Hardware Maintenance Manual

ThinkPad Edge E540
Note: Before using this information and the product it supports, be sure to read the general information under Appendix A “Notices” on page 123.
## Contents

**About this manual**  
iii

**Chapter 1. Safety information**  
1

- General safety  
1
- Electrical safety  
2
- Safety inspection guide  
3
- Handling devices that are sensitive to electrostatic discharge  
3
- Grounding requirements  
4
- Safety notices (multilingual translations)  
4
- Laser compliance statement (multilingual translations)  
17

**Chapter 2. Important service information**  
23

- Strategy for replacing FRUs  
23
  - Strategy for replacing a hard disk drive or a solid-state drive  
24
  - Important notice for replacing a system board  
24
  - How to use error codes  
24
- Strategy for replacing FRUs for CTO, special-bid, and standard models  
24
- Product definition  
24
- FRU identification  
25

**Chapter 3. General checkout**  
27

- What to do first  
27
- Checkout guide  
28
  - Lenovo Solution Center  
28
  - Quick test programs  
28
  - UEFI diagnostic program  
29
  - Bootable diagnostic programs  
29
- Power system checkout  
30
  - Checking the ac power adapter  
30
  - Checking operational charging  
31
  - Checking the battery pack  
31
  - Checking the coin-cell battery  
32

**Chapter 4. Related service information**  
33

- Restoring the factory contents by using the Recovery Disc Set  
33
- Recovery overview for the Windows 8 operating system  
34
  - Refreshing your computer  
34
  - Resetting your computer to the factory default settings  
34
  - Using the advanced startup options  
35
  - Recovering your operating system if Windows 8 fails to start  
35
  - Creating and using recovery media  
35
- Passwords  
36
  - Power-on password  
37
  - Hard disk password  
37
  - Supervisor password  
37
  - How to remove the power-on password  
37
  - How to remove the hard disk password  
38
- Power management  
38
  - Screen blank mode (for the Windows 7 operating system only)  
38
  - Sleep mode  
38
  - Hibernation mode  
39
- Symptom-to-FRU index  
39
  - Numeric error codes  
40
  - Error messages  
42
  - Beep symptoms  
42
  - No-beep symptoms  
42
  - LCD-related symptoms  
43
  - Intermittent problems  
43
  - Undetermined problems  
43

**Chapter 5. Status indicators**  
45

**Chapter 6. Special keys**  
47

**Chapter 7. Locations**  
49

- Locating computer controls, connectors, and indicators  
49
  - Front view  
49
  - Rear view  
50
  - Bottom view  
50
- Locating FRUs and CRUs  
50
  - Major FRUs and CRUs  
52
  - LCD FRUs and CRUs  
54
  - Miscellaneous kits and other FRUs  
57
- Looking up FRU information  
57

**Chapter 8. FRU replacement notices**  
59

- Screw notices  
59
- Retaining serial numbers  
60
  - Restoring the serial number of the system unit  
60
  - Retaining the UUID  
61
<table>
<thead>
<tr>
<th>Chapter 9. Removing or replacing a FRU</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td>General guidelines</td>
<td>63</td>
</tr>
<tr>
<td>Removing the SIM card</td>
<td>64</td>
</tr>
<tr>
<td>1010 Lenovo-OneLink-connector cover</td>
<td>65</td>
</tr>
<tr>
<td>1020 Battery pack</td>
<td>65</td>
</tr>
<tr>
<td>1030 Large bottom cover</td>
<td>66</td>
</tr>
<tr>
<td>1040 Small bottom cover</td>
<td>67</td>
</tr>
<tr>
<td>1050 Optical drive or optical-drive</td>
<td>68</td>
</tr>
<tr>
<td>1060 Memory modules</td>
<td>69</td>
</tr>
<tr>
<td>1070 Hard disk drive or solid-state</td>
<td>70</td>
</tr>
<tr>
<td>1080 Wireless WAN card or M.2 solid-state drive</td>
<td>72</td>
</tr>
<tr>
<td>1090 Wireless LAN card</td>
<td>75</td>
</tr>
<tr>
<td>1100 Coin-cell battery</td>
<td>76</td>
</tr>
<tr>
<td>1110 Fan assembly</td>
<td>76</td>
</tr>
<tr>
<td>1120 Keyboard</td>
<td>79</td>
</tr>
<tr>
<td>1130 Keyboard bezel assembly</td>
<td>85</td>
</tr>
<tr>
<td>1140 Microprocessor</td>
<td>87</td>
</tr>
<tr>
<td>1150 System board</td>
<td>88</td>
</tr>
<tr>
<td>1160 Media-card-reader/USB card</td>
<td>92</td>
</tr>
<tr>
<td>1170 Optical-drive card</td>
<td>93</td>
</tr>
<tr>
<td>1180 DC-in bracket</td>
<td>95</td>
</tr>
<tr>
<td>1190 DC-in/Ethernet card</td>
<td>96</td>
</tr>
<tr>
<td>1200 Speaker assembly</td>
<td>97</td>
</tr>
<tr>
<td>1210 Power-button card</td>
<td>99</td>
</tr>
<tr>
<td>1220 LCD unit</td>
<td>100</td>
</tr>
<tr>
<td>1230 Base cover assembly</td>
<td>104</td>
</tr>
<tr>
<td>For models with non-touch screen</td>
<td>106</td>
</tr>
<tr>
<td>2010 LCD bezel</td>
<td>106</td>
</tr>
<tr>
<td>2020 LCD panel</td>
<td>107</td>
</tr>
<tr>
<td>2030 LCD hinges</td>
<td>108</td>
</tr>
<tr>
<td>2040 Camera/microphone module</td>
<td>110</td>
</tr>
<tr>
<td>2050 LCD cables</td>
<td>111</td>
</tr>
<tr>
<td>2060 Wireless-LAN/WAN antenna assembly and LCD rear cover</td>
<td>112</td>
</tr>
<tr>
<td>For models with touch screen</td>
<td>114</td>
</tr>
<tr>
<td>2010 LCD-hinge caps</td>
<td>114</td>
</tr>
<tr>
<td>2020 LCD panel/screen assembly and LCD rear cover</td>
<td>116</td>
</tr>
<tr>
<td>2030 LCD cables and camera/microphone module</td>
<td>117</td>
</tr>
<tr>
<td>2040 LCD-control-card cable</td>
<td>118</td>
</tr>
<tr>
<td>2050 LCD Hinges</td>
<td>119</td>
</tr>
<tr>
<td>2060 Wireless LAN antenna</td>
<td>120</td>
</tr>
</tbody>
</table>

**Appendix A. Notices**  
Electronic emission notices.  
Trademarks.  

**Appendix B. Abbreviation and acronym table**  

About this manual

This manual contains service and reference information for the following ThinkPad® product:

ThinkPad Edge E540                     Machine Types (MT) 20C6

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 ThinkPad products. Use this manual along with the advanced diagnostic tests to troubleshoot problems effectively. Before servicing a ThinkPad product, be sure to read all the information under Chapter 1 “Safety information” on page 1 and Chapter 2 “Important service information” on page 23.
Chapter 1. Safety information

This chapter presents the following safety information that you need to be familiar with before you service a ThinkPad notebook computer.

- “General safety” on page 1
- “Electrical safety” on page 2
- “Safety inspection guide” on page 3
- “Handling devices that are sensitive to electrostatic discharge” on page 3
- “Grounding requirements” on page 4
- “Safety notices (multilingual translations)” on page 4
- “Laser compliance statement (multilingual translations)” on page 17

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 that 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. Do not attempt to lift any object that weighs more than 16 kg (35 lb) or that you think is 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 technicians 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 toolcase 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, about 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing, because 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.
- Fan louvers on the machine help to prevent overheating of internal components. Do not obstruct fan louvers or cover them with labels or stickers.
Electrical safety

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 (ESD). 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 main units
- 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. That 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.

CAUTION:
An electrical shock can occur only when there is a complete circuit. By observing the above rule, you may prevent a current from passing through your body.

- When using testers, 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. Instructions for these precautions 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:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators
  - Units similar to those listed above

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.

**Safety inspection guide**

The purpose of this inspection guide is to assist you in identifying potentially unsafe conditions. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury. This guide addresses only those items. You should use good judgment to identify potential safety hazards due to attachment of non-ThinkPad 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 a bulging capacitor
• Mechanical hazards, such as loose or missing hardware

To determine whether there are any potentially unsafe conditions, use the following checklist at the beginning of every service task. 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. Turn 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 the frame ground.
   b. The power cord should be the authorized type specified for your computer. Go to: http://www.lenovo.com/serviceparts-lookup.
   c. Insulation must not be frayed or worn.
4. Check for cracked or bulging batteries.
5. Remove the cover.
6. Check for any obvious non-ThinkPad alterations. Use good judgment as to the safety of any non-ThinkPad alterations.
7. 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.
8. Check for worn, frayed, or pinched cables.
9. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

**Handling devices that are sensitive to electrostatic discharge**

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. Ensure 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.
- 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 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 to guard against ESD damage is desirable but not necessary.
- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- When working on a double-insulated or battery-operated system, use an ESD common ground or reference point. You can use coax or connector-outside shells on these systems.
- Use the round ground prong of the ac plug on ac-operated computers.

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.

Safety notices (multilingual translations)
The safety notices in this section are provided in the following languages:
- English
- Arabic
- Brazilian Portuguese
- French
- German
- Hebrew
- Japanese
- Korean
- Spanish
- Traditional Chinese

DANGER
Before the computer is powered on after FRU replacement, make sure that all screws, springs, and other small parts are in place and are not left loose inside the computer. Verify this by shaking the computer and listening for rattling sounds. Metallic parts or metal flakes can cause electrical short circuits.
DANGER

Some standby batteries contain a small amount of nickel and cadmium. Do not disassemble a standby battery, recharge it, throw it into fire or water, or short-circuit it. Dispose of the battery as required by local ordinances or regulations. Use only the battery in the appropriate parts listing. Use of an incorrect battery can result in ignition or explosion of the battery.

DANGER

The battery pack contains small amounts of nickel. Do not disassemble it, throw it into fire or water, or short-circuit it. Dispose of the battery pack as required by local ordinances or regulations. Use only the battery in the appropriate parts listing when replacing the battery pack. Use of an incorrect battery can result in ignition or explosion of the battery.

DANGER

The lithium battery can cause a fire, an explosion, or a severe burn. Do not recharge it, remove its polarized connector, disassemble it, heat it above 100°C (212°F), incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations. Use only the battery in the appropriate parts listing. Use of an incorrect battery can result in ignition or explosion of the battery.

DANGER

If the LCD breaks and the fluid from inside the LCD gets into your eyes or on your hands, immediately wash the affected areas with water for at least 15 minutes. Seek medical care if any symptoms from the fluid are present after washing.

DANGER

To avoid shock, do not remove the plastic cover that protects the lower part of the inverter card.
Though the main batteries have low voltage, a short-circuited or grounded battery can produce enough current to burn personnel or combustible materials.

DANGER

Unless hot swap is allowed for the FRU being replaced, do as follows before removing it: power off the computer, unplug all power cords from electrical outlets, remove the battery pack, and disconnect any interconnecting cables.

DANGER

تحتوي بعض البطاريات الاحتياطية على كمية صغيرة من مادتي الليثيوم والكادميوم. لا تقم بذلك أو إعادة شحن البطارية الاحتياطية ولا تم敞开 الأغطية في النار أو الطهي ولا تتسرب في أحداث دائرة قصر بها. قد تخلص من البطارية كما هو موضح في القوانين المحلية. استخدام نوع البطارية المحدد والذي يوصى باستخدامه. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح إلى اشعالها أو انفجارها.

DANGER

تحتوي هزيمة البطارية على كمية صغيرة من مادة الليثيوم. لا تقم بذلك أو الأغطية في النار أو الطهي ولا تتسرب في أحداث دائرة قصر بها. تخلص من هزيمة البطارية وفقاً لما هو موضح في القوانين المحلية. قد يستبدل هزيمة البطارية، باستخدام الأنواع المحددة فقط، والتي يوصى باستخدامها. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح إلى اشعالها أو انفجارها.

DANGER

قد تسبب بطارية الليثيوم في حدوث حريق أو انفجار أو حدوث حرق شديد. لا تقم بإعادة شحن البطارية أو ازلال موصل الاستطباب الخاص بها ولا تناول أيضاً كُفكها أو تسخينها لأكثر من 100 درجة مئوية (212 درجة مئوية) أو حرقه أو تعرض محويتاتها الخالصة للعواء. قد بات الخصوص من البطارية ولكن كما هو موضح في القوانين المحلية. استخدام نوع البطارية المحدد والذي يوصى باستخدامه. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح إلى اشعالها أو انفجارها.

Hardware Maintenance Manual
Chapter 1. Safety information

PERIGO

If you accidentally spill water or any other liquid on the LCD display, make sure to turn off the computer immediately. If you notice any unusual symptoms, contact qualified service personnel.

PERIGO

To avoid damage, do not place the system on a wet or damp surface. Make sure it is placed on a solid and stable surface.

PERIGO

Even though the lithium batteries are not a fire hazard, new batteries may explode if not properly handled or disposed of. Make sure you replace the batteries with the correct type and follow the manufacturer's instructions for disposal.

PERIGO

Never attempt to replace or repair FRU parts or modules. Use the provided FRU parts to replace faulty components. Refer to the documentation and service guidelines provided by your service provider.

PERIGO

When replacing FRU parts, be careful not to touch the metal contacts on the boards or components. Keep electronic components away from magnetic fields.

PERIGO

When handling batteries, always use the correct type and observe the polarities. Dispose of batteries properly to prevent contamination.

PERIGO

When handling metal parts, use insulated tools. Do not touch metal parts while the system is turned on.

PERIGO

When disposing of batteries, make sure to follow the guidelines provided by your local regulations. Do not dispose of batteries in the regular trash.

PERIGO

When handling hazardous materials, wear appropriate protective equipment and follow all safety guidelines provided by your service provider.

PERIGO

A bateria de lítio pode causar incêndio, explosão ou graves queimaduras. Não a recarregue, remova seu conector polarizado, desmonte-a, aqueça-a acima de 100°C (212°F), incinere-a, ou exponha o conteúdo de sua célula à água. Descarte a bateria conforme requerido pelas leis ou regulamentos locais. Use somente a bateria nas partes listadas apropriadas. O uso de uma bateria incorreta pode resultar em combustão ou explosão da bateria.

PERIGO

Se o LCD quebrar e o fluido de dentro dele entrar em contato com seus olhos ou com suas mãos, lave as áreas afetadas imediatamente com água durante pelo menos 15 minutos. Procure cuidados médicos se algum sintoma causado pelo fluido surgir após a lavagem.

PERIGO

Para evitar choque elétrico, não remova a capa plástica que protege a parte inferior da placa inversora.

PERIGO

Embora as principais baterias possuam baixa voltagem, uma bateria em curto-circuito ou aterrada pode produzir corrente o bastante para queimar materiais de pessoal ou inflamáveis.

PERIGO

A menos que uma hot swap seja permitida para a FRU que está sendo substituída, faça o seguinte antes de removê-la: desligue o computador, desconecte todos os cabos de energia das tomadas, remova o pacote de baterias e desconecte quaisquer cabos de interconexão.
DANGER

Avant de remettre l’ordinateur sous tension après remplacement d’une unité en clientèle, vérifiez que tous les ressorts, vis et autres pièces sont bien en place et bien fixées. Pour ce faire, secouez l’unité et assurez-vous qu’aucun bruit suspect ne se produit. Des pièces métalliques ou des copeaux de métal pourraient causer un court-circuit.

DANGER

Certaines batteries de secours contiennent du nickel et du cadmium. Ne les démontez pas, ne les rechargez pas, ne les exposez ni au feu ni à l’eau. Ne les mettez pas en court-circuit. Pour les mettre au rebut, conformez-vous à la réglementation en vigueur. Lorsque vous remplacez la pile de sauvegarde ou celle de l’horloge temps réel, veillerez à n’utiliser que les modèles cités dans la liste de pièces détachées adéquate. Une batterie ou une pile inappropriée risque de prendre feu ou d’exploser.

DANGER

La batterie contient du nickel. Ne la démontez pas, ne l’exposez ni au feu ni à l’eau. Ne la mettez pas en court-circuit. Pour la mettre au rebut, conformez-vous à la réglementation en vigueur. Lorsque vous remplacez la batterie, veillez à n’utiliser que les modèles cités dans la liste de pièces détachées adéquate. En effet, une batterie inappropriée risque de prendre feu ou d’exploser.

DANGER

La pile de sauvegarde contient du lithium. Elle présente des risques d’incendie, d’explosion ou de brûlures graves. Ne la rechargez pas, ne retirez pas son connecteur polarisé et ne la démontez pas. Ne l’exposez pas à une température supérieure à 100°C, ne la faites pas brûler et n’en exposez pas le contenu à l’eau. Mettez la pile au rebut conformément à la réglementation en vigueur. Une pile inappropriée risque de prendre feu ou d’exploser.

DANGER

Si le panneau d’affichage à cristaux liquides se brise et que vous recevez dans les yeux ou sur les mains une partie du fluide, rincez-les abondamment pendant au moins quinze minutes. Consultez un médecin si des symptômes persistent après le lavage.
DANGER

Afin d'éviter tout risque de choc électrique, ne retirez pas le cache en plastique protégeant la partie inférieure de la carte d'alimentation.

DANGER

Bien que le voltage des batteries principales soit peu élevé, le court-circuit ou la mise à la masse d'une batterie peut produire suffisamment de courant pour brûler des matériaux combustibles ou causer des brûlures corporelles graves.

DANGER

Si le remplacement à chaud n'est pas autorisé pour l'unité remplaçable sur site que vous remplacez, procédez comme suit avant de retirer l'unité : mettez l'ordinateur hors tension, débranchez tous les cordons d'alimentation des prises de courant, retirez le bloc de batterie et déconnectez tous les câbles d'interconnexion.

VORSICHT


VORSICHT

VORSICHT


VORSICHT


VORSICHT


VORSICHT

Aus Sicherheitsgründen die Kunststoffabdeckung, die den unteren Teil der Spannungswandlerplatine umgibt, nicht entfernen.

VORSICHT

Obwohl Hauptbatterien eine niedrige Spannung haben, können sie doch bei Kurzschluß oder Erdung genug Strom abgeben, um brennbare Materialien zu entzünden oder Verletzungen bei Personen hervorzurufen.
Wann ein Austausch der FRU bei laufendem Betrieb nicht erlaubt ist, gehen Sie beim Austausch der FRU wie folgt vor: Schalten Sie den Computer aus, ziehen Sie alle Netzkabel von den Netzsteckdosen ab, entfernen Sie den Akku und ziehen Sie alle miteinander verbundenen Kabel ab.
危険

FRUの交換後、ThinkPadの電源を入れる前に、ねじ、ネジ、その他の小さな部品がすべて正しい位置にあり、またThinkPadの内部で縛んでいないことを確認してください。これに注意するには、ThinkPadを握って、カチャカチャと音がしないか確かめます。金属部品や金属破片はショートの原因になることがあります。

危険

予備バッテリーの中には少量のニッケルとカドミウムが含まれているものがあります。したがって、予備バッテリーの分解、再充電、火または水の中への投棄、またはショートさせることは絶対に行わないでください。バッテリーを焼却する場合は地方自治体の条例に従ってください。適切なバッテリー・リストにあるバッテリーだけを使用してください。破損したバッテリー使用すると、バッテリーが発火したり、爆発したりすることがあります。

危険

バッテリー・パックには少量のニッケルが含まれています、バッテリー・パックを分解したり、火または水の中に投げ込んだり、ショートさせないでください。バッテリー・パックの焼却にあたっては、地方自治体の条例または規則に従ってください。バッテリー・パックを交換するときは、適切なバッテリー・リストにあるバッテリーだけを使用してください。破損したバッテリーを使用すると、バッテリーが発火したり、爆発したりすることがあります。

危険

リチウム・バッテリーは、火災、爆発、または重症のやけどを引き起こすことがあります。バッテリーの分解、その取り外し、バッテリー本体の分解。
100℃（212°F）以上の加熱、焼却、電池の中身を水に浸すことはしないでください。バッテリーを焼却する場合は地方自治体の条例に従ってください。適切なバッテリー・リストにあるバッテリーだけを使用してください。破損したバッテリーを使用すると、バッテリーが発火したり、爆発したりすることがあります。

危険

LCDが破損し、LCDの中の液体が目に入ったり、手に触れたりした場合は、液体が入った部分を少なくとも5分間洗い流してください。洗い流した後に、液体によって何らかの症状が現れた場合は、医師の治療を受けてください。

危険

感電を防ぐため、インパーターカードの下部を保護しているプラスチック・カバーを外さないでください。

危険

Chapter 1. Safety information 13
危険
交換しようとしているFRUがホット・スワップ対応していない場合、それを取り外す前に、コンピューターの電源をオフにし、すべての電源コードをコンセントから抜き、バッテリーパックを取り外して、相互接続しているケーブルをすべて切り離してください。

危険
FRUを交換してから再起動する前に、内部の部品がすべて正しく取り付けられていることを確認してください。コンピューター内部に異物が挟まっている場合は、電源を切って異物を取り除いてください。

危険
内部の接続ケーブルは壊れやすいです。接続ケーブルを抜くときは、しっかりと持ち上げてください。ケーブルを破損させないよう注意してください。

危険
バッテリーパックは注意深く扱う必要があります。バッテリーパックを抜き差しするときは、電源を切ってから行うことをおすすめします。

危険
リチウムバッテリーは注意深く扱う必要があります。リチウムバッテリーを破壊すると危险です。リチウムバッテリーを破壊するときは、専門のリサイクル業者に譲渡されることをおすすめします。

危険
LCDは注意深く扱う必要があります。LCDを破壊すると、内部の液体が流出することがあります。LCDを破壊するときは、専門のリサイクル業者に譲渡することをおすすめします。
전기적 위험을 방지하기면 인버터 카드의 아래 부분을 보호하는 플라스틱 덮개를 제거하지 마십시오.

⚠️ 위험

기본 배터리의 전압은 낮지만, 단락되거나 정지된 배터리는 화상을 일으키며 충분한 전류와 가열성 물질을 발생시킬 수 있습니다.

⚠️ 위험

FRU 교체 시 Hot Swap이 지원되지 않는 경우, FRU를 제거하기 전에 컴퓨터의 전원을 고고, 전기 콘센트에서 전원 코드를 분리하고, 배터리를 제기한 후, 연결된 모든 케이블을 분리하십시오.

⚠️ PELIGRO

Antes de encender el sistema después de sustituir una FRU, compruebe que todos los tornillos, muelles y demás piezas pequeñas se encuentran en su sitio y no se encuentran sueltas dentro del sistema. Compruébelo agitando el sistema y escuchando los posibles ruidos que provocarían. Las piezas metálicas pueden causar cortocircuitos eléctricos.

⚠️ PELIGRO

Algunas baterías de reserva contienen una pequeña cantidad de níquel y cadmio. No las desmonte, ni recargue, ni las eche al fuego o al agua ni las cortocircuiten. Deséchelas tal como dispone la normativa local. Utilice sólo baterías que se encuentren en la lista de piezas. La utilización de una batería no apropiada puede provocar la ignición o explosión de la misma.

⚠️ PELIGRO

Las baterías contienen pequeñas cantidades de níquel. No las desmonte, ni recargue, ni las eche al fuego o al agua ni las cortocircuiten. Deséchelas tal como dispone la normativa local. Utilice sólo baterías que se encuentren en la lista de piezas al sustituir la batería. La utilización de una batería no apropiada puede provocar la ignición o explosión de la misma.

⚠️ PELIGRO

La batería de repuesto es una batería de litio y puede provocar incendios, explosiones o quemaduras graves. No la recargue, ni quite el conector polarizado, ni la desmonte, ni caliente por encima de los 100°C (212°F), ni la incinere ni exponga el contenido de sus celdas al agua. Deséchela tal como dispone la normativa local.
Si la LCD se rompe y el fluido de su interior entra en contacto con sus ojos o sus manos, lave inmediatamente las áreas afectadas con agua durante 15 minutos como mínimo. Obtenga atención médica si se presenta algún síntoma del fluido después de lavarse.

PELIGRO

Para evitar descargas, no quite la cubierta de plástico que rodea la parte baja de la tarjeta invertida.

PELIGRO

Aunque las baterías principales tienen un voltaje bajo, una batería cortocircuitada o con contacto a tierra puede producir la corriente suficiente como para quemar material combustible o provocar quemaduras en el personal.

PELIGRO

Salvo que se permita el intercambio en caliente para la unidad sustituible localmente, realice lo siguiente antes de extraerla: apague el sistema, desconecte todos los cables de alimentación de las tomas de alimentación eléctrica, extraiga la batería y desconecte los cables de interconexión.

危険

完成 FRU 更換之後，在開啟電源的電源之前，請確定所有螺絲、彈簧及其他小零件都已歸位，沒有遺留在電腦內部。
若要確認這一點，請搖晃電腦，聽聽看是否有卡咯的聲響。
金屬零件或機器的火花會造成電線短路。

危険

部分備用電池含有微量的銻和鎳。請勿拆開備用電池、再充電、吞入火或水中，
或使其形成短路。請按照當地法令或規定來棄置電池。
僅限使用零件清單中的電池。使用不適當的電池會導致電池起火或爆炸。

危険

電池套件含有微量的鎳。請勿拆解電池套件、吞入火或水中，或使其形成短路。
請按照當地法令或規定來棄置電池套件。
更換電池套件時，僅限使用零件清單中的電池。使用不適當的電池會導致電池
起火或爆炸。

危険
Laser compliance statement (multilingual translations)

The laser compliance statements in this section are provided in the following languages:

- English
- Arabic
- Brazilian Portuguese
- French
- German
- Hebrew
- Japanese
- Korean
- Spanish
- Traditional Chinese
CAUTION:
When laser products (such as CD-ROMs, DVD 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.

تحذير:

لمت تثبيت منتجات الليزر (مثل أقرار CD-ROM أو محركات تشغيل أقرار DVD أو أجهزة الألياف البصرية أو أقرار)، لاحظ ما يلي:

- لا تقم بتزويغ الغطاء. قد ينتج عن تزويغ غطاء منتج ليزر التعرض لأشعة ليزر في منتهى الخطرة. لا توجد أجزاء يمكن صبئتها داخل الجهاز.
- قد ينتج عن استخدام مفاتيح أو تطبيقات ضبط أو إجراءات بحرية مختلفة عما هو محدد هنا التعرض لأشعة ليزر في منتهى الخطرة.

خطر

تحتوي بعض منتجات الليزر على سماح ثنائي ليزر مصمم من Class 3B أو Class 3A. لاحظ ما يلي. Class 3B أو Class 3A توجد أشعة ليزر عند الفتح. لا تنظر للشعاع ولا تنظر بطريقة مباشرة باستخدام أدوات ضوئية وتجنب التعرض المباشر للشعاع.
CUIDADO:
Quando produtos a laser (como CD-ROMs, unidades de DVD, dispositivos de fibra ótica ou transmissores) estão instalados, observe o seguinte:

- Não remova as tampas. A remoção das tampas do produto a laser pode resultar em exposição prejudicial à radiação de laser. Não há peças que permitam manutenção no interior do dispositivo.
- A utilização de controlos ou ajustes ou a execução de procedimentos diferentes daqueles especificados aqui pode resultar em exposição perigosa à radiação.

PERIGO
Algumas produtos a laser contêm um diodo de laser Classe 3A ou Classe 3B integrado. Observe o seguinte:

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

ATTENTION:
Si des produits laser (tels que des unités de CD, DVD, à fibre optique ou des émetteurs) sont installés, lisez les informations suivantes:

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

- Werden Steuerelemente, Einstellungen oder Durchführungen von Prozeduren anders als hier angegeben verwendet, kann gefährliche Laserstrahlung auftreten.

**Gefahr**

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

**Warnung:**

Jeder, der mit Laserdioden oder Lasergeräten arbeitet, muss folgendes beachten:

- Laserstrahlung ist gefährlich. Niemals direkt in die Strahlführung schauen.
- NICHT auf die Strahlung blicken oder ungeschützt ins Auge schauen. Laserstrahlung ist gefährlich. Niemals direkt in die Strahlführung schauen.

**Vorsicht:**

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

- Werden Steuerelemente, Einstellungen oder Durchführungen von Prozeduren anders als hier angegeben verwendet, kann gefährliche Laserstrahlung auftreten.
警告:
レーザー製品（CD-ROM、DVDドライブ、光ファイバー装置、または送信機など）を取り付ける場合には、以下のことに注意してください。

- カバーを外さないこと。カバーを取り外すと有害なレーザー光を浴びることがあります。この装置の内部には保守が必要な部品はありません。
- 本書で指定された内容以外の、お客様による整備、調整、または手順を行った場合、レーザー放射の危険があります。

危険

一部のレーザー製品には、クラス3Aまたはクラス3Bのレーザー・ダイオードが組み込まれています。次の点に注意してください。

開けるとレーザー光が放射されます。光線を見つめたり、光学機械を使って直接見たり、光線を直接浴びることは避けてください。

警告:
レーザー製品（CD-ROM、DVDドライブ、光ファイバー装置または送信機）が設置されている場合、以下の注意を心掛けてください。

- 搬入を含む取扱い時に、レーザー製品の端末を遮断しないでください。レーザー製品の端末を遮断するためには、専用のレーザー・ダイオードが組み込まれています。レーザー製品の端末が遮断されている場合、装置内部の使用者が手{扱い可能でない部分が見えます。
- 本書で説明された以外の方法でドライバーを調整する他、または動作する場合、調教帽のレーザー端末に操作が行われます。光学機械を使って直接見たり、光線を直視しないでください。

危険

一部のレーザー製品はクラス3Aまたはクラス3Bレーザー・ダイオードが含まれている場合、以下の注意が必要です。

ドライバーの端末を切る際は、電気接続が行われます。端末を直接見たり、光線を直視しないでください。

Chapter 1. Safety information 21
PRECAUCIÓN:
Cuando haya instalados productos láser (por ejemplo, unidades de CD-ROM, unidades de DVD, dispositivos de fibra óptica o transmisores), tenga en cuenta lo siguiente:

- No extraiga las cubiertas. La extracción de las cubiertas del producto láser podría producir una exposición a radiación láser peligrosa. No hay ninguna pieza dentro del dispositivo que pueda reparar.
- La utilización de controles, ajustes o la realización de procedimientos diferentes a los especificados puede dar como resultado una exposición peligrosa a radiaciones.

PELIGRO

Algunos productos láser contienen un diodo láser de Clase 3A o Clase 3B incorporado. Tenga en cuenta lo siguiente.

Emite radiación láser cuando está abierto. No fije la vista en el rayo, no lo mire directamente con instrumentos ópticos y evite la exposición directa al rayo.

警告：
安装激光产品（如CD-ROM、DVD光碟機、光纖裝置或轉送器）時，請注意下列事項：

- 請勿卸下外蓋。卸下雷射產品的外蓋可能導致曝露於危險的雷射輻射。裝置內沒有可維修的零件。
- 若不遵守本文規定的控制、調整或操作程序，可能會導致危險的輻射外洩。

危險

某些雷射產品包含內嵌式3A類或3B類雷射二極體。這類光碟機的使用者應注意下列聲明。

在開啟光碟機時，會有雷射輻射。請勿直視光束或以光學儀器直接觀看光束，並避免直接暴露在光束中。
Chapter 2. Important service information

This chapter introduces the following important service information that applies to all machine types supported by this manual:

- “Strategy for replacing FRUs” on page 23
  - “Strategy for replacing a hard disk drive or a solid-state drive” on page 24
  - “Important notice for replacing a system board” on page 24
  - “How to use error codes” on page 24
- “Strategy for replacing FRUs for CTO, special-bid, and standard models” on page 24
  - “Product definition” on page 24
  - “FRU identification” on page 25

Important:

- If the computer is equipped with both a hard disk drive and an M.2 solid-state drive, do not use the M.2 solid-state drive as a bootable device. The M.2 solid-state drive is designed and developed for “cache” function purpose only.
- Advise customers to contact the Lenovo® Customer Support Center if they need any assistance in obtaining or installing any software fixes, drivers, and UEFI BIOS downloads. Telephone numbers for Lenovo Support are available at:
  http://www.lenovo.com/support/phone
- System disassembly and reassembly videos that show the FRU removal or replacement procedures for the Lenovo authorized service technicians are available at:
  http://www.lenovoservicetraining.com/ion/

Strategy for replacing FRUs

Before replacing parts:

Ensure that all software fixes, drivers, and UEFI BIOS downloads are installed before you replace any FRUs listed in this manual.

After a system board is replaced, ensure that the latest UEFI BIOS is loaded to the system board before you complete the service action.

To download and install software fixes, drivers, and UEFI BIOS, go to http://www.lenovo.com/ThinkPadDrivers and follow the instructions on the screen.

Use the following strategy to prevent unnecessary expense for replacing and servicing FRUs:

- If you are instructed to replace a FRU but the replacement does not correct the problem, reinstall the original FRU before you continue.
- Some computers have both a processor board and a system board. If you are instructed to replace either the processor board or the system board, and replacing one of them does not correct the problem, reinstall that board, and then replace the other one.
- If an adapter or a device consists of more than one FRU, any of the FRUs might be the cause of the error. Before replacing the adapter or device, remove the FRUs, one by one, to see if the symptoms change. Replace only the FRU that changed the symptoms.
Strategy for replacing a hard disk drive or a solid-state drive

Always try to run a low-level format operation before replacing a hard disk drive or a solid-state drive. This will cause all customer data on the drive to be lost. Ensure that the customer has a current backup of the data before you perform this task.

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

If the computer is shipped with both an M.2 solid-state drive and a hard disk drive, the M.2 solid-state drive is used for the “cache” function and to support the Intel® Rapid Start Technology. We recommend that users do not replace the M.2 solid-state drive by themselves. Otherwise, the “cache” function will not work and the Intel Rapid Start Technology cannot be used any more.

Attention: Ensure that you partition the M.2 solid-state drive after installing it on the computer you are servicing. Otherwise, the M.2 solid-state drive will not function correctly. For instructions on how to partition an M.2 solid-state drive, go to http://www.lenovo.com/support/msata-fru.

Important notice for replacing a system board

Some components mounted on a system board are very sensitive. Improper handling of a system board can cause damage to those components, and may cause a system malfunction.

Attention: When handling a system board:

- Do not drop a system board or apply any excessive force to it.
- Avoid rough handling of any kind.
- Avoid bending a system board and hard pushing to prevent cracking at each Ball Grid Array (BGA) chipset.

How to use error codes

Use the error codes displayed on the screen to diagnose failures. If more than one error code is displayed, begin the diagnosis with the first error code. Whatever causes the first error code might also cause false error codes. If no error code is displayed, see whether the error symptom is listed in the “Symptom-to-FRU Index” section.

Strategy for replacing FRUs for CTO, special-bid, and standard models

This topic provides information about the model types and FRU identification.

Product definition

This topic introduces different model types and how to identify each type.

Dynamic Configure To Order (CTO) model

This model provides the ability for a customer to configure a Lenovo solution from a Web site, and have this configuration sent to fulfillment, where it is built and shipped directly to the customer. The machine label and eSupport will load these products as the 4-character MT, 4-character model, and 2-character country code. The model is “CTO1” and the default country code is “WW” (example: 20AACTO1WW).

Special-bid model

This model is a unique configuration that has been negotiated between Lenovo and the customer. A unique MTM consists of a 4-character MT, a 4-character model, and a numeric 2-character country code is provided to the customer to place orders (example: 20AA000955). The country code assigned is numeric and does
not designate a specific country or region. The custom model factsheet for the MTM indicates which country the special-bid MTM is set up for. Special-bid offering is not generally announced.

**Standard model**

Standard models (fixed configuration) are announced and offered to all customers. The MTM portion of the machine label consists of a 4-character MT, a 4-character model, and an alphabetic 2-character country code. The country code assigned is alphabetic and represents a designated country or region (example: 20AA0009UK).

**FRU identification**

Use Lenovo eSupport to identify major FRUs, FRU part numbers, and FRU descriptions for a product at an MT - serial number level. Examples of major FRUs are hard disk drive, system board, liquid crystal display (LCD), and memory module.

To identify the major FRUs for a product, do the following:

1. Go to: http://www.lenovo.com/support
2. Click **Warranty & Services**.
3. Click **Check Warranty Status**.
4. On the Warranty Status Lookup page, click **Parts Lookup**.
5. Type your machine type and serial number, and then click **Submit**.

eSupport also can be used to view the general FRU list for a product.

To get the general FRU list for a product, do the following:

1. Go to: http://www.lenovo.com/support
2. Click **Parts & Accessories**.
3. Follow the instructions on the screen to select product.
4. Click **Products and Parts Detail**.
5. On the PRODUCT AND PARTS DETAIL page, click the **Parts Detail** tab to view the FRU list.

  **Note:** The FRU list is a general list of components and does not contain specific model information.
Chapter 3. General checkout

This chapter presents following information:
- “What to do first” on page 27
- “Checkout guide” on page 28
  - “Lenovo Solution Center” on page 28
  - “Quick test programs” on page 28
  - “UEFI diagnostic program” on page 29
  - “Bootable diagnostic programs” on page 29
- “Power system checkout” on page 30

Some descriptions in this chapter might not apply to your particular computer.

Before you go to the checkout guide, be sure to read the following important notes.

Important notes:
- Only certified trained personnel should service the computer.
- Before replacing any FRU, read the entire page on removing and replacing FRUs.
- When you replace FRUs, it is recommended to use new nylon-coated screws.
- Be extremely careful during such write operations as copying, saving, or formatting. Drives in the computer that you are servicing sequence might have been altered. If you select an incorrect drive, data or programs might be overwritten.
- Replace a FRU only with another FRU of the correct model. When you replace a FRU, ensure that the model of the machine and the FRU part number are correct.
- A FRU should not be replaced because of a single, unreproducible failure. Single failures can occur for a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, ESD, or software errors. Consider replacing a FRU only when a problem recurs. If you suspect that a FRU is defective, clear the error log and run the test again. If the error does not recur, do not replace the FRU.
- Be careful not to replace a nondefective FRU.

What to do first

When you return a FRU, you must include the following information in the parts exchange form or parts return form that you attach to it:
1. Name and phone number of service technician
2. Date of service
3. Date on which the machine failed
4. Date of purchase
5. Failure symptoms, error codes appearing on the display, and beep symptoms
6. Procedure index and page number in which the failing FRU was detected
7. Failing FRU name and part number
8. Machine type, model number, and serial number
9. Customer’s name and address

Note: During the warranty period, the customer may be responsible for repair costs if the computer damage was caused by misuse, accident, modification, unsuitable physical or operating environment, or improper maintenance by the customer. Following is a list of some common items that are not covered under warranty and some symptoms that might indicate that the system was subject to stress beyond normal use.

Before checking problems with the computer, determine whether the damage is covered under the warranty by referring to the following list:
The following are not covered under warranty:
- LCD panel cracked from the application of excessive force or from being dropped
- Scratched (cosmetic) parts
- Distortion, deformation, or discoloration of the cosmetic parts
- Plastic parts, latches, pins, or connectors that have been cracked or broken by excessive force
- Damage caused by liquid spilled into the system
- Damage caused by the improper insertion of a PC Card or the installation of an incompatible card
- Improper disc insertion or use of an optical drive
- Diskette drive damage caused by pressure on the diskette drive cover, foreign material in the drive, or the insertion of a diskette with multiple labels
- Damaged or bent diskette eject button
- Fuses blown by attachment of a nonsupported device
- Forgotten computer password (making the computer unusable)
- Sticky keys caused by spilling a liquid onto the keyboard
- Use of an incorrect ac power adapter on laptop products

The following symptoms might indicate damage caused by nonwarranted activities:
- Missing parts might be a symptom of unauthorized service or modification.
- Check for obvious damage to a hard disk drive. If the spindle of a hard disk drive becomes noisy, the hard disk drive might have been dropped or subject to excessive force.

Checkout guide

Use the following procedures as a guide in identifying and correcting problems with the ThinkPad notebook computer.

Note: The diagnostic tests are intended to test only ThinkPad products. The use of non-ThinkPad products, prototype cards, or modified options can lead to false indications of errors and invalid system responses.

1. Identify the failing symptoms in as much detail as possible.
2. Verify the symptoms. Try to re-create the failure by running the diagnostic test or by repeating the operation.

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.

The Lenovo Solution Center program is available for download at http://www.lenovo.com/diags

To run the Lenovo Solution Center program, go to Control Panel and click System and Security → Lenovo → System Health and Diagnostics, and then follow the instructions on the screen.

For more information about the Lenovo Solution Center program, refer to the help information system of the program.

Quick test programs

Run quick test programs to troubleshoot and resolve computer problems, especially when the computer does not have the Lenovo Solution Center program installed.

Lenovo provides the following quick test programs:
- Lenovo Hard Drive Quick Test: Use this program to troubleshoot and resolve internal storage problems.
- Lenovo Memory Quick Test: Use this program to troubleshoot and resolve memory module problems.
The quick test programs are applicable on the following operating systems:

- Microsoft® Windows® 8
- Microsoft Windows 7
- Microsoft Windows XP
- Microsoft Windows Server® 2003
- Microsoft Windows Server 2008

To download and install a quick test program, go to http://www.lenovo.com/diags and follow the instructions on the Web site.

To run a test using a quick test program, do the following:

1. Go to the C:\SWTOOLS\diag directory.
2. Double-click the gui_lsc_lite.exe file.
3. When the User Account Control window opens, click Yes.
4. Select the device class to be tested.
5. Select the devices to be tested.
6. Select the test to be performed.
7. Follow the instructions on the screen to start the test. When a problem is detected, information messages are displayed. Refer to the messages to troubleshoot the problem.

**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 “Power system checkout” on page 30, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 39 for error code descriptions and troubleshooting hints.
2. When the ThinkPad logo is displayed, repeatedly press and release the F10 key. The main screen of the UEFI diagnostic program is displayed.
3. Follow the instructions on the screen to use the program.

The options on the main screen are as follows:

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

<table>
<thead>
<tr>
<th>Tests</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Memory Test</td>
<td>System Information</td>
</tr>
<tr>
<td>Quick Storage Device Test</td>
<td>Recover Bad Sectors Tool</td>
</tr>
<tr>
<td>Exit Application</td>
<td></td>
</tr>
</tbody>
</table>

**Bootable diagnostic programs**

If the computer you are servicing is not installed with the UEFI diagnostic program, you can download a bootable diagnostic program from the Lenovo Support Web site. The bootable diagnostic programs enable you to test computer memory and internal storage devices, view system information, and check and recover the internal storage devices. To use the bootable diagnostic programs, you can create a bootable diagnostic medium on a USB device or CD.
To create a bootable diagnostic medium, do the following:

2. Click **Lenovo Bootable Diagnostics**.
3. Follow the instructions on the Web site to create a bootable diagnostic medium on a USB device or CD.

To use the diagnostic medium you have created, do one of the following:

- If you have created the bootable diagnostic medium on a USB device, do the following:
  1. Attach the USB device to the computer.
  2. Turn on the computer. If the computer cannot be turned on, go to “Power system checkout” on page 30, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 39 for error code descriptions and troubleshooting hints.
  3. When the ThinkPad logo is displayed, repeatedly press and release the F12 key. When the Boot Menu window opens, release the F12 key.
  4. Use the arrow keys to select **USB HDD** and then press Enter. The diagnostic program will be launched automatically.
  5. Follow the instructions on the screen to use the diagnostic program.

- If you have created the bootable diagnostic medium on a CD, do the following:
  1. Turn on the computer. If the computer cannot be turned on, go to “Power system checkout” on page 30, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 39 for error code descriptions and troubleshooting hints.
  2. Insert the CD into the optical drive.
  3. Restart the computer.
  4. When the ThinkPad logo is displayed, repeatedly press and release the F12 key. When the Boot Menu window opens, release the F12 key.
  5. Use the arrow keys to select **ATAPI CD(x: 0, 1, …)** and then press Enter. The diagnostic program will be launched automatically.
  6. Follow the instructions on the screen to use the diagnostic program.

---

**Power system checkout**

To verify if a battery pack or an ac power adapter is functional, do the following:

1. Turn off the computer.
2. Remove the battery pack.
3. Connect the ac power adapter.
4. Check that power is supplied when you turn on the computer.
5. Turn off the computer.
6. Disconnect the ac power adapter and install the charged battery pack.
7. Check that the battery pack supplies power when you turn on the computer.

If you suspect a power problem, see the appropriate one of the following power supply checkouts:

- “Checking the ac power adapter” on page 30
- “Checking operational charging” on page 31
- “Checking the battery pack” on page 31
- “Checking the coin-cell battery” on page 32

**Checking the ac power adapter**

If your computer fails only when the ac power adapter is used, use the following instructions.

- If the power problem occurs only when the dock is used, replace the dock.
• If the system-status indicator does not blink three times when an ac power source is connected, check the power cord of the ac power adapter for correct continuity and installation.

• If the computer does not charge during operation, go to “Checking operational charging” on page 31.

To check the ac power adapter, do the following:
1. Unplug the ac power adapter cable from the computer.
2. Measure the output voltage at the plug of the ac power adapter cable.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Voltage (V dc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+20</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
</tr>
</tbody>
</table>

**Note:** Output voltage across pin 2 of the ac power adapter might differ from the one you are servicing.
3. If the voltage is not correct, replace the ac power adapter.
4. If the voltage is acceptable, replace the system board.

**Note:** Noise from the ac power adapter does not always indicate a defect.

### Checking operational charging

To check whether the battery pack charges correctly during operation, do the following:
1. Discharge the battery pack until the remaining battery power is less than 50%.
2. Connect the computer to ac power to charge the battery pack. If the battery status icon in the Windows notification area indicates that the batteries are not charging, remove the battery pack and let them return to room temperature.
3. Reinstall the battery pack. If the batteries are still not charging, replace the battery pack.
4. Check the battery status icon again. If the same error still exists, replace the system board. Otherwise, check the original battery pack. See “Checking the battery pack” on page 31.

### Checking the battery pack

This system supports only batteries specially designed for this specific system and manufactured by Lenovo or an authorized builder. The system does not support unauthorized batteries or batteries designed for other systems. If an unauthorized battery or a battery designed for another systems is installed, the system will not charge.

**Attention:** Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.

The battery status icon in the Windows notification area displays the percentage of battery power remaining.

To check for detailed battery status information, do the following:
• For Windows 7: Open the Power Manager program and click the **Battery** tab.
• For Windows 8: Open the Lenovo Support program and click **Battery Health**, or open the Lenovo Settings program and click **Power**.

**Note:** If the battery pack becomes hot, it may not be able to charge. Remove it from the computer and leave it at room temperature for a while. After it cools down, reinstall and recharge it.
To check the battery pack, do the following:
1. Power off the computer.
2. Remove the battery pack and measure the voltage between battery terminals 1 (+) and 7 (-). See the following figure:

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Voltage (V dc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>+ 0 to + 12.6</td>
</tr>
<tr>
<td>6, 7</td>
<td>Ground (-)</td>
</tr>
</tbody>
</table>

3. If the voltage is less than +11.0 V dc, the battery pack has been discharged.
   If the voltage is still less than +11.0 V dc after recharging, replace the battery pack.
4. If the voltage is more than +11.0 V dc, measure the resistance between battery terminals 5 and 7.
   The resistance must be 4 to 30 K Ω. If the resistance is not correct, replace the battery pack. If the resistance is correct, replace the system board.

Checking the coin-cell battery

Do the following:
1. Power off the computer, and unplug the ac power adapter from it.
2. Turn the computer upside down.
3. Remove the battery pack (see “1020 Battery pack” on page 65).
4. Remove the coin-cell battery (see “1100 Coin-cell battery” on page 76).
5. Measure the voltage of the battery. See the following figure.

<table>
<thead>
<tr>
<th>Wire</th>
<th>Voltage (V dc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>+2.5 to +3.2</td>
</tr>
<tr>
<td>Black</td>
<td>Ground</td>
</tr>
</tbody>
</table>

- If the voltage is correct, replace the system board.
- If the voltage is not correct, replace the coin-cell battery.
- If the coin-cell battery discharges quickly after replacement, replace the system board.
Chapter 4. Related service information

This chapter presents following information:
- “Restoring the factory contents by using the Recovery Disc Set” on page 33
- “Recovery overview for the Windows 8 operating system” on page 34
- “Passwords” on page 36
- “Power management” on page 38
- “Symptom-to-FRU index” on page 39

Service Web site:
When the latest maintenance diskette and the system program service diskette become available, they will be posted on:
http://www.lenovo.com/support

Restoring the factory contents by using the Recovery Disc Set

When the main storage drive is replaced because of a failure, no product recovery program is on the new drive. In this case, the customer must use the Recovery Disc Set to recover the computer. Order the Recovery Disc Set and the drive at the same time so that the customer can restore the computer to the factory default settings by using the Recovery Disc Set after the new drive is installed. For information about which discs to order, go to:
http://www.lenovo.com/serviceparts-lookup

Depending on the model, the number of recovery discs included in the Recovery Disc Set differs. To restore the factory contents by using the product Recovery Disc Set, do the following:

Notes:
- During the recovery process, all data on the drive will be deleted. If possible, copy any important data or personal files that you want to keep onto removable media or a network drive before you start the recovery process.
- The recovery process takes one to two hours to complete. The length of time depends on the method you use. If you use product Recovery Disc Set, the recovery process takes about two hours.
  1. Connect an external CD/DVD drive.
  2. Make the CD/DVD drive the first startup device in the startup sequence using the following procedure:
     a. Open the ThinkPad Setup program and select Startup ➔ Boot.
     b. Select the CD/DVD drive as the 1st Boot Device.
  3. Insert the bootable recovery disc into the CD/DVD drive.
  4. Start the computer from the external CD/DVD drive.
  5. When prompted, select your language and click Next.
  6. Read the license and accept the terms and conditions. Then follow the instructions on the screen.
  7. If the Recovery Disc Set contains a Supplemental Recovery Disc, insert it when prompted and click Yes.

  Note: Not all Recovery Disc Sets come with a Supplemental Recovery Disc. If there is a Supplemental Recovery Disc, it will be clearly marked as such.

  8. When all of the data has been copied from the last disc in the set and has been processed, remove the external CD/DVD drive and restart the computer. Follow the instructions on the screen to finish the recovery.
**Note:** The rest of the recovery process is fully automated and no action from you is required. The computer will restart into the Microsoft Windows desktop several times and you might experience periods when no activity is apparent on the screen for several minutes at a time. This is normal.

9. When the recovery process completes, the Welcome to Microsoft Windows screen is displayed. Follow the instructions on the screen to complete the Windows setup.

10. After you have completed the Windows setup, you might want to restore the original startup sequence. Start the ThinkPad Setup program and then press F9 to restore the default settings. Press F10 to save changes and exit the ThinkPad Setup program.

**Note:** After restoring a drive to the factory default settings, you might need to reinstall some device drivers.

---

**Recovery overview for the Windows 8 operating system**

This section provides information about the recovery solutions for the Windows 8 operating system.

A Windows recovery image is preinstalled in the recovery partition on your computer. The Windows recovery image enables you to refresh your computer, or reset your computer to the factory default settings.

You can create recovery media as backups or replacement for the Windows recovery image. With the recovery media, you can troubleshoot and fix the problems on your computer even if you cannot start the Windows 8 operating system. It is recommended that you create recovery media as early as possible. For more information, see “Creating and using recovery media” on page 35.

**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 without losing your personal files or changing your settings.

**Attention:** If you refresh your computer, the programs that came with your computer and the programs that you installed from Windows Store will be reinstalled, but all other programs will be removed.

To refresh your computer, do the following:

1. Move your cursor to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General.**
2. In the **Refresh your PC without affecting your files** section, click **Get started.**
3. Follow the instructions on the screen to refresh your computer.

**Resetting your computer to the factory default settings**

If you want to recycle your computer or just start over, you can reset your computer to the factory default settings. Resetting the computer will reinstall the operating system, reinstall all the programs that came with your computer, and reset all the settings to the factory default settings.

**Attention:** If you reset the computer to the factory default settings, 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 to the factory default settings, do the following:

1. Move your cursor to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General.**
2. In the **Remove everything and reinstall Windows** section, click **Get started.** Then click **Next** to confirm the operation.
3. Depending on your needs, do one of the following:
• To perform a quick format, click **Just remove my files** to start the process. The process will take several minutes.

• To perform a complete format, click **Fully clean the drive** to start the process. The process will take several hours.

4. Follow the instructions on the screen to reset your computer to the factory default settings.

**Using the advanced startup options**

With the advanced startup options, you can change the firmware settings of the computer, change the startup settings of the 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 your cursor to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General**.

2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.

3. Select a desired startup option, then follow the instructions on the screen.

**Recovering your operating system if Windows 8 fails to start**

The Windows recovery environment on your computer is capable of operating independently from the Windows 8 operating system. This enables you to recover or repair the operating system even if the Windows 8 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.

**Creating and using recovery media**

You can create recovery media as backups for the Windows recovery environment and the Windows recovery image. If you cannot start the computer, you can use recovery media to troubleshoot and fix the problems on your computer.

It is recommended that you create recovery media as early as possible. Once you create recovery media, keep them in a safe place and do not use them to store other data.

**Creating recovery media**

To create recovery media, you need a USB drive with at least 8 GB of storage. The required USB capacity depends on the size of the recovery image.

**Attention:** Creating recovery media will delete anything stored on the USB drive. To avoid data loss, make a backup copy of all the data that you want to keep.

To create recovery media, do the following:

**Note:** Ensure that your computer is connected to ac power.

1. Move your cursor to the top-right or bottom-right corner of the screen to display the charms, and click **Search**.

2. Type **recovery** in the **Search** field and click **Settings**. Then click **Create a recovery drive**.

3. Click **Yes** in the User Account Control window to allow the Recovery Media Creator program to start.
4. Ensure that you select the **Copy the recovery partition from the PC to the recovery drive.** option. Then click **Next.**

   **Important:** If you clear the **Copy the recovery partition from the PC to the recovery drive.** option, you will create recovery media without the recovery partition content. You still can start the computer from the recovery media, but you might be unable to recover your computer if the recovery partition on your computer is damaged.

5. Connect a proper USB drive then click **Next.**

6. Click **Create** in the Recovery Drive window. The creation of the recovery media starts.

7. When the creation of the recovery media finishes, do one of the following:
   - To keep the recovery partition on your computer, click **Finish.**
   - To delete the recovery partition on your computer, click **Delete the recovery partition.**

   **Attention:** If you delete the recovery partition on your computer, do keep the recovery media in a safe place. The Windows recovery image will not be stored in your computer anymore, and you will need the recovery media to refresh or reset your computer.

8. Remove the USB drive. The recovery media are created successfully.

**Using recovery media**

If you cannot start your computer, or if you cannot start the Windows recovery image on your computer, use recovery media to recover your computer.

To use recovery media, do the following:

**Note:** Ensure that your computer is connected to ac power.

1. Turn on or restart the computer. Before the Windows operating system starts, repeatedly press the F12 key. The Boot Menu window opens.
2. Select the recovery drive as the boot device.
3. Select a preferred language and then select a preferred keyboard layout.
4. Click **Troubleshoot** to display the optional recovery solutions.
5. Select a corresponding recovery solution according to your situation. For example, select **Reset your PC** if you want to reset your computer to the factory default settings.

For more information about the recovery solutions provided by the Windows 8 operating system, go to: http://go.microsoft.com/fwlink/?LinkID=263800

**Passwords**

As many as three passwords might be needed for a ThinkPad notebook computer: the power-on password, the hard disk password, and the supervisor password.

If any of these passwords has been set, a prompt for it will be displayed on the screen whenever the computer is turned on. The computer does not start until the password is entered.

**Note:** If only a supervisor password is set, the password prompt will not be displayed when the operating system is started.
Power-on password

A power-on password protects the system from being turned on by an unauthorized person. The password must be entered before the operating system can be started. For instructions on how to remove the power-on password, see “How to remove the power-on password” on page 37.

Hard disk password

There are two hard disk passwords:

- User hard disk password - for the user
- Master hard disk password - for the system administrator, who can use it to get access to the hard disk even if the user has changed the user hard disk password.

Note: There are two modes for the hard disk password: **User only** and **Master + User**. The **Master + User** mode requires two hard disk passwords; the system administrator enters both in the same operation. The system administrator then provides the user hard disk password to the system user.

Attention: If the user hard disk password has been forgotten, check whether a master hard disk password has been set. If a master hard disk password has been set, it can be used to access the hard disk drive. If no master hard disk password is available, neither Lenovo nor Lenovo authorized service technicians provide any services to reset either the user hard disk password or the master hard disk password, or to recover data from the hard disk drive. The hard disk drive can be replaced for a scheduled fee.

For instructions on how to remove the hard disk password, see “How to remove the hard disk password” on page 38.

Supervisor password

A supervisor password protects the system information stored in the ThinkPad Setup program. The user must enter the supervisor password in order to get access to the ThinkPad Setup program and change the system configuration.

Attention: If the supervisor password has been forgotten and cannot be made available to the service technician, there is no service procedure to reset the password. The system board must be replaced for a scheduled fee.

How to remove the power-on password

To remove the power-on password, do one of the following:

If no supervisor password has been set, do the following to remove the power-on password:

1. Turn off the computer.
2. Remove the battery pack. For instructions on how to remove the battery pack, see “1020 Battery pack” on page 65.
3. Remove the coin-cell battery. For instructions on how to remove the coin-cell battery, see “1100 Coin-cell battery” on page 76.
4. Turn on the computer and wait until the POST ends. After the POST ends, the password prompt will not be displayed. The power-on password has been removed.
5. Reinstall the coin-cell battery and the battery pack.

If a supervisor password has been set and is known to the service technician, do the following to remove the power-on password:

1. Turn on the computer.
2. When the ThinkPad logo is displayed, immediately press F1.
3. Type the supervisor password to enter the ThinkPad Setup program.
5. Select Password.
7. Type the current supervisor password in the Enter Current Password field. Then, leave the Enter New Password field blank, and press Enter twice.
8. In the Changes have been saved window, press Enter.
9. Press Fn+F10 to save changes and exit the ThinkPad Setup program.

How to remove the hard disk password

Attention: If User only mode is selected and the user hard disk password has been forgotten and cannot be made available to the service technician, neither Lenovo nor Lenovo authorized service technicians provide any services to reset the user hard disk password, or to recover data from the hard disk drive. The hard disk drive can be replaced for a scheduled fee. To put the system back to operational status, the only Lenovo and Lenovo-authorized service solution would be to replace the hard disk drive or solid-state drive with a scheduled fee.

To remove a user hard disk password that has been forgotten, when the supervisor password and the master hard disk password are known, do the following:
1. Turn on the computer.
2. When the ThinkPad logo is displayed, immediately press F1 to enter the ThinkPad Setup program.
4. Select Password.
5. Select Hard-disk x password where x is the letter of the hard disk drive. A pop-up window opens.
6. Select Master HDP, where HDP stands for hard disk password.
7. Type the current master hard disk password in the Enter Current Password field. Then, leave the Enter New Password field blank, and press Enter twice.
8. Press Fn+F10 to save changes and exit the ThinkPad Setup program. The user hard disk password and the master hard disk password have been removed.

Power management

To reduce power consumption, the computer has three power management modes: screen blank, sleep, and hibernation.

Screen blank mode (for the Windows 7 operating system only)

If the time set on the “Turn off monitor” timer in the operating system expires, the LCD backlight turns off.

To put the computer into screen blank mode, do the following:
1. Right-click the battery gauge in the task bar.
2. Select Power off display (keep current power plan).

To end screen blank mode and resume normal operation, press any key.

Sleep mode

When the computer enters sleep mode, the following events occur in addition to what occurs in screen blank mode:
- The LCD is powered off.
• The hard disk drive or solid-state drive is powered off.
• The microprocessor stops.

To enter sleep mode, do one of the following:

• For Windows 7: Click the arrow beside the **Shut down** icon, and then select **Sleep**. To return from sleep mode, press any key.
• For Windows 8: Move the cursor to the bottom-right corner of the screen to display the charms. Then click **Settings → Power → Sleep**.

In certain circumstances, the computer goes into sleep mode automatically:

• After a period of inactivity specified in power plan settings
• When the battery power is low

To cause the computer to return from sleep mode and resume operation, do one of the following:

• Press any key.
• Open the LCD cover.
• Turn on the power button.

Also, in either of the following events, the computer automatically returns from sleep mode and resumes operation:

• The ring indicator (RI) is signaled by a serial device or a PC Card device.
• The time set on the resume timer elapses.

  **Note:** The computer does not accept any input immediately after it enters sleep mode. Wait a few seconds before taking any action to reenter operation mode.

**Hibernation mode**

In hibernation mode, the following occurs:

• The system status, RAM, VRAM, and setup data are stored on the hard disk drive or solid-state drive.
• The system is powered off.

  **Note:** If the computer enters the hibernation mode while it is connected to the dock, do not disconnect it before resuming normal operation. If you do disconnect it and then try to resume normal operation, you will get an error message, and you will have to restart the system.

If you have defined one of the following actions as the event that causes the system to go into hibernation mode, perform that action.

• Closing the lid.
• Pressing the power button.

Also, the computer goes into hibernation mode automatically after a period of inactivity specified in power plan settings.

When the power is turned on, the computer returns from hibernation mode and resumes operation. The hibernation file in the boot record on the hard disk drive or solid-state drive is read, and system status is restored from the hard disk drive or solid-state drive.

---

**Symptom-to-FRU index**

This section contains following information:

• “Numeric error codes” on page 40
• “Error messages” on page 42
• “No-beep symptoms” on page 42
• “LCD-related symptoms” on page 43
• “Intermittent problems” on page 43
• “Undetermined problems” on page 43

The symptom-to-FRU index in this section lists symptoms and errors and their possible causes. The most likely cause is listed first, in boldface type.

**Note:** Do the FRU replacement or other actions in the sequence shown in the column headed “FRU or action, in sequence.” If replacing a FRU does not solve the problem, put the original part back in the computer. Do not replace a nondefective FRU.

This index can also help you determine, during regular servicing, what FRUs are likely to need to be replaced next.

A numeric error is displayed for each error detected in POST or system operation. In the displays, n can be any number.

If no numeric code is displayed, check the narrative descriptions of symptoms. If the symptom is not described there, go to “Intermittent problems” on page 43.

**Note:** For a device not supported by diagnostic codes in the ThinkPad notebooks, see the manual for that device.

### Numeric error codes

*Table 2. Numeric error codes*

<table>
<thead>
<tr>
<th>Symptom or error (beeps, if any)</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0177</strong> Bad SVP data, stop POST task—The checksum of the supervisor password in the EEPROM is not correct.</td>
<td>Replace the system board.</td>
</tr>
</tbody>
</table>
| **0183** Bad CRC of Security Settings in EFI Variable. Enter the ThinkPad Setup program. – The checksum of the Security settings in the EFI Variable is not correct. | 1. Run the ThinkPad Setup program. The settings will be corrected automatically. Then save the current settings by pressing Fn+F10.  
2. Replace the system board. |
| **0187** EAIA data access error - The access to EEPROM is failed. | Replace the system board. |
| **0188** Invalid RFID Serialization Information Area. | Replace the system board. |
| **0189** Invalid RFID configuration information area - The EEPROM checksum is not correct. | Replace the system board. |
| **0190** Critical low-battery error | 1. Charge the battery pack.  
2. Replace the battery pack. |
| **0191** System Security - Invalid Remote Change requested. | 1. Run the ThinkPad Setup program, and then save current setting by pressing Fn+F10.  
2. Replace the system board. |
Table 2. Numeric error codes (continued)

<table>
<thead>
<tr>
<th>Symptom or error (beeps, if any)</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
</table>
| 0199 System Security - Security password retry count exceeded. | 1. Run the ThinkPad Setup program. The retry count will be reset. Then save the current settings by pressing Fn+F10.  
2. Replace the system board. |
| 0251 System CMOS checksum bad - Default configuration used. | 1. Charge the coin-cell battery for more than 8 hours by connecting the ac power adapter.  
2. Replace the coin-cell battery and run the ThinkPad Setup program to reset the time and date. |
| 0253 EFI Variable Block Data was destroyed. | 1. Run ThinkPad Setup to reconfigure the settings.  
2. Replace the system board. |
| 0271 Real-Time Clock Error. Check Date and Time settings. | 1. Run ThinkPad Setup to reset the time and date  
2. Replace the coin-cell battery and run the ThinkPad Setup program to reset the time and date. |
| 1802 Unauthorized network card is plugged in - Turn off and remove the network card. | 1. Remove the network card.  
2. Replace the system board. |
| 1820 More than one external fingerprint reader is attached. Power off and remove all but the reader that you set up within your main operating system. | Remove all but the reader that you set up for the authentication |
| 2000 ThinkVantage Active Protection sensor diagnostics failed. | Have the computer serviced. |
| 2100 Detection error on HDD0 (Main HDD) | 1. Reseat the hard disk drive.  
2. Replace the main hard disk drive.  
3. Replace the system board. |
| 2101 Detection error on HDD1 (Ultrabay HDD) | 1. Reseat the hard disk drive.  
2. Replace the Ultrabay® hard disk drive.  
3. Replace the system board. |
| 2102 Detection error on HDD2 (Mini SATA) | 1. Reseat the Mini SATA device.  
2. Replace the mini SATA device.  
3. Replace the system board. |
| 2110 Read error on HDD0 (Main HDD) | 1. Reseat the hard disk drive.  
2. Replace the main hard disk drive.  
3. Replace the system board. |
| 2111 Read error on HDD1 (Ultrabay HDD) | 1. Reseat the hard disk drive.  
2. Replace the Ultrabay hard disk drive.  
3. Replace the system board. |
| 2112 Read error on HDD2 (Mini SATA) | 1. Reseat the Mini SATA device.  
2. Replace the mini SATA device.  
3. Replace the system board. |
| 2200 Machine Type and Serial Number are invalid. | Replace the system board. |
| 2201 Machine UUID is invalid | Replace the system board. |
Error messages

Table 3. Error messages

<table>
<thead>
<tr>
<th>Symptom or error (beeps, if any)</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
</table>
| Fan error. (four short beeps, one long beep) | 1. Replace the fan.  
2. Apply thermal grease.  
3. Replace the system board. |
| Thermal sensing error. | Replace the system board. |
| The battery installed is not supported by this system and will not charge. Please replace the battery with the correct Lenovo battery for this system. Press the ESC key to continue. | Replace the battery. |
| This system does not support batteries that are not genuine Lenovo-made or authorized. The system will continue to boot, but may not charge unauthorized batteries. | Replace the battery. |

Attention: Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.

Beep symptoms

Table 4. Beep symptoms

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
</table>
| One short beep, pause, three short beeps, pause, three more short beeps, pause, and one short beep | 1. Replace the memory module.  
2. Replace the system board. |
| One long and two short beeps | Replace the system board. |
| Five short beeps | Replace the system board. |

No-beep symptoms

Table 5. No-beep symptoms

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
</table>
| No beep, power-on indicator on, LCD blank, and no POST. | 1. Ensure that every connector is connected tightly and correctly.  
2. Reseat memory module.  
3. Replace the system board. |
| No beep, power-on indicator on, and LCD blank during POST. | 1. Reseat memory module.  
2. Replace the system board. |
| The power-on password prompt appears. | A power-on password or a supervisor password is set. Type the password and press Enter. |
| The hard-disk password prompt appears. | A hard-disk password is set. Type the password and press Enter. |
LCD-related symptoms

Important: The TFT LCD for the notebook computer contains many thin-film transistors (TFTs). The presence of a small number of dots that are missing, discolored, or always lighted is characteristic of TFT LCD technology, but excessive pixel problems can cause viewing concerns.

If the LCD you are servicing has two or less visible defective pixels, it should not be considered faulty. However, if the LCD has three or more visible defective pixels, it will be deemed as defective by Lenovo and it should be replaced.

Notes:
• This policy applies to all ThinkPad Notebooks purchased on 1 January, 2008 or later.
• Lenovo will not provide warranty replacement if the LCD is within specifications because we cannot guarantee that any replacement LCD will have zero pixel defects.
• One pixel consists of R, G, B sub-pixels.

Table 6. LCD-related symptoms

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>No beep, power-on indicator on, and a blank LCD during POST.</td>
<td>Replace the system board.</td>
</tr>
<tr>
<td>• LCD backlight not working.</td>
<td>1. Reseat the LCD connectors.</td>
</tr>
<tr>
<td>• LCD too dark.</td>
<td>2. Replace the LCD assembly.</td>
</tr>
<tr>
<td>• LCD brightness cannot be adjusted.</td>
<td>3. Replace the system board.</td>
</tr>
<tr>
<td>• LCD contrast cannot be adjusted.</td>
<td></td>
</tr>
<tr>
<td>• LCD screen unreadable.</td>
<td>1. See important note for “LCD-related symptoms.”</td>
</tr>
<tr>
<td>• Characters missing pixels.</td>
<td>2. Reseat all LCD connectors.</td>
</tr>
<tr>
<td>• Screen abnormal.</td>
<td>3. Replace the LCD assembly.</td>
</tr>
<tr>
<td>• Wrong color displayed.</td>
<td>4. Replace the system board.</td>
</tr>
<tr>
<td>Horizontal or vertical lines displayed on LCD.</td>
<td>Replace the LCD assembly.</td>
</tr>
</tbody>
</table>

Intermittent problems

Intermittent system hang problems can be due to a variety of causes that have nothing to do with a hardware defect, such as cosmic radiation, ESD, or software errors. FRU replacement should be considered only when a problem recurs.

When analyzing an intermittent problem, do the following:
1. Run the diagnostic test for the system board in loop mode at least 10 times.
2. If no error is detected, do not replace any FRUs.
3. If any error is detected, replace the FRU shown by the FRU code. Rerun the test to verify that no more errors exist.

Undetermined problems

If the diagnostic tests did not identify the device that has failed, if wrong devices are installed, or if the system simply is not operating, follow these procedures to isolate the failing FRU (do not isolate FRUs that have no defects).

Verify that all attached devices are supported by the computer.

Verify that the power supply being used at the time of the failure is operating correctly. (See “Power system checkout” on page 30)
1. Turn off the computer.
2. Visually check each FRU for damage. Replace any damaged FRU.
3. Remove or disconnect all of the following devices:
   a. Non-ThinkPad devices
   b. Devices attached to the dock
   c. Printer, mouse, and other external devices
   d. Battery pack
   e. Hard disk drive or solid-state drive
   f. External diskette drive or optical drive
   g. Memory module
   h. Optical disk or diskette in the internal drive
   i. M.2 solid-state drive
4. Turn on the computer.
5. Determine whether the problem has been solved.
6. If the problem does not recur, reconnect the removed devices one at a time until you find the failing FRU.
7. If the problem remains, replace the following FRUs one at a time (do not replace a nondefective FRU):
   a. System board
   b. LCD assembly
Chapter 5. Status indicators

This chapter presents the system-status indicators that show the status of the computer.

Table 7. Status indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Speaker-mute indicator</td>
<td>On: The speakers are muted.</td>
</tr>
<tr>
<td>2  Microphone-mute</td>
<td>On: The microphones are muted.</td>
</tr>
<tr>
<td>indicator</td>
<td></td>
</tr>
<tr>
<td>3  Camera-status indicator</td>
<td>On: The camera is in use.</td>
</tr>
</tbody>
</table>
Table 7. Status indicators (continued)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| 4 4 System-status indicator | **Blinking three times**: The computer is initially connected to power.  
**On**: The computer is in use.  
**Off**: The computer is off or in hibernation mode.  
**Slow blinking**: The computer is in sleep mode.  
**Fast blinking**: The computer is entering hibernation mode. |
| 5 Fn Lock indicator | **Off**: The Fn Lock function is disabled. To initiate the special function of each key, press the function keys directly. To input F1-F12, press the Fn key and the corresponding function key.  
**On**: The Fn Lock function is enabled. To initiate the special function of each key, press the Fn key and the corresponding function key. To input F1-F12, press the function keys directly. |
## Chapter 6. Special keys

The following table describes the functions of function keys and key combinations.

### Table 8. Special keys

<table>
<thead>
<tr>
<th>Special key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="fn_lock.png" alt="Image" /></td>
<td>Enables or disables the Fn Lock function. <strong>When the Fn Lock function is disabled:</strong> The Fn Lock indicator is off. To initiate the special function of each key, press the function keys directly. To input F1-F12, press the Fn key and the corresponding function key. <strong>When the Fn Lock function is enabled:</strong> The Fn Lock indicator turns on. To initiate the special function of each key, press the Fn key and the corresponding function key. To input F1-F12, press the function keys directly.</td>
</tr>
<tr>
<td><img src="volume_mute.png" alt="Image" /></td>
<td>Mutes or unmutes the speakers. If you mute the sound and turn off your computer, the sound will remain muted when you turn on your computer again. To turn on the sound, press F1, F2, or F3.</td>
</tr>
<tr>
<td><img src="volume_decrease.png" alt="Image" /></td>
<td>Decreases the speaker volume.</td>
</tr>
<tr>
<td><img src="volume_increase.png" alt="Image" /></td>
<td>Increases the speaker volume.</td>
</tr>
<tr>
<td><img src="micro_mute.png" alt="Image" /></td>
<td>Mutes or unmutes the microphones.</td>
</tr>
<tr>
<td><img src="brightness_decrease.png" alt="Image" /></td>
<td>Darkens the display.</td>
</tr>
<tr>
<td><img src="brightness_increase.png" alt="Image" /></td>
<td>Brightens the display.</td>
</tr>
<tr>
<td><img src="display_switch.png" alt="Image" /></td>
<td>Switches the display output location.</td>
</tr>
<tr>
<td><img src="wireless.png" alt="Image" /></td>
<td>Enables or disables the built-in wireless networking features.</td>
</tr>
<tr>
<td><img src="windows8_settings.png" alt="Image" /></td>
<td>For Windows 8: Opens the <strong>Settings</strong> charm. For Windows 7: Opens <strong>Control Panel</strong>.</td>
</tr>
<tr>
<td><img src="windows8_search.png" alt="Image" /></td>
<td>For Windows 8: Opens the <strong>Search</strong> charm. For Windows 7: Opens <strong>Windows Search</strong>.</td>
</tr>
<tr>
<td><img src="computer.png" alt="Image" /></td>
<td>Views the programs that you have opened. For Windows 8: Views all the programs. For Windows 7: Opens <strong>Computer</strong>.</td>
</tr>
<tr>
<td><img src="calculator.png" alt="Image" /></td>
<td>Launches the calculator.</td>
</tr>
<tr>
<td><img src="lock.png" alt="Image" /></td>
<td>Locks the operating system.</td>
</tr>
<tr>
<td><img src="browser.png" alt="Image" /></td>
<td>Opens the default browser.</td>
</tr>
<tr>
<td>Special key</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Opens <strong>Computer</strong>.</td>
</tr>
<tr>
<td>Fn+B</td>
<td>Has the same function as the Break key on a conventional keyboard.</td>
</tr>
<tr>
<td>Fn+K</td>
<td>Has the same function as the ScrLK key on a conventional keyboard.</td>
</tr>
<tr>
<td>Fn+P</td>
<td>Has the same function as the Pause key on a conventional keyboard.</td>
</tr>
<tr>
<td>Fn+S</td>
<td>Has the same function as the SysRq key on a conventional keyboard.</td>
</tr>
</tbody>
</table>
Chapter 7. Locations

This chapter introduces the locations of the hardware components on your computer.

Locating computer controls, connectors, and indicators

This topic introduces the locations of the computer controls, connectors, and indicators.

Front view

1. Microphones
2. Camera (on some models)
3. Lenovo OneLink connector
4. ac power connector
5. Ethernet connector
6. Optical drive or optical-drive bay bezel
7. Always-On USB connector
8. System-status indicator
9. Fingerprint reader (on some models)
10. ThinkPad trackpad
11. TrackPoint® pointing stick
12. Power button

1: For the description of the system-status indicator, see Chapter 5 “Status indicators” on page 45.
Rear view

1 System-status indicator
2 Combo audio connector
3 USB 3.0 connectors
4 High-Definition Multimedia Interface (HDMI™) connector
5 VGA connector
6 Security-lock slot

1: For the description of the system-status indicator, see Chapter 5 “Status indicators” on page 45.

Bottom view

1 Small bottom cover
2 Battery pack latches
3 Battery pack
4 Large bottom cover
5 Speakers
6 Media card slot

1: The wireless LAN card and coin-cell battery are located underneath the small bottom cover.
2: The memory modules, hard disk drive or solid-state drive, and wireless WAN card or M.2 solid-state drive are located underneath the large bottom cover.

Locating FRUs and CRUs

This topic introduces the following service parts:
• “Major FRUs and CRUs” on page 52
“LCD FRUs and CRUs” on page 54

Notes:
- Each FRU is available for all types or models, unless otherwise specified.
- **CRU statement for customers:**
  
  You can resolve some problems with your product with a replacement part you can install yourself, called a “Customer Replaceable Unit” or “CRU.” Some CRUs are designated as self-service CRUs and others are designated as optional-service CRUs. **Installation of self-service CRUs is your responsibility.** For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider install the CRU according to the warranty service for your product. If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. You can find a list of CRUs for your product in this Hardware Maintenance Manual. An electronic version of this manual can be found at http://www.lenovo.com/support. Click User Guides & Manuals and then follow the on-screen instructions to find the manual for your product. You might be required to return the defective CRU. When return is required: (1) return instructions, a prepaid shipping label, and a container will be included with the replacement CRU; and (2) you might be charged for the replacement CRU if Lenovo does not receive the defective CRU within thirty (30) days of your receipt of the replacement CRU. See your Lenovo Limited Warranty documentation for full details.

  ThinkPad computers contain the following types of CRUs:
  - **Self-service CRUs:** These CRUs unplug or are held by no more than two screws. Examples of these types of CRUs include the ac power adapter, power cord, battery pack, and hard disk drive or solid-state drive. Other self-service CRUs depending on product design might include the memory module, wireless card, keyboard, and palm rest with fingerprint reader and ThinkPad trackpad.
  - **Optional-service CRUs:** These CRUs are isolated parts within the computer that 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.
Major FRUs and CRUs
<table>
<thead>
<tr>
<th>No.</th>
<th>FRU description</th>
<th>Self-service CRU</th>
<th>Optional-service CRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD unit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Power-button card</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Keyboard bezel assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Coin-cell battery</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Wireless WAN card</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>M.2 solid-state drive</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Wireless LAN/Bluetooth card</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Battery pack</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Lenovo-OneLink-connector cover</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>DC-in bracket</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>DC-in/Ethernet card</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>Optical drive or optical-drive bay bezel</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>Media-card-reader/USB card</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>Small bottom cover</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>14</td>
<td>Large bottom cover</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>15</td>
<td>Hard disk drive with bracket or solid-state drive</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>16</td>
<td>with bracket</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>17</td>
<td>Optical-drive card</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>18</td>
<td>Speaker assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>19</td>
<td>Base cover assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>20</td>
<td>Memory module</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>21</td>
<td>Microprocessor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>22</td>
<td>System board</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>23</td>
<td>Fan assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>24</td>
<td>TrackPoint cap</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
LCD FRUs and CRUs
For models with non-touch screen
Table 10. LCD FRUs and CRUs

<table>
<thead>
<tr>
<th>No.</th>
<th>FRU description</th>
<th>Self-service CRU</th>
<th>Optional-service CRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD bezel</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>LCD hinges</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Wireless-LAN/WAN antenna assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Wireless LAN antenna</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Camera/microphone module</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Microphone module</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>LCD cover kit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>LCD cables</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>LCD panel</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
For models with touch screen

1
2
3
4
5
6
7
8
Table 11. LCD FRUs and CRUs

<table>
<thead>
<tr>
<th>No.</th>
<th>FRU description</th>
<th>Self-service CRU</th>
<th>Optional-service CRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD-hinge caps</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>LCD panel/screen assembly</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Camera/microphone module</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Microphone module</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>LCD cables</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>LCD-control-card cable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>LCD hinges</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Wireless LAN antenna</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>LCD rear cover</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Miscellaneous kits and other FRUs

Table 12. Miscellaneous kits

<table>
<thead>
<tr>
<th>FRU description</th>
<th>Self-service CRU</th>
<th>Optional-service CRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw kit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• Screw kit for non-touch screen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Screw kit for touch screen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber kit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• LCD rubber caps (2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 13. Other FRUs

<table>
<thead>
<tr>
<th>FRU description</th>
<th>Self-service CRU</th>
<th>Optional-service CRU</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac power adapter</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Power cord</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Looking up FRU information

For detailed FRU information, including part numbers, descriptions, and substitution part numbers, go to: http://www.lenovo.com/serviceparts-lookup
Chapter 8. FRU replacement notices

This chapter presents notices related to removing and replacing parts. Read this chapter carefully before replacing any FRU.

**CRU statement for customers:**
You can resolve some problems with your product with a replacement part you can install yourself, called a “Customer Replaceable Unit” or “CRU.” Some CRUs are designated as self-service CRUs and others are designated as optional-service CRUs. **Installation of self-service CRUs is your responsibility.** For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider **install the CRU according to the warranty service for your product.** If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. You can find a list of CRUs for your product in this Hardware Maintenance Manual. An electronic version of this manual can be found at http://www.lenovo.com/support. Click **User Guides & Manuals** and then follow the on-screen instructions to find the manual for your product. You might be required to return the defective CRU. When return is required: (1) return instructions, a prepaid shipping label, and a container will be included with the replacement CRU; and (2) you might be charged for the replacement CRU if Lenovo does not receive the defective CRU within thirty (30) days of your receipt of the replacement CRU. See your Lenovo Limited Warranty documentation for full details.

This chapter presents notices related to removing and replacing parts. Read this chapter carefully before replacing any FRU.

**Screw notices**
Loose screws can cause a reliability problem. In the ThinkPad notebook computer, this problem is addressed with special nylon-coated screws that have the following characteristics:

- They maintain tight connections.
- They do not easily come loose, even with shock or vibration.
- They are harder to tighten.

Do the following when you service the computer:

- Keep the screw kit in your tool bag. For the part number of the screw kit, go to: http://www.lenovo.com/serviceparts-lookup
- It is recommended to use new screws.
- It is recommended to use each screw only once.

Tighten screws as follows:

- **Plastic to plastic**
  Turn an additional angle of 90 degrees after the screw head touches the surface of the plastic part.
• **Logic card to plastic**
  
  Turn an additional angle of 180 degrees after the screw head touches the surface of the logic card.

  ![180 degrees more](Cross-section)

**Notes:**

• Ensure that you use the correct screw. It is recommended to use new screws for replacements. If you have a torque screwdriver, tighten all screws firmly to the torque specified in the screw information table for each step.

• Ensure torque screwdrivers are calibrated correctly following country specifications.

---

**Retaining serial numbers**

This topic provides instructions on the following:

• “Restoring the serial number of the system unit” on page 60

• “Retaining the UUID” on page 61

**Restoring the serial number of the system unit**

When the computer was manufactured, the EEPROM on the system board was loaded with the serial numbers of the system and all major components. These numbers need to remain the same throughout the life of the computer.

If you replace the system board, you must restore the serial number of the system unit to its original value.

The serial number of the system unit is written on the label attached to the bottom of the computer.

If you can not find the serial number of the system unit on the bottom of the computer, try the following method to get the number:

**Note:** Before you perform the operation, ensure that the UEFI/Legacy setting within the **Startup** menu in the ThinkPad Setup program is set to **UEFI Only**.

1. Connect a USB memory key to the computer.

2. Go to [http://www.lenovo.com/maintenanceutilities](http://www.lenovo.com/maintenanceutilities) and follow the instructions on the screen to create a Maintenance key.

   **Note:** Only an authorized Lenovo service technician can access the above Web site.

3. Restart the computer.

4. When the logo is displayed, press Esc. The ThinkPad Config Information Update Utility interface is displayed.

5. Type 1 under **Enter the action desired**, then press Enter. The ThinkPad Serial Number Update Utility for Asset ID screen is displayed.

6. Type 2 under **Enter the action desired**, then press Enter. The serial number of each device in your computer is displayed; the serial number of the system unit is listed as follow:

   20- Serial number

7. Record the serial number of the system unit.
After you replace the system board, do the following to restore the serial number of the system unit:

1. Connect the Maintenance key to the computer.
2. When the logo is displayed, press Esc. The ThinkPad Config Information Update Utility interface is displayed.
3. Type 1 under **Enter the action desired**, then press Enter. The ThinkPad Serial Number Update Utility for Asset ID screen is displayed.
4. Type 1 under **Enter the action desired**, then press Enter. Then follow the instructions on the screen to restore the serial number of the system unit.

**Retaining the UUID**

The Universally Unique Identifier (UUID) is a 128-bit number uniquely assigned to your computer at production and stored in the EEPROM of your system board.

The algorithm that generates the number is designed to provide unique IDs until the year A.D. 3400. No two computers in the world have the same number.

When you replace the system board, perform the following steps to create a new UUID for the system board if the system board does not have a UUID:

**Note:** Before you perform the operation, ensure that the UEFI/Legacy setting within the **Startup** menu in the ThinkPad Setup program is set to **UEFI Only**.

1. Connect a USB memory key to the computer.
2. Go to http://www.lenovo.com/maintenanceutilities and follow the instructions on the screen to create a Maintenance key.

**Note:** Only an authorized Lenovo service technician can access the above Web site.
3. Restart the computer.
4. When the logo screen is displayed, press Esc. The ThinkPad Config Information Update Utility interface is displayed.
5. Type 2 under **Enter the action desired**, then press Enter. The Auto UUID generation utility interface is displayed.
6. Type y under **Change UUID. OK? [Y/N]**, then press Enter. A new UUID is created and written. If a valid UUID already exists, it is not overwritten.
Chapter 9. Removing or replacing a FRU

This chapter provides instructions on how to remove or replace a FRU.

CRU statement for customers:
You can resolve some problems with your product with a replacement part you can install yourself, called a “Customer Replaceable Unit” or “CRU.” Some CRUs are designated as self-service CRUs and others are designated as optional-service CRUs. Installation of self-service CRUs is your responsibility. For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider install the CRU according to the warranty service for your product. If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. You can find a list of CRUs for your product in this Hardware Maintenance Manual. An electronic version of this manual can be found at http://www.lenovo.com/support. Click User Guides & Manuals and then follow the on-screen instructions to find the manual for your product. You might be required to return the defective CRU. When return is required: (1) return instructions, a prepaid shipping label, and a container will be included with the replacement CRU; and (2) you might be charged for the replacement CRU if Lenovo does not receive the defective CRU within thirty (30) days of your receipt of the replacement CRU. See your Lenovo Limited Warranty documentation for full details.

General guidelines

When removing or replacing a FRU, be sure to observe the following general guidelines:

1. Do not try to service any computer unless you have been trained and certified. An untrained person runs the risk of damaging parts.
2. Before replacing any FRU, review Chapter 8 “FRU replacement notices” on page 59.
3. Begin by removing any FRUs that have to be removed before replacing the failing FRU. Any such FRUs are listed at the beginning of each FRU replacement procedure. Remove them in the order in which they are listed.
4. Follow the correct sequence in the steps for removing a FRU, as given in the drawings by the numbers in square callouts.
5. When turning a screw, turn it in the direction as given by the arrow in the drawing.
6. When removing a FRU, move it in the direction as given by the arrow in the drawing.
7. To put the new FRU in place, reverse the removal procedure and follow any notes that pertain to replacement. For information about connecting and arranging internal cables, see Chapter 7 “Locations” on page 49.
8. When replacing a FRU, use the correct screws as shown in the replacement procedure.

⚠️ DANGER

Before removing any FRU, turn off the computer, unplug all power cords from electrical outlets, remove the battery pack, and then disconnect any interconnecting cables.

Attention:

- After replacing a FRU, do not turn on the computer until you have made sure that all screws, springs, and other small parts are in place and none are loose inside the computer. Verify this by shaking the computer gently and listening for rattling sounds. Metallic parts or metal flakes can cause electrical short circuits.
- The system board is sensitive to, and can be damaged by, ESD. Before touching it, establish personal grounding by touching a ground point with one hand or by using an ESD strap.
Removing the SIM card

The computer you are servicing might have a SIM card that the customer has installed. In such situations, remove the SIM card before you start the servicing.

To remove the SIM card, you need to remove the battery pack first. See “1020 Battery pack” on page 65.

After you finish the servicing, ensure that you insert the card back into the slot firmly.
1010 Lenovo-OneLink-connector cover

Removal steps of the Lenovo-OneLink-connector cover

Note: Ensure that you reattach the connector cover to the Lenovo-OneLink-connector after finishing the servicing.

1020 Battery pack

<table>
<thead>
<tr>
<th>Important notice for replacing a battery pack</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention:</strong> Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.</td>
</tr>
</tbody>
</table>

The Lenovo Solution Center program provides an automatic battery diagnostic test that determines if the battery pack is defective. A battery pack FRU should not be replaced unless this diagnostic test shows that the battery is defective. The only exception to this is if the battery pack is physically damaged or a customer is reporting a possible safety issue.

If Lenovo Solution Center is not installed in the computer, the customer should download this program before a non-physically damaged battery pack is replaced. Note that a physically damaged battery pack is a non-warranty replacement part.

Removal steps of the battery pack

⚠️ **DANGER**

Use only the authorized battery specified for your computer. Any other battery could ignite or explode.
Unlock the battery pack latch 1. Hold the battery pack lock lever in the unlocked position 2 and remove the battery pack 3.

When installing: Install the battery pack into the slot. Ensure that the battery pack latch is in the locked position.

1030 Large bottom cover

For access, remove this FRU:
- “1020 Battery pack” on page 65

Removal steps of the large bottom cover

Loosen the screws 1 and then remove the large bottom cover 2.
When installing: Attach the large bottom cover as shown in the following illustration.

1040 Small bottom cover
For access, remove this FRU:
• “1020 Battery pack” on page 65

Removal steps of the small bottom cover
Loosen the screw 1 and then remove the small bottom cover 2
When installing: Attach the small bottom cover as shown in the following illustration.

1050 Optical drive or optical-drive bay bezel

For access, remove these FRUs in order:
• “1020 Battery pack” on page 65

Removal steps of the optical drive or optical-drive bay bezel

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 4 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
1060 Memory modules

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66

Removal steps of the memory modules
When installing:

Note: If only one memory module is to be installed on the computer you are servicing, the memory module must be installed in the lower memory slot  ● (SLOT-0), not the upper memory slot  ● (SLOT-1).

Insert the notched end of the memory module into the slot at an angle of about 20 degrees. Press the memory module firmly, and pivot it downwards until it snaps into place. Ensure that the memory module is firmly installed in the slot and does not move easily.

1070 Hard disk drive or solid-state drive

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66

Attention:
- Do not drop the drive or apply any physical shock to it. The drive is sensitive to physical shock. Improper handling can cause damage and permanent loss of data.
- Before removing the drive, have the user make a backup copy of all the information on it if possible.
- Never remove the drive while the computer is operating or is in suspend mode.
Removal steps of the hard disk drive or the solid-state drive

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 x 4 mm, wafer-head, nylon-coated (4)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

When installing: Ensure that the hard disk drive assembly or solid-state drive assembly is attached firmly.
Removal steps of the hard disk drive bracket or the solid-state drive bracket

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M3 × 3 mm, wafer-head, nylon-coated (4)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

1080 Wireless WAN card or M.2 solid-state drive

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
Removal steps of the wireless WAN card

In step 1, unplug the connectors by using the antenna RF connector removal tool or pick up the connectors with your fingers and gently unplug them as shown.

When installing: Plug the red cable into the main connector, and the blue cable into the auxiliary connector on the card.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>M2 x 3 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
Removal steps of the M.2 solid-state drive

Attention:

- Do not drop the drive or apply any physical shock to it. The drive is sensitive to physical shock. Improper handling can cause damage and permanent loss of data.
- Before removing the drive, have the user make a backup copy of all the information on it if possible.
- Never remove the drive while the computer is operating or is in suspend mode.
- Ensure that you partition the M.2 solid-state drive after installing it on the computer you are servicing. Otherwise, the M.2 solid-state drive will not function correctly. For instructions on how to partition an M.2 solid-state drive, go to http://www.lenovo.com/support/msata-fru.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 3 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
1090 Wireless LAN card

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1040 Small bottom cover” on page 67

Removal steps of the wireless LAN card

In step 1, unplug the connectors by using the antenna RF connector removal tool or pick the connectors with your fingers and gently unplug them as shown.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>M2 × 3 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
When installing: Plug the gray cable into the main connector, and the black cable into the auxiliary connector on the card.

1100 Coin-cell battery

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1040 Small bottom cover” on page 67

Removal steps of the coin-cell battery

⚠️ DANGER

Use only the authorized battery specified for your computer. Any other battery could ignite or explode.

When installing: Ensure that the connector is attached firmly.

1110 Fan assembly

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
Removal steps of the fan assembly

1. Detach the connector.

When installing: Ensure that the connector is attached firmly to the system board.

2. Loosen the screws in ascending alphabetical order as illustrated.

**Note:** Different models might have different numbers of screws.
3. Remove the fan assembly.

When installing:

- Do not press the top of the fan cover and the fan hub.
- Before you attach the fan assembly to the computer, apply thermal grease, at an amount of 0.2 grams, on the part marked [a] as shown in the following illustrations. Either too much or too less application of grease can cause a thermal problem due to imperfect contact with a component. You need to peel the thin film off from the rubbers marked [b].

For models with a discrete thermal pipes

For models with an integrated thermal pipes
1120 Keyboard

For access, remove these FRUs in order:
• “1020 Battery pack” on page 65

Keyboard multi-tool

When you remove the keyboard, use the keyboard multi-tool. The following illustration shows a keyboard multi-tool.

Removal steps of the keyboard

1. Unlock the keyboard frame.
2. To reveal the screw heads beneath the keyboard frame, slide the keyboard frame forward by 2.5 mm (0.1 inch) with the keyboard multi-tool.

3. Loosen the screws that secure the keyboard with the keyboard multi-tool.
4. Pivot the keyboard slightly upward until you can see the connectors on the bottom side of the keyboard. Then turn over the keyboard.

5. Gently put the keyboard on the palm rest and detach the connectors. Then remove the keyboard.
Installation steps of the keyboard

1. Attach the connectors and then turn over the keyboard.

2. Insert the keyboard into the space under the frame of the keyboard bezel.
3. Reveal the screw heads by sliding the keyboard frame forward with the keyboard multi-tool. Ensure that the screw heads are exposed completely.

4. Tighten the screws with the keyboard multi-tool to secure the keyboard in place.
5. Ensure that the latches of the keyboard frame are under the keyboard bezel by gently pressing the latches with your finger as shown. Then slide the keyboard frame backward by 2.5 mm (0.1 inch) with the keyboard multi-tool.

6. Adjust the keyboard frame in place with the keyboard multi-tool and ensure that all the latches are secured under the keyboard bezel.
7. Turn the computer over and lock the keyboard frame.

1130 **Keyboard bezel assembly**

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive ” on page 70
- “1120 Keyboard” on page 79

**Removal steps of the keyboard bezel assembly**

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 x 8mm, wafer-head, nylon-coated (12)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>2</td>
<td>M2 x 5 mm, wafer-head, nylon-coated (3)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>Step</td>
<td>Screw (quantity)</td>
<td>Color</td>
<td>Torque</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------</td>
<td>-------------------</td>
</tr>
<tr>
<td>3</td>
<td>M2 × 5 mm, wafer-head, nylon-coated (3)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>4</td>
<td>M2 × 2.5 mm, wafer-head, nylon-coated (2)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

*When installing:* Ensure that the connectors are attached firmly to the system board.
In step 11, release the keyboard bezel assembly from the frame using a plastic pry tool.

When installing: Ensure that the connectors are attached firmly to the system board.

1140 Microprocessor

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1110 Fan assembly” on page 76

Attention: The microprocessor is extremely sensitive. When you service the microprocessor, avoid any kind of rough handling.
Removal steps of the microprocessor
Rotate the head of the screw in the direction shown by the arrow 1 to release the lock; then remove the microprocessor 2.

When installing: Place the microprocessor above the microprocessor socket, and then rotate the head of the screw in the direction shown by the arrow 3 to secure the microprocessor.

1150 System board

Important notices for handling the system board:

When handling the system board, read the following:

- The system board has an accelerometer, which can be broken when several thousands of G-forces are applied.
  
  **Note:** Dropping a system board from a height of as little as 6 inches so that it falls flat on a hard bench can subject the accelerometer to as much as 6000 G’s of shock.
- Be careful not to drop the system board on a bench top that has a hard surface, such as metal, wood, or composite.
- Avoid rough handling of any kind.
- At every point in the process, be sure not to drop or stack the system board.
- If you put a system board down, be sure to put it only on a padded surface such as an ESD mat or a corrugated conductive surface.

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
Removal steps of the system board

Note: The system board of the computer that you are servicing might be different from the one in the following illustrations.

Attention: The following components soldered on the top side of the system board are extremely sensitive. When you service the system board, avoid any kind of rough handling.

- Microprocessor
- Platform Controller Hub (PCH)
- Graphics Processing Unit (GPU)

For models with a discrete thermal module

![Diagram of system board with labeled components a, b, and c]
For models with an integrated thermal module

Note: The LCD-control-card cable in step 7 is only available on models with touch screen.

When installing: Ensure that the connectors are attached firmly to the system board.
When installing: Ensure that the connectors are attached firmly to the system board.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>M2 ( \times ) 5 mm, wafer-head, nylon-coated (3)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
1160 Media-card-reader/USB card

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85

Removal steps of the media-card-reader/USB card

Note: The system board of the computer that you are servicing might be different from the one in the following illustrations.
**When installing:** Ensure that the connector is attached firmly to the system board.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>M2 × 5 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

**1170 Optical-drive card**

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
• “1050 Optical drive or optical-drive bay bezel” on page 68
• “1070 Hard disk drive or solid-state drive” on page 70
• “1120 Keyboard” on page 79
• “1130 Keyboard bezel assembly” on page 85

Removal steps of the optical-drive card

*Note:* The system board of the computer that you are servicing might be different from the one in the following illustrations.
Note: When installing: Make sure that the connector is attached firmly to the system board.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>M2 x 5 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

1180 DC-in bracket

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
Removal steps of the DC-in bracket

Note: The system board of the computer that you are servicing might be different from the one in the following illustration.

1190 DC-in/Ethernet card

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1180 DC-in bracket” on page 95

Removal steps of the DC-in/Ethernet card

Note: The system board of the computer that you are servicing might be different from the one in the following illustrations.
**1200 Speaker assembly**

For access, remove these FRUs in order:
- “1020 Battery pack” on page 65

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>M2 × 5 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

Chapter 9. Removing or replacing a FRU 97
1. **Step**
2. **Screw (quantity)**
3. **Color**
4. **Torque**

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 3mm, wafer-head, nylon-coated, big head (4)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

**Removal steps of the speaker assembly**
1210 Power-button card

For access, remove these FRUs in order:

- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
Removal steps of the power-button card

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 3 mm, wafer-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

1220 LCD unit

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1110 Fan assembly” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96

Removal steps of the LCD unit

Notes:
- For models with non-touch screen, either the wireless-LAN/WAN antenna assembly or the wireless LAN antenna is available.
• For models with touch screen, a LCD-control-card cable and the wireless LAN antenna are available.
• The computer that you are servicing might be different from the one in the following illustrations.

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2.5 × 5 mm, wafer-head, nylon-coated (4)</td>
<td>Black</td>
<td>0.294 Nm (3 kgf-cm)</td>
</tr>
</tbody>
</table>
In step 2, release the wireless antenna cables from the cable guides.
In step 4 release the cables from the cable guides.
1230 Base cover assembly

For access, remove these FRUs in order:

- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1110 Fan assembly” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1160 Media-card-reader/USB card” on page 92
- “1170 Optical-drive card” on page 93
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1200 Speaker assembly” on page 97
- “1220 LCD unit” on page 100
Applying labels to the base cover assembly

The new base cover FRU is shipped with a kit containing labels of several kinds. Apply those labels when you replace the base cover. For the labels that are not shipped with the new base cover, peel them from the old base cover, and adhere them to the new one.

The following illustration shows the correct location of each label.

If the Windows Certificate of Authentication (COA) label 8 is attached to a part that is replaced, return the old part with the label attached to the customer, or provide a letter to the customer stating what the label was originally on the computer and what the label part number, serial number, and product key were.

When you replace the base cover, apply the FCC label 3 and the Serial number label 4.

The following labels need to be peeled off from the old base cover, and need to be adhered to the new base cover.

1. GEO label for Taiwan only
2. GEO label
3. Wireless WAN MAC label
4. Rating label
5. Japan GEO label
6. Non-encryption label
7. Indonesia rating label
8. Israel homologation label for wireless LAN card
9. Israel homologation label for Bluetooth
10. Israel homologation label for 3G wireless WAN card
11. Swiss SIM ICCID label
12. China wireless WAN label
13. SIRIM label or Indonesia POSTEL label
14. Brazil ANATEL label for 3G wireless WAN card
15. Brazil ANATEL label for Bluetooth
16. Brazil ANATEL label for wireless LAN card
17. China product label
18. China GEO label
19. Asset tag

If the removed cover has two FCC labels, apply both to the new base cover.
For models with non-touch screen

2010 LCD bezel

For access, remove these FRUs in order:

- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100

Removal steps of the LCD bezel

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 4.5 mm, wafer-head, nylon-coated (2), with screw caps</td>
<td>Silver</td>
<td>0.392 Nm (4 kgf-cm)</td>
</tr>
</tbody>
</table>
When installing: Ensure that all the latches are attached firmly. Then secure the bezel with the screws.

2020 LCD panel

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD bezel” on page 106
Removal steps of the LCD panel

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 2.5 mm, wafer-head, nylon-coated, small head (4)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

When installing: Ensure that the LCD connector is attached firmly.

2030 LCD hinges

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
“1040 Small bottom cover” on page 67
“1050 Optical drive or optical-drive bay bezel” on page 68
“1070 Hard disk drive or solid-state drive” on page 70
“1080 Wireless WAN card or M.2 solid-state drive” on page 72
“1090 Wireless LAN card” on page 75
“1100 Coin-cell battery” on page 76
“1120 Keyboard” on page 79
“1130 Keyboard bezel assembly” on page 85
“1150 System board” on page 88
“1180 DC-in bracket” on page 95
“1190 DC-in/Ethernet card” on page 96
“1220 LCD unit” on page 100
“2010 LCD bezel” on page 106

Removal steps of the LCD hinges

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 × 3.5 mm, wafer-head, nylon-coated (4)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>2</td>
<td>M2 × 3 mm, wafer-head, nylon-coated (2)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
2040 Camera/microphone module

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD bezel” on page 106
- “2020 LCD panel” on page 107

Removal steps of the camera/microphone module

Note: Depending on the model, the computer might have the microphone module instead.
When installing: Ensure that the connector is attached firmly.

2050 LCD cables

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD bezel” on page 106
- “2020 LCD panel” on page 107
Removal steps of LCD cables

2060 Wireless-LAN/WAN antenna assembly and LCD rear cover

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1220 LCD unit” on page 100
- “2010 LCD bezel” on page 106
- “2020 LCD panel” on page 107

Removal steps of the wireless-LAN/WAN antenna assembly and the LCD rear cover

Note: Depending on the model, the computer might have the wireless LAN antenna instead.
Release the antenna cables from the cable guides on the LCD rear cover.

**Cable routing:** When you install the wireless antenna assembly, route the cables as shown in the following illustration.

**Attention:** When you route the cables, ensure that they are not subject to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.
Antenna locations

- a Wireless-LAN auxiliary antenna (black)
- b Wireless-WAN auxiliary antenna (blue)
- c Wireless-WAN main antenna (red)
- d Wireless-LAN main antenna (gray)

For models with touch screen

2010 LCD-hinge caps

- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in-bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
Removal steps of the LCD-hinge caps

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>M2 × 3 mm, wafer-head, nylon-coated (2)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>3</td>
<td>M2.5 × 5 mm, wafer-head, nylon-coated (2)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
2020 LCD panel/screen assembly and LCD rear cover

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD-hinge caps” on page 114

Removal steps of the LCD panel/screen assembly and LCD rear cover

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2.5 × 5 mm, wafer-head, nylon-coated (8)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
2030 LCD cables and camera/microphone module

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD-hinge caps” on page 114
- “2020 LCD panel/screen assembly and LCD rear cover” on page 116

Removal steps of the LCD cables and camera/microphone module

**Note:** Depending on the model, the computer might have the microphone module instead.
2040 LCD-control-card cable

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
Removal steps of the LCD-control-card cable

2050 LCD Hinges

For access, remove these FRUs in order:

- “1010 Lenovo-OneLink-connector cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
- “1190 DC-in/Ethernet card” on page 96
- “1220 LCD unit” on page 100
- “2010 LCD-hinge caps” on page 114
- “2020 LCD panel/screen assembly and LCD rear cover” on page 116
- “2030 LCD cables and camera/microphone module” on page 117
- “2040 LCD-control-card cable” on page 118
Removal steps of the LCD hinges

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M2 x 3 mm, wafer-head, nylon-coated (4)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

2060 Wireless LAN antenna

For access, remove these FRUs in order:
- “1010 Lenovo-OneLink-cover” on page 65
- “1020 Battery pack” on page 65
- “1030 Large bottom cover” on page 66
- “1040 Small bottom cover” on page 67
- “1050 Optical drive or optical-drive bay bezel” on page 68
- “1070 Hard disk drive or solid-state drive” on page 70
- “1080 Wireless WAN card or M.2 solid-state drive” on page 72
- “1090 Wireless LAN card” on page 75
- “1100 Coin-cell battery” on page 76
- “1120 Keyboard” on page 79
- “1130 Keyboard bezel assembly” on page 85
- “1150 System board” on page 88
- “1180 DC-in bracket” on page 95
“1190 DC-in/Ethernet card” on page 96
“1220 LCD unit” on page 100
“2010 LCD-hinge caps” on page 114
“2020 LCD panel/screen assembly and LCD rear cover” on page 116
“2030 LCD cables and camera/microphone module” on page 117
“2040 LCD-control-card cable” on page 118
“2050 LCD Hinges” on page 119

Removal steps of the wireless LAN antenna
Release the antenna cables from the cable guides on the LCD screen assembly.

Cable routing: When you install the wireless LAN antenna, route the cables as shown in the following illustration.

Attention: When you route the cables, ensure that they are not subject to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.
Antenna locations

1. Wireless-LAN auxiliary antenna (black)
2. Wireless-LAN main antenna (gray)
Appendix A. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
1009 Think Place - Building One
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATIOn “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary.

Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

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.
Electronic emission notices

For electronic emission information on Class B digital devices, refer to the corresponding information in the User Guide.

EU contact: Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

Trademarks

The following terms are trademarks of Lenovo in the United States, other countries or both:

Lenovo
ThinkPad
TrackPoint
Ultrabay

Microsoft, Windows, and Windows Server are trademarks of the Microsoft group of companies.

Intel is a trademark or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

The terms HDMI and HDMI High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC in the United States and other countries.

Other company, product, or service names may be the trademarks or service marks of others.
## Appendix B. Abbreviation and acronym table

The following table lists some abbreviations and acronyms which might be used in this manual.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>3G</td>
<td>third generation of mobile telecommunications technology</td>
</tr>
<tr>
<td>BGA</td>
<td>Ball Grid Array</td>
</tr>
<tr>
<td>BIOS</td>
<td>basic input/output system</td>
</tr>
<tr>
<td>CMOS</td>
<td>complementary metal-oxide semiconductor</td>
</tr>
<tr>
<td>COA</td>
<td>Certificate of Authentication</td>
</tr>
<tr>
<td>CRC</td>
<td>cyclic redundancy check</td>
</tr>
<tr>
<td>CRT</td>
<td>cathode ray tube</td>
</tr>
<tr>
<td>CRU</td>
<td>customer-replaceable unit</td>
</tr>
<tr>
<td>CTO</td>
<td>Configure To Order</td>
</tr>
<tr>
<td>EAIA</td>
<td>Enhanced Asset Information Area</td>
</tr>
<tr>
<td>ECA</td>
<td>Engineering Change Announcements</td>
</tr>
<tr>
<td>EEPROM</td>
<td>Electrically Erasable Programmable Read-Only Memory</td>
</tr>
<tr>
<td>EFI</td>
<td>Extensible Firmware Interface</td>
</tr>
<tr>
<td>EPO</td>
<td>emergency power-off</td>
</tr>
<tr>
<td>ESD</td>
<td>electrostatic discharge</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
</tr>
<tr>
<td>FRU</td>
<td>Field Replaceable Unit</td>
</tr>
<tr>
<td>GAV</td>
<td>General Announcement Variant</td>
</tr>
<tr>
<td>GPU</td>
<td>graphics processing unit</td>
</tr>
<tr>
<td>HDD</td>
<td>hard disk drive</td>
</tr>
<tr>
<td>HDMI</td>
<td>high-definition multimedia interface</td>
</tr>
<tr>
<td>ICs</td>
<td>integrated circuits</td>
</tr>
<tr>
<td>ICCID</td>
<td>integrate circuit card identity</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standardization Organization</td>
</tr>
<tr>
<td>LAN</td>
<td>local area network</td>
</tr>
<tr>
<td>LCD</td>
<td>liquid crystal display</td>
</tr>
<tr>
<td>MAC</td>
<td>media access control</td>
</tr>
<tr>
<td>MT</td>
<td>machine type</td>
</tr>
<tr>
<td>MTM</td>
<td>machine type and model</td>
</tr>
<tr>
<td>PC</td>
<td>personal computer</td>
</tr>
<tr>
<td>PCH</td>
<td>Platform Controller Hub</td>
</tr>
<tr>
<td>POST</td>
<td>power-on self-test</td>
</tr>
<tr>
<td>RAM</td>
<td>random-access memory</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Term</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>RF</td>
<td>radio frequency</td>
</tr>
<tr>
<td>RFID</td>
<td>radio-frequency identification</td>
</tr>
<tr>
<td>RI</td>
<td>ring indicator</td>
</tr>
<tr>
<td>RJ</td>
<td>registered jack</td>
</tr>
<tr>
<td>SATA</td>
<td>Serial Advanced Technology Attachment</td>
</tr>
<tr>
<td>SIM</td>
<td>subscriber identity module</td>
</tr>
<tr>
<td>SVP</td>
<td>supervisor password</td>
</tr>
<tr>
<td>TFTs</td>
<td>thin-film transistors</td>
</tr>
<tr>
<td>UEFI</td>
<td>Unified Extensible Firmware Interface</td>
</tr>
<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>UUID</td>
<td>universally unique identifier</td>
</tr>
<tr>
<td>VGA</td>
<td>video graphics array</td>
</tr>
<tr>
<td>VRAM</td>
<td>video random-access memory</td>
</tr>
<tr>
<td>WAN</td>
<td>wide area network</td>
</tr>
</tbody>
</table>