§§ **Seagate**

TechnologyPaper

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Enhanced IDE Faces Many Challenges
An Objective Perspective

Advancements in technology, products and their functionality are essential to progress. In the personal computing world this often translates to higher value for end users which can then be leveraged into the continued development and growth of markets and applications. Recently, a program referred to as Enhanced IDE was created with the intent to follow such a path.

Enhanced IDE is a collection of four features that is designed to help meet the future needs of the market. Each of the four features does indeed support improved functionality at a system level and accordingly these features are felt to be positive for the industry and for end users. As a package, however, Enhanced IDE is causing increased confusion in the industry while also raising the risks of incompatibility and mismatched system integration.

> The four features of Enhanced IDE:
> - High Capacity Addressing of ATA Hard Drives
> - Fast Data Transfer Rates for ATA Hard Drives
> - Dual ATA Host Adapters
> - Non-Hard Disc ATA Peripherals

This paper attempts to discuss the issues surrounding the Enhanced IDE program and place them into proper perspective so that system designers, integrators, distributors, resellers, end users and members of the trade press may become more knowledgeable and thus form more objective conclusions and recommendations for implementation and integration.

Uncontrolled Complexity

As can been seen in the accompanying overview of Enhanced IDE, this collection of features requires an extremely high degree of integration. Specific support is required not only for storage peripherals but also for host adapters, core logic, system bus, BIOS and operating systems — virtually ever major block of PC architecture. Adding to this complexity is the fact that there is no central industry standard which controls these features. Lack of control is already creating confusion and compatibility risks in the industry. It is clear that a better understanding of Enhanced IDE and its position in the market is needed now before users begin to suffer from the inherent risks.

Enhanced or Partially Enhanced?

At the core of much of the confusion in Enhanced IDE is the use of the term itself. A recent survey of the leading suppliers of host adapters and motherboards resulted in a random response identifying only one or two of the four features when asked the question, "What features make up Enhanced IDE?"

Due to the lack of knowledge and the lack of a central industry standard specification, a serious problem has begun to surface. Suppliers are referring to their products as Enhanced IDE even though they do not support or provide all four features of Enhanced IDE. Users can today purchase "Enhanced IDE" host adapters that only provide one function such as high capacity addressing support. One can only imagine the potential for dissatisfaction when that user attempts to install the host adapter as a second channel on a secondary address only to find out that it does not support that feature of Enhanced IDE. Customers who expect to receive full Enhanced IDE support today are more likely to receive partial support in seemingly random combinations from different vendors than to receive what they thought they were paying for. Because the descriptor "enhanced" is felt to be a legitimate adjective by suppliers, even for just one feature, it is nearly impossible to control the offerings of Enhanced IDE products and ensure consumers of complete support and satisfaction.

Collision in the Aftermarket

As previously stated, the individual features of Enhanced IDE do provide users with specific benefits. In recognition of this, almost every system manufacturer is beginning to phase-in the use of selected features for their various system platforms as the market requires. Unfortunately for Enhanced IDE, the features are being introduced independently as each manufacturer sees fit for their competitive positioning.

The result of this independent introduction is, of course, that buyers of newer systems receive only the benefit of an individual feature. For example, fast data transfer rate support is becoming standard on high-end local bus systems. This single feature could very well satisfy the users immediate requirements without the need for the other features of Enhanced IDE. In the future, however, if the same system is upgraded to add the remaining features of Enhanced IDE, the user may be forced to purchase an Enhanced IDE package that contains a feature that is already installed. This represents not only wasted features and unnecessary costs but also may result in integration conflicts and incompatibility with the original factory implementation. As time goes on, this situation will only worsen.

"Enhancements" Feel Nice, But Users Want <u>Features</u>

The easiest way to avoid confusion, waste and compatibility risks is to address the features that users want as they want them. In this fashion, the features and benefits of a system can be tailored to the specific needs of the user. We're all familiar with the upgrade packages of the automotive industry — You can't get chrome trim without metallic paint. If you want leather seats you have to buy a sunroof and sports suspension but can't have automatic transmission. Needless to say, these packages are not designed to meet the specific need of the customer. Likewise, in the computer industry, users have specific needs and features that they look for in new systems and as they upgrade. Why not simply give them what they want when they want it?
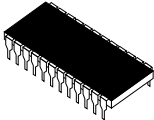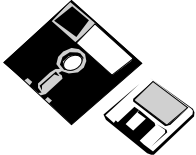
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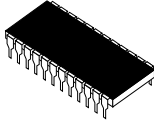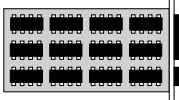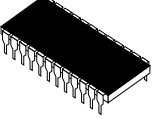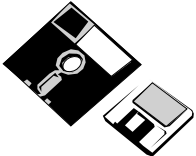
Having supported the benefits of the individual features of Enhanced IDE it should also be stated that the computer industry and computer users always find a way to utilize a capability if it's offered at the right price. To this prem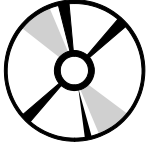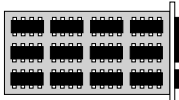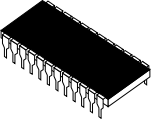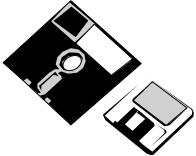ise one could conclude that the full feature set of Enhanced IDE may eventually become standard in high-end system offerings once the required ATA packet interface (ATAPI) standard is accepted. If and when this takes place it makes sense that the system manufacturers and integrators will have control over all of the required pieces to integrate a complete solution without the risks inherent in aftermarket integration. Highly integrated solutions should be left to the experts, that's what users pay for.

Playing it Safe

To ensure safe passage in the rapidly advancing world of PC technology, users should look for the specific features, performance and functionality that meets their needs. For solutions that require a high degree of integration, all but the most knowledgeable technical users should call on the expertise of leading system manufacturers to assure compatibility and fulfillment of needs well into the future.

Required Support for Enhanced IDE Features

System Components

Features	Peripherals	Host Adapter Hardware	Bios	Operating System
High Capacity	✓		✓	✓
Fast Data Transfers	✓		✓	
Dual Host Adapters		✓	✓	✓
Non-HDD Perpherals	✓	✓	✓	✓

Note: Some host adapters provide on-board BIOS support.

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Overview of Enhanced IDE
What it Does and What it Needs

The four features of Enhanced IDE:

High Capacity Addressing of ATA Hard Drives—This feature is based on a proposed AT Attachment (ATA) industry standard specification that defines how drives greater than 528 Megabytes are addressed by the system BIOS. Proper implementation for today's systems requires that the drive, BIOS and operating system all support the ATA specification. New operating systems will eliminate the need for this feature.

- This feature requires disc drives which support the ATA specification. Most ATA drives larger than 528MB provide this support.

- BIOS support conforming to the ATA specification is required. Major systems manufacturers have begun transitioning to a BIOS revision that supports this specification.

- Operating system support may be required. Windows 3.1 does not fully support the ATA specification without the use of a third party driver for the Windows "32-bit disk access" feature in virtual memory.

The need for support of this feature will diminish rapidly as most 32-bit operating systems will support logical block addressing (LBA) which does not require any BIOS-to-drive addressing scheme.

Fast Data Transfer Rates for ATA Hard Drives—This feature is based on the ATA industry standard specification for programmed input/output (PIO) mode 3 and multiword direct memory access (DMA) mode 1. These transfer modes support burst transfer rates of up to 11.1 Megabytes per second and 13.3 Megabytes per second respectively. Implementation requires support of the ATA specification by the disc drive and system BIOS.

- System BIOS support is required for full data transfer capability. The BIOS implements this feature through either the PIO mode or DMA mode but not both. PIO is the dominant implementation.

- This feature requires disc drive support. Most major drive and system designers are beginning to support this feature. Support for this feature is included among the features of *Fast ATA* products.

The fast data transfer rates help to take advantage of the higher bandwidth of ATA local bus attachments. The fast transfer capabilities are wasted if the drive is attached to a low bandwidth connection such as the ISA bus. In addition to the above PIO and DMA modes the *Fast ATA* standard (not affiliated with Enhanced IDE) supports multiple read/write to provide increased transfer rate capabilities even on ISA bus attachments.

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The four features of Enhanced IDE: (continued)

Dual ATA Host Adapters - This feature uses a secondary host adapter address along with a secondary system interrupt (IRQ15) to address a second ATA host adapter, thus supporting up to four devices. Implementation requires support in the host adapter, BIOS and operating system.

- Support by the disc drive is not required for this feature. Accordingly, the ATA industry standard does not specify or control this implementation.

- Host adapters must provide a secondary address jumper. Few host adapters today support this. Until CD-ROM and/or tape drives become available for ATA attachments (see below) this feature may not become widely supported.

- BIOS support of this feature has not been common, however, newer systems are expected to begin supporting it.

- Support by the operating system is essential. Most 32-bit operating systems will support this feature. The latest versions of DOS also supports this.

Although this feature calls for the "support" of dual channels, today there is no uniform method for obtaining the same functionality and performance on the secondary host adapter as the system provides to the primary host adapter. The impact of this is the secondary host adapter will perform at a lower level than the primary.

Non-Hard Disc ATA Peripherals - This feature is targeted at a new generation of CD-ROM and tape drives that provide a low cost connection alternative to SCSI. To support this a new specification has been drafted to accommodate the new command set that is required. The ATA Packet Interface (ATAPI) specification is currently in draft stage and is not expected to be approved in the near future. Integration of this feature requires the support of BIOS, operating systems and hardware through host adapters, core logic and peripherals.

- Disc drive support requirements are subject to change with the new standards being proposed. Existing ATA drives may not be ATAPI compatible.

- Hardware must support the ATAPI specification.

- BIOS must support the ATAPI specification.

- Operating systems must support the ATAPI specification.

This feature cannot exist in a uniform and controlled form until approval of the ATAPI standard takes place. Accordingly, no ATAPI peripherals are currently available.