RAID drive in level 0 or striping. With this configuration the drives are combined into one large fast drive that splits the data between the drives.

RAID 1 or mirroring configuration. The data is saved twice on two drives. If one side fails, the other can rebuild a new drive.

Illustrations: Promise Technologies

RAID drives can be in an external box, or inside the computer that it is attached to. This is a typical setup with the RAID inside the computer. An extra cooling fan was installed to keep the heat down.

Promise Technologies hot swap drive holders for RAID with PCI RAID computer board that can run up to 4 hard drives as one large drive or two mirrored drives. The unit is installed into the computer like a regular hard drive, except that it can be pulled out of the system while the computer is on.

RAID:
Storage Solution for Imaging Labs

One of the most frustrating aspects of running a digital lab is finding a reliable storage system. You think you have solved the problem—right up until it fails you! Your heart is in a constant state of flutter, fearing that blue screen will come up on bootup, or while saving that huge digital job. The message you never want to hear, proudly informs you that your reliable hard drive has failed. Aghh!!

Traditional Seeks
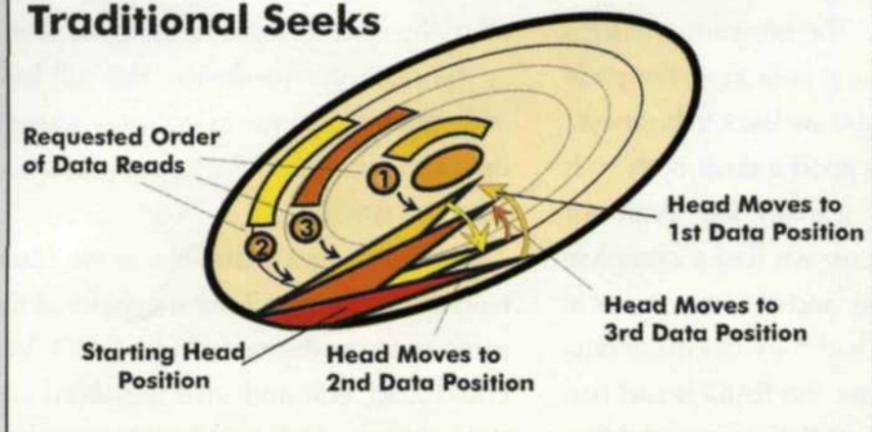
The traditional method for a hard drive to look for data. It moves back and forth as it picks up data in the order it was requested.

Tagged Command Queuing With Elevator Seek
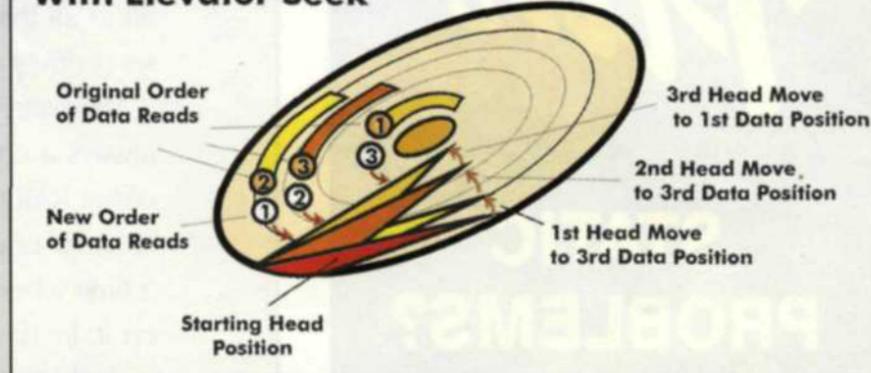
The more efficient method of retreiving data is to tag the data needed and pick it up as the head moves across the drive.

Load Balancing
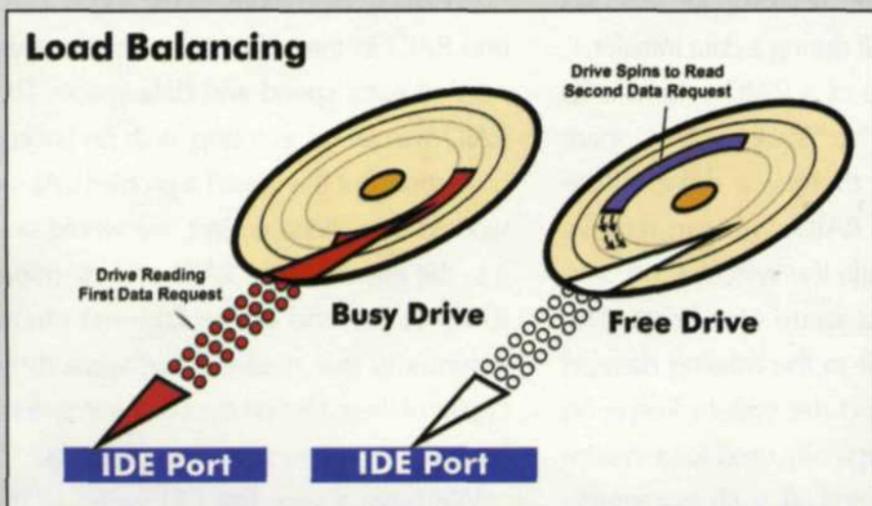
The advantage of RAID is that one drive can be reading data, while the second is looking for the next data off the mirrored drive.
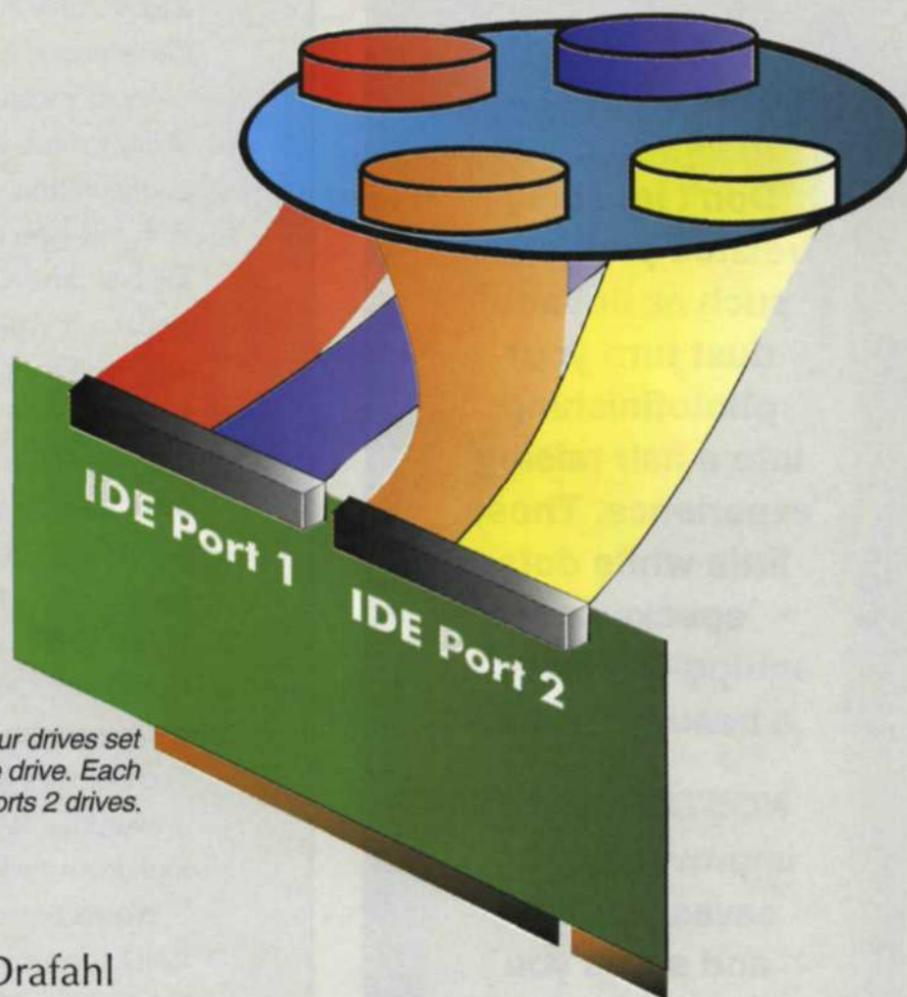
Illustration of four drives set up as a single drive. Each IDE port supports 2 drives.

Jack & Sue Drafahl

DATA LOSS FOR digital labs can be expensive, time consuming and unpredictable. Equipment manufacturers have all kinds of expensive backup solutions, but even they fail. We might sound a little paranoid, but we've learned the hard way. We lost two days' worth of jobs because a main data disk failed and we found out the backup file was corrupted, even though it verified as good.

So what is the solution? We're aware that many labs use tape backup, and most are very happy with it. The problem is that you can still lose data between scheduled backups. A video producer friend told us that he was using a RAID (Redundant Array of Independent Drives) device to store digital video files. He explained that a RAID was a group of identical drives clustered together to make one hard drive. He needed large, fast data storage on a single drive that wouldn't cost him an arm and a leg.

When RAID drives first came out, they were mainly configured with SCSI drives because they offered larger capacity and were faster than IDE drives. The problem was the exorbitant costs involved in buying four to eight drives.

Recently however, the less expensive IDE drives have increased their capacity to more than 30 gigs per drive, and can read data as fast as 66 megabytes per second. If you cluster four drives together with a RAID board, the speed increases 2–3 times as the data is spread over all four drives. This method of setting up a RAID is called "striping" and is best suited for speed.

We know you're going to say that if one of those drives fail, you stand to lose a lot of data. This is very true, and the more paranoid digital editors use a RAID setup called "mirroring". With this system you have four drives on a board, and the data is split between two sets of two drives.

In other words, every time you save a file, it saves it twice, to two sets of drives, providing instantaneous backup. If any one of the four drives fail, the firmware program on the RAID board asks if you want to replace the drive or rebuild the

one that crashed. The program will then fill in all the missing data from the good set of drives and you are back in business.

No matter how good a drive is, there is always a chance it might fail. With our oldest RAID system, we had a complete failure of one drive, and of course it was at a time when we had a lot of critical data on it. In 10 minutes the RAID board had picked up data from the two good drives and rebuilt the bad drive. As it turned out, a loose cable inside the computer box had disconnected itself during a data transfer.

Another feature of a RAID system is its ability to have a "hot" swap or "hot" spare configuration. If there is a drive failure with this type of RAID, you can remove the bad drive while the system is on, and replace it with a spare Hot drive. The array will then fill in the missing data on the new drive and the system keeps on running. This is typically used for a system that cannot be turned off, such as a server.

The most painless way to introduce yourself to the RAID system is with a bare bones system of one board and two or four drives. One of the most economical systems is from a company called Promise Technologies (www.promise.com) where a two-drive RAID is less than $450 and four drives are less than $800.

We recommend setting up your first RAID system in the mirror configuration. This is done at the bootup of the computer using the firmware program on the RAID board. The computer sees the array as one drive and assigns it one drive letter, and allows you to format it as though it were a single drive.

We have a small digital lab with only 5 workstations. For the longest time each was in a stand-alone configuration, meaning each computer had a full editing system, with all the programs, drives and CD burners. Two stations were for photo editing, a third was for presentation programs, another for video, and the last was our interface to the Internet.

When we put in the first RAID, we wanted to make the best use of it. The solution was to add an Ethernet system and connect all of the systems together using the RAID as the main storage device. We still kept individual programs on each computer's drives as we found the systems worked faster this way.

The system was incredible, as we could read or write from all our machines at the same time on the one single RAID. We could load, edit and save files from any work station which saved us vast amounts of time.

We still wanted more, so we added a second RAID in the video computer since we needed extra speed and data space. This RAID was set up as a strip, with no backup protection, but this wasn't a problem. As we worked on a video project, we would save it to the internal stripe RAID and the mirror RAID at the end of the Ethernet chain. Essentially this meant there were three copies of these files on the complete system, which eliminated some of our paranoia.

We have a very fast CD writer in the mirror RAID workstation, and all files eventually end up burned onto CD, verified and eventually removed from the RAID to allow space for more projects. CDs are now less than a buck, which makes them one of the cheapest methods of permanent storage. We generally remove all our files from a RAID and burn them onto CDs once a week. We find that RAID drives get very fragmented, and running the defrag program takes much longer than copying the files onto CD.

If you type in RAID drives in the search engine on the Web, you will find that dozens of companies make RAID drives. We just mentioned one of the most economical and efficient systems There are a lot of other backup systems on the market today that will efficiently keep your systems protected. The reason we like the RAID system is that it is easy to install and maintain, has automatic backup and helps us build confidence in our hard drives once again.   ⌐

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