
Chapter 4 Workstation

IMPORTANT: The requirements in this guide provide instructions for designing PC systems that will result in an optimal user experience with typical Windows-based applications running under either the Microsoft Windows Millennium Edition or Windows 2000 Professional or later operating systems. These design requirements are not the basic system requirements for running any version of Windows operating systems.

Workstation PC 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. While there is not a set of differentiating characteristics that define a workstation PC, this chapter provides the relevant requirements for workstations designed as PC 2001 systems. As defined herein, a workstation is optimized to run Windows 2000 and future versions of the Windows 2000 client operating system. The defined platform also supports Win32-based and Win64™-based applications.

All PC 2001 system and component requirements also apply to workstations unless this chapter provides redefinition or extension of a specific requirement if implemented in workstations.

Workstation System Design Requirements

This section summarizes the additional design requirements and exceptions for workstation PC 2001 systems.

WORK-0051. Workstation system components meet minimum performance requirements

Minimum Workstation PC 2001 system component requirements include the following.

- **WORK-0051.1. System CPU speed is 700 MHz, minimum.**
- **WORK-0051.2. System has 256 KB of cache per processor, minimum, present and enabled.**
- **WORK-0051.3. System memory is 128 MB RAM, minimum.**
- **WORK-0051.4. RAM must be capable of expansion to 2 GB, minimum.**

WORK-0052. If implemented as a multiple processor system, the system must meet PC 2001 requirements

Workstations implementing multiple processors must meet the following requirements.

- **WORK-0052.1. The system must employ those processors symmetrically.**
- **WORK-0052.2. Each processor must have a separate cache.**
- **WORK-0052.3. The system memory and external processor cache are protected with ECC memory protection.** See SYS-0054, “If implemented, system memory includes ECC memory protection” in Chapter 3.
- **WORK-0052.4. The system must comply with the ACPI 1.0b specification.** Windows NT 4.0 was the last Windows operating system to use the *MultiProcessor Specification, Version 1.4* (MPS 1.4). MPS 1.4 is a requirement for multiprocessor platforms running Windows NT 4.0.

WORK-0055. If implemented as a 64-bit system, PCI bus, bridges, and adapters support DAC command

On 64-bit workstation platforms that provide support for more than 4 GB of system memory, all PCI adapters, including 32-bit PCI adapters, must function properly in the system. In addition, certain classes of adapters, such as those on the primary data path where the majority of network and storage I/O occurs, must also address the full physical address space of the platform. For 32-bit PCI adapters on the primary data path, this means that the adapter must be able to support the PCI Dual Address Cycle (DAC) command. Note that 10/100 Ethernet adapters and embedded devices do not need to support DAC; however, 10/100 Ethernet adapters and embedded devices must still function properly in those systems even if they do not implement DAC support.

Additionally, all 32-bit PCI buses, host bridges, and PCI-to-PCI bridges must also support DAC.

On 64-bit platforms, all PCI bridges on the system board must support DAC for inbound access, and DAC-capable devices must not be connected below non-DAC capable bridges, on adapter cards, for example. New 64-bit adapters should be DAC capable. This DAC requirement does not apply to outbound accesses to PCI devices; however, for systems where DAC is not supported on outbound accesses to PCI devices, the system BIOS must not claim that the bus aperture can be placed above the 4 GB boundary.

System designers must address special considerations when using legacy devices, adapters, and bridges in systems that provide support for more than 4 GB of memory. For information on Windows 2000 behavior when a non-DAC capable bus is detected on a system that supports more than 4 GB of memory, see the PAE Server Design Web page, listed in “Workstation References.”

WORK-0056. Workstation supports 64-bit I/O bus architecture if system includes 64-bit processors

A 64-bit PCI adapter must address any location in the address space supported by the platform.

The workstation must support a 64-bit PCI bus if the workstation has 64-bit processors or has the capability to support greater than 4 GB of physical memory.

SYS-0058. For 64-bit platforms, each device and driver meets PC 2001 device requirements

For workstations implementing a 64-bit platform, each device included within the workstation must have 64-bit Windows 2000 compatible drivers.

WORK-0059. Graphics subsystem supports workstation performance demands

The graphics-intensive application requirements for hardware often exceed the hardware capabilities of the graphics subsystem.

- **WORK-0059.1. Workstation screen resolution meets minimum requirements.** For workstations, minimum graphics resolution is $1280 \times 1024 \times 32$ bpp, double buffered in 2-D mode with a 32-bit Z-buffer (defined as 24-bit Z with 8-bit stencil) in 3-D mode.
- **WORK-0059.4. If implemented, an AGP Pro Bus follows the AGP Pro 1.1 Specification, Revision 1.1a.**

WORK-0060. If implemented, multiple hard-drive system meets workstation PC 2001 performance requirements

When implementing a workstation storage subsystem capable of supporting multiple hard drives, the hard drives must either be allocated independent ATA Ultra/66 I/O channels (one channel per physical storage device) or may be grouped and interconnected using SCSI interfaces. This requirement ensures workstation data throughput while allowing less costly ATA interfaces on systems that require only a few drives.

If implementing a RAID drive storage subsystem, these arrays can be configured as:

- RAID 0: Improve performance (multiple spindle access and striping).
- RAID 1: Data mirroring on parallel drives.
- RAID 5: For data integrity using distributed data and cyclic redundancy checks (CRCs).

For all related requirements for storage, see Chapter 12, “Storage.”

PCIX–0129. If the workstation implements PCI-X, system and components comply with PCI-X 1.0

All cards, bridges, and devices that use PCI-X (a proposed extension to PCI) must meet the requirements defined in *PCI-X Specification, Revision 1.0*, listed in “Workstation References.”

Workstation References

Following are the references, services, and tools cited in this chapter that are available to help build hardware that works optimally with Windows operating systems.

Advanced Configuration and Power Interface Specification, Revision 1.0b

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

AGP Pro Specification, Revision 1.1a

http://www.agpforum.org/downloads/apro_r10.pdf

PAE Server Design

<http://www.microsoft.com/hwdev/pae/>

PCI-X Specification, Revision 1.0

<http://www.pcisig.com/>

Checklist for Workstation

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