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Data Storage Technology Makes a Giant Leap Forward

What if you could purchase a disk drive that is faster, has greater data storage capacity, is more reliable, and costs about the same as current hard drives—would you buy it?

Seagate has begun shipping two different computer hard drives that make use of a new recording technology called "Perpendicular Magnetic Re-cording" (PMR). Use of this new technology will have an impact on the entire computer hard drive industry. The first drive that hit the market was the "Momentus 5400.3". This 2.5" format drive is the first hard drive to use the PMR technology. It was a modest beginning for something with this much potential, but the little drive had a data capacity of 160 gigabytes: 33% greater capacity than previously possible, transferred data 15% faster, and used less energy than current technology drives.

Recently, Seagate announced the availability of a hard drive that will have more of an effect on the computer user community. The Seagate Barracuda 750GB, intended for workstations and file servers, has a data capacity of 750 gigabytes. That's a 50% increase in data capacity. Several industry sources claim that this drive has set new performance benchmarks in the areas of sequential read speed (+6%), maximum sustained transfer rate (+8%), 5GB read (+21%), and random read/write operations per second (+19%).

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How does it work?

In current technology, the data bits are stored as microscopic "magnets" around the data track on a hard disk. Depending on the value of the data bit (0 or 1), the poles of the magnetic particle were aligned longitudinally around the data. However, a data bit is not a perfect sphere or cube. The length of the bit from magnetic pole to magnetic pole is greater than any of its other dimensions. Because of this orientation, current technology uses the greatest possible space to store a single data bit. Not so with the new PMR technology. The data bits are oriented in a manner that reduces the physical space requirements to an absolute minimum.

The easiest way to understand how the new technology works is to imagine a tabletop on which pencils have been laid end-to-end to form a large circle. The pencils represent how data bits were oriented in the older hard drive technology. Now, imagine the same tabletop with the pencils standing on end to form a circle of the same size. When the pencils are standing up, a lot more of them that can be fitted into the same size circle. This results in more efficient use of space.

Data transfer speeds also increase as a result of tighter packing of the data and the drive uses less power because it does not require as much current to write the data to the disk. The orientation of magnetic poles of the data bits allows the reliability of reads and writes to improve. All things considered, PMR drives have more storage capacity, use less energy, and are more reliable. There is nothing bad to say about them.

What the future holds…

Most industry articles in print today place the short-term increase in storage capacity at 130% over current hard drives. Other more forward-looking articles peg the ultimate increase in capacity at 400%. That would translate into single hard drives with a capacity of 2 terabytes (1 Terabyte = 1,000 Gigabytes = 1,000,000 Megabytes). That's big.

Can I get one?

Sure. We checked the Internet and found more than a dozen vendors that claim to have these drives in stock. We found two versions of the laptop drive available on the Internet—an 80GB model for $72 and a 160GB model for $186.

It doesn't make economic sense to replace the hard drive just because something better is available, but if you are out of space or the drive in the laptop is failing, replacing it with this PMR drive would be a very good idea.

The 750GB drive comes in a variety of configurations. As an internal hard drive, it can be purchased with IDE or SATA interfaces for $335. As an external drive with USB 2.0 and/or FireWire connections, it can be yours for $500. It's not cheap, but the "cost per gigabyte" of storage is in the range of other hard drives on the market.

We expect that within the next 12-18 months, every new computer sold will contain hard drives that use this new technology.
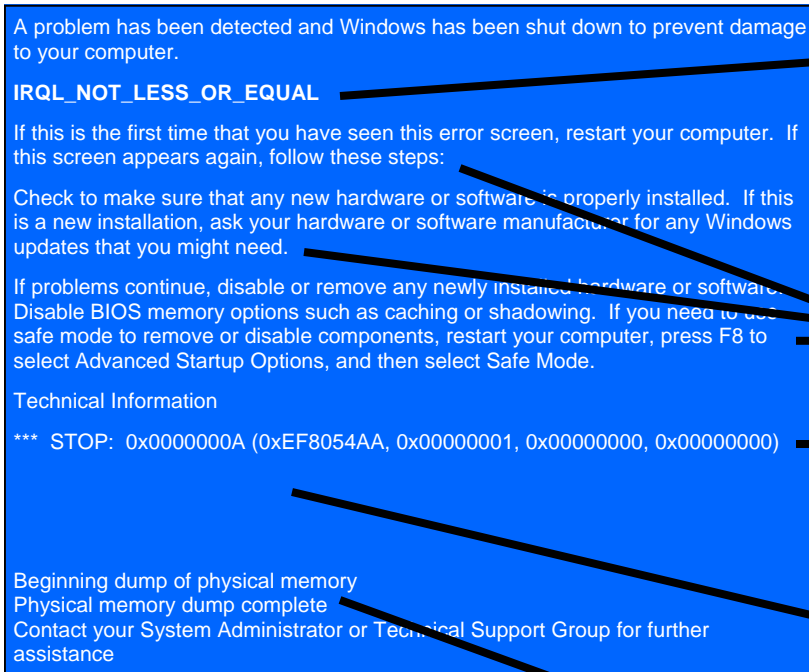
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Dealing With the Blue Screen of Death

Picture this: You have been happily working on your computer and suddenly, life gets very ugly. Instead of the monitor displaying information about the application that you were using, the background of the screen has turned blue and there is a whole bunch of techno-gibberish in white text. It's the Blue Screen of Death (also known as BSoD), and it may be trying to claim your computer.

Like most normal people, your first response is to reboot the computer and try to make the problem go away. Many times it does. But, what if it doesn't? Armed with some basic knowledge of what to look for, even non-technical users can collect the information that will help the tech staff to resolve the problem and return his or her computer to operational status. It's not hard. All of the important information is there.

Anatomy of the Blue Screen of Death

Even though it appears to be a bit intimidating at first, even the most non-technical computer user can find his or her way around the BSoD. The example below was created to demonstrate how easy it is to locate the important information on the screen:

A problem has been detected and Windows has been shut down to prevent damage to your computer.

IRQL_NOT_LESS_OR_EQUAL

If this is the first time that you have seen this error screen, restart your computer. If this screen appears again, follow these steps:

Check to make sure that any new hardware or software is properly installed. If this is a new installation, ask your hardware or software manufacturer for any Windows updates that you might need.

If problems continue, disable or remove any newly installed hardware or software. Disable BIOS memory options such as caching or shadowing. If you need to use safe mode to remove or disable components, restart your computer, press F8 to select Advanced Startup Options, and then select Safe Mode.

Technical Information

*** STOP: 0x0000000A (0xEF8054AA, 0x00000001, 0x00000000, 0x00000000)

Beginning dump of physical memory
Physical memory dump complete
Contact your System Administrator or Technical Support Group for further assistance

The Error. This is the most important piece of information on the screen. On rare occasions, this is the only information needed to solve the problem. Normally, more information is needed. In any case, the error should be recorded exactly as it appears on the screen. Refer to the information on the following pages to help to resolve the error.

Troubleshooting Advice. This information is very general in nature, and occasionally helpful.

The Stop Code. This is the second most important piece of information on the BSoD. This information must also be recorded exactly as it appears on the screen.

File Information. If the BSoD was caused by questionable device drivers, the name(s) of the driver(s) that failed to load or that malfunctioned would be listed here. Be sure to copy this information exactly as it appears.

The Memory Dump. When Windows crashes, it writes out information about what it was doing at the time into a file stored on the hard drive. When difficult problems occur, the memory dump may be the only means to figure out what happened.

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Figuring it all out…

Listed below are the most common problems that can cause a Blue Screen of Death. To most non-technical computer users, these errors may seem impossibly difficult to comprehend, but don't worry. The important issue is faithfully recording the information about the error so that the tech staff can solve the problem. The information provided about the various types of errors is only meant to provide some general information for those who are interested.

General Protection Fault (13 OD): This occurs when anything happens that is not covered by any of the other processor exceptions. This exception almost always indicates that the program has been corrupted in memory.

Page Fault (14 OE): This occurs when you are running low on memory. A page fault allows the operating system to recover small code segments from temporary storage on your hard drive that were put there when memory resources started getting low. This error usually occurs whenever an application goes looking for a piece of itself in RAM (random-access memory) and cannot find it. The operating system will attempt to retrieve the missing page of code from your hard drive. If it is unsuccessful in doing so, you get the BSoD.

0xC0000185: This problem could be caused by multiple devices attempting to use the same IRQ, an improper termination of a SCSI device, or bad SCSI cabling. Contact your tech support person.

DIVIDE_BY_ZERO_ERROR: This error is caused by an application trying to divide by zero. It's a standard programming practice to check for a zero value in the divisor before performing the division. If you see this, there is definitely a bug in the application program or operating system routine that encountered this problem. Notify the software vendor.

IRQL_NOT_LESS_OR_EQUAL: This is the most common cause of a BSoD. This problem is most often caused by one of two things:

- Installation of new hardware which improperly installs device drivers for themselves or installs buggy drivers

- A device driver was updated with a driver that contains errors.

Looking at the blue screen, check the text at the bottom of the screen. If a file name is present, it's probably the name of the device driver that caused the problem.

If you've recently added new hardware to your system, try removing it and see if the error goes away. If it does, the new hardware is the cause of the problem. Check the hardware vendor's web site for an updated or correct driver.

KMODE_EXCEPTION_NOT_HANDLED: An incorrectly configured device driver usually causes this type of error. This is a common error that can be caused by outdated drivers and actual hardware problems. Usually, the second parameter will point to the driver or function that caused the problem. Always note this address as well as the link date of the driver that contains this address.

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REGISTRY_ERROR: Such an error indicates a catastrophic failure in the system's registry. However, this error can sometimes be caused by failure to read the registry from the hard disk rather than because the registry itself is corrupt. Most of the time though, if you get this error, you'll have to restore from backup. Contact your tech support person.

INACCESSIBLE_BOOT_DEVICE: Just as the name implies, this error indicates that Windows is having trouble reading from the hard disk. This error can be caused by a faulty device driver or a bad small computer systems interface (SCSI) terminator. If you've checked for these problems, but are still receiving the error, check to make sure that a virus hasn't destroyed your boot sector.

UNEXPECTED_KERNEL_MODE_TRAP: This error message is almost always caused by your computer's memory. If you receive this error, check to make sure that all of your single inline memory modules (SIMMs) are the same type and speed. You should also check to make sure that your computer's Complementary Metal Oxide Semiconductor (CMOS) is set for the correct amount of RAM. If all of these suggestions check out, try replacing the memory in the computer.

BAD_POOL_HEADER: This is, perhaps, the most obscure error message. In most cases, if you receive this error, it's related to the most recent change you've made on your system. Try undoing the change to get rid of the error.

NTFS_FILE_SYSTEM: This error indicates hard disk corruption. If your system is bootable, run CHKDSK /F on all of your partitions immediately. If your system isn't bootable, try installing a new copy of Windows in a different directory. You can use that copy to run the CHKDSK program. When you're done with the second copy, you can edit your BOOT.INI file to make your computer start your original copy of Windows NT.

KERNEL_DATA_INPAGE_ERROR: This error indicates that Windows wasn't able to read a page of kernel data from the page file. Bad memory, a bad processor, incorrectly terminated SCSI devices, or a corrupt PAGEFILE.SYS file may cause this situation. The first step in correcting such an error is to recreate the PAGEFILE.SYS file and see if you can bring your system back online.

NMI_HARDWARE_FAILURE: This is a generic error message in which the hardware abstraction layer can't report on the true cause of the error. In such a situation, Microsoft recommends calling the hardware vendor. This error can sometimes be caused by mixing parity and non-parity SIMMs, or by bad SIMMs.

And finally…

The key to resolving the Blue Screen of Death is documentation. While it may be infuriating to receive a BSoD and burdensome to dutifully record all of the details contained in the screen, tech support will not be able to correct the problem until they have the information.

The sooner that the cause of the BSoD is discovered, the sooner computer users can get back to work doing the tasks that they intended to do.

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WNYLC Web Statistics For July 2006

Total Hits...............................………338,964
Total User Sessions......................……66,473
Average Hits/Day (Mon-Fri) ……..13,875
Average user Sessions/Weekday..…..2,465
Number of Pages Viewed.....………144,722
Avg Number of Pages /Day..………..4,522
Number of Documents Viewed..…...71,698
Accessed Using Internet Explorer.…...88%
Accessed Using Netscape.............…..…5%

Operating Systems Used:
Windows XP......................…………….52%
Windows 2000.....................……………12%
Windows 98......................……………....5%
Windows ME.....................…………....<1%
Windows 95......................…………….<1%
Windows NT...................…………..…<1%
Macintosh.......................…………....…<1%
Linux/Unix.....................…………....…<1%

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Star Watch is made possible through a grant by the IOLA Fund of New York State.

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