



# ThinkCentre M79 Hardware Maintenance Manual

ThinkThink**ThinkCentre**Think

**Machine Types:** 10CT, 10CU, 10CV, 10CW, 10J9, 10JA, 10JB, and 10JC

**Note:** Before using this information and the product it supports, be sure to read and understand the Chapter 1 “Read this first: Important safety information” on page 1 and Appendix F “Notices” on page 167.

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## About this manual

This manual provides service and reference information for ThinkCentre® computers listed on the front cover.

Use this manual along with the advanced diagnostic tests to troubleshoot problems.

**Important:** This manual is intended only for trained service technicians who are familiar with ThinkCentre computers. Use this manual along with the advanced diagnostic tests to troubleshoot problems effectively. Before servicing a ThinkCentre computer, be sure to read and understand Chapter 1 “Read this first: Important safety information” on page 1.



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## Chapter 1. Read this first: Important safety information

This chapter contains the safety information that you must be familiar with.

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### Power cords and power adapters

Use only the power cords and power adapters supplied by the product manufacturer. Do not use the ac power cord for other devices.

The power cords shall be safety approved. For Germany, it shall be H03VV-F, 3G, 0.75 mm<sup>2</sup> (the power cord connected to the power adapter), H05VV-F, 3G, 0.75 mm<sup>2</sup> (the power cord connected to the internal power supply assembly), or better. For other countries, the suitable types shall be used accordingly.

Never wrap a power cord around a power adapter or other object. Doing so can stress the cord in ways that can cause the cord to fray, crack, or crimp. This can present a safety hazard.

Always route power cords so that they will not be walked on, tripped over, or pinched by objects.

Protect power cord and power adapters from liquids. For instance, do not leave your power cord or power adapter near sinks, tubs, toilets, or on floors that are cleaned with liquid cleansers. Liquids can cause a short circuit, particularly if the power cord or power adapter has been stressed by misuse. Liquids also can cause gradual corrosion of power cord terminals and/or the connector terminals on a power adapter, which can eventually result in overheating.

Ensure that all power cord connectors are securely and completely plugged into receptacles.

Do not use any power adapter that shows corrosion at the ac input pins or shows signs of overheating (such as deformed plastic) at the ac input or anywhere on the power adapter.

Do not use any power cords where the electrical contacts on either end show signs of corrosion or overheating or where the power cord appears to have been damaged in any way.

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### General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back.

#### **Attention:**

Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.

- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.

- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.  
**Remember:** Metal objects are good electrical conductors.
- Wear safety glasses when you are: hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

---

## Electrical safety



### CAUTION:

**Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the computer covers, unless instructed otherwise in the installation and configuration procedures.**

Observe the following rules when working on electrical equipment.

**Important:** Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents. Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing Field Replaceable Units (FRUs)
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.  
**Remember:** Another person must be there to switch off the power, if necessary.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

**Remember:** There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.

- When using a tester, set the controls correctly and use the approved probe leads and accessories for that tester.
- Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered-off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generatorsand similar units. (This practice ensures correct grounding of the units.)
- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Switch off power.
  - Send another person to get medical aid.

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## Safety inspection guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock).
- Explosive hazards, such as a damaged CRT face or bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
  - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
  - b. The power cord should be the appropriate type as specified in the parts listings.
  - c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious alterations. Use good judgment as to the safety of any alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

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## Handling electrostatic discharge-sensitive devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

**Notes:**

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people while handling the part.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

**Note:** The use of a grounding system is desirable but not required to protect against ESD damage.

- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
- Use the round ground-prong of the ac plug on ac-operated computers.

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## Grounding requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.



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## Safety notices (multi-lingual translations)

The caution and danger safety notices in this section are provided in the following languages:

- English
- Arabic
- Brazilian/Portuguese
- Chinese (simplified)
- Chinese (traditional)
- French
- German
- Hebrew
- Italian
- Korean
- Spanish



### DANGER

Electrical current from power, telephone and communication cables is hazardous.

#### To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following tables when installing, moving, or opening covers on this product or attached devices.**

To Connect	To Disconnect
<ol style="list-style-type: none"><li>1. Turn everything OFF.</li><li>2. First, attach all cables to devices.</li><li>3. Attach signal cables to connectors.</li><li>4. Attach power cords to outlet.</li><li>5. Turn device ON.</li></ol>	<ol style="list-style-type: none"><li>1. Turn everything OFF.</li><li>2. First, remove power cords from outlet.</li><li>3. Remove signal cables from connectors.</li><li>4. Remove all cables from devices.</li></ol>



**CAUTION:**

When replacing the lithium battery, use only Part Number 45C1566 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of. *Do not:*

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.



**CAUTION:**

When laser products (such as CD-ROMs, DVD-ROM drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



**DANGER**

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.



≥18 kg (37 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

**CAUTION:**

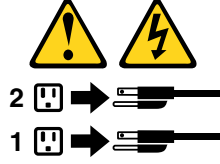
Use safe practices when lifting.



**CAUTION:**

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power

cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



خطر

التيار الكهربائي الموجود بمصدر الطاقة أو أجهزة التليفون أو أسلاك الاتصالات يشكل خطورة.  
لتفادي مخاطر الصدمات الكهربائية:  
لا تحاول توصيل أو فصل أي أسلاك أو القيام بعمليات تركيب أو صيانة أو إعادة توصيل لهذا المنتج أثناء وجود عاصفة كهربائية.  
يجب توصيل كل أسلاك الكهرباء في مخارج كهرباء ذات توصيلات أسلاك وتوصيلات أرضية صحيحة  
يجب توصيل أي جهاز سيتم الحاقه بهذا المنتج في مخارج كهرباء ذات توصيلات أسلاك صحيحة.  
وإن أمكن يجب استخدام يد واحدة فقط في توصيل أو فصل أسلاك الإشارة.  
لا تحاول تشغيل أي جهاز إذا كان هناك أثر لحرق أو مياه أو تلف بالمكونات  
يجب فصل أسلاك الكهرباء وأنظمة الاتصالات وشبكات الاتصال وأجهزة المودم الملحقة قبل فتح أغطية الجهاز، مالم يتم طلب خلاف ذلك في التعليمات الخاصة بالتركيب والتوصيل.  
قم بتوصيل وفصل الأسلاك كما هو موضح في الجدول التالي وذلك عند القيام بعمليات التركيب أو النقل أو فتح أغطية هذا المنتج أو الأجهزة الملحقة.

#### للفصل:

قم بإيقاف كل شيء.  
أولاً، قم بفصل كل أسلاك الكهرباء من المخرج.  
قم بفصل أسلاك الإشارة من الموصلات.  
قم بفصل كل الأسلاك من الأجهزة.

#### للتوصيل:

قم بإيقاف كل شيء.  
أولاً، قم بتوصيل كل الأسلاك بالأجهزة.  
قم بتوصيل أسلاك الإشارة في لموصلات.  
قم بتوصيل أسلاك الكهرباء في المخارج.  
قم بتشغيل الجهاز.



تنبيه :

عند استبدال البطارية الليثيوم، استخدم فقط رقم الجزء الخاص **Part Number 45C1566** أو نوع آخر يكون على نفس مستوى الكفاءة يحدده لك المصنع.  
إذا كان النظام الخاص يستخدم معه بطارية ليثيوم قم باستبدالها بنفس النوع الذي تم صناعته من خلال نفس المصنع. تحتوي البطارية على مادة الليثيوم ويمكن أن تنفجر في حالة عدم استخدامها أو التعامل معها بطريقة صحيحة أو عند التخلص منها بطريقة خطأ.

لا تقم بـ:

- القاء البطارية أو غمرها في الماء
- تسخينها أعلى من ١٠٠ درجة مئوية و(٢١٢ ° فهرنهايت)
- بتصليحها أو فكها

تخلص من البطارية طبقاً للقانون أو النظام المحلي .



تنبيه :

أثناء تركيب منتجات ليزر (مثل CD-ROMs أو وحدة تشغيل DVD أو أجهزة Fiber Optic أو وحدات الإرسال) يجب مراعاة الآتي:

لا تنزع الأغطية. قد ينتج عن نزع أغطية منتج الليزر انفجار أشعة الليزر شديدة الخطورة.  
لا يوجد أجزاء يمكن تغييرها داخل الجهاز. قد ينتج عن استخدام تحكمات أو تعديلات أو عمل أي تصرفات أخرى تخالف ما هو محدد هنا إلى انفجار أشعة شديدة الخطورة.



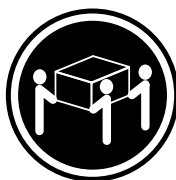
خطر

تحتوي بعض منتجات الليزر على الفئة دايود ليزر مدمج من الفئة **Class 3A** أو **Class 3B**. يجب مراعاة الآتي .

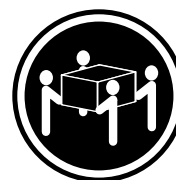
أشعة الليزر عند الفتح. لا تحقق إلى الإشعاع و لا تنظر إليه مباشرة بواسطة أي أجهزة مرئية وتجنب التعرض المباشر للإشعاع .



≥18 kg (37 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

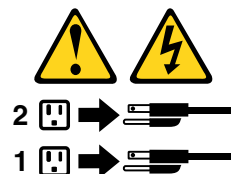
تنبيه :

يجب استخدام ممارسات أمانة عند الرفع



تنبيه :

لا يتم زر التحكم في التشغيل الموجود على الجهاز والمفتاح الكهربائي الموجود على لوحة التحكم بإيقاف التيار الكهربائي المار بالجهاز. قد يكون للجهاز أكثر من سلك كهربائي واحد. لإيقاف التيار الكهربائي المار بالجهاز، تأكد من فصل جميع أسلاك الكهرباء من مصدر الكهرباء.



## PERIGO

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicações é perigosa.

Para evitar risco de choque elétrico:

- Não conecte nem desconecte nenhum cabo ou execute instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.
- Conecte todos os cabos de alimentação a tomadas elétricas corretamente instaladas e aterradas.
- Todo equipamento que for conectado a este produto deve ser conectado a tomadas corretamente instaladas.
- Quando possível, utilize apenas uma das mãos para conectar ou desconectar cabos de sinal.
- Nunca ligue nenhum equipamento quando houver evidência de fogo, água ou danos estruturais.
- Antes de abrir tampas de dispositivos, desconecte cabos de alimentação, sistemas de telecomunicação, redes e modems conectados, a menos que especificado de maneira diferente nos procedimentos de instalação e configuração.
- Conecte e desconecte os cabos conforme descrito na tabela apresentada a seguir ao instalar, mover ou abrir tampas deste produto ou de dispositivos conectados.

Para Conectar:	Para Desconectar:
<ol style="list-style-type: none"> <li>1. DESLIGUE Tudo.</li> <li>2. Primeiramente, conecte todos os cabos aos dispositivos.</li> <li>3. Conecte os cabos de sinal aos conectores.</li> <li>4. Conecte os cabos de alimentação às tomadas.</li> <li>5. LIGUE os dispositivos.</li> </ol>	<ol style="list-style-type: none"> <li>1. DESLIGUE Tudo.</li> <li>2. Primeiramente, remova os cabos de alimentação das tomadas.</li> <li>3. Remova os cabos de sinal dos conectores.</li> <li>4. Remova todos os cabos dos dispositivos.</li> </ol>



## CUIDADO:

Ao substituir a bateria de lítio, utilize apenas uma bateria com Número de Peça 45C1566 ou um tipo de bateria equivalente recomendado pelo Se o seu sistema possui um módulo com uma bateria de lítio, substitua-o apenas por um módulo do mesmo tipo e do mesmo fabricante. A bateria contém lítio e pode explodir se não for utilizada, manuseada ou descartada de maneira correta.

Não:

- Jogue ou coloque na água
- Aqueça a mais de 100°C (212°F)
- Conserte nem desmonte

Descarte a bateria conforme requerido pelas leis ou regulamentos locais.



### PRECAUCIÓN:

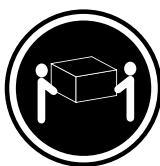
Quando produtos a laser (como unidades de CD-ROMs, unidades de DVD-ROM, dispositivos de fibra ótica ou transmissores) estiverem instalados, observe o seguinte:

- Não remova as tampas. A remoção das tampas de um produto a laser pode resultar em exposição prejudicial à radiação de laser. Não existem peças que podem ser consertadas no interior do dispositivo.
- A utilização de controles ou ajustes ou a execução de procedimentos diferentes dos especificados aqui pode resultar em exposição prejudicial à radiação.

### PERIGO

Alguns produtos a laser contêm diodo de laser integrado da Classe 3A ou da Classe 3B. Observe o seguinte:

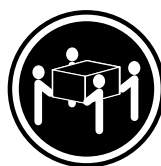
Radiação a laser quando aberto. Não olhe diretamente para o feixe a olho nu ou com instrumentos ópticos e evite exposição direta ao feixe.



≥18 kg (37 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

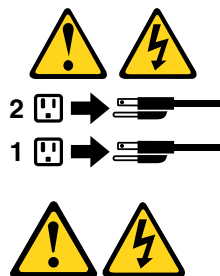
### CUIDADO:

Utilize procedimentos de segurança para levantar equipamentos.



### CUIDADO:

O botão de controle de alimentação do dispositivo e o botão para ligar/desligar da fonte de alimentação não desligam a corrente elétrica fornecida ao dispositivo. O dispositivo também pode ter mais de um cabo de alimentação. Para remover toda a corrente elétrica do dispositivo, assegure que todos os cabos de alimentação estejam desconectados da fonte de alimentação.



危险

电源、电话和通信电缆中的电流是危险的。

为避免电击危险：

- 请勿在雷电期间连接或断开任何电缆的连接，或者对本产品进行安装、维护或重新配置。
- 将所有电源线连接到正确连线 and 妥善接地的电源插座。
- 将所有要连接到该产品的设备连接到正确连线的插座。
- 如果可能，请仅使用一只手来连接或断开信号电缆的连接。
- 切勿在有火、水、结构损坏迹象的情况下开启任何设备。
- 在打开设备外盖之前请断开已连接的电源线、远程通信系统、网络和调制解调器，除非在安装和配置过程中另有说明。
- 当安装、移动或打开该产品或连接设备的外盖时，请按照下表所述来连接或断开电缆的连接。

要连接	要断开连接
<div>1. 切断所有电源。</div> <div>2. 首先将所有电缆连接到设备。</div> <div>3. 将信号电缆连接到接口。</div> <div>4. 将电源线连接到插座。</div> <div>5. 开启设备。</div>	<div>1. 切断所有电源。</div> <div>2. 首先从插座上拔出电源线。</div> <div>3. 从接口上拔出信号电缆。</div> <div>4. 从设备上拔出所有电缆。</div>



警告：  
更换锂电池时，请仅使用部件号为 45C1566 的电池或制造商推荐的同类电池。如果您的系统有包含锂电池的模块，请仅使用同一制造商生产的相同模块类型来替换该模块。该电池中含有锂，如果使用、操作或处理不当，可能会发生爆炸。

切勿：

- 投入或浸入水中
- 加热到 100 °C（212 °F）以上
- 维修或拆卸

请按照当地法令或条例的要求处理电池。



警告：  
安装激光产品（例如 CD-ROM、DVD-ROM 驱动器、光纤设备或发射设备）时，  
请注意以下声明：

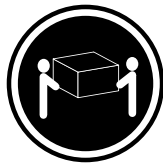
- 请勿卸下外盖。卸下激光产品的外盖可能导致遭受激光辐射的危险。该设备内没有可维修的部件。
- 如果不按照此处指定的过程进行控制、调整或操作，则有可能导致遭受辐射的危险。



危险

某些激光产品包含嵌入式 3A 类或 3B 类激光二极管。请注意以下声明：

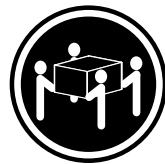
打开后有激光辐射。请勿注视光束，请勿直接用光学仪器查看，并请避免直接暴露在光束中。



≥18 千克（37 磅）



≥32 千克（70.5 磅）

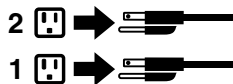


≥55 千克（121.2 磅）

警告：  
抬起时请采取安全措施。



警告：  
设备上的电源控制按钮和电源上的电源开关不会切断供给该设备的电流。该设备还可能有多条电源线。要切断该设备的所有电流，请确保所有电源线都与电源断开连接。





## 危險

電源、電話及通訊纜線上的電流都具有危險性。

若要避免觸電危險：

- 請勿在雷雨期間，連接或拔除纜線、執行安裝、維護或重新配置本產品。
- 將所有電源線連接到正確配線及接地的電源插座。
- 任何與本產品連接的設備都必須連接到配線妥當的電源插座。
- 請盡可能用單手連接或拔除信號線。
- 發生火災、水災或結構損害時，絕對不要開啟任何設備。
- 除非在安裝及配置程序中另有指示，否則在開啟裝置機蓋之前，請拔掉連接的電源線、電信系統、網路及數據機。
- 安裝、移動或開啟本產品或附屬裝置的機蓋時，請遵循下列說明連接及拔掉纜線。

連線	切斷連線
<ol style="list-style-type: none"><li>1. 關閉所有開關。</li><li>2. 首先，連接所有接線到裝置。</li><li>3. 連接信號線到接頭。</li><li>4. 連接電源線到插座。</li><li>5. 開啟裝置。</li></ol>	<ol style="list-style-type: none"><li>1. 關閉所有開關。</li><li>2. 首先，拔掉插座上的電源線。</li><li>3. 拔掉接頭上的信號線。</li><li>4. 拔掉裝置上所有接線。</li></ol>



### 警告：

更換鋰電池時，請僅使用產品編號 **45C1566** 或製造商所建議的同類型電池。

如果您的系統中含有鋰電池模組，請僅使用同一家製造商所生產的相同模組進行更換。

如果未以正確方式使用、處理或棄置含鋰的電池，會有爆炸的危險。

請勿：

- 沾溼或浸入水中
- 置於 **100°C (212°F)** 以上的高溫環境
- 修理或拆開

請按照各地區有關廢棄電池的法令和規定處理舊電池。



### 警告：

- 請勿移除機蓋。移除雷射產品的機蓋，可能會導致暴露在危險的雷射輻射中。裝置內部並無可自行維修的零件。
- 利用或執行非本文中所指定的控制、調整及執行程序，可能會導致危險的輻射外洩。

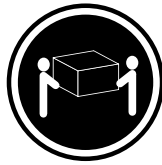


## 危險

部分雷射產品含有內嵌式 **Class 3A** 或 **Class 3B** 雷射二極體。請注意下列事項：

在開啟光碟機時，會發生雷射輻射。請勿直視光束或用光學儀器直接檢視，並避免直接暴露在光束中。

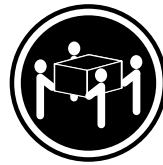




≥ 18 公斤 (37 磅)



≥ 32 公斤 (70.5 磅)

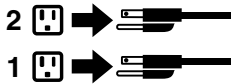


≥ 55 公斤 (121.2 磅)

警告：  
搬運時請注意安全。



警告：  
裝置上的電源控制按鈕及電源供應器上的電源開關，無法關閉裝置所產生的電流。  
該裝置可能有多條電源線。若要除去裝置流出的所有電流，請確認已切斷所有電源線的電源。



## DANGER

Le courant électrique provenant de l'alimentation, du téléphone et des câbles de transmission peut présenter un danger.

Pour éviter tout risque de choc électrique :

- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).
- Lorsque vous installez, que vous déplacez, ou que vous manipulez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion	Déconnexion
<ol style="list-style-type: none"> <li>1. Mettez les unités HORS TENSION.</li> <li>2. Commencez par brancher tous les cordons sur les unités.</li> <li>3. Branchez les câbles d'interface sur des connecteurs.</li> <li>4. Branchez les cordons d'alimentation sur des prises.</li> <li>5. Mettez les unités SOUS TENSION.</li> </ol>	<ol style="list-style-type: none"> <li>1. Mettez les unités HORS TENSION.</li> <li>2. Débranchez les cordons d'alimentation des prises.</li> <li>3. Débranchez les câbles d'interface des connecteurs.</li> <li>4. Débranchez tous les câbles des unités.</li> </ol>



#### ATTENTION:

Remplacer la pile au lithium usagée par une pile de référence identique exclusivement, (référence 45C1566), ou suivre les instructions du fabricant qui en définit les équivalences. Si votre système est doté d'un module contenant une pile au lithium, vous devez le remplacer uniquement par un module identique, produit par le même fabricant. La pile contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

Ne pas :

- la jeter à l'eau,
- l'exposer à des températures supérieures à 100°C,
- chercher à la réparer ou à la démonter.

Ne pas mettre la pile à la poubelle. Pour la mise au rebut, se reporter à la réglementation en vigueur.



#### ATTENTION:

Si des produits à laser (tels que des unités de CD-ROM, de DVD-ROM, des unités à fibres optiques, ou des émetteurs) sont installés, prenez connaissance des informations suivantes :

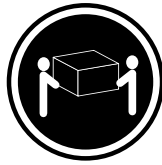
- Ne retirez pas le carter. En ouvrant l'unité de CD-ROM ou de DVD-ROM, vous vous exposez au rayonnement dangereux du laser. Aucune pièce de l'unité n'est réparable.
- Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites dans le présent manuel.



#### DANGER

Certains produits à laser contiennent une diode à laser intégrée de classe 3A ou 3B. Prenez connaissance des informations suivantes:

Rayonnement laser lorsque le carter est ouvert. Evitez toute exposition directe au rayon laser. Evitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques.



≥18 kg (37 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

#### ATTENTION:

Soulevez la machine avec précaution.



#### ATTENTION:

L'interrupteur de contrôle d'alimentation de l'unité et l'interrupteur dubloc d'alimentation ne coupent pas le courant électrique alimentant l'unité. En outre, le système peut être équipé de plusieurs cordons d'alimentation. Pour mettre l'unité hors tension, vous devez déconnecter tous les cordons de la source d'alimentation.



#### VORSICHT

An Netz-, Telefon- und Datenleitungen können gefährliche Spannungen anliegen.

#### Aus Sicherheitsgründen:

- Bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.
- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Die Signalkabel nach Möglichkeit einhändig anschließen oder lösen, um einen Stromschlag durch Berühren von Oberflächen mit unterschiedlichem elektrischem Potenzial zu vermeiden.
- Geräte niemals einschalten, wenn Hinweise auf Feuer, Wasser oder Gebäudeschäden vorliegen.

- Die Verbindung zu den angeschlossenen Netzkabeln, Telekommunikationssystemen, Netzwerken und Modems ist vor dem Öffnen des Gehäuses zu unterbrechen, sofern in den Installations- und Konfigurationsprozeduren keine anders lautenden Anweisungen enthalten sind.
- Zum Installieren, Transportieren und Öffnen der Abdeckungen des Computers oder der angeschlossenen Einheiten die Kabel gemäß der folgenden Tabelle anschließen und abziehen.

Zum Anschließen der Kabel gehen Sie wie folgt vor	Zum Abziehen der Kabel gehen Sie wie folgt vor
<ol style="list-style-type: none"> <li>1. Schalten Sie alle Einheiten AUS.</li> <li>2. Schließen Sie erst alle Kabel an die Einheiten an.</li> <li>3. Schließen Sie die Signalkabel an die Buchsen an.</li> <li>4. Schließen Sie die Netzkabel an die Steckdose an.</li> <li>5. Schalten Sie die Einheit EIN.</li> </ol>	<ol style="list-style-type: none"> <li>1. Schalten Sie alle Einheiten AUS.</li> <li>2. Ziehen Sie zuerst alle Netzkabel aus den Netzsteckdosen.</li> <li>3. Ziehen Sie die Signalkabel aus den Buchsen.</li> <li>4. Ziehen Sie alle Kabel von den Einheiten ab.</li> </ol>



#### CAUTION:

Eine verbrauchte Lithiumbatterie nur durch eine Batterie mit der Teilenummer 45C1566 oder eine gleichwertige, vom Hersteller empfohlene Batterie ersetzen. Enthält das System ein Modul mit einer Lithiumbatterie, dieses nur durch ein Modul desselben Typs und von demselben Hersteller ersetzen. Die Batterie enthält Lithium und kann bei unsachgemäßer Verwendung, Handhabung oder Entsorgung explodieren.

Die Batterie nicht:

- mit Wasser in Berührung bringen.
- über 100 C erhitzen.
- reparieren oder zerlegen.

Die örtlichen Bestimmungen für die Entsorgung von Sondermüll beachten.



#### ACHTUNG:

Bei der Installation von Lasergeräten (wie CD-ROM-Laufwerken, DVD- aufwerken, Einheiten mit Lichtwellenleitertechnik oder Sendern) Folgendes beachten:

- Die Abdeckungen nicht entfernen. Durch Entfernen der Abdeckungen des Lasergeräts können gefährliche Laserstrahlungen freigesetzt werden. Das Gerät enthält keine zu wartenden Teile.
- Werden Steuerelemente, Einstellungen oder Durchführungen von Prozeduren anders als hier angegeben verwendet, kann gefährliche Laserstrahlung auftreten.



#### VORSICHT

Einige Lasergeräte enthalten eine Laserdiode der Klasse 3A oder 3B. Beachten Sie Folgendes:

**Laserstrahlung bei geöffneter Verkleidung. Nicht in den Strahl blicken. Keine Lupen oder Spiegel verwenden. Strahlungsbereich meiden.**



≥18 kg



≥32 kg



≥55 kg

**ACHTUNG:**

**Arbeitsschutzrichtlinien beim Anheben der Maschine beachten.**



**ACHTUNG:**

**Mit dem Netzschalter an der Einheit und am Netzteil wird die Stromversorgung für die Einheit nicht unterbrochen. Die Einheit kann auch mit mehreren Netzkabeln ausgestattet sein. Um die Stromversorgung für die Einheit vollständig zu unterbrechen, müssen alle zum Gerät führenden Netzkabel vom Netz getrennt werden.**



## סכנה

זרם חשמלי המועבר בכבלי חשמל, טלפון ותקשורת הוא מסוכן.

כדי להימנע מסכנת התחשמלות:

- אל תחברו או תנתקו כבלים, ואל תבצעו פעולת התקנה, תחזוקה או שינוי תצורה במוצר זה במהלך סופת ברקים.
- חברו את כל כבלי החשמל לשקע חשמל מחווט ומוארק כהלכה.
- חברו כל ציוד שיחובר למוצר זה לשקעי חשמל מחוטים כהלכה.
- במידת האפשר, השתמשו ביד אחת בלבד לחיבור או לניתוק של כבלי אותות.
- לעולם אל תפעילו ציוד כלשהו כאשר יש עדות לנזק מבני או לנזק כתוצאה מאש או ממים.
- נתקו את כבלי החשמל, מערכות התקשורת, התקני הרשת והמודמים המחוברים לפני פתיחת כיסויי ההתקן, אלא אם הליכי ההתקנה וקביעת התצורה מורים אחרת.
- בעת התקנה, העברה או פתיחת כיסויים במוצר זה או בהתקנים המחוברים, חברו ונתקו את הכבלים כמתואר בטבלה שלהלן.

כדי לחבר	כדי לנתק
1. כבו הכל.	1. כבו הכל.
2. ראשית, חברו את כל הכבלים להתקנים.	2. ראשית, נתקו את כבלי החשמל מהשקעים.
3. חברו את כבלי האותות למחברים.	3. נתקו את כבלי האותות מהמחברים.
4. חברו את כבלי החשמל לשקעים.	4. הסירו את כל הכבלים מההתקנים.
5. הפעילו את ההתקן.	



זהירות:

בעת החלפת סוללת הליתיום, השתמשו רק בסוללה בעלת מק"ט 45C1566 או בסוג תואם שהומלץ על ידי היצרן. אם המערכת כוללת מודול המכיל סוללת ליתיום, החליפו אותו רק במודול מאותו סוג ומתוצרת אותו יצרן. הסוללה מכילה ליתיום, ועלולה להתפוצץ אם לא משתמשים ומטפלים בה או משליכים אותה כראוי.

לעולם:

- אל תטבלו במים
  - אל תחממו לטמפרטורה הגבוהה מ-100°C (212°F)
  - אל תתקנו או תפרקו
- השליכו את הסוללה כנדרש לפי התקנות והחוקים המקומיים.



זהירות:

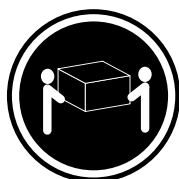
בעת התקנת מוצרי לייזר (כגון כונני תקליטורים ו-DVD, התקני סיב אופטי או משדרים), שימו לב לאזהרות הבאות:

- אל תסירו את הכיסויים. הסרת הכיסויים של מוצר הלייזר עלולה לגרום לחשיפה לקרינת לייזר מסוכנת. אין חלקים ברי טיפול בתוך ההתקן.
- שינויים, שימוש בבקורות או ביצוע הליכים אחרים מאלה המתוארים כאן, עלולים לגרום לחשיפה לקרינה מסוכנת.



## סכנה

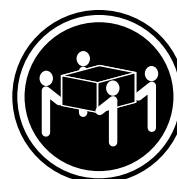
מוצרי ליזר מסוימים מכילים דיודת ליזר מסוג Class 3A או Class 3B. שימו לב לאזהרה הבאה:  
כאשר הוא פתוח, המוצר פולט קרינת ליזר. אל תביטו ישירות בקרן, אל תביטו ישירות בעזרת ציוד אופטי,  
והימנעו מחשיפה לקרן.



$\leq 18$  ק"ג (37 ליב')



$\leq 32$  ק"ג (70.5 ליב')



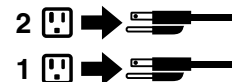
$\leq 55$  ק"ג (121.2 ליב')

זהירות:  
השתמשו בהליכים  
הנאותים בעת  
הרמת הציוד.



זהירות:

לחצן ההפעלה של ההתקן ומתג ההפעלה של ספק החשמל אינם מפסיקים את זרם החשמל המסופק להתקן.  
בנוסף, ההתקן עשוי לכלול יותר מכבל חשמל אחד. כדי לסלק את כל הזרם החשמלי מההתקן,  
ודאו שכל כבלי החשמל מנותקים ממקור החשמל.



## PERICOLO

La corrente elettrica proveniente dai cavi di alimentazione, del telefono e di comunicazione può essere pericolosa.

**Per evitare il rischio di scosse elettriche:**

- **Non collegare o scollegare qualsiasi cavo oppure effettuare l'installazione, la manutenzione o la riconfigurazione del prodotto durante un temporale.**
- **Collegare tutti i fili elettrici a una presa di alimentazione correttamente cablata e dotata di messa a terra.**



- Collegare alle prese elettriche appropriate tutte le apparecchiature che verranno utilizzate per questo prodotto.
- Se possibile, utilizzare solo una mano per collegare o scollegare i cavi di segnale.
- Non accendere assolutamente apparecchiature in presenza di incendi, perdite d'acqua o danno strutturale.
- Scollegare i cavi di alimentazione, i sistemi di telecomunicazione, le reti e il modem prima di aprire i coperchi del dispositivo, salvo istruzioni contrarie relative alle procedure di installazione e configurazione.
- Collegare e scollegare i cavi come descritto nella seguente tabella quando vengono effettuate operazioni di installazione, spostamento o apertura dei coperchi di questo prodotto o delle unità collegate.

Per collegarsi	Per scollegarsi
<ol style="list-style-type: none"> <li>1. SPEGNERE le apparecchiature.</li> <li>2. Innanzitutto, collegare tutti i cavi alle unità.</li> <li>3. Collegare i cavi di segnale ai connettori.</li> <li>4. Collegare i cavi di alimentazione alla presa.</li> <li>5. Accendere l'unità.</li> </ol>	<ol style="list-style-type: none"> <li>1. SPEGNERE le apparecchiature.</li> <li>2. Innanzitutto, rimuovere i cavi di alimentazione dalla presa.</li> <li>3. Rimuovere i cavi di segnale dai connettori.</li> <li>4. Rimuovere tutti i cavi dalle unità.</li> </ol>



#### ATTENZIONE:

Quando si sostituisce la batteria al litio, utilizzare solo il Numero parte 45C1566 o un tipo di batteria equivalente consigliato dal produttore. Se sul sistema è presente un modulo che contiene una batteria al litio, sostituirlo solo con un tipo di modulo dello stesso tipo della stessa casa di produzione. La batteria contiene litio e può esplodere se usata, maneggiata o smaltita in modo non corretto.

*Non:*

- Gettare o immergere la batteria nell'acqua
- Riscaldarla ad una temperatura superiore ai 100 gradi C (212 gradi F)
- Smontarla, ricaricarla o tentare di ripararla

Le batterie usate vanno smaltite in accordo alla normativa in vigore (DPR 915/82 e successive disposizioni e disposizioni locali).



#### ATTENZIONE:

Quando vengono installati prodotti laser (quali CD-ROM, unità DVD-ROM, unità a fibre ottiche o trasmettenti), tener presente quanto segue:

- Non rimuovere gli sportelli. L'apertura di un'unità laser può determinare l'esposizione a radiazioni laser pericolose. All'interno dell'unità non vi sono parti su cui effettuare l'assistenza tecnica.
- L'utilizzo di controlli, regolazioni o l'esecuzione di procedure non descritti nel presente manuale possono provocare l'esposizione a radiazioni pericolose.



## PERICOLO

Alcune unità laser contengono un diodo laser di Classe 3A o Classe 3B. Tener presente quanto segue:

Aperto l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici ed evitare l'esposizione al fascio.



≥18 kg



≥32 kg



≥55 kg

## ATTENZIONE:

Prestare attenzione nel sollevare l'apparecchiatura.



## ATTENZIONE:

Il pulsante di controllo dell'alimentazione presente sull'unità e l'interruttore dell'alimentatore non disattivano l'alimentazione corrente fornita all'unità. E' possibile che l'unità disponga di più cavi di alimentazione. Per disattivare l'alimentazione dall'unità, accertarsi che tutti i cavi di alimentazione siano scollegati dalla fonte di alimentazione.



## 위험

전원, 전화, 통신 케이블의 전류는 위험합니다.

감전의 위험을 피하려면 다음과 같이 하십시오.

- 번개가 치는 날에는 케이블을 연결 또는 분리하거나 본 제품을 설치, 보수, 재구성하지 마십시오.
- 모든 전원 코드는 올바르게 접지된 전기 콘센트에 연결하십시오.
- 본 제품에 연결될 장치는 올바르게 배선된 콘센트에 연결하십시오.
- 신호 케이블을 연결 또는 분리할 때 가능하면 한 손만을 사용하십시오.
- 불 또는 물로 인한 손상이나 구조적인 손상이 있을 경우 장치의 전원을 절대 켜지 마십시오.
- 설치 및 구성 과정에 별도의 지시 사항이 없는 경우, 장치의 덮개를 열기 전에 연결된 전원 코드, 원격 통신 시스템, 네트워크, 모뎀을 분리하십시오.
- 본 제품이나 연결된 장치를 설치, 이동하거나 덮개를 열 때 다음 표와 같은 순서로 케이블을 연결하거나 분리하십시오.

연결할 때:	분리할 때:
<ol style="list-style-type: none"><li>1. 모든 장치의 전원을 끄십시오.</li><li>2. 먼저 모든 케이블을 장치에 연결하십시오.</li><li>3. 커넥터에 신호 케이블을 연결하십시오.</li><li>4. 콘센트에 전원 코드를 연결하십시오.</li><li>5. 장치의 전원을 켜십시오.</li></ol>	<ol style="list-style-type: none"><li>1. 모든 장치의 전원을 끄십시오.</li><li>2. 먼저 콘센트에서 전원 코드를 분리하십시오.</li><li>3. 커넥터에서 신호 케이블을 분리하십시오.</li><li>4. 장치에서 모든 케이블을 분리하십시오.</li></ol>



### 주의:

배터리를 교환할 때는 Part Number 45C1566 또는 제조업체에서 지정한 동일한 종류의 제품을 사용하십시오. 사용자의 시스템이 리튬 배터리를 포함하는 모듈일 경우, 동일한 제조업체에서 동일한 모듈 유형으로 생산된 제품으로 교체하십시오. 배터리에는 리튬이 함유되어 있어 잘못 사용, 취급 또는 폐기할 경우 폭발의 위험이 있습니다.

사고를 방지하려면 다음 사항을 준수하십시오.

- 배터리를 물 속에 던지거나 침수시키지 마십시오.
- 100°C (212°F) 이상 가열하지 마십시오.
- 수리하거나 분해하지 마십시오.

배터리를 폐기할 때는 법령 또는 회사의 안전 수칙에 따라 폐기하십시오.



### 주의:

CD-ROM, DVD-ROM 장치, 광섬유 장치 또는 송신 장치와 같은 레이저 제품을 설치할 때, 다음과 같은 취급 주의사항을 참고하십시오.

- 덮개를 열지 마십시오. 덮개를 열면 레이저 복사 에너지에 노출될 위험이 있습니다. 장치 내부에는 사용자가 조정하거나 수리할 수 있는 부품이 없습니다.
- 규정된 것 이외의 절차 수행, 제어 조정 등의 행위로 인해 해로운 레이저 복사에 노출될 수 있습니다.



## 위험

일부 장비에는 임베디드 클래스 3A 또는 클래스 3B 레이저 다이오드가 있습니다. 다음 주의사항에 유의하십시오.

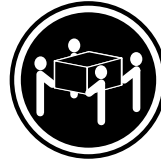
드라이브가 열리면 레이저 복사 에너지가 방출됩니다. 광선이 눈에 직접 쏘이지 않도록 하십시오. 나안 또는 광학 기구를 착용한 상태에서 광선을 직접 바라보지 않도록 하십시오.



≥ 18 kg (37 lbs)



≥ 32 kg (70.5 lbs)



≥ 55 kg (121.2 lbs)

주의:  
제품을 들어 올릴 때  
안전 규제를 따르십시오.



주의:  
장치의 전원 제어 버튼 및 전원 공급 장치의 전원 스위치를 사용하여 장치에 공급되는 전기를 차단하지 마십시오.  
장치는 둘 이상의 코드를 가지고 있을 수 있습니다. 장치에서 모든 전원을 차단하려면 콘센트에서 코드가 모두  
분리되어 있는지 확인하십시오.



## PELIGRO

La corriente eléctrica procedente de cables de alimentación, teléfonos y cables de comunicación puede ser peligrosa.

**Para evitar el riesgo de descarga eléctrica:**

- No conecte ni desconecte los cables ni realice ninguna tarea de instalación, mantenimiento o reconfiguración de este producto durante una tormenta eléctrica.
- Conecte todos los cables de alimentación a tomas de corriente debidamente cableadas y conectadas a tierra.
- Cualquier equipo que se conecte a este producto también debe conectarse a tomas de corriente debidamente cableadas.
- Siempre que sea posible, utilice una sola mano para conectar o desconectar los cables de señal.
- No encienda nunca un equipo cuando hay señales de fuego, agua o daños estructurales.

- **Desconecte los cables de alimentación, los sistemas de telecomunicaciones, las redes y los módems conectados antes de abrir las cubiertas de los dispositivos, a menos que se indique lo contrario en los procedimientos de instalación y configuración.**
- **Conecte y desconecte los cables, como se describe en la tabla siguiente, cuando instale, mueva o abra las cubiertas de este producto o de los dispositivos conectados.**

Para conectar	Para desconectar
<ol style="list-style-type: none"> <li>1. APÁGUELO todo.</li> <li>2. En primer lugar, conecte todos los cables a los dispositivos.</li> <li>3. Conecte los cables de señal a los conectores.</li> <li>4. Enchufe los cables de alimentación a las tomas de corriente.</li> <li>5. Encienda el dispositivo.</li> </ol>	<ol style="list-style-type: none"> <li>1. APÁGUELO todo.</li> <li>2. En primer lugar, desenchufe los cables de alimentación de las tomas de corriente.</li> <li>3. Desconecte los cables de señal de los conectores.</li> <li>4. Desconecte todos los cables de los dispositivos.</li> </ol>



#### **PRECAUCIÓN:**

Quando substitua uma bateria de lítio, utilize somente uma bateria número de peça 45C1566 u outra de tipo equivalente recomendada por el fabricante. Si su sistema dispone de un módulo que contiene una batería de litio, reemplácelo sólo con el mismo tipo de módulo, del mismo fabricante. La batería contiene litio y puede explotar si no se utiliza, manipula o desecha correctamente.

*No debe:*

- Arrojarla al agua o sumergirla en ella
- Exponerla a temperaturas superiores a 100°C (212°F)
- Repararla o desmontarla

Deshágase de la batería según especifiquen las leyes o normas locales.



#### **PRECAUCIÓN:**

Quando haya productos láser (como unidades de CD-ROM, unidades de DVD, dispositivos de fibra óptica o transmisores) instalados, tenga en cuenta lo siguiente:

- No quite las cubiertas. Si quita las cubiertas del producto láser, podría quedar expuesto a radiación láser peligrosa. Dentro del dispositivo no existe ninguna pieza que requiera servicio técnico.
- Si usa controles o ajustes o realiza procedimientos que no sean los especificados aquí, podría exponerse a radiaciones peligrosas.



#### **PELIGRO**

Algunos productos láser tienen incorporado un diodo láser de clase 3A o clase 3B. Tenga en cuenta lo siguiente:

Cuando se abre, queda expuesto a radiación láser. No mire directamente al rayo láser, ni siquiera con instrumentos ópticos, y evite exponerse directamente al rayo láser.



≥18 kg



≥32 kg



≥55 kg

#### PRECAUCIÓN:

Adopte procedimientos seguros al levantar el equipo.



#### PRECAUCIÓN:

El botón de control de alimentación del dispositivo y el interruptor de alimentación de la fuente de alimentación no desconectan la corriente eléctrica suministrada al dispositivo. Además, el dispositivo podría tener más de un cable de alimentación. Para suprimir toda la corriente eléctrica del dispositivo, asegúrese de que todos los cables de alimentación estén desconectados de la toma de corriente.



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## Chapter 2. Product overview

This chapter provides the following information:

- Locations of connectors
- Locations of components
- Locations of parts on the system board
- Locations of internal drives
- Computer features
- Software programs provided by Lenovo

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### Locations

This section provides the following topics:

- “Locating connectors, controls, and indicators on the front of your computer” on page 28
- “Locating connectors on the rear of your computer” on page 29
- “Locating components” on page 31
- “Locating parts on the system board” on page 34
- “Locating internal drives” on page 35
- “Locating the machine type and model label” on page 36

**Note:** The components in your computer might look slightly different from the illustrations.

## Locating connectors, controls, and indicators on the front of your computer

The following illustration shows the locations of the connectors, controls, and indicators on the front of your computer.

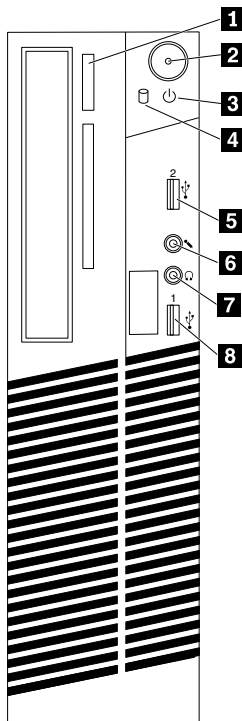


Figure 1. Front connector, control, and indicator locations

<b>1</b> Optical drive eject/close button	<b>2</b> Power button
<b>3</b> Power indicator	<b>4</b> Hard disk drive activity indicator
<b>5</b> USB 2.0 connector (USB connector 2)	<b>6</b> Microphone connector
<b>7</b> Headphone connector	<b>8</b> USB 2.0 connector (USB connector 1)



## Locating connectors on the rear of your computer

The following illustration shows the locations of the connectors on the rear of your computer. Some connectors on the rear of your computer are color-coded to help you determine where to connect the cables on your computer.

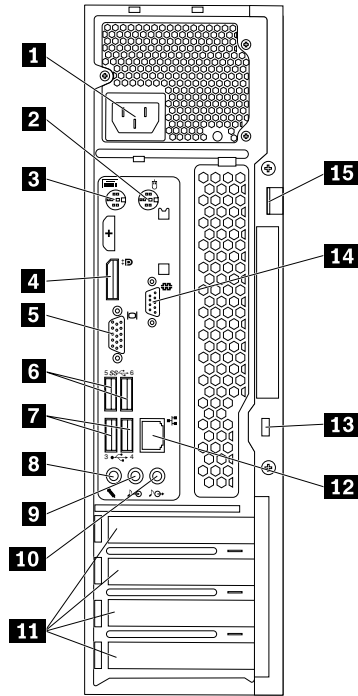


Figure 2. Rear connector locations

<b>1</b> Power cord connector	<b>2</b> PS/2 mouse connector (available on some models)
<b>3</b> PS/2 keyboard connector (available on some models)	<b>4</b> DisplayPort® connector
<b>5</b> VGA connector	<b>6</b> USB 3.0 connectors (2)
<b>7</b> USB 2.0 connectors (2)	<b>8</b> Microphone connector
<b>9</b> Audio line-out connector	<b>10</b> Audio line-in connector
<b>11</b> PCI/PCI Express card area (different cards provide different connectors)	<b>12</b> Ethernet connector
<b>13</b> Security-lock slot	<b>14</b> Serial connector
<b>15</b> Padlock loop	

**Note:** A discrete graphics card, a network interface card, or an audio card can be installed in the appropriate PCI or PCI Express card slot. If such a card is installed, ensure that you use the connectors on the card instead of the corresponding connectors on the computer.

Connector	Description
Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line-out connector of the device and the audio line-in connector of the computer.
Audio line-out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, or multimedia keyboards. To attach a stereo system or other external recording device, a cable is connected between the audio line-in connector of the device and the audio line-out connector of the computer.
DisplayPort connector	Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). <b>Note:</b> To operate the computer within FCC Class B limits, use a Category 5, 5e, or 6 Ethernet cable.
Microphone connector	Used to attach a microphone to your computer when you want to record sound or if you use speech-recognition software.
PS/2 keyboard connector (available on some models)	Used to attach a keyboard that uses a Personal System/2 (PS/2) keyboard connector.
PS/2 mouse connector (available on some models)	Used to attach a mouse, a trackball, or other pointing devices that use a PS/2 mouse connector.
Serial connector	Used to attach an external modem, a serial printer, or other devices that use a 9-pin serial connector.
USB 2.0 connector	Used to attach a device that requires a USB 2.0 connection, such as a keyboard, a mouse, a scanner, a printer, or a personal digital assistant (PDA).
USB 3.0 connector	Used to attach a device that requires a USB 2.0 or 3.0 connection, such as a keyboard, a mouse, a scanner, a printer, or a personal digital assistant (PDA). A USB 3.0 connector provides high transmission speeds to reduce the time that is required for data transmission.
VGA connector	Used to attach a VGA monitor or other devices that use a Video Graphics Array (VGA) connector.

## Locating components

The following illustration shows the locations of the various components in your computer. To remove the computer cover, see “Removing the computer cover” on page 101.

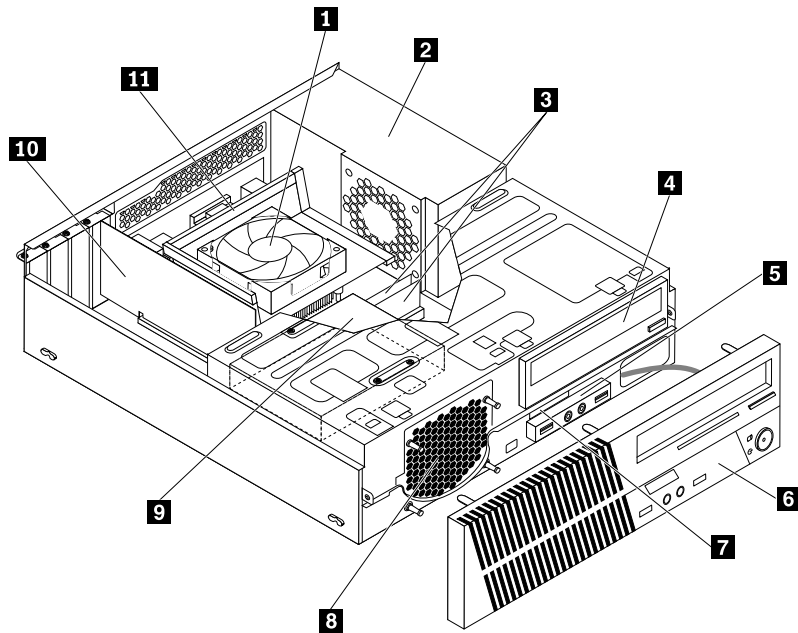


Figure 3. Component locations

<b>1</b> Heat sink and fan assembly	<b>2</b> Power supply assembly
<b>3</b> Memory modules	<b>4</b> Optical drive
<b>5</b> Front audio and USB assembly	<b>6</b> Front bezel
<b>7</b> Slim card reader	<b>8</b> Front fan (system fan) assembly
<b>9</b> Hard disk drive (or solid-state drive)	<b>10</b> PCI Express card
<b>11</b> Heat sink fan duct	

## Locating major FRUs and CRUs

Figure 4 “Component locations” on page 32 shows the locations of the various components in your computer. To remove the computer cover, see “Removing the computer cover” on page 101.

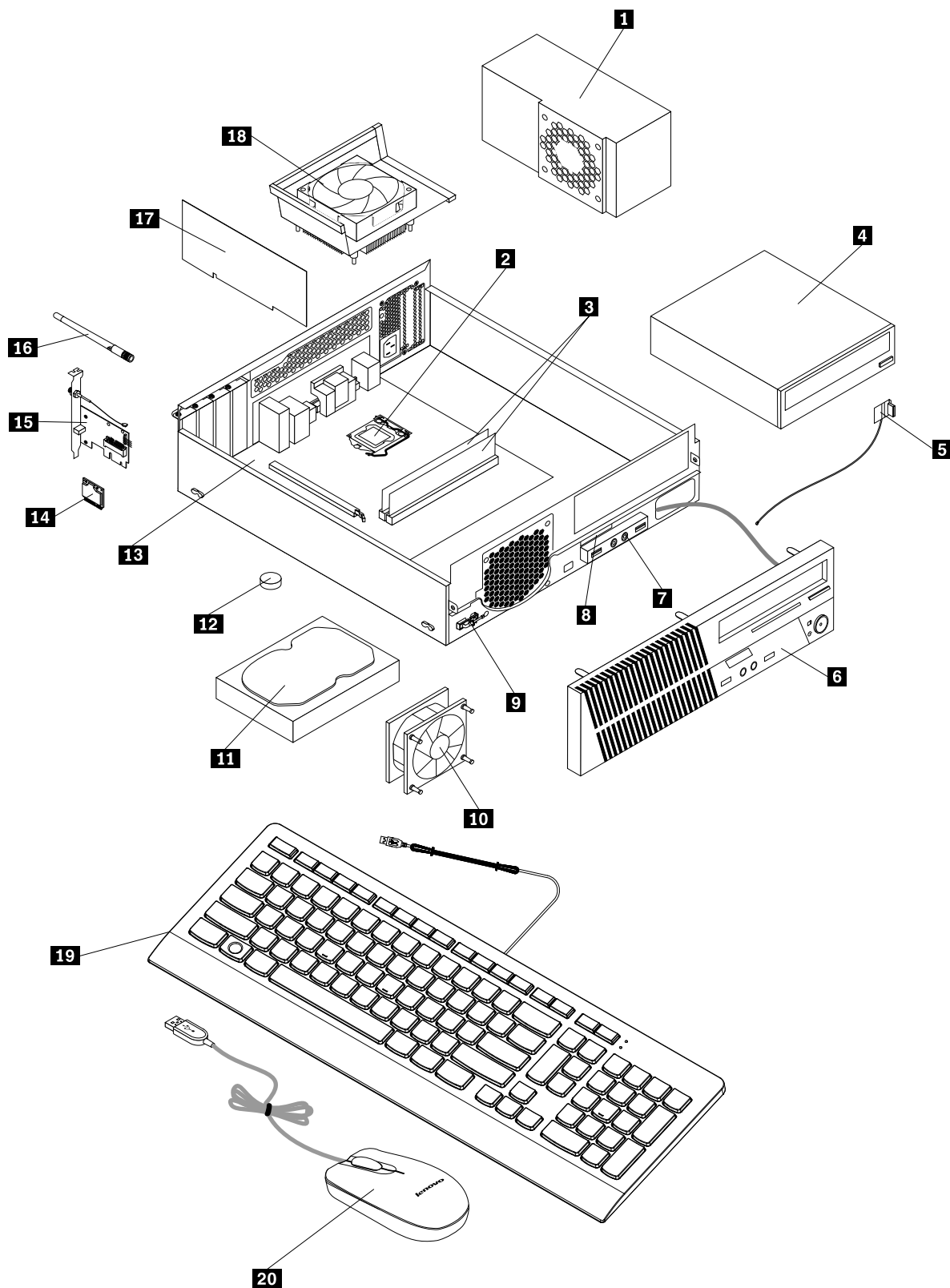


Figure 4. Component locations

The following table lists the major FRUs shown in Figure 4 “Component locations” on page 32 and identifies which FRUs also are self-service CRUs or optional-service CRUs.

**Notes:**

- Self-service CRUs: These CRUs unplug or are secured by no more than two screws. Examples of these types of CRUs include the keyboard, the mouse, any USB device, and the power cord. Other self-service CRUs depending on product design might include memory modules, adapter cards, hard disk drives, and optical drives.
- Optional-service CRUs: These CRUs are isolated parts within the computer and are concealed by an access panel that is typically secured by more than two screws. Once the access panel is removed, the specific CRU is visible.

Number	FRU description	Self-service CRU	Optional-service CRU
<b>1</b>	Power supply assembly	No	Yes
<b>2</b>	Microprocessor	No	Yes
<b>3</b>	Memory module	Yes	No
<b>4</b>	Optical drive (available on some models)	Yes	No
<b>5</b>	Front Wi-Fi antenna (available on some models)	No	Yes
<b>6</b>	Front bezel	Yes	No
<b>7</b>	Front audio and USB assembly	No	Yes
<b>8</b>	Slim card reader (available on some models)	No	Yes
<b>9</b>	Thermal sensor	No	Yes
<b>10</b>	Front fan assembly	No	Yes
<b>11</b>	Hard disk drive	No	Yes
<b>12</b>	Battery	Yes	No
<b>13</b>	System board	No	No
<b>14</b>	Wi-Fi card module (available on some models)	No	Yes
<b>15</b>	Wi-Fi adapter card (available on some models)	No	Yes
<b>16</b>	Rear Wi-Fi antenna (available on some models)	Yes	No
<b>17</b>	PCI Express card	Yes	No
<b>18</b>	Heat sink and fan assembly	No	Yes
<b>19</b>	Keyboard	Yes	No
<b>20</b>	Mouse	Yes	No

## Locating parts on the system board

The following illustration shows the locations of the parts on the system board.

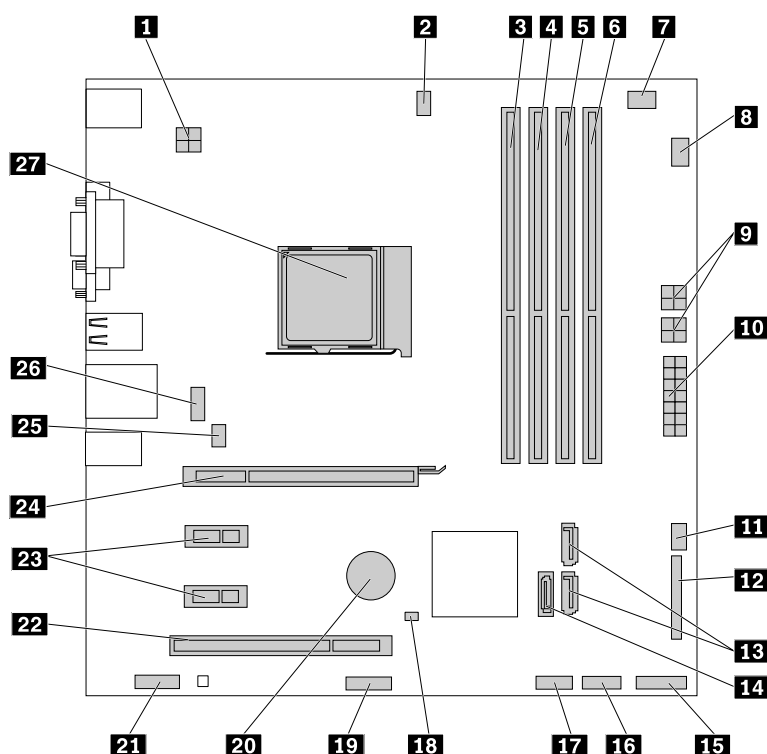


Figure 5. System board part locations

<b>1</b> Microprocessor power connector	<b>2</b> Microprocessor fan connector
<b>3</b> Memory slot 1	<b>4</b> Memory slot 2
<b>5</b> Memory slot 3	<b>6</b> Memory slot 4
<b>7</b> Thermal sensor connector	<b>8</b> Hard disk drive fan connector
<b>9</b> Optical drive and hard disk drive power connectors (2)	<b>10</b> System power connector
<b>11</b> Power fan connector	<b>12</b> Parallel connector
<b>13</b> SATA 3.0 connectors (2)	<b>14</b> SATA 3.0 connector
<b>15</b> Front panel connector (for connecting LED indicators and power button)	<b>16</b> Front USB 2.0 connector 1 (for connecting USB connectors 1 and 2 on the front bezel)
<b>17</b> Front USB 2.0 connector 2 (for connecting an additional USB device)	<b>18</b> Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper
<b>19</b> Serial connector	<b>20</b> Battery
<b>21</b> Front audio connector	<b>22</b> PCI card slot
<b>23</b> PCI Express x1 card slots (2)	<b>24</b> PCI Express x16 graphics card slot
<b>25</b> System fan connector	<b>26</b> DisplayPort connector
<b>27</b> Microprocessor	

## Locating internal drives

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and enable your computer to read other types of media. Internal drives are installed in bays.

When you install or replace an internal drive, note the type and size of the drive that each bay supports and correctly connect the required cables. Refer to the appropriate section in “Installing or replacing hardware” on page 101 for instructions on how to install or replace internal drives for your computer.

The following illustration shows the locations of the drive bays.

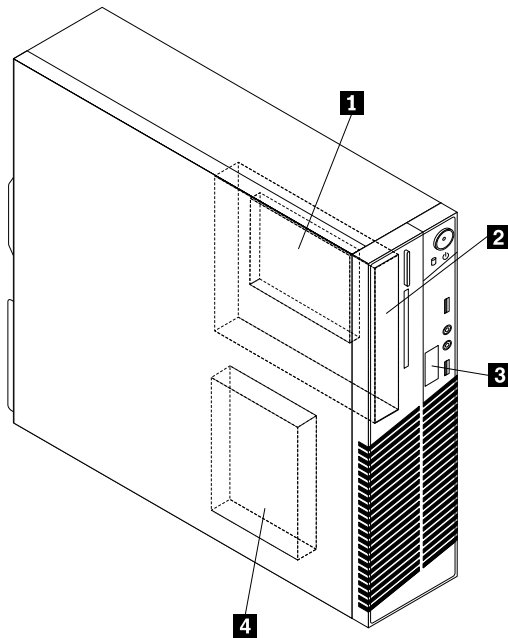


Figure 6. Drive bay locations

- 1** Secondary solid-state drive bay (with a 2.5-inch solid-state drive or a hybrid hard disk drive installed on some models)
- 2** Optical drive bay (with an optical drive installed on some models)
- 3** Slim card reader drive bay (with a slim card reader installed on some models)
- 4** Hard disk drive bay (with a 3.5-inch hard disk drive or a 2.5-inch solid-state drive installed)

## Locating the machine type and model label

The machine type and model label identifies your computer. When you contact Lenovo for help, the machine type and model information helps support technicians to identify your computer and provide faster service.

The machine type and model label is attached on the side of your computer as shown.

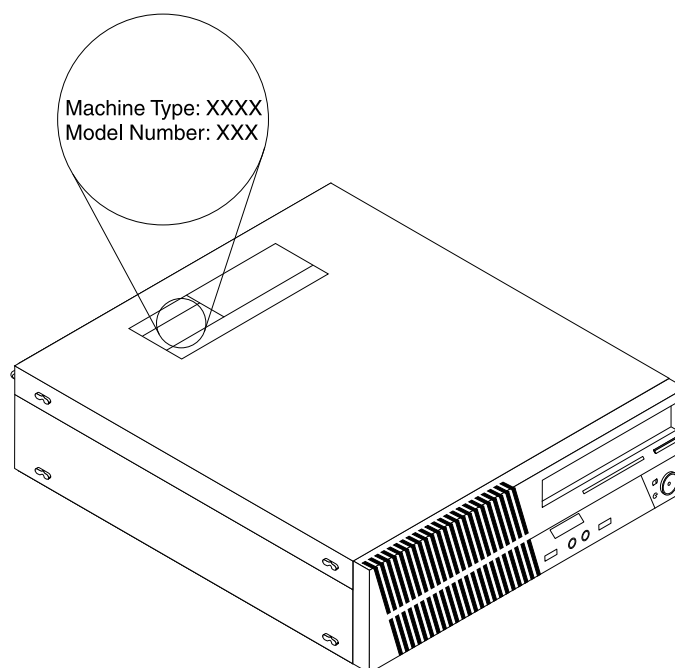


Figure 7. Machine type and model label

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## Features

This section introduces the computer features. The information covers a variety of models.

### Microprocessor

To view the microprocessor information of your computer, do the following:

- On the Microsoft® Windows® 7 operation system, click **Start**, right-click **Computer**, and select **Properties** to view the information.
- On the Microsoft Windows 8.1 operating system, go to the desktop and move your pointer to the top-right or bottom-right corner of the screen to display the charms. Then click **Settings** → **PC info** to view the information.
- On the Microsoft Windows 10 operating system, click the Start button to open the Start menu. Then, click **Settings** → **System** → **About** to view the information.

### Memory

Your computer supports up to four double data rate 3 unbuffered dual inline memory modules (DDR3 UDIMMs).

To determine the amount of memory installed on your computer, do the following:

- On the Microsoft Windows 7 operation system, click **Start**, right-click **Computer**, and select **Properties** to view the information.



- On the Microsoft Windows 8.1 operating system, go to the desktop and move your pointer to the top-right or bottom-right corner of the screen to display the charms. Then click **Settings → PC info** to view the information.
- On the Microsoft Windows 10 operating system, click the Start button to open the Start menu. Then, click **Settings → System → About** to view the information.

For more information, see “Installing or replacing a memory module” on page 105.

### **Internal drives**

- Optical drive
- Serial Advanced Technology Attachment (SATA) hard disk drive
- SATA hybrid drive (available on some models)
- SATA solid-state drive (available on some models)

### **Video features**

- Integrated graphics supports the following connectors on your computer:
  - DisplayPort connector
  - VGA connector
- Discrete graphics card installed in one of the Peripheral Component Interconnect (PCI) Express x16 graphics card slots (available on some models) (connectors vary by graphics card)

### **Audio features**

- Integrated audio controller supports the following connectors and devices on your computer:
  - Audio line-in connector
  - Audio line-out connector
  - Headphone connector
  - Internal speaker (available on some models)
  - Microphone connectors
- Discrete audio card installed in one of the PCI card slots (available on some models) (the connectors vary by audio card)

### **Input/Output (I/O) features**

- 9-pin serial connectors
- Audio connectors (audio line-in connector, audio line-out connector, headphone connector, and microphone connector)
- Ethernet connector
- Display connectors (DisplayPort connector and VGA connector)
- Personal System/2 (PS/2) keyboard connector
- PS/2 mouse connector
- USB connectors

For more information, see “Locating connectors, controls, and indicators on the front of your computer” on page 28 and “Locating connectors on the rear of your computer” on page 29.

### **Expansion**

- Card reader bay

- Hard disk drive bays
- Memory slots
- Optical drive bay
- PCI card slot
- PCI Express x1 card slots
- PCI Express x16 graphics card slot

For more information, see “Locating internal drives” on page 35 and “Locating parts on the system board” on page 34.

### **Power supply**

- 180-watt automatic voltage-sensing power supply
- 240-watt automatic voltage-sensing power supply

### **Wireless features**

Depending on your computer model, the following wireless features are supported:

- Wireless local area network (LAN)
- Bluetooth

### **System management features**

- Ability to store power-on self-test (POST) hardware test results
- Desktop Management Interface (DMI)

Desktop Management Interface provides a common path for users to access information about all aspects of a computer. The information includes processor type, installation date, attached printers and other peripherals, power sources, maintenance history, and so on.

- ErP LPS compliance mode

The energy-related products directive (ErP) lowest power state (LPS) compliance mode reduces the consumption of electricity when your computer is in sleep or off mode. For more information, see “Enabling ErP LPS compliance mode” on page 64.

- Intelligent Cooling Engine (ICE)

The Intelligent Cooling Engine is a system thermal management solution that enables your computer to run with better thermal and acoustic performance. The ICE function also monitors the thermal performance of your computer to identify thermal problems. For more information, see “ICE performance mode” on page 65 and “ICE thermal alert” on page 65.

- Preboot Execution Environment (PXE)

Preboot Execution Environment enables computers to start through a network interface independent of data storage devices (such as the hard disk drive) or installed operating systems.

- System Management (SM) Basic Input/Output System (BIOS) and SM software

The SMBIOS specification defines data structures and access methods that can be used to read management data stored in the BIOS of a computer.

- Wake on LAN

Wake on LAN is an Ethernet computer networking standard that allows a computer to be turned on or woken up by a network message. The message is usually sent by a program running on another computer on the same local area network.

- Windows Management Instrumentation (WMI)

Windows Management Instrumentation is a set of extensions to the Windows Driver Model. It provides an operating system interface through which instrumented components provide information and notification.

## **Security features**

- Ability to enable and disable a device
- Ability to enable and disable USB connectors individually
- Computrace Agent software embedded in firmware
- Cover presence switch (also called intrusion switch) (available on some models)
- Keyboard with fingerprint reader (shipped with some models)
- Power-on password (POP), administrator password, and hard disk password to deter unauthorized use of your computer
- Startup sequence control
- Startup without keyboard or mouse
- Support for a Kensington-style cable lock
- Support for a padlock
- Trusted Platform Module (TPM)

For more information, see Chapter 5 “Security” on page 57.

## **Preinstalled operating system**

Your computer is preinstalled with one of the following operating systems:

- Microsoft Windows 7 operating system
- Microsoft Windows 8.1 operating system
- Microsoft Windows 10 operating system

## **Operating system(s), certified or tested for compatibility (varies by model type)**

The operating system(s) listed here are being certified or tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by Lenovo as compatible with your computer following the publication of this manual. This list is subject to change. To determine if an operating system has been certified or tested for compatibility, check the Web site of the operating system vendor.

- Linux®

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## Specifications

This section lists the physical specifications for your computer.

### Dimensions

Width: 99.7 mm (3.93 inches)

Height: 338 mm (13.31 inches)

Depth: 385 mm (15.16 inches)

### Weight

Maximum configuration as shipped: 6.6 kg (14.55 lb) (without package)

Maximum configuration as shipped: 8.96 kg (19.75 lb) (with package)

### Environment

- Air temperature:

Operating: From 10°C (50°F) to 35°C (95°F)

Storage in original shipping package: From -40°C (-40°F) to 60°C (140°F)

Storage without package: From -10°C (14°F) to 60°C (140°F)

- Humidity:

Operating: 20%–80% (non-condensing)

Storage: 20%–90% (non-condensing)

- Altitude:

Operating: From -15.2 m (-50 ft) to 3048 m (10 000 ft)

Storage: From -15.2 m (-50 ft) to 10 668 m (35 000 ft)

### Electrical input

Input voltage:

- Low range:

Minimum: 100 V ac

Maximum: 127 V ac

Input frequency: 50/60 Hz

- High range:

Minimum: 200 V ac

Maximum: 240 V ac

Input frequency: 50/60 Hz

---



## Lenovo programs

Your computer comes with Lenovo programs to help you work more easily and securely. Depending on the Windows operating system preinstalled, the programs might vary.

### Accessing a program on your computer

**Note:** For Windows 7, some of the Lenovo programs might be ready to be installed, so you need to install them manually. Then, you can access and use these programs. To install a program that is ready to be installed, open the Lenovo ThinkVantage® Tools program, and then view the program icons using Tiles. Follow the instructions under greyed-out icons to locate the icon for the desired program. Double-click the icon to install the program.

To access a program on your computer, do one of the following:

- For Windows 7 or Windows 10:
  - From Windows Search:
    1. Depending on your Windows version, do one of the following:
      - For Windows 7: Click the Start button to open the Start menu, and then type the program name into the search box.
      - For Windows 10: Type the program name into the search box next to the Start button.
    2. In the search results, click the name of the desired program to launch the program.
  - From the Start menu or Control Panel:
    1. Click the Start button to open the Start menu.
    2. Depending on your Windows version, do one of the following:
      - For Windows 7: Click **All Programs** to display the program list. From the list or a folder in the list, click the name of the desired program to launch the program.
      - For Windows 10: From the program list or a folder in the list, click the name of the desired program to launch the program.
    3. If the program name is not displayed on the Start menu, do one of the following:
      - For Windows 7: Click **Control Panel** on the Start menu.
      - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
    4. View Control Panel using large icons or small icons, and then click the name of the desired program to launch the program.
- For Windows 8.1:
  1. Press the Windows key  to go to the Start screen. Click the name of the desired program to launch the program.
  2. Click the arrow icon  in the bottom-left corner of the screen to go to the Apps screen. Find the desired program in the apps list or search for it in the search box in the top-right corner of the screen.

## An introduction to Lenovo programs

This section provides information about the major Lenovo programs available on your operating system.

**Note:** Depending on your computer model, some of the following programs might not be available.

- For Windows 7 only:
  - **Create Recovery Media**

The Create Recovery Media program enables you to restore only the C drive or the entire storage drive to the factory-default settings.
  - **Lenovo PowerENGAGE**

The Lenovo PowerENGAGE program enables you to register your computer with Lenovo.
  - **Message Center Plus**

The Message Center Plus program automatically displays messages informing you about important notices from Lenovo, such as alerts on system updates and alerts on conditions that require your attention.

- **Rescue and Recovery®**

The Rescue and Recovery program is a one-button recovery and restore solution. It includes a set of self-recovery tools to help you diagnose computer problems, get help, and recover from system crashes, even if you cannot start the Windows operating system.

- For Windows 8.1 only:

- **Lenovo Support**

The Lenovo Support program enables you to register your computer with Lenovo, check the computer health condition and battery status, download and view user manuals for your computer, get the warranty information of your computer, and explore help and support information.

- For Windows 10 only:

- **Lenovo ID**

The Lenovo ID program enables you to create your Lenovo ID and access all supported Lenovo programs and web portals with single sign-on.

- For Windows 7 and Windows 8.1:

- **Fingerprint Manager Pro or ThinkVantage Fingerprint Software**

The Fingerprint Manager Pro or ThinkVantage Fingerprint Software program enables you to use a fingerprint reader. The integrated fingerprint reader provided on some keyboards enables you to enroll your fingerprint and associate it with your power-on password, hard disk password, and Windows password. As a result, fingerprint authentication can replace passwords and enable simple and secure user access.

- **Lenovo Bluetooth Lock**

The Lenovo Bluetooth Lock program enables you to use a Bluetooth device (such as your smartphone) as a proximity-based unit for locking or unlocking your computer automatically. By detecting the distance between your computer and the predefined Bluetooth device that you are carrying, the Lenovo Bluetooth Lock program automatically locks your computer when you walk away and unlocks your computer when you come back. This is a simple way to protect your computer against unauthorized access in case that you forget to lock your computer.

- **Password Manager**

The Password Manager program automatically captures and fills in authentication information for Windows programs and Web sites.

- **Power Manager**

The Power Manager program provides convenient, flexible, and complete power management for your computer. It enables you to adjust your computer power settings to achieve the best balance between performance and power saving.

- **System Update**

The System Update program provides regular access to the system updates for your computer, such as device driver updates, software updates, and BIOS updates. The program gathers information from the Lenovo Help Center about new updates for your computer, then sorts and displays the updates for download and installation. You have complete control of which updates to download and install.

- For Windows 8.1 and Windows 10:

- **Lenovo Companion**

Your computer's best features and capabilities should be easy to access and understand. With Lenovo Companion, they are. Use Lenovo Companion to do the following:

- Optimize your computer's performance, monitor your computer's health, and manage updates.
- Access your user guide, check warranty status, and view accessories customized for your computer.
- Read how-to articles, explore Lenovo forums, and stay up-to-date on technology news with articles and blogs from trusted sources.

Lenovo Companion is filled with exclusive Lenovo content to help you learn more about what you can do with your computer.

- For Windows 7, Windows 8.1, and Windows 10:

- **Lenovo Device Experience or Lenovo PC Experience**

The Lenovo Device Experience or Lenovo PC Experience program helps you work more easily and securely. The program provides easy access to Lenovo ThinkVantage Tools or Lenovo Tools, important settings and information about your computer, the Lenovo Support Web site, and so on.

- **Lenovo Solution Center**

The Lenovo Solution Center program enables you to troubleshoot and resolve computer problems. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for maximum system performance.

- **PC Cloud Manager**

The PC Cloud Manager (PCM) program is a browser-based solution for client-computer management. The PCM program has two components: PCM Server and PCM Client. PCM Server is installed on the computer, where the administrator performs management work, such as power management and security management. PCM Client is installed on the client computers to be managed. The administrator can log in to PCM Server to manage computers with PCM Client installed, through the Internet Web browser.





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## Chapter 3. Using your computer



This chapter provides information about the following topics:

- “Using Windows shortcut keys” on page 45
- “Using the wheel mouse” on page 45
- “Setting the computer volume” on page 46
- “Adding an icon to the Windows notification area” on page 46
- “Using a disc” on page 46
- “Navigating among screens on the Windows 8.1 operating system” on page 48
- “Accessing Control Panel on the Windows 8.1 operating system” on page 49
- “Frequently asked questions” on page 49

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### Using Windows shortcut keys

Both the standard keyboard and the fingerprint reader keyboard provide three keys you can use with your Microsoft Windows operating system.

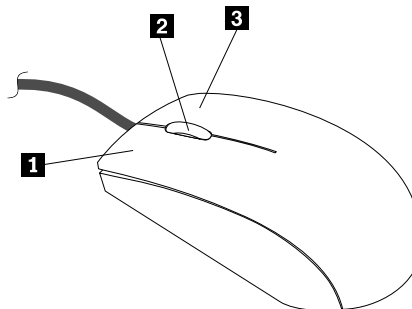
- The two Windows logo keys are located beside the Alt key on either side of the spacebar. They feature the Windows logo. On the Windows 7 or Windows 10 operating system, press the Windows key  to open the Start menu. On the Windows 8.1 operating system, press the Windows key  to switch between the current workspace and the Start screen. The style of the Windows logo varies depending on the keyboard type.
- The context-menu key is located next to the Ctrl key on the right side of the Spacebar. Pressing the context-menu key opens the context menu for the active program, icon, or object.

**Note:** You can use the mouse or the Up and Down arrow keys to highlight menu selections.

---

### Using the wheel mouse

The wheel mouse has the following controls:



- |                                 |   |
|---------------------------------|---|
| <b>1</b> Primary mouse button   | Use this button to select or start a program or menu item.  |
| <b>2</b> Wheel                  | Use the wheel to control the scrolling action of the mouse. The direction in which you rotate the wheel controls the direction of the scrolling action. |
| <b>3</b> Secondary mouse button | Use this button to display a menu for the active program, icon, or object.  |

You can switch the function of the primary and secondary mouse buttons and change other default behavior through the mouse properties function in the Windows Control Panel.

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## Setting the computer volume

To set the computer volume, do the following:

1. Click the volume icon in the Windows notification area on the taskbar.

**Note:** If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. See “Adding an icon to the Windows notification area” on page 46.

2. Follow the instructions on the screen to adjust the volume. Click the speaker icon to mute the audio.

---

## Adding an icon to the Windows notification area

To add an icon to the Windows notification area, do the following:

1. Click the arrow next to the notification area to view hidden icons. Then, click the desired icon and drag it to the notification area.
2. If the icon is not displayed, turn on the icon.
  - a. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Notification Area Icons → Turn system icons on or off**.
    - For Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **Notification Area Icons → Turn system icons on or off**.
  - Note:** For detailed information on how to open Control Panel on Windows 8.1, see “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
  - For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → Personalization → Taskbar → Turn system icons on or off**.
  - b. Turn on the desired icon.
3. If the icon is still not displayed in the Windows notification area, repeat step 1.

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## Using a disc

This section provides information about the following topics:

- “Using the optical drive” on page 46
- “Handling and storing a disc” on page 47
- “Playing and removing a disc” on page 47
- “Recording a disc” on page 47

## Using the optical drive

Depending on the model, your computer is equipped with one of the following optical drives:

- CD-ROM drive: Used to read CDs only.
- DVD-ROM drive: Used to read DVDs and CDs.
- BD-ROM drive: Used to read blu-ray discs (BDs), DVDs, and CDs.
- Recordable optical drive: Used to read and record a disc.

When using the optical drive, follow these guidelines:

- Do not place the computer in a location where the drive is exposed to any of the following conditions:
  - High temperature
  - High humidity
  - Excessive dust
  - Excessive vibration or sudden shock
  - An inclined surface
  - Direct sunlight
- Do not insert any object other than a disc into the drive.
- Do not insert damaged discs into the drive. Warped, scratched, or dirty discs can damage the drive.
- Before moving the computer, remove the disc from the drive.

## Handling and storing a disc

When handling and storing a disc, follow these guidelines:

- Hold the disc by its edges. Do not touch the surface of the side that is not labeled.
- To remove dust or fingerprints, wipe the disc with a clean, soft cloth from the center to the outside. Wiping the disc in a circular direction might cause loss of data.
- Do not write or stick paper on the disc.
- Do not scratch or mark the disc.
- Do not place or store the disc in direct sunlight.
- Do not use benzene, thinners, or other cleaners to clean the disc.
- Do not drop or bend the disc.

## Playing and removing a disc

To play a disc, do the following:

1. With the computer on, press the eject/close button on the front of the optical drive. The tray slides out of the drive.
2. Insert a disc into the tray. Some optical drive has a snap hub in the center of the tray. If your drive has a snap hub, support the tray with one hand and then push center of the disc until it snaps into place.
3. Press the eject/close button again or gently push the tray forward to close the tray. The disc player program starts automatically. For more information, refer to the help system of the disc player program.

To remove a disc from the optical drive, do the following:

1. With the computer on, press the eject/close button on the front of the optical drive. The tray slides out of the drive.
2. Carefully remove the disc from the tray.
3. Press the eject/close button again or gently push the tray forward to close the tray.

**Note:** If the tray does not slide out of the drive when you press the eject/close button, turn off your computer. Then, insert a straightened paper clip into the emergency-eject hole adjacent to the eject/close button. Use the emergency eject only in an emergency.

## Recording a disc

If your optical drive supports recording, you can record a CD or DVD.








To record a CD or DVD, do the following:

1. Insert a recordable disc into the optical drive that supports recording.
2. Open the PowerDVD Create, PowerProducer, or Power2Go program. See “Accessing a program on your computer” on page 40.
3. Follow the instructions on the screen.

---


## Navigating among screens on the Windows 8.1 operating system

To navigate among the desktop, the Start screen, and applications opened from the Start screen on the Windows 8.1 operating system, do one of the following:

- From the Start screen, do one of the following to navigate to the most recently accessed workspace (application, setting, or desktop):
  - Using a pointing device: Move the pointer to the extreme bottom-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
  - Using a touch screen: Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the Windows screen-control icon  at the bottom.
- **Note:** The Windows screen-control icon  is displayed only when you have at least one active workspace in the background of the system.
- From the desktop or any other workspace that is opened from the Start screen, do one of the following to navigate to the Start screen:
  - Using a pointing device:
    - From the desktop, click the Windows screen-control icon  in the bottom-left corner of the screen.
    - From any other workspace, move the pointer to the extreme bottom-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
  - Using a touch screen: Do one of the following:
    - From the desktop, tap the Windows screen-control icon  in the bottom-left corner of the screen.
    - From any other workspace, do one of the following:
      - Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the Windows screen-control icon  at the bottom.
      - Swipe in from the right edge of the screen to display the charms; then tap **Start**.
- From any workspace (Start screen, desktop, PC settings, or application opened from the Start screen), go to another previously-opened workspace using any of the following procedures:
  - To navigate to a previously accessed workspace (application, setting, or desktop), do one of the following:
    - Using a pointing device:
      1. Do one of the following:
        - Move the pointer to the extreme top-left corner of the screen and then move the pointer downward along the left edge of the screen.
        - Move the pointer to the extreme bottom-left corner of the screen and then move the pointer upward along the left edge of the screen.

Representations of all available workspaces are displayed along the left edge of the screen.

**Note:** Only active workspaces that you have accessed during the current Windows session are displayed along the left edge. If you close an active workspace, its representation will not be displayed along the left edge of the screen.


2. Click the representation.
- Using a touch screen:
    - Method 1
      1. Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen.
      2. Tap the desired workspace.
    - Method 2
      1. Swipe in from the left edge of the screen to navigate to the next available workspace.
      2. Repeat step 1 until you navigate to the desired workspace.
  - To navigate to the most recently accessed workspace (application, PC settings, or desktop), do one of the following:
    - Using a pointing device: Move the pointer to the extreme top-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
    - Using a touch screen: Swipe in from the left edge of the screen.

For information about using other features of the Windows 8.1 operating system, open the **Help+Tips** application from the Start screen or Apps screen. Alternatively, refer to the Windows help system. For more information, see “Windows help system” on page 149.

---

## Accessing Control Panel on the Windows 8.1 operating system

On the Windows operating system, you can view and change computer settings through Control Panel. To access Control Panel on the Windows 8.1 operating system, do one of the following:

- From the desktop
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms.
  2. Click **Settings**.
  3. Click **Control Panel**.
- From the Start screen
  1. Click the down arrow  in the bottom-left corner of the screen to go to the Apps screen.
  2. Scroll to the right side, and click **Control Panel** in the **Windows System** section.

---

## Frequently asked questions

The following are some of the frequently asked questions and their answers. The answers can help you optimize the use of your computer.

For the answers to more frequently asked questions about using your computer, go to:  
<http://www.lenovo.com/support/faq>

### How can I get my user guide in another language?

The user guide is available in various languages at:  
<http://www.lenovo.com/UserManuals>

### **Where is my recovery disc set or recovery USB key?**

Depending on your Windows version, your computer comes with a recovery disc set or recovery USB key. If your computer does not come with it, contact the Lenovo Customer Support Center to order a recovery disc set or recovery USB key. For a list of Lenovo Support phone numbers, go to <http://www.lenovo.com/support/phone>. If you cannot find the support telephone number for your country or region, contact your Lenovo reseller.

### **Where can I find help about the Windows operating system?**

See “Windows help system” on page 149.

### **How can I change the Windows 8.1 startup behavior to open either the desktop or the Start screen?**

On the Windows 8.1 operating system, you can set the computer to open either the desktop or the Start screen by default. To set the default startup screen, do the following:

1. On the desktop, right-click on the taskbar at the bottom of the screen.
2. Click **Properties**. The “Taskbar and Navigation properties” window is displayed.
3. On the **Navigation** tab, locate the **Start screen** section, and then do one of the following:
  - To set the desktop as your default startup screen, select **When I sign in or close all apps on a screen, go to the desktop instead of Start**.
  - To set the Start screen as your default startup screen, clear the **When I sign in or close all apps on a screen, go to the desktop instead of Start** check box.
4. Click **OK** to save the new setting.

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## Chapter 4. You and your computer

This chapter provides information about accessibility, comfort, and relocating your computer to other countries or regions.

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### Accessibility and comfort

Good ergonomic practice is important to get the most from your personal computer and to avoid discomfort. Arrange your workplace and the equipment you use to suit your individual needs and the kind of work that you perform. In addition, use healthy work habits to maximize your performance and comfort while using your computer.

The following topics provide information about arranging your work area, setting up your computer equipment, and establishing healthy work habits.

### Arranging your workspace

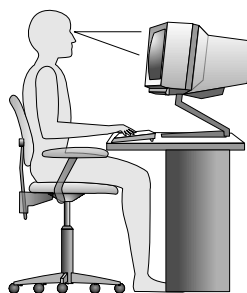
To get the most from your computer, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets can also affect the way you arrange your workspace.

### Comfort

Although no single working position is ideal for everyone, here are a few guidelines to help you find a position that suits you best.

Sitting in the same position for a long time can cause fatigue. The backrest and seat of your chair should adjust independently and provide good support. The seat should have a curved front to relieve pressure on the thighs. Adjust the seat so that your thighs are parallel to the floor and your feet are either flat on the floor or on a footrest.

When using the keyboard, keep your forearms parallel to the floor and your wrists in a comfortable position. Use a light touch on the keyboard and your hands and fingers relaxed. Change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.



Adjust the monitor so the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance, usually 51–61 cm (20–24 inches). Then, position the monitor so that you can view it without twisting your body. Also, position other equipment you use regularly, such as the telephone or a mouse, within easy reach.

## Glare and lighting

Position the monitor to minimize glare and reflections from overhead lights, windows, and other light sources. Reflected light from shiny surfaces can cause annoying reflections on your monitor screen. Place the monitor at right angles to windows and other light sources, when possible. Reduce overhead lighting, if necessary, by turning off lights or using lower wattage bulbs. If you install the monitor near a window, use curtains or blinds to block the sunlight. You can adjust the brightness and contrast controls on the monitor as the room lighting changes throughout the day.

Where it is impossible to avoid reflections or to adjust the lighting, an antiglare filter placed over the screen might be helpful. However, these filters might affect the clarity of the image on the screen; try them only after you have exhausted other methods of reducing glare.

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically using a soft cloth as directed in your monitor documentation.

## Air circulation

Your computer and monitor produce heat. The computer has a fan that pulls in fresh air and forces out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the computer and monitor so that nothing blocks the air vents; usually, 51 mm (2 inches) of air space is sufficient. Also, ensure that the vented air is not blowing on people.

## Electrical outlets and cable lengths

The following factors might determine the final placement of your computer:

- Location of electrical outlets
- Length of power cords
- Length of the cables that are connected to the monitor and other devices

When arranging your workspace:

- Avoid the use of extension cords. When possible, plug the computer power cord directly into an electrical outlet.
- Keep power cords and cables neatly routed away from walkways and other areas where they might get kicked accidentally.

For more information about power cords, see “Power cords and power adapters” on page 1.

## Accessibility information

Lenovo is committed to providing users who have hearing, vision, and mobility limitations with greater access to information and technology. This section provides information about the ways these users can get the most out of their computer experience. You also can get the most up-to-date accessibility information from the following Web site:

<http://www.lenovo.com/accessibility>

## Keyboard shortcuts

The following table contains keyboard shortcuts that can help make your computer easier to use.

**Note:** Depending on your keyboard, some of the following keyboard shortcuts might not be available.



Keyboard shortcut	Function
Windows logo key + U	Open Ease of Access Center
Right Shift for eight seconds	Turn on or turn off Filter Keys
Shift five times	Turn on or turn off Sticky Keys
Num Lock for five seconds	Turn on or turn off Toggle Keys
Left Alt+Left Shift+Num Lock	Turn on or turn off Mouse Keys
Left Alt+Left Shift+PrtScn (or PrtSc)	Turn on or turn off High Contrast

For more information, go to <http://windows.microsoft.com/>, and then perform a search using any of the following keywords: keyboard shortcuts, key combinations, shortcut keys.

## Ease of Access Center

Ease of Access Center on the Windows operating system enables users to configure their computers to suit their physical and cognitive needs.

To use Ease of Access Center, do the following:

- Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Ease of Access Center**.
  - For Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Ease of Access**.
  - For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → Ease of Access**.
- Choose the appropriate tool by following the instructions on the screen.

Ease of Access Center mainly includes the following tools:

- **Magnifier**  
Magnifier is a useful utility that enlarges the entire screen or part of the screen so that you can see the items better.
- **Narrator**  
Narrator is a screen reader that reads aloud what is displayed on the screen and describes events such as error messages.
- **On-Screen Keyboard**  
If you prefer to type or enter data into your computer using a mouse, joystick, or other pointing device instead of a physical keyboard, you can use On-Screen Keyboard. On-Screen Keyboard displays a visual keyboard with all the standard keys.
- **High Contrast**  
High Contrast is a feature that heightens the color contrast of some text and images on your screen. As a result, those items are more distinct and easier to identify.
- **Personalized keyboard**  
Adjust keyboard settings to make your keyboard easier to use. For example, you can use your keyboard to control the pointer and type certain key combinations easier.
- **Personalized mouse**  
Adjust mouse settings to make your mouse easier to use. For example, you can change the pointer appearance and make it easier to manage windows with the mouse.

## Speech Recognition

Speech Recognition enables you to control your computer by voice.

Using only your voice, you can start programs, open menus, click objects on the screen, dictate text into documents, and write and send e-mails. Everything you do with the keyboard and mouse can be done with only your voice.

To use Speech Recognition, do the following:

1. Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
  - For Windows 8.1: Open Control Panel. See “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
  - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
2. View Control Panel using Large icons or Small icons, and then click **Speech Recognition**.
3. Follow the instructions on the screen.

## Screen-reader technologies

Screen-reader technologies are primarily focused on software program interfaces, help information systems, and various online documents. For additional information about screen readers, see the following:

- Using PDFs with screen readers:  
<http://www.adobe.com/accessibility.html?promoid=DJGVE>
- Using the JAWS screen reader:  
<http://www.freedomscientific.com/jaws-hq.asp>
- Using the NVDA screen reader:  
<http://www.nvaccess.org/>

## Screen resolution

You can make the text and images on your screen easier to read by adjusting the screen resolution of your computer.

To adjust the screen resolution, do the following:

1. Right-click a blank area on the desktop.
2. Depending on your Windows version, do one of the following:
  - For Windows 7 or Windows 8.1: Click **Screen resolution**.
  - For Windows 10: Click **Display settings**. On the **Display** tab, click **Advanced display settings**.
3. Follow the instructions on the screen.

**Note:** Setting the resolution too low might prevent some items from fitting on the screen.

## Customizable item size

You can make the items on your screen easier to read by changing the item size.

- To change the item size temporarily, use the Magnifier tool in Ease of Access Center. See “Ease of Access Center” on page 53.
- To change the item size permanently, do the following:
  - Change the size of all the items on your screen.

1. Right-click a blank area on the desktop.
2. Depending on your Windows version, do one of the following:
  - For Windows 7 or Windows 8.1: Click **Screen resolution → Make text and other items larger or smaller**.
  - For Windows 10: Click **Display settings**.
3. Change the item size by following the instructions on the screen.
  - Change the size of the items on a Web page.

Press and hold Ctrl, and then press the plus-sign key (+) to enlarge or the minus-sign key (-) to reduce the text size.
  - Change the size of the items on the desktop or a window.

**Note:** This function might not work on some windows.

If your mouse has a wheel, press and hold Ctrl, and then scroll the wheel to change the item size.

### Industry-standard connectors

Your computer provides industry-standard connectors that enable you to connect assistive devices.

For more information about the location and function of the connectors, see “Locations” on page 27.

### TTY/TDD conversion modem

Your computer supports the use of a text telephone (TTY) or the telecommunications device for the deaf (TDD) conversion modem. The modem must be connected between your computer and a TTY/TDD telephone. Then, you can type a message on your computer and send it to the telephone.

### Documentation in accessible formats

Lenovo provides electronic documentation in accessible formats, such as properly tagged PDF files or HyperText Markup Language (HTML) files. Lenovo electronic documentation is developed to ensure that visually impaired users can read the documentation through a screen reader. Each image in the documentation also includes adequate alternative text so that visually impaired users can understand the image when they use a screen reader.

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## Registering your computer

When you register your computer with Lenovo, you enter required information into a Lenovo database. The information enables Lenovo to contact you when there is a recall or other severe problem and provide quicker service when you call Lenovo for help. In addition, some locations offer extended privileges and services to registered users.

To register your computer with Lenovo, ensure that your computer is connected to the Internet. Then, go to <http://www.lenovo.com/register> and follow the instructions on the screen.

---

## Moving your computer to another country or region

When you move your computer to another country or region, you must take local electrical standards into consideration.

If you relocate your computer to a country or region that uses an electrical outlet style different from the type you are currently using, you will have to purchase either electrical plug adapters or new power cords. You can order power cords directly from Lenovo.

For power cord information and part numbers, go to:  
<http://www.lenovo.com/powercordnotice>

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## Chapter 5. Security

This chapter provides information about how to protect your computer from theft and unauthorized use.

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### Security features

The following security features are available on your computer:

- Computrace Agent software embedded in firmware

The Computrace Agent software is an IT asset management and computer theft recovery solution. The software detects if changes have been made on the computer, such as hardware, software, or the computer call-in location.

**Note:** You might have to purchase a subscription to activate the Computrace Agent software.

- Cover presence switch (also called intrusion switch)

The cover presence switch prevents your computer from logging in to the operating system when the computer cover is not properly installed or closed. To enable the cover presence switch connector on the system board, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. Set the administrator password. See “Setting, changing, and deleting a password” on page 62.
3. From the **Security** submenu, select **Chassis Intrusion Detection → Enabled**. The cover presence switch connector on the system board is enabled.

When you turn on the computer, if the cover presence switch detects that your computer cover is not correctly installed or closed, an error message will be displayed. To bypass the error message and log in to the operating system, do the following:

1. Properly install or close your computer cover. See “Completing the parts replacement” on page 147.
2. Press F1 to enter the Setup Utility program. Then press F10 to save and exit the Setup Utility program. The error message will not be displayed again.

- Ability to enable and disable devices and USB connectors

For more information, see “Enabling or disabling a device” on page 63.

- Integrated fingerprint reader (available on some models)

Fingerprint authentication can replace passwords and enable simple and secure user access. For more information, see “Using fingerprint authentication” on page 60.

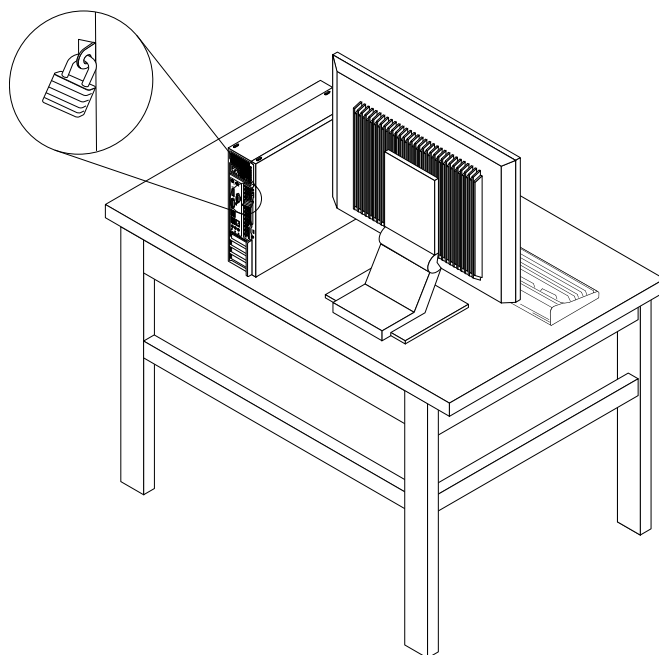
- Trusted Platform Module (TPM)

Trusted Platform Module is a secure cryptoprocessor that can store cryptographic keys that protect information stored in your computer.

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### Locking the computer cover

Locking the computer cover helps prevent unauthorized people from gaining access to the inside of your computer. Your computer comes with a padlock loop so that the computer cover cannot be removed when a padlock is installed.



*Figure 8. Installing a padlock*

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## Attaching a Kensington-style cable lock

You can use a Kensington-style cable lock to secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to the security-lock slot at the rear of your computer. Depending on the type selected, the cable lock can be operated with a key or combination. The cable lock also locks the buttons used to open the computer cover. This is the same type of lock used with many notebook computers. You can order such a cable lock directly from Lenovo by searching for *Kensington* at: <http://www.lenovo.com/support>

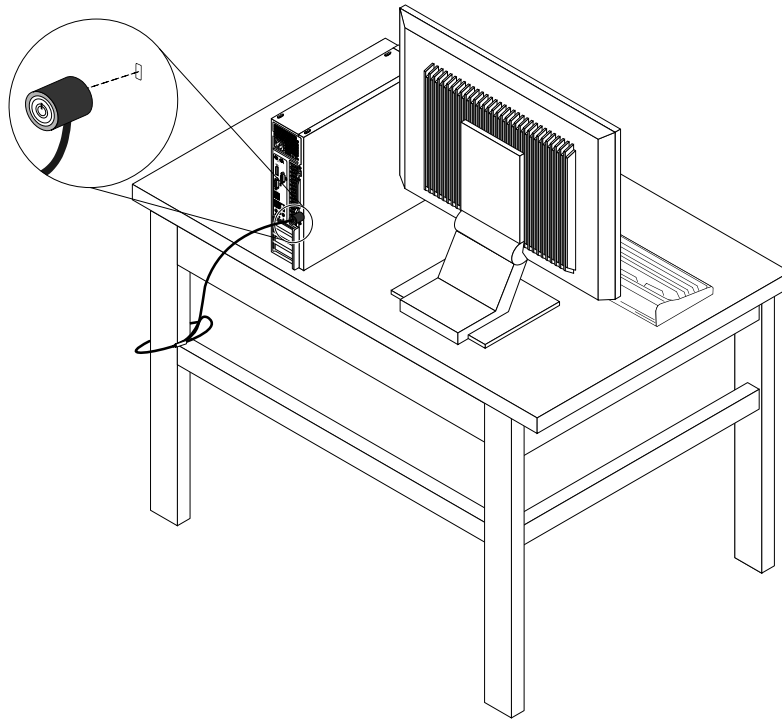


Figure 9. Kensington-style cable lock

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## Preventing unauthorized access to your computer

You can use BIOS passwords and Windows accounts to prevent unauthorized access to your computer and data.

- To use BIOS passwords, see “Using BIOS passwords” on page 62.
- To use Windows accounts, do the following:
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel → User Accounts**.
    - For Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Accounts**.
    - For Windows 10: Click the Start button to open the Start menu, and then click **Settings → Accounts**.
  2. Follow the instructions on the screen.

---

## Using fingerprint authentication

If your keyboard has a fingerprint reader, you can use fingerprint authentication to replace passwords for simple and secure user access. To use fingerprint authentication, first enroll your fingerprints and associate them with your passwords (such as the power-on password, hard disk password, and Windows password). Use the fingerprint reader and the fingerprint program to complete this procedure.

To use fingerprint authentication, do one of the following:

- For Windows 7 or Windows 8.1: Use the Fingerprint Manager Pro or ThinkVantage Fingerprint Software program provided by Lenovo. To open the program, see “Accessing a program on your computer” on page 40. For more information about using the program, refer to the help system of the program.
- For Windows 10: Use the fingerprint tool provided by Windows. Click the Start button to open the Start menu, and then click **Settings → Accounts → Sign-in options**. Follow the instructions on the screen.

To use the fingerprint reader, refer to the documentation shipped with the fingerprint keyboard or located on the Lenovo Support Web site at <http://www.lenovo.com/support/keyboards>.

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## Using and understanding firewalls

A firewall can be hardware, software, or a combination of both depending on the level of security required. Firewalls work on a set of rules to determine which inbound and outbound connections are authorized. If your computer is preinstalled with a firewall program, it helps protect against computer Internet security threats, unauthorized access, intrusions, and Internet attacks. It also protects your privacy. For more information about how to use the firewall program, refer to the help system of your firewall program.

The Windows operating system preinstalled on your computer provides the Windows Firewall. For details on using the Windows Firewall, refer to “Windows help system” on page 149.

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## Protecting data against viruses

Your computer is preinstalled with an antivirus program to help you guard against, detect, and eliminate viruses.

Lenovo provides a full version of antivirus software on your computer with a free 30-day subscription. After 30 days, you must renew the license to continue receiving the antivirus software updates.

**Note:** Virus definition files must be kept up-to-date to guard against new viruses.

For more information about how to use your antivirus software, refer to the help system of your antivirus software.



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## Chapter 6. Advanced configuration

This chapter provides the following information to help you configure the computer:

- “Using the Setup Utility program” on page 61
- “Updating or recovering the BIOS” on page 66

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### Using the Setup Utility program

The Setup Utility program is used to view and change the configuration settings of your computer, regardless of which operating system you are using. However, the operating system settings might override any similar settings in the Setup Utility program.

### Starting the Setup Utility program

To start the Setup Utility program, do the following:

1. Ensure that your computer is turned off.
2. Repeatedly press and release the F1 key when turning on the computer. When you hear multiple beeps or see a logo screen, release the F1 key.

**Note:** If a power-on password or an administrator password has been set, the Setup Utility program menu will not be displayed until you enter the correct password. For more information, see “Using BIOS passwords” on page 62.

When the POST detects that the hard disk drive has been removed from your computer or the memory size has decreased, an error message will be displayed. You must do one of the following:

- Press F1 to enter the Setup Utility program.

**Note:** After you enter the Setup Utility program, press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit. The error message will not be displayed again.

- Press F2 to bypass the error message and log in to the operating system.

**Note:** You have to enable the configuration change detection feature for the POST to detect the removal of the hard disk drive. To enable the configuration change detection feature, do the following:

1. Start the Setup Utility program.
2. From the Setup Utility program main menu, select **Security → Configuration Change Detection**, and press Enter.
3. Select **Enabled** and press Enter.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

### Viewing and changing settings

The Setup Utility program menu lists various items about the system configuration. To view or change settings, start the Setup Utility program. See “Starting the Setup Utility program” on page 61. Then, follow the instructions on the screen.

You can use either the keyboard or the mouse to navigate through menu choices. The keys used to perform various tasks are displayed at the bottom of each screen.

## Using BIOS passwords

By using the Setup Utility program, you can set passwords to prevent unauthorized access to your computer and data.

You do not have to set any passwords to use your computer. However, using passwords improves computing security. If you decide to set any passwords, read the following sections.

### Setup Utility program password types

The following types of passwords are available:

- **Power-on password**  
When a power-on password is set, you are prompted to enter a valid password each time the computer is turned on. The computer cannot be used until the valid password is entered.
- **Administrator password**  
Setting an administrator password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several computers, you might want to set an Administrator password.  
  
When an administrator password is set, you are prompted to enter a valid password each time you try to access the Setup Utility program. The Setup Utility program cannot be accessed until a valid password is entered.  
  
If both the power-on password and administrator password are set, you can enter either password. However, you must use your Administrator password to change any configuration settings.
- **Hard disk password**  
Setting a hard disk password prevents unauthorized access to the data on the hard disk drive. When a hard disk password is set, you are prompted to enter a valid password each time you try to access the hard disk drive.

#### Notes:

- After you set a hard disk password, your data on the hard disk drive is protected even if the hard disk drive is removed from one computer and installed in another.
- If the hard disk password is forgotten, there is no way to reset the password or recover data from the hard disk drive.

### Password considerations

A password can be any combination of up to 64 alphabetic and numeric characters. For security reasons, it is recommended to use a strong password that cannot be easily compromised.

**Note:** The Setup Utility program passwords are not case sensitive.

To set a strong password, consider the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

### Setting, changing, and deleting a password

To set, change, or delete a password, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Security**.

3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password**.
4. Follow the instructions on the right side of the screen to set, change, or delete a password.

**Note:** A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see “Password considerations” on page 62.

## Erasing lost or forgotten passwords (clearing CMOS)

This section provides instructions on how to erase lost or forgotten passwords, such as a user password.

To erase a lost or forgotten password, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 34.
4. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
5. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 147.
6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power button for approximately five seconds.
7. Repeat step 1 through step 2.
8. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
9. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 147.

## Enabling or disabling a device

This section provides information on how to enable or disable user access to the following devices:

<b>USB Setup</b>	Use this option to enable or disable a USB connector. When a USB connector is disabled, the device connected to the USB connector cannot be used.
<b>SATA Controller</b>	When this option is set to <b>Disable</b> , all devices connected to the SATA connectors (such as hard disk drives or optical drives) are disabled and cannot be accessed.

To enable or disable a device, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Devices**.
3. Depending on the device you want to enable or disable, do one of the following:
  - Select **USB Setup** to enable or disable a USB device.
  - Select **ATA Drive Setup** to enable or disable an internal or external SATA device.
4. Select the desired settings and press Enter.
5. Press F10 to save changes and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 66.

## Selecting a startup device

If your computer does not start up from a device as expected, do one of the following to select the startup device you want.

### Selecting a temporary startup device

Use this procedure to select a temporary startup device.

**Note:** Not all discs and hard disk drives are bootable.

1. Turn on or restart your computer.
2. When you see the logo screen, repeatedly press and release the F12 key. The Startup Device Menu window is displayed.
3. Select the desired startup device and press Enter. The computer will start up from the device you selected.

**Note:** Selecting a startup device from the Startup Device Menu window does not permanently change the startup sequence.

### Selecting or changing the startup device sequence

To view or permanently change the configured startup device sequence, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save changes and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 66.

## Enabling ErP LPS compliance mode

Lenovo computers meet the eco-design requirements of the ErP Lot 3 regulation. For more information, go to:

<http://www.lenovo.com/ecodeclaration>

You can enable ErP LPS compliance mode in the Setup Utility program to reduce the consumption of electricity when your computer is off or in sleep mode.

To enable ErP LPS compliance mode in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Power → Enhanced Power Saving Mode**, and press Enter.
3. Select **Enabled** and press Enter.
4. From the **Power** menu, select **Automatic Power On** and press Enter.
5. Select **Wake on Lan** and press Enter.
6. Select **Disabled** and press Enter.
7. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

When ErP LPS compliance mode is enabled, you can wake up your computer by doing one of the following:

- Press the power button
- Enable the wake up on alarm feature

The wake up on alarm feature enables your computer to wake up at a set time. To enable the wake up on alarm feature, do the following:

1. Start the Setup Utility program.
2. From the Setup Utility program main menu, select **Power → Automatic Power On**, and press Enter.
3. Select **Wake Up on Alarm** and press Enter. Then follow the instructions on the screen.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

- Enable the after power loss feature

The after power loss feature enables your computer to wake up when the power supply resumes after a sudden loss of electricity. To enable the after power loss feature, do the following:

1. Start the Setup Utility program.
2. From the Setup Utility program main menu, select **Power → After Power Loss**, and press Enter.
3. Select **Power On** and press Enter.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

## ICE performance mode

You can adjust the acoustic and thermal performance of your computer through the **ICE Performance Mode** menu. Two choices are available:

- **Better Acoustic Performance** (default setting)
- **Better Thermal Performance**

By enabling **Better Acoustic Performance**, your computer will run with less noise at a normal thermal level. By enabling **Better Thermal Performance**, your computer will run at a better thermal level with normal acoustic performance.

To configure the ICE performance mode, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Power**.
3. Select **Intelligent Cooling Engine (ICE)**. The Intelligent Cooling Engine (ICE) window is displayed.
4. Select **ICE Performance Mode**. The ICE Performance Mode window is displayed.
5. Select **Better Acoustic Performance** or **Better Thermal Performance** as desired.
6. Press F10 to save changes and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 66.

## ICE thermal alert

You can monitor the thermal function of your computer under critical thermal situations through the **ICE Thermal Alert** menu. Two choices are available:

- **Enabled** (default setting)
- **Disabled**

After enabling the ICE thermal alert function, when critical thermal situations occur, such as malfunctioning fans, abnormally high temperature, and poor cooling performances, an alert log will be written into the Windows system log. The alert log can help you identify the thermal problems.

To configure the ICE thermal alert function, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Power**.
3. Select **Intelligent Cooling Engine (ICE)**. The Intelligent Cooling Engine (ICE) window is displayed.
4. Select **ICE Thermal Alert**. The ICE Thermal Alert window is displayed.
5. Select **Enabled** or **Disabled** as desired.
6. Press F10 to save changes and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 66.

## Exiting the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main menu. You might have to press Esc several times. Do one of the following:

- If you want to save the new settings, press F10 to save changes and exit the Setup Utility program.
- If you do not want to save the settings, select **Exit → Discard Changes and Exit**, and then press Enter. When the Reset Without Saving window displays, select **Yes**, and then press Enter to exit the Setup Utility program.
- If you want to return to the default settings, press F9 to load the default settings, and then press F10 to save and exit the Setup Utility program.

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## Updating or recovering the BIOS

Lenovo might make changes and enhancements to the BIOS. When updates are released, they are available as downloadable files on the Lenovo Web site at <http://www.lenovo.com/drivers>. Instructions for using the BIOS updates are available in a TXT file that is included with the update files. For most models, you can download either an update program to create a system-program-update disc or an update program that can be run from the operating system.

This chapter provides information about updating the BIOS, and how to recover from a BIOS update failure.

## BIOS levels

An incorrect level of BIOS can cause false errors and unnecessary FRU replacement. Use the following information to determine the current level of BIOS installed in the computer, the latest BIOS available for the computer, and where to obtain the latest level of BIOS.

- To determine the current Level of BIOS:
  - Start the Setup Utility.
  - Select Standard CMOS Features.
- Sources for obtaining the latest level BIOS available
  1. Lenovo support web site: <http://www.lenovo.com/support/>
  2. Lenovo Customer Support Center
  3. Levels 1 and 2 Support

To update the BIOS, see “Updating or recovering the BIOS” on page 66.

**Note:** BIOS settings vary by operating system. Change the BIOS settings before installing a new operating system. See “Changing the BIOS settings before installing a new operating system” on page 66.

## Changing the BIOS settings before installing a new operating system

BIOS settings vary by operating system. Change the BIOS settings before installing a new operating system.

To change the BIOS settings, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 61.
2. From the Setup Utility program main menu, select **Exit → OS Optimized Default**.
3. Depending on the operating system to be installed, do one of the following:
  - To install the Windows 8.1 (64-bit) operating system, select **Enabled**.
  - To install an operating system other than Windows 8.1 (64-bit), select **Disabled**.
4. Select **Yes** in the window displayed and press Enter to confirm your selection.
5. Press F10 to save changes and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 66.

## Using system programs

System programs are the basic layer of software built into your computer. System programs include the POST, the BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your computer. The BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your computer. See “Using the Setup Utility program” on page 61 for detailed information.

The system board of your computer has a module called electrically erasable programmable read-only memory (EEPROM, also referred to as flash memory). It enables you to update the POST, the BIOS, and the Setup Utility program easily. To perform such an update, you can either start your computer with a system-program-update disc or run a special update program from your operating system.

Lenovo might make changes and enhancements to the POST and BIOS. When updates are released, they are available as downloadable files on the Lenovo Web site at <http://www.lenovo.com>. Instructions for using the POST and BIOS updates are available in a TXT file that is included with the update files. For most models, you can download an update program that can be used to create a system-program-update disc or be run from the operating system.

## Updating the BIOS

When you install a new program, hardware device, or device driver, you might be informed to update the BIOS. You can update the BIOS from your operating system or a flash update disc (supported only on some models).

To update the BIOS, do the following:

1. Go to <http://www.lenovo.com/drivers>.
2. Download the flash BIOS update driver for the operating system version or the ISO image version (used to create a flash update disc). Then, download the installation instructions for the flash BIOS update driver you download.
3. Print the installation instructions you download and follow the instructions to update the BIOS.

**Note:** If you want to update the BIOS from a flash update disc, the installation instructions might not provide the information about how to record the update disc. See “Recording a disc” on page 47.

## Recovering from a BIOS update failure

To recover from a BIOS update failure, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 34.

4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
7. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. See "Completing the parts replacement" on page 147.
8. Press the power button to turn on the computer and insert the BIOS update disc into the optical drive. Wait a few minutes. The recovery process begins. After the recovery process is completed, your computer will be turned off automatically.

**Note:** Depending on the computer model, the recovery process will take two to three minutes.

9. Repeat step 1 through step 4.
10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
11. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
12. Reinstall the computer cover and reconnect any cables that were disconnected.
13. Press the power button to turn on the computer and restart the operating system.



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## Chapter 7. Preventing problems

This chapter provides information that can help you avoid common problems and keep your computer running smoothly.

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### Keeping your computer current

In most cases, it is a good practice to have the most up-to-date operating system update patches, software programs, and device drivers. This section provides information about how to get the latest updates for your computer.

### Getting the latest device drivers for your computer

**Attention:** Reinstalling device drivers will change the current configuration of your computer.

To get the latest device drivers for your computer, do one of the following:

- Download the device drivers that are preinstalled on your computer. Go to <http://www.lenovo.com/drivers>.
- Use the Lenovo program or Windows Update. See “Getting the latest system updates” on page 69.

**Note:** The device drivers provided by Windows Update might not be tested by Lenovo. It is recommended that you get device drivers from Lenovo.

### Getting the latest system updates

To get the latest system updates for your computer, ensure that your computer is connected to the Internet and do one of the following:

- Use one of the following Lenovo programs to get the system updates, such as device driver updates, software updates, and BIOS updates:
  - For Windows 7 or Windows 8.1: Use the System Update program.
  - For Windows 10: Use the Lenovo Companion program.

To open the System Update or Lenovo Companion program, see “Accessing a program on your computer” on page 40. For more information about using the program, refer to the help system of the program.

- Use Windows Update to get the system updates, such as security fixes, new versions of Windows components, and device driver updates.
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Windows Update**.
    - For Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Update and recovery → Windows Update**.
    - For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → Update & security → Windows Update**.
  2. Follow the instructions on the screen.

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### Cleaning and maintenance

With appropriate care and maintenance your computer will serve you reliably. The following topics offer information to help you keep your computer in top working order.

## Basics

Here are some basic points about keeping your computer functioning properly:

- Keep your computer in a clean, dry environment. Ensure that the computer rests on a flat, steady surface.
- Do not cover any of the vents in the computer or monitor. These vents provide airflow to keep your computer from overheating.
- Keep food and drinks away from all parts of your computer. Food particles and spills might make the keyboard and mouse stick and unusable.
- Do not get the power switches or other controls wet. Moisture can damage these parts and cause an electrical hazard.
- Always disconnect a power cord by grasping the plug instead of the cord.

## Cleaning your computer

It is a good practice to clean your computer periodically to protect the surfaces and ensure trouble-free operation.

### CAUTION:

**Be sure to turn off the computer and monitor before cleaning the computer and monitor screen.**

## Computer

Use only mild cleaning solutions and a damp cloth to clean the painted surfaces of the computer.

## Keyboard

To clean your computer keyboard, do the following:

1. Apply some isopropyl rubbing alcohol to a soft, dust-free cloth.
2. Wipe each keytop surface with the cloth. Wipe the keys one by one; if you wipe several keys at a time, the cloth may hook onto an adjacent key and possibly damage it. Ensure that no liquid drips onto or between the keys.
3. To remove any crumbs or dust from beneath the keys, you can use a camera blower with a brush or cool air from a hair dryer.

**Note:** Avoid spraying cleaner directly onto the keyboard.

## Optical mouse

An optical mouse uses a light-emitting diode (LED) and an optical sensor to navigate the pointer. If the pointer on the screen does not move smoothly with the optical mouse, you might need to clean the mouse.

To clean an optical mouse, do the following:

1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down to check the lens.
  - If there is a smudge on the lens, gently clean the area with a plain cotton-tipped swab.
  - If there is debris in the lens, gently blow the debris away from the area.
4. Check the surface on which you are using the mouse. If you have a very intricate picture or pattern beneath the mouse, it might be difficult for the digital signal processor to determine changes in the mouse position.
5. Reconnect the mouse cable to the computer.
6. Turn your computer back on.

## Display screen

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically.

### Cleaning a flat-panel monitor surface

To clean the flexible film surface of a flat-panel computer display, wipe it gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Then moisten a cloth with LCD cleaner and wipe the screen surface.

Many computer supply stores carry the special cleaning fluids for displays. Use cleaning fluids developed for LCD displays only. First apply the fluid to a lint-free, soft cloth, then clean the LCD display. Some computer supply stores carry pre-moistened towelettes for LCD maintenance.

### Cleaning a glass-screen surface

To clean a glass-screen surface, wipe it gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Then use a soft cloth moistened with a nonabrasive liquid glass cleaner.

## Good maintenance practices

By performing a few good maintenance practices, you can maintain good computer performance, protect your data, and be prepared in case of a computer failure.

- Keep your computer software, device drivers, and operating system up-to-date. See “Keeping your computer current ” on page 69.
- Empty your recycle bin on a regular basis.
- Clean out your Inbox, Sent Items, and Deleted Items folders in your e-mail application on a regular basis.
- Clean up files and free up storage drive space and memory space occasionally to prevent performance problems. See “Performance and lockup problems” on page 81.
- Keep a log book. Entries might include major software or hardware changes, device-driver updates, intermittent problems and what you did to resolve them, and other issues you might have experienced. The cause of a problem might be change in hardware, change in software, or any other actions that might have taken place. A log book can help you or a Lenovo technician determine the cause of a problem.
- Back up your data on the storage drive regularly. You can restore the storage drive from a backup.

To back up your data, do one of the following:

- For Windows 7: Open the Rescue and Recovery program. See “Accessing a program on your computer” on page 40. For more information about backing up your data, refer to the help system of the program.
- For Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **File History**. Follow the instructions on the screen.

**Note:** For detailed information on how to open Control Panel on Windows 8.1, see “Accessing Control Panel on the Windows 8.1 operating system” on page 49.

- For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **File History**. Follow the instructions on the screen.
- Create a recovery medium as early as possible. You can use the recovery medium to recover your operating system even if Windows fails to start up.

To create a recovery medium, do one of the following:

- For Windows 7: Open the Create Recovery Media program. See “Accessing a program on your computer” on page 40. For more information about creating a recovery medium, refer to the help system of the program.

- For Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **Recovery**. Follow the instructions on the screen.

**Note:** For detailed information on how to open Control Panel on Windows 8.1, see “Accessing Control Panel on the Windows 8.1 operating system” on page 49.

- For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Recovery**. Follow the instructions on the screen.
- For Windows 7, create a rescue medium as early as possible. You can use the rescue medium to recover from failures that prevent you from gaining access to the Rescue and Recovery workspace on your storage drive.

To create a rescue medium, open the Rescue and Recovery program. See “Accessing a program on your computer” on page 40. For more information about creating a rescue medium, refer to the help system of the program.

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## Moving your computer

Take the following precautions before moving your computer:

1. Back up all files and data from the hard disk drive. There are a variety of backup programs available commercially. If you use the Windows 7 operating system, Lenovo provides the Rescue and Recovery program to help you back up and restore data. See “Performing backup and recovery operations” on page 94.
2. Remove all media from your computer, such as discs, USB storage devices, memory cards, and so on.
3. Turn off the computer and all attached devices. Your hard disk drive automatically parks the read/write head in a nondata area. This prevents damage to the hard disk drive.
4. Unplug the power cords from electrical outlets.
5. Disconnect communication cables, such as modem or network cables, from the outlets first, and then disconnect the other ends from the computer.
6. Note where any remaining cables are attached to the computer; then, remove them.
7. If you saved the original shipping cartons and packing materials, use them to pack the units. If you are using different cartons, cushion the units to avoid damage.

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## Chapter 8. Troubleshooting and diagnostics

This chapter provides information about diagnosing and troubleshooting computer problems. If your computer problem is not described here, see Chapter 12 “Getting information, help, and service” on page 149 for additional troubleshooting resources.

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### Basic troubleshooting

The following table provides some basic instructions to help you troubleshoot your computer problems.

**Note:** If you cannot correct the problem, have the computer serviced. For a list of service and support telephone numbers, refer to the *Safety, Warranty, and Setup Guide* that comes with your computer or go to the Lenovo Support Web site at:

<http://www.lenovo.com/support/phone>

Symptom	Action
The computer does not start when you press the power button.	Ensure that: <ul style="list-style-type: none"><li>• The power cord is correctly connected to the rear of the computer and to a working electrical outlet.</li><li>• If your computer has a secondary power switch on the rear of the computer, ensure that it is switched on.</li><li>• The power indicator on the front of the computer is on.</li><li>• The computer voltage matches the voltage available at the electrical outlet for your country or region.</li></ul>
The monitor screen is blank.	Ensure that: <ul style="list-style-type: none"><li>• The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the computer.</li><li>• The monitor power cord is correctly connected to the monitor and to a working electrical outlet.</li><li>• The monitor is turned on and the brightness and contrast is set correctly.</li><li>• The computer voltage matches the voltage available at the electrical outlet for your country or region.</li><li>• If your computer has a discrete graphics card installed, be sure to use a monitor connector on the discrete graphics card.</li></ul>
The keyboard does not work.	Ensure that: <ul style="list-style-type: none"><li>• The computer is turned on.</li><li>• The keyboard is securely connected to a PS/2 keyboard connector or a USB connector on the computer.</li><li>• No keys are stuck.</li></ul>
The mouse does not work.	Ensure that: <ul style="list-style-type: none"><li>• The computer is turned on.</li><li>• The mouse is securely connected to a PS/2 mouse connector or a USB connector on the computer.</li><li>• The mouse is clean. Refer to “Optical mouse” on page 70 for further information.</li></ul>

Symptom	Action
The operating system does not start.	Ensure that the startup sequence includes the device where the operating system resides. Usually, the operating system is on the hard disk drive. For more information, see “Selecting a startup device” on page 64.
The computer beeps multiple times before the operating system starts.	Ensure that no keys are stuck.

## Troubleshooting procedure

Use the following procedure as a starting point for diagnosing problems you are experiencing with your computer:

1. Ensure that the cables for all attached devices are connected correctly and securely.
2. Ensure that all attached devices that require ac power are connected to properly grounded, functioning electrical outlets.
3. Ensure that all attached devices are enabled in the BIOS settings of your computer. For more information about accessing and changing the BIOS settings, refer to “Using the Setup Utility program” on page 61.
4. Go to “Troubleshooting” on page 74 and follow the instructions for the type of problem you are experiencing. If the Troubleshooting information does not help you resolve a problem, continue with the next step.
5. Try using a previously captured configuration to see if a recent change to hardware or software settings has caused a problem. Before restoring a previous configuration, capture your current configuration in case the older configuration settings do not solve the problem or have adverse effects. To restore a captured configuration, do the following:
  - a. Open Control Panel by doing one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
    - For Windows 8.1: See “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
    - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
  - b. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
  - c. Follow the instructions on the screen.

If this does not correct the problem, continue with the next step.
6. Run the diagnostic program. See “Lenovo Solution Center” on page 84 for more information.
  - If the diagnostic program detects a hardware failure or if you are unable to run the diagnostic program, contact the Lenovo Customer Support Center. See Chapter 12 “Getting information, help, and service” on page 149 for more information.
  - If the diagnostic program does not detect a hardware failure, continue with the next step.
7. Use an antivirus program to see if your computer has been infected by a virus. If the program detects a virus, remove the virus.
8. If none of these actions solve the problem, seek technical assistance. See Chapter 12 “Getting information, help, and service” on page 149 for more information.

## Troubleshooting

Use the troubleshooting information to find solutions to problems that have definite symptoms.

If the symptom occurred immediately after you installed new software or a new hardware option, do the following before referring to the troubleshooting information:

1. Remove the new hardware option or software. If you must remove the computer cover to remove a hardware option, ensure that you review and follow the electrical safety information provided with your computer. For your safety, do not operate the computer with the cover removed.
2. Run the diagnostic program to ensure your computer is operating correctly.
3. Reinstall the new hardware option or software following the instructions provided by the manufacturer.

## Audio problems

This section provides solutions to audio-related problems.

### No audio in Windows

Solutions:

- If you are using powered external speakers that have an On/Off control, ensure the following:
  - The On/Off control is set to the **On** position.
  - The speaker power cable is connected to a properly grounded, functional ac electrical outlet.
- If your external speakers have a volume control, ensure that the volume is not set too low.
- On the Windows desktop, click the speaker icon in the Windows notification area. Then click **Mixer**. Ensure that the mute speakers settings are not selected and none of the volume settings is set too low.
- Some models have a front audio panel you can use to adjust volume. If you have a front audio panel, ensure that the volume is not set too low.
- Ensure that your external speakers (and headphones, if used) are connected to the correct audio connector on the computer. Most speaker cables are color-coded to match the connector.

**Note:** When external-speaker or headphone cables are attached to the audio connector, the internal speaker, if present, is disabled. In most cases, if an audio adapter is installed in one of the expansion slots, the audio function built into the system board is disabled. Therefore, you must use the audio connectors on the audio adapter.

- Ensure that the program you are running is designed for use in the Microsoft Windows operating system. If the program is designed to run in DOS, the program does not use the Windows sound feature. The program must be configured to use SoundBlaster Pro or SoundBlaster emulation.
- Ensure that the audio device drivers are correctly installed. See Windows help system for more information.

### Sound comes from one external speaker only

Solutions:

- Ensure that the speaker cable is inserted completely into the connector on the computer.
- Ensure that the cable that attaches the left speaker to the right speaker is securely connected.
- Click the speaker icon in the Windows notification area. Then click the speaker icon on top of the volume control. Click the **Levels** tab and ensure that the Balance settings are set correctly .

## CD problems

This section provides solutions to CD-related problems.

### A CD or DVD does not work

Solutions:

- Ensure that the disc is inserted correctly, with its label up.

- Ensure that the disc you are using is clean. To remove dust or fingerprints, wipe the disc clean with a soft cloth from the center to the outside. Wiping a disc in a circular motion might cause loss of data.
- Ensure that the disc you are using is not scratched or damaged. Try inserting another disc that you know is good. If you cannot read from a known-good disc, you might have a problem with your optical drive or the cabling to your optical drive. Ensure that the power cable and signal cable are securely connected to the drive.

### **Unable to use a bootable recovery medium, such as the Product Recovery CD, to start your computer**

Solution: Ensure that the CD or DVD drive is in the startup sequence before the hard disk drive. Refer to “Selecting or changing the startup device sequence” on page 64 for information on viewing and changing the startup sequence. Note that on some models the startup sequence is permanently set and cannot be changed.

## **DVD problems**

This section provides solutions to DVD-related problems.

### **Black screen instead of DVD video**

Solutions:

- Restart the DVD player program.
- Try a lower screen resolution or color depth.
- Close any open files, and then restart the computer.

### **DVD movie does not play**

Solutions:

- Ensure that the disc surface is clean and not scratched.
- Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using your computer.

### **No audio or intermittent audio while playing a DVD movie**

Solutions:

- Check the volume control settings on your computer and on your speakers.
- Ensure that the disc surface is clean and not scratched.
- Check all cable connections to and from the speakers.
- Use the DVD menu for the video to select a different audio track.

### **Playback is slow or choppy**

Solutions:

- Disable any background programs, such as AntiVirus or Desktop Themes.
- Ensure that video resolution is set to less than 1152 x 864 pixels.

### **Invalid disc or no disc found message**

Solutions:

- Ensure that a DVD disc is in the drive with the shiny side of the disc facing down.
- Ensure that video resolution is set to less than 1152 x 864 pixels.



- On computers that have a CD-ROM or CD-RW drive in addition to a DVD-ROM drive, ensure that the DVD disc is in the drive labeled “DVD”.

## Intermittent problems

Some problems occur only occasionally and are difficult to repeat.

Solutions:

- Ensure that all cables and cords are securely connected to the computer and attached devices.
- Ensure that when the computer is on, the fan grill is not blocked (there is air flow around the grill), and the fans are working. If airflow is blocked or the fans are not working, the computer might overheat.
- If Small Computer System Interface (SCSI) devices are installed, ensure that the last external device in each SCSI chain is terminated correctly. For more information, see your SCSI documentation.

## Hard disk drive problems

Select your symptom from the following list:

- “Some or all hard disk drives missing from the Setup Utility program” on page 77
- “No Operating System Found” message or the system not starting from the correct hard disk drive” on page 77

### Some or all hard disk drives missing from the Setup Utility program

Symptom: Some or all hard disk drives missing from the Setup Utility program

Actions:

- Ensure that all hard disk drive signal cables and power cables are connected correctly.
- Ensure that your computer is configured correctly to support the hard disk drives.
  - If your computer is installed with five SATA hard disk drives, ensure that the SATA hard disk drive enablement module (one to five hard disk drives) is installed.
  - If your computer is installed with SAS hard disk drives, ensure that the SAS hard disk drive enablement module (one to five hard disk drives) or the LSI MegaRAID SAS adapter is installed.

If these actions do not correct the problem, run the diagnostic program Lenovo Solution Center. See “Lenovo Solution Center” on page 84. If you need technical assistance, see Chapter 12 “Getting information, help, and service” on page 149.

### "No Operating System Found" message or the system not starting from the correct hard disk drive

Symptom: "No Operating System Found" message or the system not starting from the correct hard disk drive

Actions:

- Ensure that all hard disk drive signal cables and power cables are connected correctly. Refer to “Replacing the hard disk drive” on page 110.
- Ensure that the hard disk drive your computer starts from is listed as the first startup device in the Setup Utility program. Refer to “Selecting a startup device” on page 64.

**Note:** In rare cases, the hard disk drive with the operating system might get corrupted or damaged. In such cases, you might need to replace the hard disk drive. Refer to “Replacing the hard disk drive” on page 110.

If these actions do not correct the problem, run the diagnostic program Lenovo Solution Center. See “Lenovo Solution Center” on page 84.

## Problems with the keyboard or mouse

This section provides solutions to keyboard-related and mouse-related problems.

### The mouse does not work

Solutions:

- Connect the mouse cable to a USB connector or PS/2 mouse connector.  
**Note:** Depending on your keyboard, integrated USB connectors might be available to be used to connect a USB mouse.
- Install the device drivers for the mouse.
- If you are using a USB mouse, enable the USB connectors in the BIOS settings. For more information, see “Enabling or disabling a device” on page 63.

### The pointer on the screen does not move smoothly with the mouse

Solution: Clean the mouse. For more information, see “Optical mouse” on page 70.

### The fingerprint reader on the keyboard does not work

Solutions:

- Enroll your fingerprint correctly.
- Never scratch the surface of the reader with a hard, pointed object.
- Never scrap the surface of the reader with your nail or anything hard.
- Use or touch the reader with a clean finger.
- Ensure that the surface of your finger is the same with the one when you last enrolled.

### The wireless keyboard does not work

Solutions:

- If the transceiver communications LED is not on, reconnect the transceiver and the keyboard.
- If the wireless keyboard does not work when the transceiver communications LED is on, restart your computer.

If the problem persists after the restart, ensure that:

- The batteries are installed correctly.
- The batteries still retain their current.
- The distance from the wireless keyboard to the transceiver is less than 10 m (393.7 inches).
- The transceiver is installed fully.

## Monitor problems

This section provides solutions to monitor-related problems.

### My screen goes blank while the computer is on

Solutions: Your screen saver or power management might have been enabled. Do one of the following:

- Press a key to exit the screen saver.

- Press the power button to resume the computer from sleep or hibernation mode.

## **The monitor works when I turn on the computer, but goes blank when I start some application programs**

Solutions:

- Connect the monitor signal cable from your monitor to an appropriate connector on the computer. A loose cable might cause intermittent problems.
- Install the device drivers for the application programs. Refer to the documentation for the affected application program to check whether any device drivers are required.

## **The image appears to be flickering**

Solutions:

- The screen might be affected by interference from nearby equipment. Magnetic fields around other devices, such as transformers, appliances, fluorescent lights, and other monitors might be causing the problem. Move fluorescent desk lighting or any equipment that produces magnetic fields farther away from the screen. If this does not correct the problem, turn off the computer. Then, adjust the placement of the computer and other devices so that they are at least 305 mm (12 inches) apart. Turn on the computer.
- Reset the refresh rate supported by your computer.
  1. Right-click a blank area on the desktop.
  2. Depending on your Windows version, do one of the following:
    - For Windows 7 or Windows 8.1: Click **Screen resolution** → **Advanced settings**.
    - For Windows 10: Click **Display settings**. On the **Display** tab, click **Advanced display settings** → **Display adapter properties**.
  3. Click the **Monitor** tab, and then reset the refresh rate to be the highest and noninterlaced.

## **The image is discolored**

Solution: The monitor might be affected by interference from nearby equipment. Move fluorescent desk lighting or any equipment that produces magnetic fields further away from the monitor. If the problem persists, do the following:

1. Turn off the monitor.
2. Adjust the placement of the monitor and other devices so that they are at least 305 mm (12 inches) apart.
3. Turn on the monitor.

## **Networking problems**

This section provides solutions to networking-related problems.

### **Ethernet problems**

#### **Your computer cannot connect to the network**

Symptom: Your computer cannot connect to the network.

Actions: Ensure that:

- The cable is installed properly.

The network cable must be securely connected to both the Ethernet connector of your computer and the RJ45 connector of the hub. The maximum allowable distance from the computer to hub is 100 meters. If the cable is connected and the distance is within acceptable limits but the problem persists, try a different cable.

- The cable is installed properly.
- You are using the correct device driver.
- The switch port and the adapter have the same duplex setting.

If you configured the adapter for full duplex, ensure that the switch port is also configured for full duplex. Setting the wrong duplex mode can degrade performance, cause data loss, or result in lost connections.

- You have installed all networking software that is necessary for your network environment.  
Check with your LAN administrator for the necessary networking software.

#### **The adapter stops working for no reason**

Solution: The network driver files might be corrupt or missing. Update the driver by referring to the “Solution” description for the previous problem to ensure that the latest device driver is installed.

#### **The Wake On LAN feature is not working**

Solution: Enable the Wake On LAN (WOL) feature in the BIOS program.

#### **My computer is a Gigabit Ethernet model and I use a speed of 1000 Mbps, but the connection fails or errors occur**

Solution: Connect the network cable to the Ethernet connector using Category 5 wiring and a 100 BASE-T hub/switch (not 100 BASE-X).

#### **My computer is a Gigabit Ethernet model, but it cannot be connected to the network at 1000 Mbps, but at only 100 Mbps**

Solutions:

- Try another cable.
- Set the link partner to auto-negotiate.
- Set the switch to be 802.3ab-compliant (gigabit over copper).

#### **Sound does not come from the Bluetooth headset or headphone but comes from the local speaker even though the headset or headphone is connected using the Headset profile or AV profile**

Solution:

1. Exit the application that uses the sound device (for example, Windows Media Player).
2. Open Control Panel.

**Note:** For detailed information on how to open Control Panel on Windows 8.1, see “Accessing Control Panel on the Windows 8.1 operating system” on page 49.

3. Click **Hardware and Sound → Sound**.
4. Select the **Playback** tab.
5. If you are using the Headset profile, select **Bluetooth Hands-free Audio**, and then click **Set Default**. If you are using the AV profile, select **Stereo Audio**, and then click **Set Default**.
6. Click **OK**.

**Note:** Bluetooth is supported only on some computer models.

#### **I have connected an option to my computer, but it does not work**

Solution: Refer to the documentation that comes with the option to ensure that you have connected the option correctly.

## Performance and lockup problems

This section provides solutions to performance-related problems of your computer.

### Insufficient free hard disk drive space

Solutions: Free up hard disk drive space.

- Clean out your Inbox, Sent Items, and Deleted Items folders from your e-mail application.
- Clean up your C drive.
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Computer**.
    - For Windows 8.1: Open File Explorer.
    - For Windows 10: Click the Start button to open the Start menu, and then click **File Explorer → This PC**.
  2. Right-click your C drive and then click **Properties**.
  3. Check the amount of free space, and then click **Disk Cleanup**.
  4. A list of unnecessary file categories is displayed. Select each file category you want to delete, and then click **OK**.
- Turn some Windows features off or remove some unnecessary programs.
  1. Open Control Panel by doing one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
    - For Windows 8.1: See “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
    - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
  2. View Control Panel using Large icons or Small icons, and then click **Programs and Features**.
  3. Do one of the following:
    - To turn some Windows features off, click **Turn Windows features on or off**. Follow the instructions on the screen.
    - To remove some unnecessary programs, select the program you want to remove, and then click **Uninstall/Change** or **Uninstall**.

### Excessive number of fragmented files

Solution: Use the Windows disk defragmentation or disk optimization feature to clean up the files.

**Note:** Depending on the volume of the storage drives and amount of data stored on the storage drives, the disk-defragmentation process might take up to several hours.

1. Close any open programs and windows.
2. Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Computer**.
  - For Windows 8.1: Open File Explorer.
  - For Windows 10: Click the Start button to open the Start menu, and then click **File Explorer → This PC**.
3. Right-click your C drive and then click **Properties**.
4. Click the **Tools** tab.
5. Depending on your Windows version, do one of the following:

- For Windows 7: Click **Defragment now**.
  - For Windows 8.1 or Windows 10: Click **Optimize**. Select the desired drive, and then click **Optimize**.
6. Follow the instructions on the screen.

## Insufficient memory

Solution: Install additional memory modules. For instructions on installing memory modules, see “Installing or replacing a memory module” on page 105.

To purchase memory modules, go to:  
<http://www.lenovo.com>

## The printer does not work

Solutions:

- If you are using IEEE-approved printer signal cables, do the following:
  1. Connect the printer signal cable firmly to the correct parallel, serial, or USB connector on the computer.
  2. Load the paper correctly.
  3. Turn on the printer and keep the printer online.
- If you are using non-IEEE-approved printer signal cables, do the following:
  1. Correctly install device drivers and software that come with the printer.
  2. Assign the printer port correctly in your operating system, application program, or BIOS settings. For more information about BIOS settings, see “Using the Setup Utility program” on page 61.

If the problem persists, run the tests described in the documentation that comes with your printer. If you cannot correct the problem, have the computer serviced. See Chapter 12 “Getting information, help, and service” on page 149.

## Serial connector cannot be accessed

Solutions:

- Connect the serial cable to the serial connector on the computer and to the serial device. If the serial device has its own power cord, attach the power cord to a grounded electrical outlet.
- Turn on the serial device and keep the device online.
- Install any application programs supplied with the serial device. Refer to the documentation that comes with the serial device for more information.
- If you added one serial-connector adapter, install the adapter correctly.

## Software problems

This section provides solutions to software-related problems.

### When using a sort feature, dates cannot be sorted in the correct order

Solution: Some programs developed before the year 2000 used only the last two digits of a year to sort dates, assuming the first two digits were 19. Consequently, dates cannot be sorted in the correct order. Check with your software manufacturer to see if updates are available. Many software manufacturers make updates available from the World Wide Web.

### Some application programs do not work as expected

Symptom: Software does not work as expected.

#### Actions:

- Most software programs have built-in help systems that provide instructions for most tasks. If you are having difficulty performing a specific task within a software program, refer to the help system for that program. Help systems are typically accessible from a menu or button in the program, and frequently from the F1 key.
- If you have difficulty with the Windows operating system or one of its components, refer to the Windows help system.
- To determine if problems are caused by newly installed software, verify that:
  - Your computer has the minimum memory requirements needed to use the software. See the information supplied with the software to verify memory requirements. (If you just installed an adapter or memory, you might have a memory-address conflict.)
  - The software is designed to operate on your computer.
  - Other software works on your computer.
  - The software you are using works correctly on another computer.
- If you received any error messages while using the software program, see the printed documentation supplied with the software or the help system for that software for a description of the messages and solutions to the problem.
- Check with your software manufacturer to see if any updates are available. Many software manufacturers make updates available from the World Wide Web.
- If the software program used to work correctly, but does not work correctly now, do the following:
  1. Open Control Panel by doing one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
    - For Windows 8.1: See “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
    - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
  2. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
  3. Follow the instructions on the screen.
- If you are unable to resolve the problem through other methods, uninstall the software program and reinstall it.

If these actions do not correct the problem, you might need technical assistance. Contact your software manufacturer or see Chapter 12 “Getting information, help, and service” on page 149 for details.

## My USB connectors cannot be accessed

#### Solutions:

- Connect the USB cable from the USB connector to the USB device. If the USB device has its own power cord, attach the power cord to a grounded electrical outlet.
- Turn on the USB device and keep the device online.
- Install any device drivers or application programs supplied with the USB device. Refer to the documentation that comes with the USB device for more information.
- Detach and reattach the USB connector to reset the USB device.

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## Diagnostics

The diagnostic program is used to test hardware components of your computer. The diagnostic program can also report operating-system-controlled settings that interfere with the correct operation of your computer. You can use the preinstalled diagnostic program to diagnose computer problems, if your computer is running the Windows operating system.

### Notes:

1. Your computer is preinstalled with the Lenovo Solution Center program for diagnostic purposes. For more information about the Lenovo Solution Center program, see “Lenovo Solution Center” on page 84.
2. If you are unable to isolate and repair the problem yourself after running the diagnostic program, save and print the log files created by the diagnostic program. You will need the log files when you speak to a Lenovo technical support representative.

## Lenovo Solution Center

The Lenovo Solution Center program enables you to troubleshoot and resolve computer problems. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for maximum system performance.

- You can download the Lenovo Solution Center program from <http://www.lenovo.com/diags>.
- If you are using a Windows operating system other than Windows 7, Windows 8.1, or Windows 10, go to <http://www.lenovo.com/diags> for the latest information on diagnostics for your computer.

To run the Lenovo Solution Center program, see “Lenovo programs” on page 40.

**Note:** If you cannot isolate and repair the problem yourself after running the program, save and print the log files. You will need the log files when you speak to a Lenovo technical support representative.

For additional information, refer to the Lenovo Solution Center help system.

## UEFI diagnostic program

A UEFI diagnostic program is preinstalled on the computer. It enables you to test memory modules and internal storage devices, view system information, and check and recover bad sectors on internal storage devices.

To run the UEFI diagnostic program, do the following:

1. Turn on the computer. If the computer cannot be turned on, go to “Basic troubleshooting” on page 73. If an error code is displayed, go to “Symptom-to-FRU index” on page 88 for error code descriptions and troubleshooting hints.
2. Repeatedly press and release the F10 key when turning on the computer. The main screen of the UEFI diagnostic program is displayed.
3. Follow the instructions on the screen to use the diagnostic program.

The options on the main screen are as follows:



Table 1. Items on the main screen of the UEFI diagnostic program

DIAGNOSTICS	TOOLS
<ul style="list-style-type: none"> <li>• LCD test</li> <li>• Memory - Quick test</li> <li>• Memory - Extended test</li> <li>• Motherboard test</li> <li>• PCI-e test</li> <li>• Storage - Quick test</li> </ul>	<ul style="list-style-type: none"> <li>• System information</li> <li>• Recover bad sectors tool</li> <li>• Generate configuration file</li> <li>• Execute from configuration file</li> <li>• Exit application</li> </ul>



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## Chapter 9. Service checkout and symptom-to-FRU index

This chapter provides information about general service checkout and symptom-to-FRU index.

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### Service checkout

**Attention:** The drives in the computer you are servicing might have been rearranged or the drive startup sequence changed. Be extremely careful during write operations such as copying, saving, or formatting. Data or programs can be overwritten if you select an incorrect drive.

General error messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.

Before replacing any FRUs, ensure that the latest level of BIOS is installed on the system. A down-level BIOS might cause false errors and unnecessary replacement of the system board. For more information on how to determine and obtain the latest level BIOS, see “BIOS levels” on page 66.

Use the following procedure to help determine the cause of the problem:

1. Power-off the computer and all external devices.
2. Check all cables and power cords.
3. Set all display controls to the middle position.
4. Power-on all external devices.
5. Power-on the computer.
  - Look for displayed error codes
  - Listen for beep codes
  - Look for readable instructions or a main menu on the display.If you *did not* receive the correct response, proceed to step 6 on page 87.  
If you *do* receive the correct response, proceed to step 7 on page 87.
6. Look at the following conditions and follow the instructions:
  - If you hear beep codes during POST, go to “Beep symptoms” on page 89.
  - If the computer displays a POST error, go to “POST error codes” on page 89.
  - If the computer hangs and no error is displayed, continue at step 7 on page 87.
7. Run the Diagnostic programs. See “Diagnostics” on page 84.
  - If you receive an error, replace the part that the diagnostic program calls out.
  - If the test stops and you cannot continue, replace the last device tested.

### Problem determination tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Processor or hard disk drive upgrades
- Failure symptom
  - Do diagnostics indicate a failure?

- What, when, where, single, or multiple systems?
- Is the failure repeatable?
- Has this configuration ever worked?
- If it has been working, what changes were made prior to it failing?
- Is this the original reported failure?
- Diagnostics version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

**Notes:** To eliminate confusion, identical systems are considered identical only if they:

1. Are the exact machine type and models
2. Have the same BIOS level
3. Have the same adapters/attachments in the same locations
4. Have the same address jumpers/terminators/cabling
5. Have the same software versions and levels
6. Have the same Diagnostic Diskettes (version)
7. Have the same configuration options set in the system
8. Have the same setup for the operating system control files

Comparing the configuration and software set-up between “working and non-working” systems will often lead to problem resolution.

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## Symptom-to-FRU index

The Symptom-to-FRU index lists error symptoms and possible causes. The most likely cause is listed first. Always begin with “Service checkout” on page 87. This index can also be used to help you decide which FRUs to have available when servicing a computer. If you are unable to correct the problem using this index, go to “Undetermined problems” on page 92.

### Notes:

- The Symptom-to-FRU index is not specific to any machine type and are applicable to all ThinkCentre computers.
- If you have both an error message and an incorrect audio response, diagnose the error message first.
- If you cannot run the diagnostic tests or you get a diagnostic error code when running a test, but did receive a POST error message, diagnose the POST error message first.
- If you did not receive any error message, look for a description of your error symptoms in the first part of this index.

## Hard disk drive boot error

A hard disk drive boot error can have the following causes.

Error	FRU/Action
The start-up drive is not in the boot sequence in configuration.	Check the configuration and ensure the start-up drive is in the boot sequence.
No operating system installed on the boot drive.	Install an operating system on the boot drive.
The boot sector on the startup drive is corrupted.	The drive must be formatted. Do the following: <ol style="list-style-type: none"> <li>1. Attempt to back up the data on the failing hard disk drive.</li> <li>2. Using the operating system programs, format the hard disk drive.</li> </ol>
The drive is defective.	Replace the hard disk drive.

## Power supply problems

If you suspect a power problem, use the following procedures.

Check/Verify	FRU/Action
Check the following for proper installation. <ul style="list-style-type: none"> <li>• Power cord</li> <li>• On/Off switch connector</li> <li>• On/Off switch power supply connector</li> <li>• System board power supply connectors</li> <li>• Microprocessor(s) connection</li> </ul>	Reseat connectors
Check the power cord for continuity.	Power cord
Check the power-on switch for continuity.	Power-on switch

## Beep symptoms

Beep symptoms are tones or a series of tones separated by pauses (intervals without sound) during POST.

The following table describes the beep symptoms.

Beep symptom	FRU/Action
<b>2 short beeps</b> CMOS setting error	Common error code, see the detail failure information in "POST error codes" on page 89.
<b>3 short and 1 long beeps</b> DRAM memory error	Perform the following actions in order. <ol style="list-style-type: none"> <li>1. Make sure the memory module(s) are properly seated in the connector(s).</li> <li>2. Replace the memory module(s).</li> <li>3. Replace the system board.</li> </ol>

## POST error codes

Each time you power-on the system, it performs a series of tests that check the operation of the system and some options. This series of tests is called the *Power-On Self-Test*, or *POST*. POST does the following operations.

- Checks some basic system-board operations
- Checks the memory operation

- Starts the video operation
- Verifies that the boot drive is working

If the POST detects a problem, an error message appears on the screen. A single problem can cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system.

Error code	POST error message	Description/Action
0135	Fan failure	The system might be overheating.  Press F10 to exit.  <b>Note:</b> If the problem is caused by the microprocessor fan, press F10 will not solve the problem.
0211	Keyboard not found	When there is no keyboard detected, the error message will be displayed.
0164	Memory size decreased	Press F10 to exit.
1762	Configuration change has occurred	This error message is displayed when a hard disk drive or optical drive change has been made.  Press F10 to exit.
1820	More than one external fingerprint reader are attached. Power off and remove all but the reader that you set up within your main operating system.	If more than one external fingerprint reader are connected to a computer, this error message will be displayed to inform you to remove all of the fingerprint keyboards except the one compatible with the fingerprint application on your computer.
1962	No operating system found. Press any key to repeat boot sequence.	This error occurs only after the POST is completed.  Press any key to repeat boot sequence.

## Miscellaneous error conditions

Message/Symptom	FRU/Action
Changing display colors	<b>Display/Monitor</b>
Computer will <i>not</i> power-off. See "Hard disk drive boot error" on page 88.	<ol style="list-style-type: none"> <li>1. Power Switch</li> <li>2. System Board</li> <li>3. Riser card, if installed.</li> </ol>
Computer will <i>not</i> RPL from server	<ol style="list-style-type: none"> <li>1. Ensure that network is in startup sequence as first device or first device after diskette.</li> <li>2. Ensure that network adapter is enabled for RPL.</li> <li>3. Network adapter (Advise network administrator of new MAC address)</li> </ol>

Message/Symptom	FRU/Action
Computer will <i>not</i> perform a Wake On LAN® (if applicable)	<ol style="list-style-type: none"> <li>1. Check power supply and signal cable connections to network adapter.</li> <li>2. Ensure that the operating system settings are set to enable Wake on LAN.</li> <li>3. Ensure Wake On LAN feature is enabled in Setup/Configuration (see "Starting the Setup Utility program" on page 61)</li> <li>4. Ensure network administrator is using correct MAC address.</li> <li>5. Ensure no interrupt or I/O address conflicts.</li> <li>6. Network adapter (advise network administrator of new MAC address)</li> </ol>
Dead computer. See "Hard disk drive boot error" on page 88.	<ol style="list-style-type: none"> <li>1. Power Supply</li> <li>2. System Board</li> </ol>
Diskette drive in-use light remains on or does not light when drive is active.	<ol style="list-style-type: none"> <li>1. Diskette Drive</li> <li>2. System Board</li> <li>3. Diskette Drive Cable</li> </ol>
Blank screen except for flashing cursor.	<ol style="list-style-type: none"> <li>1. System Board</li> <li>2. Primary Hard Disk Drive</li> <li>3. Hard Disk Drive Cable</li> </ol>
Incorrect memory size during POST	<ol style="list-style-type: none"> <li>1. Run the Memory tests.</li> <li>2. Memory Module</li> <li>3. System Board</li> </ol>
"Insert a Diskette" icon appears with a known-good diagnostics diskette in the first 3.5-inch diskette drive.	<ol style="list-style-type: none"> <li>1. System Board</li> <li>2. Diskette Drive Cable</li> <li>3. Network Adapter</li> </ol>
Intensity or color varies from left to right of characters and color bars	<ol style="list-style-type: none"> <li>1. Display</li> <li>2. Video adapter (if present)</li> <li>3. System Board</li> </ol>
No power or fan not running	<ol style="list-style-type: none"> <li>1. See "Hard disk drive boot error" on page 88.</li> </ol>
Non-system disk or disk error-type message with a known-good diagnostic diskette.	<ol style="list-style-type: none"> <li>1. Diskette Drive</li> <li>2. System Board</li> <li>3. Diskette Drive Cable</li> </ol>
Other display symptoms not listed above (including blank or illegible display)	<ol style="list-style-type: none"> <li>1. Display</li> <li>2. System Board</li> </ol>
Power-on indicator or hard disk drive in-use light not on, but computer works correctly	<ol style="list-style-type: none"> <li>1. Power switch/LED assembly</li> <li>2. System Board</li> </ol>
Printer problems	<ol style="list-style-type: none"> <li>1. Printer</li> <li>2. System Board</li> </ol>

Message/Symptom	FRU/Action
Program loads from the hard disk with a known-good diagnostics diskette in the first 3.5-inch diskette drive	<ol style="list-style-type: none"> <li>1. Run the Setup Utility program and check Startup sequence.</li> <li>2. Diskette Drive</li> <li>3. Diskette Drive Cable</li> <li>4. System Board</li> <li>5. Power Supply</li> </ol>
RPL computer cannot access programs from its own hard disk.	<ol style="list-style-type: none"> <li>1. If network administrator is using LCCM Hybrid RPL, check startup sequence: <ol style="list-style-type: none"> <li>a. <b>First device - network</b></li> <li>b. <b>Second device - hard disk</b></li> </ol> </li> <li>2. Hard disk drive</li> </ol>
RPL computer does not RPL from server	<ol style="list-style-type: none"> <li>1. Check startup sequence.</li> <li>2. Check the network adapter LED status.</li> </ol>
Serial or parallel connector device failure (system board connector)	<ol style="list-style-type: none"> <li>1. External Device Self-Test OK?</li> <li>2. External Device</li> <li>3. Cable</li> <li>4. System Board</li> </ol>
Serial or parallel connector device failure (adapter connector)	<ol style="list-style-type: none"> <li>1. External Device Self-Test OK?</li> <li>2. External Device</li> <li>3. Cable</li> <li>4. Alternate Adapter</li> <li>5. System Board</li> </ol>
Some or all keys on the keyboard do not work	<ol style="list-style-type: none"> <li>1. Keyboard</li> <li>2. Keyboard Cable</li> <li>3. System Board</li> </ol>

## Undetermined problems

This section provides instructions on how to find out the failing devices or adapters.

1. Power-off the computer.
2. Remove or disconnect the following components (if installed) one at a time.
  - a. External devices (modem, printer, or mouse)
  - b. Any adapters
  - c. Memory modules
  - d. Extended video memory
  - e. External Cache
  - f. External Cache RAM
  - g. Hard disk drive
  - h. Diskette drive
3. Power-on the computer to re-test the system.
4. Repeat steps 1 through 3 until you find the failing device or adapter.

If all devices and adapters have been removed, and the problem continues, replace the system board. See "Replacing the system board" on page 131.



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## Chapter 10. Recovery information

This chapter provides information about the recovery solutions. There are a variety of methods to choose from when considering how to recover from a software- or hardware-related problem. Some methods vary depending on the type of operating system that is installed. You can restore the computer settings using a program or the recovery disc set. For more information about using the recovery disc set, see the documentation that comes with the disc set.

This chapter contains the following topics:

- “Recovery information for the Windows 7 operating system” on page 93
- “Recovery information for the Windows 8.1 operating system” on page 98
- “Recovery information for the Windows 10 operating system” on page 99

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### Recovery information for the Windows 7 operating system

The recovery information in this section only applies to the computers that have the Rescue and Recovery program or the Product Recovery program installed. If the **Enhanced Backup and Restore** icon in the Lenovo ThinkVantage Tools program is dimmed, it indicates that you must install the Rescue and Recovery program manually before enabling its features. To install the Rescue and Recovery program, do the following:

1. Click **Start → All Programs → Lenovo ThinkVantage Tools**, and double-click **Enhanced Backup and Restore**.
2. Follow the instructions on the screen.
3. When the installation process finishes, the **Enhanced Backup and Restore** icon is activated.

This section contains the following topics:

- “Creating and using recovery media” on page 93
- “Performing backup and recovery operations” on page 94
- “Creating and using a rescue medium” on page 96
- “Reinstalling programs and device drivers” on page 96
- “Solving recovery problems” on page 98

### Creating and using recovery media

Recovery media enable you to restore the hard disk drive to the factory-default state and put the computer in an operational state after all other recovery methods have failed. Recovery media are useful if you transfer the computer to another area, sell the computer, or recycle the computer. As a precautionary measure, it is important to create recovery media as early as possible. The data on the recovery media can be used for the following purposes:

- Reinstall the programs and device drivers on your computer
- Reinstall the operating system
- Modify the data files on the hard disk drive using the Additional Files

**Note:** The recovery operations you can perform using recovery media vary depending on the operating system from which the recovery media were created. The recovery media might contain a boot medium and a data medium. Your Microsoft Windows license permits you to create only one data medium. It is recommended that you store the recovery media in a safe place after you have made them.

## Creating recovery media

**Note:** On the Windows 7 operating system, you can create recovery media using discs or external USB storage devices.

To create recovery media on the Windows 7 operating system, click **Start → All Programs → Lenovo ThinkVantage Tools → Factory Recovery Disks**. Then, follow the instructions on the screen.

## Using recovery media

**Attention:** When you use recovery media to restore the hard disk drive to the factory-default state, all the files currently on the hard disk drive will be deleted. These files will be replaced by the factory-default files.

To use recovery media on the Windows 7 operating system, do the following:

1. Depending on the type of your recovery media, connect the boot USB storage device to the computer, or insert the boot disc into the optical drive.
2. Turn on or restart your computer.
3. When you see the logo screen, repeatedly press and release the F12 key. The Startup Device Menu window is displayed.
4. Select the desired startup device and press Enter. The restore process begins.
5. Follow the instructions on the screen to complete the operation.

**Note:** After restoring your computer hard disk drive to the factory-default state, you might have to reinstall device drivers for some devices. See “Reinstalling programs and device drivers” on page 96.

## Performing backup and recovery operations

The Rescue and Recovery program enables you to back up all your hard disk drive contents including the operating system, data files, software programs, and personal settings. You can store the backup at the following locations:

- The Rescue and Recovery workspace
- The secondary hard disk drive if a secondary hard disk drive is installed in your computer
- An external USB hard disk drive connected to your computer
- A network drive
- Recordable discs (a recordable optical drive is required for this option)

After you have completed the backup operation, you can restore parts or whole of the data on the hard disk drive.

### Performing a backup operation

To perform a backup operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click **Back up your hard drive** and select backup operation options. Then, follow the instructions on the screen to complete the backup operation.

### Performing a recovery operation

This section provides the following topics:

- “Performing a recovery operation from Windows 7” on page 95

- “Performing a recovery operation from the Rescue and Recovery workspace” on page 95

### Performing a recovery operation from Windows 7

To perform a recovery operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click the **Restore your system from a backup** icon.
4. Follow the instructions on the screen to complete the recovery operation.

### Performing a recovery operation from the Rescue and Recovery workspace

The Rescue and Recovery workspace resides in a protected and hidden area of your hard disk drive that operates independently from the Windows operating system. The Rescue and Recovery workspace enables you to perform recovery operations even if you cannot start the Windows operating system. You can perform the following recovery operations from the Rescue and Recovery workspace:

- **Rescue files from your hard disk drive or from a backup:**  
You can locate files on your hard disk drive and transfer them to a network drive or other recordable media, such as a USB device or a disc. This solution is available even if you did not back up your files or if changes were made to the files since your last backup operation. You also can rescue individual files from a Rescue and Recovery backup located on your local hard disk drive, a USB device, or a network drive.
- **Restore your hard disk drive from a Rescue and Recovery backup:**  
If you have backed up your hard disk drive using the Rescue and Recovery program, you can restore the hard disk drive from a Rescue and Recovery backup, even if you cannot start the Windows operating system.
- **Restore your hard disk drive to the factory-default state:**  
You can restore the complete contents of your hard disk drive to the factory-default state even if you cannot start the Windows operating system. If you have multiple partitions on your hard disk drive, you have the option to restore the C: partition and leave the other partitions intact.

**Attention:** You can restore the hard disk drive from a Rescue and Recovery backup or restore the hard disk drive to the factory-default settings. During either process, all files on the primary hard disk drive partition (usually drive C:) will be deleted. If possible, make copies of important files. If you cannot start the Windows operating system, you can use the rescue files feature of the Rescue and Recovery workspace to copy files from your hard disk drive to other media.

To perform a recovery operation from the Rescue and Recovery workspace, do the following:

1. Turn on or restart your computer.
2. When you see the logo screen, press Enter, and then press F11 to enter the Rescue and Recovery workspace.
3. If you have set a Rescue and Recovery password, enter your password when prompted. The Rescue and Recovery workspace opens after a short delay.

**Note:** If the Rescue and Recovery workspace fails to open, see “Solving recovery problems” on page 98.

4. Do one of the following:
  - To rescue files from your hard disk drive, click **Rescue files** and follow the instructions on the screen.
  - To restore your hard disk drive from a Rescue and Recovery backup or to restore your hard disk drive to the factory-default state, click **Full Restore** and follow the on-screen instructions.

**Note:** After restoring your computer hard disk drive to the factory-default state, you might have to reinstall device drivers for some devices. See “Reinstalling programs and device drivers” on page 96.

For more information about the features of the Rescue and Recovery workspace, click **Help**.

## Creating and using a rescue medium

Create rescue media using discs or USB storage devices as early as possible. You can use a rescue medium to recover from failures that prevent you from gaining access to the Windows environment or the Rescue and Recovery workspace on your hard disk drive.

### Notes:

- The recovery operations you can perform using a rescue medium vary depending on the operating system.
- The rescue disc can be started in all types of optical drives.

## Creating a rescue medium

To create a rescue medium on the Windows 7 operating system, do the following:

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click the **Create Rescue Media** icon. The “Create Rescue and Recovery Media” window opens.
4. In the **Rescue Media** area, select the type of the rescue medium you want to create. You can create a rescue medium using a disc, a USB storage device with sufficient capacity, or a secondary internal hard disk drive.
5. Click **OK** and follow the instructions on the screen to create a rescue medium.

## Using a rescue medium

Depending on whether you have created a rescue medium using a disc or a USB hard disk drive, do one of the following:

- If you have created a rescue medium using a disc, do the following:
  1. Turn on or restart your computer.
  2. When you see the logo screen, repeatedly press and release the F12 key. The Startup Device Menu window is displayed.
  3. Select the desired optical drive as the first boot device. Then, insert the rescue disc into the optical drive and press Enter. The rescue medium starts.
- If you have created a rescue medium using a USB hard disk drive, do the following:
  1. Connect the USB hard disk drive to one of the USB connectors on your computer.
  2. Turn on or restart your computer.
  3. When you see the logo screen, repeatedly press and release the F12 key. The Startup Device Menu window is displayed.
  4. Select the USB hard disk drive as the first boot device and press Enter. The rescue medium starts.

When the rescue medium starts, the Rescue and Recovery workspace opens. The help information for each feature is available from the Rescue and Recovery workspace. Follow the instructions to complete the recovery process.

## Reinstalling programs and device drivers

This section provides the following items:

- “Reinstalling preinstalled programs and device drivers” on page 97
- “Reinstalling programs and device drivers that are not preinstalled” on page 97

## Reinstalling preinstalled programs and device drivers

Your computer enables you to reinstall preinstalled programs and device drivers.

### Reinstalling preinstalled programs

To reinstall programs preinstalled on your Lenovo computer, do the following:

1. Turn on the computer.
2. Go to C:\SWTOOLS.
3. Open the apps folder and locate the subfolder that is named after the program preinstalled on your computer.
4. Open the subfolder and locate the EXE file.
5. Double-click the EXE file and follow the instructions on the screen to complete the installation.

### Reinstalling preinstalled device drivers

**Attention:** Reinstalling device drivers will change the current configuration of your computer. Reinstall device drivers only when it is necessary to correct a problem with your computer.

To reinstall the device driver for a factory-installed device, do the following:

1. Turn on the computer.
2. Go to C:\SWTOOLS.
3. Open the DRIVERS folder and locate the subfolder that is named after the factory-installed device in your computer, such as AUDIO or VIDEO.
4. Open the subfolder.
5. Do one of the following:
  - Locate the EXE file. Double-click the EXE file and follow the instructions on the screen to complete the installation.
  - Locate the readme file with the .txt extension. The device driver installation information is included in the readme file. Follow the instructions to complete the installation.
  - If the device subfolder contains an INF file and you want to install the device driver using the INF file, see the Windows help system for detailed information.

**Note:** For more information about the latest device drivers, see “Getting the latest device drivers for your computer” on page 69.

## Reinstalling programs and device drivers that are not preinstalled

Your computer enables you to reinstall programs and device drivers that are not preinstalled.

### Reinstalling programs that are not preinstalled

If a software program you installed on your computer is not working correctly, you might need to uninstall and then reinstall it. Reinstalling a program overwrites the existing program files and usually fixes any problems that you might have had with the program.

To uninstall a program from your system, refer to the Microsoft Windows help system.

To reinstall most commercially available programs on your system, refer to the Microsoft Windows help system together with the documentation provided with the program.

### Reinstalling device drivers that are not preinstalled

To reinstall a device driver for an option you installed, refer to the documentation that comes with the option.

**Note:** Reinstall device drivers will change the current configuration of your computer. Reinstall device drivers only when it is necessary to correct a problem with your computer.

## Solving recovery problems

**Note:** Ensure that your rescue device is set as the first boot device in the startup device sequence in the Setup Utility program. See “Selecting a startup device” on page 64 for detailed information about temporarily or permanently changing the startup device sequence. For more information about the Setup Utility program, see “Using the Setup Utility program” on page 61.

If you cannot access the Rescue and Recovery workspace or the Windows environment, do one of the following:

- Use a rescue medium to start the Rescue and Recovery workspace. See “Creating and using a rescue medium” on page 96.
- Use recovery media if all other methods of recovery have failed and you must restore the hard disk drive to the factory-default settings. See “Creating and using recovery media” on page 93.

It is important to create a rescue medium and a set of recovery media as early as possible and store them in a safe place for future use.

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## Recovery information for the Windows 8.1 operating system

This section contains the following topics:

- “Refreshing your computer” on page 98
- “Resetting your computer to the factory-default settings” on page 98
- “Using the advanced startup options” on page 99
- “Recovering your operating system if Windows 8.1 fails to start” on page 99

### Refreshing your computer

If your computer does not perform well and the problem might be caused by a recently installed program, you can refresh your computer.

**Attention:** If you refresh your computer, the programs preinstalled on your computer and the programs that you installed from Windows Store will be reinstalled. However, all other programs will be uninstalled.

To refresh your computer, do the following:

1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
2. In the **Refresh your PC without affecting your files** section, click **Get started**.

### Resetting your computer to the factory-default settings

You can reset your computer to the factory-default settings. Resetting the computer will reinstall the operating system and all the programs that come with your computer.

**Attention:** If you reset your computer, all your personal files and settings will be deleted. To avoid data loss, make a backup copy of all the data that you want to keep.

To reset your computer, do the following:

1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.

2. In the **Remove everything and reinstall Windows** section, click **Get started**.

## Using the advanced startup options

Advanced startup options enable you to change the startup settings of your Windows operating system, start the computer from an external device, or restore the Windows operating system from a system image.

To use the advanced startup options, do the following:

1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.
3. Restart your computer following the instructions on the screen.

## Recovering your operating system if Windows 8.1 fails to start

The Windows recovery environment on your computer is capable of operating independently from the Windows 8.1 operating system. It enables you to recover or repair the operating system even if the Windows 8.1 operating system fails to start.

After two consecutive failed boot attempts, the Windows recovery environment starts automatically. Then you can choose repair and recovery options by following the instructions on the screen.

**Note:** Ensure that your computer is connected to ac power during the recovery process.

For more details about the recovery solutions provided on computers preinstalled with the Windows 8.1 operating system, refer to the help information system of the Windows 8.1 operating system.

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## Recovery information for the Windows 10 operating system

To recover your Windows 10 operating system, use the following solutions:

- Use Windows recovery solutions.
  - Use recovery solutions in Windows Settings.
    1. Click the Start button to open the Start menu.
    2. Click **Settings → Update & security → Recovery**.
    3. Choose the appropriate recovery solution by following the instructions on the screen.
  - Use System Restore to restore system files and settings to an earlier point.
    1. Right-click the Start button to open the Start context menu.
    2. Click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
    3. Follow the instructions on the screen.
  - Use the File History tool to restore your files from a backup.

**Note:** If you use the File History tool to restore your files from a backup, ensure that you backed up your data earlier with the tool.

1. Right-click the Start button to open the Start context menu.
  2. Click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **File History → Restore personal files**.
  3. Follow the instructions on the screen.
- Use the Windows recovery environment by doing one of the following:

- After several consecutive failed boot attempts, the Windows recovery environment might start automatically. Follow the instructions on the screen to choose the appropriate recovery solution.
- Select the recovery medium you created earlier with the Windows tool as the startup device. See “Selecting a temporary startup device” on page 64. Then, follow the instructions on the screen to choose the appropriate recovery solution.

**Note:** To create a recovery medium, see “Good maintenance practices” on page 71.

- Use the recovery USB key provided by Lenovo to restore the entire storage drive to the factory-default settings.
  - If your computer comes with the recovery USB key, follow the instructions shipped with the USB key.
  - If your computer does not come with the recovery USB key, contact the Lenovo Customer Support Center to order a recovery USB key. For a list of Lenovo Support phone numbers, go to <http://www.lenovo.com/support/phone>. If you cannot find the support telephone number for your country or region, contact your Lenovo reseller.



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## Chapter 11. Installing or replacing hardware

This chapter provides instructions on how to install or replace hardware for your computer.

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### Handling static-sensitive devices

Do not open the static-protective package containing the new part until the defective part has been removed and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage computer components and parts.

When you handle parts and other computer components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle parts and other computer components carefully. Handle PCI cards, memory modules, system boards, and microprocessors by the edges. Never touch any exposed circuitry.
- Prevent others from touching the parts and other computer components.
- Touch the static-protective package containing the part to a metal expansion-slot cover or other unpainted metal surface on the computer for at least two seconds. This reduces static electricity from the package and your body before you install or replace a new part.
- When possible, remove the new part from the static-protective package, and install it directly in the computer without setting the part down. When this is not possible, place the static-protective package that the part came in on a smooth, level surface and place the part on the package.
- Do not place the part on the computer cover or other metal surface.

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### Installing or replacing hardware

This section provides instructions on how to install or replace hardware for your computer. You can expand the capabilities of your computer and maintain your computer by installing or replacing hardware.

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

#### Notes:

- Use only computer parts provided by Lenovo.
- When installing or replacing an option, use the appropriate instructions in this section along with the instructions that come with the option.

### Installing external options

You can connect external options to your computer, such as external speakers, a printer, or a scanner. For some external options, you must install additional software in addition to making the physical connection. When installing an external option, see “Locating connectors, controls, and indicators on the front of your computer” on page 28 and “Locating connectors on the rear of your computer” on page 29 to identify the required connector. Use the instructions shipped with the option to help you make the connection and install any software or device drivers that are required for the option.

### Removing the computer cover

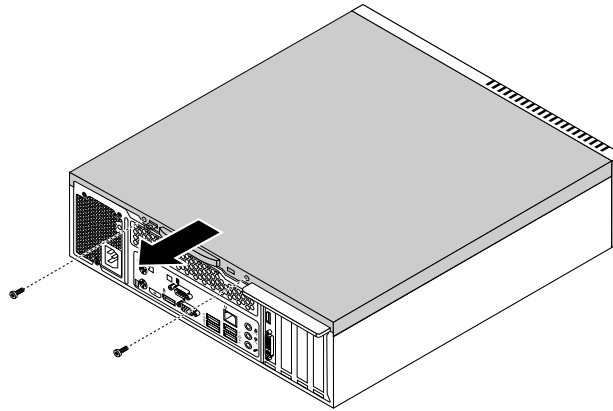
**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

**CAUTION:**

**Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.**

To open the computer cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cord, Input/Output cables, and any other cables that are connected to the computer. See “Locating connectors, controls, and indicators on the front of your computer” on page 28 and “Locating connectors on the rear of your computer” on page 29.
4. Remove any locking device that secures the computer cover, such as an integrated cable lock or a padlock. See “Attaching a Kensington-style cable lock” on page 59 or “Locking the computer cover” on page 57.
5. Remove the two screws that secure the computer cover and slide the computer cover to the rear to remove it.



*Figure 10. Removing the computer cover*

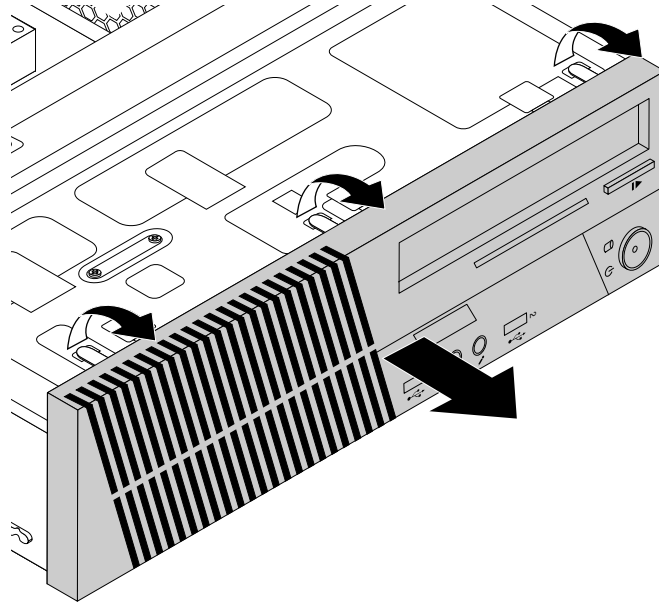
## Removing and reinstalling the front bezel

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To remove and reinstall the front bezel, do the following:

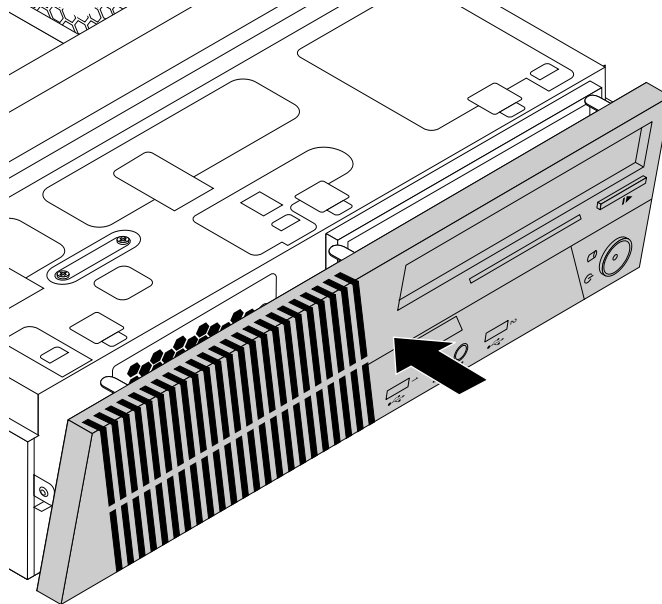
1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.

3. Remove the front bezel by releasing the three plastic tabs on the top of the front bezel and pivoting the front bezel outward to remove it from the computer. Carefully lay the front bezel aside without disconnecting the power switch and light-emitting diode (LED) assembly cable.



*Figure 11. Removing the front bezel*

4. To reinstall the front bezel, align the other three plastic tabs on the bottom of the front bezel with the corresponding holes in the chassis, then pivot the front bezel inward until it snaps into position.



*Figure 12. Reinstalling the front bezel*

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Accessing the system board components and drives

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To access the system board components and drives, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward to access all the internal drives, cables, and other components.

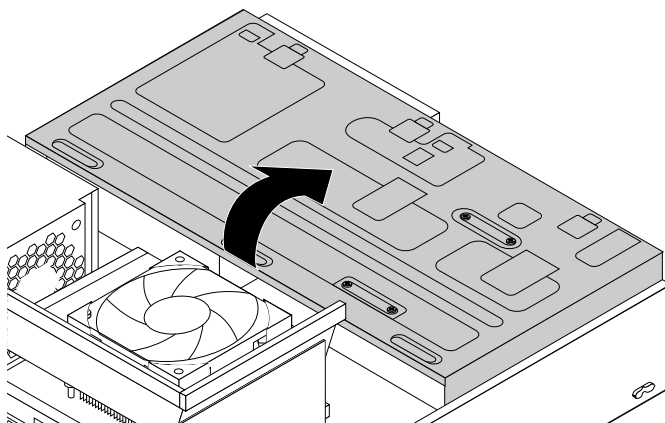


Figure 13. Pivoting the drive bay assembly upward

5. To lower the drive bay assembly, slightly press the drive bay assembly clip **1** inward and pivot the drive bay assembly downward as shown.

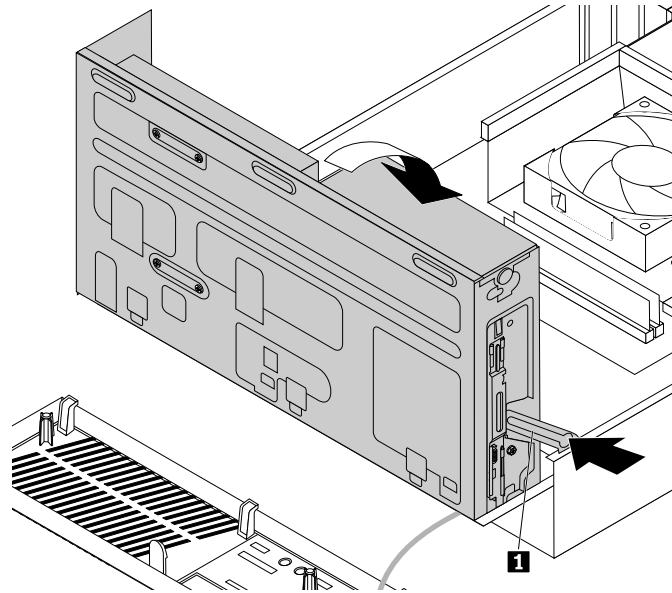


Figure 14. Lowering the drive bay assembly

## Installing or replacing a memory module

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

Your computer has four slots for installing or replacing DDR3 UDIMMs that provide up to a maximum of 32 GB system memory. When installing or replacing a memory module, use 2 GB, 4 GB, or 8 GB DDR3 UDIMMs in any combination up to a maximum of 32 GB.

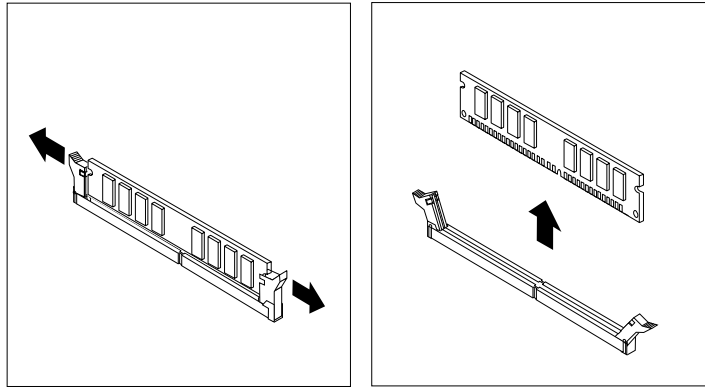
The following table provides information about the memory module installation rules that you should consider when installing or removing a memory module. The “X” mark indicates the memory slot(s) into which the memory module(s) should be installed in different situations. The numbers 1, 2, 3, and 4 indicate the installation sequence. To locate the memory module slots, see “Locating parts on the system board” on page 34.

UDIMM	DIMM 1	DIMM 2	DIMM 3	DIMM 4
One UDIMM	X			
Two UDIMMs	X, 1		X, 2	
Three UDIMMs	X, 1	X, 3	X, 2	
Four UDIMMs	X, 1	X, 3	X, 2	X, 4

To install or replace a memory module, do the following:

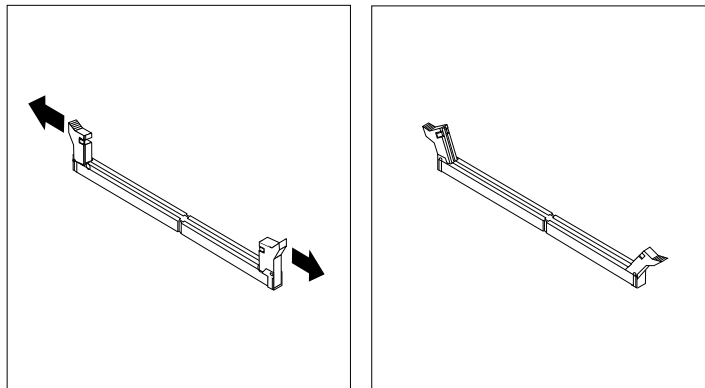
1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Lay the computer on its side for easier access to the system board.
4. Remove the heat sink fan duct. See “Replacing the heat sink and fan assembly” on page 122.

5. Locate the memory slots. See “Locating parts on the system board” on page 34.
6. Remove any parts that might prevent access to the memory slots.
7. Depending on whether you are installing or replacing a memory module, do one of the following:
  - If you are replacing an old memory module, open the retaining clips and gently pull the memory module out of the memory slot.



*Figure 15. Removing a memory module*

- If you are installing a memory module, open the retaining clips of the memory slot into which you want to install the memory module.



*Figure 16. Opening the retaining clips*

8. Position the new memory module over the memory slot. Make sure that the notch **1** on the memory module aligns correctly with the slot key **2** on the system board. Push the memory module straight down into the slot until the retaining clips close.

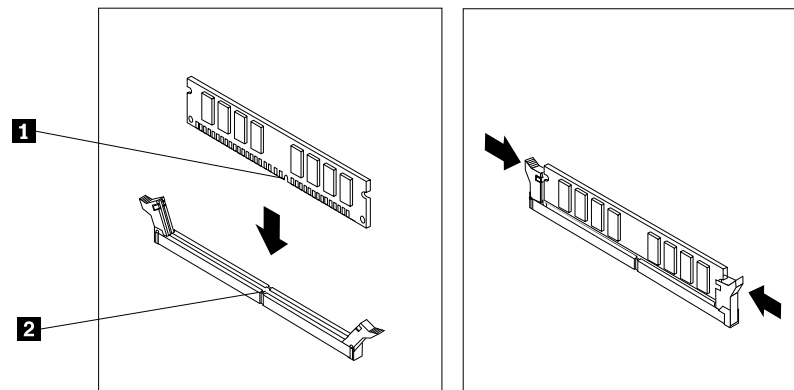


Figure 17. Installing a memory module

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Installing or replacing a PCI card

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

Your computer has one standard PCI card slot, two PCI Express x1 card slots, and one PCI Express x16 graphics card slot.

To install or replace a PCI card, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward. See “Accessing the system board components and drives” on page 104.
5. Depending on whether you are installing or replacing a PCI card, do one of the following:
  - If you are replacing an old PCI card, remove the screw that secures the old PCI card and release the old PCI card from the PCI card slot.

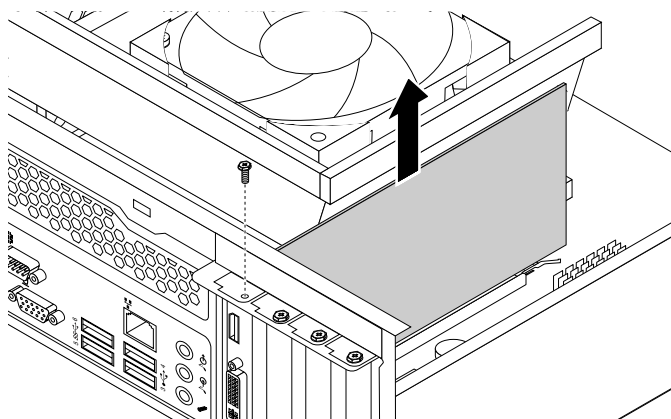
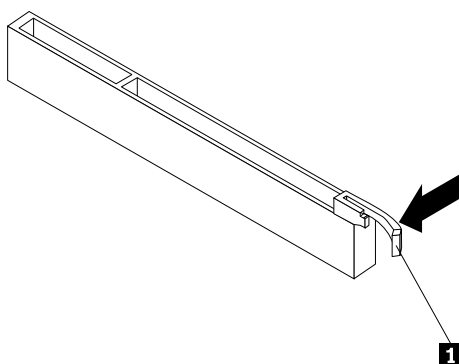


Figure 18. Removing a PCI card

**Notes:**

- The card fits tightly into the card slot. If necessary, alternate moving each side of the card a small amount until it is removed from the card slot.
- If the card is held in place by a retaining latch, press the card retaining latch **1** as shown to disengage the latch. Grasp the card and gently pull it out of the slot.



- If you are installing a PCI card, remove the screw that secures the appropriate metal slot cover. Then, remove the metal slot cover.
6. Remove the new PCI card from its static-protective package.



7. Install the new PCI card into the appropriate PCI card slot on the system board. Then, install the screw to secure the new PCI card in place.

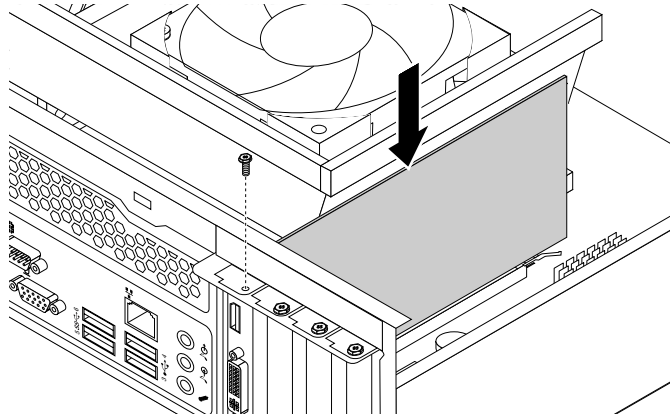


Figure 19. Installing a PCI card

8. If necessary, connect any cables between the PCI card and the system board. See “Locating parts on the system board” on page 34 to identify the various connectors on the system board.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the battery

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as parallel-connector assignments (configuration). A battery keeps this information active when you turn off the computer.

The battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the battery fails, the date, time, and configuration information (including passwords) are lost. An error message is displayed when you turn on the computer.

Refer to the “Lithium coin cell battery notice” in the *Safety, Warranty, and Setup Guide* for information about replacing and disposing of the battery.

To replace the battery, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Locate the battery. See “Locating parts on the system board” on page 34.

4. Remove the old battery.

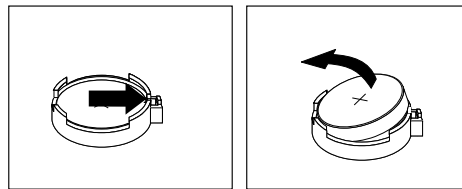


Figure 20. Removing the old battery

5. Install a new battery.

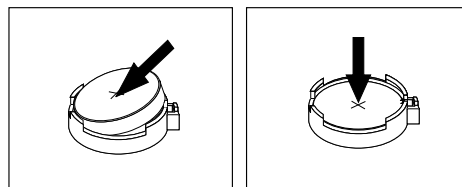


Figure 21. Installing a new battery

6. Reinstall the computer cover and connect the cables. See “Completing the parts replacement” on page 147.

**Note:** When the computer is turned on for the first time after replacing the battery, an error message might be displayed. This is normal after replacing the battery.

7. Turn on the computer and all attached devices.
8. Use the Setup Utility program to set the date, time, and any passwords. See “Using the Setup Utility program” on page 61.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the hard disk drive

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To replace the hard disk drive, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.

4. Note the location of the four screws **1** that secure the hard disk drive. Then, pivot the drive bay assembly upward.

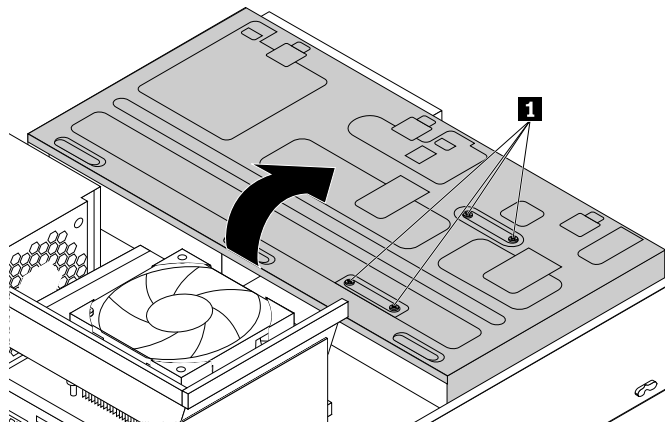


Figure 22. Pivoting the drive bay assembly

5. Hold the hard disk drive and remove the four screws that secure the hard disk drive. Then, remove the hard disk drive from the drive bay assembly.

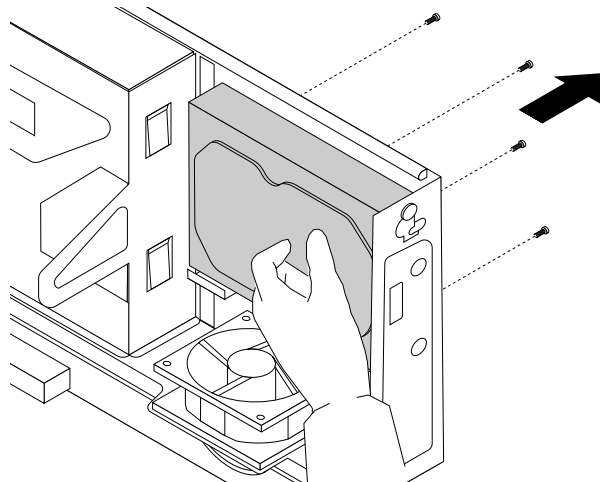


Figure 23. Removing the hard disk drive

6. Disconnect the signal cable and the power cable from the hard disk drive to completely remove the hard disk drive from the chassis.

7. Connect one end of the signal cable to the rear of the new hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 34. Then, locate an available four-wire power connector and connect it to the rear of the new hard disk drive.

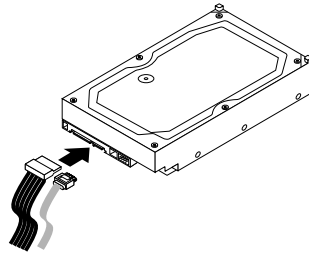


Figure 24. Connecting a SATA hard disk drive

8. Position the new hard disk drive into the hard disk drive bay and align the screw holes in the new hard disk drive with the corresponding holes in the drive bay. Then, install the four screws to secure the new hard disk drive in place.

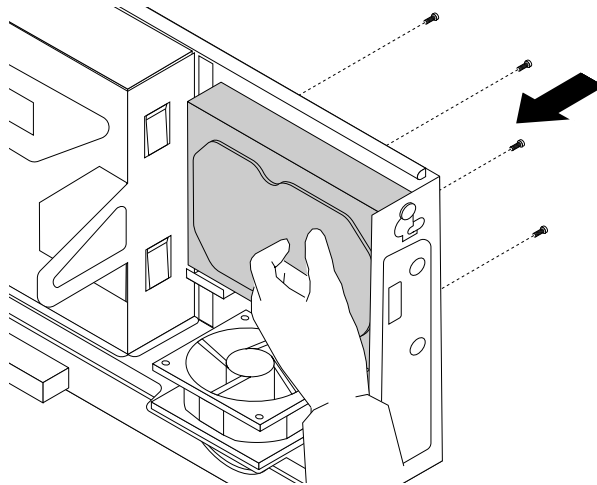


Figure 25. Installing the hard disk drive

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the solid-state drive

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

The solid-state drive is only available on some models. It might be installed in the hard disk drive bay or on the bottom of the optical drive bay.

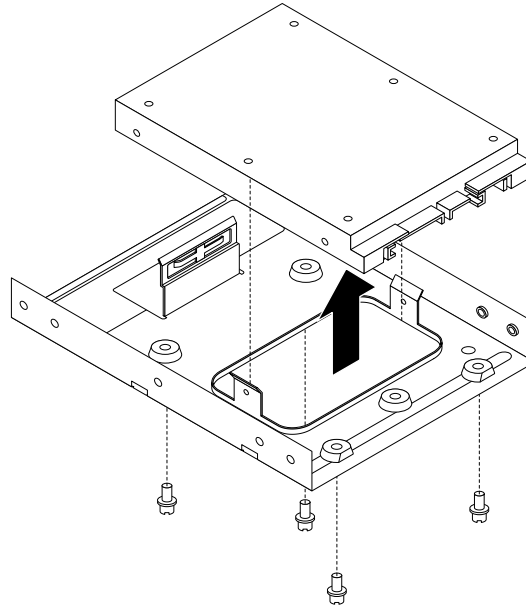
- To replace the solid-state drive in the hard disk drive bay, see “Replacing the solid-state drive in the hard disk drive bay” on page 113.
- To replace the solid-state drive on the bottom of the optical drive bay, see “Replacing the solid-state drive on the bottom of the optical drive bay” on page 114.

## Replacing the solid-state drive in the hard disk drive bay

To replace the storage converter with the solid-state drive installed in it, you might follow the steps of replacing the hard disk drive. See “Replacing the hard disk drive” on page 110.

To replace the solid-state drive in the storage converter, do the following:

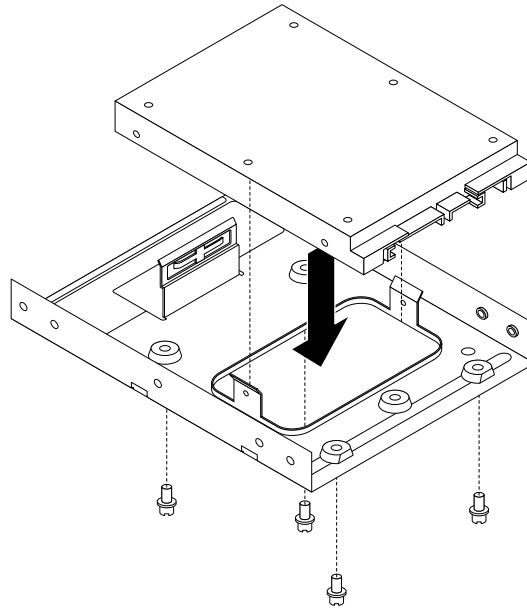
1. Remove the four screws that secure the solid-state drive to the storage converter. Then, remove the drive from the converter as shown.



*Figure 26. Removing the solid-state drive from the storage converter*

2. Take the new solid-state drive out of the static-protective package.

3. Position the solid-state drive into the storage converter so that the holes in the drive are aligned with the corresponding holes in the converter. Then, install the four screws to secure the solid-state drive to the converter.



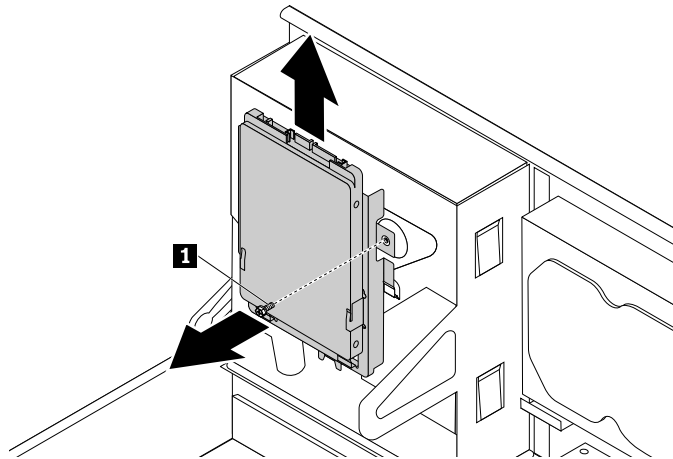
*Figure 27. Installing the solid-state drive into the storage converter*

### **Replacing the solid-state drive on the bottom of the optical drive bay**

To replace the solid-state drive on the bottom of the optical drive bay, do the following:

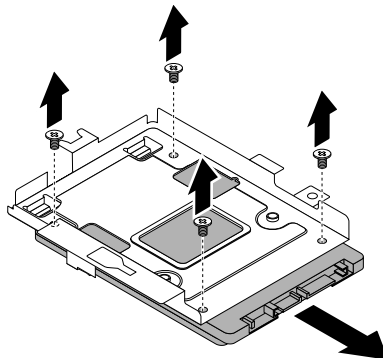
1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward. See “Accessing the system board components and drives” on page 104.
5. Disconnect the signal cable and the power cable from the solid-state drive.

6. Remove the screw **1** and then carefully slide the solid-state drive bracket upward to remove the bracket from the bottom of the optical drive bay.



*Figure 28. Removing the solid-state drive bracket*

7. Remove the four screws that secure the solid-state drive to the bracket. Then, slide the drive as shown to remove it from the bracket.



*Figure 29. Removing the solid-state drive from the bracket*

8. Take the new solid-state drive out of the static-protective package.

- Slide the new solid-state drive into the solid-state drive bracket as shown until the four holes in the drive are aligned with the corresponding holes in the bracket. Then, install the four screws to secure the new solid-state drive to the bracket.

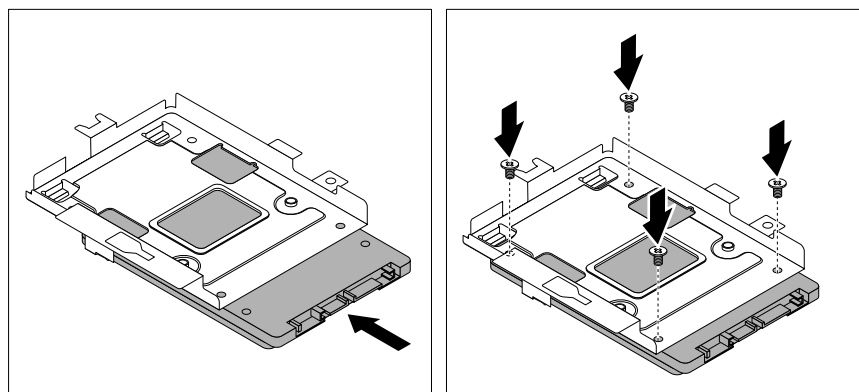


Figure 30. Installing the solid-state drive into the bracket

- Carefully slide the solid-state drive bracket downward until it is secured by the three retaining clips **1** on the bottom of the optical drive bay.

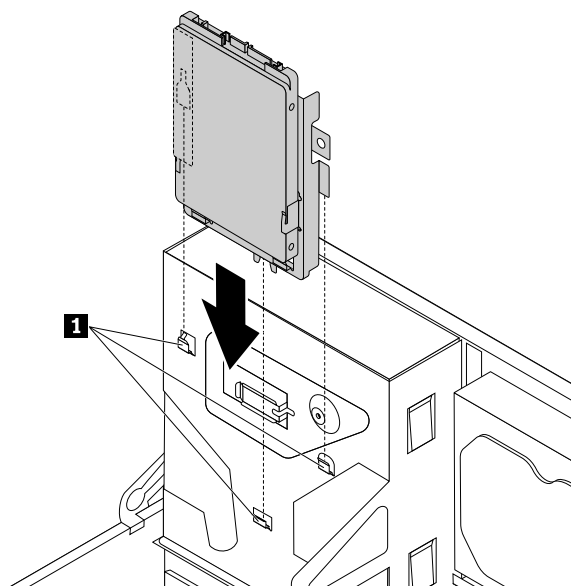


Figure 31. Installing the solid-state drive bracket



11. Install the screw **1** to secure the bracket on the bottom of the optical drive bay.

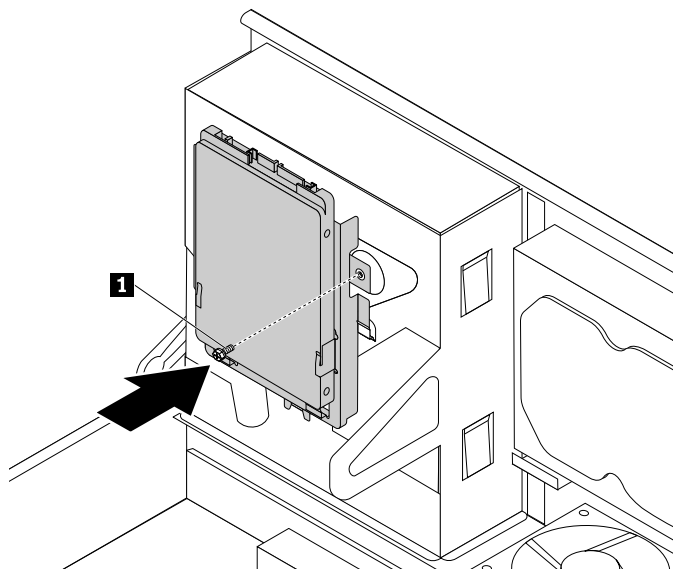


Figure 32. Installing the screw to secure the bracket on the bottom of the optical drive bay

12. Connect one end of the signal cable to the bottom of the new solid-state drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 34. Then, locate an available four-wire power connector and connect it to the bottom of the new solid-state drive.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Installing or replacing the optical drive

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

**Note:** The optical drive is only available on some models.

To install or replace an optical drive, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward. See “Accessing the system board components and drives” on page 104.
5. Disconnect the signal cable and the power cable from the optical drive.

6. Hold the optical drive and remove the two screws that secure the optical drive.

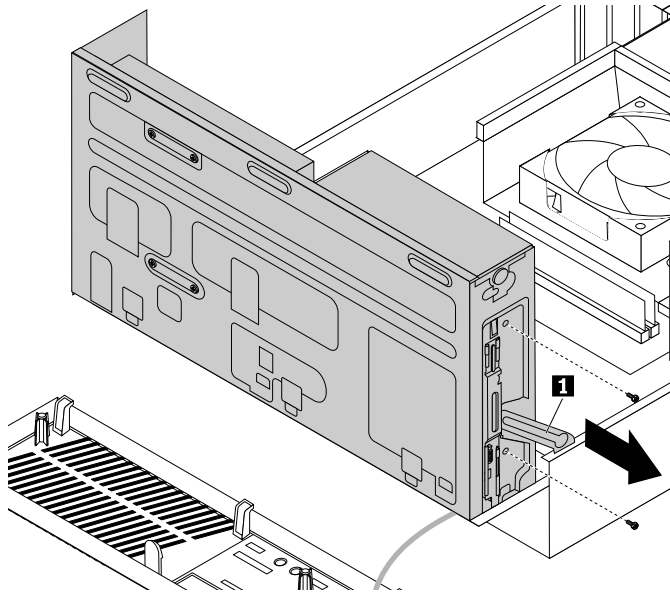


Figure 33. Removing the optical drive screws

7. Slightly press the drive bay assembly clip **1** inward and pivot the drive bay assembly downward as shown.

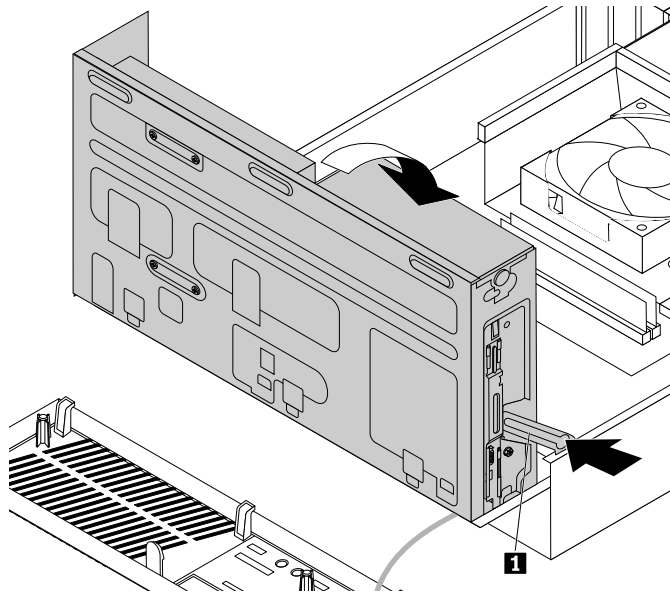
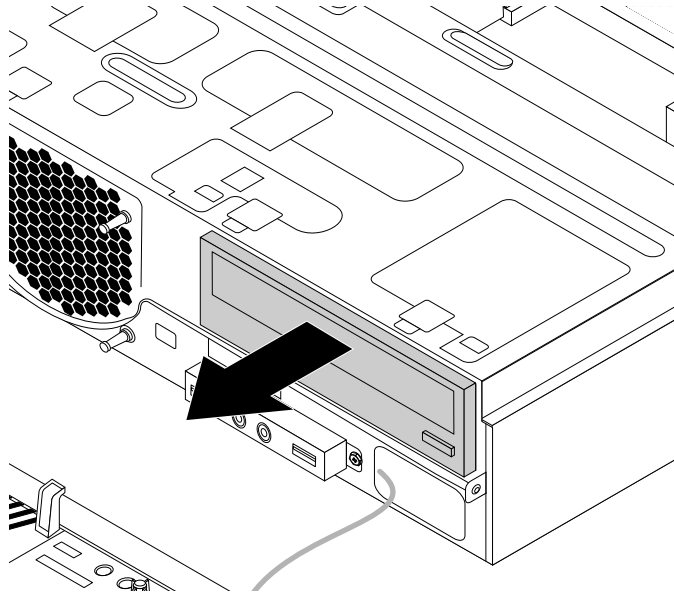


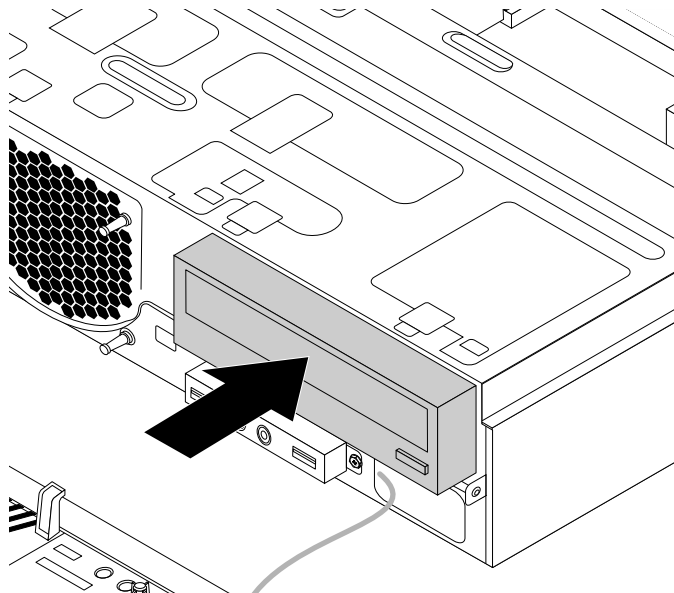
Figure 34. Lowering the drive bay assembly

- Slide the optical drive out of the front of the computer.



*Figure 35. Removing the optical drive*

- Slide the new optical drive into the optical drive bay from the front of the computer.



*Figure 36. Installing a new optical drive*

10. Hold the new optical drive and pivot the drive bay assembly upward. Align the screw holes in the new optical drive with the corresponding holes in the drive bay. Then, install the two screws to secure the new optical drive in place.

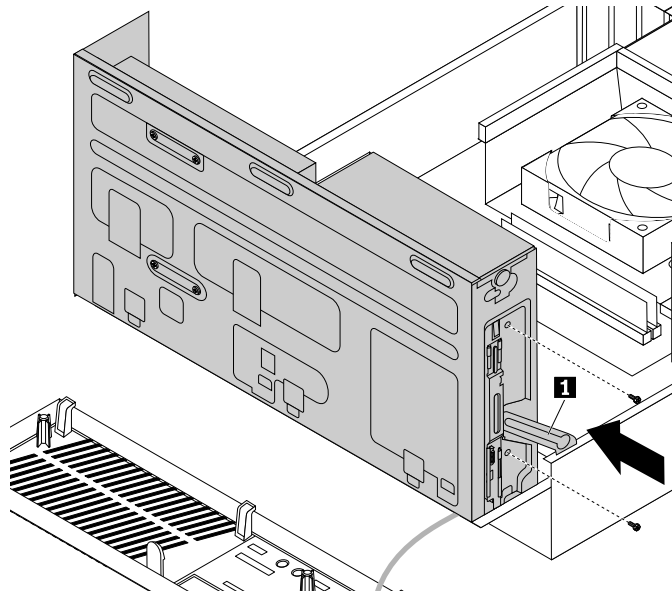


Figure 37. Installing the optical drive

11. Connect one end of the signal cable to the rear of the new optical drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 34. Then, locate an available four-wire power connector and connect it to the rear of the new optical drive.

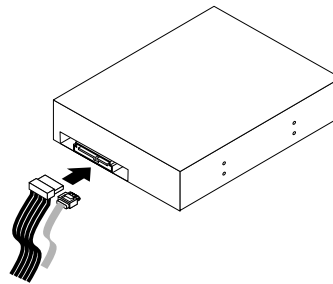


Figure 38. Connecting a SATA optical drive

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the slim card reader

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

**Note:** The slim card reader is only available on some models.

To replace the slim card reader, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Record the cable routing of the installed slim card reader and disconnect the cable of the slim card reader from the system board.
5. Remove the screw that secures the slim card reader bracket and then remove the bracket from the chassis.

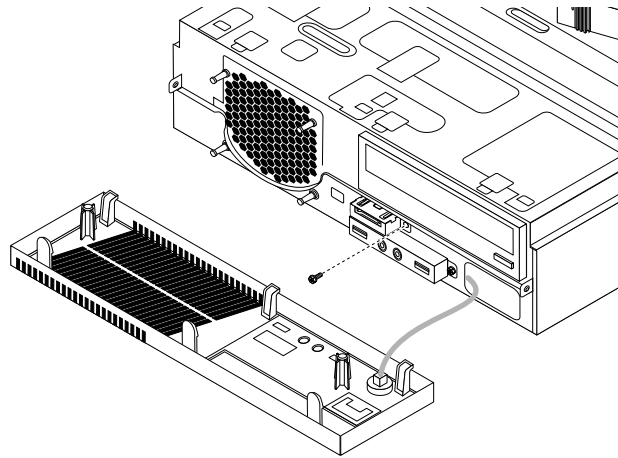


Figure 39. Removing the slim card reader bracket

6. Remove the two screws that secure the slim card reader to the bracket. Then, slide the slim card reader as shown to remove it from the bracket.

**Note:** Touch only the edges of the slim card reader. Do not touch the circuit board of it.

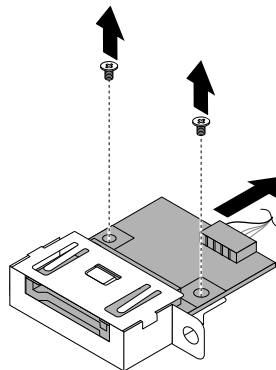


Figure 40. Removing the slim card reader from the bracket

7. Take the new slim card reader out of the static-protective package by its sides.
8. Align the new slim card reader in the slim card reader bracket and slide the slim card reader into the rail as shown until it stops. Then, install the two screws to secure the new slim card reader to the bracket.

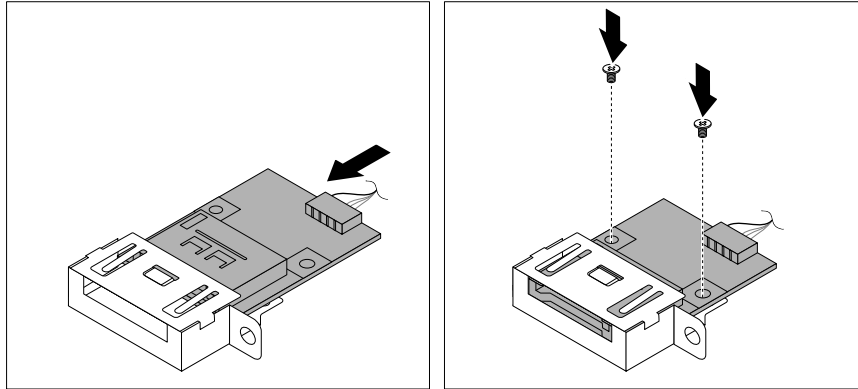


Figure 41. Installing the new slim card reader into the bracket

9. Route the cable of the new slim card reader through the corresponding hole for the slim card reader bracket in the front of the chassis.
10. Install the slim card reader bracket into the chassis so that the hole in the bracket is aligned with the corresponding hole in the chassis. Then, install the screw to secure the slim card reader bracket to the chassis.

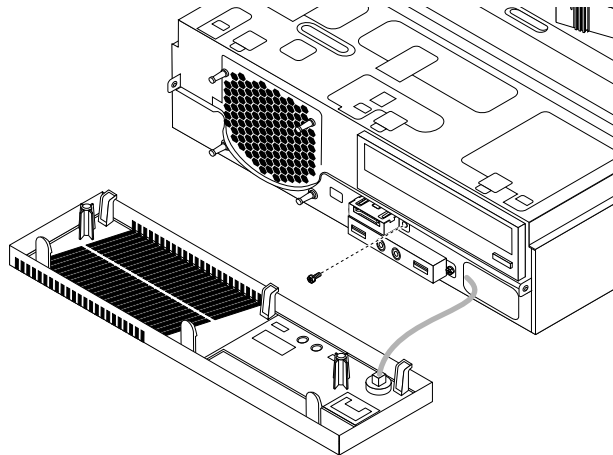


Figure 42. Installing the slim card reader bracket

11. Connect the cable of the new slim card reader to the system board. See “Locating parts on the system board” on page 34.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the heat sink and fan assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

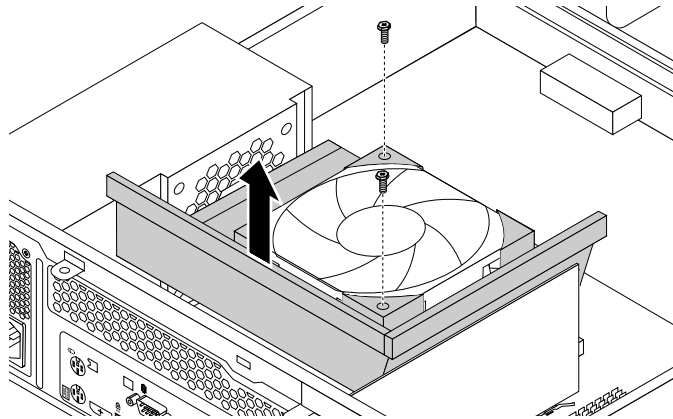
**CAUTION:**



The heat sink and fan assembly might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.

To replace the heat sink and fan assembly, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Pivot the drive bay assembly upward. Then, pivot the two plastic retaining clips outward to remove the heat sink fan duct from the failing heat sink and fan assembly.



*Figure 43. Removing the heat sink fan duct*

4. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 34.

5. Follow the following sequence to remove the four screws that secure the heat sink and fan assembly to the system board:
  - a. Partially remove screw **1**, then fully remove screw **2**, and then fully remove screw **1**.
  - b. Partially remove screw **3**, then fully remove screw **4**, and then fully remove screw **3**.

**Note:** Carefully remove the four screws from the system board to avoid any possible damage to the system board. The four screws cannot be removed from the heat sink and fan assembly.

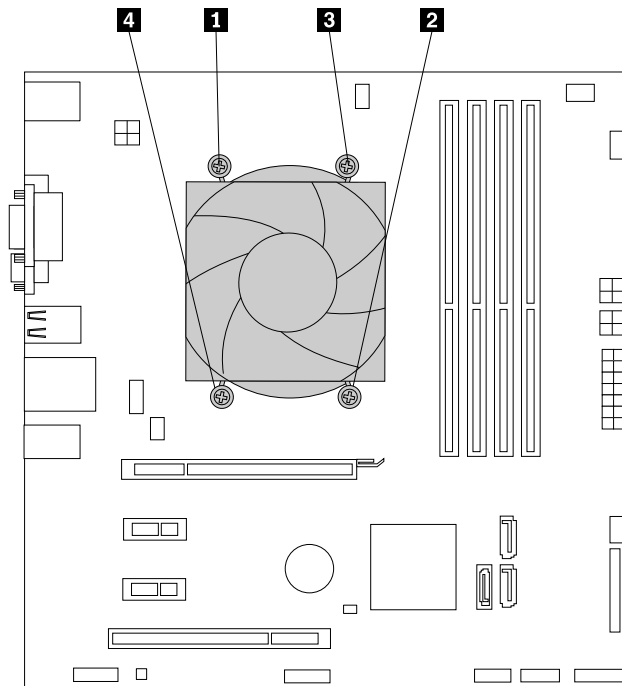


Figure 44. Removing the heat sink and fan assembly

6. Lift the heat sink and fan assembly off the system board.

**Notes:**

- You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
  - When handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of the heat sink and fan assembly.
7. Place the new heat sink and fan assembly on the system board so that the four screws are aligned with the corresponding holes in the system board. Make sure that you properly place the new heat sink and fan assembly so that you can easily connect the new heat sink and fan assembly cable to the microprocessor fan connector on the system board.
  8. Follow the following sequence to install the four screws to secure the new heat sink and fan assembly. Do not over-tighten the screws.
    - a. Partially tighten screw **1**, then fully tighten screw **2**, and then fully tighten screw **1**.
    - b. Partially tighten screw **3**, then fully tighten screw **4**, and then fully tighten screw **3**.
  9. Connect the new heat sink and fan assembly cable to the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 34.



10. Lower and position the heat sink fan duct on the top of the heat sink and fan assembly until it snaps into position.

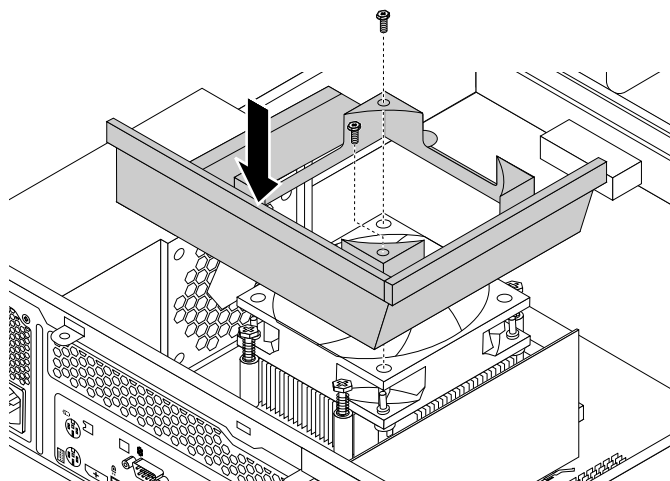


Figure 45. Installing the heat sink fan duct

**What to do next:**

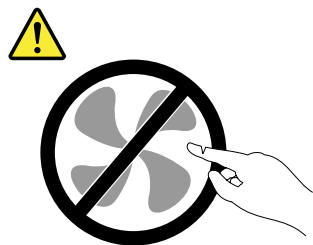
- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the power supply assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

Although there are no moving parts in your computer after the power cord has been disconnected, the following warnings are required for your safety and proper Underwriters Laboratories (UL) certification.

**CAUTION:**



**Hazardous moving parts. Keep fingers and other body parts away.**

**CAUTION:**

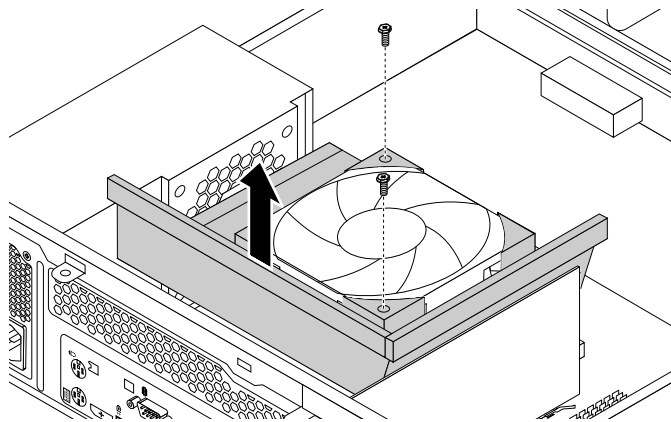
**Never remove the cover on a power supply or any part that has the following label attached.**



**Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.**

To replace the power supply assembly, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Remove the two screws that secure the heat sink fan duct, and then lift the heat sink fan duct out of the chassis.



*Figure 46. Removing the heat sink fan duct*

5. Disconnect the power supply assembly cables from the system board and all drives. See “Locating parts on the system board” on page 34.

**Note:** You might also need to release the power supply assembly cables from some cable clips or ties that secure the cables to the chassis. Ensure that you note the cable routing before disconnecting the cables.

6. At the rear of the computer, remove the three screws that secure the power supply assembly. Press the power supply clip **1** downward to release the power supply assembly and then slide the power supply assembly to the front of the computer. Lift the power supply assembly out of the computer.

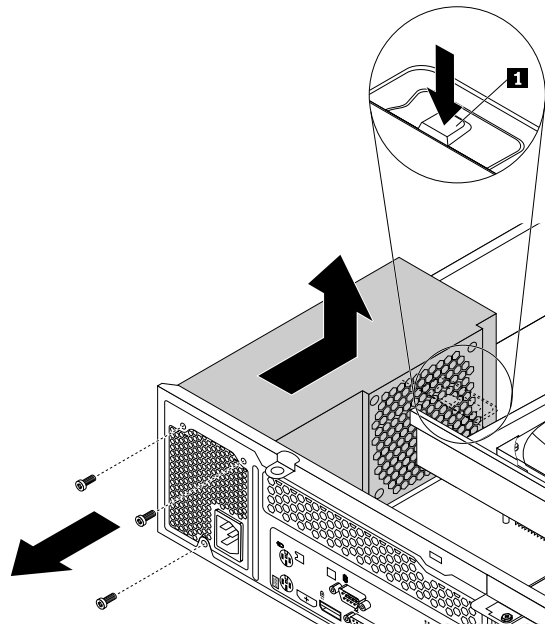


Figure 47. Removing the power supply assembly

7. Make sure that the new power supply assembly is the correct replacement.
8. Install the new power supply assembly into the chassis so that the screw holes in the new power supply assembly are aligned with the corresponding holes in the rear of the chassis. Then, install the three screws to secure the new power supply assembly in place.

**Note:** Use only screws provided by Lenovo.

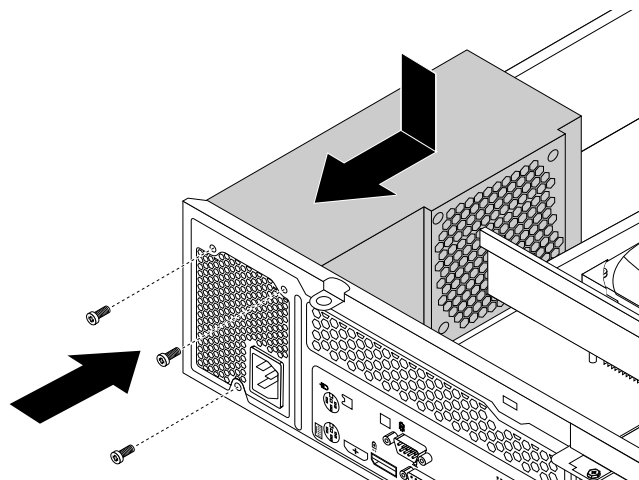


Figure 48. Installing the power supply assembly

9. Connect the new power supply assembly cables to all drives and the system board. See “Locating parts on the system board” on page 34.
10. Lower and position the heat sink fan duct on the top of the heat sink and fan assembly until the two screw holes in the heat sink fan duct are aligned with those in the heat sink and fan assembly. Install the two screws to secure the heat sink fan duct.

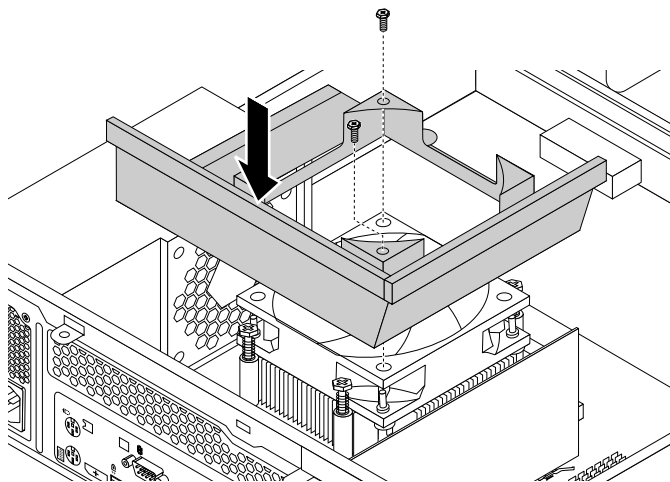


Figure 49. Installing the heat sink fan duct

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the microprocessor

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

#### CAUTION:



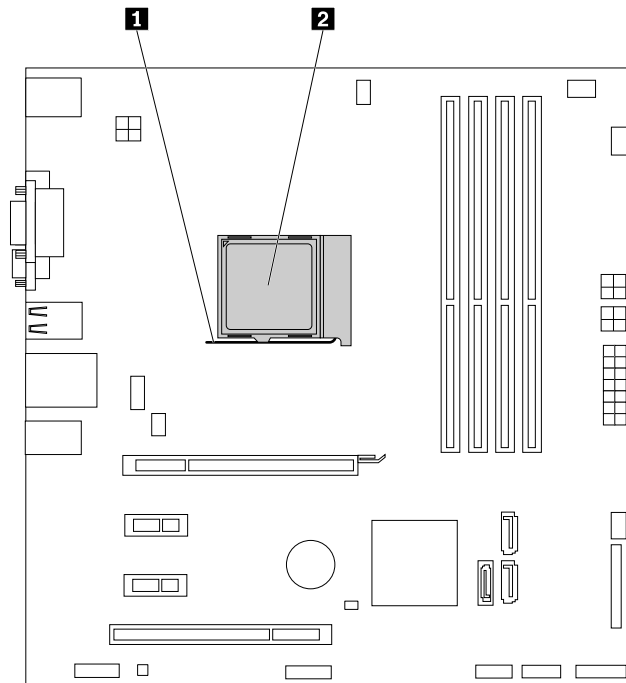
**The heat sink and microprocessor might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.**

To replace the microprocessor, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Locate the system board and disconnect all cables connected to the system board. See “Locating parts on the system board” on page 34.
4. Remove the heat sink and fan assembly with the fan duct. See “Replacing the heat sink and fan assembly” on page 122.

**Note:** Place the heat sink and fan assembly on its side so that the thermal grease on the bottom of it does not get in contact with anything.

5. Lift the small handle **1** to release the microprocessor **2** secured on the system board.



*Figure 50. Accessing the microprocessor*

6. Lift the microprocessor straight up and out of the microprocessor socket.

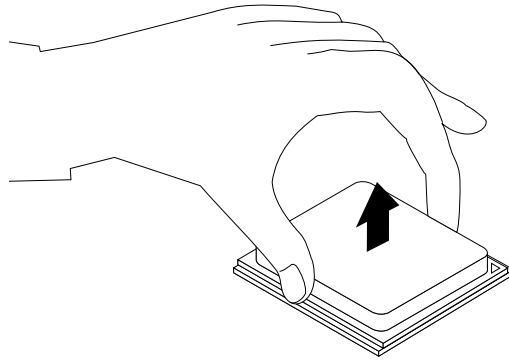
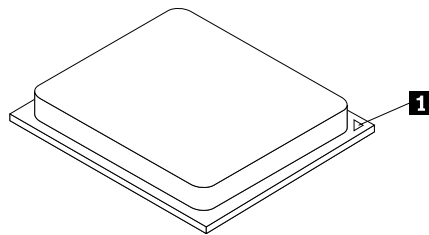


Figure 51. Removing the microprocessor

**Notes:**

- Your microprocessor and socket might look different from the one illustrated.
- Note the orientation of the microprocessor in the socket. You can look for the small triangle **1** on one corner of the microprocessor. This is important when installing the new microprocessor on the system board.



- Touch only the edges of the microprocessor. Do not touch the gold contacts on the bottom.
  - Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.
7. Ensure that the small handle is in the raised position.
  8. Remove the protective cover that protects the gold contacts of the new microprocessor.
  9. Hold the new microprocessor by its sides and align the small triangle on one corner of the new microprocessor with the corresponding small triangle on one corner of the microprocessor socket.
  10. Lower the new microprocessor straight down into the microprocessor socket on the system board.
  11. Lower the small handle to secure the new microprocessor in the socket.
  12. Reinstall the heat sink and fan assembly with the fan duct. See “Replacing the heat sink and fan assembly” on page 122.
  13. Reconnect all cables that were disconnected from the system board.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 147.

## Replacing the system board

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

**Note:** Each computer has a unique Vital Product Data (VPD) code stored in the nonvolatile memory on the system board. After you replace the system board, the VPD must be updated. To update the VPD, see “Updating or recovering the BIOS” on page 66.

This section provides instructions on how to replace the system board.

### CAUTION:



**The heat sink and microprocessor might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.**

To replace the system board, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward. See “Accessing the system board components and drives” on page 104.
5. Remove all memory modules and PCI Express cards that are currently installed. See “Installing or replacing a memory module” on page 105 and “Installing or replacing a PCI card” on page 107.
6. Remove the heat sink and fan assembly from the failing system board. See “Replacing the heat sink and fan assembly” on page 122.

**Note:** Do not let the thermal grease on the bottom of the heat sink and fan assembly get in contact with anything.

7. Record the cable routing and cable connections and then disconnect all cables from the system board.
8. Remove the eight screws that secure the system board.

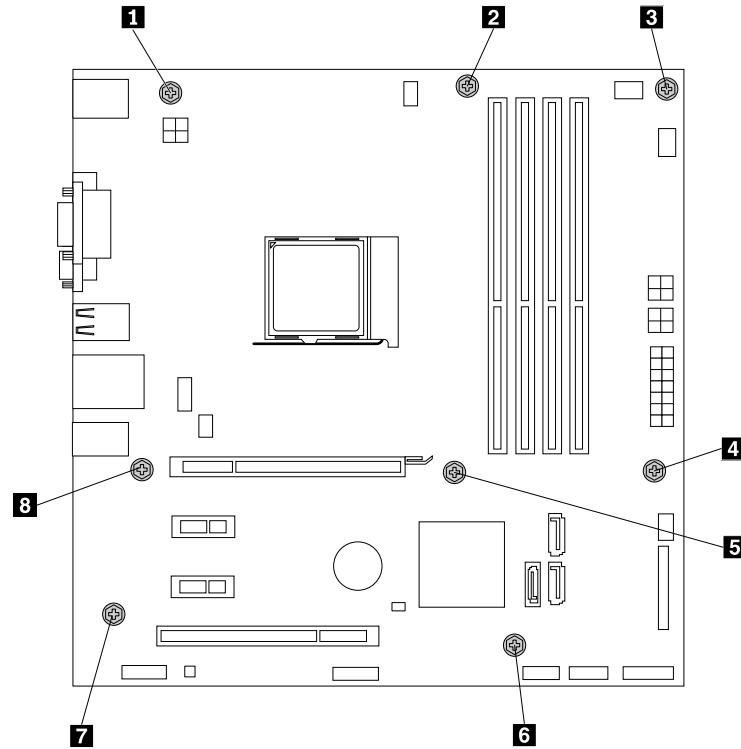


Figure 52. Removing the screws that secure the system board

9. Slide the system board to the front of the computer and then carefully lift the system board out of the chassis. Place the failing system board on a flat, clean, and static-protective surface.
  10. Remove the microprocessor from the failing system board and install it on the new system board. See “Replacing the microprocessor” on page 128.
  11. Install the new system board into the chassis by aligning the six screw holes in the new system board with the corresponding mounting studs on the chassis. Then, install the eight screws to secure the system board.
  12. Install the heat sink and fan assembly and connect the heat-sink-and-fan-assembly cable to the new system board. See “Replacing the heat sink and fan assembly” on page 122.
- Note:** If necessary, apply the appropriate amount of thermal grease on the bottom of the heat sink and fan assembly.
13. Install all memory modules and PCI Express cards removed from the failing system board onto the new system board. See “Installing or replacing a memory module” on page 105 and “Installing or replacing a PCI card” on page 107.
  14. Refer to your record to connect cables to the new system board. You also can refer to “Locating parts on the system board” on page 34 to help you locate the connectors on the system board and connect cables.
  15. To complete the replacement, go to “Completing the parts replacement” on page 147.

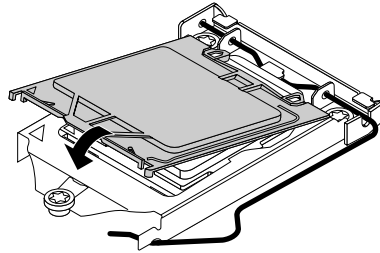
The failing system board must be returned with a microprocessor socket cover to protect the pins during shipping and handling.

To install the microprocessor socket cover, do the following:



1. After you have removed the microprocessor from the failing system board, close the microprocessor retainer and then put the lever to the locked position to secure the retainer in place.
2. Note the orientation of the socket cover, and install one side of the socket cover onto the microprocessor socket. Carefully press the other side of the socket cover downward until the socket cover snaps into position.

**Note:** Your microprocessor socket and cover might look slightly different from the illustration.



*Figure 53. Installing the socket cover onto the microprocessor socket*

3. Carefully check the four corners of the socket cover to ensure that the cover is seated securely.
4. Follow any additional instructions included with the replacement part you received.

## Replacing the front audio and USB assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To replace the front audio and USB assembly, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Pivot the drive bay assembly upward and disconnect the front audio and USB assembly cables from the system board and note the cables routing. See “Locating parts on the system board” on page 34.
5. Lower the drive bay assembly. See “Accessing the system board components and drives” on page 104.

6. Remove the screw that secures the front audio and USB assembly bracket. Then remove the front audio and USB assembly bracket from the chassis.

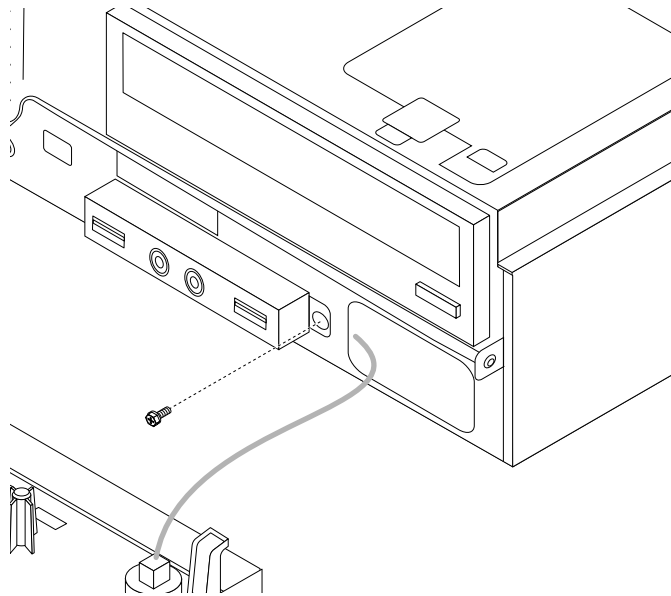


Figure 54. Removing the front audio and USB assembly

7. Remove the two screws that secure the front audio and USB assembly to its bracket. Then remove the failing front audio and USB assembly from the bracket.
8. Install a new front audio and USB assembly into the bracket and install the two screws to secure the front audio and USB assembly to the bracket.
9. Install the front audio and USB assembly bracket to the chassis and align the screw hole in the bracket with the corresponding hole in the chassis.
10. Install the screw to secure the front audio and USB assembly bracket to the chassis.
11. Pivot the drive bay assembly upward and reconnect the front USB and front audio cables to the system board. See “Locating parts on the system board” on page 34.
12. Lower the drive bay assembly. See “Accessing the system board components and drives” on page 104.
13. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 102.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the system fan assembly

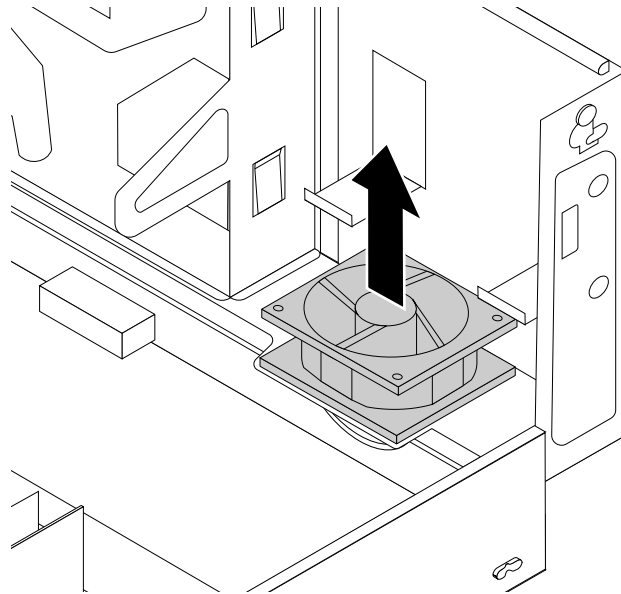
**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To replace the system fan assembly, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.

4. Pivot the drive bay assembly upward to gain access to the system fan assembly. See “Accessing the system board components and drives” on page 104.
5. Remove the hard disk drive for easier access to the system fan assembly. See “Replacing the hard disk drive” on page 110.
6. Remove the heat sink fan duct. See “Replacing the heat sink and fan assembly” on page 122.
7. Note the cable routing and disconnect the system fan assembly cable from the system fan connector on the system board. See “Locating parts on the system board” on page 34.
8. The system fan assembly is attached to the chassis by four rubber mounts. Remove the system fan assembly by cutting the rubber mounts and lifting the system fan assembly out of the chassis.

**Note:** The new system fan assembly will have four new rubber mounts attached.



*Figure 55. Removing the system fan assembly*

9. Install the new system fan assembly by aligning the new rubber mounts that came with the new system fan assembly with the corresponding holes in the chassis, and then push the rubber mounts through the holes. Then, carefully pull on the tips of the rubber mounts from the bottom until the new system fan assembly is secured in place.

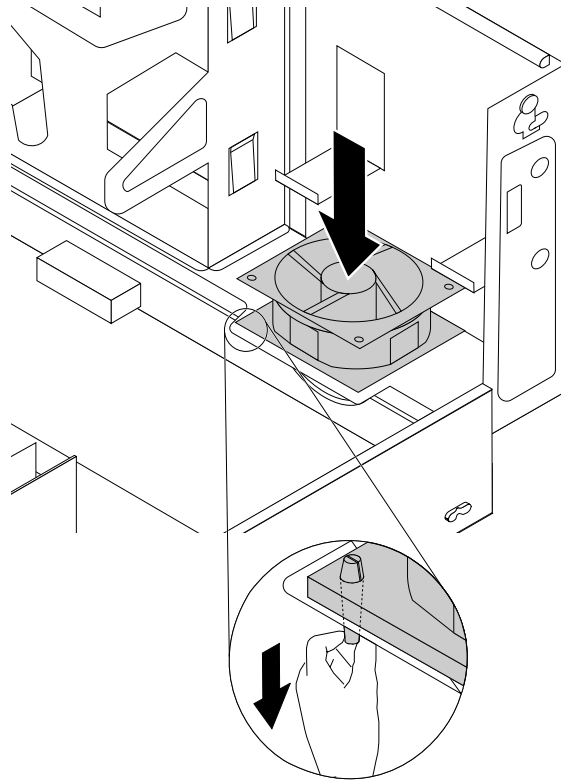


Figure 56. Installing the system fan assembly

10. Connect the new system fan assembly cable to the system fan connector on the system board. See “Locating parts on the system board” on page 34.
11. Reinstall the heat sink fan duct. See “Replacing the heat sink and fan assembly” on page 122.
12. Reinstall the hard disk drive. See “Replacing the hard disk drive” on page 110.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

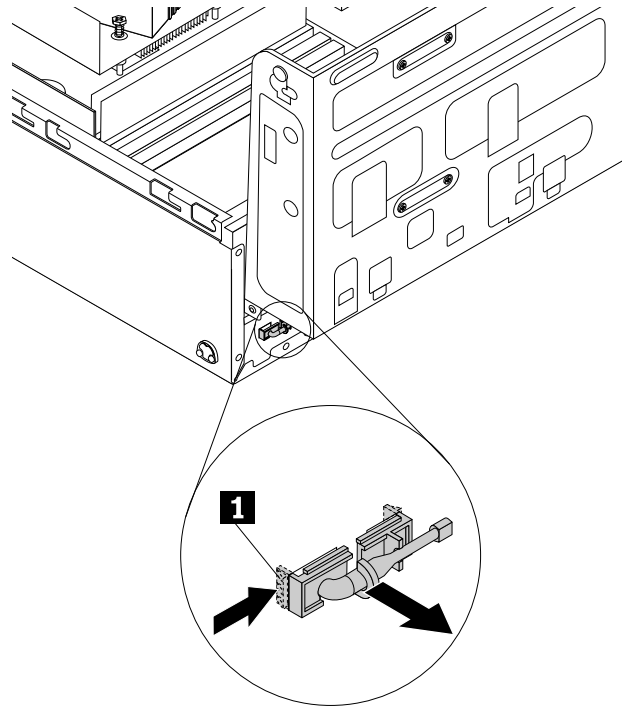
## Replacing the thermal sensor

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To replace the thermal sensor, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Locate the thermal sensor. See “Locating components” on page 31.

5. Pivot the drive bay assembly upward. See “Accessing the system board components and drives” on page 104.
6. Disconnect the thermal sensor cable from the thermal sensor connector on the system board.
7. On the inner side of the front panel, press the left retaining clip **1** that secures the plastic holder of the thermal sensor as shown and then push the clip out of the outer side of the front panel. Then, disengage the plastic holder holding the thermal sensor from the chassis.



*Figure 57. Removing the thermal sensor*

8. Pull the entire thermal sensor out of the chassis.

9. Insert the connector and cable of the new thermal sensor into the hole **1** in the chassis. Then, align the two tabs on the plastic holder holding the thermal sensor with the two holes **1** and **2** in the chassis, and push the plastic holder until it snaps into position.

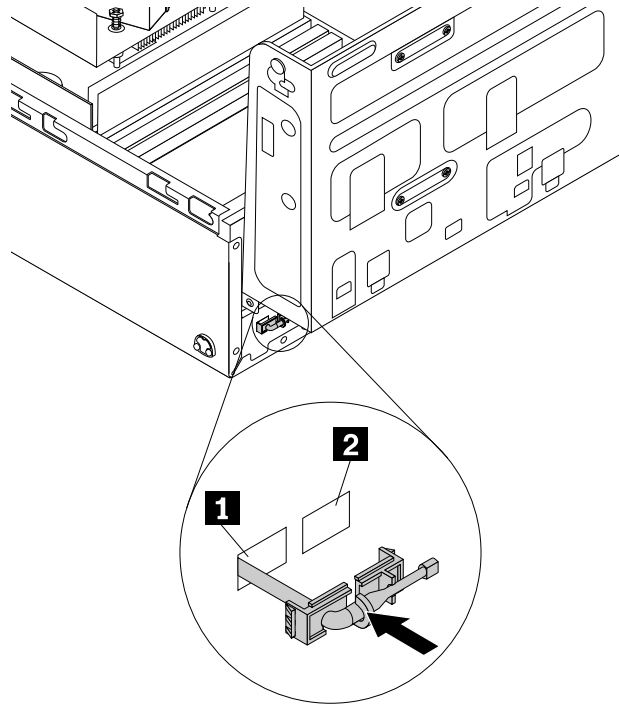


Figure 58. Installing the thermal sensor

10. Connect the cable of the new thermal sensor to the thermal sensor connector on the system board. See “Locating parts on the system board” on page 34.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Installing or removing the front Wi-Fi antenna

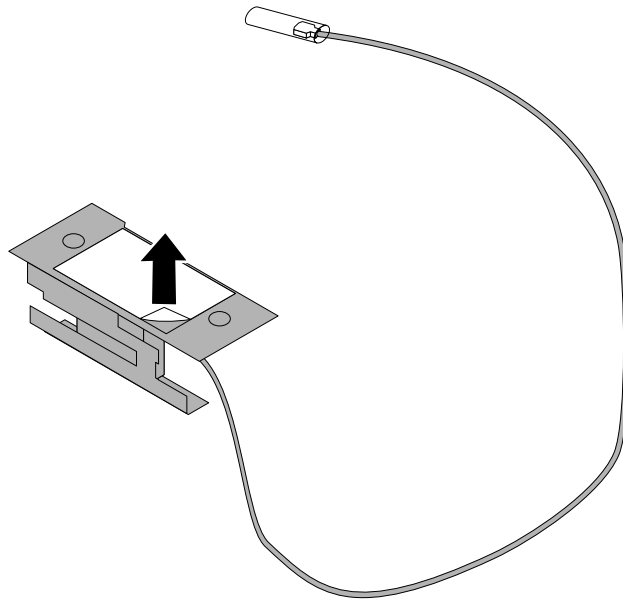
**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

### Installing the front Wi-Fi antenna

To install the front Wi-Fi antenna, do the following:

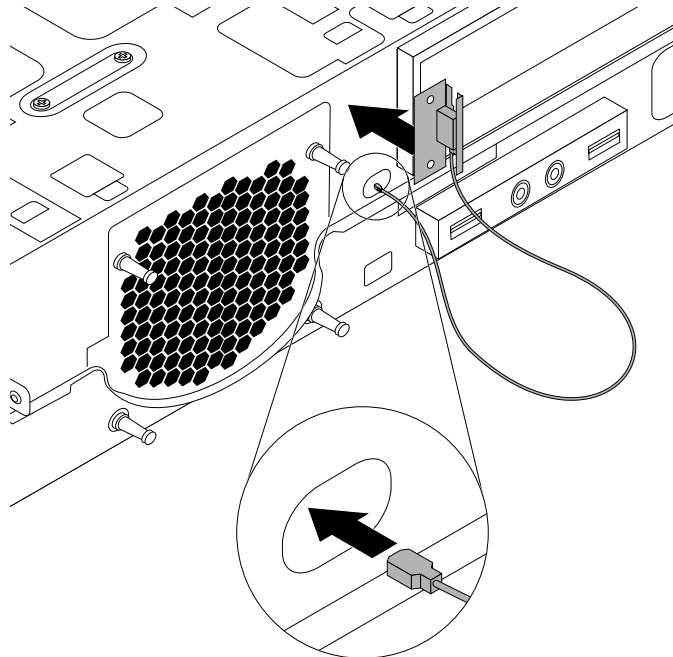
1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.

4. Peel off the paper that protects the stickers on the front antenna.



*Figure 59. Peeling off the paper that protects the stickers*

5. Stick the front antenna to the front panel as shown. Then insert the front antenna cable through the hole in the front panel.



*Figure 60. Installing the front Wi-Fi antenna*

6. Connect the front antenna cable to the Wi-Fi card module.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

**Removing the front Wi-Fi antenna**

To remove the front Wi-Fi antenna, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 102.
4. Disconnect the front antenna cable from the Wi-Fi card module.
5. Remove the front antenna and cable from the front of the computer.

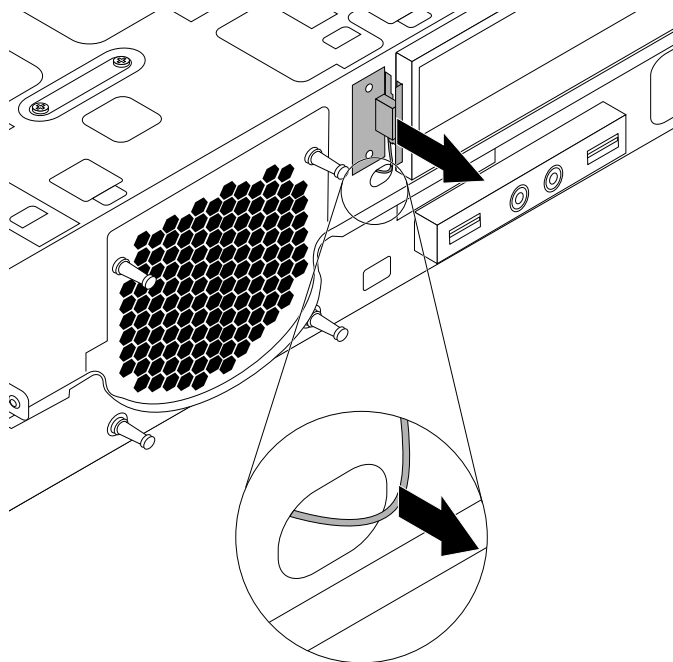


Figure 61. Removing the front Wi-Fi antenna

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

**Installing or removing the rear Wi-Fi antenna**

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

**Installing the rear Wi-Fi antenna**

To install the rear Wi-Fi antenna, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.



2. Install the rear Wi-Fi antenna to the rear Wi-Fi antenna cable connector attached on the rear of the computer.
3. Adjust the angle of the rear antenna to lower the risk of breaking the antenna by accident.

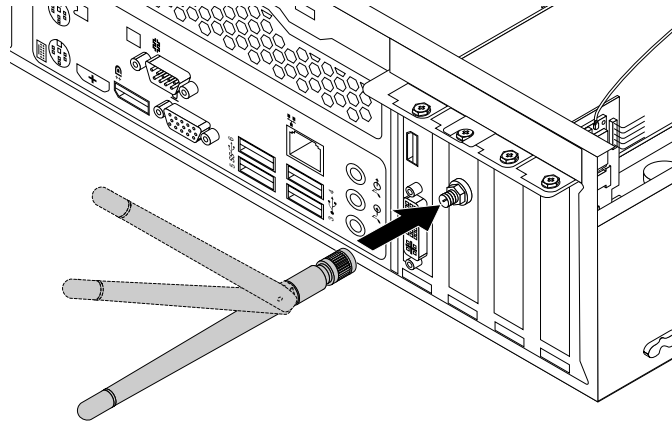


Figure 62. Installing the rear Wi-Fi antenna

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

**Removing the rear Wi-Fi antenna**

To remove the rear Wi-Fi antenna, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Straighten the rear Wi-Fi antenna so that it can be more easily twisted.
3. Hold the thicker end of the rear Wi-Fi antenna and unscrew the Wi-Fi antenna from the rear of the computer.

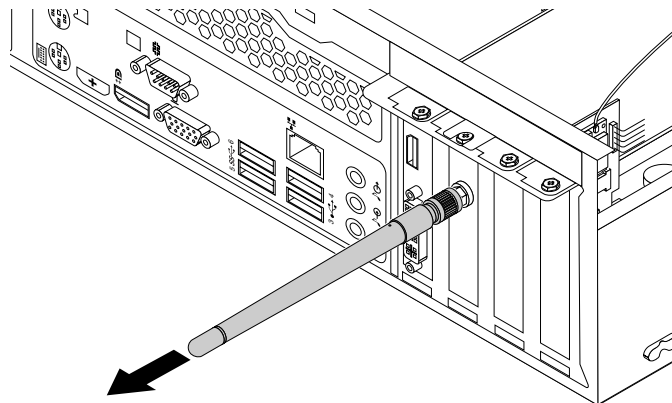


Figure 63. Removing the rear Wi-Fi antenna

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the Wi-Fi units

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

The Wi-Fi units include a Wi-Fi adapter card, a Wi-Fi card module, and a rear Wi-Fi antenna cable.

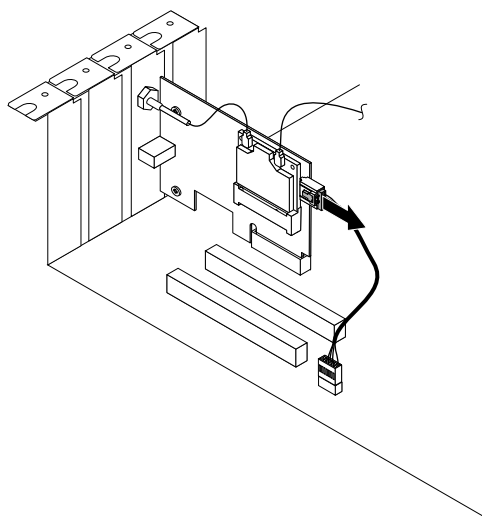
Replacing the Wi-Fi units involves the following operations:

- “Removing the Wi-Fi adapter card” on page 142
- “Removing the Wi-Fi card module” on page 143
- “Installing the Wi-Fi units” on page 144

### Removing the Wi-Fi adapter card

To remove the Wi-Fi adapter card, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 101.
3. If your computer comes with a Wi-Fi card module that supports the Bluetooth function, disconnect the Bluetooth cable from the Wi-Fi adapter card.



*Figure 64. Disconnecting the Bluetooth cable*

**Note:** The Bluetooth cable connects the Bluetooth connector on the Wi-Fi adapter card to the front USB connector on the system board to support the Bluetooth function.

4. Remove the screw that secures the Wi-Fi adapter card.

5. Grasp the Wi-Fi adapter card that is currently installed and gently pull it out of the slot.

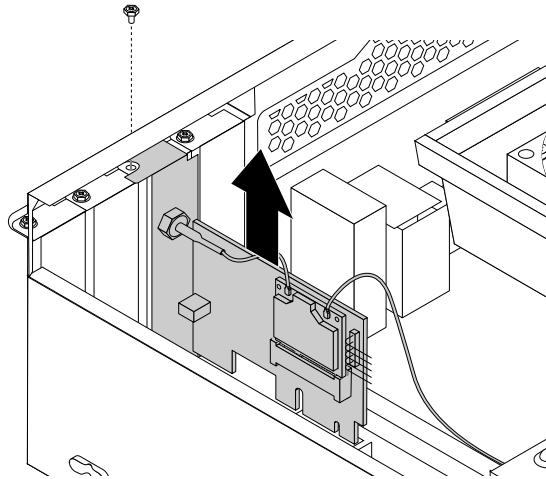


Figure 65. Removing the Wi-Fi adapter card

**Note:** The card fits tightly into the card slot. If necessary, alternate moving each side of the card a small amount until it is removed from the card slot.

## Removing the Wi-Fi card module

To remove the Wi-Fi card module, do the following:

1. Remove the Wi-Fi adapter card from the computer, and then disconnect the front and rear Wi-Fi antenna cables from the Wi-Fi card module.

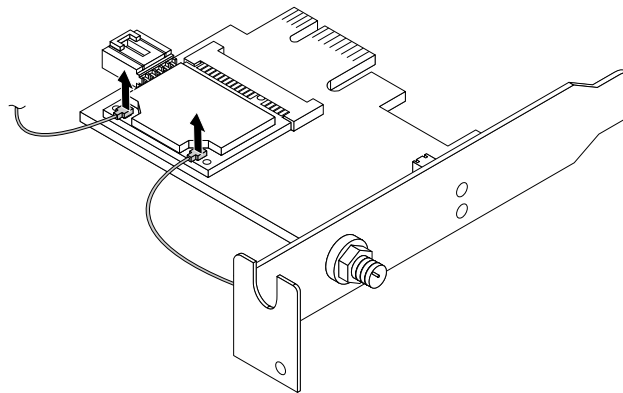
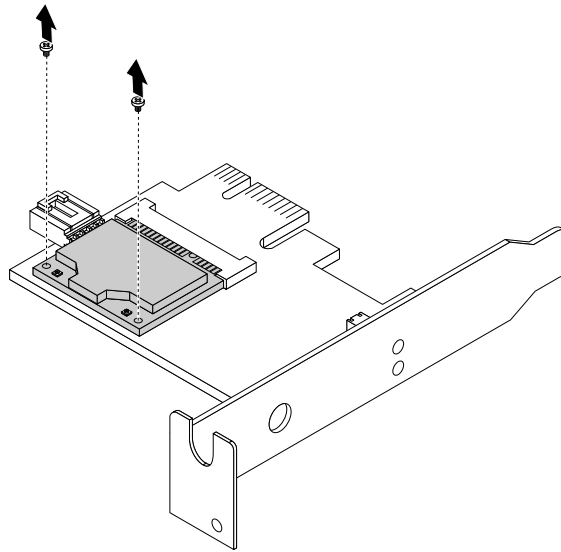


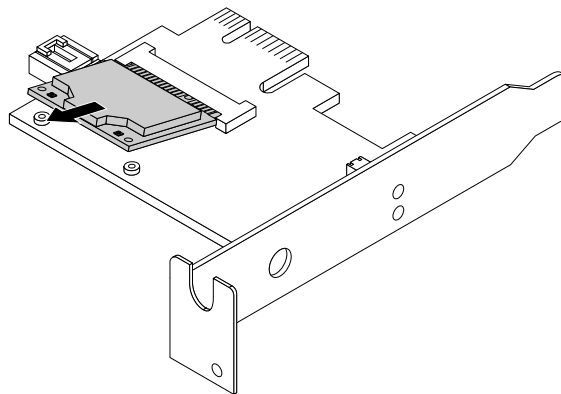
Figure 66. Removing the Wi-Fi antenna cables

2. Remove the two screws that secure the Wi-Fi card module to the Wi-Fi adapter card.



*Figure 67. Removing the screws that secure the Wi-Fi card module*

3. Pull the Wi-Fi card module out of the mini PCI Express slot to remove it from the Wi-Fi adapter card.

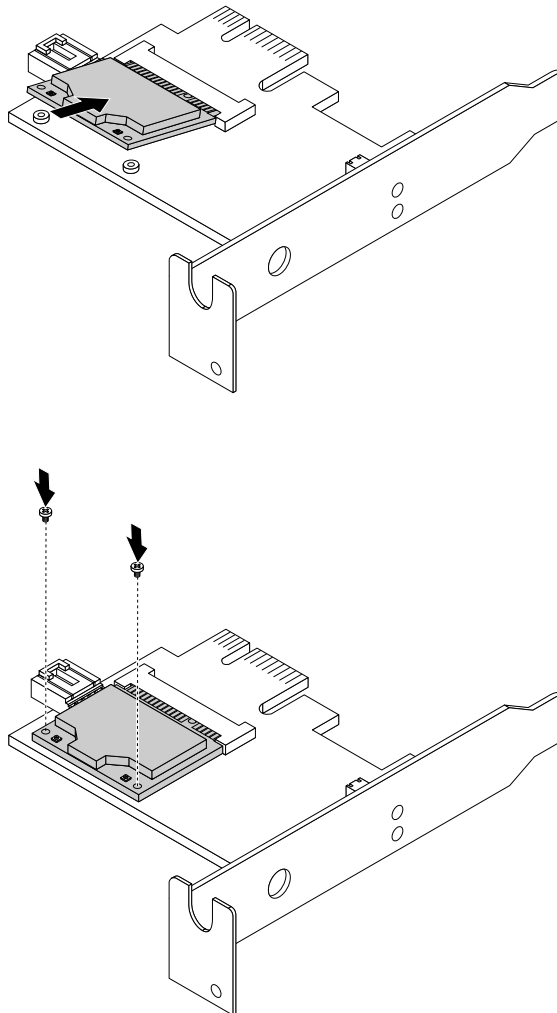


*Figure 68. Removing the Wi-Fi card module*

## **Installing the Wi-Fi units**

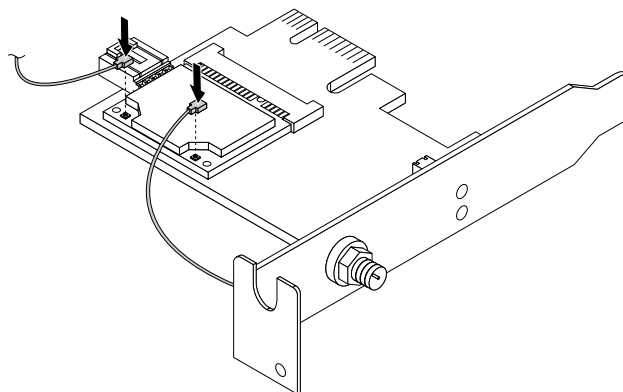
To install the Wi-Fi units, do the following:

1. Insert the Wi-Fi card module into the mini PCI Express slot, and then install the two screws to secure the Wi-Fi card module to the Wi-Fi adapter card.



*Figure 69. Installing the Wi-Fi card module*

2. Connect the front antenna cable and rear antenna cable to the Wi-Fi card module.



*Figure 70. Connecting the Wi-Fi antenna cables*

3. Locate the two PCI Express x1 slots on the system board. See “Locating parts on the system board” on page 34.
4. If the installed Wi-Fi card module supports the Bluetooth function, use a Bluetooth cable to connect the Bluetooth connector on the Wi-Fi adapter card to the front USB connector on the system board.
5. Install the Wi-Fi adapter card into one of the two PCI Express x1 slots. Then install the screw to secure the Wi-Fi adapter card in place.

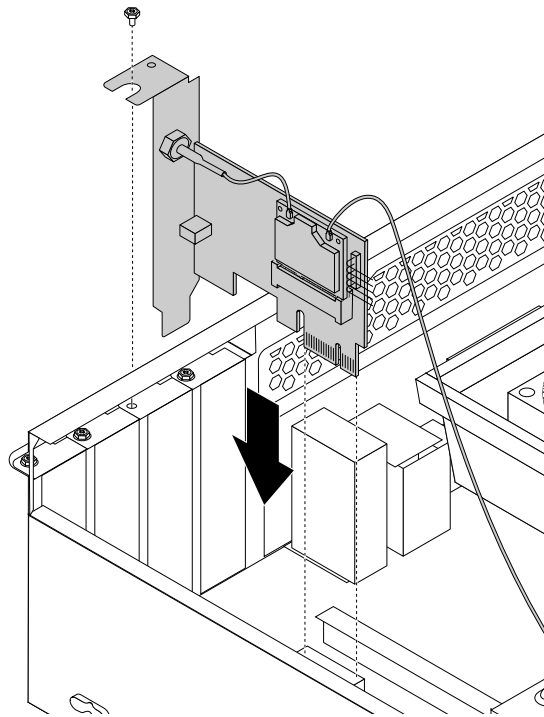


Figure 71. Installing the Wi-Fi adapter card

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

## Replacing the keyboard or mouse

**Attention:** Do not open your computer or attempt any repair before reading and understanding the Chapter 1 “Read this first: Important safety information” on page 1.

To replace the keyboard or mouse, do the following:

1. Disconnect the old keyboard cable or mouse cable from the computer.

2. Connect a new keyboard or mouse to one of the USB connectors on the computer. Depending on where you want to connect the new keyboard or mouse, see “Locating connectors, controls, and indicators on the front of your computer” on page 28 or “Locating connectors on the rear of your computer” on page 29.

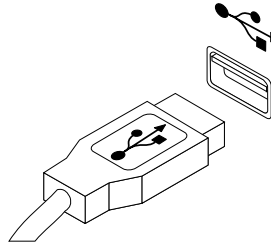


Figure 72. Connecting the USB keyboard or mouse

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 147.

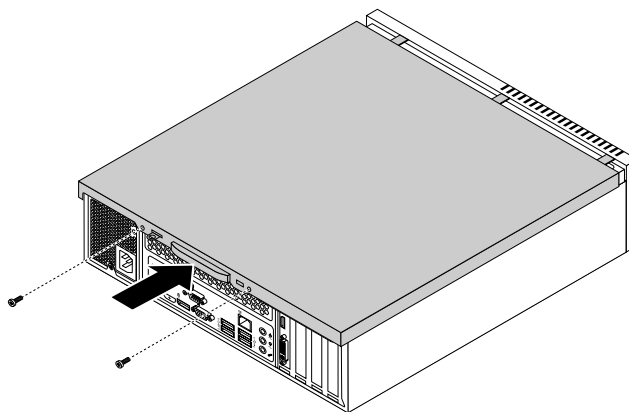
## Completing the parts replacement

After completing the installation or replacement for all parts, you need to reinstall the computer cover and reconnect cables. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to “Using the Setup Utility program” on page 61.

To reinstall the computer cover and reconnect cables to your computer, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See “Locating components” on page 31 for the locations of various components in your computer.
2. Ensure that the cables are routed correctly before reinstalling the computer cover. Keep cables clear of the hinges and sides of the computer chassis to avoid interference with reinstalling the computer cover.
3. Lower the drive bay assembly. See “Accessing the system board components and drives” on page 104.
4. If you have removed the front bezel, reinstall it. To reinstall the front bezel, align the three tabs on the front bezel with the corresponding holes in the chassis and pivot the front bezel inwards until it snaps into position.

5. Position the computer cover on the chassis so that the rail guides on the computer cover engage the rails on the chassis. Then, slide the computer cover to the front of the computer until it snaps into position and is closed. Then, install the two screws to secure the computer cover.



*Figure 73. Reinstalling the computer cover*

6. If there is any locking device available, lock the computer cover. See Chapter 5 “Security” on page 57.
7. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 29.
8. To update your configuration, refer to “Using the Setup Utility program” on page 61.

**Note:** In most areas of the world, Lenovo requires the return of the defective Customer Replaceable Unit (CRU). Information about this will come with the CRU or will come a few days after the CRU arrives.

## Obtaining device drivers

You can obtain device drivers that are not preinstalled in your operating system at <http://www.lenovo.com/support>. Installation instructions are provided in readme files with the device-driver files.



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## Chapter 12. Getting information, help, and service

This chapter contains information about help, service, and technical assistance for products manufactured by Lenovo.

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### Information resources

You can use the information in this section to access useful resources relating to your computing needs.

### Windows help system

**Note:** If you use the online help for Windows 7 or Windows 8.1, or the help for Windows 10, ensure that your computer is connected to the Internet.

The Windows help system provides you with detailed information about using the Windows operating system.

To access the Windows help system, do one of the following:

- For Windows 7: Click the Start button to open the Start menu, and then click **Help and Support**. You can choose to use the online or offline help at the bottom of the screen.
- For Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Help**. You can choose to use the online or offline help at the bottom of the screen.
- For Windows 10: Click the Start button to open the Start menu, and then click **Get started**.

### Safety and Warranty

The *Safety, Warranty, and Setup Guide* that is provided with your computer contains information on safety, setup, warranty, and notices. The safety information in the *Safety, Warranty, and Setup Guide* provides information you need to know before setting up and using this product. Read and understand all safety information provided in the *Safety, Warranty, and Setup Guide* before using this product.

The information in Chapter 1 “Read this first: Important safety information” on page 1 of this *User Guide* provides additional safety information that applies to topics and tasks described in this publication. Read and understand all safety information provided in that section before disassembling or upgrading this product.

### Lenovo Web site

The Lenovo Web site (<http://www.lenovo.com>) provides up-to-date information and services to help you buy, upgrade, and maintain your computer. You can also do the following:

- Shop for desktop and notebook computers, monitors, projectors, upgrades and accessories for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Download the latest device drivers and software updates for your computer model.
- Access the online manuals for your products.
- Access the Lenovo Limited Warranty.
- Access troubleshooting and support information for your computer model and other supported products.
- Find the service and support phone numbers for your country or region.

- Find a Service Provider located near you.

## Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at:  
<http://www.lenovo.com/support>

This Web site is updated with the latest support information such as the following:

- Drivers and software
- Diagnostic solutions
- Product and service warranty
- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions

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## Help and service

This section contains information about obtaining help and service.

### Using the documentation and diagnostic program

If you experience a problem with your computer, see Chapter 8 “Troubleshooting and diagnostics” on page 73. For information on additional resources to help you troubleshoot your computer problem, see “Information resources” on page 149.

If you suspect a software problem, see the documentation that comes with the operating system or software program, including readme files and online help.

Most computers come with a diagnostic program that help you identify hardware problems.

You can also get the latest technical information and download device drivers and updates from Lenovo Support Web site at:  
<http://www.lenovo.com/support>

### Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

The following services are available during the warranty period:

- **Problem determination** - Trained service personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair** - If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) that apply to your hardware available.

These items are not covered by the warranty:

- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade

- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the *Safety, Warranty, and Setup Guide* that comes with your computer for information about your warranty type and duration. You must retain your proof of purchase to obtain warranty service.

For a list of Lenovo Support phone numbers, go to <http://www.lenovo.com/support/phone> or refer to the *Safety, Warranty, and Setup Guide* that comes with your computer.

**Note:** Phone numbers are subject to change without notice. If the number for your country or region is not provided, contact your Lenovo reseller or Lenovo marketing representative.

If possible, be at your computer when you call. Have the following information available:

- Machine type and model
- Serial numbers of your hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

## Using other services

You might travel with your computer or relocate it to a country or region where the machine type for your desktop or notebook computer is sold. In such a situation, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries or regions where service is available, go to <http://www.lenovo.com/support>. Then click **Product & Service Warranty**, and follow the instructions on the screen.

For technical assistance with the installation of or questions related to Service Packs for your preinstalled Microsoft Windows product, go to the Microsoft Product Support Web site at <http://support.microsoft.com>. You also can contact the Lenovo Customer Support Center for help. Some fees might apply.

## Purchasing additional services

During and after the warranty period, you can purchase additional services. Examples of these additional services include:

- Support for hardware, operating systems, and application programs
- Network setup and configuration services
- Upgraded or extended hardware repair services
- Custom installation services

Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at:  
<http://www.lenovo.com>



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## Appendix A. Regulatory information

The latest compliance information is available at <http://www.lenovo.com/compliance>.

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### Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 5A992.c. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

---

### Electronic emissions notices

The following information refers to Lenovo personal computer machine types 10CT, 10CU, 10CV, 10CW, 10J9, 10JA, 10JB, and 10JC.

### Federal Communications Commission Declaration of Conformity

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an authorized dealer or service representative for help.

Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:  
Lenovo (United States) Incorporated  
1009 Think Place - Building One  
Morrisville, NC 27560  
Phone Number: 919-294-5900



### Industry Canada Class B emission compliance statement

CAN ICES-3(B)/NMB-3(B)

## **European Union - Compliance to Directives for ITE (Information Technology Equipment) and Radio Equipment**

Models without a radio device: This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC (until 19 April, 2016) and Council Directive 2014/30/EU (from 20 April, 2016) on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Models with a radio device: This product is in conformity with all the requirements and essential norms that apply to EU Council R&TTE Directive 1999/5/EC on the approximation of the laws of the Member States relating to radio equipment.

Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers. This product has been tested and found to comply with the limits for Class B equipment according to European Standards harmonized in the Directives in compliance. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia



### **German Class B compliance statement**

#### **Deutschsprachiger EU Hinweis:**

##### **Hinweis für Geräte der Klasse B EU Richtlinie zur Elektromagnetischen Verträglichkeit**

Dieses Produkt entspricht den Schutzanforderungen der EU Richtlinie 2014/30/EU (früher 2004/108/EC) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der Klasse B der Norm gemäß Richtlinie.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

#### **Deutschland:**

##### **Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmitteln**

Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EMV EU Richtlinie 2014/30/EU (früher 2004/108/EC) in der Bundesrepublik Deutschland.

**Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EU Richtlinie 2014/30/EU (früher 2004/108/EC), für Geräte der Klasse B.**

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Meitnerstr. 9, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:  
**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse B.**

### Korea Class B compliance statement

<b>B급 기기(가정용 방송통신기자재)</b>
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다
<b>무선설비 전파 혼신 (사용주파수 2400~2483.5 , 5725~5825 무선제품해당)</b>
해당 무선설비가 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음

### Japan VCCI Class B compliance statement

この装置は、クラスB 情報技術装置です。 この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。  
取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

### Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制  
高調波電流規格 JIS C 61000-3-2 適合品

### Japan notice for ac power cord

The ac power cord shipped with your product can be used only for this specific product. Do not use the ac power cord for other devices.

本製品およびオプションに電源コード・セットが付属する場合は、それぞれ専用のものになっていますので他の電気機器には使用しないでください。

### Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下:  
荷蘭商聯想股份有限公司台灣分公司  
台北市內湖區堤頂大道二段89號5樓  
服務電話: 0800-000-702

### Keyboard and mouse compliance statement for Taiwan

本產品隨貨附已取得經濟部標準檢驗局認可之PS/2或USB的鍵盤與滑鼠一組

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## Eurasian compliance mark



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## Brazil audio notice

Ouvir sons com mais de 85 decibéis por longos períodos pode provocar danos ao sistema auditivo.

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## Mexico wireless-radio compliance information

**Advertencia:** En Mexico la operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

---

## Additional regulatory information

For additional regulatory information, refer to the *Regulatory Notice* shipped with your computer. Depending on the configuration of your computer and the country or region where the computer was purchased, you might have received additional printed regulatory notices. All regulatory notices are available on the Lenovo Support Web site in electronic format. To access electronic copies of the documentation, go to <http://www.lenovo.com/support> and click **User Guides & Manuals**.



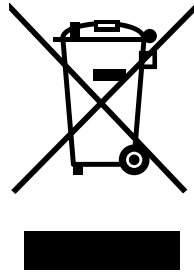
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## Appendix B. WEEE and recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:  
<http://www.lenovo.com/recycling>

---

### Important WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, the European WEEE Directive, India E-Waste Management & Handling Rules). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. Lenovo electrical and electronic equipment (EEE) may contain parts and components, which at end-of-life might qualify as hazardous waste.

EEE and waste electrical and electronic equipment (WEEE) can be delivered free of charge to the place of sale or any distributor that sells electrical and electronic equipment of the same nature and function as the used EEE or WEEE.

For additional WEEE information, go to:  
<http://www.lenovo.com/recycling>

#### WEEE information for Hungary

Lenovo, as a producer, bears the cost incurred in connection with the fulfillment of Lenovo's obligations under Hungary Law No. 197/2014 (VIII.1.) subsections (1)-(5) of section 12.

---

### Recycling information for Japan

#### Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting

and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at <http://www.lenovo.com/recycling/japan>. Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at <http://www.lenovo.com/recycling/japan>.

### **Disposing of Lenovo computer components**

Some Lenovo computer products sold in Japan may have components that contain heavy metals or other environmental sensitive substances. To properly dispose of disused components, such as a printed circuit board or drive, use the methods described above for collecting and recycling a disused computer or monitor.

### **Disposing of disused lithium batteries from Lenovo computers**

A button-shaped lithium battery is installed inside your Lenovo computer to provide power to the computer clock while the computer is off or disconnected from the main power source. If you need to replace it with a new one, contact your place of purchase or contact Lenovo for service. If you need to dispose of a disused lithium battery, insulate it with vinyl tape, contact your place of purchase or an industrial-waste-disposal operator, and follow their instructions. Disposal of a lithium battery must comply with local ordinances and regulations.

---

## **Recycling information for Brazil**

### **Declarações de Reciclagem no Brasil**

#### **Descarte de um Produto Lenovo Fora de Uso**

Equipamentos elétricos e eletrônicos não devem ser descartados em lixo comum, mas enviados à pontos de coleta, autorizados pelo fabricante do produto para que sejam encaminhados e processados por empresas especializadas no manuseio de resíduos industriais, devidamente certificadas pelos órgãos ambientais, de acordo com a legislação local.

A Lenovo possui um canal específico para auxiliá-lo no descarte desses produtos. Caso você possua um produto Lenovo em situação de descarte, ligue para o nosso SAC ou encaminhe um e-mail para: [reciclar@lenovo.com](mailto:reciclar@lenovo.com), informando o modelo, número de série e cidade, a fim de enviarmos as instruções para o correto descarte do seu produto Lenovo.

---

## **Battery recycling information for Taiwan**

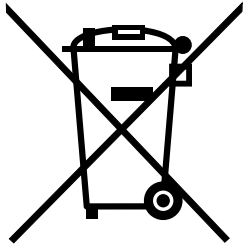


廢電池請回收

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## Battery recycling information for the European Union

EU



**Notice:** This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, go to:  
<http://www.lenovo.com/recycling>



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## Appendix C. Restriction of Hazardous Substances Directive (RoHS)

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### European Union RoHS

Lenovo products sold in the European Union, on or after 3 January 2013 meet the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS recast" or "RoHS 2").

For more information about Lenovo progress on RoHS, go to:  
[http://www.lenovo.com/social\\_responsibility/us/en/RoHS\\_Communication.pdf](http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf)

---

### Turkish RoHS

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Waste Electrical and Electronic Equipment (WEEE).

#### Türkiye AEEE Yönetmeliğine Uygunluk Beyanı

Bu Lenovo ürünü, T.C. Çevre ve Orman Bakanlığı'nın "Atık Elektrik ve Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının Sınırlandırılmasına Dair Yönetmelik (AEEE)" direktiflerine uygundur.

AEEE Yönetmeliğine Uygundur.

---

### Ukraine RoHS

Цим підтверджуємо, що продукція Леново відповідає вимогам нормативних актів України, які обмежують вміст небезпечних речовин

---

### India RoHS

RoHS compliant as per E-Waste (Management & Handling) Rules.

---

## China RoHS

### 产品中有害物质的名称及含量

部件名称	有害物质					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬(Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
印刷电路板组件*	X	O	O	O	O	O
硬盘	X	O	O	O	O	O
光驱	X	O	O	O	O	O
内存	X	O	O	O	O	O
电脑I/O 附件	X	O	O	O	O	O
电源	X	O	O	O	O	O
键盘	X	O	O	O	O	O
鼠标	X	O	O	O	O	O
机箱/ 附件	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。  
 O：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。  
 X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。  
 注：表中标记“X”的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。  
 印刷电路板组件\*：包括印刷电路板及其零部件、电容和连接器  
 根据型号的不同，可能不会含有以上的所有部件，请以实际购买机型为准



在中华人民共和国境内销售的电子信息产品必须标识此标志，标志内的数字代表在正常使用状态下的产品的环保使用期限

## Taiwan RoHS

單元	限用物質及其化學符號					
	鉛(Pb)	汞(Hg)	鎘(Cd)	六價鉻(Cr <sup>6+</sup> )	多溴聯苯(PBB)	多溴二苯醚(PBDE)
印刷電路板組件	—	O	O	O	O	O
硬碟	—	O	O	O	O	O
光碟機	—	O	O	O	O	O
記憶體	—	O	O	O	O	O
電腦I/O配件	—	O	O	O	O	O
電源供應器	—	O	O	O	O	O
鍵盤	—	O	O	O	O	O
滑鼠	—	O	O	O	O	O
機殼/配件	—	O	O	O	O	O
電池	—	O	—	O	O	O

備考1. “超出0.1 wt %”及“超出0.01 wt %”係指限用物質之百分比含量超出百分比含量基準值。

備考2. “O”係指該項限用物質之百分比含量未超出百分比含量基準值。

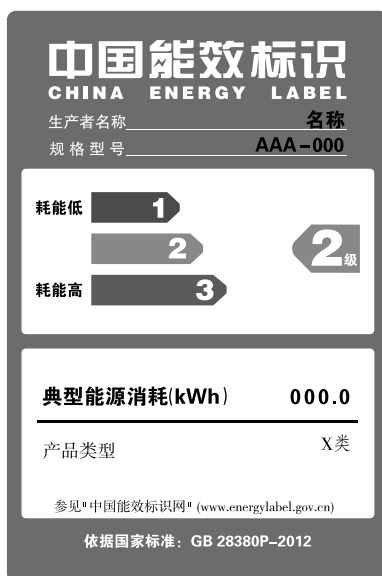
備考3. “—”係指該項限用物質為排除項目。

## Appendix D. China Energy Label

### 微型计算机能效标识声明

为满足中国《微型计算机能源效率标识实施规则》和《微型计算机能效限定值及能效等级》的相关规定和要求，联想公司对其生产及销售的每一台微型计算机产品加施能效标识，声明如下：

1. 如果您的包装箱或者产品上贴有下图所示的标识，您所购买的机器就是经测试符合《微型计算机能效限定值及能效等级》规定的相应能效等级的产品。



**Note:** 上图以2级能效标贴模板为例进行说明，具体规格型号、能效等级、产品类别和典型能源消耗等信息请以包装箱或产品上粘贴的实际能效等级标贴提供的信息为准，也可登陆“中国能效标识网”<http://www.energylabel.gov.cn>进行详细查询。

2. 如果您所购买机器的包装箱或者产品无上图所示的标识，请您忽略此部分。

《微型计算机能源效率标识实施规则》和《微型计算机能效限定值及能效等级》是由国家发展改革委员会所推行的能效标识制度，旨在通过开发节能产品和有效的节能方式来保护环境。通过使用符合能效标识制度要求的产品可以减少电源消耗、有助于节省开支、营造更清洁的环境并降低温室气体排放量。

联想很荣幸能为用户提供符合相应能效等级设计要求的产品，也鼓励用户购买高能效的产品。

有关能效标识制度的更多信息，请访问“中国能效标识网”<http://www.energylabel.gov.cn>。





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## Appendix E. ENERGY STAR model information



ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy aimed at saving money and protecting the environment through energy efficient products and practices.

Lenovo is proud to offer our customers products with an ENERGY STAR compliant designation. Some models of the following machine types have been designed and tested to conform to the ENERGY STAR program requirement for computers at the time of manufacture: 10CT, 10CU, 10CV, 10CW, 10JA, and 10JB. For more information about ENERGY STAR ratings for Lenovo computers, go to <http://www.lenovo.com>.

By using ENERGY STAR compliant products and taking advantage of the power-management features of your computer, you reduce the consumption of electricity. Reduced electrical consumption contributes to potential financial savings, a cleaner environment, and the reduction of greenhouse gas emissions.

For more information about ENERGY STAR, go to:  
<http://www.energystar.gov>

Lenovo encourages you to make efficient use of energy an integral part of your day-to-day operations. To help in this endeavor, set the following power-management features to take effect when your computer has been inactive for a specified duration:

Table 2. ENERGY STAR power-management features

Windows 7, Windows 8.1, or Windows 10 operating system
Power plan: ThinkCentre® Default <ul style="list-style-type: none"><li>• Turn off the display: After 10 minutes</li><li>• Put the computer to sleep: After 25 minutes</li><li>• Advanced power settings:<ul style="list-style-type: none"><li>– Turn off hard disk drives: After 20 minutes</li><li>– Hibernate: Never</li></ul></li></ul>

To awaken your computer from a Sleep mode, press any key on your keyboard.

To change power settings, do the following:

1. Open Control Panel by doing one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
  - For Windows 8.1: See “Accessing Control Panel on the Windows 8.1 operating system” on page 49.
  - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
2. View Control Panel using Large icons or Small icons, and then click **Power Options**.

3. Follow the instructions on the screen.

---

## Appendix F. Notices

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Morrisville, NC 27560  
U.S.A.  
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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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- The Lenovo logo
- Rescue and Recovery
- ThinkCentre
- ThinkVantage

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Linux is a registered trademark of Linus Torvalds.

DisplayPort is a Trademark of the Video Electronics Standards Association.

Other company, product, or service names may be trademarks or service marks of others.

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