Chapter 5

Understanding FastTrak Disk Array Concepts

Disk Array Adapter

The FastTrak is a high performance Ultra ATA/EIDE RAID host adapter that features parallel operation and an onboard BIOS. The two channels on the FastTrak support parallel operation that allows for overlapped I/O under multi-tasking operating systems and sharing workload between multiple drives. Two additional channels are supported by adding a second FastTrak in the system for a total of four channels.

Adapter BIOS

The FastTrak adapter has a BIOS 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. FastTrak can support drives and disk arrays with capacities exceeding 8.4 GB using Extended Interrupt13 support. From the system BIOS, users can press <F2> to enter the FastBuild™ setup to select from menu settings.

FastBuild™ Auto Menu Setup

This setup utility is used to build and manage FastTrak disk arrays. The utility is menu driven and features the <F1> Auto Setup 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 the Chapter 4 that deals with the functional descriptions.

Reserved 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 reserved 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 swapped to different FastTrak connectors or adapters in the system without reconfiguring or rebuilding.

Disk Array Terms

Disk Array Description

A Disk Array is formed in a group of 2 or more disk drives which appear to be a single drive. The advantage is to have better performance and/or fault tolerance. Better performance is accomplished by sharing the workload in parallel between multiple physical drives. Fault tolerance is achieved through data redundancy - when one drive fails or has a sector failure, a mirrored copy of the data can be found on another drive.

For optimal results, select identical EIDE 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 is coded in their "reserved sector" with configuration information that identifies the drive as a member.

Disk Array Types

For most installations, the FastBuild™ setup "<F1> Auto Setup" option will configure your system.

There are four Disk Array types that fall into three categories can be installed on the FastTrak adapter. Striping is in the Performance category while Mirroring, Striping/Mirroring are in the Fault Tolerance category, and Spanning is in the Capacity category.

The Disk Arrays in the Performance and Fault Tolerance categories conform with the **R**edundant **A**rray of **I**ndependent **D**isks technology, or RAID. The RAID levels supported are 0, 1, and 0/1.

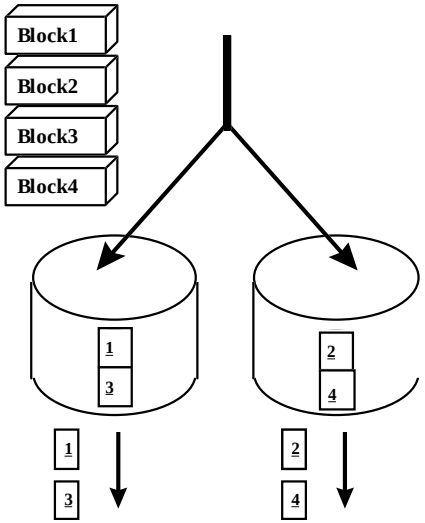
	Read / Write Performance	Capacity used for Redundancy	Number of Drives
Striping (Raid 0)	Best / Best	---	2 or more
Mirroring (Raid 1)	HI / Normal	50% minimum	Even Number
Striping/Mirroring (Raid 0/1)	Best / HI	50% minimum	4 or 8*
Spanning	Normal / Normal	---	2 or more

*with two FastTrak cards

All disk members in a formed disk array are recognized as a single physical drive to the system.

Supported Disk Array Types

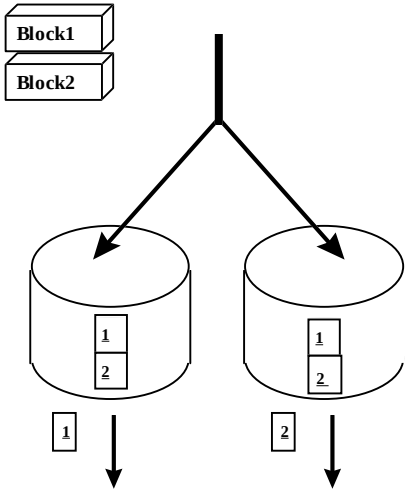
Striping (RAID 0) - reads and writes sectors of data interleaved between multiple drives. When any disk member fails, it affects the entire array. Performance is better than a single drive since the workload is balanced between the array members. This array type is for high performance systems. Identical 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 1GB and three 1.2GB drives will form a 4GB (4 x 1GB) disk array.



Stripe Size - a value can be set from 1KB to 1024KB sector size. The size can directly affect performance. Smaller sizes are better for random disk access while larger sizes are better for sequential access. In the FastBuild BIOS, the "Desktop" default is 8KB while "Server" and "A/V Editing" are 64KB.

Mirroring (RAID 1) - writes duplicate data onto a pair of drives while reads can be performed in parallel sharing the workload. IDE RAID 0 is fault tolerant when each drive of the mirrored pair is installed on separate connectors - follow the "Drive Setup By Connector" chart in Chapter 3.

The reads are performed with elevator sorting and load balancing which means that the workload will be distributed in an efficient manner. Whichever drive is not busy and is positioned closer to the data will be accessed.



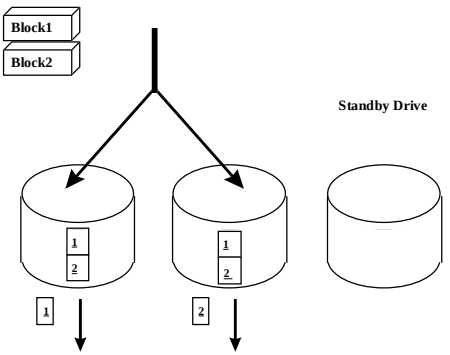
If one drive suffers a mechanical failure (e.g. spindle failure) or does not respond, the mirrored drive will continue to function. This is called ***Fault Tolerance***.

If one drive has a physical sector error, the mirrored drive will continue to function. If a ***Spare Drive*** is installed, it will be used as the new mirror for the good drive. On the next reboot, the FastBuild™ utility will display an error in the array and recommend to replace the failed drive. See Chapter 4 for a functional description. **NOTE:** Drives in a mirrored array cannot contain *any* physical sector errors.

Due to the redundancy, the drive capacity of the array is half the total drive capacity. For example, two 1GB drives that have an added capacity of 2GB would have 1GB of usable storage. With drives of different capacities, there may be unused capacity on the larger drive.

Spare Drive - when an extra "hot spare" drive is attached to the FastTrak, it will be put on standby. This drive will be activated to replace a failed drive in a mirrored array. A rebuild is performed automatically in the background to mirror the good drive onto 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/Mirror (RAID 0/1) - is a combination of both above array types. It can increase performance by reading and writing data in parallel while protecting data with duplication. A minimum of four drives need to be installed. With a four drive Disk Array, two drives are striped, and two drives mirror each of the striped drives. The data capacity is similar to a standard Mirroring array with half of total capacity dedicated for redundancy.



Capacity (Spanning) - disk array capacity is equal to the sum of all drives even when drives are of different capacities. Spanning stores data onto a drive until its filled and then proceeds to store files onto the next drive in the array. There are no performance or fault tolerance array features in this array. When any disk member fails it affects the entire array.