PC 99 System Design Guide

A Technical Reference for Designing PCs and Peripherals for the Microsoft® Windows® Family of Operating Systems

With Clarifications and Corrections from

PC 99 Addendum

Intel Corporation and Microsoft Corporation

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

The information contained in this document represents the current view of Intel Corporation and Microsoft Corporation on the issues discussed as of the date of publication. Because Intel and Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Intel and Microsoft, and Intel and Microsoft cannot guarantee the accuracy of any information presented. This document is for informational purposes only. INTEL AND MICROSOFT MAKE NO WARRANTIES, EXPRESSED OR IMPLIED, IN THIS DOCUMENT.

Intel Corporation and Microsoft Corporation may have patents or pending patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. The furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property rights.

Intel and Microsoft do not make any representation or warranty regarding specifications in this document or any product or item developed based on these specifications. Intel and Microsoft disclaim all expressed and implied warranties, including but not limited to the implied warranties of merchantability, fitness for a particular purpose, and freedom from infringement. Without limiting the generality of the foregoing, Intel and Microsoft do not make any warranty of any kind that any item developed based on these specifications, or any portion of a specification, will not infringe any copyright, patent, trade secret, or other intellectual property right of any person or entity in any country. It is your responsibility to seek licenses for such intellectual property rights where appropriate. Intel and Microsoft shall not be liable for any damages arising out of or in connection with the use of these specifications, including liability for lost profit, business interruption, or any other damages whatsoever.

Active Desktop, BackOffice, Direct3D, DirectDraw, DirectInput, DirectMusic, DirectPlay, DirectShow, DirectSound, DirectX, Microsoft, Microsoft Press, MS-DOS, NetShow, WebTV, Win32, Windows, Windows NT, and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Indeo, Intel, and Pentium are registered trademarks of Intel Corporation.

Other product and company names herein may be the trademarks of their respective owners.

© 1998–1999 Intel Corporation and Microsoft Corporation. All rights reserved.

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Contents

Welcome ..... **xi**

Part 1 System Design Issues

Chapter 1 PC 99 Design Issues **2**

Chapter 2 PC 99 Design Initiatives **14**

Part 2 PC 99 Systems

Chapter 3 PC 99 Basic Requirements **35**

PC 99 General System Requirements
PC 99 Physical Design Requirements
PC 99 General Device Requirements
PC 99 Buses and Devices
Manageability Component Instrumentation Requirements
PC 99 System References
Checklist for PC 99 Basic Requirements

Chapter 4 Workstation PC 99 ..... **79**

Workstation Design Requirements
Workstation PC 99 References
Checklist for Workstation PC 99

Chapter 5 Entertainment PC 99 ..... **85**

Entertainment PC System Requirements
Entertainment PC Audio Requirements
Entertainment PC Graphics Components
Entertainment PC Video and Broadcast Components
Entertainment PC 99 References
Checklist for Entertainment PC 99

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Chapter 6 Mobile PC 99 92
Mobile PC System Design Requirements
Mobile PC Graphics Requirements
Docking Station Requirements
Mini-notebook Guidelines
Mobile PC 99 References
Checklist for Mobile PC 99

Part 3 PC 99 Bus Design Guidelines

Chapter 7 USB 120
USB Basic Requirements
USB Host Controller Requirements
USB Hub Requirements
USB Power Management
Design Features for USB Peripherals
USB References
Checklist for USB

Chapter 8 IEEE 1394 126
IEEE 1394 Basic Requirements
Requirements for IEEE 1394 Devices
Plug and Play for IEEE 1394
Power Management for IEEE 1394 Devices
IEEE 1394 References
Checklist for IEEE 1394

Chapter 9 PCI 145
PCI Basic Requirements
PCI Controller Requirements
Plug and Play for PCI Controllers and Peripherals
Power Management for PCI Controllers and Peripherals
PCI References
Checklist for PCI

Chapter 10 ATA and ATAPI 157
ATA Controller Requirements
ATAPI Peripheral General Requirements
Plug and Play for ATA Controllers and Peripherals
Power Management for ATA Devices
ATA and ATAPI References
Checklist for ATA and ATAPI

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Chapter 11 SCSI 166
SCSI Host Adapter Requirements
SCSI Peripheral Requirements
Plug and Play for SCSI Host Adapters and Peripherals
Power Management for SCSI Devices
SCSI References
Checklist for SCSI

Chapter 12 PC Card 176
PC Card Basic Requirements
PC Card Socket Controller Requirements
Plug and Play Design for 16-bit PC Card Cards
Plug and Play Design for CardBus
PC 99 Requirements for PC Card
PC Card References
Checklist for PC Card

Part 4 Device Design Guidelines

Chapter 13 I/O Ports and Devices 193
System Requirements for I/O Ports and Devices
Serial Port Requirements
Parallel Port Requirements
Mouse Port and Peripheral Requirements
Keyboard Port and Peripheral Requirements
Game Controller Requirements
Wireless Component Requirements
Smart Card Requirements
PC 99 Design Features for Ports
References for I/O Ports and Devices
Checklist for I/O Ports and Devices

Chapter 14 Graphics Adapters 219
System Requirements for Graphics Adapters
Graphics Adapters Basic Features
PC 99 Design for Graphics Adapters
Graphics Adapters References
Checklist for Graphics Adapters

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Chapter 15 Video and Broadcast Components 253
System Requirements for Video and Broadcast Components
Basic Features for Video and Broadcast Components
MPEG-2 Video Playback Requirements
DVD-Video Playback Requirements
Video Input and Capture Requirements
Analog TV Tuner/Decoder and VBI Capture Requirements
Digital Broadcast TV Requirements
PC 99 Design for Video and Broadcast Components
Video and Broadcast Component References
Checklist for Video and Broadcast Components

Chapter 16 Monitors 282
Monitor Basic Features
Desktop Monitor Requirements
Entertainment Monitor Requirements
Plug and Play Design for Monitors
Power Management for Monitors
Monitors References
Checklist for Monitors

Chapter 17 Audio Components 292
Basic Audio Requirements
Advanced Audio Recommendations
PC 99 Design for Audio
Audio References
Checklist for Audio Components

Chapter 18 Storage and Related Peripherals 310
Storage Controller and Peripherals Basic Features
Floppy Disk Controller and Drive
Hard Disk Drives
CD Devices
Rewritable Optical ATAPI Devices
DVD Devices
PC 99 Design for Storage Components
Storage References and Resources
Checklist for Storage and Related Peripherals

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Chapter 19 Modems 330
System Requirements for Modems
Modem Basic Features
Basic Modem Performance
Driver-based Modem Guidelines
PC 99 Design for Modems
Modem References
Checklist for Modems

Chapter 20 Network Communications 355
System Requirements for Network Communications
Network Adapter Requirements
ISDN Requirements
Cable Modem Requirements
ATM Adapter Requirements
ADSL Requirements
IrDA Requirements for Network Communications
Home Networking Requirements
PC 99 Design for Network Communications
Network Communications References
Checklist for Network Communications

Chapter 21 Printers 383
Basic Printer Features
PC 99 Printer Design
Printer References
Checklist for Printers

Chapter 22 Digital Still Image Peripherals 392
Digital Still Image Devices Basic Features
PC 99 Design for Digital Still Image Devices
Digital Still Image Device References
Checklist for Digital Still Image Devices

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.

Appendixes

Appendix A Icons 404

Appendix B Device Identifiers 406

Plug and Play Vendor and Device IDs
Generic Windows Device IDs

Appendix C Accessibility 421

Introduction
Visual Displays and Indicators
Sound
Manipulation and Physical Design
Input and Controls
Labeling
Documentation
Accessibility Recommendations for PC Design
Accessibility for PC Card
Accessibility Guidelines for Input Components
Accessibility Guidelines for Display Monitors
Accessibility Guidelines for Audio Components
Accessibility Guidelines for Storage Devices
Accessibility Guidelines for Printers
Accessibility References and Resources

Appendix D Legacy Support 447

Fixed ISA Interrupts
Legacy ISA DMA Assignments
Legacy ISA I/O Address Assignments
Plug and Play ISA System Requirements
Plug and Play ISA Device Requirements

Appendix E PC 99 Master Checklist 457

Glossary 491

Index 508

©1997-1999 Intel Corporation and Microsoft Corporation. All rights reserved.