



FASTTRAK
SX4100
USER MANUAL

Version 2.2

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Radio Frequency Interference Statement

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 instruction 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 receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult Promise Technology, Inc. or an experienced radio/TV technician for help.

This device complies with Part 5 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



Caution

Only digital device equipment CERTIFIED CLASS B should be attached to this equipment and that must have shielded cables.

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Chapter 1: Introduction

- About This Manual, below
- Product Overview (page 2)
- WebPAM Management Software (page 2)

Thank you for purchasing one of Promise Technology's FastTrak SX4100 Serial ATA RAID controllers.

About This Manual

This *User Manual* describes how to setup, use and maintain the FastTrak RAID controller. It also describes how to use the WebPAM RAID management software.

This manual includes a full table of contents, chapter task lists and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:



Note

A *Note* provides helpful information such as hints or alternative ways of doing a task.



Important

An *Important* calls attention to an essential step or point required to complete a task. Important items include things often missed.



Caution

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.



Warning

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

Product Overview

FastTrak SX4100 is a Serial ATA RAID controller. When used with WebPAM software, the FastTrak RAID Controller offers a feature-rich, secure and versatile enterprise-wide ATA RAID solution. In addition, the FastTrak SX Series supports RAID expansion. The resulting RAID environment allows users and administrators to configure, manage, and monitor everything from single logical drives on local systems to logical drive networks residing in offsite locations.

The FastTrak SX4100 RAID Controller card supports 1.5 Gb/s Serial ATA hard drives. At its core, the FastTrak card provides advanced RAID management functions: creating logical drives, monitoring them, keeping them online and operating at optimum efficiency. FastTrak can also perform many other tasks, such as:

- Create logical drives at various RAID levels (0, 1, 5, 10 and JBOD), depending on the application being used
- Set up a network of FastTrak RAID servers (all running under different RAID levels) and monitor those servers from any workstation on the network
- Create a series of FastTrak RAID networks at any number of offsite locations
- Monitor and/or repair FastTrak RAID logical drives using the Internet from an offsite location—all without compromising the integrity of secure servers

XOR Acceleration

The FastTrak SX4100 Controller has a Hardware XOR accelerator, which offloads the parity calculation workload from the main CPU and transfers it to the controller card, boosting the performance of the entire system.

Hot-Swapping

Each FastTrak SX4100 can support up to four Serial ATA disk drives. You can configure the drives as RAID levels 1, 5 or 10. Attached drives can be *hot swapped* when used with the optional Promise SuperSwap drive enclosures.

WebPAM Management Software

The Web-Based Promise Array Management (WebPAM) software offers local and remote management and monitoring of all FastTrak logical drives that exist anywhere on a network. Browser-based GUI provides email notification of all major events/alarms, memory cache management, drive event logging, logical drive maintenance, rebuild, and access to all components in the RAID configuration (server, controller, logical drives, physical drives, and enclosure). For information on using WebPAM, refer to the *WebPAM User Manual* included on the CD.

Chapter 2: Installation

- Package list, below
 - Installing the FastTrak Card (page 4)
 - Installing the Disk Drives (page 5)
 - Create a Logical Drive (page 7)
-

Package List

When you receive the FastTrak SX4100 card, the package should contain the items listed below:

- FastTrak SX4100 RAID Controller Card
- Quick Start Guide
- Four 1.0m (39-inch) Serial ATA disk drive data cables
- Two Y power splitter cables
- CD with Drivers, Promise RAID Management (WebPAM) software, *WebPAM User Manual* and *FastTrak SX4100 User Manual*

If ANY of the contents are missing or appear to be damaged, please contact your dealer or distributor immediately..



Warning

The electronic components on the FastTrak RAID Controller card are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the FastTrak card or its subassemblies.



Warning

Before installing the adapter into an existing system, backup any important or useful data. Failure to follow this accepted PC practice could result in data loss.



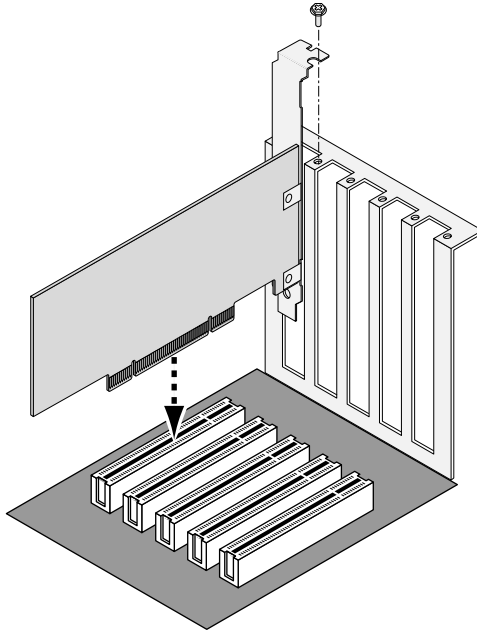
Note

The FastTrak SX4100 RAID Controller card is PCI Plug-n-Play (PnP) devices. No changes are necessary in the motherboard CMOS/BIOS Setup for resources or drive types in most applications.

Installing the FastTrak Card

The FastTrak RAID Controller card fits into any available PCI slot.

1. Remove the cover of your system.
2. Remove the inside slot cover of an available PCI slot on the motherboard.



3. Install the FastTrak card into the open slot (above).
4. Fasten the FastTrak card bracket to the system case (above).
5. Attach your system case's 2- or 4-pin LED cable to the LED connector on the FastTrak card (see page 6).

Installing the Disk Drives



Important

If you wish to include your current bootable Serial ATA drive using the Windows operating system as part of a bootable Mirrored (RAID 1) logical drive on your FastTrak card, do NOT connect the disk drive to the FastTrak yet. You MUST install the Windows driver software first onto this drive while it is still attached to your existing disk drive controller.

The FastTrak SX-Series RAID Controller card supports only 1.5 Gb/s Serial ATA disk drives. For optimal performance, install disk drives of the same model and capacity. The drives' matched performance allows the logical drive to function better as a single drive.

Level	Number of Drives
RAID 0	2 or more
RAID 1	2 only
RAID 5	3 or more
RAID 10	4 only
JBOD	1 or more

The table above shows the number of drives required for each RAID level. If you plan to create a mirror (RAID 1) for protection, you can use two new drives OR use an existing drive and a new drive. The new drive must be the same size or larger than the existing drive.

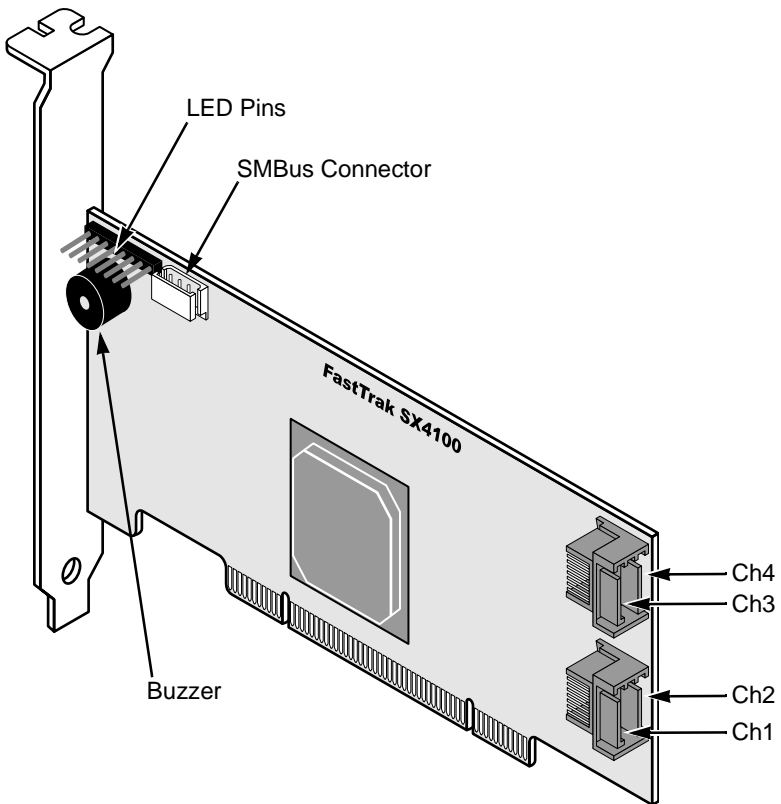
1. Install the disk drives into the disk drive bays of your system.

If you are using SuperSwap Enclosures, the SMBus ID of each disk drive must match the Channel number.



Caution

Use of removable disk drive enclosures other than Promise Technology's SuperSwap is not supported and may result in performance loss or other undesired results.



2. Attach one Serial ATA data cable to each disk drive. Then attach the other ends of the cables to the connectors on the FastTrak card (above).
3. Attach the Y-cable power splitters to each of the disk drives.

Create a Logical Drive

You will now use the onboard FastBuild BIOS utility to create a logical drive with the attached drives. Even if you plan to use the WebPAM software to manage your logical drive, you can still create your first logical drive using the FastBuild Utility, as described here.

For an explanation of the logical drive concepts, see Chapter 5 of this manual.

1. Boot your system. If this is the first time you have booted with the FastTrak card and drives installed, the Promise onboard BIOS will display the following screen (below).

```
FastTrak SX4100 (tm) BIOS Version 2.7.0.11
(c) 2004-2005 Promise Technology, Inc. All rights reserved.

Installed ECC DIMM 64 MB

No Array is defined...

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

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

```
FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[ Main Menu ]

View Drive Assignments .....[ 1 ]

Define LD.....[ 2 ]

Delete LD.....[ 3 ]

Controller Configuration.....[ 4 ]

[ Keys Available ]

Press 1..4 to Select Option [ESC]..Exit
```

3. Press 2 on the Main Menu screen to display the Define LD Menu (below).

```

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[ Define LD Menu ]

LD No      RAID Mode    Total Drv    Capacity (MB)    Status
-----
LD 1       ----        ----          -----          ----
LD 2       ----        ----          -----          ----
LD 3       ----        ----          -----          ----
LD 4       ----        ----          -----          ----
LD 5       ----        ----          -----          ----
LD 6       ----        ----          -----          ----
LD 7       ----        ----          -----          ----
LD 8       ----        ----          -----          ----

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

4. Press the arrow keys to highlight an logical drive number you want to define and press Enter to select it.

The Define LD Menu for the logical drive number you selected will next appear (below).

```

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[ Define LD Menu ]

LD No      RAID Mode    Total Drv
LD 1       RAID 5        3

Stripe Block: 64 KB          Fast Init: OFF
Gigabyte Boundary: ON       Cache Mode: WriteBack

[ Drive Assignments ]

Channel ID    Drive Model          Capacity (MB)    Assignment
-----
1:Mas ST380013AS      80027           Y
2:Mas ST380013AS      80027           Y
3:Mas ST380013AS      80027           Y
4:Mas ST380013AS      80027           N

[ Keys Available ]
[↑] Up    [↓] Down  [ESC] Exit  [Space] Change Option  [Ctrl-Y] Save
  
```

5. Choose the RAID Level you want. In the Define LD Menu section, press the Spacebar to cycle through logical drive types:
- RAID 0 (Stripe)
 - RAID 1 (Mirror)
 - RAID 5 (Block Striping with Distributed Parity)
 - RAID 10 (Stripe / Mirror)
 - JBOD (Single Drive)
6. Press the arrow keys to move to the next option. Option choices depend on the RAID Level you selected.

- Initialize logical drive, zero the disk drives. RAID 1, 5 or 10 only.
 - Stripe Block Size, the default 64KB is best for most applications.
 - Gigabyte Boundary, allows use of slightly smaller replacement drives.
 - Cache Mode, WriteThru or WriteBack.
7. Press the arrow keys to move to Disk Assignments. Press the spacebar to toggle between N and Y for each available drive. Y means this disk drive will be assigned to the logical drive.

Assign the appropriate number of disk drives to your logical drive. Refer to the table under "Installing the Disk Drives" on page 5.

A disk drive that is not assigned to a logical drive will automatically function as a Hot Spare Drive.
 8. Press Ctrl-Y to save your logical drive configuration.

You have the option allocating a portion to a second logical drive. This option is discussed under "Create a Logical Drive" on page 14.
 9. Press any key (except for Ctrl-Y) to use the full portion of the logical drive for one logical drive.
 10. Press Esc to exit to the Main Menu. Press Esc again to exit the Utility.
 11. Press Y to restart the computer.

You have successfully created a new RAID logical drive.



Important

You must be partition and format your new logical drive before you can use it. Use the same method of partitioning and formatting a logical drive as you would any other fixed disk added to your computer system.

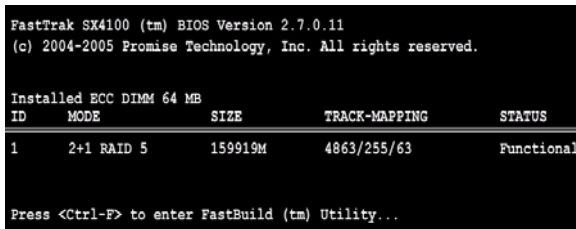
Chapter 3: FastBuild™ Utility

- FastTrak BIOS (below)
- Main Menu (page 12)
- View Drive Assignments (page 13)
- Create a Logical Drive (page 14)
- Delete Logical Drive (page 19)
- Controller Configuration (page 20)
- Logical Drive Problems (page 21)

FastTrak BIOS

This section explains the information that you can obtain from the FastTrak BIOS.

When the FastTrak BIOS loads during bootup, it displays pertinent information about the RAID logical drives that it finds. At this point, you can press Ctrl-F to enter the FastBuild Configuration Utility.



```
FastTrak SX4100 (tm) BIOS Version 2.7.0.11
(c) 2004-2005 Promise Technology, Inc. All rights reserved.

Installed ECC DIMM 64 MB
ID      MODE      SIZE      TRACK-MAPPING      STATUS
1       2+1 RAID 5     159919M     4863/255/63       Functional

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

When the FastTrak BIOS screen appears, press Ctrl-F to enter the FastBuild Utility.

The FastTrak BIOS screen displays the following information:

ID – An identification number assigned to each logical drive by the BIOS.

Mode – The RAID mode (level) configuration of the logical drive

Size – The data capacity of the logical drive in MB (Megabytes).

Track-Mapping – This is the CHS (Cylinder/Head/Sector) equivalent of the logical drive geometry as hosted by the FastTrak BIOS int 13h disk services.

Status – Shows one of three logical drive conditions:

Functional – The logical drive is fully operational, and no problems are present.

Critical – The logical drive is operational, but has lost its fault tolerance. For RAID levels 1, 5 and 10, the logical drive contains a failed drive. If there is a hot spare drive, the logical drive will rebuild automatically. You must identify and replace the failed disk drive.

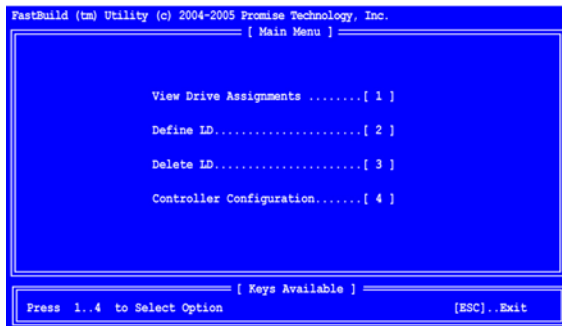
Offline – The logical drive is no longer operational and the FastBuild utility cannot rebuild it. You must identify and replace the failed drive(s). Then you can create a new logical drive and copy your data to it from the last tape backup or other device.

For RAID levels 1, 5 and 10, at least two or more disk drives in the logical drive have failed.

For a RAID 0 or JBOD logical drive, at least one disk drive has failed.

Main Menu

When the FastTrak BIOS displays on your computer screen, press Ctrl-F to launch the FastBuild utility and display the Main Menu.



The Main Menu (above) has five options:

- Press 1 to view disk drive assignments
- Press 2 to create a logical drive or view information about an existing logical drive.
- Press 3 to delete a logical drive.
- Press 4 to view and change controller configuration.
- Press Esc (Escape) to exit the menu.

View Drive Assignments

From the Main Menu screen, press 1 to see the View Drive Assignments screen (below).

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[View Drives Assignments]

Channel:ID	Drive Model	Capacity (MB)	Assignment
1:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-1
2:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-2
3:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-3
4:Mas	ST380023AS	80027	
	Extent 1	79960	Free

[Keys Available]

[F] Up [↓] Down [PgDn] Next Page [PgUp] Previous Page [ESC] Exit

This screen reports disk drive assignments and provides the following information:

Channel: ID – Shows the FastTrak Controller channel ID (1 through 4) to which a particular disk drive is attached.

Drive Model – Identifies the manufacturer, model, and model number (if applicable) of each disk drive.

Capacity (MB) – Reflects the capacity in MB (megabytes) of the disk drive.

Assignment – This field identifies the logical drive to which the disk drive belongs. In the example above, there is one logical drive composed of three disk drives. LD 1-2 means logical drive 1, disk drive 2.

Unassigned drives are labeled *free* and are considered *hot spares* to provide fault tolerance. Unassigned drives may also be used to create a new logical drive at any time.

Extent – An extent is a portion of the disk drive. The FastTrak SX Series controller allows you to split the capacity of a disk drives between two logical drives. The portion of a disk drive available to be used in a logical drive is called an *extent*. The extent, or sum of two extents, is slightly smaller than the total capacity of the disk drive.

See “View Drive Assignments, Split Disk Drives” on page 18 for an example of two extents for each disk drive.

Create a Logical Drive

- From the Main Menu screen, press 2 to display the Define LD Menu (below).

```

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
----- [ Define LD Menu ] -----

  LD No      RAID Mode    Total Drv    Capacity (MB)    Status
  ----      -
LD 1         ----         ----         -----         ----
LD 2         ----         ----         -----         ----
LD 3         ----         ----         -----         ----
LD 4         ----         ----         -----         ----
LD 5         ----         ----         -----         ----
LD 6         ----         ----         -----         ----
LD 7         ----         ----         -----         ----
LD 8         ----         ----         -----         ----

----- [ Keys Available ] -----
[↑] Up   [↓] Down  [ESC] Exit  [Enter] Select
  
```

- Press the arrow keys to highlight an logical drive number you want to define and press Enter to select it.

The Define LD Menu for the logical drive number you selected will next appear (below).

```

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
----- [ Define LD Menu ] -----

LD No      RAID Mode    Total Drv
LD 2         RAID 5           3

Stripe Block: 64 KB                Fast Init: OFF
Gigabyte Boundary: ON              Cache Mode: WriteBack

----- [ Drive Assignments ] -----

Channel ID   Drive Model          Capacity (MB)    Assignment
1:Mas ST380013AS      80027           Y
2:Mas ST380013AS      80027           Y
3:Mas ST380013AS      80027           Y
4:Mas ST380013AS      80027           N

----- [ Keys Available ] -----
[↑] Up   [↓] Down  [ESC] Exit  [Space] Change Option  [Ctrl-Y] Save
  
```

- Choose the RAID Level you want. In the Define LD Menu section, press the Spacebar to cycle through logical drive types:
 - RAID 0 (Stripe)
 - RAID 1 (Mirror)
 - RAID 5 (Block Striping with Distributed Parity)
 - RAID 10 (Stripe / Mirror)
 - JBOD (Single Drive)

See "Choosing a RAID Level" on page 39 for more information.

4. Press the arrow keys to move to the next option. Option choices depend on the RAID Level you selected.
 - Initialize logical drive, zero the disk drives. RAID 1, 5 or 10 only.
 - Stripe Block Size, the default 64KB is best for most applications.
 - Gigabyte Boundary, allows use of slightly smaller replacement drives.
 - Cache Mode, WriteThru or WriteBack.

See “Other Logical Drive Features” on page 41 for more information.

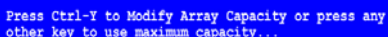
5. Press the arrow keys to move to Disk Assignments. Press the spacebar to toggle between N and Y for each available drive. Y means this disk drive will be assigned to the logical drive.

Assign the appropriate number of disk drives to your logical drive.

A disk drive that is not assigned to a logical drive will automatically function as a Hot Spare Drive.

6. Press Ctrl-Y to save your logical drive configuration.

You have the option of using all of the disk drive capacity for one logical drive or allocating a portion to a second logical drive.



7. Choose one of the following:
 - Use the full capacity of the disk drives for a single logical drive. Go to “One Logical Drive” below.
 - Split the disk drives among two logical drives. This option does not apply to JBOD. Go to “Two Logical Drives” on page 16.

One Logical Drive

Continued from *Create Logical Drive* step 7, above.

1. Press any key (except for Ctrl-Y) to use the full portion of the logical drive for one logical drive.
2. Press Esc to exit to the Main Menu. Press Esc again to exit the Utility.
3. Press Y to restart the computer.

You have successfully created a new RAID logical drive.

You must be partition and format your new logical drive before you can use it. Use the same method of partitioning and formatting a logical drive as you would any other fixed disk added to your computer system.

Two Logical Drives

Continued from *Create Logical Drive* step 7, above.

1. Press Ctrl-Y to allocate a portion of the disk drives to the first logical drive.

```
FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
===== [ Define LD Menu ] =====
LD No      RAID Mode    Total Drv   Capacity(MB)
LD 1       RAID 5       3           159919

Stripe Block: 64 KB                Fast Init: OFF
Gigabyte Boundary: ON              Cache Mode: WriteBack

===== [ Drives Assignments ] =====
Channel ID   Drive Model      Capacity (MB)   Assignment
1:Mas ST380013AS      80027          Y
2:Ma                                     Y
3:Ma                                     Y
4:Ma                                     N
Enter array capacity (in MB) here: 80000

===== [ Keys Available ] =====
[0-9] Input Capacity  [Enter] Save  [BackSpace] Delete  [ESC] Escape
```

2. Enter the desired capacity in MB for the first logical drive and press Enter. The Define LD Menu displays again.

```
FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
===== [ Define LD Menu ] =====

LD No      RAID Mode    Total Drv   Capacity (MB)   Status
LD 1       RAID 5       3           80000          Functional
LD 2       ----          ----          -----          ----
LD 3       ----          ----          -----          ----
LD 4       ----          ----          -----          ----
LD 5       ----          ----          -----          ----
LD 6       ----          ----          -----          ----
LD 7       ----          ----          -----          ----
LD 8       ----          ----          -----          ----

===== [ Keys Available ] =====
[↑] Up  [↓] Down  [ESC] Exit  [Enter] Select
```

- Press the up and down arrow keys to select an available logical drive number and press Enter.

```

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
===== [ Define LD Menu ] =====
LD No      RAID Mode    Total Drv
LD 2        RAID 5      3

Stripe Block: 64 KB                      Fast Init: OFF
Gigabyte Boundary: ON                     Cache Mode: WriteBack

===== [ Drive Assignments ] =====
Channel ID   Drive Model      Capacity (MB)   Assignment
1:Mas ST380013AS      39960           Y
2:Mas ST380013AS      39960           Y
3:Mas ST380013AS      39960           Y
4:Mas ST380013AS      80027           N

===== [ Keys Available ] =====
[F] Up      [↓] Down  [ESC] Exit   [Space] Change Option  [Ctrl-Y] Save

```

- Choose the RAID level and options for the second logical drive.
Note that the disk drives in Channels 1, 2 and 3 reflect smaller capacities because a portion of their original capacity belongs to a different logical drive.
In this example the disk drive in Channel 4 is not assigned to a logical drive in order to use it as a hot spare drive.
- Press Ctrl-Y to save your logical drive configuration.
- Press Esc to exit to the Main Menu. Press Esc again to exit the Utility.
- Press Y to restart the computer.

You have successfully created a new RAID logical drive.

You must partition and format your new logical drive before you can use it. Use the same method of partitioning and formatting a logical drive as you would any other fixed disk added to your computer system.

View Drive Assignments, Split Disk Drives

After you create two logical drives from the same set of disk drives, press 1 on the Main Menu screen to see the View Drive Assignments screen (below).

```
FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[ View Drives Assignments ]

Channel:ID      Drive Model      Capacity (MB)      Assignment
1:Mas ST380023AS      80027
   Extent 1      40000             LD 1-1
   Extent 2      39960             LD 2-1
2:Mas ST380023AS      80027
   Extent 1      40000             LD 1-2
   Extent 2      39960             LD 2-2
3:Mas ST380023AS      80027
   Extent 1      40000             LD 1-3
   Extent 2      39960             LD 2-3
4:Mas ST380023AS      80027
   Extent 1      79960             Free

[ Keys Available ]
[↑] Up  [↓] Down  [PgDn] Next Page  [PgUp] Previous Page  [ESC] Exit
```

In this example, observe how each of the disk drives in Channels 1, 2 and 3 are split between two logical drives. Extent 1 belongs to logical drive 1 (LD 1). Extent 2 belongs to logical drive 2 (LD 2).

Under Assignment, the disk drive is divided into LD 1 and LD 2. For example, LD 1-2 means logical drive 1, disk drive 2. LD 2-3 means logical drive 2, disk drive 3.

Note that the combined size of the extents is slightly smaller than the total capacity of the disk drive.

Unassigned drives are labeled *free* and are considered *hot spares* to provide fault tolerance in the event of a disk drive failure. Alternatively, you can use an unassigned drive to create a new logical drive.

Delete Logical Drive



Caution

Deletion of an existing logical drive will result in the loss of all data saved on the logical drive.

Record all logical drive information, including RAID level, disk members, stripe block size and gigabyte boundary, in case you wish to undo a deletion.

Logical drives may possibly be recovered after deletion by immediately re-defining the logical drive with information identical to the original configuration.

To delete a logical drive:

1. From the Main Menu screen, press 3 to display the Delete LD Menu (below).

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.

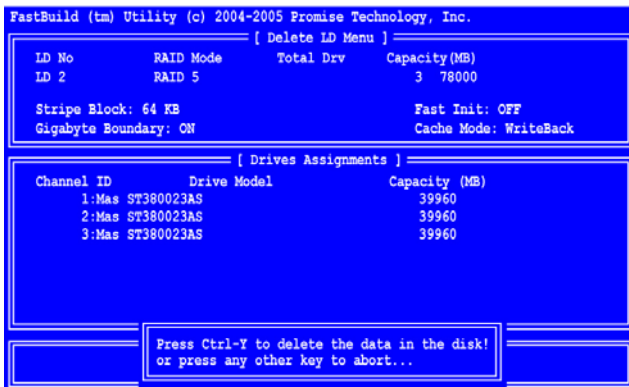
[Delete LD Menu]

LD No	RAID Mode	Total Drv	Capacity (MB)	Status
LD 1	RAID 5	3	80000	Functional
LD 2	RAID 5	3	78000	Functional
LD 3	----	----	-----	----
LD 4	----	----	-----	----
LD 5	----	----	-----	----
LD 6	----	----	-----	----
LD 7	----	----	-----	----
LD 8	----	----	-----	----

[Keys Available]

[↑] Up [↓] Down [ESC] Exit [Del or Alt+D] Delete

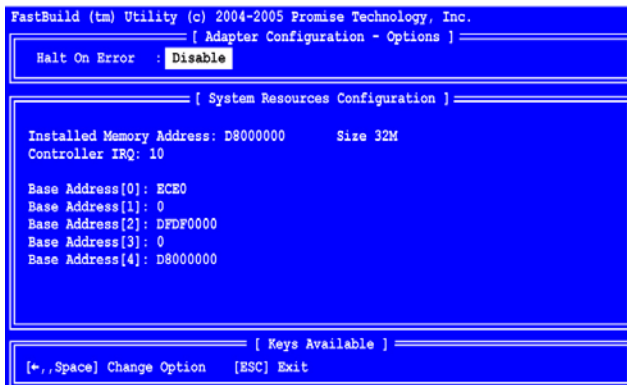
2. Highlight the logical drive you wish to delete and press the Del key or Alt-D. The Delete LD Menu for the selected logical drive appears (below).



3. Press Ctrl-Y to confirm and complete logical drive deletion.
The screen returns to the Delete LD Menu. Press Esc to return to the Main Menu.

Controller Configuration

From the Main Menu screen, press 4 to display the Controller Configuration Options screen (below).



the Controller Configuration Options screen has one setting and provides diagnostic information.

Halt On Error

The Halt On Error function causes the FastTrak controller to stop the boot process at the FastTrak BIOS screen when there is a problem with your logical drive.

For example, a disk drive failure causes your logical drive to go critical. Depending on the Halt On Error setting, one of the following events will happen:

- Enabled – Your system will stop booting at this point to alert you to the condition. Press Ctrl-F to enter the FastBuild utility and diagnose the problem.
- Disabled – Your system will continue booting. In this case, you could use WebPAM to diagnose the problem.

For more information about logical drive problems

System Resources

The information in the System Resources section might be helpful for troubleshooting purposes:

- Installed memory address and size
- The system IRQ used by the FastTrak card
- Base Addresses (advanced troubleshooting)

Logical Drive Problems

While disk drives are highly reliable, on occasion a disk drive can fail. Fault-tolerant (RAID 1, 5 and 10) logical drives go *Critical* when a disk drive fails. Non-fault-tolerant logical drives (RAID 0) and JBOD go *Offline* when a disk drive fails.

When a fault-tolerant logical drive goes Critical, one of two things must happen in order to restore the logical drive to Functional status:

If a hot spare drive is available, the FastTrak Controller will automatically begin rebuilding the logical drive with the hot spare. You must replace the failed drive, which becomes the new hot spare.

If a hot spare drive is not available, you must replace the failed drive, after which the FastTrak controller will automatically rebuild the logical drive.

For more information about hot spare drives, see page 42.

In either case, you must identify the failed drive so you can replace it. See the example below.

```
FastTrak SX4100 (tm) BIOS Version 2.7.0.11
(c) 2004-2005 Promise Technology, Inc. All rights reserved.

Installed ECC DIMM 64 MB
ID      MODE      SIZE      TRACK-MAPPING      STATUS
-----
1       2+1 RAID 5   159919M   4863/255/63        Critical

Problem ic detected with Array : 1
Critical Status:
A disk member of an array has failed or is not responding.
Please refer to your Promise User Manual for further details.

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

When you boot your system, the FastTrak BIOS screen informs you if there is a critical or offline logical drive. If you enabled the Halt On Error option, your system will stop booting at this point.

1. Press Ctrl-F to access the FastBuild utility.
2. From the Main Menu screen, press 3 to see the Define LD Menu.

```
FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.
[ Define LD Menu ]

LD No      RAID Mode    Total Drv    Capacity (MB)    Status
-----
LD 1       RAID 5             3             159919          Critical
LD 2       ----              ----             ----             ----
LD 3       ----              ----             ----             ----
LD 4       ----              ----             ----             ----
LD 5       ----              ----             ----             ----
LD 6       ----              ----             ----             ----
LD 7       ----              ----             ----             ----
LD 8       ----              ----             ----             ----

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

3. Press the up and down arrow keys to select the logical drive with Critical status and press Enter.

The Define LD Menu for the Critical logical drive displays (below).

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.				
[Define LD Menu]				
LD No	RAID Mode	Total Drv	Capacity	Status
LD 1	RAID 5	3	159919	Critical
Stripe Block: 64 KB			Cache Mode: WriteBack	
[Drive Assignments]				
Channel ID	Drive Model	Capacity (MB)		
1:Mas	ST380013AS	80027		
3:Mas	ST380013AS	80027		
? : ?	failed or disconnected...			
Any key to continue...				

- In the Define LD Menu screen, compare the number of drives assigned to the logical drive (Total Drv) with the disk drives listed under Drive Assignments.

In the above example, three drives are assigned but only two appear. The missing disk drive is the failed drive. The disk drive on Channel 2 has failed. In an actual situation, you would replace this disk drive.

See “Installing the Disk Drives” on page 5 for help identifying Channels on the FastTrak Controller card.

RAID 0 and JBOD

Because RAID 0 and JBOD logical drives are not fault-tolerant, there is no way to rebuild the logical drive when a disk drive fails. After you replace the failed disk drive, you must create a new logical drive and copy your data to it from a backup source.

Chapter 4: Installing Software Drivers

Following are driver installation procedures for the FastTrak SX4100 RAID Controller card. Download the latest drivers from the Promise Technology website at www.promise.com.

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Windows Server 2003

Install Driver During New OS Installation

1. Start the installation: 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 Setup window is generated, press S to specify an Additional Device(s)
3. Insert the Promise Technology driver diskette into drive A: and press Enter.
4. Choose *Windows 2003 Promise FastTrak SX4100 (tm) Controller* from the list that appears on screen, and then press the Enter. 1. Press S to use the driver on the floppy disk and then press Enter to continue with installation.
5. The Windows 2003 Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *Windows 2003 Promise FastTrak SX4100 (tm) Controller*.

Note: If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step.

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

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Install Driver in an Existing System



Important

If you plan to move the boot drive containing the existing Windows Server 2003 operating system to the FastTrak card, you **MUST** load the FastTrak driver to the boot drive while it is still attached to your existing hard drive controller.

Do not attach the boot drive to the FastTrak card before completing this step.

After installing the FastTrak card and rebooting your system, Windows setup will show a Found New Hardware dialog box.

1. Insert the Promise FastTrak Driver diskette in the A: drive.
2. When the New Hardware Wizard appears, select *Install from a list or specific location (advanced)* and click *Next*.
3. Under Please choose your search and installation options, select *Don't search. I will choose the driver to install* and click *Next*.
4. Under Select the device driver you want to install, click *Have Disk...*

5. Under Install from Disk, type **A:\wnet** wnet and click *OK*.
6. Under Select the device driver you want to install, click *Next*.
7. If a warning about Windows Logo testing appears, click *Continue Anyway*.
8. Under Completing the Found New Hardware Wizard, click *Finish*.
9. If the New Hardware Wizard appears again, close it.
10. Click *Yes* to restart your PC.
11. Remove the Promise FastTrak Driver diskette.
12. When the Found New Hardware Wizard appears a second time, select *Install the Software Automatically (Recommended)* and click *Next*.
13. If a warning about Windows Logo testing appears, click *Continue Anyway*.
14. Under Completing the Found New Hardware Wizard, click *Finish*.

Note: Check the readme file, included with the driver files, for instructions on installing the RAID Console.

Confirm Installation

1. From the Windows Desktop, open the Control Panel from My Computer.
2. Click on Performance and maintenance.
3. Click on the System icon.
4. Choose the Hardware tab, and then click the Device Manager button.
5. Click the + in front of SCSI controllers. *Windows 2003 Promise FastTrak SX4100 (tm) Controller* should appear.

Windows XP

Install Driver During New OS Installation

1. Start the installation: 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 Setup window is generated, press S to specify an Additional Device(s)
3. Insert the Promise Technology driver diskette into drive A: and press Enter.
4. Choose *WinXP Promise FastTrak SX4100 (tm) Controller* from the list that appears on screen, and then press the Enter. 1. Press S to use the driver on the floppy disk and then press Enter to continue with installation.
5. The Windows XP Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *WinXP Promise FastTrak SX4100 (tm) Controller*.

Note: If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step.

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

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Install Driver in an Existing System



Important

If you plan to move the boot drive containing the existing Windows Server 2003 operating system to the FastTrak card, you **MUST** load the FastTrak driver to the boot drive while it is still attached to your existing hard drive controller.

Do not attach the boot drive to the FastTrak card before completing this step.

After installing the FastTrak card and rebooting your system, Windows setup will show a Found New Hardware dialog box.

1. Insert the Promise FastTrak Driver diskette in the A: drive.
2. When the New Hardware Wizard appears, select *Install from a list or specific location (advanced)* and click *Next*.
3. Under Please choose your search and installation options, select *Don't search. I will choose the driver to install* and click *Next*.
4. Under Select the device driver you want to install, click *Have Disk...*
5. Under Install from Disk, type **A:\winxp** and click *OK*.
6. Under Select the device driver you want to install, click *Next*.
7. If a warning about Windows Logo testing appears, click *Continue Anyway*.
8. Under Completing the New Hardware Wizard, click *Finish*.
9. If the New Hardware Wizard appears again, close it.
10. Click *Yes* to restart your PC.
11. Remove the Promise FastTrak Driver diskette.

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Confirm Installation

1. From the Windows Desktop, open the Control Panel from My Computer.
2. Click on Performance and maintenance.

3. Click on the System icon.
4. Choose the Hardware tab, and then click the Device Manager button.
5. Click the + in front of SCSI controllers. *WinXP Promise FastTrak SX4100 (tm) Controller* should appear.

Windows 2000

Install Driver During New OS Installation

1. Start the installation: 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 Setup window is generated, press S to specify an Additional Device(s)
3. Insert the Promise Technology driver diskette into drive A: and press Enter.
4. Choose *Win2000 Promise FastTrak SX4100 (tm) Controller* from the list that appears on screen, and then press the Enter.
5. The Windows Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include *Win2000 Promise FastTrak SX4100 (tm) Controller*.

Note: If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step.

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

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Install Driver in an Existing System



Important

If you plan to move the boot drive containing the existing Windows Server 2003 operating system to the FastTrak card, you **MUST** load the FastTrak driver to the boot drive while it is still attached to your existing hard drive controller.

Do not attach the boot drive to the FastTrak card before completing this step.

After installing the FastTrak card and rebooting your system, Windows setup will show a Found New Hardware dialog box.

1. When the New Hardware Wizard appears, click *Next*.

2. Insert the Promise FastTrak Driver diskette in the A: drive.
3. Under Install Hardware Device Drivers, select *Search for a suitable driver...* and click *Next*.
4. Under Locate Driver Files, uncheck *Floppy disk drives and CD-ROM drives*. Check *Specify a Location* and click *Next*.
5. Under Insert the manufacturer's installation disk, type **A:\win2000** and click **OK**.
6. Under Driver Files search Results, when *a:\Win2000 \ft4100.inf* should appear, click *Next*.
7. If a Digital Signature Notice appears, click *Yes*.
8. Under Completing the New Hardware Wizard, click *Finish*.
9. Click *Yes* to restart your PC.
10. Remove the Promise FastTrak Driver diskette.

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Confirm Installation

1. From the Windows Desktop, open the Control Panel from My Computer.
2. Click on the System icon.
3. Choose the Hardware tab, and then click the Device Manager button.
4. Click the + in front of SCSI controllers. *Win2000 Promise FastTrak SX4100 (tm) Controller* should appear.

Red Hat Linux 8.0, 9.0, EL 3.0, EL 4.0

Install Driver During New OS Installation

1. Start the RedHat Linux Installation by booting with the installation diskette or bootable CD ROM.
2. At the *Welcome to Red Hat Linux ...* installation screen, a prompt labeled boot: will appear at the bottom of the screen. Type **linux dd** and press Enter.
3. When the Installer asks, *Do you have a driver disk?* click *Yes*.
4. At the *Insert your driver disk and press OK to continue*, insert the driver diskette into the floppy drive and click **OK**. At the Devices dialog box, insert the FastTrak driver diskette in the floppy drive and click **OK**.
5. When the *Devices* dialog box appears, select *Add Device*.
6. When the Installer asks, *What kind of device would you like to add?*, select **SCSI**.

7. Scroll down to the *Promise FastTrak SX4100 (tm) Controller* and click *OK*.
8. When the Installer displays *Promise FastTrak SX4100 (tm) Controller* has been found, click *Done*.
9. Continue with the installation normally.

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Install Driver in an Existing System

1. Insert FastTrak Driver Diskette into the floppy drive.
2. Log in as *root*.
3. Type Run **mount -r /dev/fd0 /mnt/floppy**.
4. Run **cd /mnt/floppy; sh ./install**.
5. When the *Installer* asks, *You are installing a driver on an existing OS. Is it true (y/n)?*, type **Y** and press Enter.
6. Run **cd; umount /mnt/floppy**.
7. Remove the FastTrak Driver Diskette and type reboot to restart the system.

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

SuSE Linux 9.1, 9.2, ES 9.0

Install Driver During New OS Installation: Single Processor

1. Insert the install CD into CD-ROM drive.
2. When the boot: picture prompts for an installation option, add the following line to the input box: **acpi=oldboot**.
3. Press the left Alt key and insert the FastTrak driver diskette into the floppy drive.
4. Finish the installation normally.

Note: Check the readme file, included with the downloaded driver files, for instructions on installing the RAID Console.

Install Driver During New OS Installation: Multi-Processor

1. Set the BIOS to boot from the CD-ROM.
2. Insert the install CD into CD-ROM drive.

3. When the boot: prompt appears on the bottom of the screen, type **acpi=oldboot** into the lower input box.
4. Press the left Alt key and insert the FastTrak driver diskette into the floppy drive.
5. Finish the installation normally.

Install Driver in an Existing System

1. Insert the FastTrak driver diskette into the floppy drive.
2. Type the following commands:

```
# mount /dev/fd0 /media /floppy
# cd /media /floppy
# ./install
# insmod FastTrak
# umount /media /floppy
```
3. Remove the FastTrak driver diskette from the floppy drive.

Chapter 5: Concepts

- About FastTrak, below
 - Introduction to RAID, below
 - Choosing a RAID Level (page 39)
 - Other Logical Drive Features (page 41)
-

About FastTrak

FastTrak SX4100 is a high performance RAID Controller card that features concurrent data channel operation and onboard BIOS. The channels on the FastTrak card support concurrent operation that allows for overlapped I/O under multi-tasking operating systems and sharing the workload between multiple drives.

Adapter BIOS

The FastTrak card 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 FastTrak BIOS appears during bootup, press Ctrl-F to enter the FastBuild setup to select from menu settings.

Introduction to RAID

RAID (Redundant Array of Independent Disks) allows multiple hard drives to be combined together into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such. The RAID software and/or controller handle all of the individual drives on its own. The benefits of a RAID can include:

- Higher data transfer rates for increased server performance
- Increased overall storage capacity for a single drive designation (such as, C, D, E, etc.)
- Data redundancy/fault tolerance for ensuring continuous system operation in the event of a hard drive failure

Different types of logical drives use different organizational models and have varying benefits. Also see Choosing RAID Level on page 39. The following outline breaks down the properties for each type of RAID logical drive:

RAID 0 – Stripe

When a logical drive is striped, the read and write blocks of data are interleaved between the sectors of multiple disk drives. Performance is increased, since the workload is balanced between drives or “members” that form the logical drive. Identical drives are recommended for performance as well as data storage efficiency. The logical drive's data capacity is equal to the number of drive members multiplied by the smallest logical drive member's capacity.

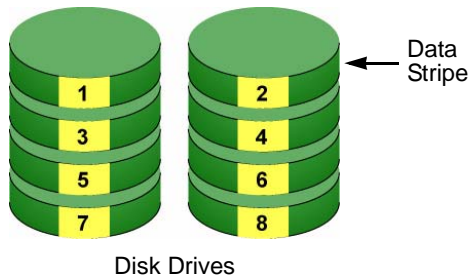


Figure 1. RAID 0 Stripe interleaves data across multiple drives

For example, one 100GB and three 120GB drives will form a 400GB (4 x 100GB) logical drive instead of 460 GB.

RAID 0 logical drives on the FastTrak SX4100 consist of one or more disk drives.

RAID 1 – Mirror

When a logical drive is mirrored, identical data is written to a pair of disk drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data will be accessed first.

With RAID 1, if one disk drive fails or has errors, the other mirrored disk drive continues to function. This is called Fault Tolerance. Moreover, if a spare disk drive is present, the spare drive will be used as the replacement drive and data will begin to be mirrored to it from the remaining good drive.

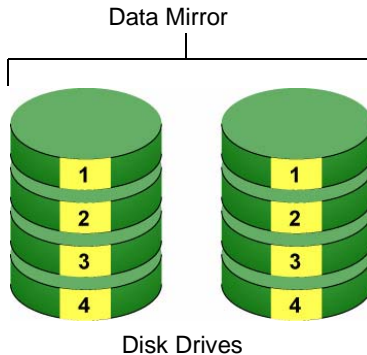


Figure 2. RAID 1 Mirrors identical data to two drives

Due to the data redundancy of mirroring, the capacity of the logical drive is only the size of the smallest disk drive. For example, two 100GB disk drives which have a combined capacity of 200GB instead would have 100GB of usable storage when set up in a mirrored logical drive. Similar to RAID 0 striping, if disk drives of different capacities are used, there will also be unused capacity on the larger drive.

RAID 1 logical drives on the FastTrak SX4100 consist of two disk drives.

When two drives do not offer sufficient data capacity, consider a RAID 10 logical drive, see page 37.

RAID 5 – Block Striping with Distributed Parity

RAID level 5 organizes data across the disk drives of the logical drive, and distributes parity information across the disk drives along with the data blocks. This organization allows increased performance by accessing multiple disk drives simultaneously for each operation, as well as fault tolerance by providing parity data. In the event of a disk drive failure, data can be re-calculated by the RAID system based on the remaining data and the parity information.

The adjustable block size of the RAID 5 logical drive allows for performance tuning based on the typical I/O request sizes for your system. The block size must be set at the time the logical drive is created and cannot be adjusted dynamically.

RAID 5 makes efficient use of hard drives and is the most versatile RAID Level. It works well for file, database, application and web servers.

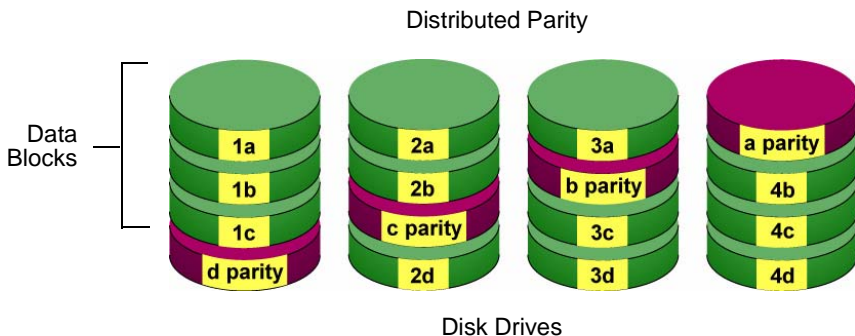


Figure 3. RAID 5 Stripes all drives with data and parity information

The capacity of a RAID 5 logical drive is the smallest disk drive size multiplied by the number of disk drives, less one. Hence, a RAID 5 logical drive with four 100 GB disk drives will have a capacity of 300 GB. A logical drive with two 120 GB disk drives and one 100 GB disk drive will have a capacity of 200 GB.

RAID 5 logical drives on the FastTrak SX4100 consist of 3 or 4 disk drives.

RAID 10 – Mirror / Stripe

Mirror/Stripe combines both of the RAID 0 and RAID 1 logical drive types. It can increase performance by reading and writing data in parallel while protecting data with duplication. At least four disk drives are needed for RAID 10 to be installed. With a four-disk-drive logical drive, one drive pair is mirrored together then striped over a second drive pair.

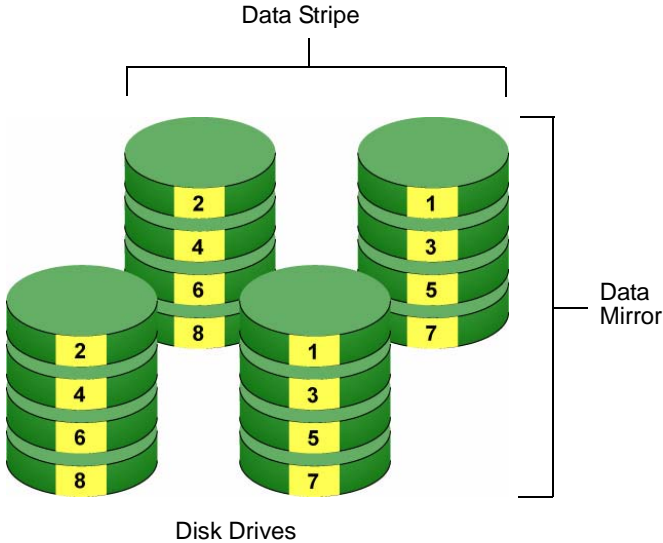


Figure 4. RAID 10 takes a data mirror on one drive pair and stripes it over two drive pairs

The data capacity is similar to a RAID 1 logical drive, with half of the total storage capacity dedicated for redundancy. An added plus for using RAID 10 is that, in many situations, such a logical drive offers double fault tolerance. Double fault tolerance may allow your logical drive to continue to operate depending on which two disk drives fail.

RAID 10 logical drives on the FastTrak SX4100 consist of 4 disk drives.

About Dual Data Redundancy

One unique (though rarely occurring) feature of RAID 10 is dual fault tolerance. In some cases, two disk drives can fail simultaneously and still maintain the integrity of data. There are six combinations in which two drives can fail. The FastTrak SX4100 card protects your data in four of those cases. Assume the drives are configured as follows:

- CH indicates channels on the FastTrak Controller card.
- A/B indicates which striped pair the drive belongs to.
- 1/2 indicates which part of stripe data.

CH1	CH2	CH3	CH4
Drive A1	Drive A2	Drive B1	Drive B2

Under RAID 10, the logical drive maintains data integrity if any 1, 2 combination survives.

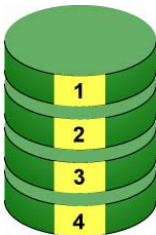
Event	Failed Drives	Logical Drive Status	Why?
1	A1/A2	Functional	B1/B2 retain integrity
2	B1/B2	Functional	A1/A2 retain integrity
3	A1/B2	Functional	B1/A2 retain integrity
4	B1/A2	Functional	A1/B2 retain integrity
5	A1/B1	Offline	B2/A2 contain only half the data
6	B2/A2	Offline	A1/B1 contain only half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

JBOD – Single Drive

An alternative to RAID, JBOD capacity is equal to the size of the disk drive itself.

JBOD appears in the User Interface as one individual drive.

There are no performance or fault-tolerance features. When one disk fails, all data on that disk is lost. The other disks are unaffected.



Disk Drive

Choosing a RAID Level

There are several issues to consider when choosing the RAID Level for your FastTrak logical drive. The following discussion summarizes some advantages, disadvantages and applications for each choice.

RAID 0

Advantages	Disadvantages
Implements a striped disk logical drive, the data is broken down into blocks and each block is written to a separate disk drive I/O performance is greatly improved by spreading the I/O load across many channels and drives No parity calculation overhead is involved	Not a true RAID because it is not fault-tolerant The failure of just one drive will result in all data in an logical drive being lost Should not be used in mission critical environments

Recommended Applications for RAID 0

- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1

Advantages	Disadvantages
Simplest RAID storage subsystem design Can increase read performance by processing data requests in parallel since the same data resides on two different drives	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 1

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 5

Advantages	Disadvantages
High Read data transaction rate Medium Write data transaction rate Good aggregate transfer rate	Disk failure has a medium impact on throughput

Recommended Applications for RAID 5

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers
- Most versatile RAID level

RAID 10

Advantages	Disadvantages
Implemented as a mirrored logical drive whose segments are RAID 0 logical drives High I/O rates are achieved thanks to multiple stripe segments	Very high disk overhead - uses only 50% of total capacity

Recommended Applications for RAID 10

- Imaging applications
- Database servers
- General fileserver

JBOD

Advantages	Disadvantages
Enables you to manage a large number of disk drives from a single controller The failure of one drive has no effect upon the data in other disk drives	An alternative to RAID without any RAID advantages Should not be used in mission critical environments

Recommended Applications for JBOD

- Any application requiring multiple disk drives but where read/write speed or fault-tolerance are not important
- Applications where low-cost operation critical

Other Logical Drive Features

Stripe Block Size

The choices are 32K, 64K and 128K. 64K is the default. This selection will directly affect performance. There are two issues to consider when selecting the stripe block size.

- Choose a stripe block size equal to or smaller than the smallest cache buffer found on any disk drive in your logical drive. A larger value slows the logical drive down because disk drives with smaller cache buffers need more time for multiple accesses to fill their buffers.

- If your data retrieval consists of fixed-size data blocks, such as some database and video applications, choose that data block size as your stripe block size.

Generally speaking, email, POS and web servers prefer smaller stripe block sizes. Video and database applications prefer larger stripe block sizes.

Gigabyte Boundary

This feature is for fault tolerant logical drives (RAID 1, 5 and 10). When a disk drive has failed and the user cannot replace the drive with the same capacity or larger, this feature permits you to install a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drives. This can be helpful in the event that a drive fails and an exact replacement model is no longer available.

You must set the Gigabyte Boundary feature to ON when you create your logical drive. Gigabyte Boundary rounds the capacity of all disk drives to the common whole GB drive size. For example, with the Gigabyte Boundary feature enabled, the remaining working drives can be 80.5 GB and the replacement drive can be 80.3, since all are rounded down to 80GB. Note that the rounding function will cause you to lose a small amount of capacity from each disk drive.

Initialization (Fast Init)

This function erases the Master Boot Record (MBR) in all of the selected disk drives. Use this function when one or more disk drives has been used in a previous logical drive.

Hot Spare Drive

Any extra drive that is not assigned to an logical drive is designated *Free* in the View Drive Assignments screen (see below). In order for a free drive to serve as a hot spare drive, you must designate the free drive as a spare using the WebPAM software.

FastBuild (tm) Utility (c) 2004-2005 Promise Technology, Inc.

[View Drives Assignments]

Channel:ID	Drive Model	Capacity (MB)	Assignment
1:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-1
2:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-2
3:Mas	ST380023AS	80027	
	Extent 1	79960	LD 1-3
4:Mas	ST380023AS	80027	
	Extent 1	79960	Free

[Keys Available]

[F] Up [J] Down [PgDn] Next Page [PgUp] Previous Page [ESC] Exit

Spare Drives are automatically added to an logical drive once a disk member of the logical drive has been detected as *failed*. To restore fault tolerance as quickly as possible, the FastTrak Controller performs 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 removed and a new drive added in its place to function as the spare drive.

Cache Settings

Sets the FastTrak controller's cache mode for each logical drive. The choices are **WriteBack** and **WriteThru** (write through). A write-back cache holds data after an I/O operation and tells the controller the data has been written. The data is written as soon as the disk drive is no longer busy.

This action increases availability of the logical drive. If the power fails before the data is written to the disk drive, the data will be lost.

The alternative is a write-through cache policy, which reports that the data has been written to the disk only when it actually has.

Logical Drive Expansion

To *expand* a logical drive is to increase the number of disk drives.

The FastTrak SX4100 RAID Controller card supports logical drive expansion. However, you must use the WebPAM software to access this function. WebPAM ships with the FastTrak SX4100 card on the software CD.

Expansion takes place on an existing Functional logical drive without disturbing the existing data. While the logical drive is expanding, you can access the data as before. When expansion is complete, your logical drive will have a larger capacity.

Level	Current Number of Drives	Possible Number of Drives
RAID 5	3	4
RAID 0	3	4
	2	3 or 4
	1	2, 3 or 4

RAID Level Migration

To *migrate* a logical drive is to do one or both of the following:

- Change its RAID level
- Increase the number of disk drives (sometimes called Expansion)

The FastTrak SX4100 RAID Controller card supports RAID Level Migration. However, you must use the WebPAM software to access this function. WebPAM ships with the FastTrak SX4100 card on the software CD.

Migration takes place on an existing Functional logical drive without disturbing the existing data. While the logical drive is migrating, you can access the data as before. When migration is complete, your logical drive will have a different RAID level and/or a larger capacity.

Different types of logical drives use different organizational models and have varying benefits. The following outline breaks down the properties for each type of RAID supported by Promise products.

From	To	Increase		Redundancy	
		Capacity	Performance	Add	Lose
RAID 10	RAID 5	•			
	RAID 0	•	•		•
RAID 5	RAID 10		•		
	RAID 0	•	•		•
RAID 1	RAID 10	•	•		
	RAID 5	•	•		
	RAID 0	•	•		•
RAID 0	RAID 10	•	•	•	

From	To	Increase		Redundancy	
		Capacity	Performance	Add	Lose
	RAID 5	•	•	•	
	RAID 1			•	
* Increases the existing redundancy					



Important

- The Target logical drive may require more disk drives than the Source logical drive
- If the Target logical drive requires an EVEN number of disk drives but the Source logical drive has an ODD number, ADD a disk drive as part of the migration process
- You cannot reduce the number of disk drives in your logical drive, even if the Target logical drive requires fewer disk drives than the Source logical drive
- RAID 1 (mirror) works with two disk drives only
- You cannot migrate a logical drive when it is Critical or performing activities such as Synchronizing, Rebuilding and PDM
- RAID level migration is not possible to or from JBOD

Ranges of Disk Logical Drive Expansion

There are limitations to how large you can expand a logical drive, depending on the size of your current logical drive.

The current SCSI and Fibre Channel HBA cards and PC Operating Systems support a 10-byte LBA format. This means that a logical drive can have up to 4 billion address blocks or sectors.

Multiply the number of blocks by the sector size to find the capacity of a logical drive:

4,000,000,000 blocks x 512 bytes per sector = 2,048,000,000,000 bytes of data for a 2TB drive.

Note that you cannot change the size of the sectors nor can you increase the number of address blocks above 4 billion.

As a result, there are range limits imposed upon logical drive expansion as shown in the table above. For example:

- You can expand a 2.5 TB logical drive up to 4 TB
- You can only expand a 1.9 TB logical drive up to 2 TB

See the table below.

Current LD Size	Maximum LD Expansion Size	Sector Size
8 to 16 TB	16 TB	4096 bytes
4 to 8 TB	8 TB	2048 bytes
2 to 4 TB	4 TB	1024 bytes
0 to 2 TB	2 TB	512 bytes

You can direct WebPAM PRO or the CLU to expand a logical drive beyond the maximum expansion size. However, when expansion is finished, your logical drive will be the maximum size listed in the table.

If you require a logical drive larger than the maximum expansion size:

1. Backup the data from the current logical drive.
2. Delete the current logical drive.
3. Create a new logical drive with the desired capacity.
4. Restore the data to the new logical drive.



Caution

Before you begin logical drive Expansion or RAID Level Migration, always back up your important data.

Chapter 6: Troubleshooting & Tips

- Motherboard Issues, below
 - System CMOS Issues, page 48
 - Drive-Related Errors, page 48
 - Operating System-Related Issues, page 49
 - Performance Tips, page 50
-

This section is used to assist with troubleshooting conflicts and FastTrak SX4100 installation problems. Also refer to the README.TXT file on the FastTrak driver and utility diskette for more recent information as well as the PromiseOnline services listed in Chapter 7.

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 Promise card 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.
- Excluding an IRQ from being used by a PCI slot – If you have an ISA card that is using an IRQ, change the setting for this particular IRQ from Available to Used by ISA card so that the motherboard will not assign this IRQ to a PCI slot.

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

System locks up during boot up or when Windows starts

There may be a possible IRQ conflict with an ISA card. Identify what IRQs are used by ISA cards, enter the Motherboard PCI Setup, and reserve the IRQ for use with ISA. PCI slots cannot share IRQs with ISA cards.

Miscellaneous problems such as:

- FastTrak BIOS does not appear during boot
- FastTrak driver does not load
- Slow data transfer rates

Move the FastTrak card to a different PCI slot.

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 FastTrak card

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 FastTrak card

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 Logical Drive Status Error reported during boot

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

Powering the system off and on once 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 a logical drive option in the WebPAM software as detailed in the *WebPAM User Manual*.

Drive cannot be formed into an logical drive

Disk drives must be free of media defects to be added into a logical drive. Promise recommends using new identical disk drives for each logical drive. 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 FastTrak 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 logical drive exceeds 64GB (Windows 2000)

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 will now recognize the total capacity of your logical drive.

Unable to Partition or Format Logical Drive

The MBR of one of the drives has become corrupt. Delete the existing logical drive, then create a new logical drive with the Fast Init feature set to ON.

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

The Operating System no longer boots after creating a Mirrored Array using your existing boot drive using Windows 2000/XP/2003 Server

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 2000, XP and 2003 Server, 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 installation of Windows

You did not press the F6 key at the appropriate time. Reboot the system, and press the F6 key when the message *Press F6 if you need to install third party SCSI or RAID driver?* appears.

“No Hard Drives Found” message appears during CD-ROM installation of Windows

You did not press the F6 key at the appropriate time. Reboot the system, and press the F6 key when the message *Press F6 if you need to install third party SCSI or RAID driver* appears.

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 a FastTrak array 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.

Re-Configure PCI Latency Setting

The PCI Latency setting appears in some Motherboard BIOS. The setting governs how much time is allocated to service each PCI slot. Promise recommends a value of 64. An optimal value will vary from system to system.

Chapter 7: Support

- Frequently Asked Questions, below
 - Contact Technical Support, page 55
 - Limited Warranty, page 57
 - Return Product for Repair, page 59
-

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)

What kind of HDDs can I use for a FastTrak SX4100 logical drive?

You can use any Serial ATA hard drive(s) to create arrays on the FastTrak SX Series. Use matching drives for multiple-drive arrays to maximize capacity usage as well as performance.

What is the maximum disk drive storage capacity of FastTrak SX4100?

FastTrak SX4100 supports up to 1.5 TB (four 400 GB disk drives).

Will ACPI work with HDDs on the FastTrak SX4100?

Yes. The FastTrak Controller supports ACPI S1, S3 and S4 standby modes.

Can I use ATAPI devices on the FastTrak SX4100?

No. The FastTrak Controller does not support ATAPI devices.

Will the FastTrak SX4100 work with 66MHz PCI bus speed?

Yes. FastTrak SX4100 supports a 66MHz PCI bus as well as a 33MHz bus.

How can I change the resources that the FastTrak uses?

The FastTrak SX4100 is fully PnP. This means all the resources that it uses are given to it by the PnP BIOS on the motherboard.

The FastTrak Controller supports IRQ sharing, but this feature only works when ALL the concerned devices support it. 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 FastTrak Controller card to a different PCI slot.

How do the FastTrak SX4100 RAID Controllers provide storage and data protection with their arrays?

The FastTrak SX4100 implements four RAID levels plus JBOD as follows:

- RAID 0 – Stripe
- RAID 1 – Mirror
- RAID 5 – Block Striping with Distributed Parity
- RAID 10 – Mirroring / Striping
- JBOD – Single disk drives

See “Introduction to RAID” on page 33 for more information.

Drive Issues

Can I add a drive to a FastTrak SX4100 logical drive via hot-swap and dynamically adjust the array size/configuration?

Yes. The FastTrak Controller supports online logical drive expansion and migration. You must use the WebPAM software to expand or migrate an existing logical drive.

Do the HDDs on the FastTrak SX4100 have to be the same size?

The disk drives that you use with the FastTrak SX4100 do not have to be the same size. If the sizes differ, the FastTrak Controller will truncate the large drive so the capacities match. The resulting difference in drive space is unusable, so avoid using disk drives of significantly different capacities.

I already have an array on an older FastTrak controller. Can I move that array to my new FastTrak SX4100 controller?

Yes. All FastTrak controllers read the arrays the same way and can be moved from one controller to another.

Can I take a drive used in a FastTrak SX4100 logical drive and access it directly with a different controller, such as the one integrated on the motherboard?

Yes, but only under certain configurations. First, the other controller must address the drives as LBA, not CHS.

Second, only the following configurations allow the drive(s) to be accessed individually on another controller:

- Single-drive RAID 0 (stripe)
- One drive from a RAID 1 (mirror) logical drive
- JBOD

Other array configurations will not work for this purpose.

If I have a problem with one of the drives on the FastTrak SX4100, how can I low-level format it to correct the problem?

Do NOT do this! Low-level formatting hard disk drives is not only unnecessary but it 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 FastTrak Controller.

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

No! Disk management software will only complicate things. The logical drive 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. Also see "Ranges of Disk Logical Drive Expansion" on page 45.

What system BIOS setup settings do I use for the drives on the FastTrak SX4100 controller?

A BIOS setting is required only if you want to boot your system from the logical drive on the FastTrak controller. After your logical drive is created, partitioned and formatted, make the change in your BIOS boot order setting.

How do I partition/format my FastTrak SX4100 RAID logical drive?

The FastTrak Controller represents the logical drive as a single disk drive to your system. Therefore, anything that you can do to a single disk drive you can do to a FastTrak logical drive.

For example, you should use the FDISK and FORMAT utilities to partition and format the logical drive. You can format the logical drive with any file system you wish.

Installation Issues (Capacity, Booting)

How can I change the system boot sequence in order to boot from the FastTrak SX4100 logical drive?

The boot sequence is controlled by the system BIOS. As far as the system BIOS is concerned, the FastTrak Controller and defined logical drives 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/PCI-X slot priority. PCI slot #1 will be first, slot #2 second, etc. Put the FastTrak Controller in the PCI slot where it will be accessed ahead of other SCSI controllers if you want to boot from the logical drive.

How can I change the boot sequence between a PCI SCSI card and the FastTrak SX Series RAID logical drive?

Since all PCI devices are PnP, it is difficult to determine which device is addressed first. Most 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

Why can't I see the drives on the FastTrak SX4100 under FDISK?

You have not created a logical drive yet. Without a logical drive, the system will not recognize the disk drives attached to the FastTrak Controller.

How can I obtain the latest FastTrak drivers?

Download the latest drivers from the Promise Technology website at **www.promise.com**. Click on Support, then on Download.

Contact Technical Support

Promise Technical Support provides several support options for Promise users to access information and updates. We encourage you to use one of our electronic services, which provide product information updates for the most efficient service and support.

If you decide to contact us, please have the following information available:

- Product model and serial number
- BIOS and driver version numbers
- A description of the problem / situation
- System configuration information, including: motherboard and CPU type, hard drive model(s), SATA/ATA/ATAPI drives & devices, and other controllers.

Technical Support Services

Promise Online™ Web Site	http://www.promise.com (technical documents, drivers, utilities, etc.)
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United States

E-mail Support	support@promise.com
Fax Technical Support	(408) 228-1097 Attention: Technical Support
Phone Technical Support	(408) 228-1400 option 4 8:00am-5:00pm M-F Pacific Time
If you wish to write us for support:	Promise Technology, Inc. Attn: Technical Support 580 Cottonwood Drive Milpitas, CA 95035, USA

Europe, Africa, Middle East

E-mail Support	support@promise-emea.com
Fax Technical Support	+31 (0) 40 256 9463 Attention: Technical Support
Phone Technical Support	+31 (0) 40 235 2600 8:30am-5:00pm M-F The Netherlands Time
If you wish to write us for support:	Promise Technology Europe B.V. Attn: Technical Support Luchthavenweg 81-125 5657 EA Eindhoven, The Netherlands

Germany

E-mail Support	support-de@promise-emea.com
Fax Technical Support	+49 (0) 2 31 56 76 48 - 29 Attention: Technical Support
Phone Technical Support	+49 (0) 2 31 56 76 48 - 0 8:30am-5:00pm M-F Germany Time
If you wish to write us for support:	Promise Technology Germany Attn: Technical Support Europaplatz 9 44269 Dortmund, Germany

Taiwan

E-mail Support	support@promise.com.tw
Fax Technical Support	+886 3 578 2390 Attention: Technical Support
Phone Technical Support	+886 3 578 2395 (ext. 8870) 9:00am-5:30pm M-F Taiwan Time
If you wish to write us for support:	Promise Technology, Inc. Attn: Technical Support 2F, No. 30, Industry E. Rd. IX Science-based Industrial Park Hsinchu, Taiwan, R.O.C.

China

E-mail Support	support-china@promise.com
Fax Technical Support	+86-10-8857-8015 Attention: Technical Support
Phone Technical Support	+86-10-8857-8085/8095 9:00am-6:00pm M-F China Time
If you wish to write us for support:	Promise Technology China Attn: Technical Support Room 1205, Tower 3 Webok Time Center, No.17 South Zhong Guan Cun Street Hai Dian District, Beijing 100081, China

Limited Warranty

Promise Technology, Inc. ("Promise") warrants that for three (3) years from the time of the delivery of the product to the original end user:

- a) the product will conform to Promise's specifications;
- b) the product will be free from defects in material and workmanship under normal use and service.

This warranty:

- a) applies only to products which are new and in cartons on the date of purchase;
- b) is not transferable;
- c) is valid only when accompanied by a copy of the original purchase invoice.
- d) Is not valid on spare parts, fans, and power supplies

This warranty shall not apply to defects resulting from:

- a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;
- b) operation outside the environmental specifications for the product;
- c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a Promise or a Promise-authorized service center.

Disclaimer of other warranties

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, Promise DISCLAIMS any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. Promise makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

Promise DOES NOT WARRANT that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

Promise's sole responsibility with respect to any product is to do one of the following:

- a) replace the product with a conforming unit of the same or superior product;
- b) repair the product.

Promise shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether Promise has been advised of the possibility of such damages. Promise is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the State of California.

Your Responsibilities

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. Promise is not liable for any damage to equipment or data loss resulting from the use of any product.

Return Product For Repair

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support Staff through one of our Technical Services, making sure to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician will assist you in determining whether the product requires repair. If the product needs repair, the Technical Support Department will issue an RMA (Return Merchandise Authorization) number.



Important

Obtain an RMA number from Technical Support *before* you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return **ONLY** the specific product covered by the warranty (do not ship cables, manuals, diskettes, etc.), with a copy of your proof of purchase to:

USA and Canada:	Promise Technology, Inc. Customer Service Dept. Attn.: RMA # _____ 47654 Kato Road Fremont, CA 94538
Other Countries:	Return the product to your dealer or retailer. Contact them for instructions before shipping the product.

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem(s)
- Write an attention line on the box with the RMA number
- Include a copy of proof of purchase

You are responsible for the cost of insurance and shipment of the product to Promise. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned product(s), Promise may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit will be under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

Promise will pay for standard return shipping charges only. You will be required to pay for any additional shipping options (such as express shipping).