

## 4.5.6 Hardware Device Facts

You should understand the following concepts that relate to installing hardware devices.

Concept	Description
System Resources	<p>A computer assigns system resources to hardware devices, and the computer uses these assignments to communicate with the device. You should be familiar with three categories of system resources:</p> <ul style="list-style-type: none"> <li>Devices use IRQ (Interrupt Request) to interact with the CPU. An IRQ allows a device to interrupt the CPU and request processing time. All new devices allow the sharing of an IRQ; older (legacy) devices had to be assigned a unique IRQ.</li> <li>DMA (Direct Memory Access) channels are conduits high-speed devices use to bypass the CPU and communicate with RAM directly. <ul style="list-style-type: none"> <li>Devices such as hard drives, sound cards, and FireWire cards use DMA channels to increase the speed of data transfers.</li> <li>Devices must have a unique DMA channel.</li> </ul> </li> <li>An I/O address (also known as a <i>port address</i>) allows two devices in a computer to send information to each other. <ul style="list-style-type: none"> <li>When a device wants to send information to another device, it addresses the data to the receiving I/O port number and sends it out on the system bus.</li> <li>Each device in a computer must have its own I/O address.</li> </ul> </li> </ul>
Plug and Play	<p>Newer systems use plug and play to automatically configure the resources each device needs. Be aware of the following about plug and play:</p> <ul style="list-style-type: none"> <li>The device, the BIOS, and the operating system must support plug and play standards.</li> <li>All new devices and operating systems are plug and play compatible.</li> <li>Plug and play allows IRQ sharing and ensures that the DMA and I/O resources used by each device are unique.</li> <li>A <i>legacy</i> device is one that does not support Plug and Play. In older systems, you had to manually configure the resources used by each device. Troubleshooting legacy systems often involved finding and resolving resource conflicts.</li> <li>Although a plug and play system attempts to assign configuration resources around a legacy device's needs, legacy devices often interfere with a plug and play system's ability to properly assign resources.</li> </ul>
Driver	<p>A <i>driver</i> is program that enables the operating system to interact with hardware devices.</p> <ul style="list-style-type: none"> <li>Both legacy and plug and play devices need drivers to configure and use the device.</li> <li>Windows detects newly installed devices and tries to find and load the driver automatically. <ul style="list-style-type: none"> <li>Many drivers are automatically included with the operating system.</li> <li>Some drivers are preinstalled during the operating system installation. Windows will automatically use preinstalled drivers when they match new devices.</li> <li>Windows can search the internet for some drivers.</li> <li>If Windows cannot find a suitable driver, you are prompted to identify alternate locations to search in order to find the correct driver.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>■ <i>Signed drivers</i> are drivers that include a digital signature. The digital signature proves that the driver:             <ul style="list-style-type: none"> <li>■ Comes from the reported publisher.</li> <li>■ Has not been altered or modified..</li> <li>■ Is compatible with the operating system version</li> </ul> </li> </ul> <p>Drivers that have passed specific tests on Windows qualify for the Certified for Windows logo and are given a special digital signature.</p> <ul style="list-style-type: none"> <li>■ An <i>unsigned driver</i> is one without a digital signature; a <i>self-signed driver</i> is one that includes a digital signature, but the identity of the entity that signed the driver cannot be verified. You can install unsigned or self-signed drivers.</li> </ul> <p>In addition to drivers, many devices come with special software that interacts with the driver and the operating system to customize how the device works.</p>
<p>Hot Swapping/Plugging</p>	<p>Hot swappable devices are devices that can be added and removed without shutting down the computer (technically speaking, hot plug refers to automatically detecting and configuring devices that are added, while hot swap refers to the ability to both add and remove devices).</p> <ul style="list-style-type: none"> <li>■ Hot swapping must be supported by the BIOS, the bus type or controller, the device, and the driver/operating system.</li> <li>■ USB and FireWire devices are examples of buses and devices designed specifically with hot swap support.</li> <li>■ Most newer SATA drives are hot swappable.</li> <li>■ When you connect a hot swappable device, Windows automatically detects the device, configures a driver (if one is not already installed), and enables the device.</li> <li>■ To remove a hot swappable component, use the Safely Remove Hardware feature to shut down the device before unplugging it from the system.</li> </ul>