ThinkPad X1 Carbon
Hardware Maintenance Manual

Machine types: 20A7 and 20A8
Note: Before using this information and the product it supports, be sure to read the general information under Appendix A “Notices” on page 89.
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About this manual

This manual contains service and reference information for the following ThinkPad® products.

ThinkPad X1 Carbon Machine types (MT) 20A7 and 20A8

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 19.
Chapter 1. Safety information

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

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

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. Make sure 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, make sure 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. Make sure 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.

Attention: 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. 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 have 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.

  **Attention:** Another person must be there to switch off the power, if necessary.
  – Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

  **Attention:** 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 when they are removed from their normal operating places in a machine:
  – Power supply units
  – Pumps
  – Blowers and fans
  – Motor generators
  – Similar units as 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.

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**Safety inspection guide**

The purpose of this inspection guide is to assist you in identifying potentially unsafe conditions. 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. Power off the computer. Disconnect the power cord.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and 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. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:
- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- 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.
<table>
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<tr>
<td>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.</td>
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<td>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.</td>
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<tr>
<td>To avoid shock, do not remove the plastic cover that protects the lower part of the inverter card.</td>
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<td>Though the main batteries have low voltage, a short-circuited or grounded battery can produce enough current to burn personnel or combustible materials.</td>
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<tr>
<td>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.</td>
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تحتوي بعض البطاريات الاحتفاظية على كمية صغيرة من مادة التيتان والكلوريد. لا تقم بإزالة أي عناصر من البطارية الاحتفاظية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية الإحترافية ولا تقم بإزالة أي عناصر من البطارية 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Chapter 1. Safety information
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, veillez 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'exploder.
**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.
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.

VORSICHT

Wenn 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 Netzkinb 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、バネ、その他の小さな部品がすべて正しい位置にあり、また ThinkPad の内部で焼んでいないことを確認してください。
これを確認するには、ThinkPad を裏して、キャップキャップ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、または水の中の使用は避けた方が良いです。
また、予備バッテリーを使用する際は電池を短絡させないようにしてください。
バッテリーを廃棄する場合は地方自治体の条例に従ってください。
適切なバッテリーに移行するバッテリーだけを使用してください。誤っ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。
Chapter 1. Safety information

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・パックの発熱にあたっては、地方自治体の条例または規定を従って
ください。バッテリー・パックを交換するときは、適切なパーツ・リストにある
バッテリーだけを使用してください。壊れ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。パックアップ・バッテリーの充電、その極性コネクターの取り外し、
バッテリー本体の分解。
100 ℃ (212 ℉) 以上への加熱、焼却、電池の中身を水に浸すことはしていただけ
ない。バッテリーを破棄する場合は地方自治体の条例に従ってください。適切な
パーツ・リストにあるバッテリーだけを使用してください。壊れたバッテリーを
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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
体が触れた部分を少なくとも 15 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、インバーター・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

メイン・バッテリーの電圧は低くても、ショートしたり、接地したバッテ
リーが、作業者にやけどを負わせたり、可燃物を燃やすだけの電流を発生さ
せる場合があります。

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
コンピューターから抜き、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 を取得してから、この手順を実行する前に、すべての電源コードを
コンピューターから抜き、バッテリー・パックを取り外して、相互接続している
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警告

FRU を分解する前に、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
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<table>
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<tr>
<th>위험</th>
<th>배터리 패 또는 소형의 나ヶ月 및 카드형이 포함되어 있습니다. 보조 배터리를 분해하거나, 다시 충전하거나, 물 또는 용액에 담지거나, 단락시키지 마십시오. 배터리를 폐기할 때에는 해당 지역의 법률 규정을 따르십시오. 배터리를 침해할 때에는 충전된 배터리만 사용하시십시오. 충전되지 않은 배터리를 사용하면 배터리가 발화되거나 폭발할 수 있습니다.</th>
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<td>LCD가 파손되어 LCD 내부의 액체가 눈에 들어가거나 손에 묻으면 즉시 깨끗한 물로 15분 이상 타여 내시십시오. 잔은 후에 조금이라도 이상을 느껴면 즉시 병원에 가시 의료사의 진찰을 받아야 합니다.</td>
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<td>정기적 유지를 방지하려면 인버터 카드의 아래 부분을 보호하는 플라스틱 덮개를 제거하지 마십시오.</td>
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<td>기본 배터리의 전원을 끄지 마십시오. 단락되거나 점지된 배터리는 화상을 입히기에 충분한 전류와 가연성 불균을 발생시킬 수 있습니다.</td>
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<td>FRU 교체 시 Hot Swap이 지원되지 않는 경우, FRU를 제거하기 전에 컴퓨터의 전원을 고고, 전기 콘센트에서 전원 코드를 분리하고, 배터리를 제거한 후, 연결된 모든 케이블을 분리하시십시오.</td>
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**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 encuentren 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 cortocircuite. 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 cortocircuite. 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.

PELIGRO

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.
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 更换之後，在開啟電腦的電源之前，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，請搖晃電源，聽是否有卡嗒的聲音。
金屬零件或儀器的火花會造成電線短路。

![危険]

部分備用電池含有微量的釩和納。請勿拆開備用電池、再充電、丟入火或水中，
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釩。請勿拆開電池套件、丟入火或水中，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]

鋰電池會導致起火、爆炸或嚴重燒傷。請勿再充電、拔除其電極接頭、拆開、
加熱超過 100°C (212°F)、焚燒，或讓電池組成物混到水。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]

如果 LCD 破裂導致 LCD 液體沾到您的眼睛或手，請立即以清水沖洗沾
染部位至少 15 分鐘。如果在清洗後出現該液體所造成任何症狀，請就醫治
療。

![危険]

為避免電擊，請勿拆下轉換卡下面的塑膠護蓋。

![危険]

雖然主電池的電壓很低，但短路或接地電池所產生的電流，仍足以使人燒傷或
使可燃物質起火。
危險

除非 FRU 允許以熱抽換來替換，否則請依下列方式將其移除：將電腦關機，拔除插
座上所有電源線，移除電池包，並拔開任何交互連接的線材。
Chapter 2. Important service information

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

- “Strategy for replacing FRUs” on page 19
  - “Strategy for replacing a solid-state drive” on page 19
  - “Important notice for replacing a system board” on page 20
  - “How to use error message” on page 20
- “Strategy for replacing FRUs for CTO, special-bid, and standard models” on page 20
  - “Product definition” on page 20
  - “FRU identification” on page 20

Important:
- 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/Reassembly videos that show the FRU removals or replacements for the Lenovo authorized service technicians are available in the following support site: 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 replacing 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 completing the service action.

To download 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 may 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 solid-state drive

Always try to run a low-level format before replacing a solid-state drive. This will cause all customer data on the solid-state drive to be lost. Be sure that the customer has a current backup of the data before doing this task.

Attention: The drive startup sequence in the computer you are servicing may 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.
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 BGA (Ball Grid Array) chipset.

How to use error message

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 may also cause false error codes. If no error code is displayed, see whether the error symptom is listed in the Symptom-to-FRU Index for the computer you are servicing.

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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: 20A7CTO1WW).

**Special-bid model**

This is a unique configuration that has been negotiated between Lenovo and the customer. A unique machine type model (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: 20A7000955). 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: 20A70009UK).

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 solid-state drive, system board, and liquid crystal display (LCD).

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 introduces following information:

- “What to do first” on page 23
- “Checkout guide” on page 24
  - “Lenovo Solution Center” on page 24
  - “Quick test programs” on page 24
  - “UEFI diagnostic program” on page 25
  - “Bootable diagnostic programs” on page 25
- “Power system checkout” on page 26

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 use new nylon-coated screws.
- Be extremely careful during such write operations as copying, saving, or formatting. The sequence of the drives in the computer that you are servicing 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 by referring to the web site: http://www.lenovo.com/serviceparts-lookup
- A FRU should not be replaced because of a single, unreproducible failure. Single failures can occur for various reasons that have nothing to do with a hardware defect, such as cosmic radiation, electrostatic discharge, 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 subjected 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
- 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.
- If the spindle of a hard disk drive becomes noisy, it may have been subjected to excessive force, or dropped.

**Checkout guide**

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

**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**

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

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 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 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 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 36 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 diagnostic program.

**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 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 36 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 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 36 for error code descriptions and troubleshooting hints.

2. Insert the CD into the external 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 CDx (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 and an ac power adapter are functional, do the following:

1. Turn off the computer.
2. Connect the ac power adapter.
3. Turn on the computer. If the computer can be turned on, it means that either the battery or the ac power adapter is functional.
4. Insert a straightened paper clip into the emergency reset hole to reset the computer. If the computer is still powered on, it means that the ac power adapter is functional.
5. Turn off the computer.
6. Disconnect the ac adapter and turn on the computer. If the computer can be turned on, it means the battery is functional.

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

- “Checking the ac power adapter” on page 26
- “Checking the battery and operational charging” on page 27
- “Checking the coin-cell battery” on page 27

### Checking the ac power adapter

You are here because the computer fails only when the ac power adapter is used.

- 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 the battery and operational charging” on page 27.

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. See the following illustration:

<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 of pin 2 of the ac power adapter might differ from the one you are servicing.

3. If the voltage is incorrect, 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 the battery and operational charging

Checking the battery
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.

To check the percentage of battery power remaining or the battery charging status, click the battery status icon in the Windows notification area. To check for detailed battery status information, do the following:

• For Windows 7: Double-click the battery gauge icon in the right side of the task bar to open the Power Manager program and then click the Battery tab.
• For Windows 8.1: Open the Lenovo Support program and click Battery Health, or open the Lenovo Settings program and click Power.

Checking the operational charging
To check whether the battery charges properly during operation, do the following:

1. Discharge the battery until the remained battery power is less than 50%.
2. Perform operational charging. Click the battery status icon in the Windows notification area to display detailed battery information. If it indicates that the battery is not charging, replace the battery.
3. Check the battery status again. If the same error still exists, replace the system board.

Checking the coin-cell battery
To check the coin-cell battery, do the following:

1. Disable the built-in battery. See “Disabling the built-in battery” on page 54.
2. Remove the coin-cell battery. See “1110 System board assembly and coin-cell battery” on page 66.
3. Measure the voltage of the coin-cell battery. See the following illustration.

<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 product Recovery Disc Set” on page 29
- “Using the Windows recovery programs on the Windows 8.1 operating system” on page 30
- “Passwords” on page 32
- “Power management” on page 34
- “Symptom-to-FRU index” on page 36

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 product Recovery Disc Set

When the main storage device 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 tablet. Order the Recovery Disc Set and the drive at the same time so that the customer can restore the tablet 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:

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.

Using the Windows recovery programs on the Windows 8.1 operating system

This section provides information about the recovery solutions for the Windows 8.1 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 8.1 operating system. It is recommended that you create recovery media as early as possible. For more information, see “.” on page 31

Refreshing the 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 pointer to the top-right or bottom-right corner of the screen to display the charms. Click Settings → Change PC settings → Update and recovery → Recovery.
2. In the Refresh your PC without affecting your files section, click Get started.
3. Follow the instructions on the screen to refresh your computer.

Resetting the 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 pointer to the top-right or bottom-right corner of the screen to display the charms. Click Settings → Change PC settings → Update and recovery → Recovery.
2. In the Remove everything and reinstall Windows section, click Get started. 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 pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.
3. Select a desired startup option, then follow the instructions on the screen.

**Recovering your computer from the Windows recovery environment**

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

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

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

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 pointer 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 the Search button. 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 8.1 operating system, go to: http://go.microsoft.com/fwlink/?LinkId=263800

**Passwords**

As many as three passwords may be needed for any 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 powered on by an unauthorized person. The password must be entered before an 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 33.

**Hard disk password**

There are two kinds of 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 it has, it can be used for access to 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 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 how to remove the hard disk password, see “How to remove the hard disk password" on page 34.

**Supervisor password**

A supervisor password protects the system information stored in the ThinkPad Setup. The user must enter the supervisor password in order to get access to the ThinkPad Setup 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 a power-on password, do the following:

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

1. Turn off the computer and disconnect ac power.
2. Disable the built-in battery. See “Disabling the built-in battery” on page 54.
3. Remove the base cover assembly. See “1010 Base cover assembly” on page 55.
4. Locate the coin-cell-battery reset button 1. Press the reset button to disable the coin-cell battery. Then wait for a few seconds.

5. Reinstall the base cover assembly.
6. Reconnect ac power.
7. Turn on the computer and wait until the POST ends. After the POST ends, the password prompt does not appear. The power-on password has been removed.

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 F10 to save changes and exit the ThinkPad Setup program. The power-on password has been removed.

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 passwords or to recover data from the hard disk drive. The hard disk drive can be replaced for a scheduled fee.

To remove a user hard disk password that has been forgotten, when the supervisor password and master hard disk password are known, do the following:
   1. Turn on the computer.
   2. When the ThinkPad logo comes up, immediately press F1 to enter the ThinkPad Setup program. When the power-on password icon is displayed on the screen, enter either the power-on password or the supervisor password.
   3. When the user hard disk password icon is displayed on the screen, press F1. The master hard disk password icon is displayed.
   4. Enter the master hard disk password to enter the ThinkPad Setup program.
   5. Select Security.
   6. Select Password.
   7. Select Hard-disk x password, where x is the letter of the hard disk drive. A pop-up window opens.
   8. Select Master hard disk password.
   9. 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.
   11. Press 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**.

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 solid-state drive is powered off.
- The microprocessor stops.

To enter sleep mode, press Fn+4 or do the following:

- **For Windows 7**: Use the Start menu shutdown option.
- **For Windows 8.1**: Move the pointer to the bottom right corner of the screen to bring up 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 indicator blinks orange, indicating that the battery power is low

To resume the computer from sleep mode, press 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.
- The system is powered off.

**Note**: If the computer enters the hibernation mode while it is docked to the docking station, do not undock it before resuming normal operation. If you do undock 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 is read, and system status is restored from the hard disk drive.

Symptom-to-FRU index

This section contains following information:

- “Numeric error codes” on page 36
- “Error messages” on page 37
- “Beep symptoms” on page 37
- “No-beep symptoms” on page 38
- “LCD-related symptoms” on page 38
- “Intermittent problems” on page 38
- “Undetermined problems” on page 39

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 38.

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

Numeric error codes

Table 1. Numeric error codes

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>0177 Bad SVP data, stop POST task—The</td>
<td>System board</td>
</tr>
<tr>
<td>checksum of the supervisor password in</td>
<td></td>
</tr>
<tr>
<td>the EEPROM is not correct.</td>
<td></td>
</tr>
<tr>
<td>0183 Bad CRC of Security Settings in EFI</td>
<td>1. Run the ThinkPad Setup program, and then save current setting by pressing F10.</td>
</tr>
<tr>
<td>Variable. Enter the ThinkPad Setup</td>
<td>2. System board</td>
</tr>
<tr>
<td>program.</td>
<td></td>
</tr>
<tr>
<td>0187 EAIA data access error—The access</td>
<td>System board</td>
</tr>
<tr>
<td>to EEPROM is failed.</td>
<td></td>
</tr>
<tr>
<td>0188 Invalid RFID Serialization</td>
<td>System board</td>
</tr>
<tr>
<td>Information Area.</td>
<td></td>
</tr>
<tr>
<td>0189 Invalid RFID configuration</td>
<td>System board</td>
</tr>
<tr>
<td>information area—The EEPROM checksum is</td>
<td></td>
</tr>
<tr>
<td>not correct.</td>
<td></td>
</tr>
<tr>
<td>0190 Critical low-battery error</td>
<td>1. Charge the battery.</td>
</tr>
<tr>
<td></td>
<td>2. Battery</td>
</tr>
</tbody>
</table>
Table 1. Numeric error codes (continued)

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>0191</td>
<td>1. Run the ThinkPad Setup program, and then save current setting by pressing F10. 2. System board</td>
</tr>
<tr>
<td>0199</td>
<td>1. Run the ThinkPad Setup program, and then save the current setting by pressing F10. 2. System board</td>
</tr>
<tr>
<td>1802</td>
<td>1. Remove wireless network card. 2. System board</td>
</tr>
<tr>
<td>1820</td>
<td>Remove all but the reader that you set up for the authentication.</td>
</tr>
<tr>
<td>2100</td>
<td>1. Reseat the hard disk drive. 2. Main hard disk drive 3. System board</td>
</tr>
<tr>
<td>2110</td>
<td>1. Reseat the hard disk drive. 2. Main hard disk drive 3. System board</td>
</tr>
<tr>
<td>2200</td>
<td>System board</td>
</tr>
<tr>
<td>2201</td>
<td>System board</td>
</tr>
</tbody>
</table>

Error messages

Table 2. Error messages

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan error</td>
<td>1. Fan 2. Thermal grease 3. System board</td>
</tr>
<tr>
<td>Thermal sensing error</td>
<td>System board</td>
</tr>
</tbody>
</table>

Beep symptoms

Table 3. Beep symptoms

<table>
<thead>
<tr>
<th>Symptom or error</th>
<th>FRU or action, in sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>One short beep, pause, three short beeps, pause, three more short beeps, pause, and one short beep</td>
<td>System board</td>
</tr>
<tr>
<td>One long and two short beeps</td>
<td>System board</td>
</tr>
<tr>
<td>Four cycles of four short beeps</td>
<td>System board</td>
</tr>
<tr>
<td>Five short beeps</td>
<td>System board</td>
</tr>
</tbody>
</table>
No-beep symptoms

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

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 replacement if the LCD is within specification as we cannot guarantee that any replacement LCD will have zero pixel defects.
- One pixel consists of R, G, B sub-pixels.

<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>System board</td>
</tr>
<tr>
<td>LCD backlight not working.</td>
<td>1. Reseat the LCD connectors. 2. LCD assembly 3. System board</td>
</tr>
<tr>
<td>LCD too dark.</td>
<td>1. Reseat the LCD connectors. 2. LCD assembly 3. System board</td>
</tr>
<tr>
<td>LCD brightness cannot be adjusted.</td>
<td>1. Reseat the LCD connectors. 2. LCD assembly 3. System board</td>
</tr>
<tr>
<td>LCD contrast cannot be adjusted.</td>
<td>1. Reseat the LCD connectors. 2. LCD assembly 3. System board</td>
</tr>
<tr>
<td>LCD screen unreadable.</td>
<td>1. See important note for “LCD-related symptoms.” 2. Reseat all LCD connectors. 3. LCD assembly 4. System board</td>
</tr>
<tr>
<td>Characters missing pixels.</td>
<td>1. See important note for “LCD-related symptoms.” 2. Reseat all LCD connectors. 3. LCD assembly 4. System board</td>
</tr>
<tr>
<td>Screen abnormal.</td>
<td>1. See important note for “LCD-related symptoms.” 2. Reseat all LCD connectors. 3. LCD assembly 4. System board</td>
</tr>
<tr>
<td>Wrong color displayed.</td>
<td>1. See important note for “LCD-related symptoms.” 2. Reseat all LCD connectors. 3. LCD assembly 4. System board</td>
</tr>
<tr>
<td>Horizontal or vertical lines displayed on LCD.</td>
<td>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, electrostatic discharge, 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 adapter or 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 26.

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. Printer, mouse, and other external devices
   c. External diskette drive or optical drive
   d. Wireless cards
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. 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. Camera
2. Camera-status indicator
3. Microphones
4. Power button with system-status indicator
5. Security-lock slot
6. Fan louvers
7. Ethernet extension connector
8. USB 3.0 connector
9. Fingerprint reader
10. NFC logo (on some models)
11. ThinkPad® trackpad
12. TrackPoint® pointing stick
13. Caps Lock indicator on the left Shift key
14. Adaptive Keys
15. Ambient light sensor

¹: The indicator in the ThinkPad logo and the indicator in the center of the power button show the system status of the computer.

Blinks for three times: The computer is initially connected to power.

On: The computer is on (in normal mode).
Blinks fast: The computer is entering sleep or hibernation mode.
Blinks slowly: The computer is in sleep mode.
Off: The computer is off or in hibernation mode.

2: To turn on or turn off Caps Lock mode, press the left Shift key twice.

Rear view

1 Audio connector
2 Always-on USB 3.0 connector
3 Mini DisplayPort® connector
4 HDMI™ connector
5 Lenovo OneLink connector
6 Power connector
7 Micro-SIM-card tray (on some models)
8 System-status indicator

1: The indicator in the ThinkPad logo and the indicator in the center of the power button show the system status of the computer.

Blinks for three times: The computer is initially connected to power.
On: The computer is on (in normal mode).
Blinks fast: The computer is entering sleep or hibernation mode.
Blinks slowly: The computer is in sleep mode.
Off: The computer is off or in hibernation mode.
Locating FRUs and CRUs

This topic introduces the following service parts:
- “Major FRUs” on page 44
- “LCD FRUs” on page 45

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 Guides & Manuals and then follow the on-screen instructions to find the manual for your product. You might be required to return the defective part that is replaced by the 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, and hard disk drive. Other self-service CRUs depending on product design might include the memory module, wireless card, keyboard, and palm rest with finger print reader and touch pad.
- 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.
- A CRU is identified by a single asterisk (*) or two asterisks (**) in the CRU ID column. An N in the CRU ID column means that the part is not a CRU. A single asterisk (*) means that the part is a self-service CRU; two asterisks (**) means that the part is an optional-service CRU.
- FRUs marked with Optional are available as options.
Major FRUs

<table>
<thead>
<tr>
<th>No.</th>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD unit (see “LCD FRUs” on page 45)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Keyboard assembly (backlit keyboard with keyboard bezel and trackpad, with/without NFC)</td>
<td>N</td>
</tr>
<tr>
<td>3</td>
<td>Adaptive Keys row (dynamic function row)</td>
<td>N</td>
</tr>
</tbody>
</table>

ThinkPad X1 Carbon Hardware Maintenance Manual
<table>
<thead>
<tr>
<th>No.</th>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Micro-SIM-card-tray bracket (see “Miscellaneous parts and other FRUs” on page 48)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Micro-SIM-card tray (see “Miscellaneous parts and other FRUs” on page 48)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>System board assembly</td>
<td>N</td>
</tr>
<tr>
<td>7</td>
<td>Thermal fan</td>
<td>N</td>
</tr>
<tr>
<td>8</td>
<td>RJ45 card with USB connector</td>
<td>N</td>
</tr>
<tr>
<td>9</td>
<td>Fingerprint reader assembly</td>
<td>N</td>
</tr>
<tr>
<td>10</td>
<td>Battery</td>
<td>N</td>
</tr>
<tr>
<td>11</td>
<td>Speaker assembly</td>
<td>N</td>
</tr>
<tr>
<td>12</td>
<td>Base cover assembly</td>
<td>**</td>
</tr>
<tr>
<td>13</td>
<td>Wireless WAN card</td>
<td>**</td>
</tr>
<tr>
<td>14</td>
<td>Wireless LAN card</td>
<td>**</td>
</tr>
<tr>
<td>15</td>
<td>Audio card with USB connector</td>
<td>N</td>
</tr>
<tr>
<td>16</td>
<td>Solid-state drive</td>
<td>**</td>
</tr>
<tr>
<td>17</td>
<td>dc-in bracket</td>
<td>N</td>
</tr>
<tr>
<td>18</td>
<td>Coin-cell battery</td>
<td>N</td>
</tr>
<tr>
<td>19</td>
<td>Brackets for Adaptive Keys row</td>
<td>N</td>
</tr>
<tr>
<td>20</td>
<td>Trackpoint cap</td>
<td>*</td>
</tr>
<tr>
<td>21</td>
<td>Ethernet extension adapter</td>
<td>*</td>
</tr>
</tbody>
</table>

**LCD FRUs**

For models without touch panel:
<table>
<thead>
<tr>
<th>No.</th>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD front sheet bezel</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>LCD bezel</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Camera/microphone card</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>LCD panel without touch function</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>Hinges</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>LED cable assembly</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Antenna kit or antenna dummy kit</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>LCD rear cover assembly</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>LCD cable</td>
<td>No</td>
</tr>
</tbody>
</table>
For models with touch panel:

<table>
<thead>
<tr>
<th>No.</th>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD panel with touch function</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>LCD bezel</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Camera/microphone card</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Hinges</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>LED cable assembly</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Antenna kit or antenna dummy kit</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>LCD rear cover assembly</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>LCD cable</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>Touch sensor cable (for touch panel only)</td>
<td>No</td>
</tr>
</tbody>
</table>
### Miscellaneous parts and other FRUs

#### Miscellaneous part

<table>
<thead>
<tr>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
</table>
| Screw kit  
  - Screw M2.0 x L3.0, flat-head, silver (10)  
  - Screw M1.2 x L1.5, flat-head, black (73)  
  - Screw M2.0 x L2.5, flat-head, black (14)  
  - Screw M2.0 x L4.0, flat-head with shoulder, black (8)  
  - Screw M2.0 x L1.5, flat-head, black (10)  
  - Screw M2.0 x L4.0, flat-head, black (14)  
  - Screw M2.5 x L4.0, flat-head, silver (8)  
  - Screw M2.0 x L3.0, big head, silver (6)  
  - Screw M2.0 x L2.0, big head, silver (12) | No |

#### System miscellaneous kit

- Keyboard rubber (1)  
- Keyboard mylar (1)  
- Cable of Adaptive Keys row (1)  
- Trackpad and NFC FFC cable (1)  
- NFC tape (1)  
- Fingerprint reader FPC (1)  
- Fingerprint reader FPC rubber (1)  
- Micro-SIM-card tray (1)  
- Micro-SIM-card-tray bracket (1)  
- dc-in bracket (1)  
- Tape for antenna cable routing (1)

#### LCD miscellaneous kit

- A-cover mylar (2)  
- A-cover AL foil (3)  
- A-cover gasket (3)  
- A-cover sponge (6)  
- Camera rubber (2)  
- AL foil for fix LED cable (1)  
- A-cover hinge mylar (2)

#### Other FRUs

<table>
<thead>
<tr>
<th>FRU descriptions</th>
<th>CRU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac adapter</td>
<td>*</td>
</tr>
<tr>
<td>Power cord</td>
<td>*</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-look up.
Chapter 6. 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 Guides & Manuals and then follow the on-screen instructions to find the manual for your product. You might be required to return the defective part that is replaced by the 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.

Common service tools

Below is the list of common service tools that you might need while servicing the computer.
• Screwdriver kit
• 1/4" drive spinne r handle
• 1/4" Sq. to 1/4" hex torx adapter
• TR7-TR-10 tamper resistant torx bits
• Removal tool antenna RF connector
• USB 2.0 CD-RW/DVD-ROM combo drive II
• USB cable
• USB Maintenance Key
• USB floppy diskette drive for maintenance diskette
• USB floppy diskette drive tool kit
• Test card for integrated Smart Card
• LENOVO ThinkPad Hardware Maintenance Diskette Version 1.76 or later

Note: Download the file from the following Web site:
http://www.lenovo.com/support

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 this machine:
• 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 90 degrees after the screw head touches the surface of the plastic part.

![90 degrees more](image)

(Cross-section)

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

![180 degrees more](image)

(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 that torque screwdrivers are calibrated correctly following country specifications.

**Retaining serial numbers**

This section includes the following descriptions:

- “Restoring the serial number of the system unit” on page 50
- “Retaining the UUID” on page 51
- “Reading or writing the ECA information” on page 52

**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 cannot 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 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.
Reading or writing the ECA information

Information on Engineering Change Announcements (ECA) are stored in the EEPROM of the system board. The electronic storage of this information simplifies the procedure to check if the ECA has been previously applied to a machine. The machine does not need to be disassembled to check for the ECA application.

To check what ECAs have been previously applied to the machine, use the ECA Information Read/Write function on the USB Maintenance Key.

1. Insert the Maintenance Key and restart the computer.
2. From the main menu, select 6. Set ECA Information.
3. To read the ECA information, select 2. Read ECA/ rework number from EEPROM and follow the instructions on the screen.
4. To read the box build date, select 5. Read box build date from EEPROM, and follow the instruction on the screen.

After an ECA has been applied to the machine, the EEPROM must be updated to reflect the ECA’s application. Use the Maintenance Key to update the EEPROM.

Note: Only the ECA number is stored in the EEPROM. The machine type of the ECA is assumed to be the same as the machine type of the machine that had the ECA applied to it.

1. Insert the Maintenance Key and restart the computer.
2. From the main menu, select 6. Set ECA Information.
3. To write the ECA information, select 1. Write ECA/ rework number from EEPROM, and follow the instructions on the screen.
4. To write the box build date, select 4. Write box build date from EEPROM, and follow the instruction on the screen.

If the system board is being replaced, try to read the ECA information from the old system board and transfer the information to the new system. If the system board is inoperable, this will not be possible.
Chapter 7. 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 is available for downloading at http://www.lenovo.com/support. 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 part 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 6 “FRU replacement notices” on page 49.
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 section. 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.
8. When replacing a FRU, use the correct screws as shown in the replacement procedures.

⚠️ DANGER

*Before removing any FRU, turn off the computer, unplug all power cords from electrical outlets, disconnect any interconnecting cables, and then disable the built-in battery.*

**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.

**Attention:** The system board is sensitive to, and can be damaged by, electrostatic discharge (ESD). Before touching it, establish personal grounding by touching a ground point with one hand or by using an ESD strap.
Before servicing the computer

Carefully read this topic before servicing the computer.

Disabling the built-in battery

Before replacing any FRU, ensure that you have disabled the built-in battery by doing the following:

1. Turn off your computer and disconnect the ac power adapter and all cables from the computer.
2. Turn on your computer. When the ThinkPad logo is displayed, immediately press F1 to enter ThinkPad Setup.
3. Select Config → Power. The Power submenu is displayed.
4. Select Disable built-in battery and press Enter.
5. Select Yes in the Setup Confirmation window. The built-in battery is disabled and the computer turns off automatically. Wait three to five minutes to let the computer cool.

Removing the micro-SIM-card tray and the micro SIM card

Remove the micro-SIM-card tray before you start the servicing. If the computer has a micro SIM card installed, you also must remove the micro SIM card.

After you finish the servicing, ensure that you install the micro SIM card (if available) and the micro-SIM-card tray back into the computer.

Removing a major FRU

This section provides instructions on how to remove a major FRU.
1010 Base cover assembly

Removal steps of the base cover assembly

Applying labels to the base cover:

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

The following illustration shows the location of each label.

1 GEO label
2 Genuine Microsoft label
3 Certificate of Authenticity information
4 IMEI label
5 Asset tag
6 Country-specific label
1020 Battery

Important notices for replacing a 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.

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

If the Lenovo Solution Center program is not installed on the computer, the customer should download and install the program to diagnose the battery, before getting a non-physically damaged battery replaced. Note that the replacement of a physically damaged battery is not covered by the warranty.

For access, remove this FRU:
• “1010 Base cover assembly” on page 55

Removal steps of the battery

⚠️ DANGER

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

<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 × L2.5 mm, flat-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>2</td>
<td>M2 × L4 mm, flat-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 two battery tabs are inserted underneath the system board.

1030 Solid-state drive

For access, remove this FRU:
• “1010 Base cover assembly” on page 55

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 system is operating or in suspend mode.
Removal steps of 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 L3 mm, flat-head, nylon-coated (1)</td>
<td>Silver</td>
<td>0.181 Nm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

When installing: Ensure that the solid-state drive is firmly attached.

1040 Wireless LAN card

For access, remove this FRU:
- “1010 Base cover assembly” on page 55
Removal steps of the wireless LAN 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 L3 mm, flat-head, nylon-coated (1)</td>
<td>Silver</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.

1050 Wireless WAN card

For access, remove this FRU:
- “1010 Base cover assembly” on page 55
Removal steps of the wireless WAN 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 L3 mm, flat-head, nylon-coated (1)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

When installing: Plug the orange cable into the main connector and the blue cable into the auxiliary connector.

1060 Thermal fan

For access, remove this FRU:
- “1010 Base cover assembly” on page 55
Removal steps of the thermal fan

Loosen the screws 3 in ascending alphabetical order as illustrated.

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

When installing: Do not touch the top and bottom areas marked 3 in the following illustration.
1070 Audio card

For access, remove these FRU in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56

Removal steps of the audio 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 x L4 mm, flat-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
When installing: Ensure that the connector is attached firmly.

1080 Speaker assembly

For access, remove this FRU:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1070 Audio card” on page 62

Removal steps of the speaker assembly

<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 L4 mm, flat-head shoulder, nylon-coated (4)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

When installing: Ensure that the connector is attached firmly.
**Cable routing:** When you install the speaker assembly, route the cables as shown in the following illustration.

**1090 RJ45 card**

For access, remove this FRU:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56

**Removal steps of the RJ45 card**

**When installing:** Ensure that the connector is attached firmly.
### 1100 Fingerprint reader assembly

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1090 RJ45 card” on page 64

**Removal steps of the fingerprint reader assembly**

<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 × L4 mm, flat-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

**When installing:** Ensure that the connector is attached firmly.
1110 System board assembly and coin-cell battery

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 six 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 material.

For access, remove these FRUs in order:

- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60

**Attention**: The microprocessor 1 soldered on the system board is extremely sensitive. When you service the system board, avoid any kind of rough handling.
Removal steps of the system board 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>M2.5 x L4 mm, flat-head, nylon-coated (1)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

**Note:** If the computer you are servicing does not have a touch panel, ignore step 3 and step 4.

**When installing:** Ensure that the connectors are attached firmly.
<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>M2 × L3 mm, flat-head, nylon-coated (5)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

Removal steps of the coin-cell battery

1120 LCD unit

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
Removal steps of the LCD unit

<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 L4 mm, flat-head, nylon-coated (1)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>3</td>
<td>M2.5 x L4 mm, flat-head, nylon-coated (3)</td>
<td>Silver</td>
<td>0.392 Nm (4.0 kgf-cm)</td>
</tr>
</tbody>
</table>
When installing: Ensure that you route the cables firmly in the proper positions as show in the following illustration. 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.

1130 Adaptive Keys row

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
• “1110 System board assembly and coin-cell battery” on page 66
• “1120 LCD unit” on page 68

Removal steps of the Adaptive Keys row

<table>
<thead>
<tr>
<th>Step</th>
<th>Screw (quantity)</th>
<th>Color</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M1.2 × L1.7 mm, flat-head, nylon-coated (4)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
<tr>
<td>3</td>
<td>M2 × L2.5 mm, flat-head, nylon-coated (3)</td>
<td>Black</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
When installing: Ensure that the Adaptive Keys row is completely locked by the hooks.

1140 Keyboard assembly

Removal steps of the keyboard assembly
To replace the keyboard assembly, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
Removing an LCD FRU for models without touch panel

This section provides instructions on how to remove an LCD FRU for models without touch panel.

2010 LCD bezel assembly

The LCD bezel assembly FRU for non-touch models consists of an LCD front sheet bezel and an LCD bezel.

Important: Once an LCD bezel assembly is removed, it cannot be used anymore. A new LCD bezel assembly is required for replacement.

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66

Removal steps of the LCD bezel assembly

When installing: Ensure that all the latches are attached firmly.

2020 LCD panel and LCD cable

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
“1020 Battery” on page 56
“1030 Solid-state drive” on page 57
“1040 Wireless LAN card” on page 58
“1050 Wireless WAN card” on page 59
“1060 Thermal fan” on page 60
“1110 System board assembly and coin-cell battery” on page 66
“1120 LCD unit” on page 68
“2010 LCD bezel assembly” on page 73

Removal steps of LCD panel and LCD cable

<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 L2.5 mm, flat-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 LCD connector is attached firmly.

2030 Hinges
For access, remove these FRUs in order:
• “1010 Base cover assembly” on page 55
• “1020 Battery” on page 56
• “1030 Solid-state drive” on page 57
• “1040 Wireless LAN card” on page 58
• “1050 Wireless WAN card” on page 59
• “1060 Thermal fan” on page 60
• “1110 System board assembly and coin-cell battery” on page 66
• “1120 LCD unit” on page 68
• “2010 LCD bezel assembly” on page 73

Removal steps of the 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 L2 mm, big-head, nylon-coated (6)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>

2040 Camera/microphone card

For access, remove these FRUs in order:
• “1010 Base cover assembly” on page 55
• “1020 Battery” on page 56
• “1030 Solid-state drive” on page 57
• “1040 Wireless LAN card” on page 58
• “1050 Wireless WAN card” on page 59
• “1060 Thermal fan” on page 60
• “1110 System board assembly and coin-cell battery” on page 66
• “1120 LCD unit” on page 68
• “2010 LCD bezel assembly” on page 73
• “2020 LCD panel and LCD cable” on page 73
Removal steps of the camera/microphone card

When installing: Ensure that the connector is attached firmly.

2050 LED cable assembly

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “2010 LCD bezel assembly” on page 73
- “2020 LCD panel and LCD cable” on page 73
- “2030 Hinges” on page 74
**Removal step of LED cable assembly**

When installing: Ensure that the connector is attached firmly.

**2060 Antenna kit and LCD rear cover assembly**

**Removal steps of the antenna kit**

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “2010 LCD bezel assembly” on page 73
- “2020 LCD panel and LCD cable” on page 73
- “2030 Hinges” on page 74
**Cable routing:** When you install the antenna kit, route the cables as shown in the following illustration. As 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.

- Black cable (WLAN auxiliary)
- Blue cable (WWAN auxiliary)
- Orange cable (WWAN main)
- Gray cable (WLAN main)
Antenna locations

1. WLAN auxiliary antenna (black)
2. WWAN auxiliary antenna (blue)
3. WWAN main antenna (orange)
4. WLAN main antenna (gray)

Removal steps of the LCD rear cover assembly
To replace the LCD rear cover assembly, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “2010 LCD bezel assembly” on page 73
- “2020 LCD panel and LCD cable” on page 73
- “2030 Hinges” on page 74
- “2040 Camera/microphone card” on page 75
- “2050 LED cable assembly” on page 76
- “Removal steps of the antenna kit” on page 77

Removing an LCD FRU for models with touch panel
This section provides instructions on how to remove an LCD FRU for models with touch panel.

3010 LCD panel assembly, LCD cable, and touch sensor cable
For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
Removal steps of the LCD panel assembly, LCD cable, and touch sensor cable

The LCD panel assembly consists of an LCD panel and an LCD bezel. The LCD bezel is glued to the back side of the LCD panel.

Important: Once an LCD bezel is removed, it cannot be used anymore. A new LCD bezel is required for replacement.
When installing: Ensure that the connector is attached firmly.

3020 Hinges

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “3010 LCD panel assembly, LCD cable, and touch sensor cable” on page 80

Removal steps of the 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 × L2 mm, big-head, nylon-coated (6)</td>
<td>Silver</td>
<td>0.181 Nm (1.85 kgf-cm)</td>
</tr>
</tbody>
</table>
3030 Camera/microphone card

For access, remove these FRUs in order:

- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “3010 LCD panel assembly, LCD cable, and touch sensor cable” on page 80

Removal steps of the camera/microphone card

When installing: Ensure that the connector is attached firmly.
3040 LED cable assembly

For access, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “3010 LCD panel assembly, LCD cable, and touch sensor cable” on page 80
- “3020 Hinges” on page 82

Removal step of the LED cable assembly

When installing: Ensure that the connector is attached firmly.
3050 Antenna kit and LCD rear cover assembly

Removal steps of the antenna kit

For access, remove these FRUs in order:
• “1010 Base cover assembly” on page 55
• “1020 Battery” on page 56
• “1030 Solid-state drive” on page 57
• “1040 Wireless LAN card” on page 58
• “1050 Wireless WAN card” on page 59
• “1060 Thermal fan” on page 60
• “1110 System board assembly and coin-cell battery” on page 66
• “1120 LCD unit” on page 68
• “3010 LCD panel assembly, LCD cable, and touch sensor cable” on page 80
• “3020 Hinges” on page 82
Cable routing: When you install the antenna kit, route the cables as shown in the following illustration. As 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.

- Black cable (WLAN auxiliary)
- Blue cable (WWAN auxiliary)
- Orange cable (WWAN main)
- Gray cable (WLAN main)
Antenna locations

- **a**: WLAN auxiliary antenna (black)
- **b**: WWAN auxiliary antenna (blue)
- **c**: WWAN main antenna (orange)
- **d**: WLAN main antenna (gray)

Removal steps of the LCD rear cover assembly

To replace the LCD rear cover assembly, remove these FRUs in order:
- “1010 Base cover assembly” on page 55
- “1020 Battery” on page 56
- “1030 Solid-state drive” on page 57
- “1040 Wireless LAN card” on page 58
- “1050 Wireless WAN card” on page 59
- “1060 Thermal fan” on page 60
- “1110 System board assembly and coin-cell battery” on page 66
- “1120 LCD unit” on page 68
- “3010 LCD panel assembly, LCD cable, and touch sensor cable” on page 80
- “3020 Hinges” on page 82
- “3030 Camera/microphone card” on page 83
- “3040 LED cable assembly” on page 84
- “Removal steps of the antenna kit” on page 85
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