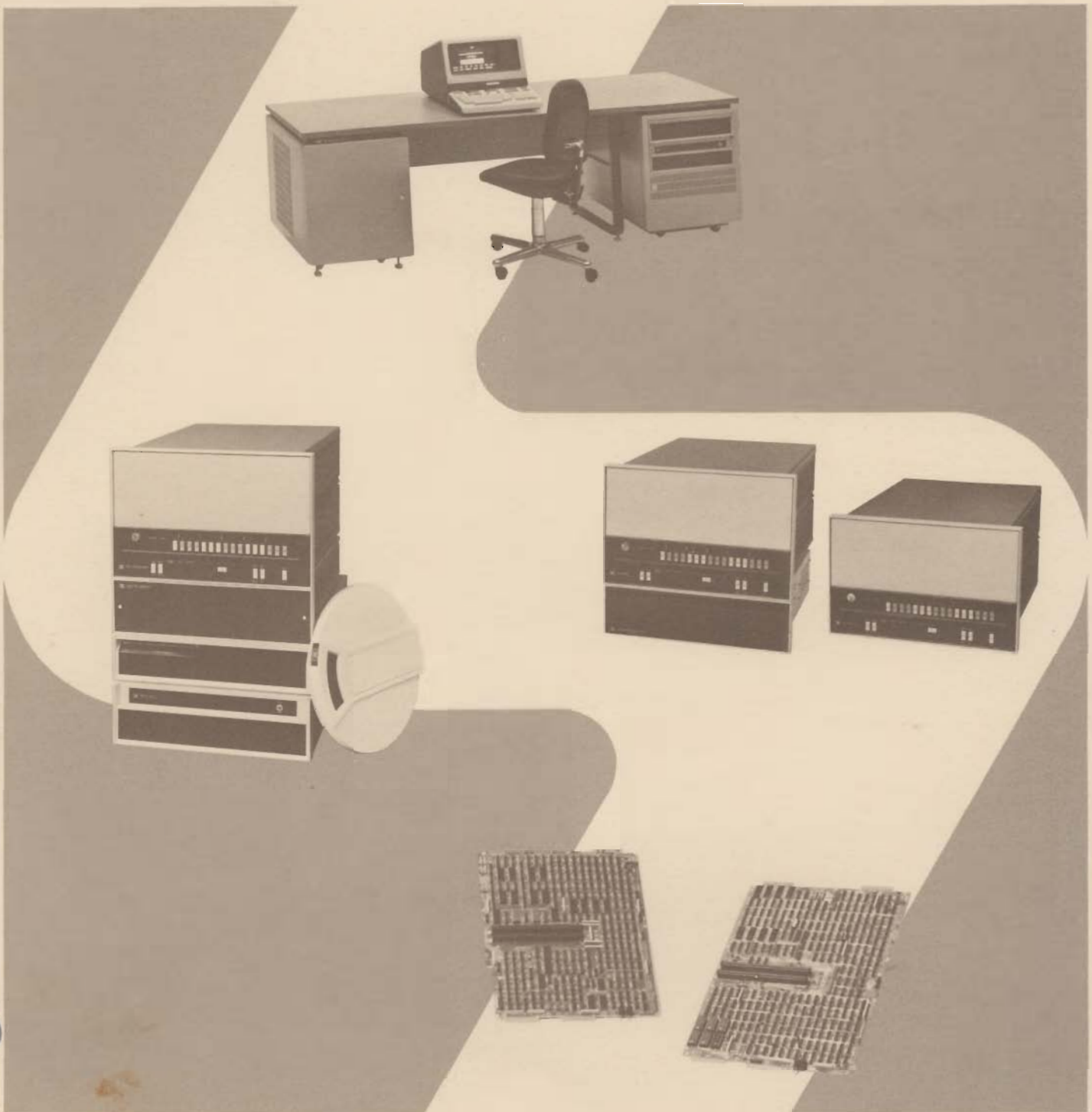


# HP 1000 Computer Systems

HEWLETT  PACKARD

## Field Training Manual

Part I — HP 1000 Computer Systems, Models 20, 25, 30, 40, 45  
Part II — Model 45 System in Computation Applications



For Internal Use Only

# Preface

The HP 1000 system family has just passed the 1000th shipment mark — a little over one year after its introduction.

The system offering has grown in capability until we now offer five basic models varying from a \$22K Model 20 memory based system to a super high performance \$47K Model 45 system. Also we now have an excellent range of feature products that enhance the HP 1000 performance for instrumentation, computation and operations management applications.

Because of the great range of capability now offered we have created separate training manuals to cover processors, operating systems, datacap, etc. Therefore, this manual will concentrate on the HP 1000 computer system family and new extensions for computation applications.



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# HP 1000 COMPUTER SYSTEM — PART I

## Press Release

### *HP Adds High Performance Capability to its HP 1000 Computer System Family*

HP announced today that it has added three new models to its 1000 computer system family. These new systems are designated Models 25, 40 and 45 and are similar to the existing Models 20 and 30 which are aimed at computation, instrumentation and operations management applications both for OEM system houses and manufactures with computer applications experience.

**NEW PROCESSOR** — Models 25 and 45 were described as high performance versions of HP's Models 20 and 40 systems and are reported to utilize HP's new HP 1000 F-series processor.

The new F-Series computer is compatible with the 1000 E-Series computer, and in fact has the same basic instruction set. The F-Series also features a separate hardware processor for fast execution of floating point instructions, a new Scientific Instruction Set for hardware execution of transcendental and logarithmic functions, and a set of microprogrammed routines that accelerate FORTRAN performance.

The Floating Point Processor is a separate hardware processor that improves floating point execution speeds by a factor of five to seven over previously available firmware routines. The F-Series computer executes a floating multiply, for example in 5.9 microseconds.

"Our E series HP 1000 systems have proven to be a very good solution in a wide variety of industrial and scientific applications," according to the HP spokesman. The Models 25 and 45 are being offered for customers who require high precision, fast processing, typically needed for real-time data reduction and algorithm processing as well as for a wide range of computation intensive applications such as linear programming and numeric analysis.

The Model 25 system utilizes HP's memory based RTE-M operating system. Model 45 system utilizes HP's new disc based RTE IV operating system.

**NEW OPERATING SYSTEM** — Model 40 and 45 systems utilize a new high performance real time operating system just announced by HP. According to HP the new operating system, designated RTE IV, is an extension to HP's existing RTE III operating system and offers several significant new features. HP said that RTE IV supports user program code up to 56Kbytes in size in each of 64 memory partitions. The available space for user code is independent of operating system size and number of drivers in the system. Also, HP stated that RTE IV employs a new microprogrammed feature called EMA (Extended Memory Array) which permits program access to large memory resident data arrays as large as physical memory (up to 1.8 Megabytes).

HP described RTE IV as a logical extension to RTE III providing a much more powerful resource manager for the wide variety of applications presently being served by its HP 1000 computer system family. In addition, the new operating system gives the Models 40 and 45 system added capability for computation intensive applications requiring large user programs and large data array manipulation. According to HP the Model 40 utilizes HP's E-Series processor. Model 45 utilizes the F-Series processor.

**APPLICATION IN COMPUTATION** — According to HP the new Model 45 HP 1000 computer system is especially well suited for computation applications permitting customers to move more computation intensive jobs to the lower cost minicomputer system. The Model 45 features built-in floating point processor, microcoded trigonometric and exponential functions, ability to handle large program and data arrays and built-in graphics capability. Like all HP 1000's the Model 45 is programmable in FORTRAN, BASIC and HP Assembly Language. In addition several terminals can be active concurrently developing separate programs or providing data entry functions while the system is executing other programs.

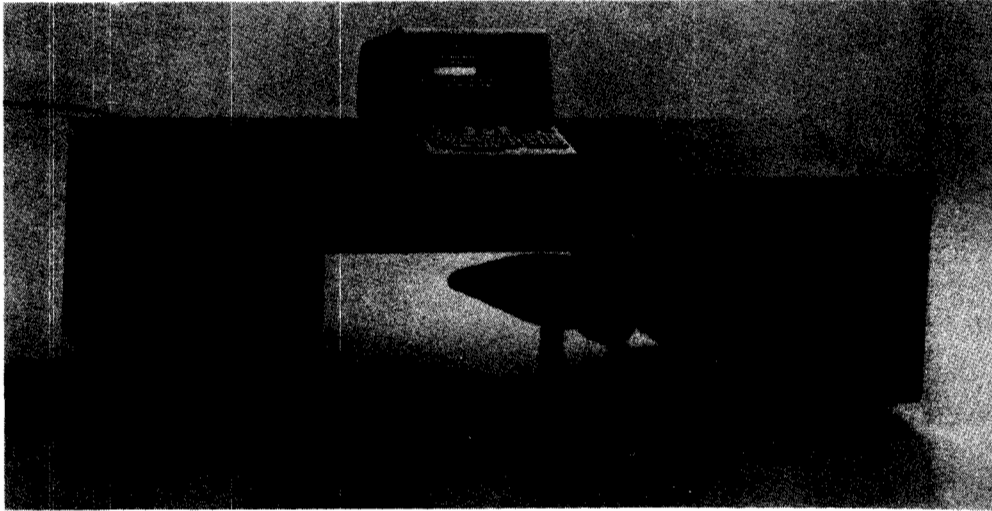
**FAMILY OF SYSTEMS** — According to the HP spokesman HP 1000 computer Models 20, 25, 30, 40, and 45 offer users a range of computing power for small, medium and large applications. They are designed as a compatible family of systems that can be upgraded as the user applications grow. Also they can be linked together via HP distributed systems software. Prices are as follows: Model 20 — \$22,000; Model 25 — \$27,500; Model 30 — \$36,500; Model 40 — \$40,000 and Model 45 -- \$46,500. Availability for all systems is 12 weeks ARO.

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

**For research and education purposes only.**

## Product Description

INTRODUCING . . . MORE COMPUTING AND APPLICATIONS POWER FOR THE HP 1000 SYSTEM FAMILY WITH THE ADDITION OF THE F SERIES PROCESSOR, RTE IV, DATACAP, GRAPHICS AND MORE!



THE KEY TO YOUR SELLING SUCCESS IS THE FACT THAT THE HP 1000 SYSTEM IS THE PRICE PERFORMANCE LEADER IN THE MINI COMPUTER MARKET TODAY! CHECK THESE SILVER BULLETS.



- ☛ THE HOTTEST PROCESSOR IN ITS PRICE RANGE  
The F Series processor provides near DEC 11/60 performance at **two-thirds** the 11/60 price and superior performance in scientific instructions execution, high performance memory and I/O capability.
- ☛ THE BEST REAL TIME OPERATING SYSTEM IN THE MARKET  
RTE IV now offers program code size to 54KB/partition size and data size to 1.8 M bytes. Your customer won't find a better real time operating system in the market.
- ☛ THE BEST HIGH PERFORMANCE PERIPHERALS IN THE MARKET  
Compare HP's 2645 Terminal, 2631 printer, 7906 disc with any comparable peripheral on the market today. Typically a 7906 disc offers HP a \$5K to \$15K price advantage over comparable offerings from our key competitors!
- ☛ THE BEST APPLICATIONS SOFTWARE IN THE MARKET  
Just look at the list — DS 1000 distributed systems, IMAGE 1000 data base management, Data Cap 1000 data entry, Graphics Plotting Software, HP-IB/IEEE 488 hardware & software! Where else can you get this range of quality applications software packages.

# HP 1000 COMPUTER SYSTEM — PART I

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## What is Being Added to the HP 1000 Family?

### **Three new HP 1000 system models to complement today's Model 20 and Model 30 systems**

NEW — MODEL 25 HP 1000 SYSTEM featuring the F-Series processor, high performance memory and RTE-M for high performance memory based system applications.

NEW — MODEL 40 HP 1000 SYSTEM featuring RTE IV and the E-Series processor for general purpose disc based system applications.

NEW — MODEL 45 HP 1000 SYSTEM featuring the F-Series processor, high performance memory, RTE IV and graphics capability for high performance disc based system applications.

### **Three new system enhancements that extend the HP 1000 systems applications capability**

NEW — DATA CAPTURE 1000 software and 3070B data entry terminal for source data capture applications.

NEW — MULTIPOINT TERMINAL INTERFACE for efficient terminal interface in program development and data entry applications.

NEW — GRAPHICS PLOTTING SOFTWARE with support for the 2648 graphic terminal, 7245 printing plotter and 9872 four color plotter.

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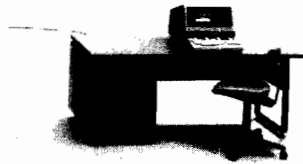
## What does the system family look like?

### MODEL 20 GENERAL PURPOSE MEMORY BASED SYSTEM

(Includes RTE-M, E-Series processor, 2645 console and upright or desk enclosure)



HP 2174A  
(\$22,000)



HP 2174B  
(\$22,000)

**Features:** 65Kb memory expandable to 1024Kb, optional flexible disk, interactive real-time multi user access to system resources with 128Kb or more memory, optional DS1000 Link, BASIC, FORTRAN or ASSEMBLY language programming, and much more.

**Applications:** Good entry level system for small or dedicated applications; good low cost system at the end of a DS1000 link in product test, process control or data entry applications; good environmentally hardened system where rotating disc cannot be tolerated.

### MODEL 25 HIGH PERFORMANCE MEMORY BASED SYSTEM

(Includes RTE-M, F-Series Processor, 350ns memory, 2645 Console and upright or desk enclosure)



HP 2175A  
(\$27,500)



HP 2175B  
(\$27,500)

**Features:** Same as Model 20 except includes high performance F Series processor with hardware floating point, scientific instruction set and high performance memory.

**Applications:** Good high performance system for test or process control applications requiring fast computation of control or data reduction algorithms.

# HP 1000 COMPUTER SYSTEM — PART I

## MODEL 40 GENERAL PURPOSE DISC BASED SYSTEM

(Includes RTE IV, E-Series Processor, 2645 console, 7906 Disc and upright or desk enclosure)



HP 2176A  
(\$40,000)



HP 2176B  
(\$40,000)

**Features:** 128Kb memory expandable to 1.8mb (upright cabinet); high performance operating system (code to 56Kb, Data to 1.8mb); BASIC, FORTRAN, ASSEMBLY language and optional microprogramming; optional IMAGE, DATACAP, GRAPHICS, DS1000 and much more.

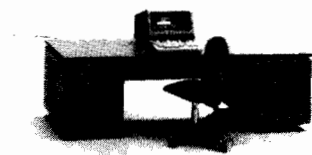
**Applications:** Appropriate for general purpose instrumentation control, computation and operations management applications requiring big performance real time computer power — e.g. product test, process control, CAD, data base management, etc.

## MODEL 45 HIGH PERFORMANCE DISC BASED SYSTEM

(Includes RTE IV, F-Series Processor, 350ns memory, 2648 Graphics Terminal, 7906 and upright or desk enclosure)



HP 2177A  
(\$46,500)



HP 2177B  
(\$46,500)

**Features:** Same as model 40 except includes high performance F-Series processor with hardware floating point, scientific instruction set, high performance memory, 2648 graphics console and graphics software.

**Applications:** Excellent for applications demanding super high performance in computation, instrumentation and operations management. Computation applications include CAD, Linear Programming, Array Processing.

## MODEL 30 LOW COST DISC BASED SYSTEM

(Includes RTE II, E-Series Processor, 2645 Console, 7906 Disc and upright or desk enclosure)



HP 2170A  
(7900 Disc)  
(\$31,500)  
HP 2171A  
(\$36,500)  
(7906 Disc)



HP 2172A  
(\$36,500)

**Features:** Same as Model 40 except with RTE II operating system and **maximum** of 64Kb memory.

**Applications:** Good low cost disc based system for applications requiring medium performance real time computer power.



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## What is the HP 1000 today and how will it change?

### The HP 1000 Standard System Concept

The HP 1000 system was first introduced to the market in late 1976 with the objective of creating a single family identity to DSD's computer system family. The HP 1000 packaged system product offering has been tremendously successful. Today about 25% of all DSD processors are sold as standard HP 1000 systems. The following summarizes the basic HP 1000 system concepts.

- The system is aimed at end users, volume end users and OEM's who want a high performance easy and ready to use packaged system.
- The HP 1000 system family consists of several standard base systems (Model 20, Model 30, etc.) plus a series of separately orderable "compatible" peripherals, I/O cards, instruments and software packages that extend the base system capability to meet a wide variety of application requirements.
- Standard HP 1000 systems include system level "getting started" manuals and a configured auto boot-up capability that functions whenever power is turned on.
- All standard HP 1000 systems include racking, integration, test, RTE generation, installation assistance and site preparation consultation for the core system (processor, terminal, operating system, system disc and cabinet). In addition most peripherals can be ordered on the coordinated shipment program (line printers, mag tapes, etc.)
- Standard HP 1000 systems are list priced at less than the sum of prices of the hardware components and services that comprise the system (typically \$2000 to \$5000 less).
- A maximum 28% OEM discount is available on standard HP 1000 systems. Note that prior to May 78 the discount was 30%.
- HP 1000 systems are limited to standard UL approved racking configurations defined by the orderable product numbers 2170A, 2171A, etc., and their options. Modification to the racking configurations or substitutions of components are not allowed.

### Additions and changes to the HP 1000 System Family

- New Model 25 High Performance memory based system containing **RTEM** and the new **F-Series processor**.
- New Model 40 General Purpose Disc based system containing the new **RTE IV operating system** and the **E-Series Processor**.
- New Model 45 High Performance Disc based system containing the new **RTE IV Operating System, F-Series Processor, Graphics Plotting Software** with the 2648 terminal and **high density** high speed 350 memory.
- New Data Cap. 1000 software and the 3070B Data Entry Terminal-compatible with models 40 and 45 HP 1000 systems.
- New multi-point terminal interface card compatible with Models 40 and 45 HP 1000 system models.
- New Graphics Plotting Software with support for 2648, 9872 and 7245 peripherals compatible with HP 1000 system — models 20, 25, 40, 45.
- New 20 Mbyte 7906 system disc added to all disc based HP 1000 systems in place of the 7905 disc. The 7906 is plug for plug compatible with the 7905 including the format of the removable cartridge.
- New low level analog input and data output capability to the 2240 M/C.
- Deletion of Model 21, 31 terminology to identify upright cabinet configurations from desk configuration. Model 20 will now refer to either cabinet configuration or the difference by the product # A/B — see next page.
- Deletion of Models 80/81 from the HP 1000 family. This deletion does not affect existing product numbers since the Model 80 was only a merchandising vehicle for IMAGE. IMAGE software will be promoted just as strongly as before, but as an add-on feature product rather than bundled into an HP 1000 model.

# HP 1000 COMPUTER SYSTEM — PART I

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- Deletion of RTE III from our product offering. Model 30 is designed to be our low cost disc based offering and, therefore, is restricted to RTE II with maximum of 64 Kbytes of memory.
- New way of ordering memory. Because of the increasing variety of memory capabilities now available we have chosen to change the way in which additional memory is ordered. Option 014 will delete the base system memory and refer to a memory expansion package chart for selection of additional memory.
- We are clarifying our policy regarding RTE generations supplied with HP 1000 systems. All systems will be shipped from the factory with an operational RTE generation that verifies system function and permits the customer to begin using the system. However, the price of the system does not include an additional "custom" RTE generation required to incorporate additional peripherals or optimize the system for the customer's particular application. Reference the configuration guide for more details.
- Effective with Model 40 RTE IV systems, the right-to-copy RTE IV is **not** included in the purchase price of the system. This represents a change in policy from the RTE III system. Reference the Software Policies Training Manual for detailed explanation.
- Product numbering for the desk version of Model 20 has been changed from HP 2173A to HP 2174B to be consistent with other HP 1000 model numbers. At the same time the price of the Desk Model 20 system has been increased by \$1000.
- Site preparation consultation is now included with the purchase of all HP 1000 models. HP's local CE will automatically contact the customer several weeks prior to the system shipment date.
- Three months comprehensive software support is now included in the purchase price of all HP 1000 systems.

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# Features and Benefits



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## System Family Benefits

### Feature

A family of systems designed to satisfy diverse capability needs in computation, instrumentation and operations management applications.

### Benefit

A single family of systems has the following advantages:

1. Standardization of computers throughout the firm.
2. Software compatibilities.
3. Cost savings due to volume discounts.
4. Same programs can be used in similar applications.
5. Small spares inventory.

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### Feature

HP 1000 family compatibility.

### Benefit

The overall design of the 1000 family provides for ease of upgrading to a more powerful system as customer needs change. To this end, the 1000 system design attempts to maintain continuity in hardware racking and configuration for easy expansion. The use of RTE based software throughout the 1000 system series, provides the user with software continuity, expandability and compatibility. Show to the potential customer the file managers of RTE-M and RTE IV. They allow for the same OPEN's, READ, WRITE, etc.

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### Feature

All HP 1000 Systems have Underwriters Laboratory (UL) and CSA approval (exception for CSA approval of the desk mounted Flexible Disc Subsystem).

### Benefit

This is a MUST in selling systems to many government and private organizations.

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### Feature

The HP 1000 family is based on a family of "System Computers". These System Computers include all the hardware and software required for operation and diagnostic software for ease of servicing.

### Benefit

The user has a working system to start program development immediately — no lost time, better productivity. No need to search for missing drivers (did I forget to order it?) or diagnostics. "A commendable trend toward packaging minicomputer systems rather than offering the user a bewildering array of devices and options to choose from. Package configurations alleviate the problem of finding the right minimum system for the right operating system. . .". in the words of the Auerbach report on the HP 1000.

# HP 1000 COMPUTER SYSTEM — PART I

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## Feature

Choice of enclosures — 56-inch cabinets and desk-style enclosures.

## Benefit

The HP 1000 offers a desk-style cabinetry that looks better for office environments. This will make it easier to actually locate computers closer to people in their work situations. The upright cabinet economizes use of floor space and is suitable for factory environments.

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## Feature

A range of standard system models to choose from —

MODEL 20	\$22000
MODEL 25	27500
MODEL 30 (7900)	31500
MODEL 30 (7906)	36500
MODEL 40 (7900)	35390
MODEL 40 (7906)	40000
MODEL 40 (7920)	45020
MODEL 45 (7906)	46500
MODEL 45 (7920)	51520

## Benefit

Customer can select the appropriate price performance system for his application and budget — **and** he is assured of an upgrade path as his application grows.

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## Processor and Peripheral Benefits

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### Feature

Choice of high performance processors. A choice of HP 1000E or F Series Processor. Both processors offer full microprogrammability with three sub-routine levels, ROM diagnostics for CPU and memory, and an asynchronous memory interface.

### Benefit

High performance and super high performance processing! Check out the F Series performance benchmarks! Rarely will memory or I/O expanders be required.

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### Feature

Choice of high performance 350ns memory.

### Benefit

With faster memory, you can gain another 20 to 30% in speed.

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### Feature

User microprogrammability, fully supported by RTE IV. A complete set of microprogramming tools for the development and operation of customer firmware is supported by the RTE operating system. It includes a microassembler, a Microdebug-Editor, a WCS Load Utility for dynamically loading microcode into WCS boards, WCS driver for accessing microcode routines stored in WCS boards, and a PROM Tape Generator that produces PROM mask tapes. The package allows the addressing of up to 16K words of microcode. Hardware limitations puts a maximum limit of 3K words of WCS and 4.5K in ROM's. RET-M supports operation of custom firmware, via the WCS driver and Load utility. Microprogram development has to be done in a RTE IV system.

### Benefit

The user can microprogram many more functions to obtain faster program operation and less storage space. He can, by swapping WCS code, stored in disc files have a large library of microcode that can be loaded when appropriate. Microprogramming is a simple way to upgrade your processor without changing it. Users of PDP-11/34, if they run out of computing horse-power, would have to go to a PDP-11/60. A very expensive change. Not so with E-Series microprogramming. Another example where the cost of ownership is lower with HP.

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**Feature**

Advanced Interactive Display. The 2645 is the fast 9600 baud Display Station. This intelligent terminal can be provided with "SOFT KEYS" that can be programmed to automatically enter multiple keystroke sequences. With a single stroke of a user defined "SOFT KEY" you can load or compile a program, query a data base, etc. The 2645 also is provided with dual mini cartridges each with 110K bytes of storage and optional printers.

**Benefit**

The 2645 provides for fast operation, friendlier user interface with the operating system, flexible forms design for varied data entry requirements, off-line editing and off-line printing.

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**Feature**

Support of 2645 peripherals — mini cartridges, 9866 thermal and 2631 matrix printer, all via a single driver (DVR05).

**Benefit**

A lot of off-line printing can be done — from mini-cartridges to 9866/2631 — without tying up the computer. (It is sort of "spooling" to mini cartridges!) And, unlike many competitors, we just need one driver for all these devices with consequent memory savings. And DVR05 driver is smart — if the 2645 sub-device does not respond, only that device will be placed inoperative, without affecting the rest of operation.

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**Feature**

Choice of 5mb, 20mb and 50mb high performance system discs with up to 1 mb/sec transfer rates.

**Benefit**

Gives the user a choice of appropriate disc capacity for his system at an appropriate price.

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**Feature**

HP-IB support on all models.

**Benefit**

The HP-IB hardware and software extends the HP 1000 computational and control capabilities to a large array of HP and non-HP instruments for measurement, control and test.

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**Feature**

Wide range of EDP and Measurement and Control interfaces, supported by drivers and many device subroutines and libraries.

**Benefit**

Users hate to have to write drivers and interface routines before they can even start their applications work. We can save 3 to 6 months of this time because of our wide support of general purpose interface cards, drivers, routines for conversion of data to or from floating point to external representation, etc. No competitors have such support!

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## Software Benefits

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**Feature**

Choice of RTE M, RTE II and RTE IV operating systems — ranging from a cost effective full capability RTE M memory based system to a big performance state-of-the-art RTE IV disc based system.

**Benefit**

Customer can choose the operating system appropriate to his application and budget.

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# HP 1000 COMPUTER SYSTEM — PART I

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## Feature

HP 1000 supports multi-terminal operation. Up to 64 programs (or copies of the same program) can be in memory simultaneously. Several users at different terminals can enter and edit application programs independently of each other. While one user is compiling, assembling, loading or executing a FORTRAN or Assembly language program other users can be developing Real Time BASIC programs.

## Benefit

Increased system productivity. Cheaper unit-time cost per user.

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## Feature

Distribution of RTE and supported software, including all drivers, on disc cartridges on one "grandfather" cartridge and one configured cartridge. Distribution of all diagnostics in minicartridges.

## Benefit

Customer will store in a safe place his "grandfather" disc and will periodically update it with software received through his subscription service and he uses the customized disc for his work. He uses the new copy utility to maintain other copies of his disc on other cartridges or mag tape. If he adds a new peripheral, the required driver is already in the "grandfather" disc.

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## Feature

DS1000 Distributed Systems Network Capability. HP 1000 can function in multi-system networks. Several HP 1000 Systems can be linked together using hardwired or telephone connections.

## Benefit

Computational power that grows as your needs grow.

- Central information management.
- Computational power that goes to work where the work is.
- More efficient use of peripheral devices.

HP 1000 Computer System Networks give you a way to build large-system capability in affordable stages.

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## Feature

IMAGE/1000 data base management system — tools for consolidating the user organization's individual data files into a single data base.

## Benefit

An interrelated data base can be used by many different people for a wide variety of purposes. You get the fullest possible use of all your information. IMAGE/1000 makes the RTE data management capabilities more accessible to the non-computer expert such as a production engineer. The "query" capability is a problem-oriented language and therefore more English-like than the RTE file management commands.

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## Feature

DATA CAP/1000 data capture software and 3070B Data Entry Terminals. Provides the customer with all the tools needed for specifying and executing data entry procedures at multiple 3070B terminals, including the validating of data.

## Benefit

Helps customers get right now answers to right now questions about their manufacturing operation. Bypasses the costly error prone process of filling out hand written forms, key punching and reading cards into the system. Provides lower overall information processing costs and improved data timeliness and accuracy.

# Configuration and Ordering

**HP 1000 SYSTEM COMPATIBILITY MATRIX SUMMARY**

	MODEL 20		MODEL 25		MODEL 40		MODEL 45		MODEL 30		
	2174A	2174B	2175A	2175B	2176A	2176B	2177A	2177B	2170A	2171A	2172A
Base System											
Processor	E-Series		F-Series		E-Series		F-Series		E-Series		
Op Systems	RTE M		RTE M		RTE IV		RTE IV		RTE II		
Terminal	2645		2645		2645		2648		2645		
Memory	64Kb		64Kb Hi Pref (350 )		128Kb Std		128Kb Hi Pref (350 )		64Kb Std		
System Disc	None		None		7906		7906		7900	7906	7906
Cabinet	Upright	Desk	Upright	Desk	Upright	Desk	Upright	Desk	Upright	Upright	Desk
Base System Price	22000	22000	27500	27500	40000	40000	46500	46500	31500	36500	36500
Optional Systems Disc	None		None		7900 or 7920		7920		None		
Flexible Disc	Yes		Yes		Yes		Yes		Yes		
RJE 1000	No		No		Yes		Yes		Yes		
DS1000	Yes		Yes		Yes		Yes		No		
DS IB	No		No		No		No		Yes		
IMAGE 1000	No		No		Yes		Yes		Yes		
DATA CAP 1000	No		No		Yes		Yes		No		
91000A/2313	Yes		Yes		Available soon		Available soon		Yes		
92840A Graphics	Yes		Yes		Yes		Yes		No		
2240	Yes		Yes		Yes		Yes		Yes		
I/O Extender	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Mem Extender	Yes	No	No	No	Yes	No	No	No	No	No	No
Multipoint Terminal Interface Card	Yes		Yes		Yes		Yes		No		
Additional Terminals, Line Printers, Mag Tapes, etc.	Generally compatible with all systems but check the configuration guide before ordering.										

**Things to remember:**

1. The HP 1000 system has a precisely defined compatibility matrix that specifies which peripherals and software can be added to the standard systems and their prerequisites. Be sure to check the configuration guide before quoting systems.
2. RTE II is now a Class B mature software product, and therefore will not necessarily be compatible with new capabilities added to the HP 1000 line. Check the compatible Matrix.

Table 1. Summary of HP 1000 base system equipment supplied and options

2170A	2171A	2172A	2174A/B	2175A/B	2176A/B	2177A/B	Description of equipment and options
							<b>Computer</b>
X	X	X	X		X		2113 (HP 1000 E-Series) Computer with 14 I/O chan, space for 10 memory modules, and disc and punched tape loader ROMs
				X	X		2117 (HP 1000 F-Series) Computer with hardware Floating Point Processor, Scientific Instruction Set, Fast FORTRAN Processor, 14 I/O chan, space for 10 memory modules, and disc and punched tape loader ROMs
X	X	X	X				2102B Memory controller, two 13187B 32,768 byte Std perf memory modules (65,536 bytes total), and 12892B Memory protect
				X			2102E Memory controller, two 12741A 32,768 byte High perf memory modules (65,536 bytes total), and 12892B Memory protect
					X		12786A 128k byte Std perf memory package, including memory controller and memory, 128k byte memory module, and dynamic mapping system
						X	12788A 128k byte High perf memory package, including memory controller, 128k byte memory module, and dynamic mapping system
X	X	X			X	X	12897B Dual-Channel Port Controller
X	X	X	X	X	X	X	12991B Power Fail Recovery System
X	X	X	X	X	X	X	12992C CRT Console Loader ROM for loading of software into the system from Mini cartridge tapes
X	X	X	X	X	X	X	12539C Time Base Generator (uses one I/O channel)
X	X	X	X		X		13304A Firmware Accessory Board (included in 2117 Computer, so not listed here for systems with 2117)
X	X	X	F	F	X	X	Auto bootup capability
							<b>System console and standard input/output unit</b>
X	X	X	X	X	X		2645A Display Station (serves as system console), with: <ul style="list-style-type: none"> <li>Option 001: 128 character set</li> <li>Option 007: Dual Mini cartridge tape I/O (serves as standard input/output unit)</li> <li>Option 013: Five blank Mini cartridges</li> <li>Option 030: Deletes standard communications card from 2645A (for replacement with 13260B)</li> <li>13260B Extended asynchronous communications card for 2645A</li> <li>12966A+001 Buffered asynchronous computer interface with 2645A-to-12966A cable (uses one I/O channel)</li> </ul>
						X	2648A Graphics Terminal (serves as system console with same basic equipment as 2645A, but using 13260B+003)
							<b>System cabinet</b>
X	X		A	A	A	A	29402B Single-bay upright cabinet, including standard 115V configuration and front door <ul style="list-style-type: none"> <li>40017A Cabinet Stabilizer</li> </ul>
			X	B	B	B	29421A Desk cabinet with 115V power input
							<b>System disc</b>
X							12960A (4.9M byte) Cartridge disc subsystem (uses two I/O channels)
	X				A	A	7906MR+020 (19.6M byte) Master cartridge disc with controller and rack mounting slides, plus 13175A interface (uses one I/O channel)
		X			B	B	7906M (19.6M byte) Master cartridge disc with controller in disc minirack, plus 13175A interface (uses one I/O channel)

2170A	2171A	2172A	2174A/B	2175A/B	2176A/B	2177A/B	Operating system and other software and services
X	X	X					92001B RTE-II operating system with Batch-Spool Monitor and 92062A RTE drivers
X							<ul style="list-style-type: none"> <li>Option 030: RTE-II software on 12869A (2.5M byte) disc cartridge for use with 12960A disc subsystem</li> <li>Option 031: RTE-II software on 12940A (10M byte) disc cartridge for use with 7906M Master disc unit</li> </ul>
	X	X					92064A+020 RTE-M operating system with file manager and drivers from 92062B RTE drivers package, on Mini cartridges
			X	X			92065A+020 BASIC/1000M subsystem on Mini cartridges
					X	X	92067A+031 RTE-IV operating system with Batch-Spool Monitor and 92062B RTE drivers on 12940A (10M byte) disc cartridge for use with 7906M Master disc unit
					X		92840A+020 GRAPHICS/1000 Graphics Plotting Software on Mini cartridges
X	X	X	X	X	X	X	92066A+020 RTE Measurement and Control Software Package on Mini cartridges
X	X	X	X	X	X	X	Diagnostics on Mini cartridges
X	X	X	X	X	X	X	Factory configuration and test (includes installation of door on 29402B upright cabinet)
X	X	X	X	X	X	X	On-site installation assistance
X	X	X	X	X	X	X	Site prep consultation
X	X	X	X	X	X	X	Three months Comprehensive Software Support after installation
							<b>217xA/B System Options</b>
X	X				A	A	002: To 2170A, 2171A, 2176A, or 2177A system, adds a second upright cabinet bay (29402B+400 and 051) to the system to receive a mag tape unit and/or additional disc unit. Includes front door
			X		B	B	002: In 2172A, 2176B, or 2177B system, replaces 7906M Master cartridge disc in disc minirack with 7906MR+020 disc in 29402B+400 and 051 upright cabinet that includes front door
							008: Replaces 2645A Display Station with 2648A Graphics Terminal as system console (same equipment as 2645A plus graphics capabilities)
X	X	X	X	X	X	X	014: Deletes memory package or components supplied with the base system to permit replacement with a different memory package or different components ordered separately, which will be required for operation
					X		030: Replaces 7906M/MR+020 Master cartridge disc with 13175A interface with 12960A Cartridge disc subsystem and 92067A+031 RTE-IV system with 92067A+030 RTE-IV system on 12869A (2.5M byte) disc cartridge
			X	X			032: Delete 92064A+020 RTE-M operating system and 92065A+020 BASIC/1000M subsystem and add: <ul style="list-style-type: none"> <li>12732A Flexible disc subsystem (514k bytes) (uses two I/O channels) and flexible disc loader ROM</li> <li>12897B Dual-Channel Port Controller</li> <li>92064A+040 RTE-M operating system and 92065A+040 BASIC/1000M subsystem on flexible discs</li> </ul>
					X	X	033: Replaces 7906M/MR+020 Master cartridge disc with 7920M (50M byte) Master top-loading disc and 92067A+031 RTE-IV system with 92067A+032 RTE-IV system on 13394A disc pack
X	X	X	X	X	X	X	015: 230V operation

LEGEND: x check marks an item as being supplied or an option as being applicable to the system(s) in whose column it appears

A check marks an item as being supplied or an option as being applicable only to the "A" model of the system(s) in whose column it appears

B check marks an item as being supplied or an option as being applicable only to the "B" model of the system(s) in whose column it appears

F check marks capability that requires flexible disc option 032 in 2174A/B and 2175A/B systems



## Summary of Equipment and Options for Base Systems

### How does the system price compare with components?

For end user customers the 2176A is \$2K to \$5K less expensive!

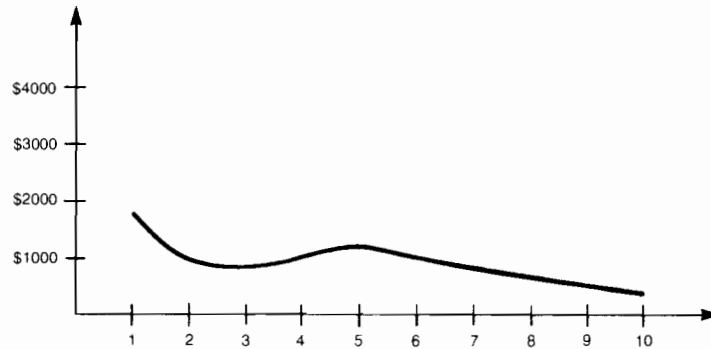
Components and services included with system			First System	Repeat System
1.	2113B	CPU	6,850	
2.	12786A	Memory Package (includes 2102B, 13305A, 12747A)	5,300	
3.	12897B	DCPC	750	
4.	12991B	Power Fail Recovery System	600	
5.	13304A	Fab Assembly	300	
6.	12992C	2645A Loader ROM	100	
7.	12992B	7906/20 RPL Loader ROM	100	
8.	12539C	Time Base Generator	350	
9.	2645A	Display Station	3,500	
10.	-001	128 Character Set	100	
	-007	Mini-Cartridge Drives	1,600	
	-013	5 Blank Mini-Cartridges	90	
	-030	Delete Standard Interface	(160)	
11.	13260B	Add Extended Asynch Comm Intfc	325	
12.	12966A	Buffered Async Comm Intfc	750	
	-001	Interface Cable for 2645A	NC	
13.	92067A	RTE-IV Operating System	5,000	(2000)
	-031	RTE-IV Media — 7906 Disc	180	
14.	92067-13101	RTE-IV Grandfather Disc for 7906	180	(0)
15.	7906	Disc Subsystem (7906R + 13037B + 13175A)	13,500	
16.	24998-14002	HP 1000 Diagnostic Library	360	
17.	29402B	1-bay 56" Upright Cabinet	1,150	
	-200	115V/60Hz	650	
	-050	Hinged, Locking Front Door	400	
18.	92066	DAS Library	250	(0)
19.	Installation and Site Preparation Consultation		810	
20.	Three Month On-Site Warranty instead of 30-Day Return to HP		360	
21.	Integration, Test, Racking and Configuration		1,500	
22.	Three Month Comprehensive Software Support		525	
Total Price of Components & Services			45,420	41,990
HP 1000 2176A Price			40,000	40,000
Advantage of Systems over Components			\$5,420	\$1,990



# HP 1000 COMPUTER SYSTEM — PART I

**For OEM Customers the 2176A is Still Less Expensive!  
(Assumes OEM Wants Services Bundled into System Price)**

**Average Per System Price Advantage of systems vs. Components**



Average cost per system for 10 systems purchased (2176A) = \$32,729.  
Average cost per system for 10 systems purchased (components) = \$32,557.

## Ordering Examples

Model 40 system with: upright cabinet, 256Kb memory, 2648 graphics terminal (in place of 2645), two 7920 disc drives (in place of 7906), two additional 2640B terminals, and a mag tape subsystem.

2176A Model 40 HP 1000 system	\$40,000
Option 008            2648 in place of 2645	2,000
Option 014            Delete base system memory	-4,800
12786B                256Kb Memory Package	9,000
Option 033            7920 in place of 7906	5,020
Option 002            Additional Cabinet for Mag Tape	1,850
7920S                 Slave Disc	14,000
2640B (X2)            Terminals	5,200
12531D with option 002 (X2) Terminal I/F	810
12970A Mag Tape Subsystem	9,500
	\$82,580

Model 40 system with: 7900 disc in place of 7906, HPIB Card, 2240 M/C Processor.

2176A Model 40 HP 1000 system	40,000
59310B HPIB I/O	600
Option 030            7900 Disc in place of 7906 Disc	-4,610
2240A M/C Processor	2,750
	\$38,740

Note: 2240 will not be racked with the 2176A since additional cabinet was not ordered. See configuration guide for detailed explanation.

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# Competition

## Bullets to Deal With Competition

### Remember the Four Silver Bullets for the HP 1000 System

- The hottest processor in its price range.
- The best real time operating system in the market.
- The best high performance peripherals in the market.
- The best applications software in the market.

### A few tarnished bullets

- Languages — stress our overall software strengths.
- Stack architecture — Counter with microcode, EMA and Memory Register Architecture.
- LOW END — Talk M Series processor, board computers, etc.

### DEC in particular

- Wide range of CPUs — not always good — hi support costs.
- One CPU family for all applications — HP optimizing 3000s for commercial, 1000s for technical.
- Offer CORE or MOS Memory — this complicates power supply — their MOS is in plastic.
- 11/34 and 11/60 limited to 256 KB — dead end computer.
- System discs are one-half speed of HP discs.
- 48 bit microcode — our 24 bit is easier to use — we store more.

DEC has no DBMS below 11/70 and no QUERY or DMBS11.

### DG in particular

- The low ball champs — don't play their game — get it apples to apples.
- Stack architecture — most real time applications don't need — we use microcode instead.
- RDOS — only two partition real time — no spooling.
- EAU — \$1400, unsigned multiply and divide.
- Microcode — their 56 bits is less efficient than our 24 bits.
- INFOS — it's a file manager not true DBMS — no schema or utilities.
- DISC — one third speed of HP Disc.

### IBM in particular

- Limited range of CPUs, peripherals, etc. — sell high and low.
- Our instruction set is 2 times faster.
- Our memory speed is better than 2 times faster.
- NO BASIC.
- They offer low cost Winchester disc but it's too slow for most real time applications.

# HP 1000 COMPUTER SYSTEM — PART I

## Where Are the Big Differences in System Pricing (HP vs. DEC)?

Component	HP	DEC	Advantage/Disadvantage
Processor (E)	E Series (with 128 KB mem.)	11/34 (with 128 KB mem.)	Average \$4K advantage
Processor (F)	F Series (with 128KB mem.)	11/60 (with 128 KB mem.)	Average \$13K advantage
Additional Memory	128 KB \$4500	128 KB \$10,200	\$5700 advantage
Disc (5Mb)	7900 (5Mb) (\$9000)	RK05J/F (7.5Mb) (\$15,000)	\$6000 advantage (plus HP is twice as fast)
Disc (20Mb)	7906 (20Mb) (\$13,500)	RK611FA (28Mb) (Two RK06, \$26,400)	\$13000 advantage (plus HP is twice as fast)
Flexible Disc (Single Drive)	12732A (\$4200)	RX11AA (\$3350)	\$850 disadvantage
Flexible Disc (Dual Drive)	12732/33 (\$6800)	RX11AB (\$4300)	\$2500 disadvantage (see conclusion note #3)
Console/Printer (Disc based systems)	2645/2631 \$5500 + \$3250	VT52AE/LA11PA \$1900 + \$3770	\$3080 disadvantage (but HP has superior console performance — soft keys, etc.)
Additional Programmer Terminals	2640B/ Multipoint I/O \$2700	VT52AE/I/O \$2100	\$600 disadvantage
Operator Console and Input/Output (Memory Based Execution only Systems)	2645 with mini- cartridges and 2631 (\$5500 + \$3250)	LA36 Decwriter and RX11AA Floppy (\$2200 + \$3350)	\$3300 disadvantage
Cabinet Enclosure	\$1200 to \$3500	\$800 to \$2000	\$800 to \$1500 disadvantage

### Conclusions

- Note HP's tremendous price advantage with DISC drives. Don't be afraid to quote the 7900 against DEC's RK05J/F but move to the 7906 for a whopping big price advantage. Note that the RK06 disc is a single platter (removable) disc. Therefore **DEC must quote two drives** in most applications to provide system backup.
- HP has a price advantage in processors and memory. The more memory you sell the better we look.
- Try not to sell two HP flexible disc drives against DEC's dual floppy. Instead sell a single HP flexible disc with the 2645 minicartridge serving as temporary storage for intermediate results.
- For low end memory based execution-only systems DEC tends to gain \$1K to \$3K advantage because of the price advantage of the LA 36 terminal printer over the 2645/2631. Sell more memory — Stress our performance advantages.

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## Questions and Answers

*What about customers who want RTE II systems with Graphics, Multipoint, DS 1000 or 7920?*

As mentioned in the RTE IV training manual, RTE II is now a mature software product and therefore generally will not be enhanced or checked out with new peripherals and software packages. We will keep RTE II Model 30 systems in the product line for another 5 to 6 months for customers who need a slightly lower cost disc based system.

*What about customers who need 2313 or 91000 A/D subsystems with Model 40/45 systems?*

Our lab is working on an RTE IV driver for the 2313/91000 subsystem which we expect to announce early summer (June/July time frame). Also remember that the 2240 now has low level analog input capability that is more economical than the 2313 up to about 64 channels.

*What about customers who want a 2635 as a system console rather than the 2645?*

All HP 1000 systems require a console with minicartridge support since all software diagnostics are distributed on minicartridges. HP has no firm plans to add minicartridges to the 2635 in the short term.

*What about customers who want to put a mag tape unit underneath the computer in 2171 or 2176A option 033 (7920) systems to avoid ordering an extra cabinet?*

The computer/mag tape cabinet configuration has not been environmentally checked out and submitted for UL approval. A new lower cost stand-alone mag tape cabinet will be introduced by Boise Division in June '78 which will help answer customer objections to high cabinet costs.

*What about field upgrades of existing HP 1000 systems for RTE IV?*

Standard upgrade packages are available for both software and hardware. Note that the E Processor may require certain hardware/firmware updates to be compatible with RTE IV and these must be quoted to the customer as part of the upgrade. Also note that for a few months the 2313/91000 will not be compatible with RTE IV.

*What about customers who want to continue buying RTE III based HP 1000 systems?*

HP 2171A option 003 (RTE III HP 1000 system) will remain on the price list for another 4 or 5 months until HP ATS and 9571 DTS software can be moved to RTE IV. However all HP 1000 sales literature will no longer reference or promote RTE III.

*What about outstanding quotes of HP 1000 systems with the old option product numbers e.g. 2171 option 010, 012, 003 and 2173A?*

To accommodate your outstanding quotes we will leave the old product numbers on the Corporate Price List thru May 31st.

*What about customers who want fast delivery of RTE IV HP 1000 systems by ordering a Model 30 system and 92076 RTE IV upgrade?*

This approach will not buy you any delivery savings after May 1st since Model 30 and Model 40 systems will have approximately the same availability. However, for Model 30 systems ordered prior to May 1st there could be a delivery saving provided the customer is willing to pay the normal RTE IV upgrade and field installation costs.

*Why is option 014 (memory delete option) priced less than the sum of the components prices?*

Overall system manufacturing and test efficiencies permit us to price bundled components less than stand alone components. Therefore components are deleted from systems at a systems component price rather than the stand alone price.

# HP 1000 COMPUTER SYSTEM — PART II

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## Model 45 for Computation

### Introducing the Model 45 — New Speed and Power for CPU Intensive Computation Applications

There was a time that you had to walk away from those RFQs for computation applications. That's because computation applications were really high performance applications requiring hardware floating point equipment and published benchmark results. Well friends, the times are changing! With the introduction of the Model 45 F-Series computer system, HP now offers the high-performance mini-computer market a truly competitive product with some outstanding features no other mini can match.

- **RTE IV** — This powerful new operating system allows users up to 2 megabytes (1.7 MB with fault control memory) of data space! This means giant arrays can be processed entirely in physical memory without the need for disc swaps, offering significant reductions in execution times. And it's user transparent too! (Knowledgeable users willing to program in assembly language can realize an additional factor of 8 improvement in memory access times by controlling the memory mapping functions.) And RTE IV with its bigger usable partition size (27K words) allows for larger programs.
- **Hardware Floating Point Processor (HFPP)** — Now floating point calculations can be done in hardware where they belong! In addition to really fast calculations (4.8 us/11.8 us 32bit/48 bit add and subtract, 5.9 us/12.7 us 32 bit/48 bit multiply, 7.2 us/14.8 us 32 bit/48 bit divide) this processor supports 48 bit (11 decimal places) extended precision.
- **Graphics** — Almost all computation applications need or can benefit by a graphics capability. HP has an expanding line of intelligent graphics peripherals as well as new device and language independent graphics software — GRAPHICS/1000. Also standard on the Model 45 is the 2648A graphics terminal.
- **Microcoded Scientific Instruction Set (S.I.S.)** — The 9 most commonly used transcendental functions (sine, cosine, tangent, arc tangent, hyperbolic tangent, square root, natural logarithm, base 10 logarithm, exponent e of X) have been microcoded for extremely fast execution. Benchmarks have shown that these routines execute faster than any other mini, and faster than many mainframes as well! The term transcendental means that there is no exact answer, only close approximations. Well you'll be pleased to know that HP transcendentals have significantly less relative error than our competition. This is crucial in complex engineering calculations where repeated calls introduce increasing cumulative errors. (What's the value of 64 bit precision if your transcendental values start diverging significantly in bit 29?)
- **7906 Disk Drive** — This cartridge unit is a plug for plug compatible performance upgrade of the already superfast, reliable 7905. The 7906 offers 5 Mb more storage and new temperature compensating circuitry that allows faster start-up.
- **Fast Fortran Processor** — This microcoded library of FORTRAN callable routines decrease FORTRAN execution times by factors of 2 to 20.
- **350 Nanosecond Memory** — High performance memory, standard on Model 45, offers better than cache speed performance. Improvements range up to 30% over regular 595 nanosecond memory. An additional plus is our new 128K Byte hi-density board that frees up memory slots eliminating, in many cases, the need for an extender.

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## And Don't Forget:

- **DS/1000** — Distributed processing is becoming more and more important in coping with processor bound applications. Satellite computers at data acquisition sites allow pre-processing of data at these locations thereby unloading many tasks from the central CPU.
- **Image/1000** — When analyzing massive amounts of data, a comprehensive, efficient data base management system is a must.
- **User Microcode Capability**— Writeable control store memory plus the activity profile generator allows users to easily identify those CPU bound portions of their programs and convert them to lightening fast microcode. HP also offers a debugger — something almost everyone else forgot to include!

## And Lastly:

- **Price** — Once you've established that an HP 1000 can solve their problems, talk PRICE, PRICE, AND PRICE. Not only the initial purchase price, but the basic monthly maintenance charge, too! On a price-performance basis, the Model 45 can't be beaten.

You get all of this performance for a low system price of \$46,500!

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## Applications

The purpose of this section is to briefly introduce the major classes of computation applications. Though brief, the discussions will hopefully benefit those who have never dealt with them, and provide a basis for further investigation. While it is never possible to understand a computation application so well as the user, it is often helpful to understand the fundamental language and process they will use.

### Linear Programming

Linear programming is a technique used to determine the best way to deploy limited resources or capacities in order to optimize an objective, such as **lowest** cost, **highest** profit, or **least** time, when those resources have alternate uses.

Specifically, a series of linear equations (constraints) which describes the limitations on the resources is derived, as well as a linear objective function to be optimized.

Realizing that this may be confusing, an example might be helpful:

Sam Schlitz, the manufacturing manager for XYZ Lamp Company, strolled into work last Monday morning and found a memo on his desk from Mr. Big, the company president. The memo described XYZ's recent profit slump, and instructed Sam to schedule this week's lamp production such that total profits would be maximized.

Sam thought for a minute, then pulled out his cost information for the four lamps in XYZ's product line and derived this chart:

Model	Profit
Desk Lamp (D)	\$10.00
Floor Lamp (F)	\$15.00
Tiffany Lamp (T)	\$22.00
Hi-Intensity Lamp (H)	\$ 7.00

"Since my profits are described by:

$$\text{Total Profits} = (\$10 \times D) + (\$15 \times F) + (\$22 \times T) + (\$7 \times H)$$

this must be my OBJECTIVE FUNCTION," he reasoned.

"But I can't build all Tiffany Lamps . . . I'll run out of materials and have assemblers idle by Thursday. Further, I need to build at least enough of each lamp to meet this week's orders." After digging through his desk, he found the following information:

#### Open Order Summary

Model	On Order
Desk (D)	5
Floor (F)	10
Tiffany (T)	3
Hi Intensity (H)	8

# HP 1000 COMPUTER SYSTEM — PART II

## Inputs Inventory

Input	Quantity Available
Wood	60 Units
Glass	40 Units
Paint	45 Units
Labor	200 Units

## Lamp Requirements (Units)

Model	Wood	Glass	Paint	Labor
Desk	1		1	4
Floor	3	1		9
Tiffany		3	1	12
Hi Intensity		1	2	4

"I know I must build for open orders so a few CONSTRAINTS on production quantities are."

$$\begin{aligned} D &\geq 5 \\ F &\geq 10 \\ T &\geq 3 \\ H &\geq 8 \end{aligned}$$

"I've also got to be sure I don't run out of inputs, so . . . ."

$$\begin{aligned} (1 \text{ wood} \times D) + (3 \text{ wood} \times F) &\leq 60 \text{ Total Units wood} \\ (1 \text{ glass} \times F) + (3 \text{ glass} \times T) + (1 \text{ glass} \times H) &\leq 40 \text{ Total Units glass} \\ (1 \text{ paint} \times D) + (1 \text{ paint} \times T) + (2 \text{ paint} \times H) &\leq 45 \text{ Total Units paint} \\ (4 \text{ labor} \times D) + (9 \text{ labor} \times F) + (12 \text{ labor} \times T) + (4 \text{ labor} \times H) &\leq 200 \text{ Total Units labor} \end{aligned}$$

"Boy, this is sure complicated . . . if I had a linear program package on our computer it could solve this system of equations in a snap. Then I'd know how many D, F, T, and H to make to maximize profits. Where's that HP salesman's phone number . . ."

Real world LP problems are considerably more complex — often resulting in hundreds of constraints in hundreds of variables. (An auto assembly line may have 70,000 parts and 80 different models!) It is here that the power of linear programming really becomes evident.

RTE-IV is singularly well suited for linear programming applications since the computational techniques underlying LP involve manipulation of multiple arrays as well as numerous random accesses in those arrays. Virtual memory schemes and data segmenting methods are much more time consuming and less efficient since they suffer from disc to memory thrashing problems.

## TYPICAL LP APPLICATIONS

- **Transportation Problems** — A multi-plant manufacturing company uses LP to set production schedules at each plant to minimize total delivered cost to their distribution centers. Costs include not only manufacturing costs for each plant, but also delivery costs and options from each plant to each distribution center.
- **Process Waste Minimization** — A large paper company processes all of its paper into 80 inch standard rolls. It then cuts these rolls into 12, 15, 20 and 36 inch widths per customer order. The company assures minimum wastage by using LP to determine cutting widths.
- **Machine Loading** — A manufacturing company faced serious machine overloading and was considering purchase of additional machines. Using LP methods, optimal loading was scheduled that not only eliminated the need for additional capacity but reduced total machine hours on existing machines while still producing the same number of parts on time. Additional savings resulted from smaller work-in-process inventories.
- **Other applications include:**
  - make or buy decisions
  - inventory strategies (where/what/when to stock)
  - personnel assignment
  - contracts evaluations
  - budgeting decisions
  - blending problems

**NOTE:** The LP applications in manufacturing environments are limited only by the imagination of the customer and **YOU** — the HP Sales Representative!

## DESIRED COMPUTER CAPABILITIES

- **CALCULATION SPEED**
  - floating point hardware
  - microcode capability
  - memory speed (350 ns is faster than cache)
  - disc speed (remember — we've got the fastest)
- **EMA** — Large memory area of RTE IV allows the giant data arrays associated with LP to be handled in main memory.



## Simulation

Computer simulation is a problem solving technique which represents the actual system to be studied by a more simple model of the system. These models can be sets of mathematical equations that describe system responses to given inputs (aircraft headings given joystick movements) or procedures that keep track of the various states of the system (output of a machine with given raw material inputs and machine capacities by increment of time).

Simulation differs from analytical techniques in two important ways. First, a simulation model can be evaluated in a discrete, step-by-step manner. This is significant when realizing that most systems involve complex equations — integrals, differentials, and so on; and are often extremely difficult to solve even on computers. Second, analytic methods assume no descriptive inputs and hence, give generalized responses, while simulation yields specific responses to specific inputs. (In the study of automobile suspensions, an analytic solution will describe all conditions causing oscillation, providing the equations can be solved, while simulation easily tells only whether a specific set of conditions did or did not cause oscillation.)

These factors combine to make simulation tremendously powerful and especially well suited for "what if" kinds of problems. Since the execution of simulations describe the system in successive time intervals, a simulation can be stopped at any instant to allow observation of the system in any state of response. Variables can be changed in mid-execution and the system will then respond to those changes.

Note that simulation differs from linear programming in that simulation will not yield the "best" (optimal) answer, but will describe the step-by-step response of a system to given inputs.

There are two main categories of simulations. The first type are those that simulate the system under study and merely describe its responses. These usually require some graphics or other special I/O capability and are not time dependent, although they simulate time in a user controlled interval fashion. These are typical in computer aided design/analysis applications. The second, more complex type, simulate both the system and its responses. These are usually training simulations (flight trainers, process control operator trainers) and are interrupt driven and very much real-time dependent. These simulations usually require D-A converters and special transducer interfaces, and in the case of motion translators require extended precision to translate digital information to exact movements.

## TYPICAL SIMULATION APPLICATIONS

### TYPE I (System Simulation Only)

- Electronic Circuit Simulation — describes outputs of electronic circuits when given various inputs. Especially helpful in digital design problems.
- Structural Design Analysis — exhibits automobile, airframe, etcetera responses to expected forces.
- Chemical Plant Simulation — yields output results given changing process variables (temperatures, flow rates, feedstock characteristics, etc.)
- Missile Guidance System Evaluations — describes missile responses to different wind, speed, and attitude variables.

### TYPE II (System and Response Simulation)

- Flight Trainer — actual cockpit environment physically moves in response to pilot control.
- Oil Tanker Control Room Simulator — complete control room mock-up (alarms, gauges, controllers, navigational controls) respond to pilot actions.

## DESIRED COMPUTER FEATURES

### TYPE I

- Fast Calculation Speed
  - floating point hardware
  - microcode capability
  - memory speeds
  - disc speeds
- Graphics Language
- Graphics Peripherals
- Simulation Language

### TYPE II

- Type I Capabilities
- Fast Interrupt Response Time
- Extended Precision (larger word requires fewer word transfers per element)
- HPIB and 2240 MACS (helpful for interfacing)

# HP 1000 COMPUTER SYSTEM — PART II

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## Other Computation Applications

### SCIENTIFIC PROBLEM SOLVING/ENGINEERING CALCULATIONS

These types of calculations are the more traditional computation applications of computers and by far exceed the others in both number and complexity. Whether known as data reduction or numerical analysis they typically require evaluation of complex integrals, differential equations, and series expansions. Hence, these calculations are highly transcendental. That is, there exists no exact answers, only close approximations.

### TYPICAL APPLICATIONS

- Fast Fourier Transforms — all periodic waveforms (optical, mechanical, acoustic, etc.) are made up of sine and cosine components. These frequency components (spectra) are of great interest in engineering evaluations and are obtained with more ease through the use of Fast Fourier Transforms.
- Curve Fitting — Often, mounds of experimental data are analyzed in order to derive a generalized function describing the experimental results. This function then allows the experimenter to extrapolate the response of the system under study to various inputs or stimuli.

### DESIRED COMPUTER FEATURES

- FAST CALCULATION SPEED
  - hardware floating point
  - microcode capability
  - memory speed
  - disc speed
- TRANSCENDENTAL LIBRARY
  - speed (microcoded)
  - relative error (Recall that transcendental is close approximations. The less relative error the more exact the answer.)
  - completeness
- PRECISION (Extended precision needed to provide closer approximations.)

### GRAPHICS

With increasing frequency, the computation application market is demanding graphics capability. For the lab engineer involved with engineering problem solving, a graphical output device is often a more meaningful interpreter of relevant data than a mere table of numbers. Similarly, a simulation to aid in the design of a system, be it electrical, mechanical, or whatever, is often best done with an interactive capability to allow the user to easily modify the input variables. Pictorial representation of the system under study is therefore extremely useful.

So while HP is not in the true "graphics system" market, we do provide the necessary basic tools for all but the dedicated graphics applications. Things to help sell the computation applications include:

- GRAPHICS/1000 — Besides HP, only DEC offers a basic graphics language. Initial release of GRAPHICS/1000 will include commands to drive graphics output devices but will be expanded in the future to provide powerful graphics capability that will be easy to use. And remember, GRAPHICS/1000 is device and language independent.
- GRAPHICS PERIPHERALS — The 2648A microprocessor-based terminal provides an excellent interactive CRT with many unique features. Additionally, the 7245 plotter-printer and the 9872 4-color plotter offer high quality hard copy capability.

## Competition

This section compares the most frequently encountered competition in the computation market. While the competitors have been restricted to 16 bit machines, 24 and 32 bit machines do exist. However, their high relative cost dictates that they be used only in applications where their architectures can be fully utilized (such as massive memory addressing requirements or when both top speed **and** extended precision are needed with the fewest number of word transfers). Therefore, whenever you encounter these "super-minis" in a situation where a Model 45 will fit, sell around them with price.

The following machines and their system configurations and prices are included:

### DEC 11/60 COST BMMC

- 50% MORE EXPENSIVE THAN MODEL 45
- 256 Kb MEMORY LIMIT
- OPTIMIZED FOR FORTRAN — RUNS FTN4+ FAST
- DISCS ONLY HALF AS FAST AS OURS
- NO DATA BASE MANAGEMENT SYSTEM

128 Kb MOS error-correcting memory  
with cache, memory management,  
2-RK06 14 Mb Disc Drives, LA 36

Dec Writer, RSX11/M	62,300	409
Delete LA36 Dec Writer	- 1,900	-19
Add VT55EA Graphics Terminal	2,750	25
LA11PA Line Printer	3,770	55
FP11-E Hardware Floating Point	5,600	42
	<u>72,520</u>	<u>512</u>

Writable Control Store	5,000	—
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### PRIME 300

- 50% MORE EXPENSIVE THAN MODEL 45
- 512 Kb MEMORY LIMIT
- NO ERROR CORRECTING MEMORY AVAILABLE
- NO GRAPHICS
- ONLY 256 64 BIT WORDS OF WCS
- NO DATA BASE MANAGEMENT SYSTEM
- NO DISTRIBUTED SYSTEMS
- RUNS VERY LARGE FORTRAN PROGRAMS (UP TO 128Kb)
- WEAK PERIPHERALS

64 Kb MOS byte parity (no error  
correcting available) memory,  
memory management, Terminet 30  
console, PRIMOS III

64 Kb MOS byte parity memory	8,500	55
12 Mb Disc	11,500	109
12 Mb Disc	11,500	109
4002 Disc Controller	3,500	25
165 CPS Line Printer	6,000	60
Hardware Floating Point	2,000	12
	<u>69,000</u>	<u>625</u>

Writable Control Store and Hardware Floating Point (Note: No graphics)	5,000	40
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### DG ECLIPSE S/130

### COST BMMC

- 256 Kb MEMORY LIMIT
- NO HARDWARE FLOATING POINT
- NO GRAPHICS
- NO DATA BASE MANAGEMENT SYSTEM
- NO DISTRIBUTED SYSTEMS
- DISCS ONLY ONE-THIRD AS FAST AS OURS

128Kb MOS error-correcting memory,  
memory management

Floating Point <b>FIRMWARE</b>	21,000	175
6012 Terminal	2,000	15
6046 20 Mb Disc	2,700	30
165 CPS Line Printer	18,250	200
AOS Operating System	4,500	40
	2,500	—
	<u>50,950</u>	<u>460</u>

Writable Control Store (Note: No graphics)	4,000	30
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# HP 1000 COMPUTER SYSTEM — PART II

## DG ECLIPSE S/230

- 512 Kb MEMORY LIMIT
- NO GRAPHICS
- ONLY 256 56 BIT WORDS OF WCS
- NO DATA BASE MANAGEMENT SYSTEM
- NO DISTRIBUTED SYSTEMS
- DISCS ONLY ONE-THIRD AS FAST AS OURS

128Kb MOS error-correcting memory,		
Memory Management	32,500	240
Floating Point Hardware	5,000	40
6012 Terminal	2,700	30
6046 20 Mb Disc	18,250	200
165 CPS Line Printer	4,500	40
AOS Operating System	2,500	—
	<u>65,450</u>	<u>550</u>
Writable Control Store (Note: No graphics)	3,000	25

## HP 1000/MODEL 45

- ONLY MINI IN CLASS TO HANDLE 2 Mb OF MEMORY
- IMAGE
- DS/1000
- EXTENDED MEMORY AREA
- MICROCODED SCIENTIFIC INSTRUCTION SET
- COMPLETE SOFTWARE AIDS FOR WCS
- LOWEST PRICE IN CLASS

128 Kb MOS 350 nanosecond MOS Memory,		
Memory Management, Scientific Instruction		
Set, 2648 Graphics Terminal, Graphics/1000,		
Hardware Floating Point, Fast FORTRAN		
Processor, 7906 20 Mb Disc, RTE IV		
Operating System	46,500	289
2631 180 CPS Line Printer	3,800	31
	<u>50,300</u>	<u>320</u>
Writable Control Store Hardware (3K capacity)	2,000	12
	(per 1K)	
Writable Control Store Software	1,000	20

	Memory	Maximum Memory Size/ Maximum Partition Size	Transcendentals (Math Library)	Operational Systems	Languages	Graphics Language/ Graphics Peripherals	Floating Point	DBMS	EMA	Microcode
HP 1000 MODEL 45	350 nS MOS Fault Control Optional	2 Mb/ 64 Kb	Microcoded with best relative error	RTE-IV	FTN4, Assembler, Basic	YES/ YES	Hardware Standard (32, 48 bit)	Image	YES	3K-24 bit words. WCS with full software aids
DEC 11/60	530nS MOS with cache, error correcting	256 Kb/ 64 Kb	Software	RSX11/M RS11/S IAS	FTN4, FTN4+, BASIC, MACRO-ASSEMBLER COBOL	YES/ YES	Firmware Standard, FP11-E Hardware Optional (32, 64 bit)	NO	NO	1K-48 bit words. WCS Assembler, and loader, RUMOR: No Debugger!
PRIME 300	600 nS MOS byte parity only	512 Kb/ 128 Kb	Software	PRIMOS III	BASIC, FTN4, COBOL, RPG II	NO/ NO	Hardware Optional (32, 64 bit)	NO	NO	256-64 bit words. WCS
DG ECLIPSE S/130	800 nS CORE or 500 nS MOS with cache, error correcting optional with MOS only	256 Kb/ 64 Kb	Software	RDOS, MRDOS, AOS	FTN4, FTN5, BASIC, ALGOL (RDOS) Assembler	NO/ NO	Firmware Optional	NO	NO	1K-56 bit words. WCS Assembler and Loader RUMOR: No Debugger! (2K-56 bit PROMS available from DG)
DG ECLIPSE S/230	800 nS CORE or 500 nS MOS with cache and error correcting standard	512 Kb/ 64 Kb	Software	RDOS, MRDOS, AOS	FTN4, FTN5, BASIC, ALGOL (RDOS), Assembler	NO/ NO	Hardware Optional (32, 64 bit)	NO	NO	256-56 bit words. WCS assembler and loader RUMOR: No Debugger! (2K-56 bit PROMS available from DG)

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