is supplied instead of 030, for compatibility with the 19.6M byte disc drive.

### 2172A computer system

The 2172A Computer System consists of:

1. Same as item 1 of the 2170A Computer System.
2. 7906M Master 19.6M byte Cartridge Disc Drive in minirack cabinet and 13175A interface.
3. 29421A Desk Cabinet.
- 4-10. Same as items 4 through 10 of the 2170A Computer System, except that 92001B media option 031 is supplied instead of 030, for compatibility with the 19.6M byte disc drive.

### 2170A, 2171A, and 2172A options

- 002:** Upright cabinet to house magnetic tape drive and system disc or additional disc. In 2170A and 2171A, provides additional 29402B+400 cabinet bay with front door. In 2172A, replaces 7906M disc in minirack with 7906MR+020 disc in 29402B+200 master upright cabinet.
- 008:** Replaces 2645A Display Station with 2648A Graphics Terminal as system console (all system console options and accessories are same as for 2645A).
- 014:** Deletes 2102B Memory Controller, two 13187B Memory modules, and 12892B Memory protect to permit their replacement with one of the following combinations of memory components, which must be ordered separately:
- 2102E High performance memory controller, two 12741A 32k byte Memory modules, and 12892B Memory protect
  - 2102C Standard performance fault control memory controller, two 13187B 32k byte memory modules, 12779A 256k byte Check bit array board, and 12892B Memory protect
  - 2102H High performance fault control memory controller, two 12741A 32k byte memory modules, 12779H 256k byte Check bit array board, and 12892B Memory protect
- 015:** 230V/50 Hz operation.

### 2170A, 2171A, and 2172A accessories

2170A (HP 1000 Model 30) Accessories are listed in Table 1-1, pages 1-4 through 1-6, described in their respective data sheets in this and other data books, and listed in the HP 1000 Computer Systems Configuration and Site Preparation Guide.

The 2113 and 2117 are the Computers that provide the control and data processing capabilities of HP 1000 Computer Systems. The HP 2113 is used in HP 1000 Model 20, 30, and 40 Computer Systems. The HP 2117 is used in HP 1000 Model 25 and 45 Computer Systems. The memory systems and accessories supplied with these computers or available as alternatives for expansion are covered in separate data sheets.

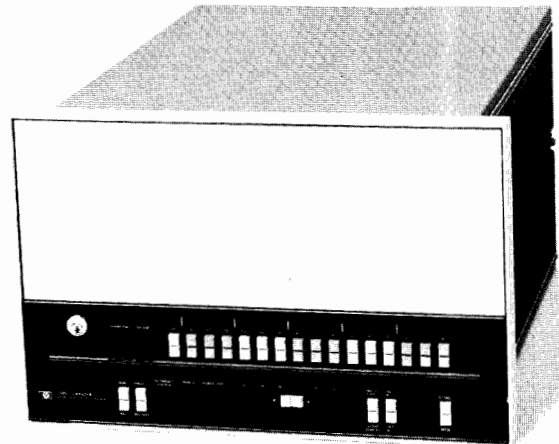
## Features

- High performance Floating Point Processor dedicated to floating point operations (2117 only)
- Scientific Instruction Set of nine instructions for extremely fast computation of trigonometric and logarithmic functions (2117 only)
- Fast FORTRAN Processor instructions for performing frequently-used FORTRAN subroutines 2 to 20 times faster than software speed (standard in 2117, optional in 2113)
- Powerful architecture and 128 base set instructions featuring variable microcycle timing for optimum price/performance
- 14 I/O channels
- 10 memory module slots
- Choice of 350 nanosecond high performance memory or 595 nanosec standard performance memory, with or without fault control.
- Optional dynamic mapping system for accessing up to 2 megabytes of memory (1.8 million bytes with fault control) in 2113, up to 1.28 megabytes (1.024 megabytes with fault control) in 2117
- High speed direct memory access via the Dual Channel Port Controller, with transfer rates up to 2.3 million bytes per second
- Built-in self test for cpu, memory, (and the Floating Point Processor and Scientific Instruction Set in the 2117 Computer)
- Optional writable control store and user control store for incorporation of software subroutines in faster-executing microprograms by the user
- Auto boot-up for easier use

## Functional specifications

### Input/output capacity

14 I/O channels in mainframe; up to 30 channels with the 12979B Dual-port I/O Extender in HP 1000 Computer Systems with upright cabinet configuration (2170A, 2171A, 2174A, 2175A, 2176A, and 2177A).



2113 Computer



2117 Computer

### Memory capacity

**2113:** Memory controller and up to ten memory modules (up to 1.28M bytes, 1.024M bytes with fault control) in the mainframe, up to nine more memory modules (up to 0.768M bytes) of additional memory in accessory 12990B Memory Extender in certain HP 1000 Computer Systems with upright cabinet configuration (2174A, and 2176A).

**2117:** Memory controller and up to ten memory modules (up to 1.28M bytes, 1.024M bytes with fault control) in the mainframe. Mounting position of its Floating Point Processor below the computer mainframe in HP 1000 Computer Systems precludes use of the 12990B Memory Extender for further memory expansion, even in upright-cabinet systems, except with special racking.

## Approximate instruction execution times

Instruction	Execution time ( $\mu$ sec) with High performance memory	
	In 2113	In 2117
<b>Single-precision floating point (8 total in 2117)</b>		
Add	12.91-27.44	4.9-6.5
Subtract	13.61-29.22	4.9-6.5
Multiply	25.27-34.90	6.2-6.5
Divide	33.18-47.11	6.2-9.0
Conversion to single integer	4.06-7.35	3.7-4.8
Conversion to double integer		3.5-5.9
Conversion from single integer	6.97-10.82	3.4-4.5
Conversion from double integer		3.3-5.2
<b>Extended precision floating point (8 total in 2117; requires optional 13306A Fast FORTRAN Processor in 2113)</b>		
Add/Subtract	37.5-50.20	10.7-13.4
Multiply	56.0-64.80	12.6-13.3
Divide	80.0-92.40	12.6-17.1
Conversion to single integer		5.8-6.9
Conversion to double integer	23.9-58.6	6.4-8.4
Conversion from single integer		5.9-6.6
Conversion from double integer		6.6-7.3
<b>Scientific Instruction Set (9 total in 2117; typical execution times comparison is with software routines aided by the 13306B Fast FORTRAN Processor in 2113)</b>		
SIN (Sine) function	289.9	47.6
COS (Cosine) function	314.4	47.9
TAN (Tangent) function	978.8	48.4
ATAN (Arc Tangent) function	1044.8	42.4
TANH (Hyperbolic Tangent) function	471.1	57.2
SQRT (Square Root) function	197.2	30.9
EXP ( $e^x$ ) function	362.2	44.7
ALOG (Natural Logarithm) function	301.2	43.3
ALOGT (Base 10 Logarithm) function	334.5	49.4
<b>Fast FORTRAN Processor Instructions (9 total in 2117; requires 13306A in 2113)</b>		
Moves to new locations:		
— Extended precision variable	8.96-12.81	8.96-12.81
— Address of parameters from calling sequence into subroutine list	13.9+	13.9+
Calculation of $X^*2N$ for real X & integer N	$3.7 \times NP$	$3.7 \times NP$
Unpacking of real variable	8.4	8.4
Normalization, rounding, and packing of mantissa of extended precision variable	3.1	3.1
Complementing of extended precision variable	18.9-29.5	18.9-29.5
Complementing and normalization of extended precision variable	11.7-12.1	11.7-12.1
Transfer of control to destination of FORTRAN computed GOTO statement	22.1-33.4	22.1-33.4
Computes address of specified element of 2 or 3-dimensional array	10.6	10.6
Computes address of specified element of 2 or 3-dimensional array	17.7-27.2	17.7-27.2
<b>Memory reference group (14 total)</b>		
Add/load/AND/IOR/XOR	0.91	0.91
Store	1.26	1.26
Jump	0.74	0.74
Jump to subroutine	1.61	1.61
Compare (normal/skip)	1.09/1.43	1.09/1.43
Increment, skip if zero	1.54/1.61	1.54/1.61
Indirect address, per level	0.46	0.46
<b>Register reference group (43 total)</b>		
Normal/skip	0.91/1.26	0.91/1.26
<b>I/O group (13 total)</b>		
SFS/SFC/SOS/SOC (normal)	1.58-2.28	1.58-2.28
SFS/SFC/SOS/SOC (skip)	1.96-2.66	1.96-2.66
All others	1.58-2.28	1.58-2.28
<b>Extended Instruction Group (10 total)</b>		
Integer multiply	5.3-6.0	5.3-6.0
Integer divide	7.7-9.1	7.7-9.1
Double load	2.07	2.07
Double store	2.7	2.7
Shift/rotate (basic)	1.47	1.47
Additional per shift	0.175	0.175
Indirect address, per level	0.81	0.81

Instruction	Execution time ( $\mu$ sec) with High performance memory	
	In 2113	In 2117
<b>Index Instructions (32 total)</b>		
Copy	1.29	1.29
Exchange	1.92	1.92
Increment or decrement (normal/skip)	1.75/2.0	1.75/2.0
Load or add index	2.66	2.66
Store index	2.94	2.94
Load indexed	3.19	3.19
Store indexed	3.46	3.46
Jump and load Y	2.67	2.67
Jump and index X	2.28	2.28
<b>Data communications (10 total)</b>		
Load byte	3.36	3.36
Store byte	3.89	3.89
Move bytes or words (basic)	3.75	3.75
Additional per byte	4.00	4.00
Additional per word	1.68	1.68
Compare bytes or words (basic)	3.75	3.75
Additional per byte	3.5-3.78	3.5-3.78
Additional per word	2.38	2.38
Scan for byte (basic)	1.92	1.92
Additional per byte	2.735	2.735
Set or clear bits	4.48	4.48
Test bits (normal/skip)	4.73/4.94	4.73/4.94

NOTE: More detailed information on instruction times is provided in the HP 1000 E-Series and F-Series reference manuals (02109-90001 and 02111-90001). Fault control memory and dynamic mapping system may each add 0 to 0.4 microseconds to these instruction execution times. Asynchronous memory may cause variations of  $\pm 0.035$  microseconds per memory reference.

## Processor architecture

Data path width: 16 bits

### Standard registers:

Accumulators: 2 (A and B), 16 bits each, addressable as registers or memory locations

Index: 2 (X and Y), 16 bits each

Memory control: 3 (T,P) 16 bits each; (M), 15 bits

Supplementary: 2 (overflow and extend), 1 bit each

Manual data: 1 16-bit (display)

### Instruction types:

Memory-to-accumulator      Accumulator-to-I/O

Memory-to-memory          Device control

Direct register modification

### Instruction formats:

Combined single word      Single-precision floating point

Single word                  Extended-precision floating point

**Instruction expansion:** 176 instruction codes are available to the user for instruction additions.

### Addressing modes:

Direct                          Triple word

Multi-level indirect        Double word

Indexed                        Single word

Indirect indexed            Byte

Register implicit            Bit

**Bus structure:** Separate memory data, memory address, and I/O buses tied to the unified internal processor's S Bus

**Input/Output:** Vectored priority interrupt structure for up to 50 I/O and system devices, such as DCPC, power fail, parity, and memory protect.

## Control processor

**Instruction execution time:** Variable, 175 or 280 nsec

**Control path:** 24 bits

**Data path:** 16 bits

### Registers:

Standard registers: 4 (A,B,X,Y), 16 bits

Scratch registers: 12 16-bit registers accessible to the microprogrammer

Iteration counter: 8 bits

Instruction register: 16 bits

Latch register: 16 bits

Status flag: 1 bit

Subroutine levels stack: 3 — 14 bits each

### Instruction formats:

TYPE 1 Data transfer and modification

TYPE 2 Constant formation

TYPE 3 Conditional branch

TYPE 4 Unconditional branch

**Bus structure:** Unified single bus with program access to memory data, memory addresses, and I/O buses

**Bus speed:** 11.4M bytes/sec

### Control memory structure:

Type: Bipolar LSI semiconductor R/W or ROM

Address space: 16,384 words; 64 modules of 256-words each

Word size: 24 bits

Cycle time: Variable, 175 or 280 nsec

### Module assignments:

0 to 3 assigned to E/F-Series base instruction set, including the new Hardware Floating Point Processor instructions in the 2117B, 4 through 19 reserved for planned HP enhancements

20-31 reserved for planned HP enhancements or user-microprogramming

32 reserved for Dynamic Mapping System instructions

33 through 35 reserved for Fast FORTRAN Processor

36 and 37 reserved for RTE-IV Extended Memory Area mapping instructions

38 and 39 reserved for DS/1000 firmware

40 through 43 reserved for Scientific Instruction Set

44 and 45 reserved for HP enhancements

46 through 63 reserved for user microroutines

**Control processor instructions:** 211 total; up to 5 may be combined in 1 instruction

Operations: 15 total

Special: 32 total

ALU and conditional: 68 total

Store (destination): 32 total

S-bus (source): 32 total

Reverse Sense: 32 total

## Memory parity check

**Operation:** Monitors all words read from memory. Utilizes 17th bit in memory. Switch programmable to halt or ignore parity error when detected. Interrupt on error requires memory protect option. Parity error indication is displayed on the front panel.

## Power fail interrupt

**Priority:** Highest priority interrupt

**Power failure:** Detects power failure and generates an interrupt to memory location 4 for vector to user-written power failure routine. A minimum of 500 microseconds is provided for execution of the user-written system state save routine.

## Compatibility

**Instruction set:** The HP 1000 E/F-Series instruction set is backwards compatible with previous 2100 Series computers

**Program:** Most programs written for 2100 Series computers are compatible with the E/F-Series, except those with timing loop dependence.

## Floating Point Processor (FPP) in 2117

### Floating point data formats:

Single-precision: 32 bits (4 bytes), providing at least 6 significant decimal digits in mantissa

Extended-precision: 48 bits (6 bytes), providing at least 11 significant decimal digits in mantissa

**Exponent range:** Exponent range:  $2^{-128}$  to  $2^{+127}$  in all floating point data formats; decimal equivalent is  $10^{\pm 38}$ .

### Fixed point data formats:

Single-precision: 16 bits (2 bytes), twos complement integer

Double-precision: 32 bits (4 bytes), twos complement integer

**Execution times:** See Approximate instruction execution times table

**Computation times applicable to direct, chained micro-programming use of the Floating Point Processor:** The following computation times apply to directly microprogrammed use of the Floating Point Processor for chained floating point calculations in which intermediate results are stored in its internal accumulator.

Instruction	Computation Time ( $\mu$ sec)		
	Min.	Typ.	Max.
<b>Single-precision Floating Point Operations (8 total)</b>			
Add/Subtract	0.55	0.63	3.15
Multiply	1.55	1.78	2.5
Divide	1.65	3.03	4.9
Conversion to single integer	0.33	0.88	1.45
Conversion to double integer	0.33	1.48	2.65
Conversion from single integer	0.28	0.6	1.45
Conversion from double integer	0.28	0.6	1.45
<b>Extended-precision Floating Point Operations (8 total)</b>			
Add/Subtract	0.55	0.68	4.8
Multiply	2.4	2.75	3.3
Divide	2.5	4.88	7.7
Conversion to single integer	0.33	0.88	1.45
Conversion to double integer	0.33	1.48	2.65
Conversion from single integer	0.28	0.6	1.45
Conversion from double integer	0.28	0.6	1.45

## Scientific instruction set in 2117

**Data format:** Single-precision

**Execution times and function definitions:** See Approximate instruction execution times table

**Accuracy:** RMS relative error for the various Scientific Instruction Set functions is as follows:

Function	RMS Rel. Error	Function	RMS Rel. Error
SIN	8.80E-8	SQRT	6.74E-8
COS	8.82E-8	EXP	1.38E-7
TAN	1.99E-7	ALOG	1.28E-7
ATAN	1.34E-7	ALOGT	1.39E-7
TANH	1.33E-7		

## Fast FORTRAN processor (FFP) in 2117

**Data formats and exponent range:** Same as Hardware Floating Point Processor.

**Execution times:** See Approximate instruction execution times table

## Ordering information

### 2113 Computer

The 2113 Computer, which consists of the following items, is factory installed in all HP 1000 Computer Systems:

1. 2113 Computer with punched tape and disc loader ROMs.
2. 02109-90001 reference manual.
3. 02109-90014 microprogramming manual.
4. 02109-90002 installation and service manual.
5. Auto bootstrap capability.

### 2117 Computer

The 2117 Computer consists of:

1. 2117 Computer with separate mainframe, including paper tape and disc loader ROMs, and 02117-60001 Floating Point Processor.
2. 12943-16001 and 16002; 24396-12001, 12002, and 12003; 12740-16001; 12977-16004 and 16005; and 24296-60001 Diagnostics and configurator on paper tape.
3. 02111-90001 HP 1000 F-Series computers operating and reference manual.
4. 02109-90014 Microprogramming manual.
5. 02111-90002 HP 1000 F-Series installation and service manual.
6. 12943-90004, 24396-140001, 12740-90001, and 12977-90002 diagnostic manuals.
7. 12740-90007 Floating Point Processor installation and service manual.

## 2113 and 2117 Option

015: 220V operation (applies only to 2113B and computer mainframe of 2117B; Floating Point Processor input voltages are switch selectable).

## Memory system and accessories included in HP 1000 system computer

- 64k bytes or 128k bytes of standard performance or high performance memory.
- 12892B Memory protect or 13305A dynamic mapping system.
- 12991D Power fail recovery system.
- 12992C CRT terminal loader ROM.
- 12539C Time base generator.
- 13304A Firmware accessory board.
- 12897B Dual channel port controller (in all systems except 2174A/B and 2175A/B without flexible disc option 032).

## Optional memory systems and accessories

- Different type of memory and/or larger-capacity memory package (see memory systems data sheet for details).
- 13306A Fast Fortran processor (included in 2117).
- 13197A 1k Writable control store.
- 13047A 2k User control store.
- 12979B Dual-port I/O extender.
- 12898A Dual-channel port controller for I/O extender.
- 12990B Memory extender (not usable with 2117, except by special racking).
- 12991B Power fail recovery system for 12990B.
- 12992D 9-track Magnetic tape loader ROM.
- 12620A Breadboard interface for privileged interrupt control.





## Computer memory systems and memory packages

models 2102B, 13187B, 12747A, 2102C, 12779A, 12780A, 2102E, 12741A, 12747H, 2102H, 12779H, 12790H, 12786A-D, 12787A-D, 12788A-D, 12789A-D

Each HP 1000 Computer System includes a memory system with controller, memory protect, and one or two memory modules that is commensurate in size and type with the system's design-targeted base capability. HP 1000 Computer System Models 20, 25, and 30 include 64k byte memory systems as summarized in Table 1, below. HP 1000 Models 40 and 45, respectively include 12786A and 12788A 128k byte standard and high performance memory packages.

The standard memory system of any HP 1000 Computer System can be replaced with another memory system by ordering delete option 014 and the desired memory system. The component memory systems of HP 1000 Models 20, 25, and 30 can be replaced with alternate component memory systems, selected from those listed in Table 1. The component memory systems of HP 1000 Models 20 and 25 and the memory packages of HP 1000 Models 40 and 45 can be replaced with one of the compatible memory packages listed in Table 2. With memory packages, additional memory modules, and the 12990B Memory Extender (and one or two additional check bit array boards with fault control memory), up to 2.048 megabytes (1.792 megabytes with fault control) can be provided in upright cabinet versions (2174A and 2176A) of the HP 1000 Model 20 and 40 Computer Systems.

### Features

- 64k bytes of memory standard in memory based systems and disc-based Model 30 system, 128k bytes of memory standard in disc-based Model 40 and 45 systems
- Choice of standard performance (595 ns) and high performance (350 ns) memory.
- Optional fault control for significant MTBF improvement with either standard performance memory or high performance memory.
- Up to 1.28M bytes (1.024M bytes with fault control) in computer mainframe, up to 2.048M bytes (1.792M bytes with fault control) with memory extender in upright cabinet versions of HP 1000 Models 20 and 40
- Convenient memory packages for large-memory systems in HP 1000 Models 20, 25, 40, and 45

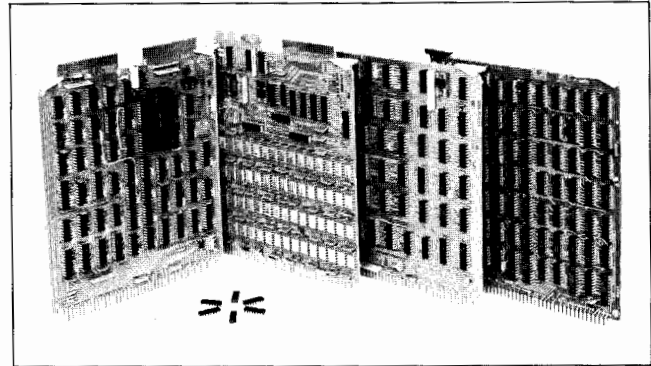
### Functional specifications

Compatible memory components for HP 1000 Computer System Models 20, 25, and 30

See Table 1.

Compatible memory packages and larger memory sizes for HP 1000 Computer System Models 20, 25, 40, and 45

See Table 2.



12786A 128k byte Standard performance memory package, including, left-to-right; 2102B Memory controller, 12747A 128k byte Memory module, 12892B Memory protect module, and 12731A Memory expansion module; 13307A Dynamic mapping instruction ROMs in the foreground.

Table 1. Compatible memory components for HP 1000 Computer System Models 20, 25\*, and 30

	No fault control		With fault control	
	Std perf	High perf	Std perf	High perf
Std w/HP 1000 Model(s)	20 & 30	25*		
Cycle times	595 ns	350 ns	620 ns	385 ns
Memory controller	2102B	2102E	2102C	2102H
Memory modules	2 x 13187B	2 x 12741A	2 x 13187B	2 x 12741A
Memory protect	12892B	12892B	12892B	12892B
Fault control check bit array board			12779A	12779H
Memory provided	64k bytes	64k bytes	64k bytes	64k bytes

\*HP 1000 Model 25 Systems can use only high performance or high performance fault control memory.

### Memory cycle times for components and packages

Dynamic mapping system in memory packages adds 70 ns to memory cycle times; fault control adds 35 ns, as shown in Tables 1 and 2.

### Memory organization

Type: 4k (13187B and 12741A) or 16k (12747A/H, 12779A/H, and 12780A/H) chip N-channel MOS/RAM semiconductor.

Word size: 16 bits (2 bytes) with 17th parity bit; 22 bits (2 bytes plus 5 check bits and parity bit) with fault control.

Page size: 2048 bytes (1024 words).

Direct addressing: Two pages.



**Indirect addressing:** 32 pages, expandable through dynamic mapping in the 12786A-D, 12787A-D, 12788A-D, and 12789A-D memory packages to 1024 pages (2.048M bytes).

**Volatility protection:** The 2113B/2117B Computer provides memory sustaining power for a line loss up to 8 milliseconds. The 12991B Power fail recovery system (included with the computer in HP 1000 Computer Systems) provides memory power for at least 1.6 hours in case of total line failure.

Table 2. Compatible memory packages and larger memory sizes for HP 1000 Computer System Models 20, 25†, 40, and 45†

	No fault control		With fault control	
	Std perf	High perf	Std perf	High perf
CYCLE TIMES	665 ns	420 ns	700 ns	455 ns
MEMORY SIZES				
128k bytes	12786A(A)	12788A(B)	12787A	12789A
256k bytes	12786B	12788B	12787B	12789B
512k bytes	12786C	12788C	12787C	12789C
1024k bytes (1.024M bytes)	12786D	12788D	12787D	12789D
1280k bytes * (1.28M bytes)	12786D+ 2 × 12747A	12788D+ 2 × 12747H	12787D+ 2 × 12747A + 12779A + 12990B**	12789D+ 2 × 12747H + 12779H + 12990B**
1536k bytes (1.536M bytes)	12786D+ 4 × 12747A + 12990B**	12788D+ 4 × 12747H + 12990B**	12787D+ 4 × 12747A + 12780A + 12990B**	12789D+ 4 × 12747H + 12780H + 12990B**
1792k bytes * (1.792M bytes)	12787D+ 6 × 12747A + 12990B**	12788D+ 6 × 12747H + 12990B**	12787D+ 6 × 12747A + 12779A + 12780A + 12990B**	12789D+ 6 × 12747H + 12779H + 12780H + 12990B**
2048k bytes * (2.048M bytes)	12786D+ 8 × 12747A + 12990B**	12788D+ 8 × 12747H + 12990B**	Not available	Not available

(A) 12786A is the standard memory for the base HP 1000 Model 40 (2176A/B) Computer System

(B) 12788A is the standard memory for the base HP 1000 Model 45 (2177A/B) computer System

†HP 1000 Model 25 and 45 Systems can use only high performance or high performance fault control memory packages 12788A-D or 12789A-D.

\*Fault control memory is strongly recommended for memory sizes greater than 1024k bytes to maximize reliability.

\*\*This memory configuration requires the HP 12990B Memory Extender which can be used in the upright cabinet versions (2174A and 2176A) of the HP 1000 Model 20 and 40 Computer Systems. (Use in upright cabinet versions (2175A or 2177A) of the Computer Systems requires special racking.)

## Ordering information

### 2102B/13187B 64k byte Standard performance memory system

The 2102B/13187B 64k byte Standard performance memory system, which consists of the following items, is installed in the 2113 Computer in HP 1000 Model 20 and 30 (2174A/B and 2170A/71A/72A) Computer Systems unless 217xA/B option 014 is ordered, permitting its replacement with another choice, selected from Table 1 (Model 20, 25, or 30) or Table 2 (Model 20 or 25 only):

1. 2102B Memory controller, including installation manual and cable.
2. Two 13187B 32k byte Memory modules, including installation manual.
3. 12892B Memory protect card, including installation manual.

### 2102C/13187B/12779A 64k byte Standard performance fault control memory system

The 2102C/13187B/12779A 64k byte Standard performance fault control memory system, which consists of the following items, can be substituted for the standard memory system in HP 1000 Model 20, and 30 (2174A/B, and 2170A/71A/72A) Computer Systems which have been ordered with delete option 014:

1. 2102C Memory controller, including installation manual and cables.
- 2-3. Same as items 2 and 3 of the 2102B/13187B memory system, listed previously.
4. 12779A 256k byte Fault control check bit board, including installation manual.

### 2102E/12741A 64k byte High performance memory system

The 2102E/12741A 64k bytes High performance memory system, which consists of the following items, is installed in the 2117 Computer in HP 1000 Model 25 (2175A/B) Computer Systems unless 2175A/B option 014 is ordered, permitting its replacement with another choice, selected from Table 1 or Table 2:

1. 2102E Memory controller, including installation on manual card cable.
2. Two 12741A 32k byte Memory modules, including installation manual.
3. 12892B Memory protect module, including installation manual.

### 2102H/12741A/12779H 64k byte High performance fault control memory system

The 2102H/12741A/12779H 64k byte High performance fault control memory system, which consists of the following items, may be substituted for the standard memory system in HP 1000 Model 20, 25, and 30 (2174A/B, 2175A/B, and 2170A/71A/72A) Computer Systems which have been ordered with delete option 014:

1. 2102H Memory controller, including installation manual and cables.
- 2-3. Same as items 2 and 3 of the 2102E/12741A memory system, listed previously.
4. 12779H 256k byte Fault control check bit board, including installation manual.

### 12786A 128k byte Standard performance memory package

The 12786A memory package, which consists of the following items, is installed in the 2113 computer in HP 1000 Model 40 Systems unless 2176A/B option 014 is ordered, permitting its replacement with another choice, selected from Table 2. The 12786A may also be substituted for the standard memory system in HP 1000 Model 20, (2174A/B) Computer System which has been ordered with delete option 014:

1. 2102B Memory controller board, including installation manual and cable.
2. 12747A 128k byte Memory module, including installation manual.
3. 12892B Memory protect card, including installation manual.
4. 12731A Memory expansion module, including installation.
5. 13307A Dynamic mapping instructions.
6. 13305-90001 Dynamic mapping system installation manual.

*NOTE: The 12786B, 12786C, and 12786D 256k byte 512k byte, and 1024k byte Standard performance memory packages, which follow, may be substituted for the standard memory system in HP 1000 Model 20 and 40 (2174A/B and 2176A/B) Computer Systems which have been ordered with delete option 014.*

#### **12786B 256k byte Standard performance memory package**

The 12786B memory package is the same as the 12786A package, but with two 12747A 128k byte memory modules.

#### **12786C 512k byte Standard performance memory package**

The 12786C memory package is the same as the 12786A package, but with four 12747A 128k byte memory modules.

#### **12786D 1024k byte Standard performance memory package**

The 12786D memory package is the same as the 12786A package, but with eight 12747A 128k byte memory modules.

#### **12788A 128k byte High performance memory package**

The 12788A memory package, which consists of the following items, is installed in the 2117 Computer in HP 1000 Model 45 Systems unless 2177A/B option 014 is ordered, permitting its replacement with another choice, selected from Table 2. The 12788A may also be substituted for the standard memory system in HP 1000 Model 20, 25, and 40 (2174A/B, 2175A/B, and 2176A/B Computer Systems which have been ordered with delete option 014:

1. 2102E Memory controller board, including installation manual and cable.
2. 12747H 128k byte Memory module, including installation manual and cable.
- 3-6. Same as items 3 through 6 of the 12786A memory package, listed previously.

*NOTE: The 12788B, 12788C, and 12788D 256k byte, 512k byte, and 1024k byte High performance memory packages, which follow, may be substituted for the standard memory system in HP 1000 Model 20, 25, 40, and 45 (2174A/B, 2175A/B, 2176A/B, and 2177A/B) Computer Systems which have been ordered with delete option 014.*

#### **12788B 256k byte High performance memory package**

The 12788B memory package is the same as the 12788A package, but with two 12747H 128k byte memory modules.

#### **12788C 512k byte High performance memory package**

The 12788C memory package is the same as the 12788A package, but with four 12747H 128k byte memory modules.

#### **12788D 1024k byte High performance memory package**

The 12788D memory package is the same as the 12788A package, but with eight 12747H 128k byte memory modules.

*NOTE: The 12787A-D Fault control memory packages, which follow, may be substituted for the standard memory system in HP 1000 Model 20, and 40 (2174A/B, and 2176A/B) Computer Systems which have been ordered with delete option 014.*

#### **12787A 128k byte Standard performance fault control memory package**

The 12787A memory package consists of the following items;

1. 02102C Memory controller, including installation manual and cables.

2-6. Same as items 2 through 6 of the 12786A package, listed previously

7. 12779A 256k byte Check bit array board, including installation manual.

#### **12787B 256k byte Standard performance fault control memory package**

The 12787B memory package is the same as the 12787A package, but with two 12747A 128k byte memory modules.

#### **12787C 512k byte Standard performance fault control memory package**

The 12787C memory package is the same as the 12787A package, but with four 12747A 128k byte memory modules and a 12780A 512k byte check bit board instead of the 12779A check bit board.

#### **12787D 1024k byte Standard performance fault control memory package**

The 12787D memory package is the same as the 12787A package, but with eight 12747A 128k byte memory modules and two 12780A 512k byte check bit boards instead of the 12779A check bit board.

*NOTE: The 12789A-D Fault control memory packages, which follow, may be substituted for the standard memory system in HP 1000 Model 20, 25, 40, and 45 (2174A/B, 2175A/B, 2176A/B, and 2177A/B) Computer Systems which have been ordered with delete option 014.*

#### **12789A 128k byte High performance fault control memory package**

The 12789A memory package consists of the following items;

1. 2102H Memory controller, including installation manual and cables.
2. 12747H 128k byte Memory module.
- 3-6. Same as items 3 through 6 of the 12786A package, listed previously.
7. 12779H 256k byte Check bit, including installation manual.

#### **12789B 256k byte High performance fault control memory package**

The 12789B memory package is the same as the 12789A package, but with two 12747H 128k byte memory modules.

#### **12789C 512k byte High performance fault control memory package**

The 12789C memory package is the same as the 12789A package, but with four 12747H 128k byte memory modules and a 12780H 512k byte check bit board instead of the 12779H check bit board.

#### **12789D 1024k byte High performance fault control memory package**

The 12789D memory package is the same as the 12789A package, but with eight 12747H 128k byte memory modules and two 12780H 512k byte check bit boards instead of the 12779H check bit board.

**12747A additional 128k byte Standard performance memory module**

The 12747A memory module may be used to increase memory of HP 1000 Systems with 12786 or 12787 memory packages as shown in Table 2. It consists of:

1. 12747-60001 128k byte Memory module.
2. 13187-90004 Memory Module installation manual.

**12747H additional 128k byte High performance memory module**

The 12747H memory module may be used to increase memory of HP 1000 Systems with 12788 or 12789 memory packages as shown in Table 2. It consists of:

1. 12747-60002 128k byte Memory module.
2. 13187-90004 Memory module installation manual.

**12779H additional 256k byte High performance fault control check bit array board**

The 12779H check bit array board may be used to support additional fault control memory in HP 1000 Systems with 12789 memory packages as shown in Table 2. It consists of:

1. 12779-60002 256k byte Check bit array board.
2. 12779-90001 Check bit board installation manual.

**12780H additional 512k byte High performance fault control check bit array board**

The 12780H check bit array board may be used to support additional fault control memory in HP 1000 Systems with 12789 memory packages as shown in Table 2. It consists of:

1. 12780-60002 512k byte Check bit array board.
2. 12779-90001 Check bit board installation manual.

models 12539C, 12620A, 12892B, 12897B, 12979B, 12898A, 12990B, 12991B, 12992C/D, 13047A, 13197A, 13304A, and 13306A

This data sheet describes the computer accessories included in, and available for, HP 1000 Computer Systems.

## Features

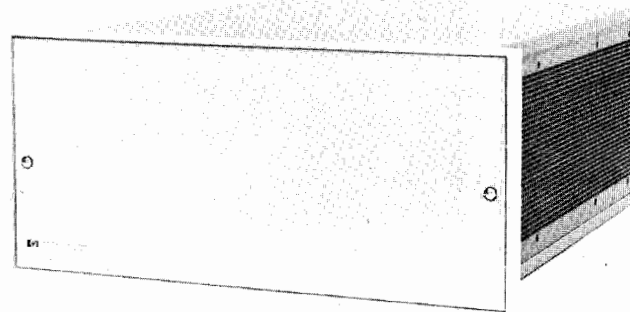
- 12539C Time base generator for system timing reference
- Optional 12620A Breadboard interface for privileged interrupt control
- 12892B Memory protect for protection of operating system
- 12897B Dual channel port controller for direct memory access in HP 1000 Model 30, 40, and 45 Computer Systems and in HP 1000 Model 20 and 25 Systems with flexible disc
- Optional 12979B Dual port I/O extender for addition of 16 I/O channels to upright cabinet system
- Optional 12898A Dual channel port controller for extension of direct memory access to the 12979B Dual-port I/O extender
- Optional 12990B Memory extender for addition of 9 memory slots to the system (HP 1000 Model 20 and 40 upright cabinet systems only)
- 12991B Power fail recovery system for sustaining memory contents through power failure
- 12992C Terminal loader ROM for system boot-up and/or program loading from the cartridge tape units of the system console
- Optional 12992D Magnetic tape loader ROM for program loading from 9-track magnetic tape subsystem
- Optional 13047A User control store board for mounting up to 2k words of user programmed control store instruction ROMs
- Optional 13197A Writable control store for providing 1k words of RAM memory for user-programmed control store instructions
- 13304A Firmware accessory board for mounting HP firmware enhancements to the base instruction set
- 13306A Fast FORTRAN Processor for 2 to 20-fold increase in execution speed of frequently used FORTRAN subroutines, standard in HP 1000 Models 25 and 45, optional in Models 20, 30, and 40

## 12539C Time base generator specifications

### Time base

**Intervals:** decade multiples from 01 millisecond to 1000 seconds.

**Stability:** 2 parts in  $10^6$  per week.



12979B Dual-port I/O Extender

**Temperature Effects:** 20 parts in  $10^6$  over  $15^{\circ}$  to  $35^{\circ}\text{C}$  ( $59^{\circ}$  to  $95^{\circ}\text{F}$ ) temperature range.

**Total Stability:** 1/2 second per 24-hour day.

**Selection:** by interval code under control of operating system. The 10 millisecond interval used in RTE-M, RTE-II, and RTE-IV, operating systems may be changed by programming a different interval in the operating system.

## 12620A Interface breadboard specifications

### Application

The 12620A Interface breadboard provides a means to distinguish between privileged (high priority/low select code) and non-privileged (low priority/high select code) I/O channel functions in RTE systems. It is specifically required for modem communication channels operating under DS/1000 Network software-firmware and/or modem communication channels operating under RJE/1000. It is physically installed in the computer backplane between the I/O channel(s) serving a privileged I/O function(s) and I/O channel(s) serving other function(s).

## 12892B Memory protect specifications

### Fence register

Set under program control to contain memory address below which memory is protected.

### Memory protect interrupt

**Priority:** second highest in the computer (shared with Memory Parity Interrupt).

**Conditions:** Memory Protect Interrupt warns RTE-M, RTE-II, or RTE-IV system of memory protect violation when user program: 1) attempts to alter a protected location, 2) attempts to jump into a protected area, 3) attempts to execute an I/O instruction.

**Violation register**

Contains memory address of violating instruction.

**12897B Dual-channel port controller (DCPC) specifications**

**Number of channels**

Two, assignable to any two I/O channels.

**Number of memory ports**

One.

**Maximum block size**

32,768 words.

**Registers**

Two word count registers, two address registers, and two select code registers.

**Typical DCPC transfer rates (bytes/sec)**

	W/Standard Performance Memory	W/Std Perf. Fault Control Memory	W/High Performance Memory
Input	1,950,000	1,884,000	2,280,000
Output w/o DMS*	1,778,000	1,672,000	2,280,000
Output w/DMS*	1,676,000	1,626,000	2,100,000

\*DMS = Dynamic Mapping System.

**12898A Dual-channel port controller specifications**

**Application**

The 12898A Dual channel port controller extends direct memory access to the 12979B Dual-port I/O extender when the 12979B is used in the HP 1000 Computer system. The 12898A is installed in the 12979B.

**12979B Dual port I/O extender specifications**

**Application**

The 12979B Dual-port I/O extender provides additional I/O channels for HP 1000 Computer Systems. Its dual-port capability of serving two computers is not software supported in HP 1000 systems.

**Capacity**

The extender provides 16 additional I/O channels. Only one extender per system.

**12990B Memory extender specifications**

**Capacity**

Nine memory module spaces powered by the 12990B.

**Recommended accessory**

12991B Power Fail Recovery System.

**12991B Power fail recovery system specifications**

**Capacity**

Battery is capable of sustaining ten memory modules for 1.6 hours in computer or nine modules for 1.9 hours in 12990B.

**Power restart**

Detects resumption of power and generates an interrupt to a trap cell for auto restart program which has been protected in memory by the sustaining battery.

**Power control and charge unit**

Monitors battery charge status and provides 350 mA charge rate.

**12992C/D Loader ROM specifications**

**Application**

**12992C Terminal loader ROM:** provides for loading software into the system from the cartridge tape units of the 2645A/2648A+007 system console.

**12992D Magnetic tape loader ROM:** provides for loading software into the system from an HP 7970B/E+236 9-track Magnetic tape subsystem.

*NOTE: The 12992D Magnetic tape loader ROM can be installed only by removing the paper tape loader ROM or another loader ROM that is not needed in the user's system, a user-performed procedure.*

**13047A User control store (UCS) specifications**

**Application**

The 13047A User Control Store Card provides for addition of up to 2048 microinstruction words of Programmable Read-Only Memory to the system controller instruction set. The 2048 word capacity of the UCS is subdivided into eight 256-word functional modules, which facilitates incremental expansion of the controller instruction set.

**Capacity**

**No. of 256-Word Functional Modules:** Up to eight.

**No. of PROMs per Functional Module:** Six.

**Microinstructions per Functional Module:** 256.

**Microinstructions per UCS Card:** Up to 2048.

**No. of UCS cards per computer:** Two.

## Recommended PROMs

HP 1816-0782, Harris 7611-5.

## 13197A Writable control store (WCS) specifications

### Application

Provides semiconductor, random-access memory for storage of user-written microprograms prepared with the aid of the 92061A+020. RTE Microprogramming Package (optional software item).

### Capacity

No. of 24-bit microinstructions per WCS card: 1024.

No. of WCS cards per computer: Three.

## 13304A Firmware accessory board specifications

### Application

Provides mounting space for ROMs of 13307A Dynamic Mapping Instructions, 13306A Fast FORTRAN Processor, 12823A Scientific Instruction Set, RTE-IV EMA firmware, and DS/1000 firmware.

## 13306A Fast Fortran processor specifications

### Application

Provides microcoded subroutines which greatly enhance the throughput efficiency of user's application programs in FORTRAN, ALGOL, and HP Assembly language.

### Microcoded Routines, (Op Codes), and (Run Times)

**DBLE** (105201) Converts single to extended precision (13.02  $\mu$ sec).

**SNGL** (105202) Converts extended to single precision (18.2  $\mu$ sec).

**.XMPY** (105203) and **XMPY** (105211) Extended multiply (56.7 to 64.8  $\mu$ sec; 36.4  $\mu$ sec, max. uninterruptible time).

**.XDIV** (105204) and **XDIV** (105212) Extended divide (80.7 to 93.1  $\mu$ sec; 37.8  $\mu$ sec, max. uninterruptible time).

**.XADD** (105213) and **XADD** (105207) Extended add (38 to 50.7  $\mu$ s; 25.7  $\mu$ sec, max. uninterruptible time).

**.XSUB** (105214) and **XSUB** (105210) Extended subtract (38 to 50.7  $\mu$ sec; 25.7  $\mu$ sec, max. uninterruptible time).

**DFER** (105205) and **.XFER** (105220) Transfers an extended precision variable to another location (12.81  $\mu$ sec).

**.PWR2** (105225) Calculates  $X * 2^N$  for real X and integer N (8.4  $\mu$ sec).

**.FLUN** (105226) Unpacks a real variable (3.1  $\mu$ sec).

**.XPAK** (105206) Normalizes, rounds, and packs mantissa of extended precision number (18.9 to 29.5  $\mu$ sec; 11.6  $\mu$ sec, max. uninterruptible time).

**.PACK** (105230) Normalizes a real variable (19.2 to 27.2  $\mu$ sec).

**.XCOM** (105215) Compliments an extended precision number (11.7 to 12.1  $\mu$ sec).

**.DCM** (105216) Compliments and normalizes an extended precision number ((22.1 to 33.4  $\mu$ sec; 12.2  $\mu$ sec, max. uninterruptible time)

**DDINT** (105217) Converts extended precision real to extended integer (23.9 to 58.6  $\mu$ sec; 30.6  $\mu$ sec, max. uninterruptible time).

**.GOTO** (105221) Transfers control to location indicated by FORTRAN computed GOTO statement (10.6  $\mu$ sec).

**.MAP** (105222) Computes address of a specified element of 2 or 3 dimensional array (17.7 to 27.2  $\mu$ sec).

**.ENTR** (105223) and **.ENTP** (105224) Transfers address of parameters from a calling sequence into a subroutine list (13.9  $\mu$ sec + 3.7  $\mu$ sec times the number of parameters).

**.SETP** (105227) Sets a table of increasing value (6.4  $\mu$ sec + 1.2  $\mu$ sec times the number of counts).

## Ordering information

### 12539C Time base generator

The 12539C Time base generator, which includes an operating and service manual (12539-90008), is installed in the Computer in all HP 1000 Computer Systems.

### 12620A Interface breadboard

The 12620A Interface breadboard, which consists of the following items, can be added to HP 1000 Computer Systems to provide privileged interrupt control:

1. 5060-6282 TTL breadboard.
2. 5060-8339 48-pin connector kit.
3. 5951-4498 Pocket guide to interfacing.
4. 12620-90001 Interface manual.

### 12892B Memory protect

The 12892B memory protect module, which includes an installation manual (12892-90007) is installed in the Computer in all HP 1000 Computer Systems.

### 12897B Dual-channel port controller

The 12897B Dual-channel port controller, which consists of the following items, is installed in the Computer in all HP 1000 Computer Systems, except Models 20 and 25 that are not equipped with flexible disc (2174A/B or 2175A/B option 032):

1. 12897-60004 dual-channel port controller module
2. 12897-60002 cable.
3. 12897-90005 installation manual.

### 12979B Dual-port I/O extender

The 12979B Dual-port I/O extender can be added to HP 1000 Computer Systems based on the 2170A, 2171A, 2174A, 2175A, 2176A, or 2177A Computer System building block to increase the total number of I/O channels in the system to 30. The 12979B includes:

1. 12979B Dual-port I/O extender.
2. 12979-60022 I/O buffer card.
3. 12979-60024 I/O data cable.
4. 12979-60008 I/O control cable.
5. 12979-90016 installation and service manual.
6. 12979-90014 operating and reference manual.

### 12898A Dual-channel port controller for 12979B

The 12898A can be added to the 12979B to extend Dual channel port controller direct memory access to the I/O channels in the extender; it includes:

1. 12898-60001 dual channel port controller.
2. 12898-60002 cable.
3. 12898-90001 installation manual.

### **12990B Memory extender**

The 12990B Memory extender can be added to HP 1000 Computer systems based on the 2174A or 2176A Computer System building block to increase the total number of memory module slots in the system to 19. The 12990B includes

1. 12990B Memory extender.
2. 12990-60014 computer-extender power control cable.
3. 12990-60011 extended memory cable with 20 connectors.
4. 12990-90003 installation manual.

### **12991B Power fail recovery system**

The 12991B Power fail recovery system is installed in the Computer in all HP 1000 Computer Systems; an additional 12991B Power fail recovery system should be provided for the 12990B Memory extender in those HP 1000 Computer Systems for which the memory extender is ordered.

### **12992C CRT terminal loader ROM**

The 12992C CRT terminal loader ROM is installed in the Computer in all HP 1000 Computer Systems.

### **12992D Magnetic tape loader ROM**

The 12992D Magnetic tape loader ROM can be substituted by the user for one of the four ROMs in the Computer that is not required for the user's application. The 12992D includes an installation manual (12992-90007).

### **13047A User control store board**

The 13047A User control store board, which consists of the following items, is offered for mounting of permanent microprogrammed instruction ROMs (maximum of two per HP 1000 Computer System):

1. 13047-60001 User control store board.
2. 5060-8393 Cable.
3. 13047-90001 Installation manual.

### **13197A Writable control store**

The 13197A Writable control store, which consists of the following items, is available for dynamic storage of user-developed, microprogrammed subroutines (maximum of three per HP 1000 Computer System):

1. 13197-60001 Writable control store board.
2. 5060-8393 Cable.
3. 13197-90001 RTE WCS manual.
4. 13197-90003 Reference manual.

### **13304A Firmware accessory board**

The 13304A Firmware accessory board, which includes an installation and service manual (13304-90001), is installed in the Computer in all HP 1000 Computer Systems.

### **13306A Fast Fortran processor**

The 13306A Fast Fortran processor, which consists of the following items, is included in HP 1000 Model 25 and 45 (2175A/B and 2177A/B) System and is an optional accessory for HP 1000 Model 20, 30, and 40 (2174A/B, 2170A/71A/72A, and 2176A/B) Computer Systems:

1. 1816-0944 through 0946 4k ROMs.
2. 13306-80001 through 80006 1k ROMs.
3. 13306-90001 installation manual.

### **12979B/12990B Option 015**

Option 015 to the 12979B or 12990B provides 176-264V (220V  $\pm$  20%) operation.



The 2645A with option 007 dual Mini cartridge tape transport serves as the system console in HP 1000 Model 20, 25, 30, and 40 Systems and as a standard input/output unit as well. Optionally, the 2645A system console can be replaced with the 2648A and 007 Graphics terminal in those systems, which adds powerful graphics display capabilities to the alphanumeric I/O and mini cartridge I/O capabilities of the 2645A. The 2648A with option 007 and 92840A GRAPHICS/1000 Graphics Plotting Software is standard in HP 1000 Model 45 Systems. The computer system can communicate with the 2645A or 2648A display at rates up to 960 characters/second. The 2645A and/or 2648A can also be used as additional local or modem-connected terminals, with or without the Mini cartridge option. They may be connected via a single interface or multiple 2645A or 2648A terminals may be connected to a single I/O channel via the new 12790A multipoint interface in HP 1000 Model 20, 25, 40, and 45 Systems.



2645A+007 Display Station; 2648A+007 Graphics Terminal is similar

## Features

### Models 2645A and 2648A

- Plug-in character set flexibility, including upper/lower case, math, line drawing set, and user-designed character set options
- Character or block mode operation
- Built-in self test
- Full editing capability
- Multi-task keyboard
- Off-screen storage with scrolling capability
- Programmable protected fields for forms
- Inverse video for highlighting
- Optional blinking, underline, and half-bright display
- Microprocessor control
- Automatic data logging with Minicartridge I/O
- Formatted ASCII or binary program/data storage
- User-definable display/control/transmission functions
- Flexible, powerful multiple data paths

### Additional 2648A features

- Independent graphics memory with 720×360 displayable points
- Automatic plotting
- Hardware pan and zoom

## Functional specifications

### Display

**Screen size:** 127×254mm (5×10 in).

**Capacity:** 24 lines × 80 columns (alphanumeric), 720 dots × 360 rows (graphics in 2648A only).

**Character generation:** 7 × 9 dot matrix enhanced by dot shifting in 9 × 15 character cell; non-interlaced raster scan.

**2645A Character set:** 64 upper-case Roman standard, 128 upper/lower case Roman with option 001. Drawing sets available as accessories.

**2648A character set:** 128 upper/lower case Roman. Drawing sets available as accessories.

**Cursor:** Blinking underline.

**Display modes:** White on black or black on white (inverse video).

**Implosion protection:** Bonded implosion panel.

### Memory

**2640B:** 1024 bytes of RAM memory (enough for 8 full lines or 50 short lines), expandable to 8192 bytes by adding two 13234A memory modules.

**2645A:** 4096 bytes of RAM memory, expandable to 12,288 bytes by adding two 13234A memory modules.

**2648A:** 37 lines of 80 alphanumeric characters (less control codes) and 720 dots by 360 rows of displayable points for graphic display.

## Keyboard

**2645A:** Full ASCII code keyboard, 8 special function keys, 18 additional control and editing keys, 10-key numeric pad, cursor pad, multi-speed auto repeat, N-key rollover; standalone with 1.22m (4 ft) cable.

**2648A:** Same as 2645A, but with graphics pad in place of 10-key numeric pad.

## Option slots available

**Model:** 2645A 2648A  
**Slots:** seven four

## 2645A or 2648A Mini cartridge tape transports

Option 007 equips the 2645A or 2648A Terminal with two Mini cartridge tape transports. This option is included in 2645A or 2648A supplied as system console for HP 1000 Computer systems.

**Read/write speed:** 10 ips.

**Search/rewind speed:** 60 ips.

**Recording density:** 800 bpi.

**Storage capacity:** 110k bytes/cartridge, maximum; actual useful storage depends upon the number of inter-record and inter-file gaps.

## Data rates

**2645A or 2648A:** 110, 150, 300, 1200, 2400, 4800, and 9600 baud (11, 15, 30, 120, 240, 480, and 960 char/sec) to/from display, switch selectable.

**2645A or 2648A, display or system to/from Mini cartridge:** 200 to 350 char/sec, depending on record length.

**2648A, graphics display:** Up to 190 vectors/second.

## Configuration information

### 2645A as system console

**Options supplied:** 001 (128 character set), 007 (dual Mini-cartridge transports), 013 (five mini cartridges), 030 (deletes standard asynchronous communications interface).

**Accessory supplied:** 13260B extended asynchronous communications card in terminal.

**System I/O card supplied:** 12966A and 001 cable (supports Mini cartridge transports and terminal printer subsystems).

**Software support:** Local driver DVR05 or modem driver DVA05, supplied in 92062 RTE drivers package and 92840A GRAPHICS/1000 plotting software for 2648A.

### 2648A as system console

Same as 2645A, above, except that 128 character set is standard in 2648A, so option 001 is not needed, and 13260B+003 extended asynchronous communications card is required in terminal.

## Ordering information

### 2645A Display station

A 2645A Display station including the following items, options, and additional accessories is supplied with HP 1000

Model 20, 25, 30, and 40 Computer Systems as the system console:

1. 2645A Display Station.
2. 02645-90001 User's manual.
3. 02645-90005 Reference manual.

The following 2645A options are provided in the HP 1000 Computer System system console:

- 001: 128 character set.
- 007: Dual Mini cartridge I/O.
- 013: Package of five Mini cartridges.
- 030: Deletion of standard communications interface.

The following accessories and interfaces are provided with the 2645A used as an HP 1000 Computer System system console:

1. 13260B Extended asynchronous communications card.
2. 12966A+001 Buffered asynchronous communications (computer) interface.

### 2648A Graphics terminal

A 2648A Graphics terminal including the following items, options, and additional accessories is supplied with HP 1000 Model 45 Computer Systems as the system console, and can be substituted for the 2645A as system console in other HP 1000 systems by ordering 217xA/B option 008:

The base 2648A includes:

1. 2648A Graphics Terminal.
2. 02648-90001 User's manual.
3. 02648-90002 Reference manual.

The following 2648A options are provided in the HP 1000 Computer System system console:

- 007: Dual Mini cartridge I/O.
- 013: Package of five Mini cartridges.
- 030: Deletion of standard communications interface.

The following accessories and interfaces are provided with the 2648A used as an HP 1000 Computer System system console:

1. 13260B+003 Extended asynchronous communications card.
2. 12966A+001 Buffered asynchronous communications (computer) interface.

### 2645A and 2648A accessories

**13231A** Display enhancements (blinking, half-bright, and underline; also provides space for addition of three 128-character sets; uses one option slot).

**13234A** + 4k byte terminal memory module (uses one option slot).

**13246A/B** auxiliary Printer Subsystem (see HP 1000 Peripherals Data book).

**13349A** auxiliary Printer Subsystem (see HP 1000 Peripherals Data book).

**2631A+240** auxiliary Printer Subsystem (see HP 1000 Peripherals Data book).

The 12732A is a Flexible disc subsystem for storage of programs and data in HP 1000 Computer Systems. Required for on-line program development in RTE-M based systems, the 12732A is available as an option with the 2174A/B and 2175A/B Computer System products. It can also be ordered as a separate item for use with other HP 1000 Computer System configurations.

The 12733A is add-on drive for the 12732A subsystem. The configuration limit in HP 1000 (217xA/B) Computer Systems is one additional drive.

## Features

- Provides 514,560 bytes of user-available storage per drive
- Double-density read/write
- Available in table top and rack-mountable configurations

## Functional specifications

### Storage capacity

Tracks per disc: 67, maximum.

Sectors per track: 30.

Bytes per sector: 256.

Total storage per disc: 514,560 bytes.

Disc drives per subsystem: Four, maximum; two, maximum, in HP 1000 Computer System.

Disc drives per subsystem: Two, maximum.

### Rotational delay (latency)

83.3 milliseconds average (1/2 revolution).

### Head positioning

Head loading: 50 milliseconds, typical.

Track-to-track: 10 milliseconds plus 10 milliseconds for head settling.

### Total average access time (rotation and position)

270 milliseconds.

### Data transfer rates

Effective, using "fast" disc format: 46,000 bytes/second.

Effective, using standard disc format: 9,200 bytes/second.

### Configuration information

The 12732A Flexible disc subsystem requires two computer I/O channels and uses driver DVR33 and diagnostics that are furnished with the HP 1000 Computer System. The required system interface cards are supplied with the 12732A



subsystem. One 12732A subsystem and one 12733A add-on drive can be used in HP 1000 Computer systems.

## Ordering information

### 12732A Flexible disc subsystem

The 12732A subsystem includes:

1. 9885M Flexible disc drive (includes two flexible discs).
2. 12732-13401 Format utility disc.
3. 12732-16003 Absolute diagnostic on paper tape.
4. 12735A Interface kit, including two interface cards and 4.6m (15 ft) interface cable.
5. 12679B 30-inch racking support rails.
6. 09885-90030 Disc driver service manual.
7. 09885-90020 Disc driver maintenance note.
8. 12732-90003 Diagnostics manual.
9. 12732-90005 Flexible disc subsystem manual.

### 12733A Add-on Flexible disc drive

The 12733A add-on drive includes:

1. 9885S Flexible disc drive (includes two flexible discs).
2. 12679B 30-inch racking support rails.
3. 09885-61617 1.8m (6 ft) interface cable.
4. 09885-90030 disc drive service manual.
5. 09885-90020 Disc drive maintenance note.

### 12732A and 12733A Options

001: For table top operation (deletes 30-inch racking support rails).

015: 50 Hz operation (voltage is switch selectable).

### Flexible disc subsystem in HP 1000 Model 20 and 25 Computer Systems

The 12732A Flexible disc subsystem, as defined below, is ordered for HP 1000 Model 20 (2174A/B) and 25 (2175A/B) Computer Systems as 217xA/B option 032, which also extends the RTE-M program development, file management, and other capabilities of those computer systems.



## 4.9M byte Cartridge disc subsystem

model 12960A

The HP 12960A is a 4.9M byte cartridge disc subsystem that provides fast-access program and data storage in HP 1000 Computer Systems using the 2170A system building block and optionally in HP 1000 Computer Systems using the 2176A system building block.

### Features

- Convenient front-loading cartridge plus fixed disc.
- 4.9M byte capacity, expandable to 9.8M bytes with an additional drive.
- Average seek time less than 30 milliseconds.

### Functional specifications

#### Capacity

4,915,200 bytes on fixed disc and interchangeable cartridge disc in each drive. In the HP 1000 system, two drives, providing a total storage capacity of 9,830,400 bytes can be used.

#### Data access

##### Head positioning, including settling time

Track-to-track: 7 milliseconds, maximum

Average: 30 milliseconds.\*

Span of 203 tracks: 55 milliseconds, maximum.

##### Rotational delay (latency)

Average ( $\frac{1}{2}$  revolution): 12.5 milliseconds.

Maximum (1 revolution): 25 milliseconds.

**Total average access time (position and rotation):** 42.5 milliseconds.

**Data transfer rate:** 312k bytes/second.

**Cartridge change (60Hz operation):** Stop time is 25 sec; start time is 30 sec.

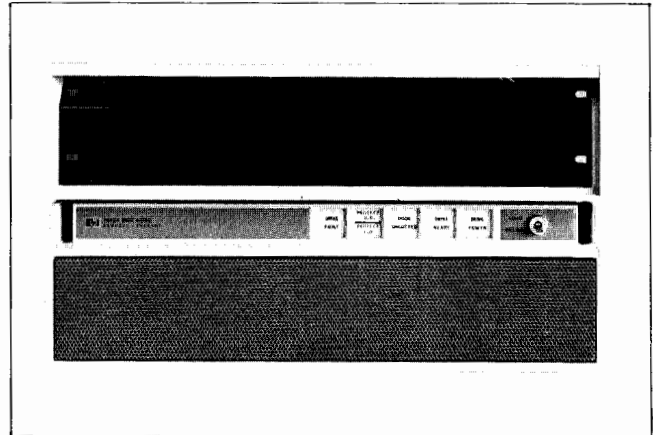
#### Disc interchangeability

Any disc written on any 12960A within the HP 1000 System's operating temperature range can be read on any other 12960A operating within the same range.

*\*Average seek time is the time required to perform all possible seeks divided by the number of possible seeks.*

#### Configuration information

The 12960A Subsystem requires two computer I/O channels and uses driver DVR31 and diagnostics that are supplied with the 2170A or 2176A Computer System. The required system interface cards are supplied with the 12960A.



### Ordering information

The 12960A Cartridge Disc Subsystem is included in the 2170 Computer System building block for HP 1000 Model 30 Computer Systems and, optionally in the 2176A building block for Model 40 Systems. An additional 4.9M byte disc drive may be added to the subsystem by ordering 12960A and option 010 (a 2170A/2176A option 002 additional cabinet bay is also required). Additional 12869A disc cartridges are also available.

#### HP 12960A Cartridge Disc Subsystem

Includes:

1. 7900A Disc Drive.
2. 13215A Disc Power Supply.
3. 13210A Disc Interface Kit (two cards).
4. 12896A Disc Cartridge.
5. 13111A Disc Rack Mounting Kit.
6. 07900-90002 Disc operating and service manual.
7. 12960-90001 Disc subsystem reference manual.
8. 12960-90003 Disc subsystem installation and service manual.

#### Options

**010:** Replaces 13210A interface kit with 13212A Multi-Unit Cable for daisy-chain connection to master disc drive. (One additional 12960A and option 010 drives may be used with a 2170A+002 or 2176A+002, 030 Computer System.)

**015:** 220/240V, 50 Hz operation.



## High performance cartridge and top loading disc memories

models 7906M/MR+020/S/SR+020 and 7920M/S

The 7906M/MR+020 is a 19.6M byte master cartridge disc drive for HP 1000 Computer systems using the 2171A, 2172A, 2176A/B, and 2177A/B Computer system building blocks. HP 2176A/B and 2177A/B option 033 can be used to replace the 19.6M byte cartridge disc with a 50M byte 7920M master top loading disc. Up to seven add-on drives may be used with each master drive. Each 7906S/SR+020 add-on drive provides 19.6M bytes of additional storage. 7920S add-on 50M byte slave top loading disc drives each add 50M bytes of additional storage, and can be used with either the 7906M/MR+020 master drive or the 7920M master drive.

### Features

- 19.6M byte capacity expandable to 370M bytes with additional drives in RTE-II or RTE-IV based system; optional 50M byte capacity expandable to 400M bytes with additional drives in RTE-IV based system
- Hardware error correction for enhanced data reliability
- Microprocessor-based disc controller
- Constant spindle speed, independent of line frequency
- Choice of rack mounting or attractive low-profile cabinet for 7906 master and add-on drives

### Functional specifications

#### Capacity

**7906:** 19,660,800 bytes — 1/2 on fixed disc, 1/2 on interchangeable cartridge disc in each drive.

**7920M/S:** 50,073,600 bytes on removable disc pack in each drive.

**Maximum with 7906 drives:** 370,176,000 bytes using seven 7920S add-on slave drives.

**Maximum with 7920M/S drives:** 400,588,800 bytes with one 7920M and seven 7920S drives.

#### Data access

**Head positioning, including settling time**

**Track-to-track:** 5 milliseconds, average.

**Average of all seeks:** 25 milliseconds.\*

**Rotational delay (latency)**

**Average (1/2 revolution):** 8.3 milliseconds.

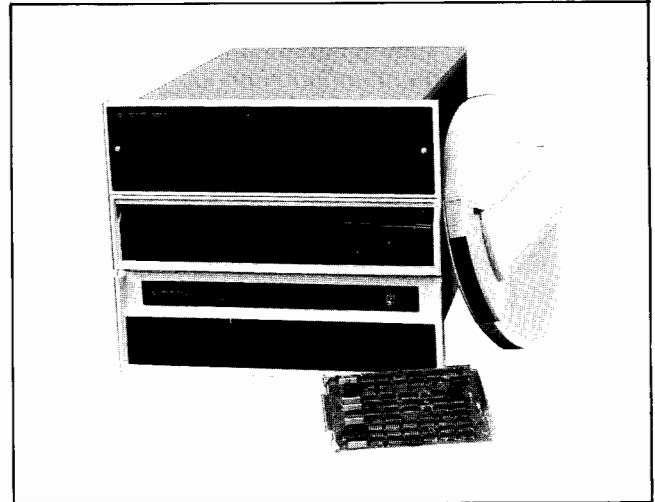
**Maximum (1 revolution):** 16.6 milliseconds.

**Total average access time:** 33.3 milliseconds, including both head position and rotation.

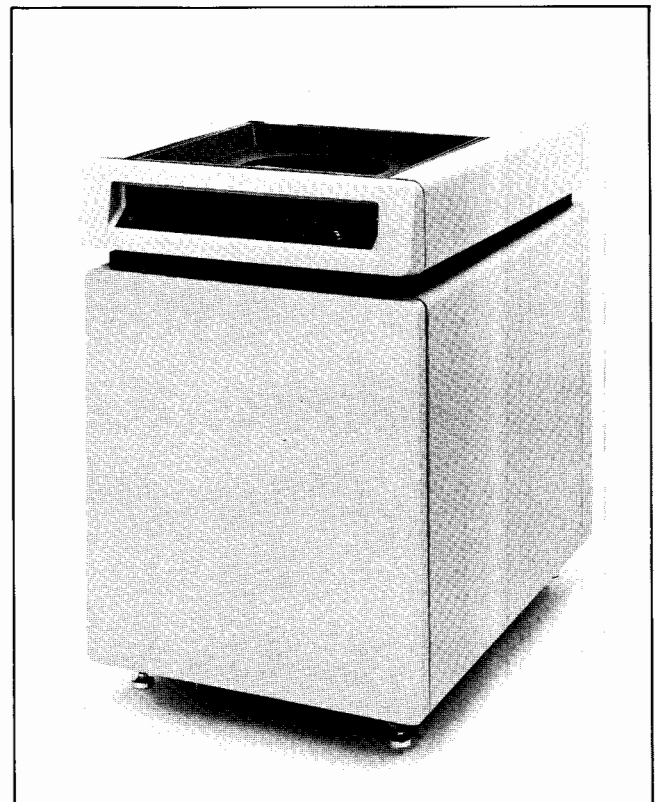
\*Average seek time is the time required to perform all possible seeks, divided by the number of all possible seeks.

#### Data transfer rate

937.5k bytes/second.



7906MR+020 19.6M byte Cartridge Disc and 13175A interface



7920M/S 50M byte Top Loading Disc

## Configuration information

The 7906M/MR+020 cartridge disc (or 7920M master top-loading disc) requires one computer I/O channel and uses DVR32, an interface, and diagnostics that are supplied with the 2171A, 2172A, 2176A/B, or 2177A/B Computer System.

## Ordering information

### 7906MR+020 Master cartridge disc drive (rack mounting)

The 7906MR+020 Master cartridge disc drive is included in the 2171A, 2176A, or 2177A Computer System products for HP 1000 Computer systems, Model 30, 40, or 45. It includes:

1. 7906 Disc drive.
2. 12940A Disc cartridge.
3. 13037B Disc controller.
4. 13213A 3m (10 ft) Data cable.
5. 13013A 3.6m (12 ft) Multi-unit cable.
6. 07906-90901 User's manual for 7906.
7. 07906-90902 Installation manual for 7906.
8. 12904A+001 Rack slide kit.

### 7906M Master cartridge disc drive (in minirack)

The 7906M Master cartridge disc drive is included in the 2172A, 2176B, or 2177B Computer System products for HP 1000 Computer systems, Model 30, 40, or 45. It includes:

- 1-4. Same as items 1-4 of 7906MR, above.
5. 13013A+001 1.5m (5 ft) Multi-unit cable.
6. 29425A Low-profile cabinet.
- 7-8. Same as items 6 and 7 of 7906MR+020, above.
9. 29425-90001 Low-profile cabinet installation and service manual.

### 7920M Master disc drive in standalone cabinet

The 7920M Master disc drive may be substituted for the 7906M/MR Master disc drive in HP 1000 Computer systems, Model 40, or 45 by ordering 2176A/B or 2177A/B option 033.

The 7920M includes:

1. 7920A Disc drive in minicabinet.
2. 13394A Formatted disc pack.
3. 13037B Disc controller.
4. 13013A+001 1.5m (5 ft) Multi-unit cable.
5. 13213A 3.0m (10 ft) Data cable.
6. 07920-90030 Disc drive operator's manual.
7. 07920-90001 Disc drive operating and service manual.
8. 13037-90006 Disc controller installation and service manual.

### 7906SR+020 2nd to 8th Disc drive for 7906MR+020 (rack mounting)

The 7906SR+020 Disc Drive is similar to the 7906MR+020 Disc Drive, but without the 13037B Disc controller and manuals.

### 7906S 2nd to 8th Disc drive in Minirack for 7906M/MR

The 7906S Disc Drive is similar to the 7906M Disc Drive, but without the 13037B Disc controller and manuals.

### 7920S Add-on (50M byte) Disc drive (for 7906M/MR or 7920M) in stand-alone cabinet

- 1-2. Same as items 1 and 2 of 7920M, above.
3. 13013A-003 2.4m (8 ft) Multi-unit cable.
4. 13213A-002 15.2m (50 ft) Data cable.
5. 07920-90030 Disc drive operator's manual.

*NOTE: The 7920S is also available in multi-drive add-on packages providing a significant cost saving. See the HP 1000 Configuration guide for information.*

### Option 015 for 7906M/MR/S/SR and 7920M/S

220/240V operation

## 29402B Cabinet

The 29402B is a one-bay, 142.3cm (56 in) Cabinet for rack-mounted installation of HP 1000 Model 20, 25, 30, 40, and 45 Computer Systems, or additional rack mounting for peripherals for any of the HP 1000 Computer Systems, in configurations using relatively little floor space.

### Features

- **Sturdy, lightweight aluminum structure.**
- **Bolt-on addition of cabinet bays for easy expansion of equipment racking capacity.**
- **Built-in power and ventilation conforming to EIA and ANSI Standards.**
- **Compactness; 48.3cm (19 in) rack width fits into only 53.3cm (21 in) overall width per bay.**
- **UL recognized component.**

### Functional specifications

#### Anti-tip provisions

**Extender Feet:** Pull-out extender feet provide front-of-cabinet anti-tipover support. Two feet slide out 15.2cm (6 in) from the extreme left and right sides of the cabinet (see photo at right). The feet can be retracted or removed for moving the cabinet through doorways.

**Cabinet Stabilizer:** Standalone upright HP 1000 Computer System Cabinet bays may also include a rear-mounting stabilizer if additional anti-tip protection is necessary.

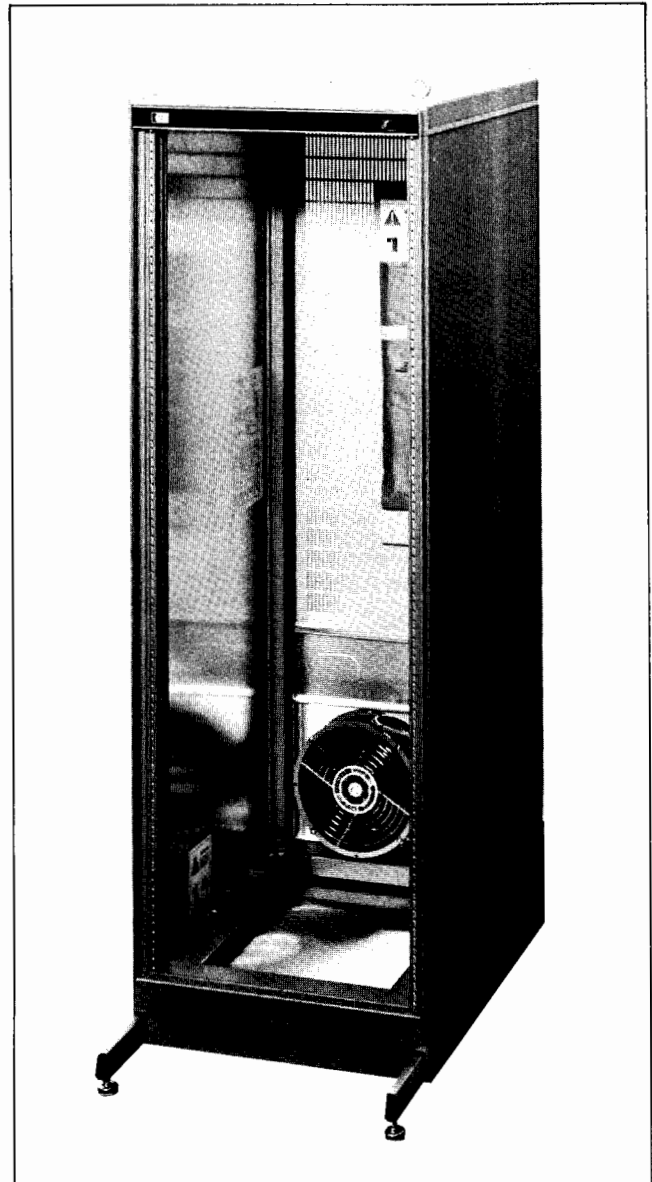
#### Bolt-on addition of cabinet bays

Additional cabinet bays bolt to a main (or master) system or peripheral cabinet through threaded tie blocks, after removal of adjacent detachable side panels. This keeps the cabinets lined up at the operating site, further improves anti-tip stability, and makes it easy to add capabilities as needed.

#### Power control and distribution

Power within stand-alone single-bay system or peripheral cabinets is controlled by a master control unit, Option 200 (115V) or 210 (230V). From this master bay, power is jumper-connected successively to one or two additional bolted-on cabinet bay(s) by power distribution unit(s), Option 400 (115V) or 410 (230V).

**Power Connection:** User-supplied external ac power cable connects to a single terminal strip in the master power control unit (bottom rear of cabinet).



**Option 200 (115V) Power Modes:** The following power modes are selectable by jumper strapping within the power control unit:

1. 120V, single phase, two wire plus earth ground.
2. 120/240V split phase, three wire plus earth ground.
3. 120/208V three phase, four wire plus earth ground.

**Option 210 (230V) Power Mode:** 230V single phase, two wire plus earth ground.

**Power On/Off Control:** A pushbutton switch on the right end of the top casting of the master bay energizes a 24V control relay. The 24V control circuit is used through the switch, rather than full main power, for greater safety.

**Power Service Strips:** Options 200 and 400 each provide one power service strip with 9 NEMA 5-15R outlets; options 210 and 410 each provide one power service strip with 12 CEE-22R outlets.

**Overcurrent Protection:** A three-pole circuit breaker disconnects main power if current in any pole exceeds 20A (Option 200) or 10A (Option 210).

## Ventilation

The power control unit and power distribution unit options all include a fan in the rear of the cabinet, so each cabinet bay is provided with cooling airflow past the instruments and peripherals it houses.

## Instrumentation support rails

Five pairs of instrument support rails and attaching parts are supplied with each cabinet bay.

## Physical characteristics

**Racking Height:** 142.3cm (56 in).

**Overall Height:** 163.2cm (64.25 in).

**Width of Panel Opening:** 48.3cm (19 in).

**Overall Width:** 53.4cm (21 in).

**Overall Depth\*:** 93.3cm (36.75 in).

**Net Weight:** 67.2kg (148 lb).

*\*Including 15.2cm (6 in) added by the extender feet when fully extended.*

## Ordering information

### 29402B Cabinet

The 29402B cabinet includes the basic cabinet frame, with base, casters, top cover, rear door, detachable screw-on side panels, pull-out front extender feet, five pairs of equipment support rails, and two front panel trim strips.

### Cabinet options

**050:** Hinged, locking front door with solid front panel and cutout panel for 7900 series cartridge disc drive.

**051:** Snap-on, non-locking front door with solid front panel and cutout panels to accommodate 7970 mag tape unit and/or 7900 series cartridge disc drive.

**200:** Standard master cabinet configuration for 115V rack-mounted equipment, which includes:

1. 86-127V, 20A power control module with system on/off power switch.
2. 86-127V 47.5-66 Hz ventilation fan.
3. Power service strip with 9 NEMA 5-15R power receptacles (U.S. standard).
4. Vented rear door in place of the standard door.
5. Pre-drilled tapped holes for mounting system front door.

6. Pull-out anti-tip rear extender feet.

7. 3.048m (10 ft) 20A power cable with NEMA 5-20P plug (is deleted from master cabinet that is assembled with one or more 29402B and option 400 add-on cabinet bays).

**210:** Standard master cabinet configuration for 230V rack-mounted equipment, which includes:

1. 195-253V, 10A power control module with system on/off power switch.
2. 195-253V, 47.5-66 Hz ventilation fan.
3. Power service strip with 12 CEE-22R power receptacles (European standard).
- 4-6. Same as items 4 through 6 of option 200, listed above.

**400:** Standard add-on cabinet configuration for 115V rack-mounted equipment, which includes:

1. 86-127V power distribution module.
- 2-5. Same as items 2 through 5 of option 200, listed above.
6. Removal of both side panels.
7. Tie-together hardware for bolting the add-on cabinet to the master cabinet or other add-on cabinet.
8. Barrier panel to separate air flow in the add-on cabinet from air flow in the adjacent cabinet.

**410:** Standard add-on cabinet configuration for 230V rack-mounted equipment, which includes:

1. 195-253V power distribution module.
- 2-3. Same as items 2 through 3 of option 210, listed above.
- 4-5. Same as items 4 through 5 of option 200, listed above.
- 6-8. Same as items 6 through 8 of option 400, listed above.

## HP 1000 base system and optional cabinet packages

**Base systems:** The 2170A, 2171A, 2174A, 2175A, 2176A, and 2177A systems include a 29402B+200 master cabinet with both front and rear doors.

**System options:** 2172A, 2176B, and 2177B system option 002 provides a 29402B+200 master cabinet for mounting both the disc subsystem and a mag tape drive. The cabinet includes both front and rear doors. 2170A, 2171A, 2176A, and 2177A system option 002 adds a 29402B+400 cabinet bay with both front and rear doors to the master cabinet. This provides space for a magnetic tape drive and an additional disc drive.

## Accessories

**40010A Cabinet lifting fixture** for lifting loaded one or two bay cabinets (mounts in place of forged eyebolts supplied with cabinet).

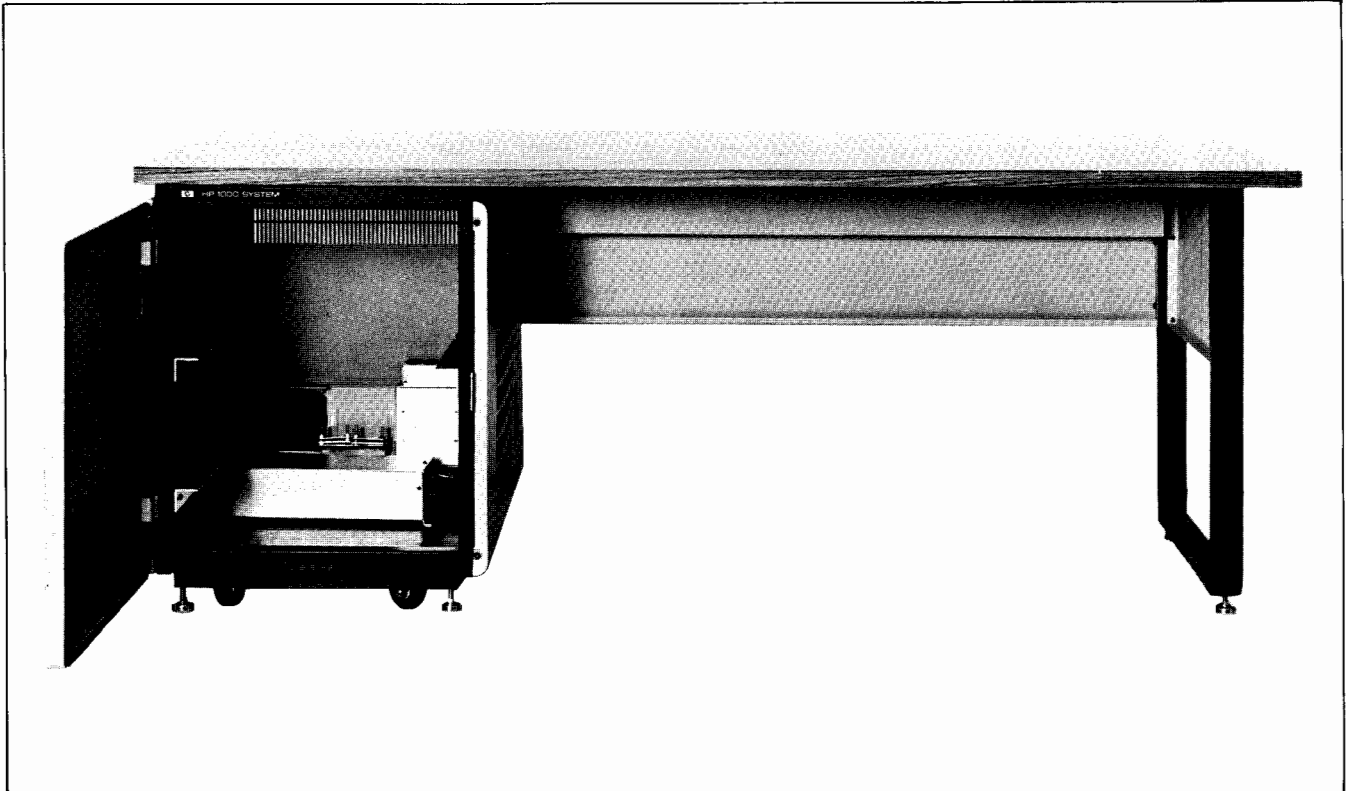
**40017A Heavy duty rear and side stabilizer** is required to meet anti-tip safety requirements on one-bay stand-alone cabinets under conditions specified in the 29402B Cabinets data sheet, which is available from your Hewlett-Packard representative.





## Desk cabinet

model 29421A



The 29421A is an attractive desk cabinet which houses the computer that serves as the system controller for certain versions of the HP 1000 Model 20, 25, 30, 40, and 45 Computer Systems. The desk top provides a convenient location for the system console, which would otherwise require its own pedestal. In addition, ample desktop area is available for a flexible disc drive, auxiliary printer, program listings, or other reference material, or for HP-IB instruments used in automatic test or measurement and control systems. Lockable front and rear doors protect the computer from unauthorized access.

### Features

- Attractive appearance that fits into the decor of modern offices.
- Large desktop work surface.
- Lockable doors that protect the computer from unauthorized access.

### Physical characteristics

**Height:** 71.8cm (28.25 in).

**Width:** 182.9cm (72 in).

**Depth:** 78.7cm (31 in).

**Net Weight:** 95kg (210 lb).

### Power service outlets

Seven NEMA 5-15R outlets, four inside cabinet and three outside cabinet (std). Seven CEE-22R outlets, four inside cabinet and three outside cabinet (Option 015).

### Ordering information

#### 29421A Desk cabinet

The 29421A Desk Cabinet is furnished with the 2172A, 2174B, 2175B, 2176B, and 2177B Computer Systems.

#### Options

015: 230V/50 Hz operation. (This is included in 2172A or 2173A Computer System option 015.)





## HP 1000 Computer Systems Product Support Information

Support offered for HP 1000 Computer Systems and Accessories includes:

1. User training services.
2. Site prep consultation.
3. Installation assistance.
4. Warranty.
5. Diagnostics subscription service.
6. Hardware service agreements.
7. Software notification service.
8. Software subscription service.
9. Comprehensive software support.
10. Software consulting service.

### User training services

Regularly-scheduled training is available on HP 1000 software and on hardware maintenance. The courses offered are listed in the HP Computer Systems Group Course Schedule, along with registration information and course locations. The course schedule is available from your Hewlett-Packard Sales Representative.

### Site prep consultation

To assist you in planning your HP 1000 Computer System installation, Hewlett-Packard includes Site Prep Consultation in the HP 1000 Computer System product. After you've ordered your system, an HP Customer Engineer will send you the HP Site Preparation manual accompanied by a letter requesting that you review the manual and then contact the Customer Engineer to schedule an on-site visit with him for site prep consultation. During that visit, the HP Customer Engineer will discuss with the person designated as your Site Coordinator the site preparation steps given in the manual and will assist your people in determining what electrical and environmental preparation should be accomplished at the system's operating site prior to installation.

### Installation assistance

After your System Manager or Site Coordinator has seen to it that the operating site is prepared and has confirmed that the necessary hardware and software has been delivered and moved to the operating site, an HP Customer Engineer will:

1. Supervise unpacking, assembly, and installation of the system components and peripheral hardware
2. Test the primary system.
3. Test the primary system peripherals and subsystems.
4. Run off-line diagnostic tests on non-configured peripherals.
5. Demonstrate the software backup procedure.
6. Provide your System Manager with the phone number for the Phone-In Consulting Service, which is part of Comprehensive Software Support, a service provided for the first three months following installation.

### Warranty

All Hewlett-Packard software products, computers, components, and systems are covered by warranty for a minimum of 30 days or a maximum of 90 days, depending upon the type of product and the conditions of purchase. For specific information, contact your Hewlett-Packard Sales Representative.

### Diagnostics Subscription Service

The 24396S Option 025 Diagnostics Subscription Service provides quarterly distribution of update information and revised diagnostic routines necessary to keep the Diagnostic Library (HP part no. 24998-14002) supplied with your HP 1000 Computer System up to date with respect to diagnostic improvements by the factory. Updated diagnostic routines are provided on Mini cartridges and documentation is updated by supplying revised diagnostic manuals or updating supplements for the affected manuals. The 24396S+025 service is ordered in monthly units for a minimum of six months, or it can be prepaid for an entire year.

### Hardware service agreements

Service agreements are available for coverage of HP 1000 Computer Systems and accessories. The Basic Monthly Maintenance Charge (BMMC) covering all necessary parts, labor, and travel within the normal service zone for preventive maintenance, remedial maintenance, and engineering updates will be quoted on request by your Hewlett-Packard Sales Representative. The basic charge provides coverage from 8 A.M. to 5 P.M., five days per week, excluding Hewlett-Packard holidays. Extended coverage is available at additional cost.

### Software Notification Service

The Software Notification Service provides information on changes to HP 1000 Computer System operating systems and software subsystems. This includes:

- Six periodically-published issues of the *Communicator*, containing useful application data, abstracts, and ordering information for new contributed software, current revision codes of various software products, and the latest schedules of pertinent training courses.
- Twenty-four issues of *Software Status Bulletins* that give corrections for reported discrepancies in software and manuals. Every three months, a cumulative printing of these is provided to consolidate all current information.
- Four issues of *Software Update Notices*, which cover changes in software. The *Notices* tell what the factory has changed and the effect of the changes, including increased or decreased memory requirements. In addition, the *Notices* give instruction on how customers on the Software Subscription Service can update their archival copy and incorporate the new software into their operating systems.

The Software Notification Service is included with the Software Subscription Service for an operating system and is also separately orderable for one year, renewable annually, as product number 92830A.

### **Software Subscription Service**

The purchaser of an HP 1000 Computer System can order the Software Subscription Service for his operating system and other software to thus be assured of receiving updates to the software and manuals whenever design changes are released by the factory. This automatically provides the latest enhancements and changes to the software. The updates are available on various types of media, as defined in the HP 1000 Computer Systems Configuration and Site Preparation Guide. Software Subscription Service coverage purchased for an operating system also automatically includes the Software Notification Service. Software Subscription Service is ordered modularly for each software product in your HP 1000 Computer System in monthly units for a minimum of six months, billable quarterly.

### **Comprehensive Software Support**

Comprehensive Software Support provides the Software Subscription Service as defined above, plus a Phone-In Consulting Service for over-the-phone discussion of questions directly related to covered software with a trained HP

System Engineer. This service is included with your system for the first three months following installation. Thereafter it is ordered modularly for each software product in your HP 1000 Computer System in monthly units for a minimum of six months, billable quarterly.

### **Software consulting**

Assistance by a Hewlett-Packard System Engineer can be ordered as product number 22976B. This assistance is intended to provide a one-day, on-site visit by a qualified HP System Engineer to help you better understand how to apply your HP 1000 software. Although this service does not include coding of software for your particular application, the insight gained through this service can help you better understand how to use the full potential of your HP 1000 Computer System and software. Multiple days of this service are ordered as a quantity multiplier of the 22976B product number.

### **Ordering information**

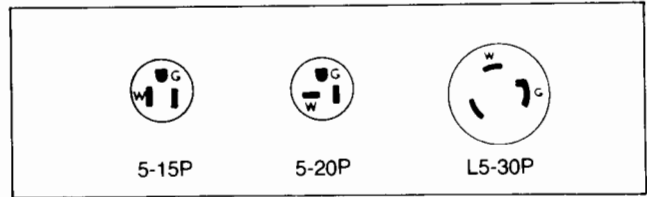
Product numbers and descriptions for user training courses and product and option numbers and prices for all applicable HP 1000 Computer System product support services are given in the HP 1000 Computer Systems Configuration and Site Preparation Guide, which is available from your Hewlett-Packard Sales Representative.



# HP 1000 computer systems site planning information

The customer is responsible for preparing the operating site for installation of the HP 1000 Computer System. Installation cannot be accomplished until you have provided installation space and prepared the ac power supply, grounding, etc., at the operating site. To assist your preparations, this section contains the environmental specifications of the system and its accessories (Table 7-1, below), power requirements (Table 7-2 on the next page, supported by a power plug illustration at right, and physical characteristics, including floor space recommendations, weight, and heat dissipation (Table 7-3, on the last page of this section).

Additional information on site planning and preparation is provided in the HP 1000 Computer Systems Configuration and Site Preparation Guide.



Power plugs used in HP 1000 computer systems

Table 7-1. HP 1000 Computer Systems and Accessories environmental specifications

Item	Temperature Range		Rel. Hum.*	Maximum Altitude	
	Operating °C and (°F)	Non-operating °C and (°F)		Operating m & (ft)	Non-operating m & (ft)
2170A Computer System**	10 to 40 (50 to 104)	-40 to 75 (-40 to 167)	20% to 80%	3048 (10,000)	7620 (25,000)
2171A Computer System**	10 to 40 (50 to 104)	-40 to 65 (-40 to 149)	20% to 80%	3048 (10,000)	7620 (25,000)
2172A Computer System**	10 to 40 (50 to 104)	-40 to 65 (-40 to 149)	20% to 80%	3048 (10,000)	7620 (25,000)
2174A/B Computer System**	0 to 40 (32 to 104)	-40 to 75 (-40 to 167)	20% to 80%	4572 (15,000)	15240 (50,000)
2175A/B Computer System**	0 to 40 (32 to 104)	-40 to 75 (-40 to 167)	20% to 80%	4572 (15,000)	15240 (50,000)
2176A/B Computer System**	10 to 40 (50 to 104)	-40 to 65 (-40 to 149)	20% to 80%	3048 (10,000)	7620 (25,000)
2177A/B Computer System**	10 to 40 (50 to 104)	-40 to 65 (-40 to 149)	20% to 80%	3048 (10,000)	7620 (25,000)
System console	5 to 40 (41 to 104)	-10 to 60 (-15 to 140)	20% to 80%	4572 (15,000)	7620 (25,000)
217xA/B Opt. 032 Flexible Disc	10 to 45 (50 to 113)	-40 to 60 (-40 to 140)	20% to 80%	4572 (15,000)	7620 (25,000)
217xA/B Opt. 033 Top-Loading Disc	10 to 40 (50 to 104)	-40 to 75 (-40 to 167)	8% to 80%	4572 (15,000)	15240 (50,000)

\* Relative humidity assumes no condensation, wet bulb temperature must not exceed 25.6°C (78°F).

\*\* Not including system console; see separate specification listing in the table.

Accessories for HP 1000 Computer Systems meet or exceed the environmental specifications for the system console, except for:

- 7970B/E Magnetic tape subsystem operating altitude is 3048 metres (10,000 ft).
- 2613A and 2617A Line Printers require a minimum relative humidity of 30%.
- 12985A Card Reader Subsystem maximum storage temperature is 57°C (134°F).



Table 7-2. HP 1000 Computer Systems and Accessories power requirements

Product	Max AC Power†	Voltage Limits (V) 115V (230V)	Frequency Limits (Hz) 115V Power (230V Power)	Power Cable Length m & (ft)	Signal Cable Length m & (ft)	NEMA Power Plug(s) Supplied
2170A Computer System	1223 W	90 - 126‡ (180 - 252)*	54 66 (47.5 - 52.5)	3 (10) (A)		5-20P (A)
2171A/76A Computer System	1565W	90 - 126‡ (180 - 252)*	54 - 66 (47.5 - 52.5)	3 (10) (A)		5-20P (A)
2172A/76B	1545W	90 - 126‡ (180 - 252)*	54 - 66 (47.5 - 52.5)	3 (10) (A)		2 x 5-20P (A)
2172A/76B opt. 002: Upright Cabinet instead of minirack	+20W	Same as 2172A	Same as 2172A	Same as 2172A/6A		no change
2174A Computer System	815W	90 - 126‡ (184 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-15P (A)
2174B Computer System	765W	90 - 126‡ (184 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-15P (A)
2175A Computer System	1015W	90 - 126‡ (198 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-15P (A)
2175B Computer System	965W	90 - 126‡ (198 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-15P (A)
2177A Computer System	1765W	90 - 126‡ (198 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-20P (A)
2177B Computer System	1745W	90 - 126‡ (198 - 253)	48 - 66n (48 - 66)	3 (10) (A)		5-20P (A)
217xA/B opt. 032 Flexible disc	160W	90 - 126‡ (198 - 253)	48 - 66 (48 - 66)	3 (10) (A)		5-15P
217xA/B opt. 033 Top-loading disc	no chg	90 - 126‡ (198 - 253)	48 - 66 (48 - 66)	3.6 (12)	3.6 (12)	5-15P
Additional cabinet bay	50W	Depends upon items in cabinet		(B)		(B)
12979B I/O Extender	625W	88 - 132 (176 - 264)	47.5 - 66 (47.5 - 66)	Rack mtg		(C)
12990B Memory Extender	300W	88 - 132 (176 - 264)	47.5 - 66 (47.5 - 66)	Rack mtg		(C)
2240A Meas. & Control Proc.	130W	87 - 127 (172 - 254)	48 - 66 (48 - 66)	Rack mtg		5-15P
2241A Extender	130W	87 - 177 (172 - 254)	48 - 66 (48 - 66)	Rack mtg		5-15P
2635A Printing terminal	220VA	88 - 132‡ (194 - 264)*	48 - 62 (48 - 62)	4.8 (16)	3.8 (12.5)	5-15P
2640B CRT Terminal	125W	92 - 126 (184 - 253)	48 - 66 (48 - 66)	2.8 (7.5)	1.5 (5)	5-15P (D)
2645A Display Station	140W	88 - 126 (177 - 253)	48 - 66 (48 - 66)	2.8 (7.5)	1.5 (5)	5-15P (D)
2648A Graphics Terminal	140W	88 - 126 (177 - 253)	48 - 66 (48 - 66)	2.8 (7.5)	1.5 (5)	5-15P (D)
3070B Data Capture Terminal	50W	90 - 126‡ (198 - 252)*	47.5 - 66 (47.5 - 66)	2.1 (7)	See data sheet	5-15P (D)
12732A Flexible Disc s/s	160W	90 - 126‡ (198 - 252)*	57.9 - 62.1 (48.3 - 51.7)	2.1 (7)	1.8 (6)	(C)
12733A add-opn Flexible Disc Drive	130W	90 - 126‡ (198 - 252)*	57.9 - 62.1 (48.3 - 51.7)	2.1 (7)	1.8 (6)	(C)
12925A Tape Reader s/s	240W	104 - 126 (207 - 253)	57 - 63 (47.5 - 52.5)	Rack mtg	3.6 (12)	(C)
12926A Tape Punch s/s	300VA	104 - 126 (198 - 275)*	47.5 - 100 (47.5 - 100)	Rack mtg	3.6 (12)	(C)
12960A Disc	408W	99 - 132 (198 - 252)*	58.8 - 61.2 (49 - 51)	Rack mtg	4.5 (15)	(C)
2613A Line Printer	525W	104 - 126 (198 - 264)	58.8 - 61.2 (49 - 51)	3.6 (12)	7.6 (25)	5-15P
2617A Line Printer	680W	104 - 126 (198 - 264)*	58.8 - 61.2 (49 - 51)	3.6 (12)	7.6 (25)	5-15P
2618A Line Printer	1950W	104 - 126 (207 - 253)	58.8 - 61.2 (49 - 51)	3.6 (12)	7.6 (25)	L5-30P (E)
2631A Printer	265VA	88 - 132‡ (194 - 264)*	48 - 62 (48 - 62)	4.8 (16)	3.8 (12.5)	5-15P
12985A Card Reader Subsystem (F)	460VA	104 - 126 (207 - 253)	58.8 - 61.2 (49 - 51)	1.8 (6)	4.5 (15)	5-15P (D)
12986A Optical Mark Reader s/s	300VA	90 - 126‡ (198 - 252)*	47.5 - 66 (47.5 - 66)	2.8 (7.5)	2.8 (7.5)	5-15P (D)
12987A Line Printer Subsystem (G)	800VA	105 - 140 (187 - 264)	58.2 - 61.8 (48.5 - 51.5)	2.8 (7.5)	7.6 (25)	5-15P
12996A Page Printer s/s	250VA	90 - 126‡ (198 - 252)*	48 - 66 (48 - 66)	1.8 (6)	4.5 (15)	5-15P (E)
7245A Plotter/printer	300W	90 - 126‡ (198 - 252)*	48 - 66 (48 - 66)	2.8 (7.5)		5-15P (D)
7906 Disc Drive in low profile cabinet	530W	90 - 126‡ (198 - 252)*	47 - 66 (47 - 66)	3.6 (12)	7.6 (25)	5-15P (D)
7906SR Rack Mounting Disc	500W	90 - 126‡ (198 - 252)*	47 - 66 (47 - 66)	Rack mtg	7.6 (25)	(C)
7920 Disc Drive	460W	90 - 126‡ (198 - 252)*	48 - 62 (48 - 62)	3.6 (12)	(H)	5-15P (A)
7970B/E Mag Tape drive	400VA	104 - 126 (207 - 253)	48 - 60 (48 - 60)	Rack mtg	4.5 (15)	(C)
9872A Graphic Plotter	220VA	90 - 126‡ (180 - 252)*	48 - 66 (48 - 66)	2.1 (7)		5-15P

† Power specifications for 217xA/B Computer Systems, include power for System Console.

\* Range shown for 230V here includes user-selectable choice of 200V or 220V and 240V or 250V input plus the voltage tolerance.

‡ Range shown for 115V here includes user-selectable choice of 100V or 120V; there is a gap between 105V and 108V.

(A) Power cable is not supplied for 230V or for multi-bay upright cabinet systems operation; it must be furnished by the user.

(B) Power cable is not supplied for additional cabinet bays; it must be furnished by the user.

(C) Power cable with 60 Hz NEMA 5-15P plug or 50 Hz CEE-22P plug is provided for connection to mating receptacles in power service strips inside the cabinet.

(D) 230V version includes power cable with CEE-22P power plug.

(E) An adapter may be required for connection of 50 Hz version to the appropriate 230V/50 Hz outlet.

(F) 12985A starting load is 1426VA.

(G) 12987A standby power is 10VA; non-printing power is 500 VA.

(H) The 7920S multi-unit cable used for daisy-chain connection of multiple drives is 2.4m (8 ft) long; the data cable, which must reach back to the disc controller, is 15.2m (50 ft) long.

Table 7-3. HP 1000 Computer Systems and Accessories physical characteristics and heat dissipation

Product	Height cm & (in)	Width cm & (in)	Depth cm & (in)	Approximate Floor Space Recommended m & (ft)	Net Weight kg & (lb)	Max. Heat Dissipation kg-cal/hr & (BTU/hr)
2170A Computer System	163.1 (64.25)	53.3 (21)*	76.2 (30)*‡	3 x 3 (9 x 9)*	232.7 (512)	1052 (4174)
2171A/76A Computer System	163.1 (64.25)	53.3 (21.1)*	76.2 (30)*‡	3 x 3 (9 x 9)*	245.9 (541)	1346 (5341)
2172A/76B Computer System	106.5 (41.75)	238.1 (93.75)	78.7 (31)	5 x 3 (15 x 9)	300 (660)	1328 (5272)
2174A Computer System	163.1 (64.25)	53.3 (21)*	76.2 (30)*‡	3 x 3 (9 x 9)*	133.6 (294)	701 (2782)
2174B Computer system	106.5 (41.75)	182.9 (72)	78.7 (31)	4 x 3 (12 x 9)	141.5 (312)	658 (2611)
2175A Computer System	163.1 (64.25)	53.3 (21)*	76.2 (30)*‡	3 x 3 (9 x 9)*	147.2 (324)	873 (3464)
2175B Computer System	106.5 (41.75)	182.9 (72)	78.7 (31)	4 x 3 (12 x 9)	155.1 (332)	830 (3293)
2177A Computer System	163.1 (64.25)	53.3 (21)*	76.2 (30)*‡	3 x 3 (9 x 9)*	259.5 (571)	1518 (6024)
2177B Computer System	106.5 (41.75)	238.1 (93.75)	78.7 (31)	5 x 3 (15 x 9)	313.6 (690)	1500 (5956)
Additional cabinet bay	163.1 (64.25)	53.3 (21)	76.2 (30)*‡	1 x 3 (3 x 9)	77.2 (170)	43 (171)
12979B I/O Extender	22.2 (8.75)	Rack width	59.6 (23.5)	Rack mtg	16 (35)	537 (2133)
12990B Memory Extender	22.2 (8.75)	Rack width	70.8 (27.88) ♦	Rack mtg	25.5 (56) ♦	258 (1024)
2240A Meas. & Control Proc.	22.2 (8.75)	Rack width	35.6 (14)	Bench/Rack mtg	13.8 (30.4)	112 (444)
2241A Extender	22.2 (8.75)	Rack width	35.6 (14)	Bench/Rack mtg	13.1 (28.8)	112 (444)
2313B Analog I/O s/s	44.5 (17.5)	Rack width	42.6 (16.75)	Rack mtg	22 (48.5)	345 (1365)
12764A/65A Analog I/O Expander	44.5 (17.5)	Rack width	42.6 (16.75)	Rack mtg	22 (48.5)	345 (1365)
2635A Printing Terminal	21.5 (8.5)†	64 (25.2)	59.5 (23.1)	1 x 2 (3 x 6)	25.4 (56)†	189 (751)
2640B CRT Terminal	34.3 (13.5)	44.5 (17.5)	64.8 (25.5)	Table mtg	20 (44)	107 (426)
2645A Display Station	34.3 (13.5)	44.5 (17.5)	64.8 (25.5)	Table mtg	22.7 (50)	120 (478)
2648A Graphics Terminal	34.3 (13.5)	44.5 (17.5)	64.8 (25.5)	Table mtg	22.7 (50)	120 (478)
3070B Data Capture Terminal	11.7 (4.6)	27.7 (10.9)	40 (15.7)	Table mtg	4.7 (10.3)	43 (171)
12732A Flexible Disc s/s	13.3 (5.25)	Rack width	42.5 (16.75) ♦	Rack/Table mtg	14.8 (32.5)	138 (546)
12733A add'l Disc Drive	13.3 (5.25)	Rack width	42.5 (16.75) ♦	Rack/Table mtg	14.8 (32.5)	112 (444)
12925A Tape Reader s/s	17.8 (7)	Rack width	40.6 (16) ♦	Rack mtg	19.1 (42)	206 (819)
12926A Tape Punch s/s	26.7 (10.5)	Rack width	53.8 (21.19)	Rack mtg	15.9 (35)	198 (785)
12960A Disc	44.5 (17.5)	Rack width	58.4 (23) ♦	Rack mtg	78.1 (172)	351 (1393)
2613A Line Printer	114.5 (45)	83.8 (33)	55.9 (22)	1 x 3 (3 x 9)	154.2 (340)	451 (1792)
2617A Line Printer	114.5 (45)	83.8 (33)	66 (26)	1 x 3 (3 x 9)	167.8 (370)	585 (2321)
2618A Line Printer	116.8 (46)	123.3 (48.5)	92.7 (36.5)	3 x 3 (9 x 9)	362.9 (800)	1676 (6655)
2631A Printer	21.5 (8.5)†	64 (25.2)	46.9 (18.5)	1 x 2 (3 x 6)	23.2 (51)†	228 (904)
12985A Card Reader s/s	41.3 (16.25)	58.6 (23.06)	45.7 (18)	Table mtg	34 (75)	396 (1570)
12986A Optical Mark Reader s/s	26.7 (10.5)	36.8 (14.5)	61 (24)	Table mtg	24.6 (54)	257 (1024)
12987A Line Printer s/s	102 (40)	71 (28)	58 (23)	1 x 3 (3 x 9)	96 (210)	688 (2730)
12996A Page Printer s/s	15.2 (6)	45.1 (17.75)	40.1 (16.13)	Table mtg	18.1 (40)	215 (853)
7245A Plotter/printer	20.3 (8)	44.1 (17.38)	53.3 (21)	Table mtg	19 (42)	258 (1024)
7906 Disc in low profile cabinet	71.8 (28.25)	55.3 (21.75)	79 (31.13)	1 x 3 (3 x 9)	139 (303)	456 (1809)
7906 Rack Mounting Disk	26.7 (10.5)	Rack width	71.1 (28)	Rack mtg	73.5 (162)	430 (1706)
7920 Disc	82.6 (32.5)	50 (19.65)	81.3 (32)	1 x 3 (3 x 9)	142.8 (315)	396 (1570)
7970B Mag Tape Unit	66.7 (26.25)	Rack width	30.4 (12)	Rack mtg	59.1 (130)	344 (1365)
7970E Mag Tape Unit	66.7 (26.25)	Rack width	30.4 (12)	Rack mtg	63.6 (140)	344 (1365)
9872A Graphic Plotter	18.9 (7.4)	49.7 (19.6)	45.5 (17.9)	Table mtg	18.2 (40)	189 (751)

\* Not including space required for 2645A Display Station or 2648A Graphics Terminal supplied as system console and table or pedestal (not supplied) used to support the 2645A.

‡ Not including extender feet, which pull out of the cabinet 16.5 cm (6.5 in) at the operating site to prevent tip-over in the event units are pulled out on slides for servicing.

♦ Including 12991B Power Fail Recovery battery pack.

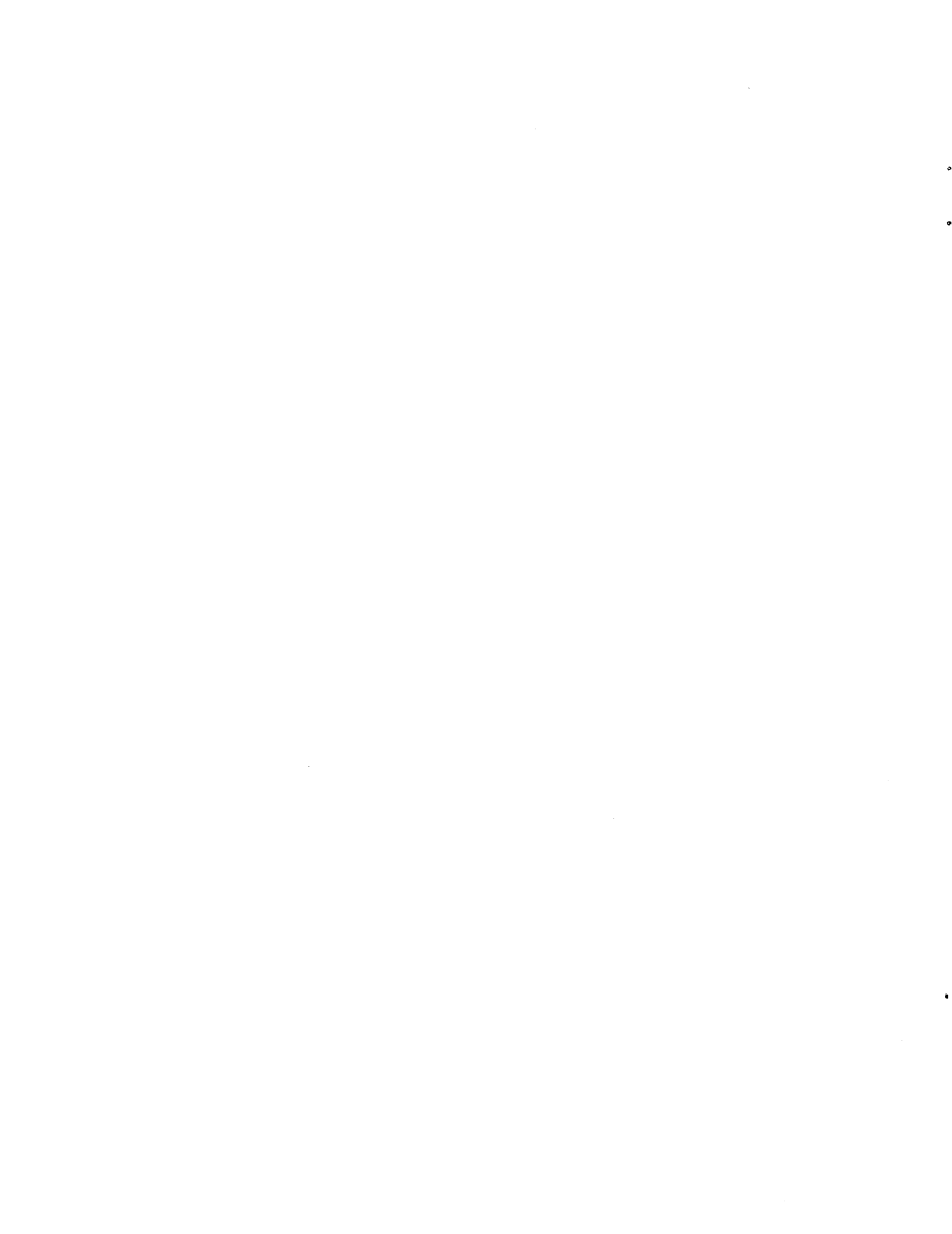
◆ Not including 2.5 to 7.5 cm (1 to 3 in) for cable clearance behind the rear panel.

† Not including optional pedestal.











Sales and service from 172 offices in 65 countries.  
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