

Western Digital Glossary of Terms

| [A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

A

Access — Retrieval of data from or transfer of data into a storage device or area such as [RAM](#) or a register.

Access Time — The amount of time, including [Seek](#) time, [Latency](#) and [Controller](#) time, needed for a storage device to retrieve information.

Acoustics — A function of both energy input into a device and the device's ability to translate that energy into sound. Reducing acoustic emissions to the greatest degree possible results in a quieter hard drive. *See also* [Airborne Acoustics](#) and [Structure-borne Acoustics](#).

Active LED Status — External [LED](#) requirement for WD hard drives that provides an activity [LED](#) output which is ON during command execution and OFF otherwise.

Active Partition — The partition of the drive that contains the [Operating System](#). If the drive has multiple partitions, only the primary partition can be made active. A hard drive can have only one active partition.

Active Termination — Works to control the impedance at the end of the SCSI bus by using a voltage regulator. This reduces the susceptibility of the bus to noise, particularly when cables are long or when many devices are connected to the bus. Active termination is more stable than [Passive Termination](#).

Actuator — A mechanical assembly that positions the read/write [Head](#) over the appropriate [Track](#).

Actuator Arm — The part of the actuator assembly that includes the positioning arm and the read/write heads.

Adaptive Caching — A feature of Western Digital hard drives that enables the drive to determine the environment in which it's being used and optimize the way it handles commands and data.

Address — In the hard drive industry, there are several types of addresses; an address may refer to that of a drive, called a unit address; radial position, called a [Cylinder](#) address; or circumferential position, referred to as a [Sector](#) address.

Advanced Defect Management — WD hard drives are preformatted (low-level) at the factory and come with a full complement of automatic [Defect Management](#) functions. Extensively tested during the manufacturing process, media defects found during intelligent burn-in are mapped out with Western Digital's high-performance defect management technique. No modifications are required before installation.

Airborne Acoustics — The [Sound Power](#) level of a hard drive is measured in a sound chamber, where the drive is suspended and untouched by other objects. In this state, the hard drive emits airborne [Acoustics](#) that are not necessarily indicative of the acoustics emitted by a drive mounted in a digital device.

Algorithm — A set of steps or formula that solves a specific problem.

Allocation — The method DOS uses to assign a specific area of the hard drive to a given file. *See also* [Cluster](#).

ANSI — American National Standards Institute. A governmental body of the United States responsible for approving US standards in many areas, including computers and communications. ANSI is a member of the International Standards Organization (ISO).

AMR (Anisotropic Magnetoresistive) Heads — AMR heads were developed to increase areal density and improve drive performance. AMR heads use separate read and write elements, as opposed to traditional inductive [Thin Film](#) read/write heads. AMR heads use an inductive element for writing data, and a separate magnetoresistive element for reading information. Magnetoresistive head technology (MR) and AMR are the same. *See also* [Giant Magnetoresistive \(GMR\) Heads](#).

Arbitrated Loop — [Fibre Channel \(FC\)](#) topology where two or more ports can interconnect but only two ports can communicate at the same time.

Arbitration — The act of determining which command, device, or communication protocol controls the operating environment.

Areal Density — The number of bits of data that can be recorded onto the surface of a disk or platter usually measured in square inches. The areal density is calculated by multiplying the bit density [BPI](#) by Tracks Per Inch ([TPI](#)).

Asynchronous Transmission — Each [Byte](#) of information is synchronized individually through the use of request and acknowledge signals.

ATA — Advanced Technology Attachment. Name used by [ANSI](#) to describe what the computer industry calls [IDE \(Integrated Drive Electronics\)](#).

ATAPI — Advanced Technology Attachment Packet Interface. [ATA](#) interface extension that allows support of peripherals such as CD-ROMs and removable disk drives.

ATA Error Logging — Provides an industry standard means to record error events and supporting information accessible by the host. It can reliably and quickly determine if a system problem is the result of a hard drive failure or other component malfunction. Error Logging retains total

error count for the life of the drive and complete records for the last five errors.

ATA Security — The ATA Security Mode feature set allows the user to create a device lock password that prevents unauthorized hard disk access even if the drive is removed from the host computer. The correct password must be supplied to the hard drive in order to access user data. Both the User and Master Password features are supported, along with the High and Maximum security modes.

AT Bus Attachment — The interface defined by IBM for the original ATA disk controller. Western Digital designs its EIDE hard drives to be fully ATA compatible. *See also* [Ultra ATA/100](#).

Auto Defect Retirement — If the drive finds defective sectors during reads or writes, they are automatically mapped out and relocated.

Automatic Acoustic Management (AAM) — This WD feature allows the host to select the acoustic level of the hard drive.

Automatic Head Parking — [Head](#) parking is automatic on WD hard drives. On power-down, the heads retract to a safe, non-data [Landing Zone](#) and lock into position, improving data integrity and resistance to non-operational shock.

Auto Park — Turning off the drive power causes the drive to move the read/write heads to a safe, non-data [Landing Zone](#) and lock into position, improving data integrity and resistance to non-operational shock. Also known as *Automatic Head Parking* (above).

Auto-Read Reallocation/Auto-Write Reallocation (ARRE/AWRE) — Error recovery feature that controls whether automatic reallocation takes place during read and write commands.

Average Access Time — The average length of time a drive takes to perform seeks.

Average Read Seek Time — Equal to the total time of a test divided by 50,000 random length and random head seeks.

B

Backplane — Large circuit board or assembly that contains sockets with connectors for easy insertion and removal of hard drives.

Bandwidth — The amount of data that can be sent over a given circuit. *See also* [Buffer Bandwidth](#).

BIOS — Basic Input/Output System. A program or set of programs that control the basic functions of the computer.

Bit — An abbreviation for a binary digit which can be either 0 or 1. A bit is the basic data unit of all digital computers. It is usually part of a data

Byte, or data **Word**; however, a single bit can be used to control or read logic ON/OFF functions. A bit is a single digit in a binary number. Bits are the basic unit of information capacity on a computer storage device. Eight bits equal one byte.

Bit Density — Expressed as bits per inch (BPI), the number of bits that can be written onto one inch of track on a disk surface.

Block — A group of bytes handled, stored, and accessed as a logical data unit, such as an individual file record. A block in UNIX workstation environments is the smallest contiguous area that can be allocated for the storage of data. (Note: A different definition of the term is used when referring to the physical configuration of a hard drive).

Block Mode — Block mode increases overall **Data Transfer Rates** by transferring more data between system interrupts.

Boot — To start or restart your computer; loading the **Operating System**.

BPI — Bits per Inch. Indicates the density of information on a hard drive. *See* **Bit Density**.

Buffer — A temporary data storage area used to make up for a difference in data transfer rates and/or data processing rates between sender and receiver. For example, a printer buffer copies data from the computer and holds it until the printer is ready to print it.

Buffer Bandwidth — The speed of transferring data to or from the buffer.

Burst Mode Transfer Rate — The transfer rate into the buffer **RAM** of the hard drive. This rate does not factor in delays due to latencies or **Host** delays. *See also* **Transfer Rate**.

Bus — The path that carries data between the computer (microprocessor) and peripheral devices. An **EIDE** interface cable and a **SCSI** cable are both examples of a bus.

Bus Mastering — A high-performance method of data transfer in which the **Host** adapter's on-board processor handles the transfer of data directly to and from a computer's memory without intervention from the computer's microprocessor.

Byte — A sequence of eight binary digits or bits regarded to be a unit or binary **Word**.

C

Cable Select (CSEL) — Used in place of setting **Master/Slave** jumpers in the designation of drives in a dual drive configuration. Master/Slave designation is based on the position of the drives relative to the cable. Special cabling is required by the system manufacturer to selectively

ground the CSEL signal on one of the [EIDE](#) cable connectors. For example, when one of the drives is connected to the grounded CSEL conductor, it configures itself as the Master. When the second drive is connected to the other connector, on which CSEL is not grounded, it becomes the slave. This eliminates the need for unique jumpering configurations between the [Master](#) and Slave drives.

Cache — High-speed [RAM](#) (Random Access Memory) used as a buffer between the [CPU](#) and a hard drive. The cache retains recently accessed information to speed up subsequent accesses to the same data. When data is read from or written to the disk, a copy is saved in the cache, along with the associated disk address. The cache monitors the addresses of subsequent read operations to see if the required data is already in the cache. If it is, the drive returns the data immediately. If it is not in the cache, then it is fetched from the disk and saved in the cache.

Cache Buffer — See [Cache](#).

Capacity — The amount of information, measured in bytes, that can be stored on a hard drive. Also known as [Storage Capacity](#).

Channel — A connection or socket on the motherboard or controller card. A motherboard may have one or two channels (primary and secondary). If your motherboard has only one channel, you may need to add a controller card to create a secondary channel.

Chip— A small electronic device made out of a piece of [Semiconductor](#) material.

Clean Room — An environmentally-controlled, dust-free assembly or repair facility in which hard drives are assembled or opened for internal servicing.

Cluster — A cluster is defined as an allocation unit. At least one cluster is allocated to each file, regardless of the file's size, that is stored in the [DOS \(Disk Operating System\)](#) environment. The cluster size increases with the [Partition](#) size determined during formatting. With a 1024 MB partition, the cluster size is 32 KB. Each file stored consumes 32 KB of storage space, no matter how small the file. Create multiple, smaller partitions to avoid wasting space on small files.

CMOS (Complementary Metal Oxide Semiconductor) — A commonly used type of semiconductor.

CMOS Setup — A program supplied in most systems that allows you to configure internal and external devices.

Command — A specific instruction for a [Computer](#) to perform a defined task.

Command Aging — A SCSI feature that prevents the command reordering [Algorithm](#) from keeping I/O processes waiting in the command queue for extended periods of time.

Command Queuing — A feature that enables the drive to receive I/O processes from one or more initiators and execute them in an optimum sequence.

Command Reordering — A feature that allows the drive to reorder I/O processes in the command queue, which results in minimizing the seek time and rotational latency and thus increases throughput.

Computer— Programmable machine that can respond to and execute a set of (often prerecorded) instructions.

Controller — *See* [Disk Controller](#), [Interface Controller](#), and [Hard Disk Drive Controller](#).

Controller Card — An adapter with the control electronics for one or more hard drives. Usually installed in a [Bus](#) slot in the computer.

Correctable Error — An error that the drive can correct by using [ECC On-the-Fly](#).

CCC — Customer Configuration Code. A [Firmware](#) revision tracking code that defines a major product change. This number increments as form, fit or function changes are implemented. The CCC code guarantees that the correct revision of the drive product is provided to the customer.

CPU — Central Processing Unit. The CPU is the “brains” of the computer; the place where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

CRC — Cyclic Redundancy Check. Data stored or transmitted with data to detect corruption. By calculating the CRC data and comparing it to the original data sent, the receiver can detect some types of transmission errors.

Cylinder — The cylindrical surface formed by identical track numbers on vertically stacked disks.

Cylinder, Head, Sector (CHS) Addressing — A method of referencing the sectors on a drive as a collection of unique cylinder, head and sector addresses. Each block on the drive will have a unique cylinder, [Head](#), and sector [Address](#).

D

Database — A collection of data stored on a computer system medium, such as a hard drive.

Data Lifeguard™ — A Western Digital-exclusive data reliability feature comprised of an expanded set of data protection tools that includes shock protection, an environmental protection system, and embedded error detection and repair features that automatically find, isolate, and repair problem areas that may develop over the extended use of the hard drive. With these enhanced data reliability features, the drive can perform more accurate monitoring, error repair, and deliver exceptional data security.

Data Lifeguard Tools™ — A set of software utilities that work in conjunction with the embedded Data Lifeguard features to make hard drive installation, drive management diagnostics, and repair simple and worry-free.

Data Synchronizer — An electronic circuit that produces a clock signal that is synchronous with the incoming data stream. The clock signal is then used to decode the data.

Data Transfer Rate — Speed at which data transfers to and from the disk media (actual disk platter); a function of the recording frequency. Modern hard drives have an increasing range of disk transfer rates from the inner diameter to the outer diameter of the disk. This is called a “zoned” recording technique.

DDSS — Digital Dynamic Seek Shaping. [WhisperDrive™](#)'s active suppressant in which electrical current transmission is applied in such a way that it “shapes” the movement of the [Actuator Arm](#) to reduce noise during seeks.

Dedicated Landing Zone — The designated radial zone of the disk, usually at the inner portion of the disk, where the heads are stored to avoid contact with the data cylinders when power to the drive is off.

Defect-free — A term used to describe a recording [Surface](#) that has no detectable defects.

Defect Management — A general methodology of eliminating data errors on a recording surface by mapping out known defects on the media. The defective areas are rendered inaccessible, so that when information is written to the disk, it is stored to non-defective locations on the disk.

Desktop — A personal computer sized to fit on or under a desktop. Western Digital EIDE hard drives are designed to fit into a desktop PC.

Device Driver — A software program that enables a PC to communicate with peripheral devices such as fixed hard drives and CD-ROM drives. Each kind of device requires a different driver. Device driver programs are stored on a PC's fixed disk and are loaded into memory at boot time.

Differential SCSI — An electrical signal configuration which uses pairs of lines for data transfer. Each signal consists of two lines called “–Signal” and “+Signal.” Commands and data are carried over two sets of wires, and

the difference is taken between each set of signals. Two-wire signaling is a proven way to achieve reliable signal transmission in noisy environments and over long distances. Used primarily in applications requiring long cable lengths of up to 82 feet (25 meters).

Direct Memory Access (DMA) — A process for transferring data directly to and from main memory, without passing through the [CPU](#). DMA improves speed and efficiency by allowing the system to continue [CPU](#) processing even while it is transferring data to/from the hard drive.

Disk — A rigid [Platter](#), usually constructed of aluminum or Mylar, with a magnetic surface that allows the recording of data to be stored inside the drive.

Disk Controller — The chip or circuit that controls the transfer of data between the hard drive and [Buffer](#). *See also* [Hard Disk Drive Controller](#) and [Interface Controller](#).

Disk Transfer Rate — Speed at which data transfers to and from the disk media (actual disk platter); a function of the recording frequency. Hard drives have an increasing range of disk transfer rates from the inner diameter to the outer diameter of the disk.

DOS (Disk Operating System) — A 16-bit operating system developed by Microsoft that was formerly the standard operating system for IBM-compatible PCs. DOS does not support multiple users or multitasking.

DRAM (Dynamic Random Access Memory) — A common type of [RAM](#) (random access memory) used in personal computers and workstations.

E

Early Exit from Landing Zone (EEZ) — During spin up, EEZ allows the read/write [Heads](#) to exit the landing zone as soon as the spindle reaches transition (3000-4000) RPM, to reduce frictional energy dissipation.

ECC On-the-Fly — A hardware correction technique that corrects errors in the read buffer prior to [Host](#) transfer without any performance penalties. These error corrections are invisible to the host system because they do not require assistance from the drive's firmware. Also known as Reed Solomon ECC On-the-Fly.

E-coat — Electro-deposited organic coating applied to the base casting. This smooth coating reduces the particle count inside the drive housing, which results in a clean environment for [AMR \(Anisotropic Magnetoresistive\) Heads](#).

EEPROM — Electrically Erasable Programmable Read Only Memory. Devices that can be erased instantly.

EIDE — Enhanced Integrated Drive Electronics. Improves the [AT Bus Attachment](#) standard interface by overcoming device support and capacity limitations, improving [Data Transfer Rates](#), and allowing connection of CD-ROMs and other peripherals.

Embedded Servo — The embedded servo control design generates accurate feedback information to the head position [Servo](#) system without requiring a full data surface (which is required with a “dedicated” servo control method) because servo control data is stored on every surface.

Encoding — The process of modifying data patterns prior to writing them on the disk surface.

Enterprise — The series of computers employed largely in high-volume and multi-user environments such as servers or networking applications; may include single-user workstations required in demanding design, engineering, and audio/visual applications.

EPR-4 (Enhanced Partial Response-4) — A [PRML \(Partial Response Maximum Likelihood\)](#) read channel technology used in WD hard drives. Its efficient coding accommodates high bit densities and boosts performance.

Error Correction Code (ECC) — A mathematical [Algorithm](#) that detects and corrects errors in a data field by adding check bits to the original data.

Error Log — A record that contains error information.

Error Rate — The number of errors of a given type that occur when reading a specified number of bits.

ESD — Electrostatic Discharge. Rapid discharge of static electricity that can damage integrated circuits in computers and communications equipment. ESD prevention is aided by such items as ESD wrist straps and ESD hard drive bags. ESD prevention procedures are outlined in detail in the *Western Digital Hard Handling Guide*.

Extended Partition — You can create multiple [Partitions](#) on a hard drive, one [Primary Partition](#) and one or more extended partition(s). [Operating System](#) files must reside on the primary partition. An extended partition is a partition where non-system files (files other than DOS or operating system files) can be stored on a disk. You can also create [Logical Drives](#) on the extended partition.

External Hard Drives — Standalone Western Digital retail hard drives that connect to a personal computer via a [FireWire](#) or [USB](#) connection

EZ-Drive — A software utility that quickly and easily partitions and formats a new hard drive. If needed, added code is installed in the boot sector of a hard drive if EZ-Drive determines that its system BIOS does not support its full capacity.

F

Fast-20 SCSI — *See* [Ultra SCSI](#).

Fast Spin Down (FSD) — During spin down, FSD brings the disk to a stop 35 percent faster to reduce sliding distance of the read/write heads in the [Landing Zone](#).

FAT — File Allocation Table. A data table stored at the beginning of each partition on the disk that is used by the operating system to determine which sectors are allocated to each file and in what order. The FAT system for versions of Windows previous to Windows 95 OSR2 is called FAT16 or VFAT. The newer version of FAT is known as FAT32.

Fdisk — A software utility used to partition a hard drive. This utility is included with DOS and Windows 95 [Operating Systems](#).

Fetch — The process of retrieving data.

Fibre Channel (FC) — This set of standards defines new [Protocols](#) for flexible information transfer. Fibre Channel supports three topologies: point-to-point, arbitrated loop, and fabric.

Fibre Channel Arbitrated Loop (FC-AL) — A subset of Fibre Channel network systems interconnection. A serial storage interface designed to meet the needs of high-end applications.

FireWire — This high-speed serial bus, also known as IEEE 1394, provides a non-proprietary, high-performance method of interconnecting digital devices. Its scaleable architecture and flexible peer-to-peer topology make it ideal for connecting devices from computers and hard drives to digital video and audio equipment with real-time processing requirements for on-time [Multimedia](#).

Firmware — Permanent instructions and data programmed directly into the circuitry of read-only memory for controlling the operation of the computer.

FIT (Functional Integrity Testing) — A suite of tests Western Digital performs on all its drive products to ensure compatibility with different hosts, operating systems, adapters, application programs, and peripherals. This testing must be performed before the product can be released to manufacturing.

FIT Lab™ — Performs extensive qualification and testing on Western Digital products in a variety of system environments, using diverse operating systems and applications software.

FlexPower™ — WD connector technology that accepts power from both industry-standard and new [Serial ATA \(SATA\)](#) power supplies.

Floppy Disk Drive (FDD) — Machine that reads from and writes data to floppy (i.e., portable, magnetic) [Disks](#).

Flow Control — In [PIO](#) transfers, the ability of an [EIDE](#) drive to control the speed at which the host transfers data to or from the drive by using an electrical signal. The host temporarily stops transferring data whenever the drive deasserts the signal. When the drive reasserts the signal, the host continues the data transfer.

Fluid Dynamic Bearings (FDB) — Bearing design that incorporates a layer of high-viscosity lubricant instead of ball bearings in the hard drive spindle motor. As an alternative to conventional ball bearing technology, FDB designs provide increased non-operational shock resistance, speed control, and improved [Acoustics](#).

Format — A process that prepares a hard drive to store data. [Low-level formatting](#) sets up the locations of sectors so user data can be stored in them. Western Digital hard drives are low-level formatted at the factory and therefore do not need to be low-level formatted by the end user. You need to perform a [High-Level Format](#) (using [Data Lifeguard Tools™](#)) on your new Western Digital hard drive before you can use it. Formatting erases all the information on a hard drive and it sets up the file system needed for storing and retrieving files.

Formatted Capacity — The actual capacity available to store data in a mass storage device. The formatted capacity is the gross capacity minus the capacity taken up by the overhead data required for formatting the media.

Form Factor — The industry standard that defines the physical and external dimensions of a particular device.

Full-Duplex — A communication protocol that permits simultaneous transmission in both directions.

G

GB (Gigabyte) — Western Digital defines a gigabyte as 1,000,000,000 (one billion) [Bytes](#) or 1000 (one thousand) [MB \(Megabyte\)](#)s.

Giant Magnetoresistive (GMR) Heads — WD hard drives incorporate giant magnetoresistive head technology to meet increasing capacity requirements. The GMR head structure incorporates a complex assembly of magnetic materials that provide greater sensitivity to changing disk magnetization. As a result, GMR heads achieve significant increases in areal densities and performance levels over either inductive [Thin Film](#) or [AMR \(Anisotropic Magnetoresistive\) Heads](#).

Ground (GND) — A conducting object, such as a wire or pin, that is connected to such an a position of zero potential.

H

Half-Duplex — A communications [Protocol](#) that permits transmission in both directions but in only one direction at a time.

Half-Height Drives — Standard 3.5-inch hard drives are available in heights of 1.0 inch and 1.6 inches. Half-height drives measure 1.6 inches in height. *See also* [Low Profile \(LP\)](#).

Hard Disk Drive (HDD) — *See* [Hard Drive](#).

Hard Disk Drive Controller — Controller electronics that include the [Disk Controller](#) and the [Interface Controller](#).

Hard Drive — An electromechanical device used for information storage and retrieval, incorporating one or more rotating disks on which data is recorded, stored, and read magnetically. Western Digital's principal product.

Hard Error — An error that is repeatable every time the same area on a disk is accessed. A hard error cannot be corrected by the error recovery process.

Hard Reset (Hardware Reset) — [ATA](#) reset type in which the drive resets the interface circuitry as well as [Soft Reset](#). Hard reset negates the RESET- signal in the [ATA Bus](#).

Hard Sectored — A technique that uses a digital signal to indicate the beginning of a sector on a track.

Head — The minute electromagnetic coil and metal pole which write and read back magnetic patterns on the disk. Also known as a read/write head. A drive with several disk surfaces or platters will have a separate head for each data surface. *See also* [AMR \(Anisotropic Magnetoresistive\) Heads](#).

Head Crash — Refers to the damage incurred to a read/write head when the head comes into contact with the disk surface. A head crash might be caused by severe shock, dust, fingerprints, or smoke, and can cause damage to the surface of the disk and/or the head.

HDA (Head Disk Assembly) — The mechanical components of a hard drive, including the [Disks](#), [Heads](#), [Spindle Motor](#) and [Actuator](#).

Head Loading Zone — An area on the disk specifically reserved for the heads to use when taking off or landing when power to the drive is turned on or off. No data storage occurs in the head loading zone.

Head Stack Assembly — The electromechanical mechanism containing read/write heads and their supporting devices.

Headerless Format — The lack of a header or ID fields (track format). This enables greater format efficiency and increased user capacity.

High-Level Format — A high-level format must be performed (with [Data Lifeguard Tools™](#) or the Format command) on your new Western Digital hard drive before you can use it. Formatting erases all the information on a hard drive and it sets up the file system needed for storing and retrieving files.

Host — The computer that other computers and peripherals connect to. *See also* [Initiator](#).

Host Adapter — A plug-in board that acts as the interface between a computer system bus and the hard drive.

Host Interface — The point at which the host and the drive are connected to each other.

Host Transfer Rate — Speed at which the host computer can transfer data across the [SCSI](#) interface; or, the speed at which the host computer can transfer data across the EIDE interface. [PIO](#) modes and [Direct Memory Access \(DMA\)](#) modes are defined in the ATA-4 industry specifications for the [EIDE](#) interface.

Hot-Plug — Ability to swap out a hard drive without having to power down the system or reboot. Hot plugging capability promotes system design flexibility, data availability, and serviceability.

Hot-Swap — *See* [Hot-Plug](#).

HWCS (Host Writable Control Store) — Part of the [i295 System-on-a-Chip](#) firmware that bypasses the microprocessor to directly handle faster host commands such as caching, host transfer protocols, etc.

I

i295 System-on-a-Chip — The i295 System-on-a-Chip is the center piece of Western Digital's fifth generation electronics architecture, Arch-V. It integrates the [Disk Controller](#), a 16-bit embedded microprocessor (ST10R272), and [SRAM](#) memory, resulting in lower component count, and therefore greater reliability and performance.

IDE (Integrated Drive Electronics) — A type of drive where the interface controller electronics are incorporated into the design of the hard drive rather than as a separate [Controller](#).

IEEE 1394 — *See* [FireWire](#).

Index Pulse Signal — A digital pulse signal indicating the beginning of a disk revolution. An embedded servo pattern or other prerecorded information is present on the disk following index.

Initiator — A device in control of the [SCSI](#) bus that sends commands to a target. Most SCSI devices have a fixed role as an initiator or a target; however, some devices can assume both roles.

Initialization — See [Low-level formatting](#).

Input — The incoming data that the computer processes, such as commands issued by the user.

I/O — Input/Output. An operation, program, or device that that transfers data to or from a computer or other device.

Interface — A hardware or software protocol that handles the exchange of data between the device and the computer; the most common ones are [EIDE](#) and [SCSI](#).

Interface Controller — The chip or circuit that translates computer data and commands into a form suitable for use by the hard drive and controls the transfer of data between the buffer and the host. See [Disk Controller](#) and [Hard Disk Drive Controller](#).

Interleave — The arrangement of sectors on a track.

Internal Environmental Protection System — A [Data Lifeguard™](#) feature which includes dual filters that protect the inside environment of the drive from contamination.

Internal Hard Drive — Hard drive designed for mounting inside a personal computer. Also known as [Desktop](#) hard drive.

Interrupt — A signal sent by a subsystem to the [CPU](#) that signifies a process has either completed or could not be completed.

ISA (Industry Standard Architecture) — The standard 16-bit AT bus designed by IBM for the PC/AT system. ISA was the only industry standard bus for PCs until the recent release of MCA (MicroChannel Architecture), EISA (Extended Industry Standard Architecture), and PCI (Peripheral Component Interconnect).

Isochronous — Data transfer method in which data channels provide guaranteed data transport at a pre-determined rate. This is especially important for time-critical [Multimedia](#) data where just-in-time delivery eliminates the need for costly buffering.

J

Jumper — In [EIDE](#) drives, a jumper is an electrically-conductive component that you place over pairs of pins that extend from the circuit board on the hard drive jumper block to connect them electronically. For example, a jumper is one way to designate a hard drive as master or slave. The jumper block is located next to the 40-pin connector on the hard drive.

K

Kilobyte (KB) — Usually, this is a unit of 1000 bytes. In the case of computer memory, which is partitioned into sizes that are a power of two, a kilobyte is equal to 2^{10} or 1024 bytes.

L

LAN (Local Area Network) — A system in which computer users in the same company or organization are linked to each other and often to centrally-stored collections of data in LAN servers.

Landing Zone — The heads move to this location on the inner portion of the disk when commanded, or when the power has been turned off. User data is not stored in this area of the disk.

Laser Textured Media — Laser textured disks minimize the wear and friction on a hard drive. The precision and consistency of the laser zone texturing process is a contributor to the robustness of Western Digital hard drives.

Latency — The period of time that the read/write heads wait for the disk to rotate to the correct position to access the desired data. For a disk rotating at 5400 RPM, the average latency is 5.5 milliseconds or the average time delay between the head arriving on track and the data rotating to the head. (Calculated as one-half the revolution period).

LED — Light Emitting Diode. A device (usually red in color) that lights up when power is passed through it.

Logical Address — A storage location address that may not describe the physical location; instead, it is used as a means to request information from a controller. The controller converts the request from a logical to a physical address that is able to retrieve the data from an actual physical location on the storage device.

LBA — Logical Block Addressing. A method of addressing the sectors on a drive. Addresses the sectors on the drive as a single group of logical block numbers instead of cylinder, head and sector addresses. It allows for accessing larger drives than is normally possible with [Cylinder, Head, Sector \(CHS\) Addressing](#).

Logical Drive — A logical drive is a section of the hard disk that appears to be a separate drive in a directory structure. You create logical drives on the extended partition of a hard disk. While 26 letters exist for logical drives, the first three are reserved. A and B are reserved for floppy disk drives, and C is reserved for the first primary DOS partition. Therefore, you can create up to 23 logical drives on your [Extended Partition](#). Logical drives are usually used to group directories and files.

Low-level formatting — The process of creating [Sectors](#) on the disk surface; this permits the [Operating System](#) to use the regions needed to create the file structure. Also called initialization. Low-level formatting is performed at the Western Digital factory. There is no need for you to low-level format a Western Digital drive.

Low Profile (LP) — Standard 3.5-inch hard drives are available in heights of 1.0 inch and 1.6 inches. Low-profile hard drives measure 1.0-inches in height. *See also* [Half-Height Drives](#).

M

Magnetic flux — The pattern of magnetic pole directions of the bits written on the disk.

Master — The first drive in a dual drive combination. A master drive by itself (with no [Slave](#)) is called a single drive.

MB (Megabyte) — Western Digital defines a megabyte as 1,000,000 (one million) bytes.

Mechanical Latencies — Include both [Seek Time](#) and [Rotational Latency](#). Mechanical latencies are the main hindrance to higher performance in hard drives. The time delays of mechanical latencies are one hundred times higher than electronic (non-mechanical) latencies associated with the transferring of data.

Media — In hard drives, the disks and their magnetic coatings; sometimes refers to the coating material alone.

Memory — A device or storage system capable of storing and retrieving data.

MFM (Multiple Frequency Modulation) — A method of encoding analog signals into magnetic pulses or bits.

MTBF (Mean Time Between Failures) — Average time (expressed in hours) that a component works without failure. It is calculated by dividing the total number of operating hours observed by the total number of failures. Also, the length of time a user may reasonably expect a device or system to work before an incapacitating fault occurs.

MTTR (Mean Time to Repair) — The average time it takes to repair a drive in the field. In the field, only major subassemblies are changed (the PCB, sealed housing, etc.), excluding component level repairs as these are not performed in the field.

Multimedia — A simultaneous presentation of data in more than one form, such as by means of both visual and audio.

Multi-user — In information technology, a system that enables more than one user to access data at the same time.

N

Network Computer — A kind of computer that contains limited data storage capacity and is used to communicate with a central data storage facility such as a [Server](#) or [RAID](#) system.

Non-Repeatable Runout (NRRO) — Limiting factor in ball bearing drives in which the [Spindle](#) exhibits a high level of random departure from the precise circular motion of the spindle hub due to surface imperfections in the ball bearing design.

O

OEM — Original Equipment Manufacturer. Company X (e.g., Dell) that has a business relationship with company Y (e.g., Western Digital). Company X integrates the components from company Y into their product (i.e., a [Personal Computer](#)). This product is then sold under company X's name.

Operating System — Software that allows the user and programs installed on your system to communicate with computer hardware such as a hard drive.

OSI (Open Systems Interconnection) — A description of how messages are to be transmitted between any two points in a telecommunication network. OSI was developed to promote interoperability between different types of products.

P

Partition — A way to logically divide a hard drive so that an [Operating System](#) treats each partition as a separate hard drive. Each partition has a unique drive letter.

Passive Termination — A termination architecture that is used to match the impedance at the end of the [SCSI](#) bus by using a voltage divider network of passive resistors. *See also* [Active Termination](#).

Personal Computer — A relatively small and inexpensive [Computer](#) designed for single-user use.

PIO — Programmed [I/O](#) (input/output). In a hard drive with an [ATA](#) interface, data transfers between the drive and host using programmed I/O (PIO). The host uses PIO to write to the Command Block Registers (CBRs) when transmitting control information, such as the location of a read command.

Physical — Term that refers to anything pertaining to hardware. A physical data structure refers to the actual organization of data on a storage device. By contrast, the logical data structure refers to how the information appears to a program or user. For example, a data file is a collection of

information stored together. This is its logical structure. Physically, however, a file could be stored on a disk in several scattered pieces.

Platform — A basic design from which a Western Digital series of products is engineered and produced.

Platter — An actual metal (or other rigid material) disk that is mounted inside a fixed-disk drive. Many drives consist of multiple platters mounted on the spindle to provide more data storage surfaces. Each platter may use one or both surfaces to store data. *See also* [Disk](#).

Point-to-point — Bus configuration that utilizes the full [Bandwidth](#) of each drive interface in a networked environment. In point-to-point connectivity, each port on a [Serial ATA \(SATA\)](#) controller serves just one device; that is, the controller communicates with a given drive only through the port where it is connected. Because there is no sharing of the bus, each drive can communicate directly with the system at any time.

Port — A connection or socket on the motherboard or controller card. A motherboard may have one or two ports (primary and secondary). If your motherboard has only one port, you may need to add a controller card to create a secondary port.

POR (Power On Reset) — ATA reset type in which the drive executes a series of circuit diagnostics, spins up the [HDA \(Head Disk Assembly\)](#), tests speed and other mechanical parameters, and sets default values.

Power-up in Standby — A WD feature set that allows devices to be powered-up into the Standby power management state to minimize inrush current at power-up and to allow the host to sequence the spin-up of devices. This feature may be enabled or disabled via the Set Features command or may be enabled by the use of a jumper.

Pre-fetch — Instructions that are loaded into a queue when the processor's external [Bus](#) is otherwise idle.

Primary Partition — The partition where the [Operating System](#) files are stored. To start an [Operating System](#) from a hard drive, it must have a primary partition. The primary partition can also be made into an [Active Partition](#).

Protective Head Parking — Western Digital has added Protective Head Parking to its impressive list of enhancements. This new feature is an extension of [Auto Park](#) and safely places the read/write heads over the landing area on the drive even if other system components lose functionality. This action protects the media from damage which, in turn, guards against data loss.

Protocol — A convention of data transmission that defines timing, control format, and data representation.

PRML (Partial Response Maximum Likelihood) — A [Read Channel](#) using sampled data, active equalization and [Viterbi Detection](#) to accurately retrieve the user data off the disk.

Proximity Recording — A recording technology that increases recording density by allowing the read/write head to come in close proximity to the disk surface.

Q

Queue — A first-in-first-out (FIFO) data structure used to sequence multiple demands for a resource such as a printer, processor, or communications channel. The host adds objects to the end of the queue and takes them off the front.

R

Radial Path — The straight-line path from the center of the disk to the outer edge of the disk.

RAID — Redundant Arrays of Independent Disks. Groupings of hard drives in a single system to provide greater performance and data integrity.

RAM — Random Access Memory. Memory that allows any storage location to be accessed randomly, as opposed to tape drives, which are [Sequential Access](#) devices.

RBC — Reduced Block Command. Specification defines the actual commands that hard drives must support. Hard drives use a subset of this specification, which includes commands for removable storage and other forms of storage such as optical disks.

Read Channel — Performs the data encoding and conversions the drive needs to write computer generated information onto a magnetic medium and then read that information back with a high degree of accuracy.

Read Verify — A data accuracy check performed by having the disk read data to the controller, which in turn checks for errors but does not pass the data on to the system.

Read/Write Head — *See* [Head](#).

Recoverable Error — A read error, transient or otherwise, that the drive can correct by ECC recovery or by re-reading the data.

Reseller — A company that buys products in bulk from a manufacturer, then adds software applications or other components to the original product.

RLL (Run Length Limited) — An encoding scheme used during write operations to facilitate data readback.

ROM (Read Only Memory) — Integrated circuit memory chip containing programs and data that the computer or host can read but cannot modify. The computer can read instructions out of ROM, but cannot store data in ROM.

Rotational Latency — The amount of delay in obtaining information from a disk due to the rotation of the disk. For a disk rotating at 5400 RPM, the average rotational latency is 5.5 milliseconds. *See also* [Mechanical Latencies](#).

RPM (Revolutions Per Minute) — Rotational speed of the media (disk), also known as the spindle speed. Hard drives typically spin at one constant speed. The slower the RPM, the higher the mechanical latencies. Disk RPM is a critical component of hard drive performance because it directly impacts the [Rotational Latency](#).

S

SBP-2 (Serial Bus Protocol-2) — Specification that defines the protocol for command and data transfer of mass storage devices using the IEEE 1394 ([FireWire](#)) bus. It describes the basic transport protocol for mass storage devices, and specifies the data structures and operations above the transaction layer that provide efficient mechanisms for this class of devices. Western Digital was a key contributor to this standard.

SCA-2 — SCA-2 (Single Connector Attach) interface incorporates a grounding contact, blindmate connector, direct plug misalignment tolerance, [ESD](#) protection, hot swap capability, and backplane connector options for SCSI devices. SCA-2 is commonly called the 80-pin SCSI connector.

SCSI — Small Computer System Interface. An interface between a computer and peripheral controllers. Commonly used in enterprise computing and Apple Macintosh systems. Usually pronounced as “scuzzy.” The equivalent interface system in most personal computers is Enhanced Integrated Drive Electronics ([EIDE](#)).

SCAM — SCSI Configure AutoMagically. Allows users to attach SCSI devices without worrying about configuration options.

Sector — A 512-byte packet of data in [EIDE](#) and [SCSI](#) hard drives. This is the smallest amount of data that can be read or written to the drive from the host interface. On Macintosh and UNIX drives, sectors are usually grouped into blocks or logical blocks that function as the smallest data unit permitted. Since these blocks are often defined as a single sector, the terms block and sector are sometimes used interchangeably in this context (Note: The meaning of the term block in connection with the physical configuration of the disk is different from its meaning at the system level). *See also* [Block](#) and [Cluster](#).

Sector Slipping — A technique used to push-down defective sector sites during a format or reassignment operation to maintain sequential order of the data. Spares are located throughout the disk for this purpose.

SecureConnect™ — WD connection [Serial ATA \(SATA\)](#) cable technology that provides a 500 percent stronger cable-to-drive connection than first-generation SATA hard drives and cables. Also ensures backward compatibility with legacy SATA cables and backplanes.

Seek — The movement of a set of read/write heads to a desired location. The [Actuator](#) moves the heads to the cylinder containing the track and sector where the data is stored.

Seek Time — A measure (in milliseconds) of how fast the hard drive can move its read/write [Heads](#) to a desired location.

SelectWD — [Reseller](#)/Retail membership-based team of valuable partners who sell WD hard drives and profit through partnership.

Self-Test — Tests all the critical subsystems of the drive. The test may be performed as a background task as the drive processes other commands from the [Host](#). Since the test is embedded in the drive's firmware, it is always available, requires no software installation and can be faster and more effective than a software-based drive test.

Semiconductor — A material that does not effectively conduct of electricity or insulate against it. The most common semiconductor material is silicon. Semiconductors make the miniaturization of electronic components possible.

Sequential Access — The reading or writing of data in a sequential order as opposed to random access. Magnetic tape drives store data in sequential [Blocks](#).

Serial ATA (SATA) — The next generation bus interface for hard drives. SATA has many advantages including increased transfer rate (performance roadmap that begins with 150 MB/s and extends to 600 MB/s), improved signal integrity, enhanced data protection, and [Hot-Plugging](#).

Serpentine™ Seek Technology — Effectively reduces the overhead associated with [Actuator](#) movement, thereby increasing sustained data throughput.

Server — A computer used primarily to store data, providing access to shared resources. Usually contains a network [Operating System](#).

Servo — Provides positioning information to the [Actuator Arm](#), found at equal intervals on each disk surface ([Embedded Servo](#)) or on an entire surface (dedicated servo).

Single-ended SCSI — The standard electrical interface for [SCSI](#). Single-ended means an interface with one signal and one corresponding

ground line for each SCSI signal. Used primarily in applications requiring cable lengths under 19 feet (6 meters).

Slave — The second drive in a dual drive combination.

S.M.A.R.T. (Self-Monitoring, Analysis, and Reporting Technology) — S.M.A.R.T. enables a drive's internal status to be monitored through diagnostic commands at the host level and during off-line activities. S.M.A.R.T. devices employ data analysis [Algorithms](#) that are used to predict the likelihood of some near-term degradation or fault conditions. When used with a S.M.A.R.T. application, the drive can alert the host system of a negative reliability status condition. The host system can then warn the user of the impending risk of data loss and recommend an appropriate action.

Soft Error — An error that does not repeat when the same location is re-read.

Soft Reset — ATA reset type in which the drive resets the interface circuitry according to the Set Features command requirement.

Soft Sectored — A technique that allows the [Controller](#) to determine the beginning of a sector by reading the format information from the disk.

Sound Logic — Optional Western Digital technology that significantly reduces acoustic levels in hard drives, and is ideal in for use in quiet home and business environments.

Sound Pressure — A value representing the sound level emitted by a hard drive from a single point. Only one microphone is used to measure sound pressure.

Sound Power — A value measured using 8-12 microphones which represents the sound level emitted from the entire hemispherical area surrounding the drive. Because sound power more closely corresponds to the sound level detected by the human ear, it is used as the industry standard for measuring hard drive [Acoustics](#).

Spindle — The center, rod-like axle on which the disks are mounted.

Spindle Motor — The motor that rotates the spindle and ultimately the disks.

Spindle Speed — *See* [RPM \(Revolutions Per Minute\)](#).

Spindle Synchronization — A feature that causes SCSI hard drives in multiple-drive systems to rotate to the same address location at the same time.

SRAM — Static [RAM \(Random Access Memory\)](#) that retains data bits in its memory as long as power is being supplied. Unlike [DRAM \(Dynamic Random Access Memory\)](#), which stores bits in cells consisting of a

capacitor and a transistor, SRAM does not have to be periodically refreshed.

Storage Capacity — The amount of data that can be stored on a hard drive.

StreamWeaver™ — This technology enables optimization of hard drive performance for audio/video (A/V streams). Pioneered by Western Digital in cooperation with Sony, the technology embedded in StreamWeaver has also been adopted as the base document for industry standardization. *See also* [WhisperDrive™](#).

Structure-borne Acoustics — When mounted in a digital device, the hard drive generates additional noise as a result of vibration. This type of noise, caused by the hard drive's proximity to other system components, is referred to as structure-borne acoustics.

Subsystem — A secondary or component part of a system; a hard drive is a subsystem of a personal computer.

Surface — The top or the bottom side of a [Platter](#) coated with a magnetic material required to record data. A [Platter](#) may use one or both surfaces to store data.

Synchronous Transmission — Transmission in which the sending and receiving devices operate continuously at the same frequency and are held in a desired phase relationship by a correction device.

System Files — The files needed to run an [Operating System](#).

System Integrator — An independent professional who specifies and provides the necessary combinations of hardware and software in response to an end user's needs.

T

Tailgate (1394 to EIDE Bridge Controller) — Specification defining the requirements for a low-cost bridge device that allows existing legacy EIDE/ATAPI devices to be connected to the [IEEE 1394 \(FireWire\)](#) bus using [EIDE](#) protocol.

Tagged Queuing — The ability of the drive to receive multiple I/O processes from each initiator.

Task File — The set of I/O Host Interface Registers used to transfer status, commands, and data between the host and the drive for the [EIDE](#) interface.

Thin Client Architecture — A computer system in which data is stored centrally, with only limited storage capacity at the various points of use.

Thin Film — A type of coating deposited on a flat surface through a photolithographic process. Thin film is used on disk platters and read/

write heads, as well as on the write element of [AMR \(Anisotropic Magnetoresistive\) Heads](#) heads.

Thin-Film Inductive Head (TFI) — A head technology that uses a thin-film inductive element to read and write data bits on the magnetic surface of the [Disk](#).

Thermal Asperity — A thermal asperity is a baseline shift in the read-back signal due to heating of the magnetoresistive stripe on the head as a result of physical contact with the disk or a particle.

Thermal Management — Set of [Data Lifeguard™](#) reliability features for WD Raptor drives that includes state-of-the-art mechanical design, closed loop servo management, and [S.M.A.R.T. \(Self-Monitoring, Analysis, and Reporting Technology\)](#) HDA Temperature Attribute support.

TPI — Tracks Per Inch. The number of tracks written within each inch of the disk's surfaces, used to measure how closely the tracks are packed on a disk surface.

Track — A concentric magnetic circle pattern on a [Disk](#) surface used for storing and reading data.

Track-to-Track Seek Time — The time that elapses when the read/write heads move from one track to an adjacent track.

Transfer Rate — The rate at which the hard drive sends and receives data from the [Controller](#). Processing, head switches, and seeks are all figured into the transfer rate in order to accurately portray drive performance. The [Burst Mode Transfer Rate](#) is separate from transfer rate, as it refers only to the transfer of data into [RAM](#).

Translating BIOS — A system [BIOS](#) that allows access to [EIDE](#) drives larger than 528 MB.

U

Ultra ATA/33 — A high-speed host data transfer feature that transfers data at 33.3 MB per second. *See also* [Ultra DMA](#).

Ultra ATA/66 — Data transmission protocol that delivers heightened data integrity to the [EIDE](#) interface through use of a 40-pin, 80-conductor cable. Ultra ATA/66 allows host computers to send and receive data at 66.6 MB/s, twice the 33.3 MB/s data transfer speed of Ultra ATA/33.

Ultra ATA/100 — A high-speed host data transfer feature that transfers data at 100 MB per second, 50 percent faster than Ultra ATA/66. Also known as Ultra DMA/100.

Ultra DMA — A [Protocol](#) for transferring data between a hard drive through the [Bus](#) to the computer's [RAM](#). Also known as [Ultra ATA/33](#), [Ultra ATA/66](#), [Ultra ATA/100](#).

Ultra SCSI — Provides 20 MB/s transfers over an 8-bit bus or 40 MB/s transfers over a 16-bit Wide SCSI bus. Also known as Fast-20 SCSI.

Uncorrectable Error — An error that cannot be overcome using [Error Correction Code \(ECC\)](#) or by re-reading the data when host retries are enabled.

Unformatted Capacity — The total number of usable bytes on a disk, including the space that is required to record location, boundary definitions, and servo data. *See also* [Formatted Capacity](#).

Universal Address Translation — WD hard drives provide a linear disk [Address](#) translator to convert logical sector addresses to physical sector addresses. This allows easy installation and compatibility with numerous drive types.

Unrecoverable Error — A read error that cannot be overcome by an ECC scheme or by rereading the data when host retries are enabled.

Untagged Queuing — The ability of the drive to receive a maximum of one I/O process from each [Initiator](#).

Upgrade — In hard drives, the replacement of a hard drive with one offering greater capacity or performance, or both.

USB — Universal Serial Bus. External [Bus](#) standard used to connect devices such as external hard drives to a [Personal Computer](#). USB supports [Hot-Plugging](#).

V

VAR — Value Added Reseller. *See* [Reseller](#).

Viterbi Detection — An [Algorithm](#) used in read channel technology that detects an entire sequence of data bits at a time and determines the most likely sequence of data bits by comparing actual sequence of data bit samples with sequences of possible data bit sample to accurately detect that data written to disk.

Voice Coil — An [Actuator](#) motor; the force of the magnetic rotary voice coil produces a movement of the head that is proportionate to the force exerted by the coil.

W

WhisperDrive™ — Western Digital technology comprised of an advanced feature set that achieves acoustic reduction in idle and seek, innovations in firmware and system design, and quiet operation compatible with the home environment.

Wide SCSI Bus — See [Ultra SCSI](#).

Winchester Disk — Former code name for an early IBM hard drive model, sometimes still used to refer to the technology and design of most traditional hard drives.

Word — Two bytes that are processed together in a single operation.

Workstation — A personal computer with exceptional capacity and performance capabilities for use mainly in engineering, design and audiovisual applications demanding immediate access to data and the ability to manipulate it in technically sophisticated ways.

Write — The recording of flux reversals onto the magnetic surface of a disk.

Write Cache — High speed [RAM](#) used to buffer data transfer from the host to the hard drive.

Write Coalescing — Allows the drive to combine write commands that write data to sequential portions of the media into one operation.

Write Verify — Immediately after writing data to the disk, a drive with the Write Verify feature will verify that it can read the data it just wrote to the disk to ensure that it will be able to retrieve it later. If the drive is unable to read the data, it writes it to another area of the disk, where it attempts to write verify it again.

Z

Zoned Recording — Increases the data density on the outer [Tracks](#) of the drive where most of the [Sectors](#) are located. This type of recording affords more disk [Capacity](#) because there can be more sectors on the larger outer tracks than would be possible if the number of sectors per track were constant for the whole drive.