

## Workstation PC 98

This chapter provides a summary of the key requirements for workstations designed as PC 98 systems. If there is a conflict with requirements or recommendations made elsewhere in this guide, the items in this chapter have precedence for workstations. Unless a specific requirement or exception is defined in this chapter, the requirements defined in the “Basic PC 98” chapter apply for workstations.

**Important:** The system requirements defined in this chapter provide guidelines for designing PC systems that will result in the optimal user experience with typical Windows-based applications running under the Microsoft Windows NT Workstation operating system only. These design requirements are not basic system requirements for running the Windows NT operating system.

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## Workstation Platform Guidelines

The goal of this chapter is to describe requirements that define a workstation that is optimized to run Windows NT Workstation and to support Win32-based applications created for the workstation. The workstation is a platform for users whose principal computing tasks involve running mission-critical networked applications, engineering or scientific applications, media-authoring tools, or software-development tools.

Although Windows NT Workstation is used on stand-alone systems, the PC 98 requirements support the more common use of Windows NT Workstation as a platform for network productivity.

The key design issues for PC 98 workstations include processor, memory, and bus architecture requirements to support intensive computational activities.

### 1. Workstation meets all requirements for Office PC 98

*Required*

Each Basic PC 98 component indicated as a requirement for Office PC 98 is also a requirement for PC 98 workstations.

**Note:** Systems designed to run only on Windows NT are not required to meet PC 98 requirements for legacy Plug and Play support. If the system is designed to run either Windows 98 or Windows NT, it must meet all PC 98 requirements for legacy Plug and Play support.

### 2. Workstation meets requirements for optimal performance

*Required*

In addition to the basic PC 98 minimum requirements, the following items are required for optimal workstation performance:

- Pentium Pro or Pentium II processor, RISC-based processor, or equivalent performance.
- 64-MB RAM.  
For multiprocessor systems, 64 MB minimum is required for each processor.
- Minimum 512K L2 cache (per processor for multiple processors).

### 3. Workstation supports multiple processors

*Recommended*

Multiprocessor support using Intel Architecture processors must comply with *MultiProcessor Specification, Version 1.4* or higher, from Intel Corporation.

If multiprocessor support is provided, each processor must have a separate L2 cache.

**4. Workstation RAM can be expanded***Recommended*

Workstation RAM should be capable of being expanded to at least 1 GB.

**5. Workstation system memory includes ECC memory protection***Required*

The system memory and L2 cache must be protected with Error Correction Code (ECC) memory protection. The ECC must be able to detect a double-bit error in one word and to correct a single-bit error in one word, where “word” means the base width in bits of the memory subsystem. To detect the failure of a single DRAM device, the ECC should be capable of detecting a 4-bit or 8-bit error in one word, with detection of 4-bit errors preferred. An error that cannot be corrected must result in a system fault.

**6. Workstation includes APIC support***Required*

The workstation must include APIC support, implemented as defined in the APIC extension to the ACPI 1.0 specification. Features such as targeted interrupts, broadcast interrupts, and prior-owner interrupts must be supported. Intel Architecture processor implementations can use the Intel APIC component.

**7. Workstation includes high-performance components***Recommended*

Basic PC 98 requirements support high-performance components for workstations, such as bus mastering for I/O and storage and write combining for Pentium Pro and Pentium II processors. In addition, the PC 98 recommendation for ensuring that drivers are tuned for 32-bit performance is especially recommended for workstations.

**8. Workstation supports 64-bit I/O bus architecture***Recommended*

For PCI, the workstation should support the 64-bit physical address space, and PCI adapters should be able to address any location in that address space.

**9. Workstation does not include ISA expansion slots***Recommended*

It is strongly recommended that workstations not include ISA expansion slots. ISA devices cannot meet the high-performance requirements for workstation systems, resulting in a performance bottleneck.

## 10. Graphics subsystem supports workstation performance demands

*Required*

This requirement is for workstations designed to support high-resolution graphics applications. A workstation does not have to meet this requirement if it is designed for financial or transaction-based markets and is not intended to support graphics-intensive applications.

For a workstation PC that is intended to support graphics-intensive applications the following PC 98 support must be provided:

- For Pentium Pro and Pentium II or compatible processors, 4 MB of display RAM and support for write-combining optimizations under Windows NT.
- Support for 3-D hardware acceleration with DirectX support or OpenGL acceleration.

Direct3D hardware designed to support OpenGL-based applications must be capable of meeting the OpenGL rasterization rules. Direct3D drivers must report through the appropriate capabilities bit whether or not the hardware actually conforms to OpenGL requirements.

For information about 3-D hardware acceleration supported by Direct3D, see the “Graphics Adapters” chapter in Part 4 of this guide. For information about OpenGL rasterization requirements and conformance rules, see the web site at <http://www.sgi.com/technology/opengl/arb.html>.

For workstation systems intended for use with computer-aided design (CAD) or other high-performance graphical applications, 1280 × 1024 × 24 bpp resolution is recommended. Hardware that implements 32-bpp display modes (for example, display hardware for high-end engineering workstations) should implement RGB-mode rasterization.

## 11. Workstation meets PC 98 DVD-Video and MPEG-2 playback requirements

*Required, with DVD-Video*

Support for DVD-Video playback is required for a workstation only if the workstation supports playback on DVD-Video devices.

If the workstation does include a DVD-Video device, then the system must support MPEG-2 and DVD-Video playback as described in the “Graphics Adapters” and “Video and Broadcast Components” chapters in Part 4 of this guide.

**12. Storage components rely on SCSI controller***Recommended*

SCSI is a flexible I/O bus that supports good performance for access and throughput to meet a workstation's intensive data transfer needs. For more information about related requirements, see the "SCSI" chapter in Part 3 of this guide.

**13. Workstation includes multiple hard drives***Recommended*

Recommended: Hardware acceleration of RAID (redundant array of inexpensive disks) drives.

Multiple hard drives can be incorporated for improved performance (multiple spindle access and striping with RAID 0) or for data integrity (RAID 1/5).

## Workstation PC 98 References

The following represents some of the references, services, and tools available to help build hardware that is optimized to work with Windows operating systems.

*Advanced Configuration and Power Interface Specification, Revision 1.0*

<http://www.teleport.com/~acpi/>

Intel hardware developer site

<http://developer.intel.com>

*MultiProcessor Specification, Version 1.4*

Intel part number: 242016-002

<http://developer.intel.com>

OpenGL conformance rules from the OpenGL Architectural Review Board

<http://www.sgi.com/technology/opengl/arb.html>

UseNet news group for OpenGL at [comp.graphics.opengl](mailto:comp.graphics.opengl)

Windows NT DDK

MSDN Professional membership

## Checklist for Workstation PC 98

If a recommended feature is implemented, it must meet the PC 98 requirements for that feature as defined in this document.

1. Workstation meets all requirements for Office PC 98  
*Required*
2. Workstation meets requirements for optimal performance  
*Required*
3. Workstation supports multiple processors  
*Recommended*
4. Workstation RAM can be expanded  
*Recommended*
5. Workstation system memory includes ECC memory protection  
*Required*
6. Workstation includes APIC support  
*Required*
7. Workstation includes high-performance components  
*Recommended*
8. Workstation supports 64-bit I/O bus architecture  
*Recommended*
9. Workstation does not include ISA expansion slots  
*Recommended*
10. Graphics subsystem supports workstation performance demands  
*Required*
11. Workstation meets PC 98 DVD-Video and MPEG-2 playback requirements  
*Required, with DVD-Video*
12. Storage components rely on SCSI controller  
*Recommended*
13. Workstation includes multiple hard drives  
*Recommended*