Symantec ™

DeployCenter 5.7

User Guide

Symantec™ DeployCenter 5.7 User guide

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When you contact Technical Support, please have the following information available:

- Product release level
- Hardware information

- Available memory, disk space, and NIC information
- Operating system
- Version and patch level
- Network topology
- Router, gateway, and IP address information
- Problem description:
  - Error messages and log files
  - Troubleshooting that was performed before contacting Symantec
  - Recent software configuration changes and network changes

Licensing and registration

If your Symantec product requires registration or a license key, access our technical support Web page at the following URL:

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Customer service

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Customer Service is available to assist with non-technical questions, such as the following types of issues:

- Questions regarding product licensing or serialization
- Product registration updates, such as address or name changes
- General product information (features, language availability, local dealers)
- Latest information about product updates and upgrades
- Information about upgrade assurance and support contracts
- Information about the Symantec Buying Programs
- Advice about Symantec's technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs, DVDs, or manuals

Support agreement resources

If you want to contact Symantec regarding an existing support agreement, please contact the support agreement administration team for your region as follows:

Asia-Pacific and Japan	customercare_apj@symantec.com
Europe, Middle-East, and Africa	semea@symantec.com
North America and Latin America	supportsolutions@symantec.com

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Chapter 8: ImageExplorer

Chapter 9: Using PXE to Deploy Image Files

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Introduction

What is Symantec DeployCenter?

Symantec™ DeployCenter helps you deploy an exact image of a hard disk and manage multiple workstation images. Small to enterprise organizations use DeployCenter to:

- Deploy or upgrade Windows workstations
- Create a standard, customized work environment for faster deployment of new computers
- Easily introduce new systems to the network

What's on the DeployCenter CD?

- **ImageCenter**—Lets you create and restore image files and copy information from an existing disk to a new one during a hardware upgrade. The executable is PQIMGCTR.EXE. See Chapters 2, 4, 5, 11, and 12.
- **Boot Disk Builder**—Wizard interface that allows you to create boot disks, including virtual floppy disks, for connecting to a network, PowerCast server, or Unicast server, or to run ImageCenter without network connectivity. The executable is PQBDB32.EXE (in the Bdbuild folder). See Chapter 3.
- **PowerCasting**—Lets you deploy an image to multiple machines simultaneously. There are executables for DOS and Windows PowerCast servers and a DOS PowerCast client. See Chapter 6.
- **Unicasting**—Establishes a Unicast server to which workstations can connect as a point-to-point Unicast client to create and deploy images. Unicasting differs from multicasting in that it uses a point-to-point transport connection and a specific IP address on both the server and client sides instead of sending data using a multicast (limited broadcast) IP address. Use Boot Disk Builder to create Unicast client boot disks. Unicast Server is only available under Windows NT, Windows 2000, and Windows XP. See Chapter 7.
- **PXE Server**—Allows assignment of unique PXE boot environments to individual clients. Use PXE Configuration Utility on the Start menu to set up the PXE server. PXE Server is only available under Windows NT, Windows 2000, and Windows XP. See Chapter 9.

- **ImageExplorer**—Lets you create and copy image files, copy partitions within image files, compress/uncompress partitions, and restore individual files from images. The executable is PQIEXP32.EXE. See Chapter 8 of this user guide and the ImageExplorer online help.
- **DeployPrep**—Aids in the use of Microsoft SysPrep for deploying images with Windows 2000 or Windows XP. It automates the testing of a SysPrep configuration. It also adds additional configuration options to Microsoft SysPrep. The executable is PQPREP32.EXE. See Appendix A.
- **Symantec VF Editor**—Enables you to modify virtual floppy files used by ImageCenter. See Chapter 6 or Symantec VF Editor online help.
- **PARTINFO**—Generates a diagnostic report that includes information about your hard disk. See Appendix C.

What's new in Symantec DeployCenter

Symantec DeployCenter has limited Vista support, as follows:

- Symantec DeployCenter Library tools run on WinPE 2.0. Symantec DeployCenter Library cannot be installed on Vista, and the tools will not run on Vista.
- Symantec DeployCenter Library tools can handle the disk layouts as seen by Vista disk manager.
- System restore points that are captured during image creation are removed upon image deployment.
- If a disk signature does not already exist on a target disk, Symantec DeployCenter Library tools create a new disk signature for the cloned disk and patch it into the registry of mounted devices in Vista.
- Symantec DeployCenter Library tools support new Vista boot manager configuration updates.
- Symantec DeployCenter Library tools work with non-cylinder aligned partitions. In restore operations an image file is restored with the same partition alignment as was captured.
- PQDisk can resize and move Vista partitions.
- When dealing with transactional NTFS, Symantec DeployCenter Library tools trigger the resource manager to reset itself to eliminate all unresolved transactions, if any, upon next boot.

- Symantec DeployCenter Library tools do not support BitLocker.
- A Virtual Floppy can be executed on Vista.

About This Guide

This user guide can help you set up and use Symantec DeployCenter. Symantec recommends that you have Adobe® Acrobat® version 4.0 or later for best viewing quality. You can download the current version of Acrobat for free from the Adobe web site, *www.adobe.com*. You can click cross-references (including page numbers in the table of contents and index) to jump to the relevant material. You can also click references to web sites to start your browser and go to the web site. The hand pointer in Acrobat changes to a pointing finger when it is located over text that is linked to other material.

CHAPTER 1

Getting Started

Symantec DeployCenter System Requirements

The following are the system requirements for ImageCenter and the supporting applications included on the DeployCenter CD.

Hardware/Software	Requirement
Processor	Pentium or above
RAM	32 MB (Working with large hard disks or partitions may require significantly more memory.)
Diskette drive	None; 3.5-inch diskette drive recommended
CD drive	Any speed; MMC-2 compliant IDE or SCSI CD-R or CD-R/W required for creating images directly to CD
Hard disk free space	52 MB
Operating system	Windows 98, Windows NT 4.0, Windows 2000, Windows XP, Windows 2003, DOS*
Monitor	VGA; SVGA recommended
Pointing device	None required; Microsoft mouse recommended

*Only ImageCenter and DOS utilities are supported under DOS.

DeployPrep is only supported under Windows 2000 Professional and Windows XP.

Installing DeployCenter

The DeployCenter CD includes installation programs for DeployCenter (including ImageCenter, ImageExplorer, and Boot Disk Builder).

1. Insert the CD into your CD drive.

   If CD auto-run is enabled, the installation program automatically launches when you place the DeployCenter CD in your CD drive.

2. If the CD auto-run is not enabled, insert the CD, click **Start > Run**, then type `drive:\autorun` (where *drive* is the drive letter of your CD drive), then click **OK**.

3. Click **Tools**.

4. Click **DeployCenter**, and follow the on-screen installation instructions.

Installing Removable Device Drivers

During the DeployCenter install, you can install drivers for Iomega and Magneto-Optical removable media storage devices.

- To install Iomega drivers, select Iomega drivers during installation.
- To install Magneto-Optical drivers, select Fujitsu ATAPI or SCSI MO drivers.

For specific information on individual device drivers, contact the manufacturer directly. For more information on setting up Iomega and Magneto-Optical drivers, see "Setting Up Removable Storage Devices" on page 213.

You can also access a document, "Using Drive Image with Iomega Removable Drivers," at the Symantec support web site. Go to *http://service.symantec.com*, and search for "Iomega." This document is available in English only.

Using Parallel Port Devices with a Network Client

Loading a parallel port device driver with a network client installed may cause the system to hang. To successfully load the device driver for a parallel port drive, you must reboot the system without loading the network client. You can use the boot diskette set created by the install program to do this. For more information on resolving this problem, contact your network administrator.

Getting Online Help

1. Click **Help > Contents** to display general instructions for using ImageCenter Help, or press <F1> at any time to access the Help Index.

The Windows applications included with DeployCenter (ImageExplorer, Boot Disk Builder, VF Editor, and PowerCast Server) include help systems you can access from the Help menu.

Uninstalling DeployCenter

1. Click **Start > Settings > Control Panel > Add/Remove Programs > DeployCenter 5.7**.
2. Follow the instructions on the screen.

CHAPTER 2

Creating Boot Disks

Overview

Symantec Boot Disk Builder is a Windows application that automates and simplifies the creation of five types of DOS boot disks:

- PowerCast
- Unicast
- Novell NetWare Client
- Microsoft TCP/IP
- Standalone

Network boot disks are necessary for creating or restoring image files on a network drive. To access the network, you must create a network boot disk in addition to the ImageCenter rescue diskettes. Then boot your computer from the network boot disk and run ImageCenter from the second rescue diskette. When you follow this process, you can create and restore images on a network drive as you can on a local drive. Peer-to-peer networking is not supported.

You can also use Boot Disk Builder to create a QuickBoot executable, a “virtual floppy” that you can send to end users or package as an MSI file.

Boot Disk Builder has been enhanced to generate a random computer name for each computer to use when it is booted to DOS, so multiple DOS computers ca be on the network at the same time.

When you create a boot disk with Boot Disk Builder, the time zone is set to match the value of the time zone for the machine that is running Boot Disk Builder.

For information about creating PowerCast boot disks, see “Building PowerCast DOS Boot Disks” on page 74. For information about creating Unicast boot disks, see “Creating Unicast Client Boot Disks” on page 86.

Installing Microsoft Client Files

For the following types of boot disks, Microsoft Client files must be installed on the Boot Disk Builder computer before creating a boot disk:

- Unicast with a TCP/IP driver
- Microsoft TCP/IP

To install Microsoft Client files, you must be logged onto the computer as an Administrator and connected to the Internet. You can run the batch file **Getmslan.bat** to automatically download the Microsoft Client files and install them on your computer. Getmslan.bat is installed in the installation location of the Boot Disk Builder.

Starting Boot Disk Builder

Boot Disk Builder is installed during the DeployCenter installation. To run Boot Disk Builder, click **Start > Programs > Symantec DeployCenter 5.7 > DeployCenter 5.7 Tools > Boot Disk Builder**.

IMPORTANT! Before you start, note that to add a network driver, you will need either the .INF file for the driver and a .COM or .EXE for NetWare and/or an .EXE or .DOS file for Microsoft, or you will need to specify the network adapter ID.

Creating DOS Boot Disks for NetWare

To create or restore images on a network drive, you must boot your computer from boot disks that include the network drivers.

1. From the Boot Disk Builder main menu, select **Novell NetWare Client Boot Disks**, then click **Next**.
2. Enter the Novell NetWare client settings, then click **Next**.
   a. Enter the User name that will be used to log in to the network.

      If this boot disk is part of a task, the designated user must have the necessary rights to perform the network-based tasks.

   b. If the boot disk needs to run "hands-off," that is, without user input, mark **Login automatically** and enter the user's password in the **Password** and **Confirm password** fields.

   c. Indicate the network's first mapped drive in the **First network drive** drop-down list.

   d. In the **Preferred server** field, enter the full NDS context name for the server that the user typically logs in to (the server that has the user's network files and directories). The preferred server is the same as the NDS tree.

   e. In the **Name context** field, enter the NDS context for the user's NDS User object. (For example, docs.dev.acmecorp.)

   f. If you want to automatically map a network drive at boot up, mark **Map a network drive**.

      This requires that you designate the drive letter to be mapped and the UNC path it is mapped to. For example, Q:\ might be mapped to \\SERVER\Volume.

3 Specify the location and parameters for ImageCenter, and click **Next**.

The Novell NetWare Client boot disk automatically boots a network workstation to ImageCenter. Therefore, you must indicate where it can find the ImageCenter program files. Parameters for ImageCenter are optional.

a. Select **Boot Disk** to launch ImageCenter from the boot disk.

If you are writing the boot file to a floppy diskette, copying ImageCenter to the boot disk may require two diskettes. You will be prompted if a second diskette is needed.

If you are writing the boot file to a folder or virtual boot disk, all files (including ImageCenter) are copied to the designated location.

b. To run ImageCenter from the network or workstation, select **Specified location** and enter the path to the ImageCenter program files.

The path to ImageCenter must use 8.3 format instead of long filenames. For example, if you have ImageCenter installed to C:\Program Files\Symantec\DeployCenter 5 that path needs to be entered as C:\Progra~1\PowerQ~1\Deploy~1\pqimgctr.exe. You can type in the short path, or you can click the browse button, browse to the correct location for pqimgctr.exe, and have Boot Disk Builder convert the path to the short format for you. This must be the path where ImageCenter can be found when the user boots from the floppy disk.

c. Select **Do not run ImageCenter** if you do not want to launch ImageCenter at boot up.

d. *(Optional)* In the **Command line parameters** field, specify any switches you would like to be run when launching ImageCenter.

4 Select your network adapter or multiple adapters, then click **Next**.

You can select multiple NICs. All of the files for those NICs will be copied to the boot disk. (There must be enough space on the first disk for all the selected NICs.) At boot time, the list of NICs copied is compared to the NIC in the computer. If one matches, that driver is loaded and the system is configured for it. Selecting multiple NICs for the boot disk enables the disk to be used on computers with different NICs.

If you select “Run from laptop,” you can only select one network adapter from the list, and the NIC detect feature will not run at boot time.

If your network adapter is not listed, add it to the list of network adapters. See “Adding a NIC to the Network Adapter List” on page 19. Mark this page, so you can return to these steps after adding the NIC you need to the list and selecting it .

5 Specify your client network properties, then click **Next**.

a. Click **Obtain an IP address from a DHCP server** if a DHCP server is used to assign client IP addresses. On a DHCP server, the IP address is leased out temporarily on a first-come, first-served basis and increments automatically. The DHCP server also provides the subnet mask.

b. Click **Specify an IP address** if there is no DHCP server and you need to use TCP/IP on the network. In this case, you must enter a static IP address and subnet mask.

c. Select your network's communication protocol from the **Frame type** drop-down list.

   Token Ring is included as an option in the Frame type drop-down list. If you are running NetWare on an IBM Token Ring network, select Token Ring in the Frame type list.

6 Select the type of boot disk to build.

Option	Description
Floppy Disk	If you are creating a DOS boot disk, click **Floppy Disk**, then choose the drive letter where your floppy disk is located. Boot Disk Builder can only write to a formatted disk. Any existing information on the disk will be lost. The network and ImageCenter files may require two disks. You will be prompted if a second disk is needed.
Copy boot disk contents to a folder	Click **Copy boot disk contents to a folder** if you want to temporarily store the boot file in a folder. This option is practical when you want to electronically distribute the boot file to other administrators or users. Though the file is stored in a folder and can be electronically transferred, it must be copied to a floppy disk or burned to CD before it can be used. You can use this option to create a bootable CD-ROM for ImageCenter.

Option	Description
Virtual Boot Disk file	Click **Virtual Boot Disk file** to write a fully active boot file to a location other than a floppy disk. A virtual boot disk file does not need to be launched from a floppy disk. Rather, computers can reference this file from any directory location upon reboot as if it were using a floppy. Virtual boot disk files are used by ImageCenter to boot to DOS. Be aware that some rare instances NICs are deinitialized when you reboot with a virtual floppy. You can work around this problem by using the NIC's diagnostic utility in the AUTOEXEC.BAT file to initialize the NIC.

By default, Boot Disk Builder uses the operating system's DOS files to build boot disk files on Windows 95, 98, or Windows Me systems. On Windows NT or 2000 systems, Boot Disk Builder builds boot disks using the Caldera DOS files included with Boot Disk Builder.

7 If you want to use a specific set of DOS files in building your boot diskette, complete the following:

a. Insert a boot diskette that boots to the version of DOS want to use in building your boot disk file.

b. From the Boot Disk Builder menu bar, click **Tools > Load DOS Reference Diskette > From A:**.

   The files from your boot disk will be copied to the REFDISK directory where Boot Disk Builder is installed.

   If there are too many files to fit on a single floppy diskette, you can delete everything ***except*** CONFIG.SYS, any drivers started within the CONFIG.SYS file, COMMAND.COM, HIMEM.SYS, BR.DAT, and the system commands for the version of DOS you use (for IBMDOS: IBMBIO.COM and IBMDOS.COM; for MS-DOS: IO.SYS and MSDOS.SYS).

   If you use a reference disk for DOS files, you must include HIMEM.SYS and load it from your CONFIG.SYS file, or the virtual floppy will not work properly.

c. Mark **Use Reference Disk for DOS files** at the bottom of the dialog.

d. If you are writing your boot disk file to disk, remove your original boot disk and insert a formatted diskette.

   If you do not remove your original disk, Boot Disk Builder will overwrite the files on it.

8. If you want to save your choices for later use, click **File > Save Configuration** from the menu bar. Name and save the file.

9. Click **Back** to make any changes, or click **Finish** to build the boot disk.

In building the boot disk file, Boot Disk Builder copies the DOS system files and the boot information to the designated location. Any existing information on the floppy diskette or in the designated folder is erased.

When you boot a computer from these diskettes, ImageCenter will start in graphical user interface (GUI) mode. You can then select any operations.

Creating Additional Boot Disks

After the boot disk file has been created, you are asked if you want to create another boot diskette. If you click **Yes**, Boot Disk Builder creates another boot disk file using the current configuration.

If the current configuration uses a static IP address and if you are creating the file on floppy diskettes, Boot Disk Builder auto-increments the assigned IP address on each boot diskette.

Creating DOS Boot Disks for Microsoft TCP/IP

This option is disabled if you do not have the Microsoft Client files installed. See “Installing Microsoft Client Files” on page 10..

1. From the Boot Disk Builder main menu, select **Microsoft TCP/IP Boot Disks**, then click **Next**.

2. Enter the Microsoft TCP/IP settings, then click **Next**.

   a. Enter the User name that will be used to log in to the network.

      If this boot disk is part of a task, the designated user must have the necessary rights to perform the network-based tasks.

b. If the boot disk needs to run "hands-off" (without user input), mark **Login automatically** and enter the user's password in the **Password** and **Confirm password** fields. Note that you should not have a password on a shared volume if you are going to access it with a boot disk; the password you enter will only allow access to the domain, not the domain and a shared volume.

c. Click **Login to workgroup** to log the user into a workgroup, or click **Login to domain** to log the user into a domain.

d. Designate the network drive letter to be mapped at boot up and the UNC path it is mapped to.

3 Specify the location and parameters *(optional)* for ImageCenter, then click **Next**.

The Microsoft TCP/IP Boot Disk automatically boots a network workstation to ImageCenter. Therefore, you must indicate where it can find the ImageCenter program files.

a. Mark **Boot Disk** to launch ImageCenter from the boot disk.

If you are writing the boot file to a floppy diskette, copying ImageCenter to the boot disk may require two diskettes. You will be prompted if a second diskette is needed.

If you are writing the boot file to a folder or virtual boot disk, all files (including ImageCenter) are copied to the designated location.

b. To run ImageCenter from the network or workstation, mark **Specified location** and enter the path to the ImageCenter program files.

The path to ImageCenter must use 8.3 format instead of long filenames. For example, if you have ImageCenter installed to C:\Program Files\Symantec\DeployCenter 5, that path needs to be entered as C:\Progra~1\PowerQ~1\Deploy~1\pqimgctr.exe. You can type in the short path, or you can click the browse button, browse to the correct location for pqimgctr.exe, and have Boot Disk Builder convert the path to the short format for you. This must be the path where ImageCenter can be found when the user boots from the floppy disk.

c. *(Optional)* In the **Command line parameters** field, specify any switches you would like to be run when launching ImageCenter.

4 Select your network adapter or multiple adapters, and click **Next**.

You can select multiple NICs. All of the files for those NICs will be copied to the boot disk. (There must be enough space on the first disk for all the selected NICs.) At boot time, the list of NICs copied is compared to the NIC in the computer. If one matches, that driver is loaded and the system is configured for it. Selecting multiple NICs for the boot disk enables the disk to be used on computers with different NICs.

If your network adapter is not listed, add it to the list of network adapters. See "Adding a NIC to the Network Adapter List" on page 19. Mark this page, so you can return to these steps after adding the NIC you need to the list and selecting it.

5 Specify your client network properties, and click **Next**.

Boot Disk Builder does not support token ring NICs on Microsoft TCP/IP networks.

a. Click **Obtain an IP address from a DHCP server** if a DHCP server is used to assign client IP addresses. On a DHCP server, the IP address is leased out temporarily on a first-come, first-served basis and increments automatically. The DHCP server also provides the subnet mask.

b. Click **Specify an IP address** if there is no DHCP server and you need to use TCP/IP on the network. In this case, you must enter a static IP address and subnet mask.

6 Select the type of boot disk to build.

Option	Description
Floppy Disk	If you are creating a DOS boot disk, select **Floppy Disk** and choose the drive letter where your floppy disk is located. Boot Disk Builder can only write to formatted disk. Any existing information on the disk will be lost. The network and ImageCenter files may require two disks. You will be prompted if a second disk is needed.
Copy boot disk contents to a folder	Click **Copy boot disk contents to a folder** if you want to temporarily store the boot file in a folder. You can use this option to create a bootable CD-ROM for ImageCenter. This option is practical when you want to electronically distribute the boot file to other administrators or users. Though the file is stored in a folder and can be electronically transferred, it must be copied to a floppy disk or burned to CD before it can be used.

Option	Description
Virtual Boot Disk file	Click **Virtual Boot Disk file** to write a fully active boot file to a location other than a floppy disk. A virtual boot disk file does not need to be launched from a floppy disk. Rather, computers can reference this file from any directory location upon reboot as if it were using a floppy. ImageCenter uses a virtual boot disk to boot to DOS. Be aware that some rare instances NICs are deinitialized when you reboot with a virtual floppy. You can work around this problem by using the NIC's diagnostic utility in the AUTOEXEC.BAT file to initialize the NIC.

7 By default, Boot Disk Builder uses the operating system's DOS files to build boot disk files on Windows 95, 98, or Me systems. On Windows NT or 2000 systems, Boot Disk Builder builds boot disk files using the Caldera DOS files included with Boot Disk Builder.

If you want to use a specific set of DOS files in building your boot diskette, complete the following:

a. Insert a boot diskette that boots to the version of DOS want to use in building your boot disk file.

b. From the Boot Disk Builder menu bar, click **Tools > Load DOS Reference Diskette > From A:**.

The files from your boot disk will be copied to the REFDISK directory where Boot Disk Builder is installed.

If there are too many files to fit on a single floppy diskette, you can delete everything but CONFIG.SYS, any drivers started within the CONFIG.SYS file, COMMAND.COM, HIMEM.SYS, and the system commands for the version of DOS you use (for IBMDOS: IBMBIO.COM and IBMDOS.COM; for MS-DOS: IO.SYS and MSDOS.SYS).

If you use a reference disk for DOS files, you must include HIMEM.SYS and load it from your CONFIG.SYS file, or the virtual floppy will not work properly.

c. Mark **Use Reference Disk for DOS files** at the bottom of the dialog.

d. If you are writing your boot disk file to disk, remove your original boot disk and insert a formatted diskette.

If you do not remove your original disk, Boot Disk Builder will overwrite the files on it.

8. If you want to save your choices for later use, click **File > Save Configuration** from the menu bar. Name and save the file.

9. Click **Back** to make any changes, or click **Finish** to build the boot disk.

   In building the boot disk file, ImageCenter copies the DOS system files and the boot information to the designated location. Any existing information on the floppy diskette or in the designated folder is erased.

When you boot a computer from these diskettes, ImageCenter will start in graphical user interface (GUI) mode. You can then select any operations.

Creating Additional Boot Disks

After the boot disk file has been created, you are asked if you want to create another boot diskette. If you click **Yes**, Boot Disk Builder creates another boot disk file using the current configuration.

If the current configuration uses a static IP address and if you are creating the file on floppy diskettes, Boot Disk Builder auto-increments the assigned IP address on each boot diskette.

Microsoft Networking Files

You can obtain the Microsoft Network 3.0 Client for MS-DOS files used to support NDIS drivers from a Windows NT Server 4.0 CD. To automate this process, insert the Windows NT Server CD into your CD-ROM drive, open a DOS box, and run the GETMSLAN.BAT file in the C:\Program Files\Symantec\DeployCenter 5\BDBuild directory (or in the BDBuild directory wherever ImageCenter was installed). Pass in as a parameter the drive letter for the CD drive. Example: GETMSLAN E:. The batch file will copy the required files from the CD to the Boot Disk Builder directories. You can also get the Microsoft Network 3.0 Client MS-DOS file from Microsoft's web site.

Adding a NIC to the Network Adapter List

If your NIC is not listed by default in the Boot Disk Builder network adapter list, you can add it.

1. From the **Select network adapters** screen, click **Add**.

2 Under **Select driver types to add**, specify whether you want to add Microsoft and NetWare drivers or just one type of driver, then click **Next**.

If you are creating a Microsoft TCP/IP boot disk, the Microsoft option is selected by default and dimmed so you cannot deselect it. If you are creating a Novell NetWare IPX or PowerCast boot disk, the Novell NetWare IPX/PowerCast option is selected by default and dimmed so you cannot deselect it.

3 Under **Enter driver information**, specify where Boot Disk Builder can get information about the driver.

Location of information	Procedure
Driver file	Specify the location of the driver file (*.INF) for your network adapter. You can click the browse button to browse the directory tree for the driver file. Choose one more adapters from the list, then click **Next**. Select the network drivers, and click **Finish**.
Enter manually	In the **Add Network Drivers** dialog, specify whether you want the boot disk to support multiple NICs. Specify the network adapter ID and a descriptive name for the network adapter. The name you type will display in the adapter list in Boot Disk Builder. If you deselected the option to support multi-driver boot disks, you do not need to specify the network adapter ID. Specify the location of the Microsoft and NetWare DOS driver files as prompted. You can click the browse button to browse for the appropriate files. Click **Finish**.

4 To proceed with creating a boot disk, select the network adapter you just added from the bottom of the list box, and click **Next**. Return to the steps you were using before you were referred to this section of the documentation.

Consolidating NICs in the Network Adapter List

If the list of network adapters in Boot Disk Builder is too long to manage, you can consolidate the list.

The .INI file includes strings that control the list of adapters. For example:

```
[2]
PCI\VEN_10b7&DEV_9058=3C90X,3c90x.com
```

The string is broken down into three parts:

- Part one (PCI\VEN_10b7&DEV_9058=) is the driver ID.
- Part two (3C90X) is added to NET.CFG.
- Part three (3c90x.com) is added to AUTOEXEC.BAT. This is the NIC filename.

Understanding the parts of a string will help you consolidate a list by allowing you to create descriptive strings that include all the adapters in one simplified string. For example, if your list contained 10 3c905 3Com drivers, you could combine the list into one inclusive description as follows:

```
1=3Com EtherLink 10/100 PCI NIC (3C905x/3C920x/3C900x)
```

To consolidate a NIC list,

1. Combine all similar drivers into one tagged group.

   For example, in the following .INI example, similar driver ID strings are combined under [1].

   ```
   [NICList]

   1=3Com EtherLink 10/100 PCI NIC (3C905x/3C920x/3C900x)

   [1]
   PCI\VEN_10b7&DEV_9200&SUBSYS_100010B7=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9058=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_905A=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9055&SUBSYS_905510b7=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_900A=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9004=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9005=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9006=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9200=3C90X,3c90x.com
   PCI\VEN_10b7&DEV_9055=3C90X,3c90x.com
   ```

2. Edit the driver ID by removing the exclusive parts.

For example, in the driver ID string used above ([2] PCI\VEN_10b7&DEV_9058= 3C90X,3c90x.com), you can remove the string after 905 but before the = sign to make a new string (PCI\VEN_10b7&DEV_905=). This edit creates an inclusive string that covers the range of 3C905x drivers (3C905A, 3C905B, 3C905C, 3C9058, and so forth) and allows Boot Disk Builder to load any of these drivers.

In this next example, the driver ID string (PCI\VEN_10b7&DEV_9200&SUBSYS_ 100010B7=3C90X,3c90x.com) has 0&SUBSYS removed just after 920. The new string would now appear as PCI\VEN_10b7&DEV_920=3C90X,3c90x.com and is capable of loading any 3C920x drivers.

Continuing with the .INI example, the driver IDs are made inclusive so they appear as follows:

```
[NICList]

1=3Com EtherLink 10/100 PCI NIC (3C905x/3C920x/3C900x)

[1]
PCI\VEN_10b7&DEV_920=3C90X,3c90x.com
PCI\VEN_10b7&DEV_905=3C90X,3c90x.com
PCI\VEN_10b7&DEV_905=3C90X,3c90x.com
PCI\VEN_10b7&DEV_905=3C90X,3c90x.com
PCI\VEN_10b7&DEV_900=3C90X,3c90x.com
PCI\VEN_10b7&DEV_900=3C90X,3c90x.com
PCI\VEN_10b7&DEV_900=3C90X,3c90x.com
PCI\VEN_10b7&DEV_900=3C90X,3c90x.com
PCI\VEN_10b7&DEV_920=3C90X,3c90x.com
PCI\VEN_10b7&DEV_905=3C90X,3c90x.com
```

In the image above, there are numerous identical strings (combined into one tagged group). Therefore, the list can easily be reorganized and any redundant strings removed to create the final list below.

```
[NICList]

1=3Com EtherLink 10/100 PCI NIC (3C905x/3C920x/3C900x)

[1]
PCI\VEN_10b7&DEV_905=3C90X,3c90x.com
PCI\VEN_10b7&DEV_900=3C90X,3c90x.com
PCI\VEN_10b7&DEV_920=3C90X,3c90x.com
```

Deleting Adapters from the List

1. Open the files DRIVERN.INI, DRIVERM.INI and DRIVERIP.INI.

   They are usually located in the DRIVERS subfolder, within the BDBUILD folder.

2. Delete the descriptive string of the NICs (Network Interface Card) you want to delete, within the [NICList] section of the .INI file.

3. Delete the driver ID/NIC filename tag section near the bottom of the file.

   For example, in the example .INI below, suppose you want to delete the following drivers:

   ```
   9=3Com 3C920 Integrated Fast Ethernet Controller (3C905C-TX
   Compatible)
   ```

   ```
   10=3Com 3C918 Integrated Fast Ethernet Controller (3C905B-TX
   Compatible)
   ```

   You would delete the 9 and 10 lines from the [NICList] section of the .INI file, then you would delete the following two sections near the bottom of the file:

   ```
   [9]
   PCI\VEN_10b7&DEV_9200=3C90X,3c90x.com
   ```

   ```
   [10]
   PCI\VEN_10b7&DEV_9055=3C90X,3c90x.com
   ```

4. Save the files.

Creating a QuickBoot Executable

You can easily create a QuickBoot executable program that extracts a virtual boot disk file to the Windows temporary folder, and then uses the file to reboot the user's computer.

After you create the QuickBoot executable, you can send it to users via e-mail or package it in an MSI file. Users then run the QuickBoot executable on their computers just like a traditional executable (.EXE) program.

IMPORTANT! Before you can build a QuickBoot executable, you must have created a virtual boot disk using Boot Disk Builder. You cannot create a QuickBoot executable if a virtual floppy does not exist.

1 From the Boot Disk Builder pull-down menu, click **Tools** > **Build a QuickBoot Executable**.

2 Specify the name of an existing virtual boot disk configuration file (*.VFD) in the **Virtual Boot Disk file** text field. Click the browse button to navigate to the file's location.

3 Specify the filename of the QuickBoot executable you want to build in the **QuickBoot executable to build** text field. Click the browse button to navigate to the location where you want to save the executable.

4 (*Optional*) Type a brief description of the executable and what it does in the **QuickBoot description** text field.

Users will be able to read the description only when they run the executable with the /PROMPT option selected. If you want users to always see the description, select the option **Prompt the user before rebooting** as described in step 5.

5 (*Optional*) If you want to prompt a user before rebooting their computer, select **Prompt the user before rebooting**.

6 Click **OK**.

Creating DOS Standalone Boot Disks

1. From the Boot Disk Builder main menu, select **Standalone Boot Disks**, then click **Next**.

2. Specify the location and parameters *(optional)* for ImageCenter, then click **Next**.

   A standalone boot disk automatically boots the computer to ImageCenter. Therefore, you must indicate where it can find the ImageCenter program files.

   a. Select **Boot Disk** to launch ImageCenter from the boot disk, or select **Specified location** and enter the path to the ImageCenter program files to run from a local drive (typically the hard disk).

      The path to ImageCenter must use 8.3 format instead of long filenames. For example, if you have ImageCenter installed to C:\Program Files\Symantec\DeployCenter 5, that path needs to be entered as C:\Progra~1\PowerQ~1\Deploy~1\pqimgctr.exe. You can type in the short path, or you can click the browse button, browse to the correct location for pqimgctr.exe, and have Boot Disk Builder convert the path to the short format for you. This must be the path where ImageCenter can be found when the user boots from the floppy disk.

      If you are writing the boot file to a floppy disk, copying ImageCenter to the boot disk may require two disks. You will be prompted if a second disk is needed.

      If you are writing the boot file to a folder or virtual boot disk, all files (including ImageCenter) are copied to the designated location.

   b. *(Optional)* In the **Command line parameters** text box, specify any switches that you want to run when launching ImageCenter.

3. Select the type of boot disk to build.

Option	Description
Floppy Disk	If you are creating a DOS boot disk, click **Floppy Disk**, then choose the drive letter where your floppy disk is located. Boot Disk Builder can only write to a formatted disk. Any existing information on the disk will be lost. For information on formatting a disk using Boot Disk Builder, click **See Also** on the Help toolbar, then click **To format disks using Boot Disk Builder**. The network and ImageCenter files may require two disks. You will be prompted if a second disk is needed.

Option	Description
Copy boot disk contents to a folder	Click **Copy boot disk contents to a folder** if you want to temporarily store the boot file in a folder. This option is practical when you want to electronically distribute the boot file to other administrators or users. Though the file is stored in a folder and can be electronically transferred, it must be copied to a floppy disk or burned to CD before it can be used. You can use this option to create a bootable CD-ROM for ImageCenter.
Virtual Boot Disk file	Click **Virtual Boot Disk file** to write a fully active boot file to a location other than a floppy disk. A virtual boot disk file does not need to be launched from a floppy disk. Rather, computers can reference this file from any directory location upon reboot as if it were using a floppy. Virtual boot disk files are used by ImageCenter to boot to DOS. Be aware that some rare instances NICs are deinitialized when you reboot with a virtual floppy. You can work around this problem by using the NIC's diagnostic utility in the AUTOEXEC.BAT file to initialize the NIC.

4 By default, Boot Disk Builder uses the operating system's DOS files to build boot disk files on Windows 95, 98, or Windows Me systems. On Windows NT or 2000 systems, Boot Disk Builder builds boot disk files using the Caldera DOS files included with Boot Disk Builder.

If you want to use a specific set of DOS files in building your boot diskette, complete the following:

a. Insert a boot diskette that boots to the version of DOS you want to use in building your boot disk file.

b. From the Boot Disk Builder menu bar, click **Tools > Load DOS Reference Diskette > From A:**.

The files from your boot disk will be copied to the REFDISK directory where Boot Disk Builder is installed.

If there are too many files to fit on a single floppy diskette, you can delete everything but CONFIG.SYS, any drivers started within the CONFIG.SYS file, COMMAND.COM, HIMEM.SYS, and the system commands for the version of DOS you use (for IBMDOS: IBMBIO.COM and IBMDOS.COM; for MS-DOS: IO.SYS and MSDOS.SYS).

If you use a reference disk for DOS files, you must include HIMEM.SYS and load it from your CONFIG.SYS file, or the virtual floppy will not work properly.

c. Mark **Use Reference Disk for DOS files** at the bottom of the dialog.

d. If you are writing your boot disk file to disk, remove your original boot disk and insert a formatted diskette.

If you do not remove your original disk, Boot Disk Builder will overwrite the files on it.

5 *(Optional)* To save your choices to a configuration file (*.BDC) for later use, click **File > Save Configuration**, type the filename for the configuration file, then click **Save**.

6 Click **Back** to make any changes, or click **Finish** to build the boot disk.

In building the boot disk file, ImageCenter copies the DOS system files and the boot information to the designated location. Any existing information on the floppy disk or in the designated folder is erased.

Creating Additional Boot Disks

After the boot disk file has been created, you are asked if you want to create another boot disk. If you click **Yes**, Boot Disk Builder creates another boot disk file using the current configuration.

If the current configuration uses a static IP address and if you are creating the file on floppy disks, Boot Disk Builder auto-increments the assigned IP address on each boot disk.

Integrating a Boot Disk with the MS RIS Boot Menu

The Microsoft RIS Integration option on the **Tools** menu is specific to Windows 2000 RIS (Remote Installation Services). RIS is a Microsoft technology that enables PCs with a boot-from-network-enabled card to boot to a network menu where users can run automated tasks for system maintenance.

Boot Disk Builder's Microsoft RIS Integration tool lets you add tasks to your network's RIS menu.

1. Create a virtual boot disk in Boot Disk Builder.

   The virtual boot disk file can be created as a PowerCast, Novell NetWare, Microsoft TCP/IP, or Standalone boot disk.

2. Edit the virtual boot disk file using the Symantec VF Editor utility that ships with DeployCenter.

   See “Editing Virtual Boot Disks” on page 204.

3. Add any commands you want to execute. You can add any command line function; however, typically, you will use the virtual boot disk to launch a task.

4. Re-save the virtual boot disk file.

5. Open Boot Disk Builder.

6. Click **Tools > Microsoft RIS Integration**.

7. In the **Virtual Boot Disk** file text box, type the file name of virtual boot disk file that you want to add to the RIS menu. Click the browse button to browse the directory tree.

   ImageCenter ships with PQVF.VFD, a virtual boot disk file that automatically launches ImageCenter.

8. Type a menu name for the virtual boot disk file (for example, “Restore Windows 2000 Configuration”).

   The name you type is what actually appears on the RIS menu.

9. Type a description for the menu option.

   The description is intended to help users identify what the menu option will do.

10. In the **Remote install folder** text box, identify the root folder where the RIS menu files are located.

    The default location is *servername*\REMOTEINSTALL. Click the browse button to browse the directory tree for the folder location.

    Once you have specified a folder, the Language drop-down list is populated with the languages installed on the RIS server.

11. Select a language for the current menu option.

For example, if the current menu option runs a German version of ImageCenter, you would select **German** as the language. (You would also want to indicate the language in the menu name or description.)

12. Click **OK** to add the current option to the RIS menu.

After the option is added to the RIS menu, you can add additional options to the RIS menu.

Formatting Diskettes with Boot Disk Builder

1. Click **Tools > Format >** drive letter.
2. Select the capacity of your floppy disk from the **Capacity** drop-down list.
3. Click a format type.

Quick (erase)	Click **Quick (erase)** to erase existing information on a currently formatted disk.
Full	Click **Full** to completely format the disk.
Copy system files only	Select **Copy system files only** to copy DOS system files to a previously formatted disk. Boot Disk Builder automatically copies the system files to the floppy disk when building the boot disk.

4. Type the disk label in the **Label** text box, or select **No Label**.
5. By default, **Display summary when finished** is selected. This gives you a summary of the disk format for troubleshooting purposes.

   If you do not want to have a format summary, deselect this option.
6. Select **Copy system files** to copy the DOS system files while formatting the disk.

   This option is only relevant for the Quick (erase) and Full format types.

CHAPTER 3

ImageCenter

Creating Rescue Diskettes under Windows

There are three ways to create ImageCenter rescue diskettes under Windows 95 or later. All methods create a set of two diskettes for ImageCenter. The first is a DOS boot diskette. The second includes the ImageCenter program. If you experience a hard disk failure or are unable to access Windows, you can run ImageCenter from the rescue diskettes.

- On the installation CD, navigate to \DeployCenter Library\Rescue Disk, and run Setup.exe.
- Run the Boot Disk Builder program that is included with DeployCenter. At the Boot Disk Builder main screen, click **Standalone Boot Disks**, then follow the on-screen prompts. For more information about the Boot Disk Builder, refer to "Creating Boot Disks" on page 9.
- If you selected the Rescue Diskettes option during the DeployCenter installation, you can create ImageCenter rescue diskettes by clicking **Start > Programs > Symantec DeployCenter 5.7 > DeployCenter 5.7 Tools > Create Rescue Diskettes**.

Drive Letter Assignments

Be aware that NTFS partitions will not be assigned drive letters when you run ImageCenter from the rescue diskettes. In some cases, partitions that cross or exist past the 1024 cylinder boundary (including partitions that reside in an extended partition that crosses or exists past the 1024 cylinder boundary) are not assigned drive letters.

You can save image files to a partition that does not have a drive letter. At the **Name Image File** screen, click **Browse** instead of typing a path and filename in the **Image File** field. The **New Image File** dialog appears. Display the drop-down list under the **Drives** field. Partitions that have not been assigned a drive letter display as follows:

\\.\disk*n*.part*m NAME*

where *n* is the number of the disk, *m* is the number of the partition on that disk, and *NAME* is the volume label assigned to that partition (if applicable). Choose the partition where you want to save the image, type a filename in the **File Name** field, and click **OK**.

Before Running ImageCenter

Before running any of the applications on the DeployCenter CD, you must run a disk utility (such as a thorough ScanDisk or CHKDSK /F) on each partition of the source drives to check for file system errors. After you check for file system errors, Symantec recommends that you create ImageCenter rescue disks. See “Creating Rescue Diskettes under Windows” on page 32.

Any discussion of deployment, including hard disk imaging, assumes that all software, including the operating system, is being copied in accordance with the license agreements from the software manufacturer.

Running ImageCenter

With ImageCenter, you can create and restore an image file of an entire hard disk or individual partitions of a hard disk on a local drive, a network, or on removable media device. You can run ImageCenter from a floppy diskette or from the hard disk. The following two procedures describe how to run ImageCenter in interactive mode. To run ImageCenter from a batch file or using scripts, see “Command Line Switches and Scripting Commands” on page 123.

Running ImageCenter from a Hard Disk

1. Click **Start > Programs > Symantec DeployCenter 5.7 > ImageCenter**.

If you encounter problems under Windows 95a, run ImageCenter from the rescue diskettes.

Loading EMM386 before running ImageCenter limits the memory available and could dramatically increase the time required to create and restore image files. EMM386 is not loaded by default.

Running ImageCenter from Rescue Diskettes

1. Insert a bootable diskette (such as Diskette 1 of the ImageCenter floppy set).

   To create a boot diskette and an ImageCenter floppy (rescue diskettes), see “Creating Rescue Diskettes under Windows” on page 32.

2. Reboot your machine.

   DOS loads and displays an A: prompt.

3 Insert the ImageCenter program floppy (the second rescue disk), and press any key to continue.

ImageCenter (PQIMGCTR.EXE) runs automatically.

Be aware that ImageCenter has some limitations when you run from the rescue diskettes. Aside from these limitations, the features in ImageCenter running from the rescue diskettes are the same as those running it from a hard disk. See "Drive Letter Assignments" on page 32.

An image must be saved to a FAT, FAT32, or NTFS partition if you are going to restore it when running from the ImageCenter rescue disks.

Navigating ImageCenter without a Mouse

If you cannot use your mouse while running ImageCenter (only the case if, for some reason, the mouse driver is not loaded), you can use ImageCenter with the keyboard.

Press the Alt key to use mnemonics (for example, <Alt + N> for Next). Use the arrow keys to highlight different drives or partitions. Press <Tab> or <Shift + Tab> to move from one field to another. Press the space bar to select or deselect a highlighted checkbox or option within a dialog. In the **Open File** dialog, press <Alt + down arrow> to display the list of drives available; then use the arrow keys to select the drive you want.

Accessing Network Drives from ImageCenter

If you start ImageCenter from Windows or from the standard ImageCenter rescue diskettes, you cannot access network drives. However, you can create a network boot disk that will make network directories accessible for creating or restoring image files.

1 Create a set of ImageCenter rescue diskettes.

   You will run ImageCenter from the second rescue diskette.

2 Create a network boot diskette, so your network directories will be available under DOS.

   You can use Boot Disk Builder to create the boot disk. For information about Boot Disk Builder, see "Overview" on page 10.

   IMPORTANT! ImageCenter does not support peer-to-peer networks.

3 Boot from the network boot disk.

4 Run PQIMGCTR from the second ImageCenter rescue diskette.

Using ImageCenter on Servers

Before you use ImageCenter on a server, you should be familiar with the guidelines and restrictions outlined in this section. ImageCenter includes limited support for use with Windows 2000 Server, Windows 2000 Advanced Server, Windows NT Server, Windows XP Server, and Linux servers.

If you require NetWare support, you should use Symantec® ServerMagic™ for NetWare.® Microsoft Exchange 2000, Microsoft SQL Server 2000, and Microsoft Windows 2000 DataCenter Servers are not supported.

Deploying Windows Servers

You can use ImageCenter to deploy Windows 2000 Server, Windows 2000 Advanced Server, Windows XP Server, and Windows NT Server machines.

1 Follow the setup instructions to install Windows 2000 Server to the computer.

2 Use Microsoft's SysPrep to remove machine-specific entries to allow deployment to several identical computers.

Refer to your SysPrep documentation for information about using SysPrep.

You must ensure that the image will be restored on a machine with identical hardware.

Symantec only supports the imaging of a Windows 2000 Server that has not had its server responsibilities (Active Directory, dynamic disks, indexing services, etc.) set. If SysPrep has been applied to the system before the image is taken, then the image can be restored to other identical computers.

Be aware that when you run SysPrep, you are subject to Microsoft's technical restrictions on using SysPrep. For example, imaging to machines with different hardware is not directly supported by Microsoft.

3 Reboot the computer using the ImageCenter rescue diskettes.

You may need to create and use your own boot floppy that will enable access to a data storage region large enough to store the image of the Windows 2000 Server system.

4 Image the Windows server.

5 Restore the image on the target computer.

When you reboot the imaged computer, SysPrep runs according to the settings you specified in the answer file to prepare the server for use.

Restoring Primary Domain Controllers (Windows NT)

Exercise caution when restoring an imaged Primary Domain Controller. ImageCenter will automatically convert a PDC (Primary Domain Controller) to a BDC (Backup Domain Controller) when you restore the image file. If you want the restored image to be the PDC, you must promote a BDC to a PDC before restoring the image. Then restore the image, and promote the restored image server to become the PDC.

Running ImageCenter with Linux

If you run ImageCenter with Linux, be aware of the following limitations:

- ImageCenter is not a native Linux application. To use it on a Linux machine, you must run it from DOS disks (such as the ImageCenter rescue disks).
- You cannot save a Linux image or an image of any other partition type to a local Linux partition.
- To restore an image on a Linux machine, you must have at least as much free space (space not assigned to any partition) as the size of the original partition. After you have restored the image, you can resize it down to the size of the data that resides on the partition using a tool such as Norton™ PartitionMagic®.

Running ImageCenter on Dell Computers

ImageCenter protects the diagnostic, fifth partition on Dell personal computers. You cannot image, delete, or boot to that partition. If you look at the partition map in ImageCenter, the diagnostic partition is shown as unused space on the hard disk.

CHAPTER 4

Creating Image Files

Overview

You can use ImageCenter to create image files on any physical or logical drive that DOS has assigned a drive letter, including floppy drives, secondary hard drives, network drives, and removable media storage devices such as Jaz, Zip, and Magneto-Optical drives.

You can also create image files on hidden NTFS, FAT, and FAT32 partitions and standard, MMC2-compliant IDE or SCSI CD-R or CD-RW drives that have not been assigned drive letters.

If you are unsure whether a drive is available to save an image file, click **Browse** and all of the available drives will display. See step 6 on page 41 for more information.

The master boot record (MBR) is always included in image files you create. If you want to restore the MBR when you restore an image, start ImageCenter with the /MBR switch. See page 128 for information about the /MBR switch.

Image Files and Hardware Configurations

Because of operating system conflicts that can result from different hardware configurations, ImageCenter was not intended to copy or image a hard drive that will be used in a system with different hardware configurations.

If you create an image on one machine and restore the image on a machine with a different configuration (for example, a different motherboard or video card), the operating system may not boot correctly. Therefore, we recommend imaging and restoring only to machines with identical hardware configurations.

Be aware that your hard drive jumpers must be set up so that you have a master drive and a slave drive. DeployCenter will report incorrect drive information if the jumpers are set up in a cable select configuration.

Any discussion of deployment, including hard-disk imaging, assumes that the software, including the operating system, is being copied in accordance with the license agreement with the software manufacturer.

ImageCenter and Windows NT/2000/XP

There are some special considerations if you are using ImageCenter to copy Windows NT, Windows 2000, or Window XP partitions or to clone Windows NT/2000/XP machines.

Copying Windows NT Partitions

If you are using ImageCenter to copy Windows NT, Windows 2000, or Windows XP partitions (where Windows is installed), you may experience problems related to the BOOT.INI file. The BOOT.INI file includes information about the boot options for Windows' loader and the order of the Windows partition. If you have used ImageCenter to copy a Windows partition, and the partition order has changed from the original order, then the BOOT.INI file may not be updated to reflect the new order of the Windows NT/2000 operating system files. Therefore, you will be unable to boot your Windows partition.

Cloning Windows NT/2000/XP Machines

If you use ImageCenter to clone Windows NT/2000/XP for installation on other machines, you must consider the Security Identifier (SID). Improperly cloning a Windows NT/2000/XP workstation will result in your having another machine with the same SID, which causes an NT/2000/XP server conflict. You can use the Microsoft System Preparation Tool (SysPrep) to resolve SID conflicts. Refer to your Microsoft SysPrep documentation for information about SysPrep.

Preparation

1. Before creating an image with ImageCenter, use a disk utility program such as a thorough ScanDisk or Norton's Disk Doctor to identify and repair any errors on your hard disk.

   Under Windows NT, Windows 2000, or Windows XP, run CHKDSK /F.

2. You may also choose to run a disk defragmenting utility to further optimize your hard drive.

   If you are running under Windows 98 or Windows NT Workstation, refer to the Microsoft documentation on running the Microsoft Windows 98 Preparation Tool or the Windows System Preparation Tool (SysPrep).

3. You should disable virus detection in the BIOS before creating an image file.

   If virus protection is enabled, ImageCenter may hang after you click Finish or incorrectly report a virus when you reboot.

4. Check to ensure that the drive where you want to create an image is available under DOS. You can see the available drives by clicking **Browse** at the Name Image File screen. (See step 6 on page 41 for additional information.) You may need to set up

removable media or create boot disks to access network drives before you can create an image. See “Overview” on page 10 for information about using Boot Disk Builder to create boot disks to access network drives.

Creating Image Files on CD-R or CD-RW

ImageCenter enables you to create image files directly on CD media. However, you must meet the following requirements, or your CD-R/CD-RW drive will not be available as a destination for an image file.

- You must have an MMC2-compliant IDE or SCSI CD-R or CD-RW drive. USB and FireWire CD-R/W drives are not supported, and drives connected via a parallel port are not supported.
- Load HIMEM.SYS in your CONFIG.SYS file.
- **Do not** load EMM386.EXE in your CONFIG.SYS file.
- CD-RW media must be blank but not formatted. You cannot save more than one image file to a single CD or create an image on a CD that already contains other data. If you reuse CD-RW media, you must perform a Full Erase, not a Quick Erase, before saving image files to the media. CD-RW media that has been quick erased may cause ImageCenter to return errors when creating the image file.

Be aware that sometimes when you create image files on CDs, ImageCenter cannot write data fast enough to keep the CD burner working continually. Consequently, ImageCenter may create many image files. If this happens, you will see files ending with .PQI, .002, .003, and so forth. The image will still work as designed to back up your data. If the image spans more than one CD, you may wish to browse them after the image is created and note which files are on each CD. Then during the restore, when ImageCenter prompts you to insert “PQI.012” (for example), you will know which CD that file resides on and insert the proper CD to continue the restore process.

If you experience slow burning speeds (20MB/minute or slower), you may wish to switch to Gold media. Gold media may increase burning speeds from 2x to 4x.

When you create an image file directly to a CD, the CD is bootable. You can use the CD to recover your system if your computer becomes unbootable.

Creating an Image File

1. Run a thorough ScanDisk on your drives before imaging them.
2. At the ImageCenter main screen, click **Create Image**.

The **Select Source Drive** screen appears.

3. Select the disks that include the partitions you want to include in the image file.

   You can click **All Disks** to select partitions from every hard disk on your machine.

   The **Select Source Partitions** screen appears. It displays all the partitions on the disks that you selected. The partition map near the top of the screen is a graphic display of your hard disk. It includes a blue indicator for the 2 GB boot code boundary and a black indicator for the 1024 cylinder limit. The indicators can be useful when you are creating partitions that need to be bootable, since many operating systems require that boot code be located somewhere within the first 2 GB of the disk.

4. Select the partitions you wish to include in the image file (the source partitions) from the partition list, or click **Select All** to automatically select all partitions.

   You may need to scroll to view all the partitions on your machine. Note that if you have more than one hard disk on your machine, the first column in the partition list shows the physical hard disk where the partition is located.

   To deselect partitions, click again on a partition or click **Select None** to deselect all partitions at once.

5. Click **Next**.

6. Type the desired path and image filename in the **Image File** field (for example, D:\MYIMAGE.PQI).

   You must save your image file to a partition that you are *not* including in your image file. You can click **Browse** to find the directory where you want to save the image file. You should click **Browse** to select a CD-R or CD-RW drive because you cannot just type the CD-R drive letter to save an image to CD. CD drives will appear in the list as \\.\pqcd*x*\name of drive, where *x* is the number of the CD drive.

   An image must be saved to a FAT, FAT32, or NTFS partition if you are going to restore it when running from the ImageCenter rescue diskettes.

   You can save an image to a hidden FAT partition or to an NTFS or FAT32 partition that has not been assigned a drive letter by choosing it from the **New Image File** dialog box that appears when you click **Browse**. A hidden FAT partition or an NTFS or FAT32 partition will appear in the Drives list as \\.\Disk*n*.Part*m*, where *n* is the number of the disk and *m* is the number of the partition on that disk. For example, if an NTFS partition were the third partition on the first disk, it would appear as \\.\Disk1.Part3. To further identify the partition, the volume label will display, if available.

IMPORTANT! Do not include spaces or extended characters in the filename, or you may not be able to access the image file from ImageCenter, DOS, or ImageExplorer.

IMPORTANT! If you are creating an image on CD-RW media, the media must be empty but not formatted. You cannot save more than one image file to a single CD or create images on CDs that already contain other data.

You may need to create DOS boot diskettes to access network drives while running ImageCenter. See "Creating DOS Boot Disks for NetWare" on page 11 or "Creating DOS Boot Disks for Microsoft TCP/IP" on page 15 for additional information.

You cannot save images to local Linux partitions.

Make sure there is no existing file with the same name, unless you want the existing file to be overwritten. ImageCenter uses .PQI as the default image filename extension.

If an image is split because it exceeds 2 GB in size or to span media, the first segment of the image file will have the name you specify. Subsequent segments will have .002, .003, etc. extensions.

7 *(Optional)* Type brief comments about your image file in the **Image File Comments** field.

Image file comments cannot exceed 232 characters. ImageCenter will automatically insert information about the drive, partition, and label in the image file properties.

8 Click **Next**.

9 Select the desired compression level.

ImageCenter estimates the size of the image file for each level of compression. If you are creating an image file on removable media, ImageCenter also estimates the number of media that will be required to save the image file. The numbers displayed are only estimates; the actual size for compressed images will vary according to how well the data on the disk compresses.

Be aware that if you create an image file that is larger than 2 GB, it will automatically be split into multiple files (segments).

- **No Compression** is usually the fastest method for creating an image file and is useful if storage space is not an issue. However, if you are saving your image file to a busy network drive or to a relatively slow removable media device, high compression may be faster than no compression since there is less data to write to the file. ImageCenter selects **No Compression** by default.

- **Low** compression offers a 40% average compression ratio.
- **High** compression offers a 50% average compression ratio.

You cannot read compressed ImageCenter images with Symantec Drive Image or Drive Image Pro.

10 Click **Next**.

ImageCenter displays all the information you have entered to this point.

To modify any settings, click **Back**.

11 *(Optional)* Click **Advanced Options** to split an image file into multiple files (for removable media), to disable file system error-checking or SmartSector copying, to password protect your image file, to verify the integrity of the image file after it is created, or to verify disk writes.

See "Advanced Options" on page 44 for additional information.

12 Click **Finish** to begin creating the image file.

If you entered a name of a current file (step 6), ImageCenter displays a message that <*path and filename*> already exists. You can replace the existing file or choose a new filename. **If you click Replace, the existing image file will be deleted immediately.**

If ImageCenter detects that you are saving your image file to a floppy drive or removable media, it enables a media-spanning feature that spreads the image file over a series of disks. You must have at least 128K of available space on each disk in the series. If you use the media-spanning feature, be sure to number the disks in order, since you must insert them in sequence when restoring the image file.

The **Creating the Image** dialog appears.

Upon completion, the following message appears: "Image was copied successfully to file: <*image filename*>."

If you created the image on CD media, the CD is bootable. If you experience a system crash that renders your computer unbootable, you can boot from the image CD and restore the image file to fix your system.

13 Click **OK** to return to the ImageCenter main screen.

IMPORTANT! Because operating system conflicts can result from different hardware configurations, you should not restore the image you just created on a system with different hardware.

Advanced Options

The **Create Image Advanced Options** dialog appears when you click **Advanced Options** at the **Ready To Create Image File** screen.

Select this:	To do this:
Check for File System Errors	Clear the **Check for File System Errors** check box if you want to disable error checking. If you have already used a disk utility program such as ScanDisk to check your hard disk for errors, it is not necessary to have ImageCenter check for file system errors. Clearing **Check for File System Errors** saves time in copying the partitions. If you did not run a disk utility program before loading ImageCenter, leave the **Check for File System Errors** check box selected. Be aware that ScanDisk finds more errors than the Check feature in ImageCenter.
Disable SmartSector Copying	ImageCenter's SmartSector technology speeds up the copying process by only copying clusters and sectors that contain data. However, in some cases, such as high-security environments, it may be desirable to copy all clusters and sectors in their original layout, whether or not they contain data. If you wish to copy both used and unused clusters and sectors, click **Disable SmartSector Copying**. Disabling SmartSector Copying increases processing time and image file size.
Verify Disk Writes	Select this option if you want ImageCenter to verify that data is being written to disk. Verifying disk writes is not necessary and can slow image file creation substantially. If you are creating an image file to CD-R/W, this option is selected by default and performs a different function. After burning the image file to a CD, ImageCenter will check to see that the image file can be read from the CD. If there is a problem with the image, you will have an opportunity to recreate it. Having this option selected for CD-R/W does not affect the speed of image file creation or the size of the image file.

Select this:	To do this:
Verify Image Contents	If you select this option, ImageCenter: • Checks to see that all of the files in the image are available for you to open. • Checks to see that the internal data structures in the image file match the data that is available. • Checks to see that the image file can be uncompressed and create the expected amount of data. • Checks that the data in the image file you created matches the contents of the disk that was just imaged. ImageCenter reports whether the image file passes or fails the integrity check.
Password Protect Image File	To password-protect your image file, click **Password Protect Image File** and type a password in the **Password** field. Passwords are case-sensitive. To change or undo a password, use ImageExplorer. For more information, see "Adding a Password to an Image" on page 98. ***IMPORTANT!*** Store image file passwords in a safe place. If you forget the password, you cannot restore the file.
Split Image File Into Multiple Files	If you plan to copy an image file to removable media after creating it, you can force ImageCenter to split a large image file into smaller files. To do so, click **Split Image File Into Multiple Files** and enter the maximum byte size for each file in the **File Size** (bytes) field. To save the files to CDs, specify a file size of 670,000,000 bytes (approximately 650 MB) or less. The minimum is 10 MB.

CHAPTER 5

Restoring Image Files

Overview

This chapter describes restoring an ImageCenter file to a different drive or partition.

IMPORTANT! If you create an image on one machine and restore the image on a machine with a different configuration (for example, a different motherboard or video card), the operating system may not boot correctly. Therefore, we recommend restoring only to machines with similar hardware configurations. If you created an image for use on multiple machines, be aware that you must run SysPrep before creating the image on the source machine. Then when you restore the image, SysPrep will run according to the settings you specified in the answer file.

Related Tasks

- To restore selected files from a compressed or spanned image file, see "Restoring Individual Files or Partitions" on page 101.
- If you are restoring an image file to set up a new hard drive on a machine with a BIOS older than 1994, see "Using ImageCenter with Drive Overlay Software" on page 205.
- If you want to restore images to multiple machines simultaneously across an Ethernet or Token Ring network, see "PowerCasting" on page 59.

Restoring Primary Domain Controllers

Exercise caution when restoring an imaged Primary Domain Controller. ImageCenter will automatically convert a PDC (Primary Domain Controller) to a BDC (Backup Domain Controller) when you restore the image file. If you want the restored image to be the PDC, you must promote a BDC to a PDC before restoring the image. Then restore the image. The image will be restored as a BDC. Next, promote the restored image server to become the PDC; when you do so, the previously promoted PDC will be demoted back to a BDC.

Restoring Images from CD Drives

If you created an image file directly to CD media, the CD containing the image is bootable. (For spanned images, any CD in the series is bootable.) If your system becomes unbootable, you can boot from the image CD and restore the image to fix the system problem. If you created an image on a hard disk and then copied the image to CD media, the CD media is not bootable.

When you click **Browse** at the Select Image File screen, your CD drive will display as \\.\pqcd*x*, where *x* is the number of the CD drive. Select the drive, and the image file will display so you can restore it.

Your CD drives may also display with drive letters. However, you should not choose the drive letter. Instead choose the \\.\pqcd*x* designation.

Be aware that sometimes when you create image files on CDs, ImageCenter may break the image into many segments. If this happens, your CD will include image files ending with .PQI, .002, .003, and so forth. The image will still work as designed to back up your data. If the image spans more than one CD, you may wish to browse them after the image is created and note which files are on each CD. Then during the restore, when ImageCenter prompts you to insert "IMAGE.012" (for example), you will know which CD that file resides on and insert the proper CD to continue the restore process.

Bootable Partitions

Before restoring a bootable partition, you should understand the information outlined in the following table. A bootable partition must begin below the boot code boundary specified in the table below for the operating system to boot. The boot code boundary is a boundary on the disk, not a restriction on partition size. For additional information about operating system requirements, contact the operating system manufacturer.

Operating System	Boots from	Supported Partition Types	Boot Code Boundary	Minimum Space
DOS 6.22 and earlier	Primary	FAT	2 GB	8 MB
Windows 95	Primary	FAT, FAT32*	8 GB	90 MB
Windows 98	Primary	FAT, FAT32	>8 GB	175 MB
Windows Me	Primary	FAT, FAT32	>8GB	295 MB
Windows NT	Primary**	FAT, NTFS	2 GB***	125 MB
Windows 2000	Primary**	FAT, FAT32, NTFS	>8 GB	1 GB
Windows XP	Primary**	FAT, FAT32, NTFS	>8	1 GB

Operating System	Boots from	Supported Partition Types	Boot Code Boundary	Minimum Space
Linux (LILO)	Either	Linux Ext2	8 GB	250 MB

* A FAT32 partition is only accessible from Windows 95 if you have a version OSR2 (4.00.950B) or above.

**Windows NT, Windows 2000, and Windows XP must boot from a primary partition on the first drive. However, only a few Windows NT/Windows 2000 files must reside on that partition; the remaining files can reside on a logical partition, which can be located on the first or a subsequent drive. The Windows NT/Windows 2000 boot partition can be shared with another operating system.

***Microsoft recommends putting the Windows NT partition within the first 2 GB of the drive, ending before the 1024 cylinder limit (about 7.8 GB).

Restoring an Image File

1. Disable virus detection in the BIOS.

   If virus protection is enabled, ImageCenter may hang after you click **Finish** or incorrectly report a virus when you reboot.

2. At the ImageCenter main screen, click **Restore Image**.

   If you booted your computer from a CD containing the image, the main screen does not display, so you begin with step 3.

3. In the **Image File** field, enter the path and filename of the image file you want to restore, or click **Browse** to select the path and image file.

   If you assigned a password to the image file when you created it, the **Get Image File Password** dialog appears. You must enter the password to restore the image file. Symantec does not maintain image file passwords or have a workaround for restoring password-protected images without the password.

   If you are restoring a Primary Domain Controller, refer to “Restoring Primary Domain Controllers” on page 48. If you are restoring an image from a CD, refer to “Restoring Images from CD Drives” on page 48.

   You need to run ImageCenter from DOS network boot diskettes to access network drives while running ImageCenter. See “Creating DOS Boot Disks for NetWare” on page 11 or “Creating DOS Boot Disks for Microsoft TCP/IP” on page 15.

You can restore an image from a hidden NTFS, FAT, or FAT32 partition by choosing it from the **Open Image File** dialog box that appears when you click **Browse**. A hidden NTFS partition will appear in the **Drives** list as \\.\Disk*n*.Part*m*, where *n* is the number of the disk and *m* is the number of the partition on that disk. To further identify the hidden partition, the volume label will display, if available.

If you click **Browse** and select an image file, you will have an option to verify the integrity of an image file before you attempt to restore it. Click **Verify**, and ImageCenter will check to see that all of the files in the image are available for you to open, the internal data structures in the image file match the data that is available, and the image file can be uncompressed and create the expected amount of data. ImageCenter reports whether the image file passes or fails the integrity check.

If you are running ImageCenter from rescue diskettes, you can restore image files from FAT, FAT32, or NTFS partitions.

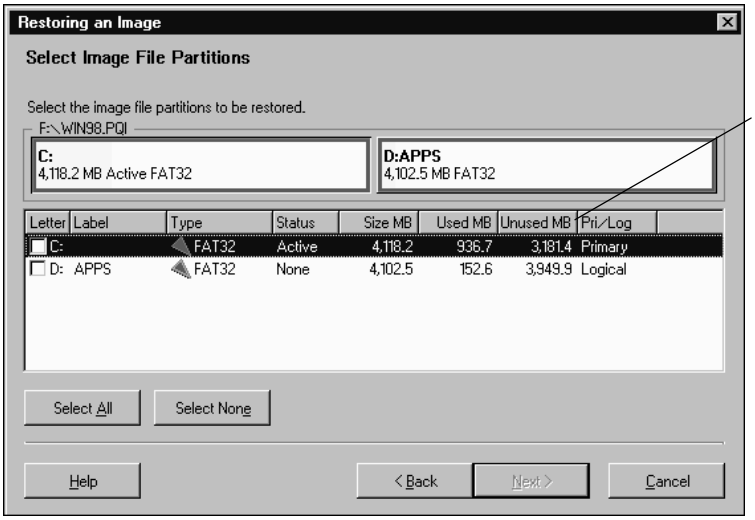
4 Click **Next**.

At any point prior to actual image file restore, you can click **Back** to return to the previous step and change your settings.

5 From the **Select Destination Drive** dialog, select the disk that includes the unallocated space or partitions where you want to restore the image file.

If you only have one hard disk, this step is omitted.

6 If you have more than one partition, you can select the partitions you want to restore. (If you have only one partition, this step is omitted.) Click partitions to select them individually, or click **Select All**.

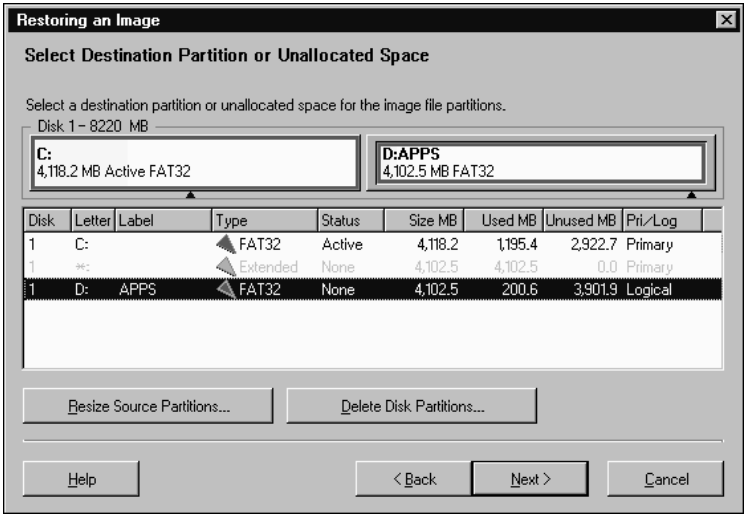


To deselect partitions, click again on a partition or click **Select None**.

7 Click **Next**.

8 Select an existing partition or unallocated space where you want to restore the image.

The partition list includes all the partitions on your machine. If you have more than one hard disk, the first column in the partition list shows the disk on which a partition is located.



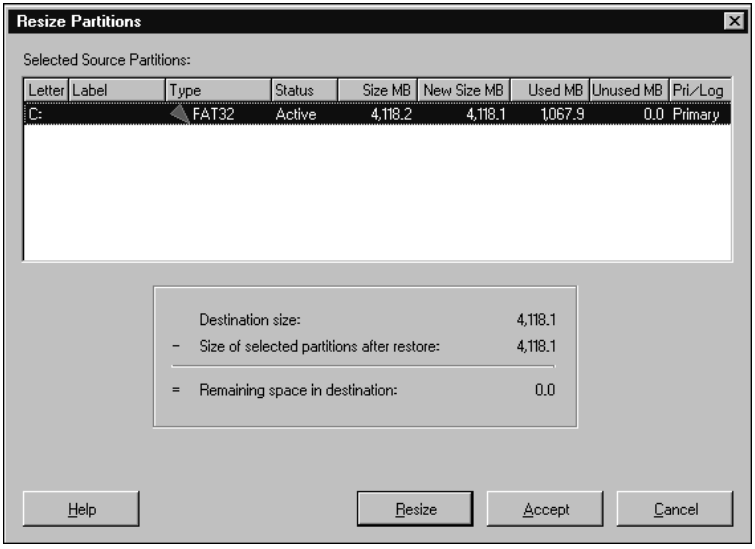
When you restore an image to unallocated space, ImageCenter creates a new partition for the image. The unallocated space where you restore an image must be at least as large as the used space required by the image. For example, if you created an image of a 500 MB FAT32 partition that included 300 MB of data, the unallocated space where you restore the image must be at least 300 MB. In addition, if you are restoring an NTFS partition, it cannot be resized below the master file table (MFT), regardless of how much data is included in the partition. The MFT is generally near the midpoint of the partition.

If the destination partition or unallocated space is not large enough to accommodate the partitions you wish to restore, or if you are restoring the image file to a larger drive and want to set a specific size for partitions rather than use the proportional resize option, you may want to resize the partitions.

If you do not want to resize the partitions, go to step 13.

9 Click **Resize Source Partitions**.

The **Resize Partitions** window displays, and the **Selected Source Partitions** group box displays the partitions you selected to restore.



10 Click **Resize**.

The **Resize Partition** window appears.

11 In the **New Size** field, enter the size for the new partition (in MB), then click **OK**.

The size you enter must be equal to or larger than the Minimum Size and less than or equal to the Maximum Size displayed in the dialog. Since partitions must end on a cylinder boundary, ImageCenter rounds the new size up to the next cylinder boundary.

12 Click **Accept**.

When you restore the image file, ImageCenter will resize the partition.

13 Click **Next**.

If you selected an existing partition as the destination, ImageCenter will display a dialog telling you that the existing partition will be deleted before your image file is restored. ImageCenter does not delete the partition until you click **Finish** on the **Ready to Restore Image File** screen.

If the unallocated space on the destination drive is greater than the space required to restore the selected partitions, the **Resize Options** dialog appears. For more information, see "Resize Options" on page 57.

ImageCenter displays all the information you have entered to this point. To change any settings, click **Back**.

14 *(Optional)* To enable bad-sector checking, turn on DOS disk-write verification, check for file system errors, or hide partitions after restore, click **Advanced Options**. For more information, see "Advanced Options" on page 58.

IMPORTANT! Restoring partitions can cause the drive letters of subsequent partitions to change. This may make the computer unbootable or cause applications to fail.

IMPORTANT! If you are restoring a primary partition that contains an operating system, and it will not replace your existing primary partition, you must click **Advanced Options** and choose to hide the partition after restoring it. Otherwise, data corruption could occur.

15 Click **Finish** to begin restoring the image file.

If ImageCenter detects that you are restoring your image file from removable media, it enables a media-spanning feature that is capable of reading the image file from a series of disks. As ImageCenter prompts you for each media, be careful to insert them sequentially.

The **Restoring the Image** dialog appears, tracking the progress of the image restore. Upon completion, the following message appears: "Image was restored successfully."

16 Click **OK** to return to the ImageCenter main screen.

Recovering a Local System Automatically

You can use DeployCenter to create a CD (or set of CDs) for recovering your computer in the event of a failure. This is an especially useful process for laptop computers, which may need to be recovered when the user is away from the office and needs to have his system up and running again quickly.

Prerequisites

- Access to a partition (other than the partition you are imaging) that is large enough to hold the image file you are going to create
- DOS boot diskette created under Windows 98
- CD burning software
- ImageCenter rescue diskettes

Preparing and Creating the Recovery CD

1. Run a disk-checking utility to ensure that your hard disk does not have any file system errors.
2. Use ImageCenter to create an image of your system partition. If necessary, split the image file into segments, so it will fit on CDs. It is recommended that you split the file into segments of 620,000,000 bytes to allow space on the CDs to store additional program and boot files that automate the restore process.
3. Copy the contents of the second ImageCenter rescue disk (the program disk) to a folder on your hard disk.
4. Modify the autoexec.bat file on the Windows 98 boot diskette as follows:
   - Locate any lines that contain `MSCDEX.EXE`, and change the `/L:` parameter (if it exists) on those lines to `/L:Z`. If the `/L` parameter is not present on those lines, add it. The new parameter assigns a static drive letter to the CD drive, so ImageCenter can automatically locate the image files on the auto-recovery CD.
   - Add the following lines to the end of the autoexec.bat file (where "Imgctr" is the folder where you copied the contents of the ImageCenter program diskette and "myimage.pqi" is the name of your image file):

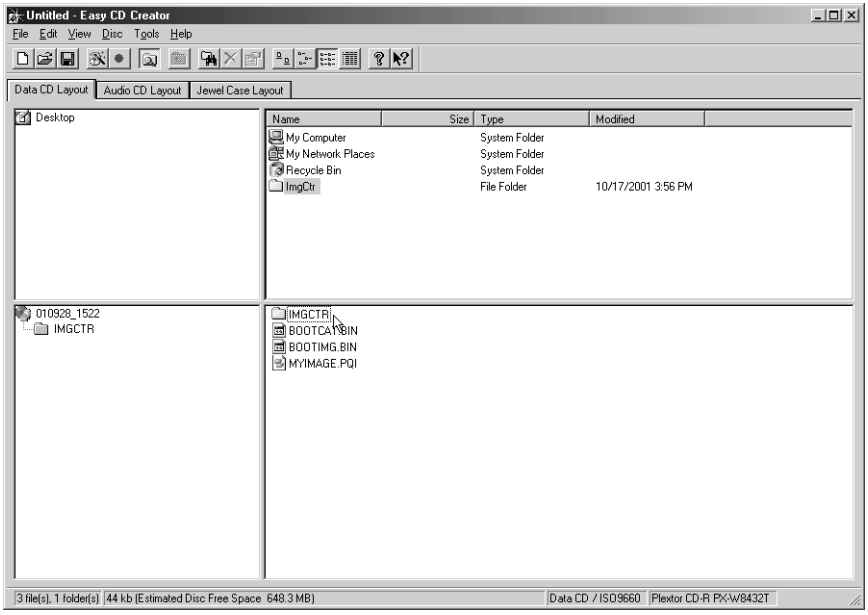
     ```
     Z:
     cd\Imgctr
     PQIMGCTR /img=Z:\myimage.pqi /cmd=restore_all
     ```

An autoexec.bat file with the `/cmd=restore_all` switch restores all the partitions within the specified image file, sizing them proportionally to fit on the hard disk. If you want more control over the restore operation, you could use the `/cmd=a:\script.txt` switch instead, then create a script file to specify what actions to take and save the script file on the Windows 98 boot diskette. See "Scripting Commands" on page 156 for information about ImageCenter scripting commands.

5 With your CD burning software, create a bootable data CD with a ISO9660 file system. You will be prompted for a bootable floppy; use the Windows 98 boot diskette. The CD burning software will create a boot image with two files: BOOTIMG.BIN and BOOTCAT.BIN and display them in the CD layout pane.

6 Drag the image file (or the first segment of the image file) into the CD layout pane.

7 Drag the folder containing the files from the second ImageCenter rescue diskette into the CD layout pane. The following is an example of what the layout might look like if you use Roxio's Easy CD Creator and the ImageCenter files were saved in a folder named IMGCTR.



8 Create the CD.

9 If your image file includes multiple segments, create an additional CD for each segment of the image. Be sure to label each CD in order of its creation.

Recovering the System with the CD

With the recovery CD (or set of CDs), a user can insert the first CD in the computer and reboot. The computer boots to the CD, loads the CD drivers, runs ImageCenter, and restores the image. If the image spans multiple CDs, the user will be prompted to insert each CD as it is needed.

Resize Options

If the unallocated space on the destination drive is greater than the space required by the partitions you are restoring, you have three options for how to handle the extra space.

Click this option:	To do this:
Automatically resize partitions proportionally to fit	Allow ImageCenter to automatically expand the partitions in equal proportions to occupy the destination drive's remaining free space.
Leave remaining unused space	Leave any remaining free space unused (unpartitioned) on the destination drive after the partitions are restored. This option will retain the original partition size.
Resize partitions manually to fit	Display the **Resize Partition** window where you can manually set the size of the partitions to fit in the destination drive's remaining free space. For more information on resizing partitions, see step 9 of "Restoring an Image File" on page 50 (beginning of steps).

Advanced Options

At the **Ready To Restore Image File** screen, click **Advanced Options** to access the following:

Option:	Description:
Check for File System Errors	Clear the **Check for File System Errors** check box to disable error checking. If you leave this option selected, ImageCenter will check your disk for errors after restoring the image file.
Skip Bad Sector Check	This is selected by default to save time in restoring the image file. Although most drives do not have bad sectors, the potential for problems increases during the lifetime of the hard drive. If you have an older hard drive, it is wise to enable bad-sector checking by clearing the **Skip Bad Sector Check** box.
Verify Disk Writes	Click **Verify Disk Writes** if you want to enable DOS disk write verification. Disk write verification is not critical to safely restore image files. Enabling disk write verification can slow the image restore process significantly.
Hide Partition After Restore	Restoring multiple logical partitions can cause the drive letters of subsequent partitions to change. This may make the computer unbootable or cause applications to fail. Most operating systems only allow one primary partition to be visible (bootable) at a time. If you are restoring an image of a primary partition, and you do not want to make that partition your visible (bootable) partition, click **Hide Partition After Restore**. Failing to do so could cause data corruption. For example, if you are using your secondary hard drive as a complete backup of your primary drive, clicking **Hide Partition After Copy** preserves all the secondary drive information without changing any drive letters. When the computer boots up, a drive letter will not be assigned to the hidden partition. For more information about hiding partitions, see “Hiding Partitions” on page 196.

CHAPTER 6

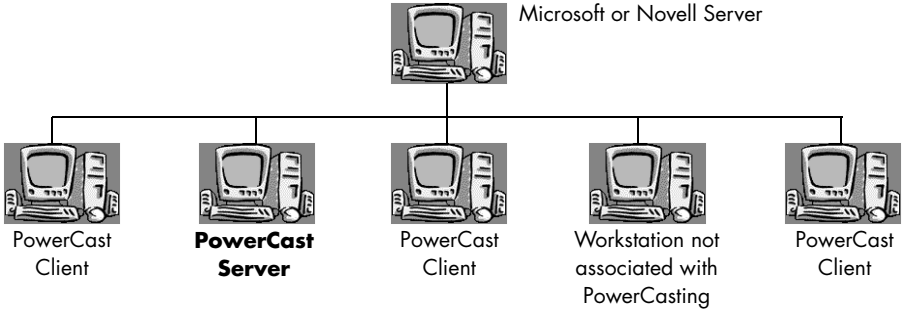
PowerCasting

Overview

ImageCenter combines SmartSector imaging technology together with Ethernet or Token Ring multicasting to provide a fast and robust method for deploying workstations. PowerCasting sends an image file to one or more Symantec PowerCast clients simultaneously. The image file is sent only once by the server to all the client computers, rather than separately to each client. This decreases network traffic by eliminating duplicate restore processes when preparing multiple workstations and when performing computer rollouts and migrations.

IMPORTANT! If you have a Token Ring network and an IBM 16/4 ISA Token Ring card, you must use the NIC driver for the IBM 16/4 ISA Token Ring network cards that is included on the DeployCenter CD. If you use a newer version of the driver, the PowerCast Server will lock up when any workstation attaches to or is removed from the ring, regardless of whether that computer is set up as a PowerCast Client.

IMPORTANT! ImageCenter PowerCasting does not currently support bus networks (broadcast networks, based on a single length of cable) or peer-to-peer networks.



ImageCenter contains both the PowerCast Server and Client. You can access PowerCasting by creating a PowerCast DOS boot disk and running PQPCAST.EXE from that disk.

The PowerCast Server reads the PQI image file and then PowerCasts the image file to the PowerCast Client computers.

If you PowerCast from DOS, the image to be PowerCast should reside on the PowerCast Server. If the image file is on the PowerCast Server's hard disk, the PowerCast Server does not need access to the Novell or Microsoft server to PowerCast. The PowerCast server can be the same machine as the Novell or Microsoft server, but it does not have to

be the same machine. (To access an image on a Novell server, the server must be downed and booted to DOS.) You can also choose to resize the image file to fit various disk sizes on different PowerCast Clients.

The client computers receive and write the image file to the client disks. You must boot PowerCast Clients from boot disks that establish them as PowerCast Clients looking for a PowerCast session. PowerCast Clients do not have access to the Novell or Microsoft server when they are in PowerCast Client mode. Workstations that are on the same network but have not been booted as PowerCast Clients do not receive the PowerCast image file. See "Building PowerCast DOS Boot Disks" on page 74 for additional information.

Using the Windows 32-bit PowerCast Server, you can access image files that reside on a Novell or Microsoft server for PowerCasting. However, this may decrease the speed of the PowerCast because the PowerCast Server must read and PowerCast the image over the same wire, doubling the bandwidth needed.

PowerCasting through Routers

ImageCenter supports PowerCasting through routers. To PowerCast through a router, the router must support forwarding of multicast packets.

To set up router support for ImageCenter, each computer involved in the PowerCast session (the PowerCast server and all of the clients) must be configured correctly. Each boot disk must have a WATTCP.CFG file with the following line:

`MCTTL=`*`n`*

where *n* is the number of routers the multicast packet is allowed to pass through.

With the Windows PowerCast Server, you can set the MCTTL in the **Advanced Options** dialog instead of through the WATTCP.CFG file. See "Windows PowerCast Server Advanced Options" on page 72.

This MCTTL number should equal the number of routers + 1. MCTTL refers to Multicast Time To Live. This is a value stored in the multicast packet that tells the router whether or not to forward the packet. When the multicast packet reaches the router, the router will subtract 1 from the value. If the MCTTL value is greater than one, the packet will be forwarded; if it is one, the router will drop the packet. Therefore, if the multicast packet has a TTL set to 1, the first router it reaches will drop the packet. If the TTL is set to 2, the packet will pass the first router, and the second router will drop the packet.

The WATTCP.CFG file must also include a line specifying either a static IP address or DHCP. If a static IP address is specified, it must be unique for each computer participating in the PowerCast, including the server.

The WATTCP.CFG is an ASCII text file that can be created and copied to a disk. The disk can then be duplicated using Diskcopy or can be added to the boot disk during disk creation using Boot Disk Builder. To create a boot disk with router support in Boot Disk Builder, enter a value in the **PowerCast TTL** field to specify the number of routers the packet can pass through. This will automatically create the WATTCP.CFG file with the correct information.

The following is a sample WATTCP.CFG file that will have ImageCenter obtain an IP address from a DHCP server and allow the multicast packet past one router:

```
IP=DHCP
MCTTL=2
```

NOTE: To support PowerCasting through a router with NetWare, you must have Netware 3.12 or later, have TCP/IP support loaded, and load the module PIM.NLM (Protocol Independent Multicasting).

NOTE: Windows NT (through Service Pack 6) cannot forward multicast packets.

NOTE: Hardware routers must also be configured to allow multicast packet forwarding. Check the manual that came with the router or contact the router manufacturer to determine the configuration settings for multicast support.

Assigning IP Addresses

For the ImageCenter PowerCast Server to communicate with each of the client computers on the network, the server and each client computer must have a unique IP address. The PowerCast Server or Client will request an IP address from a DHCP or BOOTP server, or use the IP address specified in the optional WATTCP.CFG file.

When you start a PowerCast Server or Client, it first looks for a WATTCP.CFG file for its IP address.

If there is no WATTCP.CFG file, the PowerCast Server or Client looks for a DHCP server. The DHCP server method of assigning IP addresses is preferred because it saves time and is more versatile. For example, say you have 100 computers to configure. If you use the

WATTCP.CFG method, you will need to build 100 different boot diskettes, each with its own IP address in the WATTCP.CFG file. But with DHCP, all the boot disks can be identical. Then when each computer boots up, it gets its IP address from the DHCP server.

When you use the Windows PowerCast Server, you must have a DHCP server available. The Windows PowerCast Server does not have a BOOTP server.

The PowerCast DOS Server contains a built-in BOOTP server for use where no DHCP server is available. The IP address range used by the built-in BOOTP server is specified in the PowerCast Server Advanced Options window. Symantec recommends you use addresses in the range of 192.168.0.0 through 192.168.255.255 or 172.16.0.0 through 172.31.255.255. See "DOS PowerCast Server Advanced Options" on page 71 or "Windows PowerCast Server Advanced Options" on page 72 for more details.

Valid local subnet IP addresses are specified by the subnet mask. It is common to use a mask of 255.255.255.0 to specify that IP addresses in the range 0 through 255 are in the subnet and are accessible. For example: if a computer's IP address is 192.168.2.4 and the subnet mask is 255.255.255.0, then all IP addresses from 192.168.2.0 through 192.168.2.255 are in the same local subnet and are accessible. Any IP addresses outside this range are not accessible from this computer.

If the client fails to get an IP address, it will display error #1876 and disable the PowerCasting features.

Running the PowerCast Server from DOS

The server operation includes selecting a client mode, naming the session, and selecting the image file and partitions to be made available to PowerCast clients. While it is not mandatory, you will have better performance with a PowerCast session if you boot the PowerCast Server before the PowerCast Clients.

1. Boot your computer from a PowerCast boot diskette that includes the drivers necessary for PowerCasting.

   See "Building PowerCast DOS Boot Disks" on page 74 for more information.

2. Boot from the PowerCasting boot disk.

   The **Select PowerCast Mode** dialog appears.

3. Click **Server** then click **Next**.

If the driver for your network interface card (NIC) is not properly loaded and configured, you will receive error #1864. This error can be caused by ImageCenter not having the NIC driver loaded or by invalid configuration settings such as the line FRAME ETHERNET_II (for IP PowerCasting) or FRAME TOKEN-RING (for Token Ring PowerCasting) missing from the configuration files.

You can see more information about error #1864 on the Symantec web site *http://service.symantec.com*. Search for "1864." This information is available in English only.

4 Select a client mode.

- Click **Express** if you want to eliminate a decision step on the client side and have the image file replace the entire contents of the drive chosen by the client. The client does not have to choose a destination partition or free space. This option will replace the contents of the entire hard disk, not just a single partition.
- Click **Custom** if you want to allow the client to choose the destination (partition or free space) and partition resize values.

5 Click **Next**.

6 Type the name you have chosen for the PowerCast session (for example, SESSION1), then click **Next**.

This name will be used by the clients to select a session to join.

7 Specify the location and name of the image file to be PowerCast during this session, then click **Next**.

You can click **Browse** to locate the drive and image file. Note that you cannot PowerCast images spanned across multiple removable media.

8 If the image file contains more than one partition, the partitions are displayed.

Use one of the following methods to select the part of the image file you want to PowerCast:

- Click the partitions you want to include.
- Click **Select All** to include the entire image file.
- Click **Select None** to clear the selections.

After selecting partitions, click **Next**. The **Resize Options** dialog appears.

9 Specify how you want to configure the remaining free space on the client computers.

- Click **Automatically resize partitions proportionally to fit**, if you want the selected image file to fill all available space.

- Click **Leave remaining free space**, if you want the selected image file to occupy equal space and leave the remaining space free.

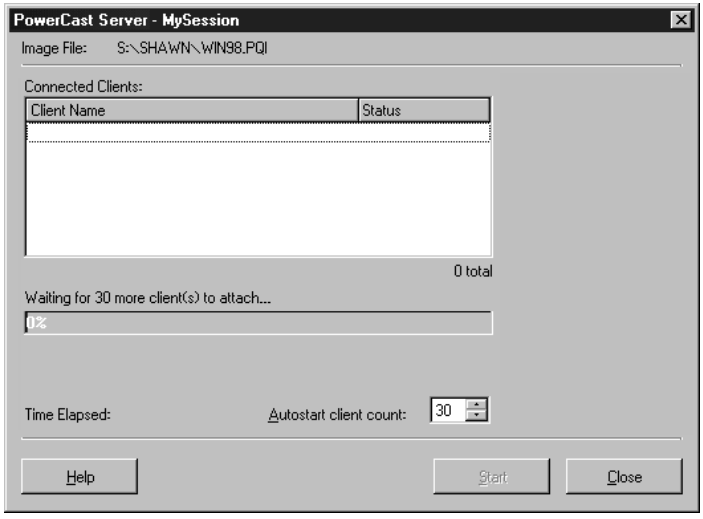
10 Click **OK**.

11 You can review your selections. If you want to disable file system checking, enable bad-sector checking, turn on DOS disk write verification, hide partitions after restore, or specify an IP address range, click **Advanced Options**.

For more details about options, see "DOS PowerCast Server Advanced Options" on page 71.

12 After reviewing selections, click **Finish**.

The **Symantec PowerCast Server** dialog appears. You can see how many clients have connected to the session and control when you want the session to start.



13 To begin the restore process when a specified number of clients join the session, specify an **Autostart client count**. To begin the session without waiting for a specified number to join, click **Start**.

Once started, ImageCenter displays the client status, server status, and PowerCast image transmission progress.

If ImageCenter returns error 1810, the PowerCast Server and PowerCast Clients cannot see each other. The following situations could cause this problem.

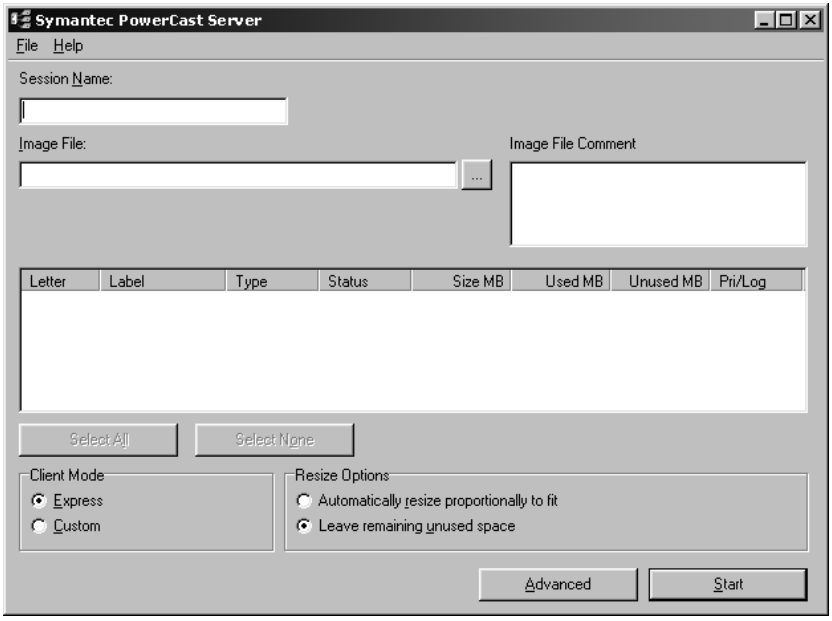
- The TTL value is set incorrectly, so the PowerCast packet is not passing through the required number of routers.
- There is a gateway between the PowerCast Server and PowerCast Clients. PowerCast packets cannot pass through gateways.
- There are routers set to kill the multicast signal as it passes through a router.

Running the PowerCast Server from Windows

If you have a Token Ring network, you must run the PowerCast Server from DOS. See "Running the PowerCast Server from DOS" on page 63. While it is not mandatory, you will have better performance with a PowerCast session if you run the PowerCast Server before the PowerCast Clients. Also, you can run the PowerCast Server from a server, but you will probably have better performance if the PowerCast Server is a client machine.

1 From the Windows Start menu, click **Programs > Symantec DeployCenter 5.7 > DeployCenter 5.7 Tools > PowerCast Server**.

If you are concerned that your PowerCast session will use too much network bandwidth, you can start PowerCasting from a command line prompt with the /PCTHR switch. See page 134 for details.



You must run the Windows PowerCast Server on a network with a DHCP server. The Windows PowerCast Server does not support the PowerCast BOOTP server. If you do not have a DHCP server, you can run the PowerCast server from DOS.

To run the Windows PowerCast Server from Windows 95, you must have WinSock2 installed. If the version of Windows 95 you are running does not include WinSock2, you should go to www.microsoft.com and download the updated software.

2. Type the name you have chosen for the PowerCast session (for example, SESSION1) in the **Session Name** text box.

   The session name will be used by the clients to select a session to join.

3. Specify the full path and image filename to be PowerCast during this session. If necessary, click the browse button to locate the image file you want.

   Note that you cannot PowerCast images spanned across multiple removable media.

4. If the image file contains more than one partition, each partition is displayed in the list box.

   Use one of the following methods to select the part of the image file you want to PowerCast:

   - In the partitions list box, select the partitions you want to include.
   - Click **Select All** to include all partitions in the image file.
   - Click **Select None** to clear the selections.

5. In the **Resize Options** group box, specify how you want to configure the remaining free space on the client computers.

If you want the image file to:	Click:
Fill all available space	Automatically resize partitions proportionally to fit
Occupy equal space and leave the remaining space free	Leave remaining free space

6. Select the **Client Mode** option you want.

   Express Eliminate a decision step on the client side and have the image file replace the entire contents of the hard disk chosen by the client. The client does not have to choose a destination partition or free space. Do not choose this option unless you are confident you can replace the entire contents of the hard disk.

Custom Let the client choose the destination (partition or free space) and partition resize values.

If you are finished setting PowerCast Server options, you can either set advanced options before launching the PowerCast session, or you can launch the PowerCast session.

Running the DOS PowerCast Client

The client operation includes logging into a PowerCast session and selecting restore options. While it is not mandatory, you will have better performance with a PowerCast session if you run the PowerCast Server before the PowerCast Clients.

To run the PowerCast Client from the command line, see "Command Line Operation" on page 73.

1. Boot your computer from a PowerCast boot disk.

   See "Creating PowerCast Boot Diskettes Manually" on page 77 for information about creating boot disks that will work with the graphical user interface (as shown in these steps).

   If you build a PowerCast boot disk with Boot Disk Builder, the PowerCast Client will run from the command line (without the full user interface).

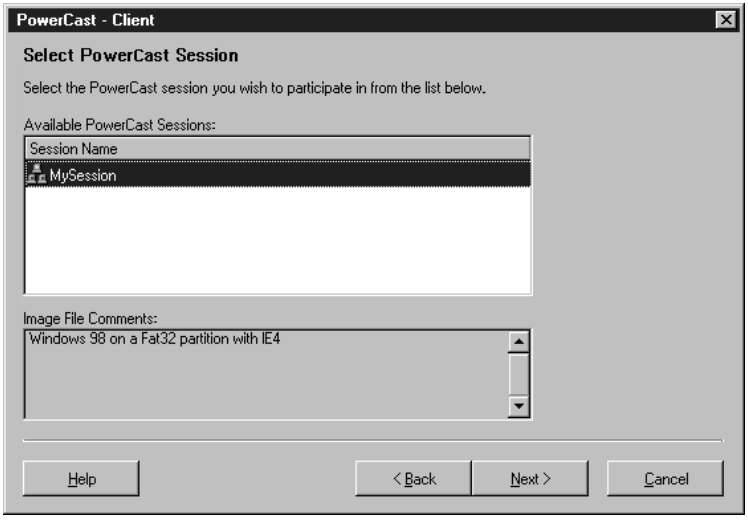
2. At the PowerCasting main screen, click **PowerCast**.

3. Click **Client** and then click **Next**.

   The active PowerCast session names are listed in the **Available PowerCast Sessions** box.

   If the driver for your network interface card (NIC) is not properly loaded and configured, you will receive error #1864. This error can be caused by ImageCenter not being able to find an IP address or by invalid configuration settings such as the line `FRAME ETHERNET_II` or `FRAME TOKEN-RING` missing from the configuration files.

4. Select the PowerCast session you want to join. The comments attached to the image file are displayed in the **Image File Comments** window. Click **Next**.

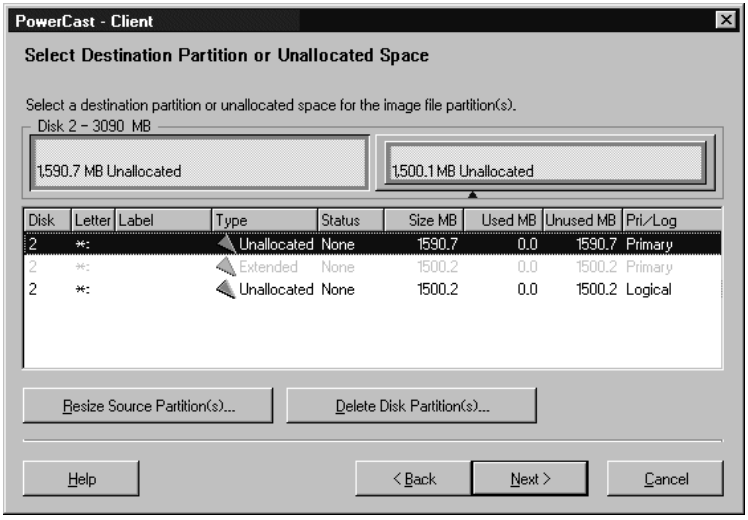


5 If the session prompts you to select a destination drive, select the physical drive where you want to restore the image file, then click **Next**.

If ImageCenter was not able to get the NIC or NIC driver into multicast mode correctly, you will see error #1810. ImageCenter may not be able to PowerCast. Check with the NIC manufacturer for multicasting support information.

If you selected **Custom** on the server and if the drive you have selected contains more than one partition or free space, the following dialog appears.

If you did not select **Custom** on the server, go to step 8.



6 Select the partition or unallocated space where you want to restore the image file. You can also select from the following two options to alter partitions:

- **Resize Source Partitions**: Lets you specify new sizes for the partitions in the received image file. The partitions will be restored to the destination disk and then resized to the selected sizes.
- **Delete Disk Partitions**: Lets you delete partitions on the destination disk.

Review your selections or change them by clicking **Back**.

7 When done selecting partitions and options, click **Next**.

8 To complete the client setup, click **Finish**.

The **Receiving PowerCast Image** dialog appears which displays progress of the PowerCast session.

9 After the PowerCast session is complete, click **Exit**.

DOS PowerCast Server Advanced Options

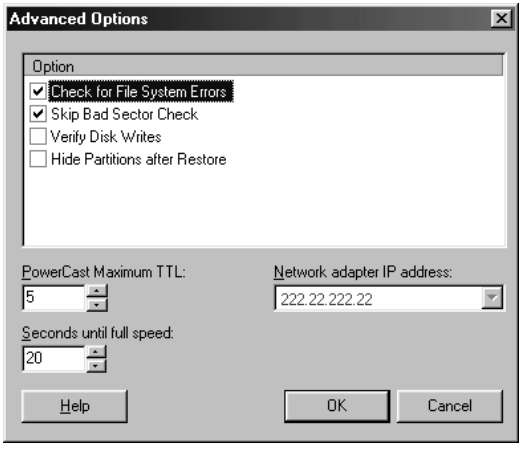
At the **Ready To PowerCast Image File** screen, click **Advanced Options**.

Select this:	To do this:
Check for File System Errors	Clear the **Check for File System Errors** check box if you want to ignore file system errors. This may allow a partition with file system errors to be PowerCast. However, you cannot restore a partition with partition table errors.
Skip Bad Sector Check	This is selected by default to save time in restoring the image file. Although most drives do not have bad sectors, the potential for problems increases during the lifetime of the hard drive. If you have an older hard drive, it is wise to enable bad-sector checking by clearing the **Skip Bad Sector Check** box.
Verify Disk Writes	Click **Verify Disk Writes** if you want to enable DOS disk write verification. Disk write verification is not critical to safely restore image files. Enabling disk write verification can slow the image restore process dramatically.
Hide Partitions After Restore	Restoring multiple logical partitions can cause the drive letters of subsequent partitions to change. This may make the computer unbootable or cause applications to fail. Most operating systems only allow one primary partition to be visible (bootable) at a time. If you are restoring an image of a primary partition, and you do not want to make that partition your visible (bootable) partition, click **Hide Partition After Restore**. For example, if you are using your secondary hard drive as a complete backup of your primary drive, clicking **Hide Partition After Restore** preserves all the secondary drive information without changing any drive letters. When the computer boots up, a drive letter will not be assigned to the hidden hard drive.

Select this:	To do this:
PowerCast Server Options *(Server only)*	When a network DHCP server or WATTCP.CFG file cannot be found, ImageCenter acts as a BOOTP server. These options let you specify the IP address range used. You can enter a range or use the defaults. • **Start IP Address:** Enter the first IP address to be leased out to a client (lowest number). • **End IP Address:** Enter the last IP address to be leased out to a client (highest number).

Windows PowerCast Server Advanced Options

The Windows PowerCast Server includes several advanced options in addition to the options available with the DOS PowerCast Server.



Option:	Description:
PowerCast Maximum TTL	Determines how many routers a PowerCast packet can pass through before it is killed. The PowerCast TTL field is equivalent to the MCTTL value you specify in your WATTCP.CFG file if you use the DOS PowerCast Server.

Option:	Description:
Seconds until full speed	Determines number of seconds a PowerCast session should transmit at reduced speed to allow for proper network pruning. The default value is zero (no delay). The value you choose will be preserved for future PowerCast sessions.
Network adapter IP address	Determines which network adapter will be used during the PowerCast session. You can also set this value using the /IP switch at startup. See “Command Line Switches for PowerCasting (Windows)” on page 132.

Command Line Operation

Both the DOS PowerCast Server and PowerCast Client operate from either the graphical user interface or from the command line.

PowerCast Server

To start the DOS PowerCast Server from the command line specify:

```
PQPCAST.EXE /MSN=”session name” /IMG=”image filename”
```

This will start PowerCasting in server mode and display the server progress screen, wait for the specified number of clients to attach, and PowerCast the specified image file. Upon completion, the server will wait for additional clients to attach until **Close** is selected.

PowerCast Client

To start the DOS PowerCast client from the command line specify:

```
PQPCAST.EXE /MSN=”session name” /DSK=n
```

This will start PowerCasting in client mode, display the PowerCast client progress screen, attach to the specified PowerCast session, delete all partitions on the specified disk, and restore the partitions from the image file received from the PowerCast server. Upon completion, the computer will reboot.

PowerCast Client boot disks created by Boot Disk Builder execute the commands shown above automatically.

Additional command line switches may also be specified to modify the behavior of PowerCasting. See“Command Line Switches for PowerCasting (DOS)” on page 135.

Building PowerCast DOS Boot Disks

PowerCast client machines must have the necessary NIC drivers and network configuration files to receive PowerCast sessions. You can create boot disks for PowerCast clients with Boot Disk Builder or manually. Symantec recommends using Boot Disk Builder.

Using Boot Disk Builder to Create PowerCast Boot Diskettes

1. From the Boot Disk Builder main menu, select **PowerCast Boot Disks**, then click **Next**.
2. Click the start-up mode for ImageCenter, then click **Next**.

   Client The Client is the workstation receiving the PowerCast session. If you click **Client**, you must indicate the session name and the hard disk number the client will use for PowerCasting.

   When a client computer is booted from a PowerCast Client boot disk, ImageCenter starts in PowerCast Client mode, connects to the designated PowerCast session, and restores the image to the specified hard disk. Any existing information on the client hard disk is completely erased.

   Server The Server is the computer PowerCasting the image to the client workstations. When a PowerCast Server is booted from a PowerCast Server boot disk, the diskette launches ImageCenter in PowerCast Server mode, displays the server progress screen, waits for the specified number of clients to attach, and PowerCasts the specified image file. When it is finished, the server waits for additional clients to attach until you click **Close**.

   You can have the server start automatically by checking this option and specifying a session name, image file path and filename, and autostart client count.

3. Select your network adapter or multiple adapters, and click **Next**.

   You can select multiple NICs. All of the files for those NICs will be copied to the boot disk. (There must be enough space on the first disk for all the selected NICs.) At boot time, the list of NICs copied is compared to the NIC in the computer. If one matches, that driver is loaded and the system is configured for it. Selecting multiple NICs for the boot disk enables the disk to be used on computers with different NICs.

You cannot use this method to deploy to laptops because there are incompatibilities with the PCBUS or PCMCIA NIC cards.

If your network adapter is not listed, do the following to add it to the list of network adapters.

a. Click **Add**.

b. Enter the location of the driver file (*.INF) for your network adapter. Click the browse button to browse the directory tree for the driver file.

   The driver .INF file contains information that allows detection of the NIC at boot time from a list of multiple selected NICs. Some disks contain multiple .INF files (some may be subfolders on the disk). You may have to try selecting different .INF files until Boot Disk Builder finds the one with the information it needs.

c. Select the driver types you need to add: Novell NetWare / PowerCast and/or Microsoft TCP/IP, then click **Next**.

d. Choose one or more adapters from the list, then click **Next**.

e. Select the NetWare and/or Microsoft TCP/IP drivers.

f. Click **Finish**.

g. Select the network adapter you are using from the list box, then click **Next**.

4 Specify your client network properties, then click **Next**.

Option	Description
Obtain an IP address from a DHCP server	Click **Obtain an IP address from a DHCP server** if a DHCP server is used to assign client IP addresses. On a DHCP server, the IP address is leased out temporarily on a first-come, first-served basis and increments automatically. The DHCP server also provides the subnet mask.
Specify an IP address	Click **Specify an IP address** if there is no DHCP server and you need to use TCP/IP on the network. In this case, you must enter a static IP address and subnet mask.
Token Ring	Select **Token Ring** if the PowerCast client or server has a token ring NIC.

In the **PowerCast Maximum TTL** text box, specify the number of routers a packet can pass through. See “PowerCasting through Routers” on page 61.

5 Select the type of boot disk to build.

Boot Disk Builder can only write to formatted diskettes. Any existing information on the diskette will be lost.

Option	Description
Floppy Disk	Creates a DOS boot diskette. Choose the drive letter where your floppy drive is located. The network and PowerCast files may require two diskettes. You will be prompted if a second disk is needed
Copy boot disk contents to a folder	Temporarily stores the boot files in a folder. This option is practical when you want to electronically distribute the boot file to other administrators or users. Though the file is stored in a folder and can be electronically transferred, it must be copied to a floppy disk or burned to CD before it can be used. You can use this option to create a bootable CD for PowerCast.
Virtual Boot Disk File	Writes a fully active boot file to a location other than a floppy disk. A virtual boot disk file does not need to be launched from a floppy disk. Rather, computers can reference this file from any directory location upon reboot as if it were using a floppy. Virtual boot disk files are used by ImageCenter to boot to DOS.

6. By default, Boot Disk Builder uses the operating system's DOS files to build boot disk files on Windows 95, 98, or Windows Me systems. On Windows NT or 2000 systems, Boot Disk Builder builds boot disk files using the Caldera DOS files included with Boot Disk Builder.

   If you do not want to use Caldera DOS files on your boot disk, do the following:

   a. Insert a boot disk that boots to the version of DOS you want to use in building your boot disk file.

   b. Click **Tools > Load DOS Reference Diskette >From A:**.

      The files from your boot disk will be copied to the REFDISK directory where Boot Disk Builder is installed.

      If there are too many files to fit on a single floppy disk, you can delete everything but CONFIG.SYS and any drivers that are started within the CONFIG.SYS file.

c. Select **Use Reference Disk for DOS files** at the bottom of the Boot Disk Builder dialog box.

d. If you are writing your boot disk file to disk, remove your original boot disk and insert a formatted disk.

   If you do not remove your original disk, Boot Disk Builder will overwrite the files on it.

7 *(Optional)* To save your choices to a configuration file (*.BDC) for later use, click **File > Save Configuration**, type the filename for the configuration file, then click **Save**.

8 Click **Back** to make any changes, or click **Finish** to build the boot disk.

   In building the boot disk file, Boot Disk Builder copies the DOS system files and the boot information to the designated location. Any existing information on the floppy diskette or in the designated folder is erased.

After the boot disk file has been created, you are asked if you want to create another boot disk. If you click **Yes**, Boot Disk Builder creates another boot disk file using the current configuration. If the current configuration uses a static IP address, and if you are creating the file on floppy disks, Boot Disk Builder auto-increments the assigned IP address on each boot disk.

Creating PowerCast Boot Diskettes Manually

The Symantec Boot Disk Builder will not create boot disks that allow simultaneous PowerCasting and network connectivity. To simultaneously PowerCast and connect to a NetWare server, the network client software must also be properly configured on the boot disk. Because of wide variations in interface cards and network configurations, this process may vary from the documented steps. You will need to obtain additional help from your network administrator. Symantec does not support this process.

You can obtain the NIC drivers from the driver diskette that came with your network card, from your network administrator or from the card manufacturer's web site. The other required network client software pieces can be obtained from your network administrator.

NDIS 2.01 NIC Driver

You can create a ImageCenter PowerCast DOS boot disk with your network interface card's NDIS 2.01 NIC driver.

The following steps outline how to add the network drivers to the ImageCenter PowerCasting boot diskette. You need to alter the example configuration and system files for use with different network interface cards.

1. Create a ImageCenter PowerCasting boot disk using Boot Disk Builder.
2. Copy the NDIS 2.01 NIC driver from your network interface card diskette to the boot diskette.

   For example, the 3Com 3x905 NIC driver is found on disk #1 in subdirectory \NDIS2\DOS and is named "EL90X.DOS."
3. Copy the DIS_PKT.DOS and the PROTOCOL.INI files to the boot diskette. These files are located on the DeployCenter CD in the ENGLISH\RESCUEME\OS2DOS subdirectory.
4. Change the "drivername=" line in the PROTOCOL.INI file [NIC_CARD] section to match your NIC's driver name. The following sample is for the EL90X.DOS driver.

   Sample PROTOCOL.INI file contents:

   ```
   [PROTMAN]
   drivername = PROTMAN$

   [PKTDRV]
   drivername = PKTDRV$
   bindings = NIC_CARD
   intvec = 0x60
   chainvec =0x66

   [NIC_CARD]
   drivername = EL90X$
   ```
5. Copy the PROTMAN.DOS, PROTMAN.EXE and NETBIND.COM programs to the boot diskette. You can obtain these files from the Windows NT Server 4.0 CD in the CLIENTS\MSCLIENT\NETSETUP directory or at the Microsoft FTP site at: *ftp://ftp.microsoft.com/msclient/*
6. Modify the CONFIG.SYS file to look as follows:

   ```
   DEVICE=HIMEM.SYS
   DEVICE=PROTMAN.DOS /I:A:\
   DEVICE=DIS_PKT.DOS
   DEVICE=xxxxx.(Change to match your NIC driver)
   LASTDRIVE=Z
   ```

7 Add the NETBIND line to the AUTOEXEC.BAT file.

```
@ECHO OFF
PROMPT $P$G
NETBIND
```

The following files should now be on the boot diskette.

- Hidden DOS system files: IO.SYS and MSDOS.SYS
- COMMAND.COM
- HIMEM.SYS
- CONFIG.SYS
- AUTOEXEC.BAT
- xxxxxx.DOS *(NDIS network card NIC driver, must match your card.)*
- DIS_PKT.DOS
- PROTMAN.DOS
- PROTMAN.EXE
- NETBIND.COM
- PROTOCOL.INI

8 On the ImageCenter PowerCasting diskette, you can create a PQPCAST.BAT file to start ImageCenter PowerCasting and, optionally, specify command line switches.

To start ImageCenter PowerCasting in user interface mode, type `PQPCAST`, then use the interface to select Server mode and options.

To start ImageCenter in PowerCast Client mode, you must specify the disk number and the PowerCast session name. Specify the disk number with the /DSK=n command line switch. **Warning! The entire disk will be erased.** Specify the PowerCast session name with the /MSN=*nnnnn* command line switch. The session name specified must match the name used by the server. For example:

```
PQPCAST /DSK=1 /MSN=SESSION
```

9 Skip this step if a DHCP server is available on the network segment that will be used for PowerCasting or if you don't want to use the ImageCenter BOOTP server.

If no DHCP server is available on the network segment, create a WATTCP.CFG file on the boot diskette to specify the IP address for this computer to use.

WATTCP.CFG file should contain:

```
IP = 192.168.1.xxx
NETMASK = 255.255.255.0
```

IP is the workstation's unique IP address. NETMASK is the proper network mask.

The second diskette should now contain the following files:

- MOUSE.COM
- PQPCAST.EXE
- PQPCAST.OVL
- PQDPLCTR.RTC
- PQPCAST.BAT *(Optional)*
- WATTCP.CFG *(Optional)*

10 Use the first diskette to boot DOS. Then insert the second diskette, and type `PQPCAST` at the command prompt to start PowerCasting.

If all the files will fit on one diskette, you can copy the files from disk #2 to disk #1 and edit the AUTOEXEC.BAT file to automatically start PowerCasting.

ODI/MLID NIC Driver

This section explains how to create a ImageCenter PowerCast DOS boot disk with your network interface card's ODI/MLID NIC driver.

Use Boot Disk Builder to create an ImageCenter PowerCasting boot disk. The following steps outline how to add the network drivers to the boot diskette. You need to alter the example configuration and system files for use with different network interface cards.

1 Copy the ODI/MLID NIC driver from your network interface diskette to the boot diskette.

For example, the 3Com 3x905B NIC driver is found on disk #1 in subdirectory \NWCLIENT and is named 3C90X.COM.

2 Copy the LSL.COM program to the boot diskette.

LSL.COM can be obtained from your network administrator, information systems technician, or from the Novell Web site at: *www.novell.com/download*

Get the Novell® Client™ v2.6 for DOS and Windows 3.1x, unzip the DW26EN.ZIP file, and copy the LSL.COM file from the \NIOS subdirectory.

3 Modify the CONFIG.SYS file to look as follows:

```
DEVICE=HIMEM.SYS
LASTDRIVE=Z
```

4 Modify the AUTOEXEC.BAT file to look as follows:

```
@ECHO OFF
PROMPT $P$G
LSL (Loads LSL program)
3C90X (Loads ODI driver)
```

5 Create a NET.CFG file with the following contents:

```
LINK SUPPORT
BUFFERS 6 1600 (Ethernet) or BUFFERS 4 4200 (Token Ring)
LINK DRIVER 3C90X (Change to match your network card driver.)
FRAME ETHERNET_802.2 (Ethernet only)
FRAME ETHERNET_II (Ethernet) or FRAME TOKEN-RING (Token Ring)
```

The `FRAME ETHERNET_II` or `FRAME TOKEN-RING` line is required for PowerCasting.

The following files should now be on the boot diskette:

- Hidden DOS system files: IO.SYS and MSDOS.SYS
- COMMAND.COM
- HIMEM.SYS
- CONFIG.SYS
- AUTOEXEC.BAT
- 3C90X.COM *(ODI/MLID network card NIC driver, must match your card.)*
- LSL.COM
- NET.CFG

6 On the ImageCenter PowerCasting boot disk, you can create a PQPCAST.BAT file to start ImageCenter PowerCasting and, optionally, specify command line switches.

To start ImageCenter PowerCasting in user interface mode, type `PQPCAST` then use the interface to select Server mode and options.

To start ImageCenter PowerCasting in Client mode, specify both the disk number and the PowerCast session name. Specify the disk number with the /DSK=*n* command line switch. **Warning! The entire disk will be erased.** Specify the PowerCast session name with the /MSN=*nnnnn* command line switch. The session name specified must match the name used by the server. For example:

```
PQPCAST /DSK=1 /MSN=SESSION1
```

7 Skip this step if a DHCP server is available on the network segment that will be used for PowerCasting or if you don't want to use the ImageCenter BOOTP server.

If no DHCP server is available on the network segment, create a WATTCP.CFG file on the boot diskette to specify the IP address for this computer to use.

WATTCP.CFG file contents:

```
IP = 192.168.1.xxx
NETMASK = 255.255.255.0
```

IP is the workstation's unique IP address. NETMASK is the proper network mask.

The second diskette should now contain the following files: MOUSE.COM, PQPCAST.EXE, PQPCAST.OVL, PQDPLCTR.RTC, PQPCAST.BAT *(Optional)*, WATTCP.CFG *(Optional)*.

8 Use the first diskette to boot DOS. Then insert the second diskette, and type `PQPCAST` at the command prompt to start PowerCasting.

If all the files will fit on one diskette, you can copy the files from disk #2 to disk #1 and edit the AUTOEXEC.BAT file to automatically start ImageCenter.

Booting With PowerCast Boot Diskettes

When a client computer is booted from a PowerCast Client boot diskette, ImageCenter will start in PowerCast Client mode, connect to the PowerCast session you named, and restore the image to the hard drive you specified. This will completely erase any existing information on the affected hard drive.

When a PowerCast Server is booted from a PowerCast Server boot diskette, ImageCenter will start in PowerCast Server mode and display the server progress screen, wait for the specified number of clients to attach, and PowerCast the specified image file. Upon completion, the server will wait for additional clients to attach until you click **Close**.

CHAPTER 7

Unicasting

Overview

The Unicast feature lets you create and restore images using a network drive without mapping the drive. It consists of a Unicast server and a Unicast client, which reside on separate machines. You can specify all Unicast parameters on the command line of either the server or the client. Unicast operations are all point-to-point and use TCP/IP protocols.

The Unicast server must be started prior to running the Unicast client or before trying to PXE-boot a client machine. Once the server has been started, you do not need to tend to it. You start all Unicast operations from the client by using a standard script file or the ImageCenter interface.

Running the Unicast Server

The Unicast server is a standalone program that runs on Windows as a Windows NT service or as an executable in the background. It does not have to run on a Windows server; it can run on a workstation. It is an image server, meaning that it provides a server interface for images and lets images be created and restored.

The command line switches you specify determine the mode of the server (whether the server runs as an executable or as a service). The parameters vary depending on the mode of the server.

Running the Unicast Server as an Executable

You run the Unicast server from its current location by typing the command line below at a DOS prompt. You can assign any of the optional switches. Command line switches can be specified in any order and can begin with a slash (/) or a dash (-).

Syntax

```
Ucservice.exe /port <port number> /imagedir <image server
path> /logfile <logfile path> /logsize <logfile size>
```

Command Line Switch	Description
/port	Specifies the port the server Ucservice.exe is to monitor. This must be a valid TCP/IP port number. This defaults to port 50137. **Example** `Ucservice.exe /port 50137`

Command Line Switch	Description
/imagedir	Specifies the path name to the image server top-level directory. This lets the Unicast client supply a relative path name rather than a complete path name when identifying the image location on the Unicast server. This parameter can specify a partial path to the final subdirectory of the image file. If the parameter specifies the complete path to the image directory, the client only needs to supply the .PQI filename. If the path includes a long filename with spaces, quotes must be placed around the path. **Example** `Ucservice.exe /imagedir D:\PQI`
/logfile	Specifies the path (including the filename) of the logfile, if you want logging. A logfile is a text file that contains log entries of events that occur as the code executes, and are mainly used for debugging. **Example** `Ucservice.exe /logfile D:\Temp\Logfile.txt`
/logsize	Specifies the size of the logfile in bytes. You can use K (or k) notation or the M (or m) notation to specify "X 1024" (kilobytes) or "X 1024 X 1024" (megabytes) respectively. The default logfile size is 128K, but for the default size to be used, the /logfile parameter must be specified and be valid. **Example** `Ucservice.exe /logfile D:\Temp\Logfile.txt /logsize 1M`

Running the Unicast Server as a Service

To run the Unicast server as a service, copy the executable (Ucservice.exe) to the desired install folder and execute it using the service switches listed below, followed by any desired execution parameters. To run this service, you must be logged in and have administrative privileges.

Syntax

```
Ucservice.exe /service /startup [auto|demand] /user
[account] /password [password] <execution parameters>
```

Command Line Switch	Description
/service	Registers the Unicast server as a service. If the service has already been installed and is executed again with /service, it first uninstalls the previous settings and then reinstalls itself.
/startup	Registers the Unicast server as service to either start automatically (auto) at boot time or manually on demand (via Services). The default startup mode is on demand (manual).
/user	When used with /password parameter, /user runs the service as something other than LocalSystem (default).
/password	When used with the /user parameter, /password runs the service as something other than LocalSystem (default).

The execution parameters are described under "Running the Unicast Server as an Executable" on page 84. The parameters you specify are saved in the registry and used when the service actually starts.

Unregistering the Unicast Server as a Service

1. From a DOS box, navigate to the install location.
2. Type `UcService /unregserver`.

This parameter unregisters the service and cleans up the registry.

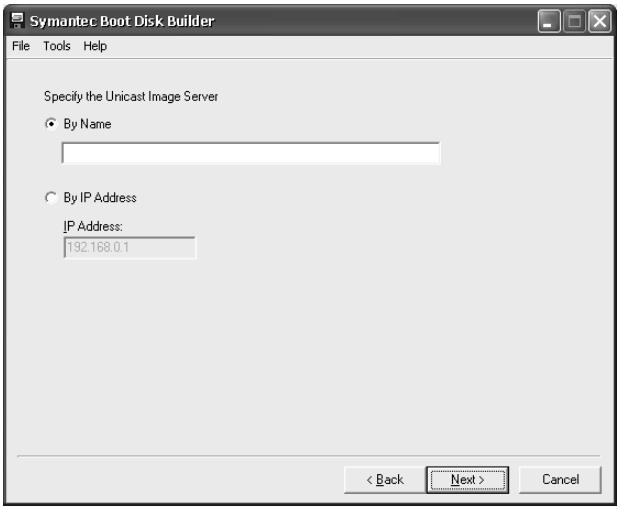
Creating Unicast Client Boot Disks

You can create Unicast client boot disks for connecting to a Unicast image server. Unicast boot disks are recommended for PXE applications. When you create the boot disks, you can specify the Unicast server to connect to and the driver to use (UNDI or Microsoft TCP/IP NDIS).

IMPORTANT! When you create disks with Boot Disk Builder, start with a clean, formatted disk.

Before creating Unicast boot disks, you must have the Microsoft Client files installed. See “Installing Microsoft Client Files” on page 10.

1 From the Boot Disk Builder main menu, click **Unicast Boot Disks**, then click **Next**.



2 Click **By Name** and specify the name of the Unicast Image server, or click **By IP Address** and specify the IP address of the Unicast Image server, then click **Next**.

3 Select a network adapter type.

Option	Description
UNDI Driver (PXE)	Click **UNDI Driver** (Universal Network Driver Interface) if you intend to boot the client computer from a PXE server. Then click **Next**. A virtual floppy disk file (.VFD) is created which you can then place on the PXE server. Use the Symantec PXE Configuration Utility to add the virtual floppy to the user’s PXE boot menu.
Microsoft TCP/IP	Click **Microsoft TCP/IP**, then click **Next**. Then select the Microsoft NDIS (Network Driver Interface Specification) driver you need. If your network adapter is not listed, see “Adding a NIC to the Network Adapter List” on page 19.

4 Specify the location and any optional command line parameters for ImageCenter.

The Microsoft TCP/IP Boot Disk automatically boots a network workstation to ImageCenter. Therefore, you must indicate where it can find the ImageCenter program files.

5 Click **Next**.

6 Specify the client network properties, then click **Next**.

Boot Disk Builder does not support token ring NICs on Microsoft TCP/IP networks.

Option	Description
Obtain an IP address from a DHCP server	Click **Obtain an IP address from a DHCP server** if a DHCP server is used to assign client IP addresses. On a DHCP server, the IP address is leased out temporarily on a first-come, first-served basis and increments automatically. The DHCP server also provides the subnet mask.
Specify an IP address	Click **Specify an IP address** if there is no DHCP server and you need to use TCP/IP on the network. In this case, you must enter a static IP address and subnet mask.

7 Select the type of boot disk to build.

Option	Description
Floppy Disk	If you are creating a DOS boot disk, click **Floppy Disk**, then choose the drive letter where your floppy disk is located. This option is not available if you chose UNDI Driver (PXE) as the network adapter type. Boot Disk Builder can only write to a formatted disk. Any existing information on the disk will be lost. The network and ImageCenter files may require two disks. You will be prompted if a second disk is needed.

Option	Description
Copy boot disk contents to a folder	Click **Copy boot disk contents to a folder** if you want to temporarily store the boot file in a folder. This option is practical when you want to electronically distribute the boot file to other administrators or users. Though the file is stored in a folder and can be electronically transferred, it must be copied to a floppy disk or burned to CD before it can be used. This option is not available if you chose UNDI Driver (PXE) as the network adapter type. You can use this option to create a bootable CD-ROM for ImageCenter.
Virtual Boot Disk file	Click **Virtual Boot Disk file** to write a fully active boot file to a location other than a floppy disk. A virtual boot disk file does not need to be launched from a floppy disk. Rather, computers can reference this file from any directory location upon reboot as if it were using a floppy. This option is selected by default if you chose UNDI Driver (PXE) as the network adapter type. Virtual boot disk files are used by ImageCenter to boot to DOS. Be aware that some rare instances NICs are deinitialized when you reboot with a virtual floppy. You can work around this problem by using the NIC's diagnostic utility in the AUTOEXEC.BAT file to initialize the NIC.

8 By default, Boot Disk Builder uses the operating system's DOS files to build boot disk files on Windows 95/98/Me systems. On Windows NT/2000/XP systems, Boot Disk Builder builds boot disk files using the Caldera DOS files included with Boot Disk Builder.

If you want to use a specific set of DOS files in building your boot disk, see steps 7a - 7d on page 14.

9. (Optional) To save your choices to a configuration file (*.BDC) for later use, click **File** > **Save Configuration**, type the filename for the configuration file, then click **Save**.

10. Click **Back** to make any changes, or click **Finish** to build the boot disk.

In building the boot disk file, Boot Disk Builder copies the DOS system files and the boot information to the designated location. Any existing information on the floppy disk or in the designated folder is erased.

Running the Unicast Client

The Unicast client runs on DOS from a client machine. It can also be PXE-booted onto a client machine as part of a virtual floppy image and then executed to pull down a PQI image from the Unicast server. The Unicast client command line is simply the ImageCenter command line.

To access the Unicast client features from within ImageCenter, the runtime configuration file, PQImgCtr.rtc, must be present in the directory from which PQImgCtr is run.

Syntax

```
PQImgCtr.exe {/img=<image location and filename>
/cmd=<script path name>} [/upn=51225] [/uis=dev-PC12]
```

Unicast Client Command Line Switches

Command Line Switch	Description
/IMG	Identifies the image location and filename. It consists of three parts: 1) the name of the Unicast name space within PQImgCtr, that is, "\\.\imgsrv", 2) the Unicast server machine name or IP address, and 3) the remote path name. If the Unicast server command line specified the “imagedir” execution parameter, the “remote path name” part (part 3) specifies the rest of the path, including the image filename. Otherwise, it specifies the complete path on the Unicast server.

Command Line Switch	Description

	Examples
	`PQImgCtr.exe /img=\\.\imgsrv\PC12\abc.pqi`
	
	where “PC12” is the Unicast server machine name, and “abc.pqi” is the remote path name
	
	`PQImgCtr.exe /img=\\.\imgsrv\0.0.0.0\abc.pqi`
	
	where “0.0.0.0” is a valid IP address

/CMD	Identifies the script path, which includes the script filename, and can be relative to the location of PQImgCtr.exe. Specifying a drive local letter here refers to the Unicast client machine. **Example** `PQImgCtr.exe /img=\\.\imgsrv\PC12\abc.pqi /cmd=restore.pqs` where restore.pqs, which is assumed to contain a restore image script, exists in the same directory as the PQImgCtr executable.
/UPN *(Optional)*	Identifies the Unicast port number that the Unicast client uses to connect to the Unicast Server. This must be a valid TCP/IP port number and must match the port number used by the Unicast server. If this parameter is not specified, the Unicast client defaults to the port number of 50137. **Example** `PQImgCtr.exe /img=\\.\imgsrv\PC12\abc.pqi /cmd=restore.pqs /upn=51225`
/UIS *(Optional - GUI only)*	Identifies the Unicast image server, so that you can browse to it in the ImageCenter interface. **Example** `PQImgCtr.exe /UIS=dev-PC12`

CHAPTER 8

ImageExplorer

Overview

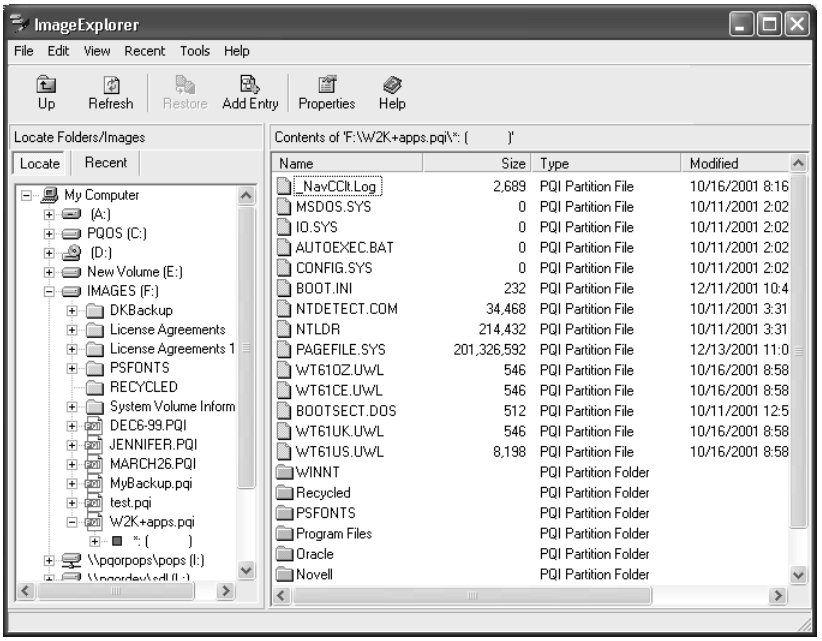
Symantec ImageExplorer simplifies management of your image files. Working within a single screen, ImageExplorer gives you total control of the image files you can access. You can view image file contents, copy image files, copy partitions within files, restore individual program and data files from the image, or add password protection to image files.

ImageExplorer also provides description capabilities, so you can easily identify individual image files and partitions.

Start ImageExplorer by clicking **Start > Programs > Symantec DeployCenter 5.7 > DeployCenter 5.7 Tools > ImageExplorer**.

Symantec ImageExplorer—Main Screen

The ImageExplorer main screen is divided into three panes: Locate, Recent, and Contents.



Screen area:	Description:
Locate pane	Displays a tree view of all the drives on your machine (local hard disks and network drives).
Recent pane	Displays a tree view of image files you have browsed to or opened recently. You can clear the list of recent images by clicking **Recent > Clear Recent Images List**.
Contents	Displays the contents of the selected drive, folder, image file, or partition.
Toolbar	Provides quick access to common tasks. You can display or hide the toolbar using the **View** menu. You can also use the **View** menu to determine whether to display text labels on the toolbar buttons.
Status bar	Displays a brief description of the toolbar button where the pointer is located. You can display or hide the status bar using the **View** menu.

Modifying Images

You can use the **Copy to Image** feature in ImageExplorer to copy single or multiple partitions to new or existing image files. When you copy a file, partition, or image, you also have an option to set the compression level for the resulting image, add a password to the image, or split the image into multiple files.

Copying Partitions to an Image File

You can drag and drop partitions from one image file to another, or you can copy partitions using the **Edit** menu. Copied partitions will not overwrite any partition already in an image file. Therefore, you can have several partitions with the same name or drive letter within one image file.

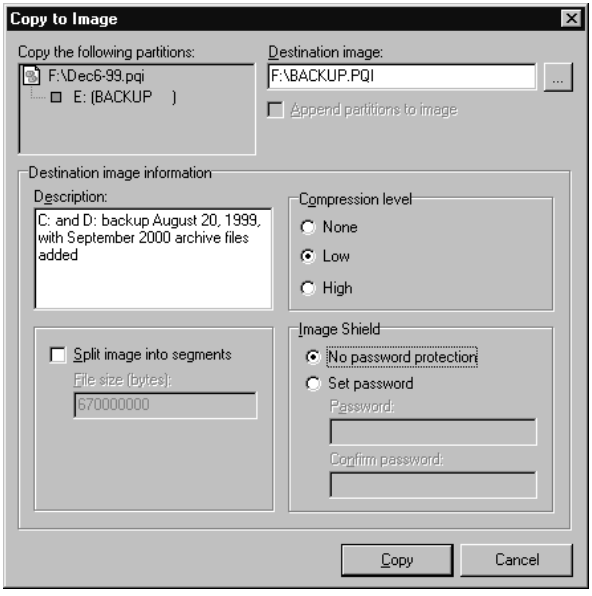
There are several methods to copy partitions or image files:

- Drag and drop the partition or image from the Recent or Locate pane onto a drive or folder in the Locate pane.
- Drag and drop a partition within an image file onto another image file or onto a folder in the Locate pane.
- Select a partition, click **File > Copy to Image**.

- Right-click a partition, click **File > Copy to Image**.
- Select a partition, click **Edit > Copy**, move the insertion point to the new location, then click **Edit > Paste**.

What you copy:	Result:
Entire .PQI image file	The **Copy to Image** dialog appears with the Destination image text box filled in according to the currently selected drive or folder in the Locate pane.
Partition within an image file	If the partition is copied to another image file, the **Copy to Image** dialog appears and the partition is added to the image file and inherits the characteristics of the target image file including compression ratio, password, and so forth. If the partition is copied to a folder, the **Copy to Image** dialog appears and the partition is added to a newly created .PQI image file.

The **Copy to Image** dialog displays the filename for the image file you are modifying (or allows you to type a filename for a new image file). It also allows you to split an image file, combine files that make up a spanned image, add a password to an image, and choose the compression level for an image.



Splitting an Image into Multiple Files

Use **Split** to save an existing image file across a series of removable media disks (for example, floppy disks, Jaz or Zip disks). You can use ImageExplorer to split image files after they have been created. You can also save split image files to a network drive and later transfer the files to removable media, such as a CD-RW.

You split an image by copying the whole image or selected partitions to a new image file and then splitting the new image file.

1. Copy the image file you want to split from the Locate or Recent pane into the Locate pane.

   The **Copy to Image** dialog appears.

2. Under **Destination image**, type a path and filename for the new image file.

3. Select **Split image into segments**.

4. Type a maximum size for each segment of the image file.

   For example, if you want to create an image file on CDs, type `670000000`.

5. Specify any other options for the new image file (such as a description, a password, or a compression level).

6. Click **Copy**.

When you split an image file to a removable media device, you are automatically prompted for new media when media in a removable device is full.

Combining Files that Make up an Image

If you select a file that is part of a split image (an image that is split across several files) and copy the file to a new image file, ImageExplorer automatically combines all the pieces of the image in the new Destination image.

You must ensure that the **Split image into segments** check box is not selected, or the new image file will be split at the specified size instead of combined into one file.

This feature is useful if you have an image file stored on removable media, but you want to save it on a network directory or your hard disk.

Adding a Password to an Image

1. Copy the image file to which you want to add a password from the Locate or Recent pane into the Locate pane.

   The **Copy to Image** dialog appears.

2. Under **ImageShield**, click **Set Password**.

3. Type the password in the **Password** and **Confirm password** fields.

   Passwords are case-sensitive. Store the password in a safe place, since you cannot copy, modify, or restore a password-protected image file without typing the password. You also cannot change a password for an image file without knowing the current password assigned to that image. Symantec does not have a workaround to access password-protected image files if you lose the password.

4. Specify any other options for the new image file (such as a description, a compression level, or a split size).

5. Click **Copy**.

Compressing Image Files

1. Copy the image file you want to compress from the Locate or Recent pane into the Locate pane.

   The **Copy to Image** dialog appears.

2. Under **Compression Level**, click the level of compression you want.

None	No compression is usually the fastest method for saving the image file and is useful if storage space is not an issue. However, if you are saving your image file to a busy network drive or to a relatively slow removable media device, it may be faster to compress the image since there is less data to write to the file.
Low	Low compression offers a 40% average compression ratio.
High	High compression offers a 50% average compression ratio.

3. Specify any other options for the new image file (such as a description, a password, or a split size).

4. Click **Copy**.

Adding or Changing an Image File Description

1. Copy the image file you want to add a comment for from the Locate or Recent pane into the Locate pane.

   The **Copy to Image** dialog appears.

2. Under **Description**, type comments about the image file.

   Comments cannot exceed 232 characters.

3. Specify any other options for the new image file (such as a password, a compression level, or a split size).

4. Click **Copy**.

Mounting a Volume

From ImageExplorer, you can mount a volume within a backup image file by assigning it a drive letter that is visible from Windows Explorer. As with any other mapped drive, you can perform a variety of tasks on the volume such as run ScanDisk (or CHKDSK), perform a virus check, defragment files, copy folders or files to an alternate location, or simply view disk information about the volume such as used space and free space. You may also be able to run executable programs that exist within the mounted volume.

When a volume is mounted, you can set it up as a shared drive. Users on a network can connect to the shared drive and restore files and folders from within the volume.

You can mount one or more volumes at a time in ImageExplorer. The volumes will remain mounted even if you close and restart ImageExplorer. If you reboot the server, however, the volumes will be dismounted. Mounted volumes do not take up extra hard disk space.

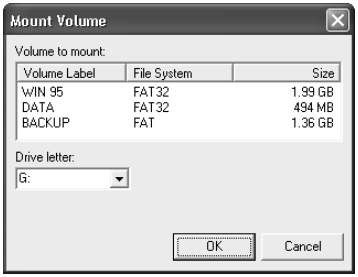
If an NTFS volume uses EFS (Encrypted File System), the security remains intact on the volume when it is mounted.

It is not necessary to mount a volume to restore files or folders from within a backup image.

IMPORTANT! When you mount a backup image under Windows 2000, the volume will appear to be a read-write volume when it is actually read-only. Attempting to make changes may crash the machine where ImageExplorer is running. Any changes you make to the volume, such as deleting or copying files, will be lost when the backup image is dismounted.

You cannot mount volumes under Windows 9x or Windows NT 4.0.

1. From the tree pane of ImageExplorer, select the image file (.PQI) that contains the volume that you want to mount.
2. Click **File > Mount Volume**.



3. Select a volume name you want mounted.
4. Choose a drive letter you want associated with the volume from the **Drive letter** drop-down list.
5. Click **OK**.

To mount additional volumes, repeat the steps above.

The mounted volume appears in the tree pane of the ImageExplorer, and Windows Explorer is automatically opened to the drive letter of the mounted volume.

Folders and files in a mounted volume are marked as read-only

Dismounting a Volume

1. From the tree pane of ImageExplorer, select a mounted backup image file, then click **File** > **Dismount volume**.

Rebooting the computer will also dismount all volumes.

Restoring Individual Files or Partitions

You can use ImageExplorer to restore individual files or partitions from within an image file. You can restore individual files or folders from spanned or compressed images without restoring the entire image file.

1. From the Locate or Recent pane, double-click the image file that contains the partition with the files you want to restore.
2. *(If applicable)* Type the image file password, then click **OK**.
3. Double-click the desired partition.
4. Select the folder or files you want to restore.

   You cannot restore individual files with international characters in the filename or files that have NT compression. These files can only be restored when you restore a complete image.
5. Click **File > Restore**.

   You can also drag a file into the desired location to restore it or right-click a file and choose **Restore** from the quick menu.

   If you selected an image file that was created with an older version of Drive Image or ImageExplorer, a progress bar displays while the ImageExplorer expands the image index. To speed up the process with older image files, refer to "Working with Images from Previous Versions" on page 102.
6. Click **To this destination**, then specify the location where you want to save the restored files. Click the browse button to navigate to the location you want.

   You can also click **Restore to original path** if you want to restore the folders or files to their original location. If the original location does not include a drive letter (because the partition was hidden when you imaged it), you must enter a drive letter for the partition before you can restore it.
7. Click **Restore** to restore the files.
8. When file restoration is complete, click **OK**.
9. Click **Close** to return to the ImageExplorer main window.

Working with Images from Previous Versions

If you restore files from an image that was created with an earlier version of ImageExplorer (a version that was included with Drive Image Pro), you can do one of the following to speed up the process. Note that these procedures are optional.

- Ensure that the index file (*.PQX) for the image is saved in the same directory where the image is saved. If ImageExplorer finds the index file in the same directory, it can use the index file instead of recreating it during the restore.
- If you do not have an index file for the image, you can use ImageExplorer to copy the image into a new ImageExplorer image.

Verifying Image Files

Use Verify Image to determine whether an image file is valid or corrupt. ImageExplorer will check to see that all of the files in the image are available for you to open, the internal data structures in the image file match the data that is available, and the image file can be uncompressed and will create the expected amount of data.

This feature is useful if you have added partitions to an image and want to verify the integrity of the image.

1. From the Locate or Recent pane, select the image file you want to check.
2. Click **File > Verify Image**.
3. When the check is complete, click **OK**.

You can also right-click an image file, then click **Verify Image** from the quick menu.

Deleting Image Files

Use Delete to remove an entire image file, including all partitions, folders, and files. If you delete an image file that resides on your local hard disk, it is sent to the Windows Recycle Bin.

1. From the Locate or Recent pane, select the image file you want to delete.

   You cannot delete individual partitions or selected files or folders within an image file.
2. Click **File > Delete Image**.

3 Click **Yes** to continue or **No** to cancel.

You can also right-click on an image file, then click **Delete Image** from the quick menu or delete the image using Windows Explorer.

Displaying Information About Images

1 From the Locate or Recent pane, select the desired image file.

2 Click **File > Properties**, or right-click the image file and click **Properties**.

The following list describes each option in the **Image Properties** dialog.

Description	A user-assigned comment associated with the partition.
MS-DOS name	A user-assigned name for the image.
Image size	The total size of the image.
Image date/time	The date and time that the image file was created.
Spanned	Whether the image file is spanned over several disks.
Compression	Whether the selected partition is compressed or uncompressed. The level of compression (Low or High) is also specified. Low level compression yields an approximate 40% compression rate. High level compression yields approximately 50%.
Password Protected	Whether the image is password protected.

3 Click **OK** to exit the dialog.

Displaying Information About Partitions

1 From the Locate or Recent pane, double-click the image file that contains the desired partition.

2 Select the partition you want.

3 Click **File > Properties**, or right-click partition and click **Properties**.

Display name	A user-assigned name for the partition.
Description	A user-assigned comment associated with the partition.
Drive letter	The partition drive letter.
Type	The file system type (for example, FAT, NTFS) used within the partition.
Primary/Logical	The selected partition's drive status as either primary or logical.
Partition size	The total size of the partition. This total includes both used and unused space.
Used space in partition	The amount of used space within the partition.
Unused space in partition	The amount unused space within the partition.
Physical size in image	The actual size of the partition within the image file. This physical size may differ from the partition size depending upon the amount of used and free space within the partition and the compression level.

4 Click **OK** to exit the dialog.

Viewing Files within an Image File

Symantec ImageExplorer enables you to view files within an image file.

1 In the Contents pane, select the file you wish to view.

You can select multiple files to view.

2 Click **File > View File**.

If you select an executable file (or a file with a .DLL, .COM, or .PIF extension), the **View File** command will be dimmed.

.BAT, .CMD, and .INF files will be opened with Notepad. Files that are registered will be opened with the registered application. Files that are not registered will display the **Open with** dialog.

You can also view a file by right-clicking it and choosing **View File** or by double-clicking on the file.

ImageExplorer Options

You can specify a default restore path or a default size for image files. The default size is that size at which images will be split during a copy. This size will display in the **Copy to Image** dialog.

1. Click **Tools > Options > General**.
2. *(Optional)* Specify the full path to the default restore location.

   This path is used if you do not initiate an image restoration using drag and drop or copy and paste.
3. *(Optional)* Specify the default byte size for splitting an image file.

   For example, if you want to save the file to CD, you could specify a file size of 670,000,000 bytes (650 MB) or less.
4. Click **OK**.

You can also specify filename extensions that will display in ImageExplorer as image files.

1. Click **Tools > Options > Image Extensions**.
2. Type the image file extension in the **Extension** text box.

   File extensions can be up to three characters long and can contain alphanumeric characters. You do not need to type the period. It will be added automatically.
3. Click **Add**.
4. Repeat steps 2 and 3 to add more file extensions, or click **OK**.

   All image files that match the extensions you have added to the list are displayed in the Locate and Recent panes.

To remove an extension, select it from the list box, then click **Remove**. To erase all extensions you have added, click **Clear**. Note that *.PQI cannot be removed from the list.

Exiting ImageExplorer

1. Click **File > Exit**.

When you run ImageExplorer again, your previous view settings will be used.

CHAPTER 9

Using PXE to Deploy Image Files

Overview of PXE

PXE (Pre-boot Execution Environment), a component of Intel's Wfm (Wired for Management) specification, allows a computer's PXE-compliant network card to download and run a virtual floppy from the network prior to booting the operating system on the hard disk. Because this task is performed remotely, it eliminates the need to visit the computer and boot it using a floppy disk.

The sequence below outlines how PXE works on a user's computer.

1. The PXE client boots up on the user's computer and asks the DHCP server for the IP address.
2. The PXE client requests a bootstrap program from the PXE server.
3. The PXE server downloads the bootstrap program to the client computer using MTFTP (Multicast Trivial File Transfer Protocol).

   IMPORTANT! If you are attempting to access a PXE server across a router or switch that does not allow MTFTP to pass, the error message "Error: No boot file name received" is displayed. To resolve the error, make sure that all routers and switches are configured to allow MTFTP.

4. The PXE client runs the bootstrap program and displays a menu of available virtual floppies.
5. The user selects a virtual floppy program, and steps 3 and 4 are repeated to download and run the bootstrap program, which in turn downloads the selected virtual floppy program.

PXE uses the UNDI protocol to transfer the bootstrap program and virtual floppy program. This lets the PXE client and server to communicate and download files without loading any specific NIC drivers.

Overview of PXE Server

Network administrators can configure a PXE server to define network boot programs that users can run on their computers. Users who boot a PXE-compliant computer can select the programs they want to run from a menu of network boot programs, or the administrator can assign a boot program to a specific machine.

DeployCenter installs and configures a PXE server that provides two sample boot programs:

- Drive Map Sample – This boot program will map a disk drive letter to a network share using the Universal Network Device Interface (UNDI) driver. This boot program must be modified to contain the correct network share and username in the AUTOEXEC.BAT and SYSTEM.INI file.
- Unicast Sample – This boot program will run ImageCenter and use the Unicast feature to access the image files. This is done using the UNDI driver. This boot program must be modified to contain the correct Unicast server name in the autoexec.bat file.

Installing the PXE Server

When you install the Symantec PXE server, the install program makes the following assumptions.

- You already have a DHCP service running on your network. PXE relies on DHCP.
- The DHCP service does not already supply PXE services. Client computers prefer the PXE services on DHCP over the PXE services on the PXE Server. Therefore, having both services makes the PXE Server ineffective. To disable PXE services on DHCP and use the PXE Server instead, see "Turning off DHCP's PXE Services" on page 110.
- You are installing PXE Server on a machine that is different from the machine that runs the DHCP service. The installation program might not fully configure PXE Server if you install it on the same machine as the DHCP service. To install PXE Server on the same machine as your DHCP service, see "Installing PXE Server on the DHCP Machine" on page 110.
- The machine on which you intend to install PXE Server already has its domain or workgroup name set. (The PXE configuration stores the domain/workgroup name.)
- One or more client machines already have a PXE-compliant network interface card, so they can boot from the network.

PXE Server Folder Structure and Files

The default directory where the PXE server is installed is C:\Program Files\Symantec\PXE Server. Three additional files, used by the PXE server, are located in the subdirectory \BootImag\X86PC\UNDI.

IMPORTANT! All three files should not be moved or deleted from their location.

- `LBOOT.0` -- Allows PXE clients to boot directly to the local hard disk instead of running a virtual floppy.

- `PXE.0` -- A generic bootstrap program used to download the virtual floppy from the PXE server.
- `MACASSIGN.TXT` -- Lists the MAC addresses and their assigned virtual floppies.

Under this same UNDI subdirectory, there are additional folders for each virtual floppy used by PXE. For example, the Sample folder contains the following two files.

- `SAMPLE.1` -- A virtual floppy that can be edited using Boot Disk Builder.
- `SAMPLE.0` -- Used to download the virtual floppy. (This file is identical to PXE.0.)

Turning off DHCP's PXE Services

If your DHCP service currently provides PXE services, but you prefer DeployCenter's PXE server to control PXE client machines, you can remove DHCP's PXE services.

Windows 2000

On Windows 2000 using Microsoft's DHCP service, you can modify DHCP with these netsh commands:

- netsh.exe dhcp server delete optionvalue 60
- netsh.exe dhcp server delete optionvalue 43
- netsh.exe dhcp server delete optiondef 60
- netsh.exe dhcp server delete optiondef 43

Windows NT 4.0 (Service pack 6a)

On Windows NT 4, or with non-Microsoft DHCP services, refer to that service's documentation for how to do the following:

- Remove DHCP's option 60
- Remove DHCP's option 43.

Installing PXE Server on the DHCP Machine

To run PXE Server and DHCP server on the same machine, you must edit your DHCP service. PXE and DHCP typically communicate on the same port. However, this is not possible if they both run on the same machine.

You *should not* edit your DHCP service using the methods below unless you installed PXE Server on the *same* machine as the DHCP service. You should do so if the installation program failed to configure your DHCP server automatically (depending on the version of Windows on the machine and which brand of DHCP server you are using).

When you edit the DHCP service, it will tell the PXE client machine to "talk" to PXE Server on an alternate port.

Editing the DHCP Server

To ensure that the DHCP server notifies the PXE client machines to use an alternate port to communicate with the PXE server, do one of the following (depending on the operating system you are running):

Under Windows 2000

Using Microsoft's DHCP service, edit DHCP with these two netsh commands:

- netsh.exe dhcp server add optiondef 60 "Class ID" string 0 PXEClient
- netsh.exe dhcp server set optionvalue 60 string PXEClient

Under Windows NT 4.0 (Service pack 6a)

Using Microsoft's DHCP service, edit DHCP using the DHCP Manager.

1. Click **Start > Programs > Administrative Tools (Common) > DHCP Manager**.
2. Double-click **Local Machine** from the DHCP Servers pane.
3. Select any DHCP scope, then click **DHCP Options > Defaults**.
4. Click **New**.
5. Type `Class ID` in the Name field.
6. Select **String** from the **Data Type** drop-down list.
7. Deselect **Array**.
8. Type `60` in the **Identifier** field, then click **OK**.

   The **DHCP Options: Default Values** dialog appears.
9. Select **060 Class ID** from the Option Name drop-down list.
10. Type `PXEClient` in the Value String field, then click **OK**.
11. Select any scope, then click **DHCP Options > Global**.
12. Select **060 Class ID** from the **Unused Options** list box.
13. Click **Add** to add the option to the **Active Options** list box.

14 Click **OK**.

15 Click **Server > Exit**.

On either Windows platform, if you use a non-Microsoft DHCP service, refer to that service's documentation to complete the following:

- Define DHCP's option 60.
- Set option 60 to `PXEClient`.
- Assign option 60 to all DHCP scopes, or at least to those scopes that contain PXE clients.

Editing the PXE Service Using the Windows Registry

1 Run REGEDIT and locate the registry entry HKEY_LOCAL_MACHINE\Software\Symantec\PXE\ProxyDhcp.

2 Double-click **UseDhcpPort** in the right pane window.

3 If the value is `1`, change it to `0`.

Teaching PXE Server That it is Not on the DHCP Machine

If, during the installation, you specified that the same machine ran the PXE Server and the DHCP service, but it does not, client machines will not be able to recognize the PXE Server. To correct the PXE Server configuration error, use REGEDIT to edit the appropriate registry entry.

1 Run REGEDIT and locate the registry HKEY_LOCAL_MACHINE\Software\Symantec\PXE\ProxyDhcp.

2 Double-click **UseDhcpPort name field** in the right pane window.

3 Type `1` in the **Value** field.

Go to the computer's Services list in the Computer Management window, and stop and restart the Symantec PXE Services.

Overview of the PXE Configuration Utility

DeployCenter includes a PXE Configuration Utility that simplifies the setup and use of PXE in DeployCenter, so you can easily deploy images across a network.

- Using the PXE Configuration Utility, you can assign a virtual floppy to a specific MAC address. Every computer has a NIC with a unique MAC address assigned to it. This unique address makes it possible to identify computers on a network.
- You can assign a MAC address so that when the matching MAC address is found on the PXE client (the user's computer), the assigned virtual floppy is sent directly to the PXE client; no menu is presented to the user. If, however, a matching MAC address is not found, a menu of virtual floppies is displayed, and the user can select which item to run.
- You can also assign a MAC address to boot to the local hard disk; the machine will proceed with a normal boot of the operating system on the hard disk.
- Virtual floppies, which are added to the PXE configuration utility, can be up 1.44 MB or 2.88 MB. Also, the local floppy drive can be accessed inside the virtual floppy by using the B: drive assignment (since A: is used by the virtual floppy environment).

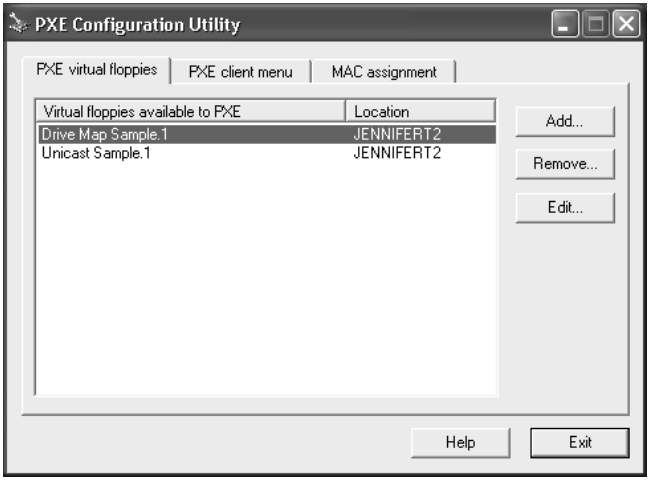
How Do I Create and Edit a Virtual Floppy?

You can use the Boot Disk Builder program included with DeployCenter to create a virtual floppy. When you build the boot disk, select the options that most closely match what you are trying to accomplish with the virtual floppy. See "Creating Boot Disks" on page 9.

You can use VF Editor, a utility included with DeployCenter, to edit a virtual floppy. See "Editing Virtual Boot Disks" on page 204.

PXE Virtual Floppies

Use the PXE Virtual Floppies property page in the PXE Configuration Utility to add virtual floppies from the PXE system.



The **Virtual floppies available to PXE** column lists all virtual floppies that are currently in use under the PXE system. The **Location** column identifies where on the network that each listed virtual floppy is located.

Adding a Virtual Floppy to the PXE System

Before you can add a PXE virtual floppy to the menu, you must have created a virtual floppy using Symantec Boot Disk Builder. You cannot add a virtual floppy if one does not exist. For complete information on creating a virtual floppy, see the Boot Disk Builder Windows help file.

1. Open the PXE Configuration Utility.
2. Click the **PXE Virtual Floppies** tab.
3. Click **Add**.
4. Specify the full path to the virtual floppy, including the filename, or click the browse button to navigate to the network folder where the virtual floppy is stored.
5. Click **OK**.

The virtual floppy is now available to the PXE system. The location of each virtual floppy you add is also specified in the list box.

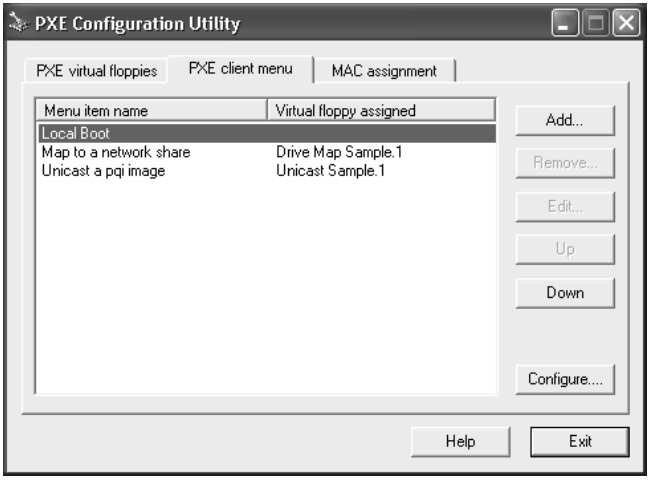
Removing a Virtual Floppy from the PXE System

1. Open the PXE Configuration Utility.
2. Click the **PXE Virtual Floppies** tab.
3. Select a virtual floppy from the list box.
4. Click **Remove**.

IMPORTANT! Removing a virtual floppy that is used elsewhere on a PXE menu will result in the following error message: "Error: Unknown virtual floppy." Before removing a virtual floppy, it is important to verify that other PXE menu items do not use the same virtual floppy.

PXE Client Menu

When a computer boots to PXE, it can optionally display a menu of all the virtual floppies that you have allowed a user to select. You can use the PXE Client Menu property page in the PXE Configuration Utility to configure or edit the PXE client menu.



The **Menu item name** column lists what will appear on the PXE client's screen. The **Virtual floppy assigned** column lists the virtual floppy associated with each menu item.

Assigning a PXE Client Menu Item to a Virtual Floppy

You can add each virtual boot disk you have made available to the PXE system (via the PXE Virtual Floppies property page), to the PXE client menu for a user to select.

1. Open the PXE Configuration Utility.
2. Click the **PXE Client Menu** tab.
3. Click **Add**.
4. Type the text that will represent what the user will select on the PXE client menu. Make sure it is descriptive of what the virtual floppy will do.
5. Select a virtual floppy from the drop-down list that you want associated with the text in step 4. If there are no virtual floppies to select, then you have not added one to the PXE system. For more information, click **See Also** on the Help toolbar, then click **To add a virtual floppy to the PXE system**.

   When the user selects the text, the associated virtual floppy will run.
6. Click **OK**.

The menu text and associated virtual floppy appear in the list box.

Removing a PXE Client Menu Item

You can remove a menu item name and its associated virtual floppy from the PXE client menu. Removing a menu item deletes the text from the PXE client menu; it does not delete the actual virtual floppy.

1. Open the PXE Configuration Utility.
2. Click the **PXE Client Menu** tab.
3. Select a menu item you want to remove from the PXE client menu.
4. Click **Remove**.
5. Click **OK**.

Editing a PXE Client Menu Item

You can change the text of a previously created menu item name or assign a different virtual floppy to the menu item name.

1. Open the PXE Configuration Utility.

2. Click the **PXE Client Menu** tab.
3. Select a menu item whose properties you want to edit.
4. Click **Edit**.
5. Change the menu item name text or assign a different virtual floppy to the menu item from the drop-down list.
6. Click **OK**.

Reordering PXE Client Menu Items

You can change the order of menu items that appear on the PXE client menu.

1. Open the PXE Configuration Utility.
2. Click the **PXE Client Menu** tab.
3. Select a menu item name.
4. Click **Up** or **Down** to move the menu item where you want.

Configuring the PXE Client Menu

You can edit the text prompt that is displayed at the top of the menu on the PXE client computer. You can also set the PXE client computer to perform a local boot if a user does not press any keys before the specified time-out period. This avoids having a computer remain at the PXE menu, waiting for a user to select a menu item.

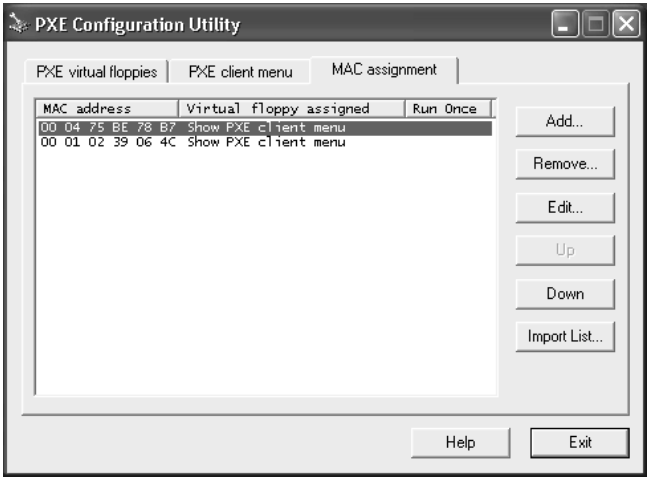
To do this, click the check box and enter the number of seconds.

1. Open the PXE Configuration Utility.
2. Click the **PXE Client Menu** tab.
3. Click **Configure**.
4. Type the text that you want displayed at the top of the menu on the PXE client computer, in the PXE client menu prompt text field.
5. *(Optional)* To have the PXE client menu time out, select **If no keys hit, time out and do a local boot**, then specify the number of seconds you want the menu to remain visible.

After the computer boots to PXE, the user will have a specified amount of time to press a key. When the user presses a key, they will be able to select an item from the menu. If a key is not pressed, the computer will automatically boot from the local hard drive.

MAC Assignment

Each computer's NIC is given a unique MAC address. This address can be used to assign PXE tasks to specific computers. When a computer first contacts PXE, the PXE server attempts to locate the MAC address in the assignment list. If the address is found, the assigned virtual floppy is run. If the address is not found, the PXE client menu is displayed instead, and the NIC's MAC address is added to the bottom of the MAC address assignment list. You can use the MAC Assignment property page to edit this address list.



The **MAC address** column lists the MAC addresses; the unique address of a user's computer.

The **Virtual floppy assigned** column lists the task that has been assigned to a specific MAC address.

The **Run Once** column identifies which tasks will be run only one time before reverting to the option **Boot to local hard disk** for all subsequent PXE boots.

The order of MAC addresses is important. When searching for a matching MAC address, the PXE server uses the first address it finds in the list. Therefore, addresses with wildcards (such as `**` or `..`) in the MAC address field should be placed at the bottom of the list, and specific, non-wildcard MAC addresses should be moved to the top of the list.

Assigning a MAC Address to a Virtual Floppy

1. Open the PXE Configuration Utility.
2. Click the **MAC Assignment** tab.
3. Click **Add**.
4. Enter the MAC address. (The cursor will automatically move to the next text field after two characters are entered.)

   To assign an entire group of contiguous MAC addresses, use a `**` or `..` in place of a two-digit text field.
5. Select a virtual floppy task that you want assigned to the MAC address.

   If there is no virtual floppy task that the assigned computer needs to run, select **Boot to local hard disk** to force PXE to boot the computer as normal.
6. (Optional) If you want the client computer to run the assigned virtual floppy task only one time, select **Run Once**.

   After the client computer has booted the assigned virtual floppy, it will revert to the option **Boot to local hard disk** for all subsequent PXE boots.
7. Click **OK**.

The MAC address and associated virtual floppy task appear in the list box.

Editing a MAC Address

1. Open the PXE Configuration Utility.
2. Click the **MAC Assignment** tab.
3. Select a MAC address from the list box.
4. Click **Edit**.
5. Change the MAC address or assign a different task from the drop-down list.
6. Click **OK**.

Removing a MAC Address

1. Open the PXE Configuration Utility.
2. Click the **MAC Assignment** tab.

3. Select a MAC address.
4. Click **Remove**.
5. Click **OK**.

Reordering MAC Addresses

The order of MAC addresses is important. When searching for a matching MAC address, the PXE server uses the first address it finds in the list. Therefore, addresses with wildcards (such as `**` or `..`) in the MAC address field should be placed at the bottom of the list, and specific, non-wildcard MAC addresses should be moved to the top of the list.

1. Open the PXE Configuration Utility.
2. Click the **MAC Assignment** tab.
3. Select a MAC address.
4. Click **Up** or **Down** to move the address where you want.

Importing a List of MAC Addresses

To save time entering a range of MAC addresses, you can import a text file containing the MAC addresses. The Import List feature is very robust; as long as spaces, commas, tabs, or new lines separate each MAC address, the file will import correctly.

If the Import List file is quite large, it is recommended that you first import only two or three MAC addresses to ensure that it imports correctly. If there are no problems, you can safely import your entire list of MAC addresses.

1. Open the PXE Configuration Utility.
2. Click the **MAC Assignment** tab.
3. Click **Import List**.
4. Enter the full path and filename to the .TXT file, or click the browse button to navigate to the file's location.
5. Select a virtual floppy task from the drop-down list that you want assigned to each of the MAC addresses in the import file.
6. Click **OK**.

The import file is read and the MAC addresses are added to the PXE system.

Use Scenarios for the PXE Configuration Utility

Scenario 1: Single Virtual Floppy, Single Computer

You have one virtual floppy that you want a single computer to run prior to booting its operating system.

1. Create and save a virtual floppy using Boot Disk Builder.
2. Open the PXE Configuration Utility, and click the **PXE virtual floppies** tab.
3. Add the virtual floppy you created in step 1 to the PXE system.
4. Click the **MAC assignment** tab.
5. Add the MAC address of the computer that will run the assigned virtual floppy.

Scenario 2: Single Virtual Floppy, Multiple Computers

You have one virtual floppy that you want multiple computers with contiguous MAC addresses to run prior to booting their operating systems.

Use the Import List feature or special syntax to define a range.

1. Create and save a virtual floppy using Boot Disk Builder.
2. Open the PXE Configuration Utility and click the **PXE virtual floppies** tab.
3. Add the virtual floppy you created in step 1 to the PXE system.
4. Click the **MAC assignment** tab.
5. Use the special syntax (`**` or `..`) in place of a two-digit text field to specify a range of contiguous MAC addresses that will run the virtual floppy you assign.

Scenario 3: Multiple Virtual Floppies (PXE menu), Multiple Computers

You want to display a menu list of several virtual floppies to multiple users and have each user select the virtual floppy they want to run prior to booting their operating systems. MAC addresses are non-contiguous.

1. Create and save virtual floppies using Boot Disk Builder.
2. Open the PXE Configuration Utility, and click the **PXE virtual floppies** tab.
3. Add each virtual floppy you created in step 1 to the PXE system.

4. Click the **PXE client menu** tab.

5. For each virtual floppy that you create, type the text that you want a user to read on the PXE menu, and assign the associated virtual floppy to each PXE menu item.

6. Click the **MAC assignment** tab.

7. Use the **Import List** feature to add MAC addresses of the computers that will be assigned to display the PXE client menu.

CHAPTER 10

Command Line Switches and Scripting Commands

Overview

ImageCenter may be run in one of two modes: interactive (the default) or batch mode. Interactive mode requires user input at discrete intervals, resulting in greater control and efficiency when working with one or two workstations. To run ImageCenter in interactive mode, you type PQIMGCTR at the DOS prompt.

Batch mode allows you to control the operation of ImageCenter with a file of script commands. Scripting is especially useful for system administrators when loading image files onto a large number of workstations, as it automates the loading process and saves time by eliminating the need for user intervention.

You can also use scripting with the Windows and DOS PowerCasting executables. Note that PowerCasting is not supported fully with scripting. For example, if you have an image with five partitions, you cannot choose partitions 2 and 3 and just PowerCast those. You can only PowerCast a complete image file with scripting.

Command Line Switches for ImageCenter

To run in script mode, ImageCenter uses a series of command line switches. To use these switches, type PQIMGCTR /*switch*, where *switch* is one or more of the available commands. For example, to invoke the command interpreter, use the /CMD=<*scriptfile*> command. If the name of the text file containing the script commands were C:\SCRIPTS\LABS.TXT, you would type the following at the command line or in your batch file:

```
PQIMGCTR /CMD=C:\SCRIPTS\LABS.TXT
```

IMPORTANT! Because ImageCenter is run at a DOS prompt, you are limited to 128 characters on the command line. See /ARG below for how to get around this limit.

Command Line Switch	Description
/?	Displays all available command line switches, their syntax, and a short description. You can send the results this switch displays to a text file for future reference by typing "pqimgctr /? > help.txt"
/AAM	(Auto-Answer messages) Don't prompt for user input unless absolutely necessary. This is the default when running ImageCenter from a script, but not when running ImageCenter interactively. Message boxes that have a default answer will not be displayed during the creation or restoration of an image. See also "/PROMPT" on page 130 and "/NMD" on page 129.
/ARG=<file>	Includes additional command line arguments in a text file. This is useful when the amount of data required for all the needed switches is too long to fit on a DOS command line, which is limited in length. It is also useful to consolidate commonly used sets of switches into a single location that many scripts can refer to, so that all scripts can be updated by changing just a single file. Each argument in the file must be preceded by either a "/" or "-" just as on the command line. Arguments within the file can be separated by a space or each can be on a separate line. Any line beginning with a "#" or ";" is ignored; they can be used for comments. The file can contain references to environment variables; they will be resolved the same as on the command line. This switch can be used multiple times on the command line or even from within a file specified by a /ARG on the command line.
/CAS	Causes every sector within a partition to be saved and restored. This will include all information in a partition including the deleted files. This option significantly slows down the imaging process and increases file size.
/CBS	Enables bad sector checking.

Command Line Switch	Description
/CDRSPD=<*number*>	Sets the CD-R write speed. This switch enables you to specify a slower speed to burn images to a CD if you encounter errors while burning images at full speed. <*Number*> indicates the speed. For example, `/CDRSPD=8` would make an image burn at 8x.
/CEC	Checks for an extra cylinder. This corrects a problem of the BIOS and DOS reporting different maximum cylinder numbers.
/CMD=<*scriptfilename*>	Designates a script text file; the script file contains arguments that are passed to the program.
/CMD=RESTORE_ALL	Restores all partitions in the image file to the specified drive. This command works in conjunction with the /DSK switch.
/CMD=STORE_ALL	Stores all partitions on the specified drive to the file specified by the /IMG= switch. This command works in conjunction with the /DSK switch.
/CMP=None | Low | High	Specifies the compression level for images. This switch is only available in scripting mode, not with the GUI version of ImageCenter
/CMT	Displays the comment associated with an image file, and exits. You must use the /IMG switch to specify the image.
/DBG=<*filename*>	Specifies an output filename for the debug file.
/DEL=<disknum>	Where <disknum> is either a disk number or an asterisk (*). If a number is specified, all partitions on that disk are deleted during application startup. If an asterisk is specified, all partitions on all disks are deleted during application startup. The Delete switch cannot be undone, and will be completed even if there is a syntax error in a script file (specified with the /CMD switch), or if the specified image file cannot be opened. The /DEL command does not wipe out the Master Boot Record. If you want to replace the MBR, either use the /MBR command to restore a MBR from an image file or use the /WFS command along with the DELETE ALL script command.

Command Line Switch	Description
/DPC	Disables safety checks and allows multiple primary partitions or full FAT size when creating partitions, restoring images, hiding partitions, unhiding partitions, and setting partitions active. Results may be incompatible with some versions of Windows 9x
/DSK=<*number*>	Specifies disk number to use for restore or save operation.
/ERR=<*errorfilename*>	Designates an error file. Because scripts execute without user intervention, these files are important for checking errors. All of the information in the error file is also contained in the log file. The error file is not created if no error occurs.
/F4K	Allows large FAT32 partitions to be created with 4 K clusters.
/IDE	(Integrated Drive Electronics – a standard used by hard drives to communicate with the controller ports or cards that allow the hard drive to interface with the computer) This switch is enabled by default. If you do not want it, you must specifically disable it by typing "/IDE=off" on the command line.
/IFC	(Ignores file system checks). This allows a partition with a known file system error (for example, cross-linked files) to be stored in an image. Likewise, that same partition can be restored if this switch is used and if during the restore process the partition does not need to be resized. If you use this switch, you may be unable to restore or boot the image of a partition.
/IHF	(Ignore hibernation files) Decreases the amount of time needed to start up ImageCenter on computers with many partitions by skipping checks to see if the machine was shut down while in hibernation.

Command Line Switch	Description
/IMG=<*imagefilename*>	Designates the path and filename for an image file. The STORE and RESTORE script commands will encounter an error if this option is not specified. If you specify an existing filename, and use the STORE command, the new image will replace the existing image. See "Accessing Images on Hidden Partitions" on page 138. for more information on how to access images located on hidden partitions, CD-ROM drives, and so forth.
/INFO	List information about each partition, including the numbering used by scripts.
/LOG=<*logfilename*>	Designates a log file. Because scripts execute without user intervention, log files are important for checking results.
/MBI=<*number*>	Images the master boot record of the specified disk.
/MBR=<*number*>	Restores an imaged master boot record to the specified disk.

/MFS=<*span-size*>	Designates the maximum number of bytes, kilobytes, megabytes, or gigabytes that an individual image file can be. For example, the following are all equivalent:
	`/MFS=1073741824`
	`/MFS=1048576K`
	`/MFS=1024M`
	`/MFS=1G`
	The minimum allowed value is 1048576, (and equivalents 1024K or 1M). When the specified size is reached, the image file is split. By default, images are spanned when they reach 2 GB in size, because this is the maximum file size supported by DOS.

/NBS	Disables bad sector checking. By default, bad sector checking is disabled.

Command Line Switch	Description
/NMD	(No Messages Displayed) ImageCenter will never prompt for user input. All questions will automatically be answered with the default response, if any, or with “Yes” or “OK.” This switch is useful for a fully unattended deployment, but generally the /AAM switch is preferred because of its ability to prompt for user input when absolutely necessary, such as prompting the user to insert the next CD in the drive.
/NOAFX	Skips basic checks. During application startup, a check is made of the basic partition structures on disk. If a problem is found that can be fixed, then a prompt is displayed asking the user if they want to fix these problems. Using this switch instructs the program to skip most of these checks.
/NOCDR	Turns off support for CD/R devices. This can be useful in the rare case the controller causes Image Center to hang. Since CDR support is initialized before the command line is fully parsed by the normal method, /NOCDR must be specified on the actual command line and will not have any effect if it is placed in a file specified by the /ARG=<filename> command line parameter.
/NRB	Suppresses the normal reboot during program exit.
/NUI	Runs ImageCenter without any user interaction.

Command Line Switch	Description
/OVI=0|1	Overlapped I/O. This switch should only be used when /IDE=ON is specified (default). This switch only affects image restore. It does not affect image creation. When /IDE is specified, ImageCenter will attempt to determine whether or not overlapping the I/O (Reading the PQI and writing the disk sectors) can be safely and efficiently overlapped. If you want to override the default, use this switch. 0 disables overlapping while 1 enables it. Overlapping should not be enabled if the PQI file is on the same disk as the partition being restored, or if the PQI is on a second disk or CD-ROM device that uses the same IDE channel as the disk being restored. Overlapping, when appropriate, will generally improve performance, except when the image being restored is highly or moderately fragmented.
/PROMPT	Always prompts for user input. This is the default for running ImageCenter interactively, but not when running ImageCenter using a script. When using a script, ImageCenter automatically answers questions that have a default response, such as asking if it should fix problems that it knows how to fix. Using /PROMPT lets you make these decisions. See also "/AAM" on page 125 and "/NMD" on page 129.
/PWD=<*password*>	Designates a password that must be given to restore the partition's data. The password may be either a number or a string. This command only works with scripting. It is ignored when in interactive mode.
/RAV	Equivalent of Verify Disk Writes. Causes each sector restored to disk to be read back and compared as an extra security precaution. Using this parameter will significantly increase restore time.
/RPP	Resizes partitions proportionally.
/SCO	Syntax Check Only causes the syntax of each command in the script file to be checked without executing the command. This is useful when writing and debugging the script file.

Command Line Switch	Description
/SNC	Disables the scripting progress **Cancel** button. This switch is only available in scripting mode, not with the interactive mode of ImageCenter.
/SSO	Store system structures only. This creates an image file that contains only the file system structures and no file data.
/UIS=<unicast server>	(Unicast Image Server) Used to specify the name or IP address of the unicast server. Only used when running in interactive mode. Not used by scripting.
/UPN=<number>	(Unicast Port Number) Used to specify the number of the Unicast port. Default is 50137.
/VER	Displays information about the version of ImageCenter you are running.
/VIP	Check to see that data in image files you create matches the contents of the disk that was just imaged. You can also perform integrity checks on a case-by-case basis by selecting **Verify Image Contents** in the **Advanced Options** dialog. Using this option doubles the time it takes to create an image, since it requires two complete passes of the disk contents, one for the original creation of the image and the second to ensure that it matches the image.
/WFS	Wipes the first sector after deleting all partitions when the DELETE ALL script command is used. This will insure that a fresh master boot record will be written to the destination disk; only meaningful when using scripting.
/ZLB	Instructs ImageCenter to create compressed image files using an alternate compression technology. /ZLB generally results in images that are about 5% smaller than when not used. However, both saving and restoring in this format is slower.

Command Line Example

To specify SCRIPT.TXT as the script file, LOG.TXT as the logfile and E:\IMAGES\DRIVE2.PQI as the image file, enter the following:

```
PQIMGCTR /CMD=SCRIPT.TXT /LOG=LOG.TXT /IMG=E:\IMAGES\DRIVE2.PQI
```

Command Line Switches for PowerCasting (Windows)

The following command line switches run with the Windows PowerCast Server (PQPCS32.EXE).

Command Line Switch	Description
/?	Displays all available command line switches, their syntax, and a short description.
/ACC=<*number*>	Specifies the number of PowerCast clients that must attach before the PowerCast server will automatically start sending the image file.
/AUTO	If you PowerCast an image file, all the partitions are selected automatically. When all the clients attach, PowerCasting begins.
/CBS	Enables bad sector checking.
/CCM	Changes the default Express Mode to the Custom Configuration Mode.
/DBG	Specifies that a debug out file should be created. It will be named PQ_DEBUG.TXT.
/ERR=<*errorfilename*>	Designates an error file that will be created if an error occurs.
/FSD=*n*[,*m*]	(Full speed delay) Specifies the number of seconds (*n*) the PowerCast session should transmit at reduced speed to enable proper network pruning and the initial throttle value (*m*) for the session. The default value for *n* is zero, which will immediately start the PowerCast session at full speed. The initial throttle value (*m*) is optional. You can enter a value between 1 and 999. The default is 200. If you set a continuous throttle value with the /PCTHR switch, the /PCTHR value overrides the value of *m*.
/HPC	Hides partitions after copying them.
/IFC	Ignores file system checks.
/IMG=<*imagefilename*>	Designates the image file that will be PowerCast. Images that were burned directly to CD by ImageCenter or Drive Image cannot be PowerCast.

Command Line Switch	Description
/IP=<*xxx.xxx.xxx.xxx*>	Specifies the IP address (in dot notation) for the network adapter that should be used for the PowerCast session, when the server has multiple NIC cards.
/LOG=<*logfilename*>	Designates a log file. Because scripts execute without user intervention, log files are important for checking results.
/MSN=<*sessionname*>	Specifies the name of the PowerCast session.
/MTA=<*number*>	Specifies the number of minutes (1 to 999) the PowerCast Server should wait before starting, regardless of how many clients have attached. If at any time the number of clients reaches the number specified in the autostart client count field, the session will start no matter how many minutes have passed. When the PowerCast session completes, a query will be made to see if any other clients are attached. If there are new clients, the minutes to autostart counter will be reset and the process will be repeated. If there are no more clients attached and the /AUTO switch was used, then the application will terminate and all windows will be closed.
/PCD=<*IP-address*>	Specifies the IP address that PowerCast clients should use to discover their PowerCast server. IP address is of the form W.X.Y.Z, where X, Y and Z must be in the range 0-255, and W must be in the range 224-239. The default address is 224.47.0.1. All of the PowerCast clients and server must use the same IP address for discovery. If multiple PowerCast servers are running, they can and should use the same IP address for discovery, but they must each have a unique session name (/MSN) and unique PowerCast session address (/PCS). It is recommended that if you specify the discovery address to the server, you also specify the session address (/PCS). ***IMPORTANT!*** If you specify the /PCD address to the server, you MUST use the /PCD option with all of the clients, specifying this same address.

Command Line Switch	Description
/PCS=<*IP-address*>	Specifies the IP address that the PowerCast server should use for its multicast session. If multiple PowerCast servers are running, each must use a unique IP address for the session. The specified IP address must fall in the same range as IP addresses allowed for /PCD. If /PCS is not specified, then the server will generate a random address based upon the discovery address (see /PCD=<IP-address> above). Assuming that the discovery address is W.X.Y.Z, then the generated PCS address will be W.X.A.B where A and B are random numbers in the range Y <= A <= 255 and Z < B <= 255. This address will be unique from the session address used by any other PowerCast server sharing the same discovery address.
/PCTHR=<*number*>	Enables you to reduce the speed at which PowerCast packets are sent, so a PowerCast session uses less bandwidth. You must enter a value between 1 and 999. Lower values have a greater delay between each packet sent. By default, the PowerCast session will send packets as fast as is possible with the hardware involved and will not consider network saturation as a drawback. Since saturation can reduce performance, moderate throttling can sometimes improve overall performance.
/RAV	Equivalent of Verify Disk Writes. Causes each sector restored to disk to be read back and compared as an extra security precaution. Using this parameter will significantly increase restore time.
/RPP	Resizes partitions proportionally.
/TTL=<number>	Sets the Time to Live value to specify the number of routers a PowerCast session can pass through before it is killed. Enter a value between 1 and 32.

Command Line Switches for PowerCasting (DOS)

The following command line switches run with DOS PowerCasting (PQPCAST.EXE). Switches apply to both the PowerCast client and server, unless noted otherwise.

Command Line Parameter	Description
/?	Displays all available command line switches, their syntax, and a short description.
/AAM	(Auto-Answer messages) Don't prompt for user input unless absolutely necessary. This is the default when running ImageCenter from a script, but not when running ImageCenter interactively. Message boxes that have a default answer will not be displayed during the creation or restoration of an image. See also /PROMPT and /NMD.
/ACC=<*number*>	*(PowerCast server only)* Specifies the number of PowerCast clients that must attach before the PowerCast server will automatically start sending the image file.
/ARG	Same as /ARG for ImageCenter. See page 125.
/CBS	*(PowerCast server only)* Enables bad sector checking.
/CEC	*(PowerCast client only)* Checks for an extra cylinder. This corrects a problem of the BIOS and DOS reporting different maximum cylinder numbers.
/DBG=<*filename*>	Specifies an output filename for the debug file.
/DEL	*(PowerCast client only)* Same as /DEL for ImageCenter. See page 126.
/DSK=<*number*>	*(PowerCast client only)* Specifies disk number to use for restore or save operation.
/ERR=<*errorfilename*>	Designates an error file. Because scripts execute without user intervention, these files are important for checking errors.
/F4K	*(PowerCast client only)* Allows large FAT32 partitions to be created with 4 K clusters.
/HPC	*(PowerCast server only)* Hides partitions after copying them.

Command Line Parameter	Description
/IDE	*(PowerCast client only)* same as /IDE for ImageCenter. See page 127.
/IFC	*(PowerCast server only)* Ignores file system checks.
/IHF	*(PowerCast client only)* (Ignore hibernation files) Decreases the amount of time needed to start up ImageCenter on computers with many partitions by skipping checks to see if the machine was shut down while in hibernation.
/IMG=<*imagefilename*>	*(PowerCast server only)* Designates an image file. This option tells the PowerCast program that it is running in server mode and specifies the image file to be PowerCast. Images that were burned directly to CD by ImageCenter or Drive Image cannot be PowerCast.
/INFO	List information about each partition, including the numbering used by scripts.
/LOG=<*logfilename*>	Designates a log file. Because scripts execute without user intervention, log files are important for checking results.
/MBR=<*number*>	*(PowerCast client only)* Restores an imaged master boot record to the specified disk.
/MSN=<*sessionname*>	Specifies the name of the PowerCast session. Use together with /DSK to start PowerCasting in multicast client mode. Use together with /IMG to start in PowerCast server mode.
/NBS	Disables bad sector checking. By default, bad sector checking is disabled.
/NMD	(No Messages Displayed) ImageCenter will never prompt for user input. All questions will automatically be answered with the default response, if any, or with "Yes" or "OK." This switch is useful for a fully unattended deployment, but generally the /AAM switch is preferred because of its ability to prompt for user input when absolutely necessary, such as prompting the user to insert the next CD in the drive.

Command Line Parameter	Description
/NOAFX	*(PowerCast client only)* Skips basic checks. During application startup, a check is made of the basic partition structures on disk. If a problem is found that can be fixed, then a prompt is displayed asking the user if they want to fix these problems. Using this switch instructs the program to skip most of these checks.
/NRB	*(PowerCast client only)* Suppresses the normal reboot during program exit.
/NUI	*(PowerCast client only)* Runs ImageCenter without any user interaction.
/OVI	Same as /OVI for ImageCenter. See page 130.
/PCD	Same as /PCD for Windows server. See page 133.
/PCS	*(PowerCast server only)* Same as /PCS for Windows server. See page 134.
/PCTHR=<*number*>	*(PowerCast server only)* Enables you to reduce the speed at which PowerCast packets are sent, so a PowerCast session uses less bandwidth. You must enter a value between 1 and 999. Lower values have a greater delay between each packet sent. By default, the PowerCast session will send packets as fast as is possible with the hardware involved and will not consider network saturation as a drawback.
/PPR=<*partition-list*>	*(PowerCast server only)* Protect Partitions. Before PowerCasting begins, the client deletes all partitions on the target disk. This option allows the user to protect the specified partitions from being deleted. <partition-list> is a comma separated list that supports specifying of partitions by number, drive letter (without a colon following), or the words FIRST, LAST, DIAGNOSTIC, UNKNOWN or ALL.
/PROMPT	Always prompts for user input. This is the default for running ImageCenter interactively, but not when running ImageCenter using a script. When using a script, ImageCenter automatically answers questions that have a default response, such as asking if it should fix problems that it knows how to fix. Using /PROMPT lets you make these decisions. See also /AAM and /NMD.

Command Line Parameter	Description
/PWD=<*password*>	Propagates the password to the client computer if there is one on the image. Designates a password that must be given to restore the partition's data. The password may be either a number or a string.
/RAV	*(PowerCast client only)* Equivalent of Verify Disk Writes. Causes each sector restored to disk to be read back and compared as an extra security precaution. Using this parameter will significantly increase restore time.
/RPP	*(PowerCast server only)* Resizes partitions proportionally.
/TTL	Sets the Time to Live value to specify the number of routers a PowerCast session can pass through before it is killed. Enter a value between 1 and 32.
/VER	Displays information about the version of PowerCasting you are running.
/WFS	*(PowerCast client only)* Wipes the first sector after deleting all partitions.

Accessing Images on Hidden Partitions

ImageCenter has the ability to read images from and write images to hidden partitions. A hidden partition is any partition not currently mounted by the file system. Under DOS, this generally means that the partition is not assigned a drive letter. To store an image to or restore an image from an otherwise inaccessible partition (types FAT16, FAT32 or NTFS only), invoke ImageCenter with the following command line option:

```
/IMG=\\.\disk1.part2\path\image.pqi
```

where the numbers after disk and part are replaced with the appropriate number drive and partition numbers for the desired hidden partition and the path and image strings are replaced with the appropriate path and file name of the PQI file on that partition. The numbers appearing after the disk and part portions are the same numbers that would be used in a script with the SELECT DRIVE and SELECT PARTITION commands. You can use the /INFO command line switch to get a listing of the assigned disk and partition

numbers. The /INFO command also displays PQAccess numbers for each partition on all disks, which consist of a number followed by a colon. PQAccess syntax can be substituted for the \\.\disk1.part2 portion of the above example as follows:

```
/IMG=2:\path\image.pqi
```

A third form allows you to use the volume label of the partition instead of a number. This can make your scripts more robust if each partition has a unique label, as it will always access the desired partition, even if the partition numbering changes. The form is:

```
/IMG=:VolLabel:\path\image.pqi
```

where the VolLabel is replaced with the actual volume's label. Note that it has a colon both before and after the label.

WARNING! If you use the hidden partition forms for creating an image on a partition that is not hidden, you must reboot before attempting to access this partition from DOS, because the DOS cache may corrupt the data that was written. This includes having the application write the log file to this partition using DOS. (Log files also support being written to hidden partitions using the same syntax as above.)

To access a CD image, either to read from or write to, use the following command line option:

```
/IMG=\\.\pqcd#\path\file.pqi
```

Where # is replaced with the number of the CD-ROM drive, which is generally 0 unless you have multiple CD/DVD drives.

To specify an image file on a Unicast server, use one of the following command line options:

```
/IMG=\\.\imgsrv\<machine.name>\path\file.pqi
```

```
/IMG=\\.\imgsrv\<IP address>\path\file.pqi
```

Script Files

The script file designated in the command line contains arguments or instructions that are passed to the program, determining which operations are executed.

Because the scripts execute without user intervention, use extra care when developing the script file. For example, if the DELETE ALL command is encountered, all the partitions on the currently selected drive will be deleted without any warning or confirmation

messages which would normally allow the user to cancel the operation. You should only enter one command per line; otherwise, only the first command and perhaps none of the commands will execute.

Variables can be used anywhere on an ImageCenter script line and mathematical expressions can be evaluated with the results assigned to local variables or used as parameters to commands. For a description on setting local variables, See “SET VAR” on page 170. If a local variable is not defined, but an environment variable with the same name exists, then the value of the environment variable will be used.

Data Types

The following data types are supported with ImageCenter scripting.

Data Types	Example	Description
<integer>	`1` `0x13FE`	A 32-bit value. Any whole number between about -2,000,000,000 and 2,000,000,000. An <integer> cannot have a decimal point or commas. An integer can be specified in hexadecimal format by preceding the value with 0x.
<number>	`1` `3.15159`	Any real number. All <integers> are <numbers>, but many <numbers> are not <integers>. For example, 3.2 is a <number> but not an <integer>. Any place a <number> can be used, an <integer> can also be used, but you cannot substitute an <number> where an <integer> is required.
<string>	`"Hello"` `'Hello'`	Any text string. Strings should generally be enclosed in quotes. You can use single or double quotes. If you want to include a quote character within a string, use the opposite type of quote character around the string, as in: `'"Hello," she said.'`

Data Types	Example	Description

<var>	%BAT%	A local variable. At startup, each environment variable is imported as a local variable with the same name and value. However, if a local variable is modified, its corresponding environment variable is not modified. Local variables are used similarly to how environment variables are used in a DOS batch file. Variables are not evaluated if they are enclosed in quotes. However if you want to have the result of a variable evaluation treated as a string, then you can surround it by a backslash then a quote. For example, assuming `%var%` evaluates to
		`Hello World`
		then
		`\"%var%\"`
		evaluates to
		`"Hello World"`
		If a local variable is undefined, then no substitution is made in the text; instead the variable name along with the percent symbols is left in the text. For example, using some of the operators defined below, these two expressions are equivalent:
		`IF \"%var%\" = "%var%" GOTO NotDefined`
		`IF NOT DEFINED var GOTO NotDefined`

<Boolean>	`true` `false`	Either TRUE or FALSE. The words "true" and "false," without quotes, can be used in a script to represent these values. If they are enclosed in quotes, then they are strings.

Operators

The table below describes the supported mathematical and logical operators. Unless otherwise noted, all operators are valid for operands of type <integer> and <number> only. If all operands are the same type, then the result is that same type unless otherwise noted. If <integer> and <number> operands are both used, result is a <number> unless otherwise noted.

Operator	Example	Description
-	`-1` -(5*3) = -15	Unary negation. Change the sign of the value to the right of the minus sign.
~	`~0x13fc = 0xffffec03`	Bitwise negation. Invert the value of each bit in the <integer>. If you want to display the result of ~0x13fc in hexadecimal, use the function HEX (~0x13fc) which results in 0xffffec03. This value is equivalent to -5117 decimal.
**	`2**10 = 1024`	Power Operator. Raise the value to the left to the power of the value to the right.
*	`2 * 3 = 6`	Multiplication.
/	`5 / 2 = 2.5`	Division. Result is always a <number>. Use "INT (5 / 2)" if you want an <integer> result.

%	`5 % 2 = 1`
	
	`5.4 % 2.1 = 1.2`
		Remainder. x % y = x – (INT (x / y) * y). In the examples, 5 / 2 equals 2 with a remainder of 1. 5.4 / 2.1 equals 2 with a remainder of 1.2

Operator	Example	Description

+	`2+2 = 4`
	
	`"test"+ "data"= "testdata"`
	
	`"test" + 8 = "test8"`
	
	`8 + "test" = "8test"`
		Addition. Add two numbers or concatenate two strings or concatenate a single string and a number.

-	`4 - 2 = 0`	Subtraction
<<	`2 << 2 = 8`	Left Shift the bits of an <integer>.
>>	`8 >> 2 = 2`	Right shift the bits of an <integer>.
&	`0xE5 & 0x7F = 0x65`	Bitwise AND operator. Valid only for <integers>.
|	`0xE5 | 0x7F = 0xFF`	Bitwise OR operator. Valid only for <integers>.
^	`0xE5 ^ 0x7F = 0x9A`	Bitwise XOR operator. Valid only for <integers>.
:=	`set var greeting:= "hello"`	Assignment operator, used with the commands SET VAR, GET INI and GET REG. The value to the right of the assignment operator can have any data type.

==	`"hello" == "HELLO"`
	
	`10 = 2 * 5`
		Comparison operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive, so `"hello"` is equal to `"Hello"`. Result is a <Boolean>.

Operator	Example	Description

!= <>	`"hello" <> "world"`
	
	`11 != 2.5`
		Inequality operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive. Gives the opposite result from = or ==. X <> Y is equivalent to NOT (X == Y). Result is a <Boolean>.

<	`"a" < "b"`
	
	`0.5 < 1`
		Less than operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive. Result is a <Boolean>.

>	`"aba" > "aac"`	Greater than operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive. Result is a <Boolean>.

<=	`"a" <= "a"`
	
	`0.5 <= 1`
		Less than or equal operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive. Result is a <Boolean>.

>=	`"aaa" >= "aaa"`	Greater than or equal operator, used to compare <strings> to other <strings> or <numbers> to other <numbers>. For strings, the comparison is case insensitive. Result is a <Boolean>.
NOT	`(NOT TRUE) = FALSE`	Invert the value of a <Boolean> or Boolean expression.
AND	`(TRUE AND FALSE) = FALSE`	A <Boolean> that is only true if both of its operands are true.
OR	`(TRUE OR FALSE) = TRUE`	A <Boolean> that is true if either of its operands are true.
XOR	`(TRUE XOR FALSE) = TRUE`	A <Boolean> that is only true if one of its operands is true and the other is false.

Operator Precedence

The following table describes the associativity and operator precedence of the operators listed in the previous section. Items on the same line have equal precedence, and precedence decreases as you go down. Parentheses can be used around any operator to force evaluation in the desired order. For example, (5 + 7) * 1024 adds five and seven before multiplying the result by 1024. Without the parentheses, the result would be different.

Operators	Associativity
- (negation) ~	Right to Left
**	Left to Right
* / %	Left to Right
+ - (subtraction)	Left to Right
<< >>	Left to Right
&	Left to Right
^	Left to Right
|	Left to Right
= == != <> < > <= >=	Left to Right
NOT	Right to Left
AND	Left to Right
XOR	Left to Right
OR	Left to Right

Functions

Functions take operands that follow the function name. The operands must be enclosed in parenthesis, unless otherwise noted. All function names are not case-sensitive, so `SQRT`, `sqrt`, and `sQrT` are all equivalent.

Function	Operand Type	Example	Description
ABS	<number>	`ABS (-3) = 3`	Absolute value of operand. The result is never a negative number.

Function	Operand Type	Example	Description
SQRT	<number>	`SQRT (9) = 3`	Square root of operand. Operand must be non-negative. Result is always a <number>, never an <integer>.
INT	<number>	`INT (6.9) = 6` `INT (-6.9) = -6`	Integer portion of a number. Result is always an <integer>. Result is obtained by truncating any value after the decimal point.

RND	<number>	`RND (6.9) = 7`
		`RND (-6.9) = -7`
		`RND (6.1) = 6`
			Round number to the <integer> that is closest in value.

HEX	<integer>	`HEX (43) = "0x0000002B"`	Convert the <integer> to a hexadecimal <string>. Result is always a <string> starting with "0x" followed by an eight-digit value.
FMIN	<number>, <number> or <string>, <string>	`FMIN (3,2) = 2` `FMIN("apple", "orange")= "apple"`	Result is the lower <number> of the two <numbers> or the lesser <string> of two <strings>.
FMAX	<number>, <number> or <string>, <string>	`FMAX (3,2) = 3` `FMAX("apple", "orange")= "orange"`	Result is the higher <number> of the two <numbers> or greater of the two <strings>.

Function	Operand Type	Example	Description

IsNumber	<number> or <string> or <Boolean>	`IsNumber (%var%)`	Result is a Boolean. It will be true if input parameter has a type of <integer> or <number>. Otherwise it will be false. Note that IsNumber ("15") is false, because the value is inside of quotes and is therefore a string, not a number. If you have a string that you want to make into a number try
			`SET VAR NUMBER := <string>`
			Where <string> could be an expression that results in a string type. %NUMBER% will then be a <number>. If you have a number that you want to make into a string, use:
			`"" + <number>`
			where <number> could be a numerical expression or a variable.

StrLen	<string>	`StrLen ("Hello") = 5`	Returns the number of single-byte characters in a string. If a string includes UTF8 characters, the result will indicate the number of bytes, not the number of characters. Result is an <integer>.

Function	Operand Type	Example	Description
EXISTS	<string>	`EXISTS "c:\boot.ini"`	Checks if the specified file exists. Result is a <Boolean>. Parentheses around the file name are optional, but it should be enclosed in quotes. The file name can use a PQAccess drive number instead of a drive letter. For example, "1:\boot.ini" would refer the file boot.ini on the first partition of the first disk. Use the /INFO command to obtain the PQAccess drive numbers. To be compatible with DOS, you can also use the word EXIST instead of EXISTS as the name of this command.
FILESIZE	<string>	`FILESIZE "c:\boot.ini"`	Returns the size of the specified file. Result is an <integer>. Parentheses around the file name are optional, but it should be enclosed in quotes. The file name can use a PQAccess drive number instead of a drive letter. For example, "1:\boot.ini" would refer the file BOOT.INI on the first partition of the first disk. Use the /INFO command to obtain the PQAccess drive numbers. It is an error to call FILESIZE on a file that does not exist.
DEFINED	<string>	`DEFINED var`	Returns true if the specified variable (specified without using percent signs around it) has a value. Result is a <Boolean>.

Queries

Queries let you obtain various values related to disks and partitions and use them in expressions or other calculations.

Multi-Disk Queries

These functions do not take any parameters. Function names can optionally be followed by an empty set of parentheses to make it more obvious that this is a function call.

Example

```
SET VAR total_disks := GetTotalDisks()
```

Function	Return Type	Description
GetTotalDisks	<integer>	Returns the number of disks in the system.
QueryLargestUnusedSize	<number>	Searches all disks and finds the partition that has the most unused space in it. Returns the size of this space in megabytes. Returns 0 if there are no partitions on any disk or if they are all completely full.
QueryLargestUnusedDisk	<integer>	Searches all disks and finds the partition that has the most unused space in it. Returns the number of the disk that contains this partition. Returns 0 if there are no partitions or they are all completely full.
QueryLargestUnallocatedSize	<number>	Searches all disks and finds the largest free space. Returns the size of this space in megabytes. Returns 0 if there are no unallocated or free spaces on any of the disks.
QueryLargestUnallocatedDisk	<integer>	Searches all disks and finds the largest free space. Returns the number of the disk that contains this free space. Returns 0 if there are no unallocated or free spaces on any of the disks.

Disk Queries - Currently Selected Disk

These queries use the disk selected with the last SELECT DISK command. These functions do not take any parameters. Function names can optionally be followed by an empty set of parentheses.

Example

```
SELECT DISK 2
SET VAR disk_size := GetDiskSize()
```

Function	Return Type	Description
GetCurrentDiskNum	<integer>	Returns the number of the last disk specified when using the SELECT DISK command. Returns 0 if SELECT DISK has not been called.
GetDiskSize	<number>	Returns the size of the disk in megabytes.
GetTotalPartitions	<integer>	Gets the total number of partitions on the disk
GetAllocatedSize	<number>	Gets the accumulated size of all of the allocated partitions on the disk.
GetAllocatedPercent	<number>	Returns the percentage of the disk that is allocated. Result will be a number between 0 and 100.
GetTotalUnallocatedSpaces	<integer>	Returns the number of free spaces on the disk.
GetUnallocatedSize	<number>	Returns the accumulated size of all of the free spaces on the disk.
GetUnallocatedPercent	<number>	Returns the percentage of the disk that is unallocated. Result will be a number between 0 and 100.

Partition Queries

These queries use the partition selected with the last SELECT PARTITION command. These functions do not take any parameters. Function names can optionally be followed by an empty set of parentheses.

Function	Return Type	Description
GetCurrentPartNum	<integer>	Returns the number of the last partition specified when using the SELECT PARTITION command. Returns 0 if there is not currently a selected partition.
GetSelectedPartitionSize	<number>	Returns the size of the partition in megabytes.
GetUsedAmount	<number>	Returns the size of the used space on the partition in megabytes.
GetUsedPercent	<number>	Returns the percentage of used space on the partition. Result will be a number between 0 and 100.
GetUnusedAmount	<number>	Returns the size of the unused space on the partition in megabytes.
GetUnusedPercent	<number>	Returns the percentage of unused space on the partition. Result will be a number between 0 and 100.
GetPartitionLabel	<string>	Gets the volume label of the selected partition. If the partition does not have a label, the result will be the empty string. If you assign this value (empty string) to a variable the result will be undefining the variable.
IsFat	<Boolean>	Returns true if the partition type is FAT16.
IsFat32	<Boolean>	Returns true if the partition type is FAT32.

Function	Return Type	Description
IsNTFS	<Boolean>	Returns true if the partition type is NTFS.
IsHPFS	<Boolean>	Returns true if the partition type is HPFS
IsLinuxExt2	<Boolean>	Returns true if the partition type is Linux Ext2.
IsLinuxExt3	<Boolean>	Returns true if the partition type is Linux Ext3.
IsLinuxSwap	<Boolean>	Returns true if the partition type is Linux swap.
IsActive	<Boolean>	Returns true if the partition is active (the selected boot partition for this disk).
IsHidden	<Boolean>	Returns true if the partition is hidden.
IsPrimary	<Boolean>	Returns true if the partition is a primary partition.
IsLogical	<Boolean>	Returns true if the partition is a logical partition, located within an extended partition.

Free Space Query

This query uses the free space selected with the last SELECT FREESPACE command. This function does not take any parameters.

Function	Return Type	Description
GetCurrentFreespaceNum	<integer>	Returns the number of the currently select free space. Returns 0 is there is no currently selected free space.

Disk Queries - Specified Disk

Each of these queries takes a disk number as a single argument. The disk number must be an <integer> and enclosed in parentheses. Specifying a non-existent disk number will result in an error.

Example

```
SET VAR disk2_size := QueryDiskSize(2)
```

Function	Return Type	Description
QueryDiskSize	<number>	Size of disk in megabytes.
QueryDiskNumPartitions	<integer>	Total number of partitions.
QueryDiskNumFreeSpaces	<integer>	Total number of free spaces.
QueryDiskNumPrimaries	<integer>	Total number of primary partitions (including the extended partition, if there is one). The maximum allowed number of primary partitions is four.
QueryDiskTotalAllocated	<number>	Accumulated size of all partitions in megabytes.
QueryDiskTotalUnallocated	<number>	Accumulated size of all free spaces in megabytes.
QueryDiskLargestUnusedSize	<number>	Searches all partitions and finds the partition that has the most unused space in it. Returns the size of this space in megabytes. Returns 0 if there are no partitions on this disk or if they are all completely full.
QueryDiskLargestUnusedPart	<integer>	Searches all partitions and finds the partition that has the most unused space in it. Returns the number of this partition. Returns 0 if there are no partitions on this disk or if they are all completely full.

Function	Return Type	Description
QueryDiskLargestUnallocatedSize	<number>	Finds the largest free space and returns the size of this space in megabytes. Returns 0 if there are no free spaces on this disk.
QueryDiskLargestUnallocatedFree	<integer>	Finds the largest free space and returns the number of this free space. Returns 0 if there are no free spaces on this disk.

Partition Queries - Specified Disk

These functions take two arguments: a disk number and a partition number. Both numbers must be <integers>, separated by a comma and enclosed in parentheses. Specifying a non-existent disk or partition will result in an error.

Example

```
SET VAR disk2_part3_size := QueryPartSize(2,3)
```

Function	Return Type	Description
QueryPartSize	<number>	Size of partition in megabytes.
QueryPartUsed	<number>	Size of the used space in megabytes.
QueryPartUnused	<number>	Size of the unused space in megabytes.
QueryPartType	<string>	Partition type as a string. The most common partition types are FAT, FAT32, NTFS, Ext2, and Ext3.
QueryPartLabel	<string>	Partition volume label returned as a string. If the partition does not have a label, the result will be the empty string. If you assign this value (empty string) to a variable the result will be undefining the variable.

Function	Return Type	Description
QueryPartIsLogical	<Boolean>	True if partition is inside an extended partition.
QueryPartIsActive	<Boolean>	True if partition is the current boot partition on this disk.
QueryPartIsHidden	<Boolean>	True if the partition has a type that is considered hidden. Hidden partitions are not seen by DOS or Win9x but can be seen by Windows 2000 and Windows XP.

Free Space Queries - Specified Disk and Free Space

These functions take two arguments: a disk number and a free space number. Both numbers must be <integers>, separated by a comma and enclosed in parentheses. Specifying a non-existent disk or free space will result in an error.

Function	Return Type	Description
QueryFreeSize	<number>	Size of the free space in megabytes.
QueryFreeIsLogical	<Boolean>	True if the free space is located inside an extended partition.

Function	Return Type	Description
QueryFreeCanBeLogical	<Boolean>	True if any of the following are true: • Free space is located inside of an extended partition. • Free space is adjacent to an extended partition, so the extended partition could be expanded to include the freespace. • There is currently no extended partition on the disk, and there are fewer than four primary partitions on the disk, so an extended partition could be created in this free space.

Scripting Commands

You can use the scripting commands explained in this section to perform common imaging tasks from a command line or batch file. Script file statements are not case-sensitive.

Each script command must be on a separate line. (Some examples in this manual wrap to a second line as a result of the page size of the book only.) Blank lines and lines that start with ";", "#", or "//" are ignored. Therefore, lines that start with these characters can be used for comments.

The syntax is shown for commands that have parameters. Several special characters are used when describing the syntax of script file statements.

[] - Denotes an optional parameter

{}- Denotes a set of parameters, any one of which can be used.

| - Denotes a choice among two or more options

<> - Denotes a parameter type that must be replaced with an actual value of that type.

If no syntax is shown for a command (for example, “HIDE” on page 160), it does not require any parameters.

APPEND

Syntax

```
APPEND "<src-file>" "<dest-file>"
```

Appends a file to the end of an existing file. <src-file> will be appended to the end of <dest-file>. The <dest-file> should already exist. Both <src-file> and <dest-file> should be placed in quotes. The source file, destination file, or both can be on hidden partitions. To specify access to a hidden partition, use the PQAccess partition number displayed when using the /INFO command line switch for ImageCenter. The example below would append the file FILE.002 on Z: (probably a CD or network drive) to the end of \images\image.pqi located on partition 1: (the first partition on the first drive).

Example

```
APPEND "Z:\FILE.002" "1:\images\image.pqi"
```

COPY

Syntax

```
COPY "<src-file>" "<dest-file>"
```

Copies a single file, <src-file>, to the location and name specified by <dest-file>. The <src-file> cannot contain wildcard characters. The <dest-file> must specify a complete path and filename. Both <src-file> and <dest-file> should be placed in quotes. The source file, the destination file, or both can be on hidden partitions. To specify access to a hidden partition, use the PQAccess partition number displayed when using the /INFO command line switch to ImageCenter. The example below copies the file network.sys from Z: (probably a CD or network drive) to partition 1: (the first partition on the first drive).

Example

```
Copy "Z:\network.sys" "1:\windows\network.sys"
```

CREATE

Syntax

```
CREATE /FS={FAT | FAT32 | NTFS | LINUXEXT2 | LINUXEXT3 |
   LINUXSWAP | EXTENDED | UNFORMATTED} [/LABEL= "<label>"]
   [/SIZE=<number>] [POSITION={BEGINNING | END}]
```

Parameter	Description
/FS	Specifies the file system for the new partition. It can be any of the specified strings. There may be cases where creating with a certain /FS would fail. For example, you cannot create an extended partition when one already exists.
/LABEL	Assigns a label to the new partition. Replace <label> (shown above) with the desired volume label. Labels must be 11 characters or fewer and be within quotes.
/SIZE	Specifies the size for the new partition in megabytes. If you do not use this parameter, the size of the partition will default to the size of the unallocated space.
/POSITION	Specifies a position within the unallocated space where the partition will be created. If the partition fills all of the unallocated space, this command does not have any effect. If you do not use this parameter, the partition will be created at the beginning of the unallocated space.

Creates a partition in the currently selected unallocated space. This command is useful if you have deployed an image to a blank machine, but the image file does not fill the entire hard disk. You can create a partition to make the remaining unallocated space usable. You must have unallocated space on the selected hard disk to create a partition on it.

This command must be contained on a single line in an actual script file.

Example

```
   CREATE /FS=NTFS /LABEL="Data" /SIZE=5000
```

DELETE

Syntax

```
DELETE [{ALL | EXTENDED}]
```

Parameter	Description
ALL	Deletes all partitions on the currently selected drive without having to select them. It is not an error to call DELETE ALL on an empty disk.The PROTECT PARTITION command can be used to prevent one of the partitions on the disk from being deleted by this command.
EXTENDED	Deletes the extended partition; the extended partition can only be deleted after all the logical drives within it have been deleted.

Deletes the specified partitions. If you do not specify any parameters, this command deletes the last partition(s) selected.

EXPIRES

Syntax

```
EXPIRES <YYYY> <MM> <DD> ["<text>"]
```

Causes the script to expire at the beginning of the specified day. This allows IT to distribute a recovery CD that has a limited life, preventing a user from restoring an old image when they should be using a newer image. <YYYY> is a four digit year between 1980 and 2038. <MM> is the month, 1-12 and <DD> is the day of the month, 1-31, when the script will expire. The year month and day should be separated by spaces, unless the whole date is placed within quotes, in which case a forward slash or a minus sign may be used as the separator. The quotes are needed to prevent division or subtraction from occurring on the numbers that make up the date. <text> is an optional text message that will be displayed to the user if the script has expired. If <text> is not supplied, a default message about the script being expired will be displayed. For international users, the text can be in UTF8 format.

Example

```
Expires '2002/12/31' 'Contact IS for a current recovery CD'
```

GET INI

Syntax

```
GET INI <varname> := [[section]] <key>
```

Sets a local variable named <varname> to a value obtained from an INI file. See USE INI command for a description of how to specify the INI file. The [section] portion can be omitted if the key is located at the beginning of the INI file before the first specified section. However, if the [section] portion is used, it must be enclosed in square brackets. Spaces are required on both sides of the ":=" symbol. The example below sets the variable COMPNAME to the value of the of the ComputerName key in the UserData section of the INI file. If this section or key is not present in the INI file, then COMPUTERNAME will be unset. If it previously had a value, it no longer will. You can use the IF DEFINED <varname> command to check the variable's status.

Example

```
GET INI COMPNAME := [UserData] ComputerName
```

GET REG

Syntax

```
GET REG <varname> := "<regpath>"
```

Sets a local variable named <varname> to a value obtained from a registry file. See "USE REGISTRY" on page 172 for a description of how to specify the registry file. The <regpath> is a relative path inside of the registry and should be enclosed in quotes. Forward slashes must be used as the separator character within the registry key path. Unlike a DOS or Windows path, backslashes are not supported. Spaces are required on both sides of the ":=" symbol.

Example

```
GET REG COMPNAME := "ControlSet001/Control/ComputerName/
   ComputerName/ComputerName"
```

If the current registry file is the Windows XP System registry, the example above will set the variable COMPNAME to the value of the of the specified ComputerName key (You must specify the ComputerName three times to get to the actual key value.) If this section or key is not present in the INI file, then COMPUTERNAME will be unset. If it previously had a value, it no longer will. You can use the IF DEFINED <varname> command to check the variable's status.

HIDE

Hides the currently selected partition.

MERGE INI

Syntax

```
MERGE INI "<file2>"
```

Opens the specified INI file (<file2>, for example) and merges every section and key into the INI file opened using the USE INI <file> command. To clarify the example, <file> is the file that will be modified, not <file2>. If both files contain keys with identical names in the same section of their respective INI files, then the values of these keys from <file2> will be used as the final values of these keys in the updated <file>.

Example

```
USE INI "1:\sysprep\sysprep.inf"
MERGE INI "z:\more.ini"
```

MESSAGE

Syntax

```
MESSAGE [/<button> [= [GOTO] <label>]] [/<button> = ABORT]
   "<text>"
```

Displays the specified message, <text> to the user.

Example

```
Message "There are" GetTotalDisks "drives in this machine."
```

For international users, the text can be in UTF8 format. If the /NMD switch is used, then the user will never see the message, otherwise the <text> will be displayed in a message box. If no <buttons> are specified, the user must press OK to acknowledge the message. If one or more <buttons> are specified and the /NMD switch is not used, then the <text> will be displayed in a message box that also includes each of the specified buttons. The user must select one of the buttons before the script will continue. If multiple <buttons> are specified and the /NMD switch has been used, then the script will proceed as if the user had selected the first specified <button>.

The following are the valid buttons: YES, NO, OK, CANCEL, ABORT, RETRY, IGNORE, HELP, YESALL, NOALL. Each specified <button> may optionally be followed by an equal sign then a <label> or the word ABORT. The word GOTO may optionally precede the <label>. If the user selects a <button> that is followed by the word ABORT, then the application will abort with error #7 (User Cancel). If the user selects a <button> that has a <label> in its definition, then the script will proceed at the specified <label>. If the selected <button> does not have a <label> or ABORT command, then the script will continue with the next line in the script. Note that the buttons have no intrinsic meaning. If the user selects the CANCEL or ABORT button, the script is not automatically cancelled unless the action of the button is ABORT or a GOTO that causes a jump to a label on the last line of the script. All of the button specifications, if any, must occur before <text>.

To display quotes within a message, you must use two sets of quotes in the MESSAGE command. For example, the following command would display a message on-screen as shown below.

MESSAGE ‘To continue, click "Yes."’

Text on screen: To continue, click "Yes."

If the message you want to display is too long to fit on a single line, you can break <text> into multiple strings and place the word NL (meaning new line) between the strings. For example, `MESSAGE "FIRST LINE" NL "SECOND LINE"` will display a two-line message.

Example

This is an example that asks the user if he would like to create a backup before deploying a new image. (The message text wraps in this example only to fit the page of the manual.)

```
SELECT DRIVE 1
MESSAGE /YES /NO=GOTO Restore "Do you want to back up your
   system before deploying the new image?"
SELECT PARTITION ALL
SET IMAGE FILENAME "n:\backup.pqi"
STORE WITH COMPRESSION HIGH
:Restore
DELETE ALL
SET IMAGE FILENAME "n:\newimage.pqi"
SELECT FREESPACE FIRST
SELECT IMAGE ALL
RESTORE
```

PROTECT PARTITION

Syntax

```
PROTECT PARTITION {FIRST | LAST | DIAGNOSTIC | UNKNOWN |
   "<volume label>" | <drive letter> | <integer>}
```

Parameter	Description
<integer>	Protects the specified partition by number on the currently selected drive. Partitions are numbered in the order of their starting sector number on the disk, excluding any extended partitions or unallocated spaces. Numbering begins with 1.

Parameter	Description
<drive letter>	Protects the partition assigned the specified drive letter by DOS. Since DOS only assigns drive letters to visible FAT partitions, only these types of partitions can be selected using this command.
"<Volume label>"	Protects the first partition with the specified volume label. For example, SELECT PARTITION “DATA” protects the first partition labeled “DATA.” If more than one partition has this label (including FAT32, NTFS, and HPFS partitions), only the first one is protected.
FIRST	Protects the first partition on the selected hard disk.
LAST	Protects the last partition on the selected hard disk.
DIAGNOSTIC	Protects a valid partition of an unknown type that is either the first or the last non-free space partition.
UNKNOWN	Protects a single partition of an unknown type. Searches from the beginning of the disk until it finds a partition of unknown type.

Protects the specified partition from being deleted. Only a single partition can be protected. It is not an error if the specified partition does not exist.

REBOOT

Reboots the computer. Any commands following this command will not be executed.

RESIZE EXTENDED

Syntax

```
RESIZE EXTENDED { MAX | <number>}
```

Parameter	Description
Max	Resizes to the maximum size possible. The right edge of the partition will be flush with end of drive or next partition, if possible.
<Number>	Resizes to value specified (in megabytes). The partition will be resized to the next smaller cylinder boundary, so it may not match the MB you specify exactly.

Resizes the extended partition on the selected disk to the size you specify or to the maximum size possible.

RESIZE IMAGE

Syntax

```
RESIZE IMAGE {NO | PROPORTIONAL| <number> | MAX |MOST SPACE}
```

Parameter	Description
NO	Causes the last selected image to not be resized when the RESTORE command is encountered.
PROPORTIONAL	Proportionally resizes the last selected image when the RESTORE command is encountered.
<Number>	Resizes the last selected image to the specified number (in MB) when the RESTORE command is encountered.
MAX	Resizes the last selected image to the maximum size possible. If this is used in a situation where the partition can take up the rest of the drive, it will fill up the drive.
MOST SPACE	Resizes the partition with the most free (unused) space. If you choose MOST SPACE for any partition (image) within an image file, that partition will get the drive's unused space, even if your script directs that other partitions be resized proportionally or to the maximum size possible. If other partitions are to be resized according to a value, those partitions will not be considered in the MOST SPACE calculations.

Causes the RESTORE command to resize the last selected images as directed by the specified parameter, during the restore operation.

RESIZE PARTITION

Syntax

```
RESIZE PARTITION {MAX | <Number>}
```

Parameter	Description
MAX	Resizes to the maximum size possible. The right edge of the partition will be flush with end of drive or next partition, if possible.

Parameter	Description
<Number>	Resizes to value specified (in megabytes). The partition will be resized to the next smaller cylinder boundary, so it may not match the MB you specify exactly. If you enter a value that is greater than the value possible on the disk, the partition will be resized to the maximum size possible.

Resizes the last selected primary or logical partition to the size indicated or to the maximum size possible.

To resize an extended partition, you should use the RESIZE EXTENDED command.

RESTORE

Downloads all selected images into the selected free space and resizes them according to the Resize commands, if any.

SECTOR CHECK

Syntax

```
SECTOR CHECK {ON | OFF}
```

Parameter	Description
ON	Enables bad sector checking for all restore operations following the command. This command provides an alternative to /CBS if you need bad sector checking turned off for some partitions and on for others.
OFF	Disables bad sector checking for all restore operations following the command. This command provides an alternative to /NBS if you need bad sector checking turned on for some partitions and off for others.

Enables or disables bad sector checking.

SELECT DISK

Syntax

```
SELECT DRIVE <integer>
```

`SELECT DISK <integer>` (preferred method)

Parameter	Description
<Integer>	Selects the disk of the number specified. To select the first hard disk on your system, you would enter `SELECT DISK 1`.

Selects the drive of the number or variable specified. After this command, all other commands refer to the selected drive until another SELECT DISK command is encountered.

Examples

```
SELECT DRIVE 1
SELECT DISK %DATA%
```

SELECT FREESPACE

Syntax

```
SELECT FREESPACE {FIRST | LAST | NEXT | PREV | LARGEST |
   <integer>}
```

Selects the specified unallocated space on the currently selected hard disk. When selecting the largest unallocated space, it does not matter whether the unallocated space is inside or outside of the extended partition.

SELECT IMAGE

Syntax

```
SELECT IMAGE {<integer> | ALL }
```

Parameter	Description
<Integer>	Selects the specified partition by number from within the current image file. Numbering begins with 1.
ALL	Selects all partitions within the image file.

Selects the specified partition in an image file. This command allows you to specify whether to restore a single partition with an image or all partitions contained in the image.

SELECT PARTITION

Syntax

```
SELECT PARTITION {<integer> | <drive letter> | "<volume
   label>" | FIRST | LAST | NEXT | PREV | DIAGNOSTIC |
   UNKNOWN | ALL}
```

Parameter	Description
<integer>	Selects the specified partition by number on the currently selected drive. Partitions are numbered in the order of their starting sector number on the disk, excluding any extended partitions or unallocated spaces. Numbering begins with 1.
<drive letter>	Selects the partition assigned the specified drive letter by DOS. Since DOS only assigns drive letters to visible FAT partitions, only these types of partitions can be selected using this command.
"<volume label>"	Selects the first partition with the specified volume label. For example, SELECT PARTITION “DATA” selects the first partition labeled “DATA.” If more than one partition has this label (including FAT32, NTFS, and HPFS partitions), only the first one is selected.
FIRST	Selects the first partition on the selected hard disk.
LAST	Selects the last partition on the selected hard disk.
NEXT	Selects the partition immediately following the last selected partition regardless of the syntax used to select that partition.
PREV	Selects the previously selected partition.
ALL	Selects all the partitions on the currently selected hard disk.
DIAGNOSTIC	Selects a valid partition of an unknown type that is either the first or the last partition on the disk.
UNKNOWN	Selects the first valid partition of an unknown type.

Selects the partition specified. After this command, all other commands refer to the selected partition until another SELECT PARTITION command is encountered. Some commands, such as STORE and DELETE refer to all previously *selected* partitions. After one of these commands, the list of previously selected partitions is cleared.

To select partitions within an image file, you should use the Select Image command. See “SELECT IMAGE” on page 166.

SET ACTIVE

Sets the last partition selected as the active partition (meaning it will be the boot partition). The last selected partition must be a primary partition.

SET DESCRIPTION

Syntax

```
SET DESCRIPTION "<description>"
```

Using this command before a STORE command will add <description> as a comment inside of the PQI file that is created. <description> should be enclosed by quotes.

Example

```
Set Description "file includes John's changes"
```

SET IMAGE FILENAME

Syntax

```
SET IMAGE FILENAME "<file>"
```

Specifies an image file. Any previously specified image file will no longer be used with the script commands that follow. The newly specified file does not need to exist if you are doing a STORE command to create a new image file, but must exist if you will be reading from the file using a command such as RESTORE. The image filename should be specified in the same way that it would be specified for the /IMG command line switch. The name of the file should be placed in quotes.

Example

```
Set Image Filename "z:\myimage.pqi"
```

SET INI

Syntax

```
SET INI [[section]] <key> := <value>
```

Creates or modifies a setting in an INI file. The specified key in the specified section of the INI file will be set to the specified value. The [section] portion can be omitted if the key is located at the beginning of the INI file before the first specified section. However, if the [section] portion is used, it must be enclosed in square brackets. Spaces are required on both sides of the ":=" symbol. The example below sets the ComputerName key in the

UserData section of the INI file to the value of the COMPNAME variable. If the UserData section is not present in the INI file, it will be added to the end of the file. If the ComputerName key is not present in the UserData section of the INI file, it will be added to this section.

Example

```
SET INI [UserData] ComputerName := %COMPNAME%
```

SET PASSWORD

Syntax

```
SET PASSWORD "<password>"
```

Specifies the password to use when creating or restoring an image. The specified password replaces any previously specified password, including any password specified using the /PWD command line switch. This command is generally used along with the SET IMAGE FILENAME command to specify a new password to be used with the new image file. The password should be placed in quotes.

Example

```
SET PASSWORD "incubus"
```

SET REG

Syntax

```
SET REG "<regpath>" := <value>
```

Sets a registry key to the specified value. See “USE REGISTRY” on page 172 for a description of how to specify the registry file. The <regpath> is a relative path inside of the registry and should be enclosed in quotes. Forward slashes must be used as the separator character within the registry key path. Unlike a DOS or Windows path, backslashes are not supported. Spaces are required on both sides of the ":=" symbol.

For this command to work, all of the following must be true:

- The registry key must already exist.
- The new value must be of the same type as the current value.
- The new value must not take up more space than the old value.
- The key type must be REG_SZ, REG_EXPAND_SZ, REG_DWORD, REG_DWORD_BIG_ENDIAN or REG_BINARY.

Note that the computer name cannot be changed simply by setting the key described in the example for GET REG, because the computer name is stored in numerous places in the registry and all locations need to be changed. Remember that modifying the registry can be very dangerous, even using Microsoft's tools such as regedit.

SET VAR

Syntax

```
SET VAR <varname> := <value>
```

Sets a local variable named <varname> to the specified value. Value can be a string or a numeric expression. If an existing variable has the specified name, its value will be replaced with the new value. Any variable set or modified by this command will only remain set until ImageCenter exits. This command cannot be used to set or modify environment variables that other programs in a DOS batch file can then access. Spaces are required on both sides of the ":=" symbol. You should not use function names, such as Get PartitionLabel, for the names of variables.

When you set a variable value as a string, the string must be in quotes, or the variable may not display correctly. For example, the following commands would display "Date is 4" because 12 divided by 3 is 4.

```
SET VAR DATE := ’12/1/03’
MESSAGE "Date is " %DATE%
```

The following commands would display the "Date is 12/1/03" correctly.

```
SET VAR DATE := ‘12/1/03’
MESSAGE "Date is " \"%DATE%\"
```

To set a variable value as a string that includes quotation marks, you must use two sets of quotation marks in the command. For example, the following commands would display a message on-screen as shown below.

```
SET VAR INSTRUCT := ‘To continue, click "Yes."’
MESSAGE "%INSTRUCT%"
```

To continue, click "Yes."

STORE

Syntax

```
STORE [WITH COMPRESSION {OFF | LOW | HIGH}]
```

Parameter	Description
OFF	Stores selected partitions with no compression.
LOW	Stores selected partitions with low compression.
HIGH	Stores selected partitions with high compression.

Stores selected partitions with the compression level indicated. If you do not set a compression parameter, the /CMP command line switch setting will be used. If /CMP is not set either, then the image will be created with no compression.

UNHIDE

Unhides the currently selected partition. This command is useful if you are running Windows NT or Windows 2000 and want to have multiple visible primary partitions. Without this command, ImageCenter automatically hides all but the boot partition.

USE INI

Syntax

```
USE INI "<file>"
```

Provides access to a Windows INI file. The file can be on a hidden partition not visible to the DOS program, such as a newly restored partition. To specify access to a hidden partition, use the PQAccess partition number displayed when using the /INFO command line switch to ImageCenter.

Only a single USE command can be active at a time. See the “SET INI” on page 168, “GET INI” on page 159, and “MERGE INI” on page 160 for more information about reading from and writing to the specified INI file.

USE NONE

Closes any previously opened INI or registry file and flushes any modified data to disk.

USE REGISTRY

Syntax

```
USE REGISTRY {SOFTWARE | SYSTEM | "<file>"}
```

Provides access to a windows registry hive. The registry must be on the currently selected partition. (See “SELECT PARTITION” on page 167.) If <file> is used, it should not include a drive letter or PQAccess partition number, and the backslash must be used as the path separator.

The SOFTWARE option is a shortcut for accessing the registry file "\windows\system32\config\software" or "\winnt\system32\config\software".

The option will check for the registry file in both places.

The SYSTEM option is a shortcut for accessing the registry file "\windows\system32\config\system" or "\winnt\system32\config\system".

The SOFTWARE and SYSTEM options load the portion of the registry that corresponds to the `HKEY_LOCAL_MACHINE/SOFTWARE` and `HKEY_LOCAL_MACHINE/SYSTEM` respectively. Therefore to access a key such as:

```
HKEY_LOCAL_MACHINE/SYSTEM/ControlSet001/Control/
   ComputerName/ComputerName/ComputerName
```

after opening the SYSTEM registry hive, you would only specify

```
/ControlSet001/Control/
   ComputerName/ComputerName/ComputerName
```

If the specified file is not found, an error will be returned. Use the IF EXISTS <file> scripting commands if there is a chance that the file is not present and you want to search for it in multiple locations. Note that you will need to prepend the drive letter to the beginning of the filename because the EXISTS command does not look for the file on the currently selected partition, but requires a full path.

Only a single USE command can be active at a time. See the “SET REG” on page 169 and “GET REG” on page 160 for more information about reading from and writing to the specified registry file.

USE SYSPREP

Identical to `USE INI '1:\sysprep\sysprep.inf'`, so that the sysprep.inf file on the first partition on the hard disk can be modified.

VERIFY IMAGE

Validates that the image file, specified by the /IMG command line parameter or the SET IMAGE FILENAME script argument, is not corrupt.

Conditional Scripting Commands

You can use the Label, IF, and GOTO commands to control the flow of your script file.

LABEL

Syntax

```
:<Label>
```

You can use the Label command together with the GOTO command for conditional script flow and iteration.

A Label command begins with a colon (:) in the first character of the line and is followed by the label name. A label can be up to 20 characters in length and cannot include spaces. All characters are considered significant.

A label can be defined anywhere in a script file. You should not use function names, such as GetPartitionLabel, for the name of a label.

Example

```
:Backup
```

GOTO

Syntax

```
GOTO <label>
```

The Goto command transfers control to the label specified. Do not include the colon (:) before the label name in the Goto command. If the specified label is not found in the script file, an error is generated and script file processing is terminated.

Example

```
GOTO END
...
:END
```

IF

Syntax

```
IF <expression> GOTO <label>
```

Parameter	Description
<Expression>	Any expression or statement that results in a value of TRUE or FALSE.
<Label>	A marker you have assigned to a certain part of a script file. See "LABEL" on page 173.

The If command evaluates the expression and if it is TRUE, it transfers control to the specified label. If the conditional text is true, the Goto command is executed. If the conditional text is false, control passes to the next line in the script.

Examples

```
IF IsFAT32 GOTO CONVERT
...
:CONVERT

IF GetTotalDisks() < 2 GOTO FirstDisk
...
:FirstDisk
```

Debugging Scripts

ImageCenter parses each script two times. During the first pass, it processes each line, in order, ignoring any GOTO statements. During this pass, it does not perform any of the specified actions; it simply makes sure that the script does not contain any syntax errors. If no syntax errors are found, then the actions specified by the script are performed during the second pass.

Because no partition changes are made during the first pass, functions such as QueryPartSize or GetPartitionLabel may not refer to the partitions that they would actually refer to when the commands are executed. Therefore, all functions that reference disks, partitions or freespaces return dummy values that are of the appropriate type, but are not the actual values. Also, local variable assignments that are made during the syntax check are discarded, so that variables do not have values that may represent dummy values, but instead must be assigned correct values during the second pass.

Syntax checking during the first pass is relaxed somewhat on lines that contain variables, because the values of these variables might be different when the actual script is evaluated, or the line may never be executed if a preceding line contains and IF DEFINED statement and skips the line in question if the variable is undefined.

During both passes, if a log file has been specified with the /LOG=<file> option, then each line is written to the log file as it is processed. During the first pass, each line is preceded with the text `Syntax Checking-->`while during the second pass each line is preceded with the text `Running-->`. Image Center also displays each of these lines in the GUI.

The line displayed may not be identical to the text in the script file. When the script parser reads a line from the script file, it first makes all variable substitutions and replaces all backslash quote characters (\) that appear in the text, not within quotes. This is the text that is displayed in the GUI and recorded in the log file.

Next, any mathematical or logical expressions are evaluated. If the evaluation results in any changes to the line, such as changing "2 + 2" into "4", then a new line is generated with the result. During the second pass, this new line is also output to the log file, preceded by the text `==========>`. This line is not displayed in the Image Center GUI. The command on this line is then executed.

If you are having a problem where the syntax check is failing and you cannot figure out why, you can run the script with the /SCO option (Syntax Check Only). When run with this option, only the syntax checking first pass of occurs. However, the line resulting from expression evaluation is output to the log file during the first pass rather so you can see the results of this expression evaluation. This allows you to see the actual text that is causing the syntax error. Note that any functions that the script calls, such as QueryPartSize, do not actually perform the action, since the partition that you want to check may not yet exist. Instead all of these functions return a random value typical of the type of value they would really return. Therefore, when you use the /SCO, do not be concerned that the results do not match the actual values you would expect for your machine.

For descriptions of any error codes, go to “Error Messages and Solutions” on page 228

Script File Examples

Scenario 1: To store all the partitions on drive 2 to the file, E:\IMAGES\DRIVE2.PQI:

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVE2.PQI
```

SCRIPT.TXT file contents:

```
SELECT DISK 2
SELECT PARTITION ALL
STORE
```

Scenario 2: To store partition 3 from drive 1, and partitions 1, 4, and 5 from drive 2 to the file, E:\IMAGES\DRIVES.PQI and have the image file split up into multiple files each 650 MB so each can be transferred to a CD-ROM:

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVES.PQI
   /MFS=650M
```

SCRIPT.TXT file contents:

```
SELECT DISK 1
SELECT PARTITION 3
STORE
SELECT DISK 2
SELECT PARTITION 1
SELECT PARTITION 4
SELECT PARTITION 5
STORE
```

Scenario 3: To restore all the images in the file, E:\IMAGES\DRIVES.PQI, to the first free space on drive 2:

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVES.PQI
```

SCRIPT.TXT file contents:

```
SELECT DISK 2
SELECT FREESPACE FIRST
SELECT IMAGE ALL
RESTORE
```

Scenario 4: To restore the first two images in the file, E:\IMAGES\DRIVES.PQI, to the largest free space on drive 1 and resize them both proportionally:

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVES.PQI
```

SCRIPT.TXT file contents:

```
SELECT DISK 1
SELECT FREESPACE LARGEST
SELECT IMAGE 1
RESIZE IMAGE PROPORTIONAL
```

```
SELECT IMAGE 2
RESIZE IMAGE PROPORTIONAL
RESTORE
```

Scenario 5: To restore the first two images in the file, E:\IMAGES\DRIVES.PQI, to the last free space on drive 1 and resize them to 500 MB each. (The image was encrypted using the password 12345678.):

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVES.PQI
   /PWD=12345678
```

SCRIPT.TXT file contents:

```
SELECT DISK 1
SELECT FREESPACE LAST
SELECT IMAGE 1
RESIZE IMAGE 500
SELECT IMAGE 2
RESIZE IMAGE 500
RESTORE
```

Scenario 6: To delete all existing partitions on drive 2 and then restore all the images in the file, \IMAGES\DRIVES.PQI located on the system's CD-ROM drive, to the free space (the image was encrypted using the password HELLO):

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=\\.\PQCD0\IMAGES\DRIVES.PQI
   /PWD=HELLO
```

where the zero in PQCD0 is a numerical zero.

SCRIPT.TXT file contents:

```
SELECT DISK 2
DELETE ALL
SELECT FREESPACE FIRST
SELECT IMAGE ALL
RESTORE
```

Scenario 7: To restore the first four images in the file, E:\IMAGES\DRIVES.PQI, to the last free space on drive 1, and then resize the first image to 500 MB, keep the second the same size, and resize the third and fourth images to proportionally take up the remaining free space:

```
PQIMGCTR /CMD=SCRIPT.TXT /IMG=E:\IMAGES\DRIVES.PQI
```

SCRIPT.TXT file contents:

```
SELECT DISK 1
SELECT FREESPACE LAST
SELECT IMAGE 1
RESIZE IMAGE 500
SELECT IMAGE 2
RESIZE IMAGE NO
SELECT IMAGE 3
RESIZE IMAGE PROPORTIONAL
SELECT IMAGE 4
RESIZE IMAGE PROPORTIONAL
RESTORE
```

Scenario 8: To start the ImageCenter DOS PowerCast Server, then start a PowerCast session named SESSION_1 and an image file named E:\ IMAGE_1.PQI:

```
PQPCAST /MSN=SESSION_1 /IMG=E:\IMAGE_1.PQI
```

To start a PowerCast client, then connect to a PowerCast session named SESSION_1 and restore the current image to drive 1:

```
PQPCAST /MSN=SESSION_1 /DSK=1
```

Scenario 9: To install a new operating system to every machine on the network. If a machine currently has an NT based operating system with an NTFS partition, restore XP. If a machine currently has a 9x based operating system with a FAT32 partition, restore ME. Many of the systems may have more than one partition. It is important that you leave all other partitions except the first partition intact. Restore the correct image and resize the partition to fill the available space. Make sure that each system has a fresh master boot record. The password to the image is "mysecret", the network drive letter is G:, and the image is NewOS.pqi. NewOS.pqi has a Windows XP, NTFS partition and a Windows Me, FAT32 partition.

```
Pqimgctr /cmd=g:\script.txt /img=g:\NewOS.pqi /rpp /wfs
   /pwd=mysecret /log=g:\log.txt
```

Script.txt file contents:

```
Select drive 1
Select partition 1
If IsNTFS Goto WindowsXP
If IsFAT32 Goto WindowsMe
MESSAGE /ABORT=GOTO END "Error Computer has unexpected
   partition type"
```

```
:WindowsXP
Delete all
Select freespace first
Select Resize Image Max image 1
Restore
Goto End

:WindowsMe
Delete all
Select freespace first
Select Resize Image Max image 2
Restore
Goto End

:End
```

Scenario 10: To restore an image of two partitions to either a) a single hard disk with both partitions, or b) two hard disks with a partition restored to each drive:

```
Pqimgctr /cmd=g:\script.txt /img=g:\image.pqi
```

Script.txt file contents:

```
If GetTotalDisks<2 GOTO OneDisk
GOTO TwoDisks

:OneDisk
SELECT DISK 1
DELETE ALL
SELECT FREESPACE FIRST
SELECT IMAGE ALL
RESIZE IMAGE PROPORTIONAL
RESTORE
GOTO END

:TwoDisks
SELECT DISK 1
DELETE ALL
SELECT FREESPACE FIRST
SELECT IMAGE 1
RESIZE IMAGE MAX
RESTORE

SELECT DISK 2
DELETE ALL
SELECT FREESPACE FIRST
```

```
SELECT IMAGE 2
RESIZE IMAGE MAX
RESTORE

:END
```

Scenario 11: Restore an image of a Windows 2000 partition to take up 50% of the drive and create a second partition that is a logical NTFS partition labeled MyData on drives that are bigger than 10 GB, but not to restore on drives that are smaller:

```
Pqimgctr /cmd=script.txt /img=\\.\disk2.part2\ntfs.pqi
   /log=a:\log.txt
```

Script.txt contents:

```
SELECT DISK 1
If GetDiskSize()>=10000 GOTO BigEnough
MESSAGE /ABORT=ABORT "Err: Computer's Disk is too small"

:BigEnough
delete all
select freespace largest
select image 1
resize image GetDiskSize()/2
restore

select freespace largest
create /FS=extended
select freespace largest
create /FS=ntfs /label="MyData"

select drive 1
select partition 1
set active
```

Scenario 12: Upgrade a computer from Windows 2000 to XP, preserving the computer name. If the script can't determine the computer's previous name, it will use the value of the environment variable COMPNAME. If that variable is not set, it will abort without making changes to the computer. This script assumes that the Windows XP image has been SysPrep'ed.

```
PqImgCtr /cmd=script.txt /img=n:\winxp.pqi
```

Script.txt Contents:

```
SELECT DISK 1
SELECT PARTITION 1
```

```
IF NOT EXISTS "1:\WINNT\System32\Config\System" GOTO
    CheckCompName
USE REGISTRY SYSTEM
GET REG OldName := ControlSet001/Control/ComputerName/
    ComputerName/ComputerName
USE NONE
#Make sure that we were able to obtain
#the computer's current name. Otherwise, don't
#modify the value of COMPNAME
IF NOT DEFINED OldName GOTO CheckCompName
SET VAR CompName := %OldName%
:CheckCompName
IF DEFINED CompName GOTO Restore
MESSAGE /ABORT=ABORT "Error: Unable to determine
    appropriate Computer Name"
:Restore
DELETE ALL
SELECT IMAGE 1
RESIZE IMAGE MAX
RESTORE
USE SYSPREP
SET INI [UserData] ComputerName := %CompName%
USE NONE
```

CHAPTER 11

Copying Disk to Disk

Preparation

If you are upgrading to a new hard drive, refer to "Using ImageCenter with SCSI Hard Disks" or "Using ImageCenter with Drive Overlay Software" on page 205 if needed.

It is strongly recommended that you perform the following steps before upgrading to a new hard drive or using ImageCenter to copy disk to disk.

- Create a set of ImageCenter rescue diskettes. See "Creating Rescue Diskettes under Windows" on page 32.
- Before running ImageCenter, use a disk utility program such as ScanDisk or Norton's Disk Doctor to identify and repair any errors on your hard drive.
- Verify that the destination drive or partition is the same size or larger than the source drive. You can copy a partition or drive from a larger to a smaller partition or drive. However, there must be enough unallocated space on the smaller destination to accommodate the used space on the larger source.

If you are copying from one partition to another partition on the same hard disk, go directly to the steps outlined under "Procedure" on page 185.

IMPORTANT! If you are using ImageCenter to copy a Windows NT partition, refer to "ImageCenter and Windows NT/2000/XP" on page 38 for information about the BOOT.INI.

Setting Up a Dual Hard Disk System

1. Get the manufacturer's installation guides for both drives.

   The installation guides provide information on installing the drives, setting up the BIOS, and changing the jumper settings. If you do not have access to these guides, contact the hard drive manufacturers directly. Most drive manufacturers maintain sites on the Internet that offer setup information.

2. Turn off the computer's power.

3. Discharge static electricity by touching a grounded metal object such as a metal filing cabinet.

   IMPORTANT! Do not allow static electricity to contact the inner parts of your computer. Static electricity can damage or destroy your computer's electronic components.

4. Remove the computer's cover.

5. Determine which drive you want to be master and which drive you want to be slave, then follow the manufacturer's instructions to change the jumper settings on your hard drives accordingly.

6. Attach the interface cable and the power supply cable to the second drive.

7. Mount the second drive.

8. Start the computer and enter its Basic Input/Output System (BIOS) Setup program before the computer completes startup.

   This is usually accomplished by pressing <DEL>, <F1>, or <F2>, according to the prompt that appears at the bottom of your screen during initial startup.

9. If the BIOS Setup program includes an **Auto-Detect** option, select it to detect both the master and slave drives.

   If there is no **Auto-Detect** option, you may be required to enter the specific number of heads, cylinders, and megabytes of the drives. This information is usually printed on the drive's outside cover. If it is not, contact the drive manufacturer.

10. If ImageCenter lists a drive size that is much smaller than its actual size, redetect the drive in the BIOS.

    Computer BIOSs made before 1994 usually do not support the EIDE standard and cannot address hard drives larger than 504 MB. Hard drives larger than 504 MB typically include software such as OnTrack Disk Manager, Maxtor Max-Blast Disk Manager, or Micro House EZ-Drive which allow computers to see larger hard drives. Follow the destination drive manufacturer's instructions to install any software included with the drive. If the size is still reported incorrectly, contact the drive manufacturer for assistance with the drive overlay software.

11. Save your BIOS settings and restart your computer.

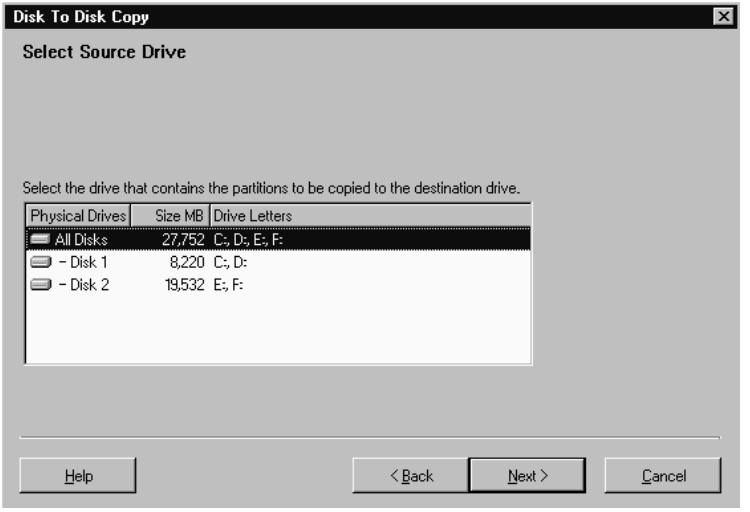
Procedure

The Disk to Disk feature copies partitions directly from one place to another without creating an image file.

It is not necessary to format your destination partition or to partition your hard drives before performing a Disk to Disk copy. ImageCenter automatically performs both these functions.

1. At the ImageCenter main screen, click **Disk To Disk**.

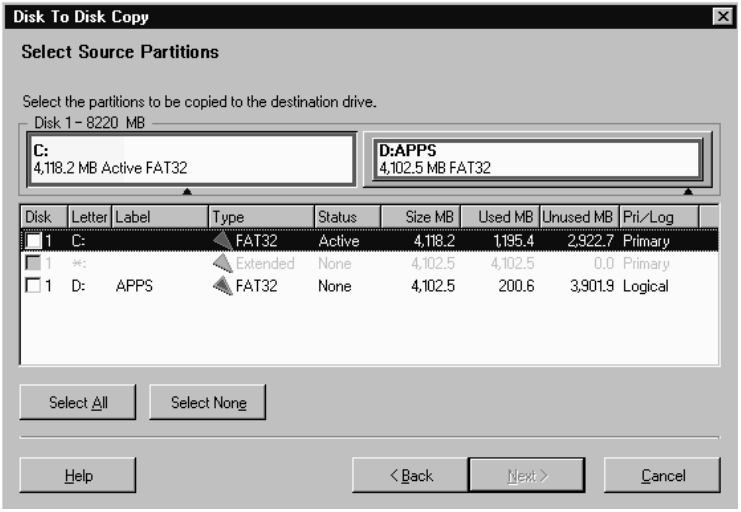
The **Select Source Drive** screen appears.



2 Select the disk or disks that include partitions you want to copy, then click **Next**.

At any point prior to actually copying partitions, you can click **Back** to change your settings.

3 If there are multiple partitions on the source drive, select the source partition you wish to copy, or click **Select All** to select all partitions. Skip this step if the **Select Source Partitions** screen does not appear.



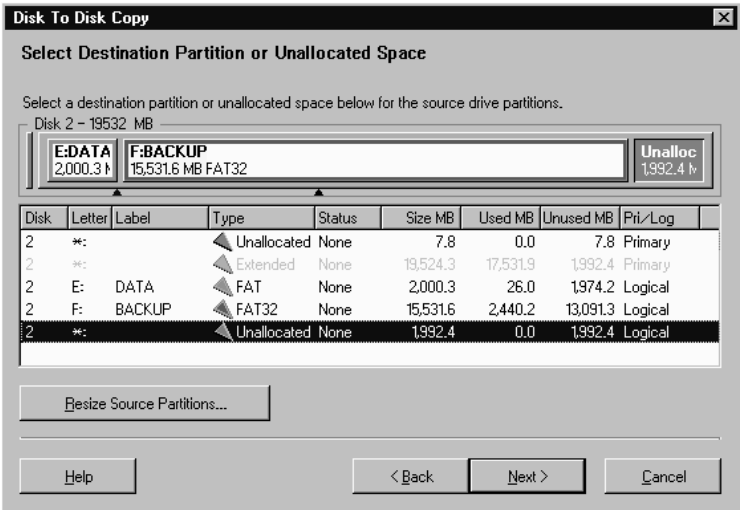
You may need to scroll to view all the partitions in the list. The first column in the partition list shows the physical hard disk where the partition is located.

A check appears to the left of selected partitions. To deselect partitions, click again on a partition or click **Select None** to deselect all partitions at once.

4 Click **Next**.

5 Select the destination drive that includes the partitions or unallocated space where you want the copied partitions to be stored, then click **Next**.

6 Select the destination partition or unallocated space, then click **Next**.



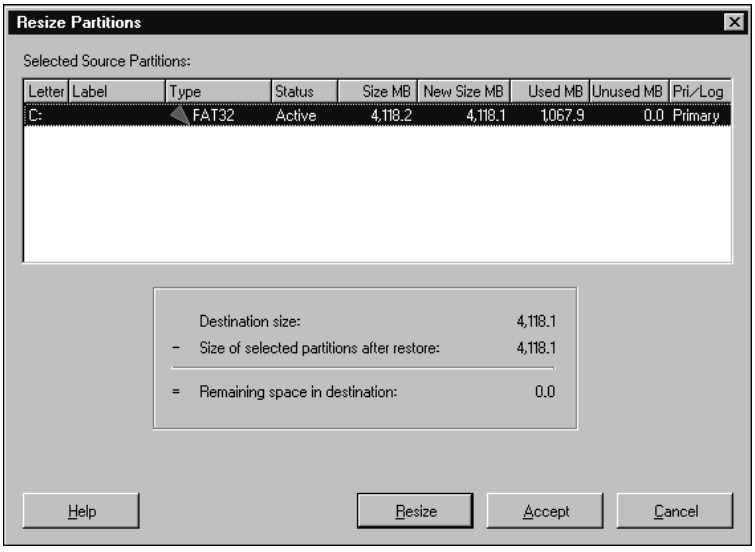
You may need to scroll to view all the partitions in the list. If there is more than one hard disk, the first column in the partition list shows the physical hard disk where the partition is located.

IMPORTANT! To copy partitions, the destination partition or drive must have unallocated space equivalent to the total used space of the selected source partition. If you copy to a partition that already includes data, the existing data will be replaced.

7 If the destination partition or unallocated space is not large enough to accommodate the partition you wish to copy, or if you are copying the partition to a larger drive and want to set a specific size for the partition rather than use the proportional resize option, you can click **Resize Source Partitions** to specify a different size for the copied partition. If you do not want to resize the source partition, go to step 12.

8 Click **Resize Source Partitions**.

The **Resize Partitions** window appears.



The **Selected Source Partitions** group box displays the partition you selected to copy. The screen also displays the destination size, current size of selected partition, and remaining free space in the destination.

9 Click **Resize**. (If you do not want to make changes, click **Cancel**.)

10 In the **New Size** field, type the size for the partition (in MB), then click **OK**.

The size you enter must be equal to or larger than the Minimum Size and less than or equal to the Maximum Size displayed in the dialog.

Since partitions must end on a cylinder boundary, ImageCenter rounds the **New Size** up to the nearest cylinder boundary.

NTFS partitions require some unused space to facilitate resizing and cannot be resized below the master file table (MFT), so the minimum size may appear larger than is necessary to accommodate the data in the partition.

11 Click **OK**, then click **Accept**.

Later, when you copy the partition, ImageCenter resizes it.

12 Click **Next**.

If you selected an existing partition as the destination, a prompt will appear reminding you that the existing partition will be deleted before copying.

ImageCenter does not delete the partition until you click **Finish** on the **Ready to Copy Disk to Disk** screen.

13 If the unallocated space on the destination drive is greater than the space required to copy the selected partition and you did not choose to resize previously, the **Resize Options** dialog appears. Click the option you want, then click **OK**.

Select this option:	To do this:
Automatically resize partitions proportionally to fit	Allow ImageCenter to automatically expand the partitions in equal proportions to occupy the destination drive's remaining unallocated space.
Leave remaining unused space	Leave any remaining unallocated space unused on the destination drive after the partitions are copied.
Resize partitions manually to fit	Display the **Resize Partitions** window where you can manually set the size of the partitions to fit in the destination drive's remaining unallocated space. (See step 8 for additional information about the Resize Partition window.)

14 ImageCenter displays all the information you have entered to this point. To alter any settings, click **Back**.

15 *(Optional)* To set options such as disabling file system error-checking or hiding partitions after copy, click **Advanced Options**. For more information, see "Advanced Options" on page 191.

Copying multiple logical partitions can cause the drive letters of subsequent partitions to change. This may make the computer unbootable or cause applications to fail.

16 Click **Finish** to begin copying the selected partition.

The **Copying Disk To Disk** dialog tracks the progress. Upon completion, the following message appears: "Selected partitions copied successfully. Would you like to view the results?"

17 Click **OK** to return to the ImageCenter main screen.

If you ever want to replace the active partition with a hidden backup partition (for instance, if you lose data from your C: partition), run ImageCenter **Disk To Disk** again. Select the hidden partition as the source and the active partition as the destination. After ImageCenter completes the copying process, it prompts you to set an active partition. Select the newly copied partition.

Advanced Options

The **Disk to Disk Advanced Options** dialog appears when you click **Advanced Options** at the **Ready To Copy Disk To Disk** screen.

Select this:	To do this:
Source Options	
Check for File System Errors	Clear the **Check for File System Errors** check box if you want to disable error checking. If you have already used a disk utility program such as ScanDisk to check your hard disk for errors, it is not necessary to have ImageCenter check for file system errors. Clearing **Check for File System Errors** saves time in copying the partitions. If you did not run a disk utility program before loading ImageCenter, leave the **Check for File System Errors** check box selected.
Disable SmartSector Copying	ImageCenter's SmartSector technology speeds up the copying process by only copying clusters and sectors that contain data. However, in some cases, such as high-security environments, it may be desirable to copy all clusters and sectors in their original layout, whether or not they contain data. If you wish to copy both used and unused clusters and sectors, click **Disable SmartSector Copying**. Disabling SmartSector copying increases processing time.
Hide Source Partitions After Copy	Hiding the source partition will ensure that your drive letters do not change when you reboot your computer. It can also avoid problems caused by having two identical operating systems visible when you reboot. You can use this option to copy an operating system to a new disk and hide the original partitions. The new partitions will be active. You can set the new drive to master and the old drive to slave, reboot and test the new operating system with the old drive still in place in case something goes wrong.

Select this:	To do this:
Destination Options	
Skip Bad Sector Check	This is selected by default to save time in copying the partitions. Although most drives do not have bad sectors, the potential for problems increases during the lifetime of the hard drive. If you have an older hard drive, it is wise to enable bad-sector checking by clearing the **Skip Bad Sector Check** box.
Verify Disk Writes	Click **Verify Disk Writes** if you want to enable DOS disk write verification. Disk write verification is not critical to safely copy files. Enabling disk write verification can slow the copying process dramatically.
Hide Destination Partitions After Copy	Some operating systems only allow one primary partition to be visible (bootable) at a time. If you are copying a primary partition and you do not want to make that partition your bootable partition, the **Hide Destination Partitions After Copy** box should be selected. If you are using your secondary hard drive as a complete backup of your primary drive, selecting **Hide Destination Partitions After Copy** preserves all the secondary drive information without changing any drive letters. When the computer boots up, a drive letter will not be assigned to the hidden hard drive. For additional information about hiding partitions, see "Hiding Partitions" on page 196.

CHAPTER 12

Common Partition Management Tasks

Overview

The **Tools** drop-down menu on the ImageCenter main screen lets you manually perform some common partition-management tasks that ImageCenter automatically performs when it processes image files or when it copies partitions. The **Tools** menu gives you access to these useful features without requiring you to create or restore image files or copy partitions.

Displaying Drive Information

The **Display Drive Information** option lets you view information about the partitions on your current hard drive.

- Drive letters
- Volume (partition) labels
- Color-coded volume (partition) types
- Status (active or hidden partition)
- Partition size
- Used MB in partitions
- Free MB in partitions
- Primary or logical drive

To display drive information,

1. At the ImageCenter main screen, click **Tools > Display Drive Information**.
2. Select the drive you want to view from the **Physical Drives** drop-down list.
3. Select the partition from the partition list.

Drive Information Displayed on the Screen (Partition Map)

Several ImageCenter dialogs include a partition map that shows the partitions on your hard disk. If the selected hard disk includes logical partitions, they are shown within an extended partition. Partitions are color coded to indicate the file system type each uses. For example, dark green indicates a FAT32 partition. In addition, each partition is shaded to show used and unused space within the partition.

The partition map also shows unallocated space (space not assigned to any partition).

There are triangle indicators on the partition map to mark the 2 GB boot code boundary and the 1024 cylinder limit. The boundary markers can help you as you restore image files or set a new partition active. If your operating system requires the boot code to be within the first 2 GB of the hard disk, for example, you can tell at a glance if the partition is located in a place that will make it bootable.

Creating or Resizing Partitions

You can use the Create command in an ImageCenter script to create a partition in unallocated space on your hard disk. For details about the Create command, see page 158.

If you do not have unallocated space on your hard disk, you can create space by deleting a partition with ImageCenter or resizing existing partitions with a product like Norton PartitionMagic. You can also use the Resize Partition command in an ImageCenter script file to resize partitions. See “RESIZE PARTITION” on page 164.

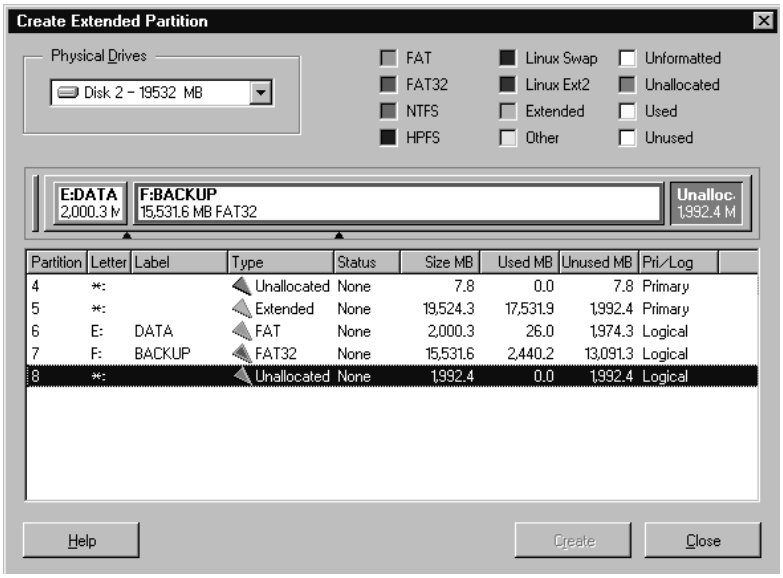
Creating Extended Partitions

If you create an image of a primary partition and want to restore it as a logical partition, you must first have an extended partition on your hard drive.

It is not necessary to manually create an extended partition when you restore an image of a logical partition. ImageCenter automatically creates an extended partition if one does not already exist.

1. At the ImageCenter main screen, click **Tools > Create Extended Partition**.

   The **Create Extended Partition** window appears.



2 Select an unallocated space from the partition list.

If there is no unallocated space on your computer, you must delete an existing partition to create unallocated space.

3 Click **Create**.

ImageCenter creates an extended partition in the selected free space.

4 Click **Close** to return to the ImageCenter main screen.

Resizing Extended Partitions

You can resize an extended partition using a product like Norton PartitionMagic, or you can use the Resize Extended command in an ImageCenter script file. See “REBOOT” on page 163.

Hiding Partitions

The **Hide/Unhide** feature allows you to protect partitions from unwanted user access. You can also hide a partition to prevent having multiple visible, primary partitions on a system where they could make your computer unbootable. Hidden partitions are not accessible

because they are not assigned drive letters when you boot your computer. If you unhide a partition, it is assigned a drive letter the next time you boot your computer and becomes accessible again.

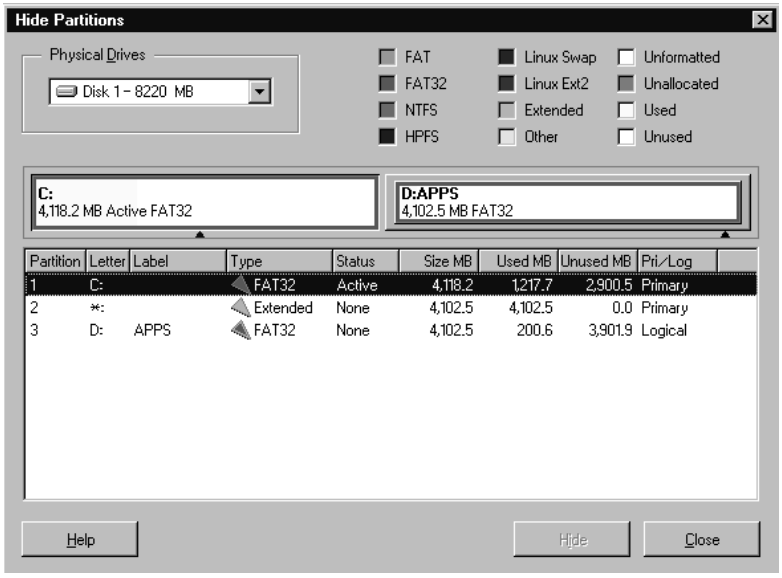
Before hiding and unhiding partitions, be aware of the following restrictions.

- Hiding or unhiding a partition can cause the drive letters of subsequent partitions to change. This may make the computer fail to boot or cause applications to fail.
- If your hard drive contains more than one primary partition, only one is visible by default. When you use the **Set Active Partition** feature, ImageCenter unhides the selected primary partition and automatically hides all other primary partitions. See "Setting the Active Partition" on page 200.
- Because a hidden partition is not bootable or accessible, if you hide the partition where ImageCenter is installed, you must re-install ImageCenter on your new active (bootable) partition to run it again.

To hide/unhide partitions,

1. At the ImageCenter main screen, click **Tools > Hide/Unhide Partitions**.

   The **Hide Partitions** window appears.



2. Click the partition you want to hide.

Normally when you select a visible partition, the **Hide** button becomes available. If the button is not available, the partition can't be hidden.

3. Click **Hide** to hide the selected partition.

   The partition status changes to "Hidden."

Unhiding Partitions

1. Click a hidden partition.

   Normally when you select a visible partition, the Unhide button becomes available. If the button is not available, the partition can't be unhidden.

2. Click **Unhide** to unhide the selected partition.

   The partition status changes to "None."

3. Click **Close** to return to the ImageCenter main screen.

4. Click **Exit** to exit ImageCenter.

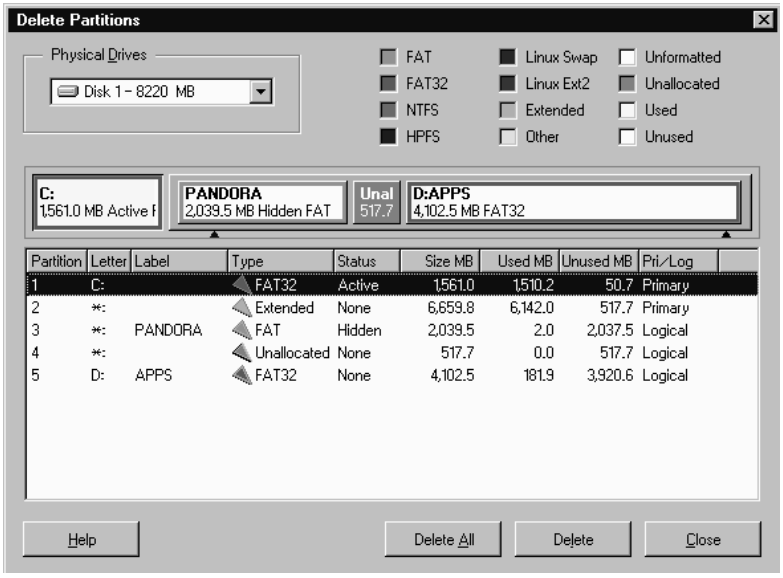
5. Reboot your computer.

Deleting Partitions

This feature deletes existing partitions to create unallocated space on your hard drive. Be aware that deleting existing partitions destroys any data they contain.

1. At the ImageCenter main screen, click **Tools > Delete Disk Partitions**.

   The **Delete Partitions** window appears.

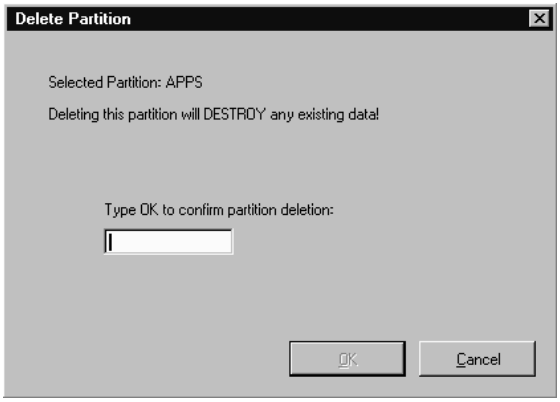


2 Click the partition you wish to delete.

You may need to scroll to view all the partitions on your machine.

3 Click **Delete**, or to delete all partitions click **Delete All**.

The **Delete Partition** dialog appears.



4 Type `OK`, then click **OK**.

ImageCenter deletes the partition and displays the message: “Volume <volume name> was deleted successfully.”

5 Click **Close** to return to the ImageCenter main screen.

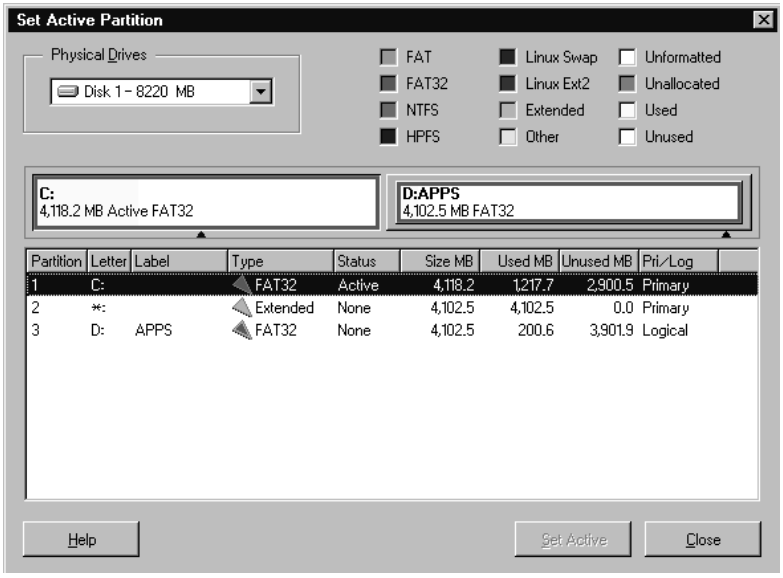
Setting the Active Partition

The **Set Active Partition** feature allows you to make a primary partition the active (bootable) partition. Under Windows 9x, only one primary partition can be active at a time. To be bootable under most operating systems, a primary partition must be located on the first (master) drive, and it must contain an operating system. When your computer boots, it scans the partition table of the first drive to find the active partition, then boots from that partition.

WARNING! Before you set an active partition, be sure it is bootable. If it is not bootable or if you are not sure, locate the boot disk you created when you installed ImageCenter. If you restart your computer and it does not boot normally, you must boot from the floppy disk, run ImageCenter from the program disk you created during ImageCenter install, and set a different partition active. Refer to “Drive Information Displayed on the Screen (Partition Map)” on page 194 for explanations of the ImageCenter screen that may also help you determine if your partition is bootable.

1 At the ImageCenter main screen, click **Tools > Set Active Partition**.

The **Set Active Partition** window appears.



2 Select a primary partition that is not currently active.

3 Click **Set Active**.

The status of the selected partition changes to "Active." Other primary partitions on the drive are hidden. Under Windows NT or Windows 2000, if you wish to maintain multiple visible primary partitions, you can unhide the other primary partitions. You can also unhide partitions using the Unhide scripting command. See page 171.

4 Click **Close**.

5 Click **Exit** to exit ImageCenter.

6 Reboot your computer.

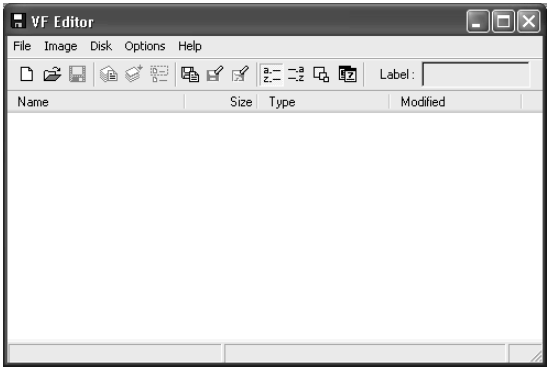
APPENDIX A

Additional Tasks

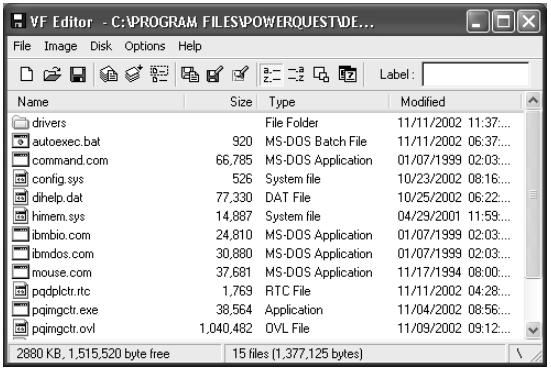
Editing Virtual Boot Disks

You may wish to modify a virtual boot disk to include custom information. Be aware that Symantec cannot support customized virtual boot disks. However, you can modify the virtual floppy with Symantec VF Editor, which is located on the DeployCenter CD.

1. Click **Start > Programs > Symantec DeployCenter 5.7 > DeployCenter 5.7 Tools > VF Editor**.



2. Open the virtual floppy file.



3. Drag the file you wish to change to your desktop, then right-click it and choose **Edit**.
4. Make any changes you want.
5. Save the file, and exit the editor.
6. Drag the edited file back into the VF Editor window.

7 Click **Yes** to overwrite the current file.

8 Exit Symantec VF Editor.

Using ImageCenter with SCSI Hard Disks

To use ImageCenter on a SCSI hard drive, you must have a SCSI controller card that supports software Interrupt 13. Most SCSI controller cards let the user enable software Interrupt 13 support in the BIOS through the card. If your SCSI controller card does not allow you to set it to use software Interrupt 13, ImageCenter will not work on drives attached to your SCSI adapter. Contact the manufacturer of the SCSI adapter to determine if your adapter can support software Interrupt 13. As a general rule, if FDISK can be used to partition the drive, you can use ImageCenter.

Using ImageCenter with Drive Overlay Software

Drive overlay software, such as Disk Manager or EZ-Drive, is needed if the system has an older BIOS and the disk copy is being made from IDE to IDE or IDE to SCSI.

If copying SCSI to SCSI, the older BIOS does not come into play because SCSI has its own translation mechanism.

This section provides information on both IDE and SCSI hard drive installations. The following are scenarios which outline, step-by-step, the installation procedures for a variety of system configurations.

Scenario 1

- The system has a BIOS that does not support large drives.
- The source drive is an IDE that is supported by the BIOS. It does not have a drive overlay program.
- The destination drive is an IDE drive that is not supported by the BIOS and needs to have a drive overlay program to be recognized by the older BIOS.

Steps

1 Install the destination drive as the master and the source drive as the slave and run the auto-detect in the BIOS.

2 Restart the computer with the drive overlay boot disk.

3 Install the drive overlay program to the destination drive that is now set as the master (check with manufacturer).

4 Restart the computer again, allowing the drive overlay program to load.

5 Put your ImageCenter bootable diskette in your diskette drive (A:).

6 In the drive overlay boot menu, select the option to boot from a floppy disk.

7 Make sure that ImageCenter is showing the correct size for each drive and the correct order for the copy sequence.

8 Finish the copy process.

Scenario 2

- The system has a BIOS that does not support large drives.
- The source drive is an IDE drive that the BIOS does not support and a drive overlay program is loaded.
- The destination is a SCSI drive and will not need a drive overlay program.

Steps

1 Leave the source drive set as the master.

2 Install the SCSI drive with the lowest SCSI ID in the SCSI chain.

3 Run the BIOS auto-detect and make sure it recognizes the IDE drive.

4 Run the SCSI BIOS to make sure the SCSI drive is recognized correctly.

5 Restart the computer and allow the drive overlay program to load.

6 Put your ImageCenter bootable diskette in your diskette drive (A:).

7 In the drive overlay boot menu, select the option to boot from a floppy disk.

8 Make sure that ImageCenter is showing the correct size for each drive and the correct order for the copy sequence.

9 Finish the copy process.

Scenario 3

- The system has a BIOS that does not support large drives.
- The source drive is an IDE drive that a drive overlay program has been loaded on.
- The BIOS has been upgraded to support larger drives.
- The destination drive is a large SCSI drive.

Steps

1. Leave the source drive set as the master.
2. Install the destination drive and set it as drive 0.
3. Run the BIOS and auto-detect the drives.
4. Make sure that LBA is off for the source drive.
5. Run the SCSI BIOS to make sure the SCSI drive is recognized correctly.
6. Restart the computer and allow the drive overlay program to load.
7. Put your ImageCenter bootable diskette in your diskette drive (A:).
8. In the drive overlay boot menu, select the option to boot from a floppy disk.
9. Make sure that ImageCenter is showing the correct size for each drive and the correct order for the copy sequence.
10. Finish the copy process.

Scenario 4

- The system has a BIOS that does not support large drives.
- The source drive is an large IDE and a drive overlay program is installed.
- The BIOS has been upgraded to support larger drives.
- The destination is a Large IDE drive.

Steps

1. Set the source drive as the master.
2. Set the destination drive as the slave.

3 Run the new BIOS and auto-detect the drives.

4 Make sure that LBA is turned on for the destination drive and off for the source drive.

5 Restart the computer and allow the drive overlay program to load.

6 Put your ImageCenter bootable diskette in your diskette drive (A:).

7 In the drive overlay boot menu, select the option to boot from a floppy disk.

8 Make sure that ImageCenter is showing the correct size for each drive and the correct order for the copy sequence.

9 Finish the copy process.

Using ImageCenter on a Notebook Computer

To make PCMCIA slots on a notebook computer active for use with ImageCenter, you must load the correct drivers in DOS. Be aware that Symantec Technical Support does not support the process of setting up PCMCIA drivers in DOS.

1 Determine the correct card services DOS driver for your hardware.

   The driver is supplied by the hardware manufacturer. It may be called card services, card-bus services, CardWare, or another name chosen by the manufacturer. Consult the hardware documentation or contact the manufacturer if you do not know which driver is required.

2 Add a statement to your CONFIG.SYS file to load the card services driver.

   For example, `DEVICE=PCMI80CL.SYS`.

   There may be additional switches to configure the device. The hardware manufacturer can provide detailed information.

3 Add a statement to your CONFIG.SYS file to load the NIC or SCSI driver you need.

   For example, `DEVICE=C:\3COM\EL589ND4.SYS`.

Using ImageCenter with a Castlewood ORB Drive

To use a Castlewood ORB drive with ImageCenter, the drive must be correctly configured in the computer BIOS so that DOS can assign it a drive letter and read and copy large files to and from the drive. ImageCenter recognizes the ORB drive as removable media only if

the computer BIOS can be configured to recognize the drive as removable media. For additional information about using ImageCenter with a Castlewood ORB drive, go to service.symantec.com and query "ORB."

Refer to your ORB drive owner's manual, or contact Castlewood Systems, Inc. (www.castlewood.com or *help@castlewood.com*) for more information about configuring the ORB drive for use under DOS.

Using International Keyboards

When you use the ImageCenter rescue disks, you may lose the ability to use your keyboard the way you are accustomed to or to view extended characters properly. The ImageCenter rescue disks include the files you need to resolve these problems.

If you use an international keyboard or character set, you must edit the AUTOEXE2.BAT and CONFIG.SYS files on the rescue disks.

1. The following lines are remarked in the AUTOEXE2.BAT file. Delete the `REM` from the beginning of the line, and replace the variables *xx* and *yyy* with the keyboard code and character set code page for your language.

   ```
   MODE CON CP PREP=((yyy)EGA.CPI)
   MODE CON CP SEL=yyy
   KEYB xx,yyy
   ```

   xx = two-letter keyboard code (for example, US or FR)
   yyy = character set code page (for example, 437)

2. Save the AUTOEXE2.BAT file.

3. The following line is remarked in the CONFIG.SYS file. Delete the `REM` from the beginning of the line, and replace the variable *yyy* with the character set code page for your language.

   ```
   DEVICE=DISPLAY.SYS CON=(EGA,yyy,)
   ```

4. Save the CONFIG.SYS file.

5. Reboot from the first rescue disk.

Finding Jumper Settings

To find the jumper settings for hard disks, consult your hard disk installation guide or contact your hard disk manufacturer directly. In most cases, the hard disk manufacturer's web site will contain the information you need to install the hard disk correctly.

Another valuable resource is the web page, www.thetechpage.com. In addition to listing the most common hard disk manufacturers, this site provides the jumper settings for every hard disk ever made. Note that Symantec is not responsible for the content on this web site and cannot guarantee that the web site addresses will not change.

Using DeployPrep

DeployPrep is a wizard that combines the SID (Security ID) function of Microsoft's SysPrep (system preparation) tool with the image creation ability of Symantec ImageCenter to give you a complete cloning solution for deploying Windows 2000 or Windows XP systems throughout an enterprise.

You can run DeployPrep under Windows 2000 Professional and Windows XP. Symantec does not support using DeployPrep on Windows 2000 Server. Be aware that Microsoft does not support the use of DeployPrep.

How Does DeployPrep Work?

The DeployPrep wizard runs the Microsoft Setup Manager to help you create an "answer file" that is used by the SysPrep tool. (On platforms that do not have the Setup Manager, you must create the answer file manually using a text editor such as Notepad.) The answer file defines how your target machine will be set up. Depending on the answers you give, the setup can run unattended or with minimal input from the workstation user.

Next, you use DeployPrep to review and test your settings in the answer file. For example, you can test your answers to determine how automated the target setup is. If you find problems in the answer file, you can go back and edit the settings.

Finally, DeployPrep commits your answer file settings to SysPrep, then runs ImageCenter from a boot disk so you can create the source image. For additional information about SysPrep, see your Microsoft documentation.

Microsoft may have a version of SysPrep that is newer than the version included on your Windows CD. If you need new features that are included in updated versions of SysPrep, you should run DeployPrep, which will prompt you for the Windows CD and copy SysPrep to the \SysPrep folder on the same drive that contains your Windows operating

system. Then download the new version of SysPrep from www.microsoft.com/windows2000/downloads/tools/sysprep/default.asp, and copy the new version of SysPrep into the SysPrep folder, overwriting the older version.

APPENDIX B

Setting Up Removable Storage Devices

This appendix describes removable media device drivers included with DeployCenter and how to manually install them on a hard drive or diskette.

The DeployCenter install program installs and configures the drivers for removable storage devices. This information is provided for those who want to manually configure these drivers or alter the standard configuration.

Using Removable Media with Network Clients

If you are using a Jaz or Zip parallel port device with a network client, be aware that loading a parallel port device driver with a network client installed will cause the system to hang. To successfully install the device driver for the parallel drive, reboot the system without loading the network client.

Iomega Drivers

Iomega provides a driver loader program that allows you to load drivers from the AUTOEXEC.BAT file. Each time the Iomega driver program loads, it must also load an ASPI manager to communicate with the Zip or Jaz drive. The DeployCenter install program copies a large set of ASPI managers to the DRIVERS directory for SCSI, IDE, and Parallel Port interfaces.

The Iomega driver program tries to load each ASPI manager until it finds one that matches. If it does not have to use this trial-and-error process to find the correct ASPI manager, it can load more quickly. (If you have a non-Iomega SCSI driver, you must load the ASPI manager manually.)

Iomega has not provided a DOS driver for their Zip drives that attach to a USB (Universal Serial Bus) port. Consequently, you cannot create or restore image files to a Zip drive that is attached to a USB port.

You can access a document, "Using Drive Image with Iomega Removable Drivers," at the Symantec support web site. Go to *service.symatec.com*, and query "Iomega." This document is available in English only.

Editing Your GUEST.INI File

If you use only one or two specific host adapters, you may want to edit the GUEST.INI file and remark (using the REM command) the ASPI managers you do not need. This way only the ASPI managers you normally use will be loaded and tested.

1. From the DRIVERS directory where you installed ImageCenter, locate the GUEST.INI file and open it using Notepad in Windows, DOS EDIT, or any other ASCII text editor.

2. Find the ASPI manager line for the Iomega driver that supports your drive. For example, if you routinely use an Iomega PC1616 adapter, use the line that reads ASPI=ASPI1616.SYS.

The following table lists the supported Iomega adapters and their corresponding ASPI managers.

Iomega Adapter	ASPI Manager
Jaz jet PCI (PC/Mac model)	ADVASPI.SYS
Jaz jet (PC-only model)	ASPI8DOS.SYS
Jaz jet ISA	ASPIPC16.SYS
Jaz Traveller	ASPIPPM1.SYS
Parallel Port Zip drive	ASPIPPM1.SYS
Zip zoom SCSI Accelerator	ASPIPC16.SYS
Zip Card PCMCIA SCSI adapter	ASPIPC16.SYS
Zip IDE drive	ASPIIDE.SYS
PC1616 adapter	ASPI1616.SYS
PC1600 adapter	ASPIPC16.SYS

3. Add a REM at the beginning of each ASPI manager line you do not want to load.

   For example, in a case where the Zip or Jaz drive is connected to an Iomega PC1616 adapter, you would remark all ASPI manager lines except ASPI1616.SYS:

```
REM ASPI=ASPIPPM1.SYS /INFO FILE=NIBBLE.ILM SPEED= 1
REM ASPI=ASPIIDE.SYS /INFO
REM ASPI=ASPI8DOS.SYS /D
REM ASPI=ADVASPI.SYS
REM ASPI=ASPIPC16.SYS INFO
ASPI=ASPI1616.SYS /SCAN /INFO
```

4. Save the changes to the GUEST.INI file and exit the text editor. If you are using a word processor, be sure to save the file as ASCII or DOS text.

   If you later need to use an ASPI manager which has been remarked, edit the GUEST.INI file again and remove the REM command at the beginning of the ASPI manager line.

ASPI Manager Reference

Detailed reference information on the ASPI managers used by the Iomega driver program is located in the electronic Installation Manual (MANUAL.EXE) on the Iomega installation diskette.

1. For either Windows or DOS, go to a DOS prompt, type `A:`, then press <Enter>.

2 Type MANUAL, then press <Enter>.

Assigning Specific Drive Letters for Iomega Drives

To specify the first drive letter you want the Iomega drive to use, add the LETTER= *option* to the command line. For example, if you type GUEST.EXE LETTER=G, then G will be assigned to the first supported drive it finds.

If you have more that one Iomega drive, each additional drive will receive a drive letter following G in alphabetical order. (When supporting more than one drive, drive letters are assigned in order of SCSI ID number, from lowest to highest.)

For more information about Iomega drives, refer to the install diskettes that came with your Iomega product or the Iomega web site *www.iomega.com*.

Magneto-Optical Disk Drives

The 3.5-inch Magneto-Optical (MO) drive is available with either a SCSI or ATAPI interface. Separate DOS device drivers are supplied for each interface type. The device driver supports the FAT (File Allocation Table) file system, read/write, and disk change status.

The SCSI device driver requires a SCSI host adapter card and its matching ASPI manager software. For more information, see the "List of ASPI Managers and Supported Adapters" on page 218 and your SCSI host adapter documentation.

The 3.5-inch Magneto-Optical disks are available in several capacities.

The volume format may be **Super floppy**, **AT Hard disk**, or **NSR** format. The driver automatically detects the volume format and assigns logical drive letters (such as D:). If no valid formats or partitions are detected, the device driver identifies the disk as unformatted. See the driver documentation supplied with the product for additional information about formatting MO disks.

Installation of Magneto-Optical Drivers

The ATAPI MO device driver is loaded in the CONFIG.SYS file using the following command:

```
DEVICE[HIGH]=(path)\MODISKAP.SYS [/P][/Ii][/Rr]
```

The SCSI MO device driver is loaded in the CONFIG.SYS file using the following:

```
DEVICE[HIGH]=(path)\ASPIXXX.SYS
```

```
DEVICE[HIGH]=(path)\MODISK2.SYS [/P][/Ii][/Rr]
```

ASPIXXX.SYS represents the ASPI manager that matches your SCSI host adapter.

Optional Switches

/P

Pauses screen messages after the driver has been loaded and initialized. Press any key to continue the operation. Use this option to check the messages displayed by the driver.

/Ii ATAPI driver

Only the device connected to port IDE i is mounted. Otherwise, all ports are scanned MO devices.

i is defined as:

1 = Primary Master
2 = Primary Slave
3 = Secondary Master
4 = Secondary Slave

/Ii SCSI driver

Only the SCSI device with ID i is mounted. Otherwise all SCSI IDs are scanned. To also specify the host adapter number, enter /Ih:i (h is the host adapter number and i is the SCSI-ID). To specify multiple devices, use the "+" character as a delimiter. For example: /I0:1+1:2

/Rr

Reserves the specified number of logical drive letters (r=1 to 10) for a single drive. Otherwise, a single drive letter is reserved. The number of reserved drive letters is independent of the number of disk partitions. The driver can access only as many partitions as the number of reserved drive letters.

If the inserted disk contains more partitions than specified by the /r option, as many drive letters are assigned to the disk drive as there are defined partitions. If the disk has fewer partitions than the number of drive letters reserved, an error occurs only when the driver attempts to access the additional drive letters.

LASTDRIVE

The CONFIG.SYS last drive command does not affect the drive letter assignment in the MO disk drive. If the driver assigns a drive letter higher than the one specified by the LASTDRIVE command (default is E:), the CD drive cannot be accessed. To enable access to the CD drive, specify a larger value in the LASTDRIVE command.

If the following conditions exist, the device driver will not be loaded into memory and the message "Driver not loaded" will display.

- No ASPI manager loaded
- Cannot find MO drive (with or without a disk inserted)
- Driver already loaded

IMPORTANT! The SMARTDRV cache is turned off by default for MO disk drives. If you attempt to write data to a write-protected disk while the SMARTDRV write cache is on, you will need to reset the computer.

You can read more about Magneto-Optical disk drivers from the install diskettes that came with the product and from the Fujitsu web site *www.fujitsu.com*.

SyQuest Drivers

Symantec does not supply, configure, or support SyQuest devices or drivers with ImageCenter.

List of ASPI Managers and Supported Adapters

The following is a list of several popular ASPI managers and the cards they support. ImageCenter will use the ASPI manager you install to support your SCSI card.

ASPI8DOS.SYS

PCI Bus

Adaptec AHA-2910A/2910B
Adaptec AHA-2930A/2930B
Adaptec AHA-2940/2940AU/2940W/2940U/2940UW
Adaptec AHA-2944W/2944UW
Adaptec AHA-3940/3940U/3940W/3940UW
Adaptec AVA-2904, AVA-2902E/I
Adaptec AIC-7850/7855/7860/7870/7880 based SCSI host adapters

Jaz jet (PC-only model)

ASPI7DOS.SYS

EISA Bus

Adaptec AHA-1740/1742/1744
Adaptec AHA-1740A/1742A
Adaptec AHA-2740/2742/2740T/2742T
Adaptec AHA-2740A/2742A/2740AT/2742AT
Adaptec AHA-2740W/2742W
Adaptec AIC-7770 based SCSI host adapters

VL BUS

Adaptec AVA-2825
Adaptec AHA-2840VL/2842VL
Adaptec AHA-2840A/2842A

ASPI4DOS.SYS

ISA Bus

Adaptec AHA-1540B/1542B
Adaptec AHA-1540C/1542C
Adaptec AHA-1540CF/1542CF
Adaptec AHA-1540CP/1542CP
Microchannel Adaptec AHA-1640

ASPI2DOS.SYS

ISA Bus

Adaptec AVA-1502P/AP
Adaptec AVA-1505
Adaptec AVA-1515
Adaptec AHA-1510/1520/1522
Adaptec AHA-1510A/1520A/1522A
Adaptec AHA-1510B/1520B/1522B
Adaptec AHA-1530P/1532P
Adaptec AVA-1502AE/AI, AVA-1505AE/AI, AVA-1505AES
Adaptec AIC-6260/6360/6370 based SCSI host adapters
Adaptec AVA-1502AE/AI, AVA-1505AE/AI, AVA-1505AES

PCMCIA Bus

Adaptec SlimSCSI (APA-460 & APA-1425/50/50A/60/60A)

MCAM18XX.SYS

PCI Bus

Adaptec AHA-2920/2920A

MA160.SYS

If needed, add this adapter to the ASPI manager lines in your GUEST.INI or LDSQSCSI.BAT files.

ISA Bus

Trantor T160
Microchannel Trantor T260

MA348.SYS

If needed, add this adapter to the ASPI manager lines in your GUEST.INI or LDSQSCSI.BAT files.

Parallel Port Trantor MiniSCSI Plus (T348)
Adaptec MiniSCSI Plus (APA-348)

MA358.SYS

If needed, add this adapter to the ASPI manager lines in your GUEST.INI or LDSQSCSI.BAT files.

Parallel Port Trantor MiniSCSI EPP (T358)
Adaptec MiniSCSI EPP (APA-358)
Adaptec MiniSCSI EPP (APA-358A)

ASPIIDE.SYS

IDE

SCSI to IDE ASPI Manager
Zip IDE drive

ASPIATAP.SYS

SCSI to ATAPI ASPI Manager

ASPIPPM1.SYS and ASPIPPM2.SYS

SCSI to Parallel Port Zip Drivers
Jaz Traveller

ASPIEDOS.SYS

Adaptec AHA-1740/1742/1744 (in Enhanced Mode only)

ASPIPC16.SYS

PC1600 adapter Zip Zoom SCSI Accelerator
Adaptec APA-1460 and other AIC-6260/5360 based adapters
Jaz jet ISA adapter
Zip zoom SCSI Accelerator
Zip Card PCMCIA SCSI adapter

ASPI1616.SYS

PC1616 adapter and other NCR-53C406A based adapters

ASPI2930.SYS

AHA-2930 adapter

APPENDIX C

Troubleshooting

Accessing Your CD Drive

If you need to access your CD drive from ImageCenter, you will need to add the command in the CONFIG.SYS file to load your CD driver. You will also need to add the command in the AUTOEXEC.BAT file to load the CD extensions.

1. At the DOS prompt, change to the directory of the CONFIG.SYS you want to edit. For example, if you are editing the CONFIG.SYS on a boot diskette, type *drive*: (where *drive* is the drive letter of the boot diskette), then press <Enter>.
2. Type `EDIT CONFIG.SYS` and press <Enter> to start the DOS Editor and retrieve the CONFIG.SYS file.
3. Add either the DEVICE or DEVICEHIGH command. For example, type one of the following:

   ```
   DEVICE=[drive:][path]filename [dd-parameters]
   ```

   ```
   DEVICEHIGH=[drive:][path]filename [dd-parameters]
   ```

   where [*drive*:][*path*]*filename* specifies the location and name of the CD device driver and [dd-*parameters*] specifies any command-line information the device driver requires.

   You may want to use DEVICEHIGH if you need to conserve conventional memory.

   For more information on your device driver, consult the documentation that came with your CD drive.
4. Click **File > Save** to save the file.
5. Click **File > Open** and retrieve the AUTOEXEC.BAT file.
6. Add the command line MSCDEX.EXE.
7. Click **File > Save** to save the file.
8. Click **File > Exit** to exit the editor.

Bootable CD

The DeployCenter CD is bootable. If your system fails, you can boot from the CD to get a command prompt.

Increasing Windows NT Server Speed

If your Windows NT server slows dramatically when running ImageCenter, the server may be trying to cache the whole image file in memory. With one or more clients on the network trying to restore images, the server fills up its RAM with the image files. With very little RAM left to handle further requests, the server slows down.

Microsoft suggests that you add more RAM to the server. You can also add the /MFS=100000000 switch to the command line when starting the ImageCenter executable. This limits each image file size to around 100 MB. This will help because each file is closed after moving to the next file, and Windows NT can reuse the memory cache. The Windows NT server no longer tries to cache the whole image file in memory. The downside is that your images will be split into many segments, making them more difficult to manage.

ATA66 and ATA100 Controllers

If ImageCenter runs slowly and your system has a UDMA ATA66 or ATA100 controller, your system may need a UCMA enabler to load from the config.sys file. Contact the controller manufacturer or motherboard manufacturer for details.

Resolving Check Errors

ImageCenter checks the integrity of a partition very thoroughly prior to creating an image file or copying a partition. These checks are substantially the same as those made by the operating system's CHKDSK, SCANDISK, or AUTOCHK utility.

If you receive a Check error message for any partition, after backing up your hard drive, run your operating system's CHKDSK program on that partition. CHKDSK usually shows the same problems as ImageCenter. (If you are using Windows NT CHKDSK, DO NOT use the /F switch on the initial run.)

Run SCANDISK if you have MS-DOS 6.x or Windows 95.

The DOS CHKDSK program does not detect problems in Extended Attributes.

If CHKDSK (or SCANDISK) does not show the same errors that ImageCenter shows, contact Symantec Technical Support. If the CHKDSK (or SCANDISK) program and ImageCenter detect the same errors (which is usually the case), run CHKDSK with the /F switch to fix the problem.

After running CHKDSK /F, run CHKDSK without the /F switch to make sure the partition is free of errors.

ImageCenter also checks a partition after restoring it. If this check fails, report the problem to Symantec Technical Support. The problem is usually a minor file system error that CHKDSK /F can correct without data loss. For more extensive errors, you may need to restore your files from a backup copy.

Resolving Partition Table Errors

In some cases, Symantec technical support can help you fix partition table errors without data loss. Check with them first before proceeding to the following steps.

To resolve some partition table errors, you must create new, error-free partition tables.

1. Make sure you have no viruses. See "Partition Tables and Viruses" on page 226.
2. Back up the data on the affected partitions.
3. Delete the partitions.
4. Recreate the partitions.
5. Restore the contents of the partitions.

Partition Tables and Viruses

If partition changes made under one operating system are not reflected under the other, and vice versa, it is possible that a master boot record (MBR) virus is present.

Use a virus check utility that can detect the latest viruses. If a virus is found, data loss is likely. If a virus is found, perform the following:

1. Before removing the virus, run ScanDisk or CHKDSK under each of the operating systems to evaluate the integrity of the partition.
2. Back up the files from any partition that passes the Check operation.
3. After backing up the files from all operating systems, remove the virus.
4. Run ScanDisk or CHKDSK under each of the operating systems again.
5. Delete and recreate any partitions which fail the check.

6 Reinstall the operating systems.

7 Restore the backup files as necessary.

Generating Diagnostic Reports with PARTINFO

PARTINFO, a Symantec utility program included on the DeployCenter CD, generates a report showing the contents of your hard disk partition table.

1 Boot the computer to DOS.

2 Change to the directory that includes PARTINFO.EXE.

3 You have several options for running PARTINFO.

To do this:	Do this:
To display partition information on your screen	Type `PARTINFO`, then press <Enter>.
To send a report directly to your printer	Type `PARTINFO >LPT1` or `PARTINFO >PRN`, then press <Enter>.
To save the report as a text file on a floppy disk	Type `PARTINFO >A:\PARTINFO.TXT`, then press <Enter>.

Symantec support technicians may request a report from PARTINFO to help you resolve any problems with Symantec ImageCenter.

Troubleshooting the PXE Server

This section addresses the following situations:

- Client machine does not prompt for network booting at start-up.
- User chooses network booting at start-up, but the client machine cannot find the PXE server.
- Client's network boot shows a menu, but it is not the expected menu.

Client machine does not prompt for network booting at start-up.

Either the machine does not have a PXE-compliant network card, or the BIOS does not list network booting before booting from disk in the boot sequence. Check your hardware and BIOS for the correct settings.

User chooses network booting at start-up, but the client machine cannot find PXE Server.

This occurs if you installed the PXE server on the same machine that provides your network's DHCP service. This happens if you failed to tell the installation program that the PXE Server machine is also running DHCP; or you did, but the install program could not automatically adjust the DHCP configuration to make it compatible with a PXE server running on the same machine. To make these two services co-exist on the same machine, see "Installing PXE Server on the DHCP Machine" on page 110.

This problem could also occur if you told the installation program that you were installing the PXE server on the same machine as DHCP, but the machine *did not* have a DHCP service running. The installation would have changed PXE server's configuration, but it could not change DHCP. You must adjust the PXE server's registry setting, so it does not conflict with the DHCP service. See the first part of "Teaching PXE Server That it is Not on the DHCP Machine" on page 112.

Client's network boot shows a menu, but it is not the expected menu.

If you have more than one PXE server on the same network, the client can choose which server menu to display. You should consider removing one of the servers and combining the menus and boot programs from one server into the other.

DHCP servers can act as PXE servers too, and clients will always choose PXE menus from DHCP servers first (if available) over those from non-DHCP servers. Unless you are intentionally using your DHCP servers's PXE capabilities, you may want to disable them. See "Turning off DHCP's PXE Services" on page 110.

Error Messages and Solutions

If you encounter an error not included in this section of the manual, check Symantec's web site, *http://service.symantec.com*.

Miscellaneous Errors (3–38)

#3 Not enough memory

The DOS ImageCenter executable running under DOS requires a minimum of 400KB of memory in the first 640KB of the computer's address space (conventional memory) and 16 MB of total memory.

#8 Could not allocate/deallocate DOS real mode memory

The DOS ImageCenter executable running under DOS requires some memory in the first 1MB of the computer's address space. (ImageCenter uses a DOS extender.) If not enough memory is available, ImageCenter cannot access the hard drive.

#23 Unsupported version of operating system

The operating system versions that are required to run ImageCenter are listed under “Symantec DeployCenter System Requirements” on page 6.

#36 DPMI Server error

ImageCenter DOS executables use a DOS extender. This error indicates a failure during a call made from ImageCenter through the DOS extender (to DOS or to the BIOS). The DOS extender may be in conflict with other programs that use extended memory. DOS would load the conflicting programs from your CONFIG.SYS or AUTOEXEC.BAT file during the normal boot sequence.

You may be able to resolve this problem by pressing <F8> while booting DOS. After DOS boots and starts to read the commands from your CONFIG.SYS and AUTOEXEC.BAT files, DOS will ask if you want to execute each command. When you see commands that load device drivers or TSR programs that you think might be conflicting with the ImageCenter DOS extender, answer N (no) to tell DOS not to execute that command (not to load that software into memory). You will often be able to find a program configuration that will enable ImageCenter (the DOS extender) to run without error.

Disk Access Errors (40–56)

Errors 40-56 indicate that ImageCenter cannot access your hard disk; these errors are often reflect hardware problems. Some problems have simple solutions; for other problems, the only solution is to replace the hard drive. When possible, ImageCenter detects errors before any changes have been made, so you can back up your data before replacing the hard drive.

#45 CRC Error in Data

This error means that either the source or destination drive has physical problems. Often, running ScanDisk, CHKDSK, or another hard drive diagnostic utility will fix this problem.

If the error still occurs after you have done this, try one of the following:

- Update to the current version of the product you are using.
- If you have two IDE hard drives on your system that are sharing the same cable, try putting the drives on separate cables.
- If the error is the result of a corrupt file, you can identify the affected file by running ImageCenter from the command line prompt using the /DBG switch and sending the results to a text file. When the error is reported again, the name of the file that was being read at the time the error occurred is written to the text file. Once you have identified the corrupt file, replace it with a good backup copy of the file if possible.

#49 Write fault
#50 Read fault

ImageCenter is unable to read or write from a specific sector on the hard drive. There are a number of possible causes of this error:

- If your PC beeps or displays a black box in the middle of the screen, virus protection is enabled in your computer's BIOS. Disable virus or boot sector protection in the BIOS.
- A virus protection application (which may be a TSR or DLL program) is in use. Disable the application before using ImageCenter.
- There is a bad sector on the hard drive. (This is usually the case with only older hard drives.) Run a thorough SCANDISK on the hard drive to perform a surface scan to verify the existence of bad sectors. If your drive has bad sectors, we recommend you replace it. You may be able to use ImageCenter, or you may need to back up your files using another method.
- You have set up disk mirroring with PC-Tools. Disable disk mirroring.
- Your caching controller card is not set up properly.

Partition Table Errors (100–199)

Errors in the 100-199 number range are partition table errors. For general information about solving this type of error, see “Resolving Partition Table Errors” on page 226.

#100 Partition table is bad

The master boot record (MBR) can contain, at most, one extended partition, and each extended partition boot record (EPBR) can contain, at most, one link to another EPBR. This error occurs when a partition table violates the foregoing rule. Since any modifications ImageCenter makes may decrease the amount of data that is recoverable from the hard drive, ImageCenter will not recognize any of the hard drive's partitions. You must create new, error-free partition tables to resolve your problem. See “Partition Tables and Viruses” on page 226.

#104 No sectors in partition

No partition should contain zero sectors. Delete the partition before using ImageCenter.

#105 Partition starts on wrong boundary
#106 Partition doesn't start with sector one

The hard-disk partition table contains erroneous values. ImageCenter expects FAT, NTFS, and HPFS partitions to begin and end on the boundaries used by FDISK. If they do not, the disk may be partially corrupted. In this circumstance, if ImageCenter were to make any modifications it might cause the loss of data. Therefore, ImageCenter will refuse to recognize any of the hard drive's partitions. To resolve this problem, see “Resolving Partition Table Errors” on page 226.

#107 Partition begins after end of disk

This error can occur when you are running ImageCenter on a hard drive that uses more than 1,024 cylinders. Under DOS, ImageCenter is restricted by the BIOS 1,024 cylinder limit. If any partitions extend beyond the limit, ImageCenter cannot safely operate on the hard drive.

This error can also occur if a partition erroneously extends beyond the physical end of the hard drive. This may happen if the hard drive has been used on a different computer or with a different hard-disk controller or if BIOS settings have been changed. Be advised that the physical geometry of the hard drive may differ from the logical geometry assigned to the hard drive by the operating system.

#108 Partition doesn't end at end of cylinder

See error #105.

#109 Partition ends after end of disk

See error #107.

#110 Partition table number of sectors is inconsistent

The hard-disk partition table contains two inconsistent descriptions of the number of sectors on the hard drive. This error is serious if both DOS and another operating system use the hard drive. Because DOS uses one description and other operating systems may use the other, data loss is likely once the partition is almost full. To resolve this error, see “Resolving Partition Table Errors” on page 226.

#111 Logical partition starts outside Extended

The hard-disk partition table contains erroneous values. All logical partitions must be totally contained within the extended partition. To resolve this error, see “Resolving Partition Table Errors” on page 226.

#112 Logical partition ends outside Extended

See error #111.

#113 Partitions overlap

The hard disk partition table contains erroneous values. If data partitions overlap, writing to one may destroy data in another.

If a primary partition overlaps the end of the extended partition, but does not overlap any logical partitions within the extended partition, the problem can be remedied by patching the partition table. **Only qualified individuals should attempt this repair!** An incorrect patch could destroy all data on the hard drive! In most instances, you should resolve the problem as explained in “Resolving Partition Table Errors” on page 226.

#116 Partition table Begin and Start inconsistent

The hard-disk partition table contains two inconsistent descriptions of the partition's starting sector. This error can occur if the operating system reports a hard-disk geometry that is different than the geometry in use when the partition table was written. Possible causes of the hard-disk geometry changing are:

- Different operating systems (for example, DOS and Windows) report different hard-disk geometries.
- You boot from a diskette that loads a different driver than is loaded when you boot from the hard drive.
- The hard drive or controller has been changed.
- The BIOS has been upgraded.
- The BIOS LBA setting has been changed.

- There is a partition table virus present on the hard drive.

In most instances, you should resolve the problem as explained in "Resolving Partition Table Errors" on page 226. You can also use a virus scanning program to remove any partition table virus. Data loss is possible if the number of heads or sectors per track has changed since you first created your partitions.

#120 The logical drive chain is incompatible

This error occurs under some OSs when logical partitions are not chained together in the expected order. DOS, Windows 95, and Windows NT require that logical partitions be chained together in ascending order. Some other operating systems do not require this. For example, some versions of the Linux FDISK utility chain logical partitions together in the order they are created.

WARNING! This error message identifies a dangerous situation; using the DOS FDISK in this situation can cause loss of one or more partitions.

For solutions to this problem, see the instructions in "Resolving Partition Table Errors" on page 226.

If you decide to back up your data and recreate your partitions, you may have to use the same partitioning program that you used to create the partitions to delete them.

#121 The first sector of the drive cannot be read

The first sector of the hard drive (cylinder 0, head 0, sector 1) contains the master boot record (MBR) and the primary partition table. ImageCenter cannot make changes to this hard drive because an error occurred when it read the first sector. See error #50 for information on resolving this error.

#122 A bad sector was found in the current or new partition area

The partition cannot be moved safely because there is a bad sector in the new or current partition area. When you see this error message, the move operation will be aborted before any corruption can occur. Try moving the partition to a different place. If your hard drive has bad sectors, we recommend that you replace the hard drive.

Check Errors (500–599)

Check errors occur when ImageCenter checks the integrity of a partition. For useful general information about resolving these errors, see "Resolving Check Errors" on page 225.

#500 Subdirectory is corrupted

This error message reveals the name of the corrupted subdirectory. Back up the contents of that directory and its subdirectories. You can then delete the corrupted subdirectory.

#501 Cross-linked files were found

ScanDisk or CHKDSK should be able to find these errors and correct them.

#506 Not enough free space on partition to shrink

Some free space (which is dependent on the hard drive's current contents) is required to resize a partition smaller. Delete unneeded and duplicate files in the partition, then attempt the operation again.

#508 As specified, the operation does not change the partition

You have entered a value that is the same as or (when rounded to the required cylinder boundary) rounds to the same as the partition's present value. Enter a larger change.

#509 A bad sector was detected in the current or new FS area

In order to perform the resize operation that you requested, ImageCenter attempted to expand the file system area. However, the program found a bad sector in the new area. Try moving the partition before you resize it. No corruption will occur when you encounter this error.

#510 The version of the file system is not supported

An updated version of ImageCenter is required to operate on this new version of the file system. Visit *service.symantec.com* for information about updated versions of ImageCenter.

NTFS Check Errors (1500–1699)

Errors 1500-1699 are NTFS-specific error messages. In this context, “attribute” does not mean read-only, hidden, system, and so on. Rather, “attribute” means one of a file’s data streams. Check errors occur when ImageCenter checks the integrity of a partition. For useful general information about resolving these errors, see “Resolving Check Errors” on page 225.

#1501 Wrong version of NTFS

The partition was created using a version of the NTFS file format that ImageCenter cannot work with.

#1503 Bad NTFS cluster size

The NTFS cluster size must be 512, 1,024, 2,048, or 4,096 bytes.

#1512 Restart record mismatch

The two restart entries in the journal file are different. This may happen if Windows NT is not properly shut down. To fix this problem, restart Windows NT and shut it down using the Shut Down command.

#1516 Partition improperly dismounted

The partition dirty flag is set in a restart record in the journal file. This error may have been caused by a power failure or system crash while the Windows NT operating system was writing the partition. Reboot Windows NT and execute CHKDSK /F to repair the damage.

#1527 Bad update sequence number

A buffer contains mismatched update sequence numbers. This error may have been caused by a power failure or system crash while the Windows NT operating system was writing to the partition. Reboot Windows NT and execute CHKDSK /F to repair the damage.

#1529 Information mismatch in directory entry

A file attribute stored in a file record is different from the attribute stored in its directory entry. If this error is in a system file (file 0-10), Windows NT's CHKDSK program will not fix it, but Windows NT will rebuild the root directory on the partition the next time the operating system is started.

#1538 Can't find contiguous space to move

The partition does not contain enough contiguous free space to hold the new copy of a file that must be contiguous. You will normally encounter this error when you use the Resize option to resize a partition smaller.

#1539 File size mismatch

The size of a system file (file 0-10) recorded in its file record does not match either the size recorded in its directory entry in the root directory or the size of its data stream.

#1544 External attribute list in external attribute

An external file record has an external attribute list.

#1545 File attributes out of order

The attributes in a file must appear in order of increasing numeric type.

#1546 Attribute neither resident nor nonresident

The attribute resident flag has a value other than resident or nonresident.

#1547 Wrong run limits

A run has more clusters than the difference between its highest and lowest cluster.

#1548 File table has fewer than 16 entries

The file table must have at least 16 entries.

#1549 File table has more than 4 billion entries

The file table must have fewer than 4 billion entries.

#1644 Bad system file sequence number

A system file has a bad sequence number. System files must have a sequence number from 0 to 10. A partition with this problem may pass a run of Windows NT's CHKDSK program, but Windows NT will not mount the partition the next time the operating system is started.

#1647 Error in root directory index

There is an error in the root directory's index. Running Windows NT's CHKDSK program will not fix this problem, but the Windows NT operating system will automatically rebuild the root directory on the partition the next time it is started.

#1654 File system smaller than partition

This is an informational message only that indicates there may be wasted space on your hard disk. However, your data is not in danger, and you do not need to do anything to correct the error.

Miscellaneous ImageCenter Error Messages

#1701 Disk not empty

Used in scripting. The DELETE ALL command failed to delete all the partitions on the drive.

#1800 Partition not open

Attempted operation on a partition in an improperly opened image file.

#1801 Partition not found

Did not find requested partition in image file.

#1802 Corrupt bundle

Image file header information is not valid.

#1803 Bundle read only

Attempted to delete or write to a partition in the image file which was opened in read-only mode.

#1804 No bitmap Image

File contains no partition bitmap.

#1805 Write failed

Error encountered while writing image to file. This error usually occurs when ImageCenter runs out of space in the partition to which it is writing an image file.

#1806 Out of memory

Out of memory.

#1807 Compression

Error encountered while compressing or decompressing image file data.

#1808 Buffer too small

Buffer too small to read in partition bitmap.

#1809 No more free space

No more free space available to process remaining partitions.

#1810 Err open failed

Could not open image file.

#1811 Err read failed

Could not read from image file.

#1822 No partitions selected

This error is returned during script file execution when a partition is not selected before a query for partition information.

#1830 Scripting Halted By Error

This error can be reported if, during a scripted restore, the image that is being restored is also open in ImageExplorer.

#1839 Invalid Parameters at end of line

Verify that the command line parameters (switches) you used are valid.

#1842 Button Already Specified

The script message command contains multiple references to same button.

#1843 Script Argument Type

The argument to the script function is an invalid type.

#1844 Script Argument Invalid

The argument to the script function has an invalid value.

#1845 Script Arguments Don't Match

Both arguments to the script function must be of the same type.

#1846 Script Unknown Parameter

The parameter to the script command is invalid.

#1847 Script Missing Parameter

The script command expects an additional parameter.

#1856 Cannot save image on this partition

You cannot save an image file to a partition that is included in the image file. For example, if you are imaging your C: and D: partitions, you cannot save the image to either of those partitions. If you are imaging an entire hard disk or system, you must either create a separate partition for the image file or save the image file to external media.

#1900 Err invalid drive number

The script contains an invalid drive number.

FAT Check Errors (2000–2099)

Check errors occur when ImageCenter checks the integrity of a partition. For general information about resolving these errors, see "Resolving Check Errors" on page 225.

#2001 FAT copies are not identical

Run ScanDisk to fix this error. This problem may also be caused by a virus. Run a virus checker and remove the virus if possible.

#2005 One or more lost clusters were found

Run ScanDisk or CHKDSK to fix this error.

#2012 Formatted FAT file system too big for partition

This error can be caused by the following circumstances:

- The number of sectors in the partition is larger than 65,536, and the bsHugeSects field of the boot sector (“Big total number of sectors” in Norton's DISKEDIT utility) shows that there are more sectors in the partition than the partition table shows.
- The number of sectors in the partition is less than 65,536, and the bsSects field of the boot sector (“Total sectors on disk” in Norton's DISKEDIT utility) shows that there are more sectors in the partition than the partition table shows.

This situation can result in data loss when the FAT file system tries to use space outside the partition that does not exist or that belongs to another partition. Since file data may exist outside the partition boundary, you cannot fix the problem by simply patching the boot sector.

To correct the error, back up all data on the partition, delete the partition, recreate the partition, and restore the data. Alternately, it has been reported that you can use Norton Disk Doctor to fix this problem.

#2013 A component of FAT geometry is bad

This error can be caused by the following circumstances:

- The number of clusters on the hard drive is greater than the FAT limits allow. This can result from bad values in the boot sector for the number of sectors, FATs, root entries, reserved sectors, and sectors per cluster.
- The number of sectors in the FAT is not large enough to hold the number of clusters present on the hard drive.

A qualified consultant may be able to fix the hard drive by performing simple patches. Alternately, you can back up the data on the partition, delete the partition, recreate the partition, and restore the files.

APPENDIX D

Symantec Technical Support

Symantec Technical Support maintains support centers globally. Technical Support's primary role is to respond to specific queries about product feature and function, installation, and configuration. The Technical Support group also authors content for our online Knowledge Base. The Technical Support group works collaboratively with the other functional areas within Symantec to answer your questions in a timely fashion. For example, the Technical Support group works with Product Engineering and Symantec Security Response to provide alerting services and virus definition updates.

Symantec's maintenance offerings include the following:

- A range of support options that give you the flexibility to select the right amount of service for any size organization
- Telephone and Web-based support that provides rapid response and up-to-the-minute information
- Upgrade insurance that delivers automatic software upgrade protection
- Global support that is available 24 hours a day, 7 days a week worldwide. Support is provided in a variety of languages for those customers that are enrolled in the Platinum Support program
- Advanced features, including Technical Account Management

For information about Symantec's Maintenance Programs, you can visit our Web site at the following URL:

www.symantec.com/techsupp/ent/enterprise.html

Select your country or language under Global Support. The specific features that are available may vary based on the level of maintenance that was purchased and the specific product that you use.

Contacting Technical Support

Customers with a current maintenance agreement may access Technical Support information at the following URL:

www.symantec.com/techsupp/ent/enterprise.html

Select your region or language under Global Support.

Before contacting Technical Support, make sure you have satisfied the system requirements that are listed in your product documentation. Also, you should be at the computer on which the problem occurred, in case it is necessary to recreate the problem.

When you contact Technical Support, please have the following information available:

- Product release level
- Hardware information
- Available memory, disk space, NIC information
- Operating system
- Version and patch level
- Network topology
- Router, gateway, and IP address information
- Problem description:
- Error messages and log files
- Troubleshooting that was performed before contacting Symantec
- Recent software configuration changes and network changes

Licensing and registration

If your Symantec product requires registration or a license key, access our technical support Web page at the following URL:

www.symantec.com/techsupp/ent/enterprise.html.

Select your region or language under Global Support, and then select the Licensing and Registration page.

Customer service

Customer service information is available at the following URL:

www.symantec.com/techsupp/ent/enterprise.html

Select your country or language under Global Support.

Customer Service is available to assist with the following types of issues:

- Questions regarding product licensing or serialization
- Product registration updates such as address or name changes
- General product information (features, language availability, local dealers)
- Latest information about product updates and upgrades
- Information about upgrade insurance and maintenance contracts
- Information about Symantec Value License Program
- Advice about Symantec's technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs or manuals

Maintenance agreement resources

If you want to contact Symantec regarding an existing maintenance agreement, please contact the maintenance agreement administration team for your region as follows:

- Asia-Pacific and Japan: contractsadmin@symantec.com
- Europe, Middle-East, and Africa: semea@symantec.com
- North America and Latin America: supportsolutions@symantec.com

Additional enterprise services

Symantec offers a comprehensive set of services that allow you to maximize your investment in Symantec products and to develop your knowledge, expertise, and global insight, which enable you to manage your business risks proactively. Additional services that are available include the following:

Symantec Early Warning Solutions	These solutions provide early warning of cyber attacks, comprehensive threat analysis, and countermeasures to prevent attacks before they occur.
Managed Security Services	These services remove the burden of managing and monitoring security devices and events, ensuring rapid response to real threats.
Consulting services	Symantec Consulting Services provide on-site technical expertise from Symantec and its trusted partners. Symantec Consulting Services offer a variety of prepackaged and customizable options that include assessment, design, implementation, monitoring and management capabilities, each focused on establishing and maintaining the integrity and availability of your IT resources.
Educational Services	These services provide a full array of technical training, security education, security certification, and awareness communication programs.

To access more information about Enterprise Services, please visit our Web site at the following URL:

www.symantec.com

Select your country or language from the site index.

Glossary

ATA
A standard used by hard drives to communicate with the controller ports or cards that allow the hard drive to interface with the computer. Before ATA, there were numerous incompatible methods for interfacing hard drives to computers. ATA simplifies this process, thus reducing the cost of developing and purchasing related hardware. ATA is the proper term for Integrated Drive Electronics (IDE).

ATA-2
ATA-2 is the common name for a new, enhanced IDE standard. This standard is still evolving and has not yet been submitted for approval as an official standard.

Batch Mode
Switches in a normally interactive program that prepare it to receive non-interactive command input.

BIOS (Basic Input/Output System)
The BIOS is the program code stored in a PC-compatible ROM to boot the computer and provide basic services such as low-level hard drive access.

Client Computer
In a PowerCast session, the computer that downloads an image file from the server and restores it to a destination partition or free space on its hard drive.

Cloning
Copying a hard drive to an image file or destination disk to create an exact duplicate.

Destination
The destination hard drive is the drive that is copied to during a copy or restore operation.

Disk
A hardware device to store data. A disk contains a Master Boot Record and partitions.

EIDE (Enhanced Integrated Drive Electronics)
A marketing program that promotes certain features of ATA-2.

Extended Partition
One of the four primary partitions on a hard drive can be an extended partition. Extended partitions do not directly hold data; rather, you can create an unlimited number of logical partitions within the extended partition to store data. An extended partition cannot be the active partition.

FAT File Allocation Table
File system used by DOS, Windows 95/98, NT and sometimes OS/2 to store and retrieve files and directories.

FAT32
FAT32 is the file system used by updated versions of Windows 95 (version 4.00.950B or above and Windows 98). FAT32 is an enhancement of the FAT file system and is based on 32-bit file allocation table entries, rather than on the 16-bit entries the FAT file system uses. As a result, FAT32 supports much larger volumes (up to 2 terabytes).

GB (Gigabyte)
1,073,741,824 bytes.

IDE
See ATA.

Image
An image is a snapshot of a drive's partitions that can be used to back up a system, install a new hard drive, or configure a new system.

Jumper
Metal prongs and a circuit completion cap on the outside of a hard drive. You can remove, reposition, and then replace the cap to create various jumper settings such as Master and Slave.

HPFS
High Performance File System, an alternative to a FAT file system which is used by OS/2.

Interactive Mode
An operation mode where the program's responses alternate with user commands, each being dependent upon the other.

LBA (Logical Block Addressing)
1) In EIDE, a means of specifying sector addresses by replacing CHS values with a single linear 28-bit number. 2) Generically, a one-dimensional address of a hard-disk sector; contrast with CHS.

Linux
Linux Ext2 file system was developed for the Linux operating system (a free-ware version of the UNIX operating system). Linux Ext2 file system supports a maximum volume size of 4 terabytes.

Logical Drive
A contiguous area inside an extended partition that can be used by the operating system to store and retrieve files.

Master
The first hard drive on an IDE hard drive controller.

MB (Megabyte)
1,048,576 bytes.

Multicasting
The ability to create a session and simultaneously send an image file from the server to one or more networked clients.

NetBIOS
A high level Network programming interface which is supported by lower level network protocols such as IPX/SPX and TCP/IP.

NetWare
The Novell NetWare network operating system uses the NetWare file system, which was developed specifically for use by NetWare servers.

NTFS New Technology File System
An alternative to FAT and HPFS file systems used by Windows NT\2000\XP.

Partition
An uninterrupted area on a disk, defined in the Master Boot Record. Every partition contains a specific file system such as FAT, FAT32, HPFS, or NTFS.

PowerCasting
see Multicasting

Primary Partition
A partition referenced in the Master Boot Record partition table. Four primary partitions can exist on a hard drive. One of these may be an extended partition. Only one primary partition on a drive may be active at time. Data and applications are often placed on a logical partition inside an extended partition. This enables the data to be accessed by all primary partitions.

Restore
Downloading an image file to a destination drive.

Slave
The second hard drive on an IDE hard drive controller.

Script File
A series of instructions, usually in text file format, written to be passed to a program running in batch mode.

Server
In a PowerCast session, the computer that creates the session and sends the image file to one or more networked client computers.

Source
The source hard drive is the drive from which the image is made.

Spanned Image
An image file that has been created in two or more segments so that it can be placed on media that is smaller than the image itself.

Unallocated Space
Space on a hard disk that is not assigned to any partition.

Volume
This user guide uses the term volume interchangeably with partition.

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