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FLASH MEMORY

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Flash memory has been evolving for several years. Intel began to market flash memory in 1988, but the cost of \$1200 for two megabytes of storage prohibited widespread demand. Still, the obvious advantages of flash memory fueled interest in the new technology. During the last twelve months, flash memory has become affordable and fast enough to be considered for mainstream computing. Dataquest, an industry research firm, believes the current sales of \$565 million will rise to \$2.5 billion by 1996.

Flash memory, or electrically erasable programmable read-only memory (EEPROM), is rewritable like normal random-access memory (RAM), but unlike dynamic RAM (DRAM) or static RAM (SRAM) holds data after the power is turned off. This nonvolatile memory is found today in two main areas of the computer industry: flash BIOS technology and flash memory cards.

Flash BIOS

System designers are using flash BIOS as a replacement for system ROM (read only memory) or EPROM (erasable programmable ROM) on hardware components. Flash BIOS is valuable not only to the product manufacturer, but also to the end user. The original equipment manufacturer (OEM) can use the flash memory to update the system ROM on a PC without replacing an expensive chip on the system board. A BIOS upgrade can be made by the end user from a floppy that is downloaded from the manufacturer's bulletin board. More than one-half of the PCs on the market today are shipping with flash BIOS.

Intel Corp., the world largest supplier of flash memory, is adding flash memory to its line of network adapter cards. The flash memory on these cards not only holds the adapter configuration, but also holds user defined information that can identify the PC and its setup to a network administrator. Hewlett-Packard has designed a remote router with flash memory giving the user the option to upgrade to new releases of the software with added functionality. Flash memory is also being used to store the configuration of ISA, EISA, or Micro Channel adapter cards for various computer systems.

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TECHNOLOGY ALERT

Flash Memory Cards

Even though flash memory is being used throughout the computer industry, the most dramatic changes in the market will be seen in the flash memory cards. These cards will replace the hard disk or floppy drive in the increasing market for mobile computers.

SunDisk Corp. introduced the industry's first credit-card-sized mass storage device in October of 1992. It was a 3 x 2 inch card that used flash memory technology and held more than 40,000 pages of information. A radical breakthrough in technology, this was the industry's first complete solid-state mass storage system on a card.

The advantages of flash memory cards are substantial:

- Nearly indestructible. A flash card can withstand up to 1,000G of force compared to 10G for hard drives.
- Reliable. Since the flash memory does not contain moving parts, it is more reliable than a hard disk.
- Convenient. The small size makes this media ideal for mobile computing and as easy to use as an ATM bank card.
- Fast. Data access times are far better than a hard disk.
- Conserves power. Flash cards use only 1/20th of the power needed to run a hard drive. An HP OmniBook 300 can work the entire day using the flash memory card without recharging the nickel hydride batteries.
- Instant responsiveness. Lengthy boot-up times will be a thing of the past.
- Less system RAM. New applications that 'eXecute in Place' use the flash memory directly and eliminate the need for additional system RAM.

There are also disadvantages in the flash memory market:

- Cost. Flash cards are expensive. Prices can range from \$100 to \$200 per megabyte. The current demand for flash memory has been outpacing the supply, keeping the prices high. The future looks bright though. Manufacturers are increasing production, and analysts expect prices to drop even as low as \$1 per megabyte by the year 2000.
- Limited storage. The amount of storage on the flash cards is also a limiting factor. Intel's new 0.6-micron technology produces flash cards with densities as high as 40 Mb. The expected maximum storage capacity is 64 Mb. Compression software that is readily available could double this amount.
- Data exchange. Yet another problem facing the user is the ability to transfer files from the flash card to another computer. A PC card reader can be purchased at an additional cost to copy files from a flash memory card to your desktop using standard DOS commands. The card reader can also format the flash cards and transfer data from one card to another. DATA I/O's card reader, CardPro, sells for \$450.
- Compatibility. Unlike a floppy disk, flash cards are not just devices, but also an adapter. The adapter must be compatible with your computer, and the card must come with drivers for your model of portable. To solve the incompatibility issue, the Personal Computer Memory Card International Association (PCMCIA) established the Socket Services and Card Services specifications. The new standards will make cards device-independent by implementing the interface in the BIOS of all new notebooks. Until this standard is fully implemented, a PCMCIA card may not be compatible with your specific computer or may need a software driver.

Even with these problems, flash memory is the wave of the future. Since the fastest-growing segment of the PC market is mobile computing devices, such as, pen-based, hand-held, and notebooks, the demand for durable, removable, compact, high-capacity, power-conserving mass storage devices is increasing as well.

Flash memory may never replace the hard drive, but it is quickly carving out its own niche.