16

Portable Systems

Portable computers, including laptops and personal digital assistants (PDAs), are some of the most complex and unique PCs that you will likely encounter. Portable systems are designed to be as powerful as possible and contain all of the features you have come to expect in modern PCs while maintaining as small of a footprint as possible, remaining light and mobile, and using as little power as possible.

Additionally, portable systems come in many different varieties, from small, light PDAs to powerful desktop replacement systems complete with DVD-RAM drives, huge storage capacities, and top-of-the-line components. And in each category of portable systems, there are numerous vendors, each accomplishing their goals in different ways.

Each make and model of a portable computer is typically unique unto itself. Unlike desktops, where most of the components are interchangeable, portable systems tend to contain components that are designed specifically for that make and model. Additionally, these components are generally packed so tightly into encasing that disassembly of a portable system must be done in a specific order in most cases.

These facts lead to a long list of suggested practices with portable systems that we will explore further in this lesson.

Goals

In this lesson, you will learn how to identify components common to portable computers. Additionally, you will learn how to install basic devices in portable systems, how to maintain portable systems, and how to identify key features in portable computers.

Lesson 16   Portable systems

Skill	A+ Hardware Objective
1. Understanding Portable Systems	1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.
2. Installing and Removing Laptop Components	1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.
3. Installing PC Cards	1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.
4. Examining Power Management	1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.
5. Maintaining and Troubleshooting Portable Systems	2.1 Recognize common problems associated with each module and their symptoms, and identify steps isolate and troubleshoot the problems. Given a problem situation, interpret the symptoms and infer the most likely cause.
6. Working with PDAs	1.8 Identify proper procedures for installing and configuring common peripheral devices. Choose the appropriate installation or configuration sequences in given scenarios.

Requirements

To complete this lesson, you will need access to a PDA and any cable or software needed to connect the PDA to a PC

skill 1   *Understanding Portable Systems*

A+ Hardware Objective

1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.

overview

The term **portable system** is an-all inclusive term that describes all computer systems capable of traveling with the user and operating via an internal power source, such as a battery. This is a very broad term that describes a number of different devices, but for our purposes, we will explore only two types of portable systems: laptops (including **tablet PCs**) and personal digital assistants (PDAs).

Laptops, also known as notebooks, are perhaps the most common type of portable computer. Laptops contain all of the hardware found in a standard PC, but shrink this hardware into a much smaller form factor. To understand this better, let's examine the diagram shown in **Figure 16-1**.

As you can see from the diagram, a laptop has essentially the same basic components as a standard desktop PC, but these components are much more compact than in a desktop PC. Additionally, you'll also notice that several of the components in laptops are not included on a desktop PC, and for those that are, they do not appear to fit into a standard PCI or ISA slot. That is because there is not enough space inside a standard laptop to fit standard PC expansion cards. Instead, laptops use PC card slots for peripheral devices such as modems or network cards. In general, the components of a laptop connect using a combination of special ribbon cables and custom connectors.

As for the devices that are not part of a standard desktop, these devices are required to support the special needs of the laptop. These specialized devices are as follows:

◆ **Display assembly**: The display assembly typically includes the LCD screen as well as all necessary brackets and connectors. In some cases, the video board will also be included as part of the assembly, though it is more often either a separate card within the main enclosure or a video chip integrated into the system board. The LCD screen is the most fragile part of the laptop, and is often the most expensive as well.

◆ **Power converter board**: This board is used to transmit and convert power from the AC adapter and internal battery to the system.

◆ **PC card board**: This board is used to provide expansion connections for the laptop in the form of PC cards.

In addition to these differences, there are also several more, not immediately noticeable, differences. Laptop hard disks are physically smaller, using the 2.5" form factor. Additionally, they are also slower than desktop hard disks. The processors in laptops are also different, typically including several power-saving features, such as the ability to reduce clock speed to conserve power, and the laptop CPU cannot be easily upgraded.

Laptop RAM is also smaller in size, and comes in form factors not supported by desktop PCs (**Figure 16-2**). These form factors are as follows:

◆ **72-pin Small Outline Dual Inline Memory Module (SO-DIMM)**: 72-pin SO-DIMMs measure 2.35" long. They use EDO or FPM and support 32-bit data paths. For a 486 or lower processor, these can be installed individually, but for Pentium and faster processors, they must be installed in pairs.

◆ **144-pin Small Outline Dual Inline Memory Module (SO-DIMM)**: 144-pin SO-DIMMs measure 2.66" long. They use EDO and SDRAM and support 64-bit data paths. These SO-DIMMs can be installed individually in laptops powered by Pentium or faster processors.

◆ **160-pin Small Outline RAMBUS Inline Memory Module (SO-RIMM)**: Only used on RAMBUS equipped laptops, these modules support a 64-bit data path and are installed individually.

◆ **144-pin Micro Dual Inline Memory Module (Micro-DIMM)**: These are used in some very lightweight sub-notebooks. They are about half the size of SO-DIMMs and support a 64-bit data path. They are also installed individually in 64-bit systems.

note

Even though the laptop hard disk form factor is called 2.5", the drive itself is physically 2.75" wide. The 2.5" moniker defines how wide the disk's platters are.
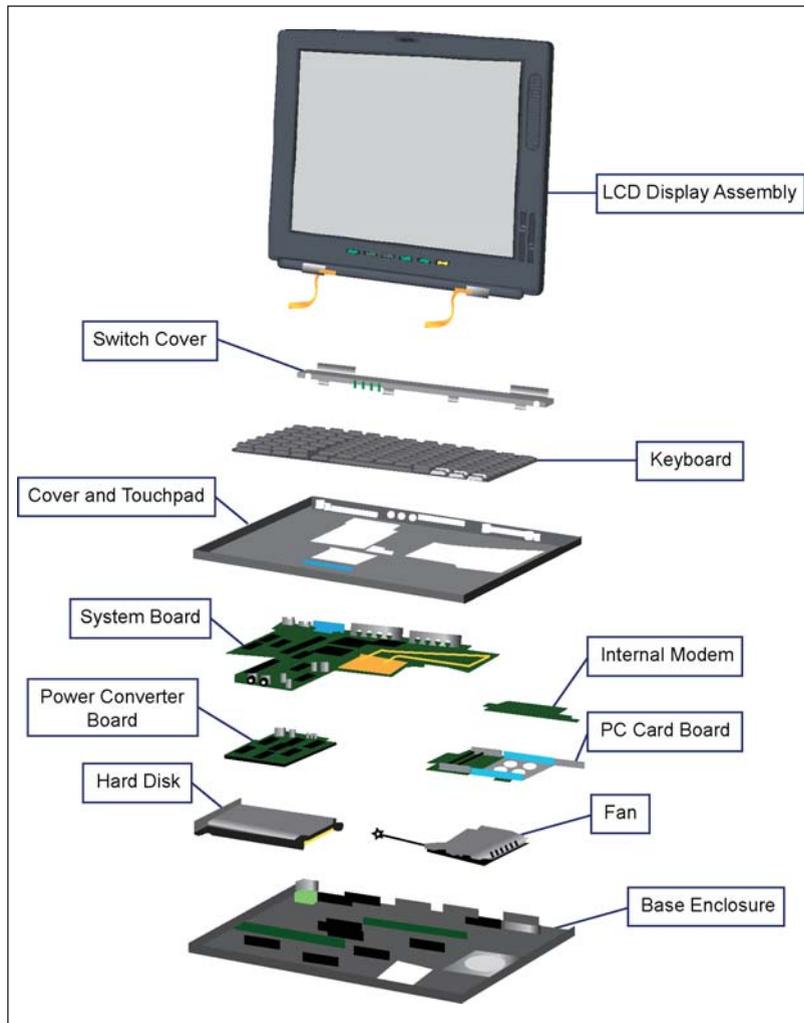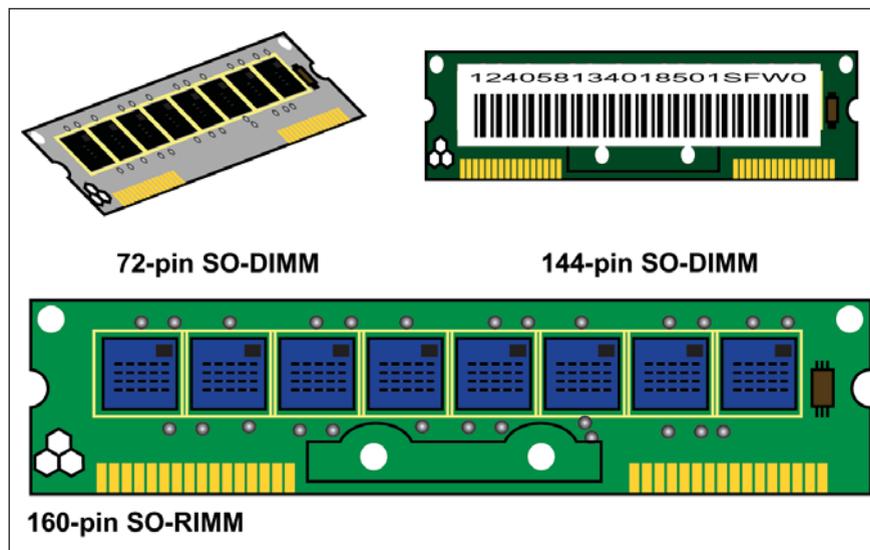
Figure 16-1 Laptop components

Figure 16-2 Laptop RAM form factors

skill 1

Understanding Portable Systems
(cont'd)

A+ Hardware Objective

1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.

overview

◆ **Credit card memory**: Early laptops did not use memory modules, but had small cards, the size of credit cards, that were inserted into slots on the laptop. Credit card memory is obsolete now.

Laptops can be powered by AC adapters, which use ordinary household current, DC adapters, which utilize power from standard car cigarette lighters or from airplane in-seat power connectors, and batteries. There are several standards for laptop batteries, and not all laptops support all battery types.

Nickel Cadmium (Ni-Cad) batteries are the oldest of the three technologies, and are also the most troublesome and least efficient. Ni-Cad batteries are heavier than the other types of batteries, which translates into shorter battery life for the same weight. Additionally, Ni-Cad batteries are well known for having a memory effect. If not completely discharged regularly (once a week is advised), Ni-Cad batteries develop a "memory" and will no longer obtain a full charge.

Nickel Metal Hydride (Ni-MH) batteries are much lighter than Ni-Cad batteries, and in most cases hold double the power of Ni-Cad in the same weight. Ni-MH batteries also are more resistant to developing a memory, though they still have some tendency to do so.

Lithium Ion (often abbreviated Li-Ion) batteries the most common type of battery for modern laptops. They are very lightweight when compared to the other battery types, weighing as much as 40% less than a Ni-MH battery of the same capacity. Li-Ion batteries also do not develop a memory, though they will still become unchargeable after a certain number of charge cycles (generally 500 or and least so).

In addition to understanding the different internal components of a laptop, you should also be able to recognize the external connectors and interfaces on the laptop. An example of the different connectors and interfaces on a common laptop is shown in **Figure 16-3**.

Although you should recognize most of these connections as standard PC connectors and interfaces, a few deserve special mention. First, note the port replicator connector on the rear view. This special connector allows the laptop to interface with a port replicator or docking station. A port replicator **(Figure 16-4)** is simply a device that expands the number and type of ports on the laptop, as you can see at the bottom of the figure. It is useful when you want to quickly connect the laptop to external peripherals (such as a mouse, keyboard, and monitor) when in the office and when you want to connect to your company's network. However, a docking station extends this idea by adding additional hard disk connections and standard PC expansion slots. This allows you to connect to more storage or additional expansion cards when the laptop is docked. Most docking stations also have the ability to lock the laptop in the station, preventing theft.

caution

Consult the documentation to determine which battery types the laptop supports. Using the wrong battery can void the manufacturer's warranty.

more

Fuel cells are an additional and least common type of power source that is expected to be available in the near future. Various types of fuel cell technologies exist, but the basic principle behind them is the same: convert chemicals into energy. Although fuel cells are promising, practical products based on fuel cells are still many years off in the future, although some may be available as early as 2007. The promise of fuel cells is cheap, plentiful energy. Sony, for instance, has developed a fuel cell that fits into the same area as a standard Li-Ion battery and yet provides upwards of 16 hours of life. Once fuel cell technology matures, it is likely that we will see fuel cells replace standard batteries in many devices, including portable systems.

Figure 16-3 **Laptop connectors and interfaces**

1	Security Slot	**Left Side**	**Right Side**	1	Battery Compartment

(Left Side)
1	Security Slot
2	CD or DVD Drive
3	CD or DVD Drive Eject Button
4	CD or DVD Drive Manual Eject Hole
5	Diskette Drive
6	Diskette Drive Eject Button

(Right Side)
1	Battery Compartment
2	PC Card Eject Button
3	PC Card Slot
4	Headphone Jack
5	Microphone Jack
6	Modem Port
7	Ethernet Port

(Rear)
1	Keyboard/Mouse Port
2	AC Adapter Connector
3	Parallel Port
4	Port Replicator Connector
5	Fan Vent
6	TV Out Connector
7	External Monitor Port
8	Serial Port
9	Universal Serial Bus Port

(Bottom)
1	Stand Feet
2	Serial Number
3	Memory Compartment Door

(Port Replicator)
1	Universal Serial Bus Port
2	Universal Serial Bus Port
3	Power (AC Adaptor) Connector
4	Keyboard/Mouse Port
5	Keyboard/Mouse Port
6	Parallel Port
7	Joystick/MIDI Port
8	Serial Port
9	External Monitor Port
10	S-Video
11	(Composite) TV Out

Figure 16-4 **Port replicator**

1	Universal Serial Bus Port	**Port Replicator**		8	Serial Port
2	Universal Serial Bus Port			9	External Monitor Port
3	Power (AC Adapter) Connector			10	S-Video
4	Keyboard/Mouse Port	5	Keyboard/Mouse Port	6	Parallel Port	7	Joystick/MIDI Port	11	(Composite) TV Out

<table>
<tr><td>**skill 2**</td><td>*Installing and Removing Laptop Components*</td></tr>
</table>

A+ Hardware Objective

1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.

overview

Although laptops have a number of restrictions regarding component modification that are not present in desktops, they can still be upgraded and modified to some degree. One component that can generally be easily modified is the battery. However, many other components can be added, modified, or replaced, including:

◆ RAM
◆ Disk drives
◆ Input devices
◆ PC cards
◆ External displays

Let's examine the process for replacing or adding each of these devices, beginning with batteries.

Replacing batteries: Laptop batteries will eventually wear out, regardless of the type of battery, and must eventually be replaced. A typical rechargeable battery may last about two years. Removing and replacing a laptop battery is simply a matter of locating the battery release mechanism, removing the battery, and replacing it. For most laptops, this process must be performed when the system is off. An example of replacing the battery on a common laptop is shown in **Figure 16-5**.

Also, some laptops have provisions for adding an additional battery pack to extend battery life. Most laptops with this capability require you to use one of the modular drive bays for this purpose. For instance, the laptop may support adding an additional battery in the location where the floppy drive normally sits. Consult your laptop's documentation for directions on this process.

Installing RAM: Installing RAM on a laptop is also typically a simple process. First, you must locate the laptop's RAM slots, which are identified in the laptop documentation. Typically, the RAM slots are accessed through a panel on the bottom of the system, but occasionally they may be in a different location, such as under the keyboard. Just as when adding RAM to a desktop, ensure you power off the system before adding RAM to a laptop. However, you should also remove the system battery before adding RAM to a laptop.

Installing internal disk drives: Installing disk drives is a slightly more complicated process, and varies depending on the type of drive and whether the drive is internal or external. For internal drives, the process differs depending on the type of drive. For floppy and CD-ROM drives, the laptop may have the drives contained in a special bay that allows for quick removal using essentially the same process as for battery replacement **(Figure 16-6)**. This layout allows for easy removal and installation of optional drives. If your laptop contains this type of bay (often called a modular bay), check the documentation to determine which types of devices can be installed in the modular bay location. Some laptops support CD-ROM and CD-R or CD-RW drives, DVD-ROM drives, standard floppy drives, LS-120 or zip drives, hard disks, and even batteries installed into a bay.

For laptops without a modular type bay, the process for replacing the optional drives is usually similar to the process for replacing the primary hard disk. In most laptops, the primary hard disk is contained in a special tray that includes an adapter to convert the drive's pinout into the proprietary pinout used by the laptop. Replacing the hard drive involves removing the drive bay, unscrewing and unplugging the drive, connecting the new drive to the bay, fastening the drive to the bay using the original screws, and reinserting the bay into the system.

tip

On nearly all laptops, you must power down the system to replace a drive.

Figure 16-5 Removing the battery

Figure 16-6 Removing a drive from a modular bay
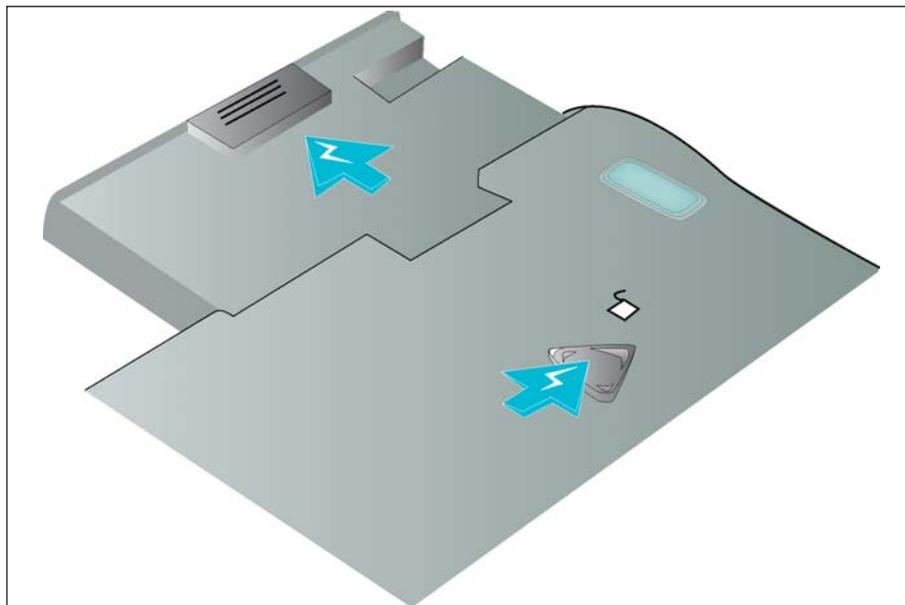
skill 2 | Installing and Removing Laptop Components *(cont'd)*

A+ Hardware Objective

1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.

overview

Installing external drives: For external drives, the process is simpler. Some laptops contain a special port allowing connection to a proprietary external floppy drive or CD/DVD drive. For these systems, connecting the external drive is simply a matter of plugging the device in, though you can only do this with external drives that are specifically made to interface with the laptop's proprietary port. However, nearly all laptops can make use of external drives using standard USB or parallel interfaces. Additionally, drives are available that use a custom PC card for interfacing with the laptop **(Figure 16-7)**. However, these types of external drives may require that you install a special driver.

Installing external input devices: For input devices, adding an external input device follows the exact same steps as for any other PC, with one exception: Laptops generally have only one PS2 port. To connect both an external keyboard and an external mouse, you can either use a special cable that splits the single PS2 port into two PS2 ports, or use a USB mouse or keyboard.

USB devices are a very popular addition to portable systems. Nearly any type of computer laptop device imaginable is available in a USB version, from input devices to network adapters to hard disks. With the advent of USB 2.0, supporting data transfer rates of up to 480 Mbps, USB devices accommodate high performance requirements as well. Perhaps the only real disadvantage of using USB with portable systems is the lack of multiple USB ports in some laptops, because many laptops support only a single USB port. This factor may necessitate purchasing a USB hub to support several devices.

Installing internal input devices: Changing the internal input devices (such as the built-in keyboard) is more involved. The internal keyboard and pointing device are generally connected to the laptop using a special ribbon cable that is very thin and fragile **(Figure 16-8)**. Replacing these devices requires you to unhook this ribbon cable from the old device and connect it to the new device. **Figure 16-9** shows how to unhook the ribbon cable. Be very careful when performing this process to keep from damaging the cable.

Finally, you can connect external displays to most laptops. In general, connecting an external display to a laptop is no different than connecting a monitor to any other PC. However, when connecting an external display to a laptop, you generally have the option to display the information on either the internal LCD, the external display, or both. This functionality is included in the BIOS of the laptop, and allows you the flexibility to use two displays in certain situations. For instance, if you are giving a presentation, you may want the presentation displayed on both the LCD display and an external projector.
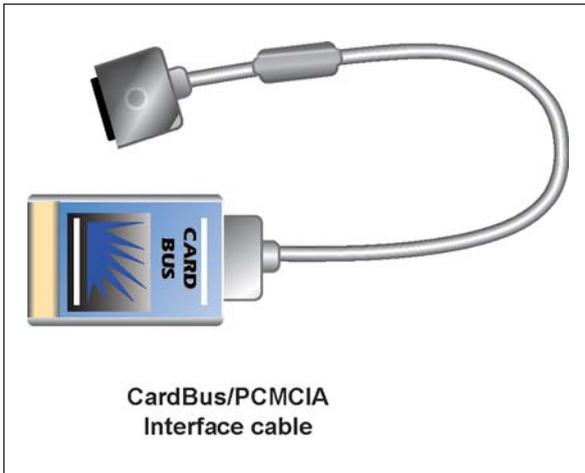
Figure 16-7 A PC card drive interface

CardBus/PCMCIA
Interface cable

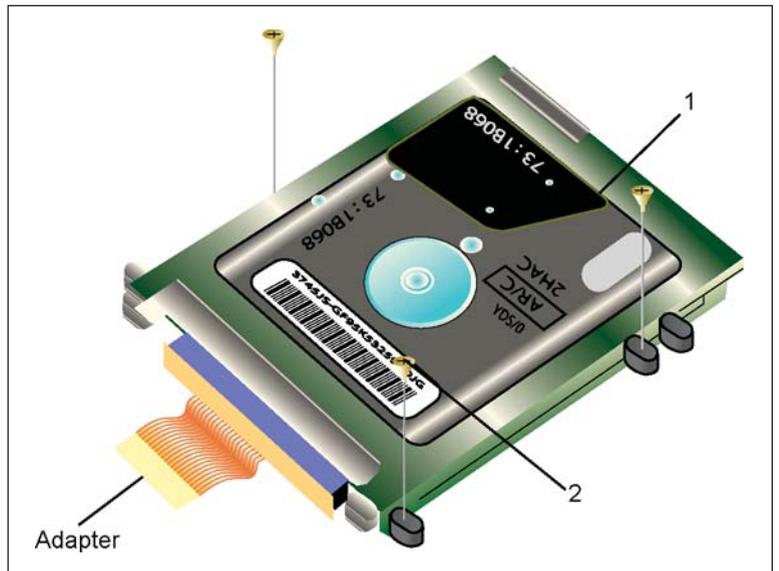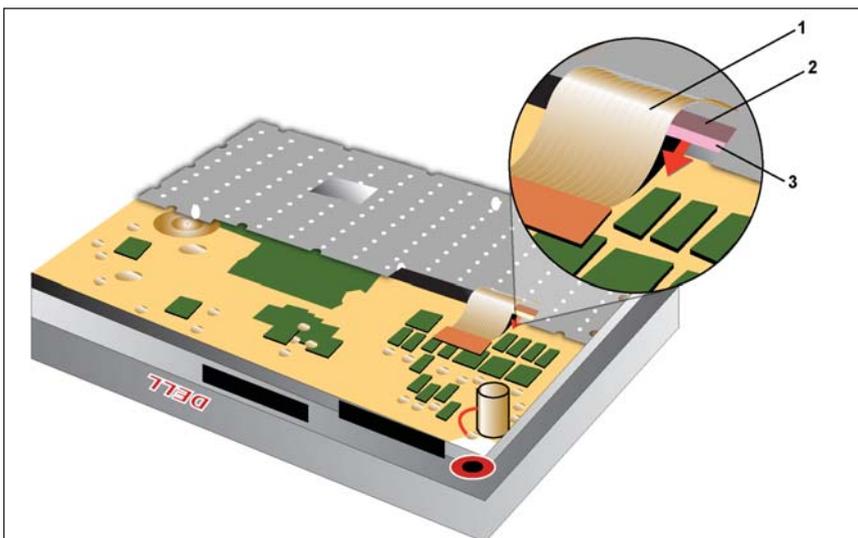**Figure 16-8 A hard drive adapter cable**

Adapter

Figure 16-9 The keyboard ribbon cable

skill 3 *Installing PC Cards*

A+ Hardware Objective

1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.

overview

Installing PC cards: Installing PC cards is perhaps the most common change you are likely to make to a laptop. PC cards are the primary expansion mechanism for laptops, and almost all types of devices, from sound cards to network adapters, can be added via PC card slots. Some PC card functionality is self-contained, such as a network card, and others may function as adapters to external devices, such as a card for an external DVD drive. PC cards were also referred to as **PCMCIA (Personal Computer Memory Card International Association) cards**.

Most laptops have a combination PC card slot system that supports either two type 2 PC cards or a single type 3 PC card. This means that the laptop can hold a single type 3 PC card or two type 2 PC cards. The type of PC card defines how large the card is physically **(Figure 16-10)**. **Type 1 PC cards** are only 3.3 mm thick, and are typically used for memory expansion in older laptops. **Type 2 PC cards**, the standard type of PC card, are 5 mm thick, and are typically used for I/O devices such as modems, network adapters, etc. Finally, **type 3 PC cards** are the largest type at 10.5 mm thick, and are used for devices that require more physical space, such as micro hard disk drives.

Card bus is an enhancement to the standard PC card specification. Card bus cards are 32-bit cards capable of operating at up to 33 MHz, which allows card bus to achieve PCI-like data transfer rates of 132 MBps. This transfer rate is up to 8 times as fast as a standard, 16-bit PC card. Physically, card bus cards are identical to standard PC cards, with the exception of a special keyed connector to prevent insertion into 16-bit only PC-card slots and a grounded shield to reduce noise at high data rates. Nearly all modern laptops support the card bus standard.

Although most PC cards are completely self-contained in the PC card unit, some PC cards, especially network adapters, have additional components to connect the card to an external device. For instance, many network adapters have a short cable that is used to provide the physical connection to the RJ-45 twisted-pair network cable. These adapter cables are commonly called **dongles**. Although dongles provide the advantage of reducing the physical size requirements of the PC card, they typically have a bad reputation because they are easily lost or broken.

To install a PC card, you simply insert the card into the PC card slot. The Windows Found New Hardware Wizard opens and guides you through the steps of installing the proper device drivers for the card.

PC cards are designed to be hot-swappable, though you should always refer to your laptop and PC card documentation to determine if there are any exceptions for your specific hardware. In most cases, however, you can remove the card and insert a new card while in the Windows GUI and Windows will recognize the change, load the appropriate driver, and allow you to use the card's functionality almost immediately.

Although most Windows versions are capable of removal of PC cards while in the Windows GUI, it is generally recommended that you stop the driver before removing the PC card. Removing the PC card without using the appropriate stop mechanism is known as a surprise removal. With Windows 98/Me, surprise removal is not supported, and removing a card without first unloading the driver can crash the OS. In Windows 2000 and XP, surprise removal is supported, but requires disabling write caching to the card, which may result in reduced performance.

To properly unload the driver in Windows 98/Me, click the PC card icon in the task bar, select the PC card you want to remove, and click **Stop**. Then, remove the card. In Windows 2000,

Figure 16-10 Different PC card types
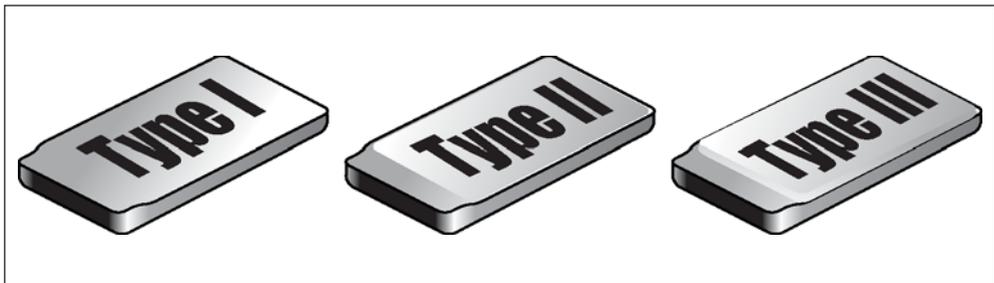
skill 3

Installing PC Cards (cont'd)

A+ Hardware Objective

1.3 Identify basic procedures for adding and removing field-replaceable modules for portable systems. Given a replacement scenario, choose the appropriate sequences.

overview

select the **Unplug/Eject hardware** icon on the taskbar and select the appropriate card to disable it. In Windows XP, select the **Safely remove hardware** icon on the taskbar (**Figure 16-11**) and then select the device to remove it.

The true power behind PC card functionality, however, is not in the hardware, but in software. PC cards are controlled by a service known as **card and socket services**. This service actually contains two components: card services and socket services. Socket services detect cards that are inserted and remove connections to cards that are ejected. It also associates each card with a specific socket. Card services then use the information about these sockets to install or remove the appropriate drivers for the socket as necessary.

Card and socket services are included in all modern versions of Windows; however, older versions (such as Windows 3.1) required special card and socket services software to be loaded before you could gain access to your PC cards.

PC cards provide the bulk of portable PC expansion, but there are other card types that provide storage services, typically in a smaller form factor. Secure Digital and Compact flash (**Figure 16-12**) are two such standards, and both provide for simple storage using flash memory as the storage medium. However, these cards provide only for storage capabilities, and are not seen as a true competitor to PC cards.

Although PC cards and other small form factor expansion devices are typically seen as expansion devices for portable systems, card readers (**Figure 16-13**) are available that allow these devices to be installed and used in desktop PCs. These devices can provide a greater return on your PC card investment, allowing you to expand the capabilities of both your laptop system when traveling as well as your desktop system when at home. However, these devices are considerably less popular than USB-based expansion devices, which provide the same benefits while also being natively supported by nearly all PC systems.

Figure 16-11 Safely remove hardware icon

Click this icon to safely
remove hardware

**Figure 16-12 Compact flash and Secure
Digital cards**

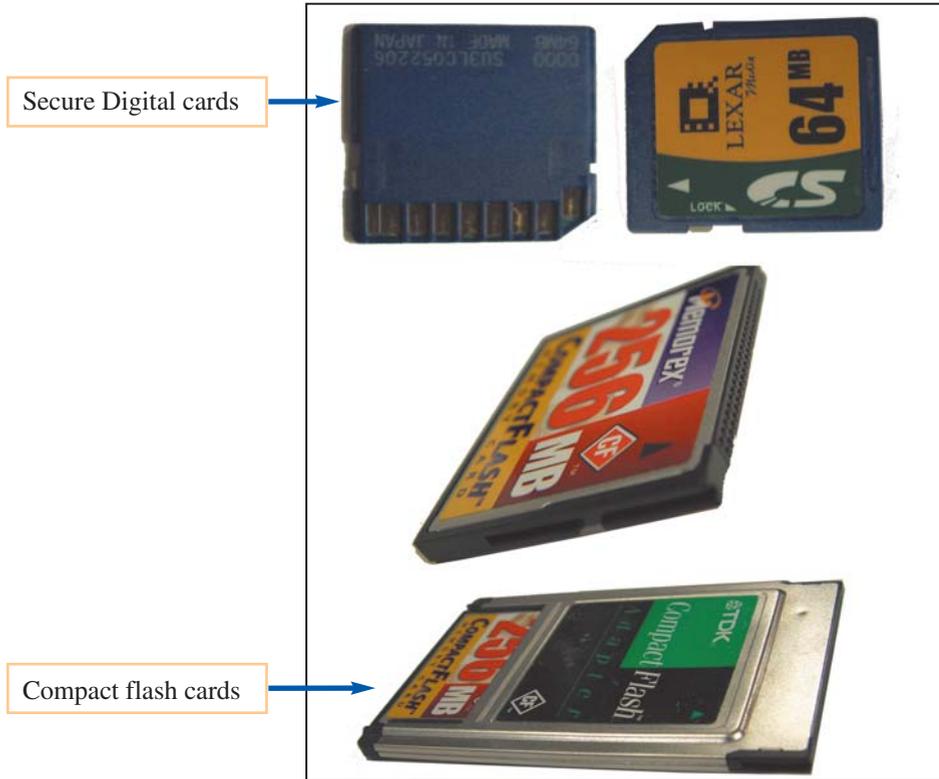Secure Digital cards

Compact flash cards

Figure 16-13 Card reader

skill 4

Examining Power Management

A+ Hardware Objective

1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.

overview

Power management is a feature of both hardware and software that is included in all modern PCs to conserve power during periods of low activity. Although power management features are available in all modern PCs, power management is particularly important for portable systems because it heavily influences battery life.

From a hardware perspective, there are two primary mechanisms for power management, **Advanced Configuration and Power Interface (ACPI)** and **Advanced Power Management (APM)**. Both of these power management technologies rely on the system BIOS and component support, however, the control mechanisms are very different for each technology.

APM was the earlier of the two standards, and is now obsolete and has been replaced by ACPI. APM relies on the system BIOS settings to control the power management features, which makes feature support and capabilities almost completely dependent on the hardware. Because of this, the power management routines of APM systems rely entirely on messages from the system hardware to determine when to reduce or increase power. For example, with APM, it is fairly common to experience a situation where a suspended state cannot be resumed through normal activities (such as moving the mouse). This is because APM does not track operating system events, relying solely on hardware messages to determine the activity level. Low impact hardware activity on a single resource, therefore, may not be sufficient to wake up the computer. This reliance on hardware ultimately leads to power management functions that are erratic at best, and completely destabilizing at worst.

ACPI, on the other hand, embodies what the industry learned from APM and puts the majority of the power control functions in the hands of the OS. Additionally, ACPI allows the OS to enumerate PCI Plug and Play devices as it sees fit, allowing the OS to take much greater control of the system hardware. By allowing the OS to control the hardware and resources, ACPI is much more aware of the current system state and power management needs than APM.

Additionally, ACPI gives the OS control of devices and resources, allowing the OS to assign hardware resources as necessary to Plug and Play devices. This improvement leads to better management of resources than is available with APM.

Most modern portable systems use ACPI, however, some older systems may still use APM. For these older systems, you need to be careful when configuring power management features. In fact, for Windows XP systems, power management is disabled by default on APM computer systems.

From a software perspective, there are several power management functions you can modify to tailor your system to your needs. These settings are accessed from the Power Options applet in Control Panel **(Figure 16-14)**, or from the Screensaver tab in the Display properties dialog box.

From either place, the first tab you are presented with is the **Power Schemes** tab. Using this tab, you can define how many minutes to wait before turning off the monitor, turning off the hard disks, entering system standby, and entering hibernation. Each of these functions relies on driver support, however, so you may not see all options in all computers. The power scheme selection modifies each of these options for you to configure your system to conform to predefined settings. For instance, the laptop/portable scheme modifies these settings, as shown in **Figure 16-15**.

Figure 16-14 **Power Options dialog box**
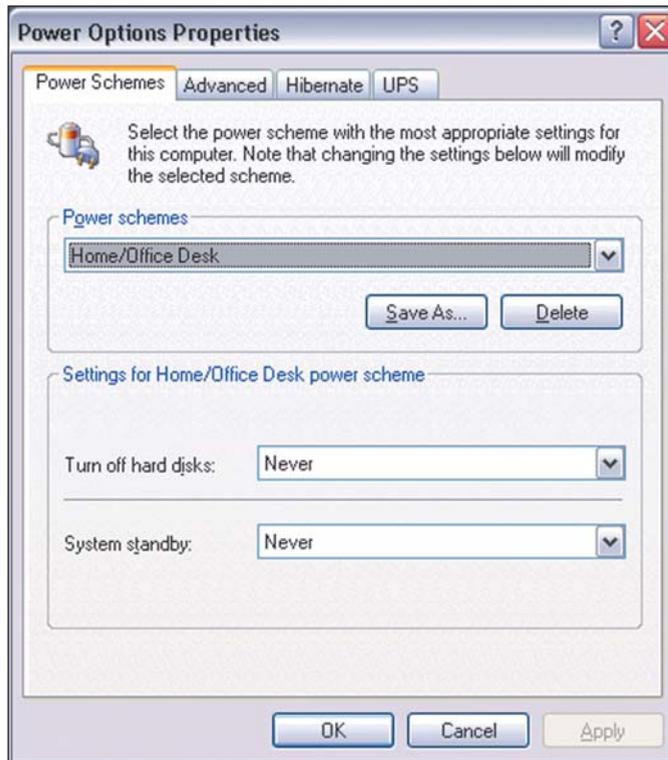
Figure 16-15 **The laptop/portable power scheme**
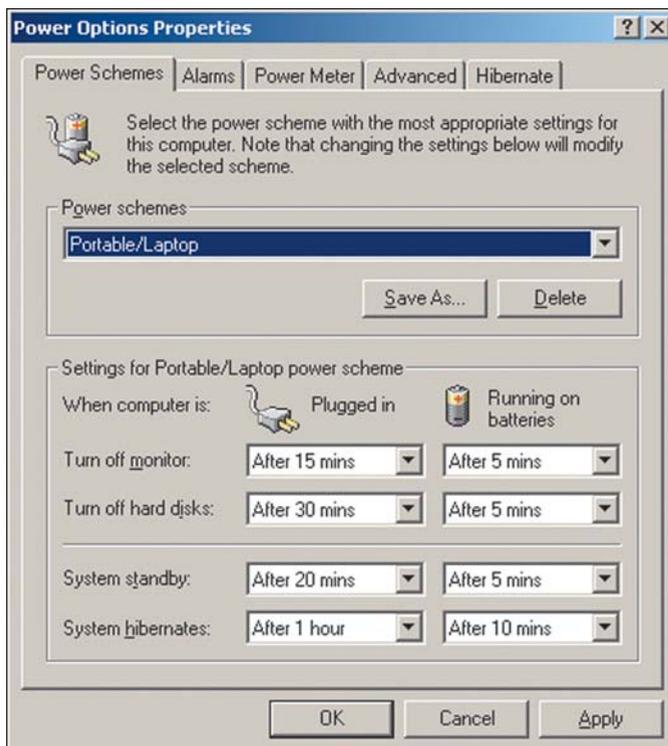
skill 4

Examining Power Management (cont'd)

A+ Hardware Objective

1.1 Identify the names, purpose, and characteristics of system modules. Recognize these modules by sight or definition.

overview

Turning off the display and hard disks is arguably the most important of these settings, as these two devices are the largest consumers of energy in a portable system. Entering **suspend mode** powers down all of the supported system devices, and significantly reduces power to the system chipset and processor. However, suspend mode still consumes some power, and if a system is left in suspend mode for too long, it will eventually run out of battery power.

Hibernate mode, on the other hand, is used to retain the laptop state for very long periods of time. Although hibernate still does use some battery power, the power use is very low, as all system memory is saved to disk, and all components are almost completely powered off.

The next tab is one typically available only on portable systems, the **Alarms** tab **(Figure 16-16)**. In the Alarm tab, you can set battery power thresholds for activating a low and critical alarm, as well as set the actions to occur when an alarm is reached **(Figure 16-17)**. Using this interface, you can choose to enter standby, hibernation mode, or power off the system when this threshold is reached.

On the **Power Meter** tab **(Figure 16-18)**, you choose to enable or disable the power meter for the system, and can also view basic information on the installed batteries. By clicking an individual battery, you can also see and review detailed information on the battery **(Figure 16-19)**.

In the **Advanced** tab **(Figure 16-20)**, you define actions for closing the laptop's lid, pressing the power button, and pressing the sleep button. Additionally, you can configure the system to show the power icon in the task bar tray even when plugged into the AC adapter, as well as configure the system to password protect itself on resume.

Finally, in the **Hibernate** tab **(Figure 16-21)**, you can enable or disable hibernation for the PC. Note the amount of disk space required to enable hibernation. The disk space is equal to the amount of RAM in the computer, and must use the system's primary partition.

As you can see, power management options for portable systems are very configurable. By choosing the options appropriately, you can configure your portable system to function in a manner that maximizes available battery life while fitting your working habits.
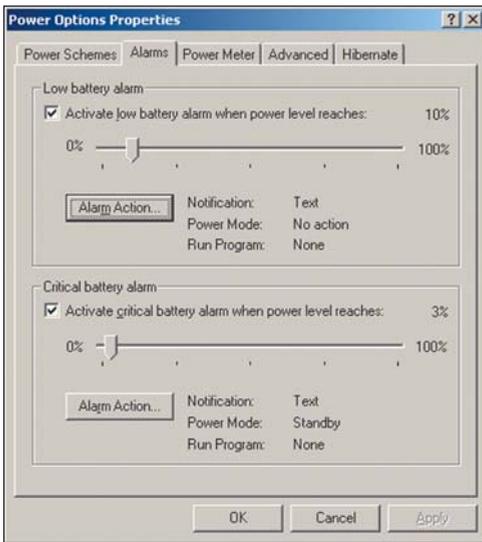
Figure 16-16 The Alarms tab
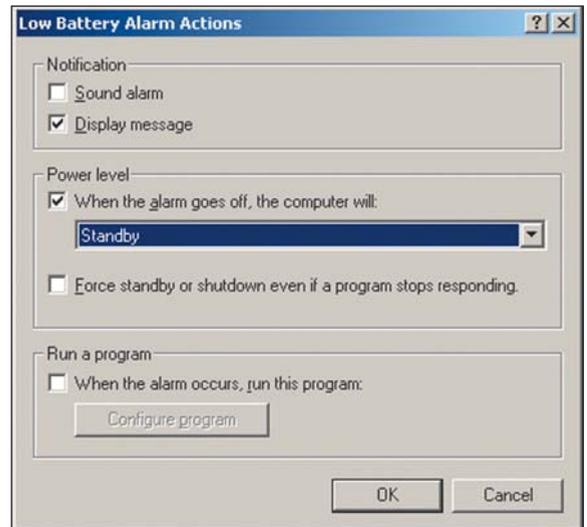

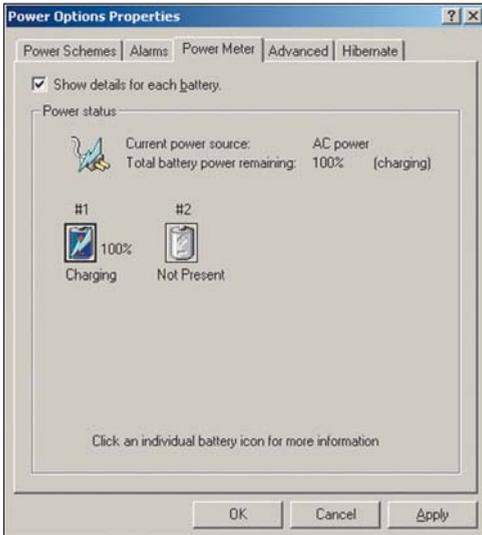**Figure 16-17 Configuring alarm actions**

Figure 16-18 Power Meter tab

Figure 16-19 Battery details
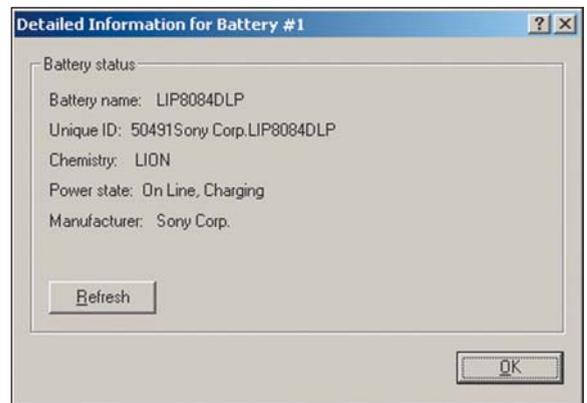
Figure 16-20 Advanced tab

Figure 16-21 Hibernate tab

A+ Hardware
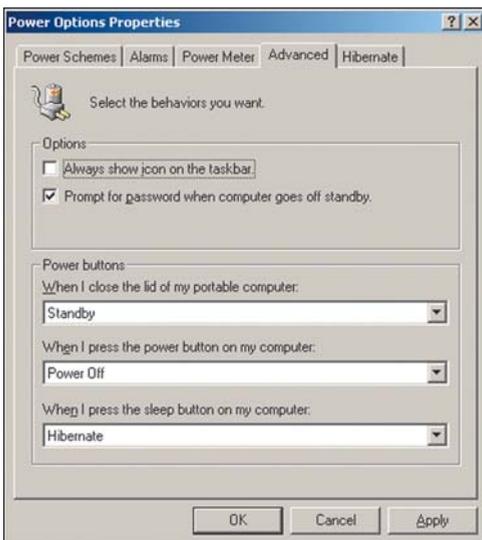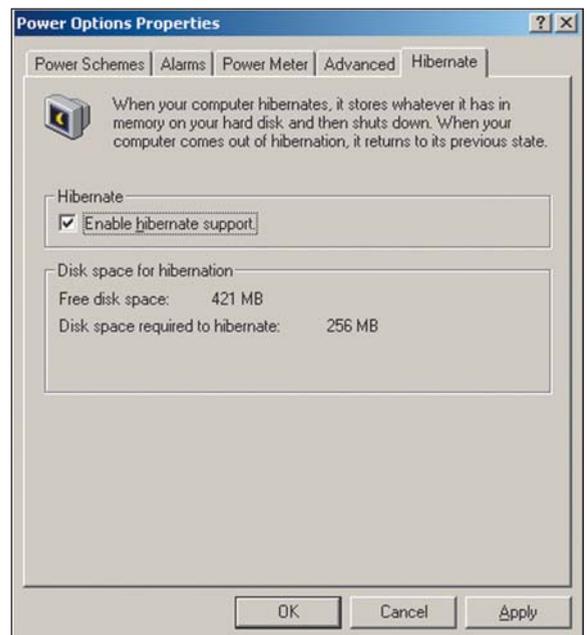
skill 5

Maintaining and Troubleshooting Portable Systems

A+ Hardware Objective

2.1 Recognize common problems associated with each module and their symptoms, and identify steps isolate and troubleshoot the problems. Given a problem situation, interpret the symptoms and infer the most likely cause.

overview

In many ways, maintaining portable systems is similar to maintaining non-portable PC systems. Drivers, applications, and core operating system files need to be up to date, the hard disk should be regularly checked for errors and defragmented, and the system data needs to be backed up regularly. If the laptop is accessing the Internet, antivirus software should be installed and virus definitions should be regularly updated. However, there are several areas of laptop maintenance that require special attention.

The laptop's LCD display is perhaps one of the most important areas that requires a different maintenance technique. A laptop's LCD is very sensitive to pressure. Additionally, the coating on the screen is usually a thin plastic layer that can yellow, crack, and scratches easily if harsh cleaners are used. In general, you want to use the products specifically made to clean LCD screens or recommended by the laptop manufacturer to clean the LCD. However, if you cannot obtain a recommendation, the following cleaners are generally safe for most laptops **(Figure 16-22)**:

◆ A soft cotton or micro-fiber cloth
◆ Any cleaning pad or wipe made specifically for LCD displays
◆ Water
◆ Vinegar and water in a 50/50 mix
◆ Isopropyl alcohol and water in a 40/60 mix

In general, you should refrain from using any other type of cloth or cleaning solution on a laptop's LCD unless specifically recommended by the manufacturer. This includes general window cleaning products, paper towels, wipes made for CRTs, and old rags (unless made from a very soft cotton). Additionally, you should refrain from spraying any cleaning agent directly onto the LCD.

Regarding troubleshooting portable systems, you generally use the same techniques on portable systems as you would on any other PC systems, with a few exceptions. First, when troubleshooting portable systems, the only parts that are recommended to be replaced are PC cards, memory, drives, and batteries. For batteries, you should replace the battery only with a model approved by the laptop manufacturer. For all other components, you are generally advised to take the laptop to an approved service center for service. Alternately, for some manufacturers, you can take a course to become an authorized repair technician. However, unless you have a repair manual handy and are authorized by the manufacturer, it is not advised that you attempt to disassemble the laptop, because many laptop components are fragile and difficult and expensive to replace. Additionally, most manufacturers will void the warranty on any laptop that has been disassembled by an unauthorized technician.

Figure 16-22 Cleaning do's and don'ts

DO USE:

✓ Soft cotton or micro-fiber cloth

✓ LCD cleaning supplies

✓ Water

✓ 50/50 Vinegar and water solution

✓ 40/60 Isopropyl alcohol and water solution

DO NOT USE:

⊘ Glass cleaner

⊘ Paper Towels

⊘ Undiluted Alcohol

⊘ CRT cleaning solution

⊘ Old rags

skill 6   *Working with PDAs*

A+ Hardware Objective

1.8 Identify proper procedures for installing and configuring common peripheral devices. Choose the appropriate installation or configuration sequences in given scenarios.

overview

Personal digital assistants (PDAs) are a new type of computing device that is gaining in popularity. With this rise in popularity, PDAs are essential for some people in business. For this reason, you are almost guaranteed to eventually encounter a situation in which you need to support a PDA.

PDAs come in many different varieties, but at the core, all PDAs are ultra-small, ultra-portable computers. Like other computer systems, they have input and output devices, storage devices, peripheral devices, and an operating system **(Table 16-1)**. However, not all PDAs are created equal, and some PDAs are more complicated and difficult to support than others.

Most PDAs have the same primary input and output devices. Many PDAs use a touch or pressure-sensitive LCD screen to both input and output information **(Figure 16-23)**. In addition, nearly all PDAs have some other method for input and output to computer systems or other PDAs **(Figure 16-24)**. These methods include:

◆   Infrared ports
◆   USB connections
◆   Wireless connectivity using 802.11 or Bluetooth technology

The connectivity, input, and output technologies for the PDA are of critical importance, because most PDAs cannot be expanded to support additional input or output methods. The primary input mechanism, in particular, is the critical criteria for a PDA purchase, because each person has a different preferred method of input, and you cannot modify the primary input method on a PDA.

Storage and peripheral options are other areas of importance when considering purchasing a PDA, as these options determine the expandability of the PDA. When choosing a PDA, you are advised to examine current and planned expansion options and weigh those against your current needs.

Finally, the PDA's OS is of key concern for many users. The two market leaders in PDA operating systems are Microsoft's Windows Mobile and Palm OSs. Both systems support similar features, but Palm OS is generally considered faster and less cumbersome, whereas Windows Mobile is generally considered the more expandable and feature-rich OS. In the end, the choice of PDA OS is a personal one, and you are advised to try both OSs before purchasing a PDA. Also ensure that you check application support for each OS, because each OS has its own set of compatible applications.

In regard to supporting PDAs, each PDA has its own set of problems that may be unique to that model. Due to the variety of PDAs available, only a few common problems apply to all PDAs. One common problem with PDAs revolves around synchronizing the data on the PDA with a standard PC. Most PDAs have limitations on the amount and type of information that can be synchronized. Although the manufacturer's documentation generally lists the applications the PDA is capable of synchronizing with, they probably will not divulge the full story on the limitations or difficulty involved with synchronizing. Your best course of action is to visit support forums for each PDA you are interested in to examine the common problems users have with their PDAs. This provides solid information on the issues involved with the PDA and the resolution to common problems with the device.
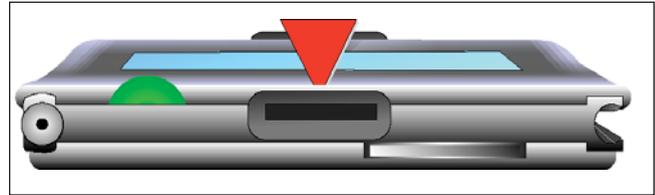
Figure 16-23 PDA's LCD

Figure 16-24 PDA ports

Table 16-1 PDA specifications

| Feature/ Component	Description	Types/Options
CPU	The engine behind the PDA, the CPU determines the OS type supported, as well as application and core OS performance.	Intel Xscale 300 MHz (Pocket PC), Intel Xscale 400 MHz (Pocket PC), Motorola Dragonball 33-200 MHz (older Palm-based PDAs, some cellphones), OMAP1510 175/200 MHz (Dual processor, Palm Tungsten T)
Primary storage	The amount of memory you will need depends on the OS as well as the applications you will run and the size of the files you are working with. Some expansion cards can hold more RAM. the applications loaded, and the amount.	8MB–16MB standard (Palm); 32 MB RAM normal (Windows CE)
External memory	PDA may have one or more memory slots to fit external memory cards. These allow for storage of larger music and multimedia files.	Secure Digital cards, Compact Flash, MultiMedia card
Operating system	Software that performs the basic PDA functions.	Palm OS, Pocket PC (was called Windows CE) containing pocket versions of Windows office applications, various vendor-specific custom operating systems
Screen	Color screen would be desired if you are playing games or working with video/photos. Higher resolutions provide clearer screen images.	Color, Monochrome, 160x160, 320x240, 640x480
Ports/interfaces	Provides additional connectivity options.	USB, serial, Bluetooth, WLAN, IrDA, custom
Synchronization/ PC integration	Allows you to transfer schedules, pictures, contact information, and even files to and from the PDA.	USB, wireless (IrDA, WLAN), serial, custom (cradle typically required)
Battery /power supply	Provides power for the PDA when disconnected from an external power source. Some PDAs require constant power to retain data (the data is stored in dynamic RAM), whereas others utilize flash RAM or other static storage methods to prevent data loss.	Standard batteries (Alkaline), standard rechargeable (Ni-Cad) batteries (normally AA or AAA), custom battery packs (Ni-Cad,Ni-MH, or Li-Ion)

skill 6

Working with PDAs (cont'd)

A+ Hardware Objective

1.8 Identify proper procedures for installing and configuring common peripheral devices. Choose the appropriate installation or configuration sequences in given scenarios.

how to

Configure a PDA to communicate with a PC (**Figure 16-25**).

1. Install the PDA's synchronization software, following the manufacturer's installation instructions.
2. If the PDA supports wireless communication via IrDA, place the PDA in close proximity to the system, ensuring that a clear line of sight exists between the PDA and the host system. If you cannot connect, ensure that IrDA support is enabled in your system's BIOS.
3. If the PDA does not support wireless communication to the PC, connect the PDA to the PC with the bundled USB or serial cable.
4. Once connected, the PDA and the PC should automatically synchronize. If this doesn't happen, make sure that the PDA is powered, check for conflicts in the Device Manager, and make sure appropriate ports are enabled in the CMOS options. Read the PDA documentation for additional troubleshooting solutions.

Figure 16-25 Connecting a PDA to a PC
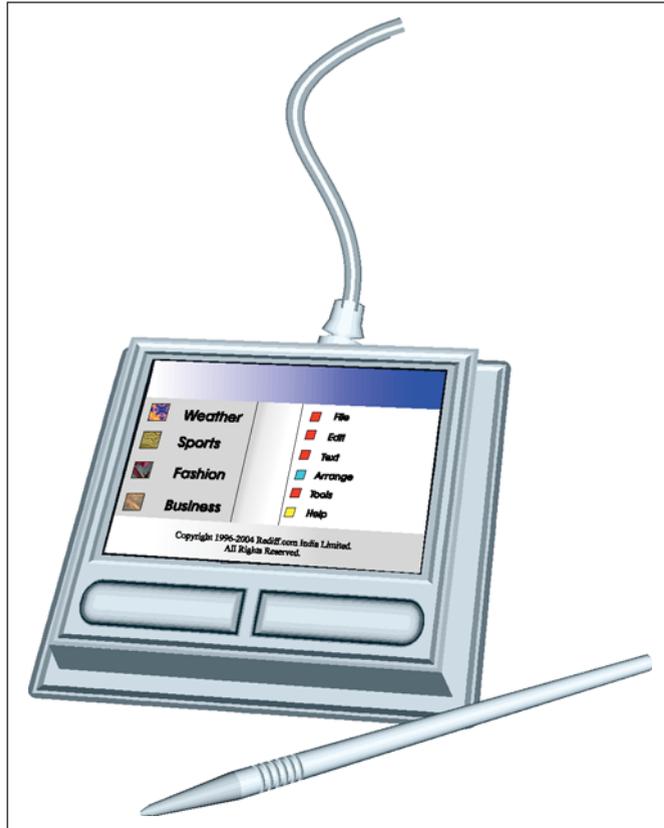
Summary

◆ A laptop has essentially the same basic components as a standard desktop PC, but these components are more compact than in a desktop PC.

◆ In general, the components of a laptop connect using a combination of special ribbon cables and custom connectors.

◆ The LCD screen is the most fragile component of the laptop, and is usually the most expensive as well.

◆ Laptop hard disks are physically smaller, using the 2.5" form factor.

◆ The processors in laptops typically include several power saving features.

◆ 72-pin SO-DIMMs measure 2.35" long and support 32-bit data paths per SO-DIMM. For a 486 or lower processor, they are installed individually, but for Pentium and faster processors, they must be installed in pairs.

◆ 144-pin SO-DIMMs measure 2.66" long and support 64-bit data paths per SO-DIMM. These SO-DIMMs can be installed individually in laptops powered by Pentium or faster processors.

◆ Only used on RAMBUS equipped laptops, 160-pin SO-RIMMs support a 64-bit data path and are installed individually.

◆ The most common type of battery for modern laptops is Lithium Ion (often abbreviated Li-Ion).

◆ Ni-Cad batteries are well known for having a memory effect.

◆ Nickel Metal Hydride batteries are much lighter than Ni-Cad batteries and hold double the power of Ni-Cad in the same weight.

◆ Lithium Ion batteries are very lightweight when compared to the other battery types, weighing as much as 40% less than a Ni-MH battery of the same capacity.

◆ The port replicator connector allows the laptop to interface with a port replicator or docking station.

◆ Some laptops have provisions for adding an additional battery pack to extend battery life.

◆ You should remove the system battery before adding RAM to a laptop.

◆ On nearly all laptops, you must power down the system to replace a storage drive.

◆ Nearly all laptops can make use of external drives using standard USB or parallel interfaces.

◆ Most laptops have a combination PC card slot system that supports either two type 2 PC cards or a single type 3 PC card.

◆ PC cards are designed to be hot-swappable, but you should always refer to your laptop and PC card documentation to determine if there are any exceptions to this for your specific hardware.

◆ Power management is particularly important for portable systems as it heavily influences battery life.

◆ APM relies on system BIOS settings to control the system power features, which makes feature support and capabilities almost completely dependent on the hardware.

◆ ACPI puts the majority of the power control functions in the hands of the OS.

◆ A laptop's LCD is very sensitive to pressure. Additionally, the coating on the screen is usually a thin plastic that can yellow or even crack if harsh cleaners are used, and also scratches easily.

◆ In general, you want to use the products specifically recommended by the laptop manufacturer to clean the LCD.

◆ For portable systems, the only parts recommended to replace are PC cards, memory, drives, and batteries. For all other components, you are generally advised to take the laptop to an approved service center for service.

Key Terms

Advanced Configuration and Power Interface (ACPI)

Advanced Power Management (APM)

Card and socket services

Dongle

Hibernate mode

Lithium Ion (Li-Ion)

Nickel Cadmium (Ni-Cad)

Nickel Metal Hydride (Ni-MH)

PCMCIA (Personal Computer Memory Card International Association) cards

Personal digital assistant (PDA)

Portable system

Suspend mode

Tablet PC

Type 1 PC card

Type 2 PC card

Type 3 PC card

Test Yourself

1. Which of the following components are not commonly found in a modern portable system? (Choose all that apply.)
a. LCD panel
b. Peripheral component interconnect slots
c. Joystick/MIDI port
d. Serial port
e. Speakers

2. You are diagnosing a video problem on a customer's laptop. Through the process of elimination, you have determined that the internal video board is most likely defective. What should be your next course of action?
a. Remove the defective video board and replace it with an upgraded AGP video board.
b. Explain to the customer that the video board cannot be repaired and that the laptop is unusable.
c. Remove the defective video board and replace it with an identical video board from the manufacturer.
d. Remove the display assembly and replace it with an identical display assembly from the manufacturer.
e. Send the laptop to an authorized repair facility.

3. You are attempting to upgrade the system RAM in a laptop. What are the most common locations for the memory slots? (Choose all that apply.)
a. Underneath the keyboard
b. In the display assembly
c. In the modular compartment
d. On the bottom of the laptop

4. Which of the following types of RAM are not supported by any laptop form factor?
a. 72-pin SIMM
b. 72-pin SO-DIMM
c. 144-pin Micro-DIMM
d. 160-pin SO-RIMM

5. Laptops can be powered by DC adapters.
a. True
b. False.

6. What advantages does a docking station have over a port replicator? (Choose all that apply.)
a. Provide additional hard disk connections
b. Provides smart UPS
c. Provides standard PC expansion slots
d. Provides up to an additional 100MB SDR-RAM

7. Which battery technology is most likely to develop a memory leak?
a. Ni-MH
b. Ni-Cad
c. Alkaline
d. Li-Iona

8. What is the maximum number of type 3 PC cards that you can insert in an average laptop?
a. 3
b. 2
c. 0
d. 1

9. Which of the following cleaning products are recommended for laptop LCD screens? (Choose all that apply.)
a. Ethyl Alcohol and water solution
b. Water
c. Facial tissues
d. Vinegar and water solution
e. Glass cleaner

10. Which of the following preventative maintenance procedures should regularly be performed on laptops? (Choose all that apply.)
a. Cleaning of the processor heat sink
b. Cleaning of the LCD display
c. Defragmentation of the hard disk
d. Updating drivers
e. Cleaning of the power conversion board contacts

Problem Solving Scenarios

1. You have been asked to configure a laptop to provide maximum battery life. The laptop can be equipped with an extra battery, and currently has approximately 2 hours of battery life with a single Ni-Cad battery, and all power saving features disabled. Estimate how much battery life the laptop can support without modifying any power management settings. You may add or remove batteries as necessary to achieve your goals.

2. In the previous case, if the laptop is being used infrequently and is rarely connected to a power source, define how you would configure power management settings.