# Computer Maintenance

Unit Subtitle: Portable Computers

Excerpted from www.howstuffworks.com

# **Summary**

- Introduction to how laptops work
- Brief history
- Anatomy of a laptop computer
- Similarities and differences compared to desktops
- Future trends
- What they can do

# Introduction to Laptops

Today's laptops have just as much computing power as desktops, without taking up as much space. You can take a laptop on the road with you to do your computing or make presentations. Perhaps you prefer comfortably working on your couch in front of the TV instead of sitting at a desk.

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# Brief History

- In 1983, Gavilan Computer produced a laptop computer with the following features:

  -64 kilobytes RAM      -Gavilan operating system

  -8088 microprocessor    -touchpad mouse

  -portable printer        -weighed 9 lbs.

- The Gavilan computer had a floppy drive that was not compatible with other computers, and it primarily used its own operating system. The company failed.

# Brief History

In 1984, Apple Computer introduced its Apple IIc model. The Apple IIc was a notebook-sized computer, but not a true laptop. The computer itself weighed about 10 to 12 pounds (about 5 kg), but the monitor was heavier. The combination computer/LCD panel made it a genuinely portable computer, although you would have to set it up once you reached your destination. The Apple IIc was aimed at the home and educational markets, and was highly successful for about five years.

# Brief History

Later, in 1986, IBM introduced its IBM PC Convertible. Unlike the Apple IIc, the PC Convertible was a true laptop computer. Like the Gavilan computer, the PC Convertible used an 8088 microprocessor, but it had 256 kilobytes of memory, two 3.5-inch (8.9-cm) floppy drives, an LCD, parallel and serial printer ports and a space for an internal modem. It came with its own applications software (basic word processing, appointment calendar, telephone/address book, calculator), weighed 12 lbs (5.4 kg) and sold for $3,500. The PC Convertible was a success, and ushered in the laptop era. A bit later, Toshiba was successful with an IBM laptop clone.
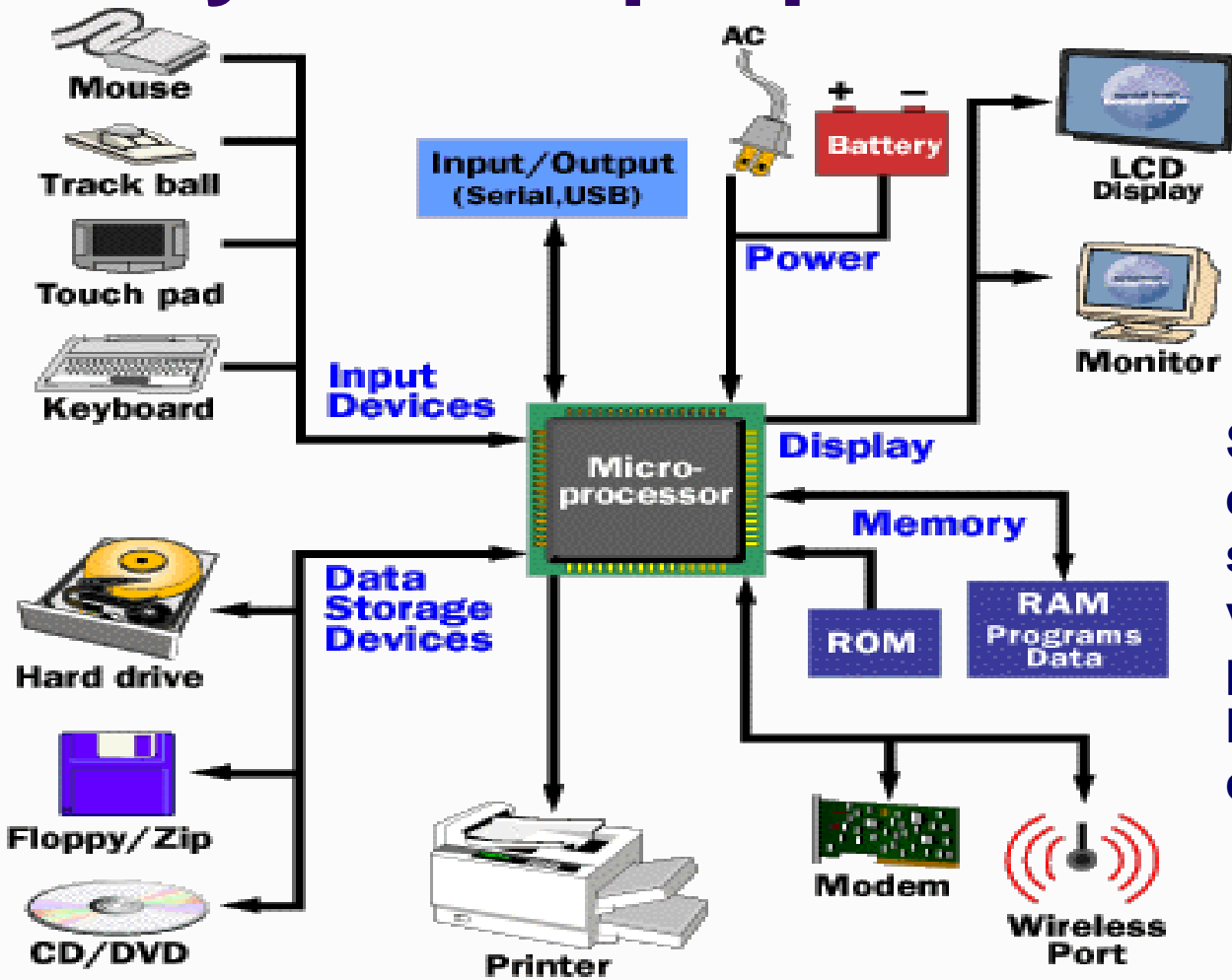
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# **Anatomy of a Laptop**

Like all computers, laptops have a central brain called a microprocessor, which performs all of the operations of the computer.



**The major parts of the Toshiba Satellite Pro laptop computer**

# Anatomy of a Laptop



**Schematic diagram showing the various parts of a laptop computer**

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# **Similarities**

How laptops are like desktops…

- Laptops have the same major parts as desktops:
    - microprocessor
    - operating system
    - solid-state memory
    - disk drives
    - input/output ports
    - sound cards and speakers

# Similarities

Like standard desktops, laptops are powered by microprocessors. The microprocessor is the brain of the laptop and coordinates all of the computer's functions according to programmed instructions. A typical laptop processor has features that reduce power consumption and heat. For example, laptop processors often run at a lower voltage and often have multiple sleep or slow-down modes that significantly increase battery life. Typical laptop microprocessors include Motorola's PowerPC family (used in Apple Macintosh computers), Intel's Pentium and Celeron families (used in PCs), and AMD's K5 and K6 families (used in PCs).

# **Similarities**

The operating system is the set of pre-programmed instructions that tell the microprocessor what to do. Operating systems on laptops include Windows XP/2000/NT (Microsoft) and Mac OS, depending upon the type of computer (PC vs. Mac), and Linux.

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# Similarities

Laptops have memory, both RAM and ROM, just like desktops. The laptop's ROM chip contains the BIOS just as it does in a desktop computer. RAM stores the application software and data files while the computer is on. RAM differs on a laptop in that it uses a different form factor – that is, the size and shape of the modules that carry the RAM.

# Similarities

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**Access panel to the memory chips on the laptop's underside.**



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**Close-up of Toshiba's memory chips**

# **Similarities**

All laptops have an internal hard disk drive, usually 6 to 20 gigabytes (GB). The hard disk drive stores operating systems, application programs, and data files. Although the hard disk drive works the same in a laptop as it does in a desktop, laptops generally have less disk space than desktops and you will have fewer choices for hard disk drives in laptops. The smaller hard disk space is one of the chief limitations of laptops.

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# Similarities



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**Close-up of Toshiba's hard drive**

# **Similarities**

In addition to hard drives, most laptops have some type of removable disk storage system, such as floppy disks, Zip disks, CDs, and DVDs.



Close-up of Toshiba's CD-ROM drive

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# Similarities

There are three options for disk drives in laptops:

- Some laptops have more than one bay built into the case for disk drives (such as floppy drive and CD-ROM drive).
- Some laptops have one bay with which you can swap or interchange various drives.
- Some laptops have no internal drives. All drives are external and connected to the computer by cables. This feature allows the laptop to be very small and thin.

# **Similarities**

- Computers need to talk to other devices (such as printers, modems, and networks). Computers send and receive information through various input/output ports, which can include serial ports, parallel ports, and USB ports.

- In addition to ports, some laptops have expansion slots for PCMCIA standard adapter cards (Type I and Type II) or "PC " cards.

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# Similarities



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**The back panel of the Toshiba Satellite Pro laptop computer, showing the various input/output ports.**

# Similarities



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**The Toshiba Satellite Pro has a PC card for modem/Ethernet connections.**

# Similarities

Like desktops, most laptops are equipped with sound cards and speakers so they can play music from CDs. However, the quality of the speakers built into most laptops does not match that of speakers for desktops because space is a major limitation in a laptop case. The Toshiba laptop that we dissected has a sound card and jacks so you could hook up a microphone or headphones; it also has a small speaker for sound.

# Similarities



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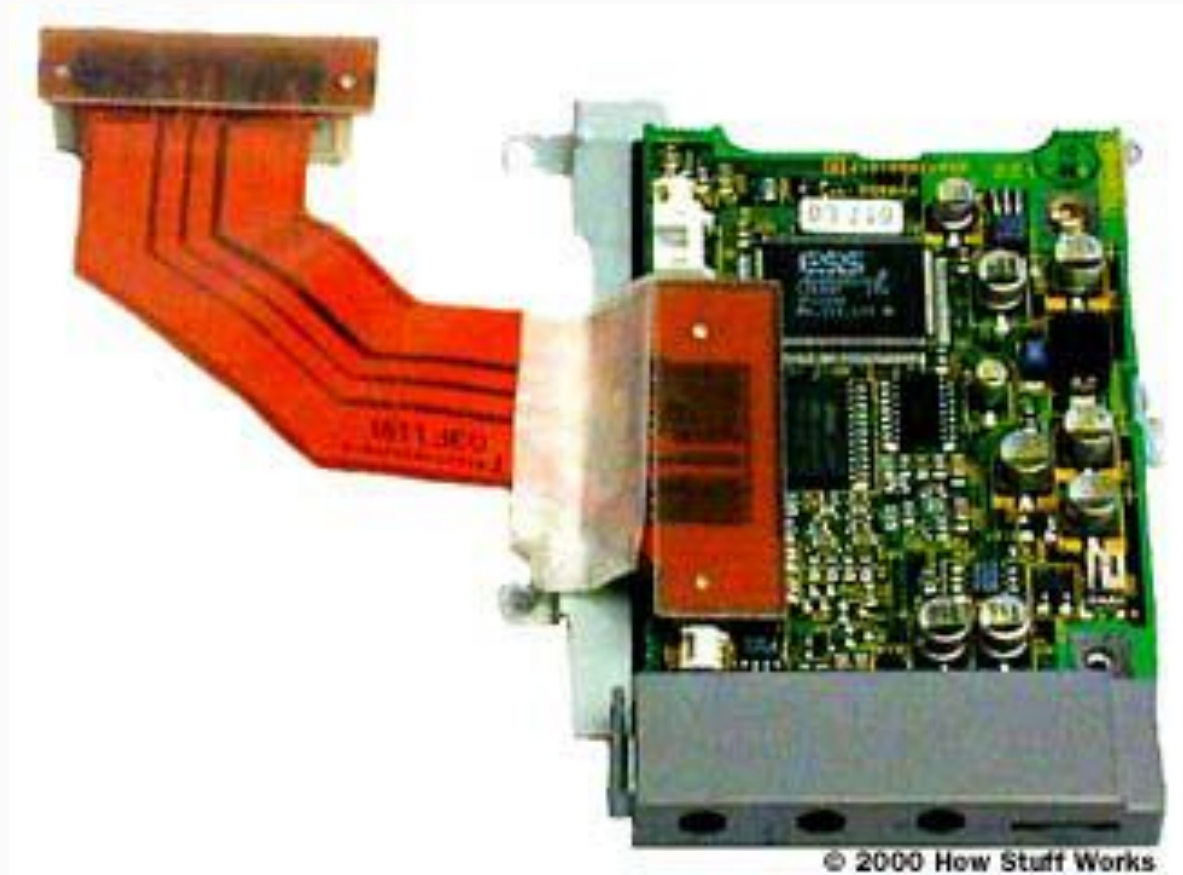
**Sound card of the Toshiba Satellite Pro laptop**

# **Differences**

Laptops differ from desktops in the following features:

- power supply
- displays
- input devices
- docking connections

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# Differences

Like desktops, laptops can be plugged into the wall to receive AC power from the electric power grid through an AC adapter. But what makes the laptop unique is that it is portable; laptops are also powered by batteries.

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**The Toshiba Satellite Pro's rechargeable battery.**

# Differences

Many laptop computer models have power management software to extend the battery life, or conserve battery power when the battery is low. You may notice that as your battery gets low, your laptop runs slower. This effect is typically the result of internal power management software, and indicates that you should plug in the computer's AC adapter, or quit and recharge your battery.

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# **Differences**

All laptops have some type of LCD display screen. Laptop LCD displays can be

- 12 to 15 inches
- black-and-white (16 grayscale) or color (65,536 colors)
- passive or active matrix – active matrix displays have sharper images and are easier to read
- reflective or backlit – backlit screens are good for low-level room lighting conditions

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# Differences



- For a desktop computer, you typically use a keyboard and mouse to enter data. Laptops come with one of three input devices:
- **trackball** - rotating the ball allows you to move the cursor on the LCD screen
- **trackpoint** - pushing your finger over the point allows you to move the cursor
- **touchpad** - moving your finger across the pad allows you to move the cursor



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# Differences

To make the laptop more convenient for desktop use, the **docking station** was invented. The docking station has several peripheral devices (full-size computer monitor, full-size keyboard, mouse, disk drives, printer) connected to it. You just plug your laptop into the station to use it as a desktop computer. Most laptops have a docking connection.

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# Future Trends

Like any other computer, future laptops will have faster microprocessors with more memory. The storage devices may change from removable disks (floppy, Zip, CD, DVD) to solid state memory, which could make them even lighter and thinner. In the future, laptops may eventually be replaced by wearable computers.

# What They Can Do

The portability of laptops allows you to do many things that you cannot do with a desktop. For example, you can write your sales proposal, article, or business presentation while traveling on a plane or commuting on the bus, train or subway.