



Image for Linux

User Manual

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Technical Support Policy

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- * The Image for Linux home page, with software and documentation update information, and support resources, can be found at www.terabyteunlimited.com/image1.html.
- * A support knowledge base for all TeraByte Unlimited products, including Image for Linux, can be found at www.terabyteunlimited.com/kb.

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System Requirements

- * IBM-compatible personal computer (i386 or newer)
- * 64-MB RAM
- * Linux based operating system - Linux kernel 2.6 recommended
- * Recommended: External hard drive

Note: You can use a writable CD or DVD drive, but using an external hard drive is the recommended method.

Image for Linux relies on the Linux kernel to provide access to mass storage devices, such as hard drives, optical drives, and network drives. To ensure the best hardware support from Image for Linux, use the newest kernel available. For the most part, modern Linux distributions running on a 2.6 series kernel are likely to support all hardware devices you may need to access. Assuming the kernel version and configuration supports it, you will be able to create, restore, and validate images using any of the following:

- * IDE, SATA, SCSI, USB 1.1/2.0, and IEEE 1394 hard drives
- * ATAPI and SCSI CD/DVD devices
- * Mounted network drives (SMB, NFS etc.)

Data Storage Size Unit Conventions

Since Image for Linux and this document refer to data storage size units, this section provides clarification on the definitions we use. Storage device manufacturers typically define gigabytes (GB) in base *decimal*, where 1 GB = 1,000 MB = 10^9 bytes = 1,000,000,000 bytes. Microsoft Windows, on the other hand, defines GB in base *binary*, where 1 GB = 1,024 MB = 2^{30} bytes = 1,073,741,824 bytes.

Because of the confusion that can result when these different data storage size unit conventions are each referred to as “gigabytes”, the *gibibyte* (along with the kibibyte, mebibyte, etc.) was established in 1998 by the International Electrotechnical Commission (IEC). A gibibyte (abbreviated GiB) is a base binary unit, so 1 GiB = 2^{30} bytes = 1,073,741,824 bytes. The IEC retained the term *gigabyte* to refer to base decimal, where 1 GB = 10^9 bytes = 1,000,000,000 bytes.

Image for Linux and this document will follow IEC recommendations, and will thus use the terms megabyte (MB), gigabyte (GB), etc. to refer to base decimal, and mebibytes (MiB), gibibytes (GiB), etc. to refer to base binary. So, when you read about the data storage size convention used by Windows, the units will appear as mebibytes (MiB) or gibibytes (GiB), even though Windows itself refers to the units as megabytes (MB) or gigabytes (GB).

How Image for Linux Works

Image for Linux is a backup and restore program that is designed to function in the Linux operating environment but can back up a hard disk containing any type of operating system. Image for Linux protects your system by creating a compressed or uncompressed “snapshot” of all *used areas* of your FAT, FAT32, NTFS, Ext2/3, or ReiserFS partition or volume. For other file systems, it saves and restores a compressed or uncompressed snapshot of *all sectors* in the partition or volume, both used and unused areas.

The snapshot backup created by Image for Linux is referred to as an *image*. You can write the image backup to a set of files that you store in a different partition of the hard drive you are backing up, on an external hard drive, on a network drive, or directly to most USB 2, IEEE 1394, ATAPI CD-R/RW, or DVD/RW drives.

Image for Linux is essentially an adaptation of Image for DOS that is designed to run on the Linux operating system. If you are familiar with Image for DOS, you will find Image for Linux to be quite similar in appearance and function. The primary differences that you will encounter are:

- * The hard drives and CD/DVD devices are listed somewhat differently in the menus.
- * You may need to mount and unmount partitions and network drives to save, restore, and validate images.

When you create an image using Image for Linux, the file system and files are backed up exactly as they are stored on the sectors of your hard drive at the time you make the backup. The backup you create is effectively a snapshot of your hard drive at the time you create the image. Image for Linux does not examine the files on your hard drive to make decisions about whether they should be backed up. See Appendix A for a description of file-based backups vs. sector-based backups. Appendix B describes the types of backup strategies you can use, and the strategy you choose plays an important role when you need to restore a backup. See Appendix D for an overview of Linux terminology and basic help topics.

When you create a backup using Image for Linux, you back up not only your data files but also the operating system in its entirety. To understand the full impact of having an image backup, suppose that you install a program to test it and discover it is not what you expected. You attempt to uninstall it and it misbehaves. Before you know it, the fully functional, well-behaved computer you fondly remember from 30 minutes ago is gone, and, in its place, you now have a devil child that won't even boot. If you restore an image backup taken before you installed the errant program, you effectively remove all traces of the program—your computer returns to the state it was in before you installed the errant program and life goes on as if the errant program never existed on your hard drive. To understand the technical details of how Image for Linux creates a sector-based image, see Appendix C, “Introduction to Hard Drive Storage.”

After backing up with Image for Linux, your computer is protected from crashes, data loss, hardware problems, and malicious software (i.e. viruses), since you can restore the snapshot image whenever necessary.

You can view individual files or folders from an image backup by using the free TBIView add-on. You can obtain TBIView from www.terabyteunlimited.com; if you purchased a disk-based version of Image for Linux, you'll find TBIView on your installation media. TBIView only runs under Windows.

Note: At the time of this writing, the current version of TBIView doesn't support Image for Linux Version 2 files, but TBIView will be updated soon.

The images you create using Image for Linux are fully compatible with the other TeraByte Unlimited Version 2 imaging programs, such as Image for Windows and Image for DOS. For example, you can create an image using Image for Linux and restore it using Image for Windows. The reverse is also true: Images created by other TeraByte Unlimited imaging programs are compatible with Image for Linux.

Ways to Use Image for Linux

You can use Image for Linux in the following ways:

- * You can create, restore, and validate images on unmounted FAT, FAT32, or NTFS partitions
- * You can create, restore, and validate images on any mounted file system, including network drives
- * You can create, restore, and validate images on ATAPI and SCSI CD/DVD devices

You also can create bootable CD/DVD restore discs and you can perform imaging operations interactively using the menus or from the command line.

Image for Linux Quick Start

In this section, you'll find a general overview of the major processes Image for Linux can perform: backing up, restoring, and validating an existing backup image. Each of these processes is described in detail, including pictures, later in this manual.

To make a full back up a drive or partition using Image for Linux, follow these steps:

Note: For detailed steps on creating a full backup, see the section, "Creating Backups with Image for Linux."

1. Create a boot disk that contains Image for Linux using either the MakeDisk utility that comes with Image for Linux or using an alternative method.
 - * To read about creating an Image for Linux boot disk using the MakeDisk utility, see the section, "Installing Image for Linux".
 - * To read about other ways to create an Image for Linux boot disk, see the section, "Installing Image for Linux Manually".
2. Boot the computer that you want to back up using the Image for Linux boot disk.
3. Using the Image for Linux menus, select a drive or partition to back up.
 - * For details on using the Image for Linux menus, see the section, "Navigating the Image for Linux Interface."
4. Select the target location where you want to store the backup image file(s).
5. Provide a name for the backup image file.
6. Set backup options.
 - * For details on available backup options, see the section, "Understanding Backup Options."

You can make a differential backup using the same steps; you simply select the Changes Only option on the Image for Linux menus instead of the Full Backup option. For details on backup strategies—that is, deciding whether to make full backups or use a combination of full backups and differential backups—see Appendix B. For details on creating a differential backup, see the section, "Creating a Differential Backup."

You can restore an Image for Linux backup using these steps:

Note: For detailed steps to restore a backup, see the section, "Using Image for Linux to Restore a Backup."

1. Boot your computer using the Image for Linux boot disk.

2. On the Image for Linux main menu, select Restore.
3. Select the source location that contains the backup image file that you want to restore.
4. Select the backup image file you want to restore.
5. Select the target location that you want Image for Linux to overwrite with the information contained in the backup image file.
6. Set restore options.
 - * For details on available restore options when you are restoring an entire drive, see the section, “Understanding Restore Options for an Entire Drive.”
 - * For details on available restore options when you are restoring an individual partition, see the section, “Understanding Restore Options for an Individual Partition.”

You can validate a backup as you create it or, if you don't have time to validate it when you create it, you validate it later. Follow these steps:

Note: For detailed steps to validate a backup, see the section, “Validating Backups with Image for Linux.”

1. Boot your computer using the Image for Linux boot disk.
2. On the Image for Linux main menu, select Validate.
3. Select the source location that contains the backup image file that you want to validate.
4. Select the backup image file you want to validate.
5. Set validation options.
 - * For details on available validation options, see the section, “Understanding Validation Options.”

Obtaining Image for Linux

You can download either the **unregistered trial version**, or the **registered version** of Image for Linux:

- * If you *have not* purchased Image for Linux, click here to download the **unregistered trial version**.

<http://www.terabyteunlimited.com/imagel.html>

- * If you *have* purchased Image for Linux, click here to display a product download form for obtaining the **registered version**. *You will need to provide your name, email address, and Image for Linux order number.*

http://www.terabyteunlimited.com/product_download.php

The file you download is a compressed file that contains at least these files:

- * IFL_EN.PDF is a copy of this manual.
- * LICENSE.TXT is a copy of the Image for Linux license agreement.
- * MAKEDISK.CFG is the MakeDisk configuration file for Image for Linux.
- * MAKEDISK.EXE is the MakeDisk utility, which allows you to easily create bootable media to run Image for Linux.
- * ORDER.TXT is an order form for Image for Linux, and is included in the trial version only.
- * config.zip is a file that contains extra files and directories you can use to customize an Image for Linux boot disc.
- * Ifl.ini is, initially, a blank text file that you can use to set configurations options for Image for Linux. See the section, "Image for Linux Advanced Configuration Options" for details on setting up the ifl.ini file.
- * iflhelp.txt is a text file that summarizes Linux commands you can use to perform a variety of functions, such as listing storage devices and displaying network information.
- * iflnet.iso is an image that you can use to create a bootable CD/DVD disc containing Image for Linux using the program's default configuration.
- * OS-Lic.zip is a file that contains all of the copyright and licensing information for the various Linux components.
- * quickstart.txt is a text file that contains overview information for using the Image for Linux Network Boot Disk, installing the network boot disk to a hard

drive or a USB Flash drive, running Image for Linux from a Linux distribution, and customizing the Image for Linux Network Boot Disk.

- * `readme.txt` is a text file that briefly summarizes the information found in this manual.
- * `setup` is the script used to install Image for Linux on a Linux distribution.

Installing Image for Linux

Image for Linux is not “installed” in the usual sense of the word. Instead, you run Image for Linux by creating a bootable CD/DVD disc that contains the Image for Linux program. Then, you simply boot with that disc to run Image for Linux.

Note: You can create a bootable USB Flash drive if you prefer; see the section, “Creating a Customized Image for Linux Boot Disc.”

If you use Windows, you can create a bootable Image for Linux disc, which is included with Image for Linux. The default boot disc you create using the MakeDisk utility uses the following default configuration parameters:

- * Wired network using eth0 interface (wireless networking is not supported)
- * DHCP server must be available to obtain IP address
- * Console login is not required on boot
- * The root password is `ifl` (used for SSH login)
- * SSH server is started
- * The ISCSI initiator daemon is started
- * The time zone is UTC
- * QWERTY keyboard layout
- * 80x25 as default video mode

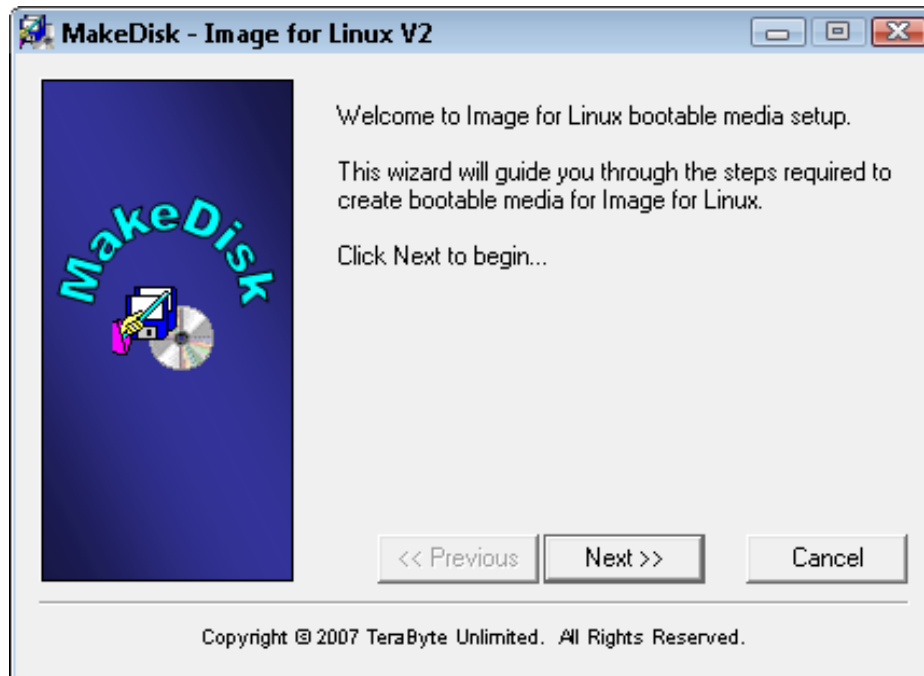
If you use an operating system platform that doesn’t support MakeDisk or if you wish to customize the contents of the bootable disc that you create, see the section, “Installing Image for Linux Manually” to create a bootable media that contains Image for Linux.

Follow these steps to use the MakeDisk utility under Windows to create a bootable Image for Linux disc; the MakeDisk utility is included in the Image for Linux ZIP archive file:

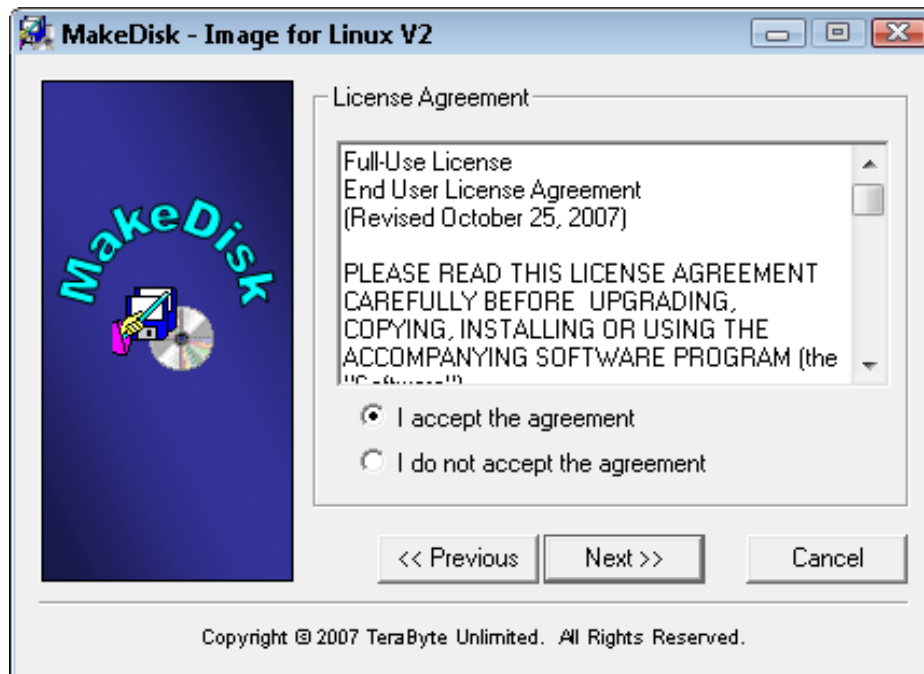
1. Extract the contents of the Image for Linux ZIP archive file to a folder of your choice.

*Note: If you are using a version of Windows that has a built-in compressed folders feature (e.g. Windows Me or Windows XP), you can double click the ZIP file and then open the **File** menu and choose **Extract all files** in Windows Explorer to extract the contents*

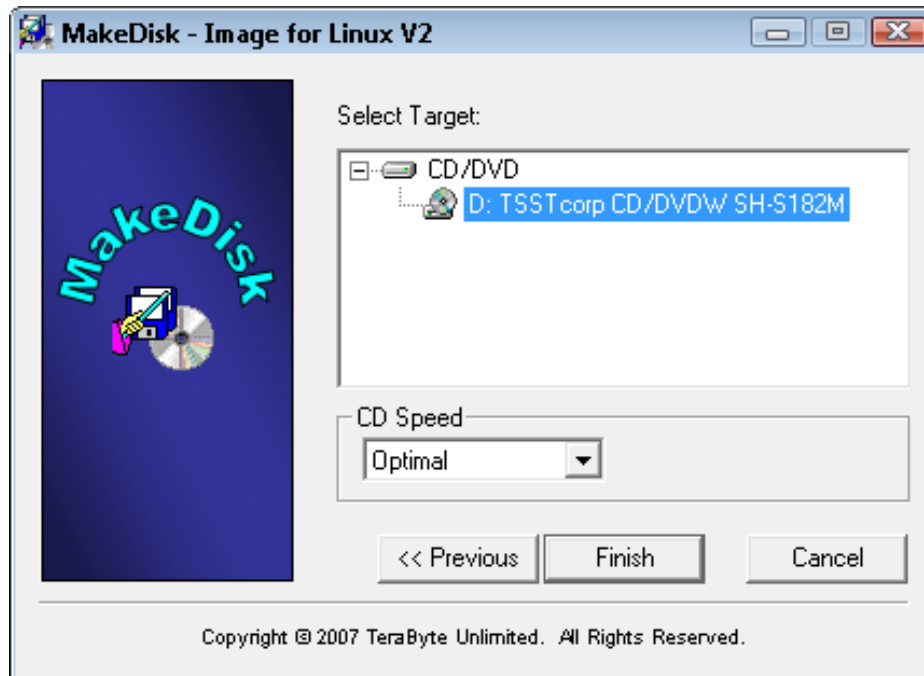
2. Double-click `MAKEDISK.EXE`. The MakeDisk welcome screen appears.



3. Click Next on the MakeDisk welcome screen. The License Agreement screen appears.



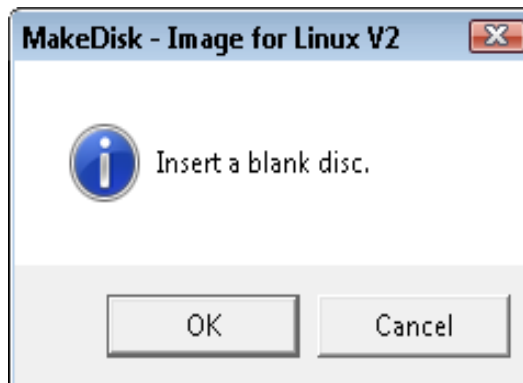
4. Read the Image for Linux license agreement, and if you accept it, select the "I accept the agreement" button and click Next. The Select Target screen appears.



5. Select the target CD/DVD drive that MakeDisk should use to create the bootable Image for Linux CD/DVD. You can select a specific CD Speed, but leaving the option set to Optimal allows the MakeDisk utility to choose the speed that will work best with your drive. Select a specific speed lower than the speed of your CD/DVD drive if you encounter problems creating the boot CD.

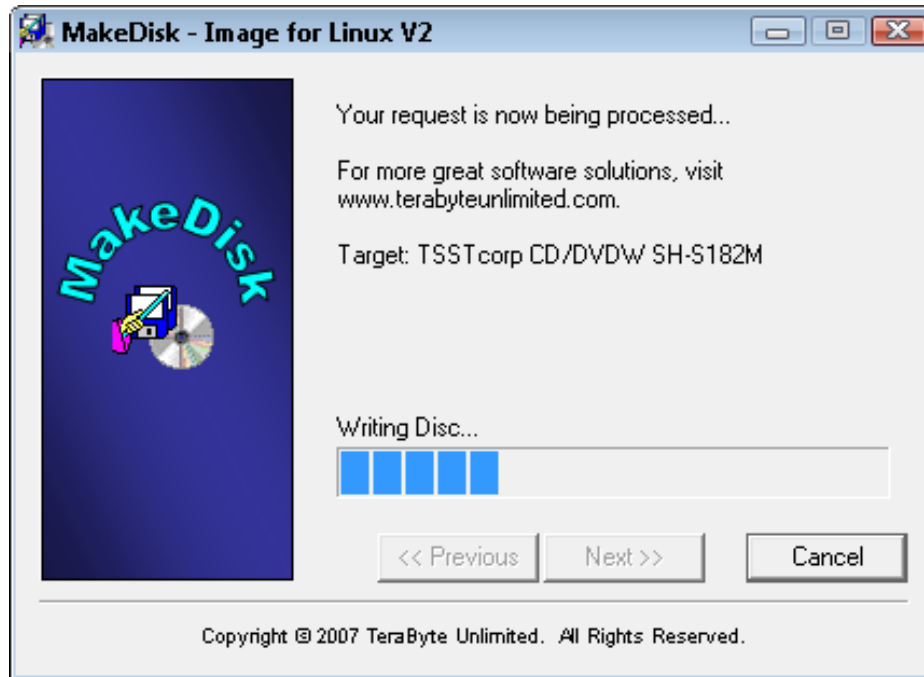
You can create a bootable USB flash drive with MakeDisk as long as the USB flash drive is smaller than 2 GB.

6. Click Next, and the License Key screen appears. If you own a licensed copy of Image for Linux, supply your serial number.
7. Click Finish. Image for Linux prompts you to insert a blank disc. Be sure to insert a *writable* CD or DVD disc before proceeding. The entire contents of this disc will be overwritten.

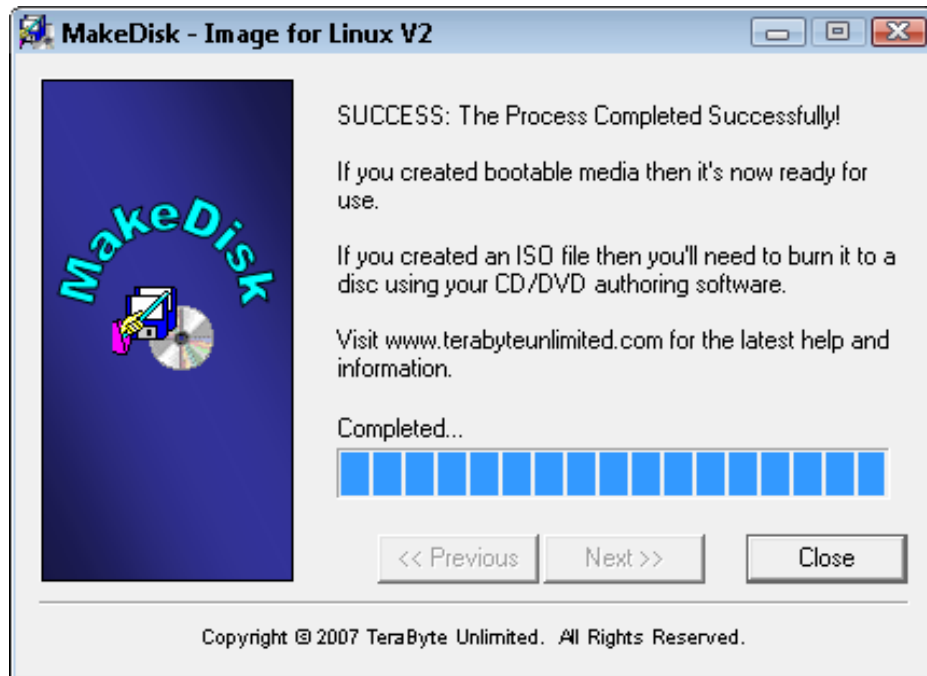


MakeDisk can automatically overwrite CD-RW, and DVD+RW media. However, if you wish to use DVD-RW media, it must be either brand new or fully blanked before being processed by MakeDisk. To fully blank the DVD-RW media, use your burning software's "full erase" function. (The "quick erase" function will not work for this purpose.)

8. Click OK. MakeDisk begins writing your bootable CD/DVD.



9. When MakeDisk finishes writing the CD/DVD, it will close the disc and then validate it. Then, the MakeDisk Success screen appears.



10. Click Close on the MakeDisk Success screen.

You can now use that media to boot and run Image for Linux.

Navigating the Image for Linux Interface

To select menu items in Image for Linux, use the arrow keys to select the desired option and then press **Enter** to display the next screen. The Backup Options screen contains several sections of options; some of the options can be toggled on or off. On the Backup Options screen, use the **Tab** key to move from section to section. For options that you can toggle on and off, highlight the option using the arrow keys and then use the space bar to toggle the option on or off, as desired.

Image for Linux also makes wide use of accelerator keys. An accelerator key is an individual letter that you can press (or press in combination with the **Alt** key) to select an option or a menu item. In Image for Linux, accelerator keys appear in yellow.

How you use an accelerator key depends on the current location of the cursor; if it is in the same section of the screen as the desired accelerator key, simply press the applicable accelerator letter. If the cursor is in any other section, press and hold the **Alt** key, and then press the applicable accelerator letter. For example, when the Backup Options screen first appears, the cursor is in the **Options** section. If you want to select **None** in the **Compression** section, press and hold the **Alt** key and then press the **n** key. Pressing just the **n** key would not work in this case, because of the initial position of the cursor. However, when you press **Alt+n**, the cursor jumps to and selects the **None** option in the **Compression** section. At that point, you can press the **t** key to select the **Standard** option.

You can use the **Esc** key to undo menu selections and move back to the previous menu. If you use the **Esc** key in this manner, Image for Linux remembers the selections you have already made throughout the Image for Linux session, in the event that you return to the same screen.

Creating Backups with Image for Linux

Create the bootable CD/DVD disc using any of the techniques described in the section “Installing Image for Linux” or “Installing Image for Linux Manually.” Insert the media into the CD/DVD drive, and reboot your computer.

To boot from a CD/DVD, you may need to change the order in which your computer selects boot devices. As your computer begins to boot, you should see a message—before you ever get to Linux—that tells you what key to press to enter Setup—typically the Delete key, F2, or F12. Once in the BIOS, you need to follow the instructions provided in your BIOS to reorder the boot sequence to permit your CD/DVD drive to be examined before your hard drive. If your system starts by offering you the option to select a boot menu, you can use the boot menu to identify the device you want to use to boot.

When you create a backup, you can create either a full backup or a differential backup. A full backup is exactly what it sounds like—Image for Linux backs up your entire hard disk. A differential backup works in conjunction with a full backup—you create a full backup the first time and then create differential backups, which contain only changes, for subsequent backups. A differential backup will, initially, be smaller than a full backup but, as you make changes, the size of the differential backup will grow over time.

Before you make the decision concerning the type of backup you want to create, read Appendix B for a detailed explanation of full backups and differential backups.

Things to Consider Before Backing Up

There are very few rules to follow when formulating a backup plan. Please consider the following ideas to help you create a backup that will help you easily recover from a disaster. For more information on backup strategies, see Appendix B.

Consider the destination for your backup. *For example, if you will be backing up around 30 GB of data, you probably will not want to store the backup on a set of CD-R/RW discs, since the backup will likely require 20 discs or more (based on an expected compression ratio of 40-60%). A better option in this case would be:*

- * *Backup directly to a set of DVD discs.*
- * *Backup to an alternate hard drive partition (and perhaps use the free add-on utility BINGBURN later to burn the backup to a set of DVD discs).*
- * *Backup to an external hard drive (recommended).*

Plan your backup with a restore strategy in mind. *You can:*

- * *Save the backup directly to a set of bootable CD or DVD discs, as explained in this manual. To restore, simply boot with the restore disc, and use Image for Linux to perform the restore.*

* *Save the backup to an alternate hard drive partition. To restore, run Image for Linux from a bootable USB drive or a CD/DVD disc.*

* *Save the backup to an external hard drive (recommended). To restore, run Image for Linux from a bootable CD/DVD disc.*

Strike your own balance between convenience and resiliency. Consider these simple ideas:

* *Save your backups directly to an alternate hard drive partition and use the free utility BINGBURN to burn a second copy of the backup to a set of CD/DVD discs. Then, if you need to restore, you can quickly and conveniently use the backup stored on the hard drive. But, if things really go wrong and the primary copy of the backup is not available, you can fall back on the copy of the backup that you saved on CD/DVD discs.*

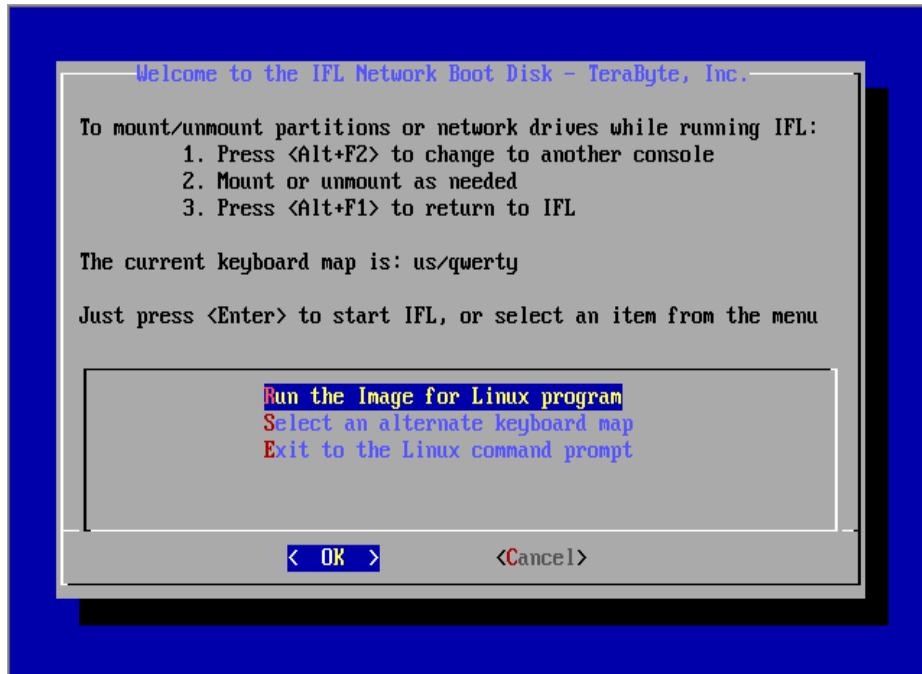
* *Don't get rid of an existing set of backup discs when you create a new set. Instead, keep two or more sets of backup discs. That way, you can fall back to an older backup if something should go wrong with the newest backup.*

* *If you are using multiple sets of backup CD/DVD discs, keep the newest set offsite to guard against physical damage.*

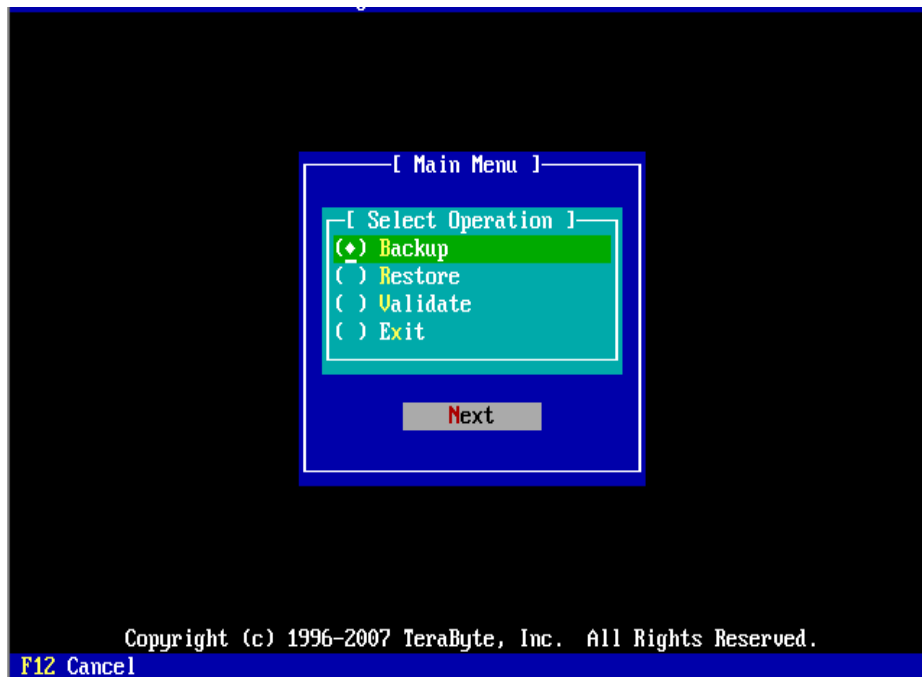
Creating a Full Backup

You walk through a series of menus to create a full backup. Insert your Image for Linux boot disk into the appropriate drive and boot your computer. Then, follow these steps:

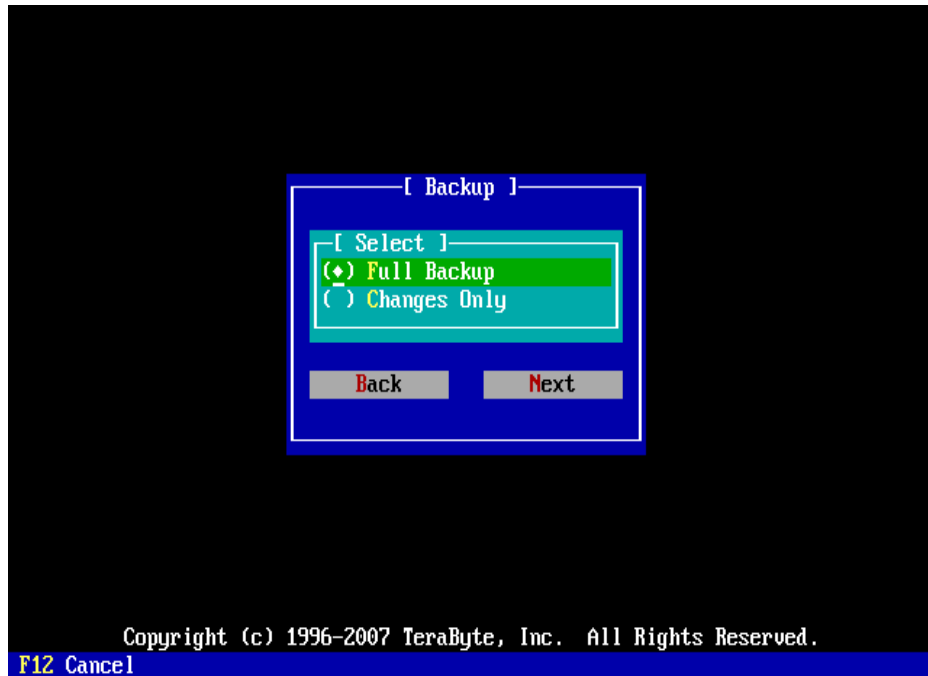
1. After a series of on-screen lines of code, the Welcome to Image for Linux screen appears. This screen explains how to mount or unmount partitions or network drives while running Image for Linux.



2. Press **Enter** to display the Image for Linux **Main Menu/Select Operation** screen.

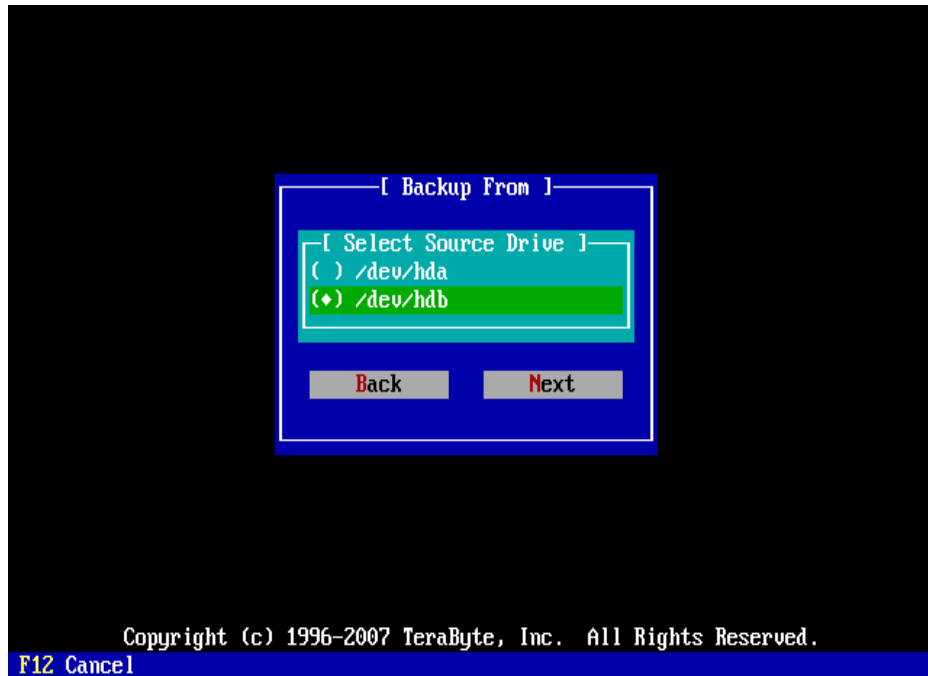


3. Select **Backup** to display the **Backup/Select** screen.

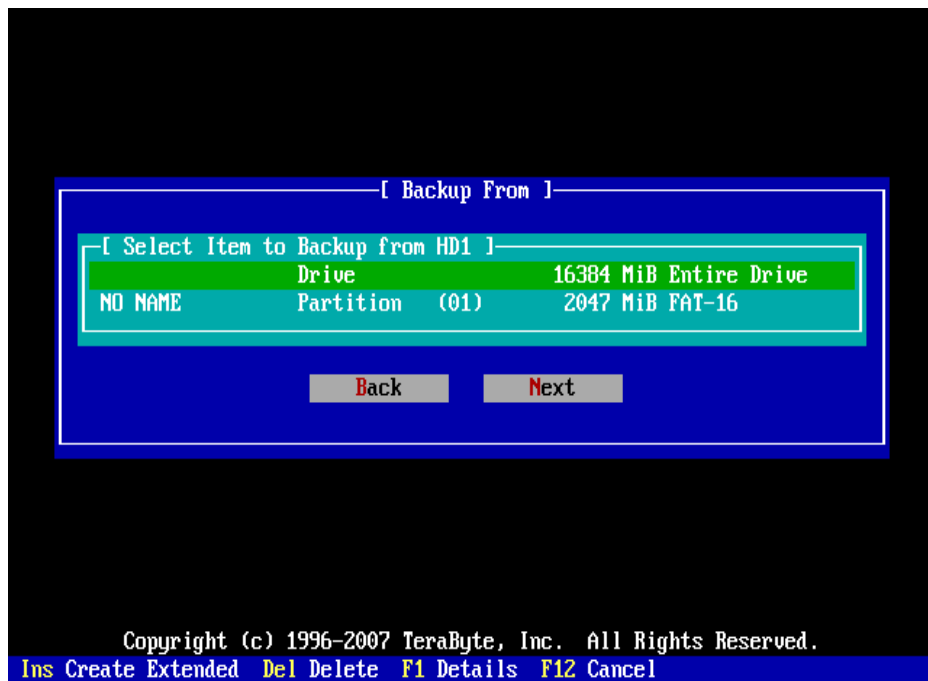


4. Select **Full Backup** to display the **Backup From/Select Source Drive** screen, listing all available hard drives. Select the drive or the drive containing the partition you want to back up.

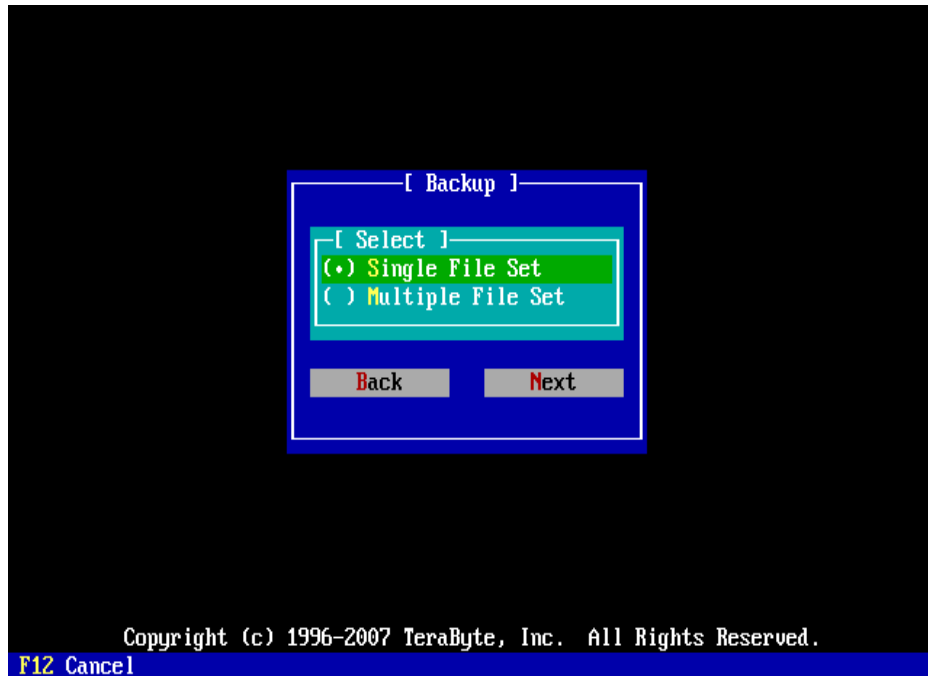
Note: Hard drives connected to an IDE controller will appear as /dev/hdn. SATA, SCSI, USB, or IEEE 1394 (FireWire) drives appear as /dev/sdn under the general category of SCSI disks. The order in which the drives appear depends on the way they are connected to the system. If you don't see all of drives that you expect to see, try pressing the ESC key, waiting a few seconds, and then selecting "Create Image" again.



5. On the **Backup From/Select Item to Backup from HD** screen that appears, select the partition or drive that you wish to backup. If you choose to back up a partition, skip to Step 7.

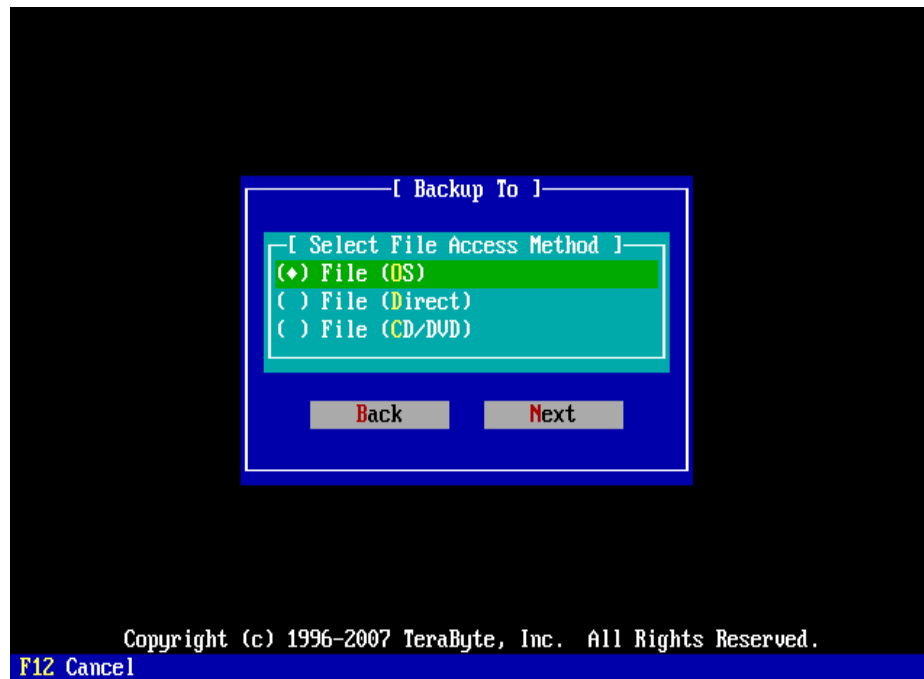


6. If, in Step 5, you chose to back up an entire drive, the **Backup/Select** screen appears. Choose one of the following options:



- * **Single File Set** – Select this option to create a backup that is comprised of a single image, regardless of how many individual partitions you are backing up. The first file created for the image set will be named <name>.TBI, where <name> is a character string you supply. If Image for Linux creates additional files, Image for Linux will name them <name>.1, <name>.2, <name>.3, and so on. The number of files Image for Linux will create depends on the overall size of the backup and the File Size setting you choose when you set the options for the backup in Step 10.
- * **Multiple File Set** – Select this option to create a backup that is comprised of one image for every individual partition that Image for Linux backs up. Image for Linux names the first file created for the first image set <name>_0.TBI, where <name> is a character string you supply. Image for Linux adds _0 to identify the image file set. If Image for Linux creates additional files for the same image set, they will be named <name>_0.1, <name>_0.2, <name>_0.3, and so on. Image for Linux names the files of the *second* image set (i.e. the second partition included in the backup) <name>_1.TBI, <name>_1.1, <name>_1.2, <name>_1.3, and so on. Image for Linux will name subsequent image sets accordingly with _2, _3, and so on, appended to the file name.
 - * If you choose this option, each file Image for Linux creates represents only a partition and you won't be able to completely restore a drive with one menu option but will have to restore each partition separately.
 - * The number of files Image for Linux will create for each image set depends on the size of the corresponding partition and the **File Size** setting you choose in a later step.

7. On the **Backup To/Select File Access Method** screen that appears, select one of the following options, which refer to the location where Image for Linux should save the backup:



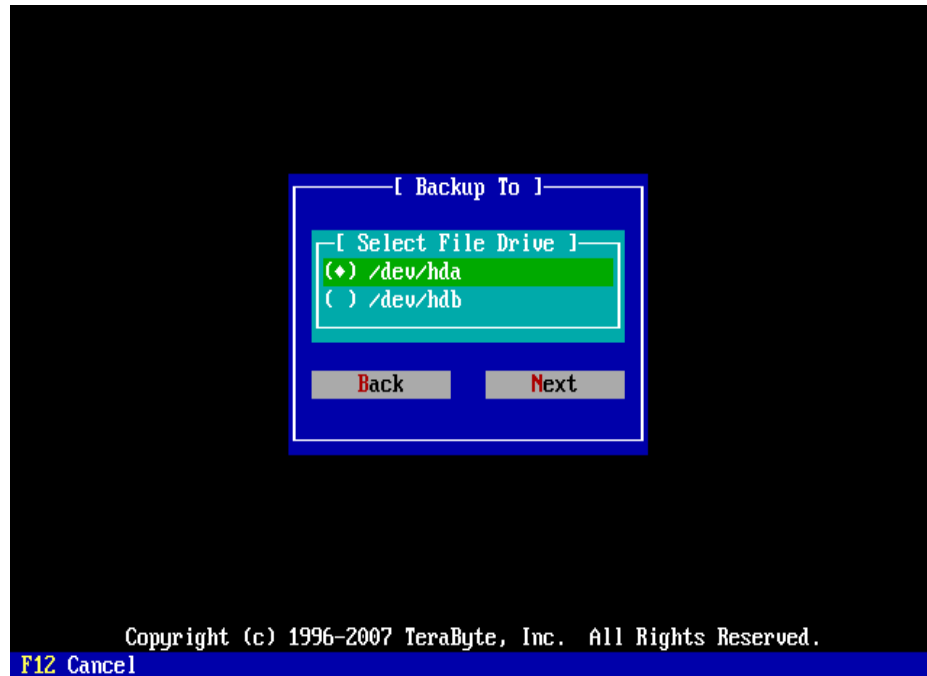
- * **File (OS)** – Choose this option to use the operating system file services to save the image files.
- * **File (Direct)** – This option allows you to save the image file(s) to a folder on a hard drive and an unmounted partition.

Note: Do not save your image to the same partition you are backing up.

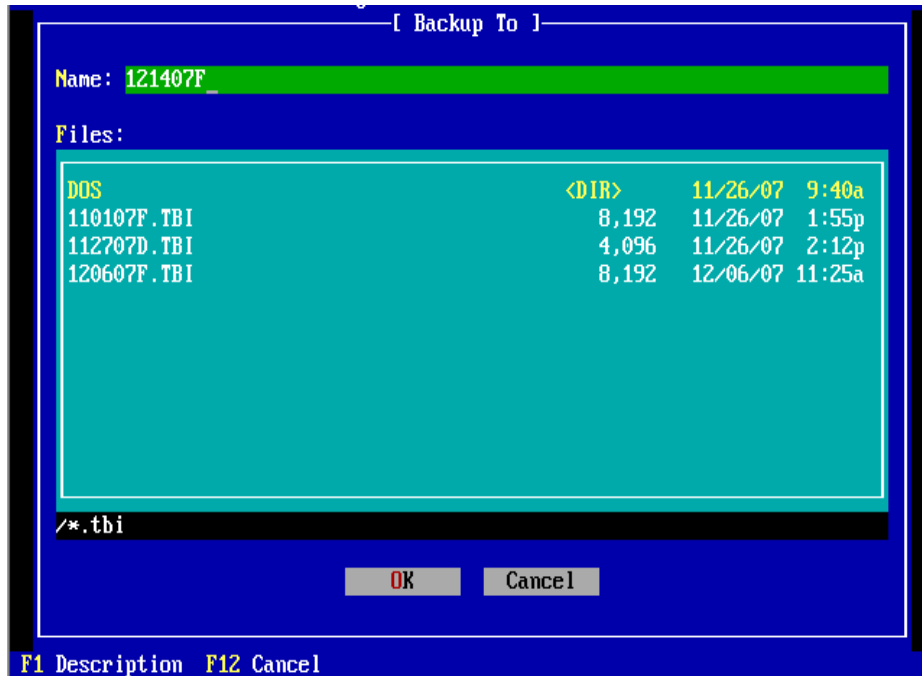
- * **File (CD/DVD)** – This option allows you to save the backup file(s) to a CD or DVD disc. Image for Linux will automatically make the first CD/DVD disc bootable.

Note: Image for Linux can automatically overwrite CD-RW and DVD+RW media. If you wish to use DVD-RW media, Image for Linux can format it, but the process takes 1 hour per disc, so you may prefer to use fully formatted, fully blanked, or brand new discs. To fully blank the DVD-RW media, use your burning software's "full erase" function. (The "quick erase" function will not work for this purpose.)

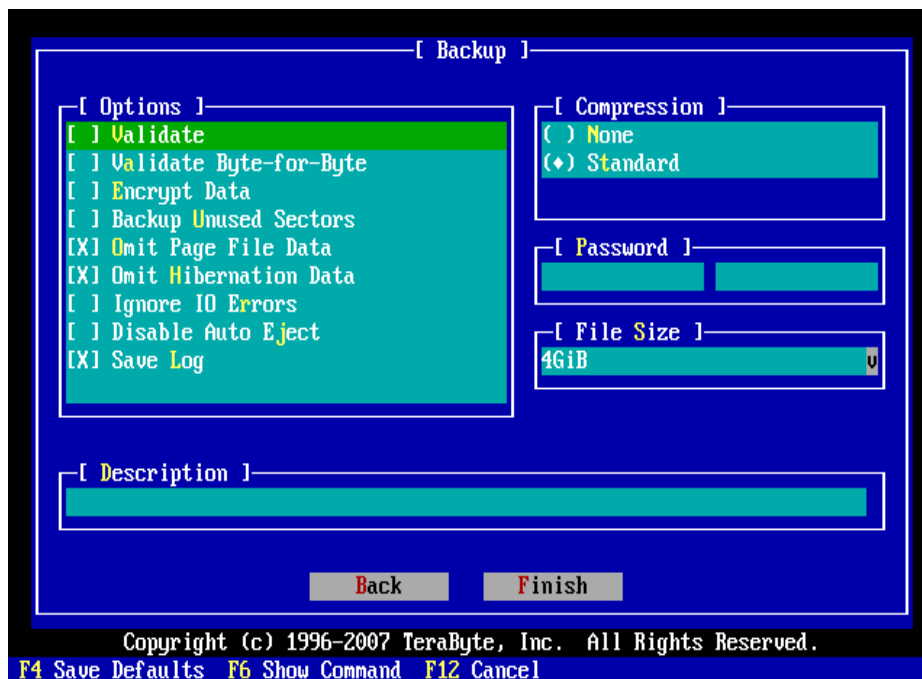
8. The screen that appears next depends on the option you chose in Step 7.



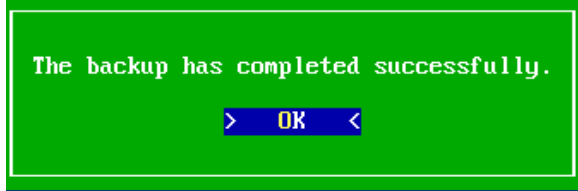
- * If you chose **File (OS)**, a screen appears where you can type a file name; see Step 9 for details.
 - * If you chose **File (Direct)**, the **Backup To/Select File Drive** screen shown in the figure appears; select the drive on which you want to store the backup. The **Backup To/Select File Location on HD** screen appears, where you can select a partition on the hard drive if it contains partitions; otherwise, press Enter to select the drive.
 - * If you chose **File (CD/DVD)**, the **Backup To/Select Drive Interface** screen appears. Select either ATAPI/SCSI or SG and then select the CD/DVD drive you want to use when making the backup. Typically, all of your CD/DVD devices will appear when you select one of the options, and, if you select the other options, a “No usable CD/DVD drive found!” message will appear. The option that works depends on your kernel version and configuration. If your system uses a 2.4 series kernel, the devices will appear on the SG menu; if your system uses a 2.6 series kernel, the devices will appear on the ATAPI/SCSI menu.
9. Use the screen shown in the figure to supply a name for the image file you want to create. You do not have to type a file extension—just the path and file name itself; Image for Linux will automatically add the .TBI extension. If you selected File (OS), you must follow DOS naming conventions and use a file name that does not exceed eight characters. You might consider using today’s date in numeric form and include F as the final character to help you identify a full backup. For example, if you are creating your backup on December 14, 2007, use 121407F as the file name.



- On the **Backup Options** screen that appears, select the options you want to use. See the next section, “Understanding Backup Options,” for an explanation of each option.



- When you select **Finish**, the imaging process begins, and a progress bar appears on-screen. You can interrupt the backup and validation operations at any time by pressing the **F12** key. Image for Linux will ask you to confirm that you want to cancel before it interrupts the current operation. When Image for Linux finishes, this message appears.



Note: If a message appears, stating that the discs created will not be bootable because the CDBOOT.INS file was not found or it contained invalid references appears, please refer to the section, "Customizing CDBOOT.F35" for information on setting up CDBOOT.INS.

After you press Enter, the main menu for Image for Linux reappears. Select **Exit** and, when prompted, remove the Image for Linux boot disk and press **Enter** to reboot your computer.

Understanding Backup Options

You can set the same options when backing up in Image for Linux whether you are backing up a partition or an entire drive:

Validate – If you select this option, Image for Linux will perform internal consistency checks on the backup file(s) after creating them. Enabling this option increases the overall processing time, but can help ensure that the backup is reliable.

Validate Byte-for-Byte – If you select this option, Image for Linux will verify that every byte in the source data was backed up correctly, ensuring 100% accuracy. This option generally doubles the processing time of the overall backup operation, but is advisable to use where maximum reliability is required. You can but do not need to select the **Validate** option if you select the **Validate Byte-for-Byte** option.

Encrypt Data – If you select this option, Image for Linux will encrypt the backup file(s) with 256-bit AES encryption prior to saving them to the target medium. If you select the **Encrypt Data** option, you must also supply a password in the **Password** text boxes. Enter the password in the first **Password** text box and retype it in the second **Password** text box for verification.

*Note: If you create a backup with the **Encrypt Data** option, you will need to supply the password whenever you wish to validate the backup, restore it, or open it in TBIView. If you lose and/or forget the password, you won't be able to open or restore from the backup. **TeraByte Unlimited has no way of recovering data from an encrypted backup with an unknown password.***

*If you do not enable the **Encrypt Data** setting, Image for Linux will use the **Password** text boxes to password-protect the image file without any encryption.*

The maximum password length is 128 characters. Passwords are case sensitive and may contain upper-case letters, lower-case letters, numbers, special characters, spaces, and non-ASCII characters.

Backup Unused Sectors – By default, if the file system(s) you are backing up are one of the recognized types (i.e. FAT, FAT32, NTFS, Ext2/3, ReiserFS, or XFS), Image for Linux will backup only used sectors. If you select this option, Image for Linux will include all used and unused sectors in the backup. This option has no effect on partitions that do not contain a recognized file system; such partitions will always be backed up in full, regardless of this setting.

Omit Page File Data – If you select this option and the `PAGEFILE.SYS` file resides in the root directory of the source partition, Image for Linux will not back up `PAGEFILE.SYS`. If `PAGEFILE.SYS` resides anywhere else on the source partition other than the root directory, Image for Linux *will* back it up, regardless of this setting.

Omit Hibernation Data – If you select option and the `HIBERFIL.SYS` file resides in the root directory of the source partition, Image for Linux will not back up `HIBERFIL.SYS`. If `HIBERFIL.SYS` resides anywhere else on the source partition other than the root directory, Image for Linux *will* back it up, regardless of this setting.

Ignore IO Errors – This option only affects how Image for Linux handles bad sectors on the *source* drive, and it applies to both the backup phase and the validation phase of the backup operation. Normally, if Image for Linux encounters a bad sector on a source partition during a backup operation, it will notify you concerning the read error and give you the option to continue or abort. If you select this option, Image for Linux will ignore the error and continue. Generally, you should select this option only if you need to backup a source partition on a drive you know contains bad sectors. On some systems, if you select this setting and Image for Linux encounters bad sectors, there will be a significant delay as the internal retry/recovery routine of the drive attempts to handle the bad sector(s). In addition, some systems may hang if the **BIOS** option is used to access the source drive. In such cases, try using the **BIOS (Direct)** option instead.

Disable Auto Eject – This option prevents Image for Linux from automatically opening the optical drive tray. If you don't select this option, Image for Linux will open the drive tray whenever a disc is needed and at the completion of the backup operation.

Save Log – Select this option to make Image for Linux log the date and time it completes the backup operation. Image for Linux saves the log as `IPL.LOG` in the `IMAGE.EXE` program directory. To be able to save `IPL.LOG`, Image for Linux must be running from a writable medium such as a non-write-protected floppy diskette. You can use the `--logfile` or `LogFile` options to specify an alternate location for `IPL.LOG`.

Validate Disk – If you store your backup on optical media, you also can choose to validate each disc to ensure that no media errors occur while Image for Linux stores the backup on each CD/DVD disc. If Image for Linux detects an error, it prompts you to replace the failed disc at the time the error is detected. If you don't enable this option, Image for Linux notifies you of errors only after the backup process is complete.

Compression – Select **Standard** to compress the backup files that Image for Linux creates. Typically, if you select **Standard**, Image for Linux produces smaller image files but it may take longer to back up. If you select **None**, Image for Linux creates your backup more quickly but produces larger image file(s). The attainable compression ratio depends on a number of factors, including the number, size, and content of the files on the source partition and the level of file fragmentation on the source partition. Typically, Image for Linux compresses backup files 40% - 60%. However, if the source partition primarily contains files that do not compress well, such as media files like MP3, JPG, and AVI, or archive files like 7Z, RAR, and ZIP, the compression ratio will be much lower.

File Size – Select this option to choose the maximum size of the image files created by Image for Linux. The available options are:

- * Max – Automatically creates the largest file(s) allowed by the file system in use on the target medium. For example, the largest files that may reside on FAT, FAT32, and NTFS partitions are 2 GiB, 4 GiB, and (just under) 16 TiB, respectively.
- * 4 GiB – Useful for FAT32 compatibility.
- * 2 GiB – Useful for FAT compatibility.
- * 698 MiB – Useful if the image file(s) will later be burned to 700-MiB CD disc(s).
- * 648 MiB – Useful if the image file(s) will later be burned to 650-MiB CD disc(s).

Write Speed – This option appears in place of the **File Size** option if you chose to save your image to CD/DVD discs. We recommend that you use the default setting for this option, which is “Optimal,” unless you encounter problems.

Description – You can use this text box to assign descriptive text to individual backups. The description you enter will be visible in the file list that appears when you are preparing to restore or validate a backup. You view the description by selecting the backup and pressing **F1**.

Creating a Differential Backup

When you create a differential backup, Image for Linux compares the condition of the source partition or hard drive to a full backup you identify to determine what changes have occurred on the source partition or hard drive since you created the full backup. A differential backup contains only the changed sectors. For details on differential backups, see Appendix B.

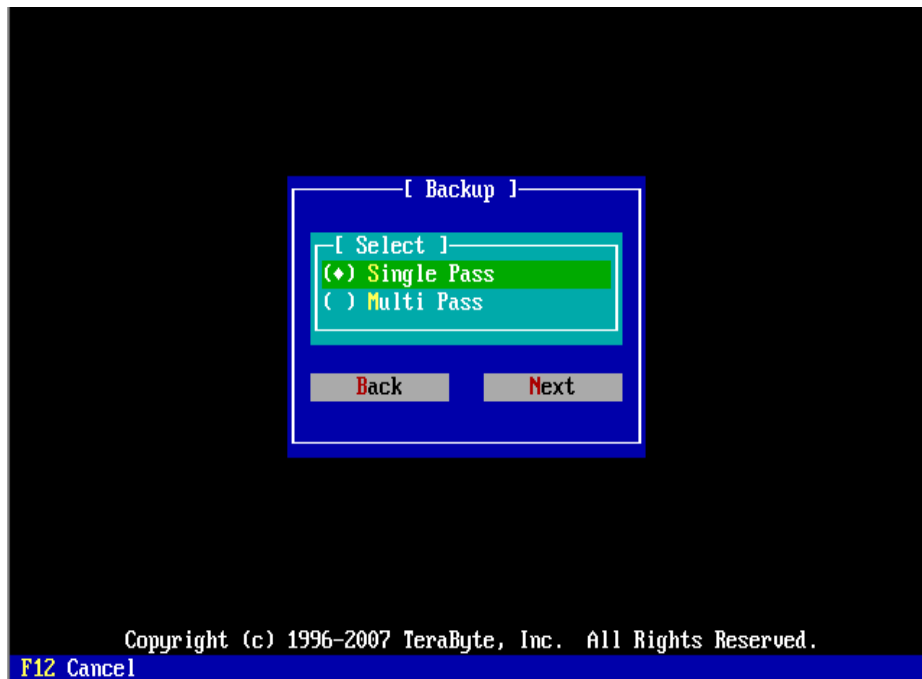
The process for creating a differential backup is very similar to the process for creating a full backup, and you set many of the same options during both processes. When you analyze the steps you take, you’ll notice the following differences:

- * When you create a full backup, you identify the source drive you want to back up.

- * When you create a differential backup, you identify the full backup Image for Linux should reference when creating the differential backup.

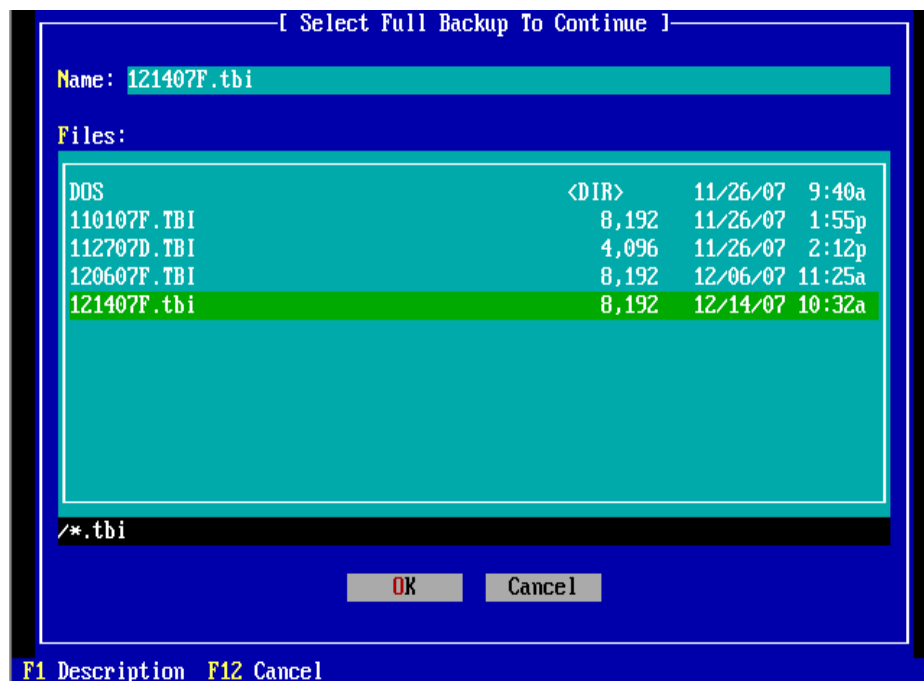
Insert your Image for Linux boot disk into the appropriate drive and boot your computer. On the Image for Linux Main Menu, select **Backup**. Then, follow these steps:

1. On the **Backup** screen that appears, select **Changes Only**.
2. On the **Backup/Select** screen that appears, select an option to determine how Image for Linux detects changes and performs the differential backup:
 - * If you choose **Single Pass**, Image for Linux identifies the changes you have made to the source partition since you created the full backup and then backs up those changes, all in one pass. You *cannot use* this option if the associated full backup spans multiple CD/DVD's.
 - * If you choose **Multi Pass**, Image for Linux compares the source partition against the full backup in one pass and then makes the differential backup in a second pass. You *must use* this option if the associated full backup spans multiple CD/DVD's.



3. On the **Select Full Backup To Continue/Select File Access Method** screen that appears, choose **File (OS)**, **File (Direct)** or **File (CD/DVD)** to identify the location of the full backup related to this differential backup.
4. The appearance of the **Select Full Backup To Continue** screen that Image for Linux displays depends on the choice you made in Step 3.

- * If you chose **File (OS)**, a screen appears where you can select the full backup file name; see Step 5 for details.
 - * If you chose **File (Direct)**, the **Select Full Backup To Continue/Select File Drive** screen appears; select the hard drive that contains the full backup from the list shown and then select the correct partition.
 - * If you chose **File (CD/DVD)**, the **Select Full Backup To Continue/Select Drive Interface** screen appears. Select either ATAPI/SCSI or SG. Then, insert the first disc in the set and then select the corresponding CD/DVD drive from the list.
5. On the **Select Full Backup To Continue** screen that appears, select the .TBI file that corresponds to the desired full backup. You can type the name of the .TBI file (you don't need to type the .TBI file extension) or you can press **Tab** and then use the arrow keys to highlight the file and press **Enter** to select it. If the .TBI file resides inside a folder, highlight the folder and press **Enter** to display the contents of the folder.



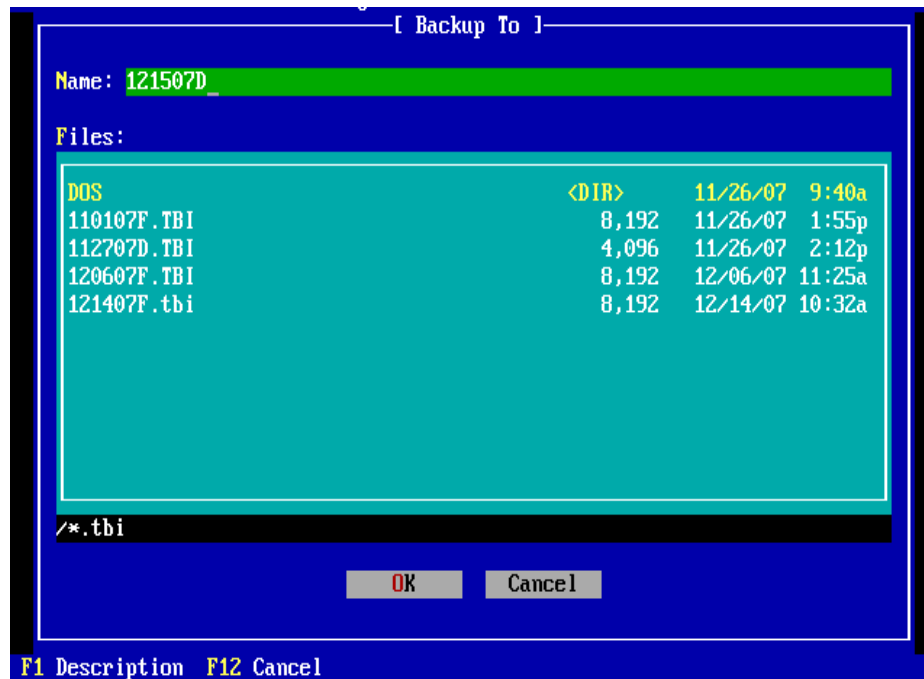
If you open a folder and want to navigate back to the parent folder, select the .. list item and press **Enter**.

If you select a file that you created using the encryption or the password-protect option, supply the correct password to continue.

6. On the **Backup To/Select File Access Method** screen that appears, choose **File (OS)**, **File (Direct)** or **File (CD/DVD)** to identify the location where you want to save the differential backup files.

Note: You do not need to store files from a differential backup in the same location where you store full backup files. When you restore a differential backup, Image for Linux will prompt you for locations for both the full backup files and the differential backup files.

- The appearance of the screen that Image for Linux displays next depends on the choice you selected in Step 6. See Step 4 for a description of your choices.
- On the **Backup To** screen that appears, supply a name for the differential backup file(s). You do not have to supply a file extension—just the path and file name itself—Image for Linux will add the extension automatically. If you are using the File (OS) option, you must follow DOS naming conventions and use a file name that does not exceed eight characters. You might consider using today's date in numeric form and include D as the final character to help you identify a differential backup. For example, if you are creating your backup on December 15, 2007, use 121507D as the file name.



- On the **Backup Options** screen that appears, select the options you want to use. See the section, “Understanding Backup Options,” for an explanation of each option.
- When you select Finish, the imaging process begins, and a progress bar appears on-screen. When Image for Linux finishes, a message appears to let you know that the backup was successful. You can interrupt the backup and validation operations at any time by pressing the F12 key. Image for Linux will ask you to confirm that you want to cancel before it interrupts the current operation.

After you press **Enter** to dismiss the message, the main menu for Image for Linux reappears. Select **Exit** and, when prompted, remove the Image for Linux boot disk and press **Enter** to reboot your computer.

Using Image for Linux to Restore a Backup

It is important to remember that you cannot restore an image over the partition that contains the image file you are using to restore.

The size of the target location where you restore an image is important. The target must be large enough to accommodate the data from the source partition. The *minimum* amount of space required in the target location is determined by the amount of space encompassed from the beginning of the source partition to the last used area of the source partition. For example, if the source partition had 2 GB of data, and the last part of that data ended 15 GB from the beginning of the source partition, the target area needs to be at least 15 GB in size, regardless of the overall size of the source partition.

Note: If the target is larger than the source partition, there will be an area of free space left over unless you perform the restore via command line using the `x` parameter (as explained later in this manual).

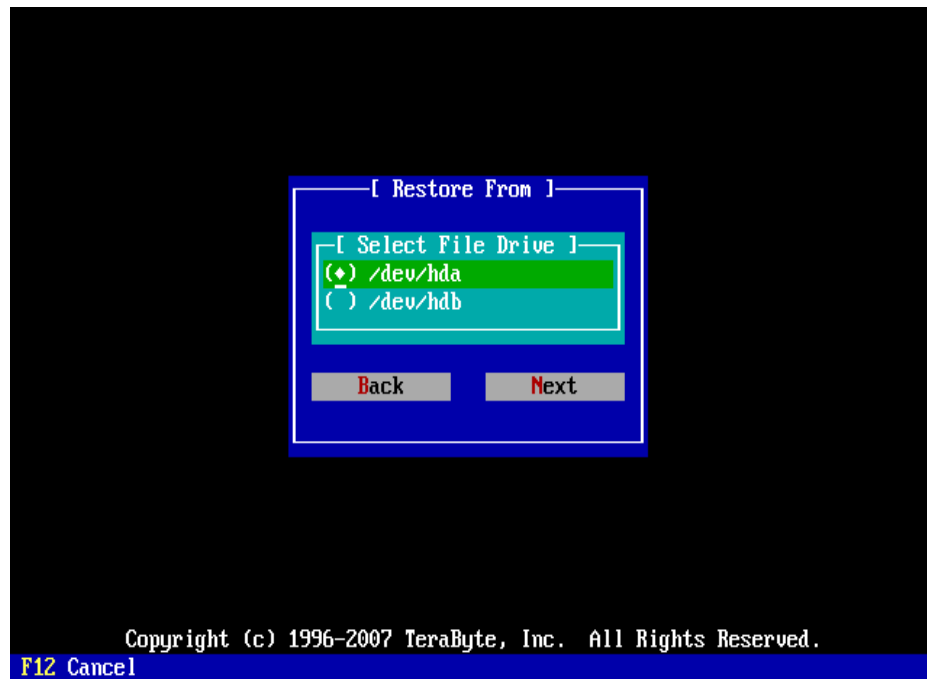
Also, if your computer contains more than one CD/DVD drive, please make sure that you insert your Image for Linux bootable disc in one drive and no other CD/DVD drive contains a bootable disc.

Restoring From a Backup with Image for Linux

Insert your Image for Linux boot disk into the appropriate drive and boot your computer. Then, follow these steps:

1. On the Image for Linux Main Menu, select **Restore**.
2. From the **Restore From/Select File Access Method** screen that appears, select between the following options, which refer to the location where Image for Linux should look for the backup file you want to restore:
 - * **File (OS)** – Choose this option to use the operating system file services to restore the image files from mounted partitions.
 - * **File (Direct)** – This option allows you to look for image file(s) to restore in a folder on a hard drive and an unmounted partition.
 - * **File (CD/DVD)** – This option allows you to look for image file(s) on a CD or DVD disc.
3. The screen that appears next depends on your choice in Step 2.
 - * If you chose **File (OS)**, a screen appears where you can select the file you want to restore; see Step 4 for details.
 - * If you chose **File (Direct)**, the **Restore From/Select File Drive** screen shown in the figure appears; select the hard drive that contains the backup you want to restore from the list shown and then select the correct partition.

- * If you chose **File (CD/DVD)**, the **Restore From/Select Drive Interface** screen appears. Select either ATAPI/SCSI or SG. Then, insert the first disc in the set and then select the corresponding CD/DVD drive from the list.

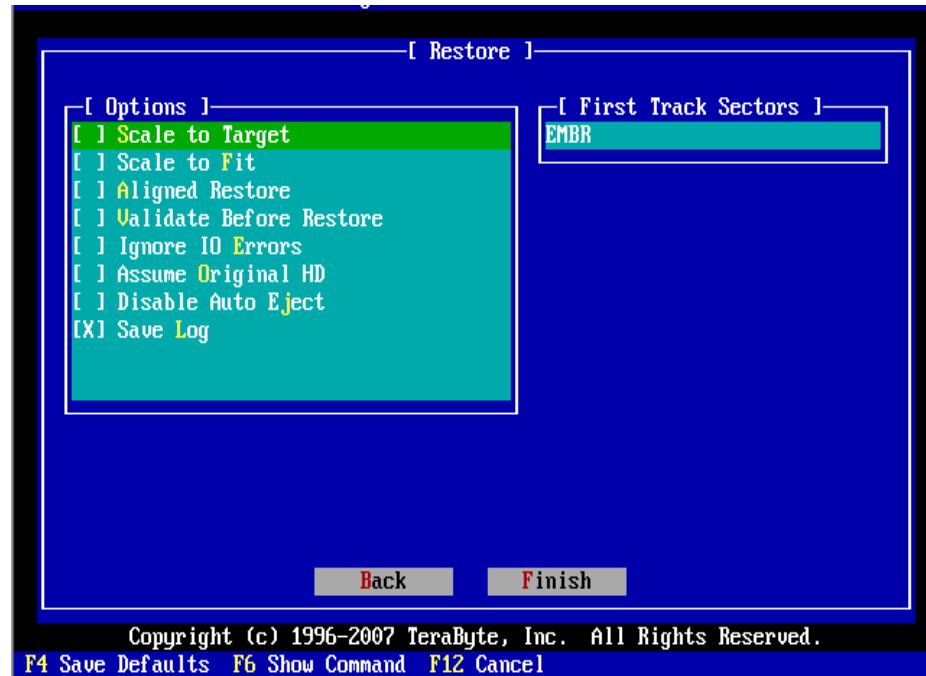


4. On the **Restore From** screen that appears, navigate to and select the backup file you want to restore. If you select a file stored on a hard drive, select either the entire drive or a partition to restore. The options you can set in Step 6 change, depending on your choice here.
5. On the **Restore To/Select Target Drive** screen that appears, select the hard drive onto which you want to restore the image you selected in Step 5. Then, select the partition on that drive. The partition you select will be deleted before Image for Linux restores the image.
6. On the **Restore Options** screen that appears, select the options you want to use while restoring. For an explanation of each option, see the next two sections, "Understanding Restore Options for an Entire Drive" and "Understanding Restore Options for an Individual Partition."
7. When you select Finish, the restore process begins immediately if you selected the entire drive as the target destination in Step 5. If, in Step 5, you selected an existing partition, Image for Linux prompts you to confirm that you want to overwrite the data in that partition. During the restore process, a progress bar appears on-screen. A message appears when Image for Linux finishes.

After you press Enter, the main menu for Image for Linux reappears. Select **Exit** and, when prompted, remove the Image for Linux boot disk and press **Enter** to reboot your computer.

Understanding Restore Options for an Entire Drive

When you restore an entire drive, Image for Linux offers these options that you can set:



Scale to Target – If you use this option when restoring an image, Image for Linux restores the image proportionally to the target drive. For example, suppose that you backed up a 100 MB hard drive and restored the image to a 200 MB hard drive. If you use this option, you allow Image for Linux to double the size of the restored image. This option only works for FAT, FAT32, and NTFS file systems and has no effect on images restored to hard drives using other file systems. You cannot use this option in conjunction with the **Scale to Fit** option. If you inadvertently enable both options, **Scale to Fit** will take precedence.

Scale to Fit – On FAT, FAT32, or NTFS file systems, selecting this option will make Image for Linux assume that the size of the original hard drive is based on the location of the end of the last partition; Image for Linux then applies the same scaling to the target hard drive. If any unpartitioned space existed at the end of the source drive, that unpartitioned space won't exist on the target drive after you restore your image. This option has no effect on images restored to hard drives using other file systems. You cannot use this option in conjunction with the **Scale to Target** option. If you inadvertently enable both options, **Scale to Fit** will take precedence.

Aligned Restore – If you select this option, Image for Linux will align each restored partition to the beginning and end of a cylinder boundary. You may want to enable this option if the target drive has a different geometry than the source drive. Disable this option if you want the target drive to be configured identically to the source drive.

Validate Before Restore – If you select this option, Image for Linux will validate the image file(s) prior to restoring them, will perform internal consistency checks on the backup file(s). If Image for Linux encounters an error during validation, Image for Linux will abort the restore operation without overwriting the partition. If you select this option, the overall processing time Image for Linux takes to restore the image will increase, but you can restore the image with greater certainty that the restored image will be reliable.

Ignore IO Errors – Under ordinary circumstances, if Image for Linux encounters a bad sector on the target partition while restoring, Image for Linux will notify you concerning the write error and give you the option to continue or abort. If you select the Ignore IO Errors option, Image for Linux will ignore the error and continue. Generally, you should select this option only if you need to restore to a target drive that contains known bad sectors. On some systems, if you select this setting and Image for Linux encounters bad sectors, there will be a significant delay as the internal retry/recovery routine of the drive attempts to handle the bad sector(s). In addition, some systems may hang if the **BIOS** option is used to access the source drive. In such cases, try using the **BIOS (Direct)** option instead.

Assume Original HD – If you select this option, Image for Linux will keep references to the source hard drive number intact within the partitions that have been restored to the target. If you do not select this option and the target drive number differs from that of the source drive, applicable drive references residing within the restored partitions will be updated to reflect the new hard drive number.

This option has no effect if you are restoring to a target drive whose number matches that of the source drive. If you are restoring to a target drive whose number differs from that of the source drive, but you plan to subsequently move the target drive so that its number matches the source drive again, enabling this option can be beneficial.

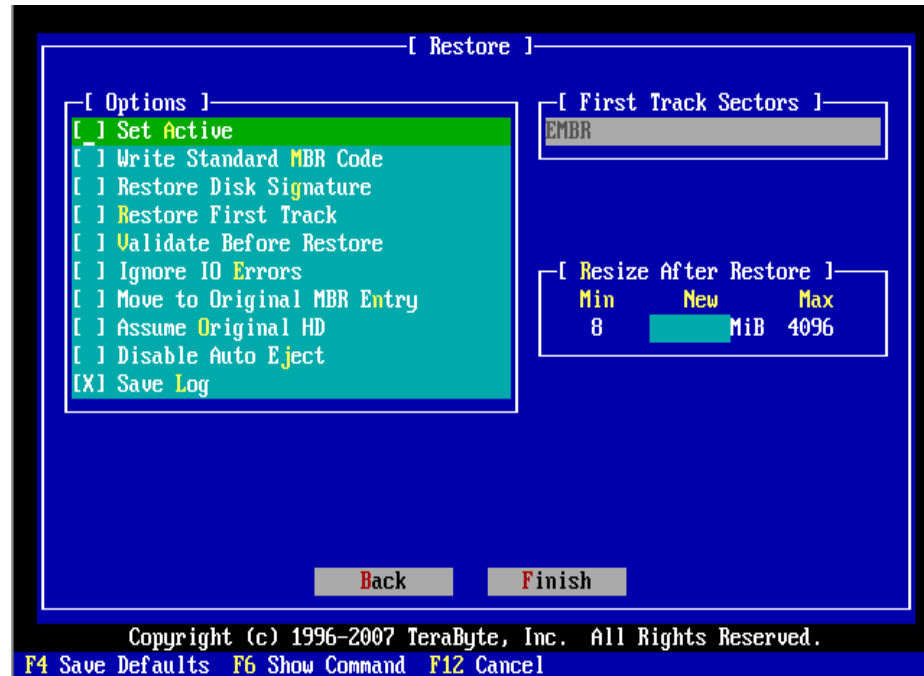
Disable Auto Eject – This option prevents Image for Linux from automatically opening the optical drive tray. If you don't select this option, Image for Linux will open the drive tray whenever a disc is needed and at the completion of the restore operation.

Save Log – Select this option to make Image for Linux log the date and time it completes the restore operation. Image for Linux saves the log as `IFL.LOG` in the `IMAGE.EXE` program directory. To be able to save `IFL.LOG`, Image for Linux must be running from a writable medium such as a non-write-protected floppy diskette. You can use the `--logfile` or `LogFile` options to specify an alternate location for `IFL.LOG`.

First Track Sectors – This text box allows you to specify how many sectors of the first track of each partition should be restored. If you enter `AUTO` in this box, the tracks needed for the EMBR will be restored. If you aren't sure, type `AUTO` in this box.

Understanding Restore Options for an Individual Partition

When you restore an individual partition, Image for Linux offers these options that you can set:



Set Active – If you select this option, Image for Linux will make the restored partition the active partition after completing the restore operation.

Write Standard MBR Code – If you select this option, Image for Linux will install standard master boot code to the Master Boot Record (MBR) after completing the restore operation. The other portions of the MBR (i.e. the partition table, disk signature(s), etc.) will not be affected.

Restore Disk Signature – This option applies when you restore a partition that had been assigned a drive letter within Windows prior to being backed up. If you select this option, Image for Linux will restore the disk signature associated with the source partition. If you don't select this option, Image for Linux will use the disk signature already present in the MBR of the target drive; if none exists, Image for Linux will create one if necessary. If you are restoring a partition that had been assigned a drive letter in Windows and you wish to keep that drive letter assignment, select this option.

Restore First Track – Whenever you back up any partition, Image for Linux also backs up the first track of the source hard drive. If you select this option, Image for Linux will restore the first track as well as the partition and the disk signature. This allows you to restore the MBR/EMBR, if desired.

Validate Before Restore – If you select this option, Image for Linux will validate the image file(s) prior to restoring them. If Image for Linux encounters an error during

validation, Image for Linux will abort the restore operation without overwriting the target.

Ignore IO Errors – Under ordinary circumstances, if Image for Linux encounters a bad sector on the target drive while restoring an image, Image for Linux will notify you concerning the write error and give you the option to continue or abort. If you select the Ignore IO Errors option, Image for Linux will ignore the error and continue. Generally, you should select this option only if you need to restore to a target drive that contains known bad sectors. On some systems, if you select this setting and Image for Linux encounters bad sectors, there will be a significant delay as the internal retry/recovery routine of the drive attempts to handle the bad sector(s). In addition, some systems may hang if the **BIOS** option is used to access the source drive. In such cases, try using the **BIOS (Direct)** option instead.

Move to Original MBR Entry – If you select this option, Image for Linux will move the partition table entry of the restored partition to the same location in the master partition table as it had on the source drive. Image for Linux will also move the existing partition table entry to another location rather than overwrite it. You may want to enable this option if you use an environment that tracks master partition table entries, such as Linux.

Assume Original HD – If you select this option, Image for Linux will keep references to the source hard drive number intact within the partitions that have been restored to the target. If you do not select this option and the target drive number differs from that of the source drive, applicable drive references residing within the restored partitions will be updated to reflect the new hard drive number.

This option has no effect if you are restoring to a target drive whose number matches that of the source drive. If you are restoring to a target drive whose number differs from that of the source drive, but you plan to subsequently move the target drive so that its number matches the source drive again, enabling this option can be beneficial.

Disable Auto Eject – This option prevents Image for Linux from automatically opening the optical drive tray. If you don't select this option, Image for Linux will open the drive tray whenever a disc is needed and at the completion of the restore operation.

Save Log – Select this option to make Image for Linux log the date and time it completes the restore operation. Image for Linux saves the log as `IPL.LOG` in the `IMAGE.EXE` program directory. To be able to save `IPL.LOG`, Image for Linux must be running from a writable medium such as a non-write-protected floppy diskette. You can use the `--logfile` or `LogFile` options to specify an alternate location for `IPL.LOG`.

First Track Sectors – This text box allows you to specify how many sectors of the first track of each partition should be restored. If you enter `AUTO` in this box, the tracks needed for the EMBR will be restored. If you aren't sure, type `AUTO` in this box.

Resize After Restore – Currently available only for FAT, FAT32, and NTFS partitions, you can use this text box to specify a new size for the restored partition, bound by the **Minimum** and **Maximum** values specified by Image for Linux. The units used here are mebibytes, abbreviated MiB. (Please refer to the section titled **Data Storage Size Unit Conventions** at the beginning of this manual for more information.)

Validating Backups with Image for Linux

You can use Image for Linux to validate backups at the time you create them and also before you restore a backup. You also can validate a backup at any time using the instructions provided below.

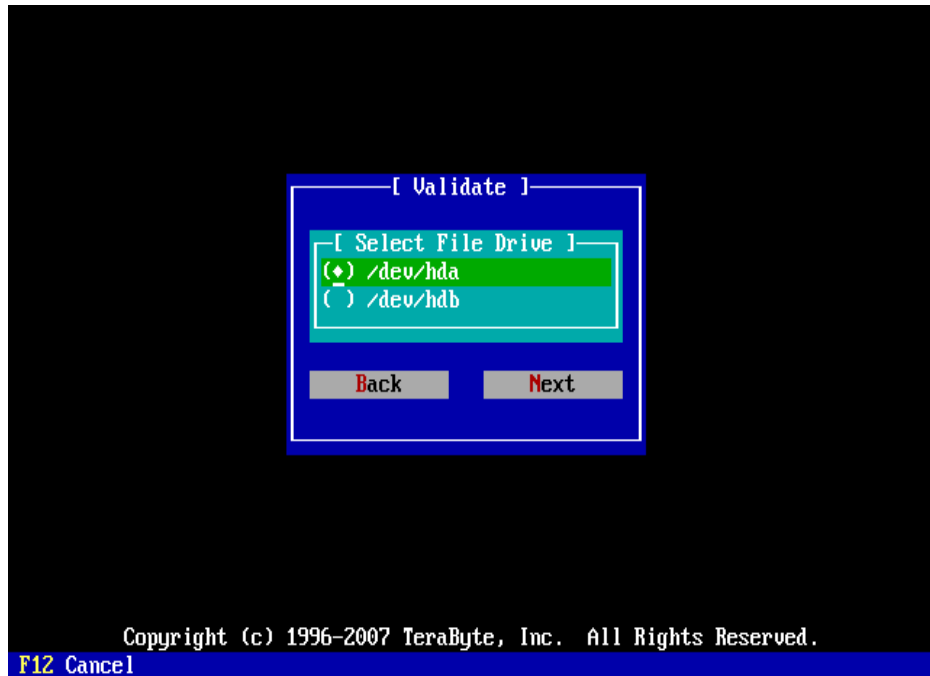
When you validate a backup, Image for Linux performs internal consistency checks on the backup file(s), helping to ensure that the backup will be reliable if you need to restore from it.

When you use the steps that follow to validate a backup, Image for Linux performs a standard validation, not a byte-for-byte validation, which provides a more intense scrutiny of a backup file. You can perform a byte-for-byte validation only as part of a backup operation. See the section, “Understanding Backup Options” for details on a byte-for-byte validation.

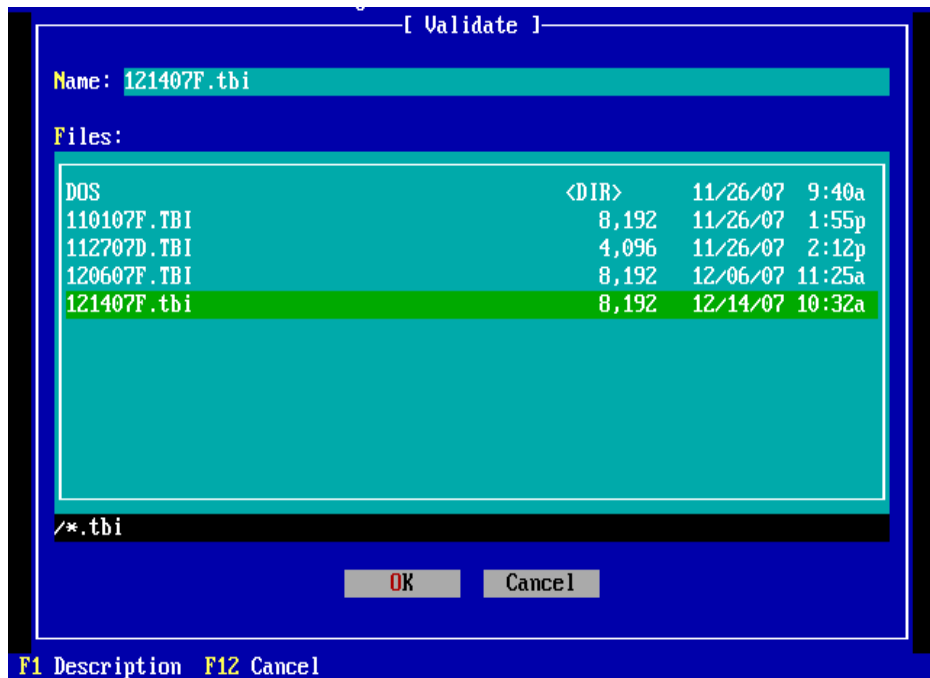
Validating a Backup

Insert your Image for Linux boot disk into the appropriate drive and boot your computer. Then, follow these steps:

1. On the Image for Linux **Main Menu/Select Operation** screen, select **Validate**.
2. On the **Validate/Select File Access Method** screen that appears, choose one of the following options, which refer to the location where Image for Linux should look for the backup to validate:
 - * **File (OS)** – Choose this option to use the operating system file services to find image files to validate on mounted partitions.
 - * **File (Direct)** – Select this option if the image file(s) you want to validate are stored on a hard drive and an unmounted partition.
 - * **File (CD/DVD)** – Select this option if the image file(s) you want to validate are stored on CD or DVD discs.
3. The screen that appears next depends on your choice in Step 2.
 - * If you chose **File (OS)**, a screen appears where you can select the file you want to validate; see Step 4 for details.
 - * If you chose **File (Direct)**, the **Restore From/Select File Drive** screen shown in the figure appears; select the hard drive that contains the backup you want to validate from the list shown and then select the correct partition.
 - * If you chose **File (CD/DVD)**, the **Restore From/Select Drive Interface** screen appears. Select either ATAPI/SCSI or SG. Then, insert the first disc in the set and then select the corresponding CD/DVD drive from the list.

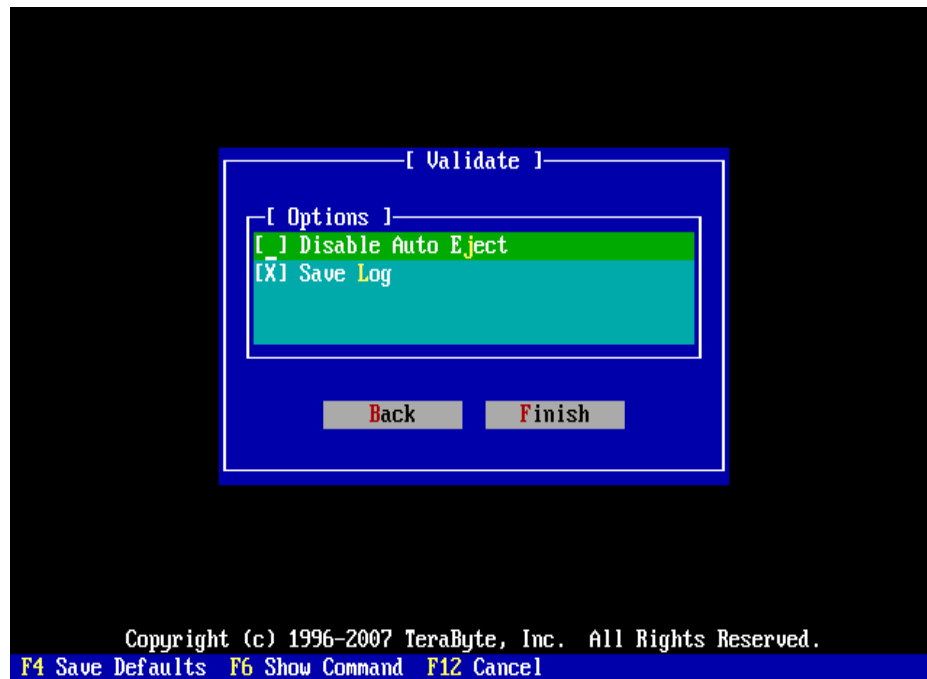


4. On the screen that appears, type the name of the image file you want to validate. You do not have to supply a file extension—just the path and file name itself. If you prefer, use the Tab key and the arrow keys to navigate to the image file you want to validate.



5. On the Validate/Select Item to Process screen, choose to validate the drive or a partition.

6. On the **Validate Options** screen that appears, select the options you want to use. See the next section, “Understanding Validation Options,” for an explanation of each option.



7. When you select Finish, the validation process begins, and a progress bar appears on-screen. A message appears when Image for Linux finishes. You can interrupt the validation operation at any time by pressing the Esc key. Image for Linux will ask you to confirm that you want to cancel before it interrupts the operation.

After you press Enter to dismiss the message that appears when Image for Linux finishes validating, the main menu for Image for Linux reappears. Select **Exit** and, when prompted, remove the Image for Linux boot disk and press **Enter** to reboot your computer.

Understanding Validation Options

You can set two options when you validate an image:

Disable Auto Eject – This option prevents Image for Linux from automatically opening the optical drive tray. If you don't select this option, Image for Linux will open the drive tray whenever a disc is needed and at the completion of the restore operation.

Save Log – Select this option to make Image for Linux log the date and time it completes the validate operation. Image for Linux saves the log as `IFL.LOG` in the `IMAGE.L.EXE` program directory. You can use the `--logfile` or `LogFile` options to specify an alternate location for `IFL.LOG`.

Installing Image for Linux Manually

In the section “Installing Image for Linux,” you saw how to use the MakeDisk utility under Windows to create boot disc for Image for Linux. You also can create the default configuration boot disc from within Linux.

If you are running Linux, you also can run Image for Linux from within Linux without creating a boot disc.

Finally, you can create a customized Linux boot disc.

Creating a Default Configuration Boot Disc from within Linux

If you use an operating system platform that doesn’t support MakeDisk, you can create the default configuration boot disc from within Linux.

Note: If your system is capable of booting from a USB Flash Drive, you also can create a bootable USB flash drive for Image for Linux. See the `readme.txt` included in the Image for Linux zip archive for details.

The default configuration sets the following options:

- * Wired network using eth0 interface (wireless networking is not supported)
- * DHCP server must be available to obtain IP address
- * Console login is not required on boot
- * The root password is `ifl` (used for SSH login)
- * SSH server is started
- * The ISCSI initiator daemon is started
- * The time zone is UTC
- * QWERTY keyboard layout
- * 80x25 as default video mode

To create a bootable disc that contains Image for Linux and uses the default settings, unzip the Image for Linux archive file to a directory of your choice on a Linux file system—`ext2/3` or `reiserfs`. Then, burn the file `iflnet.iso` to a CD/DVD using appropriate burner software. We recommend that you use the GUI program K3B.

Note: Unzipping the archive on a Linux file system helps ensure that you don’t encounter problems with file permissions and upper/lower case, which can occur if you unzip on a FAT, FAT32, or NTFS partition.

Running Image for Linux without using a Boot Disc

From within Linux, you can run Image for Linux without creating a boot disc. The first time you want to run Image for Linux, follow these steps:

1. Extract the zip archive on a Linux file system (not FAT/FAT32 or NTFS).
2. Open a terminal window such as xterm and change to the directory that contains the files you extracted from the Image for Linux archive file.
3. Become root.
4. Type `./setup` at the prompt.

Note: The setup script extracts the Image for Linux program, `image1`, from `iflnet.iso` and also sets up the IFL directory so that Image for Linux can create bootable restore discs. The setup script also offers the option to extract `config.zip` if you intend to create custom versions of the disk (see the section "Customizing a Customized Image for Linux Boot Disc").

5. To run Image for Linux, type `./image1` at the prompt.

Once you have run the `setup` script, you do not need to run it again. On subsequent occasions when you want to run Image for Linux without using a boot disc, perform Steps 2, 3, and 5.

Creating a Customized Image for Linux Boot Disc

You can create a customized set of boot files for Image for Linux and store them on a CD/DVD, a hard drive, or a USB flash drive. You also can create a set of boot files for a PXE network boot.

When you create a customized set of boot files, you can:

- * specify and use a static IP address, default route, DNS
- * use an alternate or additional network interface or no network interface
- * configure wireless networking
- * specify a default video mode other than 80x25
- * specify an alternate keyboard map (the default is US/QWERTY)
- * include custom scripts in the scripts directory
- * optionally execute some or all of the scripts on boot
- * specify a time zone other than UTC

- * specify that console login is required on boot
- * set the root password
- * specify a hostname other than `ifl`
- * disable the SSH server on boot
- * include a custom configuration for iSCSI in the `iscsi` directory
- * disable the iSCSI daemon on boot
- * edit and include the `ifl.ini` file to specify custom settings for Image for Linux
- * enable support for Linux Volume Manager volumes
- * enable login from a serial port such as COM1 and/or COM2

To create a customized boot disc, follow Steps 1 to 4 in the preceding section and make sure that you accept the option to extract the contents of `config.zip`. This archive file contains the following files that you can customize: `config.txt`, `ifl.ini`, and `wireless.txt`. Each of these files is commented to describe the options you can set by editing them.

In addition, you can set up the `scripts` directory with one or more bash scripts that you want to include on the disk. You also can set up the `iscsi` directory as needed to work with your network and `iscsi` target setup.

After you set up the options for your customized boot files, run one of three scripts—`makeISO`, `makeHDD`, or `makePXE`—to create the customized version on the medium of your choice.

Note: If you want to create a bootable USB Flash drive, use the `makeHDD` script.

If you are using Linux kernel Version 2.6 or later, make sure that you enable Enhanced Disk Drive (EDD), because Image for Linux uses EDD to determine the correct CHS geometry for the target hard drive during a restore operation. EDD is enabled by default if you create a boot disc using `MakeDisk` or using the steps described in the section, “Creating a Default Configuration Boot Disc from within Linux.”

If you are using an older version of the Linux kernel or if you are not using the EDD module, Image for Linux will attempt to use other means to determine the geometry.

Note: You can find complete details on setting up customized options in “Setting up the IFL directory to create custom versions” in Section 2 of `readme.txt`, included in the Image for Linux archive file.

Deploying Your Image

When you *deploy* an image, you restore it to a number of computers in an organization. Therefore, the information in this section does not apply to most home users.

If you are deploying images in Linux, you might find the information in `pxe.txt`, `iscsi.txt`, and `iflhelp.txt` helpful. You might also want to read the following information stored on the Terabyte website:

<http://www.terabyteunlimited.com/kb/idx.php/0/316/article/Using-IFL-to-createrestore-images-on-WindowsSamba-shares.html>

If you are deploying images of Windows machines using Image for Linux, you might want to read through the following information.

Image for Linux does not change the SID of Windows NT/2000/XP/2003 systems. If you are using Image for Linux for deployment purposes and want to change the SID for Windows NT/2000/XP you should use the MS sysprep utility or you can download a free utility named NewSID.

You may want to set up the base machine so that the last partition ends at one track less than the actual end of the hard drive (around 8 MB less) to leave room for different brands or models of the same size hard drive.

You may also want to investigate the free ImageAll utility available from the TeraByte Unlimited web site.

See the following for more information on how to prepare for deployment for Windows XP:

How to Use the Sysprep Tool to Automate Successful Deployment of Windows XP

<http://support.microsoft.com/kb/302577>

Windows XP How-to and Technical Article Resources

<http://technet.microsoft.com/en-us/library/bb878149.aspx>

Download for the Microsoft Windows XP SP1 Deployment Tools

<http://www.microsoft.com/downloads/details.aspx?familyid=7A83123D-507B-4095-9D9D-0A195F7B5F69&displaylang=en>

Download for the Microsoft Windows XP SP2 Deployment Tools

<http://www.microsoft.com/downloads/info.aspx?na=47&p=1&SrcDisplayLang=en&SrcCategoryId=&SrcFamilyId=0c4bf06-2824-4d2b-abc1-0e2223133afb&u=details.aspx%3ffamilyid%3d3E90DC91-AC56-4665-949B-BEDA3080E0F6%26displaylang%3den>

See the following for more information on how to prepare for deployment for Windows Vista:

<http://technet2.microsoft.com/WindowsVista/en/library/2957d7c4-02c7-4205-afb5-f03434d8f37d1033.mspx?mfr=true>

See the following for more information on how to prepare for deployment for Windows 2003 Server:

What is Sysprep?

<http://technet2.microsoft.com/windowsserver/en/library/c03a5469-ef71-4545-b970-ce2add5e715c1033.mspx?mfr=true>

Download for the Microsoft Windows 2003 Server Sysprep Tool:

<http://www.microsoft.com/downloads/details.aspx?familyid=93F20BB1-97AA-4356-8B43-9584B7E72556&displaylang=en>

See the following for more information on how to prepare for deployment for Windows 2000:

Download for the Microsoft Windows 2000 Sysprep Tool:

<http://www.microsoft.com/downloads/details.aspx?familyid=0C4BFB06-2824-4D2B-ABC1-0E2223133AFB&displaylang=en>

Deploying MS Windows 2000 Professional and MS Office 2000 Using Sysprep

<http://www.microsoft.com/technet/prodtechnol/windows2000pro/deploy/depopt/sysprep.mspx>

Using Sysprep to Duplicate Disks

http://www.microsoft.com/technet/prodtechnol/windows2000serv/reskit/deploy/dgcb_ins_izyl.mspx?mfr=true

See the following for more information on how to prepare for deployment for Windows NT:

Windows NT Workstation Deployment

<http://www.microsoft.com/technet/archive/ntwrkstn/deploy/depopt/default.mspx?mfr=true>

Image for Linux Advanced Configuration Options

Image for Linux offers a number of advanced configuration options. You can set these options in a user-created `IFL.INI` file or using environment variables that you include on the command line or in a batch file. The way you run Image for Linux affects the way Image for Linux processes advanced options.

If you run Image for Linux using the menu interface as described earlier in this manual, Image for Linux sets all options using `IFL.INI`, and you can customize `IFL.INI`. If you also want to set environment variables, store them in a batch file that you run prior to running Image for Linux.

If you run Image for Linux from the command line as described in the section, “Running Image for Linux from the Command Line,” Image for Linux processes the command line switches and uses `IFL.INI` to process global default options (but ignores all other options in `IFL.INI`) and finally processes any environment variables you set. So, environment variables take precedence over `IFL.INI`.

Image for Linux INI File

To apply settings to Image for Linux using the INI file, you edit the text file named `IFL.INI` using a text editor such as Notepad. Image for Linux will look for `IFL.INI` in the current directory only.

Settings you specify in `IFL.INI` need to be placed under a section name. For details on the settings available, refer to Tables 1, 2, and 3 in the section, “Running Image for Linux from the Command Line.” A typical backup `IFL.INI` file might look like this:

```
[Options]
VolumeSeq=1
TimeZone=PST8PDT

[License]
ProductKey=nnnn-nnnn-nnnn

[BACKUP_DEFAULTS]
PostValidate=2

[HD0]
UseOrgGeo=1
```

Image for Linux Environment Variables

You use the `SET` command is used to establish Image for Linux environment variables. The format for Image for Linux environment variables is:

```
SET IFL=option1;option2:value;option3
```

All of the environment variables you can use with Image for Linux are the same as the INI settings, and all INI settings appear in the right column of Tables 1 to 7.

To set an environment variable in Linux, use the `export` command in a script or from the command prompt prior to running Image for Linux. The variable names, such as IFL and IMSG, must be upper case. The following example sets up the text mode interface for Image for Linux:

```
export IFL=CONSOLE
```

Use this command to set the CD write speed to 4:

```
export IFL=CDWS:4
```

To assign more than one Image for Linux option, separate the options with a semicolon, and enclose the entire option string in single quotation marks. The following command combines the previous two examples:

```
export IFL='CDWS:4;CONSOLE'
```

To display a list of all currently assigned environment variables, use the `env` command. To see one particular variable, you can use the `echo` command – for example `'echo $IFL'`.

To remove an environment variable, use the `export` command with the `-n` option:

```
export -n IFL
```

Running Image for Linux from the Command Line

You can run Image for Linux from the command line by typing the program name followed by the options you want enabled. Be sure to separate the command line options with spaces or colons (:). You can view all available command line options by typing the following command at the command prompt:

```
imagerl -?
```

Press Esc to stop on the screen containing the stuff you want to use.

Note: The last letter of the program name is a lowercase L, not the number 1.

When running Image for Linux from the command line, you might need to include references to hard drive numbers and/or partition IDs. To determine the correct hard drive number or partition ID, complete Steps 1 through 5 in the section "Creating a Full Backup," making sure that you select the hard drive whose number and/or partition IDs you need to obtain. The hard drive number will then appear in the format "HDn" (e.g. "HD0" or "HD1"). The partition ID appears in parenthesis in the middle of each partition description and consists of either two or four characters.

Note: Under certain configurations, hard drive numbers may be different in Linux than they are in DOS, Windows or other environments.

The basic format for running Image for Linux from the command line is:

```
imagerl [action] [options]
```

Note: The last letter of the program name is a lowercase L, not the number 1.

Valid values for [action] are:

- B Backup
- R Restore
- V Validate
- L List, which lists the partitions on a particular hard drive

For example, you might type the following at the command prompt to create a backup using Image for Linux. The command specifies the source drive and partition, the target drive and partition, and the backup filename.

```
imagerl -b --d:0@0x01 --f:1@0x01:/mypath/filename
```

Note: If file names contain spaces or dashes, surround them in a back slash (\) followed by a quotation mark: \"my path/my file name\".

The first parameter, `-b`, identifies that you want to perform a backup.

The second parameter, `--d : 0`, identifies the drive to back up. This example backs up Hard Drive 0.

The next part of that parameter, `@0x01`, identifies the partition to back up on the selected hard drive; this example backs up the first partition. If you want to back up the entire drive, simply omit the part of the parameter that identifies the partition.

The third parameter, `-f`, identifies that you are about to specify where to store the backup file. `1` identifies the target drive and `@0x01` again identifies the partition; in this example, Image for Linux will store the backup file on Hard Drive 1 in the partition with ID 0x01. The information after `@0x01` represents the path and file name where you want to store the backup file. In this example, Image for Linux stores the backup file in `/mypath/filename`.

When listing information, you can include the `--d` parameter to list partitions; if you omit `--d`, Image for Linux lists the hard drives

When you specify command line options, you use the following syntax:

- The dash works on single character options, such as `d` and `b` in the example. When you use the dash, Image for Linux processes only the first character that follows the dash as an option. If you wanted to specify two single character options in a row, you could precede each by a dash. Or, you can use the next method.
- Two dashes indicate a multiple character option. For example, to specify the base option, you type `--base`.

Note: If you use the `d`: (colon) style, you need to use the `--` character. For example, Image for Linux reads `-d` as `-d` and `-:` and Image for Linux won't be able to execute the command. Instead, use `--d`: and Image for Linux will be able to execute the command.

In Table 1, you find the global parameters you can set for Image for Linux regardless of the action you set (backup, restore, or validate).

The table shows you the command line option on the left and the INI file variable on the right. In some instances, both forms of the parameter are available; in other cases, only one is available. When one form of an option isn't available, N/A appears. To set up an INI file, place these parameters in the [Options] section except as otherwise noted.

Table 1: Image for Linux Global Parameters

Command Line Option	INI Variable
<code>--uvl</code>	VolumeLabels
Instructs Image for Linux to display volume labels, if possible, rather than the string found in the partition table of the EMBR.	

This is the Default. If you disable this option and an identifier for the partition exists in the EMBR, Image for Linux will display it.

--seq

SeqVolID

Instructs Image for Linux to assign ID numbers to volumes in sequential order rather than random order.

Default if omitted: Image for Linux will assign ID numbers to the volumes in random order.

--con

N/A

Instructs Image for Linux to run in console (text-only) mode, rather than the CGUI (character graphic user interface) mode.

Default if omitted: Image for Linux runs in CGUI mode.

--nocan

NoCancel

Tells Image for Linux not to permit use of the F12 key to cancel the backup, restore, or validate operation once it has begun.

Default if omitted: You can use the F12 key to cancel the backup operation.

--logfile:x:/path/logfile.txt

LogFile

Use this parameter to specify the path and file name of the log file. *x* is a drive letter, *path* is the desired path, *logfile* (or *log file*) is the name of the log file, and *txt* is the file extension of the log file. Image for Linux doesn't automatically add a file extension. If you use paths and/or file names containing spaces or dashes, surround them in a back slash (\) followed by a quotation mark: \"x:/my path/my file name\".

The path you specify must exist because Image for Linux will not create it or the log file.

Default if omitted: If logging has not been disabled with **--log 0**, a log named `IFL.LOG` is created in the current directory of the operating environment.

--log:0

N/A

Use this option to disable logging.

Default if omitted: Image for Linux logs during a backup operation.

--relax

RelaxedMatching

Use this option when performing a differential backup to instruct Image for Linux to relax some of the criteria it uses to determine the drive you used as the source during the corresponding full backup. This option has no effect during full backup operations.

Default if omitted: Image for Linux does not relax the criteria it uses to detect the full backup source drive.

--tz:AAAnBBB

TimeZone

This option sets the time zone that Image for Linux uses. When you save images to

NTFS partitions or CD/DVD discs, using the correct time zone will ensure that the date/time stamps of the image files will be correct when they are viewed within Windows.

AAA and *BBB* are three letters you supply to represent the time zone. The characters don't mean anything to Image for Linux and are for your use.

N is the time offset number to indicate the offset from GMT (Greenwich Mean Time) and be positive or negative.

For example, you might use a time zone setting such as PST8PDT.

Please refer to <http://www.terabyteunlimited.com/kb/article.php?id=260> for more information.

Default if omitted: Image for Linux does not establish a time zone.

<code>--msg:mymessage</code>	Message
Use this option to specify the text Image for Linux displays on the top of the screen while backing up. The maximum length of the message text depends on the memory available in your computer. If your message text contains spaces, surround the message text by a backslash (\) followed by a quotation mark:	
<code>--msg:\ "my message"</code>	
Use /n to force a new line; otherwise, text wraps to screen width only:	
<code>--msg:\ "first line/nsecond line"</code>	
<i>Default if omitted:</i> No message text is displayed.	

<code>--npt</code>	NoPartTable=0x10000 Place under the [HDx] section
Use this parameter to tell Image for Linux to treat the selected drive as a drive that doesn't use a partition table. If you use this option on the command line, you must place it before the -d option. It stays in effect until you disable it using --npt:0. You may want to disable this option if you use additional options to select a device/partition such as the --f:0@0x1:/filename option.	
<i>Default if omitted:</i> Image for Linux treats the selected drive as a drive that uses a partition table.	

<code>--anpt</code>	AssumeNoPartTable=0x40000 Place under the [HDx] section
Use this parameter to tell Image for Linux to treat the selected drive as a drive that doesn't use a partition table only if the first sector on the drive is all zeros.	
<i>Default if omitted:</i> Image for Linux treats the selected drive as a drive that uses a partition table.	

<code>--nptrm</code>	NPTOptRemMedOnly=0x80000 Goes under the [HDx] section
Use this parameter to tell Image for Linux to apply the npt or anpt options on removable media only.	

Default if omitted: Image for Linux applies the npt or anpt option to all drives..

--un

N/A

Use this parameter to perform an unattended backup and tell Image for Linux to assume the answer to all Yes/No prompts is No and the answer to all OK/Cancel messages is Cancel. Image for Linux then aborts the backup process when the first Yes/No prompt appears.

Default if omitted: Image for Linux does not run an unattended backup.

--uy

N/A

Use this parameter to perform an unattended backup and tell Image for Linux to assume the answer to all Yes/No prompts is Yes and the answer to all OK/Cancel messages is OK.

Default if omitted: Image for Linux does not run an unattended backup

--ui

N/A

Use this parameter when performing an unattended backup to tell Image for Linux to assume the answer to all Abort/Retry/Ignore prompts is Ignore. Use this parameter in conjunction with **uy** or **un**.

Default if omitted: Image for Linux assumes the answer to all Abort/Retry/Ignore prompts is either Yes or No, depending on whether you set **uy** or **un**.

--um

N/A

During an unattended backup using CD/DVD discs, use this parameter to tell Image for Linux to ignore the first request for media. This option helps you start the backup if you have already inserted a disc and a prompt appears asking for the disc. This option works only for the first prompt—you need to respond to other prompts for media.

Default if omitted: You must respond to the first request for media.

Image for Linux Backup Options

In the following table, you find the command line options that you must set to use Image for Linux to make a backup image.

The table shows you both the command line option and the INI file variable. In some instances, both forms of the parameter are available; in other cases, only one is available. When one form of an option isn't available, N/A appears. To set up an INI file, place these parameters in the [Backup_Defaults] section.

Table 2: Image for Linux Required Backup Parameters

Command Line Option	INI Variable
-b	N/A
Use this option to indicate that you want to perform a backup.	
<i>Also required:</i> Either -d option to specify a full backup or --base option (for differential	

backup) and the **-f** option to specify target image file destination.

-d	N/A
<p>Use when performing a full backup to identify the source hard drive and partition. For most users, the partition ID will be a number from 1 through 4. For partition IDs of 9 or below, you can use a single digit in place of hexadecimal notation (e.g. 1 is equivalent to 0x1, and 5 is equivalent to 0x5).</p> <p>The volume ID will be a number formatted as 0xPVV, where <i>P</i> is the extended partition and <i>VV</i> is the volume number in hexadecimal from 01 to FF.</p> <p>If you are not sure what the partition or volume ID is, run Image for Linux using the interface, choose the Backup option, and click Next. The screen that lists the partitions and volumes also will display the ID in parentheses as a hexadecimal number. You should prefix that number with a 0x on the command line.</p>	
-d:d@p -d:bd@p -d:ad@p -d:ud@p -d:fd@p -d:sd@p -d:od@p	<p>d is the source hard drive number</p> <p>p is the source partition or volume ID (hex or decimal notation), depending on whether you are referring to a partition or a volume.</p> <p>You can use device modifiers as needed. When you use them, you must place them after the -d: and before the source hard drive number:</p> <p> – Linux device</p> <p>The -d option cannot be used with the --base option.</p>

--base	N/A
<p>Use when performing a differential backup to identify the full backup on which Image for Linux should base this differential backup.</p>	
--base:x:/bkup --base:x:/mypath/bkup --base:"x:/my path/bkup" Or: --base:d@p:/bkup --base:d@p:/mypath/bkup --base:"d@p:/my path/bkup"	<p>x:/ is source drive letter</p> <p><i>my path</i> or <i>my path</i> is the path to bkup</p> <p><i>bkup</i> is name of existing full backup (omit file extension)</p> <p>Or:</p> <p>Specify source device, partition, path, and file name:</p> <p>d is source hard drive number</p> <p>p is source partition ID (hex or decimal notation)</p> <p>You can use device modifiers as needed. When you use them, you must place</p>

them after the **-d:** and before the source hard drive number:

l – Linux device

g – SCSI generic device

o – Optical drive (when you combine this option with either of the options above, this option must come last)

Whether using drive letter or device/partition, you may specify any path desired. If you use paths and/or file names containing spaces or dashes, surround them in a back slash (\) followed by a quotation mark.

The **--base** option cannot be used with **-d** option.

-f

N/A

Use this option to specify the target drive letter, path, and file name for a backup file.

-f:x:/filename

x:/ is target drive letter

-f:x:/mypath/filename

mypath or *my path* is the path to filename

-f:\x:/my path/file name

filename is target file name for image

Or:

Or:

-f:d@p:/filename

Specify target device, partition, path, and file name:

-f:d@p:/mypath/filename

d is target hard drive number

-f:\d@p:/my path/filename

p is target partition ID (hex or decimal notation)

mypath or *my path* is path to filename

filename is target file name for image

Device modifiers may be used as needed. When used, they must be placed after the **-d:** and before the target hard drive number:

l – Linux device

g – SCSI generic device

o – Optical drive (when you combine this option with either of the options above, this option must come last)

Whether using drive letter or device/partition, you may specify any path

desired. If you use paths and/or file names containing spaces or dashes, surround them *in* a back slash (\) followed by quotation marks.

The above options are required when you perform a backup using Image for Linux from the command line. In Table 3, you find a list of the optional backup parameters you can use when you run Image for Linux from the command line.

The table shows you both the command line option and the INI file variable. In some instances, both forms of the options are available; in other cases, only one is available. When one form of an option isn't available, N/A appears.

Table 3: Image for Linux Optional Backup Parameters

Command Line Option	INI Variable
<code>--pw:mypassword</code> or <code>--pw:"my password"</code>	N/A
<p>Use this option to set a password for Image for Linux to use in conjunction with simple password protection or AES encryption. If your password contains spaces, surround it with a backslash (\) followed by a quotation mark. Your password cannot exceed 128 characters, and it may contain upper/lowercase letters, numbers, special characters, spaces, and non-ASCII characters.</p> <p>You must use this option if you also specify enc:1 or enc:2, described later in this table.</p> <p><i>Default if omitted:</i> Image for Linux does not assign a password, and the backup will be neither password protected nor encrypted.</p>	
<code>--rb:1</code>	N/A
<p>Instructs Image for Linux to reboot the computer after completing the backup operation.</p> <p><i>Default if omitted:</i> Image for Linux attempts to determine if the computer needs to be rebooted after completing the backup and, if so, prompts you to reboot.</p>	
<code>--mp</code>	MultiPass
<p>Use this parameter to tell Image for Linux to use Multi Pass mode when creating a differential backup. In Multi Pass mode, Image for Linux compares the source partition against the full backup in one pass and performs the differential backup in a second pass. This setting is not applicable when performing a full backup. This option <i>must</i> be used if the applicable full backup resides on removable media.</p> <p><i>Default if omitted:</i> Image for Linux uses Single Pass mode, identifying changes and backing up in one pass.</p>	
<code>--cdws:n</code>	CDWriteSpeed
<p>Use this setting to specify the <i>maximum</i> disc writing speed that Image for Linux will use when burning a CD or DVD disc and force a lower writing speed than that automatically used by the optical drive's firmware. Slower writing speeds may increase reliability.</p>	

n should be a positive integer (e.g. 2, 4, 16, etc.).

The maximum writing speed that Image for Linux actually uses is determined by whichever is *lower*: The `--cdws:n` value you specify or the speed deemed appropriate by the drive's firmware, according to the CD/DVD media in use. For example, if you are using media that is rated at 8X for burning, the maximum writing speed will be no more than 8X, regardless of the setting you choose here. Similarly, if you supply a value that is beyond or invalid for the drive's design limits, the drive will automatically use the next-highest speed supported by both the drive and the media in use.

DVD speeds are approximately 1/8 CD speeds, so if you are using DVD discs, multiply the desired speed by 8 to determine the value to use. For example, to obtain a maximum burning speed of 2X with a DVD, use `--cdws:16`, since $8 \times 2X = 16$.

Default if omitted: Image for Linux uses the **Optimal** speed setting.

<code>--max:<i>n</i>MiB</code> or <code>--max:<i>n</i>GiB</code>	MaxFileSize
Use this setting to specify the maximum file size of the image files that Image for Linux creates.	
<i>n</i> should be a positive integer (e.g. 648, 698, 877, 1003, etc.). Image for Linux uses either mebibytes or gibibytes, so you must specify either MiB or GiB , respectively. Do not place any spaces between the number and the unit designation.	
The maximum file size is ultimately dictated by the file system used on the target drive. Also, some network redirectors limit file size to 2 GiB, which can be a limiting factor for backup files stored on a network drive.	
<i>Default if omitted:</i> Image for Linux uses the maximum file size supported by the target file system.	

<code>--raw</code>	RawMode
Set this parameter to force Image for Linux to use raw mode, which backs up all sectors, rather than just used sectors, even for recognized file systems.	
<i>Default if omitted:</i> Image for Linux backs up only used sectors backed up for recognized file systems and uses raw mode automatically for unrecognized file systems.	

<code>--skp:0</code>	SkipPageFile=0
Set this parameter to instruct Image for Linux to include the page file in the backup.	
<i>Default if omitted:</i> Image for Linux skips the page file.	

<code>--skh:0</code>	SkipHiberFile=0
Set this parameter to instruct Image for Linux to include the hibernation file in the backup.	
<i>Default if omitted:</i> Image for Linux skips the hibernation file.	

<code>-v</code>	PostValidate=1
Set this parameter to instruct Image for Linux to perform a standard validation of the	

image file(s) as part of the backup operation.

To set the INI value, use PostValidate=1

Default if omitted: Image for Linux does not validate the backup image after creating it.

<code>--vb</code>	<code>PostValidate=2</code>
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Set this parameter to instruct Image for Linux to perform a byte-for-byte validation of the image file(s) as part of the backup operation.

To set the INI value, use PostValidate=2

Default if omitted: Image for Linux does not validate the backup image after creating it.

<code>--vpd</code>	<code>ValidateDisk</code>
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You can use this option when saving images to a CD or DVD drive. This option ensures that the discs containing image files are readable and verifies that the data on the discs appears to be the same as the data that Image for Linux used to create the discs. Per-disc validation can detect media errors that may have occurred during the disc writing process. If Image for Linux detects an error, Image for Linux will prompt you to recreate the failed disc.

Default if omitted: If you do not enable this option, Image for Linux will notify you of errors only after the backup process completes, and you will need to recreate all discs in the backup.

<code>--comp:0</code>	<code>Compression=0</code>
-----------------------	----------------------------

Use this parameter to specify that Image for Linux should not compress backup files as they are created.

Default if omitted: Image for Linux compresses backup files as they are created.

<code>--enc:1</code> or <code>--enc:2</code>	<code>Encryption=1</code> or <code>Encryption=2</code>
--	--

Specifies whether simple password protection *without* encryption (`--enc:1`), or 256-bit AES encryption (`--enc:2`) is to be used. If either `--enc:1` or `--enc:2` are specified, `--pw` is also required.

Default if omitted: No encryption or password protection is used.

<code>--noej</code>	<code>NoEject</code>
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Use this parameter to tell Image for Linux never to automatically open the optical drive tray.

Default if omitted: Image for Linux will automatically open the optical drive tray whenever a new disc is needed and at the completion of the backup operation.

<code>--cdrs:n</code>	<code>CDReadSpeed</code>
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Use this setting to specify the *maximum* disc reading speed that Image for Linux will use when reading a CD or DVD disc during the validation phase of a backup operation, with *n* being a positive integer (e.g. 2, 4, 16, etc.). This setting may be used to force a lower reading speed than that automatically used by the optical drive's firmware. Slower

reading speeds may increase reliability.

n should be a positive integer (e.g. 2, 4, 16, etc.).

This setting is only applicable when you are backing up to CD/DVD media and you have also included either the **-v** or **--vb** option.

The maximum reading speed that is actually used is determined by whichever is *lower*. The **--cdrs:*n*** value that you specify, or the speed deemed appropriate by the drive's firmware, according to the CD/DVD media in use. For example, if you are using media that is rated at 32X (for reading), the maximum reading speed will be no more than 32X, regardless of the setting you choose here. Similarly, if you supply a value that is invalid for or beyond the drive's design limits, the drive will automatically use the next-highest speed supported by both the drive and the media in use.

DVD speeds are approximately 1/8 CD speeds, so if you are using DVD discs, multiply the desired speed by 8 to determine the value to use here. For example, to obtain a maximum reading speed of 4X with a DVD, use **--cdrs:32**, since $8 \times 4X = 32$.

Default if omitted: Image for Linux uses the **Optimal** speed setting.

--iobs

IOBD

Include this option to try to improve I/O performance in cases where network or USB device performance is poor.

Default if omitted: Image for Linux does not use this option.

--err

AllowErrors

Use this option to tell Image for Linux to ignore read/write errors caused by bad sectors on the *source* drive during the backup operation. Image for Linux will also ignore errors during the validation phase. This parameter does not apply to bad sectors on the *target* drive.

Default if omitted: Image for Linux will notify you concerning the error and give you the option to continue or abort.

--mf

N/A

Instructs Image for Linux to use **Multiple File Set** mode. Select this option to create a backup that is comprised of one image for every individual partition that you back up.

Default if omitted: Image for Linux uses **Single File Set** mode and creates a single image, regardless of the number of individual partitions you back up.

--desc:mydescription

N/A

Use this option to specify the descriptive text you want Image for Linux to associate with the backup, up to 127 characters. If your descriptive text includes spaces, surround it with a backslash (\) followed by a quotation mark: **--desc:\ "my description"**

Default if omitted: Image for Linux doesn't add any descriptive text.

N/A

SaveLog

Use this option to disable logging.

Default if omitted: Image for Linux logs during a backup operation.

Image for Linux Restore Options

In Table 4, you find the command line options that you must set to use Image for Linux to restore a backup image. Table 5 shows you optional parameters you can set.

The table shows you both the command line option and the INI file variable. In some instances, both forms of the parameter are available; in other cases, only one is available. When one form of an option isn't available, N/A appears. To set up an INI file, place these parameters in the [Restore_Defaults] section, unless as noted otherwise.

Table 4: Image for Linux Required Restore Parameters

Command Line Option	INI Variable
-r	N/A
Use this option to indicate that you want to restore an image file.	
<i>Also required:</i> Either -d option to restore from a full backup or --base option to restore from a differential backup and the -f option to specify image file Image for Linux should use when restoring.	

-d	N/A
Use when restoring a backup to identify the target hard drive and partition. Image for Linux will restore the image to the same hard drive number and physical location on the drive that you backed up unless you override this setting.	
If the target partition was a volume and no extended partition now exists at the original location, Image for Linux will attempt to create the original extended partition. If Image for Linux cannot create the extended partition, Image for Linux will restore the image as a primary partition.	
If the target partition was originally a primary partition and an extended partition now exists at that location, Image for Linux will restore the image as a volume.	
If an existing partition or volume occupies the same starting location as the partition you want to restore, Image for Linux will display a warning message before overwriting the partition or volume. You can suppress this warning message, as described in Table 5.)	
-d:d@p -d:bd@p -d:ad@p -d:ud@p -d:fd@p -d:sd@p -d:od@p	<p>d is the target hard drive number</p> <p>p is the target partition or volume ID (hex or decimal notation), depending on whether you are referring to a partition or a volume. Use this parameter only if you are restoring an individual partition.</p> <p>You can use device modifiers as needed. When you use them, you must place them after the -d: and before the target</p>

hard drive number:

l – Linux device

The **-d** option cannot be used with the **--base** option.

--base

N/A

When restoring from a differential backup, use this parameter to identify the full backup Image for Linux should use.

--base:x:/bkup

x:/ is source drive letter

--base:x:/mypath/bkup

mypath or *my path* is path to bkup

--base:"x:/my path/bkup"

bkup is name of the full backup (omit the file extension)

Or:

Or:

--base:d@p:/bkup

Specify source device, partition, path, and file name:

--base:d@p:/mypath/bkup

d is source hard drive number

--base:"d@p:/my path/bkup"

p is source partition ID (hex or decimal notation)

You can use device modifiers as needed. When you use them, you must place them after the **-d:** and before the source hard drive number:

l – Linux device

g – SCSI generic device

o – Optical drive (when you combine this option with either of the options above, this option must come last).

Whether using drive letter or device/partition, you may specify any path desired. If you use paths and/or file names containing spaces or dashes, surround them with a back slash (\) followed by a quotation mark.

The **--base** option cannot be used with **-d** option.

-f

N/A

Use this option to specify the target drive letter, path, and file name for a backup file.

-f:x:/filename

x:/ is target drive letter

-f:x:/mypath/filename	<i>mypath</i> or <i>my path</i> is path to filename
-f:"x:/my path/file name\"	<i>filename</i> is target file name for image
Or:	Or:
-f:d@p:/filename	Specify target device, partition, path, and file name:
-f:d@p:/mypath/filename	<i>d</i> is target hard drive number
-f:"d@p:/my path/filename\"	<i>p</i> is target partition ID (hex or decimal notation)
	<i>mypath</i> or <i>my path</i> is path to filename
	<i>filename</i> is target file name for image
	Device modifiers may be used as needed. When used, they must be placed after the -d: and before the target hard drive number:
	l – Linux device
	g – SCSI generic device
	o – Optical drive (when you combine this option with either of the options above, this option must come last)
	Whether using drive letter or device/partition, you may specify any path desired. If you use paths and/or file names containing spaces or dashes, surround them with a back slash (\) followed by a quotation mark.

Table 5: Image for Linux Optional Restore Parameters

Command Line Option	INI Variable
-o	N/A
Use this option to tell Image for Linux to overwrite the target without first prompting for confirmation. <i>Default if omitted:</i> Image for Linux prompts before overwriting the target.	
--clr	N/A
Use this option to have Image for Linux clear the MBR and EMBR prior to restoring an image file. <i>Default if omitted:</i> Image for Linux does not clear the MBR and EMBR.	
--rb:1	N/A
Use this option to have Image for Linux reboot the system after restoring an image. <i>Default if omitted:</i> Image for Linux attempts to determine if the computer needs to be	

rebooted after restoring and, if so, prompts you to reboot.

--sp:p

N/A

Use this option to specify an individual partition ID to restore from a full backup. *p* is the source partition ID (in hex or decimal notation).

Default if omitted: If you supply a backup of an entire hard drive as the source for restoring, Image for Linux will restore all partitions contained in the backup.

--sig

ReplaceNTSig

Use this option if you are restoring a partition that Windows had assigned a drive letter before you backed up the drive. If you use this option, Image for Linux will restore the disk signature associated with the source partition.

Default if omitted: Image for Linux will use the disk signature already present in the MBR of the target drive, or, if none exists, Image for Linux will create one.

--ohd

UseOrgHDNum

Use this option to tell Image for Linux to keep references to the source hard drive number intact within the partition after Image for Linux has restored the partition to the target drive.

Default if omitted: If the target drive number differs from that of the source drive, Image for Linux will update applicable drive references residing within the restored partition to reflect the new hard drive number.

-a

SetActive

Use this parameter to make the partition you restore active.

Default if omitted: Image for Linux does not make the restored partition active unless no other partitions are active and the restored partition is HD0.

-t

WriteMBR

Use this parameter to have Image for Linux install standard MBR code after completing the restore operation. Standard MBR code is the code that boots the active partition.

Default if omitted: Image for Linux does not write standard MBR code unless the MBR is empty.

-e

UseSameMBREntry

Use this parameter to have Image for Linux move the partition table entry of the restored partition to the same location in the master partition table as it appeared on the source drive. Image for Linux will move the existing partition table entry to another location rather than overwriting it.

Default if omitted: Image for Linux does not move the partition table of the restored partition.

--rft

RFT

Use this parameter to have Image for Linux restore the first track when it restores the partition.

Default if omitted: Image for Linux does not restore the first track.

<code>--fts:n</code>	RFTS
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Use this option to specify how many sectors of the first track of each partition Image for Linux should restore. Use 0 to indicate the entire track

Default if omitted: Image for Linux determines the number of tracks needed to restore.

<code>--stt</code>	Scale
--------------------	-------

For NTFS/FAT/FAT32 partitions, use this parameter to tell Image for Linux to resize each restored partition proportionally, so that each partition takes up the same relative amount of space on the target drive as it did on the source drive. Unpartitioned free space that existed on the source drive at the time of the backup will still exist at the end of the target drive after Image for Linux completes the restore operation.

This option only applies when you restore an entire hard drive;

Default if omitted: Image for Linux does not scale each restored partition.

<code>-x</code>	Expand
-----------------	--------

For NTFS/FAT/FAT32 partitions, when restoring to a target that is larger than the source partition, use this parameter to have Image for Linux expand the partition after completing the restore operation.

This option is equivalent to the “Scale to Fit” option for fully restoring drives.

Default if omitted: Image for Linux will not expand the partition, and free space will remain after Image for Linux completes the restore operation.

<code>--kf</code>	KeepFree
-------------------	----------

Use this parameter if you also use either `-x` or `--stt` to specify the amount of space, in MiB, Image for Linux should leave free.

Default if omitted: Image for Linux will fill the entire available area.

<code>-m</code>	FirstFit
-----------------	----------

Use this parameter to tell Image for Linux to choose the target area automatically, based on the first area of available free space large enough to accommodate the partition you want to restore.

Default if omitted: You must explicitly specify the target area.

<code>-v</code>	PreValidate
-----------------	-------------

Use this parameter to have Image for Linux perform a standard validation on the image file(s) prior before restoring them.

Default if omitted: Image for Linux does not validate the image files before restoring them.

<code>--pw:mypassword</code> or <code>--pw:"my password"</code>	N/A
<p>Use this parameter to supply the password needed to decrypt a backup that you encrypted and/or password protected when you created it. If your password contains embedded spaces or dashes, surround your password with a back slash (\) followed by a quotation mark.</p> <p><i>Default if omitted:</i> Image for Linux does not supply a password.</p>	

<code>--noej</code>	NoEject
<p>Use this parameter to tell Image for Linux to never automatically open the optical drive tray.</p> <p><i>Default if omitted:</i> Image for Linux will automatically open the optical drive tray whenever a new disc is needed and when Image for Linux finishes restoring.</p>	

<code>--cdrs:n</code>	CDReadSpeed
<p>Use this setting to specify the <i>maximum</i> disc reading speed that Image for Linux will use when reading a CD or DVD disc while restoring a backup image, with <i>n</i> being a positive integer (e.g. 2, 4, 16, etc.). This setting may be used to force a lower reading speed than that automatically used by the optical drive's firmware. Slower reading speeds may increase reliability.</p> <p><i>n</i> should be a positive integer (e.g. 2, 4, 16, etc.).</p> <p>This setting is only applicable when you are restoring from CD/DVD media and you have also included the <code>-v</code> option.</p> <p>The maximum reading speed that is actually used is determined by whichever is <i>lower</i>: The <code>--cdrs:n</code> value that you specify, or the speed deemed appropriate by the drive's firmware, according to the CD/DVD media in use. For example, if you are using media that is rated at 32X (for reading), the maximum reading speed will be no more than 32X, regardless of the setting you choose here. Similarly, if you supply a value that is invalid for or beyond the drive's design limits, the drive will automatically use the next-highest speed supported by both the drive and the media in use.</p> <p>DVD speeds are approximately 1/8 CD speeds, so if you are using DVD discs, multiply the desired speed by 8 to determine the value to use here. For example, to obtain a maximum reading speed of 4X with a DVD, use <code>--cdrs:32</code>, since $8 \times 4X = 32$.</p> <p><i>Default if omitted:</i> Image for Linux uses the Optimal speed setting.</p>	

<code>--iobs</code>	IOBD
<p>Include this option to try to improve I/O performance in cases where network or USB device performance is poor.</p> <p><i>Default if omitted:</i> Image for Linux does not use this option.</p>	

<code>--err</code>	AllowErrors
<p>Use this option to tell Image for Linux to ignore read/write errors caused by bad sectors on the <i>target</i> drive during the backup operation. This parameter does not apply to bad sectors on the <i>source</i> drive.</p>	

Default if omitted: Image for Linux will notify you concerning the error and give you the option to continue or abort.

`--mp`

MultiPass

Use this parameter to tell Image for Linux to use **Multi Pass** mode when restoring a differential backup. In **Multi Pass** mode, Image for Linux restores the full backup in one pass and then restores the differential backup in a second pass. This setting is not applicable when restoring a full backup. You *must* use this option if the applicable full backup resides on removable media.

Default if omitted: Image for Linux uses **Single Pass** mode, restoring the full backup and the differential backup in one pass.

`--cds`

N/A

Use this parameter to tell Image for Linux to query all available CD/DVD drives when trying to locate the appropriate source backup.

Default if omitted: You must explicitly specify the CD/DVD drive that contains the source backup.

`--mo`

N/A

Instructs Image for Linux to display the following message immediately upon running:

Press the <space bar> for the menu interface or wait for the restore to start...

If you press the space bar while this message appears, Image for Linux will switch to interactive mode and wait for you to initiate the restore operation via the menu interface.

Default if omitted: The **Press the <space bar>...** message is not displayed and the restore operation proceeds using the command line.

`--og`

UseOrgGeo

Place under the [HDx] section

Set this parameter to tell Image for Linux to use the original geometry of the source drive when restoring the backup image.

Default if omitted: Image for Linux uses the geometry of the target drive.

`-C=n`

C=n

Place under the [HDx] section

Use this parameter in conjunction with `-h` and `-s` to manually specify the cylinder, head, and sector values for the target drive when you restore a backup image. This parameter specifies the last cylinder, and `n` is a number you supply.

Default if omitted: Image for Linux uses the BIOS-reported values of the drive.

`-h=n`

h=n

Place under the [HDx] section

Use this parameter in conjunction with `-c` and `-s` to manually specify the cylinder, head, and sector values for the target drive when you restore a backup image. This parameter

specifies the last head, and n is a number you supply.

Default if omitted: Image for Linux uses the BIOS-reported values of the drive.

`-s=n`

`s=n`

Place under the [HDx] section

Use this parameter in conjunction with `-c` and `-h` to manually specify the cylinder, head, and sector values for the target drive when you restore a backup image. This parameter specifies the last sector, and n is a number you supply.

Default if omitted: Image for Linux uses the BIOS-reported values of the drive.

`--rs:n`

N/A

Use this parameter to resize a partition after restoring. n is the size in MiB's that you want to establish for the restored partition. If you try to use this parameter in conjunction with `-x`, the Expand option, `-x` overrides `--rs`.

Default if omitted: Image for Linux restores the partition without resizing.

N/A

SaveLog

Use this option to disable logging.

Default if omitted: Image for Linux logs during a backup operation.

Image for Linux Validate Options

In Table 6, you find the command line options that you must set to use Image for Linux to validate an image.

The table shows you both the command line option and the INI file variable. In some instances, both forms of the parameter are available; in other cases, only one is available. When one form of an option isn't available, N/A appears. To set up an INI file, place these parameters in the [Validate_Defaults] section, unless as noted otherwise.

Table 6: Image for Linux Required Validate Parameters

Command Line Option	INI Variable
<code>-v</code>	N/A
Use this option to indicate that you want to validate an image file.	
<i>Also required:</i> <code>--CDn</code> or a path name, as described below, to identify the location of the backup image you want to validate.	
<code>--base</code>	N/A
Use when validating a differential backup to identify the full backup Image for Linux should use to validate the differential backup.	
<code>--base:x:/bkup</code>	<code>x:/</code> is source drive letter

<pre>--base:x:/mypath/bkup --base:\"x:/my path/bkup\" Or: --base:d@p/bkup --base:d@p:/mypath/bkup --base:\"d@p:/my path/bkup\"</pre>	<p>mypath or my path is path to bkup</p> <p><i>bkup</i> is name of existing full backup (omit file extension)</p> <p>Or:</p> <p>Specify source device, partition, path, and file name:</p> <p>d is source hard drive number</p> <p>p is source partition ID (hex or decimal notation)</p> <p>You can use device modifiers as needed. When you use them, you must place them after the -d: and before the source hard drive number:</p> <ul style="list-style-type: none"> l – Linux device g – SCSI generic device o – Optical drive (when you combine this option with either of the options above, this option must come last). <p>Whether using drive letter or device/partition, you may specify any path desired. If you use paths and/or file names containing spaces or dashes, surround them with a back slash (\) followed by a quotation mark.</p> <p>The --base option cannot be used with -d option.</p>
--	---

<pre>-f</pre>	<p>N/A</p>
<p>Use this option to specify the target drive letter, path, and file name for a backup file.</p>	
<pre>-f:x:/filename -f:x:/mypath/filename -f:\"x:/my path/file name\" Or: -f:d@p:/filename -f:d@p:/mypath/filename -f:\"d@p:/my path/filename\"</pre>	<p><i>x:</i> is target drive letter</p> <p><i>mypath</i> or <i>my path</i> is path to filename</p> <p><i>filename</i> is target file name for image</p> <p>Or:</p> <p>Specify target device, partition, path, and file name:</p> <p><i>d</i> is target hard drive number</p> <p><i>p</i> is target partition ID (hex or decimal notation)</p> <p><i>mypath</i> or <i>my path</i> is path to filename</p> <p><i>filename</i> is target file name for image</p>

Device modifiers may be used as needed. When used, they must be placed after the **-d:** and before the target hard drive number:

l – Linux device

g – SCSI generic device

o – Optical drive (when you combine this option with either of the options above, this option must come last)

Whether using drive letter or device/partition, you may specify any path desired. If you use paths and/or file names containing spaces or dashes, surround them with a back slash (\) followed by a quotation mark.

In Table 7, you find the command line parameters that you might want to use with Image for Linux when validating an image.

The table shows you both the command line option and the INI file variable. In some instances, both forms of the parameter are available; in other cases, only one is available. When one form of an option isn't available, N/A appears. To set up an INI file, place these parameters in the [Validate_Defaults] section, unless as noted otherwise.

Table 7: Image for Linux Optional Validation Parameters

<code>--noej</code>	NoEject
Use this parameter to tell Image for Linux never to automatically open the optical drive tray.	
<i>Default if omitted:</i> Image for Linux will automatically open the optical drive tray whenever a new disc is needed and at the completion of the backup operation.	

<code>--cdrs:n</code>	CDReadSpeed
Use this setting to specify the <i>maximum</i> disc reading speed that Image for Linux will use when reading a CD or DVD disc during validation, with <i>n</i> being a positive integer (e.g. 2, 4, 16, etc.). This setting may be used to force a lower reading speed than that automatically used by the optical drive's firmware. Slower reading speeds may increase reliability.	
<i>n</i> should be a positive integer (e.g. 2, 4, 16, etc.).	
This setting is only applicable when you are validating an image stored on CD/DVD media.	
The maximum reading speed that is actually used is determined by whichever is <i>lower</i> . The <code>--cdrs:n</code> value that you specify, or the speed deemed appropriate by the drive's firmware, according to the CD/DVD media in use. For example, if you are using media that is rated at 32X (for reading), the maximum reading speed will be no more than 32X,	

regardless of the setting you choose here. Similarly, if you supply a value that is invalid for or beyond the drive's design limits, the drive will automatically use the next-highest speed supported by both the drive and the media in use.

DVD speeds are approximately 1/8 CD speeds, so if you are using DVD discs, multiply the desired speed by 8 to determine the value to use here. For example, to obtain a maximum reading speed of 4X with a DVD, use **--cdrs:32**, since $8 \times 4X = 32$.

Default if omitted: Image for Linux uses the **Optimal** speed setting.

--jobs

IOBD

Include this option to try to improve I/O performance in cases where network or USB device performance is poor.

Default if omitted: Image for Linux does not use this option.

--mp

MultiPass

Use this parameter to tell Image for Linux to use **Multi Pass** mode when validating a differential backup. In **Multi Pass** mode, Image for Linux validates the full backup in one pass and the differential backup in a second pass. This setting is not applicable when performing a full backup. This option *must* be used if the applicable full backup resides on removable media.

Default if omitted: Image for Linux uses **Single Pass** mode, validating in one pass.

N/A

SaveLog

Use this option to disable logging.

Default if omitted: Image for Linux logs during a backup operation.

Troubleshooting

If you should encounter any problems while running Image for Linux, please visit our on-line support page at <http://www.terabyteunlimited.com/support-image-for-dos.htm>.

Appendix A: Understanding the Types of Backups

Many software packages create file-based backups, while Image for Linux creates a sector-based backup. This section describes both types of backups and their differences.

File-Based Backup

When you create a file-based backup, you copy files from one storage location to another using a third-party software package, the built in Microsoft backup utility or by dragging-and-dropping files and/or folders using Windows Explorer.

Creating a file-based backup is simple, and you can backup or restore only certain files or folders. But, a file-based backup it has drawbacks. For example, files that are in use may not be backed up. And, restoring a file-based backup can be tricky:

Files in use cannot be restored.

If the required operating system environment and software is not installed and accessible, you will first need to install it before you can restore any data.

Sector-Based Backup

A sector-based backup, also called *imaging*, differs from file-based backup because imaging operates on the entire partition, including all files and the operating system itself. This is the method of backup employed by Image for Linux.

When you create a sector-based image as your backup, you back up not only your data files but also the operating system, in its entirety. If you restore a sector-based backup, your computer returns to the state it was in when you created the image. Image for Linux places all information on the target drive in the exact location where it appeared when you created the image.

In addition, you can:

- * Restore a sector-based backup even if the operating system isn't accessible—effectively performing a bare-metal restoration.
- * Restore individual files, if you want using the free TBIView add-on.

Appendix B: Backup Strategies

Whether you create file-based backups or sector-based backups, you can choose between three different backup methods:

- * Full Backups
- * Incremental Backups
- * Differential Backups

In this section, you find information that explains each of these backup methods. The backup method you choose actually affects you most when you need to restore the backup; some backups are easier to restore than others.

In addition to understanding backup methods, it's also important to store your backup media in a safe, secure location. We strongly recommend that you store your backup media in a different physical location than your computer and that you place your backup media in a fire-proof safe designed for media. By storing your backup media offsite, you don't run the risk of losing both your computer and your backups in the event of fire or theft. By storing your backups in a fire-proof safe designed for media, your backups will be protected if a fire occurs at the location where you store your backups.

Note: Be sure to use a fire-proof safe designed for media because, while paper doesn't burn until 451 degrees Fahrenheit, media will melt.

Full Backups

A full backup, as the name implies, involves backing up all specified data.

How Often Should I Back Up?

We hear this question a lot, and there is no right answer. Instead, there is the answer that works best for you. To figure out how often to back up, ask yourself, "How much data am I willing to re-enter?" because, once you restore your latest backup, you will need to re-enter all information since you made that backup. Many people do not want to re-enter any information, so they back up daily. Others feel their computer usage is such that they are willing to back up once each week and re-enter up to seven days worth of data. Decide how much data you are willing to re-enter and set your backup schedule accordingly.

Incremental Backups

Note: Although you cannot make an incremental backup using Image for Linux, we include information on incremental backups so that you can understand how they work.

Incremental backups include only data that has changed since the *most recent backup* was performed—whether the most recent backup was a full backup or a previous incremental backup. To use this backup method, you perform a full backup at an interval of your choice—say every two weeks. In between full backups, you perform incremental backups. If you need to restore your entire system, you need to restore the latest full backup followed by each of the incremental backups you performed since that full backup.

For example, suppose that you are relying on file-based backups, and you perform a full backup that includes **FILE1**, **FILE2**, and **FILE3**. Then, you change **FILE2**, and you perform an incremental backup. This incremental backup will include only parts of **FILE2**, since you did not change the other files in the most recent full backup. Then, if you change **FILE3** and add **FILE4** and make another incremental backup, the latest incremental backup will include only data from **FILE3** and **FILE4**.

If you are relying on sector-based backups, you perform a full backup at an interval of your choice and, in between, you perform incremental backups. But, an incremental sector-based backup is not based on files that have been added or changed. Instead, an incremental sector-based backup looks for and includes newly allocated sectors and changes to the contents of any sector since the last backup.. Suppose that you move a file without changing its contents. In a sector-based backup, the sector reallocation caused by moving the file is a change that will be included in the next incremental backup, even though you didn't change the file itself.

Note: Although defragmenting the file system does not change file content, it can lead to many sector-level changes, because defragmenting files moves them from one disk location to another.

Incremental backups are hard to properly manage and tend to be troublesome during disaster recovery. It is not uncommon to discover, while trying to recover from a disaster, that an incremental backup is either lost or damaged, making all subsequent incremental backups worthless. In addition, if you accidentally restore incremental backups in the wrong order, the problems you experience may not manifest themselves until some future date, at which point recovery can become almost impossible.

Differential Backups

Differential backups include only data that has changed since the *most recent full backup* was performed. To use this method, you make a full backup at an interval of your choice. In between full backups, you perform differential backups, which include all data that has changed since the last full backup. If you need to restore your entire system, you need to restore the latest full backup followed by the latest differential backup. Unlike incremental backups, which rely on every other incremental backup in the chain, a differential backup relies only on the full backup.

For example, suppose that you are relying on file-based backups and you perform a full backup that includes **FILE1**, **FILE2**, and **FILE3**. Then, you change **FILE2**, and you perform a differential backup. This differential backup will include only parts of **FILE2**, since the other files in the most recent full backup have not changed. If you

then change **FILE3** and perform another differential backup, this differential backup will include both data from **FILE2** and **FILE3**.

A differential sector-based backup includes any sector that has changed or been allocated since you created the last full backup.

Differential backups are easy to manage during disaster recovery because you need to restore only the last full backup followed by the last differential backup. You don't run as much risk of discovering that a backup is damaged or missing, and since you only need to restore two backups, you are not as likely to restore them in the wrong order.

By its nature, the size of a differential backup grows over time. If you wait long enough between full backups, your differential backup could become almost as large as a full backup, and take almost as much time to create.

Appendix C: Introduction to Hard Drive Storage

All modern (circa 2007) personal computers make use of at least one partitioned hard drive. Knowing at least the basics of how hard drive partitioning and file systems work can help you understand how to work with TeraByte Unlimited imaging products. The information about physical hard drives that follows is intended to be a broad overview to provide you with a general understanding of the hard drive.

The Physical Hard Drive

Hard drives contain several round, thin, rigid disks called *platters*. The rigidity of these platters serves as the basis for the terms “*hard disk*” and “*hard drive*”. In the center of each platter is a hole by which the platter is mounted to a spindle. The platters rotate around this spindle at high speed (typically 5,400 to 10,000 rotations per minute, or RPM).



Internal view of a hard drive in operation. The arm appears blurred due to its rapid movement.
Photo courtesy of Michael Blessenohl

The Logical Hard Drive—Hard Drive Data Organization

Data is organized on the platters of hard drives in the form of *tracks* and *sectors*, which are established during manufacturing. The tracks, which exist on each side of each platter, are concentric circles. Sectors are defined by radial lines that go from the center point of the platter to the outer edge.

When you set up a hard drive, you can create logical partitions. A logical partition is simply a conceptual division on the hard disk. You can use different file systems in different partitions, and many users partition hard disks so that they can store different operating systems or segregate data on the same hard drive. If you set up different partitions so that you can use different operating and file systems, you can

use Terabyte's BootIT NG to select the operating system in which you want to work each time you boot your computer.

Formatting is the process that prepares a partition on the hard disk to accept data by creating an empty file system that is organized into clusters. A *cluster*, a logical grouping of contiguous sectors, is the smallest logical unit of storage that you can allocate to hold a files data.

Figures 1 through **3** depict the layout of files within clusters on a hypothetical partition. In each figure shown, 44 clusters contain data. In **Figure 1**, the *last cluster* in use (that is, the one closest to the bottom/right) is at the very end of the partition.

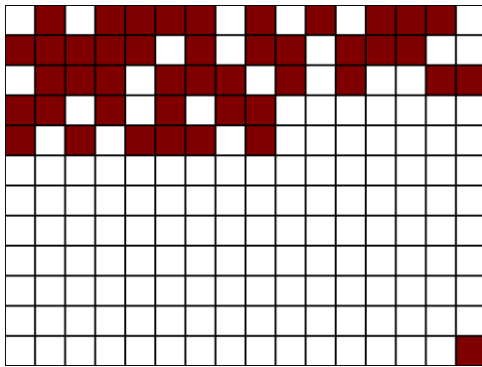


Figure 1

The location of this last cluster at the time that you create an image determines the minimum amount of free space that must be available on the hard drive to which you intend to restore—called the *target drive*.

Note: If you are restoring a partition with an image created using raw mode, or if the partition uses an unrecognized file system, the target drive needs to be equal to the full size of the source partition, regardless of cluster allocation.

Figure 2 shows the same number of clusters in use, but the *last cluster* in use is located in the fifth row, rather than at the very end of the partition:

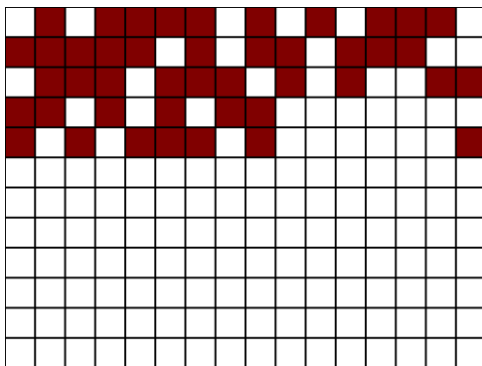


Figure 2

Although **Figure 1** and **Figure 2** depict the exact same number of used clusters, the location of the last used cluster in **Figure 2** allows you to restore an image of that partition to a much smaller target because, when an image is restored, each cluster is placed in a location on the target that is identical, relatively speaking, to its original location on the drive you imaged—called the *source* drive.

Figure 3 shows the same number of clusters in use, but the clusters are arranged optimally, with no unused clusters interspersed.

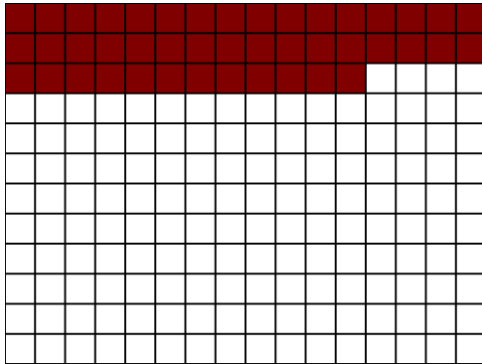


Figure 3

Although the used cluster arrangement of **Figure 3** might be most ideal, you generally can't easily arrange clusters in this way.

Appendix D: Linux Help Topics

While using Image for Linux is very similar to using Image for DOS, understanding a few key areas of Linux may help you get the most out of the Image for Linux. This section is intended to provide some introductory information for those unfamiliar with Linux.

Mounting and Unmounting Partitions

In Linux, you must mount a partition to access the files on it. In some cases, partitions are mounted automatically when the system boots, based on a table contained in the text file `/etc/fstab`. You can edit the file to mount additional partitions automatically.

Note: You do not need to mount partitions automatically to be able to access a partition to save or restore an image.

If a partition's file system is FAT, FAT32, or NTFS, you can access the partition directly—without mounting it—by choosing to save the image to a **partition** in Image for Linux, rather than to a **file**.

For other file systems, such as Ext2/3 and ReiserFS, you must first mount the partition to which you want to save a backup image or from which you want to restore a backup image.

Listing Mounted Partitions or Devices

You can use the `df` command or the `mount` command without any parameters to list all currently mounted hard drive partitions as well as any mounted CD/DVD drives, floppy drives etc. to determine whether a partition is already mounted. Most versions of `df` also support the `-T` option, which displays the file system in use on each mounted partition. At the command prompt, type:

```
df -T
```

Mounting a Partition or Device

Use the `mount` command to mount a partition. The `mount` command has the following basic syntax:

```
mount [-t] [-o] /dev/xxx mountpoint
```

`-t` is an optional parameter that specifies the file system for the partition you want to mount. `-o` is an optional parameter you can use to specify options for the device you want to mount. `/dev/xxx` represents the device you want to mount, and the `mountpoint` represents the directory on which you want to mount the device. The directory you use as the mount point in the command must already exist and should contain no files. Specifying the file system with the `-t` option is usually not necessary, but appears here for completeness. For example:

1. To mount a FAT32 partition called `dev/hda1` at the mount point `/mnt`, type:

```
mount /dev/hda1 /mnt
```

or

```
Mount -t vfat /dev/hda1 /mnt
```

2. To mount an Ext2 partition called `/dev/sdb4` at the mount point `/home/user/mount1`, type:

```
mount /dev/sdb4 /home/user/mount1
```

or

```
mount -t ext2 /dev/sdb4 /home/user/mount1
```

3. To mount a ReiserFS partition called `/dev/hdb2` at the mount point `/home/user/mount2`, type:

```
mount /dev/hdb2 /home/user/mount2
```

or

```
mount -t reiserfs /dev/hdb2 /home/user/mount2
```

Unmounting a Partition or Device

Use the `umount` command to unmount a partition.

Note: The spelling of this command is `umount`, and not `unmount`.

The syntax for `umount` is

```
umount dir
```

or

```
umount device
```

That is, you can provide the directory where the partition is mounted or the partition (device) itself as the command line parameter for `umount`. For example:

1. To unmount the partition mounted at `/mnt`, type

```
umount /mnt
```

2. To unmount the partition called `/dev/hda1`

```
umount /dev/hda1
```

Creating or Removing Mount Points

In the course of mounting and unmounting, you might need to create additional mount points or remove mount points. To create directories, use the `mkdir` command; to remove directories, use the `rmdir` command. For example, to create the directory `mydir`, type the following:

```
mkdir /mydir
```

To remove the directory `mydir`, type the following:

```
rmdir /mydir
```

The following TeraByte Unlimited KB article covers some additional information on working with partitions in Linux:

<http://terabyteunlimited.com/kb/article.php?id=131>

Working with Network Drives

Two of the more common network file systems available in Linux are `smbfs` (Samba), and `nfs` (network file system). You can mount either of these file systems over a network connection and then Image for Linux can access either of them as a network drive from a mount point in the local file system.

This section provides basics on mounting network shares; for details, see our online article:

<http://www.terabyteunlimited.com:80/kb/idx.php/0/316/article/Using-IFL-to-createrestore-images-on-WindowsSamba-shares.html>

Samba Shares

To access a Samba share from Image for Linux, you must first mount the share in Linux by using the `smbmount` command:

```
smbmount //server/share /mnt -o  
username=signonname,password=password,workgroup=domainname,lf  
s
```

You do not use spaces to separate options, which appear after the `-o` parameter above. So, the example you see above is actually one long line.

NFS Shares

You can mount and access NFS shares in much the same way as you mount and access Samba shares. Use the following format for the mount command:

```
mount -t nfs server:share mountpoint
```

Using nfs requires that you configure the Linux kernel to support nfs and that you install the correct nfs software packages. You must also configure the nfs shares properly. Although most leading distributions support using nfs, the details of how to go about setting up nfs will differ. We suggest that you refer to your distribution's documentation for more information. The following web site is also a good source of information on nfs: <http://nfs.sourceforge.net/>

Glossary

Hard Drive (HD, HDD)

A high-capacity, non-volatile, data storage device. Hard drives are typically installed inside a computer, out of sight.

Partition

A unique area of a hard drive that is allocated for use by a file system. A hard drive can contain many partitions.

File System

An organized structure that allows data to be stored and accessed by a file name. You can basically think of it as the filing system used by the operating system to store and retrieve your data. On a hard drive, the file system almost always resides in a partition.

Volume

Generally, a volume is considered to be any file system or device that is used to hold data, but, when using Image for Linux, it also represents a specific partition that resides in an extended partition.

Extended Partition

A special type of partition that is divided in to one or more partitions called volumes.

Drive Letter

A single letter that represents a file system in Microsoft operating systems. Since a file system on a hard drive is almost always in a partition or volume, it also represents a partition or volume.

Logical Drive

A term used in Microsoft operating systems to describe the specific drive letters that point to volumes. In practical terms, it is the same thing as a drive letter.

Source

When backing up, “source” refers to the hard drive that you want to back up. When restoring, “source” refers to the location on a storage medium that contains a backup you want to restore.

Target

When backing up, “target” refers to the location on a storage medium (usually a CD/DVD discs, a hard drive partition, or an external hard drive) where you want to store a backup. When restoring, “target” refers to the location on a hard drive where you want to restore a backup you previously created. A restore target can either be an area of free space or a partition. In the latter case, the partition—and any information it contains—will be deleted immediately prior to the restore.

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(f) NO THIRD PARTY BENEFICIARIES. There are no third party beneficiaries of any promises, obligations or representations made by TeraByte herein.

(g) HEIRS AND ASSIGNS. This Agreement shall be binding on and shall inure to the benefit of the heirs, executors, administrators, successors and assigns of the parties hereto, but nothing in this paragraph shall be construed as a consent by TeraByte to any assignment of this agreement except as provided hereinabove.

(h) SURVIVAL. The provisions of paragraphs 1(a)(iv), 1(c)(ii) and 3 of this Agreement shall survive any termination or expiration of this Agreement.

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Revised October 25, 2007

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- (d) **SEVERABILITY.** If any part or provision of this License is held to be unenforceable for any purpose, including but not limited to public policy grounds, then you agree that the remainder of the License shall be fully enforceable as if the unenforceable part or provision never existed.
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- (h) **SURVIVAL.** The provisions of paragraphs 1(b)(iv), 1(b)(vii), 1(b)(ix), 2, 3 and 6 of this Agreement shall survive any termination or expiration of this Agreement.

Image for Linux – Order Form

Text version in file REGISTER.TXT (see web site for additional pricing information)

Send to:

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 Las Vegas, NV 89131

Registration Name:		Date:	
Mailing Address:		Phone #:	
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		Fax #:	
E-mail Address:		PC Brand/CPU Type:	
Shipping Address:			
		Primary OS:	
How did you learn about Image for Linux?			
Description	Unit Price	Qty	Extended Price
Image for Linux	\$29.95		\$
			\$
			\$
			\$
			\$
Sub-Total			\$
Shipping and Handling Fees for orders not sent TO YOU via e-mail add \$9.95			\$
Nevada Residents add applicable sales tax			\$
TOTAL CHECK OR MONEY ORDER ENCLOSED*			\$

Check or Money Order must be drawn on a U.S. bank in U.S. Dollars.

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