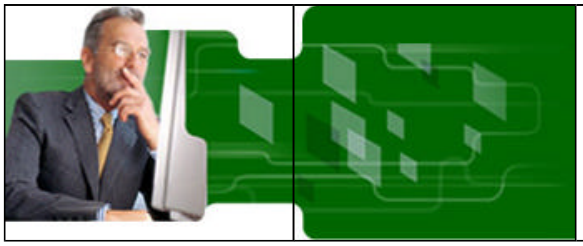
Microsoft Windows

Microsoft Windows Preinstallation Environment User's Guide



The Microsoft Windows Preinstallation Environment (Windows PE) is a minimal Win32 subsystem with limited services, based on the Windows kernel running in protected mode. It contains the minimal functionality that you need to run Windows Setup, install an operating system from a network share, automate basic processes, and perform hardware validation.

This user's guide provides information to corporate administrators about using Windows PE to deploy Microsoft Windows to computers within your organization.

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Windows Preinstallation Environment (Windows PE) Features

Microsoft Windows Preinstallation Environment (Windows PE) is a minimal Win32 subsystem with limited services, based on the Windows XP Professional kernel running in protected mode. It contains the minimal functionality that you need to run Windows Setup, install an operating system from a network share, automate basic processes, and perform hardware validation.

The Windows OPK CD is a bootable copy of the Windows Preinstallation Environment (Windows PE) (32-bit version) that supports all mass-storage and networking drivers contained on the Windows XP Professional CD.

Note

- The Windows OPK CD is only available to OEMs. Corporate users must build a custom Windows PE CD.

Windows PE provides these features:

- A hardware-independent Windows environment for both x86-based and Itanium-based architectures, with a small footprint on both the bootable media and in memory.
- A subset of the Win32 application programming interfaces (APIs), a command-line interface (Cmd.exe) capable of running batch files, and support for Windows Script Host (WSH), HTML Applications (HTA), and ActiveX Data Objects (ADO) used to create custom OEM tools or scripts.
- Network access and support for standard in-box network drivers that may be required for copying images and test suites from a network using TCP/IP. You can easily add or remove network drivers from a customized version of Windows PE.
- Support for all mass-storage devices that use Windows 2000 or Windows XP drivers. As new devices become available, you can easily remove unneeded drivers or incorporate additional drivers into a customized version of Windows PE.
- Native support to create, delete, format, and manage NTFS file system partitions.
- Hardware diagnostics can load and test specific hardware drivers.
- Support for PXE protocol. If the computer supports PXE-booting, then the computer can automatically boot from a Windows PE image located on a Remote Installation Server (RIS). The Windows PE image is not automatically installed onto the hard disk of the computer.

Incorporating Windows PE into your factory preinstallation process allows you to port your existing MS-DOS-based tools to a subset of the 32-bit Windows APIs, so you can more easily maintain these applications in a standard development environment, such as Microsoft Visual Studio®. These hardware diagnostics and other preinstallation utilities can then use the same signed Windows XP drivers in the computers that you manufacture, and you will no longer need to request 16-bit drivers from independent hardware vendors (IHVs).

You can use Windows PE on both x86- and Itanium-based computers. For Itanium-based computers, you must build a 64-bit version of Windows PE from the Windows XP 64-Bit Edition CD. For more information, see Creating a Customized Version of Windows PE.

Important

- At the time of release, none of the third-party disk-imaging products currently support the new disk-partitioning scheme, GUID Partition Table (GPT), used in Itanium-based computers. The only methods of preinstalling 64-bit editions of Windows are either to use Windows PE or perform a CD-based unattended installation. The recommended method is to use Windows PE.

For more information on using Windows PE, see these topics:

- Using Windows PE in Your Manufacturing Process
- Booting Windows PE from Remote Installation Services (RIS) Servers
- Order of Operations in Windows PE
- Creating a Customized Version of Windows PE
- Placing a Bootable Version of Windows PE on a Hard Disk
- Reducing the Size of Windows PE
- Limitations of Windows PE

Using Windows PE in Your Manufacturing Process

A basic method for using the Windows Preinstallation Environment (Windows PE) is:

1. Start the newly-assembled computer with Windows PE.
2. Run any relevant hardware diagnostic applications.
3. Configure the hard disk.
4. Deploy the operating system to the computer using one of these methods:
   - Copying an image from the network.

     –OR–

   - Running **Winnt32** from the command prompt in Windows PE and installing the operating system.
5. Restart into the installed operating system by using Sysprep in Factory mode, or seal the operating system by using Sysprep and shut down the computer.

For more information, see Windows Preinstallation Environment (Windows PE) Features.

Starting the computer by using Windows PE

The Windows OPK CD is a bootable copy of Windows PE (32-bit edition). This default version of Windows PE on the Windows OPK CD starts and runs the command **factory -winpe**.

Note
- The Windows OPK CD is only available to OEMs. Corporate users must build a custom Windows PE CD.

The default version of Startnet.cmd is located in the \Winpe folder on the Windows OPK CD. If you build a custom version of Windows PE, you can modify Startnet.cmd to contain commands specific to your manufacturing environment.

To start a computer by using Windows PE on a CD

1. Insert the Windows PE CD into the computer.
2. Configure the computer's basic input/output system (BIOS) to start from the CD before starting from the local hard disk.
3. Start the computer, pressing any key to start from the CD if the computer contains a formatted local hard disk.

When the Factory tool starts, it first locates a Winbom.ini file by searching these locations in this order:

1. The path and file name specified by the registry key **HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Factory\Winbom**.
2. The root of all removable media drives that are not CD-ROM drives, such as a floppy disk drive.
3. The root of all CD-ROM drives.
4. The location of Factory.exe, usually the %SYSTEMDRIVE%\Sysprep folder.
5. The root of %SYSTEMDRIVE%.

After locating a Winbom.ini file, the Factory tool reads the value of the WinbomType entry in the **[Factory]** section.

If the value of **WinbomType** is not appropriate in this context, the Winbom.ini file is ignored and the Factory tool continues searching for a Winbom.ini file. If the value of **WinbomType** is appropriate in this context, the Factory tool reads the value of the NewWinbom entry in the **[Factory]** section. If a value is specified for **NewWinbom**, and a Winbom.ini file is located at that location, the Factory tool examines that Winbom.ini file for a **NewWinbom** entry.

This cycle continues for a maximum of 10 times or until the Factory tool locates a Winbom.ini file that does not contain a **NewWinbom** entry, whichever occurs first. The Factory tool then continues to run, using the settings in the last identified Winbom.ini file.

After locating the intended Winbom.ini file, the computer connects to the network as specified in the [WinPE.Net] section. Plug and Play installs only the network adapter, and then the Factory tool installs networking services and binds the network protocols.

Note
- Instead of using the Windows OPK CD, you can also create a custom version of Windows PE for your factory preinstallation requirements, as described in Creating a Customized Version of Windows PE.

Running Hardware Diagnostic Applications

Because the Windows XP kernel can dynamically load and unload device drivers when Windows PE is running, the Windows NT driver for a particular device can be loaded. After the driver loads and initializes, it scans the hardware to find its device. With the driver loaded successfully, you can usually assume that the corresponding hardware is working correctly.

Your test suite can use the drivers provided by the hardware manufacturer; you do not need to use a different version of the drivers in your manufacturing environment.

Configuring the Hard Disk and Other Preparatory Tasks

You can format and partition the hard disk in these ways:

- When the command **factory -winpe** runs, you can use Windows PE to configure the hard disk of the computer as specified in the [DiskConfig] section of the Winbom.ini file.
- Run Diskpart commands from the command prompt to configure the disk.
- Run a Diskpart script.
- Use the Format command-line tool contained in Windows XP.

To ensure that the newly formatted partition is active, use **WipeDisk** in the Winbom.ini:

```
[Disk1.config]
WipeDisk = yes
Size1 = *
PartitionType1 = primary
SetActive1 = Yes
FileSystem1 = NTFS
QuickFormat1 = yes
```

This wipes the existing partition, creates a new partition, and sets it as active. You can change the NTFS line to be FAT32, but Setup will create only a 32 GB bootable FAT32 partition.

Important

- The drive letters assigned during Windows PE are not saved to any registry that persists when you restart. The drive letter assignment when you create partitions is in the order of creation, but the drive letter assignments when you restart are in the default order.

After processing the **[DiskConfig]** section of Winbom.ini, Windows PE processes the [OEMRunOnce] and [OEMRun] section, where you can specify any series of tasks to run.

Preinstalling Windows

After processing the **[OEMRunOnce]** and **[OEMRun]** sections, Windows PE then installs a configuration set as specified by the [WinPE] section.

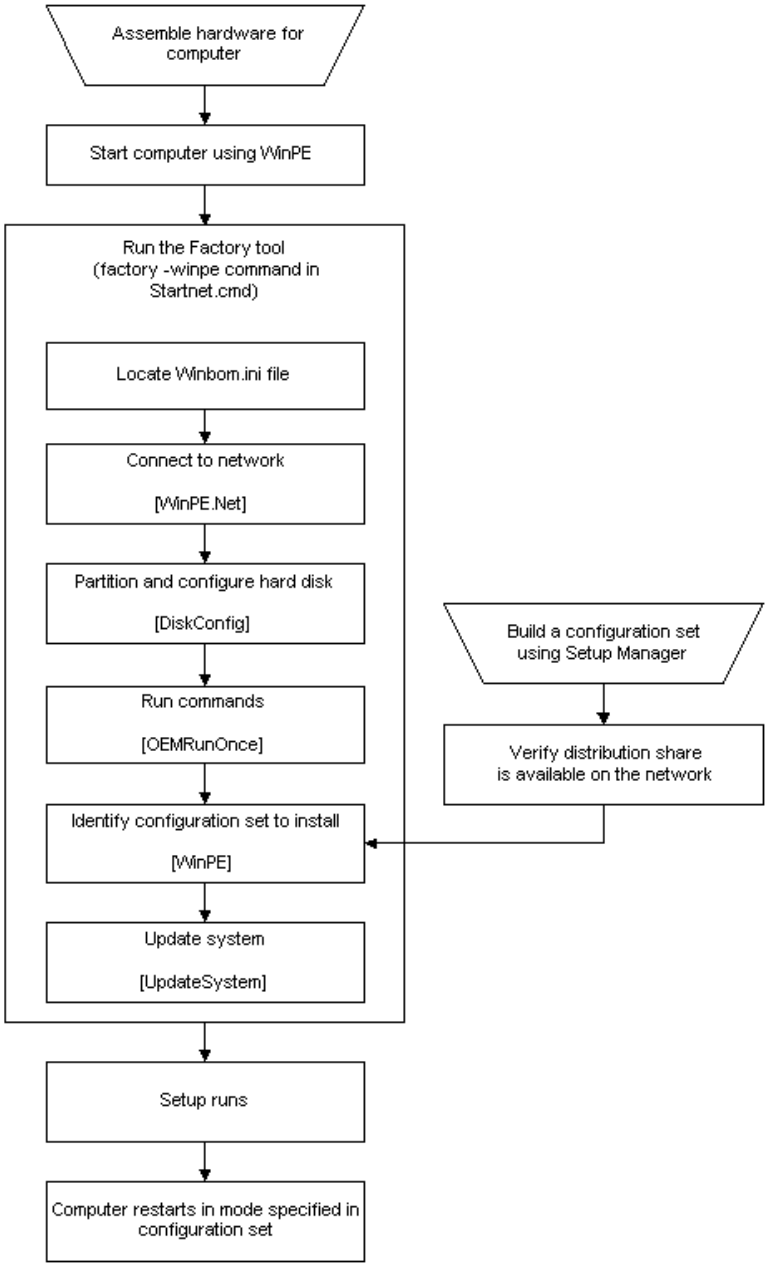
Notes

- Installing a configuration set from Windows PE may require a long time because Setup copies the i386 directory as part of the installation. The OEM License Agreement requires that you include a complete copy of the i386 directory on destination computers.
- The files are copied to the C:\i386 directory by default. If you include the SourcePath entry in the **[ComputerSettings]** section of Winbom.ini, then the i386 directory is placed in the location specified by **SourcePath**. For example:

  ```
  [ComputerSettings]
  SourcePath = %WINDIR%
  ```

Finally, Windows PE processes the [UpdateSystem] section of the Winbom.ini file, and restarts or shuts down the computer based on the value of the Restart entry in the **[WinPE]** section.

Using WinPE to Install the Operating System



Usage Scenarios

The Windows Preinstallation Environment (Windows PE) is commonly used for two scenarios:

- Desktop and server deployment
- Diagnostics and disaster recovery

Desktop and Server Deployment

Windows PE was developed specifically to address desktop and server deployment scenarios. In the past, MS-DOS boot disks were used to handle system configuration and operating system installation. With support for MS-DOS becoming harder to find, Windows PE brings a lightweight 32-bit environment that leverages the drivers and basic features as the Windows operating system.

Usage Example: Standalone Deployment

In a standalone deployment scenario, you create a CD or DVD that contains both Windows PE and the operating system to install. You can distribute this removable media to users or to technicians who install or upgrade machines at the remote site.

The following is a typical standalone deployment scenario:

1. Boot from the CD or DVD into Windows PE.
2. STARTNET.CMD loads the appropriate network services, and then passes control to a custom batch file.
3. The custom batch file inspects the computer to ensure it is the proper make/model to deploy to.
4. If the computer is a valid target, a process backs up user data from the system. Because Windows PE has full NTFS access to the

hard disk, the data can be moved to a remote location or to another location in the computer.
5. If necessary, use DISKPART to create the partitions of the hard drive.
6. After creating the partitions, use Windows Setup or a third-party disk-imaging utility to restore an image to the destination drive.

Usage Example: Network Deployment

Network deployment scenarios are similar to standalone deployment scenarios, but can include more options.

1. Boot from the CD or DVD, or start Remote Installation Services (RIS) into Windows PE.

   The STARTNET.CMD loads the appropriate network services.
2. Map a drive to a local deployment server.
3. On the local deployment server, launch a custom batch file to drive the setup process.
4. The custom batch file inspects the computer to ensure it is the proper make/model to deploy to.
5. If the computer is a valid target, a process backs up user data from the system. Because Windows PE has full NTFS access to the hard disk, move the data to a remote location or to another location in the computer.
6. If necessary, use DISKPART to create the partitions of the hard drive.
7. After creating the partitions, use Windows Setup or a third-party disk-imaging utility to restore an image to the destination drive.

Diagnostics and Disaster Recovery

You can also use Windows PE to:

- Replace corrupted files from original installation media.
- Run 32-bit diagnostic tools.
- Back up data of a corrupted installation before reinstalling.

Booting Windows PE from Remote Installation Services (RIS) Servers

To speed production, OEMs can boot destination computers with the Windows Preinstallation Environment (Windows PE) by using Remote Installation Services (RIS) servers. RIS is an optional component of Windows 2000 Server and Windows Server 2003 operating systems. By booting Windows PE remotely, the destination computers do not have to be manually booted.

This method is only available for the 32-bit version of Windows PE. The 64-bit version of Windows PE does not support this method.

Using Windows PE over any other Preboot eXecution Environment (PXE) server or network boot medium is untested. RIS is the supported method of launching Windows PE over the network.

Prerequisites

The following items are required:

- A Windows XP product CD and a Windows PE CD of the same build number.
- A properly configured Windows 2000 (SP2) or Windows RIS server.
- Your destination computers must have a PXE-enabled network interface card (NIC), or have a NIC that is supported by the RIS boot disk.

Windows 2000 RIS Server

To install on a Windows 2000 RIS server, deploy the hotfix referenced in KB article Q287546. Contact your technical account manager (TAM) or Product Support Services (PSS) to obtain this hotfix.

To fully automate the installation on a Windows 2000 RIS server,use Startrom.n12 and Oschoice.exe from Windows Server 2003. Add the tag **<META ACTION=AUTOENTER>** at the beginning of Startrom.n12 to simulate the pressing of the ENTER key on the client running the Installation Wizard.

Creating a RIS image and booting from it

1. On the RIS server, open a command prompt and run **RISetup.exe –add**.
2. When prompted for a source, point RISetup to your Windows XP product CD.
3. Browse to the location where RISetup installed the image.

   For example, *Server_name**Share_name*\REMINST\Setup*Language*\Images.
4. Open the **I386** folder in the folder of the image you just created.
5. Browse to the CD or network share containing your Windows PE files, and open its **I386** folder.
6. Copy the contents of the Windows PE **I386** folder into the Remote Install **I386** folder you just opened, overwriting all files if prompted.
7. Open the **Templates** folder in the **I386** folder you just copied Windows PE into.
8. Open the **RIStndrd.sif** file in a text editor, and on the line that starts with **OSLoadOptions**, add the switch **/minint**.
9. Start a RIS client, and select the operating system image you created in Step 1. Windows PE starts.

Order of Operations in Windows PE

The boot process of Windows PE is as follows:

1. The boot sector on the particular media is loaded. Control is passed to Setupldr.
2. Setupldr runs Ntdetect.com, which extracts basic system configuration information and stores it in **HKLM\HARDWARE\DESCRIPTION**.
3. Setupldr then loads the appropriate HAL, loads the System registry hive, and loads necessary boot drivers using Winpeoem.sif. After

it finishes loading, it prepares the environment to execute the kernel, Ntoskrnl.exe.

Note

- If you start Windows PE from read-only media such as a CD, Windows PE stores the registry hives in memory so that applications can write to the registry. Any changes made to the registry by the applications do not persist across different Windows PE sessions.

4. Ntoskrnl.exe is executed and finishes the environment setup. Control is passed to the Session Manager (SMSS).
5. SMSS loads the rest of the registry, configures the environment to run the Win32 subsystem (Win32k.sys) and its various processes. SMSS then loads the Winlogon process to create the user session and starts the services and the rest of the non-essential device drivers and the security subsystem (LSASS).
6. Windows PE loads the Command Prompt (Cmd.exe) process and executes Startnet.cmd.
7. When Startnet.cmd finishes, the command prompt is displayed. Windows PE boot is complete.

Interactive Shell Components

The Startnet.cmd batch file launches the networking processes and any custom routines that you might include. The commands in the default Startnet.cmd file are:

```
regsvr32 /s netcfgx.dll
factory -minint
netcfg -v -winpe
net start dhcp
net start nla
a:\floppy.cmd
```

Command descriptions:

- **Regsvr32 /s netcfgx.dll**: Registers the necessary helper function DLL to allow the networking components to be installed. Without this command, Factory mode will be unable to install the network card and Netcfg will fail to load the networking components.
- **Factory -minint**: Starts factory.exe in -minint mode. Factory.exe locates the Winbom.ini file, creates a computername for the Windows PE session if the name is not specified in the Winbom.ini, use Plug and Play to detect and install the network card drivers, and processes the Winbom.ini file.
- **Netcfg -v -winpe**: Installs Tcpip, Netbios and the Msclient for the Windows PE session.
- **Net start dhcp**: Starts the DHCP client.
- **Net start nla**: Starts the Network Location Awareness service.
- **a:\floppy.cmd**: Floppy.cmd is an optional sample file which you can remove from Startnet.cmd. It can contain any commands normally run at a command prompt, such as starting applications or opening additional command windows that run scripts.

For more information on the specific functionality of these commands, see Factory Command-Line Options and Netcfg Command-Line Options.

When you start a computer using Windows PE, you run the command **factory** -**winpe**, which processes these sections in Winbom.ini in this order:

- [WinPE.Net]
- [DiskConfig]
- [OEMRunOnce]
- [OEMRun]
- [WinPE], except for the **Restart** entry
- [UpdateSystem]
- Restart entry in **[WinPE]**

The settings in Winbom.ini provide a wide range of preinstallation tasks. To perform tasks beyond the scope of Winbom.ini, create batch files either to replace or supplement Winbom.ini.

With Windows PE running, you can use Winbom.ini or your own batch files in order to:

- Copy a test harness to the destination computer and run hardware diagnostics.
- Run programs, such as a utility to partition and format the drives.
- Establish network connectivity with the **NET USE** command, and change directories to the location of the preinstalled images.
- Start the unattended Setup from a network source.

Creating a Customized Version of Windows PE

The Windows OPK CD is a bootable copy of the basic 32-bit version of Windows Preinstallation Environment (Windows PE). However, you may want to create a version of Windows PE for 64-bit computers, or configure Windows PE to use a different set of drivers. To support these needs, the OPK includes a collection of scripts and utilities that enable you to build a version of Windows PE customized for your factory environment.

Important

- The Windows OPK CD is only available to OEMs. Corporate users must build a custom Windows PE CD.
- You can build a custom version of Windows PE from any version of Windows XP except Windows XP Home Edition, Windows Server 2003, Datacenter Edition, and Windows Server 2003, Web Edition.
- A custom version of Windows PE is still subject to the conditions listed on Limitations of Windows PE.
- Windows XP 64-Bit Edition and the 64-bit versions of the Windows Server 2003 family are available only in English, French, German, and Japanese.

Basic Process: Building a Custom Version of Windows PE

Building a custom version of Windows PE requires several minutes. This process creates a directory structure of the Windows PE files

and optionally creates an image file that you can burn to a CD-ROM.

Note

- You must have backup and restore privileges to use the Windows PE build tools.

To create a custom version of Windows PE

1. Create and name a directory on your hard disk, specified by *build_location*.
2. Place the Windows OPK CD into the CD-ROM drive, denoted as *cd_drive*.
3. Copy *cd_drive*\Winpe*.* to *build_location*.
4. Copy Factory.exe and Netcfg.exe from the *cd_drive*\Tools*platform* directory into the *build_location* directory.

   To build a 32-bit version of Windows PE, the value of *platform* is **x86**.

   To build a 64-bit version of Windows PE, the value of *platform* is **ia64**, and you also must copy Efinvr.exe into the *build_location* directory.
5. Remove the Windows OPK CD from the CD-ROM drive.
6. To build a 32-bit version of Windows PE:

   Place the 32-bit Windows product CD in the CD-ROM drive.

   –OR–

   To build a 64-bit version of Windows PE:

   Place the 64-bit Windows product CD in the CD-ROM drive.
7. To build a 64-bit version of Windows PE, place a floppy disk in the A:\ drive of the computer. This disk is used for temporary storage during the build process of the 64-bit Windows PE.
8. Navigate to *build_location*.
9. Run this command:

   Mkimg.cmd *source_directory destination_directory* [*image_name*]

   source_directory
   Specifies the location of the Windows product CD. If *source_directory* is a CD-ROM drive, you need only to specify the drive letter. If *source_directory* is a network path, the path must be to the parent directory of the \i386 directory.

   Note

   - Do not include a trailing slash in *source_directory*.

   destination_directory
   Specifies the path where the files necessary to create the image are temporarily stored. If this directory does not already exist, Mkimg.cmd creates it.

   image_name
   Optional. Specifies the path and file name of the ISO image file that contains this customized version of Windows PE, if you place this version of Windows PE onto a CD-ROM.
10. If you are creating a CD-ROM, use CD creation software to burn the ISO image file directly to the CD media.

Important

- You must have read/write permissions for *build_location*. You cannot run the **mkimg** command from a read-only device such as a CD-ROM drive.

  For more information, see Mkimg Command.

Example

For example, if *build_location* is C:\Build.x86, this command-line creates an ISO image called x86winpe.iso by using C:\Winpe.tmp as a temporary storage area.

```
C:\Build.x86\Mkimg.cmd E: C:\Winpe.tmp C:\x86winpe.iso
```

Note

- Instead of using the Mkimg tool, you can also use Oscdimg to create an .iso file. Oscdimg requires an existing Windows PE fileset to build the .iso from.

If you create an .iso image file, you can burn this version of Windows PE to a CD. You can also place the customized version of Windows PE on a hard disk, as described in Placing a Bootable Version of Windows PE on a Hard Disk, or on a Remote Installation Server (RIS). Although not explicitly discussed in this guide, you can also place Windows PE on bootable media other than a CD or a hard disk.

Important

- To configure the Windows PE CD so that it starts from the CD every time, if the Windows PE CD is present in the CD-ROM drive, remove the \i386\Bootfix.bin file from the Windows PE directory structure before you create an .iso file. Bootfix.bin is the file that provides the "Press any key to boot from CD-ROM" message.

Building a Bootable 64-Bit Windows PE CD

You can create a bootable 64-bit Windows PE CD that starts automatically without user interaction. This method assumes that the computer you are booting has been configured to boot from CD-ROM.

This process creates a directory structure of the Windows PE files which is used to create an ISO file that can be burned to CD-ROM.

To create a custom 64-bit version of Windows PE

1. On an x86 machine running a 32-bit version of Windows 2000 or Windows XP, open a command prompt. This can be done by clicking the **Start** menu, selecting **Run**, and typing **CMD.EXE**.
2. Create a directory on your hard disk to hold the tools required to create a Windows PE CD. For example: **MD C:\WINPE**.
3. Place the Windows OPK CD into the CD-ROM drive, denoted as *cd_drive*.
4. Type **Copy *cd_drive*\Winpe*.* C:\WinPE**.

5. Type **Copy *cd_drive*\Tools\IA64\FACTORY.EXE C:\WINPE**.
6. Type **Copy *cd_drive*\Tools\IA64\NETCFG.EXE C:\WINPE**.
7. Type **Copy *cd_drive*\Tools\IA64\EFINVR.EXE C:\WINPE**.
8. Remove the Windows OPK CD from the CD-ROM drive.
9. Place the Windows XP 64-Bit Edition CD in the CD-ROM drive.
10. Navigate to the Windows PE directory by typing **CD \WINPE**.
11. Run this command:

    Mkimg.cmd *source_directory destination_directory*

    source_directory specifies the location of the CD for the 64-bit Edition of Windows XP and *destination_directory* specifies the path where the files necessary to create the image are temporarily stored. If this directory does not already exist, Mkimg.cmd creates it.

    If *source_directory* is a CD-ROM drive, you need to specify only the drive letter. If *source_directory* is a network path, the path must be to the parent directory of the \i386 directory. Do not include a trailing slash in *source_directory*.

To build the bootable 64-bit Windows PE CD ISO file

1. Create this directory structure on a blank formatted floppy diskette:

```
A:\
|_EFI
  |_BOOT
```

   Type:

   MD A:\EFI
   MD A:\EFI\BOOT

2. Copy SETUPLDR.EFI to the A:\EFI\BOOT directory and rename it as BOOTIA64.EFI. For example:

   COPY C:\IA64PE\IA64\SETUPLDR.EFI A:\EFI\BOOT\BOOTIA64.EFI.

3. Type **CD \WINPE**.
4. Type **DSKIMAGE A: .\EFISYS.BIN**.

To create the bootable ISO image file that can be burned to CD, use this syntax:

OSCDIMG -b.\efisys.bin -n -h *destination_directory iso_filename*

For example:

```
OSCDIMG -b.\efisys.bin -n -h C:\IA64PE C:\IA64PE.ISO
```

The ISO file that is generated can be burned to CD using the CD-burning software of your choice. After burning the ISO file to CD, ensure that the target IA64 computer has been configured so that the CD-ROM drive is the primary boot device. This can be done by using the EFI Shell Boot Menu Editor.

See the documentation that came with your computer for specific details on modifying the EFI Shell Boot Menu.

Extensions of the Basic Process: More Customizations of Windows PE

You can make additional customizations of this version of Windows PE before burning it to a CD or copying it to a hard disk.

Adding Support for Other Languages

By default, multi-language Windows PE builds are not supported. Use the [RegionalSettings] section to add support for multiple languages.

There are two reasons for using multi-language support in Windows PE:

1. To use one set of preinstallation tools to build multiple localized Windows PE images.
2. To use preinstallation tools in multiple languages to build Windows PE in one language.

To use one set of tools, the key is to use **[RegionalSettings]** to always match the Language value to the language of the source Windows product CD. You then use LanguageGroup to specify the languages of both the Windows PE tools and the source CD.

In this example, the goal is to create a Japanese Windows PE image from a Japanese Windows product CD that will support using English preinstallation tools:

```
[RegionalSettings]
LanguageGroup = 1, 7
Language = 0x0411
```

1 is the LanguageGroup ID for Western Europe and United States, and 7 is the Japanese LanguageGroup ID. 0x0411 is the locale ID (LCID) for Japanese, which matches the locale of the source CD. By adding 1 to the LanguageGroup entry, you add English support so that you can use the English preinstallation tools.

To use the preinstallation tools in multiple languages, match the **Language** value to the source CD, and specify the additional languages in **LanguageGroup**. In this example, Japanese language support is added to an English Windows PE image.

```
[RegionalSettings]
LanguageGroup = 1, 7
Language = 0x0409
```

0x0409 is the LCID for English, which matches the locale of the source CD. By including 7 in the LanguageGroup entry, you add Japanese support so that you can use both the English and Japanese preinstallation tools.

If you create a custom version of Windows PE from an East Asian language version of Windows, you must ensure that the file Bootfont.bin is located in the <buildlocation>\i386 folder (for 32-bit versions of Windows PE) or in the <buildlocation>\ia64 folder (for 64-bit versions of Windows PE). Without Bootfont.bin, the loader prompt displays invalid characters instead of double-byte character sets.

Including a specific Winbom.ini file or Startnet.cmd file

You can include a generic Winbom.ini file in a custom Windows PE installation that specifies basic information about connecting to your network, formatting the hard disk, and running basic hardware diagnostics.

You can include a generic Winbom.ini file in a custom Windows PE installation. Factory uses this file if another Winbom.ini is not located in the floppy drive. After using the settings in [WinPE.Net] to establish network connectivity, the Factory tool can use the NewWinbom entry to point to another Winbom.ini file located on the network.

You can also create your own version of Startnet.cmd to run a specific set of commands, batch files, or scripts.

To gain access to Windows Networking APIs, run the command **netcfg -winpe** from the Windows PE command line, if this command is not already part of your Startnet.cmd. For more information, see Netcfg Command-Line Options.

Including Hardware Diagnostics or Other Basic Tools

If you have created any custom tools that are a core part of your validation process, you may want to include these tools in your custom Windows PE installation before preinstalling the operating system.

Adding or Removing Network Drivers

By default, all network drivers on the Windows XP Professional CD or Windows XP 64-Bit Edition are supported. When you create your own Windows PE image, you can add or remove the network drivers or replace the network driver list. By keeping the set of drivers to a minimum, you reduce the time required for Plug and Play detection.

To add network drivers to a custom Windows PE CD, copy these files as specified:

- All network driver *.inf files to the \%WINDIR%\inf directory.
- All *.sys files to the \%WINDIR%\system32\drivers directory.
- Any related *.dll, .exe, or other files to the \%WINDIR%\system32 directory.

Catalog files are unnecessary, as they are not processed by the Windows PE environment.

Adding or Removing Mass-Storage Drivers

To reduce boot time, you may configure a custom version of Windows PE to load a limited set of mass-storage drivers, instead of loading the entire set of mass-storage drivers that are natively supported in Windows XP. You may also configure Windows PE to load additional third-party drivers.

To control which mass-storage drivers are loaded in Windows PE, customize the Winpeoem.sif file. Modifying this file changes the list of drivers that Windows PE loads when it boots, which affects the boot time of Windows PE.

Changing the Winpeoem.sif file does not remove or add any files into the customized version of Windows PE. If, in addition to reducing the boot time, you also want to reduce the size of your Windows PE image, you must separately remove the unnecessary driver files from your custom version of Windows PE. If you include any third-party drivers in the Winpeoem.sif file, you must manually add any required driver files to your custom version of Windows PE.

For more information, see Winpeoem.sif.

In most cases you will add mass storage drivers to the Windows PE image rather than replace them. If you want to reduce the size or boot time of the Windows PE image, you can use the [MassStorageDrivers.Replace] section to remove the drivers from the \system32 directory.

Notes

- When files are added or removed from Windows PE, the image will have to be recreated using Oscdimg.exe unless your are booting Windows PE from a RIS server. You can use the F6 option to add mass storage devices when booting Windows PE.

To add support for mass storage controllers using Windows PE

1. Copy your driver package to a directory under %WINPEROOT%\system32. For example:

   ```
   %WINPEROOT%\system32\Driver1
   ```

2. Edit the %WINPEROOT%\system32\Winpeoem.sif to remove the semicolons from the **[OemDriverParams]** section and add the name of the directory into which you copied your driver package to the OemDriverDirs line. For example:

   ```
   [OemDriverParams]
   OemDriverRoot=""
   OemDriverDirs=Driver1
   ```

3. Optional: If you are using the **[MassStorageDrivers.Append]** or **[MassStorageDrivers.Replace]** sections of Winpeoem.sif, copy the mass storage driver *.sys file to the \system32\drivers subdirectory.
4. Optional: If the mass storage device requires any supporting *.dll files, copy those to the appropriate directory. You can determine if these files are required by examining the Txtsetup.oem file.

With these changes made, your Windows PE image will now attempt to start the driver specified in the [Defaults] section of the Txtsetup.oem in the driver package in the \Driver1 subdirectory. When the system is loaded, the Winpeoem.sif file will be opened and any mass storage drivers listed will be loaded before any of the inbox-provided drivers.

However, in some cases the Txtsetup.oem file provided by the manufacturer may have to be edited. Many driver packages today support a variety of mass storage devices, and only those listed in the [Defaults] section will be loaded. Read the [SCSI] section in the

Txtsetup.oem file to determine which driver entry corresponds to the one you wish to load. In the following example, only Driver1 will be loaded. To load Driver2, change the "scsi=" line under the [Defaults] section to "scsi = driver2".

```
[Disks]
driver1 = "generic driver for device 1", \generic.sys, \
driver2 = "generic driver for device 2", \generic2.sys, \

[Defaults]
scsi = driver1

[scsi]
driver1 = "generic driver for device 1", generic.sys
driver2 = "generic driver for device 2", generic2.sys
```

Notes

- If loading more than one mass storage driver, this must be done for each txtsetup.oem file if the Winpeoem.sif supports multiple adapters. If multiple mass storage drivers are required, you can do so by appending additional directory names to the **OemDriverDirs** entry in Winpeoem.sif. For example:

```
[OemDriverParams]
OemDriverRoot=""
OemDriverDirs=Driver1, Driver2, Driver3
```

Adding Optional Component Packages to Windows PE

BuildOptionalComponents.vbs is a script for adding support for optional component packages to Windows PE. The packages include Windows Script Host (WSH), HTML Applications (HTA), and ActiveX Data Objects (ADO) to allow database connectivity from Windows PE to a Microsoft SQL Server.

The script uses these command-line options:

Option	Function
/S:*location*	Alternate source location other than the Windows product CD
/D:*location*	Alternate destination for the WinPE Optional Component Files (I386). If not specified, the files are saved to the desktop
/ADO	Builds ADO (ActiveX Database Objects) for Microsoft SQL Server connectivity
/HTA	Builds HTA (HTML applications)
/WSH	Builds WSH (Windows Script Host)
/64	Builds and checks 64-bit version of Windows PE; requires Windows XP 64-Bit Edition
/Q	Runs the script with prompts suppressed. Notifies only on failure.
/E	Explores the resulting folder automatically when complete

To add optional components to Windows PE

1. If you are building Windows PE 1.0, then set /S to the path of the Windows XP Professional CD-ROM. If you are building Windows PE 1.1, then set /S to the path of a directory that has Windows XP SP1 integrated into a I386 directory.
2. In your \WinPE directory, run this command:

```
buildoptionalcomponents.vbs /S:d:\sourcefiles
```

   You should have the following directory on your desktop:

```
WinPE Optional Component Files (I386)
+---I386
|   +---Registration
|   \---System32
+---Program Files
|   \---Common Files
|       \---System
|           +---ado
|           +---msadc
|           \---Ole db
\---Samples
```

   The \Registration directory is created onlf if you add support for ADO, and it must be there for ADO to function.

3. If you built Windows PE to C:\bin, then copy the \Program Files directory to C:\bin\i386
4. Copy the \Samples directory to C:\bin\i386
5. Copy the \i386\system32*.* to C:\bin\i386\system32
6. Make sure that your Startnet.cmd file has the following line:

```
oc.bat
```

If you do not specify components, or you do not run this script from the command prompt, all optional components are installed. If you include HTA, WSH is included automatically, and cannot be removed.

Notes

- ADO access to Active Directory and Active Directory Service Interface are not supported in Windows PE.
- BuildOptionalComponents.vbs is not supported in the following language versions of Windows PE:
  - Brazilian
  - Danish
  - German
  - Italian
  - Norwegian

- Portuguese
- Spanish
- Swedish

Placing Bootable Windows PE on Hard Disks

You can place a customized version of the Windows Preinstallation Environment (Windows PE) on a hard disk, which can be useful for either preinstalling Windows or creating a hard disk-based recovery solution.

This procedure assumes that you have created a custom version of Windows PE, as detailed in Creating a Customized Version of Windows PE. After you complete this procedure, the customized Windows PE files will be in *build_location* on your technician computer or other network share.

Note

- If you create a bootable Windows PE hard disk from an East Asian language version of Windows, copy Bootfont.bin from the *build_location*\i386 folder (for 32-bit versions of Windows PE) or the *build_location*\ia64 folder (for 64-bit versions of Windows PE) to the root of the destination hard disk. Without Bootfont.bin, the loader prompt displays invalid characters instead of double-byte characters.

To create a bootable Windows PE disk (32-bit versions of Windows PE)

1. Boot the destination computer into Windows PE by using a Windows PE CD.
2. Create a formatted and active partition labeled C.
3. On the active partition, create a directory called C:\Minint. You must name the directory "Minint".
4. Copy the contents of *build_location*\i386 to C:\Minint.

   ```
   xcopy "C:\Build.x86\i386\*.*" C:\Minint /S
   ```

5. Copy Ntdetect.com from *build_location*\I386 to drive C.

   ```
   xcopy "C:\Build.x86\I386\ntdetect.com" C:\
   ```

6. On the destination hard disk, copy C:\Minint\setupldr.bin to C:\ntldr.

   ```
   xcopy "C:\Minint\setupldr.bin" C:\ntldr
   ```

7. Restart the destination computer.

   The computer starts using Windows PE.

To create a bootable Windows PE disk (64-bit versions of Windows PE)

This procedure assumes that the destination computer has a clean hard disk and that you have created a custom version of Windows PE stored in *build_location* on your technician computer or other network share, as detailed in Creating a Customized Version of Windows PE.

1. Boot the destination computer into Windows PE by using a Windows PE CD.
2. Create EFI and primary data partitions by running Diskpart.exe with the following commands:

   ```
   select disk 0
   clean
   convert gpt
   create partition efi size=100
   assign letter=g
   create partition msr size=32
   create partition pri
   assign letter=c
   exit
   ```

   The EFI partition is assigned the letter G and the data partition is letter C.
3. Format the new partitions by running Format.exe with the following commands:

   ```
   format G: /fs:fat32 /q /y
   format C: /fs:ntfs /q /y
   ```

4. On drive C, create a directory called \Winpe.

   ```
   mkdir C:\Winpe
   ```

5. Copy the contents of *build_location*\ia64 to C:\Winpe.

   ```
   xcopy "C:\Build.ia64\ia64\*.*" C:\Winpe /hide
   ```

6. Copy *build_location*\ia64\Setupldr.efi to drive G.

   ```
   xcopy \\server\share\ia64\Setupldr.efi G:\
   ```

7. Create an empty file named $WinPE$.$$$ on drive G.

```
echo empty file > G:\$Winpe$.$$$
```

8. Add a boot entry for this version of Windows PE that you have placed on drive C by running the Efinvr command.

```
efinvr /add G:\Setupldr.efi C:\Winpe\ia64 /setactive
```

9. Restart the destination computer.

   There is now a new option in NVRAM to boot Windows PE.

Note

- You can follow a similar procedure if you start the computer from an operating system located on the hard disk, instead of initially starting the computer with a Windows PE CD. When you run Diskpart from a full Windows operating system, Diskpart cannot assign a drive letter to an EFI partition. Instead, in step 2 of this procedure, use the **Mountvol** command.

```
mountvol /s g:
```

For more information on using Diskpart to format and partition the hard disk, see DiskPart Commands.

Reducing the Size of Windows PE

Windows Preinstallation Environment (Windows PE) is a minimal operating system based on the Windows kernel. Windows PE replaces MS-DOS as a means for starting a computer in order to install operating systems and applications. It contains the minimum functionality needed to run Windows Setup, scripts, or custom applications.

The non-customized size of Windows PE can range from 120 to 220 megabytes (MB). By removing non-essential files, you can reduce the 32-bit version of Windows PE to an on-disk image size of 81 MB.

Size of Windows PE

The approximate size of a non-customized version of Windows PE is as follows:

Platform	On-disk image size	In-memory size
32-bit versions of Windows PE	About 120 MB	About 40 MB
64-bit versions Windows PE	About 220 MB	About 42 MB

In-memory sizes are computed when networking services are running.

Localized versions of Windows PE vary in size between 300-370 MB, depending upon the language.

The size of a custom version of Windows PE will vary, depending on the set of drivers that you choose to include or exclude. The on-disk size of the default Windows PE configuration includes all in-box drivers, many of which are uncompressed.

The approximate size of each directory on the 32-bit version of Windows PE is as follows:

Directory	Approximate size
\fonts	9 MB
\inf	4 MB
\System32	66 MB
\System32\Drivers	29 MB

While Windows PE is too large to fit on a floppy disk, you can place your customized version of Windows PE on many types of bootable media including CD-ROM, DVD, hard disk, or a Remote Installation Services (RIS) Server. If you use a CD-R or CD-RW, the system that you start must support starting from a CD, as well as the ability to read CD-R or CD-RW media.

Reducing the Windows PE Footprint

The following files can be removed from a Windows PE image. Removing certain files listed may affect your ability to connect to a network, but otherwise will not interfere with the functionality of the image. If you remove all of these files, the 32-bit version of Windows PE can be reduced to an on-disk image size of 81 MB.

The following table includes a list of fonts that can be safely removed without reducing Windows PE functionality, as well as a list of drivers and other files that can be safely removed.

File name	Description	File name	Description
Angsaz.ttf	Font file	Rasacd.sys	
Artrbdo.ttf	Font file		
Artro.ttf		Raspppoe.sys	
Browa.ttf	Font file	Raspptp.sys	
Browab.ttf	Font file	Rawwan.sys	
Browai.ttf	Font file	Rlnet5.sys	
Browau.ttf	Font file	Rocket.sys	
Browaub.ttf	Font file	Rootmdm.sys	Modem device driver
Browaui.ttf	Font file	Sonydcam.sys	Multimedia file
Browauz.ttf	Font file	Speed.sys	Serial Device driver
Browaz.ttf	Font file	Stlnata.sys	
Comic.ttf	Font file	Sx.sys	Multimedia file
Comicbd.ttf	Font file	Tbatm155.sys	
Cordia.ttf	Font file	Tos4mo.sys	Multimedia file
Cordiab.ttf	Font file	Tpro4.sys	Multimedia file

Cordiai.ttf	Font file	Tsbvcap.sys	Multimedia file
Cordiau.ttf	Font file	Usbcamd.sys	Multimedia file
Cordiaub.ttf	Font file	Usbcamd2.sys	Multimedia file
Cordiaui.ttf	Font file	Usbintel.sys	Multimedia file
Cordiauz.ttf	Font file	Vdmindvd.sys	Multimedia file
Cordiaz.ttf	Font file	Wanarp.sys	Networking driver
David.ttf	Font file	Wlandrv2.sys	
Davidbd.ttf	Font file	Sfcfiles.dll	This file can be safely removed, but without it Windows PE does not support 800 x 600 resolution; it is only capable of the default resolution of 640 x 480 pixels.
Davidtr.ttf	Font file	Avmc20.dll	
Estre.ttf	Font file	Avmcapi.dll	
Frank.ttf	Font file	Avmenum.dll	
Gautami.ttf	Font file	Dgclass.dll	
Georgia.ttf	Font file	Dgconfig.dll	
Georgiab.ttf	Font file	Dgrpsetu.dll	
Georgiai.ttf	Font file	Diapi2.dll	
Georgiaz.ttf	Font file	Diapi232.dll	
Impact.ttf	Font file	Diapi2nt.dll	
Latha.ttf	Font file	Digirlpt.dll	
Mriam.ttf	Font file	Disrvci.dll	
Mriamc.ttf	Font file	Disrvpp.dll	
Mriamfx.ttf	Font file	Disrvsu.dll	
Mriamtr.ttf	Font file	Ditrace.exe	
Mvboli.ttf	Font file	Divaci.dll	
Nrkis.ttf	Font file	Divaprop.dll	
Pala.ttf	Font file	Divasu.dll	
Palab.ttf	Font file	Elsa20.dll	
Palabi.ttf	Font file	Elsa2032.dll	
Palai.ttf	Font file	Eqnclass.dll	
Raavi.ttf	Font file	Eqndiag.exe	
Rod.ttf	Font file	Eqnlogr.exe	
Rodtr.ttf	Font file	Eqnloop.exe	
Shruti.ttf	Font file	Fpnpbase.sys	
Simpbdo.ttf	Font file	Fpnpbase.usa	
Simpfxo.ttf	Font file	Fus2base.sys	
Simpo.ttf	Font file	Io8ports.dll	
Trebuc.ttf	Font file	Mxicfg.dll	
Trebucbd.ttf	Font file	Mxport.dll	
Trebucbi.ttf	Font file	Peer.exe	
Trebucit.ttf	Font file	Snmpapi.dll	Network
Tunga.ttf	Font file	Spdports.dll	
Upcdb.ttf	Font file	Spxcoins.dll	
Upcdbi.ttf	Font file	Spxports.dll	
Upcdi.ttf	Font file	Spxupchk.dll	
Upcdl.ttf	Font file	Stlncoin.dll	
Upceb.ttf	Font file	Stlnprop.dll	
Upcebi.ttf	Font file	Sxports.dll	
Upcei.ttf	Font file	Query.dll	Content indexing dll
Upcel.ttf	Font file		
Upcfb.ttf	Font file		
Upcfbi.ttf	Font file		
Upcfi.ttf	Font file		
Upcfl.ttf	Font file		
Upcib.ttf	Font file		
Upcibi.ttf	Font file		
Upcii.ttf	Font file		
Upcil.ttf	Font file		
Upcjb.ttf	Font file		
Upcjbi.ttf	Font file		
Upcji.ttf	Font file		
Upcjl.ttf	Font file		
Upckb.ttf	Font file		
Upckbi.ttf	Font file		
Upcki.ttf	Font file		
Upckl.ttf	Font file		
Upclb.ttf	Font file		
Upclbi.ttf	Font file		
Upcli.ttf	Font file		
Upcll.ttf	Font file		

The following table includes a complete list of the included .inf and .sys files associated with in-box supported network drivers. You may

remove these files, but without them Windows PE will be unable to connect to the network.

Driver files	Inf files	Exe files	Additional	Description
Ac300nd5.sys	Net10.inf	Ditrace.exe	Netshell.dll	Network connections shell
Adm8511.sys	Net1394.inf	Ipconfig.exe	Nwprovau.dll	Networking dll file
Adptsf50.sys	Net21x4.inf	Net.exe	Rasdlg.dll	Remote access library
Ali5261.sys	Net3c556.inf	Net1.exe	Te_protm.pm	Not present in SP1 versions of Windows PE.
Amb8002.sys	Net3c589.inf	Netcfg.exe	Te_protm.pm2	Not present in SP1 versions of Windows PE.
An983.sys	Net3c985.inf	Ping.exe	Te_protu.qm	Not present in SP1 versions of Windows PE.
Arp1394.sys	Net3sr.inf	Rundll32.exe	Te_protu.sm	Not present in SP1 versions of Windows PE.
Aspndis3.sys	Net5515n.inf		Wzcsapi.dll	Wireless networking configuration file
Asyncmac.sys	Net557.inf		Wzcsvc.dll	Wireless configuration manager
Atmarpc.sys	Net559ib.inf			
Atmepvc.sys	Net575nt.inf			
Atmlane.sys	Net650d.inf			
Atmuni.sys	Net656c5.inf			
B57xp32.sys	Net656n5.inf			
B57xp64.sys	Net713.inf			
Bcm42u.sys	Net83820.inf			
Bcm42xx5.sys	Net8511.inf			
Bcm4e5.sys	Netac300.inf			
Bridge.sys	Netali.inf			
Brzwlan.sys	Netambi.inf			
Cb102.sys	Netamd.inf			
Cb325.sys	Netamd2.inf			
Cben5.sys	Netamdhl.inf			
Ce2n5.sys	Netan983.inf			
Ce3n5.sys	Netana.inf			
Cem28n5.sys	Netasp2k.inf			
Cem33n5.sys	Netauni.inf			
Cem56n5.sys	Netb57xp.inf			
Cicap.sys	Netbcm4e.inf			
Cnxt1803.sys	Netbcm4p.inf			
Cpqndis5.sys	Netbcm4u.inf			
Cpqtrnd5.sys	Netbrdgm.inf			
D100ib5.sys	Netbrdgs.inf			
Dc21x4.sys	Netbrzw.inf			
Defpa.sys	Netcb102.inf			
Dfe650.sys	Netcb325.inf			
Dfe650d.sys	Netcbe.inf			
Digidxb.sys	Netce2.inf			
Dlh5xnd5.sys	Netce3.inf			
Dm9pci5.sys	Netcem28.inf			
Dp83820.sys	Netcem33.inf			
E1000645.sys	Netcem56.inf			
E1000nt5.sys	Netcicap.inf			
E100b325.sys	Netcis.inf			
E100b645.sys	Netclass.inf			
E100isa4.sys	Netcpqc.inf			
El515.sys	Netcpqg.inf			
El556nd5.sys	Netcpqi.inf			
El574nd4.sys	Netcpqmt.inf			
El575nd5.sys	Netctmrk.inf			
El589nd5.sys	Netdav.inf			
El656cd5.sys	Netdefxa.inf			
El656ct5.sys	Netdf650.inf			
El656se5.sys	Netdgdxb.inf			
El656nd5.sys	Netdlh5x.inf			
El90xbc5.sys	Netdm.inf			
El90xnd5.sys	Nete1000.inf			
El985n51.sys	Nete100i.inf			
El98xn5.sys	Netejxmp.inf			
El99xn51.sys	Netel515.inf			
El99xrun.out	Netel574.inf			
Elnk3.sys	Netel5x9.inf			
Em556n4a.sys	Netel90a.inf			
Em556n4b.sys	Netel90b.inf			
Em556n4i.sys	Netel980.inf			

Epro4.sys	Netel99x.inf			
Ex10.sys	Netepicn.inf			
F3ab18xi.sys	Netepro.inf			
F3ab18xj.sys	Netepvcm.inf			
Fa312nd5.sys	Netepvcp.inf			
Fa410nd5.sys	Netex10.inf			
Fem556na.sys	Netf56n5.inf			
Fem556nb.sys	Netfa312.inf			
Fem556ni.sys	Netfa410.inf			
Fem556n5.sys	Netfjvi.inf			
Fetnd5.sys	Netfjvj.inf			
Forehe.sys	Netfore.inf			
Ibmexmp.sys	Netforeh.inf			
Iologmsg.dll	Netgpc.inf			
Ip5515.sys	Netias.inf			
Ipfltdrv.sys	Netibm.inf			
Ipinip.sys	Netibm2.inf			
Ipnat.sys	Netip6.inf			
Ipsec.sys	Netiprip.inf			
Irda.sys	Netirda.inf			
Irenum.sys	Netirsir.inf			
Irsir.sys	Netklsi.inf			
Ktc111.sys	Netktc.inf			
Lanepic5.sys	Netlanem.inf			
Lmndis3.sys	Netlanep.inf			
Lne100.sys	Netlm.inf			
Lne100tx.sys	Netlm56.inf			
Loop.sys	Netlnev2.inf			
Mdgndis5.sys	Netloop.inf			
Mrxdav.sys	Netlpd.inf			
Mrxsmb.sys	Netmadge.inf			
Msgpc.sys	Netmhzn5.inf			
Mxnic.sys	Netmscli.inf			
N1000645.sys	Netnb.inf			
N1000nt5.sys	Netnf3.inf			
N100325.sys	Netngr.inf			
N100645.sys	Netnm.inf			
Ndistapi.sys	Netnovel.inf			
Ndiswan.sys	Netnwcli.inf			
Ne2000.sys	Netnwlnk.inf			
Netbios.sys	Netoc.inf			
Netbt.sys	Netosi2c.inf			
Netevent.dll	Netosi5.inf			
Netflx3.sys	Netpc100.inf			
Netwlan5.sys	Netpnic.inf			
Ngrpci.sys	Netpsa.inf			
Nic1394.sys	Netpschd.inf			
Nmnt.sys	Netpwr2.inf			
Nwlnkflt.sys	Netrasa.inf			
Nwlnkfwd.sys	Netrass.inf			
Nwlnkipx.sys	Netrast.inf			
Nwlnknb.sys	Netrlw2k.inf			
Nwlnkspx.sys	Netrsvp.inf			
Nwrdr.sys	Netrtpnt.inf			
Otc06x5.sys	Netrtsnt.inf			
Otceth5.sys	Netrwan.inf			
Pc100nds.sys	Netsap.inf			
Pca200e.sys	Netserv.inf			
Pcmlm56.sys	Netsis.inf			
Pcntn5hl.sys	Netsk98.inf			
Pcntn5m.sys	Netsk_fp.inf			
Pcntpci5.sys	Netsla30.inf			
Pcx500.sys	Netsmc.inf			
Psched.sys	Netsnip.inf			
Ptilink.sys	Netsnmp.inf			
Rasacd.sys	Nettb155.inf			
Rasirda.sys	Nettcpip.inf			
Rasl2tp.sys	Nettdkb.inf			
Raspppoe.sys	Nettiger.inf			
Raspptp.sys	Nettpro.inf			
Raspti.sys	Nettpsmp.inf			
Rawwan.sys	Netupnp.inf			

Rdbss.sys	Netupnph.inf			
Rlnet5.sys	Netvt86.inf			
Rocket.sys	Netw840.inf			
Rtl8029.sys	Netw926.inf			
Rtl8139.sys	Netw940.inf			
Sisnic.sys	Netwlan.inf			
Sk98xwin.sys	Netwlan2.inf			
Skfpwin.sys	Netwv48.inf			
Sla30nd5.sys	Netwzc.inf			
Smc8000n.sys	Netx500.inf			
Smcpwr2n.sys	Netx56n5.inf			
Srv.sys	Netxcpq.inf			
Srwlnd5.sys				
Tbatm155.sys				
Tcpip.sys				
Tcpip6.sys				
Tdk100b.sys				
Tdkcd31.sys				
Tjisdn.sys				
Tpro4.sys				
Usb101et.sys				
Vinwm.sys				
W926nd.sys				
W940nd.sys				
Wanarp.sys				
Wlandrv2.sys				
Wlluc48.sys				
Xem336n5.sys				

The following table includes file names of tools and a bitmap. You can safely remove these files without affecting core functionality. Note that if you remove some of these files, you will lose functionality that you may need, such as Factory.exe, partitioning tools, debugging tools, and registry editing tools.

File name	Description
Attrib.exe	Common command-line tool
Chkdsk.exe	Common command-line tool
Clipsrv.exe	Common command-line tool
Diskpart.exe	Partitioning tool (also used by Factory.exe)
Dmadmin.exe	Partitioning tool (also used by Factory.exe)
Eqndiag.exe	Common command-line tool
Eqnlogr.exe	Common command-line tool
Eqnloop.exe	Common command-line tool
Expand.exe	Common command-line tool
Factory.exe	Factory preinstallation tool
Locator.exe	Common command-line tool
Notepad.exe	Common command-line tool
Ntsd.exe	Common command-line tool
Odbcad32.exe	Common command-line tool
Odbcconf.exe	Common command-line tool
Peer.exe	Common command-line tool
Pentnt.exe	Common command-line tool
Portmon.exe	Common command-line tool
Reg.exe	Common command-line tool
Regedit.exe	Common command-line tool
Regedt32.exe	Common command-line tool
Regsvr32.exe	Common command-line tool
Rsvp.exe	Common command-line tool
Setup.exe	Common command-line tool
Spoolsv.exe	Common command-line tool
Taskmgr.exe	Common command-line tool
Winpe.bmp	Background bitmap for Windows PE (optional)
Xcopy.exe	Common command-line tool
Xlog.exe	Common command-line tool

Limitations of Windows PE

Windows PE has these limitations:

- To reduce its size, Windows PE includes only a subset of the available Win32 APIs. Included are I/O (disk and network) and core Win32 APIs.
- To prevent its use as a pirated operating system, Windows PE automatically stops running the shell and reboots after 24 hours of continuous use.
- No network access to files or folders on a Windows PE computer from another location on your network.
- Distributed File System (DFS) name resolution is supported as of the Service Pack 1 releases of Windows XP Home Edition,

Windows XP Professional, and Windows XP 64-Bit Edition.

- The tested methods of gaining network connectivity to file servers are TCP/IP and NetBIOS over TCP/IP. Other methods, such as the IPX/SPX network protocol, are not supported.
- The drive letters assigned during Windows PE are not saved to any registry that persists when you reboot. The drive letter assignment when you create partitions is in the order of creation, but the drive letter assignments when you reboot will be in the default order.
- Windows PE requires a VGA-compatible device and uses a screen resolution of 800 x 600 pixels. If Windows PE cannot detect video settings, the default screen resolution is 640 x 480 pixels.
- Windows PE is too large to fit on a floppy disk. For more information, see Reducing the Size of Windows PE.
- You cannot build a custom version of Windows PE from Windows XP Home Edition.
- Windows PE does not support the Microsoft .NET framework.
- The "Windows on Windows 32" (WOW32) subsystem was introduced into Windows NT to allow 16-bit applications to run on the Windows NT 32-bit platform. Similarly, a new 32-bit subsystem called "Windows on Windows 64" (WOW64) has been introduced into Windows XP 64-bit versions. This subsystem provides all the 32-bit Windows services needed for 32-bit applications to run properly. However, the WOW32 subsystem is not included in 32-bit versions of Windows PE, so 16-bit applications will not function. And in 64-bit versions of Windows PE, there is no WOW64 subsystem, so 32-bit applications will also not function.
- Windows PE can be used to configure and partition a computer's disks before starting Windows Setup. If any hard disks are converted to dynamic disks with Diskpart.exe before you start Windows Setup, then those hard disks are recognized as foreign when the operating system is installed, and any volumes on those hard disks will not be accessible.

Windows APIs That Are Not Supported on Windows PE

The following categories of functions of the Win32 API set are not present in Windows PE. For more information on these categories, see the Microsoft Platform SDK in the MSDN Library (http://msdn.microsoft.com/library/): Select **Windows Development**, and then select **Platform SDK**.

- Windows Management Instrumentation (WMI)
- Windows Multimedia
- Still Image
- OpenGL
- NetShow Theater Administration
- Windows Shell
- Access Control
- Power Options
- Printing and Print Spooler
- Window Station and Desktop
- Terminal Services
- User Profile
- Tape Backup

For information on adding support for Windows Script Host (WSH), HTML Applications (HTA), and ActiveX Data Objects (ADO) to Windows PE, see Adding Optional Component Packages to Windows PE in the topic Creating a Customized Version of Windows PE.

Helpful Command-Line Tools

These tools are used when building a customized version of Windows Preinstallation Environment (Windows PE) or when preinstalling Windows using Windows PE.

- DiskPart Commands
- DiskPart Scripting
- Dskimage Command-Line Options
- Factory Command-Line Options
- Mkimg Command
- Netcfg Command-Line Options
- Oscdimg Command-Line Options
- Sys Command-Line Options

DiskPark is contained in the Windows operating system CD.

DiskPart Commands

DiskPart is a text-mode command interpreter contained in the Windows XP and the Windows Server 2003 family. This tool enables you to manage objects (disks, partitions, or volumes) by using scripts or direct input from a command prompt. Before you can use DiskPart commands on a disk, partition, or volume, you must first list and then select the object to give it focus. When an object has focus, any DiskPart commands that you type act on that object.

You can list the available objects and determine an object's number or drive letter by using the **list disk**, **list volume**, and **list partition** commands. The **list disk** and **list volume** commands display all disks and volumes on the computer. However, the **list partition** command displays only partitions on the disk that have focus. When you use the **list** commands, an asterisk (*) appears next to the object with focus. You select an object by its number or drive letter, such as disk 0, partition 1, volume 3, or volume C.

When you select an object, the focus remains on that object until you select a different object. For example, if the focus is set on disk 0, and you select volume 8 on disk 2, the focus shifts from disk 0 to disk 2, volume 8. Some commands automatically change the focus. For example, when you create a new partition, the focus automatically changes to the new partition.

You can give focus only to a partition on the selected disk. When a partition has focus, the related volume (if any) also has focus. When

a volume has focus, the related disk and partition also have focus if the volume maps to a single specific partition. If this is not the case, then focus on the disk and partition is lost.

Important

- When using the DiskPart command as a part of a script, it is recommended that you complete all of the DiskPart operations together as part of a single DiskPart script. You can run consecutive DiskPart scripts, but you must allow at least 15 seconds between each script for a complete shutdown of the previous execution before running the DiskPart command again in successive scripts. Otherwise, the successive scripts might fail. You can add a pause between consecutive DiskPart scripts by adding the timeout `/t 15` command to your batch file along with your DiskPart scripts.

For more information about DiskPart, see Disk Management at the Microsoft Windows Resource Kits Web site. (http://www.microsoft.com/)

DiskPart Commands

This table identifies the syntax and parameters of the DiskPart commands.

Command	Syntax	Description
active	**active**	On basic disks, marks the partition with focus as active. This informs the basic input/output system (BIOS) or Extensible Firmware Interface (EFI) that the partition or volume is a valid system partition or system volume. Only partitions can be marked as active. Important • DiskPart verifies that only the partition is capable of containing an operating system's startup files. DiskPart does not check the contents of the partition. If you mistakenly mark a partition as "active" and it does not contain the operating system's startup files, your computer might not start.
add disk	**add disk=***n* [**noerr**]	Mirrors the simple volume with focus to the specified disk. *n* Specifies the disk to contain the mirror. You can mirror only simple volumes. The specified disk must have unallocated space at least as large as the size of the simple volume that you want to mirror. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
assign	**assign** [{**letter=***d*|**mount=***path*}] [**noerr**]	Assigns a drive letter or mount point to the volume with focus. If no drive letter or mount point is specified, then the next available drive letter is assigned. If the assigned drive letter or mount point is already in use, an error is generated. Using the **assign** command, you can change the drive letter associated with a removable drive. You cannot assign drive letters to system volumes, boot volumes, or volumes that contain the paging file. In addition, you cannot assign a drive letter to an original equipment manufacturer (OEM) partition or any GPT partition other than a basic data partition. **letter=***d* Specifies the drive letter that you want to assign to the volume. **mount=***path* Specifies the mount point path that you want to assign to the volume. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
break disk	**break disk=***n* [**nokeep**] [**noerr**]	Applies to dynamic disks only. Breaks the mirrored volume with focus into two simple volumes. One simple volume retains the drive letter and any mount points of the mirrored volume, while the other simple volume receives the focus so that you can assign it a drive letter. By default, the contents of both halves of the mirror are retained; each half becomes a simple volume. Using the **nokeep** parameter, only one-half of the mirror is retained as a simple volume, while the other half is deleted and converted to free space. Neither volume receives the focus. *n* Specifies the disk that contains the mirrored volume. **nokeep** Specifies that only one of the mirrored volumes is retained; the other simple volume is deleted and converted to free space. Neither volume receives the focus. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
clean	**clean** [**all**]	Removes any and all partition or volume formatting from the disk with focus. On master boot record (MBR) disks, only the MBR partitioning information and hidden sector information are overwritten. On GUID partition table (GPT) disks, the GPT partitioning information, including the Protective MBR, is overwritten; there is no hidden sector information. **all** Specifies that each and every sector on the disk is zeroed, which completely deletes all data

		contained on the disk.
convert basic	**convert basic** [**noerr**]	Converts an empty dynamic disk into a basic disk. Important • The disk must be empty to convert it to a dynamic disk. Back up your data, and then delete all partitions or volumes before converting the disk. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
convert dynamic	**convert dynamic** [**noerr**]	Converts a basic disk into a dynamic disk. Any existing partitions on the disk become simple volumes. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
convert gpt	**convert gpt** [**noerr**]	On Itanium-based computers, converts an empty basic disk with the master boot record (MBR) partition style into a basic disk with the GUID partition table (GPT) partition style. Important • The disk must be empty to convert it to a GPT disk. Back up your data and then delete all partitions or volumes before converting the disk. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
convert mbr	**convert mbr** [**noerr**]	On Itanium-based computers, converts an empty basic disk with the GUID Partition Table (GPT) partition style to a basic disk with the master boot record (MBR) partition style. Important • The disk must be empty to convert it to an MBR disk. Back up your data and then delete all partitions or volumes before converting the disk. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
create partition efi	**create partition efi** [**size=***n*] [**offset**=*n*] [**noerr**]	On Itanium-based computers, creates an Extensible Firmware Interface (EFI) system partition on a GUID Partition Table (GPT) disk. After the partition has been created, the focus is given to the new partition. **size=***n* Specifies the size of the partition in megabytes (MB). If no size is given, the partition continues until there is no more free space in the current region. **offset**=*n* Specifies the byte offset at which to create the partition. If no offset is given, the partition is placed in the first disk extent that is large enough to hold it. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
create partition extended	**create partition extended** [**size=***n*] [**offset=***n*] [**noerr**]	Creates an extended partition on the current drive. After the partition has been created, the focus automatically shifts to the new partition. Only one extended partition can be created per disk. This command fails if you attempt to create an extended partition within another extended partition. You must create an extended partition before you can create logical drives. **size=***n* Specifies the size of the extended partition in megabytes (MB). If no size is given, then the partition continues until there is no more free space in the region. The size is cylinder snapped; that is, the size is rounded to the closest cylinder boundary. For example, if you specify a size of 500 MB, the partition size rounds up to 504 MB. **offset=***n* Applies to master boot record (MBR) disks only. Specifies the byte offset at which to create the extended partition. If no offset is given, the partition starts at the beginning of the first free space on the disk. The offset is cylinder snapped; that is, the offset is rounded to the closest cylinder boundary. For example, if you specify an offset that is 27 MB and the cylinder size is 8 MB, the offset is rounded to the 24-MB boundary. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
		Creates a logical drive in the extended partition. After the partition has been created, the focus automatically shifts to the new logical drive. **size=***n* The size of the logical drive in megabytes (MB). If no size is given, then the partition continues until there is no more free space in the current region. **offset=***n*

create partition logical	**create partition logical** [**size=***n*] [**offset=***n*] [**noerr**]	Applies to master boot record (MBR) disks only. Specifies the byte offset at which to create the logical drive. The offset is cylinder snapped; that is, the offset rounds up to completely fill whatever cylinder size is used. If no offset is given, then the partition is placed in the first disk extent that is large enough to hold it. The partition is at least as long in bytes as the number specified by **size=***n*. If you specify a size for the logical drive, it must be smaller than the extended partition. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
create partition msr	**create partition msr** [**size=***n*] [**offset=***n*] [**noerr**]	On Itanium-based computers, creates a Microsoft reserved (MSR) partition on a GUID Partition Table (GPT) disk. Caution • Be very careful when using the **create partition msr** command. GPT disks require a specific partition layout, and so creating Microsoft Reserved Partitions can cause the disk to become unreadable. On GPT disks that are used to start Windows XP 64-Bit Edition or the 64-bit versions of the Windows Server 2003 family, the EFI system partition is the first partition on the disk, followed by the Microsoft Reserved Partition. GPT disks used only for data storage do not have an EFI system partition; the Microsoft Reserved Partition is the first partition. Windows XP and the Windows Server 2003 family do not mount Microsoft Reserved Partitions. You cannot store data on them and you cannot delete them. **size=***n* Specifies the size of the partition in megabytes (MB). The partition is at least as long in bytes as the number specified by **size=***n*. If no size is given, the partition continues until there is no more free space in the current region. **offset=***n* Specifies the byte offset at which to create the partition. The partition starts at the byte offset specified by **offset=***n*. It is sector snapped; that is, the offset rounds up to completely fill whatever sector size is used. If no offset is given, then the partition is placed in the first disk extent that is large enough to hold it. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.

create partition primary	**create partition primary** [**size=***n*] [**offset=***n*] [**ID=** {*byte*|*GUID*}] [**noerr**]	Creates a primary partition on the current basic disk. After you create the partition, the focus automatically shifts to the new partition. The partition does not receive a drive letter; you must use the **assign** command to assign a drive letter to the partition.
		size=*n*
		Specifies the size of the partition in megabytes (MB). If no size is given, the partition continues until there is no more unallocated space in the current region. The size is cylinder snapped; that is, the size rounds to the closest cylinder boundary. For example, if you specify a size of 500 MB, the partition size rounds up to 504 MB.
		offset=*n*
		Specifies the byte offset at which to create the partition. If no offset is given, the partition starts at the beginning of the first free space on the disk. For master boot record (MBR) disks, the offset is cylinder snapped; that is, the offset rounds to the closest cylinder boundary. For example, if you specify an offset that is 27 MB and the cylinder size is 8 MB, the offset rounds to the 24-MB boundary.
		ID={*byte*|*GUID*}
		Intended for original equipment manufacturer (OEM) use only.
		Caution
		• Creating partitions with this parameter might cause your computer to crash or be unable to start. Unless you are an OEM or an IT professional experienced with GPT disks, do not create partitions on GPT disks using the **ID=***byte* | *GUID* parameter. Instead, always use the **create partition efi** command to create EFI System partitions, the **create partition msr** command to create Microsoft Reserved Partitions, and the **create partition primary** command (without the **ID=***byte* | *GUID* parameter) to create primary partitions on GPT disks.
		noerr
		For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
		Comments
		To partition a GPT disk with an OEM partition
		1. Generate an OEM-GUID.
		2. Use this command to create an EFI partition:
		`Create partition efi size=n`
		3. Use this command to create a primary partition:
		`Create partition primary size=n ID={byte|GUID}`

		4. Use this command to create an MSR partition: `Create partition MSR size=n` Important • You must create the OEM partition between the EFI and MSR partitions. • Never create the LDM metadata or LDM data partitions explicitly as partitions. Instead, convert the disk to dynamic. For master boot record (MBR) disks, you can specify a partition type byte, in hexadecimal form, for the partition. If you do not specify a partition type byte on an MBR disk, the **create partition primary** command creates a partition of type 0x6. Any partition type byte can be specified with the **ID=***byte* | *GUID* parameter. DiskPart does not check the partition type byte for validity, nor does it perform any other checking of the ID parameter. For GPT disks, you can specify a partition type GUID for the partition that you want to create: • EFI System partition: c12a7328-f81f-11d2-ba4b-00a0c93ec93b • Microsoft reserved partition: e3c9e316-0b5c-4db8-817d-f92df00215ae • Basic data partition: ebd0a0a2-b9e5-4433-87c0-68b6b72699c7 • LDM metadata partition on a dynamic disk: 5808c8aa-7e8f-42e0-85d2-e1e90434cfb3 • LDM data partition on a dynamic disk: af9b60a0-1431-4f62-bc68-3311714a69ad If you do not specify a partition type GUID, the **create partition primary** command creates a basic data partition. Any partition type can be specified with the **ID=***byte* | *GUID* parameter. DiskPart does not check the partition GUID for validity, nor does it perform any other checking of the ID parameter.
create volume raid	**create volume raid** [**size=***n*] [**disk=***n*,*n*,*n*[,*n*,...]] [**noerr**]	Creates a RAID-5 volume on three or more specified dynamic disks. After you create the volume, the focus automatically shifts to the new volume. **size=***n* Specifies the amount of disk space, in megabytes (MB), that the volume occupies on each disk. If no size is given, the largest possible RAID-5 volume is created. The disk with the smallest available contiguous free space determines the size for the RAID-5 volume and the same amount of space is allocated from each disk. The actual amount of usable disk space in the RAID-5 volume is less than the combined amount of disk space because some of the disk space is required for parity. **disk=***n*,*n*,*n*[,*n*,...] Specifies the dynamic disks on which to create the volume. You need at least three dynamic disks in order to create a RAID-5 volume. An amount of space equal to **size=***n* is allocated on each disk. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
create volume simple	**create volume simple** [**size=***n*] [**disk=***n*] [**noerr**]	Creates a simple volume. After you create the volume, the focus automatically shifts to the new volume. **size=***n* Specifies the size of the volume in megabytes (MB). If no size is given, the new volume takes up the remaining free space on the disk. **disk=***n* Specifies the dynamic disk on which to create the volume. If no disk is given, the current disk is used. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
create volume stripe	**create volume stripe** [**size=***n*] [**disk=***n*,*n*[,*n*,...]] [**noerr**]	Creates a striped volume using two or more specified dynamic disks. After you create the volume, the focus automatically shifts to the new volume. **size=***n* Specifies the amount of disk space, in megabytes (MB), that the volume occupies on each disk. If no size is given, the new volume takes up the remaining free space on the smallest disk and an equal amount of space on each subsequent disk. **disk=***n*,*n*[,*n*,...] Specifies the dynamic disks on which to create the volume. You need at least two dynamic disks to create a striped volume. An amount of space equal to **size=***n* is allocated on each disk. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
	delete disk [**noerr**]	Deletes a missing dynamic disk from the disk list. **noerr** For scripting only. When an error is encountered, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error

delete disk	[**override**]	causes DiskPart to exit with an error code. **override** Enables DiskPart to delete all simple volumes on the disk. If the disk contains half of a mirrored volume, the half of the mirror on the disk is deleted. The **delete disk override** command fails if the disk is a member of a RAID-5 volume.
delete partition	**delete partition** [**noerr**] [**override**]	On a basic disk, deletes the partition with focus. You cannot delete the system partition, boot partition, or any partition that contains the active paging file or crash dump (memory dump). Caution • Deleting a partition on a dynamic disk can delete all dynamic volumes on the disk, thus destroying any data and leaving the disk in a corrupted state. To delete a dynamic volume, always use the **delete volume** command instead. You can delete partitions from dynamic disks, but you must not create them. For example, it is possible to delete an unrecognized GUID Partition Table (GPT) partition on a dynamic GPT disk. However, deleting such a partition does not cause the resulting free space to become available. This command is intended to enable space reclamation on a corrupted offline dynamic disk in an emergency situation where the **clean** command cannot be used. **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code. **override** Enables DiskPart to delete any partition regardless of type. Normally, DiskPart only enables you to delete known data partitions.
delete volume	**delete volume** [**noerr**]	Deletes the selected volume. You cannot delete the system volume, boot volume, or any volume that contains the active paging file or crash dump (memory dump). **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
detail disk	**detail disk**	Displays the properties of the selected disk and the volumes on that disk.
detail volume	**detail volume**	Displays the disks on which the current volume resides.
exit	**exit**	Exits the DiskPart command interpreter.
extend	**extend** [**size=***n*] [**disk=***n*] [**noerr**]	Extends the volume with focus into the next contiguous unallocated space. For basic volumes, the unallocated space must be on the same disk as, and must follow (have a higher sector offset number than) the partition with focus. A dynamic simple or spanned volume can be extended to any empty space on any dynamic disk. Using this command, you can extend an existing volume into newly created space. If the partition was previously formatted with the NTFS file system, the file system is automatically extended to occupy the larger partition. No data loss occurs. If the partition was previously formatted with any file system format other than NTFS, the command fails with no change to the partition. You cannot extend the current system or boot partitions. **size=***n* Specifies the amount of space, in megabytes (MB), to add to the current partition. If you do not specify a size, the disk is extended to take up all of the next contiguous unallocated space. **disk=***n* Specifies the dynamic disk on which to extend the volume. An amount of space equal to **size=***n* is allocated on the disk. If no disk is specified, the volume is extended on the current disk. **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
help	**help**	Displays a list of the available commands.
import	**import** [**noerr**]	Imports a foreign disk group into the local computer's disk group. The **import** command imports every disk that is in the same group as the disk that has focus. **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
inactive	**inactive**	On basic master boot record (MBR) disks, marks the system partition or boot partition with focus as inactive. The computer starts from the next option specified in the BIOS such as the CD-ROM drive or a Pre-Boot eXecution Environment (PXE)-based boot environment (such as Remote Installation Services (RIS)) when you restart the computer. Caution • Your computer might not start without an active partition. Do not mark a system or boot partition as inactive unless you are an experienced user with a thorough understanding of the Windows Server 2003 family. If you are unable to start your computer after marking the system or boot partition as inactive, try repairing the partition using the **Fixmbr** and **Fixboot** commands in the Recovery Console.

list disk	**list disk**	Displays a list of disks and information about them, such as their size, amount of available free space, whether the disk is a basic or dynamic disk, and whether the disk uses the master boot record (MBR) or GUID partition table (GPT) partition style. The disk marked with an asterisk (*) has focus.
list partition	**list partition**	Displays the partitions listed in the partition table of the current disk. On dynamic disks, these partitions may not correspond to the dynamic volumes on the disk. This discrepancy occurs because dynamic disks contain entries in the partition table for the system volume or boot volume (if present on the disk). Dynamic disks also contain a partition that occupies the remainder of the disk in order to reserve the space for use by dynamic volumes.
list volume	**list volume**	Displays a list of basic and dynamic volumes on all disks.
online	**online** [**noerr**]	Brings an offline disk or volume with focus online. **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.

rem	**rem**	Provides a way to add comments to a script. For example:
		
		`rem These commands set up 3 drives.`
		`create partition primary size=2048`
		`assign d:`
		`create partition extend`
		`create partition logical size=2048`
		`assign e:`
		`create partition logical`
		`assign f:`

remove	**remove** [{**letter=***d*|**mount=***path* [**all**]}] [**noerr**]	Removes a drive letter or mount point from the volume with focus. If the **all** parameter is used, all current drive letters and mount points are removed. If you do not specify a drive letter or mount point, then DiskPart removes the first drive letter or mount point that it encounters. You can use the **remove** command to change the drive letter associated with a removable drive. You cannot remove the drive letters on system, boot, or paging volumes. In addition, you cannot remove the drive letter for an OEM partition, any GPT partition with an unrecognized GUID, or any of the special, non-data, GPT partitions such as the EFI system partition. **letter=***d* Specifies the drive letter to remove. **mount=***path* Specifies the mount point path to remove. **all** Removes all current drive letters and mount points. **noerr** For scripting only. When an error occurs, specifies that DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
repair disk	**repair disk=***n* [**noerr**]	Repairs the RAID-5 volume with focus by replacing the failed RAID-5 member with the specified dynamic disk. The specified dynamic disk must have free space greater than or equal to the total size of the failed RAID-5 member. *n* Specifies the dynamic disk that replaces the failed RAID-5 member. The specified disk must have free space equal to or larger than the total size of the failed RAID-5 member. **noerr** For scripting only. When an error occurs, DiskPart continues to process commands as if the error did not occur. Without the **noerr** parameter, an error causes DiskPart to exit with an error code.
rescan	**rescan**	Locates new disks that may have been added to the computer.
retain	**retain**	Prepares an existing dynamic simple volume to use as a boot or system volume. On an x86-based computer, creates a partition entry in the master boot record (MBR) on the dynamic simple volume with focus. To create an MBR partition, the dynamic simple volume must start at a cylinder aligned offset and be an integral number of cylinders in size. On an Itanium-based computer, creates a partition entry in the GUID partition table (GPT) on the dynamic simple volume with focus. Note • The **retain** command is intended for use only during unattended Setup or by original equipment manufacturers (OEMs).
select disk	**select disk=**[*n*]	Selects the specified disk and shifts the focus to it. *n* Specifies the disk number of the disk to receive focus. If you do not specify a disk number, the **select** command lists the disk that currently has the focus. You can view the numbers for all disks on the computer by using the **list disk** command.
select	**select partition=**[{*n*|*d*}]	Selects the specified partition and gives it focus. If If you do not specify a partition, the **select** command lists the current partition with focus. You can view the numbers of all partitions on the current disk by using the **list partition** command. *n*

partition		Specifies the number of the partition to receive the focus. *d* Specifies the drive letter or mount point path of the partition to receive the focus.
select volume	**select volume=**[{*n*|*d*}]	Selects the specified volume and shifts the focus to it. If you do not specify a volume, the **select** command lists the current volume with focus. You can specify the volume by number, drive letter, or mount point path. On a basic disk, selecting a volume also gives the corresponding partition focus. You can view the numbers of all volumes on the computer by using the **list volume** command. *n* Specifies the number of the volume to receive the focus. *d* Specifies the drive letter or mount point path of the volume to receive the focus.

For more information, see DiskPart Scripting.

DiskPart Scripting

By using the DiskPart command-line tool, you can create scripts to automate disk-related tasks, such as creating volumes or converting disks to dynamic disks. Scripting these tasks is useful if you deploy Windows by using unattended Setup or Sysprep, which do not support creating volumes other than the boot volume.

For more information about DiskPart scripts, see "Disk Management" in the *Microsoft Windows XP Professional Resource Kit*.

To start a DiskPart script, at the command prompt, type:

```
DiskPart /S scriptname.txt
```

where *scriptname.txt* is the name of the text file that contains your script.

To redirect DiskPart's scripting output to a file, type:

```
DiskPart /S scriptname.txt > logfile.txt
```

where *logfile.txt* is the name of the text file where DiskPart writes its output.

When DiskPart starts, the DiskPart version and computer name display at the command prompt. By default, if DiskPart encounters an error while attempting to perform a scripted task, DiskPart stops processing the script and displays an error code (unless you specified the **noerr** parameter). However, DiskPart always returns errors when it encounters syntax errors, regardless of whether you used the **noerr** parameter. The **noerr** parameter enables you to perform useful tasks such as using a single script to delete all partitions on all disks regardless of the total number of disks.

This table lists the DiskPart error codes:

Error	Description
0	No errors occurred. The entire script ran without failure.
1	A fatal exception occurred. There may be a serious problem.
2	The parameters specified for a DiskPart command are incorrect.
3	DiskPart was unable to open the specified script or output file.
4	One of the services that DiskPart uses returned a failure.
5	A command syntax error occurred. The script failed because an object was improperly selected or was invalid for use with that command.

Dskimage Command-Line Options

You can build a 64-bit version of Windows PE from a computer running a 32-bit operating system. However, building a 64-bit Windows PE CD requires one additional step. You must copy the file Setupldr.efi to a floppy disk, then use the Dskimage tool to make an image of the floppy disk. After you create an image of the 1.44-MB floppy disk, pass that image file into Oscdimg as an argument, in the same way you pass Etfsboot.com.

For example:

```
copy C:\Build.ia64\ia64\Setupldr.efi A:
dskimage A: .\Efisys.bin
oscdimg -b.\Efisys.bin -n C:\Build.ia64 C:\64_winpe.iso
```

The syntax of the **Dskimage** tool:

dskimage *drive_letter image_file*

Option	Description
drive_letter	The letter name of the floppy drive containing Setupild.efi.
image_file	The name of the image file to pass to Oscdimg.

Factory Command-Line Options

You can use the Factory tool in two ways: from the command-line tool in the Windows Preinstallation Environment (Windows PE), and from within Sysprep.

Use the Factory tool to update drivers, run Plug and Play enumeration, install applications, test, configure the computer with customer data, or make other configuration changes in your factory environment. For companies that use disk imaging (or cloning) software, efficient use of Factory.exe can reduce the number of images you require.

Running the Factory Tool in Sysprep

To run the Factory tool from within Sysprep, use this syntax:

sysprep -factory

This command restarts in a network-enabled state without displaying Windows Welcome or Mini-Setup.

When you have finished your set of tasks in Factory mode, run Sysprep with the **-reseal** option to prepare the computer for delivery to the end user.

Running the Factory Tool in Windows PE

The syntax of the **Factory** tool:

factory {**-minint** | **-winpe**}

Option	Action
-minint	Uses Plug and Play to install the network interface card (NIC).
-winpe	Locates a Winbom.ini file and processes these sections in this order: • [WinPE.Net] • [DiskConfig] • [OEMRunOnce] • [OEMRun] • [WinPE], except for the **Restart** entry • [UpdateSystem] • Restart entry in **[WinPE]**

Locating a Winbom.ini File

Factory.exe searches for a Winbom.ini file in these locations in this order:

1. The root of all removable media drives that are not CD-ROM drives, such as a floppy disk drive.
2. The root of all CD-ROM drives.
3. The location of Factory.exe, usually the %SYSTEMDRIVE%\Sysprep folder.
4. The root of %SYSTEMDRIVE%.

Notes

- If Factory.exe is running in the Windows Preinstallation Environment (Windows PE), the computer does not have network access until it processes a Winbom.ini file that contains a [WinPE.Net] section.
- Windows PE is licensed to original equipment manufacturers (OEMs) and corporations with Enterprise Agreements or Select Agreements with Software Assurance Membership in the Systems Pool.
- The last path and file name used by Factory.exe is stored in the registry key **HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Factory\Winbom**.

After locating a Winbom.ini file, the Factory tool reads the value of the WinbomType entry in the **[Factory]** section.

If the value of **WinbomType** does not match the current mode of Factory.exe (Factory, Windows PE, or OOBE), then the Winbom.ini file is ignored and the Factory tool continues searching for a Winbom.ini file. If the value of **WinbomType** does match the current mode, the Factory tool reads the value of the NewWinbom entry in the **[Factory]** section. If a value is specified for **NewWinbom**, and a Winbom.ini file is located at the location specified by **NewWinBom**, then the Factory tool examines that Winbom.ini file for a **NewWinbom** entry.

This cycle continues for a maximum of 10 times or until the Factory tool locates a Winbom.ini file that does not contain a **NewWinbom** entry, whichever occurs first. The Factory tool then continues to run, using the settings in the last identified Winbom.ini file.

When you run Sysprep in Factory mode, **NewWinbom** is processed only once at each boot.

After locating the intended Winbom.ini file, the computer connects to the network as specified in the [WinPE.Net] section. Plug and Play installs only the network adapter, and the Factory tool installs network services and binds the network protocols.

Mkimg Command

This command builds the file set for the Windows Preinstallation Environment (Windows PE) from any Windows XP or Windows Server 2003, Standard Edition product CD except Windows XP Home Edition, Windows Server 2003, Datacenter Edition, and Windows Server 2003, Web Edition, and optionally creates an .iso image of the files. You can then burn that .iso file to a CD-ROM. The CD image creation process takes several minutes. The files are placed in the same location as where you run the **mkimg** command.

The syntax of the Mkimg command:

Mkimg.cmd [/**nover**] *source_directory destination_directory* [*image_name*]

Option	Action
/**nover**	Disables version checking that would normally prevent the creation of unsupported Windows PE images.
source_directory	Specifies the location of the CD-ROM containing the Windows product CD. Do not use Windows XP Home Edition. If *source_directory* is a CD-ROM drive, you need to specify only the drive letter. If *source_directory* is a network path, the path must be to the parent directory of the \i386 directory. Note

	• Do not include a trailing slash in *source_directory*.
destination_directory	Specifies the path where the files necessary to create the image are temporarily stored. If this directory does not already exist, Mkimg creates it.
image_name	Specifies the path and file name of an ISO image file (.iso) that contains your customized version of Windows PE. You can burn this .iso file to a CD-ROM to create a bootable Windows PE CD. Alternatively, you can make more customizations of this version of Windows PE by using Oscdimg to create an .iso file of a 64-bit version of Windows PE.

Important

- You must run the **mkimg** command from a location where you have read/write permissions, such as a local directory. You cannot run the **mkimg** command from a read-only device such as a CD-ROM drive.

Example

This example creates an ISO image called ia64winpe.iso by using C:\Winpe.tmp and the floppy disk as temporary storage areas.

```
C:\Build.ia64\Mkimg.cmd E: C:\Winpe.tmp C:\ia64winpe.iso
```

Netcfg Command-Line Options

The network configuration tool (Netcfg) configures network access. When preinstalling Windows, it is most commonly used in a script that runs during Windows PE.

Note

- The tested methods for Windows PE to gain network connectivity to file servers are TCP/IP and NetBIOS over TCP/IP. Other methods, such as the IPX/SPX network protocol, are not supported.

For greater flexibility, the default version of Startnet.cmd includes a **netcfg** command instead of **factory -winpe**. For more information on Startnet.cmd, see Creating a Customized Version of Windows PE.

The syntax of the Netcfg tool relevant to OEMs:

netcfg [**-v**] [**-winpe**] [**-l** *path_to_component_inf*] [**-c** {**c** | **p** | **s**}] [**-i** *component_id*]

Option	Action
-v	Specifies verbose mode.
-winpe	Installs TCP/IP, NetBIOS, and the Client for Microsoft Networks (MSClient) when running in the Windows Preinstallation Environment (Windows PE).
-l *path_to_component_inf*	Specifies the complete path of the .inf file.
-c	Specifies the class of the component to install. Valid options are **c**, **p**, and **s**. **c** Client **p** Protocol **s** Service
component_id	Specifies the component ID of the networking component to install from the .inf file.

Examples

This command line installs the protocol MyProtocol from C:\Oemdir\file.inf:

```
netcfg -l c:\oemdir\file.inf -c p -i MyProtocol
```

This command line installs the MS_Server service:

```
netcfg -c s -i MS_Server
```

This command line installs TCP/IP, NetBIOS, and MSClient in Windows PE:

```
netcfg -v -winpe
```

Additional Netcfg Command-Line Options

The syntax of additional Netcfg options:

netcfg [**-s** {**a** | **n**}] [{**-b** | **-q** | **-u**} *component_id*]

Option	Action
-s	Specifies the type of the component to display; valid options are **a** and **n**. **a** Displays network adapters. **n**

	Displays network components.
-b	Displays the binding paths that contain the specified *component_id*.
-q	Queries if a particular component, specified by *component_id*, is installed.
-u	Uninstalls a particular component, specified by *component_id*.
component_id	Specifies the component ID of the relevant component.

Oscdimg Command-Line Options

This is a command-line tool in the OPK that creates an image (.iso) file of a customized 32-bit or 64-bit version of Windows PE. You can then burn that .iso file to a CD-ROM.

The syntax of the **Oscdimg** tool:

oscdimg [-**b***location*] [-**d**] [-**h**] [*image_file*] [-**j1**] [-**j2**] [-**l***labelname*] [-**n**] [-**nt**] [-**o**[**i**][**s**]] *sourceroot* [-**t***mm*/*dd*/*yyyy*,*hh*:*mm*:*ss* [-**g**]] [-**x**]

Option	Action
-**b***location*	Specifies the location of the El Torito boot sector file. Do not use any spaces. For example: `-bc:\directory\Etfsboot.com`
-**d**	Does not force lowercase file names to uppercase.
-**g**	Uses the Universal Coordinated Time for all files rather than the local time.
-**h**	Includes hidden files and directories.
image_file	Specifies the name of the .iso image file you want to create from the Windows PE files.
-**j1**	Encodes Joliet Unicode file names and generates DOS-compatible 8.3 file names in the ISO-9660 name space. These file names can be read by either Joliet systems or conventional ISO-9660 systems, but Oscdimg may change some of the file names in the ISO-9660 name space to comply with DOS 8.3 and/or ISO-9660 naming restrictions. When using the **-j1** or **-j2** options, the **-d**, **-n**, and **-nt** options do not apply and cannot be used.
-**j2**	Encodes Joliet Unicode file names without standard ISO-9660 names (requires a Joliet operating system to read files from the CD-ROM). When using the **-j1** or **-j2** options, the **-d**, **-n**, and **-nt** options do not apply and cannot be used.
-**l***labelname*	Specifies the volume label. Do not use spaces between the **l** and the *labelname*. For example: `-lMYLABEL`
-**n**	Allows long file names.
-**nt**	Allows long file names that are compatible with Windows NT 3.51.
-**o**	Optimizes storage by encoding duplicate files only once.
-**oi**	Optimizes storage by encoding duplicate files only once. When comparing files, ignores diamond compression time stamps.
-**os**	Optimizes storage by encoding duplicate files only once. Shows duplicate files when creating the image.
-**ois**	Optimizes storage by encoding duplicate files only once. When comparing files, ignores diamond compression time stamps. Shows duplicate files when creating the image.
sourceroot	Required. Specifies the location of the Windows PE files that you want to build into an .iso image.
-**t***mm*/*dd*/*yyyy*,*hh*:*mm*:*ss*	Specifies the time stamp for all files and directories. Do not use any spaces. Use the United States date format and a 24-hour clock. You can use any delimiter between the items. For example: `-t12/31/2000,15:01:00`
-**x**	Computes and encodes the AutoCRC value in the image.

Sys Command-Line Options

You can use Windows PE to preinstall Windows 95, Windows 98, and Windows Millennium Edition. In these cases, the hard disk needs the boot sector common to these operating systems. Use the Sys.exe utility to write the boot sectors for these operating systems.

By default, Sys writes a Windows 95, Windows 98, and Windows Millennium Edition boot sector. Use the **/xp** option to write a Windows XP boot sector.

The syntax of the Sys tool:

sys [**/xp**] *drive_letter*

Option	Action
/xp	Optional. Writes the Windows XP boot sector.
drive_letter	Specifies the letter name of the drive to write the boot sector to.