COMPAQ DESKPRO 386/33
Personal Computer
Features/Specifications

COMPAQ

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COMPAQ DESKPRO 386/33 PERSONAL COMPUTER
FEATURES/SPECIFICATIONS
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Compaq Computer Corporation

Introduction

The COMPAQ DESKPRO 386/33 Personal Computer incorporates the features of the 33-MHz Intel 386™ microprocessor and an advanced cache memory architecture to make it the most powerful and expandable desktop personal computer available, while maintaining full compatibility with the established industry standard. This high-performance combination delivers a 35% performance improvement in CPU-intensive applications over 25-MHz 386 cache-based personal computers.

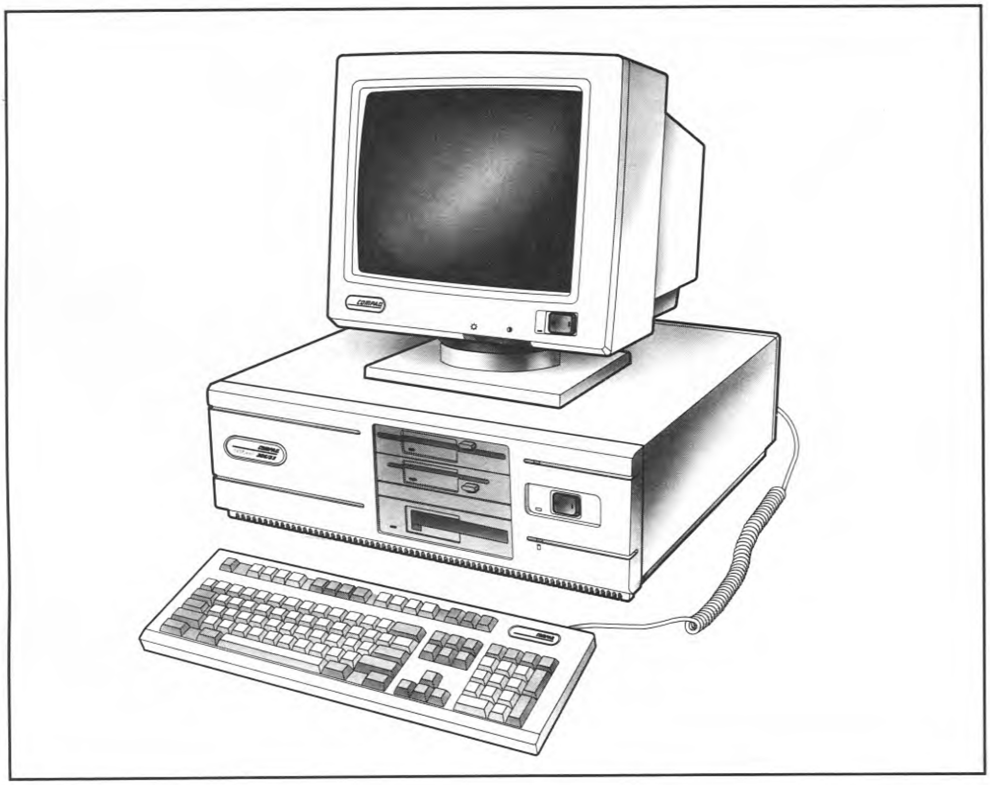
Contributing to this high performance is the COMPAQ Flexible Advanced Systems Architecture. This feature, providing concurrent memory and peripheral buses, permits memory accesses to occur at 33-MHz, while maintaining compatibility with industry-standard peripherals and software.

The high-performance features of the COMPAQ DESKPRO 386/33 include 32-bit architecture, a 33-MHz Intel® 82385 Cache Memory Controller with its own 64 Kbytes of high-speed (25-ns) static RAM, up to 16 megabytes of interleaved 32-bit memory, and separate sockets that allow optional 33-MHz Intel 387™ and Weitek coprocessors to be present in the system at the same time.

Besides exceptional speed advantages, the COMPAQ DESKPRO 386/33 delivers maximum storage and expansion capabilities to handle the latest in software and hardware applications, with up to 1.3 gigabytes of internal storage capacity. Up to 2.6 gigabytes of high-performance fixed disk drive capacity is available (with the optional Fixed Disk Expansion Unit) for large storage requirements, including database management, networking, and multiuser applications.

The fixed disk drives have been specifically designed to increase overall system performance. The 650- and 320-megabyte fixed disk drives have average access times of less than 18 milliseconds, a forward reading buffer, and 1:1 interleave. The 84-megabyte fixed disk drive has an average access time of less than 25 milliseconds and 1:1 interleave. The COMPAQ DESKPRO 386/33 Model 84 provides six available industry-standard expansion slots. Model 650 and Model 320 use a high-performance 15-MHz ESDI Controller and also provide six available industry-standard expansion slots.

Compaq Computer Corporation offers a wide range of options for the COMPAQ DESKPRO 386/33 to give users flexibility in configuring systems to meet their specific needs. The COMPAQ DESKPRO 386/33 provides the highest performance available in a personal computer for specialized applications such as CAD/CAE, financial analysis, software programming, database management, multitasking and networking.



The COMPAQ DESKPRO 386/33 Personal Computer

Standard Models and Options

MODEL 650

- Two megabytes of 32-bit system memory (RAM)
- 5¼-Inch 1.2-Megabyte Diskette Drive
- 650-Megabyte Fixed Disk Drive (full-height)
- 15-MHz ESDI Controller
- Six full-sized industry-standard expansion slots available
  - Five 8-/16-bit
  - One 8-bit

MODEL 320

- Two megabytes of 32-bit system memory (RAM)
- 5¼-Inch 1.2-Megabyte Diskette Drive
- 320-Megabyte Fixed Disk Drive (half-height)
- 15-MHz ESDI Controller
- Six full-sized industry-standard expansion slots available
  - Five 8-/16-bit
  - One 8-bit

MODEL 84

- Two megabytes of 32-bit system memory (RAM)
- 5¼-Inch 1.2-Megabyte Diskette Drive
- 84-Megabyte Fixed Disk Drive (half-height) with integrated controller
- Six full-sized industry-standard expansion slots available
  - Five 8-/16-bit
  - One 8-bit

STANDARD FEATURES ON ALL MODELS

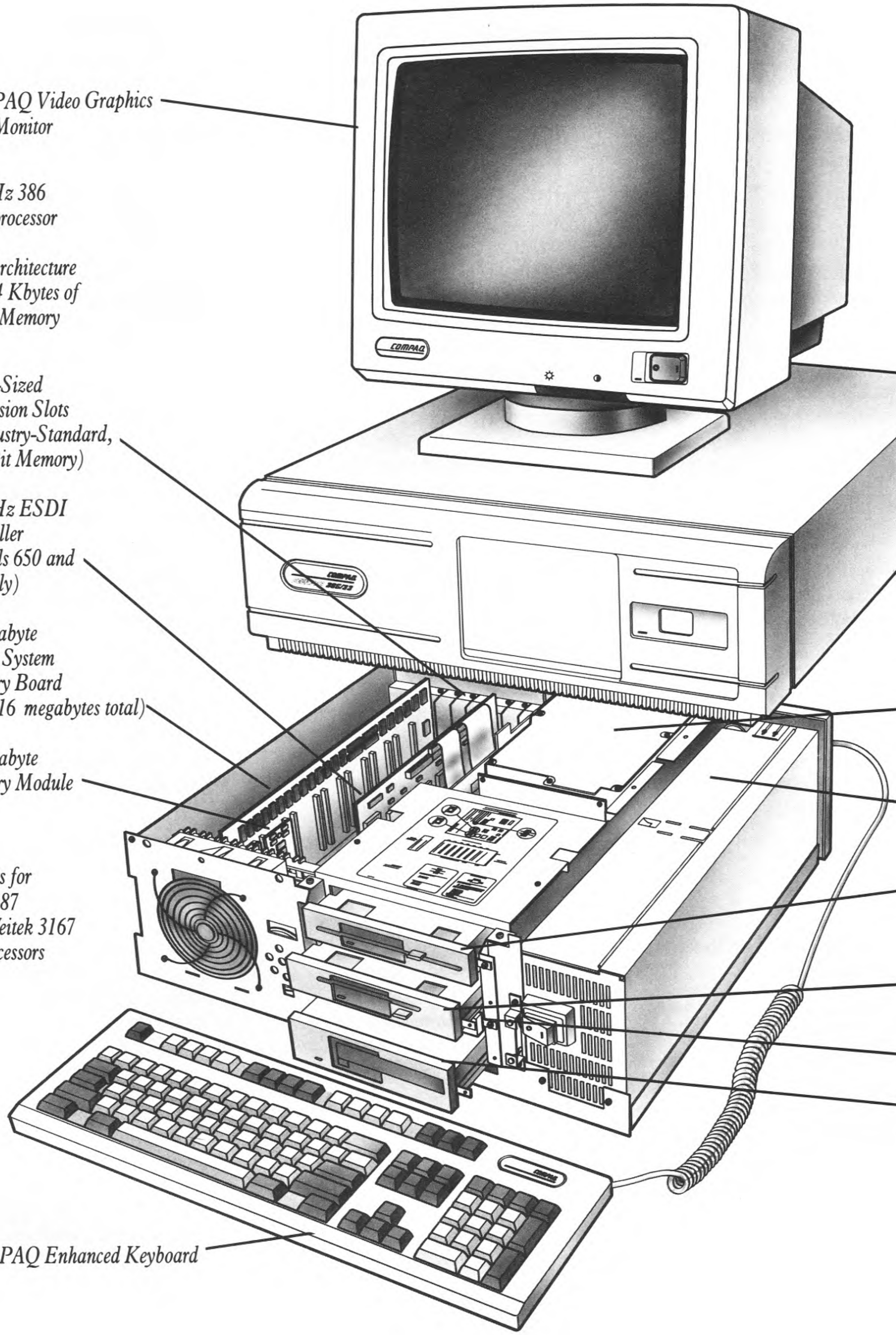
- 33-MHz 386 microprocessor
- 33-MHz 82385 Cache Memory Controller with 64 Kbytes of Cache Memory (25-ns Static RAM)
- Interleaved Memory Architecture (80-ns DRAM)
- Separate sockets for 33-MHz Intel 387 Coprocessor and 33-MHz Weitek 3167 Coprocessor
- Two megabytes of 32-bit system memory (RAM); expandable to 16 megabytes
- Eight full-sized expansion slots
  - One 32-bit high-speed memory slot
  - Six full-sized 8-/16-bit industry-standard slots
  - One full-sized 8-bit industry-standard slot
- Five storage device positions
- One 5¼-Inch 1.2-Megabyte Diskette Drive
- 16-bit Integrated Video Graphics Controller
- VGA Pass-Through
- Enhanced Keyboard
- Parallel, Asynchronous (Serial) Communications, and Pointing Device Interfaces
- COMPAQ Expanded Memory Manager (CEMM)
- Disk Cache Utility
- Security Features
  - Keylock
  - Power-on Password
  - Keyboard Password
  - Network Server Mode
- 300-watt power supply with Automatic Line Switching
- Full One-Year Limited Warranty

OPTIONS

- 33-MHz Intel 387 Coprocessor
- 33-MHz Weitek 3167 Coprocessor
- 2-Megabyte 32-Bit Memory Module
- 5¼-Inch 1.2-Megabyte Diskette Drive
- 5¼-Inch 360-Kbyte Diskette Drive
- 3½-Inch 1.44-Megabyte Diskette Drive
- 650-Megabyte Fixed Disk Drive*
- 320-Megabyte Fixed Disk Drive
- 300-Megabyte Fixed Disk Drive (Expansion Unit Only)*
- 110-Megabyte Fixed Disk Drive
- 84-Megabyte Fixed Disk Drive
- 15-MHz ESDI Controller
- 150-/250-Megabyte Tape Drive
- 40-Megabyte Tape Drive
- 2400-Baud Internal Modem (U.S. and Canada only)
- Asynchronous Communications/Parallel Printer Board
- Advanced Graphics 1024 Board
- Advanced Graphics Memory Board
- Advanced Graphics Color Monitor
- COMPAQ Video Graphics Color Monitor
- COMPAQ Video Graphics Monochrome Monitor
- Fixed Disk Expansion Unit*
  - Model 650 (650-Megabyte Fixed Disk Drive)
  - Model 300 (300-Megabyte Fixed Disk Drive)
- 250-Megabyte Tape Cartridge (DC 6250)
- 150-Megabyte Tape Cartridge (DC 6150)
- 40-Megabyte Tape Cartridge (DC 2000)
- MS-DOS® Version 4 as published by Compaq
- MS-DOS Version 3 as published by Compaq
- Microsoft® Operating System/2 Standard Version 1.1 as published by Compaq
- *COMPAQ DESKPRO 386/33 Technical Reference Guide*

*The Fixed Disk Expansion Unit comes with one 650- or 300-megabyte fixed disk drive (depending on model) installed; a second optional drive, 650- or 300-megabyte, may be added to either model. The 650-megabyte drive is also an option for the COMPAQ DESKPRO 386/33.

Features Illustration



COMPAQ Video Graphics Color Monitor

33-MHz 386 Microprocessor

Flex Architecture with 64 Kbytes of Cache Memory

8 Full-Sized Expansion Slots (7 Industry-Standard, 1 32-Bit Memory)

15-MHz ESDI Controller (Models 650 and 320 only)

2-Megabyte 32-Bit System Memory Board (up to 16 megabytes total)

2-Megabyte Memory Module

Sockets for Intel 387 and Weitek 3167 Coprocessors

COMPAQ Enhanced Keyboard

650-Megabyte Fixed Disk Drive Full-Height

300-Watt Power Supply

5¼-Inch 1.2-Megabyte Diskette Drive

3½-Inch 1.44-Megabyte Diskette Drive

⅙-Height Bezel

150-/250-Megabyte Tape Drive

Up to Five Mass Storage Devices

COMPAQ DESKPRO 386/33 Features/Functions/Benefits

Feature	Function	Benefit
MICROPROCESSOR		
33-MHz 386 Microprocessor	Performs up to 32% faster than 25-MHz 386; provides gateway to current and future 32-bit software	Faster speed increases productivity; advanced features permit system to keep pace with new software developments
33-MHz Cache Memory Controller	Copies requested data from main memory to cache memory	Improves data access and system performance
64 Kbytes of Cache Memory	Holds twice as much frequently-accessed data as 32-Kbyte cache memory	Allows virtually all microprocessor requests to be processed at zero wait-states
COMPAQ Flexible Advanced Systems Architecture	Uses separate buses for memory and peripherals; runs 32-bit memory slot at processor speed while maintaining industry-standard speed in expansion slots	Optimizes system performance while maintaining compatibility with industry-standard hardware
COPROCESSORS		
33-MHz Intel 387 Coprocessor (optional)	Increases calculation speed for numeric-intensive applications	Reduces processing time of numeric-intensive business applications such as spreadsheets and CAD/CAE
33-MHz 3167 Weitek Coprocessor (optional)	Improves numeric processing for scientific, engineering, or financial applications; if desired, can be used with the 387 for optimal performance	Provides significant performance improvement over the 387 coprocessor
SYSTEM MEMORY		
Interleaved Memory Architecture with 80-ns Enhanced Paged Memory	Permits two memory pages to be accessed simultaneously and reduces the number of wait-states	Improves system performance for increased productivity
2-Megabyte Memory Module	Installs on standard 32-bit system memory board	Allows straightforward expansion to 16 megabytes of system memory to meet current and future memory requirements
COMPAQ Expanded Memory Manager (CEMM)	Supports the Lotus/Intel/Microsoft Expanded Memory Specification (LIM/EMS) Standard Version 4.0, enabling applications to access memory beyond the MS-DOS limit of 640 Kbytes	Allows efficient manipulation of large amounts of data without purchase of additional hardware or software
MASS STORAGE DEVICES		
Support for up to five mass storage devices installed internally, including four half-height or two full-height fixed disk drives	Permits wide range of mass storage device combinations	Allows configuration flexibility to suit individual computing needs, from multiple media types to up to 1.3 gigabytes of internal fixed disk drive storage

Feature	Function	Benefit
MASS STORAGE DEVICES (continued)		
• Diskette Drives (supports up to two)	• Choice of sizes, capacities	• Provides compatibility with industry standard and flexibility in capacity
– 3½-Inch 1.44-Megabyte (one third-height) (optional)	– Reads from/writes to 1.44-megabyte and 720-Kbyte diskettes	
– 5¼-Inch 1.2-Megabyte (one third-height) (standard and optional)	– Reads from/writes to 1.2-megabyte diskettes; reads 360-Kbyte diskettes	
– 5¼-Inch 360-Kbyte (one third-height) (optional)	– Reads from/writes to 360-Kbyte diskettes	
• Fixed Disk Drives (supports up to four)	• Provides choice of high-performance internal mass-storage devices	• Permits customizing of system for a wide range of individual and multi-user applications: CAD/CAE, financial analysis, database management, multi-tasking, networking servers
– 650-Megabyte (standard and optional) – full-height – <18 ms average access time – 1:1 interleave – ESDI controller		
– 320-Megabyte (standard and optional) – half-height – <18 ms average access time – 1:1 interleave – ESDI controller		
– 110-Megabyte (optional) – half-height – <25 ms average access time – 1:1 interleave – integrated controller		
– 84-Megabyte (standard and optional) – half-height – <25 ms average access time – 1:1 interleave – integrated controller		
• Disk Cache Utility (standard)	• Copies requested data from fixed disk drive to system memory	• Increases productivity by permitting faster access to frequently-requested data
• Fixed Disk Expansion Unit (Models 650 and 300) (optional)	• Supports up to two full-height fixed disk drives in each unit: 650-megabyte or 300-megabyte	• Allows up to 2.6 gigabytes of total system mass-storage capacity for the most demanding applications
• 300-Megabyte Fixed Disk Drive (optional) – full-height – < 18 ms average access time – 1:1 interleave – ESDI controller	• Increases capacity of Fixed Disk Expansion Unit by 300 megabytes	• Allows gradual build-up in expansion units

COMPAQ DESKPRO 386/33 Features/Functions/Benefits

Feature	Function	Benefit
MASS STORAGE DEVICES (continued)		
• EXTDISK	• Allows MS-DOS users access to up to four ESDI fixed disk drives	• Permits increased system storage capacity by supporting up to four high-capacity fixed disk drives, including drive(s) installed in the Fixed Disk Expansion Unit
• ISADISK (Novell VADD—Value-Added Disk Driver)	• Provides Novell Netware support for ESDI fixed disk drives	• Supports up to 2.6 gigabytes of mass storage when running Novell Netware
• Tape Drives (Choice of two internal)	• Duplicates data stored on a fixed disk drive onto a removable tape cartridge and verifies	• Permits backup and protection of important or sensitive data
– 150-/250-Megabyte (optional)	– Permits choice of 150- or 250-megabyte media – Copies 150 or 250 megabytes of data, depending on tape length selected, at 5 megabytes per minute transfer rate	• Allows choice of tape size to suit size of drive to be backed up; larger tape cartridge capacity allows unattended backup of large capacity fixed disk drive
– 40-Megabyte (optional)	– Copies 40 megabytes of data at 2 megabytes per minute transfer rate	• Permits easy backup, especially of smaller logical drives or of selected large directories or files
• SY-TOS™ Tape Operating System	• Provides high-performance software utilities to manage data backup	• Makes backing up data easy and efficient and reduces the possibility of lost data
	• Supports data backups in MS-DOS and MS® OS/2 environments	• Ensures complete and accurate data backups and file transportability across several operating systems
EXPANSION		
• Eight slots total: – One 32-bit memory expansion slot – Six full-sized 8-/16-bit industry-standard expansion slots – One full-sized 8-bit industry standard expansion slot	• Permits internal memory expansion and the installation of industry-standard expansion boards such as modems, LAN cards, I/O boards, and micro-to-mainframe communication boards	• Increases configuration flexibility by providing the ability to customize the system
STANDARD INTERFACES		
• Pointing Device (mouse) • Parallel Printer • Asynchronous (Serial) Communications	• Permits use of mouse or other pointing device and allows the connection of parallel and high-speed serial (up to 19.2-Kbaud) devices	• Offers flexibility in choosing output devices at no incremental cost and without using an expansion slot
• Standard interfaces and controllers provided on the system board	• Eliminates use of expansion slots for standard features	• Allows the use of seven expansion slots to customize the system for specific applications

Feature	Function	Benefit
KEYBOARD		
• Enhanced Keyboard	• Includes ten-key pad and dedicated keys for screen and cursor control	• Increases productivity by enabling faster cursor and screen movement and easier numeric input
POWER SUPPLY		
• Steady State: 300 watts with Automatic Line Switching (110/220-240V)	• Determines voltage of incoming power and switches to provide power for all available configurations	• Provides ample power to run existing and anticipated system configurations in either 110V or 220-240V environments
PHYSICAL CHARACTERISTICS		
• System Unit Dimensions – Height 6.5 in (16.51 cm) – Depth 17.7 in (44.96 cm) – Width 19.2 in (48.77 cm)	• Offers a high degree of functionality in an updated desktop system enclosure. Provides maximum flexibility and expansion in a desktop form factor	• Allows configuration to fit current and future needs
OPERATING SYSTEMS		
• MS-DOS Version 4 Diskettes and Reference Guide (optional)	• Includes MS-DOS Shell graphical user interface and COMPAQ FASTART installation and upgrade utility; supports LIM 4.0 for expanded memory enhancements; and allows logical fixed disk drive partitions up to 2 gigabytes	• Increases productivity through ease-of-use improvements, expanded memory use, and greater fixed disk drive partition size
• MS-DOS Version 3 Diskettes and Reference Guide (optional)	• Enables partitioning of high-capacity fixed disk drives into logical drives of up to 512 megabytes each	• Ensures compatibility with the installed base of software and allows efficient use of high-capacity fixed disk drives
• MS OS/2 Standard Version 1.1 Diskettes, Command Reference and Users Guide (optional)	• Includes Presentation Manager, a graphical user interface to assist users in interacting with a personal computer; allows logical fixed disk drive partitions up to 2 gigabytes	• Increases productivity by allowing multiple Presentation Manager applications to be run in a windowed environment, reducing training time, and providing user-friendly features
	• Provides multitasking feature that allows an application to run in the foreground while other applications continue to run in the background	• Increases productivity by permitting a user to run multiple applications at the same time
	• Expands the addressable memory capacity to 16 megabytes	• Enhances productivity by allowing increased memory capacity for multitasking and larger data files

COMPAQ DESKPRO 386/33 Features/Functions/Benefits

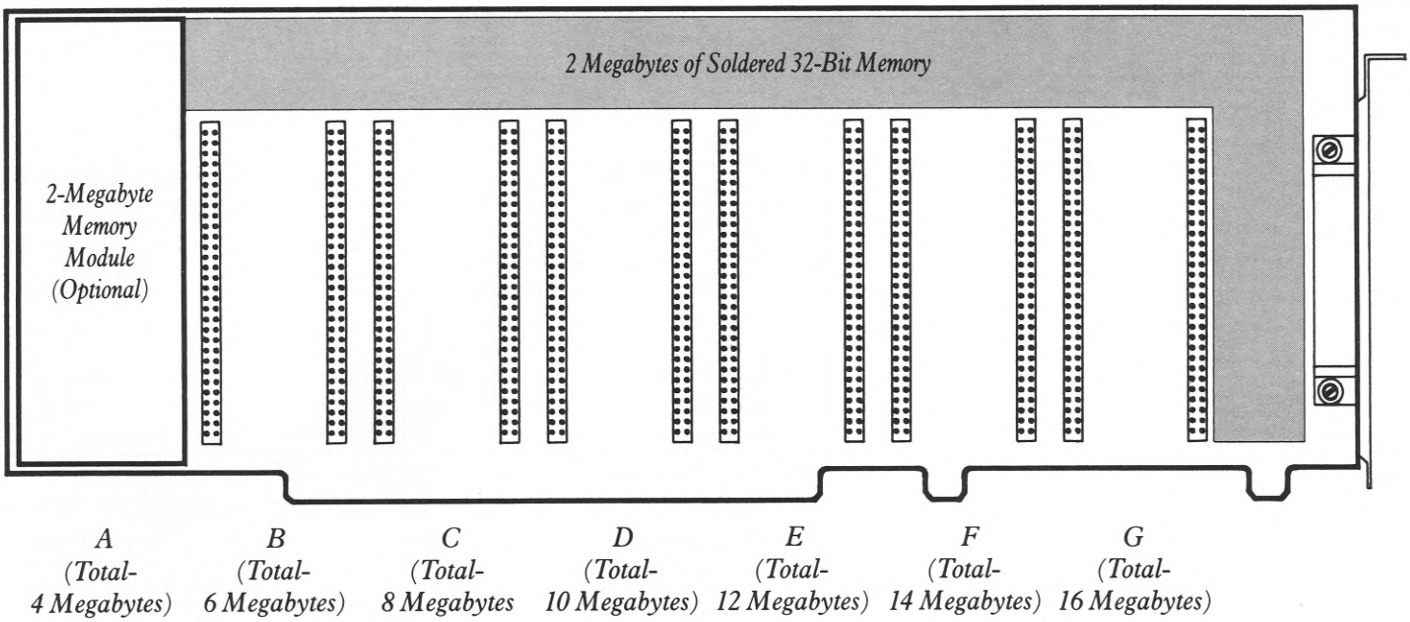
Feature	Function	Benefit
GRAPHICS CONTROLLER and MONITORS		
• Integrated COMPAQ Video Graphics Controller (standard)	• Supports VGA, EGA, and CGA graphics resolutions, displaying up to 256 colors; displays graphics and scrolls text up to 50% faster than other VGA products	• Integrated on system board; saves expansion slot, permits flexibility in monitor choice, graphics standard
• VGA Pass-Through (standard)	• Provides VGA, EGA, and CGA compatibility when used with video display boards that support resolutions beyond VGA	• Protects investment by ensuring VGA software compatibility when using higher-resolution display boards
• Advanced Graphics 1024 Board (optional)	• Provides high-performance, high-resolution display capabilities – 1024 x 768 resolution with 16 colors – 1024 x 768 resolution with 256 colors with optional memory board – TI 34010 Graphics System Processor	• Provides higher performance in graphics-intensive applications such as CAD/CAE or business graphics
• Advanced Graphics Color Monitor (optional)	• High-resolution graphics on a 16-inch (diagonal) screen with up to 256 colors in 1024 x 768 or 640 x 480 resolutions	• Provides a high-quality image that makes details more precise and easier to see
• COMPAQ Video Graphics Color Monitor (optional)	• VGA-compatible, displaying 256 colors in 320 x 200 graphics resolution and 16 colors in 640 x 480 resolution on a 14-inch (diagonal) screen	• Provides high-quality images with a wide selection of colors for business applications
• COMPAQ Video Graphics Monochrome Monitor (optional)	• Displays graphics in 640 x 480 resolution and text in 720 x 400 resolution; allows for black letters on white display with 12-inch (diagonal) screen	• For less-demanding applications and environments requiring high-quality display such as networking or word processing
MODEM		
• 2400-Baud Internal Modem (optional)	• Provides communications capabilities to transfer data to and from other personal computers, mainframes, or outside services over phone lines	• Enables user to choose from a wide array of Hayes-compatible communications programs

The COMPAQ DESKPRO 386/33 Personal Computer is configured with two megabytes of system memory and offers memory expansion up to 16 megabytes without using an industry-standard expansion slot. All 32-bit memory on the COMPAQ DESKPRO 386/33 is on a 32-bit system memory board installed in the high-speed memory slot which runs at 33 MHz.

All models come standard with a system memory board, on which two megabytes of memory are soldered. The system memory board contains connections for a total of seven optional 2-Megabyte 32-Bit Memory Modules. System memory can be expanded to 4, 6, 8, 10, 12, 14 or 16 megabytes of 32-bit memory without taking an industry-standard slot.

The following diagram illustrates the COMPAQ DESKPRO 386/33 Personal Computer memory:

2-Megabyte 32-Bit System Memory Board
(Expandable to 16 Megabytes of 32-Bit Memory)


2 Megabytes of Soldered 32-Bit Memory
2-Megabyte Memory Module (Optional)
A (Total- 4 Megabytes)
B (Total- 6 Megabytes)
C (Total- 8 Megabytes
D (Total- 10 Megabytes)
E (Total- 12 Megabytes)
F (Total- 14 Megabytes)
G (Total- 16 Megabytes)

MASS STORAGE DEVICES

Diskette Drives	1.2-Megabyte 5¼-Inch	360-Kbyte 5¼-Inch	1.44-Megabyte 3½-Inch
LED Indicators (high/low density)	Green/Orange	N/A /Orange	Green/Orange
Capacity Per Diskette (high/low)	1.2 MB/360 KB	N/A /360 KB	1.44 MB/720 KB
Drives Supported	Two	Two	Two
Drive Height	One-third	One-third	One-third
Drive Rotation (rpm)	360	300	300
Transfer Rate (bits/sec)(high/low)	500 K/300 K	N/A /250 K	500 K/250 K
Bytes Per Sector	512	512	512
Sectors Per Track (high/low)	15/9	N/A /9	18/9
Tracks Per Side (high/low)	80/40	N/A /40	80/80
Access Times: Track-to-Track (ms)	3	6	3
Average (ms)	79	80	79
Settling Time (ms)	15	15	15
Latency Average (ms)	84	100	100
Cylinders (high/low)	80/40	40	80/80
Read/Write Heads	Two	Two	Two

Fixed Disk Drives	650-Megabyte (Standard and Optional)	320-Megabyte (Standard and Optional)	84-Megabyte (Standard and Optional)
Standard Configuration	COMPAQ DESKPRO 386/33 Model 650, Fixed Disk Expansion Unit Model 650	COMPAQ DESKPRO 386/33 Model 320	COMPAQ DESKPRO 386/33 Model 84
LED Indicator	Green	Green	Green
Formatted Capacity/Drive	650.9 MB	325.0 MB	84.3 MB
Drives Supported	Two*	Four	Two
Drive Height	Full	Half	Half
Drive Size (in)	5¼	5¼	3½
Drive Type(s)	49, 41	28	27
Controller	15-MHz ESDI	15-MHz ESDI	Integrated
Transfer Rate (bits/sec)	15 M	15 M	10 M
Sector Interleave	1:1	1:1	1:1
Access Times (settling included): Track-to-Track (ms)	5	5	8
Average (ms)	< 18	< 18	< 25
Maximum (ms)	40	40	45

*Per system unit or per optional Expansion Unit, permitting up to a total of four.

MASS STORAGE DEVICES (continued)

Fixed Disk Drives (continued)	**650-Megabyte (Standard and Optional)**	**320-Megabyte (Standard and Optional)**	**84-Megabyte (Standard and Optional)**
Physical Configuration:			
Cylinders	1631	1744	832
Heads	15	7	6
Sectors/Track	52	52	33
Bytes Per Sector	512	512	512
Logical Configuration:			
Cylinders	816/1631	872	832
Heads	30/15	14	6
Sectors/Track	52/52	52	33
Bytes Per Sector	512/512	512	512

Fixed Disk Drives	**300-Megabyte (Standard and Optional)**	**110-Megabyte (Optional—System Unit)**
Standard Configuration	Fixed Disk Expansion Unit Model 300	N/A
LED Indicator	Green	Green
Formatted Capacity Per Drive	315.3 MB	112.4 MB
Drives Supported	Two*	Two
Drive Height	Full	Half
Drive Size (in)	5¼	3½
Drive Type	38	33
Controller	15-MHz ESDI	Integrated
Transfer Rate (bits/sec)	10 M	10 M
Sector Interleave	1:1	1:1
Access Times (settling included):		
Track-to-Track (ms)	5	8
Average (ms)	< 18	< 25
Maximum (ms)	40	45
Physical Configuration:		
Cylinders	1222	832
Heads	15	8
Sectors/Track	34	33
Bytes Per Sector	512	512
Logical Configuration:		
Cylinders	611	832
Heads	16	8
Sectors/Track	63	33
Bytes Per Sector	512	512

* Per Expansion Unit

MASS STORAGE DEVICES (continued)

Tape Drives	**150-/250-Megabyte**	**40-Megabyte**
LED Indicator	Green	Green
Drive Height	Half	Half
Approximate Operating Times:		
Backup and Verify	5 MB/min	1 MB/min
Restore	5 MB/min	2 MB/min
Format Blank Cartridge	Not required	74 min
Maximum Formatted Capacities:		
Per Track	7.5 MB/12.5MB	2.0 MB
Per Data Block (bytes)	512	16,384
Per Sector (bytes)	N/A	1,024
Mechanical Measurements:		
Tape Width	0.25 in	0.25 in
Tape Length	600 ft/1000 ft	205 ft
Tape Speed:		
Read/Write (both directions)	72 ips	50 ips
Rewind/Fast Forward	90 ips	70 ips
Track Pattern:	Serpentine	Serpentine
Number of Tracks	18	20
Number of Blocks Per Track	16,276/27,126	124
Number of Data Sectors Per Block	N/A	16
Percentage of ECC	6.25	11.11
Recording Density/Inch	10,000 bits	10,000 bits
Flux Reversals/Inch	12,500 bits	10,000 bits
Track Density/Inch	76	83
Data Encoding Method	4,5 GCR	MFM
Data Transfer Rate (bits/sec)	720K	500K
Error Detection/Correction	CRC/ECC	CRC/ECC
Tape Cartridge	3M 6150/3M 6250	
Read/Write	QIC150	3M DC2000
Read	QIC24, QIC120	3M DC1000
Connection	Tape Host Adapter (requires ISA slot)	System Board

EXPANSION SLOTS

Slot 1	8-/16-bit full-sized (recommended for optional high-resolution video board)
Slot 2	8-/16-bit full-sized (used for drive controller)
Slot 3	8-/16-bit full-sized
Slot 4	8-/16-bit full-sized
Slot 5	8-/16-bit full-sized
Slot 6	32-bit (used for 32-Bit System Memory Board)
Slot 7	8-/16-bit full-sized
Slot 8	8-bit full-sized

SYSTEM UNIT

	English	Metric
Dimensions: Height	6.5 in	16.5 cm
Depth	17.7 in	45.0 cm
Width	19.2 in	48.8 cm
Weight: Model 650	43.0 lb	19.5 kg
Model 320	40.0 lb	18.2 kg
Model 84	37.7 lb	17.1 kg
Power Supply: Operating Voltage	120 V, 60 Hz	220-240 V, 50 Hz
Steady-State Power	300 W	300 W
Peak Power	360 W	360 W
Fuse	10 A	10 A
Temperature Range: Operating	50° to 104°F	10° to 40°C
Non-operating	50° to 140°F	10° to 60°C
Shipping	– 22° to 140°F	– 30° to 60°C
Relative Humidity (noncondensing): Operating	20% to 80%	20% to 80%
Non-operating	5% to 90%	5% to 90%

COMPAQ ENHANCED KEYBOARD

	English	Metric
Dimensions: Height	1.7 in	4.3 cm
Depth	7.0 in	17.8 cm
Width	18.5 in	47.0 cm
Weight	4.0 lb	1.8 kg

FIXED DISK EXPANSION UNIT (MODEL 650, MODEL 300)

	English	Metric
Dimensions: Height	6.5 in	16.2 cm
Depth	16.5 in	41.9 cm
Width	14.1 in	35.9 cm
Weight	27.5 lb	12.4 kg
Standard Drive: One 650-Megabyte Fixed Disk Drive (Model 650)		
One 300-Megabyte Fixed Disk Drive (Model 300)		

ADVANCED VIDEO GRAPHICS COLOR MONITOR

	English	Metric
Type	Color	Color
Mounting	External	External
Dot Pitch	.29 mm	.29 mm
Maximum Resolution: Text Mode	720 x 400	720 x 400
Graphics mode	1024 x 768	1024 x 768
Color Scale	Supports up to 256 colors simultaneously	Supports up to 256 colors simultaneously
Brightness and Contrast	Adjustable	Adjustable
Diagonal Size	16.0 in	40.6 cm
Scanning	Non-interlaced	Non-interlaced
Bandwidth	41.0 MHz	41.0 MHz
Horizontal Frequency (Dual-synchronous)	53.5 KHz (31.5 KHz VGA mode)	53.5 KHz (31.5 KHz VGA mode)
Vertical Frequency	66 Hz (70 Hz VGA mode)	66 Hz (70 Hz VGA mode)
Integrated Tilt	5° down, 15° up	5° down, 15° up
Swivel	+ 1° or − 90°	+ 1° or − 90°
Temperature Range: Operating (sea level to 7,000 ft)	50° to 95°F	10° to 35°C
Operating (above 7,000 ft)	50° to 86°F	10° to 30°C
Non-operating	30° to 140°F	0° to 60°C

ADVANCED VIDEO GRAPHICS COLOR MONITOR (continued)

	English	Metric
Relative Humidity (noncondensing): Operating	10% to 90%	10% to 90%
Non-operating	10% to 95%	10% to 95%
Altitude (mean sea level): Operating	12,000 ft	3,658 m
Non-operating	40,000 ft	12,192 m
Dimensions: Height	15.0 in	38.1 cm
Depth	15.5 in	39.4 cm
Width	16.0 in	40.6 cm
Weight	40.0 lb	18.2 kg

ADVANCED GRAPHICS 1024 BOARD

	English	Metric
Operating Modes:	1024 x 768	1024 x 768
	640 x 480	640 x 480
	VGA via VGA pass-through	VGA via VGA pass-through
Color Scale Standard: 1024 x 768	16 out of 16.7 million palette	16 out of 16.7 million palette
640 x 480	256 out of 16.7 million palette	256 out of 16.7 million palette
With Optional Memory Expansion: 1024 x 768	256 out of 16.7 million palette	256 out of 16.7 million palette
640 x 480	256 out of 16.7 million palette	256 out of 16.7 million palette
Standard Memory:	512 Kbytes VRAM	512 Kbytes VRAM
	128 Kbytes DRAM	128 Kbytes DRAM
Optional Memory Expansion	512 Kbytes VRAM for 1 MB total	512 Kbytes VRAM for 1 MB total
Bus Width	16-Bit ISA (8-/16-bit operation)	16-Bit ISA (8-/16-bit operation)
Graphics Coprocessor	TI 34010 (50-MHz)	TI 34010 (50-MHz)
Scan Frequency (horizontal/vertical): 640 x 480	31.5 KHz/60 Hz	31.5 KHz/60 Hz
1024 x 768	53.5 KHz/66 Hz	53.5 KHz/66 Hz
1024 x 768	48.0 KHz/60 Hz	48.0 KHz/60 Hz
VGA	31.5 KHz/60-70Hz	31.5 KHz/60-70Hz
Interface	Analog 15-pin video connector	Analog 15-pin video connector
Environmental Requirements: Temperature (with VCC held between 4.74 and 5.25V)	50° to 104°F	10° to 40°C
Humidity	20% to 80%	20% to 80%
Altitude	– 100 ft to 8,000 ft	– 30 m to 2438 m

COMPAQ VIDEO GRAPHICS COLOR MONITOR

	English	Metric
Type	Analog/Color	Analog/Color
Mounting	External	External
Dot Pitch	.31 mm	.31 mm
Maximum Resolution: Text mode	720 x 400	720 x 400
Graphics mode	640 x 480	640 x 480
Character Display	80 x 25	80 x 25
Color Scale	Up to 256 colors	Up to 256 colors
Brightness	Adjustable	Adjustable
Diagonal Size	14.0 in	35.56 cm
Bandwidth	30.0 MHz	30.0 MHz
Horizontal Frequency	31.5 KHz	31.5 KHz
Vertical Frequency	60.0/70.0 Hz	60.0/70.0 Hz
Dimensions: Height	14.1 in	35.7 cm
Depth	14.6 in	37.0 cm
Width	13.8 in	35.0 cm
Weight	32.0 lb	14.5 kg

COMPAQ VIDEO GRAPHICS MONOCHROME MONITOR

	English	Metric
Type	Analog	Analog
Mounting	External	External
Maximum Resolution Text Mode	720 x 400	720 x 400
Graphics Mode	640 x 480	640 x 480
Character Display	80 x 25	80 x 25
Gray Scale	64 Levels	64 Levels
Brightness	Adjustable	Adjustable
Diagonal Size	12.0 in	30.48 cm
Bandwidth	30.0 MHz	30.0 MHz
Horizontal Frequency	31.5 KHz	31.5 KHz
Vertical Frequency	60.0/70.0 Hz	60.0/70.0 Hz
Dimensions: Height	10.2 in	26.0 cm
Depth	12.6 in	32.1 cm
Width	11.7 in	29.8 cm
Weight	13.0 lb	5.9 kg

COMPAQ DESKPRO 386/33
SYSTEM DESIGN OVERVIEW

Introduction

With the COMPAQ DESKPRO 386/33 Personal Computer, Compaq offers a level of performance and flexibility never before possible in an industry-standard desktop computer. A 33-MHz 386 microprocessor provides exceptional speed and advanced processing features. Enhanced cache memory architecture with 64 Kbytes of dedicated memory increases performance levels even more. Support for a wide range of standard and optional mass storage devices allows system configuration to fit specific data storage needs. These and other features make the COMPAQ DESKPRO 386/33 capable of handling a variety of demanding computing applications and environments.

This overview describes the features responsible for the excellent throughput of the COMPAQ DESKPRO 386/33. The subsystem features that contribute to high performance are examined first:

- CPU/Memory
- Coprocessors
- Fixed Disk Drives
- Video

Next, the overview provides performance evaluations of the COMPAQ DESKPRO 386/33 Personal Computer in several operating environments:

- Specialized application
- Multitasking
- Multiuser

Throughout, the overview evaluates the COMPAQ DESKPRO 386/33 in the context of currently-available comparable systems by means of benchmarks and sample applications tests. A discussion of COMPAQ Flexible Advanced Systems Architecture (Flex Architecture) explains the contribution bus structure makes to performance.

A description of test methodology and a chart of "Tested Hardware Configurations" can be found at the end of the overview.

READING BENCHMARK AND APPLICATION TEST RESULTS

In evaluating results, please keep in mind that:

- if values are given as functions of time, such as in milliseconds (ms), *the lower the value, the better (faster) the performance.*
- if values are given as functions of other units of measure in ratio to time, such as in kilobits per second (Kb/sec) or as indexes, *the higher the value, the better (faster) the performance.*

Subsystem Performance

Application testing demonstrates the subsystem balance and optimization typical of COMPAQ products such as the COMPAQ DESKPRO 386/33 Personal Computer. Since applications vary in structure and purpose, various types of applications exercise a computer's component subsystems in different ways.

For example, applications with memory-resident data, such as spreadsheets, are primarily affected by CPU and memory speed. Databases and similar disk-intensive applications require fast disk throughput to achieve maximum performance. CAD/CAE, engineering, or scientific applications, which involve highly-complex, numerically-intensive operations, require a fast coprocessor subsystem. Sophisticated graphics and modeling applications require high-resolution video capabilities supported by high-speed CPU and memory.

CPU/MEMORY SUBSYSTEM

The 33-MHz 386 microprocessor, with 32-bit processing and advanced cache memory architecture, contributes heavily to the exceptional performance of the COMPAQ DESKPRO 386/33 Personal Computer. This design, combined with Flex Architecture (see "Bus Design" later in this overview), offers full compatibility with existing industry-standard hardware and software as well as the ability to handle new developments in 32-bit technology. High-speed, easily-expandable system memory supports and enhances these features. In CPU-intensive applications, the combination of CPU, cache memory, bus structure, and system memory delivers a 35 percent performance improvement over 25-MHz cache-based 386 personal computers.

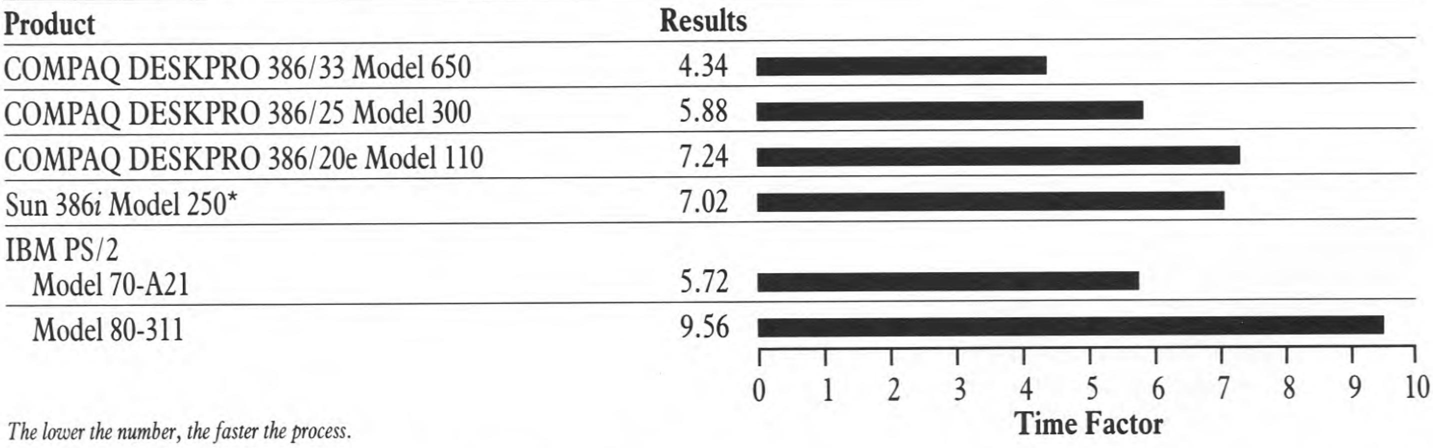
Part of this increase is due to a 32 percent faster CPU (33 MHz/25 MHz = 1.32). Part is due to the Intel 82385 Cache Memory Controller, which stores frequently-used data in its 64 Kbytes of high-speed (25-ns) static RAM, allowing up to 98 percent of all memory accesses to occur with zero wait-states.[1]

System memory for the COMPAQ DESKPRO 386/33 Personal Computer is interleaved high-speed (80-ns) 32-bit Enhanced Paged Memory. Interleaving is a method of memory addressing that permits two 32-bit blocks of memory to be accessed simultaneously rather than in two separate 32-bit block accesses. Enhanced paging permits sequential access to a page of memory. Both features reduce the number of wait states required to process non-cached memory. The result is even faster and more efficient memory/CPU transactions.

The standard 2-Megabyte 32-Bit System Memory Board has connectors for seven optional 2-Megabyte Memory Modules. System memory can be increased in 2-megabyte increments to up to 16 megabytes without using any of the industry-standard expansion slots.

Chart 1, "CPU/Memory Performance Using Lotus 1-2-3," demonstrates the impact of CPU/memory design on application performance. The task performed was the recalculation of a complex business forecast spreadsheet using Lotus 1-2-3, Version 2.01. The results, expressed in increments of time, are shown numerically and in bar graph form. The COMPAQ DESKPRO 386/33 outperformed all other systems, running nearly 62 percent faster than the Sun 386*i* and well over twice as fast as the IBM PS/2 Model 80-311.

Chart 1. *CPU/Memory Performance Using Lotus 1-2-3*



Product	**Results**
COMPAQ DESKPRO 386/33 Model 650	4.34
COMPAQ DESKPRO 386/25 Model 300	5.88
COMPAQ DESKPRO 386/20e Model 110	7.24
Sun 386*i* Model 250*	7.02
IBM PS/2 Model 70-A21	5.72
Model 80-311	9.56

The lower the number, the faster the process.

**Because the standard configuration for the Sun 386i Model 250 includes a 25-MHz 387 coprocessor, this system was tested with coprocessor installed. The other systems were tested without coprocessors.*

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[1] In 286- and 386-based personal computers a minimum of two microprocessor clock cycles is required to complete a memory transaction. Each additional cycle beyond these two is referred to as a "wait-state" and represents a cycle the CPU must wait before the memory transaction is complete. A "zero-wait-state" operation is one in which no additional cycles are required.

COPROCESSOR SUBSYSTEM

The optional 33-MHz Intel 387 and 33-MHz Weitek 3167 Coprocessors bring minicomputer floating-point computation speeds to the COMPAQ DESKPRO 386/33 Personal Computer. Separate sockets permit both coprocessors to be present on the system board at the same time, enabling the user to take advantage of applications written either for the 387 or for the 3167 without having to reconfigure the system.

The industry-standard 387 is the most widely-used coprocessor on 386-based personal computers. A COMPAQ DESKPRO 386/33 equipped with a 33-MHz 387 coprocessor delivers a performance level traditionally associated with specialized engineering and scientific workstations running CAD/CAE or sophisticated business applications.

A COMPAQ DESKPRO 386/33 equipped with a 33-MHz Weitek 3167 handles extremely complex computations and offers personal computer users a whole new class of applications. This configuration executes solids modeling, 3-D CAD, and other floating-point-intensive applications at performance levels comparable to those of minicomputers.

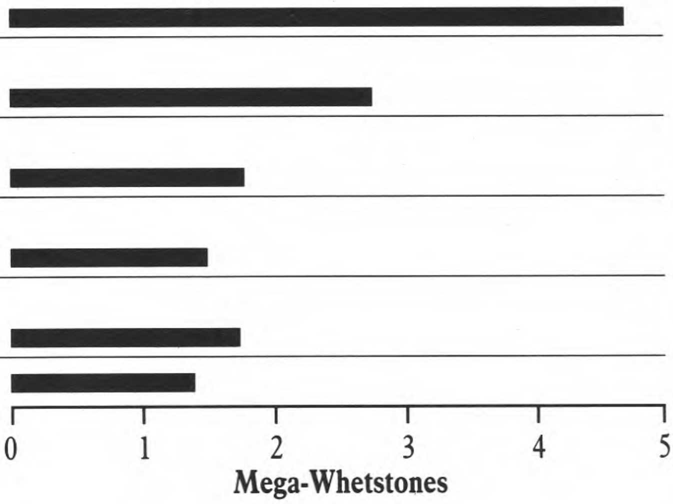
Chart 2, "Whetstone Performance Index," indicates performance with the 387 installed. Benchmark results are presented in units of mega-whetstones. A whetstone is a measurement of the number of floating-point computations that can be completed within a given unit of time. The Whetstone Coprocessor Indexes were run using the form of DOS published by the manufacturer of a tested system.

Also included in Chart 2 is the COMPAQ DESKPRO 386/33 performance with a 33-MHz Weitek 3167 installed. Since applications written for this coprocessor typically involve more intensive floating-point operations than those written for the Intel 387, they require the higher level of performance achieved with this configuration.

Whetstone performance of the 33-MHz 386/387 COMPAQ DESKPRO 386/33 system exceeded the 25-MHz COMPAQ DESKPRO 386/25 by 44 percent, that of the 25-MHz IBM PS/2 Model 70-A21 by 57 percent, and that of the IBM PS/2 20-MHz Model 80-311 by over 96 percent.

Chart 2. *Whetstone Performance Index**

Product	Coprocessor	Index
COMPAQ DESKPRO 386/33 Model 650	33-MHz Weitek	4.70
COMPAQ DESKPRO 386/33 Model 650	33-MHz 387	2.75
COMPAQ DESKPRO 386/25 Model 300	25-MHz 387	1.90
COMPAQ DESKPRO 386/20e Model 110	20-MHz 387	1.50
IBM PS/2 Model 70-A21	25-MHz 387	1.75
Model 80-311	20-MHz 387	1.40



The higher the number, the faster the process.

**The version of MS-DOS on the Sun 386i does not support this Whetstone test; therefore no numbers are available.*

FIXED DISK DRIVE SUBSYSTEM

The COMPAQ DESKPRO 386/33 Personal Computer supports a variety of fixed disk drive configurations and capacities, including installation of two full-height 650-megabyte drives for a total of 1.3 gigabytes of internal storage. Addition of the optional Fixed Disk Expansion Unit can bring the system total to 2.6 gigabytes. To take full advantage of the larger fixed disk drives, both MS-DOS Version 4, as published by Compaq, and MS OS/2 Version 1.1, as published by Compaq, permit logical partitions of up to 2 gigabytes. The Santa Cruz Operation XENIX® (Version 2.3.1 or later) and Interactive Systems UNIX® (386/ix Version 2.0 or greater) operating systems provide equivalent logical partition support.

The standard COMPAQ DESKPRO 386/33 fixed disk drive subsystem includes a high-performance 650-, 320-, or 84-megabyte fixed disk drive, depending on model. All three standard drives offer 1:1 interleave and read-ahead buffered controllers, the 650- and 320-megabyte drives via an ESDI controller, the 84-megabyte drive via an integrated controller. The buffered controller reads data requested by the CPU and anticipates future read requests by continuing to read successive data until the buffer is filled. In many cases, the next CPU request will be for data already stored in the buffer; the controller can then provide the buffered data immediately, significantly reducing the number of fixed disk drive accesses and thus increasing productivity. Both controllers can transfer a full track of data between the disk and buffer in one revolution (1:1 interleave).

The Disk Cache utility provided with every COMPAQ DESKPRO 386/33 complements the buffered controller by holding frequently-used data in system memory and thereby reducing the number of disk-reads required. The combination of data buffering and disk caching provides very high performance, especially in disk-intensive applications such as databases.

To test this subsystem, a series of four operations (copy, sort, index, and replace) on an 11,000-record database under dBASE IV, Version 1.0, was performed. The test was run both with and without disk caching; results are given in Chart 3, "Fixed Disk Drive Performance Using dBase IV (with Cache)," and Chart 4, "Fixed Disk Drive Performance Using dBase IV (without Cache)." Fixed disk drive configurations used in this test are presented in Table 1.

The performance advantage provided by the COMPAQ DESKPRO 386/33 is clearly demonstrated by examining the results shown in Charts 3 and 4. The fastest of all the configurations was the COMPAQ DESKPRO 386/33 with disk caching, which outperformed all other systems with disk caching (Chart 3); it ran nearly 61 percent faster than the Sun 386*i*, over 88 percent faster than the IBM PS/2 Model 70-A21, and more than twice as fast as the IBM PS/2 Model 80-311.

Note that the third-fastest configuration was the COMPAQ DESKPRO 386/33 running *without* disk caching (Chart 4), which outperformed nearly all the remaining systems running with disk caching; it was 27 percent faster than the Sun 386*i* with disk caching and exceeded the IBM PS-2 Models 70-A21 and 80-311 by even higher percentages.

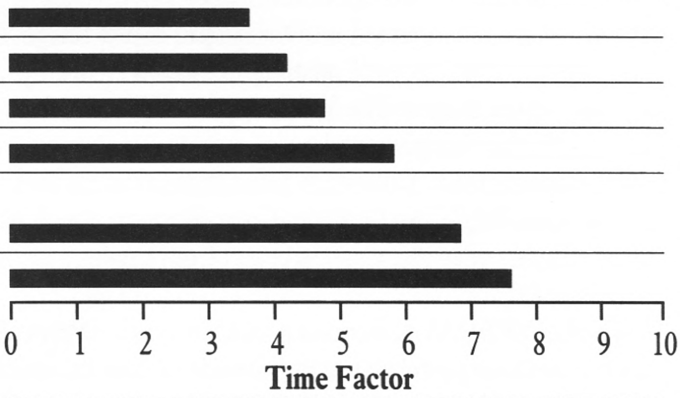
***Table 1.** Fixed Disk Drive Storage Capacity and Performance*

Product	Capacity	Average Access Time	Transfer Rate (Mbit/Sec)	Interleave
COMPAQ DESKPRO 386/33 Model 650	650 MB	< 18 ms	15.0	1:1
COMPAQ DESKPRO 386/25 Model 300	300 MB	< 18 ms	10.0	1:1
COMPAQ DESKPRO 386/20e Model 110	110 MB	< 25 ms	10.0	1:1
Sun 386*i* Model 250	327 MB	16.5 ms	12.0	1:1
IBM PS/2				
Model 70-A21	120 MB	23 ms	10.5	1:1
Model 80-311	314 MB	23 ms	10.0	1:1

The lower a number expressing units of time (such as ms, "Average Access Time"), the faster the process. The higher a number expressing measurement/unit of time (such as Mbit/sec, "Transfer Rate"), the faster the process.

Chart 3. *Fixed Disk Drive Performance Using dBASE IV (with Cache)*

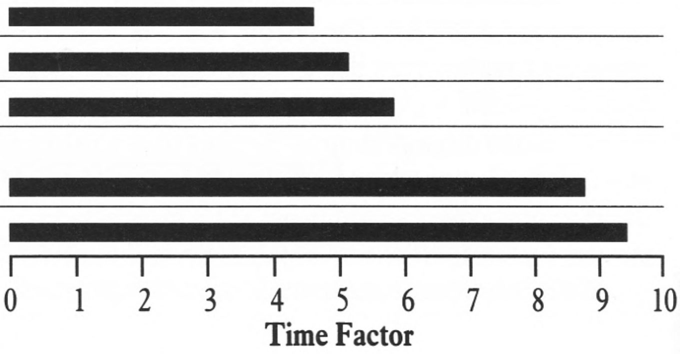
Product	Results
COMPAQ DESKPRO 386/33 Model 650	3.61
COMPAQ DESKPRO 386/25 Model 300	4.22
COMPAQ DESKPRO 386/20e Model 110	4.74
Sun 386*i* Model 250	5.80
IBM PS/2	
Model 70-A21	6.80
Model 80-311	7.57



The lower the number, the faster the process.

Chart 4. *Fixed Disk Drive Performance Using dBASE IV (without Cache*)*

Product	Results
COMPAQ DESKPRO 386/33 Model 650	4.57
COMPAQ DESKPRO 386/25 Model 300	5.12
COMPAQ DESKPRO 386/20e Model 110	5.87
IBM PS/2	
Model 70-A21	8.76
Model 80-311	9.48



The lower the number, the faster the process.

**Disk caching is automatic on the Sun 386i; therefore no numbers are available for that system.*

VIDEO SUBSYSTEM

The COMPAQ DESKPRO 386/33 Personal Computer incorporates the COMPAQ Video Graphics Controller (VGC), which is integrated into the system board design and includes 256 Kbytes of memory dedicated to storing and displaying images. The VGC supports VGA, EGA, CGA, and MDA display modes and monitors without use of an expansion slot. On a VGA-compatible monitor such as the COMPAQ Video Graphics Color Monitor, the VGC allows display of as many as 256 colors from a palette of over 262,000.

The COMPAQ VGC features enhancements that provide up to 50 percent performance improvements over other VGA. The COMPAQ DESKPRO 386/33 optimizes video performance by providing increased BIOS execution speed, a 16-bit data path, and enhanced video memory arbitration to improve text scrolling and graphics speed.

The optional Advanced Graphics System supports applications requiring even more sophisticated display capabilities, such as CAD/CAE. The system, which includes the Advanced Graphics 1024 Board and Advanced Graphics Monitor, permits 1024 x 768 resolution on a 16-inch (diagonal) screen and displays in up to 16 colors from a palette of 16.7 million. A connector on the Advanced Graphics 1024 Board accommodates an additional 512 Kbytes of video memory (optional) to permit display of up to 256 colors out of the palette of 16.7 million. The VGA pass-through feature, standard on the COMPAQ DESKPRO 386/33, allows full compatibility with existing VGA graphics software.

The Advanced Graphics system is designed to maximize CAD application display speed. Typically in these applications the CPU receives vectors and then calculates the pixel location to which they refer and what action should be taken on that pixel. The results are then sent over the I/O bus to the monitor for display. This process is both computation- and I/O-intensive.

In the Advanced Graphics System, much of this computational overhead is offloaded to a dedicated graphics coprocessor (the Graphics System Processor) on the Advanced Graphics 1024 Board. The CPU is freed for other operations, increasing overall system throughput.

A special driver provided with the Advanced Graphics System further improves display response time for users of AutoDesk's popular AutoCAD® package by utilizing "display list" technology. This technology, normally found only on highly-specialized graphics platforms, permits almost instantaneous displays of drawings once they have been generated by AutoCAD.

Other drivers included with the Advanced Graphics System allow applications written to the MS-Windows graphical environment for VGA to run at the 1024 x 768 resolution.

While the individual subsystems in the COMPAQ DESKPRO 386/33 Personal Computer have been optimized to provide outstanding performance levels, their integration into a single system has also been optimized to provide exceptional overall performance.

Overall system performance is best demonstrated through tests examining operation in complex applications and computing environments in which the interaction of subsystems can be evaluated. The COMPAQ DESKPRO 386/33 Personal Computer delivers high performance to these application and computing environments because of its balanced system design.

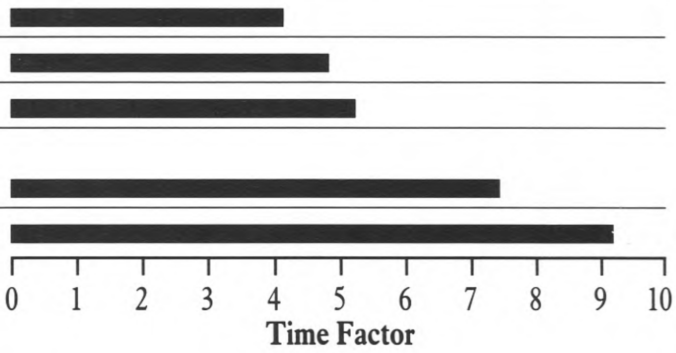
SPECIALIZED APPLICATION

A typical application area for the COMPAQ DESKPRO 386/33 Personal Computer is CAD/CAE. Demonstrating the system's ability to handle such applications is a test involving AutoCAD, the results of which are shown in Chart 5, "System Performance Using AutoCAD Under DOS." This test, a public-domain routine obtained from the San Diego AutoCAD Users' Group, exercises the CPU/memory, coprocessor, fixed disk drive, and video subsystems in handling a number of typical AutoCAD operations. The COMPAQ DESKPRO 386/33 was nearly 79 percent faster than the IBM PS/2 Model 70-A21 and more than twice as fast as the Model 80-311.

All COMPAQ configurations included the optional COMPAQ Advanced Graphics System; the IBM configurations included the optional IBM PS/2 Adapter 8514/A and 8514 Color Display. The DOS used on tested systems was that published by the manufacturer of the system.

***Chart** 5. System Performance Using AutoCAD Under DOS**

Product	Results
COMPAQ DESKPRO 386/33 Model 650	4.14
COMPAQ DESKPRO 386/25 Model 300	4.79
COMPAQ DESKPRO 386/20e Model 110	5.25
IBM PS/2 Model 70-A21	7.39
Model 80-311	9.23



The lower the number, the faster the process.

**This test could not be run on all the systems under comparable operating systems. Since the DOS version accommodated all but one, the Sun 386i, that configuration is not included.*

MULTITASKING

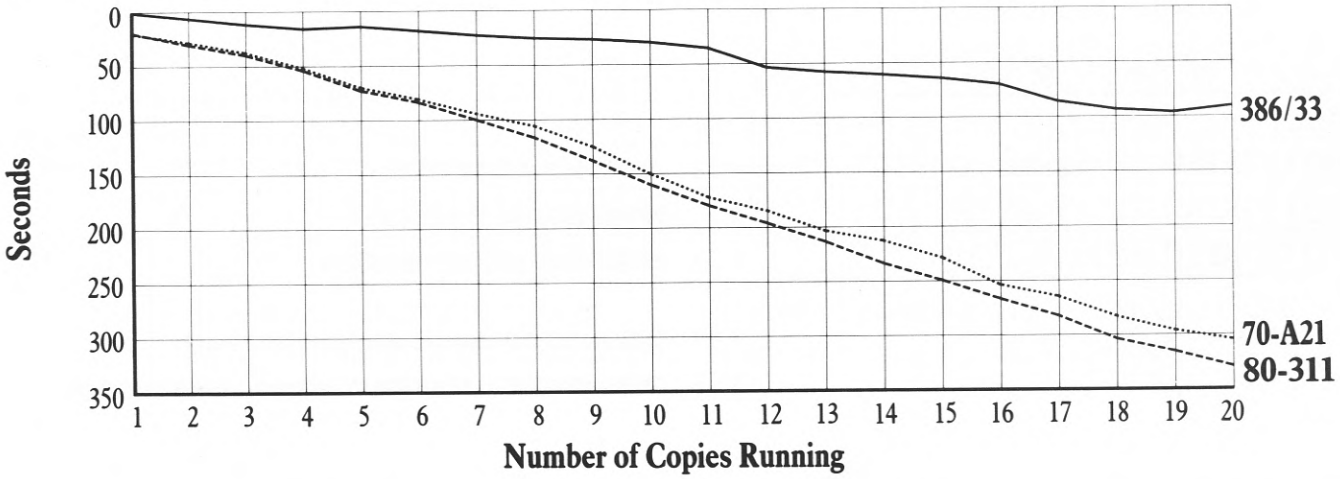
In a multitasking environment, a single user can run two or more tasks simultaneously. The user might be running a communications task in the background, for example, while word-processing a report in the foreground. Performance in a multitasking environment is typically measured by the rate of performance drop-off as more and more tasks are added to the system. The slower the rate of drop-off, the better the system functions in a multitasking environment.

The industry-accepted Neal Nelson & Associates Business Benchmark® has been used for this performance evaluation. The benchmark has 18 different subtests, such as reading from and writing to the fixed disk drive and performing floating point calculations.

Multitasking takes advantage of the high-speed CPU and memory, increased fixed disk drive performance, and excellent overall throughput of the COMPAQ DESKPRO 386/33 Personal Computer. Chart 6 shows the resulting superiority of the COMPAQ DESKPRO 386/33 in a multitasking environment. At fifteen tasks it is running nearly 4 times faster than the IBM PS/2 Models 70-A21 and 80-311.

The COMPAQ DESKPRO 386/33 is running the latest version of MS OS/2 as published by Compaq; the PS/2 systems are running IBM OS/2.

Chart 6. *Business Benchmark for Multitasking Computing (Test 1)*



MULTIUSER

In a multiuser environment, several users are connected to a single system unit, sharing CPU, memory, mass storage, and peripherals. As happens in multitasking as more tasks are added, multiuser computing shows a performance drop-off as more users are added. System performance is indicated by the rate of drop-off, or slowing of the host system. A multiuser environment requires speed and optimized system performance, such as is offered by the COMPAQ DESKPRO 386/33 Personal Computer.

The industry-accepted Neal Nelson & Associates Business Benchmark for multiuser environments has been used for this performance evaluation. The benchmark has 18 different subtests, such as reading from and writing to the fixed disk and performing floating point calculations. Activities within the subtests are intended to replicate "average" activities by "average" users. Multiple users are simulated by running multiple copies of the test simultaneously.

Minicomputers have typically been used as multiuser host systems; therefore, in addition to the IBM PS/2 Model 70-A21 personal computer, the COMPAQ DESKPRO 386/33 was put up against two minicomputers, the DEC VAX 785 and the IBM 9370-60. The specific configurations tested are presented in Table 2. All systems are running under the appropriate type of UNIX®/XENIX®.

The Business Benchmark results in Chart 7 show that the COMPAQ DESKPRO 386/33 establishes its performance edge at about 6 users. By the time 38 users are reached, it is running 23 percent faster than the Model 70-A21 and 58 percent faster than either of the two minicomputers.

***Chart** 7. Business Benchmark for Multiuser Computing (Test 1)*

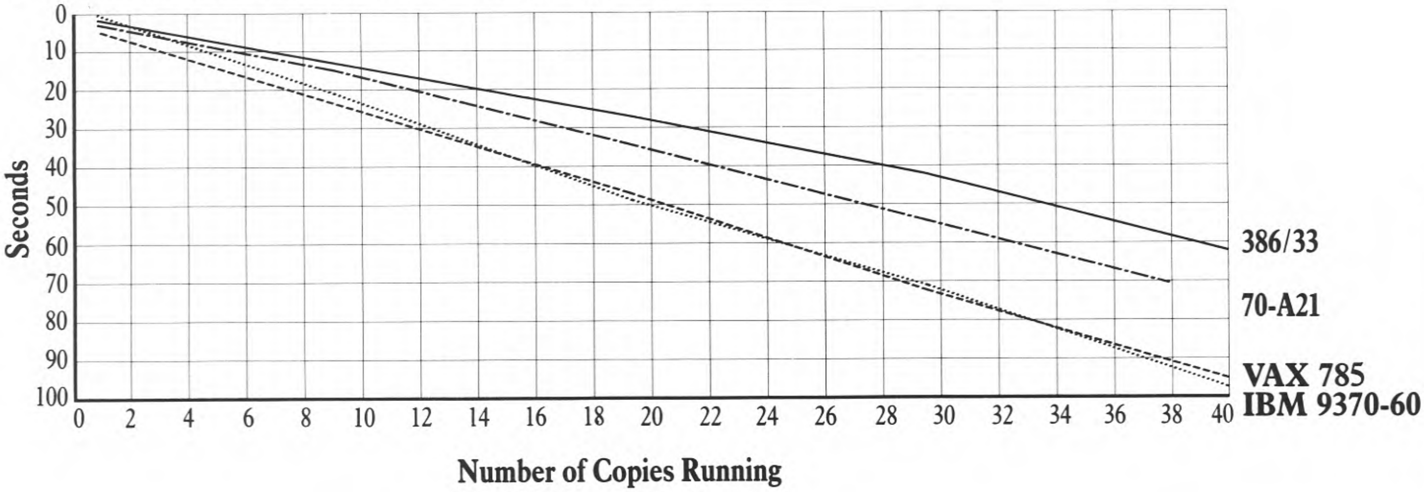


***Table** 2. Configurations Tested in Business Benchmark for Multiuser Computing*

Product	Operating System	Amount of Memory	Fixed Disk Drive Capacity
COMPAQ DESKPRO 386/33 Model 650	SCO XENIX, v. 2.3.1	16 MB	650 MB
IBM PS/2 Model 70-A21	SCO XENIX, v. 2.3.1	16 MB	120 MB
DEC VAX-785	ULTRIX 7.3	16 MB	456 MB
IBM Model 9370-60	UNIX System V	8 MB	824 MB

Bus architecture is the way in which a bus provides appropriate throughput for all the attached system components. The CPU, memory, and I/O peripherals are the active contributors to system performance, with the bus providing support. Think of a bus as a road; it should be as clear and well-designed as possible, in order to permit traffic to flow quickly and freely, but it cannot actively affect the speed of that traffic. In other words, bus architecture can only be a limiter of system throughput, not an enhancer; the CPU and peripherals (especially the fixed disk drive subsystem) are the primary determinants of system performance. As long as the bus architecture does not create a bottleneck for these critical subsystems, it is essentially a neutral factor in overall system performance.

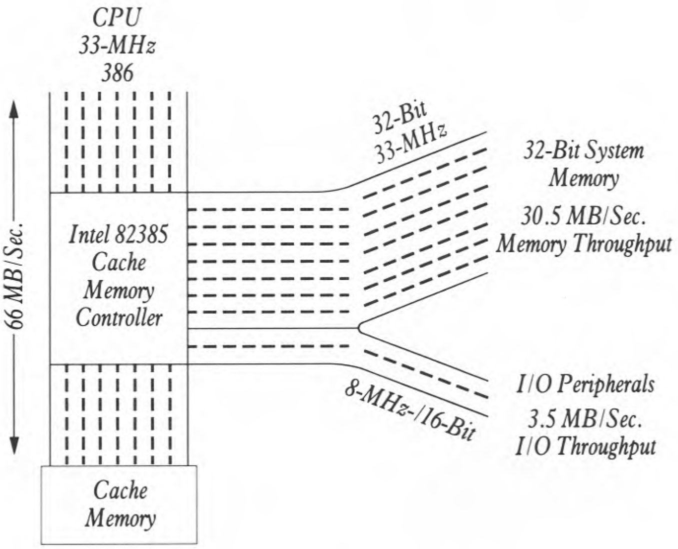
Providing maximum throughput to the COMPAQ DESKPRO 386/33 Personal Computer is COMPAQ Flexible Advanced Systems Architecture, originally introduced on the COMPAQ DESKPRO 386/20. This design combines an advanced memory caching system with concurrent buses for memory and peripherals.

For optimum system performance, data transfers between system memory and the 386 microprocessor must occur so rapidly that the 386 almost never waits to receive data from system memory. Cache memory design incorporating the Intel 82385 cache memory controller and its 64 Kbytes of dedicated memory satisfies this need for rapid data transfer; on the COMPAQ DESKPRO 386/33, up to 98 percent of all memory requests from the microprocessor are filled from cache memory and thus are satisfied at zero wait-states.

The concurrent bus structure of COMPAQ products allows independent memory and peripheral bus speeds. Memory accesses, which typically make up 90 percent of data traffic, occur at the CPU clock rate—in the case of the COMPAQ DESKPRO 386/33, at 33 MHz. The peripheral bus operates at the industry-standard clock rate of 8 MHz.

This design also permits certain activities to occur on the concurrent bus at the same time that a CPU is accessing cache memory. For example, while the CPU is accessing cache memory during a database operation, data can be transferred over a LAN from another computer and stored in system memory for later use.

Thus COMPAQ Flex Architecture permits even greater utilization of the high speed and high-performance features of the COMPAQ DESKPRO 386/33 while maintaining full compatibility with industry-standard boards and peripherals.



COMPAQ Flexible Advanced Systems Architecture on the COMPAQ DESKPRO 386/33

Providing meaningful test results requires that careful consideration be given to choosing equivalent products for comparison and to using relevant benchmarks and application and environment tests. Since the COMPAQ DESKPRO 386/33 Personal Computer is designed for advanced business computing, it was compared in this System Performance Overview to three 386-based personal computers, two from the IBM Corporation and one from Sun Microsystems, as well as to two additional COMPAQ 386-based personal computers.

The hardware configurations tested, all of which are available to the user, are listed in the table below, "Tested Hardware Configurations." Any variations are indicated in the discussion of the specific test.

In all subsystem tests, COMPAQ products were running under MS-DOS, as published by Compaq, while all IBM products were running under PC-DOS, as published by IBM. The Sun 386*i* was running SunOS, its proprietary UNIX-based operating system, with integrated MS-DOS 3.3.

In certain highly-specialized computing environment tests, other operating systems or hardware configurations typically used in those environments were used to provide a reasonable survey of that market segment. All hardware configurations used in such tests are also available to the user and are indicated as part of the specific test section.

Table 3: *Tested Configurations*

Product	**Microprocessor/ Coprocessor**	**Memory**	**Fixed Disk Drive**	**Video**	**Monitor**
COMPAQ DESKPRO 386/33 Model 650	33-MHz 386/387	4 MB	650 MB	VGA	COMPAQ Color Monitor
COMPAQ DESKPRO 386/25 Model 300	25-MHz 386/387	4 MB	300 MB	VGA	COMPAQ Color Monitor
COMPAQ DESKPRO 386/20e Model 110	20-MHz 386/387	4 MB	110 MB	VGA	COMPAQ Color Monitor
Sun 386*i* Model 250	25-MHz 386/387	8 MB	327 MB	MGA/VGA	Sun Color Monitor
IBM PS/2 Model 70-A21	25-MHz 386/387	4 MB	120 MB	VGA	IBM Color Monitor
Model 80-311	20-MHz 386/387	4 MB	314 MB	VGA	IBM Color

Q: *What is interleaved memory?*

A: Interleaved memory permits simultaneous access to memory in double 32-bit blocks. This approach allows the system to access memory more quickly and more efficiently, thereby decreasing processing time.

Q: *What is disk interleaving?*

A: The number of fixed disk drive revolutions required to read or write one complete track of data. For example, a 3:1 interleave requires three complete disk revolutions to read or write an entire track of data; a 1:1 interleave requires only one complete disk revolution to read or write an entire track of data. The lower the ratio, the faster the read/write operation.

Q: *What type of peripherals and expansion boards can I use in the COMPAQ DESKPRO 386/33?*

A: The COMPAQ DESKPRO 386/33 has standard interfaces for industry-standard parallel and asynchronous communications devices and for a pointing device such as a mouse, as well as a standard connector on Models 650 and 320 for the Fixed Disk Expansion Unit. Six industry-standard expansion slots are available to accept a wide variety of expansion options, from modems to networking to micro-to-mainframe communications.

Q: *Why does the COMPAQ DESKPRO 386/33 have a new form factor?*

A: The new form factor combines increased mass storage and expansion board capacities with an updated appearance.

Q: *What is Extended Industry Standard Architecture (EISA)? What benefits does it provide?*

A: EISA is a 32-bit extension to the industry standard I/O bus that is compatible with boards for the industry standard architecture. EISA is a broadly-supported architecture that is open to all developers.

EISA exceeds today's peripheral requirements, but future high-performance peripherals will require EISA's capacity in order to deliver a new class of personal computer applications, such as departmental computing, for environments requiring simultaneous operation of multiple high-performance peripherals.

Q: *Does the COMPAQ DESKPRO 386/33 Personal Computer have Extended Industry Standard Architecture (EISA) slots?*

A: No. The Flex Architecture used in the COMPAQ DESKPRO 386/33 provides the performance required by sophisticated stand-alone applications. The COMPAQ DESKPRO 386/33 system with VGA, a 650-megabyte fixed disk drive, a LAN card, and a modem utilizes less than half of the processing capacity of the industry-standard expansion bus, even when all of the system components access the bus simultaneously. The remaining capacity is available for use with additional or higher-performance devices. In the future, personal computers with EISA slots will serve even more demanding applications, such as departmental computing. For individual users, the need for EISA is still several years away.

Q: *Does the COMPAQ DESKPRO 386/33 have what the industry is calling Shadow RAM?*

A: Yes, video and system ROM BIOS are copied into high-speed 32-bit system memory using a technique pioneered by Compaq to maximize system performance on the COMPAQ DESKPRO 386.

Q: *Are any Unix/Xenix operating systems supported on the COMPAQ DESKPRO 386/33?*

A: Yes, both The Santa Cruz Operation XENIX (Version 2.3.1 or later) and Interactive Systems UNIX 386/ix (Version 2.0 or greater) operating systems support features of the COMPAQ DESKPRO 386/33, including support for up to four 650-megabyte fixed disk drives.

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