days, hard disk drives are small, robust, sleek, and have high storage capacities. For example, when hard disk drives were introduced, they were able to store data up to 50 MB of data only and required a lot of care. However, modern hard disk drives are shock resistant and come with more than 500 GB of data storage capacity.

A hard disk drive plays a significant role in terms of performance, storage capacity, and reliability. Performance determines the speed at which data is retrieved and stored in a hard disk drive. The storage capacity determines the amount of data that can be stored in a hard disk drive. Reliability determines the life of a hard disk drive and capability to prevent data loss.

After learning about a hard disk drive, let's now explore the various components that make up a hard disk drive in the next section.

Exploring the Components of a Hard Disk Drive

A hard disk drive is a device that stores data. You need to know the internal working of a hard disk drive and understand the aspects that affect its performance, reliability, and consistency. The working principle of almost every hard disk drive remains the same, irrespective to the development of technology.

A hard disk drive uses round and flat disks called platters that are coated with special magnetic material to store data. These platters are introduced with a hole at the center and are mounted on a hard disk drive by stacking them onto a spindle (a small cylinder that rotates the platters). The platters in the hard disk drive rotate at high speed by a special spindle motor attached to the spindle. An electromagnetic read/write device knows as heads, are mounted onto head sliders (provide a physical support to the head). The heads are used to record information onto the hard disk drive or read information from the hard disk drive. The head sliders attach with head arms (move read/write heads on the location where the information needs to be read or written), which are connected mechanically into a head assembly (an assembly that contains a spindle motor and a voice coil) and placed over the surface of the hard disk drive through a device called an actuator. A logic board (is a circuit board) controls the working of all the parts present in the hard disk drive, and communicates with a computer.

Spindle motor moves heads in a fixed angle onto the platter; whereas, the voice coil moves heads in a straight line.

In a platter, one surface has capacity to hold 10 billion bits of data. The platter records information in concentric circles called tracks. These tracks are further split into various chunks called sectors that holds 512 bytes of information.

Fig.HD-6.1 shows inside view of a hard disk drive:

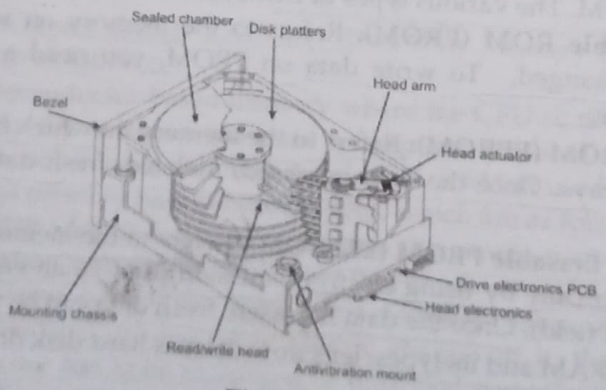


Fig.HD-6.1

Let's now learn about hard disk drive platters, magnetic media, tracks and sectors, areal density, and read/write heads in the following section.

Platters

A hard disk drive has one or more platters to store information. These platters are basically made up of two main substances- a substrate material that makes platters and provides their structures and

rigidities, and a magnetic media coating that actually holds data. For this reason, the quality of platters, particularly their media coating, must be the best. The surfaces of each platter are precisely designed to remove any imperfections, such as uneven size, thickness, and uneven media coating. If any of the imperfection persists, then the data cannot be stored or retrieved.

Let's now learn about the platter size.

Size of Platters

In a hard disk drive, the size of platters is the primary element of its overall physical dimensions, called the form factor of a hard disk drive. The size of the platter is usually equal for all hard disk drives with the same form factors.

Fig.HD-6.2 shows the detailed view of a hard disk drive along with platters:

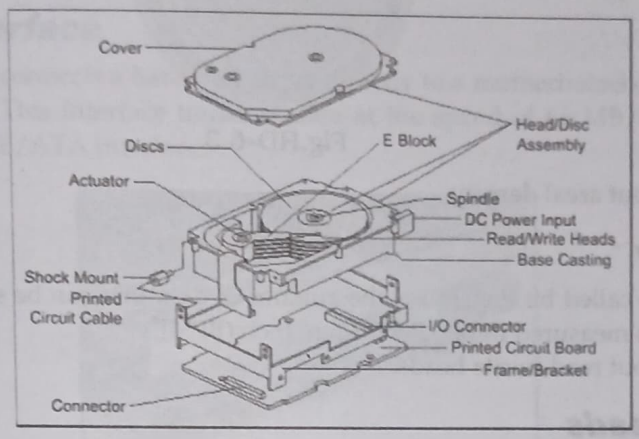


Fig.HD-6.2

Earlier, hard disk drives for desktop computers came with 5.25 inches of platter size. Today, hard disk drives for desktop computers come with 3.5 inches of platter size.

Laptops use smaller hard disk drives in which the size of platters ranges between 2.5 inches and 1.8 inches.

Now, let's learn about the number of platters in a hard disk drive.

Number of Platters

Depending upon designs, a hard disk drive can have one or more platters. Usually, a hard disk drive has one to five platters. Some high-end hard disk drives usually used in servers, have approximately a dozen platters. All the platters in a hard disk drive are physically connected through a common central spindle to make the platters a single assembly that spins as one unit. These platters have separate spacer rings that fit over the spindle. The whole assembly is protected from top by using a cap or cover and screws.

Let's now learn about magnetic media.

Magnetic Media

Platters of a hard disk drive are made of substrate materials that form a base where a media layer (thin coating of magnetic material) is placed to store data. In older hard disk drives, iron oxide-rusts were used as magnetic materials. The binding agent was used to attach rust particles with the platter surface. The rust particles to be attached were light brown in color.

Nowadays, hard disk drives use thin film media. As the name suggests, thin film media contains a thin layer of a magnetic material that is applied to the surface of platters. Thin film media is uniform and smooth as compared to oxide media, and its superior magnetic property allows the hard disk drive to hold more data in the same amount of space. The bottom of the platter in a hard disk drive is usually covered with a thin protective layer made of carbon, and the top of the platter is covered with a thin lubricating layer. These materials are used to protect a hard disk drive from getting damage.

Let's now learn about tracks and sectors of a hard disk drive.

Tracks and Sectors

Platters are arranged in a hard disk drive to store data in an organized manner. The platter of a hard disk is divided into thousands of tracks that are strongly packed concentric circles and contains a large

amount of information. These tracks are further broken down into sectors. A sector is the smallest individually addressable unit on a hard disk drive that holds up to 512 bytes of information. Earlier hard disk drives of a computer had 17 sectors per track; whereas, today, hard disk drives can have thousands of sectors in a single track.

Fig.HD-6.3 shows tracks and sectors on a platter:

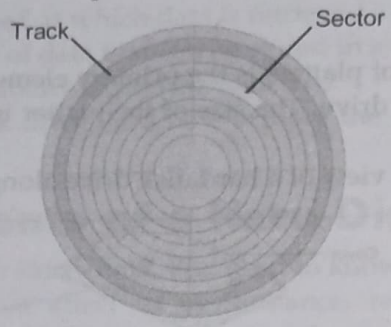


Fig.HD-6.3

Let's now learn about areal density.

Areal Density

Areal density (also called bit density) is the amount of data that can be stored in a unit area of a platter. The areal density is measured in Bits Per Square Inch (BPSI).

Let's now learn about read/write heads.

Read/Write Heads

Read/write heads of a hard disk drive work as the interface between magnetic media and electronic components. These heads store data in form of magnetic pulses on platters of a hard disk drive. Whenever the stored data is read, read/write heads convert the magnetic pulses into electrical signals.

After understanding the components of a hard disk drive, let's now understand SSD in the next section.

Understanding SSD

SSD is another storage device in comparison to hard disk drives. An SSD does not contain any moving parts, such as spinning platters and heads; therefore, it is faster than hard disk drives. An SSD uses transistors to store data. In SSD, the information can be accessed immediately, because there is no latency time when data is transferred. For this reason, SSDs have greater stability and reliability than hard disk drives. Moreover, SSDs are more expensive than hard disk drives. In addition, SSD store up to 256 GB of data. Fig.HD-6.4 shows the SSD:

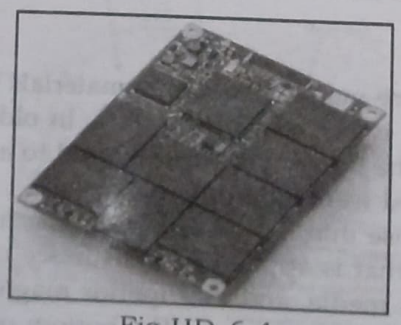


Fig.HD-6.4

The working of an SSD is different from the working of a hard disk drive. In an SSD, an electric current passes to transistors in the form of 0s and 1s. If a transistor allows the electric current to pass through it, then it is represented as 1 and if the transistor does not allows the electric current to pass through it, then it is represented as 0. An SSD has a controller that reads and writes data to the transistors and transfers the data to a computer. In addition, a controller manages all the data that are stored in the SSD by keeping tracks of data and ensuring even distribution of data over transistors.

After learning about SSDs, let's now discuss interfaces of hard disk drives.

Table 6.3: File Systems on the Basis of their Features

Criteria	ReFS	NTFS 5	NTFS	FAT32	FAT16	FAT12
Object Permissions	No	Yes	Yes	No	No	No
Disk Quotas	No	Yes	No	No	No	No
Built-In Security	Yes	Yes	Yes	No	No	No
Recoverability	Yes	Yes	Yes	No	No	No
Performance	Low on small size volumes and high on large size volumes	Low on small size volumes and high on large size volumes	Low on small size volumes and high on large size volumes	High on small size volumes and low on large size volumes	Highest on small size volumes and low on large size volumes	High on all sizes of volumes
Fault Tolerance	Maximum	Maximum	Maximum	Minimum	Average	Average

After learning about different types of file systems, let's now learn about various built-in tools provided by the Windows operating system to manage of a hard disk drive and fix problems of a hard disk drive in the next section.

Exploring Hard Disk Drive Tools

Hard disk drives are quite robust and reliable devices. Generally, they do not break down easily and have longer life than any other device present in a computer. However, poor maintenance can crash this data center of a computer and result in loss of data, programs, and other invaluable information stored on your computer. Therefore, hard disk drives must be maintained at all cost.

Windows 7 offers a few built-in tools for the maintenance of a hard disk drive. Some software vendors also offer some other tools for hard disk drive maintenance other than these built-in tools. However, it is recommended to use only those tools that come with the Windows 7 operating system.

Let's now learn about built-in tools of Window 7, such as Disk Cleanup and Error-checking, to maintain a hard disk drive. Let's now discuss disk cleanup tool.

Disk Cleanup

When you run an operating system on your computer, you may not always know the significance of all files available on your computer. Sometimes an operating system, such as Windows 98/Me/2000/XP, uses files for a specific task and then retains them in a folder designated for temporary files. You may have some useless components of the previously installed Windows operating system. Due to numerous reasons, you may want to reduce the number of files on your hard disk drive or create more free space without affecting any program. You can do this with the help of Disk Cleanup.

The Disk Cleanup tool helps to create free space on your hard disk drive by deleting temporary files, Internet cache files, and unnecessary programs. In addition that, you can use the Disk Cleanup tool to delete the following types of files from the hard disk drive to create free space:

- Downloaded program files (ActiveX controls and Java applets downloaded from the Internet)
- Recycle Bin files
- Windows temporary files
- Windows components that you are not using
- Installed programs that you are not using

Perform the following steps to use the Disk Cleanup tool:

1. *Double-click* the **Computer** icon on the Desktop. The **Computer** window appears displaying different disk volumes (Fig.HD-6.10).
2. *Right-click* a disk volume in the **Computer** window on which you want to run the **Disk Cleanup** tool. In our case, we have right-clicked the **Windows XP (D:)** disk volume (Fig.HD-6.10).

   A context menu appears (Fig.HD-6.10).
3. *Select* the **Properties** Option from the context menu (Fig.HD-6.10).

   The **Properties** dialog box appears for the selected disk volume appears displaying different options under **General** tab. In our case, dialog box appears with the name **Windows XP (D:) Properties** (Fig.HD-6.11).
4. *Click* the **Disk Cleanup** button in the **General** tab, as shown in Fig.HD-6.11:

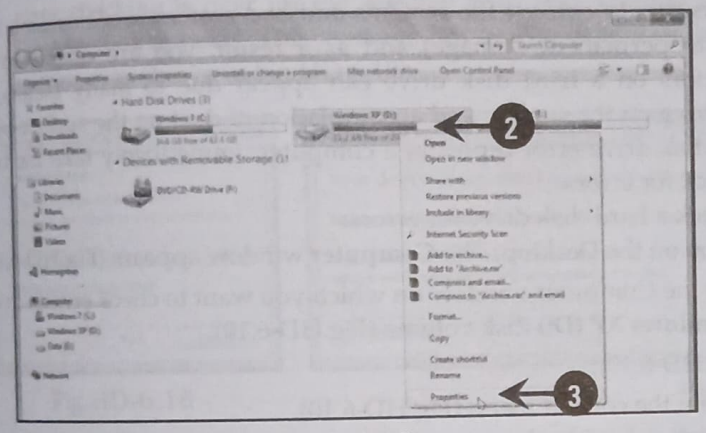


Fig.HD-6.10

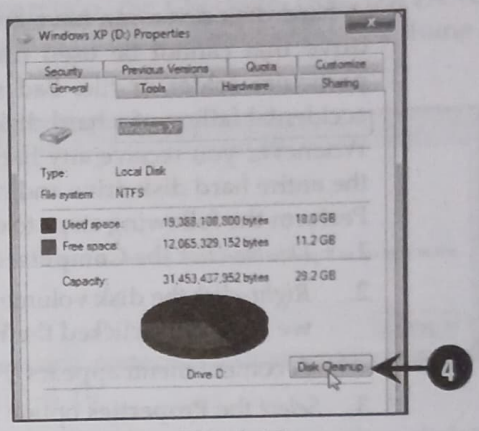


Fig.HD-6.11

The **Disk Cleanup for Windows XP (D:)** dialog box appears displaying a list of files along with their sizes that can be freed from the hard disk drive after deleting them. A checkbox appears selected beside each file name that indicates the file for deletion. However, if you do not want to delete a particular file, then clear the checkbox to deselect the file (Fig.HD-6.12).

5. *Select* appropriate check boxes in the **Disk Cleanup for Windows XP (D:)** dialog box (Fig.HD-6.12) to free the space. In our case, we have selected check boxes beside **Microsoft Office Temporary Files** and **Recycle Bin**.
6. *Click* the **OK** button in the **Disk Cleanup for Windows XP (D:)** dialog box, as shown in Fig.HD-6.12:

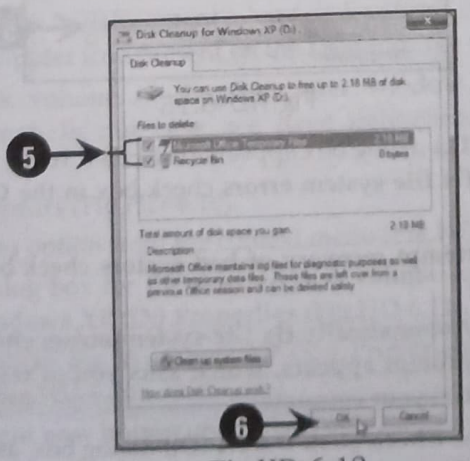


Fig.HD-6.12

The **Disk Cleanup** message box appears (Fig.HD-6.13).

7. *Click* the **Delete Files** button in the **Disk Cleanup** message box (Fig.HD-6.13).

   The **Disk Cleanup** message box display the process of deleting files, as shown in Fig.HD-6.14:

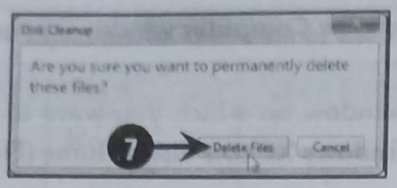


Fig.HD-6.13

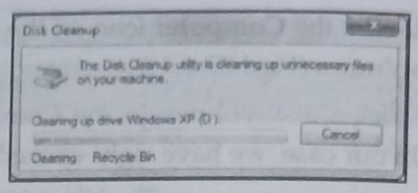


Fig.HD-6.14

Once all unwanted files are deleted, the **Properties** dialog box for the selected hard disk or partition reappears. Close the **Properties** dialog box by clicking the **Close (X)** button.

After learning to delete unwanted and temporary files from a hard disk drive, now let's learn to check a hard disk or its partition for errors.

Check Errors in a Hard Disk Drive

A hard disk drive can have errors due to corrupt file systems and bad sectors (a sector on a hard disk drive that cannot be used due to permanent damage) and as a result, you are unable to access a particular folder or file. Bad sectors on a hard disk drive can appear due to many factors, such as accidental falling of a hard disk drive on the surface and accumulation of dust on the surface of platters. Whenever you receive any hard disk drive error report in a computer, immediately take the backup of the entire hard disk drive and check for errors.

Perform the following steps to check a hard disk drive for errors:

1. *Double-click* the **Computer** icon on the Desktop. The **Computer** window appears (Fig.HD-6.10).
2. *Right-click* the disk volume in the Computer window on which you want to check errors. In our case, we have right-clicked the **Windows XP (D:)** disk volume (Fig.HD-6.10).

   A context menu appears (Fig.HD-6.10).
3. *Select* the **Properties** option from the context menu (Fig.HD-6.10).

   The **Properties** dialog box for the selected disk volume appears. In our case, dialog box appears with the name **Windows XP (D:) Properties** (Fig.HD-6.11).
4. *Select* the **Tools** tab. The **Tools** tab appears displaying different options (Fig.HD-6.15).
5. *Click* the **Check now** button in the **Tools** tab, as shown in Fig.HD-6.15:

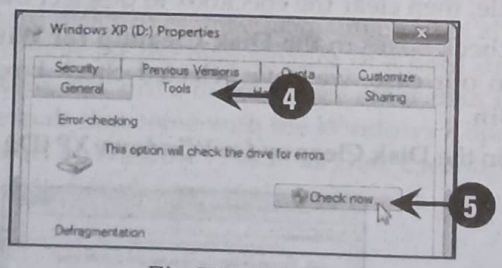


Fig.HD-6.15

   The **Check Disk DATA (D:)** dialog box appears (Fig.HD-6.16).
6. *Clear* the **Automatically fix file system errors** check box in the **Check Disk DATA (D:)** dialog box (Fig.HD-6.17).
7. *Select* the **Scan for and attempt recovery of bad sectors** check box in the **Check Disk DATA (D:)** dialog box (Fig.HD-6.17).

If you select the Automatically fix file system errors check box for a hard disk volume or partition, then a prompt appears, which asks you to reschedule the disk to check for the next time you restart your computer.

8. *Click* the **Start** button in the **Check Disk DATA (D:)** dialog box, as shown in Fig.HD-6.17:

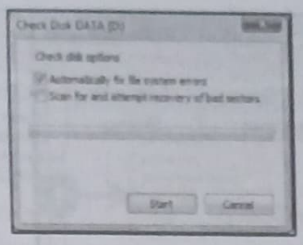


Fig.HD-6.16

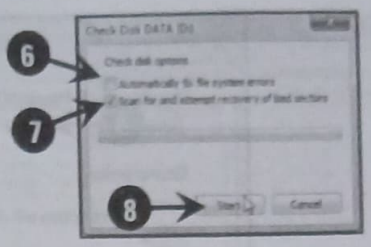


Fig.HD-6.17

The process of errors checking in a particular hard disk volume or partition starts. This process may take some time depending upon the size of the hard disk volume or partition and computer configuration (Fig.HD-6.18).

When error checking is in progress, do not use your computer for other purposes. Once the process of error checking is over for the selected hard disk volume or partition, the **Checking Disk DATA (D:)** message box appears. This message box briefly describes the status of the selected hard disk volume or partition, as shown in Fig.HD-6.19:

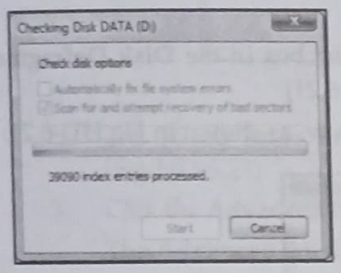


Fig.HD-6.18

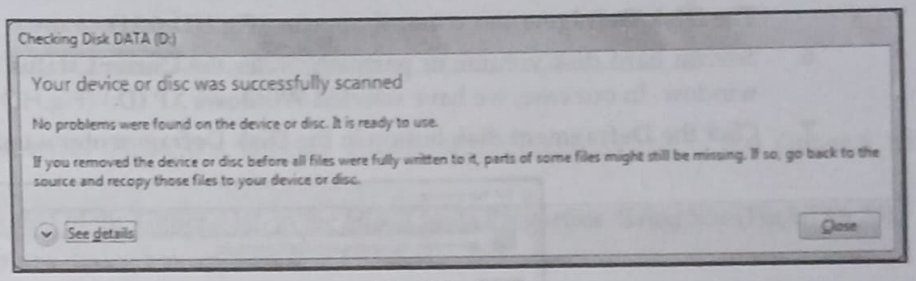


Fig.HD-6.19

If you wish to view the details of the error checking for the hard disk volume or partition, then click the **See details** button located at the lower-left corner of the **Checking Disk DATA (D:)** message box. Otherwise, click the **Close** button to close the message box.

Now, let's discuss Disk Defragmentation.

Disk Defragmentation

The Disk Defragmentation tool locates fragmented files (files whose data are scattered on various locations of a hard disk drive or partition) on a hard disk drive or its partition. In the **Computer** window, partitions appear as local disks, such as C: or D:. The data of a fragmented file or folder scatters over these partitions.

Perform the following steps to defragment a hard disk volume or partition:

1. *Double-click* the **Computer** icon present on the **Desktop**. The Computer window appears (Fig.HD-6.10).
2. *Right-click* the disk volume in the **Computer** window on which you want to run the Disk Defragmentation tool. In our case, we have right-clicked the **Windows XP (D:)** disk volume (Fig.HD-6.10).

   A context menu appears (Fig.HD-6.10).
3. *Select* the **Properties** option from the context menu (Fig.HD-6.10).

   The **Properties** dialog box for the selected disk volume appears. In our case, a dialog box appears with the name **Windows XP (D:) Properties** (Fig.HD-6.11).
4. *Select* the **Tools** tab in the **Windows XP (D:) Properties** box. The **Tools** tab appears displaying different options (Fig.HD-6.20).
5. *Click* the **Defragment now** button under the **Tools** tab, as shown in Fig.HD-6.20:

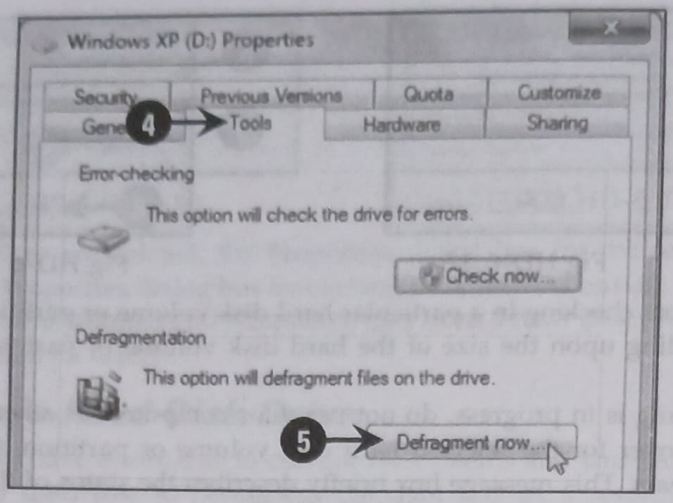


Fig.HD-6.20

The **Disk Defragmenter** window appears (Fig.HD-6.21).

6. *Select* a hard disk volume or partition under the **Current status** list box in the **Disk Defragmenter** window. In our case, we have selected **Windows XP (D:)** (Fig.HD-6.21).
7. *Click* the **Defragment disk** button in the **Disk Defragmenter** window, as shown in Fig.HD-6.21:

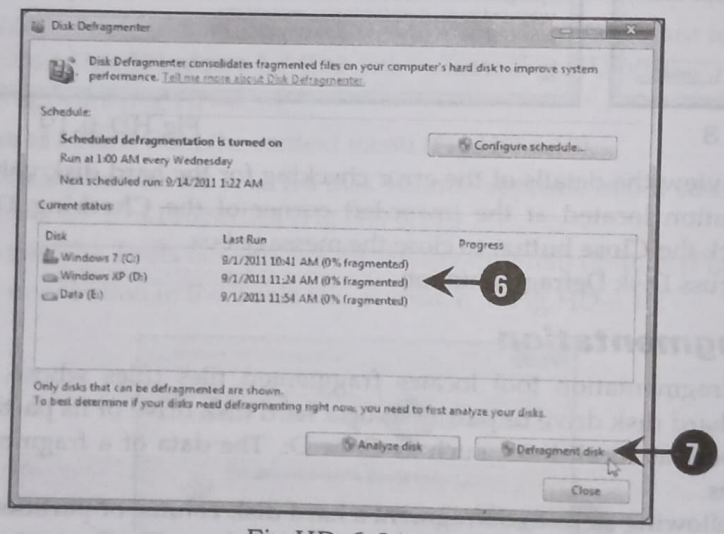


Fig.HD-6.21

The **Disk Defragmenter** window starts the process of defragmentation. Depending on the size of hard disk volume or partition and number of fragmented files, the defragmentation process may take some time. If you wish to abort the process of defragmentation (which is not recommended), then click the **Stop operation** button. After the process of defragmentation is over, click the **Close** button to close the **Disk Defragmenter** window.

After learning the process of defragmenting a hard disk drive or a hard disk partition, let's now learn to compress files and folders.

Compress Files or Folders

You can compress files or folders to save the space of a hard disk drive and increase the transfer speed of files or folders to other storage medium quickly.

Perform the following steps to compress files or folders:

1. *Right-click* a file or folder you want to compress. In our case, we have right-clicked the **Hindi fonts** folder in the **Data (E:)** drive. A context menu appears (Fig.HD-6.22).
2. *Select* **Properties** from the context menu, as shown in Fig.HD-6.22:

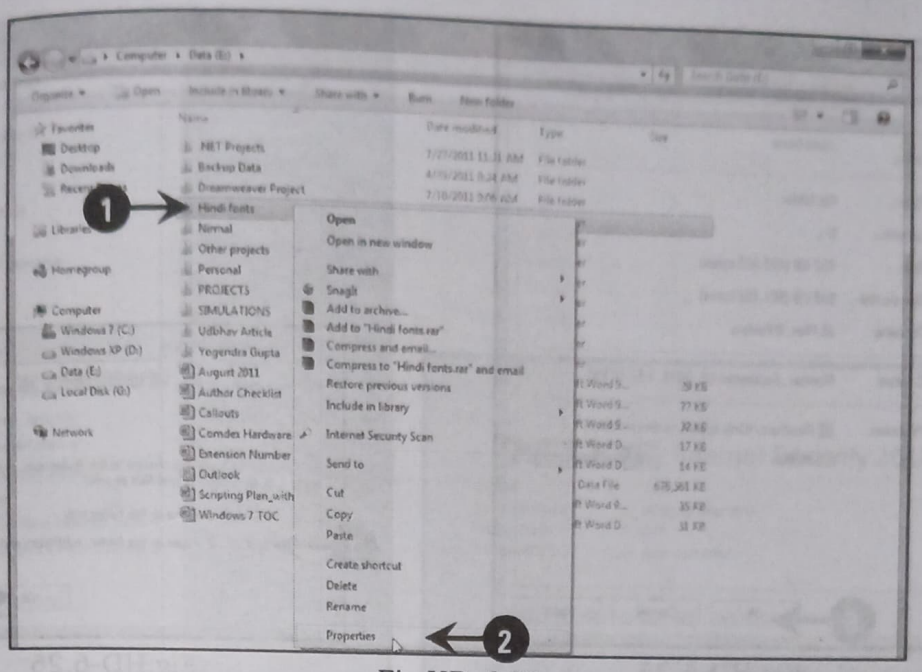
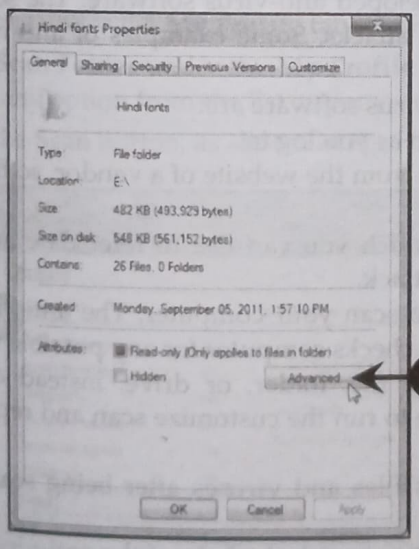


Fig.HD-6.22

The **Hindi fonts Properties** dialog box appears displaying different options of the **General** tab (Fig.HD-6.23).

3. *Click* the **Advanced** button of the **General** tab in the **Hindi fonts Properties** dialog box (Fig.HD-6.23). The **Advanced Attributes** dialog box appears (Fig.HD-6.24).
4. *Select* the **Compress contents to save disk space** check box of the **Compress or Encrypt attributes** section in the **Advanced Attributes** dialog box (Fig.HD-6.24).
5. *Click* the **OK** button in the **Advanced Attributes** dialog box, as shown in Fig.HD-6.24:



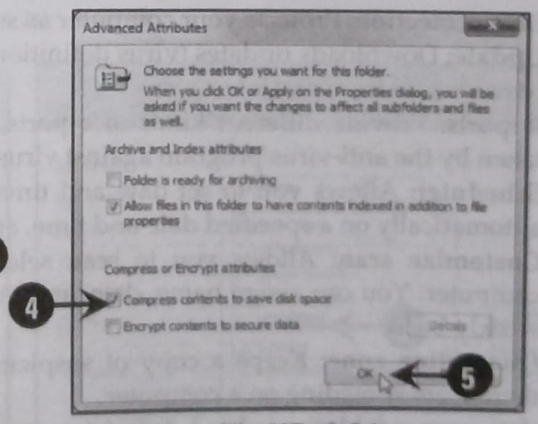


Fig.HD-6.23 Fig.HD-6.24

The **Hindi fonts Properties** diaog box reappears (Fig.HD-6.25).

6. *Click* the **OK** button in the **Hindi fonts Properties** diaog box (Fig.HD-6.25). The **Confirm Attribute Changes** dialog box appears (Fig.HD-6.26).
7. *Select* the the **Apply changes to this folder, sub folder and files** radio button in the **Confirm Attribute Changes** dialog box to compress the folder including its subfolders and files (Fig.HD-6.26).
8. *Click* the **OK** button in the **Confirm Attribute Changes** dialog box, as shown in Fig.HD-6.26:

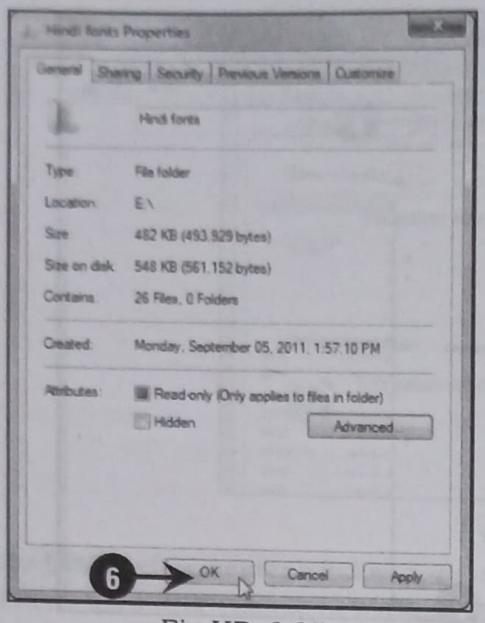


Fig.HD-6.25

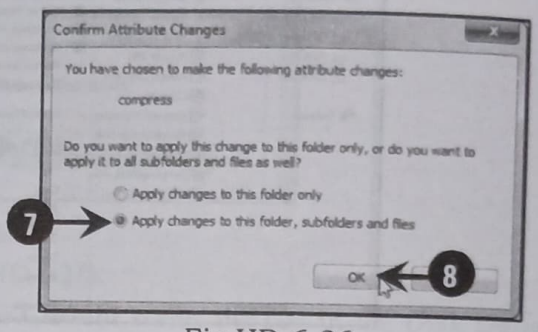


Fig.HD-6.26

The Hindi fonts folder gets compressed.

After compressing files and folders, let's now learn to check hard disk drives for viruses.

Check Hard Disk Drives for Viruses

With growing popularity of the Internet, a new threat has emerged, that is, virus. In simple terms, a computer virus is a malicious program that is designed to harm a computer. Virus can reach your computer through electronic mails (emails), nasty websites, accidental mouse click on some unsolicited hyperlinks, CDs, or floppy disks, and it attacks your hard disk drive. To encounter this problem, various software organizations around the world have developed anti-virus software. The sole purpose of this software is to protect your computer against virus attacks. Some examples of anti-virus programs are Norton, McAfee, and Quick Heal.

Some common characteristics among different anti-virus software are:

- **Live protection:** Protects your computer as soon as you log in.
- **Update:** Downloads updates (virus definitions) from the website of a vendor, so that your computer remains safe from any latest virus.
- **Reports:** Provide different kinds of reports, which you can use to refer date and time of actions taken by the anti-virus program against virus attack.
- **Scheduler:** Allows you to set date and time to scan your computer. The anti-virus program runs automatically on a specified date and time, and checks computer for any possible virus threat.
- **Customize scan:** Allows you to scan selected file, folder, or drive, instead of scanning entire computer. You can assign name, date, and time to run the customize scan and repeat it on a daily or weekly basis.
- **Quarantine zone:** Keeps a copy of suspicious files and viruses after being scanned and prevent them from spreading on a computer.

Now let's scan a folder on a hard disk drive or partition with the help of the anti-virus software. In our case, we will scan the folder with the help of the Quick Heal Internet Security 2010 anti-virus program.

Perform the following steps to scan a selected folder on a hard disk drive or partition:

1. *Click* **Start→All Programs→Quick Heal Internet Security→Quick Heal Internet Security** (Fig.HD-6.27).

   The **Quick Heal Internet Security** program starts, as shown in Fig.HD-6.28:

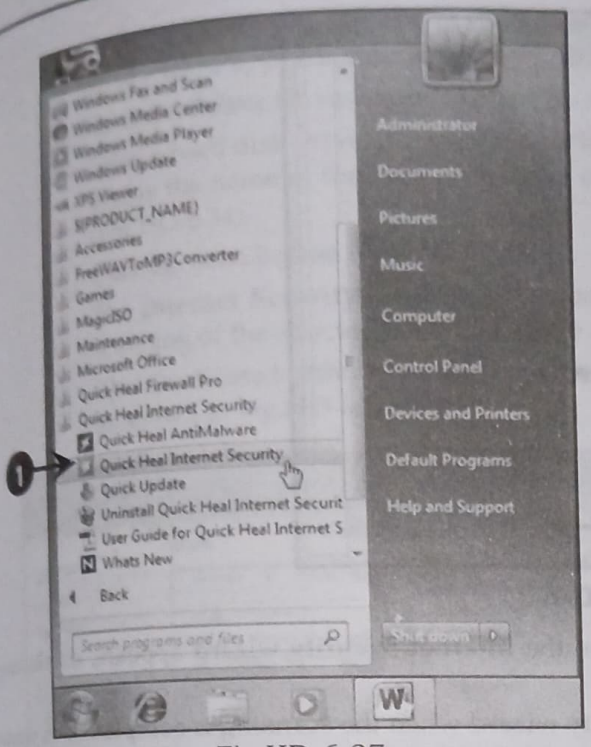


Fig.HD-6.27

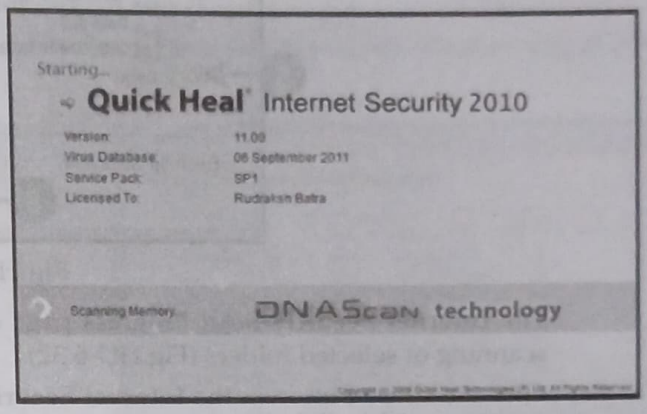


Fig.HD-6.28

In a few moment, the **Status** page of the **Quick Heal Internet Security** 2010 wizard appears, displaying the security status of your computer and a list of various options in the Navigation pane (Fig.HD-6.29).

2. *Click* the **Scan** option in the **Navigation** pane (Fig.HD-6.29).

   The **Scan** page of the **Quick Heal Internet Security 2010** wizard appears, displaying various locations under the **My Profile** tab (Fig.HD-6.30).

3. *Click* **Scan Folder** under the **My Profile** tab in the **Scan** page to scan folders (Fig.HD-6.30). You can select any option from the list as per your requirements.

4. *Click* the **Scan** button, as shown in Fig.HD-6.30:

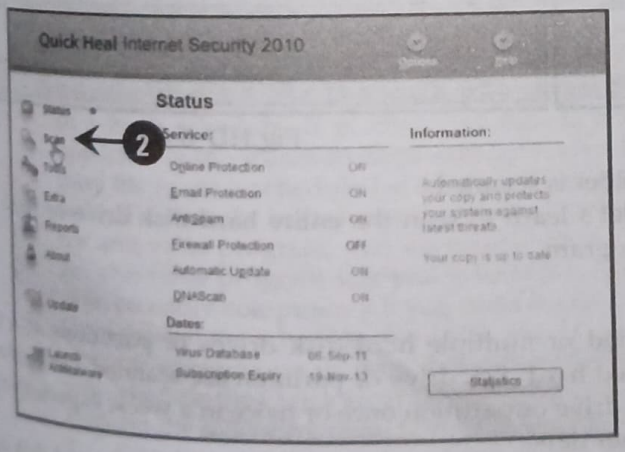


Fig.HD-6.29

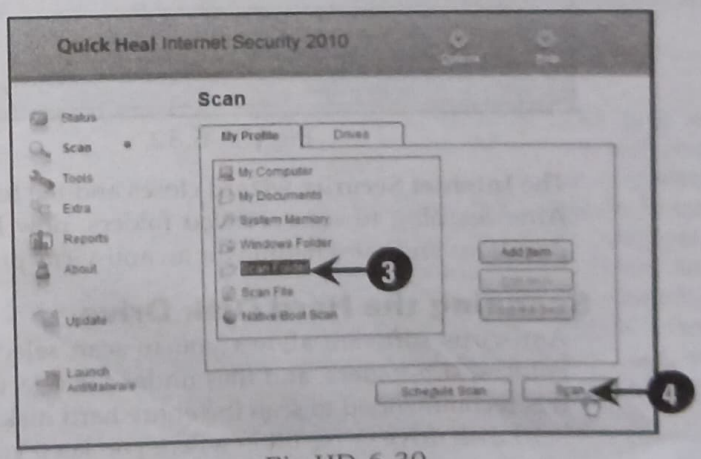


Fig.HD-6.30

The **Browse for Folder** dialog box appears (Fig.HD-6.31).

5. *Select* checkboxes beside the folders that you want to scan in the **Browse for Folder** dialog box. In our case, we have selected the checkbox beside the **Data** folder (Fig.HD-6.31).

6. *Click* the **OK** button in the **Browse for Folder** dialog box, as shown in Fig.HD-6.31:

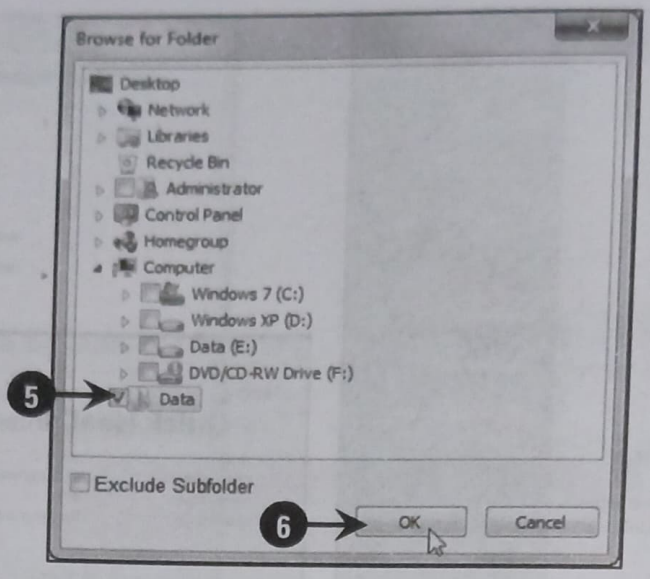


Fig.HD-6.31

The **Internet Security Scan Progress** page of the **Internet Security** wizard appears, displaying the scanning of selected folders (Fig.HD-6.32).

7. *Click* the **Close** button in the **Internet Security** wizard when the scanning is completed, as shown in Fig.HD-6.33:

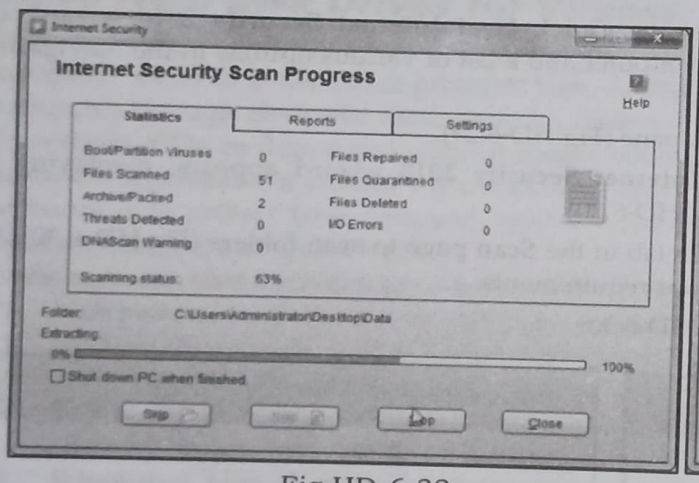


Fig.HD-6.32

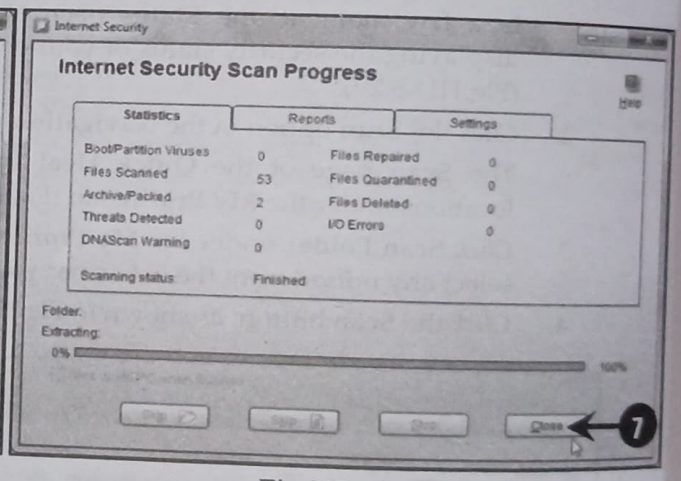


Fig.HD-6.33

The **Internet Security** wizard closes and the folder is scanned.

After learning to scan selected folders, now let's learn to scan the entire hard disk drive or hard disk partitions and set schedule for an anti-virus program.

Scanning the Hard Disk Drive

Anti-virus software allows you to scan selected or multiple hard disk drives or partitions at a time. Folders, sub-folders, and files under the selected hard disk drive or partition are scanned automatically. It is recommended to scan the entire hard disk drive or partition once or twice in a week, especially those hard disk drive or partition where you keep your data.

Now let's scan the entire hard disk drive or partition. In our case, we will scan the entire hard disk drive with the help of the Quick Heal Internet Security anti-virus program.

Perform the following steps to scan the entire hard disk drive or a hard disk partition:

1. *Click* **Start→All Programs→Quick Heal Internet Security→Quick Heal Internet Security**. The **Status** page of the **Quick Heal Internet Security 2010** wizard appears, displaying the security status of your computer and a list of various options in the **Navigation** pane (Fig.HD-6.29).

2. *Click* the **Scan** option in the **Navigation** pane. The **Scan** page of the **Quick Heal Internet Security 2010** wizard appears, displaying various locations under the **My Profile** tab (Fig.HD-6.30).
3. *Select* the **Drives** tab under the **Scan** page. A list of hard disk drives or partitions appears (Fig.HD-6.34).
4. *Select* a hard disk drive or hard disk partition that you want to scan by simply selecting the checkbox beside the name of the hard disk drive or hard disk partition. In our case, we have selected **E: Data** (Fig.HD-6.34).
5. *Click* the **Scan** button (Fig.HD-6.34).

   The **Internet Security Scan Progress** page of the **Internet Security** wizard appears displaying the scanning of the selected hard disk drive for any viruses (Fig.HD-6.35).
6. *Click* the **Close** button in the **Internet Security Scan Progress** page when the scanning is completed, as shown in Fig.HD-6.35:

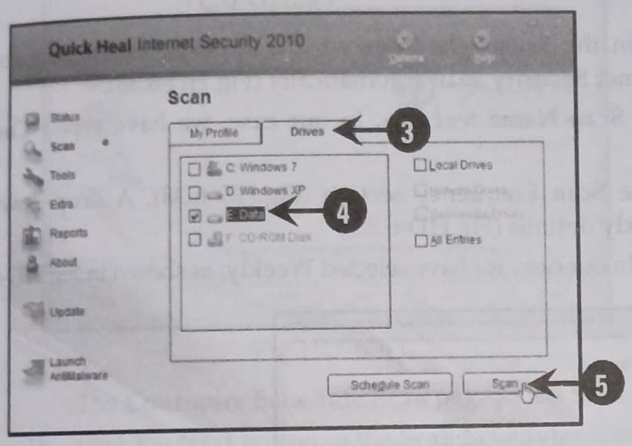


Fig.HD-6.34

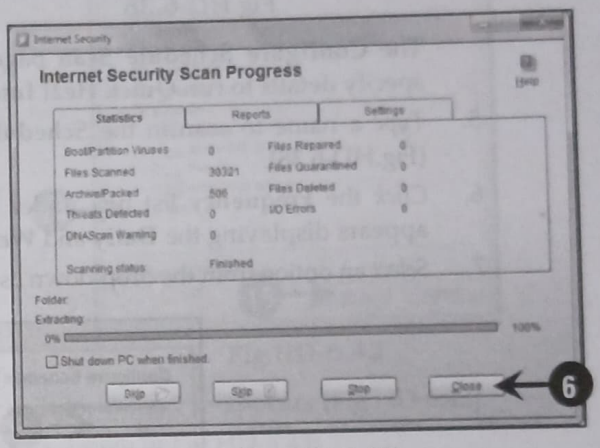


Fig.HD-6.35

The **Internet Security Scan Progress** page of the **Internet Security** wizard closes after scanning the selected hard disk drive for viruses.

You can scan a drive or folder directly through the Quick Heal Internet Security 2010 by right-clicking the drive or folder and then clicking the Quick Heal Internet Security Scan.

After learning how to scan hard disk drives, let's now learn how to schedule an anti-virus program for automatic scanning of selected folders or hard disk drive on a specified date and time.

Scheduling an Anti-virus Program for Automatic Scanning

In a busy schedule, it is observed that many users fail to scan their computers timely and give an opportunity to viruses to enter and spread in the computers. If you can spare a few minutes out of your busy life to set a schedule for automatic scanning, then you do not need to worry about various routine tasks. These tasks include remembering the last date of running the scan, maintaining a schedule to run the anti-virus program, and keeping a record of all the automatic updates installed on your computer. An anti-virus program lets you schedule a scan for selected or multiple folders, hard disks drives, and even an entire computer. All you need to do is to schedule an anti-virus program for automatic scanning. Once you set the schedule, the anti-virus program starts on the specified date and time automatically and perform scanning on its own. Now, let's schedule an anti-virus for automatic scanning. In our case, we will schedule the Quick Heal Internet Security anti-virus program.

Perform the following steps to schedule an automatic scan:

1. *Click* **Start→All Programs→Quick Heal Internet Security→Quick Heal Internet Security.**

   The **Status** page of the **Quick Heal Internet Security 2010** wizard appears, displaying the security status of your computer and a list of various options in the **Navigation** pane.
2. *Click* the **Scan** option in the **Navigation** pane.

   The **Scan** page of the **Quick Heal Internet Security 2010** wizard appears, displaying various locations under the **My Profile** tab (Fig.HD-6.36).
3. *Click* the **Schedule Scan** button (Fig.HD-6.36).

   The **Scan Scheduler** page of the **Scan Scheduler** wizard appears (Fig.HD-6.37).
4. *Click* the **Next** button, as shown in Fig.HD-6.37:

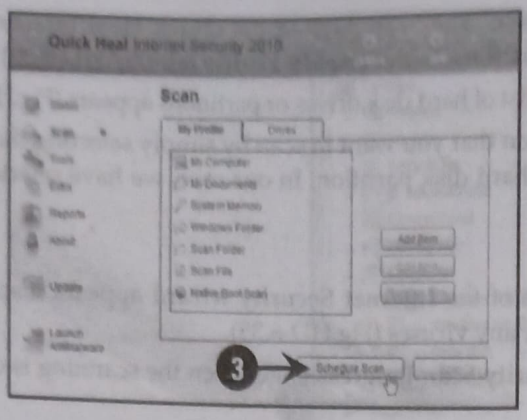


Fig.HD-6.36

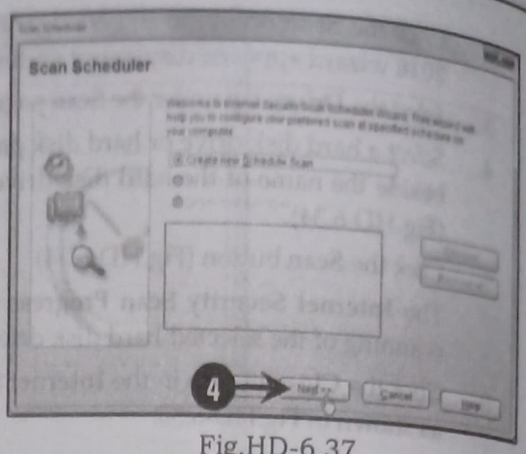


Fig.HD-6.37

The **Configure Schedule Scan** page in the **Scan Scheduler** wizard appears where you need to specify details to run **Quick Heal Internet Security 2010** automatically (Fig.HD-6.38).

5. *Type* a name to scan in the **Schedule Scan Name** text box. In our case, we have typed **Comdex** (Fig.HD-6.38).
6. *Click* the **Frequency** list box under the **Scan Frequency** section (Fig.HD-6.38). A drop-down list appears displaying the **Daily** and **Weekly** options (Fig.HD-6.38).
7. *Select* an option from the drop-down list. In our case, we have selected **Weekly**, as shown in Fig.HD-6.38:

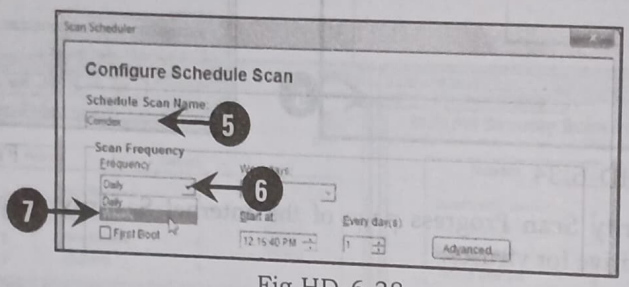


Fig.HD-6.38

8. *Click* the **Weekdays** list box under in the **Scan Frequency** section. A drop-down list appears (Fig.HD-6.39).
9. *Select* a weekday from the drop-down list. In our case, we have selected **Wednesday** (Fig.HD-6.39).
10. *Enter* the time in the **Start at** spin box in the **Scan Frequency** section to specify the time of starting **Quick Heal Internet Security 2010.** In our case, we have typed **3:00:00 PM** (Fig.HD-6.40).
11. *Enter* a value in the **Every week(s)** spin box. In our case, we have typed **16** to run **Quick Heal Internet Security 2010** automatically for next 16 weeks on every Wednesday at 3:00 PM (Fig.HD-6.40).
12. *Click* the **Next** button in the **Configure Schedule Scan** page of the **Scan Scheduler** wizard, as shown in Fig.HD-6.40:

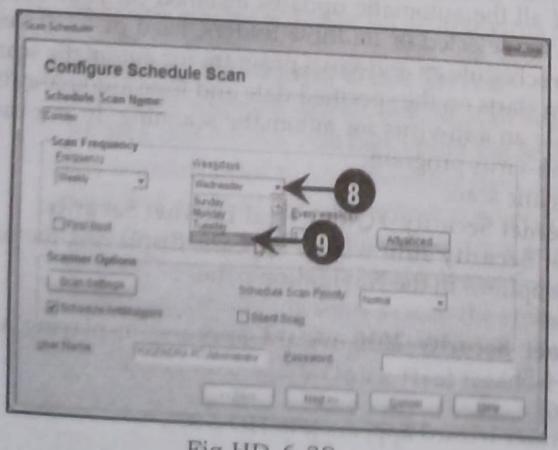


Fig.HD-6.39

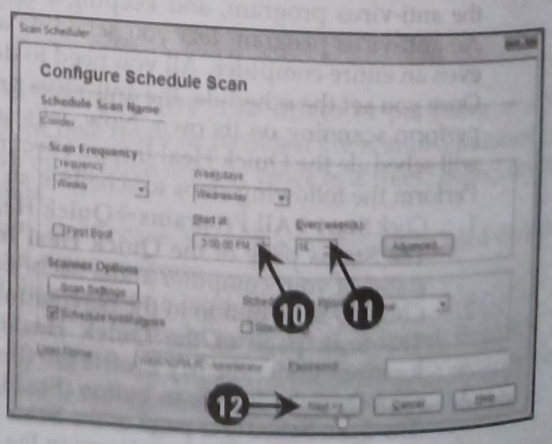


Fig.HD-6.40

The **Configure Schedule Scan** page of the **Scan Scheduler** wizard appears with the **Add Folders** button to scan desired folders and hard disk volumes at scheduled time (Fig.HD-6.41).

13. *Click* the **Add Folders** button of the **Configure Schedule Scan** page in the **Scan Scheduler** wizard (Fig.HD-6.41).

    The **Browse for Folder** dialog box appears (Fig.HD-6.42).

14. *Select* check boxes beside the folders and hard disk drives for which you want to schedule the scan. In our case, we have selected the **Data** check box (Fig.HD-6.42).

15. *Click* the **OK** button in the **Browse for Folder** dialog box, as shown in Fig.HD-6.42:

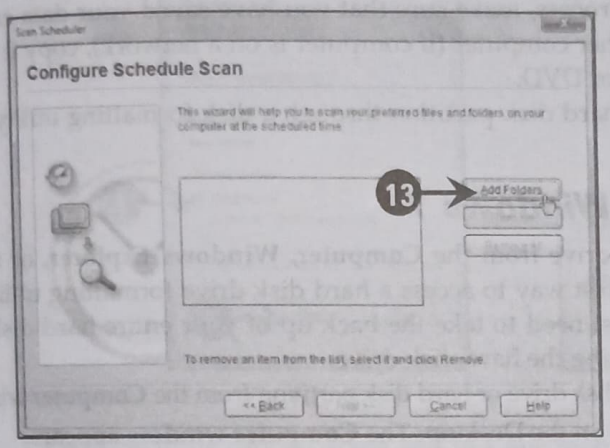


Fig.HD-6.41

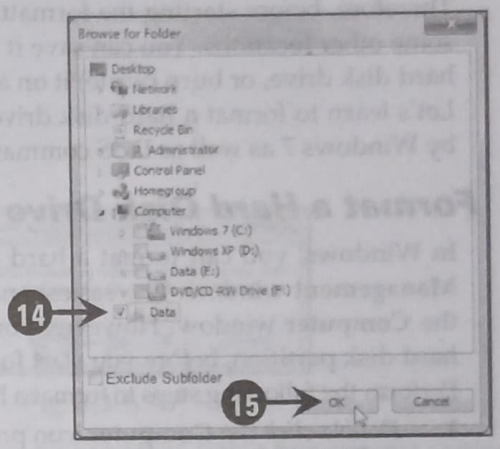


Fig.HD-6.42

The **Configure Schedule Scan** page in the **Scan Scheduler** wizard re-appears (Fig.HD-6.43).

16. *Click* the **Next** button in the **Scan Scheduler** wizard, as shown in Fig.HD-6.43:

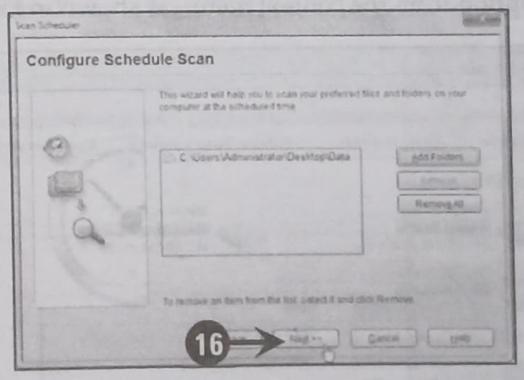


Fig.HD-6.43

The summary of scan you scheduled for the folder appears in the **Configure Schedule Scan** page of the **Scan Scheduler** wizard (Fig.HD-6.44).

17. *Click* the **Finish** button to close the **Scan Scheduler** wizard, as shown in Fig.HD-6.44:

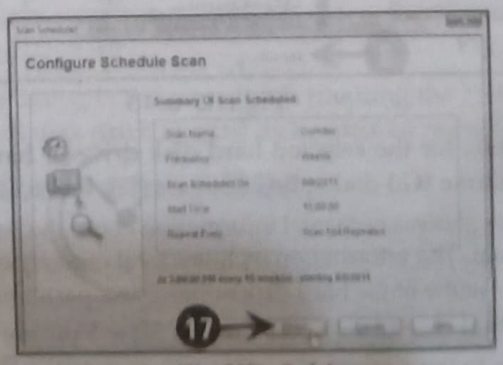


Fig.HD-6.44

Now, **Quick Heal Internet Security 2010** will run on every Wednesday at 3:00 PM for next 16 weeks and scan the **Data** folder.

After learning about hardware tools to manage of a hard disk drive and fix problems of a hard disk drive, now let's learn to format a hard disk drive in the next section.

Formatting a Hard Disk Drive

Formatting a hard disk drive means reallocating tracks, sectors, and file systems on a selected hard disk drive or hard disk drive partition. Formatting deletes the entire data stored on a hard disk drive. Therefore, before starting the formatting process, make sure that you have saved your data carefully on some other locations. You can save it in other computer (if computer is on a network), copy it to another hard disk drive, or burn (write) it on a CD or DVD.

Let's learn to format a hard disk drive or hard disk partition through a disk formatting utility provided by Windows 7 as well as DOS commands.

Format a Hard Disk Drive by Windows 7

In Windows, you can format a hard disk drive from the **Computer, Windows Explorer,** or **Computer Management** window. The easiest and fastest way to access a hard disk drive formatting utility is from the **Computer** window. However, you must need to take the back up of your entire hard disk drive or hard disk partition, before you start formatting the hard disk drive.

Perform the following steps to format a hard disk drive or hard disk partition from the **Computer** window:

1. *Double-click* the **Computer** icon present on the Desktop. The **Computer** window appears.
2. *Right-click* a hard disk drive in the **Computer** window. In our case, we have right-clicked the **New Volume (G:)** drive (Fig.HD-6.45).

   A context menu appears (Fig.HD-6.45).
3. *Select* the **Format** option from the context menu, as shown in Fig.HD-6.45:

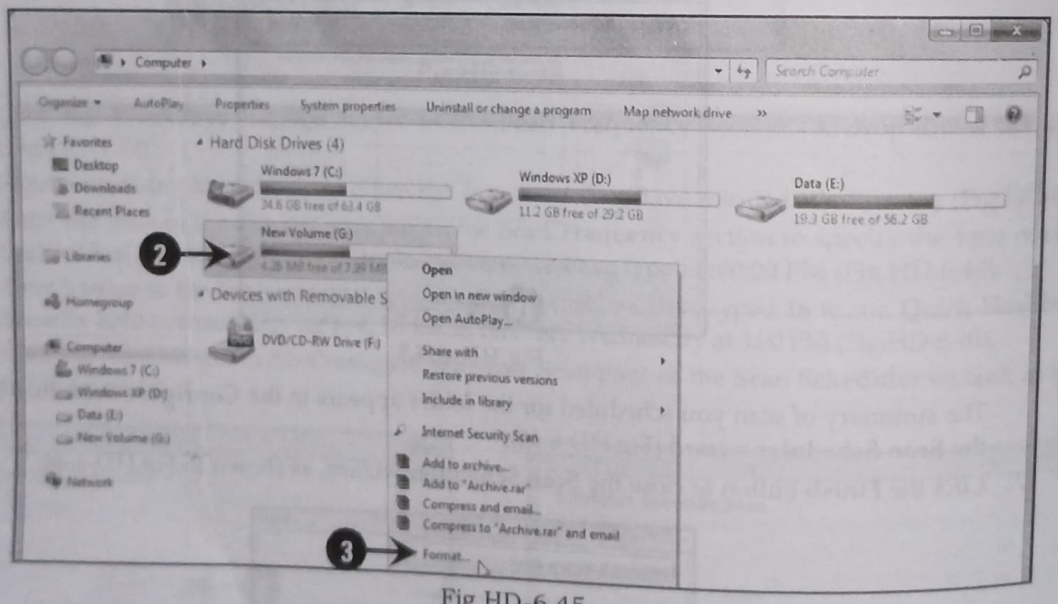


Fig.HD-6.45

The **Format** dialog box for the selected hard disk drive or hard disk partition appears. In our case, the **Format New Volume (G:)** dialog box appears (Fig.HD-6.46).

The **Format** dialog box shows some vital information about the hard disk drive or hard disk partition that you are about to format. The information includes total capacity of hard disk drive or hard disk partition, file system in use, and name of the hard disk or hard disk partition (Fig.HD-6.46).

4. *Select* the **Quick Format** check box in the **Format New Volume (G:)** dialog box (Fig.HD-6.46).
5. *Click* the **Start** button in the **Format New Volume (G:)** dialog box (Fig.HD-6.46).

The cursor re-appears at the prompt for next command, as shown in Fig.HD-6.55:

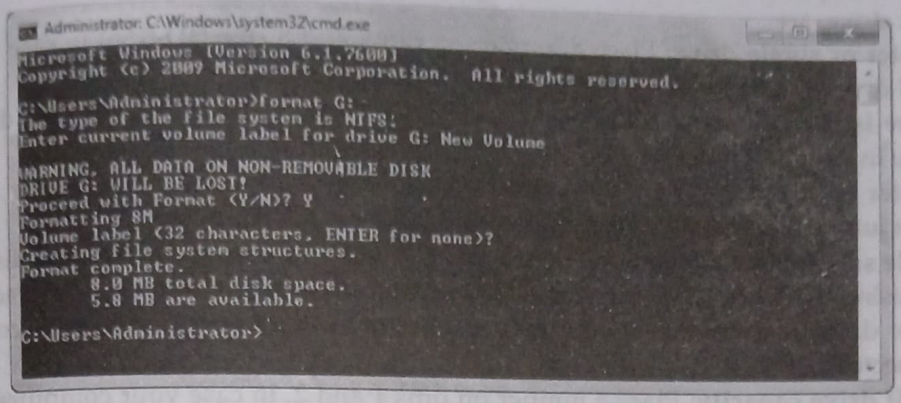


Fig.HD-6.55

After learning about formatting a hard disk drive or hard disk partition, let's now learn how to add an additional hard disk drive in a computer.

Adding an Additional Hard Disk Drive

Each IDE interface can support two hard disk drives at a time. IDE hard disk drives contain their own integrated controllers; therefore, to maintain the working hierarchy of the IDE interface, it is necessary to distinguish the two hard disk drives. For differentiating the two hard disk drives, each hard disk drive or partition is designated as Master or Slave.

The Slave drive does not depend on the Master drive to perform its operations. In general, the computer considers the first drive as the Master drive and second drive as the Slave drive.

Both the Master and Slave drives use one cable to connect with a motherboard. For this, the drives must be first configured as Master and the other as Slave. After configuration, the Master and Slave drives appear in the Device Manager window and as per the configuration, the computer uses the drives to carry out necessary operations, such as booting the computer and loading program files. The Master drive usually appears with the C letter and the Slave drive appears with the D letter.

If a computer is equipped with an IDE hard disk, then it is configured as Master or Slave with the help of a jumper (is a small piece made up of plastic and metal that is place on the jumper pins). These pins are located between the Power and IDE cable connectors (Fig.HD-6.56). Each manufacturer uses different configuration of pins to specify Master or Slave drives.

Fig.HD-6.56 shows the jumper setting of a hard disk drive:

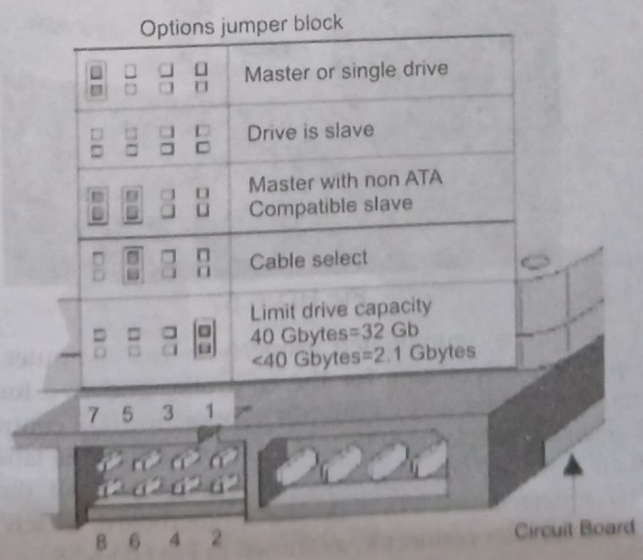


Fig.HD-6.56

The different options available under the jumper block, which can be used to control the working of a hard disk drive, are:

- **Master or single drive:** Place a jumper on pin 7 and 8 (Fig.HD-6.56) in case you want to install a hard disk drive as the single Master drive in a computer
- **Drive is slave:** Remove all jumpers in case you want to install a hard disk drive as an additional drive in your computer
- **Master with a non ATA Compatible slave:** Place two jumpers, one jumper on pins 5 and 6 and other jumper on pins 7 and 8, in case a Slave drive is not identified
- **Cable select:** Place a jumper on pins 5 and 6 to make Master and Slave hard disk drives, in case you are using the Ultra ATA data cable. The Master drive is connected to the black connector and the Slave drive is connected to the gray connector, and the host adapter is connected to the blue connector.
- **Limit drive capacity:** Place a jumper on pins 1 and 2, in case your computer does not recognize the newly installed hard disk drive, or if the computer does not boot after installing a new hard disk drive.

When you add a second hard disk drive to a computer, make sure that the jumper setting for the first hard disk drive is set as Master and the jumper setting for the new hard disk is set as Slave. In case, your motherboard does not support the capacity of new hard disk, then you may need to set the jumper to limit the hard disk drive storage capacity. Fig.HD-6.56 shows that the motherboard supports hard disks of 40 GB only, but the capacity of the new hard disk drive is more than 40 GB. In such a situation, you need to set the jumper to limit the capacity of the hard disk drive; otherwise, you cannot use the hard disk drive. Due to this limitation of the motherboard, you have to sacrifice certain amount of hard disk drive storage capacity. As shown in Fig.HD-6.56, if disk capacity of hard disk is 40 GB or more, then you get the storage capacity of only 32 GB. In case, the capacity of hard disk drive is less than 40 GB, then 2.1 GB is deducted and you can use only 38 GB (approx.) storage space.

Once jumpers are in place, it is time to fit the hard disk drive into a computer case. Usually, the size of a hard disk drive is 3.5 inches wide or 5.25 inches wide. Inside the computer case, there are bays to hold hard disk drives of both sizes. Simply insert the drive into the appropriate bay and fasten the hard disk drive using screws, as shown in Fig.HD-6.57:

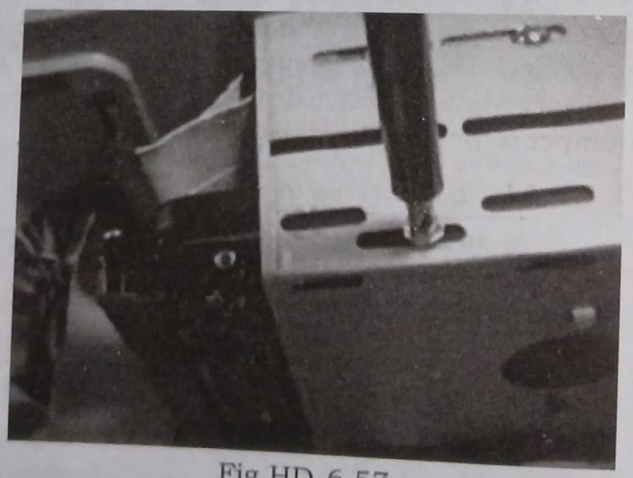


Fig.HD-6.57

When the hard disk drive is accommodated properly in the computer case, you can attach its cable, which has three 40–pin connectors, one for the controller and two for the Master and Slave drives. Nowadays, all motherboards come with a built-in support for IDE controllers. The controller connector on a motherboard is generally labeled as Pin 1. If you cannot find the label of the controller connector on the motherboard, then refer to the motherboard manual or visit the motherboard manufacturer's website. Once you have determined Pin 1 on the motherboard, attach the cable with the stripe side adjacent to Pin 1 on the controller connector, as shown in Fig.HD-6.58:

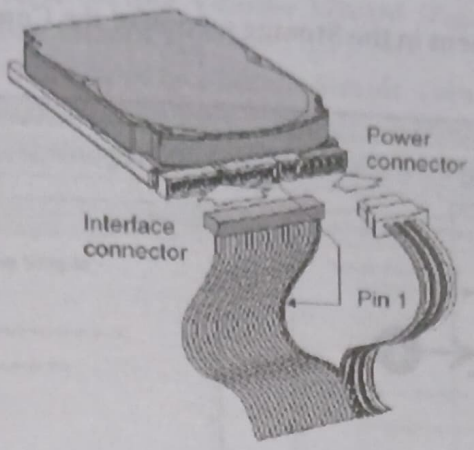


Fig.HD-6.58

Now, connect the remaining connector of the cable to the 40-pin slot of the hard disk drive. Usually, Pin 1 is located beside the power connector for the hard disk drive. Now connect the power connector at the back of the hard disk drive and another power connector on the motherboard.

In case, if you want to attach SATA hard disk drive as an additional drive to the computer, you have to specify boot device priority settings in the computer BIOS. When you use SATA drives, there is no need to define jumpers in a hard disk to define Master and Slave. Different motherboard manufacturer provides different key combinations, such as DEL and F2, to view the BIOS setup utility. The Boot Device Priority setting in the Boot menu of the BIOS Setup Utility allows you to set the priority for device from which the OS will boot. You can give priority to the newly attached SATA drive over other drive in the case if you want to allow OS to boot from this drive.

After installing the secondary hard disk drive, you need to allocate the space by using the **Computer Management** window.

Perform the following steps to allocate the space of a newly installed hard disk drive:

1. *Click* the **Start** button (Fig.HD-6.59). The **Start** menu appears (Fig.HD-6.59).
2. *Right-click* **Computer** in the **Start** menu (Fig.HD-6.59). A context menu appears (Fig.HD-6.59).
3. *Select* the **Manage** option from the context menu, as shown in Fig.HD-6.59:

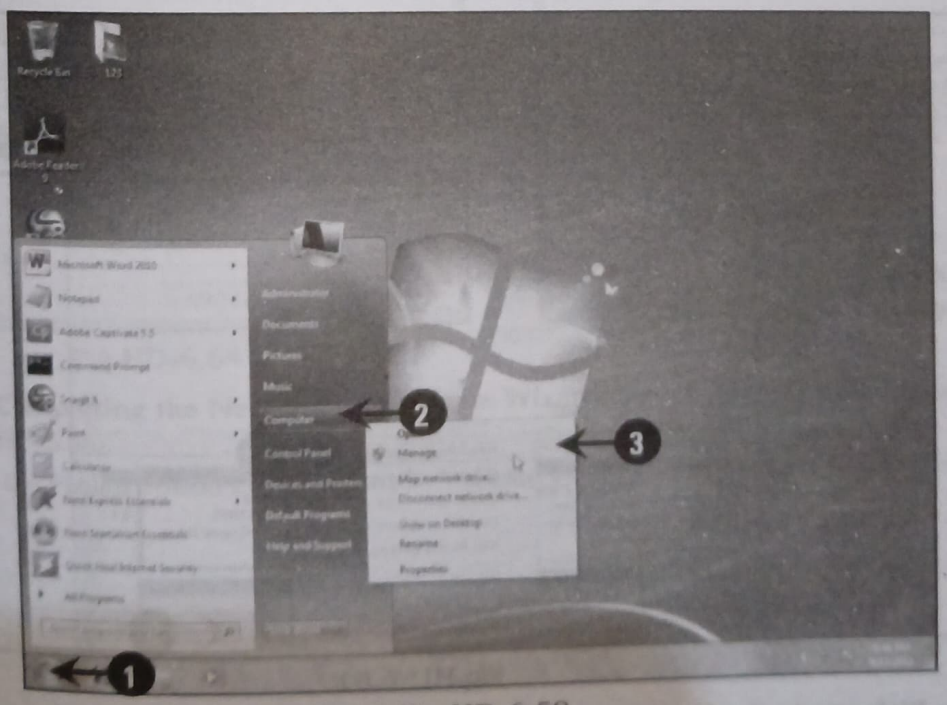


Fig.HD-6.59

The **Computer Management** window appears (Fig.HD-6.60).

4. *Select* **Disk Management** in the **Storage** section of the **Computer Management** window, as shown in Fig.HD-6.60:

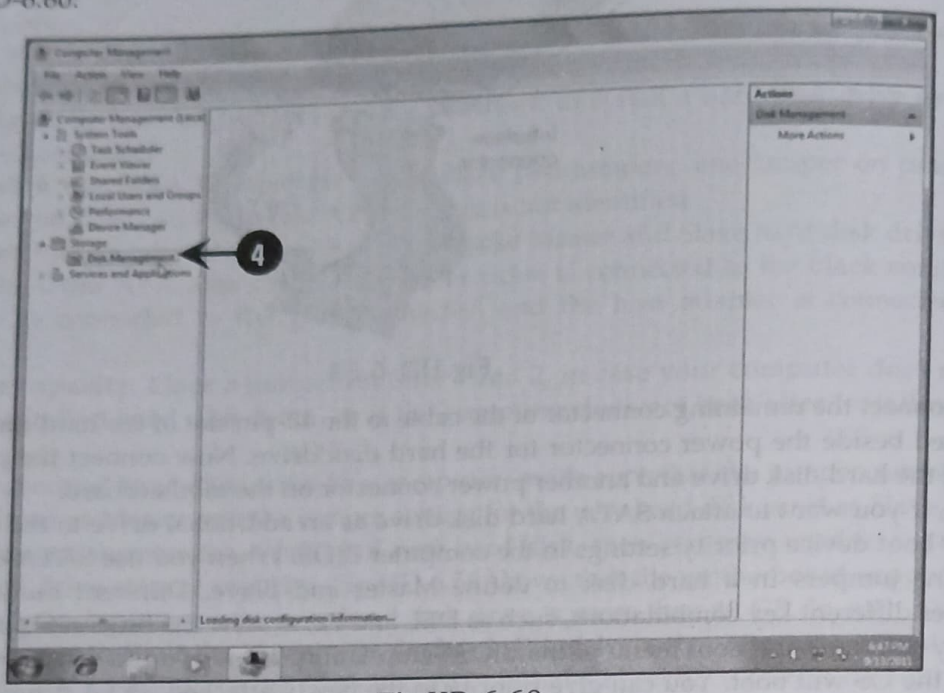


Fig.HD-6.60

The **Computer Management** window displays the available hard disk drive and its volumes (Fig.HD-6.61).

5. *Right-click* inside the secondary hard disk drive (Fig.HD-6.61). In our case, we have right-clicked **Disk 1** (Fig.HD-6.61).

A context menu appears (Fig.HD-6.61).

6. *Select* the **New Simple Volume** option from the context menu, as shown in Fig.HD-6.61:

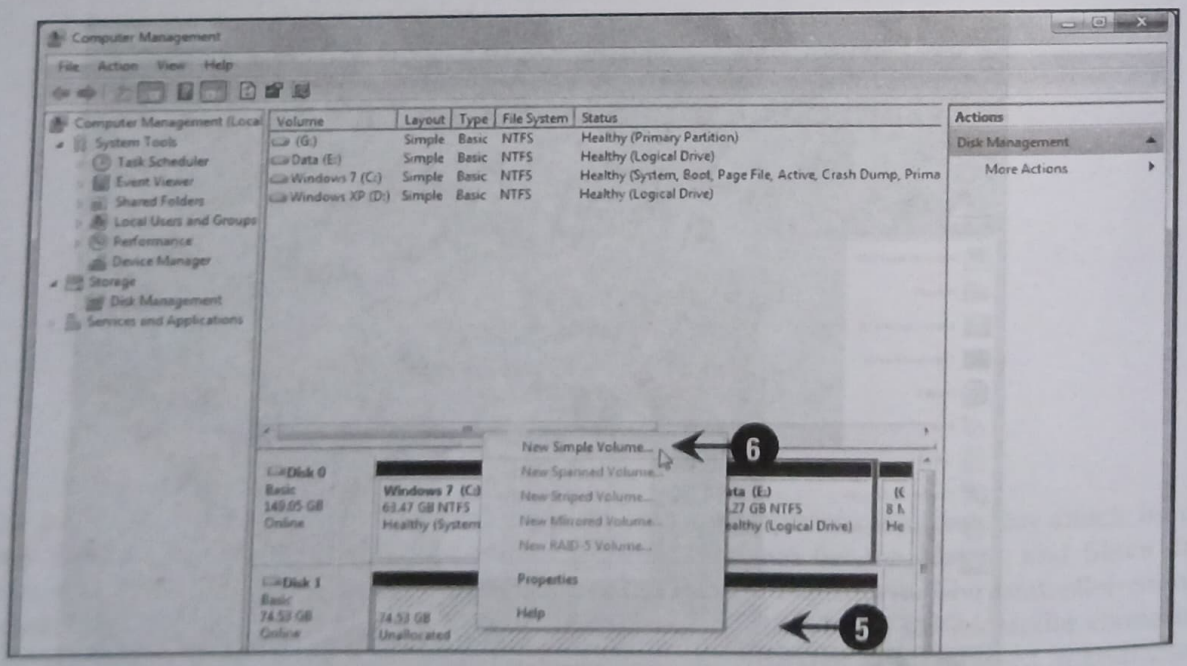


Fig.HD-6.61

The **Welcome to the New Simple Volume Wizard** page of **New Simple Volume Wizard** appears (Fig.HD-6.62).

7. *Click* the **Next** button in **New Simple Volume Wizard** (Fig.HD-6.62). The **Specify Volume Size** page of **New Simple Volume Wizard** appears (Fig.HD-6.63).
8. *Specify* the size of **Disk 1** in the spin box beside **Simple volume size in MB**. In our case, we have specified **35000** (Fig.HD-6.63).
9. *Click* the **Next** button in **New Simple Volume Wizard**, as shown in Fig.HD-6.63:

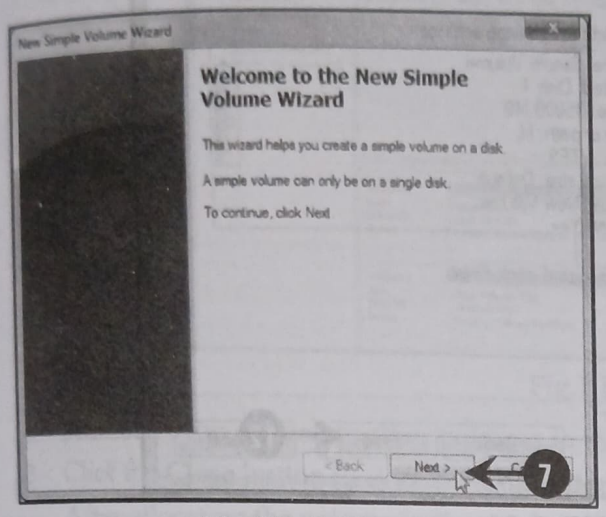


Fig.HD-6.62

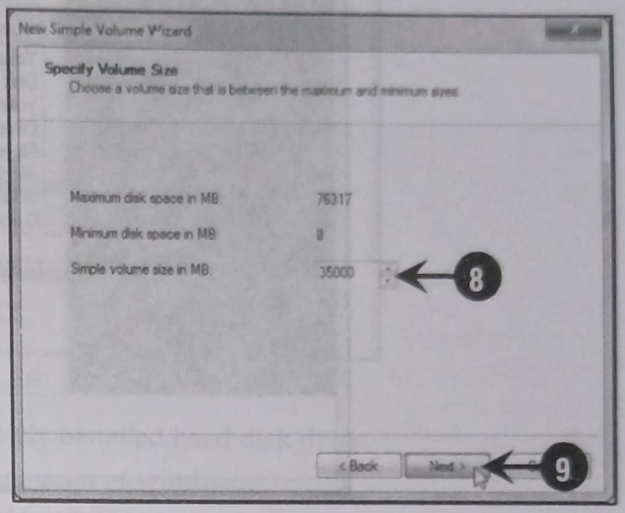


Fig.HD-6.63

The **Assign Drive Letter or Path** page of **New Simple Volume Wizard** appears (Fig.HD-6.64).

10. *Click* the **Next** button in **New Simple Volume Wizard** (Fig.HD-6.64).The **Format Partition** page of **New Simple Volume Wizard** appears displaying different options set by default (Fig.HD-6.65). In our case, we have selected the default options for formatting the newly installed hard disk drive.
11. *Click* the **Next** button in **New Simple Volume Wizard**, as shown in Fig.HD-6.65:

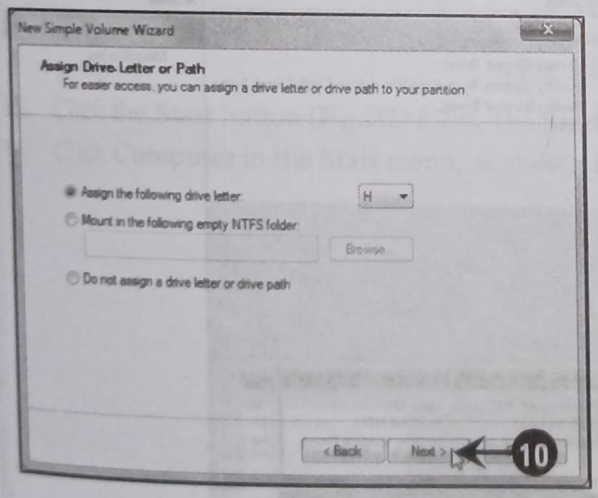


Fig.HD-6.64

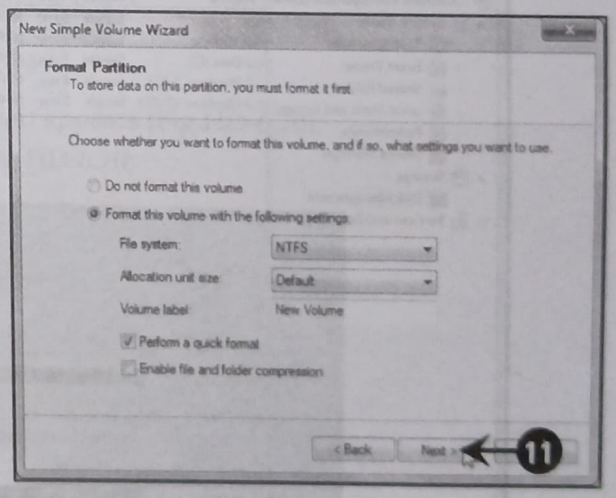


Fig.HD-6.65

The **Completing the New Simple Volume Wizard** page of **New Simple Volume Wizard** appears (Fig.HD-6.66).

12. *Click* the **Finish** button in **New Simple Volume Wizard**, as shown in Fig.HD-6.66:

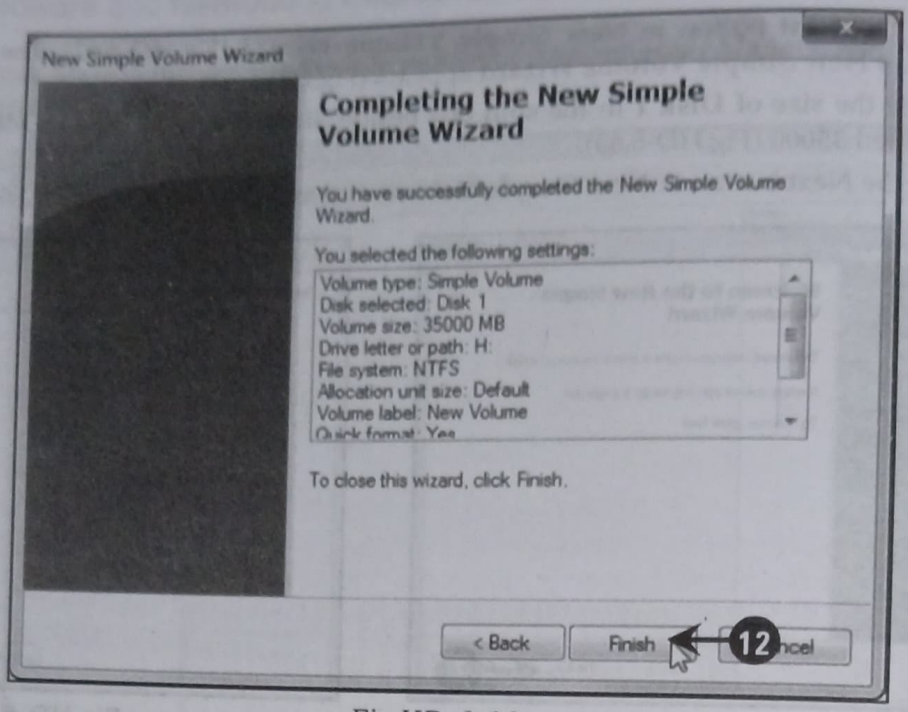


Fig.HD-6.66

The **Computer Management** window reappears, which formats the new volume of the hard disk drive, as shown in Fig.HD-6.67:

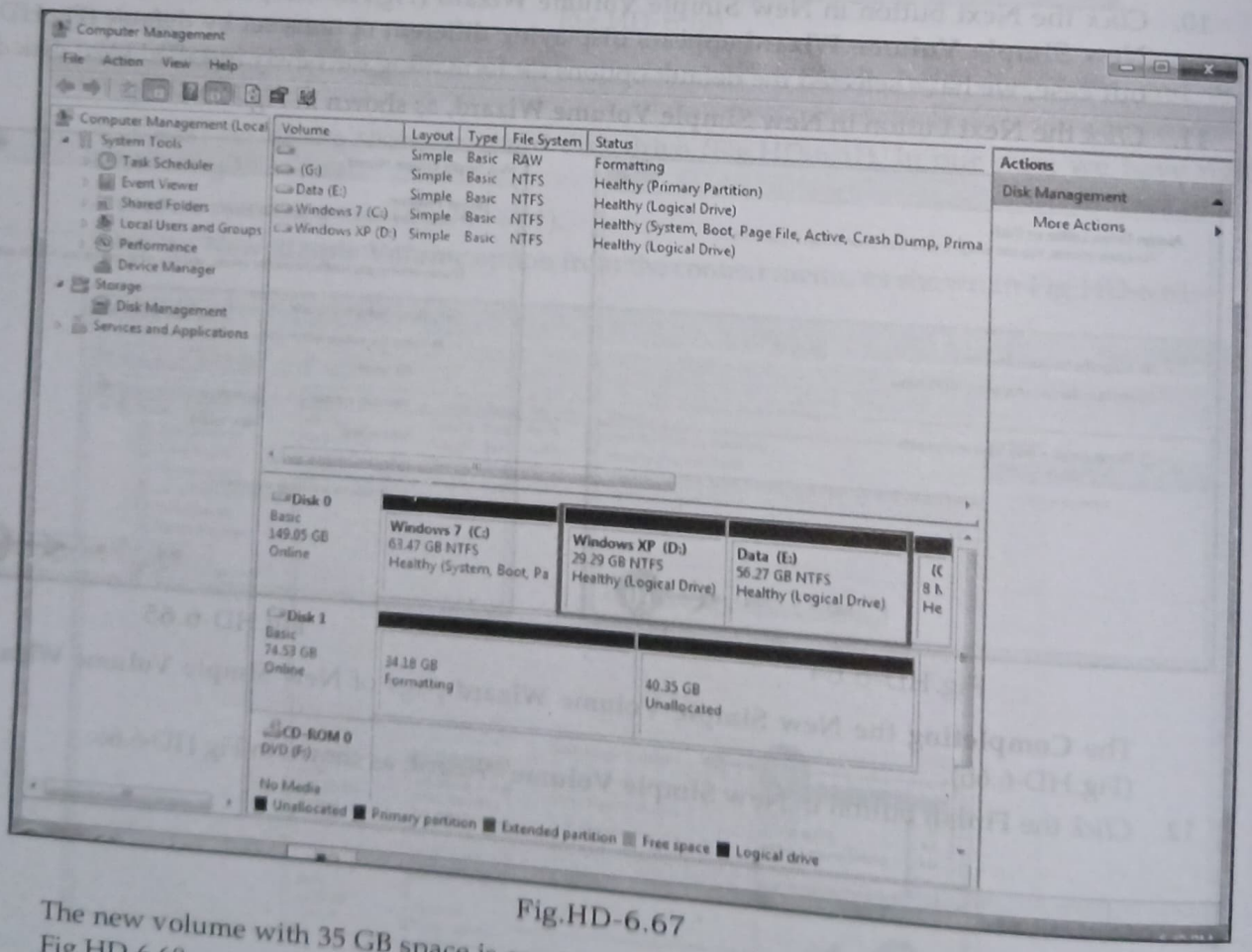


Fig.HD-6.67

The new volume with 35 GB space is created in the new volume of the hard disk drive, as shown in Fig.HD-6.68:

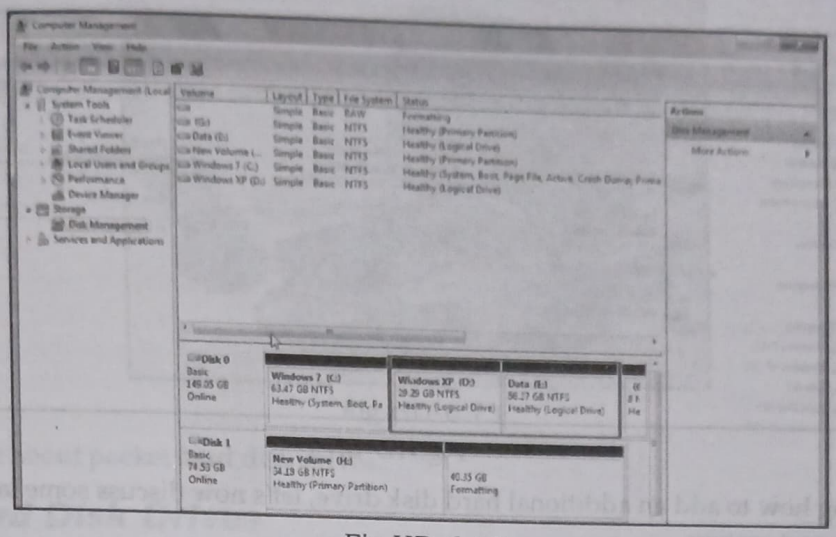


Fig.HD-6.68

Similarly, you can create other volumes in the newly installed hard disk drive.

13. *Click* the **Close** button to close the **Computer Management** window.

After allocating the volume in the newly installed hard disk drive, the **AutoPlay** window appears.

14. *Click* the **Close** button to close the **AutoPlay** window, as shown in Fig.HD-6.69:

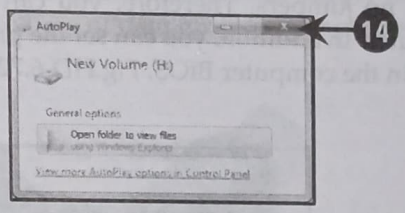


Fig.HD-6.69

15. *Click* the **Start** button (Fig.HD-6.70). The **Start** menu appears (Fig.HD-6.70).
16. *Click* **Computer** in the **Start** menu, as shown in Fig.HD-6.70:

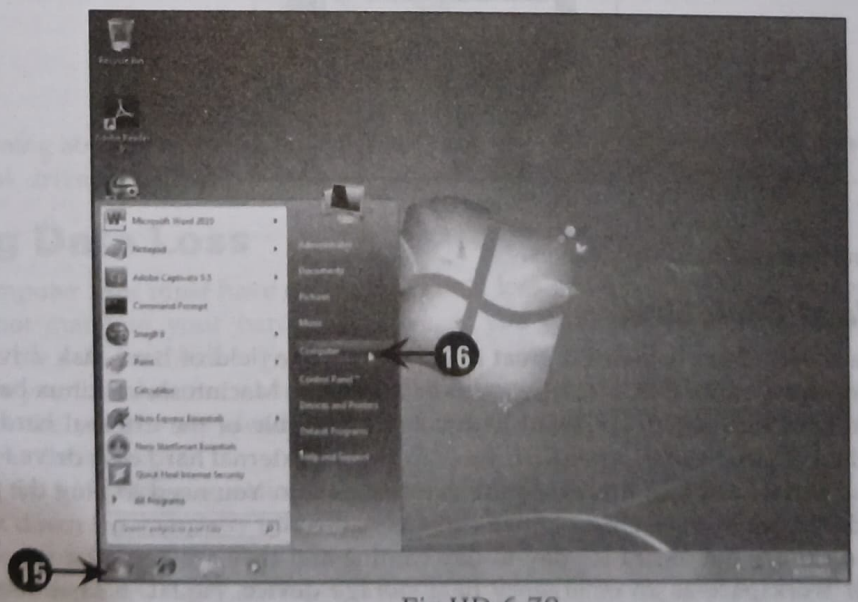


Fig.HD-6.70

The **Computer** window appears displaying the new volumes of the secondary hard disk drive that we have created, as shown in Fig.HD-6.71:

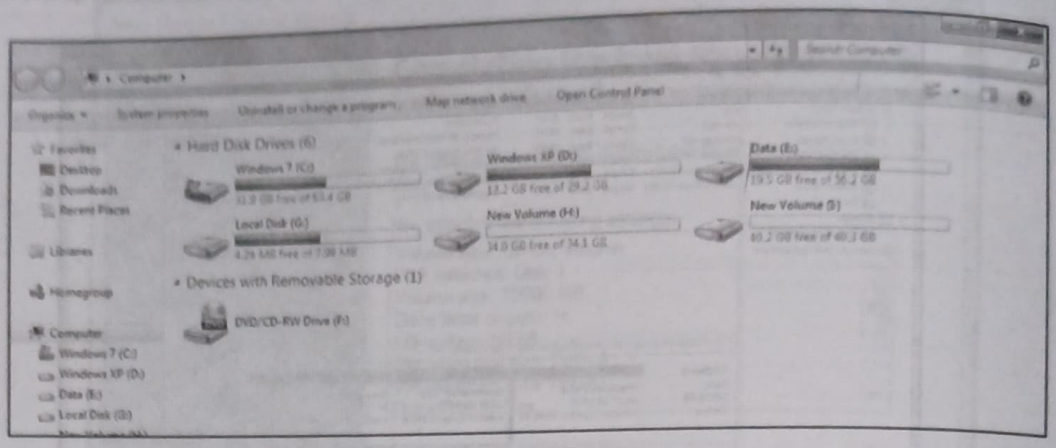


Fig.HD-6.71

After learning how to add an additional hard disk drive, let's now discuss some latest trends in hard disk drives in the next section.

Exploring New Trends in Hard Disk Drives

Among various trends that came in the field of hard disk drives, such as external hard disk drive, pocket hard disk drive and SATA. Among them, the most popular one is SATA. It is a new format of a hard disk drive, which is easier to use and manage as compared to IDE hard disk drives. SATA drives are designed for easy installation with no jumpers. Therefore, you can connect more SATA drives directly to the motherboard of the computer. In addition, you can set the primary drive from which the OS is to be load, by specifying the settings in the computer BIOS. Fig.HD-6.72 shows a comparison in the cable of IDE and SATA hard disk drives:

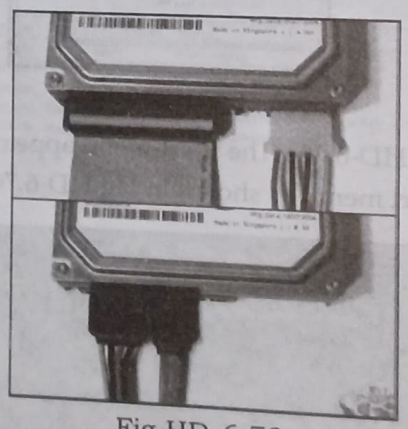


Fig.HD-6.72

Let's learn about external hard disk drives.

External Hard Disk Drives

An external hard disk drive is the next great innovation in the field of hard disk drives. Equipped with shock absorbers and a USB cable, it can be used on Windows, Macintosh, or Linux based computers. To use an external hard disk drive, you need to attach a USB cable of the external hard disk drive with a USB port attached of a computer. After that, you can use the external hard disk drive for storing files and folders. Some external hard disk drives require external power. You need to plug the power cable of the external hard disk drive in an electrical outlet.

External hard disks are not meant for day-to-day routine and they are kept at a safe location within an organization or workspace as an emergency data storage device. Fig.HD-6.73 shows an external hard disk drive: