Windows 137GB Capacity Barrier
48-bit Logical Block Addressing Support for ATA, Serial ATA or ATAPI Disc Drives

version 1.0
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Abbreviations and Acronyms
See Appendix B.

Overview
The Windows 137GB Capacity Barrier is also known as 48-bit Logical Block Addressing Support for ATA (IDE), Serial ATA or ATAPI disc drives. The 137GB limitation does not affect SCSI interface disc drives.

In order to properly access the full capacity of an ATA interface hard drive larger than 137GB, your system must meet the system requirements described below. There are three general methods of support:

1) Operating System Solutions for Windows XP and Windows 2000
2) Ultra ATA/133 PCI Controller Card for Windows XP, 2000, Me, 98SE and NT 4.x
3) Intel Chipset Solutions for Windows Me, 98SE and NT 4.x (partial)

Warning: Formatting an ATA interface drive past the 137GB barrier on a system that does not meet all requirements will result in data loss.

Attention: Always Back Up First - Whenever you make a significant change to your system, be absolutely sure to back up your critical files. Whether you are troubleshooting a drive, adding a new hardware or installing an application, back up your data first. These are the kinds of events that may need a recovery plan if aborted prematurely. Also, all required system maintenance such as ScanDisk, Defrag, and virus scanning should be
completed on all existing disc drives before proceeding. Windows Startup or emergency recovery diskettes should be created and on hand in case a recovery requires their use. Seagate is not responsible for lost data.

Windows XP and Millennium users should also consider using the System Restore capability and create a new Restore Point prior to making any significant change to your system. (See support.microsoft.com, Q267951: "Description of the System Restore Utility in Windows Millennium Edition")

If you have an add-in Ultra ATA/133 PCI controller card, you can safely install and use your drive with the PCI card on Windows XP, 2000, Me, 98SE and NT 4.0 SP4. You must follow the controller card manufacturer's installation instructions. Questions about controller card device drivers should be directed to the manufacturer of the card.

1) Operating System Solutions for Windows XP and 2000

The only current Windows operating systems that natively support the full capacity of ATA drives larger than 137GB are:

- Windows XP Home Service Pack 1 (SP1) or higher
- Windows XP Professional SP1 or higher
- Windows 2000 Professional SP3 or higher
- Windows 2000 Server SP3 or higher

The original Windows XP (RTM or Release to Manufacturing) and previous Windows 2000 Service Packs do not support ATA interface disc drives larger than 137GB.

Note: When building a new system, some motherboards may provide new ATA or ATAPI disk device drivers that are optimized for the OEM system. The Windows XP or Windows 2000 operating system installation will pause briefly and ask for you to insert an OEM floppy diskette. This pause for new "adapter" drivers happens soon after the boot near the beginning of the installation. See your system documentation for specifics. These drivers may have 137GB limitations. Be sure to check for driver updates.

Even with new device drivers, the latest Service Pack from Microsoft must be installed to ensure support for large drives. If this is the only drive in your system and your version of Windows predates the Service Packs listed above, initially, you may still need to limit the maximum partition size to 137GB. Then to download the latest Service Pack for Windows XP or 2000, visit http://support.microsoft.com.

See also the support.microsoft.com Knowledgebase articles that explain how to enable large drive support after the Service Packs are installed. For Windows XP SP1 see article Q303013: "How to Enable 48-bit Logical Block Addressing Support for ATAPI Disk Drives in Windows XP". For Windows 2000 SP3 see article Q305098: "48-bit LBA Support for ATAPI Disk Drives in Windows 2000".

Once you have installed the latest Service Pack, you can install the Windows version of DiscWizard to properly partition and format the remaining full capacity of the drive.

If you are adding this drive as additional storage to an existing Windows system, you can install the drive with the Windows version of DiscWizard. First verify that the correct versions of Windows and Service Packs are installed before partitioning to insure support for the full capacity of the drive. This includes any controller card drivers if utilized.
If you intend to install a new hard disc drive and also upgrade an older version of Windows to Windows XP SP1 or Windows 2000 SP3, the preferred approach is to do the OS upgrade prior to installing the hard drive.

If you do not have one of the operating systems listed above, Seagate recommends that you limit the partition size to 137GB or upgrade your operating system or try one of the solutions listed below.

2) Ultra ATA/133 PCI Controller Card for Windows XP, 2000, Me, 98SE and NT 4.x (partial)

One of the easiest solutions is using an Ultra ATA/133 PCI controller card (host adapter) that is fully compatible with all capacities of Seagate ATA hard drives. Be sure to verify that the controller card in fact breaks the 137GB barrier. You should contact or visit your controller card manufacturer’s website to see if they have information about the 137GB Windows operating system limitation and drivers available for your operating system.

Some system BIOS do not support booting to drives attached to alternate adapters, so you may only be able to use the drive as additional storage and not as the boot drive.

Seagate is not responsible for controller card support issues.

Note: Controller card manufacturers may provide new ATA or ATAPI disk device drivers that are optimized for the controller. The Windows XP or Windows 2000 operating system installation will pause briefly and ask for you to insert an OEM floppy diskette. This pause for new “adapter” drivers happens soon after the boot near the beginning of the installation. See your controller card documentation for specifics. These drivers may have 137GB limitations. Be sure to check for driver updates.

3) Intel Chipset Solutions for Windows Me, 98SE and NT 4.x (partial)

Intel offers drivers to support the full capacity of drives larger than 137 GB on motherboards equipped with the Intel 810, 810E, 810E2, 815, 815, 815E, 815EP, 815P, 820, 820E, 830M, 830MP, 830MG, 840, 845, 850, or 860 chipset. The Intel Application Accelerator v2.3 or above is compatible with Windows XP, Me, 2000, 98SE and NT operating systems. Detailed information and the latest version of the driver can be downloaded from www.intel.com/support/chipsets/iaa/. If you are not sure what kind of chipset your motherboard has, contact your system or motherboard manufacturer. See the section below titled Chipset Identification.

Seagate is not responsible for Intel Application Accelerator support issues.

Caution: If your system boot drive uses a drive overlay program (DDO) to overcome a previous BIOS capacity limitation (such as Disk Manager or DiscWizard and identifiable as a blue banner box before the operating system loads), then the Intel Application Accelerator is incompatible with your system. If you have this configuration, the Ultra ATA controller card is the only solution for these operating systems.

Motherboards and PCI ATA cards equipped with VIA, SiS, ALi, NVIDIA, HighPoint, and Promise chipsets may have drivers or updates that will allow you to access the full capacity of a drive larger than 137GB. You should contact or visit your chipset, system or motherboard manufacturer’s website to see if they have information and 48-bit addressing drivers for the Windows operating systems.

If chipset and operating system device drivers are not available, you could consider the purchase of an Ultra ATA/133 PCI Controller Card, available from most retail and online computer stores.
Otherwise, if you plan to upgrade to an operating system that has native support of 48-bit addressing, the drive could be prepared up to 137GB with the remaining capacity added later.

End of Overview

A more complete discussion of the Windows 137GB limitations follows with these sections:

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**Background**

Hard disc drives and Microsoft disk operating systems (OS) have evolved together in a mutually supportive way. Many times since the introduction of the original DOS v1 operating system the fundamental reason for an OS upgrade has to do with the support of larger and larger disc drives. The operating system elements that deal with storage devices are the kernel, file system and hardware specific device drivers.

Hard disc drives are engineered to ANSI standards that are followed by the drive and computer system manufacturers. Called hard drive Interfaces, these standards define communication protocols, timing between devices, commands and even physical measurements. These Interface definitions are continuously revised to support new technologies and higher capacities. One of the very first hard disc drive interfaces was released in 1982 as the ST-506 interface named after the Seagate Technology 5-megabyte drive. This interface was eventually renamed to the MFM interface.

Today, the two most common interfaces used in personal computer system are SCSI and ATA. The ATA interface (also known as IDE, EIDE and ATAPI) will be the focus of this discussion. The original ATA interface specification has been officially revised six times and is currently named ATA-6. Prior to ATA-6, the maximum capacity disc drive that could be defined by the interface was 137GB.

More recently, an evolutionary version of ATA called Serial ATA has entered the marketplace with many promising enhancements. Serial ATA commands are backward compatible with the original parallel ATA. Serial SCSI is also under development. The main difference between serial and parallel has to do with the types of cables.

OS components and ANSI interface specifications are engineered to provide room for growth. While there have been several file system innovations such as FAT32 and NTFS that can address capacities up to 2TB and more, Microsoft operating system device drivers that read and write to ATA interface disc devices follow the same interface specification as the hardware manufacturers.

**Bottom Line**

Microsoft operating systems that were released or have Service Packs released prior to August 2002 have a fundamental native maximum limit accessing ATA interface disc drives of 137GB.

Motherboards and hard drive controller cards that have system BIOS released prior to ATA-6 may have the same fundamental 137GB limitation.

**Names for this Capacity Limitation**

Typically, a disc drives is described and defined by terms which describe its storage capacity. For example, a disc drive has so many gigabytes. Taking this further into the drive itself, it has one or more platters with read write recording heads on both sides of the platters. These heads seek to concentric tracks and access individual sectors that rotate under the heads. These sectors hold our data and each has 512 bytes. Therefore, one way to say how large is a drive is based on its total number of sectors.

Operating systems look at these physical sectors from the simple perspective of numbering them logically from the first one through to the last one. These are called logical blocks and the method of managing them in an operating system is called logical block addressing or LBA. An 80GB disc drive, for example, has approximately 156 million LBAs.

Prior to ATA-6, the ATA interface defined commands capable of addressing 28 bits worth of LBAs. Because of this foundation, the early ATA interfaces are said to use 28-bit Addressing. In
binary (base 2) this is \(11111111111111111111_2\). In hexadecimal notation this is \(FFFFFFh\). In ordinary decimal notation it is 268,435,455. If each LBA is 512 bytes then this represents a maximum addressable capacity of 137,438,952,960 bytes or 137GB.

ATA-6 defines 48-bit Addressing and opens a new higher limit that will carry storage capacities far into the future towards a theoretical maximum of 144 petabytes.

Various sources refer to the 137GB limitation by different names. For example, it may be called the 28-bit limitation. Likewise, if the focus is on the solution, the discussion may be about ATA-6 or 48-bit Addressing. In all cases, the issue is about ATA interface disc drive that are greater than 137GB and the subsequent hardware and operating system support elements required to achieve full capacity.

Note: Windows Explorer properties and some BIOS displays may represent the drive capacity as 131,073MB using a divisor of \(2^{20}\) or as 128GB using a divisor of \(2^{30}\).

**Solutions exist!**

New systems can be built with full 48-bit support in both the BIOS and operating system.

Upgrading a legacy system, on the other hand, will require a little more effort than in previous upgrade cycles to larger hard disc drives. Fortunately, solutions exist to add 48-bit addressing to these systems. Some, but not all, of the solutions may require additional expense for OS updates or hardware products to reach the goal of supporting ATA interface disc drives greater than 137GB.

**WARNING:** There is a HIGH RISK OF DATA LOSS if a partition on an ATA drive is greater than 137GB and 48-bit addressing support is not installed. Seagate is not responsible for lost data. Without proper support, writing or saving data past the boundary line will wrap around to the front of the file system and overwrite all of your file system information, effectively erasing your drive. The following situations can result in data loss:

- Moving a large drive from a 48-bit compliant system to one that is not
- Booting to a CD or floppy without 48-bit support
- Re-installation of the Windows operating system without upgrading the Service pack or other required device drivers.

**Motherboard and BIOS Considerations**

Most motherboards have built-in connectors for the hard drive and CD-ROM drives. 40-pin ribbon cables connect the drives to the motherboard. These motherboard connectors are often labeled IDE Channel 0 and Channel 1. They are also called Primary Port and Secondary Port. Both are the same. The system BIOS auto-detects the hard disc drive and issues an inquiry to get the drive's number of LBAs. The largest number it is prepared to receive may be 137GB. In this case you might check with your system manufacturer for a BIOS upgrade. Many name-brand systems have the ability to "flash" the BIOS with new firmware. This process varies in difficulty and is optional.

Alternatively, BIOS support for ATA>137GB can also be accomplished by putting the necessary boot code on the disc drive itself. This small bit of programming emulates the BIOS support so that when the higher-level operating system drivers begin to launch they can "see" the full potential capacity of the drive. Seagate provides hard disc installation software called DiscWizard to help with this task. DiscWizard writes boot code called a DDO on discs that do not have native BIOS support for the full capacity of the drive. DiscWizard only writes the DDO when required.

Note: It is a common misconception that the DDO is some kind of memory resident program or that it has the potential to slow disc access by being in memory. Like all BIOS routines, the DDO is discarded from memory after about 5 seconds into the launch of the operating
system when the 32-bit direct access device drivers take over. The DDO exists only to detect and then present the full capacity of the disc drive to these operating system device drivers.

**BIOS Update Considerations**

Many manufacturers of motherboards provide a means to update the system BIOS. Updates are also available for many brands of controller cards. The BIOS is responsible for managing the initial power-on boot process which includes the discovery of peripheral hardware devices—including hard drives. A BIOS update can fix many types of compatibility issues including hard disc drive capacity limitations. While it is possible to work around a capacity limitation with the DiscWizard DDO, a BIOS update can possibly correct the issue and eliminate the need for a DDO. Some PC operating systems, such as Linux, cannot utilize the DDO.

See your system documentation or website to find out about your particular BIOS update procedure. This may be difficult to do if you do not have specific instructions. Unfortunately, the sheer number of brands, processors, chipsets and BIOS make it very challenging to track down updates. Nonetheless, several Internet web sites exist which specialize on the subject of system BIOS updates. Seagate does not assist in BIOS updates.

**Controller Card (host adapter) Considerations**

In many respects, controller cards are the easiest solution when adding an ATA>137GB drive to an existing system. A hard drive controller card is a circuit board that plugs into an available PCI slot on the motherboard and provides new connections for the drive cables. These controller cards have the added advantage of bringing their own BIOS support. If you purchase a controller card with the intention of supporting ATA>137BG be sure to verify that this support exists. Controller card manufacturers usually provide Windows device drivers that allow support of ATA>137GB.

Note: There are boot order compatibility issues that may occur in systems that have drives attached to both the motherboard and a controller card. In this situation, your system BIOS must release boot control from the Primary Master driver to the controller card. See your system and controller card documentation for direction.

**Serial ATA Considerations**

The new Serial ATA (SATA) interface is compatible, by design, with the original parallel ATA (PATA) interface. In fact, they are so similar, accessory adapters are available that allow an existing PATA drive to plug into a SATA controller or motherboard.

The inaugural SATA interface coincides with ATA-6 and is therefore equivalent with regards to 48-bit Addressing. SATA devices are ready to support greater than 137GB at the hardware and BIOS levels. However, since native operating system ATA device drivers can communicate with either type of interface, OS limitations may still apply.

SATA PCI controller cards came to market before motherboards. Like PATA controller cards, custom device drivers are supplied by the manufacturer that are optimized for the card. Any instructions for controller cards are consistent for SATA and PATA.

The first SATA motherboards have embedded chipsets similar to or designed by controller card manufacturers and use custom device drivers similar to those used on controller cards. These motherboards are similar in concept to a motherboard that has a built in SCSI adapter. If you have a SATA-ready motherboard, check for device drivers. Eventually, motherboard will have generic SATA support and rules regarding operating systems and service packs will still apply.

Where PATA systems can have Master and Slave drives on the same ribbon cable, SATA uses one cable per drive. The SATA controller cards have individually numbered connectors that set
the drive order. If two drives are attached on one serial ATA host adapter, the host operating system views the two devices as if they were both "masters" on two separate ports.

**Operating System Considerations**

Microsoft supports 48-bit Addressing (ATA>137GB) in Windows XP SP1 and Windows 2000 SP3. While no other native Microsoft solutions are available for earlier versions of Windows, some third-party support solutions exist for the legacy versions. Either way, updating the operating system and then partitioning and formatting the hard drive is more complicated now in this transition phase than it has been in many years. Similar transition phases occurred to the OS at 32MB, the ATA interface at 528MB and to the motherboard BIOS at 8.4GB. Fortunately, those previous transitions happened at separate times, unlike our current ATA>137GB.

A Windows Service Pack is a very large operating system update. Service Packs, which are often larger than 100 megabytes, are available online and noted below. Service Packs are usually updates to a working Windows system. This is an important distinction because it means that even Windows XP and Windows 2000 had ATA>137GB limitations prior to the latest Service Pack updates.

If you build a system with a single drive from scratch, then the boot drive's capacity is limited to the capability of the original OS installation CD. This means that a large boot drive may not see the benefit of 48-bit addressing during the first partitioning. At this time (Jan 2003) WinXP and Win2000 Installation CDs with native 48-bit addressing are commercially available.

A complex procedure called "slipstreaming" allows you to merge a Windows Service Pack with an original OS installation CD. You can search the Internet for "slipstreaming Windows" to find instructions on this process. Seagate does not assist in preparing slipstream installation CDs. Seagate does not recommend this method because even though the SP is integrated into the OS, a specific required registry setting `EnableBigLBA` may not yet be activated.

The general approach when analyzing the Windows 137GB capacity barrier is to start from the connection method and Windows OS version - then from either a new system single-drive installation or a storage upgrade to a working system.
Installation Matrix and Guidelines

Installation instructions and advice are significantly different depending on whether the drive is attached to the motherboard or to a controller and also which operating system is in use.

Throughout the following discussion, please keep in mind that the process of adding 48-bit LBA Addressing to any particular operating system will be different if it is a single drive system built from scratch or the addition of a second hard drive to an existing system. Adding a second drive as simple additional storage or for the eventual copying of all files and subsequent repositioning of the new drive as the boot drive have separate procedures.

The following table has squares from 1 to 14 that correspond to various combinations. Match up your current operating system with the connection method you intend to use and then jump to the associated note number for further information.

<table>
<thead>
<tr>
<th>Operating System (OS)</th>
<th>ATA drive connection method</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>Windows XP</td>
<td>Motherboard IDE 1*</td>
<td>2</td>
</tr>
<tr>
<td>Windows Millennium (Me)</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Windows 2000</td>
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<td>6</td>
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<tr>
<td>Windows 98SE</td>
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<tr>
<td>Linux</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>

* Indicates the note number for this combination.

1. Windows XP on a traditional motherboard

At the time of this writing (January 2003), new copies of Windows XP Full Versions have incorporated 48-bit Addressing for ATA interface disc drives. You can confirm that your copy has this support by inspecting the installation CD artwork. It should say "Windows XP Home (or Professional) Edition Including Service Pack 1."

Windows XP manufactured prior to August 2002 has a native limitation of 137GB supporting ATA interface disc drives that are attached to traditional Primary and Secondary IDE Channels on the motherboard. In this configuration WinXP will not create partitions greater than 137GB until after the Service Pack is installed and registry bit EnableBigLBA is set to 1.

See Microsoft Knowledgebase article Q322389:"How to Obtain the Latest Windows XP Service Pack" at support.microsoft.com.

See also the Microsoft Knowledgebase article that explains how to enable large drive support after the Service Packs are installed. For Windows XP SP1 see article Q303013:"How to Enable 48-bit Logical Block Addressing Support for ATAPI Disk Drives in Windows XP" at support.microsoft.com.

Windows XP has a feature called System Restore that records and tracks changes to the system settings and files. If a restore point exists you can undo harmful changes to the previous settings. It is highly recommended that you create new system restore points prior to making significant changes to your system.

Microsoft has issued updates that relate specifically to ATA (IDE) interface disc drives and recommends that you keep the OS updated with the latest drivers. For example, see also the
Microsoft Knowledgebase article Q331958: “Hard Disk May Become Corrupted When Entering Standby or Hibernation” at support.microsoft.com.

New system consideration – If your system BIOS sees the full capacity of the drive and your Windows XP CD says “… Including Service Pack 1” you are completely ready to utilize ATA interface disc drives greater than 137GB. If your BIOS is not up to the task you can apply a BIOS update or use Seagate’s DiscWizard Starter Edition and the DDO described above.

If your Windows XP CD does not indicate SP1, then your boot drive partition will have a maximum size of 137GB. After the OS and SP1 are installed, any additional gigabytes will show up as unallocated space on the drive and you can easily create a second partition with DiscWizard 2003 or the Windows disk management tools. Also, if you prefer to have a single partition, third party applications such as Partition Commander from VCom or Partition Magic from Powerquest may be able to stretch the partition to annex the newly found capacity.

Microsoft does provide a method of merging the Service Pack into an older copy of Windows XP. This process is called “Slipstreaming” and is very complicated. This process requires that you be able to burn a new Windows XP OS installation CD. You can search the Internet for "slipstreaming Windows XP" to find instructions on this process. Seagate does not assist in preparing slipstream installation CDs.

Adding a drive to an existing system – If Windows XP is already up and running then check MyComputer Properties to determine if your version has SP1. If not, you should install the Service Pack before working with the new hard drive. If SP1 is installed and the Disk Administrator tools show 137GB on your new drive, then EnableBigLBA is not yet on.

Seagate’s DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible. For your convenience, Seagate’s DiscWizard installation software can set the EnableBigLBA bit in the registry and prepare the drive to full capacity if service pack support is active in the operating system. Windows XP may require re-registration of the operating system if the boot device is changed after the original installation.

2. Windows XP on a PCI controller card

Controller cards support ATA interface disc drives through onboard BIOS and custom Windows device drivers. These storage controller cards are plug-and-play compatible and usually detected in the Windows Device Manager as “mass storage controller” or as “SCSI controllers” due to the similarity in disc access command structure. Since the drives are supported by drivers that emulate the SCSI driver approach, the native Windows 137GB ATA limitation does not apply since those drivers are not in use.

Companies which are known to manufacture ATA controller cards that support drives greater than 137GB are SIIG, Inc (http://www.siig.com), Promise Technology, Inc. (http://www.promise.com), HighPoint Technologies, Inc. (http://www.highpoint-tech.com) and ACARD Technology (http://www.acard.com). If your disc drives are recognized by the controller BIOS when the system is first powered on but later the drives are not seen by Windows then the device drivers for the controller card need to be installed. See your controller card documentation for direction.

As a matter of system maintenance, Microsoft recommends that you keep your system updated with the latest Windows XP Service Pack. See Microsoft Knowledgebase article Q322389: “How to Obtain the Latest Windows XP Service Pack” at support.microsoft.com.
Windows XP has a feature called System Restore that records and tracks changes to the system settings and files. If a restore point exists you can undo harmful changes to the previous settings. It is highly recommended that you create new system restore points prior to making significant changes to your system.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. This software supports several controller card models.

When building a new system, if you are using an ATA/133 PCI controller card which includes new ATA or ATAPI disk device drivers, the Windows XP operating system installation will pause briefly and ask for you to insert an OEM floppy diskette. This pause for new "adapter" drivers happens soon after the boot near the beginning of the installation. See your controller documentation for specifics.

If your Windows XP CD does not indicate SP1, then your boot drive partition will have a maximum size of 137GB. After the OS and SP1 are installed, any additional gigabytes will show up as unallocated space on the drive and you can easily create a second partition with DiscWizard 2003 or the Windows disk management tools. Also, if you prefer to have a single partition, third party applications such as Partition Commander from VCom or Partition Magic from Powerquest may be able to stretch the partition to annex the newly found capacity.

Microsoft does provide a method of merging the Service Pack into an older copy of Windows XP. This process is called "Slipstreaming" and is very complicated. This process requires that you be able to burn a new Windows XP OS installation CD. You can search the Internet for "slipstreaming Windows XP" to find instructions on this process. Seagate does not assist in preparing slipstream installation CDs.

Adding a drive to an existing system – The installation procedure is relatively easy if your original boot drive is attached to the motherboard and your new drive is attached to the controller card as additional storage. If you want your new drive to become the boot drive, your system BIOS must have an option to control the boot device or to release boot control from the Primary Master to the controller card. This is sometimes listed as "boot from SCSI". Windows XP may require re-registration of the operating system if the boot device is changed after the original installation.

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.

3. Windows Millennium (Me) on a traditional motherboard

Microsoft Windows Me has a native limitation of 137GB supporting ATA interface disc drives that are attached to traditional Primary and Secondary IDE Channels on the motherboard. In this configuration WinMe will not create partitions greater than 137GB.

Intel offers drivers to support the full capacity of drives larger than 137 GB on motherboards equipped with the Intel 800 Series chipset. For help identifying your Intel chipset see the Chipset Identification section below. If you are not sure what kind of chipset your motherboard has, contact your system or motherboard manufacturer. If your motherboard is unsupported by a non-Microsoft driver, Windows Me support of ATA drives larger than 137GB is possible on an ATA controller card. Otherwise, if you plan to upgrade to an operating system that has native support...
of 48-bit addressing, the drive could be prepared up to 137GB with the remaining capacity added later.

The Intel Application Accelerator v2.3 or above is listed compatible with Windows Me. Detailed information and the latest version of the driver can be downloaded from [http://www.intel.com/support/chipsets/iaa/](http://www.intel.com/support/chipsets/iaa/). See the Intel Application Accelerator section below for addition information.

Caution: If your system's old boot drive is less than 137GB and uses a drive overlay program (DDO) to overcome a previous BIOS capacity limitation (such as Disk Manager or DiscWizard and identifiable as a blue banner box before the operating system loads), then the Intel Application Accelerator is incompatible with your system. If you have this legacy configuration, the Ultra ATA controller card is the only solution for Windows Me. If you install the Intel Application Accelerator on this type of system, loss of data will occur. If you are not sure if your system uses a DDO, contact your drive manufacturer.

In general, if you are building a new single-drive system with a 137GB BIOS limitation and the drive is greater than 137GB, then DiscWizard Starter Edition will utilize a DDO that is compatible with IAA.

Microsoft has issued updates that relate specifically to ATA (IDE) interface disc drives and recommends that you keep the OS updated with the latest drivers. For example, see also the Microsoft Knowledgebase article Q273017: "Windows IDE Hard Drive Cache package" at support.microsoft.com.

Windows Me has a feature call System Restore that records and tracks changes to the system settings and files. If a restore point exists you can undo harmful changes to the previous settings. It is highly recommended that you create new system restore points prior to making significant changes to your system.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. If your system BIOS sees the full capacity of the drive DiscWizard will not install a DDO. If your BIOS has a capacity limitation, DWSE will install a DDO that is compatible with the IAA or eventual OS upgrade. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools.

Windows Me has a default limitation of 137GB supporting ATA interface disc drives. Therefore, your boot drive partition will have a maximum size of 137GB.

Warning: Formatting a drive past the 137GB barrier on a system that does not meet all requirements of BIOS support and the Intel Application Accelerator 48-bit Addressing operating system drivers will result in data loss. Seagate is not responsible for lost data.

If you have an Intel compatible chipset, and after the OS and IAA are installed, any additional gigabytes will show up later as unallocated space on the drive. You can easily create a second partition with DiscWizard 2003 or the Windows Fdisk partitioning tools.

Adding a drive to an existing system – Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.
4. Windows Millennium (Me) on a PCI controller card

Controller cards support ATA interface disc drives through their own onboard BIOS and Windows device drivers. These storage controller cards are plug-and-play compatible and usually detected in the Windows Device Manager as "SCSI controllers" due to the similarity in disc access command structure. Since the drives are supported by drivers that emulate the SCSI driver approach, the native Windows 137GB ATA limitation does not apply since those drivers are not in use.

Companies which are known to manufacture ATA controller cards that support drives greater than 137GB are SIIG, Inc [http://www.siig.com], Promise Technology, Inc. [http://www.promise.com], HighPoint Technologies, Inc. [http://www.highpoint-tech.com] and ACARD Technology [http://www.acard.com].

If your disc drives are recognized by the controller BIOS when the system is first powered on but later the drives are not seen by Windows then the device drivers for the controller card need to be installed. See your controller card documentation for direction.

Windows Me has a feature call System Restore that records and tracks changes to the system settings and files. If a restore point exists you can undo harmful changes to the previous settings. It is highly recommended that you create new system restore points prior to making significant changes to your system.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools. This software supports several controller card models.

As noted above, controller cards utilize custom 48-bit device drivers that support the full capacity of the drive. Unfortunately, in Windows Me, these drivers are added after the operating system is installed. This means that the initial partition may be smaller than the full capacity of the drive. Once the controller card drivers are installed, any additional gigabytes will show up later as unallocated space on the drive. You can easily create a second partition with DiscWizard 2003 or the Windows Fdisk partitioning tools.

Adding a drive to an existing system – The installation procedure is relatively easy if your original boot drive is attached to the motherboard and your new drive is attached to the controller card as additional storage. If you want your new drive to become the boot drive, your system BIOS must have an option to control the boot device or to release boot control from the Primary Master to the controller card. This is sometimes listed as "boot from SCSI".

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.

5. Windows 2000 on a traditional motherboard

At the time of this writing (January 2003), new copies of Windows 2000 Full Versions have incorporated full 48-bit Addressing for ATA interface disc drives. You can confirm that your copy
has this support by inspecting the installation CD artwork. It should say "Windows 2000 Including Service Pack 3."

Windows 2000 manufactured prior to August 2002 has a native limitation of 137GB supporting ATA interface disc drives that are attached to traditional Primary and Secondary IDE Channels on the motherboard. In this configuration Win2000 will not create partitions greater than 137GB until after the Service Pack is installed and registry bit EnableBigLBA is set to 1.


See also the Microsoft Knowledgebase article that explains how to enable large drive support after the Service Packs are installed. For Windows 2000 SP3 see article Q305098: "48-bit LBA Support for ATAPI Disk Drives in Windows 2000" at support.microsoft.com.

New system consideration – If your system BIOS sees the full capacity of the drive and your Windows 2000 CD says "... Including Service Pack 3" you are completely ready to utilize ATA interface disc drives greater than 137GB. If your BIOS is not up to the task you can apply a BIOS update or use Seagate's DiscWizard Starter Edition and the DDO described above. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools.

If your Windows 2000 CD does not indicate SP3, then your boot drive partition will have a maximum size of 137GB. After the OS and SP3 are installed, any additional gigabytes will show up as unallocated space on the drive and you can easily create a second partition with DiscWizard 2003 or the Windows disk management tools. Also, if you prefer to have a single partition, third party applications such as Partition Commander from VCom or Partition Magic from Powerquest may be able to stretch the partition to annex the newly found capacity.

Microsoft does provide a method of merging the Service Pack into an older copy of Windows 2000. This process is called "Slipstreaming" and is very complicated. This process requires that you be able to burn a new Windows 2000 OS installation CD. You can search the Internet for "slipstreaming Windows 2000" to find instructions on this process. Seagate does not assist in preparing slipstream installation CDs.

Adding a drive to an existing system – If Windows 2000 is already up and running then check MyComputer Properties to determine if your version has SP3. If not, you should install the Service Pack before working with the new hard drive. If SP3 is installed and the Disk Administrator tools show 137GB on your new drive, then EnableBigLBA is not yet on.

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible. For your convenience, Seagate's DiscWizard installation software can set the EnableBigLBA bit in the registry and prepare the drive to full capacity if service pack support is active in the operating system.

6. Windows 2000 on a PCI controller card

Controller cards support ATA interface disc drives through onboard BIOS and custom Windows device drivers. These storage controller cards are plug-and-play compatible and usually detected in the Windows Device Manager as "mass storage controller" or as "SCSI controllers" due to the similarity in disc access command structure. Since the drives are supported by drivers that
emulate the SCSI driver approach, the native Windows 137GB ATA limitation does not apply since those drivers are not in use.

Companies which are known to manufacture ATA controller cards that support drives greater than 137GB are SIIG, Inc (http://www.siig.com), Promise Technology, Inc. (http://www.promise.com), HighPoint Technologies, Inc. (http://www.highpoint-tech.com) and ACARD Technology (http://www.acard.com).

If your disc drives are recognized by the controller BIOS when the system is first powered on but later the drives are not seen by Windows then the device drivers for the controller card need to be installed. See your controller card documentation for direction.

As a matter of system maintenance, Microsoft recommends that you keep your system updated with the latest Windows 2000 Service Pack. See Microsoft Knowledgebase article Q260910: "How to Obtain the Latest Windows 2000 Service Pack" at support.microsoft.com.

If your disc drives are recognized by the controller BIOS when the system is first powered on but later the drives are not seen by Windows then the device drivers for the controller card need to be installed.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. This software supports several controller card models. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools.

When building a new system, if you are using a ATA/133 PCI controller card which includes new ATA or ATAPI disk device drivers, the Windows 2000 operating system installation will pause briefly and ask for you to insert a OEM floppy diskette. This pause for new "adapter" drivers happens soon after the boot near the beginning of the installation. See your controller documentation for specifics.

If your Windows 2000 CD does not indicate SP3, then your boot drive partition will have a maximum size of 137GB. After the OS and SP3 are installed, any additional gigabytes will show up as unallocated space on the drive and you can easily create a second partition with DiscWizard 2003 or the Windows disk management tools. Also, if you prefer to have a single partition, third party applications such as Partition Commander from VCom or Partition Magic from Powerquest may be able to stretch the partition to annex the newly found capacity.

Microsoft does provide a method of merging the Service Pack into an older copy of Windows 2000. This process is called "Slipstreaming" and is very complicated. This process requires that you be able to burn a new Windows 2000 OS installation CD. You can search the Internet for "slipstreaming Windows 2000" to find instructions on this process. Seagate does not assist in preparing slipstream installation CDs.

Adding a drive to an existing system – The installation procedure is relatively easy if your original boot drive is attached to the motherboard and your new drive is attached to the controller card as additional storage. If you want your new drive to become the boot drive, your system BIOS must have an option to control the boot device or to release boot control from the Primary Master to the controller card. This is sometimes listed as "boot from SCSI".

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.
7. Windows 98SE on a traditional motherboard

Microsoft Windows 98SE has a native limitation of 137GB supporting ATA interface disc drives that are attached to traditional Primary and Secondary IDE Channels on the motherboard. In this configuration Win98SE will not create partitions greater than 137GB.

Nonetheless, the native Windows 98SE ScanDisk and Defrag utilities are limited to smaller partition sizes and may not function on partitions greater than 127GB. Because the 16-bit memory model causes this limitation it applies to any type of drive interface on either motherboards or controller cards. There are no fixes available from Microsoft for this limitation. Third-party software may be available to defrag and monitor larger FAT32 file systems. Seagate recommends creating partitions of a size that can be managed by the native Windows 98SE ScanDisk and Defrag utilities.

Intel offers drivers to support the full capacity of drives larger than 137 GB on motherboards equipped with the Intel 800 Series chipset. For help identifying your Intel chipset see the Chipset Identification section below. If you are not sure what kind of chipset your motherboard has, contact your system or motherboard manufacturer. If your motherboard is unsupported by a non-Microsoft driver, Windows 98 support of ATA drives larger than 137GB are possible on an ATA controller card. Otherwise, if you plan to upgrade to an operating system that has native support of 48-bit addressing, the drive could be prepared up to 137GB with the remaining capacity added later.

The Intel Application Accelerator v2.3 or above is listed compatible with Windows 98SE. Detailed information and the latest version of the driver can be downloaded from [http://www.intel.com/support/chipsets/iaa/](http://www.intel.com/support/chipsets/iaa/) See the Intel Application Accelerator section below for addition information.

Caution: If your system's old boot drive is less than 137GB and uses a drive overlay program (DDO) to overcome a previous BIOS capacity limitation (such as Disk Manager or DiscWizard and identifiable as a blue banner box before the operating system loads), then the Intel Application Accelerator is incompatible with your system. If you have this legacy configuration, the Ultra ATA controller card is the only solution for Windows 98SE. If you install the Intel Application Accelerator on this type of system, loss of data will occur. If you are not sure if your system uses a DDO, contact your drive manufacturer.

In general, if you are building a new single-drive system with a 137GB BIOS limitation and the drive is greater than 137GB, then DiscWizard Starter Edition will utilize a DDO that is compatible with IAA.

Microsoft has issued updates that relate specifically to ATA (IDE) interface disc drives and Windows 98SE limitations and recommends that you keep the OS updated with the latest drivers. For example, see also the Microsoft Knowledgebase articles Q273017:“Windows IDE Hard Drive Cache package”, Q263044:“Fdisk Does Not Recognize Full Size of Hard Disks Larger than 64 GB” and Q184006:“Limitations of FAT32 File System” (regarding the ScanDisk tool) at support.microsoft.com.
New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. If your system BIOS sees the full capacity of the drive DiscWizard will not install a DDO. If your BIOS has a capacity limitation, DWSE will install a DDO that is compatible with the IAA or eventual OS upgrade. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools.

Windows 98SE has a default limitation of 137GB supporting ATA interface disc drives. Therefore, your boot drive partition will have a maximum size of 137GB.

Warning: Formatting a drive past the 137GB barrier on a system that does not meet all requirements of BIOS support and the Intel Application Accelerator 48-bit Addressing operating system drivers will result in data loss. Seagate is not responsible for lost data.

If you have an Intel compatible chipset, and after the OS and IAA are installed, any additional gigabytes will show up later as unallocated space on the drive. You can easily create a second partition with DiscWizard 2003 or the Windows Fdisk partitioning tools.

Adding a drive to an existing system – Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.

8. Windows 98SE on a PCI controller card

Controller cards support ATA interface disc drives through their own onboard BIOS and Windows device drivers. These storage controller cards are plug-and-play compatible and usually detected in the Windows Device Manager as "SCSI controllers" due to the similarity in disc access command structure. Since the drives are supported by drivers that emulate the SCSI driver approach, the native Windows 137GB ATA limitation does not apply since those drivers are not in use.

If your disc drives are recognized by the controller BIOS when the system is first powered on but later the drives are not seen by Windows then the device drivers for the controller card need to be installed. See your controller card documentation for direction.

Companies which are known to manufacture ATA controller cards that support drives greater than 137GB are SIIG, Inc. [http://www.siig.com], Promise Technology, Inc. [http://www.promise.com], HighPoint Technologies, Inc. [http://www.highpoint-tech.com] and ACARD Technology [http://www.acard.com].

Nonetheless, the native Windows 98SE ScanDisk and Defrag utilities are limited to smaller partition sizes and may not function on partitions greater than 127GB. Because the 16-bit memory model causes this limitation it applies to any type of drive interface on either motherboards or controller cards. There are no fixes available from Microsoft for this limitation. Third-party software may be available to defrag and monitor larger FAT32 file systems. Seagate recommends creating partitions of a size that can be managed by the native Windows 98SE ScanDisk and Defrag utilities.

Microsoft has issued updates that relate specifically to ATA (IDE) interface disc drives and Windows 98SE limitations and recommends that you keep the OS updated with the latest drivers. For example, see also the Microsoft Knowledgebase articles Q273017:“Windows IDE Hard Drive
Cache package*, Q263044:*"Fdisk Does Not Recognize Full Size of Hard Disks Larger than 64 GB* and Q184006:*"Limitations of FAT32 File System" (regarding the ScanDisk tool) at support.microsoft.com.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools. This software supports several controller card models.

As noted above, controller cards utilize custom 48-bit device drivers that support the full capacity of the drive. Unfortunately, in Windows 98, these drivers are added after the operating system is installed. This means that the initial partition may be smaller than the full capacity of the drive. Once the controller card drivers are installed, any additional gigabytes will show up later as unallocated space on the drive. You can easily create a second partition with DiscWizard 2003 or the Windows Fdisk partitioning tools.

Adding a drive to an existing system – The installation procedure is relatively easy if your original boot drive is attached to the motherboard and your new drive is attached to the controller card as additional storage. If you want your new drive to become the boot drive, your system BIOS must have an option to control the boot device or to release boot control from the Primary Master to the controller card. This is sometimes listed as "boot from SCSI".

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.

9. Windows NT v4 on a traditional motherboard

Microsoft Windows NT v4 SP4 or higher has a native limitation of 137GB supporting ATA interface disc drives that are attached to traditional Primary and Secondary IDE Channels on the motherboard. In this configuration WinNT4 will not create partitions greater than 137GB.

Since the likelihood of an existing Windows NT installation will be on an older BIOS and motherboard is high, it is best to use an controller card when adding an ATA drive greater than 137GB. The sensitivity of the operating system to changes can create difficult recovery scenarios and the controller card approach, which is based on a SCSI-type of support model, is significantly easier.

Caution: If your system's old boot drive is less than 137GB and uses a drive overlay program (DDO) to overcome a previous BIOS capacity limitation (such as Disk Manager or DiscWizard and identifiable as a blue banner box before the operating system loads), then the Intel Application Accelerator is incompatible with your system. If you have this legacy configuration, the Ultra ATA controller card is the only solution for Windows NT. If you install the Intel Application Accelerator on this type of system, loss of data will occur. If you are not sure if your system uses a DDO, contact your drive manufacturer.

In general, if you are building a new single-drive system with a 137GB BIOS limitation and the drive is greater than 137GB, then DiscWizard Starter Edition will utilize a DDO that is compatible with IAA.
Some sources may suggest the IAA. While it is true that WinNT is listed, for the purposes of this 
discussion, Seagate only suggests the IAA as an alternative when building a new system and not 
for adding a drive to an existing Windows NT system.

Windows NT supports FAT16 and NTFS file systems. Several partitioning rules exist for 
Windows NT which are beyond the scope of this paper. For further information, see 
Q114841:"Windows NT Boot Process and Hard Disk Constraints", Q119497:"Boot Partition 
Created During Setup Limited to 4 Gigabytes", Q138364:"Windows NT Partitioning Rules During 
Setup" at support.microsoft.com.

New system consideration – Seagate's DiscWizard Starter Edition disc installation software is 
designed to make building a new system as easy as possible. If your system BIOS sees the full 
capacity of the drive DiscWizard will not install a DDO. If your BIOS has a capacity limitation, 
DWSE will install a DDO that is compatible with the IAA. DWSE also provides the convenience of 
a fast partition and format saving nearly an hour over the operating system tools.

Boot partitions are limited to 4GB. The remaining capacity of the drive can be prepared as an 
NTFS partition from within the Windows environment after loading the operating system.

Warning: Formatting a drive past the 137GB barrier on a system that does not meet all 
requirements of BIOS support and the Intel Application Accelerator 48-bit Addressing 
operating system drivers will result in data loss. Seagate is not responsible for lost data.

If you have an Intel compatible chipset, and after the OS and IAA are installed, any additional 
gigabytes will show up later as unallocated space on the drive. You can easily create a second 
partition with DiscWizard 2003 or the Windows Disk Management partitioning tools.

Adding a drive to an existing system – Controller cards are the easiest solution when adding an 
ATA>137GB drive to an existing system. Seagate's DiscWizard 2003 disc installation software 
for Windows is designed to make adding a new drive to a system as easy as possible.

10. Windows NT v4 on a PCI controller card

Controller cards support ATA interface disc drives through their own onboard BIOS and Windows 
device drivers. These storage controller cards are plug-and-play compatible and usually detected 
in the Windows Device Manager as "SCSI controllers" due to the similarity in disc access 
command structure. Since the drives are supported by drivers that emulate the SCSI driver 
approach, the native Windows 137GB ATA limitation does not apply since those drivers are not in 
use.

Companies which are known to manufacture ATA controller cards that support drives greater 
than 137GB are SIIG, Inc [http://www.siig.com], Promise Technology, Inc. 
[http://www.promise.com], HighPoint Technologies, Inc. [http://www.highpoint-tech.com] and 
ACARD Technology [http://www.acard.com].

If your disc drives are recognized by the controller BIOS when the system is first powered on but 
later the drives are not seen by Windows then the device drivers for the controller card need to be 
installed. See your controller card documentation for direction.

Windows NT supports FAT16 and NTFS file systems. Several partitioning rules exist for 
Windows NT which are beyond the scope of this paper. For further information, see
New system consideration – Seagate's DiscWizard Starter Edition disc installation software is designed to make building a new system as easy as possible. This software supports several controller card models. DWSE also provides the convenience of a fast partition and format saving nearly an hour over the operating system tools.

When building a new system, if you are using an ATA/133 PCI controller card which includes new ATA or ATAPI disk device drivers, the Windows NT operating system installation will pause briefly and ask for you to insert a OEM floppy diskette. This pause for new “SCSI or RAID adapter” drivers happens soon after the boot near the beginning of the installation. See your controller documentation for specifics.

Adding a drive to an existing system – The installation procedure is relatively easy if your original boot drive is attached to the motherboard and your new drive is attached to the controller card as additional storage. If you want your new drive to become the boot drive, your system BIOS must have an option to control the boot device or to release boot control from the Primary Master to the controller card. This is sometimes listed as "boot from SCSI".

Seagate's DiscWizard 2003 disc installation software for Windows is designed to make adding a new drive to a system as easy as possible.

11. Macintosh System X on a traditional motherboard

Most Apple Macintosh systems have a native limitation of 137GB supporting ATA interface disc drives. Operating system support for 48-bit LBA addressing begins with OS X 10.2/9.2.2. BootROM support for 48-bit is also a requirement. For further information, see article ID: 86178 "Macintosh: Using 128 GB or Larger ATA Hard Drives" at info.apple.com.

48-bit hard drives attached to systems built prior to OS X 10.2/9.2.2 and without adequate BootROM support will be limited to 137GB. Otherwise, you could consider the purchase of an Ultra ATA/133 PCI Controller Card specifically designed for Macintosh computers, available from most retail and online computer stores.

12. Macintosh System X on a PCI controller card

New controller cards are available that support ATA interface disc drives through their own onboard BIOS and custom Mac OS device drivers. Companies which are known to manufacture ATA controller cards that support Mac OS drives greater than 137GB are SIIG, Inc
13. Linux on a traditional motherboard

Linux kernels have added native support for 48-bit LBA addressing with IDE driver patches beginning with kernel v2.4.16. Most current commercial compilations of Linux have incorporated the newest IDE/ATA drivers. For example, Red Hat v7.2 has the native 137GB limitation while Red Hat v7.3 has added 48-bit Addressing; SuSE v8.0 Professional begins support for 48-bit addressing; Caldera OpenLinux v3.1 may support 48-bit addressing.

Linux operating systems are inherently upgradeable. Nonetheless, patches to the fundamental disc access drivers are technically challenging. Many web page articles are available which discuss the new 48-bit LBA IDE or ATA drivers. A good place to begin your research is at the Linux home page (http://www.linux.org) or the Linux ATA Development and Linux Disk Certification Project (http://www.linux-ide.org/)

Certain disc utilities, such as DD, which depend on low-level disc access may not support 48-bit LBAs until they are updated.

14. Linux on a PCI controller card

New controller cards are available that support ATA interface disc drives through their own onboard BIOS and custom Linux device drivers. Companies which are known to manufacture ATA controller cards that support drives greater than 137GB are SIIG, Inc (http://www.siig.com), Promise Technology, Inc. (http://www.promise.com), HighPoint Technologies, Inc. (http://www.highpoint-tech.com) and ACARD Technology (http://www.acard.com).
**Regaining Capacity After-the-Fact**

Often, a system is prepared and put into use before a capacity limitation is discovered. Primarily, because most partitioning utilities, unlike DiscWizard, are unable to recognize BIOS or operating system limitations and make appropriate suggestions. In the event that a working system is found to have a 137GB limitation, after-the-fact, there are usually ways to add 48-bit addressing support. In fact, several procedures noted above are after-the-fact with regards to Service Packs and device drivers.

In most cases, DiscWizard for Windows is able to add a new partition to an existing system after 48-bit addressing support is added to the operating system. If the drive is attached to the motherboard, DiscWizard will try to determine if the system BIOS is able to support the drive. DiscWizard may add a DDO or suggest running DWSE if Windows blocks the BIOS test. If a DDO is added, a blue banner box is visible after the DDO loads for a few seconds shortly before Windows boots into graphics mode.

If the drive in question is attached to a controller, the 137GB limitation may be because the BIOS on the card has 28-bit addressing and needs to be updated or replaced. If the BIOS on the card is good then perhaps the device drivers are out-of-date.
Chipset Identification
Many utilities are available to help identify the CPU and chipset components that are used on a PC motherboard. These utilities can be found on the Internet by searching for "CPU ID utility" or "CPU chipset identification utility".

Intel chipsets are typically a 5-digit number starting with 82 and the last three digits being the chipset number. For example, the "82810s System and Graphic Controller" is the 810E chipset. The "82443BX" is a 400 series chipset. Intel has a small chipset ID utility you can download to help: [http://www.intel.com/support/chipsets/int/chipsetid.htm](http://www.intel.com/support/chipsets/int/chipsetid.htm)

For VIA and Intel chipsets, in Device Manager, you can also expand the "Hard disk controllers" or "IDE ATA/ATAPI controllers" listing to show the IDE controller name and number.

You can check your system chipset identification in Windows Device Manager. Start by Right Clicking on My Computer. Then follow the sequence for your version of Windows:

For Windows XP or Windows 2000:
-> select the Hardware tab -> click the Device Manager… button -> expand the 'System devices' listing.

For Windows Me, Windows 98, or Windows 95:
-> select the Device Manager tab -> expand the 'System devices' listing.

Intel Application Accelerator

The Intel Application Accelerator v2.3 or above support ATA interface disc drives greater than 137GB. Detailed information and the latest version of the driver can be downloaded from [http://www.intel.com/support/chipsets/iaa/](http://www.intel.com/support/chipsets/iaa/). The Intel 800 Series chipsets include 810, 810E, 810E2, 815, 815E, 815EP, 815P, 820, 820E, 830, 830M, 830MP, 830MG, 840, 845, 850, or 860 chipset.

Caution: If your system boot drive uses a drive overlay program (DDO) to overcome a previous BIOS capacity limitation (such as Disk Manager or DiscWizard and identifiable as a blue banner box before the operating system loads), then the Intel Application Accelerator is incompatible with your system. If you have this legacy configuration, the Ultra ATA controller card is the only solution for Windows Me or 98SE.
Appendix A –

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Appendix B –

Abbreviations and Acronyms

ANSI  American National Standards Institute
ATA  AT Attached drives
ATAPI  AT Attached Packet Interface
BIOS  Basic Input/Output System
CD  Compact Disc
DDO  Dynamic Drive Overlay
DWSE  DiscWizard Starter Edition
FAT  File Allocation Table
GB  Gigabyte (1,000,000,000 bytes)
IAA  Intel Application Accelerator
IDE  Intelligent Drive Electronics or Integrated Drive Electronics
LBA  Logical Block Addressing
Me  Millennium
OEM  Original Equipment Manufacturer
OS  Operating System
PATA  Parallel ATA
PCI  Peripheral Component Interconnect
RTM  Release to Manufacturing
SATA  Serial ATA
SCSI  Small Computer Systems Interface
SE  Second Edition
SP  Service Pack
TB  Terabyte (1,000,000,000,000 bytes)

IDE ATA/ATAPI  Refers to the three names used by various hard drive manufacturers for the same drive technology
Appendix C –

Change History  March 7, 2003

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>version 0.9 (Draft)</td>
<td>March 2, 2003</td>
<td>Minor changes addressing comments. Added Disclaimer Appendix A.</td>
</tr>
<tr>
<td>v0.91 (Draft)</td>
<td>March 7, 2003</td>
<td>Added Regaining Capacity After-the-Fact section. Added Chipset Identification section.</td>
</tr>
<tr>
<td>v1.0 (Final)</td>
<td>March 7, 2003</td>
<td>Released to Seagate support services, PDF file format version to public.</td>
</tr>
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</table>

Developer notes:
none pending