Fixed Disks vs. Removable Disks

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04/09/1999

Removable storage is a fairly good complement to fixed storage.

Removable storage in this context means any form of read/write storage that you can remove from your computer. Until recently, the only removable storage choices for most computer users were the floppy disk and the tape drive. But floppy disks lacked the capacity users need, and tape drives lacked the flexibility to do more than back up files. Other options such as the Bernoulli Box and the SyQuest cartridge system found only a limited following among project managers who had to lock up files at night, and among graphic artists sending files to service bureaus.

It was Iomega, however, that almost single-handedly moved this category of drive into the mainstream with its affordable, easy-to-use Zip Drive (now $150 street), introduced in 1995. The cartridges, which are basically floppy disks (that is, flexible magnetic media) in a case, cost about $14 apiece, or 14 cents per megabyte.

The biggest strength of the removable storage category is also its weakness: There are so many competing, noninterchangeable choices. Capacities range from 100MB to 4.6GB; drive prices range from $150 to $3,000, and cartridge prices range from $10 to $169 (or from about 1 cent to 19 cents per megabyte).

Tape drives as a group offer a lower cost per megabyte for their cartridges. The tapes for the Sony SDT-2000E drive included here, for example, are less than 1 cent per megabyte--versus 3 cents to 19 cents per megabyte for the other technologies. Tape drives, however, are highly limited for other kinds of applications. Even though some software lets you treat tape drives as if they were disk drives, the time it takes to wind through the tape and find the right file makes them difficult to use for loading a spreadsheet, working on it, and saving it back to tape. For better or worse, end users haven't bonded with tape.

Disk-based drives are by far the more appropriate choice for most purposes, since they will let you read and save files directly from any program and even run programs from the disks. They also make up for their higher cost per megabyte (relative to tape drives) with added convenience. For example, you can back up files by copying them; you don't have to use backup and restore utilities.

Disk-based removable drives are almost all fast enough to serve for near-line or secondary storage -- which lets you keep files handy on multiple disks and pop in the right disk as needed. This is particularly useful if you generate a steady stream of multimedia files with sizes measured in tens of megabytes.

Some choices offer good enough performance that they can serve as primary storage, either instead of or along with a hard disk. For example, you can put all your programs on your hard disk but keep your data on a removable disk that you move between your desktop and notebook or your home and office.

With higher-capacity disks at 1GB or more, you have room to put both your data and programs on the disk, so you don't even have to worry about differences in option settings or program versions between systems. Given performance equal to that of a fixed disk, they can be used as a computer's primary drive. For a system shared by many users, such as a home PC, each individual can have a personal isolated system. This lets you keep your work-at-home environment isolated from the kids' sometimes devastating PC meandering.

100MB TO 150MB: Floppy Replacements

With today's hard disks measured in gigabytes, and with multimedia and graphics file sizes often measured in tens of megabytes, a capacity of 100MB to 150MB is just right for taking over the traditional functions of a floppy disk--moving a few files between systems, archiving or backing up individual files or directories, and sending files by mail. It's not surprising, then, that drives in this range are bidding to be the next-generation replacement for floppy disk drives.

We placed two disk drives in this category: Iomega's Zip Drive and the LS-120 drive from O.R. Technology. There is also a third announced contender--the 130MB UHC-130, with versions promised from Mitsumi and from Swan, but neither was ready in time for this roundup. With a claimed transfer rate of 3,000 KBps (kilobytes per second), the UHC-130 drives should prove faster than the LS-120 (450 KBps) and still be able to read 3.5-inch disks. The street price for this group is under $200, which is about right for a floppy disk drive replacement.

These drives had the slowest performance on our tests--even with a SCSI connection on the Zip Drive and an IDE connection on the LS-120. The parallel-port version of the Zip Drive was even slower, though it has the advantage of being able to connect to virtually any computer. When you look at performance figures, keep in mind the role of these drives as floppy disk drive replacements. Don't expect to run video clips from them.

We were most impressed with the Zip Drive. It outperformed the LS-120 and was a snap to install. The 1-pound external model travels well, and the large installed base makes it easy to share files, although we recommend that you go with the faster internal version unless you know you'll need to share the device.

200MB TO 250MB: Super Floppies

The 200MB to 250MB range is best understood as super-floppy territory. This is about double the capacity of the floppy disk drive wanna-bes, with performance more akin to a hard disk than a floppy disk drive. We found five drives in this group. Two are 230MB MO drives: the DynaMO 230 Portable PC Card Drive, from Fujitsu, and the Olympus SYS.230 Universal, from Olympus America. The other

three--the EZFlyer 230 (an Editors' Choice), from SyQuest Technology, and the Shark 250 and Avatar AR-3210NS, from Avatar--use magnetic hard disk media.

Drives in this category not only offer more capacity than you need for a next-generation floppy disk drive replacement, they cost more than you'd probably be willing to pay for one, with street prices of about $250 to $500.

You may find this capacity just right for backing up your data directories or for holding all your current data files so you can move them easily from one system to another. In that context, note that many of these drives are also at home on a notebook, with internal notebook versions (from Avatar and Fujitsu), external parallel-port versions (Avatar, Olympus, SyQuest), and even a PC-Card, battery-powered version (Fujitsu). This is also a convenient capacity for archiving and for near-line storage for multimedia files.

The magnetic-media drives in this group offer better performance than the MO drives. But even the MO drive performance is good enough to let you play video clips directly from the drives, at least for the SCSI versions.

All five drives in this category are solid choices. Our favorite is the EZFlyer 230 ($230 street), which offers the right mix of capacity and performance at a reasonable price. Just don't try sticking an EZFlyer cartridge in your shirt pocket; it measures about 5 inches across. Laptop users will want to take a close look, too, at Avatar's Shark 250. The drive's half-pound weight and the tiny (2.5-inch), rugged cartridges appeal to the road warrior.

540MB TO 650MB: Hard Disk Complement

The next step up in capacity--540MB to 650MB--is enough to back up a reasonably large hard disk partition. Most such drives also offer good enough performance to function as secondary if slow hard disks.

We found six drives in this range. The Nomai 540 uses magnetic hard disk media. The Panasonic PD Drive and Toray's Phasewriter DUAL are both PD drives, which means they read and write phase-change disks and read CD-ROMs. Fujitsu's DynaMO 640 and Pinnacle Micro's Tahoe 640 MB are both MO drives, with formatted capacities of about 600MB on their 3.5-inch cartridges. Also included in this group is Sony's Spressa CSP-9411-S, a CD-R drive.

Street prices for this category range from a surprisingly low $300 for the Nomai 540 to $660 for Fujitsu's DynaMO 640. The MO drives claim to offer 640MB, but that works out to about 600MB after formatting. The PD and CD-R drives offer 650MB after formatting, and the Nomai delivers 540MB.

From this midrange group we preferred the Nomai ($300 street after rebate). It's relatively speedy and backward-compatible with SyQuest's 270MB cartridges.

Here again, though, the other options are compelling. The MO drives are a good choice for those who have a commitment to MO, or who need bulletproof long-term storage. The Panasonic and Toray PD drives ($450 to $600) offer a good mix of capacity, performance, and low cost per megabyte for near-line applications, with the bonus of being CD-ROM drives. The Spressa CD-R ($800 list) is suitable for permanent backups, archiving, in-house CD publishing, and--thanks to the ubiquitousness of CD-ROM drives--distributing data to almost any PC user.

1GB and up: Near Hard Disks

Like near beer, near hard disks don't offer the same punch as the real thing. But with capacities of 1GB and up, and performance that is well into hard disk territory, they are close enough to hard disks to serve as additional primary storage or even your only primary storage if necessary.

We found eight drives in this category. Iomega's 1GB Jaz Drive and SyQuest's 1.5GB SyJet both use magnetic hard disk media. The rest are MO drives. Hewlett-Packard's HP SureStore Optical 2600fx Multifunction Disk Drive, the Maxoptix T4-2600, MicroDesign International's MDI SCSI Express 2600SL, Olympus America's Olympus PowerMO 2600/SCSI, and the Sony CMO-R540-10 all follow 2.6GB standards. Pinnacle Micro's Apex uses a proprietary 4.6GB scheme.

Street prices are $400 for the Jaz and the SyJet and $1,800 to $3,000 for the MO drives. MO disks are two-sided; that means you have only half the capacity available online at any given time. After formatting, an MO cartridge leaves you with 1.06GB per side. The Apex 4.6 GB cartridge offers 2.12GB per side.

In this class, the SyJet ($400 list) stands out as the value leader. It is faster than the Jaz and offers 50 percent greater capacity for the same price, although the Jaz has more market presence. With its huge capacity, the Apex 4.6 GB ($1,900 list) is in a class by itself, and it's worth a look for those whose capacity needs climb that high.

Interface Options

It should be no surprise that SCSI drives are faster than equivalent drives that connect through a parallel port or PC Card port. But our results show that an inherently slow drive, such as the Zip Drive, connected through a SCSI port, offers dramatically better performance for many purposes than a faster drive, such as Iomega's Jaz Drive, connected through a parallel port.

As a group, SCSI drives are easier to install in Windows 95 than other drives. If you already have a SCSI card installed, you often can simply plug in the drive, and Windows 95 will recognize it on boot-up. At most, you'll have to set the

drive's SCSI ID so it won't conflict with other SCSI devices on the card, and make sure the SCSI chain is properly terminated--with termination on both ends of the chain and nowhere in between.

Be aware, too, that only a few of the SCSI drives we saw include bundled SCSI cards. This is a new trend. Manufacturers point out that if they included a card, it would have to be an ISA-bus card to ensure it would plug into any system. If you wanted a higher-performance PCI card, you would still have to pay for the ISA card you'd never use. If you need a card, you can get it from the same source as the drive in most cases. You'll find that installing it in Windows 95 is usually simple. Plug in a SCSI card and Windows will generally recognize it on boot-up, then stop to let you choose whether it should install the appropriate drive from the Windows 95 disk or from a disk that came with the card.

Here is a brief table in conclusion.

Type	Usuage	Option
Floppy disk replacement 100MB to 120MB	sharing small to medium-sized file with others Making backups of important files Carrying files back and forth between home and work	Iomega Zip Drive a:drive
Super floppy disk 210MB to 250MB	Sharing large files with others Sending graphics files to a service bureau Making backups of large files and directories Bringing data and multimedia presentations on the road	Avatar Peripherals Shark 250 Avatar Systems AR-3210NS Fujitsu DynaMO 230 Portable Olympus SYS.230 Universal SyQuest EZFlyer 230

Hard disk complement 540MB to 650MB	Distributing large amounts of data Backing up hard disk partitions Storing and running little-used applications Storing multimedia and image files for near-line access Locking up sensitive project files	Fujitsu DynaMO 640 Nomai 540 Panasonic PD Drive Pinnacle Micro Tahoe 640MB Sony Spressa CSP-94115 Toray Phasewriter DUAL
Near-hard disk 1GB and up	Creating backups of entire hard disks Using as a second, removable hard disk Maintaining separate operating environments on one PC Storing and running video clips Archiving image files Backing up network drives	HP SureStore Optical 2600fx Iomega Jaz Drive Maxoptix T4-2600 MDI SCSI Express 2600SL SCSI Olympus PowerMO 2600 Pinnacle Micro Apex 4.6 GB Sony CMO-9540-10 Sony SDT-2000E SyQuest SyJet