PROMISE®
TECHNOLOGY, INC.

PDC20319
SATA RAID CONTROLLER
USER MANUAL

Version 1.3

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Contents

Chapter 1: Introduction

Thank you for purchasing Promise Technology's PDC20319 SATA RAID Controller. The PC which you are using already contains a PDC20319 installed by a third-party.

- For information about RAID and how to use the PDC20319 SATA RAID Controller, see *Chapter 2: Create Your Disk Array*, *Chapter 3: Use the FastBuild™ Utility* and *Chapter 5: Disk Array Concepts*.

- If you are experiencing difficulty with the hard drive being recognized by the Controller, see *Chapter 6: Troubleshooting*.

- If your operating system has crashed or you have downloaded updated drivers from the Promise website (www.promise.com) and you wish to reinstall software drivers for the PDC20319 SATA RAID controller, see *Chapter 4: Installing Drivers*.

PDC20319 SATA RAID Controller

Promise originally designed the PDC20319 SATA RAID Controller as a cost-effective, high performance RAID Controller that adds performance and/or reliability to PC desktops and/or servers using Serial ATA drives.

The PDC20319 SATA RAID Controller has four independent data channels to support a maximum of four Serial ATA drives and it supports:

- Striping (RAID 0) – Identical drives can read and write data in parallel to increase performance.
- Mirroring (RAID 1) – Mirroring increases read performance through load balancing and elevator sorting while creating a complete backup of your files.
- Striping / Mirroring (RAID 0+1) – Combining striping with mirroring offers both high read/write performance and fault tolerance

A Striped array can double the sustained data transfer rate of Serial ATA drives.

The PDC20319 SATA RAID Controller offers fault tolerant, data redundancy for entry-level network file servers or simply for desktop PC users wanting to continually protect valuable data on their PC. Each model offers RAID 1 mirroring (for two drives) and RAID 0+1 mirroring plus striping (for four drives) to protect data.

Should a drive that is part of a mirrored array fail, the PDC20319 SATA RAID Controller uses the mirrored drive (which contains identical data) to assume all data handling. When a new replacement drive is later installed, Controller rebuilds data to the new drive from the mirrored drive to restore fault tolerance.

The PDC20319 SATA RAID Controller's bootable BIOS supports individual drives larger than 137 GB. With FAT32 and NTFS partitioning, the array can be addressed as one large single volume.

Promise Array Management (PAM) Software

The Promise Array Management (PAM) software offers local and remote management and monitoring of all PDC20319 SATA RAID Controller arrays that exist anywhere on a network. Windows-based GUI provides email notification of all major events/alarms, memory cache management, logging for NT/2000 servers, array maintenance, rebuild, and access to all components in array (server, controller, data channels, individual drives, and enclosure). For information on using PAM, refer to the *PAM User Manual*, which is included on the CD that came with your The PDC20319 SATA RAID Controller. Or download it from the Promise website.

Key Features and Benefits

The following information offers an overview of the major features of your new Promise PDC20319 SATA RAID Controller.

Advanced Hardware Design	
Features	**Benefits**
Supports 66MHz PCI bus motherboards (automatically backward compatible with 33MHz PCI slots)	Allows maximum data transfers of up to 266MB per second (133 MB/s in 33 MHz slot) over the bus to dramatically reduce the time to save and retrieve large files.
Supports: data striping (RAID 0), mirroring (RAID 1), and striping/mirroring (RAID 0+1)	Provides dramatic increase in drive performance and/or fault tolerant options. Offers performance customization and data rebuilds from the BIOS menu.
Supports Serial ATA Specification	Burst data transfer rates up to 150MB/sec from Serial ATA drives to boost overall system performance.
Independent data channels for Serial ATA drives	Drives can multiply their data transfer performance when striped together and each drive uses a separate data channel.
PCI Plug-n-Play, PCI Interrupt sharing and coexists with motherboard IDE and SCSI controllers	Easy to install; supports 4 Serial ATA drives on the PDC20319 while still supporting 4 devices on motherboard ATA controller.
Supports concurrent ATA channel operation	Drive workload is distributed in parallel between members of the array.
Supports bus master operation	Allows multitasking during disk transfers that increase CPU efficiency. The CPU is free to process tasks during data transfers through the PCI Bus to/from system memory.
Utilizes FastBuild automenu from the PDC20319 onboard BIOS	Has "Auto Setup" option for quick and easy array builds.
Displays status and error checking messages during bootup	Notifies user of possible errors and allows for recovery of mirrored drive arrays directly from FastBuild.

Employs the latest Promise PCI Serial ATA ASIC technology	Fully supports Serial ATA specifications with 150 MB/sec timing and CRC error-checking at high speeds.
Mirroring supports automatic background rebuilds	Fault tolerance can be restored automatically without rebooting.

Compatibility	
Features	**Benefits**
Complies with PCI v2.3 Local Bus standard	Provides highest level of hardware compatibility.
Complies with SATA Specification 1.0	Provides full compatibility with first generation Serial ATA hard drives.
Compliant with PCI Bus Master standard. PCI Bus Master support	Provides 32-bit I/O and Bus Master performance for optimal system performance.
Tested compatibility to coexist with motherboards that have integrated IDE controllers	Improves system performance of new and existing installations.
Features LBA and Extended Interrupt13 drive translation in controller onboard BIOS	Breaks capacity barriers for support of drives greater than 137 GB in capacity. Offers flexible storage options for space demanding applications.

Chapter 2: Create Your Disk Array

Your PDC20319 SATA RAID Controller includes the onboard FastBuild BIOS utility to create your array using the attached drives. There are three different scenarios in creating the array. You can create an array for:

• Performance

• Security, using new hard drives (recommended)

• Security, using an existing hard drive and a new one

• Security, using Quick Initialization

The first three steps are the same for all three choices. After that, follow the steps for the array you want to create.

1. Boot your system. If this is the first time you have booted with the PDC20319 SATA RAID Controller and drives installed, the Promise onboard BIOS will display the following screen.

> FastTrak S150 TXx (tm) BIOS Version 1.aa (Build xxxx)
> (c) 2002-2005 Promise Technology, Inc. All Rights Reserved
>
> No array defined . . .
>
> Press <Ctrl-F> to ender FastBuild (tm) Utility
> Or press <ESC> key to continue booting the system

2. Press the Ctrl-F keys to display the FastBuild Utility Main Menu.

3. Press "1" to display the Auto Setup Menu below. This is the fastest and easiest method to creating your first array.

```
FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                    [Auto Setup Options Menu]


   Optimize Array for:                        Performance

                 [ Auto Setup Configuration ]

   Mode ....................................................... Stripe
   Spare Drive ............................................. 0
   Drives used in Array ................................ 2
   Array Disk Capacity................................. 160048


                    [ Keys Available ]

[↑] Up [↓] Down [←, →, Space] Change Option [ESC] Exit [Ctrl-Y] Save
```

Create a Performance Array

Use this setting to create a Striped (RAID 0) array. PDC20319 enables you to create striped arrays with 1, 2, 3, or 4 drives. These arrays have no fault tolerance.

To create an array for best performance, follow these steps:

1. Press the Spacebar to choose *Performance* under the Optimize Array for section.
2. Press Ctrl-Y to Save and create the array.
3. Reboot your system.
4. Once the array has been created, you will need to FDISK and format the array as if it were a new single hard drive.
5. Once the arrayed drives have been formatted, proceed to Chapter 4 of this Manual to install your operating system and/or driver.

Create a Security Array with New Drives

Use this setting to create a Mirrored (RAID 1) array with two new hard drives. If one of the drives has data on it, follow the *Creating a Security Array with an Existing Data Drive* procedure on the next page.

	Note
	When creating a Security array with new drives, a feature called Gigabyte Boundary will automatically be set to ON. For a description of this feature, see page 19 in this Manual.

To create an array for data protection using new hard drives, follow these steps:

1. Press the Spacebar to choose *Security* under the Optimize Array for section.
2. Press Ctrl-Y to Save your selection.
3. The window below will appear.

> Do you want the disk image to be duplicated to another or do quick initialize or create only?
> Y - Create and Duplicate
> N - Create Only
> I - Create and Quick Initialize

4. Press N for the Create Only option.
5. A window will appear almost immediately confirming that your Security array has been created. Press any key to reboot the system.

> Array has been created.
> <Press Any Key to Reboot>

6. Proceed with normal FDISK and format procedures as if you had just installed a new hard drive.
7. Once the arrayed drives have been formatted, proceed to Chapter 4 of this Manual to install your operating system and/or driver.

Create a Security Array with an Existing Data Drive

Use this setting to create a Mirrored (RAID 1) array with a new hard drive and an existing drive with data and/or the bootable system drive in your system. Use a new drive of identical or larger storage capacity as the existing drive.

	Warning
	If you are creating a Security array using an existing hard drive, backup any important data. Failure to do so could result in data loss.

	Important
	If you wish to include your current bootable drive using the Windows NT 4.0, Windows 2000, or Windows XP operating system as part of a bootable Mirrored (RAID 1) array on your PDC20319 SATA RAID Controller, do NOT connect the hard drive to the Controller yet.
	You MUST install the Windows NT4, 2000, or XP driver software first to this drive while it is still attached to your existing hard drive controller. See chapter 4 of this Manual.

Follow these steps:

1. Press the Spacebar to choose *Security* under the Optimize Array for section.

2. Press Ctrl-Y to Save your selection. The window below will appear.

> Do you want the disk image to be duplicated to another or do quick initialize or create only?
>
> Y - Create and Duplicate
> N - Create Only
> I - Create and Quick Initialize

3. Press Y for the Create and Duplicate option. The window below will appear asking you to select the Source drive to use. FastBuild will copy all data from the Source drive to the Target drive.

```
                            Source Disk
Channel:ID                  Drive Model              Capacity (MB)
-----                       -----                    -----
                            Target Disk
Channel:ID                  Drive Model              Capacity (MB)
-----                       -----                    -----
                   [Please Select A Source Disk]
Channel:ID                  Drive Model              Capacity (MB)
1 :                     SEAGATE S380023AS               80024
2 :                     SEAGATE S380023AS               80024


[↑] Up [↓] Down [ESC] Exit [Ctrl-Y] Save
```

4.   Use the arrow keys to choose which drive contains the existing data to be copied.
5.   Press Ctrl-Y to Save selection and start duplication. The following progress screen will appear.

> Start to duplicate the image . . .
> Do you want to continue? (Yes/No)
> Y – Continue N - Abort

6.   Select Y to continue. If you choose N, you will be returned to step 1.
7.   Once complete, the following screen will appear confirming that your Security array has been created. Press any key to reboot the system.

> Array has been created.
> <Press Any Key to Reboot>

8.   Once the arrayed drives have been formatted, proceed to Chapter 4 of this Manual to install your operating system and/or driver.

Create a Security Array with Quick Initialization

Use this setting to create a Mirrored (RAID 1) array with one or two existing hard drives containing data that you do *not* want to keep. This method creates a mirrored array and erases the first data block from your existing drives.

Warning

Using the Quick Initialization option on existing drives will result in the loss of all data on those drives.

Note

When creating a Security array with new drives, a feature called Gigabyte Boundary will automatically be set to ON. For a description of this feature, see page 19 in this Manual.

Follow these steps:

1. Press the Spacebar to choose *Security* under the Optimize Array for section.
2. Press Ctrl-Y to Save your selection.
3. The window below will appear.

> Do you want the disk image to be duplicated to another or do quick initialize or create only?
> Y - Create and Duplicate
> N - Create Only
> I - Create and Quick Initialize

4. Press I for the Create and Quick Initialize
5. A window will appear almost immediately confirming that your Security array has been created. Press any key to reboot the system.

> Array has been created.
> <Press Any Key to Reboot>

6. Proceed with normal FDISK and format procedures as if you had just installed a new hard drive.
7. Once the arrayed drives have been formatted, proceed to Chapter 4 of this Manual to install your operating system and/or driver.

Chapter 3: Use the FastBuild™ Utility

The FastBuild Configuration Utility offers several menu choices to create and manage the drive array on the Promise PDC20319 RAID Controller. For purposes of this manual, it is assumed you have already created an array in the previous chapter and now wish to make a change to the array or view other options.

View the BIOS Screen

When you boot your system with the PDC20319 SATA RAID Controller and drives installed, the Promise onboard BIOS will detect the drives attached and show the following screen.

```
FastTrak S150 TXx (tm) BIOS Version 1.xx (Build xxxx)
(c) 2002-2005 Promise Technology, Inc. All Rights Reserved.

ID       MODE   SIZE      TRACK-MAPPING        STATUS

1 *      2+0 Stripe       160048M        611/128/32      Functional


Press <Ctrl-F> to enter FastBuild (tm) Utility....
```

If an array exists already, the BIOS will display the above screen showing the card's BIOS version and status of the array.

The array status consists of five possible conditions: *Functional, Synchronizing, Rebuilding, Critical,* and *Offline.*

Functional – The array is operational.

Synchronizing – The process of verifying data integrity by recalculating redundant data and matching the data on the disk drives

Rebuilding – The process of reconstructing an array in Critical mode by placing redundant data on a replacement disk drive.

Critical – Degraded array condition due to a failed or removed disk drive. Applies to mirrored arrays (RAID 1 and 0+1) only. Fault tolerance is lost but the data is still accessible. Triggers automatic rebuilding.

Offline – Striped arrays (RAID 0): Degraded array condition due to one failed or removed disk drive. The data is not accessible.

Mirrored arrays (RAID 1 and 0+1): Degraded array condition due to two failed or removed disk drives. Fault tolerance is lost. The data is not accessible.

If your array goes Offline, contact Promise Technical Support for assistance. See Appendix B.

Navigate the FastBuild Setup Menu

When using the menus, these are some of the basic navigation tips: Arrow keys highlights through choices; the Space bar allows to cycle through options; Enter selects an option; Esc aborts or exits the current menu.

Use the Main Menu

This is the first option screen when entering the FastBuild Setup.

```
FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                          [ Main Menu ]


          Auto Setup.......................................... [ 1 ]
          View Drive Assignments..................... [ 2 ]
          Define Array....................................... [ 3 ]
          Delete Array....................................... [ 4 ]
          Rebuild Array..................................... [ 5 ]



                       [ Keys Available ]

Press 1...6 to Select Option   [ESC] Exit
```

To create a new array automatically, follow the steps under *Creating Arrays Automatically* on page 17. Promise recommends this option for most users.

To manually create an array, see *Manually Creating an Array* on page 21.

You will also need to manually create an array if you wish to modify block size.

To view drives assigned to arrays, see *Viewing Drive Assignments* on page 20.

To delete an array (but not delete the data contained on the array), see *Deleting an Array* on page 28.

To rebuild a mirrored array, see *Rebuilding a Mirrored Array* on page 30.

Notes

After you install the PDC20319 SATA RAID Controller and configure an array using FastBuild, use FDISK to format the arrayed drive(s) if you are using new, blank drives

Create an Array Automatically

The Auto Setup (1) selection from the Main Menu can intuitively help create your disk array. It will assign all available drives appropriate for the disk array you are creating. After making all selections, press Ctrl-Y to Save the selections. FastBuild will automatically build the array.

```
         FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                             [Auto Setup Options Menu]


         Optimize Array for:                    Performance


                           [ Auto Setup Configuration ]

         Mode................................................Stripe
         Spare Drive Count ................................. 1
         Drives used in Array ............................. 2
         Array Disk Capacity (size in MB) ............... 160048

                               [ Keys Available ]

  [↑] Up [↓] Down [←, →, Space] Change Option [ESC] Exit [Ctrl-Y] Save
```

Optimize Array for

Select whether you want Performance (RAID 0), Security (RAID 1 or RAID 0+1) under the Optimize Array for setting.

Performance

RAID 0 (Striping) supports the high performance. The storage capacity equals the number of drives times the capacity of the smallest drive in the disk array.

	Note
	The PDC20319 SATA RAID Controller permits striped arrays using 1, 2, 3, or 4 drives attached in Auto Setup mode.
	Under the Security setting, Controller permits two drives to be used for a single Mirrored array or four drives to be used for a Mirrored/Striped array in Auto Setup.

Security

(RAID 1 Mirroring, or RAID 0+1 Striping/ Mirroring) creates a mirrored (or fault tolerant) array for data security. The storage capacity equals one-half the number of drives times the capacity of the smallest drive in the disk array.

	Note
	Under the Security setting, the PDC20319 SATA RAID Controller permits two drives to be used for a single Mirrored array or four drives to be used for a Mirrored/Striped array in Auto Setup.

Security and Performance

RAID 0+1 (Striping/Mirroring) creates an array with striping for high performance plus mirroring for fault tolerance and data security. The storage capacity equals the number of drives times the capacity of the smallest drive in the disk array. This option requires 4 drives.

Use a Hot Spare Drive

If a third drive is attached and is not assigned to a mirrored two-drive disk array (one optimized for Security), it will be recognized as a spare drive. Such a drive is immediately used as a standby replacement. It is automatically added to an array once a disk member of the array has been detected as failed.

To restore fault tolerance as quickly as possible, the PDC20319 SATA RAID Controller begins to perform an automatic data rebuild on the spare drive in the background without the need to restart the system.

At a later time, the failed drive can be physically disconnected from the Controller and an extra drive added in its place to function as the spare drive.

	Important
	The hot spare drive must have a capacity that is equal to or larger than the smallest array member.

Create Multiple Arrays

If you plan to create multiple arrays,

1. Attach only the drives necessary to create the first disk array and complete the Auto Setup (1).

2. Install the additional drives needed for the second array and again use the Auto Setup (1).

	Note
	If you wish to customize the settings of individual disk arrays (such as block size), you must manually create disk arrays with the Define Array (3) option from the Main Menu.

View Drive Assignments

The View Drive Assignments (2) option in the Main Menu displays whether drives are assigned to a disk array or are unassigned.

Under the Assignment column, drives are labeled with their assigned disk array or shown as Free if unassigned. Such Free drives can be used for a future array or used as a spare drive when a drive fails in a mirrored array, provided the free drive's capacity is equal to or larger than the smallest array member. Unassigned drives are not accessible by the OS. The menu also displays the data transfer mode that relates to speed used by each drive (U5 refers to 100MB/sec transfers, U4 refers to 66MB/sec transfers, etc...)

```
        FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                          [ View Drive Assignments ]

Channel:ID      Drive Model          Capacity(MB)  Assignment   Mode
1 :             SEAGATE S380023AS      80024         Array 1      U
2 :             SEAGATE S380023AS      80024         Array 1      U
3 :             SEAGATE S380023AS      80024          Free        U
4 :             SEAGATE S380023AS      80024          Free        U

                              [ Keys Available ]

[↑] Up [↓] Down  [ESC] Exit   Mode (U=UDMA, D=DMA)
```

Create an Array Manually

The Define Array (3) option from the Main Menu allows users to begin the process of manually defining the drive elements and RAID levels for one or multiple disk arrays attached to the PDC20319 SATA RAID Controller.

Users will commonly create one or two drive arrays with the PDC20319 SATA RAID Controller, though the card will support a maximum of four arrays. You may use a single drive in striping mode with the Controller. In this rare scenario, the card will create an individual array ID but will offer conventional controller performance depending on the drive type. At a later time, you can add a second drive to the array and recreate the array to support RAID 1 mirroring.

	Note
	For most installations, Promise recommends the (1) Auto Setup for easy disk array creation.

```
        FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                              [Define Array Menu]

   Array No        RAID Mode      Total Drv      Capacity(MB)      Status
   Array 1          Stripe            2             160048        Functional
   Array 2           ——              ——             ——             ——
   Array 3           ——              ——             ——             ——
   Array 4           ——              ——             ——             ——
                              [ Keys Available ]

   [↑] Up [↓] Down   [ESC] Exit   [Enter] Select
```

To manually create an array from the Define Array Menu:

1. Press the arrow keys to highlight the array number you wish to define, and press Enter to select.

2. The Define Array Definition Menu will next appear that allows drive assignments to the disk array (see next page).

Select Array Type

1. Under the Definition section of this menu, highlight the Array # for which you want to assign a RAID level.

2. Press the Spacebar to cycle through three array types:

    •   Performance (RAID 0 Striping)

    •   Security (RAID 1 Mirroring)

    •   RAID 0+1 Striping/Mirroring (for 4 drives)

    See page 45 for more information about RAID levels.

```
      FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                        [ Define Array Definition Menu ]

Array No           RAID Mode          Total Drv              Status
Array 1              Stripe               2                Functional

Stripe Block:  64 KB                             Gigabyte Boundary: ON
                        [ Drive Assignments ]

Channel:ID                    Drive Model              Assignment
 1 :                       SEAGATE S380023AS               Y
 2 :                       SEAGATE S380023AS               Y
 3 :                       SEAGATE S380023AS               N
 4 :                       SEAGATE S380023AS               N

                          [ Keys Available ]

[↑] Up [↓] Down   [ESC] Exit   [Space] Select   [Ctrl-Y] Save
```

Select Stripe Block

For RAID 0 and RAID 0+1 arrays you may manually select the stripe block size. Press the Spacebar to scroll through choices progressing as follows (16, 32, 64, 128 MB).

The size selected affects how the PDC20319 SATA RAID Controller sends and retrieves data blocks to and from the drives. You will need to perform your own testing to determine how the data block size is affecting your particular use of the array. In general, a larger block size is better when handling large data transfers (such as in A/V editing or graphics) while a smaller block size is better when handling e-mail and other common server data. The default is 64K.

Gigabyte Boundary

The Gigabyte Boundary feature is designed for mirrored arrays (RAID 1 or RAID 0+1) in which a drive has failed and the user cannot replace the drive with the same capacity or larger. Instead, the Gigabyte Boundary feature permits the installation of a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive (for example, an 80.5 GB drive would be rounded down to 80 GB).

This can be helpful in the event that a drive fails and an exact replacement model is no longer available. Without this feature enabled, the PDC20319 SATA RAID Controller will NOT permit the use of a replacement drive that is slightly smaller than the remaining working drive.

For the Gigabyte Boundary feature to work, the Gigabyte Boundary feature must be set to ON when the original mirrored array is created. When enabled, the Gigabyte Boundary feature rounds the drive capacity of both drives to the common whole GB drive size. For example, with the Gigabyte Boundary feature enabled, the remaining working drive can be 80.5 GB and the replacement drive can be 80.3, since both are rounded down to 80GB.

This permits the smaller drive to be used. Please note that users will lose a small amount of available storage capacity from both drives in order to arrive at a common drive size.

Note

Gigabyte Boundary is automatically disabled when creating a mirrored array (RAID 1) from an existing drive (versus using two brand new drives). This protects the existing drive's partition table in order to maintain data integrity.

Assign Drive(s) to the Array

1. Under the Drive Assignments section, highlight a drive by pressing the ↑ and ↓ keys.

2. Press the Spacebar to change the Assignable option to Y to add the drive to the disk array.

3. Press Ctrl-Y to save the disk array information. Depending on the array type selected, the following scenarios will take place:

    •   If choosing a Striping or Mirroring/Striping array, the initial Define Array Menu screen will appear with the arrays defined. From there you may ESC to exit and return to the Main Menu of FastBuild.

    •   If you selected a Mirroring array for two drives, there is an additional window that appears as described in order to create the array. To do this you will use either two brand new drives, or one drive that contains existing data that you wish to mirror.

Create a Striped Array

As described in the Drive Assignments Option section above, if you selected a performance array, follow the directions here.

1. Set the Stripe Block size. 64 KB is the default.

2. Assign new drives to the Performance array.

   You may assign from one to four drives. If you assign only one drive, there will be no performance benefit

3. Save the information by pressing Ctrl-Y. You will return to the Define Array Menu.

   Your system will reboot when you exit the FastBuild Utility.

Create a Mirrored Array Using New Drives

As described in the Drive Assignments Option section above, if you selected a mirroring array and wish to use two new assigned drives, follow the directions here.

1. Assign new drives to a Mirroring array

2. Save the information by pressing Ctrl-Y, the window below will appear.

> Do you want the disk image to be duplicated to another or do quick initialize or create only?
> Y - Create and Duplicate
> N - Create Only
> I - Create and Quick Initialize

3. Press N for the Create Only option. A window will appear almost immediately confirming that your Security array has been created.

> Array has been created.
> <Press Any Key to Reboot>

4. Press any key to reboot the system.

Add Fault Tolerance to an Existing Drive

The PDC20319 SATA RAID Controller will create a mirrored array using an existing system drive with data. You must assign the existing drive and another drive of same or larger capacity to the Mirroring array. The BIOS will send the existing data to the new blank drive.

	Warning
⚠️	Backup any necessary data before proceeding. Failure to follow this accepted PC practice could result in data loss.

	Important
✓	If you wish to include your current bootable drive using the Windows NT 4.0, 2000 or XP operating system as part of a bootable Mirrored (RAID 1) array on your PDC20319 SATA RAID Controller, You MUST install the driver software while the bootable drive is still attached to your existing hard drive controller. See Chapter 4.

1. Assign the drives to a Mirroring array.

2. Press Ctrl-Y to Save your selection. The window below will appear.

> Do you want the disk image to be duplicated to another or do quick initialize or create only?
>
> Y - Create and Duplicate
> N - Create Only
> I - Create and Quick Initiate

	Note
✏️	Gigabyte Boundary is automatically disabled when creating a mirrored array (RAID 1) from an existing drive (versus using two brand new drives). This protects the existing drive's partition table in order to maintain data integrity.

3. Press Y for the Create and Duplicate option. The window below will appear asking you to select the Source drive to use. FastBuild will copy all data from the Source drive to the Target drive.

```
                            Source Disk
Channel:ID                  Drive Model          Capacity (MB)


                            Target Disk
Channel:ID                  Drive Model          Capacity (MB)


                  [Please Select A Source Disk]
 Channel:ID                 Drive Model        Capacity (MB)
 1 :                   SEAGATE S380023AS         80024
 2 :                   SEAGATE S380023AS         80024

[↑] Up [↓]   [ESC] Exit   [Ctrl-Y] Save
```

4. Press the arrow keys to choose which drive contains the existing data to be copied.

Warning

All target drive data will be erased. Make sure you choose the correct drive.

5. Press Ctrl-Y to Save selection and start duplication. The following confirmation screen will appear.

```
Start to duplicate the image . . .
Do you want to continue? (Yes/No)
Y – Continue  N – Abort
```

6. Select Y to continue. If you choose N, you will be returned to step 1.

7. Once you select Y, the following progress screen will appear. The process will take a few minutes.

```
Please Wait While Duplicating The Image

                                                10%
Complete
```

Once mirroring is complete, the following screen will appear confirming that your Security array has been created.

> Array has been created.
> <Press Any Key to Reboot>

8. Press any key to reboot the system.

Create a Hot Spare Drive for Mirrored Arrays

For automatic rebuilds of a mirrored array, attach a spare drive to the PDC20319 SATA RAID Controller. Drives that are not assigned to an array and are the same size or larger than the original will be used for the automatic rebuild. This is performed in the background under all supported operating systems, except DOS. At a later time, the system can be turned off and the failed drive can be physically removed.

How the PDC20319 SATA RAID Controller Orders Arrays

During startup, the disk arrays on the PDC20319 are recognized in this order:

1. The array set to bootable in the FastBuild Setup.
2. The Array number (i.e. Array 0, Array 1…). This would be involved in determining which drive letters will be assigned to each disk array.

How the PDC20319 SATA RAID Controller Saves Array Information

All disk array data is saved into the reserved sector on each array member. Promise suggests that users record their disk array information for future reference.

Another feature of the PDC20319 SATA RAID Controller disk array system is to recognize drive members even if drives are moved between different PDC20319 SATA RAID Controller connectors. Since each drive's array data identifies itself to the array, it is possible to move or swap drives without modifying the array setup. This is valuable when adding drives, or during a rebuild.

Delete an Array

The Delete Array (4) Menu option allows for deletion of disk array assignments. This is not the same as deleting data from the drives themselves.

	Important
	If you delete an array by accident, immediately define a new array identical to one you deleted. This action normally recovers the deleted array.

	Warning
	Deleting an existing disk array could result in its data loss. Make sure to record all array information including the array type, the disk members, and stripe block size in case you wish to undo a deletion.

```
        FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                              [ Delete Array Menu ]

   Array No        RAID Mode      Total Drv     Capacity(MB)       Status
   Array 1          Stripe            2            160048         Functional
   Array 2          Mirror            2             80024         Functional
   Array 3           ——              ——             ——             ——
   Array 4           ——              ——             ——             ——
                              [ Keys Available ]

   [↑] Up [↓] Down     [ESC] Exit    [Del] Delete
```

1. To delete an array, highlight the Array you wish to delete and press the Delete key.

2. The Array Definition menu will appear (see below) showing which drives are assigned to this array.

```
FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                      [ Define Array Menu ]

Array No      RAID Mode      Total Drv     Capacity(MB)       Status
Array 1        Stripe            2            160048         Functional

Stripe Block: 64 KB                              Gigabyte Boundary: OFF
                      [ Drive Assignments ]

Channel:ID            Drive Model         Capacity (MB)    Assignment
  1 :           SEAGATE S380023AS            80024              Y
  2 :           SEAGATE S380023AS            80024              Y
```

Press Ctrl-Y to confirm Yes to the following warning message and continue array deletion:

```
Are you sure you want to delete this array?
Press Ctrl-Y to Delete, others to Abort
```

After deleting the array, create a new array using Auto Setup or the Define Array menu from the FastBuild Main Menu.

Rebuild a Mirrored Array

The Rebuild Array (5) Menu option can be used to recover from an error in a mirrored disk array. You will receive an error message when booting your system from the PDC20319 SATA RAID Controller BIOS.

	Important
✓	Drives MUST be replaced if they contain any physical errors.

Follow these steps before using the Rebuild Array menu option:

1. On bootup, the PDC20319 SATA RAID Controller BIOS will display an error message identifying which drive has failed.

2. Press Ctrl-F to enter FastBuild Utility's Main Menu.

3. Select submenu Define Array (3).

4. Select the failed array and identify the Channel number of the failed drive.
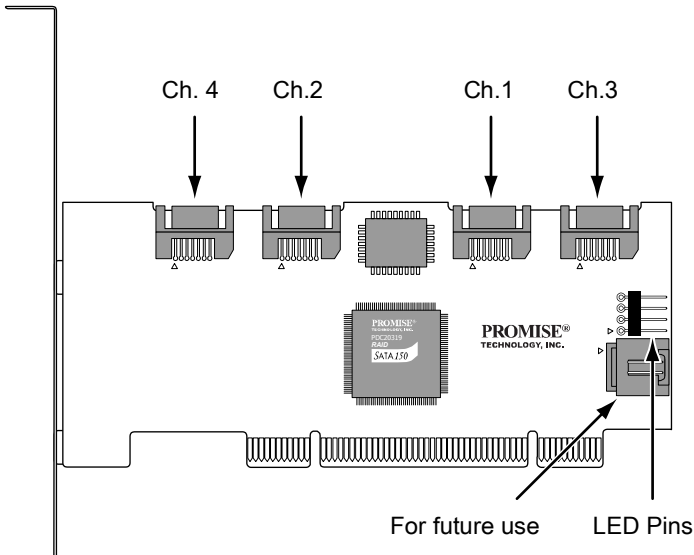
Figure 2. **Identify a failed drive by its Channel number on the Controller.**

5. Power off your computer and open the case.

6. Follow the Serial ATA cable from the Controller channel reporting the failed drive to the drive itself. Remove the failed drive.

7. Replace the failed drive with an identical new drive.

8. Close the computer case.

9. Reboot the system and press Ctrl-F to enter the FastBuild Main Menu.

10. Select the Rebuild Array (5) option. The following screen will appear.

```
   FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                         [ Rebuild Array Menu ]

Array No        RAID Mode    Total Drv      Capacity(MB)      Status
Array 1           Stripe         2             160048       Functional
Array 2           Mirror         2              80024        Critical
Array 3            ——           ——             ——            ——
Array 4            ——           ——             ——            ——

                         [ Keys Available ]

[↑] Up [↓] Down    [ESC] Exit   [Enter] Select
```

11. Highlight the array whose Status is Critical.

12. Press Enter. The following screen will then appear.

```
   FastBuild (tm) Utility 2.xx (c) 2002-2005 Promise Technology, Inc.
                         [ Rebuild Array Menu ]

Array No           RAID Mode          Total Drv          Status
Array 2              Mirror              2               Critical

Stripe Block: Not Available                      Gigabyte Boundary: ON
                       [ Select Drive for Rebuild ]

Channel:ID                   Drive Model                Capacity (MB)
 1 :                    SEAGATE S380023AS                  80024

                         [ Keys Available ]

[↑] Up [↓] Down    [ESC] Exit   [Enter] Select
```
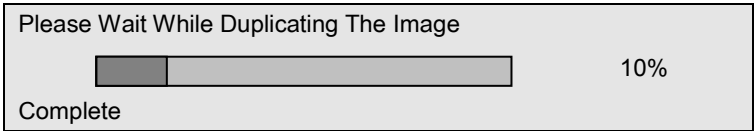
13. Under Select Drive for Rebuild, highlight the replacement drive.

14. Press Enter and confirm that the data will be copied on to the selected drive. All data on the replacement drive will be written over with mirrored information from the array drive. A progress bar will appear as below.

Please Wait While Duplicating The Image

10%

Complete

15. Once the rebuild process is complete, reboot the system.

Chapter 4: Install Software Drivers

Following are driver installation procedures for the Windows operating systems that support the PDC20319 SATA RAID Controller. The software drivers for Windows are included on the driver diskette.

Drivers and installation instructions for other Operating Systems are downloadable from the Promise website at www.promise.com.

Important

If you wish to include your current bootable Serial ATA drive using the Windows NT4.0, Windows 2000, or Windows XP operating system on your PDC20319 SATA RAID Controller, you MUST install the Windows driver software first onto this drive while it is still attached to your existing hard drive controller.

New Windows Server 2003 Installation

The following details the installation of the drivers while installing Windows Server 2003.

1. Start the installation:

   - Floppy Install: Boot the computer with the Windows XP installation diskettes.

   - CD-ROM Install: Boot from the CD-ROM. Press F6 after the message "Press F6 if you need to install third party SCSI or RAID driver" appears.

2. When the Windows Server 2003 Setup window is generated, press S to specify an Additional Device(s).

3. Insert the driver diskette into drive A: and press Enter.

4. Choose *WinServer 2003: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen, and press Enter.

5. Press S to use the driver on the floppy disk and then press Enter to continue with installation.

6. The WinServer 2003 Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *WinServer 2003: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)*.

   NOTE: If there are any additional devices to be installed, specify them now. When all devices are specified, continue to the next step.

7. From the Windows Server 2003 Setup screen, press the Enter. Setup will now load all device files and then continue the Windows Server 2003 installation.

Existing Windows Server 2003 Installation

After reinstalling the PDC20319 SATA RAID Controller and rebooting your system, Windows Server 2003 setup will show a "Found New Hardware" dialog box. Under Windows Server 2003, "Mass Storage Controller" will be displayed.

1. Insert the PDC20319 SATA RAID Controller driver diskette into the A:\ drive.

2. Choose *Install the software automatically* and press Enter.

3. Choose *WinServer 2003: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen, and press the Enter key.

4. If using a driver that has not been digitally signed by Microsoft, you will be asked if you want to continue the installation. Click Continue anyway.

5. When the New Hardware Wizard has finished installing the driver, click Finish.

Confirm Windows Server 2003 Driver Installation

1. Right-click on the My Computer icon and select Manage from the popup menu.

2. From the left panel, select Device Manager.

3. Click the "+" in front of SCSI controllers. *WinServer 2003: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* should appear.

New Windows XP Installation

The following details the installation of the drivers while installing Windows XP.

1. Start the installation:

   - Floppy Install: Boot the computer with the Windows XP installation diskettes.

   - CD-ROM Install: Boot from the CD-ROM. Press F6 after the message "Press F6 if you need to install third party SCSI or RAID driver" appears.

2. When the Windows XP Setup window is generated, press S to specify an Additional Device(s).

3. Insert the driver diskette into drive A: and press Enter.

4. Choose *Windows XP: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen, and press Enter.

5. Press S to use the driver on the floppy disk and then press Enter to continue with installation.

6. The Windows XP Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *Windows XP: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)*.

   NOTE: If there are any additional devices to be installed, specify them now. When all devices are specified, continue to the next step.

7. From the Windows XP Setup screen, press the Enter. Setup will now load all device files and then continue the Windows XP installation.

Existing Windows XP Installation

After reinstalling the PDC20319 SATA RAID Controller and rebooting your system, Windows XP setup will show a "Found New Hardware" dialog box. Under Windows XP, "Mass Storage Controller" will be displayed.

1. Insert the PDC20319 SATA RAID Controller driver diskette into the A:\ drive.

2. Choose *Install the software automatically* and press Enter.

3. Choose *Windows XP: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen, and press the Enter key.

4. If using a driver that has not been digitally signed by Microsoft, you will be asked if you want to continue the installation. Click Continue anyway.

5. When the New Hardware Wizard has finished installing the driver, click Finish.

Confirm Windows XP Driver Installation

1. Right-click on the My Computer icon and select Manage from the popup menu.

2. From the left panel, select Device Manager.

3. Click the "+" in front of SCSI controllers. *Windows XP: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* should appear.

New Windows 2000 Installation

The following details the installation of the drivers while installing Windows 2000.

1. Start the installation:

    *   Floppy Install: Boot the computer with the Windows 2000 installation diskettes.

    *   CD-ROM Install: Boot from the CD-ROM. Press F6 after the message "Press F6 if you need to install third party SCSI or RAID driver" appears.

2. When the Windows 2000 Setup window is generated, press S to specify an Additional Device(s).

3. Insert the driver diskette into drive A: and press Enter.

4. Choose *Windows 2000: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen then press Enter.

5. The Windows 2000 Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *Windows 2000: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4).*

    NOTE: If there are any additional devices to be installed, specify them now. When all devices are specified, continue to the next step.

6. From the Windows 2000 Setup screen, press Enter. Setup will now load all device files and then continue the Windows 2000 installation.

Existing Windows 2000 Installation

After reinstalling the PDC20319 SATA RAID Controller and rebooting your system, Windows 2000 setup will show a "New Hardware Found" dialog box. Under Windows 2000, "PCI Mass Storage Controller" will be displayed.

1. Choose *Add New Hardware Wizard* from the list, and then press Enter.

2. Choose *Add/Troubleshoot a device* and click Next. The new hardware wizard will show device list

3. Choose *Mass Storage controller* and click Next. At the following screen click Finish.

4. Choose *Display a list the known drivers for this device so that I can choose a specific driver* then click Next.

5. When the Windows 2000 supported SCSI adapter drivers list appears, click Have disk.

6. Insert the driver diskette in drive A:\.

7. Type **A:\Win2000** in the text box. Click OK.

8. Choose *Windows 2000: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen, then click Next.

9. Click Yes to confirm continue the installation and copy the driver to system.

10. Remove the diskette and click Finish to restart the system. Windows 2000 will then restart for the driver installation to take effect.

Confirm Windows 2000 Driver Installation

1. Right-click on the My Computer icon and select Manage from the popup menu.

2. From the left panel, select Device Manager.

3. Click the "+" in front of SCSI controllers. *Windows 2000: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* should appear.

New Windows NT4.0 Installation

The following details the installation of the PDC20319 SATA RAID Controller drivers while installing Windows NT4.0.

1. Start the system installation by booting from the Windows NT disk:

    - Floppy install: boot the system with the Windows NT installation diskettes.

    - CD-ROM disk install: boot from the CD-ROM disk and press F6 when the message "Setup is inspecting your computer's hardware configuration…" appears.

2. When the Windows NT Setup window is generated, press S to Specify an Additional Device(s).

3. Press O to select *Other* then press Enter.

4. Insert the driver diskette into drive A: and press Enter.

5. Choose *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* from the list that appears on screen then press Enter.

6. The Windows NT Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)*.

    NOTE: If there are any additional devices to be installed, specify them now. When all devices are specified, continue to the next step.

7. From the Windows NT Setup screen, press Enter. Setup will now load all device files and then continue the Windows NT installation.

8. After a successful installation, the SCSI Adapter Setup box will show that the *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* driver has been installed.

Existing Windows NT4.0 Installation

The following section details the reinstallation of PDC20319 SATA RAID Controller drivers on a system that has Windows NT4.0 already installed and running.

NOTE: Do not attach the boot drive or any other hard drive to the PDC20319 SATA RAID Controller before completing this step.

1. From the Start menu, choose Settings.

2. From the Settings menu, choose Control Panel.

3. Double-click the SCSI Adapters icon. The SCSI Adapters dialog box appears.

4. Choose Drivers then click Add.

5. In the Install Drivers dialog box, click Have Disk…

6. When Install From Disk appears, insert the driver diskette in drive A:.

7. Type **A:\NT4** in the text box window then click OK.

8. When the Install Driver dialog box appears, select *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* then click OK.

9. When the Select SCSI Adapter Option dialog box appears, click Install.

10. After a successful installation, the SCSI Adapter Setup box will show that the *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* has been installed.

11. Power off your system.

12. If you plan to move the boot drive to the PDC20319 SATA RAID Controller, do it now. Otherwise reboot.

Remove Driver from Windows NT4.0

1. From the Start menu, choose Setup then choose Control Panel.

2. In Control Panel, choose SCSI Adapter then choose Drivers.

3. Click the Remove button.

4. After successful removal, the SCSI Adapter Setup box will show that the *Windows NT4.0: Promise PDC20319 SATA RAID Controller (FastTrak S150 TX4)* has been removed.

Chapter 5: Disk Array Concepts

About the PDC20319 SATA RAID Controller

The PDC20319 SATA RAID Controller is a high performance Serial ATA RAID controller card that features concurrent data channel operation and onboard BIOS. The channels on the Controller support concurrent operation that allows for overlapped I/O under multi-tasking operating systems and sharing the workload between multiple drives.

About the BIOS

The PDC20319 SATA RAID Controller contains a BIOS code that extends the standard disk service routine provided through Int13. The BIOS is bootable for DOS and other operating systems that rely on the system BIOS for drive operation. When the Controller BIOS appears during bootup, press Ctrl-F to enter the FastBuild setup to select from menu settings.

FastBuild Auto Menu Setup

This setup utility is used to build and manage PDC20319 SATA RAID Controller disk arrays. The utility is menu driven and features the Auto Setup (1) option that uses a simple, interactive setup process. Once the array is built, all the array members store the configuration information in the drive's reserved area. See Chapter 3, which provides descriptions of individual functions.

Reserve Sector

Array configuration data about the drive member and other members in the disk array are saved on a special location on the disk drives called the *reserve sector*. If any member of the array becomes corrupt or lost, the redundant configuration data on the other members can be used for rebuilds.

Disk array members do not have a memory of their drive positions. This allows drives to be placed on different PDC20319 SATA RAID Controllers or connectors within the system without reconfiguring or rebuilding.

Disk Array Terms

Disk Array Description

A disk array is formed from a group of two or more disk drives that appear to the system as a single drive. The advantage of an array is to provide better throughput performance and/or data fault tolerance.

Better performance is accomplished by sharing the workload among multiple physical drives.

Fault tolerance is achieved through data redundancy operation where if one (or more) drive fails or has a sector failure, a mirrored copy of the data can be found on another drive(s).

For optimal results, select identical Ultra ATA/133 drives or Serial ATA drives to install in disk arrays. The drives' matched performance allows the array to function better as a single drive.

Disk Array Member

The individual disk drives in an array are called members. Each member of a specific disk array has coded in its reserved sector configuration information that identifies the drive as a member. All disk members in a formed disk array are recognized as a single physical drive to the system.

Disk Array Types

For most installations, the FastBuild setup Auto Setup (1) option will configure your system.

There are three disk array types (**RAID 0, 1** and **0+1**) in two categories that can be installed on the PDC20319 SATA RAID Controller. Striping is in the Performance category while Mirroring and Striping/Mirroring are in the Fault Tolerance category.

Disk arrays within the Performance and Fault Tolerance categories conform to the Redundant Array of Independent Disks technology, or RAID. The RAID levels supported are 0, 1, and 0+1.

RAID Level	Performance	Fault Tolerance	Capacity	No. of Drives
RAID 0 (Striping)	Highest	No	No. Drives x Smallest Size	2 to 4
RAID 1 (Mirroring)	Normal	Yes	Smallest Size Drive	2
RAID 0+1 (Stripe/Mirror)	High	Yes	2X Smallest Size Drive	4

About RAID Levels

Striping (RAID 0)

Reads and writes sectors of data interleaved between multiple drives. When any disk member fails, it affects the entire array. Performance is better than a single drive since the workload is balanced between the array members.

This array type is for high performance systems. Identical drives are recommended for performance as well as data storage efficiency. The disk array data capacity is equal to the number of drive members times the smallest member capacity. For example, one 100 GB and three 120 GB drives will form a 400 GB (4 x 100 GB) disk array.

Stripe Size – A value can be set from 16KB to 128KB sector size. The size can directly affect performance. In the FastBuild BIOS, the default is 64KB.

Disk Drives

Mirroring (RAID 1)

Writes duplicate data on to a pair of drives while reads are performed in parallel. ATA RAID 1 is fault tolerant because each drive of a mirrored pair is installed on separate IDE channels. If one of the mirrored drives suffers a mechanical failure (for example, spindle failure) or does not respond, the remaining drive will continue to function. This is called Fault Tolerance. If one drive has a physical sector error, the mirrored drive will continue to function.

Data Mirror

Disk Drives
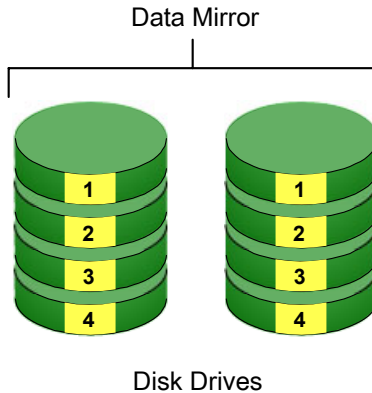
On the next reboot, the FastBuild Utility will display an error in the array and recommend replacing the failed drive. Users may choose to continue using their PC, however Promise recommends replacing the failed drive as soon as possible.

Due to redundancy, the drive capacity of the array is half the total drive capacity. For example, two 100 GB drives that have a combined capacity of 200 GB would have 100 GB of usable storage. With drives of different capacities, there may be unused capacity on the larger drive.

Using a Spare Drive – Under a RAID 1 setup, an extra hot spare drive. You can attach a third drive to the PDC20319 SATA RAID Controller without assigning it to the array. Such a drive will be activated to replace a failed drive that is part of a mirrored array. A rebuild takes place automatically in the background to mirror the good drive data on to the spare.

At a later time, the system can be powered off and the failed drive can be physically removed and replaced. Spare drives must be the same or larger capacity than the smallest array member.

Striping / Mirroring (RAID 0+1)

A combination of RAID 0 and RAID 1 arrays. It can increase performance by reading and writing data in parallel while protecting data with duplication. A minimum of four drives are required.

With a four-drive disk array, two pairs of drives are striped. Each pair mirrors the data on the other pair of striped drives. The data capacity is similar to a standard Mirroring array with half of total capacity dedicated for redundancy.

Data Stripe

Data Mirror

Disk Drives
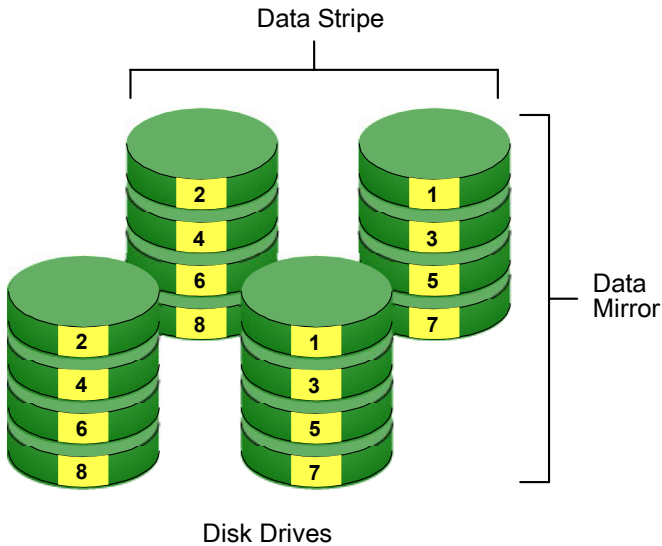
About Dual Data Redundancy

One unique (though rarely occurring) feature of RAID 0+1 is dual fault tolerance. In some cases, two drives can fail simultaneously yet the array still maintains the integrity of data. There are six combinations in which two of the four drives can fail. The PDC20319 SATA RAID Controller protects the data array in four of those cases.

Assume the drives are configured as follows:

• CH indicates channels on the PDC20319 SATA RAID Controller.

• A/B indicates which striped pair the drive belongs to.

• 1/2 indicates which part of stripe data.

CH 1	CH 2	CH 3	CH 4
Drive A1	Drive A2	Drive B1	Drive B2

Under RAID 0+1, the array maintains data integrity if any 1, 2 combination survives.

Event	Failed Drives	Array Status	Why?
1	A1/A2	Functional	B1/B2 retain array integrity
2	B1/B2	Functional	A1/A2 retain array integrity
3	A1/B2	Functional	B1/A2 retain array integrity
4	B1/A2	Functional	A1/B2 retain array integrity
5	A1/B1	Offline	B2/A2 contain only half of array data
6	B2/A2	Offline	A1/B1 contain only half of array data

Chapter 6: Troubleshooting & Tips

This section is intended to assist with troubleshooting conflicts and PDC20319 SATA RAID Controller problems.

Also refer to the README.TXT file on the driver diskette. For more recent information, see the services listed in Appendix B.

The section is divided into the following categories: Motherboard Issues, System CMOS Issues, Drive Errors, Operating System Errors, and Audio/Video Editing Tips.

Motherboard Issues

Freeing additional IRQ resources

Since the PDC20319 SATA RAID Controller supports PCI Interrupt sharing, it is possible to use IRQs already assigned to another PCI card. Interrupt Sharing is not supported with onboard IDE controllers. If the onboard IDE controller(s) are not used, you may disable the controllers to free IRQ 14 and/or 15.

Configuring PCI IRQ resources

Setting the IRQ for a particular PCI slot will be different depending on the motherboard BIOS. This setting is usually made in the PCI Configuration and/or Plug and Play (PnP) section of the motherboard BIOS setup. There are three common methods that motherboard BIOS's handle assignment of IRQs to PCI slots:

- Specifically assigning an IRQ to a particular slot - You can tell the motherboard to use IRQ 10 for PCI slot 1, IRQ 11 for PCI slot 2, etc.
- Listing which IRQs are available to be assigned to the PCI slots - This BIOS has an option where you specify 1st Available IRQ, 2nd Available IRQ, etc. The BIOS then scans the PCI slots for PCI cards and assigns these IRQs in the order that it finds the PCI cards.

Consult your motherboard manual for information that is specific to your motherboard.

Intermittent data problems

Overclocking the PCI bus may cause the system to hang or data corruption. If you experience either of these problems and you are overclocking the PCI bus, set the PCI bus back to its normal setting to see if this is causing the errors.

System CMOS Issues

Set Motherboard CMOS Boot sequence to boot to the PDC20319 SATA RAID Controller

On some Motherboard BIOS, it is necessary to set the Boot sequence to SCSI, A:, C: since the Promise card is identified as a SCSI card.

Motherboard CMOS displays C: or D: drive failure during startup

See the Drive-Related Errors section.

Using an Onboard IDE Card with the PDC20319 SATA RAID Controller

If an onboard IDE controller is installed with hard disks, enable support in the Motherboard Standard CMOS Setup for the drives. Note that the onboard IDE hard drives will then be the bootable hard disk unless the system BIOS has a boot sequence setting with the option to specify booting to a different device.

Drive-Related Errors

Critical Array Status Error Reported during Boot

If a critical status error message appears on the PDC20319 SATA RAID Controller BIOS startup screen for a mirrored array (see below), there is a drive in the array that has failed or is not responding. The Controller will identify the failed drive by channel number. The mirrored array has lost its fault tolerance, but will still perform normal drive reads and writes.

> Operation aborted because FastBuild encountered an error as follows:
>
> Location: Channel 2
> Array Status: Critical
>
> Please retry using Promise Array Management utility to recover all data. Reboot the system by pressing the ENTER key.

Try powering the system off and on to reset the drive. Also confirm that cables are properly attached and the drive is receiving power. If the drive still appears to have failed, refer to the Rebuilding an Array option in the Promise Array Management (PAM) utility as detailed in the PAM User Manual.

Drive cannot be formed into an array

Drives must support Serial ATA and be free of media defects to be added into an array. Promise recommends using new identical drives for each array. Re-secure data and power cabling while checking for proper alignment.

System CMOS displays C: or D: drive failure during Startup

Do not reference C: or D: in the Motherboard Standard CMOS for drives attached to the PDC20319 SATA RAID Controller. Only enter drive information in the Motherboard CMOS for drives attached to the onboard IDE controller.

FDISK reports a much lower drive capacity if a single physical drive or a striped array exceeds 64GB

Due to a limitation with FDISK, the utility reports only the storage capacity that exceeds 64GB. This is a cosmetic, not actual, limitation. Simply create a single DOS drive partition, reboot, and then format the partition. The Format command will recognize the total capacity of the partition accurately. Windows NT/2000 will now recognize the total capacity of your array.

Unable to Partition or Format Array

This condition may occur when the Reserve Sector of one of the drives has become corrupt or bad. Removing the Reserve Sector will remedy any issue related directly to a Bad Reserve Sector.

<table>
<tr><td rowspan="2">⚠️</td><td>Warning</td></tr>
<tr><td>Before removing the Reserve Sector of the drive(s), backup any existing data. Removal of the reserve sector of any drive permanently deletes all data from the hard drive.</td></tr>
</table>

For Mirrored arrays (RAID 1), remove the Reserve Sector from the mirrored drive first (this will appear during Step 3 below) then rebuild the mirrored array. Remove the Reserve Sector on the Master Drive only as a last resort.

For Striped arrays (RAID 0), removing the Reserve Sector from any of the drives that are striped will destroy the arrayed data.

To remove the Reserve Sector, follow these steps:

1. During boot up, press Ctrl-F to enter the FastBuild BIOS utility.

2. Choose option 2, View Drive Assignments.

3. Press arrow keys to highlight the drive where you wish to remove the reserve sector.

4. Press Alt-F1. The highlighted drive will start blinking on the screen.

5. Press Ctrl-Tab. A message will appear that says the reserved sector (which is where array information is kept) on the disk will be wiped.

6. Press Y to confirm.

7. Take the appropriate action:

   • For striped arrays, repeat this process for each member of the particular array that is having a problem. When you are finished, press the Esc key twice to reboot.

   • For mirrored arrays, hit the Esc key twice to reboot.

8. After rebooting, use FastBuild to re-create the array.

   • For striped arrays, use FDISK and FORMAT after setting up the array.

   • For mirrored arrays, rebuild the mirrored array.

Array Constantly Goes Into Critical or Offline Mode During Reboot

See *Unable to Partition or Format array*, above.

Cannot Rebuild Mirrored (RAID 1) Array

See *Unable to Partition or Format array*, above.

Fatal Errors or Data Corruption Are Constantly Reported When Reading or Writing to Drive Array

See *Unable to Partition or Format array*, above.

Operating System-Related Issues

Different drive lettering under Windows NT

This may happen when using a SCSI card in addition to the PDC20319 SATA RAID Controller. Windows NT does not necessarily load the driver for the boot device controller first. This results in a drive that in MS-DOS is the C: drive being the D:, or E:, etc. in Windows NT. Use the Windows NT Disk Administrator utility to reassign the letters that NT has improperly assigned to the drives. See your Windows NT documentation for instructions on how to use Disk Administrator.

The Operating System no longer boots after creating a Mirrored Array using your existing boot drive using Windows NT4, 2000, or XP

This is due to Drive Geometry issues. You can verify this if you move the original drive back to the onboard controller and it boots successfully. Each controller can view a drive differently. This can be an issue for a new controller that loads the original Master Boot Record (MBR) and then has a problem translating it or the Operating System boot record.

For Windows NT, 2000,and XP, Promise recommends a clean install of the Operating System. This action restores the MBR and OS boot record. This requires repartitioning and formatting the drive.

Promise Windows driver does not appear in Device Manager

Windows may already be listing the controller under Other Devices instead of the Hard disk controllers section. In Device Manager under Other Devices to see if it lists a PCI Card or RAID Controller. If so, highlight this listing and click on the Properties button then click on the Driver tab. Depending on your version of Windows, choose either Change Driver or Update Driver. Follow the on-screen prompts to complete installation of the driver. If Windows asks if you want to test if the device can be removed safely, click on CANCEL. Reboot the system to complete installation of the driver.

"Inaccessible Boot Device" Message Appears During Floppyless Install of Windows NT, 2000, or XP

The F6 key was not pressed at the appropriate time. Reboot the system, and press the F6 key when the message "Setup is inspecting your computer's hardware configuration…" appears in Windows NT4 or the message "Press F6 if you need to install third party SCSI or RAID driver" appears in Windows 2000.

"No Hard Drives Found" Message Appears During CD-ROM Install of Windows NT, 2000, or XP

The F6 key was not pressed at the appropriate time. Reboot the system, and press the F6 key when the message "Setup is inspecting your computer's hardware configuration…" appears in Windows NT4 or the message "Press F6 if you need to install third party SCSI or RAID driver" appears in Windows 2000 and XP.

Performance Tips

Here are some tips that may optimize performance in a RAID 0 striped array. If you are using an audio/video-editing card, we also recommend reviewing your card's documentation for additional information.

Use the PDC20319 SATA RAID Controller as D: or other non-bootable drive in a Striped Array

For Audio/Video editing, keep the original system boot drive on the standard IDE controller as C: drive. Partitioning software such as FDISK will see the array as one physical drive, D: or later. This will prevent file fragmentation and provide better accessibility to the array.

Optimize Array for "Performance"

The Promise FastBuild BIOS Utility autosetup menu allows optimizing the array for Performance applications such as A/V Editing. The default Performance setting (Striping) selects a Stripe Block size of 64. This larger block size is recommended for the data streaming requirements of A/V editing. You may select an even larger block size in manual mode (see Chapter 3).

```
        FastTrak (tm) / FastTrak (tm) BIOS Version 1.xx (Build xxxx)
        (c) 2002-2005 Promise Technology, Inc. All Rights Reserved.

                        [ Auto Setup Options Menu ]

    Optimize Array for:                 Performance

                        [ Auto Setup Configuration ]

    Mode................................................ Stripe
    Stripe Block Size...................................64
    Drive used in Array ................................2
    Array Disk Capacity .....................160048

                        [ Keys Available ]

[↑] Up [↓] Down  [←, →, Space] Change Option  [ESC] Exit  [Ctrl-Y] Save
```

Change Setting of PCI Bus Utilization

Certain brands of video capture cards can produce a glitch on play back of .AVI files. A setting of Less for PCI Bus utilization reduces the time which the PDC20319 SATA RAID Controller occupies on the PCI bus and frees that time for use by other PCI devices and will eliminate the glitch dropout effect on playback.

1. In PAM, click on the Controller icon in Tree View to display its Options in Information View.

2. At the bottom of the window is the PCI bus utilization slider.

3. Move the slider to the left to reduce the time Controller occupies the PCI bus. Then click the Commit button.

Once a PCI bus setting has been selected, no reboot is required.

Appendix A: Frequently Asked Questions

This section lists frequently asked questions involving pre-installation, drive issues, installation, and post-installation.

Pre-Installation

(Speed, Device Types, Capacity, Cabling)

Q: What kind of hard drives can I use for a PDC20319 SATA RAID Controller array?

A: You can use any Serial ATA hard drive(s) to create arrays on the Controller. You should use matching drives for multiple-drive arrays to maximize capacity usage as well as performance.

Q: Will ACPI work with HDDs on the PDC20319 SATA RAID Controller?

A: Yes.

Q: Can I use ATAPI devices on the PDC20319 SATA RAID Controller?

A: No. The Controller does not support ATAPI devices.

Q: Will the PDC20319 SATA RAID Controller work with 66MHz PCI bus speed?

A: Yes, the Controller is designed to accommodate the newer PCI bus speed and is backward compatible with 33MHz speeds.

Q: How can I change the resources that the PDC20319 SATA RAID Controller uses?

A: The Controller is fully PnP. This means all the resources that it uses are given to it by the PnP BIOS on the motherboard. The Controller does support IRQ sharing, but this will not work unless ALL the concerned devices support the feature. If your motherboard allows you to control the assignment of these resources, you may be able to remedy the problem by:

Changing the IRQ assignments to the PCI slots in the motherboard BIOS during boot up.

Reset the configuration data in your CMOS. This is usually an option in the PnP section of your CMOS.

Otherwise, switch the PDC20319 SATA RAID Controller to a different PCI slot.

Q: How does the PDC20319 SATA RAID Controller provide storage and/or data protection with their arrays?

A: The Controller implements three different types of RAID levels as follows:

RAID 0 (Stripe)

For capacity – The PDC20319 SATA RAID Controller array will be as big as the smallest HDD in the array times however many HDDs are in the array. Any larger HDDs will simply be truncated. The truncated space on the bigger HDDs will then be unusable.

For sustained data transfers – Using the PDC20319 SATA RAID Controller, a RAID 0 array consisting of two HDDs will transfer at about twice the speed of the slowest HDD in the array. A RAID 0 array consisting of four HDDs will transfer at about three times the speed of the slowest HDD in the array.

RAID 1 (Mirror)

For capacity – The PDC20319 SATA RAID Controller array will be as big as the smallest HDD in the array. The larger HDD will simply be truncated. The truncated space on the bigger HDD will then be unusable.

For sustained data transfers – The PDC20319 SATA RAID Controller array will write data at the rate of the slowest HDD in the array. The array will read data at twice the rate of the slowest HDD in the array.

Drive Issues

Q: Can I add a drive to a PDC20319 SATA RAID Controller array via hot-swap and dynamically adjust the array size/configuration?

A: No. The Controller does not support dynamically adjustable RAID size/configurations.

Q: Do the HDDs on the PDC20319 SATA RAID Controller have to be the same size?

A: The HDDs that you use with the Controller do not have to be the same size. If the sizes differ, the Controller will truncate the bigger HDD so the drives match. The resulting difference in HDD space is unusable, so avoid using HDDs of significantly different capacities.

Q: I already have an array on an older Promise FastTrak controller. Can I move that array to my new PDC20319 SATA RAID Controller?

A: Yes. A FastTrak controller and the PDC20319 SATA RAID Controller read arrays the same way. The arrays can move from one controller to the other.

Q: Can I take a drive used in a PDC20319 SATA RAID Controller array and access it directly with a different controller, such as the one integrated on the motherboard?

A: Only Single-drive striped (RAID 0) and Mirrored (RAID 1) array configurations allow the drive(s) to be accessed individually on another controller. *Multiple*-drive striped (RAID 0) will not work.

Q: If I have a problem with one of the drives on the PDC20319 SATA RAID Controller, how can I low-level format it to correct the problem?

A: Do NOT do this. Low-level formatting IDE drives is unnecessary and generally does not correct problems commonly experienced during use.

Errors such as bad sectors or ECC/CRC failure are best remedied by completely replacing the drive. For this reason, do NOT low-level format the drives attached to the PDC20319 SATA RAID Controller.

Q: Do I have to install disk management software on my array in order to access the full storage capacity of drives?

A: No! Disk management software will only complicate things. The array should be fully addressable by your OS as it is. Remember that some operating systems have varying limits on the sizes of partitions and logical drives that can be defined. Consult your OS documentation about partitioning larger drives.

Q: What system BIOS setup settings do I use for the drives on the PDC20319 SATA RAID Controller?

A: None. The drives on the PDC20319 SATA RAID Controller are supported by its own BIOS and/or OS drivers, not by your system BIOS.

Q: How do I partition/format my PDC20319 SATA RAID Controller array?

A: The Controller represents the array as a single HDD to your system. Therefore, anything that you can do to a single HDD you can do to a PDC20319 SATA RAID Controller array. For example, you should use the FDISK and FORMAT utilities to partition/format the array. You can partition the array as you see fit. You can format the array with any file system you wish.

Installation Issues

(Capacity, Booting)

Q: Why are some drives recognized by the PDC20319 SATA RAID Controller Array Setup utilities with only partial capacity?

A: Some hard drives ship with a jumper that reduces the addressable capacity of the drive to prevent problems with older systems that don't support larger drives. Consult your hard drive documentation to set the jumper so that you can use the full capacity of the drive.

Q: How can I change the system boot sequence in order to boot from the PDC20319 SATA RAID Controller array?

A: The boot sequence is controlled by the system BIOS. As far as the system BIOS is concerned, the PDC20319 SATA RAID Controller and defined arrays are categorized as a SCSI device. This allows you to set the boot sequence in your BIOS setup utility to boot from SCSI first, rather than IDE.

If there are multiple SCSI add-in controllers in the system, then the boot sequence among them will be determined exclusively by their PCI slot priority. PCI slot #1 will be first, slot #2 second, etc. Put the PDC20319 SATA RAID Controller in the PCI slot where it will be accessed ahead of other SCSI controllers if you want to boot from the array.

Q: How can I change the boot sequence between a PCI SCSI card and the PDC20319 SATA RAID Controller array?

A: Since all PCI devices are PnP, it is difficult to determine which device is addressed first. Some newer motherboard BIOSes have advanced options that identify devices and allow you to select which device will be assigned resources first. Otherwise you may have to physically switch the device cards on the PCI slots so that the boot device is in the highest priority slot number (see previous question).

Post-Installation

Q: Why can't I see the drives on the PDC20319 SATA RAID Controller under FDISK?

A: You have not created an array yet. If no array has been created, the system will not recognize drive(s) attached to the Controller.