# Chapter 15 Printers

> **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.

This chapter presents the PC 2001 requirements for printers. The goal of the PC 2001 requirements for printers is to provide the following:

- A true Plug and Play experience for users, using non-legacy interfaces
- High-quality color matching between display and color output devices
- Well-behaved driver and component installation

Unless this chapter defines a specific requirement or exception, all requirements for printers apply as presented in Chapter 3, "PC System," and Chapter 6, "Buses and Interfaces."

## Basic Printer Requirements

This section summarizes the basic PC 2001 hardware requirements for printers.

### PRNT–0294. Device uses USB, IEEE 1394, or network interface port connection

PC 2001 requires the use of a USB, IEEE 1394, or network interface port connection for printers. No proprietary solutions are acceptable; however, other legacy port connections may be present on the device.

USB printers must conform to *Universal Serial Bus Device Class Definition for Printing Devices, Version 1.1*.

Network printers must meet the requirements in Chapter 14, "Network Communications."

If an IEEE 1284, serial, or IR port connection is included on the printer, that connection must meet the requirements defined in *Legacy Plug and Play Guidelines*, which contains the requirements for these connections as defined in earlier versions of the system design guide.

**PRNT–0295. Network printer supports standard port monitor**

Network-connected printers must support TCP/IP standards for Line Printer Remote (LPR) and Line Printer Daemon (LPD) (RFC 1179), Port 9100 printing (raw mode printing), or both types.

**PRNT–0296. Device with IEEE 1284.4 capabilities complies with specification**

If any device provides IEEE 1284.4 capabilities, the device must comply with the IEEE 1284.4 specification.

**PRNT–0297. MFP devices correctly implement multifunction support**

If a device—commonly referred to as a multifunction printer (MFP)—contains more than print-only capabilities, then driver support, INF file requirements, device ID, resource allocation, and other Plug and Play capabilities for all functions in the device comply with the requirements defined in *Multifunction Print Device Design Guidelines* for compatibility with Windows operating systems. This paper is listed in "Printers References."

# Device Drivers and Installation for Printers

This section summarizes device driver requirements for printers. The items in this section are requirements for all PC 2001 systems.

**PRNT–0298. Printer INF file and installation meet PC 2001 requirements**

The manufacturer must provide a printer INF file that installs all printer device components. The manufacturer does not need to supply a printer INF file if a standard printer INF file provided with the operating system can be used.

INF file requirements for MFPs are defined in requirement PRNT–0297, "MFP devices correctly implement multifunction support."

If the manufacturer provides an INF file, it must be complete and free of errors. This INF file must comply with the printer-specific extensions listed in the Windows 98 DDK and Windows 2000 DDK and requirement SYS–0025, "Each device, device driver, and installation of either device or driver meet PC 2001 requirements," in Chapter 3.

Plug and Play IDs must be specific, and INF file [*Install*] sections must only key off the most specific IDs, as described in the following list.

**Plug and Play ID Strings**

| Protocol | ID string in the printer INF file |
|---|---|
| USB | Contains **&VID** and **&PID** in the ID string |
| IEEE 1394 | Always specific, with **1394** in the ID string |
| Parallel port printer | Contains **LPTENUM\** in the ID string |
| USB printer | Contains **USBPRINT\** in the ID string |
| Dot4 printer | Contains **DOT4\** in the ID string |

For Windows 2000, DEVMODEW structure is defined in "Graphics Driver Structures" of "Common Graphics Driver Interface" in the "Graphics Drivers Reference" of the Windows 2000 DDK.

For Windows Me, DEVMODE structure is defined in "New Function and Structure Reference" of "Printer Driver Overview" in the "Windows 95 Documentation" of the Windows 98 DDK.

**PRNT–0299. Driver correctly reports device capabilities**

The driver must correctly support the DEVMODE structure as defined in Windows 98 DDK and Windows 2000 DDK.

Required Windows Me support is defined in "Printer INF File Extension" and "Printer-Specific INF File Extensions Reference" in the "Windows 95 Documentation" of the Windows 98 DDK.

Required Windows 2000 support is defined in "Printer Drivers and Spooler Components" of "Graphics Drivers Design Guide" in the Windows 2000 DDK.

**PRNT–0300. Driver supports sRGB output or an ICC profile is provided**

The device must default either to creating sRGB output or using a vendor-supplied ICC profile.

Windows Me and Windows 2000 support using color profiles that comply with the *Specification ICC.1:1998-09 File Format for Color Profiles*, listed in "Printers References." The ICM APIs and functionality for Windows Me, Windows 98, and Windows 2000 are defined in the Microsoft Platform SDK, the Windows 98 DDK, Windows Me DDK, and the Windows 2000 DDK. For further information, see the Color Management and Windows Operating Systems Web page, listed in "Printers References."

For color-capable devices that do not default to sRGB output, the vendor must install and associate one or more ICC profiles for ICM. Devices that are sRGB-compliant do not need to provide an ICC profile. The sRGB profile is distributed in Windows Me and Windows 2000 and subsequent releases to these operating systems.

The requirements for sRGB are defined in *IEC 61966-2-1 Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*, listed in "Printers References."

### PRNT–0301. Color printer complies with Windows Color Quality Specifications

Color matching capabilities supported in a color printer must comply with the requirements defined in Section 8 of "Windows color quality specifications for printer OEMs," listed in "Printers References." In particular, the following Delta E tolerances must be met for image, graphics, and Pantone patches with default rendering intent:

- Average Delta E less than or equal to 12 for center colors
- Average Delta E less than or equal to 20 for device colors

### PRNT–0302. Port monitor software meets DDK requirements

Any port monitor or language monitor software provided with a print device must accurately report errors and support bidirectional communication as defined in the Windows 98 DDK and Windows 2000 DDK. The relevant DDK sections are cited in requirement PRNT–306, "Driver supports required DDIs."

### PRNT–0303. Driver supports point-and-print network installation

The user must be able to install a driver from a server by double-clicking on the printer share icon.

This capability must accommodate file-number limits and other differences between operating systems that might run on the client and server.

### PRNT–0304. Device is available immediately following installation

The user must not have to restart the system after device installation in order to print.

### PRNT–0305. Device supports accurate printable regions

The printable regions that can be selected in the user interface must be accurately supported in the actual print output.

### PRNT–0306. Driver supports required DDIs

Printer drivers must make sure that print commands from Win32-based applications are executed correctly on the specified printer or plotter. Because these APIs are not hardware specific, each printer driver must interpret the commands for its specific hardware.

For Windows 2000 drivers, the required device driver interfaces (DDIs) are defined in the Windows 2000 DDK. See "Printer Drivers and Spooler Components" in the Windows 2000 DDK.

For Windows Me drivers, this requirement includes correct support of all features advertised for the device, plus required support for Windows features. The required DDIs for Windows Me drivers are listed in the "Printer Driver Overview" in the "Windows 95 Documentation" of the Windows 98 DDK.

**PRNT–0307. Printer driver does not run in kernel mode**

Printer drivers for Windows 2000 must run only in user mode. Drivers that run in kernel mode can incur stability problems. For driver implementation requirements, see "Choosing User Mode or Kernel Mode" in the DDK, listed in "Printer References."

**PRNT–0308. Printer device and driver support Default Device-class Power Management Specification**

All printer devices, printer drivers, and supporting components must support the D0 and D3 power states consistent with the *Default Device Class Power Management Reference Specification, Version 1.0.* Each device must be able to complete successfully a system sleep/wake transition, where the device transitions from D0 to D3 to D0, without losing functionality and without requiring user intervention to restore functionality. System power must be removed in the D3 state.

# Printers 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.

Color Management and Windows Operating Systems Web page
   http://www.microsoft.com/hwdev/color/

*Default Device Class Power Management Reference Specification, Version 1.0*
   http://www.microsoft.com/hwdev/specs/pmref/

*IEC 61966-2-1 Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB*
   http://www.iec.ch

*Legacy Plug and Play Guidelines*
   http://www.pcdesguide.org/legacypnp/

*Multifunction Print Device Design Guidelines*
   http://www.microsoft.com/hwdev/mf/mfp.htm

RFC 1179
>   http://www.rfc-editor.org/rfc.html

*Specification ICC.1:1998-09 File Format for Color Profiles*
>   http://www.color.org/profiles.html

*Universal Serial Bus Device Class Definition for Printing Devices, Version 1.1*
>   http://www.usb.org/developers/devclass.html

Window*s* 98 DDK, Windows Me DDK, Windows 2000 DDK, and Microsoft Platform SDK
>   http://msdn.microsoft.com/library/default.asp

"Windows Color Quality Specifications for Printer OEMs"
>   http://www.microsoft.com/hwdev/color/

# Checklist for Printers

PRNT–0294. Device uses USB, IEEE 1394, or network interface port connection
PRNT–0295. Network printer supports standard port monitor
PRNT–0296. Device with IEEE 1284.4 capabilities complies with specification
PRNT–0297. MFP devices correctly implement multifunction support
PRNT–0298. Printer INF file and installation meet PC 2001 requirements
PRNT–0299. Driver correctly reports device capabilities
PRNT–0300. Driver supports sRGB output or an ICC profile is provided
PRNT–0301. Color printer complies with Windows Color Quality Specifications
PRNT–0302. Port monitor software meets DDK requirements
PRNT–0303. Driver supports point-and-print network installation
PRNT–0304. Device is available immediately following installation
PRNT–0305. Device supports accurate printable regions
PRNT–0306. Driver supports required DDIs
PRNT–0307. Printer driver does not run in kernel mode
PRNT–0308. Printer device and driver support Default Device-class Power Management Specification