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Hints and Tips

Deskstar 7K250

UltraATA 100 Hard disk drive

HDS722504VLAT20
HDS722508VLAT20
HDS722512VLAT20
HDS722512VLAT80
HDS722516VLAT20
HDS722516VLAT80
HDS722525VLAT80



Hints and tips

This document provides device and system information as a supplement to the individual system integration process. Please use this information in conjunction with your system and Operating System documentation. If you require more information, please contact Hitachi Global Storage Technologies Technical Support.

Hitachi Global Storage Technologies recommends you back up all data before installing your new hard drive.

BIOS 8.4GB limitation

Systems built prior to 1997 are unlikely to support a drive with capacity greater than 8.4 GB. This is because the LBA method of translation used ID words 1, 3 and 6 of the Identify Device data. The maximum values for words 1, 3 and 6 are 16383 cylinders, 16 heads and 63 sectors for a capacity of 8.4 GB. To go beyond this boundary a new Extended Interrupt 13 function was defined. By mid 1998, most new systems introduced this support.

Problems with systems that do not support greater than 8.4 GB can be solved with one of the following methods:

- 1) Obtain a new version of BIOS from your system vendor that includes Extended Interrupt 13 support.
- 2) Setting the drive CHS configuration to 15 head mode will sometimes overcome a situation where the system BIOS hangs after auto-detection of the drive geometry. This is achieved by changing the option jumper setting on the Deskstar 7K250 drive. *[Jumper functions are described on the label adjacent to the jumper area.]*
- 3) Use third party BIOS overlay software that adds support for larger drives.
- 4) Use an 'intelligent' add-on ATA adapter which can support Extended Interrupt 13. These avoid use of the motherboard controller and BIOS.

BIOS 33.8GB limitation

Some legacy systems with either AMI or Award BIOS have a capacity limit of 33.8GB. This could affect all Deskstar 7K250 models. The symptom of this problem is a hang condition during ATA drive detection during startup.

There are two solutions to this problem:

- Obtain a BIOS upgrade from your motherboard supplier.
- Use a third party BIOS overlay software product.

BIOS 137GB limitation

Many older systems have an inherent capacity limitation of 137GB. This is due to an addressing limitation within traditional ATA. So only the first 137GB of larger versions of the 7K250 family will be accessible in these systems.

ANSI ATA-6 defined a new 48bit addressing scheme to access devices larger than 137GB. So to switch to this scheme and access the full capacity it will be necessary to obtain latest BIOS that provides 48 bit addressing support, or load a third party BIOS overlay.

Alternatively a modern additional Adaptor card can be installed that provides 48bit ATA addressing support.

If the system is based around an Intel 8xx chipset then loading of latest BIOS and use of the Intel 'ATA Application Accelerator' (v2.3 or later) can resolve all limitations within a Windows environment (for Windows 2000 see "Operating System Capacity Limits" section). It should provide access to the full capacity and handle UDMA performance settings.

If the chipset is not Intel 8xx based, then support maybe limited, and latest BIOS and drivers should be obtained from the system board manufacturer.

BIOS Display Errors

During system startup users may see unexpected drive capacities reported by the BIOS. The values displayed are caused by display register overflow conditions and do not affect correct operation of, or access to, the full Deskstar 7K250 drive capacity.

Typical maximum values displayed are:

AMI or Phoenix BIOS may display 65535MB
Compaq or Surepath may display 11333MB

Operating System Capacity Limits

DOS / Windows 95 (original version) do not support drives with a capacity larger than 8.4 GB.

Windows 95 (OSR2.x) / **Windows 98** support Extended Interrupt 13 and offer an option to use the FAT32 File System. This makes it possible to create partitions of any size up to 137GB on a Deskstar 7K250 drive.

(see BIOS 137GB limitation above)

There is an FDISK display limitation which suggests that partitions are limited to 64GB. Microsoft have issued a patch to resolve this:

<http://support.microsoft.com/default.aspx?scid=kb;en-us;Q263044>

Windows NT 4.0 does not currently support ATA drives larger than 8.4 GB at installation time. Microsoft has improved this by releasing a new ATAPI.SYS driver available within Service Pack 3, or later.

Windows 2000 requires addition of Service pack 3 (or later) and the user to perform a Windows Registry Edit to fully enable 48 bit addressing for any hard drive larger than 137GB. Note: Great care must be taken with this operation to avoid 'fatal' windows corruption.

(See Microsoft Knowledge Base article: Q305098 for the detailed procedure)

Windows XP requires the addition of service pack 1 to provide 48bit addressing support for access to HDD with capacities greater than 137GB.

Linux Although Linux uses its own geometric translation methodology the boot partition must be accessible through the BIOS. Therefore BIOS's with 8.4GB, 33GB or 137GB limitations must have a boot partition that resides within the range of the BIOS. The linux kernel contains a generic ide.o driver which has the following limitations: i) 33GB Limit: The ide.o driver in older versions of the Linux kernel (<= 2.2.14) requires upgrading either through a kernel upgrade or patch. ii) 137GB Limit: requires a ide.o driver which supports 48 bit addressing. This is contained in the 2.4.19 release of the kernel or in a patched version of the 2.4.18 kernel - available in RedHat 7.3 (and above) or SuSE 8.0 (and above). The end user should check with their chosen distributor for 48 bit addressing Compliance..

Note: Additionally 3rd Party PCI cards which do not utilize the Linux Kernel's ide.o driver and use their own proprioritary drivers, may require kernel patches or additional drivers to be loaded prior to providing 48-bit support. Please consult your card manufacturer for details.

Enabling UDMA Operation

SCO Unix Your version may not currently support UDMA operation. Contact SCO support for provision of a driver to overcome this limitation.

Linux, reference to the Hitachi FAQ's Web site:

<http://www.hgst.com/support/linuxfaqs.htm>

provides good general information and insight and also provides links to the Linux Documentation Project site . This site provides an extensive "How To" index sections.

- **UDMA SUPPORT**

Support for the UDMA operation of the drive is dependent upon the version of device driver loaded in the kernel. Check your distribution information for kernel/driver support. Note: even if your kernel/driver supports UDMA operations they may not be enabled by default. To check which options have been enabled the program "hdparm" can be used.

To confirm whether or not UDMA has been enabled issue the command: `hdparm /dev/hda`

(list the properties of the first ATA device - hda)

To enable UDMA use the command:

`hdparm -c1 -A1 -m16 -d1 /dev/hda`

(-c1 enables 32 bit, -A1 enables look-ahead,

-m16 enables 16 sector transfers & -d1 enables dma)

For more information see the MAN Pages for hdparm command and the Ultra-DMA Howto document maintained by the linux document project.

Ref: <http://www.linuxhq.com/ldp/howto/mini/Ultra-DMA.html>

Windows 95/98/NT/2K may not automatically enable UDMA operation. Drives may continue to operate in PIO Mode unless action is taken to change the Operating System installation settings.

When necessary this can be done in the following manner:

Windows 95 and 98

- When the Operating System is installed, open the *Control Panel*
- Select *System*
- Select *Device Manager*
- Select *ATA drive*
- Select *Settings*
- Enable DMA check box

You will then be advised to reboot the System for this change to take effect.

Windows NT 4.0

UDMA operation cannot be selected as in Windows 95 and 98. There are two ways to enable UDMA with Windows NT which are listed below. The first one is the preferred one.

- Install the DMA driver that can be obtained from the motherboard manufacturer's WEB site.
- Install DMA driver from the diskette or CD that was supplied with motherboard.

Note: We recommend that in all cases, whenever possible, the latest drivers provided by the hardware vendor should be used, rather than the older drivers provided with the operating system.

Windows 2000

Service pack 3 (or later) should be added to provide UDMA operation. In some systems with ATA-100 chipsets a fix may be required which is only available direct from Microsoft Knowledge Base article: Q260233.

Windows XP

Windows XP will automatically enable UDMA operation at the highest possible speed supported by the system and the Deskstar 7K250. It is seldom necessary to add 3rd party drivers to achieve correct UDMA operation.

UDMA Mode - ATA Controller Compatibility

The Deskstar 7K250 drive is capable of ATA-100 (UDMA mode 5) operation. Many motherboards now offer ATA-100 capability. Older boards successfully operate at their highest supported speed, i.e., ATA-66 (UDMA mode 4) or ATA-33 (UDMA mode 2).

Unfortunately, on certain boards the UDMA Driver/BIOS/Chip-set combination cannot correctly activate UDMA operation when the hard drive reports a capability higher than the motherboard chipset was designed for. (see below for details by OS)

Windows 95

When the system does not correctly switch to a compatible speed, the most common symptom is failure to complete start up of Windows 95 after enabling the DMA feature in the Windows Control Panel as described in the above DMA Operation section. (See below for solutions)

Windows 98

When the system does not correctly switch to a compatible speed, the most common symptom is failure to complete start up of Windows 98 after enabling the DMA feature in the Windows Control Panel as described above in DMA Operation section.

Alternatively, Windows boots successfully but examination of the system settings in the Control Panel shows that the DMA check box has been unchecked by Windows. In this case system performance will be poor because all data transfers will be at PIO mode 4 speeds. (See below for solutions)

Windows NT 4.0

Again the most common symptom that may be experienced is a failure to boot after a Bus Mastering Driver has been added and loaded.

Solutions

In all the above situations there are two solutions:

1. Obtain a new BIOS for the motherboard to correct the UDMA capability detection problem, or
2. Change the Deskstar 7K250 drive to report a lesser UDMA capability. Once changed the drive will correctly perform at the lower UDMA transfer rate. A "Feature Tool" for performing this alteration is available at

[Http://www.hgst.com/support/download.htm](http://www.hgst.com/support/download.htm)

Note: This tool provides a convenient way to change the drive back to UDMA-5 at a later date, if required.

Windows XP

If Windows XP detects frequent CRC errors during data transfers, it will automatically reduce the transfer mode to a point where CRC errors no longer occur. If this downturn in speed is detected, users should check quality of all ATA cables in use, and if necessary obtain a newer controller BIOS to resolve the signal timing issues that maybe causing the CRC failures.

Cabling

For operation faster than ATA-33 (UDMA-2) the ATA/ATAPI-4 standard requires that 80 conductor cable be used for attachment of devices to these faster ATA controllers.

A new signal is created within these 80 conductor cables called CBLID. It enables the controller to detect if this type of cable has been fitted. If the controller does not detect 80 conductor type cable, operation will be limited to ATA-33 operation.

The connectors on 80 conductor cable are color coded as follows for correct installation:

- Blue - Motherboard / ATA Controller
- Black - Master Drive
- Gray - Slave Drive

Incorrect cable orientation will stop correct 80 conductor cable detection and also stop correct Master/Slave operation in a two-drive system.

80 conductor cables are readily available in all geographies.

Round section cables are now becoming popular. For reliable operation these must be manufactured from twisted pairs of conductors.

ACPI

It has been reported that some motherboard / OS combinations experience instability with ACPI enabled. It is claimed, by some, to be capable of causing data corruption under Windows 2000 because of incorrect management of the cache during an ACPI initiated shutdown.

If you wish to disable ACPI in Windows 2000 proceed as follows:

- Open Device Manager (Control panel - system - hardware - Device Manager)
- Go to Computer Tab and select the "ACPI Enabled" option
- Select Properties
- Go to Driver Tab
- Press Update Driver
- "Welcome to Upgrade Device Driver" screen appears
- Press Next
- Select "Display a list of known drivers....."
- Select "Show all Hardware of this device class"
- From Standard Computers select "Standard PC"
- After new driver has been installed - Reboot
- Windows will now detect hardware and install drivers
- After reboot open Device Manager again.
- Open Computer Tab and examine each "Standard PC" device entry.
- Delete any that report "Driver not installed" in their Device Status screen.

ACPI is then no longer in use.

RAID 5

Operation of ATA drives in a RAID environment

Where multiple Deskstar drives are being installed as elements in a RAID 5 array it is important to understand limitations that may be imposed by the RAID controller architecture.

i) RAID Build / Initialization Operations:

Some controllers will perform a total read / write operation across all array elements as part of the initialization to create the RAID 5 parity data. This is fine providing the drive elements do not contain a sector that cannot be read (a Read hard Error) for any reason. In this situation the array element maybe rejected and the array build could fail.

Some possible reasons for a read hard error could be:

- as a result of excessive shock/vibration
- a power glitch during a previous write operation.

These apparent errors are not real hard drive defects and a rewrite of the same sector would recover the

situation. This rewrite could be achieved using the Hitachi DFT Erase Disk facility, available from:

<Http://www.hgst.com/support/download.htm>

For this reason many controller manufacturers prefer to perform a Write / Read operation sequence to create the parity data, thus avoiding any latent problems from previous hard drive usage.

ii) Errors during RAID operation:

If a read hard error is encountered for any reason during an access to data striped across the array then the RAID controller will reconstitute the 'missing' data and return the requested data in its entirety to the requesting application. Manufacturers of RAID controllers differ in what action they take regarding the array member that failed to provide the requested data. Variations experienced include:

- immediately drop the array member and inform the user that his array is now 'critical'.
- remap that whole stripe containing the one 'defective' sector to an alternative location on the array. This can only occur a few times before the remap area of the controller (in NVRAM) is full. At that point the array member will be 'dropped' and the array declared 'critical'.

Neither of these actions make use of the extensive error management capabilities built into the Deskstar 7K250 family.

Hitachi has provided input to major RAID controller manufactures in an attempt to achieve better alignment between RAID controller architecture and the sophisticated error handling management functions designed into the Hitachi Deskstar 7K250.

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