



From: Personal Storage Product Marketing
Date: July 2000
Number: TP-350



T E C H N O L O G Y P A P E R

S E A G A T E F O R M

Ultra ATA/100 Advanced ATA Storage Interface

Introduction

To provide PC users with the performance they deserve, the ATA interface data-transfer rate should remain above the data-transfer rate from the disc drive's media. System performance will degrade if this requirement is not met. Degradation occurs whenever the drive waits for data to become available for Write commands or for space to become available in the data buffer for Read commands. Ultra ATA/100 provides the increased interface data-transfer rate required for tomorrow's Seagate Technology® Personal Storage disc drives.

By itself, Ultra ATA/100 enables relatively small performance gains for most PC applications. The increased bandwidth afforded by Ultra ATA/100 will, however, be an enabling technology for increased overall system performance as system components leverage the additional bandwidth.

Seagate has worked closely with major motherboard and controller manufacturers to introduce Ultra ATA/100 systems. In conjunction with its motherboard and controller partners, Seagate has performed extensive testing to provide rapid, low-risk deployment of Ultra ATA/100.

Interface History

The hard drive interface is the path through which data travels between the PC and the hard drive. The original hard drive interface, Interface Standard Architecture (ISA), was limited to 4 Mbytes per second at its introduction and has been pushed to 8 Mbytes per second since that time. Faster and more efficient interface data-transfer protocols, such as programmed input/output (PIO) and direct memory access (DMA) were designed to take advantage of local bus architectures that replaced ISA. Interface transfer rates have progressed from 8.3, 11.1, 13.3 up to 16.6 Mbytes per second using PIO and DMA modes. Ultra ATA/66, the precursor of Ultra ATA/100, supports transfer rates up to 66.6 Mbytes per second.

Why is a faster disc interface necessary?

Today's applications require performance to drive productivity applications, produce high-quality graphics, manipulate complex databases, and respond to more demanding operating systems. The entire PC system has undergone performance enhancements, with new bus, memory and processor technologies. Ultra ATA/100 is designed to move data at top speed, meeting the performance requirements of today's PC systems.

The path to the system for data stored in disc drive cache memory is additionally limited, to a large degree, by the speed of the interface. Ultra ATA/100 provides a means to move cached data to the system as quickly as possible.



INTELLIGENCE

Corporate Headquarters
Scotts Valley, California, USA +1-831-438-6550

Asia/Pacific Headquarters
Singapore +65-488-7200

Europe, Middle East and Africa Headquarters
Boulogne-Billancourt, France +33 1-41 86 10 00



What is Ultra ATA/100?

Ultra ATA/100 is based on the technical specification Ultra DMA-100. It is a modification of a design originally created by Intel, Quantum and Seagate. Ultra ATA/100 meets several criteria:

- Greater throughput than today's Ultra ATA/66 interface
- Same cost as the Ultra ATA/66 interface
- Backward-compatibility with the Ultra ATA/66 interface
- Lower electromagnetic interference through cabling technology
- Same improved, 80-conductor 40-pin cable as Ultra ATA/66

Cable Integrity

Ultra ATA/100 requires the same 80-conductor cable as Ultra ATA/66 (Ultra ATA/33 requires a 40-conductor cable). The 80-conductor cable is connected to ground, reduces cross-talk and improves signal integrity by reducing electromagnetic interference. The 80-conductor cable also improves signal quality by matching driver impedance. A sensing mechanism allows the host to detect the 80-conductor cable and determine whether to enable Ultra ATA/66/100 transfer rates.

Technology Overview

In ATA/2 and ATA/3, a clock pulse (or strobe) is sent from the host to clock data transfers to and from the disc drive. One pulse is sent for each word of data. The leading (rising) edge of the strobe enables data onto the bus. The trailing edge of the pulse latches the data. To increase the data-transfer rate, the pulse rate must be increased. As the pulse rate increases, the system becomes increasingly sensitive to signal interference (noise) and signal integrity (shape). Rather than increasing the speed of the clock pulses, Ultra ATA/100 uses both the rising and falling edges of the clock signal to send and receive data. The same pulse provides two strobes (the rising and falling edges) without actually increasing the speed of the pulse. Twice as much data is transferred within the same time period since both the rising and falling edge of the pulse are used.

Performance

Ultra ATA/100 provides higher performance than the previous implementation of Ultra ATA, which transfers data at up to 66.6 Mbytes per second.

Cost

Ultra ATA/100 costs the same as Ultra ATA/66.

Backward-Compatibility

Ultra ATA/100 is backward-compatible with Ultra ATA/66 products. Currently installed PCs can use new Ultra ATA/100 disc drives in legacy ATA modes at transfer rates of up to 66 Mbytes per second.

Reliability

Reliability is always an area of customer concern. Like its predecessor, Ultra ATA/100 uses cyclical redundancy checking (CRC) data verification. CRC is an error-detection mechanism that allows system retries for improved data integrity. If the system detects an error, the data transfer may be repeated. This feature may be turned off if the performance impact of retries is intolerable. This feature may not be supported by non-Seagate disc drives. By placing this function on its drives, Seagate has allowed the PC to choose to enable support or ignore the function.