

HPT370
PCI UDMA/ATA100
RAID Controller
User's Guide

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ☐ Reorient or relocate the receiving antenna.
- ☐ Increase the separation between the equipment and the receiver.
- ☐ Connect the equipment onto an outlet on a circuit different from that to which the receiver is connected.
- ☐ Consult the dealer or an experienced radio/TV technician for help.

Shielded interconnect cables and a shielded AC power cable must be employed with this equipment to ensure compliance with the pertinent RF emission limits governing this device. Changes or modifications not expressly approved by the system's manufacturer could void the user's authority to operate the equipment.

Declaration of Conformity

This device complies with part 15 of the FCC rules. Operation is subject to the following conditions:

- ☐ This device may not cause harmful interference, and
- ☐ This device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications

This class B digital apparatus meets all requirements of the Canadian Interference-causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Disclaimer

The information in this document is subject to change without notice. The manufacturer makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Further, the manufacturer reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of the manufacturer to notify any person of such revision or changes.

Trademark Recognition

Microsoft, MS-DOS and Windows are registered trademarks of Microsoft Corp.

MMX, Pentium, Pentium-II, Pentium-III, Celeron are registered trademarks of Intel Corporation.

Other product names used in this manual are the properties of their respective owners and are acknowledged.

Copyright

This publication, including all photographs, illustrations and software, is protected under international copyright laws, with all rights reserved. Neither this manual, nor any of the material contained herein, may be reproduced without the express written consent of the copyright holders.

© November 2000

Version 1.0

Contents

1: INTRODUCTION	1
The HPT370 Onboard RAID Controller	1
<i>Features</i>	2
<i>RAID Basics</i>	3
2: INSTALLATION	5
Hard Disk Drive Selection	5
Connecting Drives To the Controller	6
3: SETUP	7
HPT370 BIOS Setting Utility	7
<i>BIOS Setting Utility Functions</i>	8
<i>Creating A Raid Array</i>	10
4: SOFTWARE	13
HPT 370 DEVICE DRIVERS	13
<i>Device Drivers For Windows 95/98</i>	13
<i>Device Drivers For Windows NT 4.0</i>	15
<i>Device Drivers For Windows 2000</i>	18
<i>Uninstalling HPT370 Device Drivers</i>	21
The HPT RAID Administrator Utility	22
<i>Installing The Utility</i>	22
<i>The Utility Interface</i>	22

About this Manual

The manual consists of the following chapters:

Introduction

The **Introduction** has general information about the product, what items come with it and a basic explanation of what RAID is and how it works.

Installation

The **Installation** chapter explains how to connect the hardware needed to establish a RAID array.

Setup

The **Setup** chapter explains how to set up and maintain a RAID array using the HPT370 BIOS.

Software

The **Software** chapter explains how to install the HPT370 driver software and use the HPT RAID Administrator Windows utility program to control and view the RAID array.

1: Introduction

The HPT370 Onboard RAID Controller

This User's Guide is for an onboard HPT370 PCI UDMA/ATA 100 RAID controller. The guide is supplied with computer mainboard models that have the Highpoint technologies, Inc. HPT370 controller integrated onto the board.

For general information on the setup installation and use of the mainboard this guide came with, please refer to the Mainboard User's Guide. This guide is only for the RAID controller, though it does make reference to the mainboard where necessary. Since this guide is generic and is intended for use with more than one mainboard, there will not be specific reference to the mainboard you received this guide with and the illustrations in the guide will not necessarily be of the mainboard you purchased.

This chapter contains the following information:

- ☐ **Checklist**
A list of the additional items you should receive with your mainboard with the HPT370 option
- ☐ **Features**
Some feature and specification information about the HPT370 RAID controller.
- ☐ **RAID Basics**
A brief explanation of what RAID is and which RAID modes are available with the onboard HPT370 option

Checklist

You should receive the following additional items with your mainboard when it has the HPT370 option:

- ☐ 2 ATA100 80-wire drive connector cables
- ☐ HPT370 Driver Disk (floppy disk - drivers are also on Mainboard Support Disk CD)
- ☐ HPT370 utility software on Mainboard Support Disk CD
- ☐ This User's Guide

Features

The HPT370 RAID controller is an optional feature built onto your computer mainboard. It provides convenient, simple and inexpensive RAID features using inexpensive and widely available IDE or "ATA" hard disk drives to provide data security and enhanced performance.

The HPT370 RAID controller has the following main features:

- Supports up to four additional IDE hard disk drives connected to the mainboard
- Has a PCI UDMA/ATA interface
- Supports IDE drives using transfer modes from PIO 1-4 to UDMA/ATA33-66-100, also supports older MW-DMA drives (usually auto-detected)
- HPT370 built-in BIOS creates, deletes and manages RAID arrays
- Microsoft Windows HPT RAID Administrator utility allows you to manage the array configuration and view status

RAID Basics

This section explains the basic concepts you need to understand to use the HPT370 RAID controller to create a RAID array.

RAID stands for 'Redundant Array of Independent Disks', which is a type of hard disk drive subsystem that can increase performance, provide fault tolerance or both. A RAID array is made up of at least two hard disk drives. There are several types or "levels" of RAID array. The HPT370 supports three RAID levels and a storage maximization mode:

Level 0:

Level 0 uses a technique called Striping to maximize data transfer performance.

Level 1:

Level 1 uses a technique called Mirroring to provide reliable data redundancy in the event of disk failure.

Level 0+1:

This is a combination of Level 0 and Level 1 which uses both Striping and Mirroring.

Spanning:

Spanning is not a type of RAID array. It is a technique where multiple drives are treated as if they are one drive.

It is important to understand the two main RAID techniques the HPT370 supports.

Striping

Striping is a technique that interleaves data (switches back and forth between drives) in bytes or blocks of bytes across more than one disk. This allows the array to perform both disk reads and writes at the same time. This technique substantially increases data transfer performance but does not provide any data redundancy.

Mirroring

Mirroring is a technique where all the data written to one drive is also written to a second drive providing complete redundancy. This ensures that if one drive fails, an identical backup is available. The HPT370 has the additional benefit of being able to write to both drive simultaneously, unlike conventional mirroring that writes to first one drive then the other. This feature speeds up performance by writing data in half the time.

Striping & Mirroring

RAID Level 0 + 1 is a combination of the two techniques explained above. This provides both improved data transfer performance and fault tolerant redundancy. This mode requires twice as many hard disk drives as using either mode alone.

Spanning

While not actually a RAID, the HPT370 supports Spanning, or JBOD (Just A Bunch Of Disks) as an additional feature. Spanning does not provide data redundancy and does not speed up data transfer. It does allow you to use multiple disks as one contiguous disk drive.

With the HPT370, you use the built-in BIOS Setting Utility to create and manage arrays.

2: Installation

This chapter covers what types of hard disk drives you can use with the HPT370 controller and what you need to do to connect them to it.

Hard Disk Drive Selection

As previously noted, you can use a wide variety of IDE hard disk drives with the HPT370 controller. IDE drives are mainly differentiated by their transfer mode. The main difference between the various modes is transfer speed. There are also other factors which affect hard disk drive performance including the platter rotation speed and cache size of the drive.

To obtain maximum performance from the HPT370, you should use ATA100 drives with a high rotation speed. You can, however, obtain the benefits of using a RAID array with any of the drive types the HPT370 supports.

You should use drives of the same size and speed to set up an array. It is most preferable to use two identical drives. Selecting a drive size is a matter of how much data storage you require.

You will need to start with at least two drives. Since the HPT370 supports two channels, you can always add additional drives later if you need additional storage.

Connecting Drives To the Controller

The drive connectors for the HPT370 are standard onboard IDE drive 40-pin connectors. Remember that you must use 80-wire ribbon cable if you will use drives with a UDMA/ATA66 or 100 transfer mode. Other drives can use either 80-wire or standard 40-wire ribbon cables.

The HPT370 controller views IDE channels the same way a conventional IDE controller does. This means that it sees a Primary and Secondary channel and each channel has a master and a Slave drive. If you are using a two disk array, you must connect one drive to each channel in the Master position.

Refer to your mainboard manual for instructions on how to connect IDE drives if you need them.

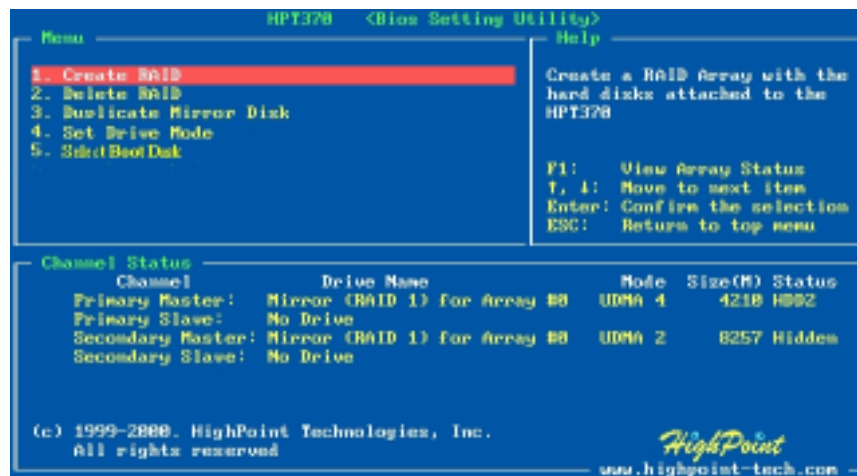
3: Setup

This chapter covers how to use the HPT370 BIOS to set up a RAID array.

HPT370 BIOS Setting Utility

To enter the HPT370 BIOS Setting Utility, press Control + H when the HPT370 BIOS notice is first displayed during the boot process. You must already have at least one hard disk drive connected to one of the drive connectors or the BIOS Setting Utility will not load.

This is the BIOS Setting Utility screen that appears (the example screen shows an array already set up):



BIOS Setting Utility Functions

The BIOS Setting Utility has the following initial functions:

1. Create RAID

Creates a RAID array with the hard disk drives connected to the controller. A submenu appears when you select this and press the Enter key.

2. Delete RAID

Deletes an existing RAID array created by the controller.

3. Duplicate Mirror Disk

Duplicates a drive connected to the controller that already has data on it. This step is necessary to preserve the existing data on the source disk. Selecting this item and pressing the Enter key loads another menu where you select Source and Target disks and initiate the duplication.

4. Set Drive Mode

The BIOS Setting Utility will auto-detect the IDE drive mode for most disks. Unless you have some reason to doubt the detected mode, you can accept it. When you select this item and press the Enter key, it selects the first drive in the list in the Channel Status box. Use the arrow keys to select which drive you want to set the status for and press Enter again. A submenu with mode options pops up. Select a mode based on the manufacturer's drive information.

5. Select Boot Disk

This item allows you to set which drive in the array will be the boot drive. Selecting this and pressing the Enter key allows you to toggle the boot status of the drives connected to the HPT370 controller.

Utility Controls & Help

The HPT370 BIOS Setting Utility has a simple set of controls and context-based Help messages.

Utility Controls

The BIOS Setting Utility controls are listed in the Help box section of the interface:

F1: View Array Status

Pressing the F1 key will display information about an existing array. The Channel Status box switches to an Array Status display. Pressing the F1 key again sets the box back to Channel Status.

↑, ↓: Move to next item

Use the Up and Down arrow keys to move around the program and select items.

Enter: Confirm the selection

Pressing the Enter key opens additional menu levels, activates menu functions and confirms the individual selection you have made in a menu.

ESC: Exit from the utility

Pressing the Esc key exits the utility. There is no accept or abandon changes step when you do this, so any actions taken or settings made during the session will be active. If you want to abandon any actions or settings, undo them manually before exiting the utility.

Utility Help

Context based Help messages appear in the Help box as you move around the program. Most of the messages are instructional and explain how to use the items selected.

Creating A Raid Array

Stripe Array (Level 0) (2-4 disks) For High-Performance

1. Select the "Create RAID" selection from the main menu.
2. Select "Striping (RAID 0)" in the "Array Mode" pop-up menu.
3. Select the drives to be used with "Select Disk Drives".
4. Select the appropriate block size in the "Block Size" pop-up menu. The default setting is 64K.
5. Select the "Start Creation Process" selection.

Mirror Array (Level 1) (2 disks) For Data Redundancy

1. Select the "Create RAID" selection from the main menu.
2. Select "Mirror (RAID 1)" in the "Array Mode" pop-up menu.
3. Select the drives to be used with the "Select Disk Drives".
4. Select the "Start Creation Process" selection.

Note: Source disk must be same size or larger than target disk.

Striping + Mirror Array (Level 0 + Level 1) (3-4 disks) For High-Performance with Data Redundancy

1. Create Stripe arrays on all disks as in Stripe Array instructions above. This requires two Stripe Array operations on four disks.
2. Select the "Create RAID" selection from the main menu.
3. Select "Striping + Mirror (RAID 0+ 1)" in the "Array Mode" pop-up menu.
4. Select the disk drives and/or RAID 1 arrays to be used with the "Select Disk Drives" selection.
5. Select the "Start Creation Process" selection.

Note: The source disk/array must be equal in size or larger than the target disk/array.

SPANNING (JBOD)
(2-4 disks required)
Recommended for Full Data Storage Capacity

1. Select the "Create RAID" selection from the main menu.
2. Select "Spanning (JBOD)" in the "Array Mode" pop-up menu.
3. Select the disk drives to be used with the "Select Disk Drives" selection.
4. Select the "Start Creation Process" selection.

Deleting An HPT370 RAID Array

1. Select the "Delete RAID" selection from the main menu
2. Select the RAID Array from the "Channel Status" menu
3. Confirm the deletion of the RAID Array.

Creating A Duplicated Disk

Required for preparation of mirror arrays with disks already containing data.

1. Select the "Duplicate Mirror Disk" selection from the main menu.
2. Select the Source Disk to be copied.
3. Select the Target Disk to be duplicated.
4. Select the "Start Duplication Process" selection.

Note: The source disk must be equal in size or larger than the target disk.

Once you have used the BIOS Setting Utility to create an array, you need to install a driver for the Operating System you will use and format the drives under that OS. Drivers for various versions of Microsoft Windows are supplied on the HPT370 Support Disk. See the next chapter for more information.



4: Software

The HPT370 support software includes Windows driver software and utility software for array monitoring.

HPT 370 DEVICE DRIVERS

Device drivers for various Windows versions are supplied with the HPT370. This section explains how to install them.

Device Drivers For Windows 95/98

OVERVIEW

There are 4 files related to the HPT370 Device Driver for Microsoft Windows 95/98:

HPT3XX.MPD	The driver file
HPT3XX.INF	The installation file
README98.TXT	Installation instructions
R370PWR.VXD	ACPI function driver

1. Driver Installation

When plugging the HPT370 into your system and boot up the Windows 95/98 system, Windows will detect the HPT370 automatically, and ask you to install the driver for it. Follow the instructions prompted by the system to install the driver.

NOTE: The driver (HPT3XX.MPD) and installation file (HPT3XX.INF) must be located on the same directory of the install floppy disk.

If Windows 95/98 does not automatically detect the HPT370, follow the instructions outlined below:

1. Close any running applications.
2. Open "My Computer".

3. Double click on the "Control Panel" icon.
4. Double click on the "Add New Hardware" icon.
5. Click on the "Next" button.
6. A window will ask: "Do you want Windows to search for new hardware?", select "No" then click on the "Next" button.
7. A window will be displayed that lists various hardware. Select "SCSI" controllers and click on the "Next" button
8. Insert the HPT370 driver floppy disk into drive A: then click on the "Have Disk..." button.
9. Click on the "OK" button.
10. Click on the "Next" button.
11. If you see a window displaying the settings (resources) to be used by the driver, click on "Next" again. Windows will then install the driver.
12. Click on the "Finish" button.

The system will then ask you to restart the system. If the settings reported in step 12 are not what is actually set for the HPT370, you must adjust the settings by using the device manager in the System control panel before restarting your computer.

The driver for ACPI function is useful only if hardware supports ACPI function.

Device Drivers For Windows NT 4.0

Overview:

The Windows NT sub-directory (\NT) on the driver disk contains the following files:

HPT3XXNT.SYS	HPT370 device driver
HPT3XXNT.INF	Used by Windows NT 4.0 Setup
370REA~1.TXT	Driver description text file
TXTSETUP.OEM	Used during Windows NT installation
DISK1	Device driver flag

1. Driver Installation

Installing The Driver For A Fresh NT Installation

(When booting from the NT CD):

1. Press the "F6" key when Windows NT displays the following message: "Setup is inspecting you're computer systems hardware". This will display a new setup screen, then prompt you to press the "S" key to add a device.
2. Press S, and insert the HPT370 driver floppy disk. Press Enter when prompted and allow Windows NT to install the HPT370 drivers.
3. Windows NT will continue and complete the installation procedure.

Installing The Driver For A Fresh Windows NT Installation

(When booting from NT floppy diskettes):

Windows NT will proceed with installation normally, then display a new setup screen and prompt you to press "S" to add a device.

Press S, and insert the HPT370 driver floppy disk. Press Enter when prompted and allow Windows NT to install the HPT370 drivers. Windows NT will continue and complete the installation procedure.

Installing The HPT370 Driver (For A Pre-Installed NT System)

When Windows NT is up and running, install the HPT370 device driver as follows:

1. Open My Computer
2. Open Control Panel
3. Double click icon SCSI Adapters
4. Click Drivers
5. Click Add...
6. Click Have Disk...
7. Insert the HPT370 driver floppy disk that contains the Windows NT 4.0 device into drive A: and type in "A:\NT[Enter]", then click OK
8. Select HPT370, you will be asked to enter the full path to the HPT370 files, type in A:\NT and then click Continue
9. When asked to restart your computer, click Yes

2. Checking Installation

If you want to check if the HPT370 and its device driver are correctly installed, you can:

1. Open My Computer
2. Open Control Panel
3. Double click icon SCSI Adapters. You should see the item HPT370 (Started)

NOTE: Your hard disk drive attached to the HPT370 must be partitioned and formatted before you can access it. Please see Partitioning your Hard Disk for information on partitioning and formatting a hard disk drive.

3. Partitioning Your Hard Disk

If the hard disk drive attached to the HPT370 has not been partitioned and formatted yet, you need to partition it first. To partition the hard disk drive attached to the HPT370, follow the following steps:

1. Click the Startup button
2. Go to Administrative Tools (Common)
3. Run Disk Administrator
4. Select disk number you would like to partition
5. Select the menu Partition
6. Decide the partition size create partition of the size
7. Exit Disk Administrator
8. Select the new created partition (logical disk drive) and format it.

4. Troubleshooting

The boot manager for Windows NT contains recovery logic to allow you to return to the last known good configuration. If you have changed your host adapter configuration and Windows NT no longer boots, follow these steps to recover:

1. Undo any hardware changes you have made to the computer since it was last operational.
2. Reboot the computer. Watch the display carefully during booting up. If the following message appears, press the Spacebar and follow the instructions on the display screen to continue booting with the last known good configuration: Press spacebar NOW to invoke the Last Known Good menu
3. Once your computer is operational again, check all of the hardware and software configuration changes you want to make. Look specially for conflicts with parts of the existing system configuration that are not being changed.

If Windows NT can boot but the driver has not been started (see Checking the Installation), please check the following:

Make sure the devices are correctly connected to the controller. Double check that the cable between the controller and the devices is correctly attached. And also check the jumper setting on the drive is correct. Make sure that a power cable is properly attached to each drive attached to the HPT370.

If the driver has been started and you still cannot access a hard disk drive attached to the HPT370, the hard disk drive might have not been partitioned and formatted yet. You may need to partition and format it.

Device Drivers For Windows 2000

Overview:

There are 8 files related to the HPT370 Device Driver for Microsoft Windows 2000:

HPT3XX2K.INF	The Windows 2000 installation file
370REA~1.TXT	Driver installation instructions
HPT3XX2K.SYS	The driver file
TXTSETUP.OEM	The Windows 2000 Installation file
DISK1	Device driver flag

1. Driver Installation

Installing The Driver

(During a fresh Windows 2000 installation):

1. During the first part of the setup procedure, Win2K will prompt you to press F6 to specify an additional device. Press F6, and let Windows continue on with setup. It will continue to scroll through various device listings for several minutes, then prompt you to press the "S" key to Add a device.
2. Press S, and insert the HPT370 driver floppy disk. Press Enter when prompted and allow Win2K to install the HPT370 drivers.
3. Win2K will continue and complete the installation procedure.

Installing The Driver

(With Operating System already installed):

1. Normally, when Windows 2000 loads it will be able to detect the HPT370 controller automatically,
2. Install the HPT370 driver
3. Follow the instructions that appear to install the driver.

NOTE: The driver (HPT3XX2K.SYS) and installation file (HPT3XX2K.INF) must be located in the same directory.

If Windows 2000 does not automatically detect the HPT370, you can install the driver by following the procedure below:

1. Windows 2000 must be installed prior to installing the driver.
2. Close any running applications.
3. Open "My Computer".
4. Double click on the "Control Panel" icon.
5. Double click on the "System" applet.
6. Click on the "Hardware" button.
7. Click on the "Device Manager" button.
8. There is a Window listing hardware types, select the "SCSI and RAID controllers" then double click it.
9. There is a Window listing drivers types, select the "HPT370 Ultra DMA 100 controllers" then click the right key of mouse.
10. Double Click on the "Properties".
11. Click on the "Driver" button.
12. Click on the "Update Driver" button.
13. Select "Search for a suitable driver for my device", then Click on the "Next" button.
14. Select "Floppy disk drivers" and insert the HPT370 driver floppy disk into drive A: then click on the "Next" button.
15. The wizard found HPT370 Ultra DMA 100 Controllers, click on the "Next" button.
16. To Continue, Click on the "Next" button.
17. Completing the Upgrade Device Driver Wizard. Click on the "Finish" button.
18. Restart the System.

2. Partitioning Your Hard Disk

If the hard disk drive attached to the HPT370 has not been partitioned and formatted yet, you need to partition it first. To partition the hard disk drive attached to the HPT370, follow the following steps:

1. Click the Startup button
2. Go to Administrative Tools (Common)
3. Run Disk Administrator
4. Select disk number you would like to partition
5. Select the menu Partition
6. Decide the partition size create partition of the size
7. Exit Disk Administrator
8. Select the new created partition and format it

Uninstalling HPT370 Device Drivers

WINDOWS 95/98

REMOVING THE HPT370 DEVICE DRIVER

You can use the Device Manager, in the System Control Panel to remove the driver for the HPT370. Once in Device Manager, double click on SCSI controllers and highlight the HPT370 entry. Click on remove and restart the system.

WINDOWS NT 4.0

Removing The Hpt370 Device Driver

1. Open My Computer
2. Open Control Panel
3. Double click SCSI Adapters
4. Click Drivers
5. Select HPT370 Ultra DMA Controller, then click Remove

WINDOWS 2000

Removing The HPT370 Device Driver

You can use the device manager in the System control panel to remove the driver. Go to Device Manager and select SCSI controllers. Highlight the HPT370 entry and click on remove. Restart the system.

The HPT RAID Administrator Utility

The HPT370 support software includes a Windows utility program for monitoring an HPT370 RAID array.

Installing The Utility

To install the HPT RAID Administrator utility, run the Setup program in the Utility folder that is in the HPT370 folder in the folder for your mainboard on the Mainboard Support Disk CD-ROM. Follow the instructions that appear and install the software on the system's boot hard disk drive.

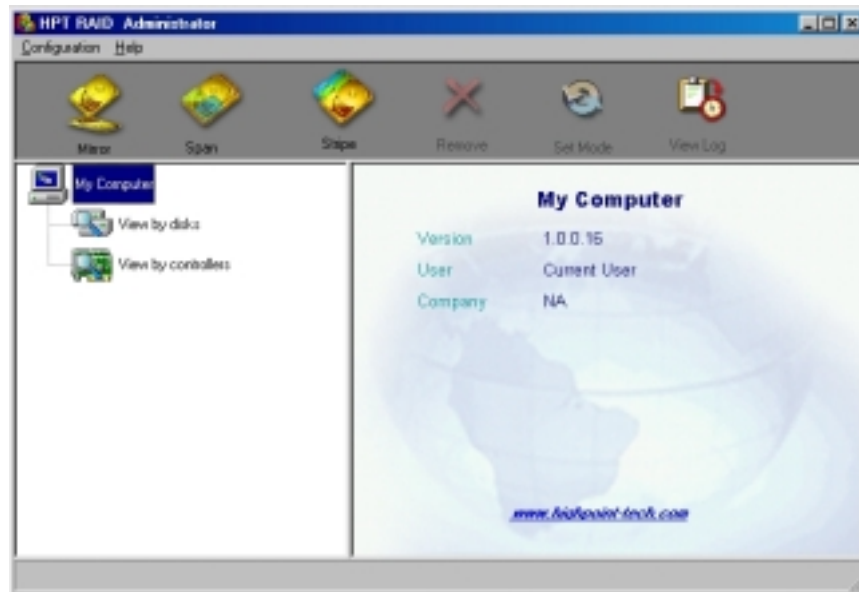
The utility will work in all supported versions of Windows. You must have an HPT370 array established for the utility to work.

The Utility Interface

The HPT RAID Administrator utility provides highly useful configuration and monitoring features that allow you to monitor and control an HPT RAID array from within Windows.

The utility includes controls for creating and deleting Mirror and Stripe and Span arrays and has a graphical array status monitoring window. It also has a control for setting disk timing and an event log. The program has an extensive online Help system that fully explains how to use the utility.

The screen illustration on the next page shows the HPT RAID Administrator interface.



This is the HPT RAID Administrator main screen. The upper section and Configuration menu in the menu bar have the array control features. The monitoring features are in the large lower section of the window.

Using the Help System

To launch the Help system, click on Help in the menu bar and then click on the Contents item. The Help window will open as shown below. Expand the window to make it easier to use.

