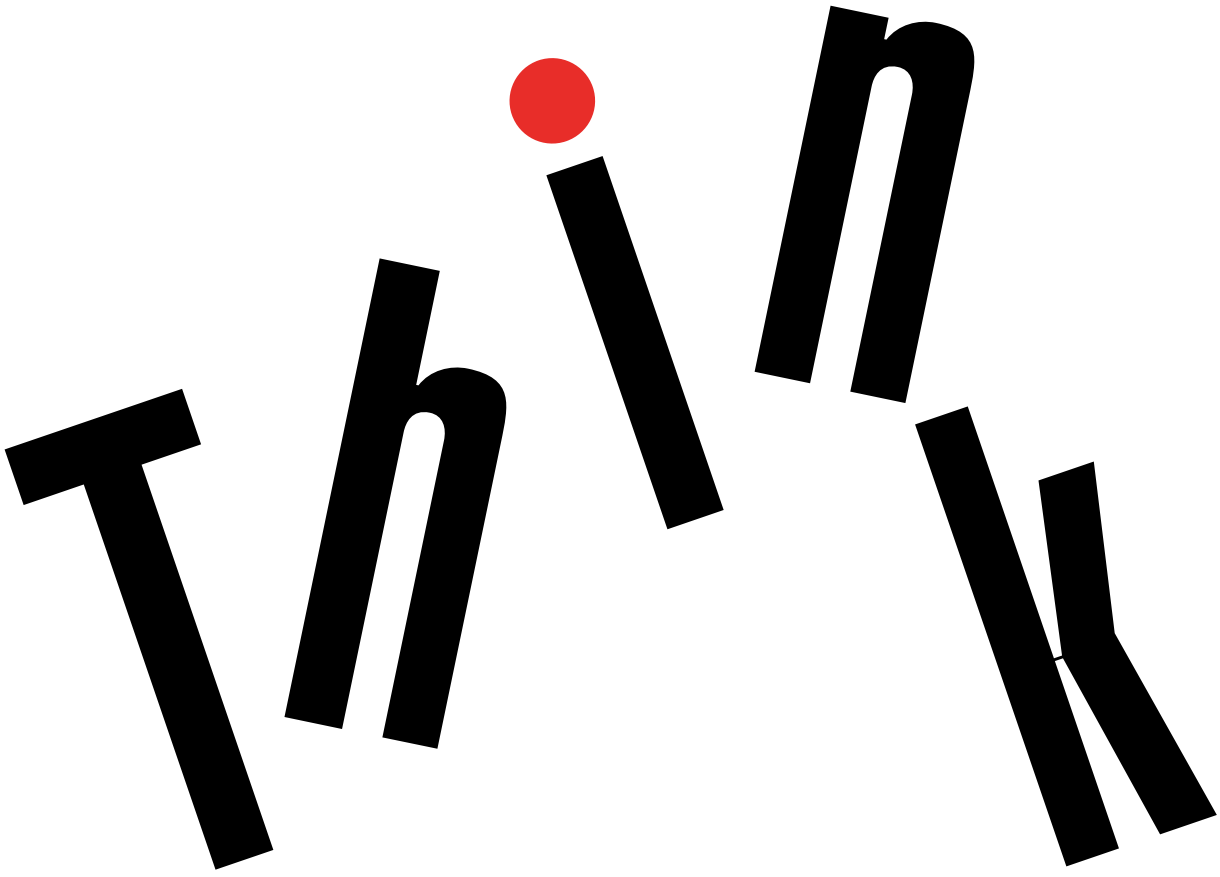
Lenovo

ThinkPad

ThinkPad X260 Hardware Maintenance Manual



Note: Before using this information and the product it supports, be sure to read the general information under Appendix A “Notices” on page 95.

Third Edition (October 2017)

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About this manual

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

ThinkPad X260	Machine types (MT): 20F5 and 20F6

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 21.

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Chapter 1. Safety information

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

- “General safety” on page 1
- “Electrical safety” on page 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.

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- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine, and to lock the wall box in the off position.
- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

    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.

Safety inspection guide

The purpose of this inspection guide is to assist you in identifying potentially unsafe conditions. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury. This guide addresses only those items. You should use good judgment to identify potential safety hazards due to attachment of non-ThinkPad features or options not covered by this inspection guide.

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

Consider these conditions and the safety hazards they present:
- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock)
- Explosive hazards, such as a damaged CRT face or a bulging capacitor
- Mechanical hazards, such as loose or missing hardware

To determine whether there are any potentially unsafe conditions, use the following checklist at the beginning of every service task. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. 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.



DANGER

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



DANGER

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



DANGER

To avoid shock, do not remove the plastic cover that protects the lower part of the inverter card.



DANGER

Though the main batteries have low voltage, a short-circuited or grounded battery can produce enough current to burn personnel or combustible materials.



DANGER

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



خطر

قبل اعادة تشغيل الحاسب بعد الانتهاء من استبدال FRU، تأكد من أنه قد تم اعادة كل من المسامير و السوست وكل الأجزاء الصغيرة الأخرى في أماكنهم ولم يتم فقدهم داخل الحاسب. ويمكن التحقق من ذلك عن طريق هز الحاسب والاستماع لأي صوت صاخب يصدر منه. قد تؤدي الأجزاء أو الرقائق المعدنية الى حدوث دائرة قصر.



خطر

تحتوي بعض البطاريات الاحتياطية على كمية صغيرة من مادتي النيكل والكادميوم. لا تقم بفك أو اعادة شحن البطارية الاحتياطية ولا تقم أيضا بالقاءها في النار أو الماء ولا تتسبب في احداث دائرة قصر بها. قم بالتخلص من البطارية كما هو موضح في القوانين المحلية. استخدم نوع البطارية المحدد والذي يوصى باستخدامه. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح الى اشتعالها أو انفجارها.



خطر

تحتوي حزمة البطارية على كمية صغيرة من مادة النيكل. لا تقم بفكها أو القاءها في النار أو الماء ولا تتسبب في احداث دائرة قصر بها. تخلص من حزمة البطارية وفقا لما هو موضح في القوانين المحلية. قم، عند استبدال حزمة البطارية، باستخدام الأنواع المحددة فقط والتي يوصى باستخدامها. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح الى اشتعالها أو انفجارها.



خطر

قد تتسبب بطارية الليثيوم في حدوث حريق أو انفجار أو حدوث حروق شديدة. لا تقم باعادة شحن البطارية أو ازالة موصل الاستقطاب الخاص بها ولا تحاول أيضا فكها أو تسخينها لأكثر من ١٠٠ درجة منوية (٢١٢ فهرنهايت) أو حرقها أو تعريض محتويات الخانة الخاصة بها للماء. قم بالتخلص من البطارية وفقا لما هو موضح في القوانين المحلية. استخدم نوع البطارية المحدد والذي يوصى باستخدامه. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح الى اشتعالها أو انفجارها.



خطر

اذا ما انكسرت شاشة LCD ولامس السائل الداخلي عينيك أو يديك، قم في الحال بغسلهما بالماء لمدة لا تقل عن ١٥ دقيقة. اذا ما وجدت أي أعراض بعد الغسل اطلب عندئذ المساعدة الطبية.



خطر

لتجنب التعرض لأي صدمات، لا تقم بازالة الغطاء البلاستيكي الذي يحمي الجزء الأسفل من بطاقة العاكس.



خطر

على الرغم من أن البطاريات الرئيسية يكون لها جهد منخفض، الا أنه قد تقوم البطاريات التي حدث قصور بها أو التي تم توصيلها أرضيا باصدار تيار يكفي لحدوث حروق للأفراد أو تعرض المواد القابلة للاشتعال للحريق.



خطر

ما لم يتم السماح بالتبديل الفوري لأي FRU الجاري استبداله بدون ضرورة اغلاق النظام، قم بتنفيذ ما يلي قبل ازالته: قم بايقاف تشغيل الحاسب ونزع كل أسلاك الطاقة من المخارج الكهربائية وقم أيضا بازالة حزمة البطارية ثم قم بفصل أي كابلات متصلة.



PERIGO

Antes de ligar o computador após a substituição da FRU, certifique-se de que todos os parafusos, molas e outras peças pequenas estejam no lugar e não estejam soltos dentro do computador. Verifique isso sacudindo o computador e procurando ouvir sons de peças soltas. Peças metálicas ou lascas de metal podem causar curto-circuito.



PERIGO

Algumas baterias reserva contêm uma pequena quantidade de níquel e cádmio. Não desmonte uma bateria reserva, recarregue-a, jogue-a no fogo ou na água, ou deixe-a entrar em curto-circuito. Descarte a bateria conforme requerido pelas leis ou regulamentos locais. Use somente a bateria nas partes listadas apropriadas. O uso de uma bateria incorreta pode resultar em combustão ou explosão da bateria.



PERIGO

O pacote da bateria contém uma pequena quantidade de níquel. Não o desmonte, jogue-o no fogo ou na água, ou deixe-o entrar em curto-circuito. Descarte o pacote da bateria conforme requerido pelas leis ou regulamentos locais. Use somente a bateria nas partes listadas apropriadas ao substituir o pacote da bateria. O uso de uma bateria incorreta pode resultar em combustão ou explosão da bateria.



PERIGO

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



PERIGO

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



PERIGO

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



PERIGO

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



PERIGO

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



DANGER

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



DANGER

Certaines batteries de secours contiennent du nickel et du cadmium. Ne les démontez pas, ne les rechargez pas, ne les exposez ni au feu ni à l'eau. Ne les mettez pas en court-circuit. Pour les mettre au rebut, conformez-vous à la réglementation en vigueur. Lorsque vous remplacez la pile de sauvegarde ou celle de l'horloge temps réel, 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'exploser.



DANGER

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



DANGER

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



DANGER

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



DANGER

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



DANGER

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



DANGER

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



VORSICHT

Bevor nach einem FRU-Austausch der Computer wieder angeschlossen wird, muß sichergestellt werden, daß keine Schrauben, Federn oder andere Kleinteile fehlen oder im Gehäuse vergessen wurden. Der Computer muß geschüttelt und auf Klappergeräusche geprüft werden. Metallteile oder-splitter können Kurzschlüsse erzeugen.



VORSICHT

Die Bereitschaftsbatterie, die sich unter dem Diskettenlaufwerk befindet, kann geringe Mengen Nickel und Cadmium enthalten. Sie darf nur durch die Verkaufsstelle oder den IBM Kundendienst ausgetauscht werden. Sie darf nicht zerlegt, wiederaufgeladen, kurzgeschlossen, oder Feuer oder Wasser ausgesetzt werden. Die Batterie kann schwere Verbrennungen oder Verätzungen verursachen. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Bereitschafts-oder Systembatterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.



VORSICHT

Akkus enthalten geringe Mengen von Nickel. Sie dürfen nicht zerlegt, wiederaufgeladen, kurzgeschlossen, oder Feuer oder Wasser ausgesetzt werden. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Batterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.



VORSICHT

Die Systembatterie ist eine Lithiumbatterie. Sie kann sich entzünden, explodieren oder schwere Verbrennungen hervorrufen. Batterien dieses Typs dürfen nicht aufgeladen, zerlegt, über 100°C erhitzt oder verbrannt werden. Auch darf ihr Inhalt nicht mit Wasser in Verbindung gebracht oder der zur richtigen Polung angebrachte Verbindungsstecker entfernt werden. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Beim Ersetzen der Batterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.



VORSICHT

Die Leuchtstoffröhre im LCD-Bildschirm enthält Quecksilber. Bei der Entsorgung die örtlichen Bestimmungen für Sondermüll beachten. Der LCD-Bildschirm besteht aus Glas und kann zerbrechen, wenn er unsachgemäß behandelt wird oder der Computer auf den Boden fällt. Wenn der Bildschirm beschädigt ist und die darin befindliche Flüssigkeit in Kontakt mit Haut und Augen gerät, sollten die betroffenen Stellen mindestens 15 Minuten mit Wasser abgespült und bei Beschwerden anschließend ein Arzt aufgesucht werden.



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 Netzkabel von den Netzsteckdosen ab, entfernen Sie den Akku und ziehen Sie alle miteinander verbundenen Kabel ab.



סכנה

לפני הפעלת המחשב לאחר החלפת FRU יש לוודא שכל הברגים, הקפיצים, וחלקים קטנים אחרים נמצאים במקומם ואינם חופשיים לזוז בתוך המחשב. כדי לוודא זאת, יש לטלטל את המחשב ולחקשיב לגילוי קולות שקשוק. חלקי או שבבי מתכת עלולים לגרום לקצרים חשמליים.



סכנה

סוללות המתנה מסוימות מכילות כמות קטנה של ניקל וקדמיום. אין לפרק סוללת המתנה, לטעון אותה מחדש, להשליך אותה לאש או למים או לקצר אותה. יש לסלק את הסוללה כנדרש על ידי התקנות והחוקים המקומיים. יש להשתמש רק בסוללה המופיעה ברשימת החלקים המתאימה. שימוש בסוללה לא מתאימה עלול לגרום להצתה או התפוצצות של הסוללה.



סכנה

מארז הסוללה מכיל כמות קטנה של ניקל וקדמיום. אין לפרק את מארז הסוללה, להשליך אותו לאש או למים או לקצר אותו. יש לטפל את מארז הסוללה הסוללה כנדרש על ידי התקנות והחוקים המקומיים. יש להשתמש רק בסוללה המופיעה ברשימת החלקים המתאימה בזמן החלפת מארז הסוללה. שימוש בסוללה לא מתאימה עלול לגרום להצתה או התפוצצות של הסוללה.



סכנה

סוללת הליתיום עלולה לגרום לשריפה, להתפוצצות או לכוויות קשות. אין לטעון אותה מחדש, לפרק את המחבר המקוטב שלה, לפרק אותה או לחמם אותה לטמפרטורה העולה על 100 מעלות צלזיוס. אין לשרוף את הסוללה ואין לחשוף את תוכן התא למים. יש לטפל את הסוללה כנדרש בתקנות ובחוקים המקומיים. יש להשתמש רק בסוללה המופיעה ברשימת החלקים המתאימים. שימוש בסוללה אחרת עלול לגרום לסכנת שריפה או התפוצצות.



סכנה

אם מסך הגביש הנוזלי (LCD) נשבר והנוזל מתוך המסך בא במגע עם עיניכם או ידיכם, שטפו את האזורים הנגועים מיד במים במשך 15 דקות לפחות. פנו לקבלת עזרה רפואית אם תסמינים הנובעים מהמגע עם הנוזל נמשכים לאחר השטיפה.



סכנה

כדי למנוע התחשמלות, אין להסיר את מכסה הפלסטיק המגן על חלקו התחתון של הכרטיס ההפוך.



סכנה

אף שסוללות הראשיות הן בעלות מתח נמוך, סוללה מקוצרת או מוארקת עלולה להפיק זרם מספיק לגרימת כוויות או להצתת חומרים דליקים.



סכנה

אלא אם כן מותרת 'החלפה חמה' של ה-FRU המוחלף, פעלו כדלהלן לפני הסרתו:
כבו את המחשב, נתקו את כל כבלי החשמל מהשקעים, הוציאו את מארז הסוללות ונתקו את כל הכבלים המחוברים.



危險

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 の内部で緩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 を振って、カチャカチャと音がしないか確かめます。金属部品や金属破片はショートの原因になることがあります。



危険

予備バッテリーの中には少量のニッケルとカドミウムが含まれているものがあります。したがって、予備バッテリーの分解、再充電、火または水の中への投棄、またはショートさせることは決して行わないでください。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。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。



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・パックの廃棄にあたっては、地方自治体の条例または規則に従ってください。バッテリー・パックを交換するときは、適切なパーツ・リストにあるバッテリーだけを使用してください。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。



危険

リチウム・バッテリーは、火災、爆発、または重症のやけどを引き起こすことがあります。バックアップ・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 ˚F) 以上への加熱、焼却、電池の中身を水に浸すことはしないでください。バッテリーを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。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。



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・スワップに対応していない場合、それを取り外す前に、コンピューターの電源をオフにし、すべての電源コードをコンセントから抜き、バッテリー・パックを取り外して、相互接続しているケーブルをすべて切り離してください。



위험

FRU를 교체하고 나서 컴퓨터 전원을 켜기 전에 모든 나사, 스프링 및 기타 작은 부품들이 올바른 위치에 있는지, 컴퓨터 내부에 단단하게 연결되어 있는지 확인하십시오. 컴퓨터를 흔들어 달깍거리는 소리가 나지 않는지 확인하십시오. 금속 부품 또는 금속 조각은 누전을 일으킬 수 있습니다.



위험

일부 보조 배터리에는 소량의 니켈 및 카트뮴이 포함되어 있습니다. 보조 배터리를 분해하거나, 다시 충전하거나, 불 또는 물에 던지거나, 단락시키지 마십시오. 배터리 팩을 폐기할 때에는 해당 지역의 법률 규정을 따르십시오. 배터리 팩을 교체할 때에는 올바른 배터리만 사용하십시오. 올바르지 않은 배터리를 사용하면 배터리가 발화되거나 폭발할 수 있습니다.



위험

배터리 팩에는 소량의 니켈이 포함되어 있습니다. 배터리 팩을 분해하거나, 불 또는 물에 던지거나, 단락시키지 마십시오. 배터리 팩을 폐기할 때에는 해당 지역의 법률 규정을 따르십시오. 배터리 팩을 교체할 때에는 올바른 배터리만 사용하십시오. 올바르지 않은 배터리를 사용하면 배터리가 발화되거나 폭발할 수 있습니다.



위험

리튬 배터리는 화재, 폭발 또는 심각한 화상을 일으킬 수 있습니다. 리튬 배터리를 다시 충전하거나, 극성 커넥터를 제거하거나, 분해하거나, 100C(212F) 이상으로 가열하거나, 소각하거나, 전지 내용물을 물에 노출시키지 마십시오. 배터리를 폐기할 때에는 해당 지역을 법률 규정을 따르십시오. 올바른 배터리만 사용하십시오. 올바르지 않은 배터리를 사용하면 배터리가 발화되거나 폭발할 수 있습니다.



위험

LCD가 파손되어 LCD 내부의 액체가 눈에 들어가거나 손에 묻으면 즉시 깨끗한 물로 15분 이상 닦아 내십시오. 씻은 후에 조금이라도 이상을 느끼면 즉시 병원에 가서 의사의 진찰을 받아야 합니다.



위험

전기적 위험을 방지하려면 인버터 카드의 아래 부분을 보호하는 플라스틱 덮개를 제거하지 마십시오.



위험

기본 배터리의 전압은 낮지만, 단락되거나 접지된 배터리는 화상을 입히기에 충분한 전류와 가연성 물질을 발생시킬 수 있습니다.



위험

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



PELIGRO

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



PELIGRO

Algunas baterías de reserva contienen una pequeña cantidad de níquel y cadmio. No las desmonte, ni recargue, ni las eche al fuego o al agua ni las 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 medica si se presenta algún síntoma del fluido despues de lavarse.



PELIGRO

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



PELIGRO

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



PELIGRO

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



危險

完成 FRU 更換之後，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，請搖晃電腦，聽聽看是否有卡嗒的聲響。
金屬零件或儀錶的火花會造成電線短路。



危險

部分備用電池含有微量的鋰和鎘。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。



危險

電池套件含有微量的鋰。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。



危險

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，或讓電池組成物浸到水。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。



危險

如果 LCD 破裂導致 LCD 流出的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的任何症狀，請就醫治療。



危險

為避免電擊，請勿拆下轉換卡下面的塑膠護蓋。



危險

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 21
  - "Strategy for replacing a hard disk drive or a solid-state drive" on page 21
  - "Important notice for replacing a system board" on page 22
  - "How to use error message" on page 22
- "Strategy for replacing FRUs for CTO, special-bid, and standard models" on page 22
  - "Product definition" on page 22
  - "FRU identification" on page 22

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 hard disk drive or a solid-state drive

Always try to run a low-level format before replacing a hard disk drive or a solid-state drive. This will cause all customer data on the 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.

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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.

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

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

Product definition

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

Dynamic Configure To Order (CTO) model

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

Special-bid model

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

Standard model

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

FRU identification

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

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

1. Go to http://support.lenovo.com/ibasepartslookup.
2. Type the Machine Type and Serial Number in the corresponding fields.

3. Click **Submit**.

eSupport also can be used to view the general FRU list for a product. The FRU list is a general list of components and does not contain specific model information.

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

1. Go to http://www.lenovo.com/support.
2. Follow the instructions on the screen to select a product.
3. Click the **Product & Parts** tab.
4. Select **System Service Parts** to view a general FRU list.

Chapter 3. General checkout

This chapter contains the following topics:

- “What to do first” on page 25
- “Checkout guide” on page 26
  - “Lenovo Solution Center” on page 26
  - “Quick test programs” on page 26
  - “UEFI diagnostic program” on page 27
  - “Bootable diagnostic programs” on page 27
- “Power system checkout” on page 28

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 a variety of 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.

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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
- Fuses blown by attachment of a nonsupported device
- Forgotten computer password (making the computer unusable)
- Sticky keys caused by spilling a liquid onto the keyboard
- Use of an incorrect ac power adapter on laptop products

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

Checkout guide

Use the following procedures as a guide in identifying and correcting problems with the ThinkPad notebook 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, click **System and Security → Lenovo - System Health and Diagnostics**, and then follow the instructions on the screen.

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

Quick test programs

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

Lenovo provides the following quick test programs:
- **Lenovo Hard Drive Quick Test**: Use this program to troubleshoot and resolve internal storage problems.
- **Lenovo Memory Quick Test**: Use this program to troubleshoot and resolve memory module problems.

The quick test programs are applicable on the following operating systems:

- Microsoft® Windows® 10
- Microsoft Windows 8.1
- Microsoft Windows 8
- Microsoft Windows 7
- Microsoft Windows XP
- Microsoft Windows Server® 2003
- Microsoft Windows Server 2008

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

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

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

UEFI diagnostic program

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

To run the UEFI diagnostic program, do the following:

1. Turn on the computer. If the computer cannot be turned on, go to “Power system checkout” on page 28, 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 logo screen 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:

1. Go to http://www.lenovo.com/diags.
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 28, 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 logo screen 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 28, 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 logo screen 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 the batteries and the 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 power adapter and turn on the computer. If the computer can be turned on, it means that the battery is functional.

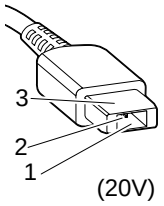
If you suspect that the power problem is caused by a specific power device, refer to the appropriate checkout item in the following list:
- “Checking the ac power adapter” on page 28
- “Checking operational charging” on page 29
- “Checking the coin-cell battery” on page 30

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 (the indicator in the ThinkPad logo or the indicator in the center of the power button) does not blink three times when an ac power source is connected, check the power cord of the ac power adapter for correct continuity and installation.
- If the computer does not charge during operation, go to “Checking operational charging” on page 29.

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.



Pin	Voltage (V dc)
1	+20
2	0
3	Ground

Note: Output voltage of pin 2 of the ac power adapter might differ from the one you are servicing.

3. If the voltage is not correct, replace the ac power adapter.
4. If the voltage is acceptable, replace the system board.

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

Checking operational charging

To check whether the batteries charge properly during operation, do the following:

1. Discharge the batteries until the remaining battery power is less than 50%.
2. Connect the computer to ac power to charge the batteries. If the battery status icon in the Windows notification area indicates that the batteries are not charging, remove the batteries and let them return to room temperature.
3. Reinstall the batteries. If the batteries are still not charging, replace the batteries.
4. Check the battery status icon again. If the same error still exists, replace the system board.

Checking the removable 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 system is installed, the system will not charge.

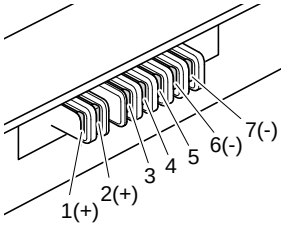
Attention: Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.

Move your pointer to the battery-status icon in the Windows notification area to check the battery status. The battery-status icon displays the percentage of battery power remaining and how long you can use your computer before you must charge the battery.

Note: If the battery becomes hot, it may not be able to charge. Remove it from the computer and leave it at room temperature for a while. After it cools down, reinstall and recharge it.

To check the battery, do the following:

1. Power off the computer.
2. Remove the battery and measure the voltage between battery terminals 1 (+) and 7 (-). See the following figure:



Terminal	Voltage (V dc)
1, 2	+ 0 to + 12.6
6, 7	Ground (-)

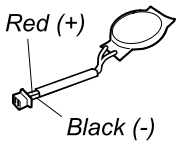
3. If the voltage is less than +11.0 V dc, the battery has been discharged.

   If the voltage is still less than +11.0 V dc after recharging, replace the battery.
4. If the voltage is more than +11.0 V dc, measure the resistance between battery terminals 5 and 7. The resistance must be 4 to 30 K Ω. If the resistance is not correct, replace the battery. If the resistance is correct, 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 62.
2. Remove the coin-cell battery. See “1110 Coin-cell battery” on page 78.
3. Measure the voltage of the coin-cell battery.



Wire	Voltage (V dc)
Red	+2.5 to +3.2
Black	Ground

- 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 contains the following topics:

- “Restoring the factory contents by using the product Recovery Disc Set” on page 31
- “Recovery overview for the Windows 10 operating system” on page 32
- “Passwords” on page 33
- “Power management” on page 35
- “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 computer. Order the Recovery Disc Set and the drive at the same time so that the customer can restore the computer to the factory default settings by using the Recovery Disc Set after the new drive is installed. For information about which discs to order, go to http://www.lenovo.com/serviceparts-lookup.

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

Notes:

- During the recovery process, all data on the drive will be deleted. If possible, copy any important data or personal files that you want to keep onto removable media or a network drive before you start the recovery process.
- The recovery process takes one to two hours to complete. The length of time depends on the method you use. If you use product Recovery Disc Set, the recovery process takes about two hours.

1. Connect an external CD/DVD drive.
2. Make the CD/DVD drive the first startup device in the startup sequence using the following procedure:
   a. Open the ThinkPad Setup program and select **Startup → Boot**.
   b. Select the CD/DVD drive as the **1st Boot Device**.
3. Insert the bootable recovery disc into the CD/DVD drive.
4. Start the computer from the external CD/DVD drive.
5. When promoted, 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.

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9. When the recovery process completes, the Welcome to Microsoft Windows screen is displayed. Follow the instructions on the screen to complete the Windows setup.
10. After you have completed the Windows setup, you might want to restore the original startup sequence. Start the ThinkPad Setup program and then press F9 to restore the default settings. Press F10 to save changes and exit the ThinkPad Setup program.

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

Recovery overview for the Windows 10 operating system

The Windows recovery programs enable you to reset your computer or use advanced startup options.

It is recommended that you create a recovery USB drive as early as possible. Store the recovery USB drive as a backup or replacement for the Windows recovery programs.

For more information, see “Creating and using a recovery USB drive” on page 33.

Resetting your computer

If your computer does not perform well, you might consider resetting your computer. In the resetting process, you can choose to keep your files or remove them, and then reinstall the Windows operating system.

To reset your computer, do the following:

Note: The graphical user interface (GUI) items of the operating system might change without notice.

1. Open the Start menu and then click **Settings**. If **Settings** is not displayed, click **All apps** to display all programs, and then click **Settings → Update & security → Recovery**.
2. In the **Reset this PC** section, click **Get started**.
3. Follow the instructions on the screen to reset your computer.

Using advanced startup options

With 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 advanced startup options, do the following:

Note: The GUI items of the operating system might change without notice.

1. Open the Start menu and then click **Settings**. If **Settings** is not displayed, click **All apps** to display all programs, and then click **Settings → Update & security → Recovery**.
2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.
3. Select a desired startup option and follow the instructions on the screen.

Recovering your operating system if Windows 10 fails to start

The Windows recovery environment on your computer is capable of operating independently from the Windows 10 operating system. This enables you to recover or repair the operating system even if the Windows 10 operating system fails to start.

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

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

Creating and using a recovery USB drive

You can create a recovery USB drive as a backup for the Windows recovery programs. With the recovery USB drive, you can troubleshoot and fix the problems even if the preinstalled Windows recovery programs are damaged.

Creating a recovery USB drive

The USB drive that you use to create the recovery USB drive must be at least 16 GB of storage. The actual USB capacity that is required depends on the size of the recovery image.

Attention: The creation process deletes 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 a recovery USB drive, do the following:

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

1. Connect a proper USB drive (at least 16 GB of storage).
2. Type recovery in the search box on the taskbar. 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. In the Recovery Drive window, follow the on-screen instructions to create a recovery USB drive.

Using the recovery USB drive

If you cannot start your computer, use the recovery USB drive to recover your computer.

To use a recovery USB drive, do the following:

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

1. Connect the recovery USB drive to the computer.
2. Turn on or restart the computer. Before the Windows operating system starts, repeatedly press the F12 key. The Boot Menu window opens.
3. Select the recovery USB drive as the boot device.
4. Select a preferred keyboard layout.
5. Click **Troubleshoot** to display the optional recovery solutions.
6. Select a corresponding recovery solution according to your situation. Then follow the instructions on the screen to complete the process.

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.

To remove the 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.
  2. Remove the built-in batteries. For instructions on how to remove the battery, see “1030 Built-in battery” on page 65.
  3. Remove the coin-cell battery. For instructions on how to remove the coin-cell battery, see “1110 Coin-cell battery” on page 78. Wait for a few seconds.
  4. Reinstall the coin-cell battery. For instructions on how to install the coin-cell battery, see “1110 Coin-cell battery” on page 78.
  5. Reinstall the built-in batteries. For instructions on how to install the battery, see “1030 Built-in battery” on page 65.
  6. 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 logo screen is displayed, immediately press F1. Type the supervisor password to enter the ThinkPad Setup program.
  3. Select **Security**.
  4. Select **Password**.
  5. Select **Power-On Password**.
  6. Type the current supervisor password in the **Enter Current Password** field. Then leave the **Enter New Password** field blank, and press Enter twice.
  7. In the Changes have been saved window, press Enter.
  8. Press F10 to save changes and exit the ThinkPad Setup program.

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. To put the system back to operational status, the only Lenovo and Lenovo-authorized service solution would be to replace the hard disk drive with 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 logo screen is displayed, immediately press F1.
3. When the user hard disk password icon is displayed on the screen, press F1. The master hard disk password icon is displayed. Enter the master hard disk password.
4. When the supervisor password icon is displayed, enter the supervisor 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.
10. 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.

Supervisor password

The supervisor password protects the system information stored in the ThinkPad Setup program. It provides the following security features:

- If only a supervisor password is set, a password prompt is displayed when you try to start the ThinkPad Setup program. Unauthorized users cannot change most of the system configuration options in the ThinkPad Setup program without the password.
- The system administrator can use the supervisor password to access a computer even if the user of that computer has set a power-on password. The supervisor password overrides the power-on password.
- The system administrator can set the same supervisor password on many ThinkPad notebook computers to make administration easier.

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.

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 on the taskbar.
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 hard disk drive or solid-state drive is powered off.
- The microprocessor stops.

To put your computer into sleep mode, do the following:

- For Windows 7: Open the Start menu, click the arrow next to the **Shutdown** button, and then click **Sleep** from the menu displayed.
- For Windows 10: Open the Start menu, click **Power**, and then click **Sleep**.

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

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

To cause the computer to return from sleep mode and resume operation, do one of the following:
- Press the Fn key.
- Open the LCD cover.
- Turn on the power button.

Hibernation mode

In hibernation mode, the following occurs:

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

If you have defined one of the following actions as the event that causes the system to go into hibernation mode, perform that action.
- Closing the lid.
- Pressing the power button.

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

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

Symptom-to-FRU index

This section contains following information:

- “Numeric error codes” on page 37
- “Error messages” on page 38
- “Beep symptoms” on page 39
- “No-beep symptoms” on page 39
- “LCD-related symptoms” on page 39
- “Intermittent problems” on page 40
- “Undetermined problems” on page 40

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 40.

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

Numeric error codes

Symptom or error	FRU or action, in sequence
0177 Bad SVP data, stop POST task—The checksum of the supervisor password in the EEPROM is not correct.	**Replace the system board.**
0183 Bad CRC of Security Settings in EFI Variable. Enter the ThinkPad Setup program. – The checksum of the Security settings in the EFI Variable is not correct.	1. **Run the ThinkPad Setup program. The settings will be corrected automatically. Then save the current settings by pressing F10.** 2. Replace the system board.
0187 EAIA data access error—The access to EEPROM is failed.	**Replace the system board.**
0188 Invalid RFID Serialization Information Area.	**Replace the system board.**
0189 Invalid RFID configuration information area—The EEPROM checksum is not correct.	**Replace the system board.**
0190 Critical low-battery error	1. **Charge the battery.** 2. Replace the battery.
0191 System Security—Invalid Remote Change requested.	1. **Run the ThinkPad Setup program, and then save current setting by pressing F10.** 2. Replace the system board.
0199 System Security— Security password retry count exceeded.	1. **Run the ThinkPad Setup program. The retry count will be reset. Then save the current settings by pressing F10.** 2. Replace the system board.
0270 Real Time Clock Error.	**System Real Time Clock is not functional. Have the computer serviced.**
0271 Check Date and Time settings.	**Neither the date nor the time is set in the computer. Set the date and time, using ThinkPad Setup.**
1802 Unauthorized network card is plugged in—Turn off and remove the network card.	1. **Remove network card.** 2. Replace the system board.

Symptom or error	FRU or action, in sequence
1820 More than one external fingerprint reader is attached. Power off and remove all but the reader that you set up within your main operating system.	**Remove all but the reader that you set up for the authentication.**
2100 Detection error on HDD0 (Main HDD)	1. **Reseat the hard disk drive.** 2. Replace the main hard disk drive. 3. Replace the system board.
2110 Read error on HDD0 (Main HDD)	1. **Reseat the hard disk drive.** 2. Replace the main hard disk drive. 3. Replace the system board.
2200 Machine Type and Serial Number are invalid.	**Replace the system board.**
2201 Machine UUID is invalid	**Replace the system board.**

Error messages

Symptom or error	FRU or action, in sequence
Fan error.	1. **Replace the fan**. 2. Apply thermal grease. 3. Replace the system board.
Thermal sensing error.	**Replace the system board**.
The System UEFI Variable Storage is nearly full.	**Note:** This error indicates that the operating system or applications cannot create, modify, or delete data in the non-volatile system UEFI variable storage due to insufficient storage space after POST. The non-volatile system UEFI variable storage is used by the UEFI BIOS and by the operating system or applications. This error occurs when the operating system or applications store large amounts of data in the variable storage. All data needed for POST, such as BIOS setup settings, chipset or platform configuration data, are stored in a separate UEFI variable storage. **Solution**: Enter ThinkPad Setup. A dialog asks the user for confirmation to clean up the storage. If the user selects “Yes”, all data that were created by the operating system or applications are deleted except global variables defined by the Unified Extensible Firmware Interface Specification. If the user selects “No”, all data is kept, but the operating system or applications will not be able to create, modify, or delete data in the storage. If this error happens at a service center, Lenovo authorized service personnel will clean up the non-volatile system UEFI variable storage using the above solution.

Beep symptoms

Symptom or error	Solution
One short beep, pause, three short beeps, pause, three more short beeps, pause, and one short beep (1-3-3-1 beeps)	Memory problem. Shut down the computer immediately and have the computer serviced.
One long and two short beeps	Video problem. Shut down the computer immediately and have the computer serviced.
Three short beeps, pause, one short beep, pause, one short beep, pause, and three more short beeps (3-1-1-3 beeps)	PCI resource problem. Shut down the computer immediately and have the computer serviced.
Four cycles of four short beeps	TCG*-compliant functionality-related problem (might be the TPM initialization failure). Shut down the computer immediately and have the computer serviced. * TCG is the abbreviation for Trusted Computing Group.
Five short beeps	System board problem. Shut down the computer immediately and have the computer serviced.
Five short beeps, pause, five more short beeps, and pause	TCG-compliant functionality-related problem (might be the BIOS code validation failure). Shut down the computer immediately and have the computer serviced.

No-beep symptoms

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

LCD-related symptoms

Important: The TFT LCD for the notebook computer contains many thin-film transistors (TFTs). The presence of a small number of dots that are missing, discolored, or always lighted is characteristic of TFT LCD technology, but excessive pixel problems can cause viewing concerns.If the LCD you are servicing has two or less visible defective pixels, it should not be considered faulty. However, if the LCD has three or more visible defective pixels, it will be deemed as defective by Lenovo and it should be replaced.

Notes:

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

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

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).

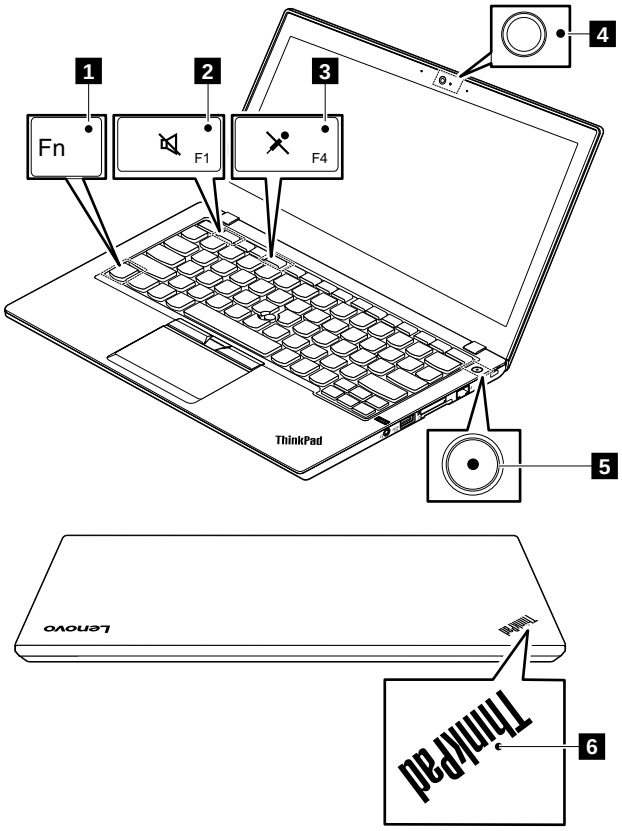
Verify that all attached devices are supported by the computer.

Verify that the power supply being used at the time of the failure is operating correctly. See "Power system checkout" on page 28.

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. batteries
   d. Internal storage drive
   e. External diskette drive or optical drive
   f. Memory module
   g. M.2 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. Status indicators

This chapter helps you locate and identify the various status indicators on your computer.



Indicator	Indicator behavior and description
1 Fn Lock indicator	• **Off**: The Fn Lock function is disabled. To initiate the special function printed as an icon on each key, press the function key directly. To input F1- F12, press the Fn key and the corresponding function key. • **On**: The Fn Lock function is enabled. To input F1- F12, press the function keys directly. To initiate the special function printed as an icon on each key, press the Fn key and the corresponding function key.
2 Speaker-mute indicator	**On**: The speakers are muted.
3 Microphone-mute indicator	**On**: The microphones are muted.
4 Camera-status indicator	**On**: The camera is in use.
5 6 System-status indicators	• **Blinking three times**: The computer is initially connected to power. • **On**: The computer is in use. • **Off**: The computer is off or in hibernation mode. • **Slow-blinking**: The computer is in sleep mode. • **Fast-blinking**: The computer is entering sleep or hibernation mode.

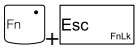
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Chapter 6. Function keys and combinations

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

Function keys and key combinations	Description
	Mutes or unmutes the speakers. If you mute the sound and turn off your computer, the sound will remain muted when you turn on your computer again. To turn on the sound, press the volume-down key  or volume-up key  .
	Decreases the speaker volume.
	Increases the speaker volume.
	Mutes or unmutes the microphones.
	Darkens the computer display.
	Brightens the computer display.
	Manages the external displays.
	Enables or disables the wireless features.
	• For Windows 7: Opens **Control Panel**. • For Windows 10: Opens the Settings window.
	• For Windows 7: Opens **Windows Search**. • For Windows 10: Opens the Cortana® search box.
	Views all the programs that you have opened.
	• For Windows 7: Opens **Computer**. • For Windows 10: Views all the programs.

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Function keys and key combinations	Description
	You can configure the Fn key and function keys in the Keyboard Properties window by doing the following: 1. Go to Control Panel. Change the view of Control Panel from Category to Large icons or Small icons. 2. Click **Keyboard**. In the Keyboard Properties window, click the **ThinkPad F1-F12 keys** or **Fn and function keys** tab. 3. Select the option of your preference: Press Fn+Esc to enable or disable the Fn Lock function. • **When the Fn Lock function is disabled**: The Fn Lock indicator is off. To initiate the special function printed as an icon on each key, press the function key directly. To input F1-F12, press the Fn key and the corresponding function key. • **When the Fn Lock function is enabled**: The Fn Lock indicator turns on. To input F1-F12, press the function keys directly. To initiate the special function printed as an icon on each key, press the Fn key and the corresponding function key.
Fn+Spacebar	Controls the keyboard backlight. There are three modes for the keyboard backlight: **Off**, **Low**, and **High**. Press Fn+Spacebar to change the mode of the keyboard backlight.
Fn+B	Has the same function as the Break key on a conventional keyboard.
Fn+P	Has the same function as the Pause key on a conventional keyboard.
Fn+S	Has the same function as the SysRq key on a conventional keyboard.
Fn+K	Has the same function as the ScrLK key on a conventional keyboard.
Fn+End	Has the same function as the Insert key on a conventional keyboard.
Fn+4	Puts your computer into sleep mode. To return to normal operation, press the Fn key only.

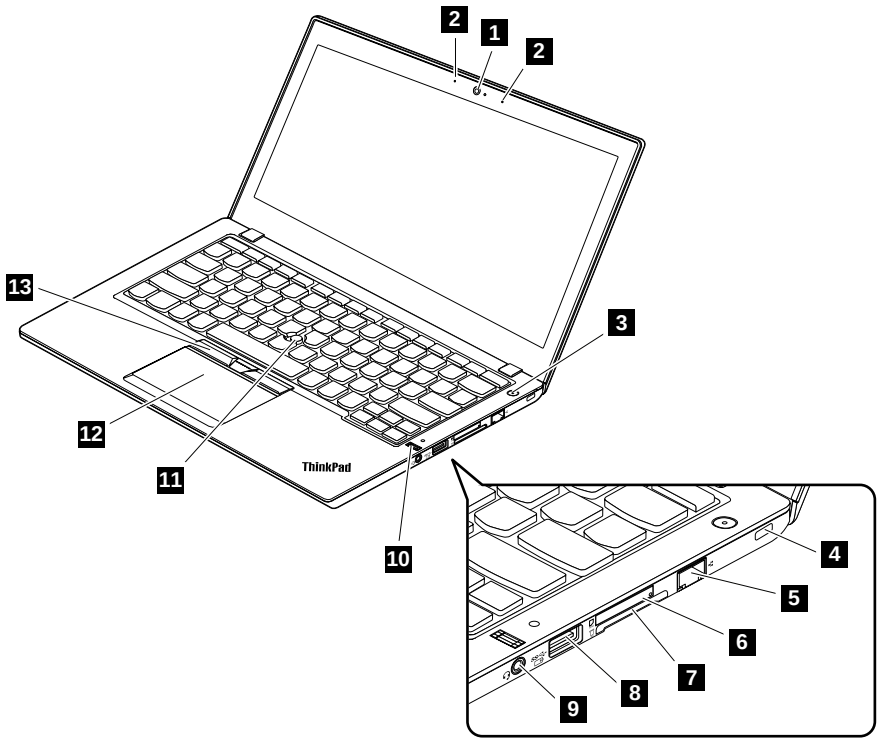
Chapter 7. Locations

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

Locating computer controls, connectors, and indicators

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

Front view



1 Camera (available on some models)

2 Microphones (available on some models)

3 Power button

4 Security-lock slot

5 Ethernet connector

6 Micro-SIM-card tray (available on some models)

7 Media-card slot

8 Always On USB 3.0 connector

9 Audio connector

10 Fingerprint reader (available on some models)

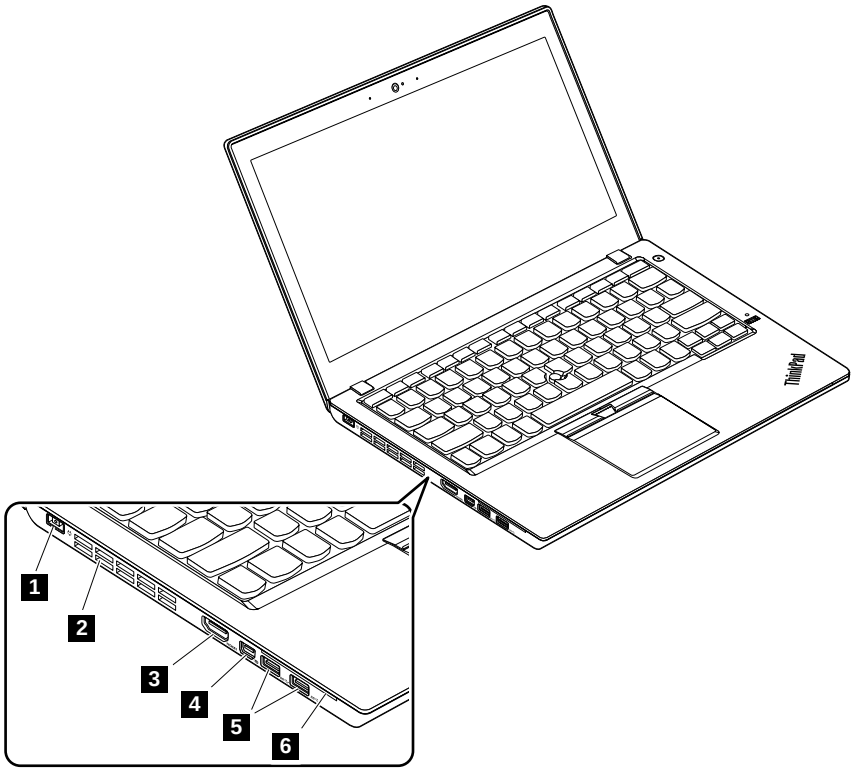
11 TrackPoint® pointing stick

12 Trackpad

13 TrackPoint buttons

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Left-side view



1 Power connector

2 Fan louvers

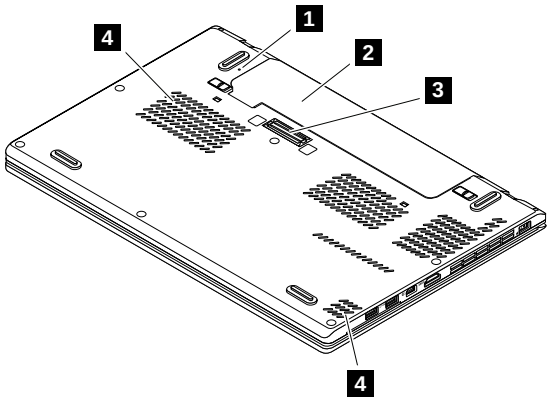
3 HDMI™ connector

4 Mini DisplayPort® connector

5 USB 3.0 connectors

6 Smart-card reader slot (available on some models)

Bottom view



1 Emergency-reset hole

2 Removable battery

3 Docking station connector

4 Speakers

Locating FRUs and CRUs

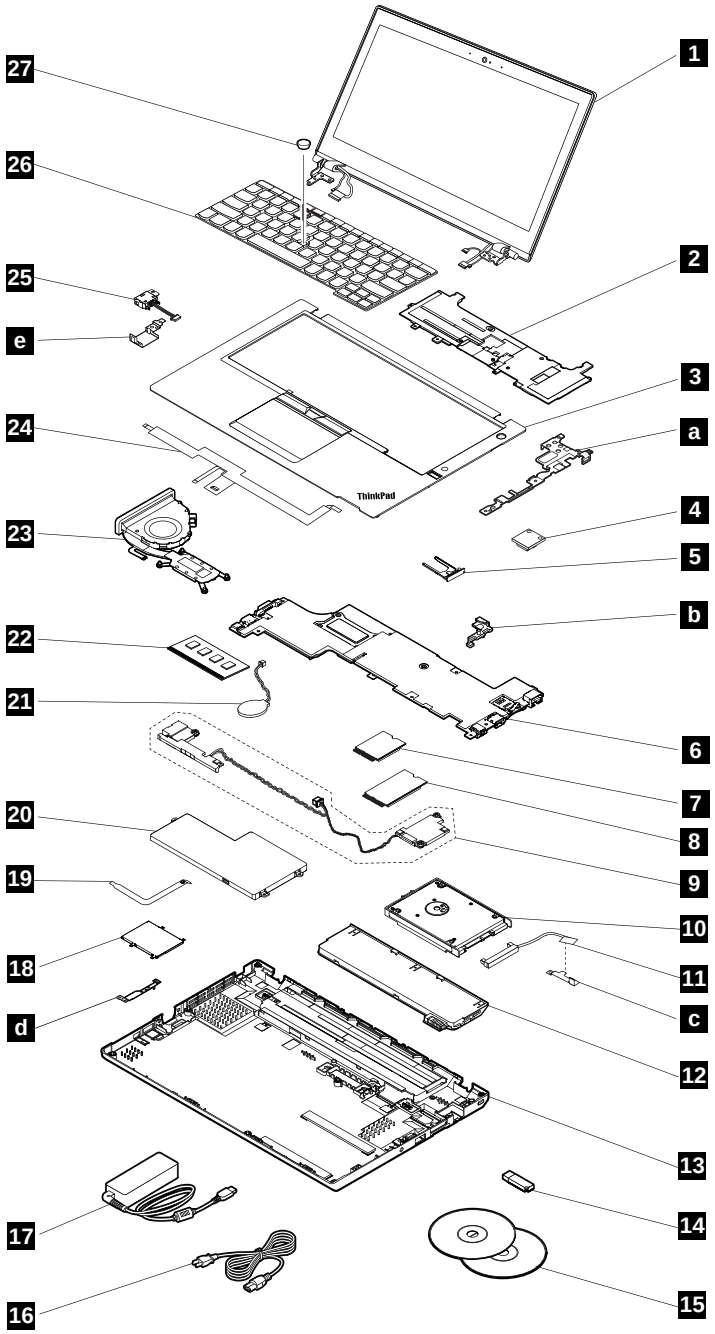
This topic introduces the following service parts:

- “Major FRUs” on page 48
- “LCD FRUs” on page 50
- “Miscellaneous parts” on page 51

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 and FRU:
  - **Self-service CRUs:** Refer to parts that can be installed or replaced easily by customer themselves or by trained service technicians at an additional cost.
  - **Optional-service CRUs:** Refer to parts that can be installed or replaced by customers with a greater skill level. Trained service technicians can also provide service to install or replace the parts under the type of warranty designated for the customer’s machine.
  - **FRUs:** Refer to parts that must be installed or replaced only by trained service technicians. If customers choose to replace the FRUs by themselves, the product warranty might be affected.

Major FRUs

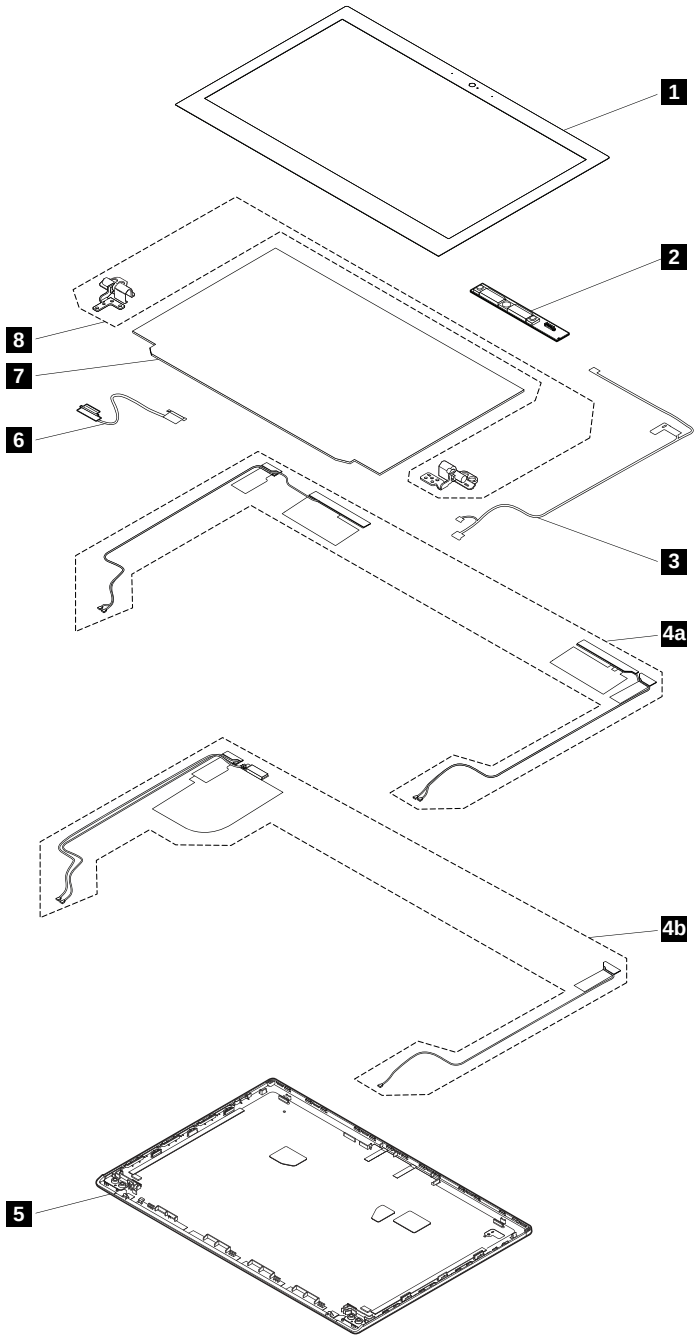


No.	FRU descriptions	Self-service CRU	Optional-service CRU
1	LCD unit (see “LCD FRUs” on page 50)	No	No
2	Keyboard spacer	No	No
3	Keyboard bezel assembly (with or without fingerprint reader)	No	No
4	Power-button card	No	No
5	Micro-SIM-card tray (available on some models)	No	No

No.	FRU descriptions	Self-service CRU	Optional-service CRU
6	System board	No	No
7	Wireless-LAN card or Wireless Gigabit (WiGig) module	Yes	No
8	Wireless-WAN card (available on some models)	Yes	No
9	Speaker assembly	No	No
10	Internal storage drive (hard disk drive or solid-state drive)	Yes	No
11	Internal-storage-drive cable	No	Yes
12	Removable battery	Yes	No
13	Base cover assembly	Yes	No
14	Lenovo factory recovery USB key*	No	No
15	Lenovo recovery disc set*	No	No
16	Power cord	Yes	No
17	ac power adapter	Yes	No
18	Smart-card reader (available on some models)	No	No
19	Flexible printed circuits (FPC) for smart-card reader (available on some models)	No	No
20	Built-in battery	No	No
21	Coin-cell battery	No	No
22	Memory module	Yes	No
23	Thermal fan assembly	No	No
24	FPC for trackpad (with or without fingerprint reader)	No	No
25	dc-in cable assembly	No	Yes
26	Keyboard	No	No
27	TrackPoint cap	No	No
a–e	Miscellaneous parts (see “Miscellaneous parts” on page 51)	No	No

Note: The Lenovo factory recovery USB key 14 and the Lenovo recovery disc set 15 are used to restore the Microsoft Windows operating system. They might not come with the computer, and a user might order them from http://www.lenovo.com/lenovorecovery, though additional shipping and handling fees might apply.

LCD FRUs



No.	FRU descriptions	Self-service CRU	Optional-service CRU
1	LCD bezel	No	No
2	Camera/microphone module	No	No
3	Camera cable	No	No
4a	Wireless-LAN/WAN antenna assembly (with the wireless-WAN antenna assembly available on some models)[1]	No	No
4b	Wireless-LAN/WiGig antenna assembly[1]	No	No

No.	FRU descriptions	Self-service CRU	Optional-service CRU
5	LCD rear-cover assembly	No	No
6	LCD cable	No	No
7	LCD panel	No	No
8	LCD hinges	No	No

[1]: The wireless-LAN/WAN antenna assembly is available on computer models with the wireless-LAN feature or wireless-LAN/WAN feature; and the wireless-LAN/WiGig antenna assembly is available on computer models with the wireless-LAN feature and WiGig feature.

Miscellaneous parts

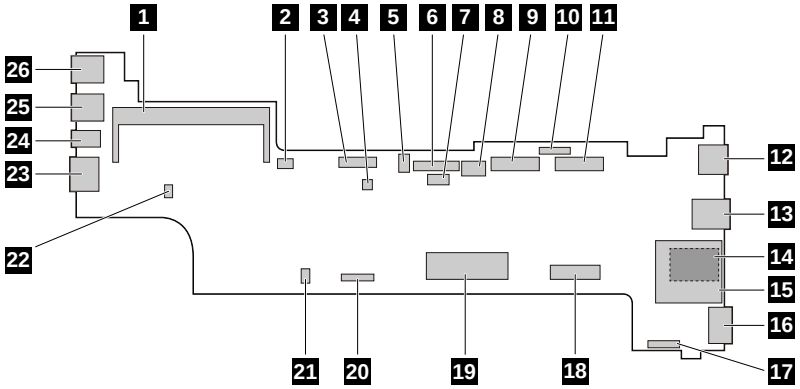
FRU descriptions	Self-service CRU	Optional-service CRU
System miscellaneous kit: • b Antenna cable guide • c Bracket for the internal-storage-drive cable • Microphone rubber for camera model • Microphone rubber for non-camera model	No	No
Screw and tape kit: • Screw for hinges, M2.5*L2.2 (8) • Screw, M2*L2 (4) • Screw, M2*L2.7 (24) • Screw, M2.5*4, flat head (4) • Screw, M2*L4 (18) • Step screw, M2*L2.3 (8) • Screw, M2.5*L4, flat head (4) • Screw, M2*L3.2 (4) • Screw, M2*L3.5, silver, small head (18) • Illustration sheet for antenna • Tape for fixing cable	No	No
a Hinge bracket (available in the keyboard bezel assembly kit)	No	No
d Smart-card-reader bracket (available in the keyboard bezel assembly kit)	No	No
e dc-in bracket (available in the keyboard bezel assembly kit)	No	No

Connector and cable guide

This section provides information to help Lenovo-authorized service technicians identify connectors and cables for replacement purpose. To view each FRU and the exploded illustration of the computer, see “Major FRUs” on page 48 and “LCD FRUs” on page 50.

Note: Depending on the computer model, some connectors or cables might not be available.

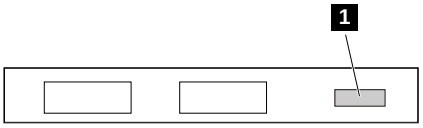
System board connectors and cables



No.	Connector/location	Internal cable
1	Memory module slot (internal)	None, with the memory module directly connecting to the system board
2	Coin-cell battery connector (internal)	Coin-cell battery with cable
3 6	Keyboard connectors (internal)	Keyboard assembly with cables
4	Smart-card-reader connector (internal)	FPC for smart-card reader, connecting the smart-card reader to the system board
5	Speaker connector (internal)	Speaker assembly with cable
7	Trackpad connector (internal)	FPC for trackpad, connecting the trackpad to the system board
8	Built-in-battery connector (internal)	Built-in battery assembly with cable
9	Wireless-LAN card or WiGig module slot (internal)	None, with the wireless-LAN card or WiGig module directly connecting to the system board
10	Internal-storage-drive connector (internal)	Internal-storage-drive cable, connecting the internal storage drive to the system board
11	Wireless-WAN card slot (internal)	None, with the wireless-WAN card directly connecting to the system board
12	Audio connector (right side)	None. Integrated.
13	Always On USB 3.0 connector (right side)	None. Integrated.
14	Micro-SIM-card reader (right side)	None. Integrated.
15	Media-card reader (right side)	None. Integrated.
16	Ethernet connector (right side)	None. Integrated.
17	Camera/microphone module connector (internal)	Camera cable, connecting the camera/microphone module, the power-button card, and the ThinkPad logo LED (on the A-cover) to the system board
18	Removable-battery connector (internal)	None, with the removable battery directly connecting to the system board
19	Docking station connector (bottom)	None. Integrated.
20	LCD connector (internal)	LCD cable, connecting the LCD unit to the system board

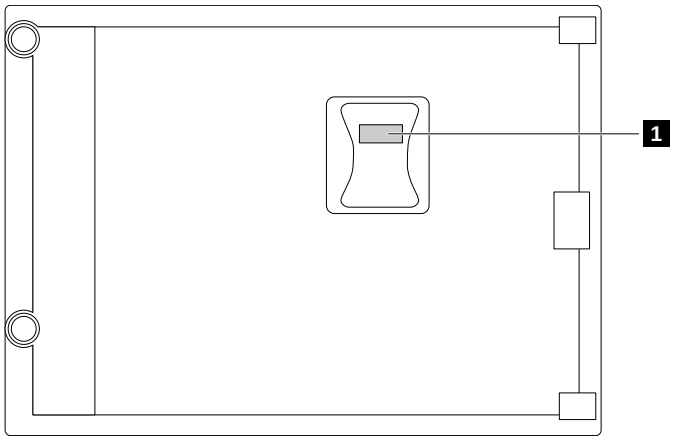
No.	Connector/location	Internal cable
21	ac power connector (left side)	None. Integrated.
22	Thermal fan connector (internal)	Thermal fan assembly with cable
23	HDMI connector (left side)	None. Integrated.
24	Mini DisplayPort connector (left side)	None. Integrated.
25 26	USB 3.0 connectors (left side)	None. Integrated.

Camera/microphone module connector and cable



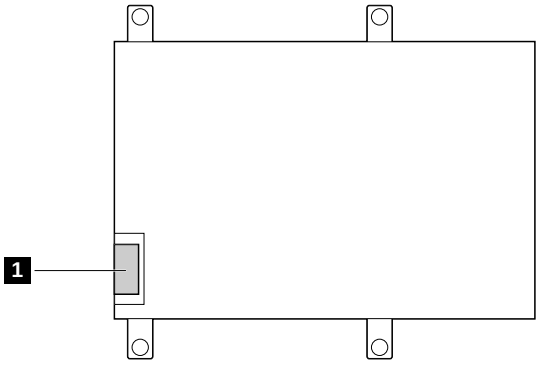
No.	Connector/location	Internal cable
1	Camera/microphone module connector (internal)	Camera cable, connecting the camera/microphone module, the power-button card, and the ThinkPad logo LED (on the A-cover) to the system board

Keyboard bezel assembly connector and cable



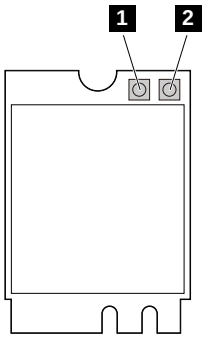
No.	Connector/location	Internal cable
1	Trackpad connector (internal)	FPC for trackpad, connecting the trackpad to the system board

Smart-card reader connector and cable



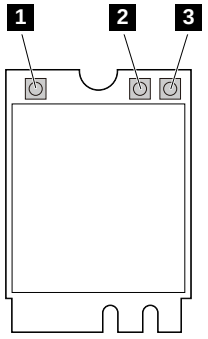
No.	Connector/location	Internal cable
1	Smart-card reader connector (internal)	FPC for smart-card reader, connecting the smart-card reader to the system board

Wireless-LAN card connectors and cables



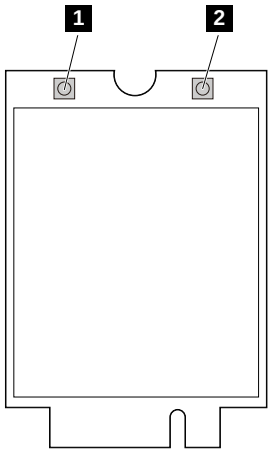
No.	Connector/location	Internal cable
1	Wireless-LAN antenna connector (internal)	Wireless-LAN antenna assembly with cable (gray), connecting the main wireless-LAN antenna to the wireless-LAN card
2	Wireless-LAN antenna connector (internal)	Wireless-LAN antenna assembly with cable (black), connecting the auxiliary wireless-LAN antenna to the wireless-LAN card

WiGig module connectors and cables



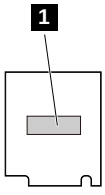
No.	Connector/location	Internal cable
1	WiGig antenna connector (internal)	WiGig antenna assembly with cable (white), connecting the WiGig antenna to the WiGig module
2	Wireless-LAN antenna connector (internal)	Wireless-LAN antenna assembly with cable (gray), connecting the main wireless-LAN antenna to the wireless-LAN card
3	Wireless-LAN antenna connector (internal)	Wireless-LAN antenna assembly with cable (black), connecting the auxiliary wireless-LAN antenna to the wireless-LAN card

Wireless-WAN card connectors and cables



No.	Connector/location	Internal cable
1	Wireless-WAN antenna connector (internal)	Wireless-WAN antenna assembly with cable (orange), connecting the main wireless-WAN antenna to the wireless-WAN card
2	Wireless-WAN antenna connector (internal)	Wireless-WAN antenna assembly with cable (blue), connecting the auxiliary wireless-WAN antenna to the wireless-WAN card

Power-button card connector and cable



No.	Connector/location	Internal cable
1	Power-button card connector (internal)	Camera cable, connecting the power-button card to the system board, the ThinkPad logo LED (on the A-cover), and the camera/microphone module

Looking up FRU information

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

Chapter 8. FRU replacement notices

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

CRU statement for customers:
You can resolve some problems with your product with a replacement part you can install yourself, called a "Customer Replaceable Unit" or "CRU." Some CRUs are designated as self-service CRUs and others are designated as optional-service CRUs. *Installation of self-service CRUs is your responsibility. For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider install the CRU according to the warranty service for your product.* If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. You can find a list of CRUs for your product in this *Hardware Maintenance Manual*. An electronic version of this manual can be found at http://www.lenovo.com/support. Click **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.

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:

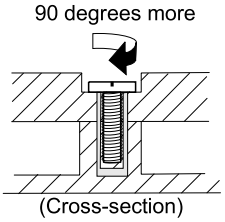
- They maintain tight connections.
- They do not easily come loose, even with shock or vibration.
- They are harder to tighten.

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.

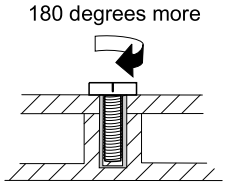
Tighten screws as follows:

- **Plastic to plastic**
  Turn an additional 90 degrees after the screw head touches the surface of the plastic part.



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

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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 58
- "Retaining the UUID" on page 59

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** and press Enter. The ThinkPad Serial Number Update Utility for Asset ID screen is displayed.
6. Type 2 under **Enter the action desired** and press Enter. The serial number of each device in your computer is displayed; the serial number of the system unit is listed as follows:
   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** and press Enter. The ThinkPad Serial Number Update Utility for Asset ID screen is displayed.
4. Type 1 under **Enter the action desired** and 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** and press Enter. The Auto UUID generation utility interface is displayed.
6. Type y under **Change UUID. OK? [Y/N]** and 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) is 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 LENOVO ThinkPad Hardware Maintenance Diskette or Maintenance Key.

1. Insert the latest version of LENOVO ThinkPad Hardware Maintenance Diskette or Maintenance Key, and then 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. 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 latest version of LENOVO ThinkPad Hardware Maintenance Diskette or 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 latest version of LENOVO ThinkPad Hardware Maintenance Diskette or Maintenance Key, and then 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. 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 9. Removing or replacing a FRU

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

CRU statement for customers:
You can resolve some problems with your product with a replacement part you can install yourself, called a "Customer Replaceable Unit" or "CRU." Some CRUs are designated as self-service CRUs and others are designated as optional-service CRUs. *Installation of self-service CRUs is your responsibility. For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider install the CRU according to the warranty service for your product.* If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. You can find a list of CRUs for your product in this *Hardware Maintenance Manual*. An electronic version of this manual 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 8 "FRU replacement notices" on page 57.
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, remove the battery, and then disconnect any interconnecting cables.

Attention:

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

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Before servicing the computer

Carefully read this topic before servicing the computer.

Disabling the built-in battery

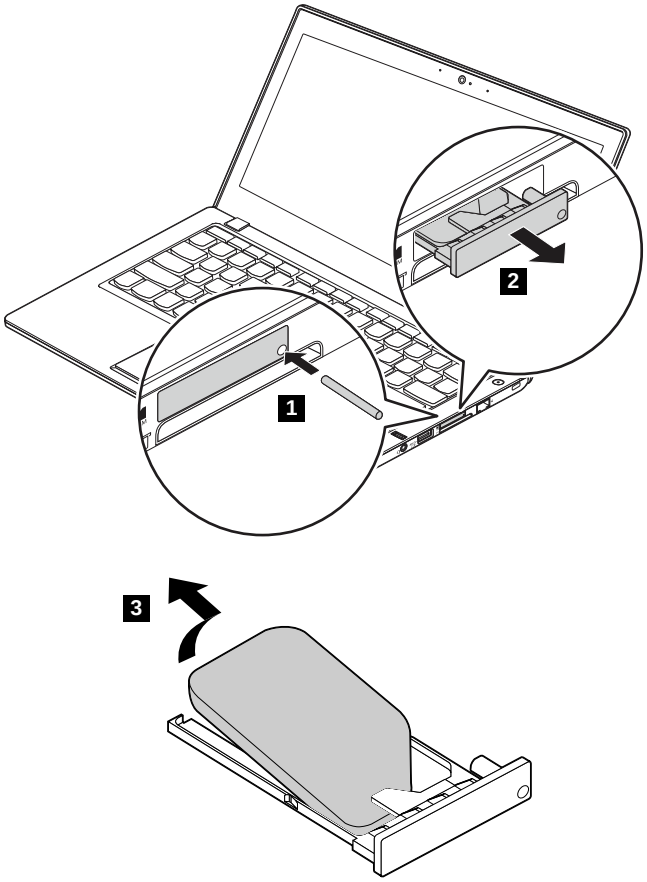
Before replacing any FRU, ensure that you have disabled the built-in battery by doing the following:

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

The battery will be automatically enabled when the ac power adapter is reconnected to the computer.

Removing the micro-SIM-card tray

Before you start the servicing, remove installed micro-SIM card (or dummy micro-SIM card) and the micro-SIM-card tray from the computer.



After you finish the servicing, ensure that you install the micro-SIM-card tray with the micro-SIM card back into the computer.

1010 Removable battery

Important notice for replacing a removable 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.

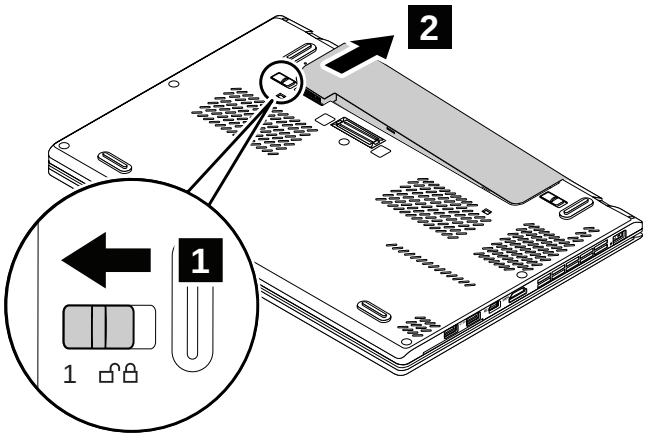
The Lenovo Solution Center program provides an automatic battery diagnostic test that determines if the battery is defective. A battery FRU should not be replaced unless this diagnostic test shows that the battery is defective. The only exception to this is if the battery is physically damaged or a customer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

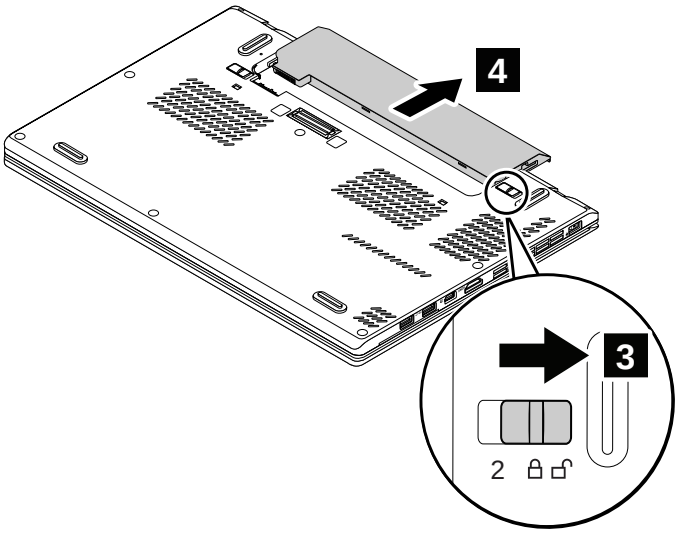
If the Lenovo Solution Center program is not installed on the computer, the customer should download and install the program to diagnose the battery, before getting a non-physically damaged battery replaced. Note that the replacement of a physically damaged battery is not covered by the warranty.

Removal steps of the removable battery

DANGER

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



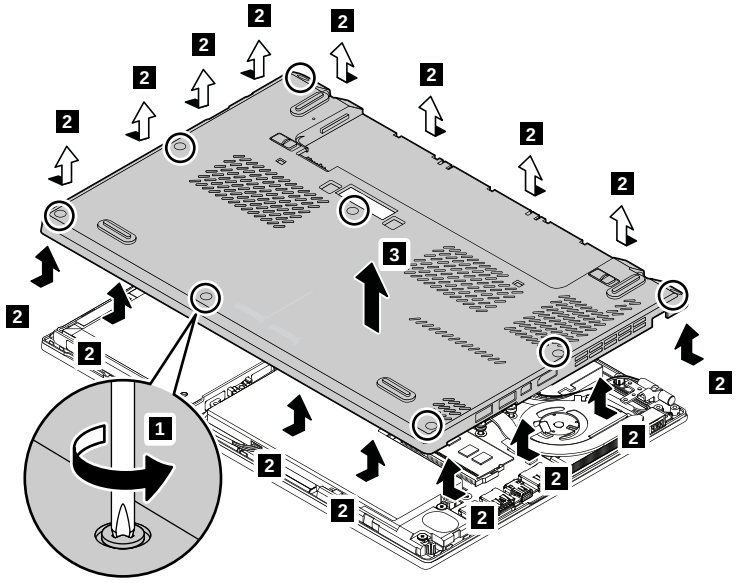


1020 Base cover assembly

For access, remove this FRU:
- “1010 Removable battery” on page 63

Note: Depending on the model, your computer might look slightly different from the illustrations in this topic.

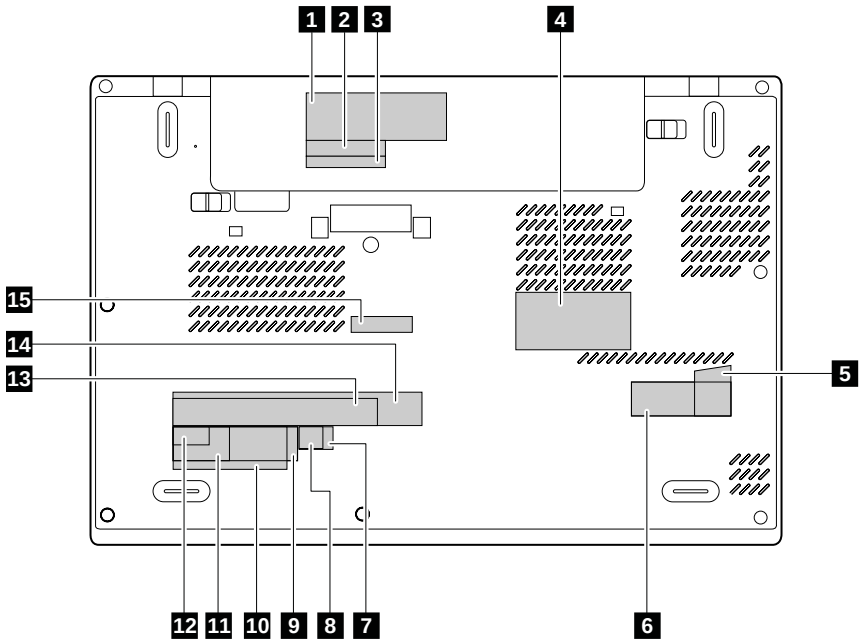
Removal steps of the base cover assembly



Applying labels to the base cover assembly

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

The following illustration shows the location of each label.



1 GEO label

2 S/N label

3 Taiwan WWAN label

4 Asset tag

5 Genuine Microsoft label (for Windows 10)

6 Certificate of Authentication (COA) label (for Windows 7)

7 Indonesia postel label

8 MCMC label for Malaysia

9 Indonesia rating label

10 Israel Homologation label

11 Brazil Anatel label

12 ICASA label

13 BIS label

14 China GEO label

15 IMEI label

1030 Built-in battery

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

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.

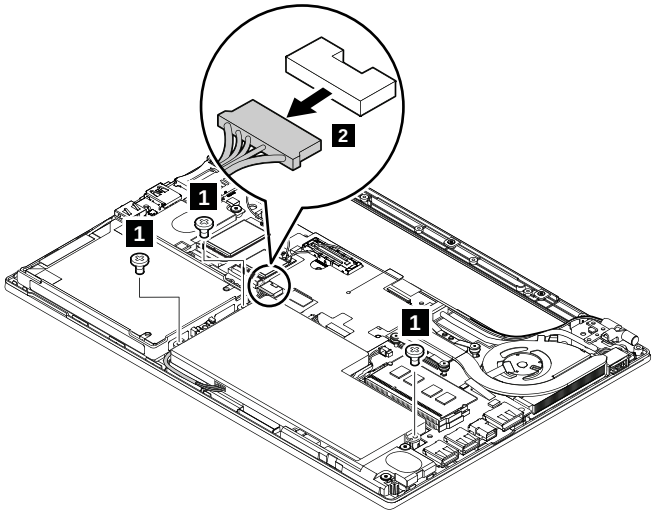
The Lenovo Solution Center program provides an automatic battery diagnostic test that determines if the battery is defective. A battery FRU should not be replaced unless this diagnostic test shows that the battery is defective. The only exception to this is if the battery is physically damaged or a customer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

DANGER

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

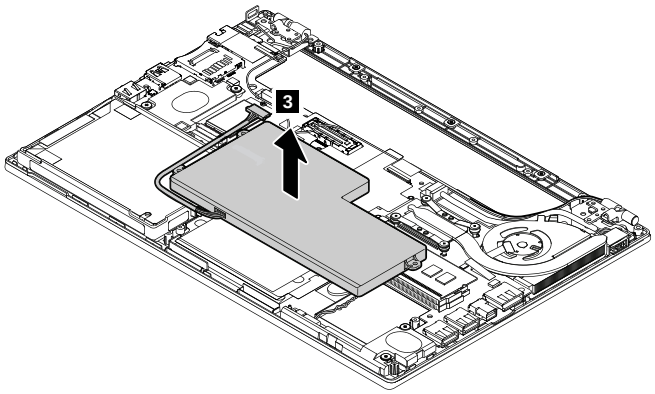
Removal steps of the built-in battery



To disconnect the battery connector in step 2, use one finger to slightly hold the connector. Then use the other hand to hold the battery cable and pull it out horizontally.

Attention: When connecting the battery cable, align the battery cable with the battery connector first. Then insert the battery cable straight into the battery connector horizontally. Otherwise, the battery cable might be damaged.

Step	Screw (quantity)	Color	Torque
1	M2 × 3 mm, small-head, nylon-coated (3)	Silver	0.181 Nm (1.85 kgf-cm)



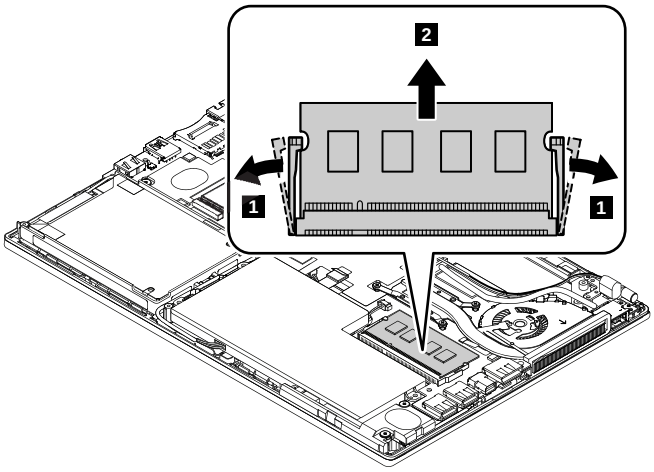
1040 Memory module

For access, remove these FRUs in order:

- “1010 Removable battery” on page 63

- “1020 Base cover assembly” on page 64

Removal steps of the memory module



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

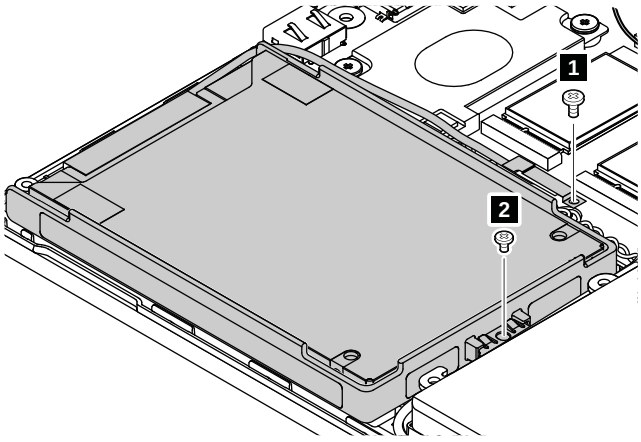
1050 Internal storage drive and drive cable

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

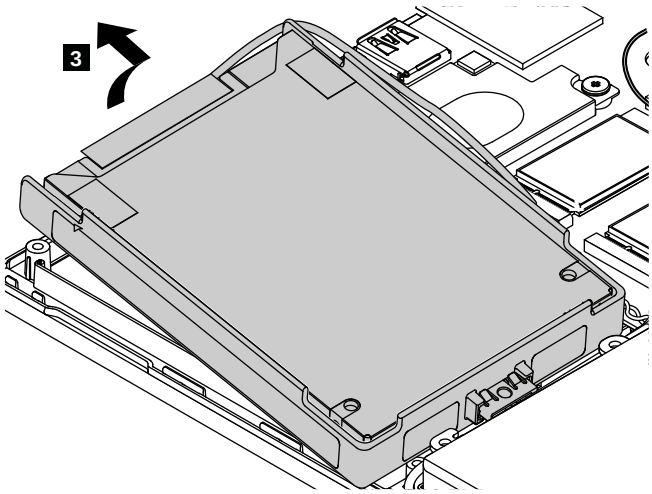
Attention:

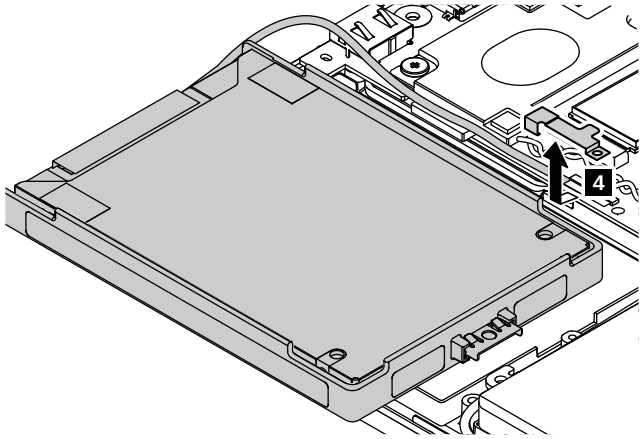
- Do not drop the internal storage drive or apply any physical shock to it. The internal storage drive is sensitive to physical shock. Improper handling can cause damage and permanent loss of data.
- Before removing the internal storage drive, have the user make a backup copy of all the information on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

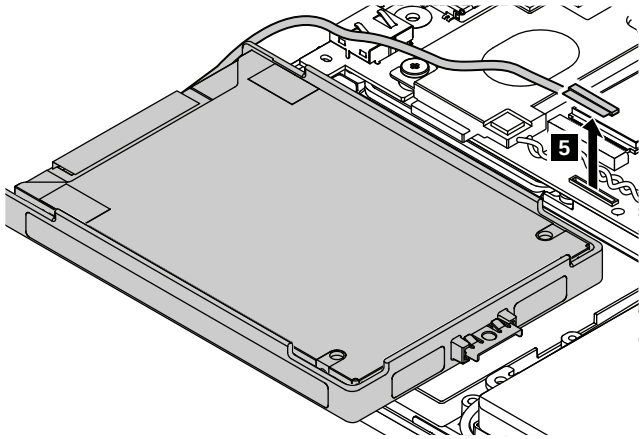
Removal steps of the internal storage drive and drive cable

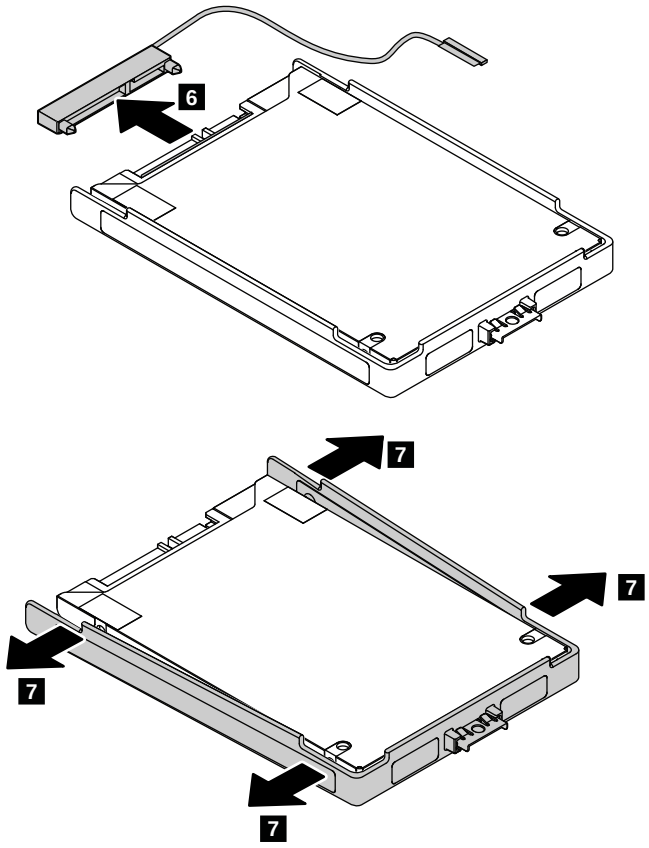


Step	Screw (quantity)	Color	Torque
1	M2 × 4 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)
2	M2 × 2.7 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)









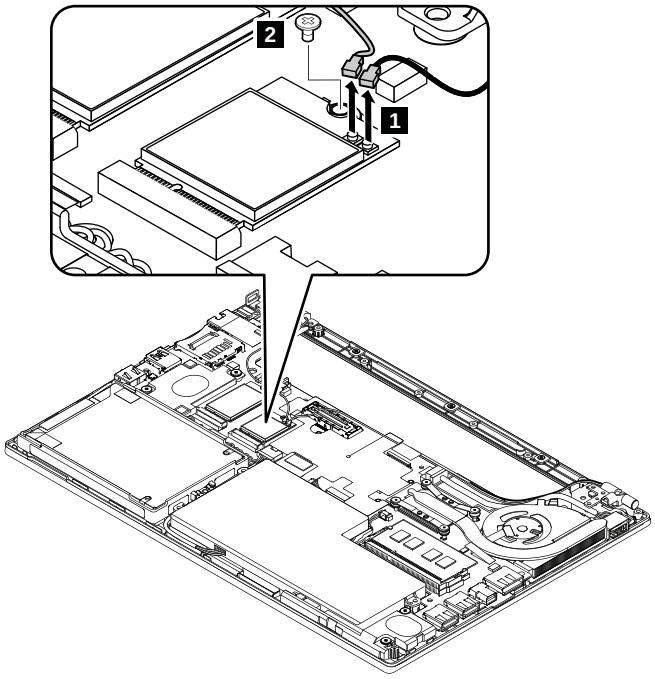
When installing:
Ensure that the internal storage drive is firmly attached.

1060 Wireless-LAN card or WiGig module

For access, remove these FRUs in order:

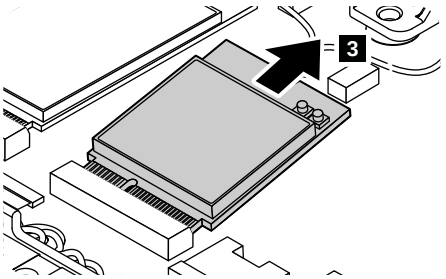
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

Removal steps of the wireless-LAN card



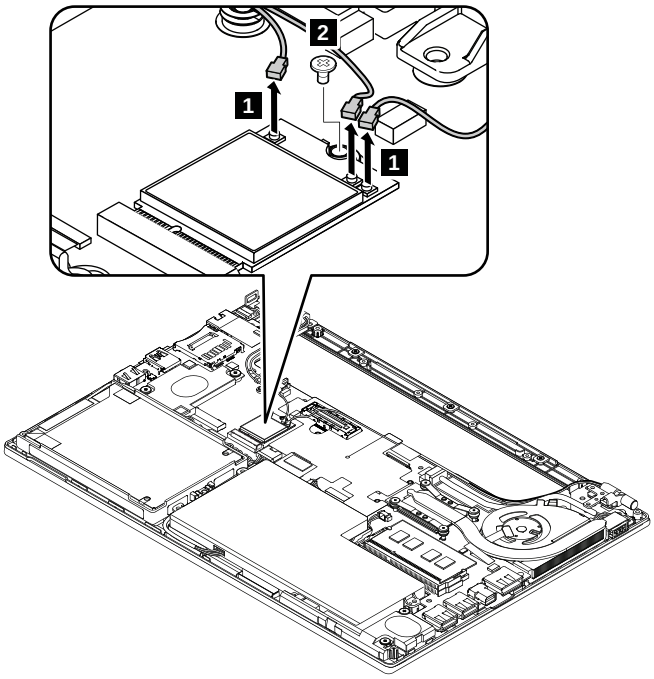
In step 1, disconnect the connectors by using the removal tool for the antenna RF connector or pick off the connectors in the direction as shown by using your fingers.

Step	Screw (quantity)	Color	Torque
2	M2 × 2.7 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)



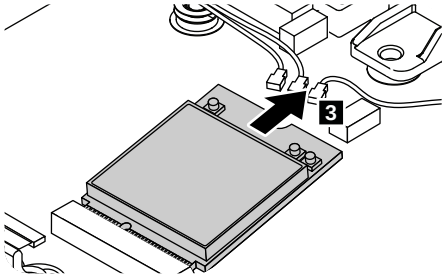
When installing:
Plug the gray cable into the main connector and the black cable into the auxiliary connector on the card.

Removal steps of the WiGig module



In step 1, disconnect the connectors by using the removal tool for the antenna RF connector or pick off the connectors in the direction as shown by using your fingers.

Step	Screw (quantity)	Color	Torque
2	M2 × 2.7 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)

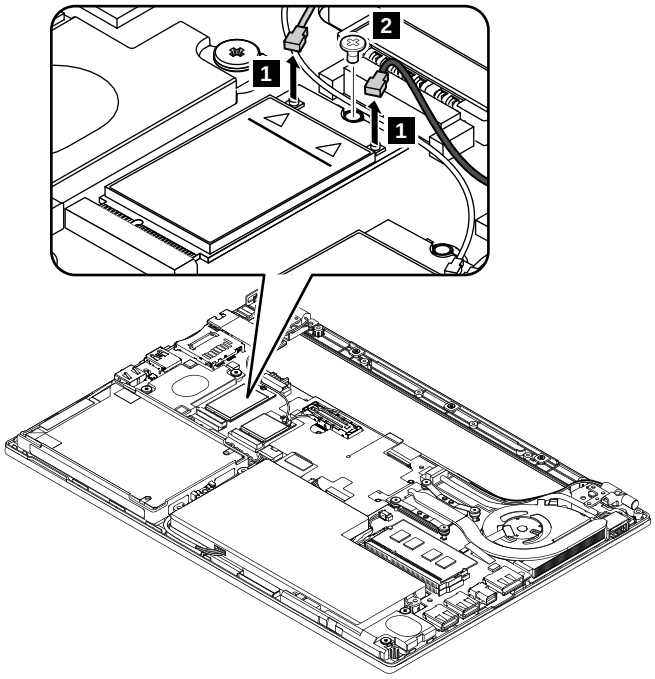


When installing:
Plug the gray cable into the main connector, the black cable into the auxiliary connector, and the white cable into the WiGig connector on the module.

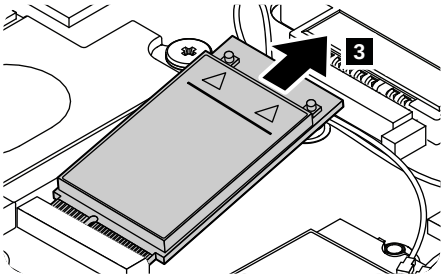
1070 Wireless-WAN card (available on some models)

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

Removal steps of the wireless-WAN card



Step	Screw (quantity)	Color	Torque
2	M2 × 2.7 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)

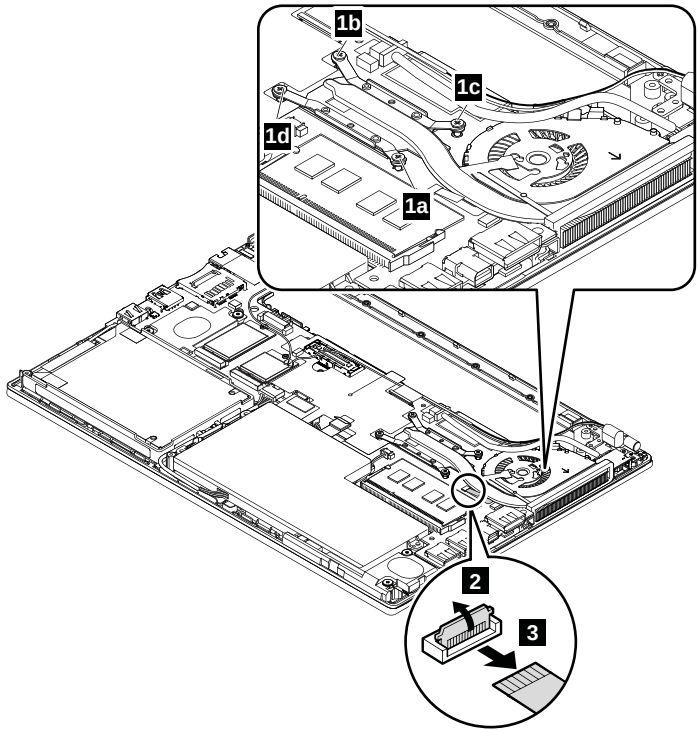


1080 Thermal fan assembly

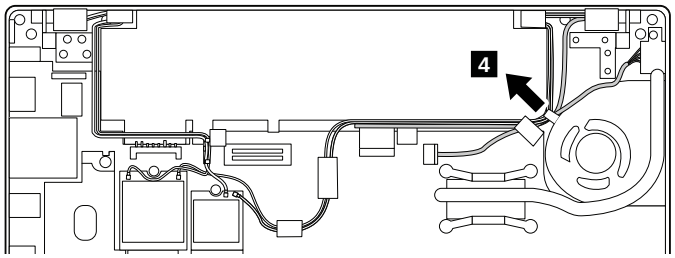
For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

Removal steps of the thermal fan assembly

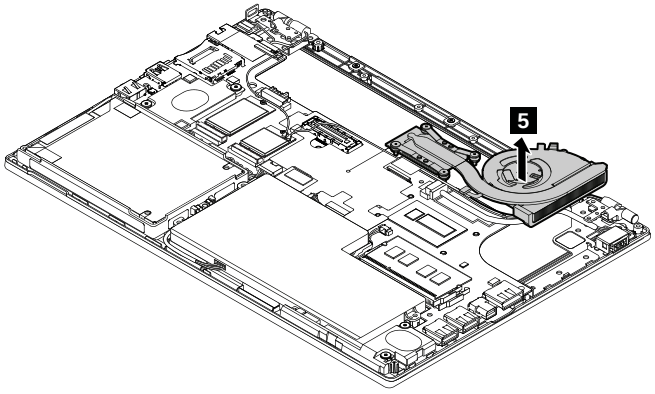
1. Loosen the screws 1 in ascending alphabetical order (a to d) as illustrated.



2. Release the cables from the cable holder on the thermal fan assembly.



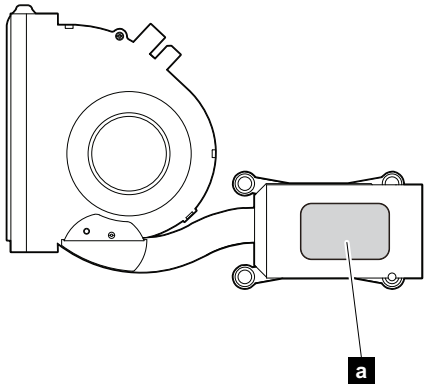
3. Remove the thermal fan assembly.



When installing:

- Always wear fingerstalls when handling the thermal fan assembly. Do not touch or hold any part of the thermal fan assembly with bare fingers.
- Before you attach the thermal fan assembly to the computer, apply thermal grease, at an amount of 0.2 grams, on the part marked a in the following illustration. Either too much or too less application of grease

can cause a thermal problem due to imperfect contact with a component. If a thermal fan assembly needs to be reused, remove and reapply thermal grease.

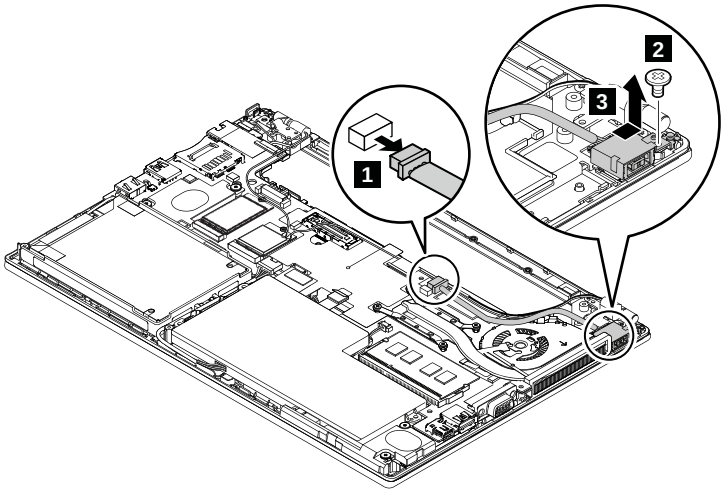


- Do not touch the thermal grease.
- Do not press, touch, or rotate the fan impeller.
- Do not touch the fan inlet hole.
- Do not twist or pull the cable of the thermal fan assembly.
- Do not apply pressure on the top and bottom covers of the thermal fan assembly.
- Do not press the heat pipe. Hold both sides of the heat pipe if you need to take the thermal fan assembly.
- Do not shake or drop the thermal fan assembly.
- Ensure that the fan connector is attached firmly.
- Replace the thermal fan assembly if you observe the following:
  - The cover of the thermal fan assembly is deformed or damaged.
  - There is abnormal noise during rotation.

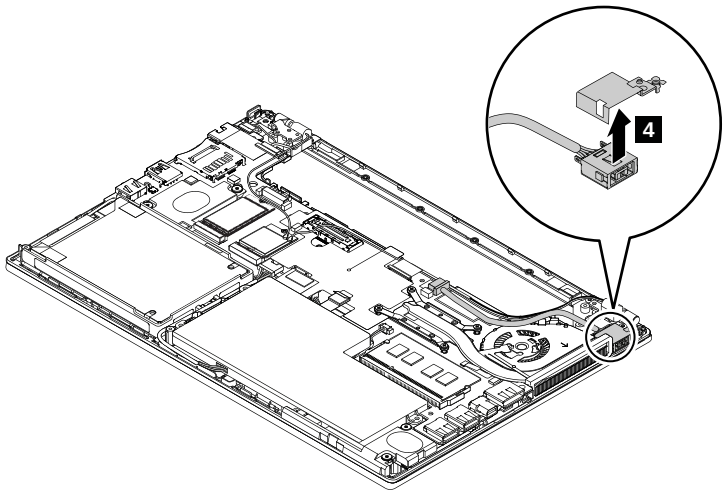
1090 dc-in cable assembly

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

Removal steps of the dc-in cable assembly



Step	Screw (quantity)	Color	Torque
2	M2 × 4 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)



1100 System board

Important notices for handling the system board

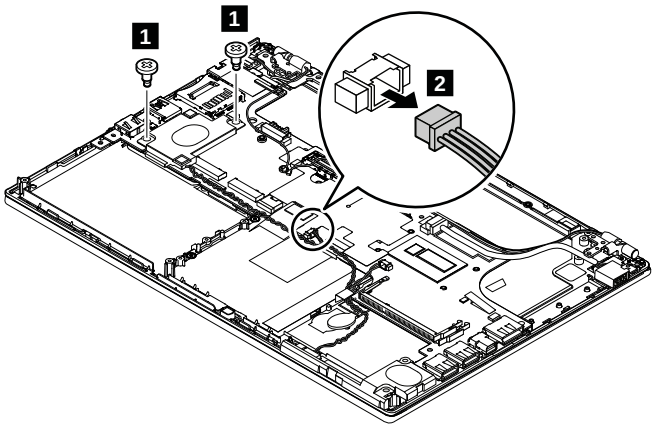
When handling the system board, observe the following:

- The system board has an accelerometer, which can be broken when several thousands of G-forces are applied.

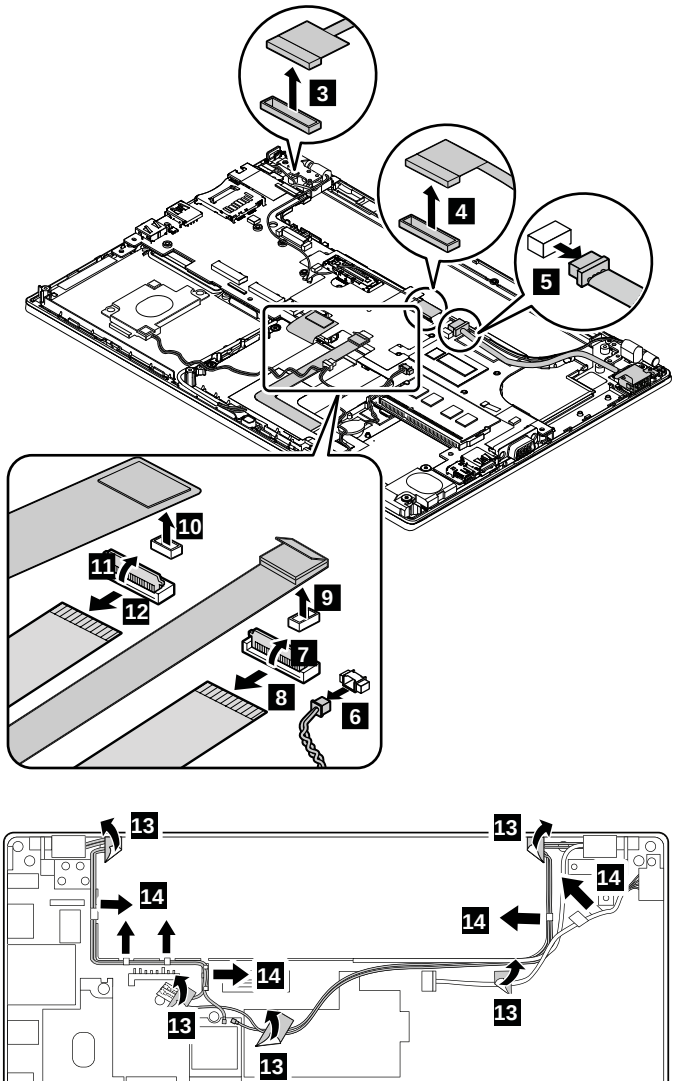
  Note: Dropping a system board from a height of as little as 15 cm (6 inches) so that it falls flat on a hard bench can subject the accelerometer to as much as 6000 G's of shock.
- Be careful not to drop the system board on a bench top that has a hard surface, such as metal, wood, or composite.
- Avoid rough handling of any kind.
- At every point in the process, be sure not to drop or stack the system board.
- If you put a system board down, be sure to put it only on a padded surface such as an ESD mat or a corrugated conductive material.

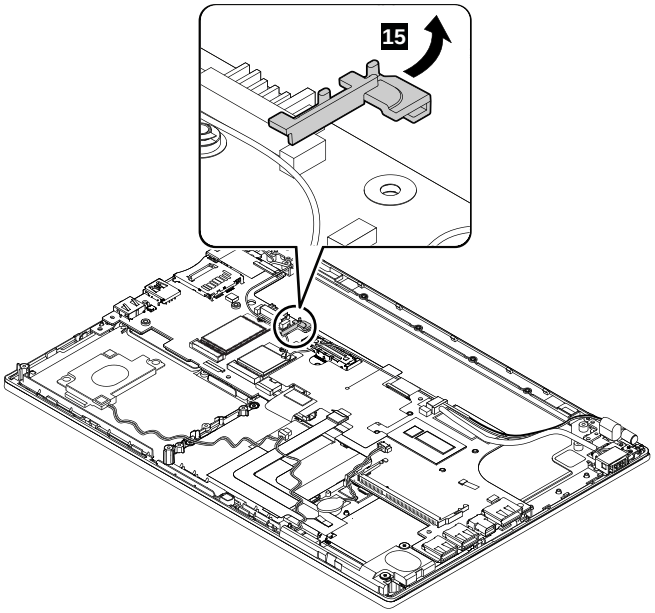
For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72

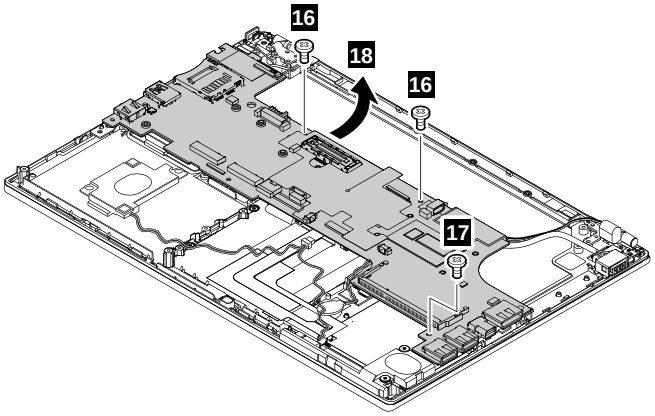
Removal steps of the system board



Step	Screw (quantity)	Color	Torque
1	M2 × 2.3 mm, big head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)





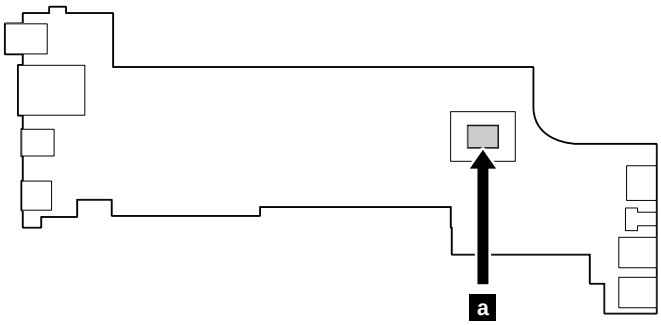


Step	Screw (quantity)	Color	Torque
16	M2 × 4 mm, flat-head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)
17	M2 × 3 mm, flat-head, nylon-coated (1)	Black	0.181 Nm (1.85 kgf-cm)

When installing:
Ensure that the connectors are attached firmly.

The following component soldered on the top side of the system board is extremely sensitive. When you service the system board, avoid any kind of rough handling.

a Microprocessor



1110 Coin-cell battery

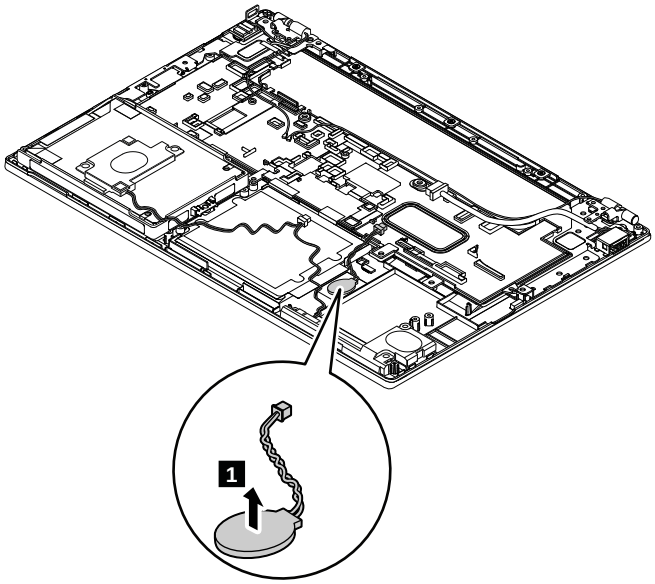
For access, remove these FRUs in order:

- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72
- “1100 System board” on page 75

DANGER

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

Removal steps of the coin-cell battery

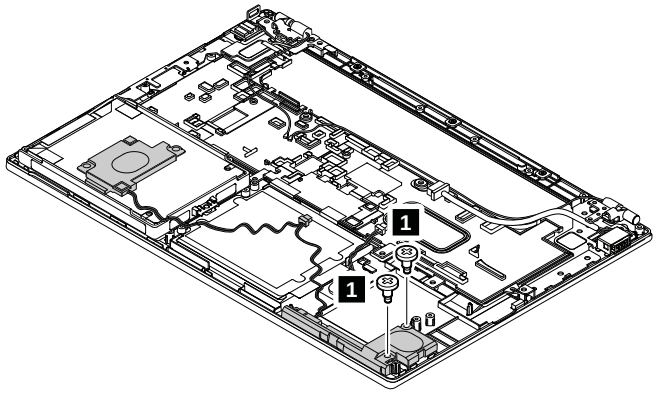


When installing:
Ensure that the coin-cell battery connector is attached firmly.

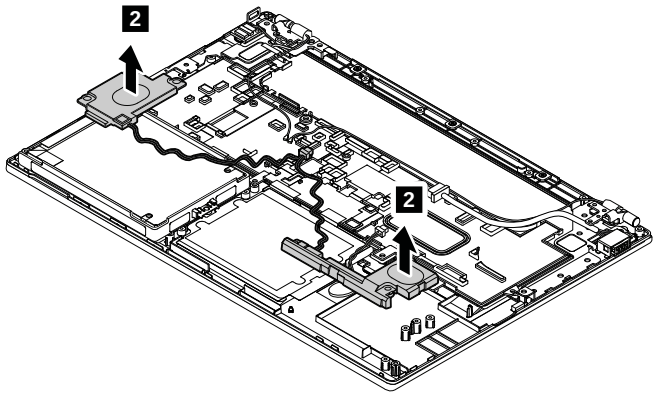
1120 Speaker assembly

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72
- “1100 System board” on page 75

Removal steps of the speaker assembly



Step	Screw (quantity)	Color	Torque
1	M2 × 2.3 mm, big head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)



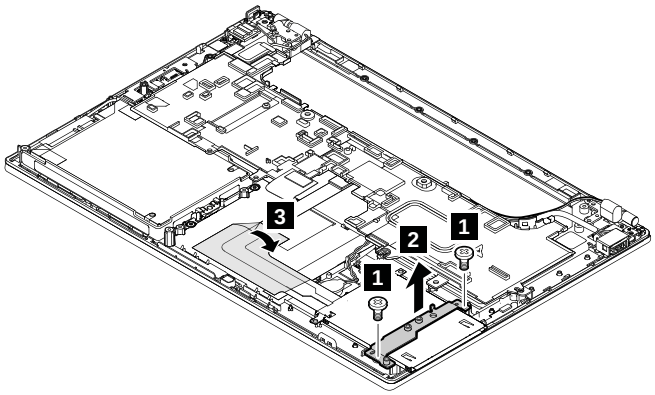
When installing:
Ensure that the connector is attached firmly.

1130 Smart-card reader assembly (available on some models)

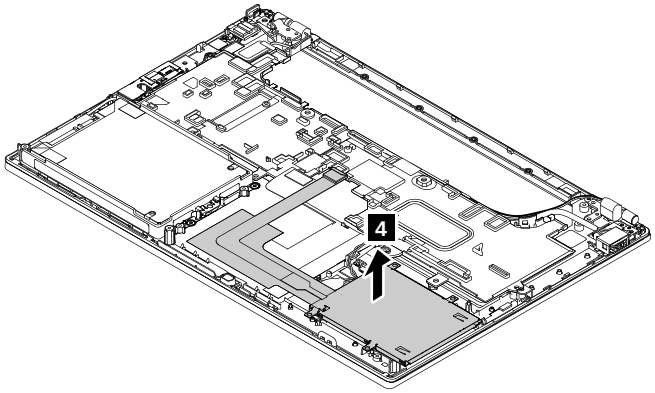
For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

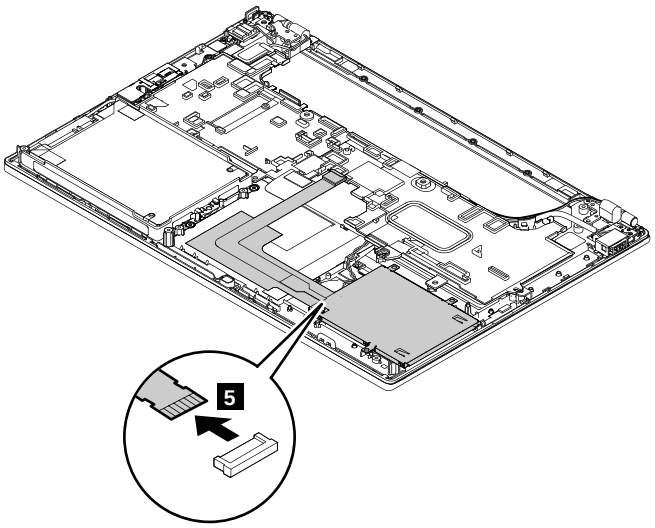
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72
- “1100 System board” on page 75
- “1120 Speaker assembly” on page 79

Removal steps of the smart-card reader assembly



Step	Screw (quantity)	Color	Torque
1	M2 × 3 mm, flat-head, nylon-coated (2)	Silver	0.181 Nm (1.85 kgf-cm)



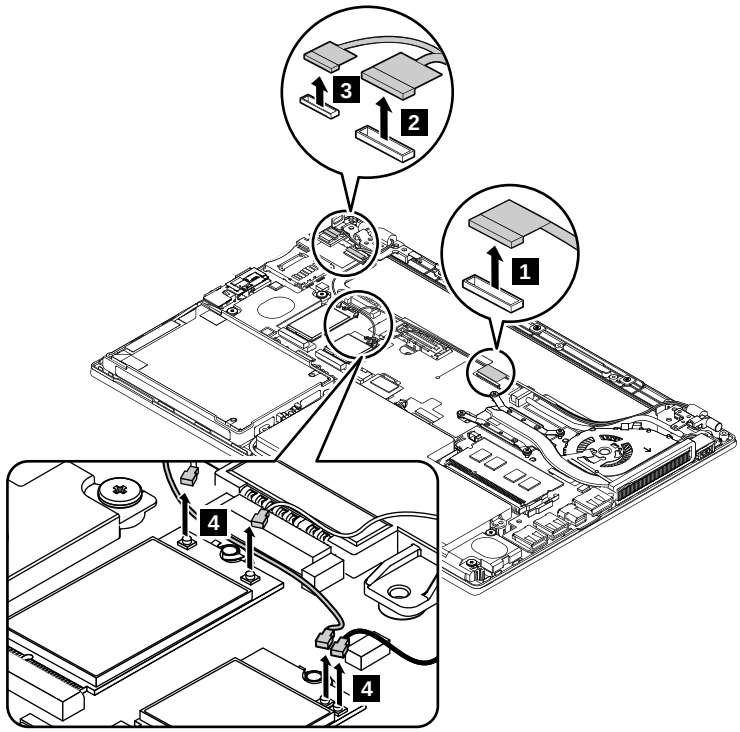


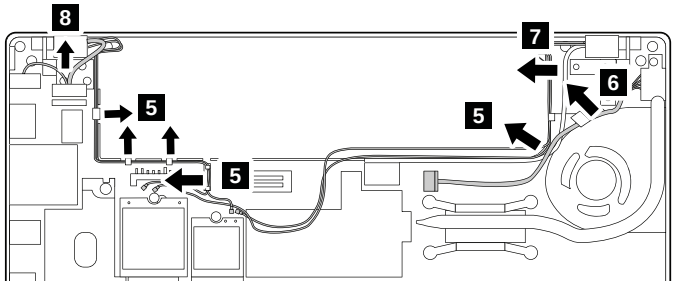
When installing:
Ensure that the connector is attached firmly.

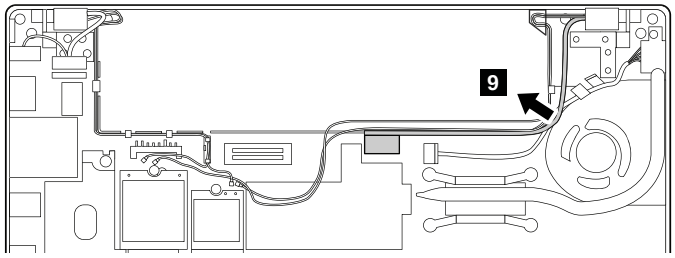
1140 LCD unit

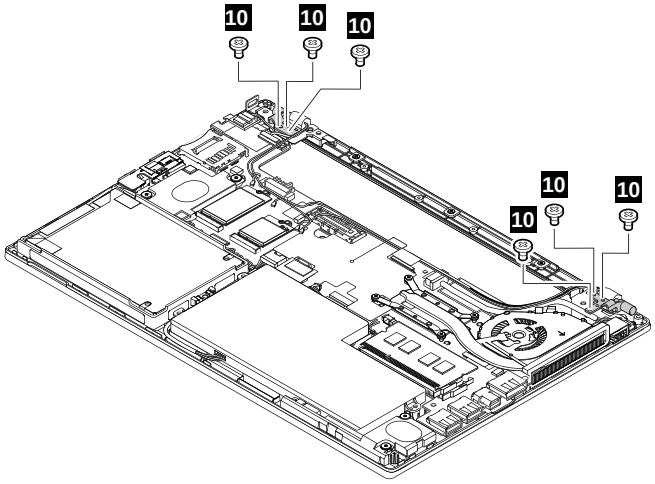
For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64

Removal steps of the LCD unit

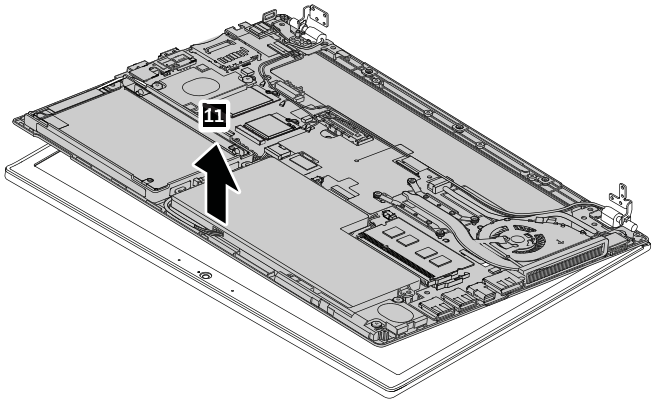


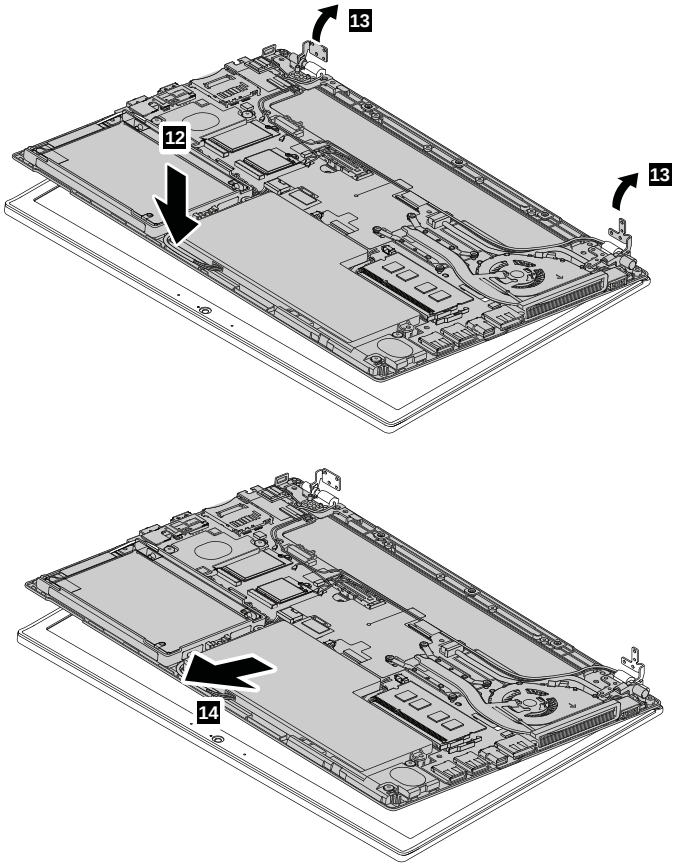






Step	Screw (quantity)	Color	Torque
10	M2 × 4 mm, flat-head, nylon-coated (6)	Silver	0.181 Nm (1.85 kgf-cm)





When installing:

- Ensure that the connectors are attached firmly.
- Ensure that you correctly route and secure the cables.

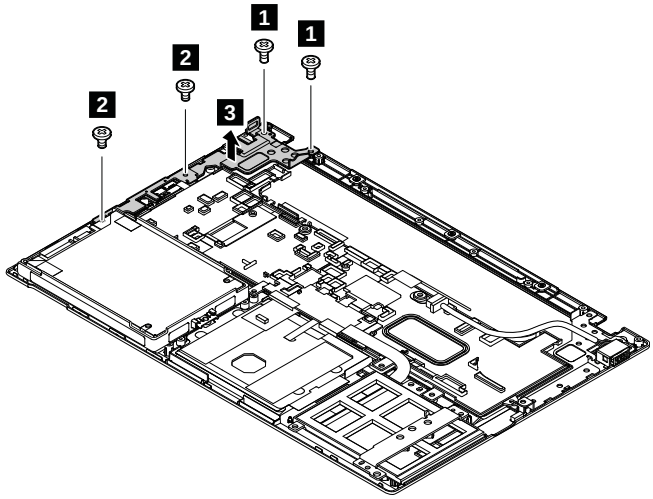
Attention: When you route the cables, ensure that they are not subject to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.

1150 Power-button card

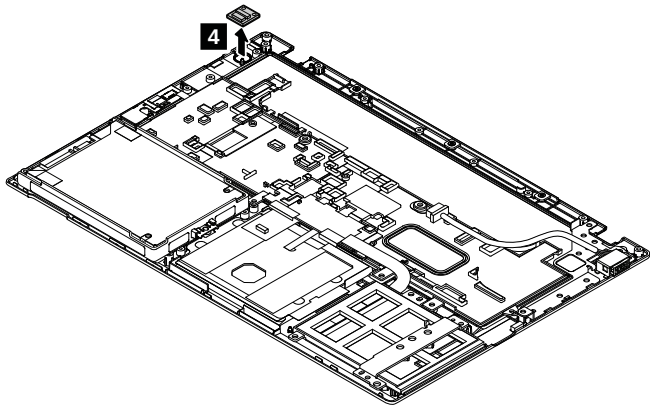
For access, remove these FRUs in order:

- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72
- “1100 System board” on page 75

Removal steps of the power-button card



Step	Screw (quantity)	Color	Torque
1	M2.5 × 4 mm, flat-head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)
2	M2 × 2.7 mm, flat-head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)



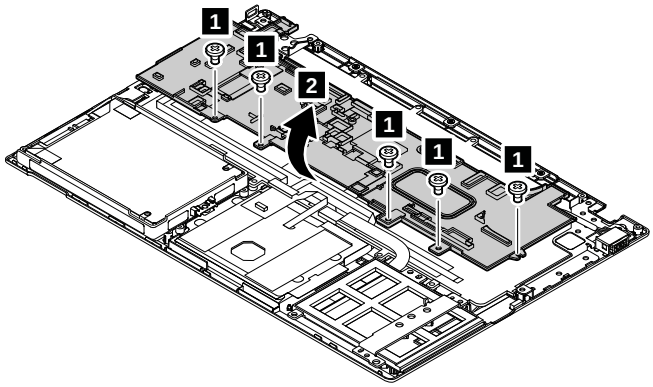
When installing:
Ensure that the connector is attached firmly.

1160 Keyboard assembly

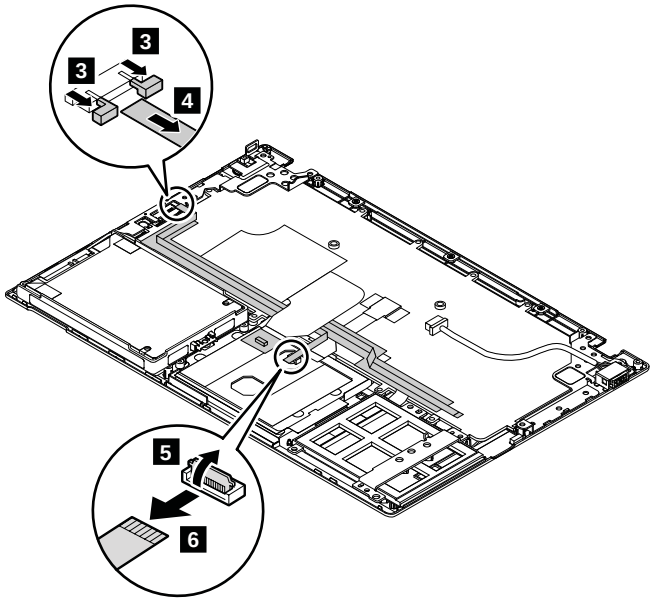
For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1030 Built-in battery” on page 65
- “1040 Memory module” on page 66
- “1050 Internal storage drive and drive cable” on page 67
- “1060 Wireless-LAN card or WiGig module” on page 69
- “1070 Wireless-WAN card (available on some models)” on page 71
- “1080 Thermal fan assembly” on page 72
- “1100 System board” on page 75

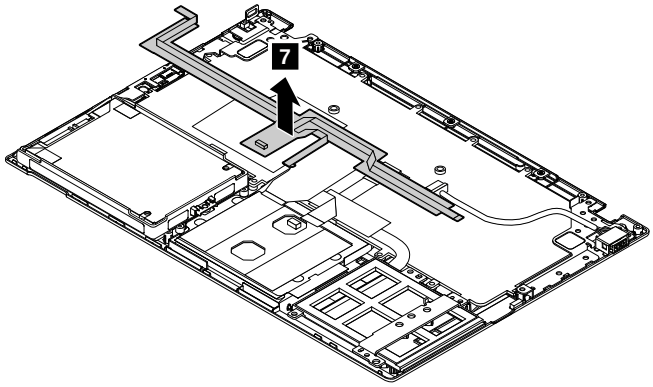
- “1110 Coin-cell battery” on page 78
- “1120 Speaker assembly” on page 79
- “1140 LCD unit” on page 81

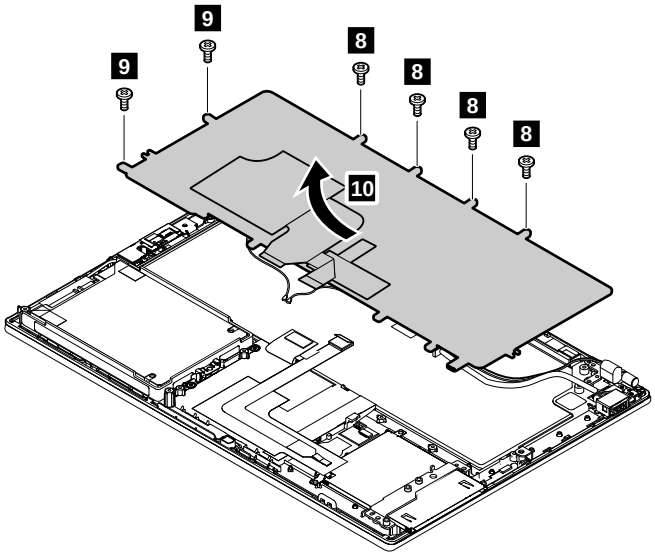
Removal steps of the keyboard assembly



Step	Screw (quantity)	Color	Torque
1	M2 × 4 mm, flat-head, nylon-coated (5)	Black	0.181 Nm (1.85 kgf-cm)







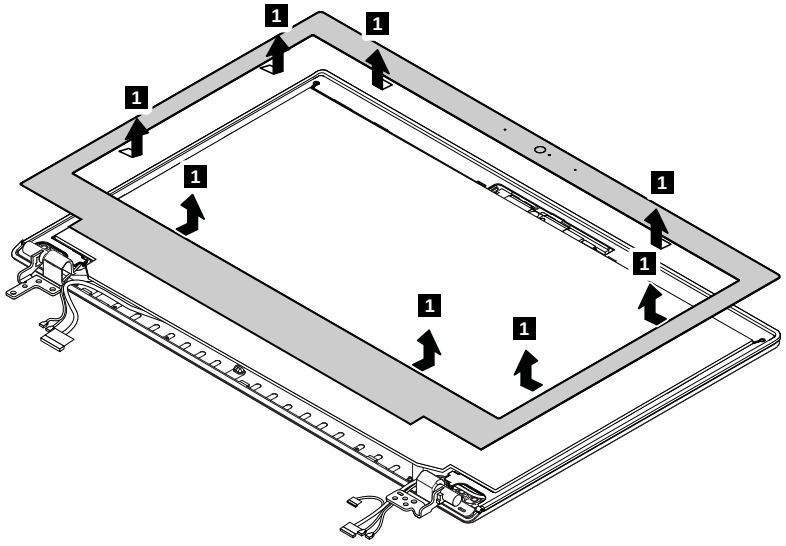
Step	Screw (quantity)	Color	Torque
8	M2 × 2.7 mm, flat-head, nylon-coated (4)	Black	0.181 Nm (1.85 kgf-cm)
9	M2 × 3 mm, flat-head, nylon-coated (2)	Black	0.181 Nm (1.85 kgf-cm)

2010 LCD bezel

For access, remove these FRUs in order:

- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1140 LCD unit” on page 81

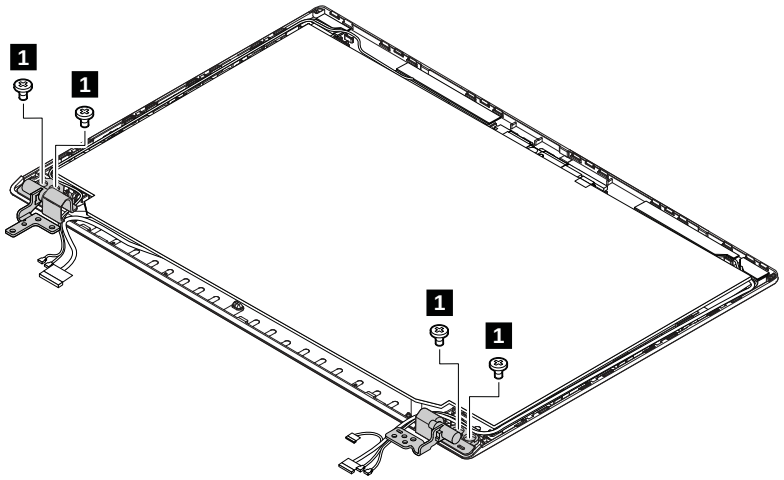
Removal steps of the LCD bezel



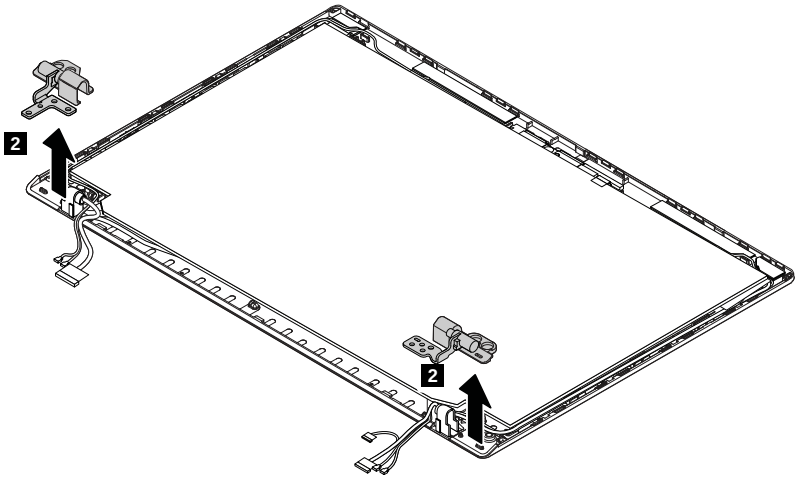
2020 LCD hinges, LCD panel, and LCD cable

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1140 LCD unit” on page 81
- “2010 LCD bezel” on page 86

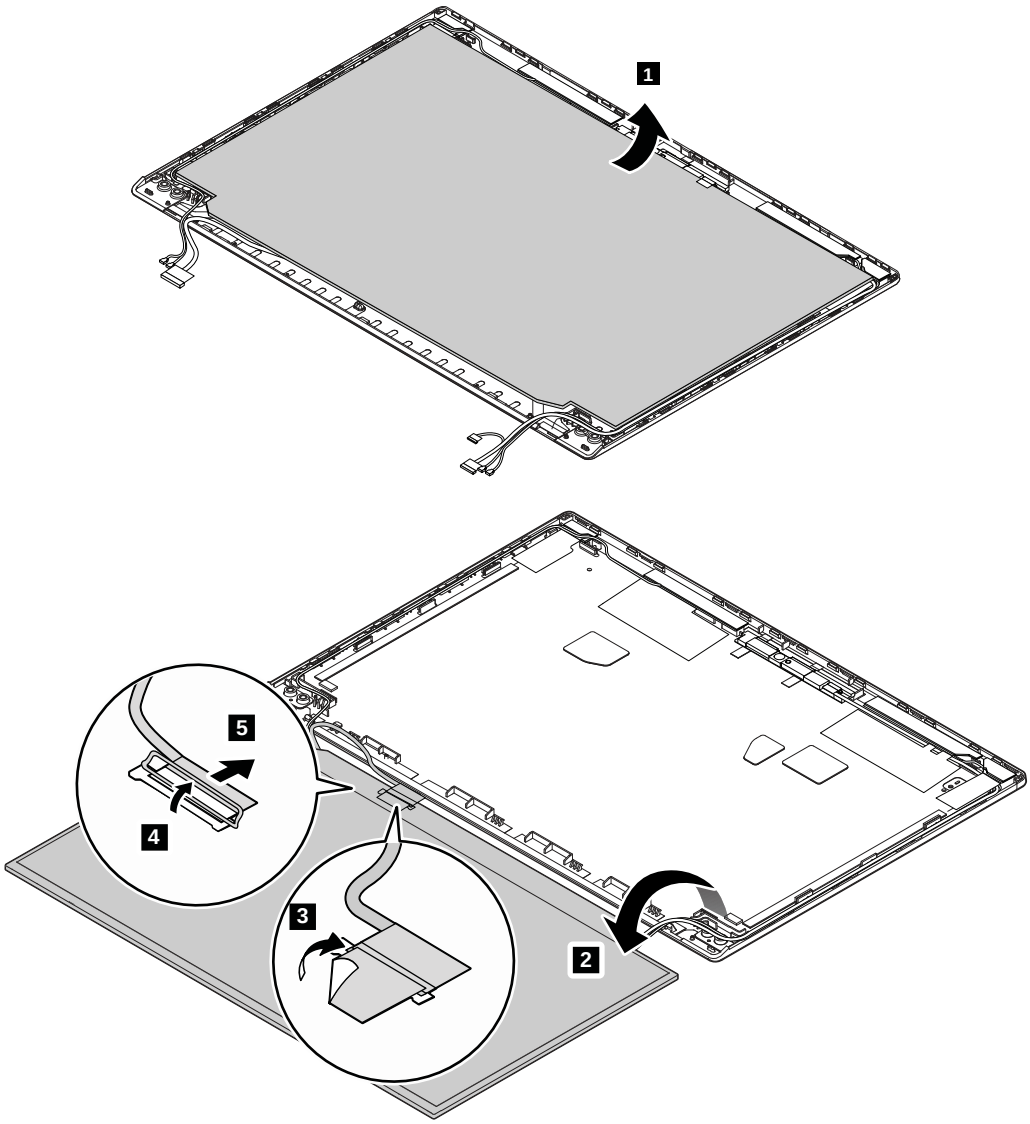
Removal steps of the LCD hinges



Step	Screw (quantity)	Color	Torque
1	M2.5 × 2.2 mm, big-head, nylon-coated (4)	Black	0.181 Nm (1.85 kgf-cm)



Removal steps of the LCD panel and LCD cable

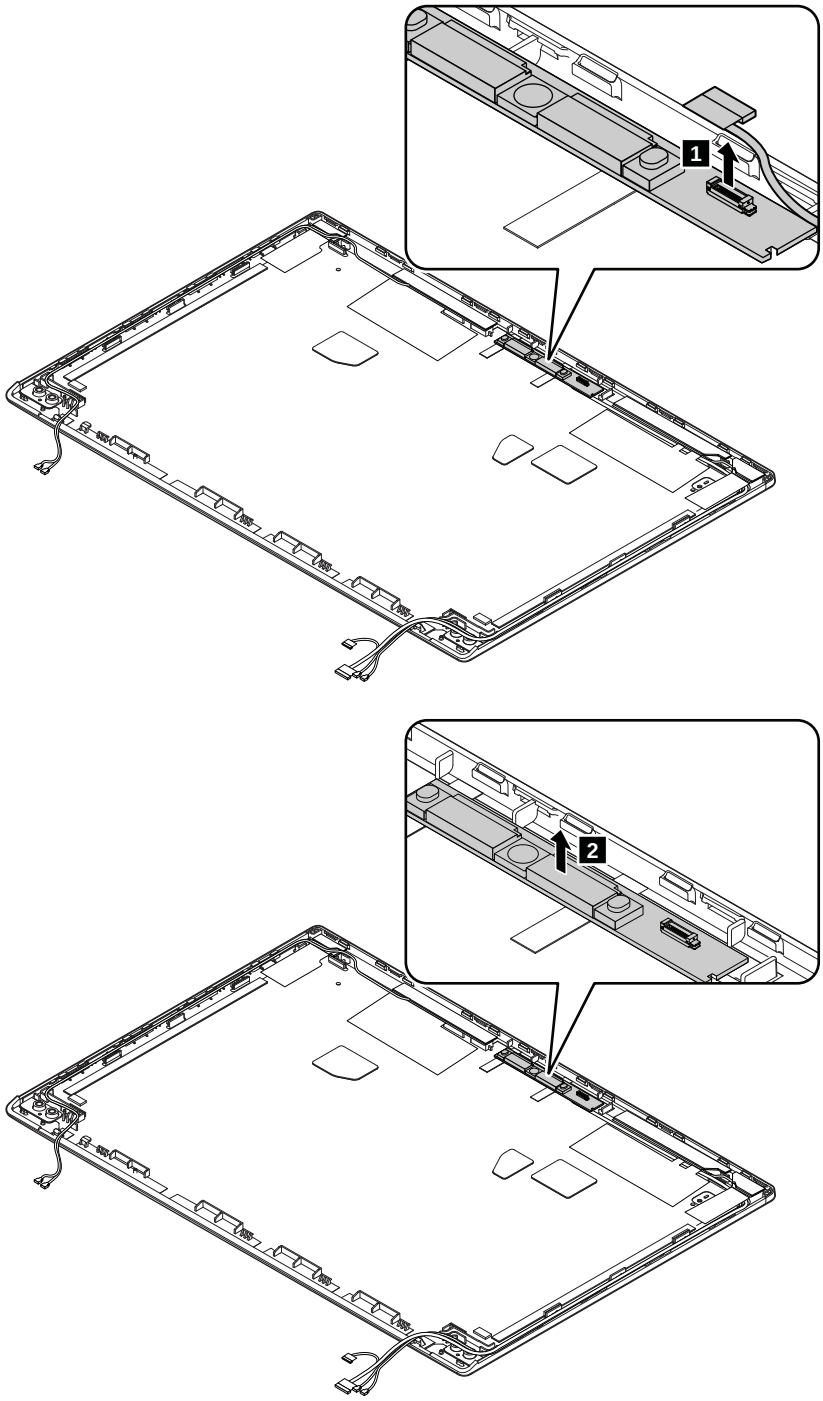


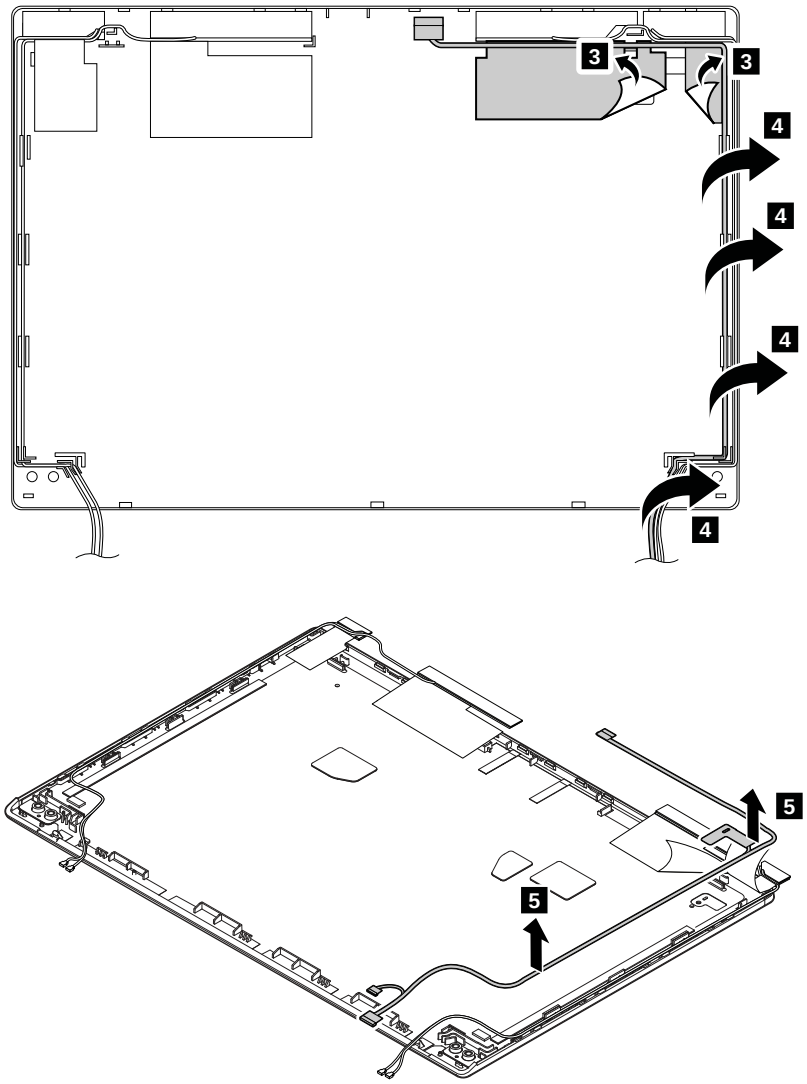
When installing: Ensure that the LCD connector is attached firmly.

2030 Camera/microphone module and camera cable (available on some models)

For access, remove these FRUs in order:
- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1140 LCD unit” on page 81
- “2010 LCD bezel” on page 86
- “2020 LCD hinges, LCD panel, and LCD cable” on page 87

Removal steps of the camera/microphone module and camera cable





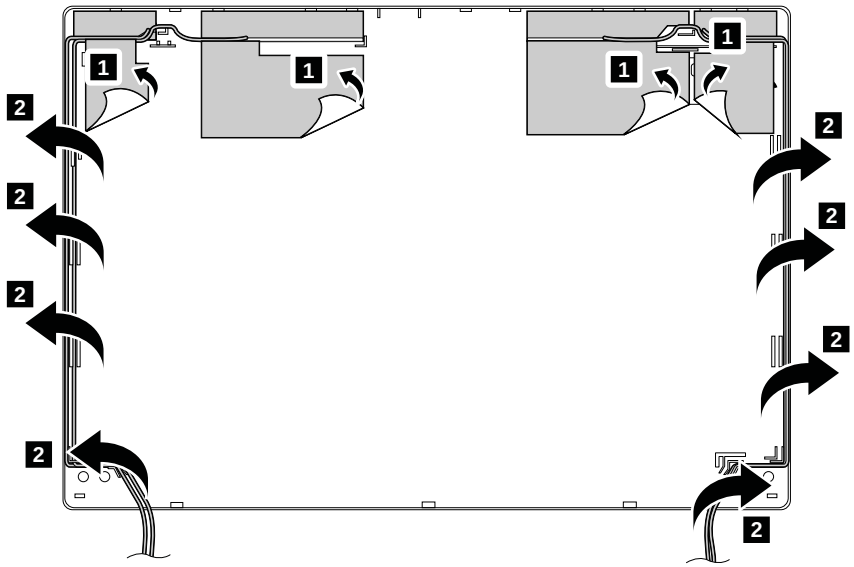
2040 Wireless-LAN/Wireless-WAN/WiGig antenna assembly and LCD rear-cover assembly

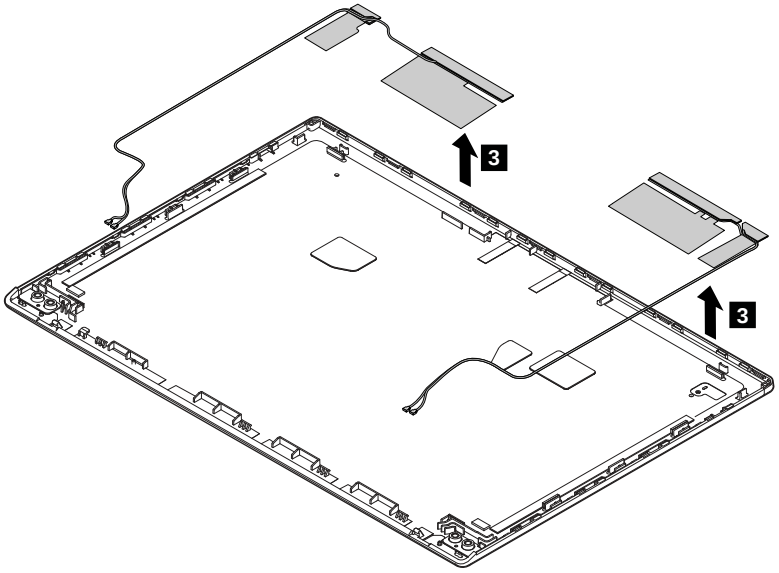
For access, remove these FRUs in order:

- “1010 Removable battery” on page 63
- “1020 Base cover assembly” on page 64
- “1140 LCD unit” on page 81
- “2010 LCD bezel” on page 86
- “2020 LCD hinges, LCD panel, and LCD cable” on page 87
- “2030 Camera/microphone module and camera cable (available on some models)” on page 88

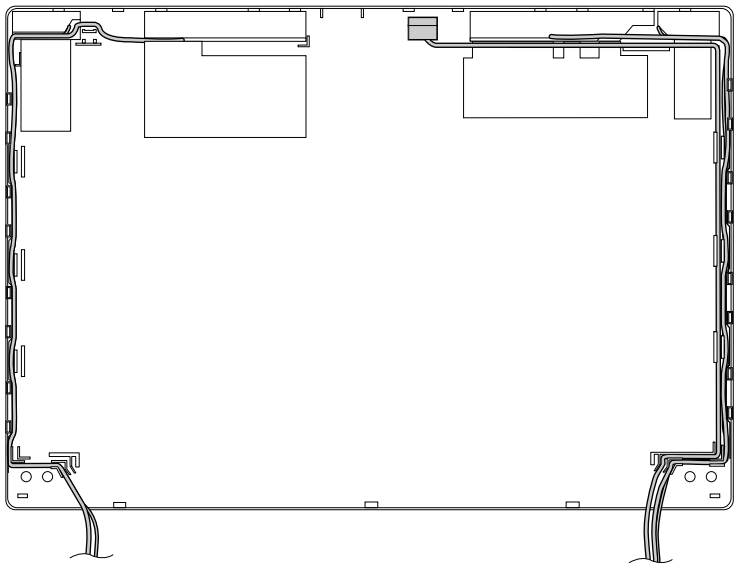
Removal steps of the wireless-LAN/Wireless-WAN/WiGig antenna assembly

For computer models with the wireless-LAN feature or wireless-LAN/WAN feature:

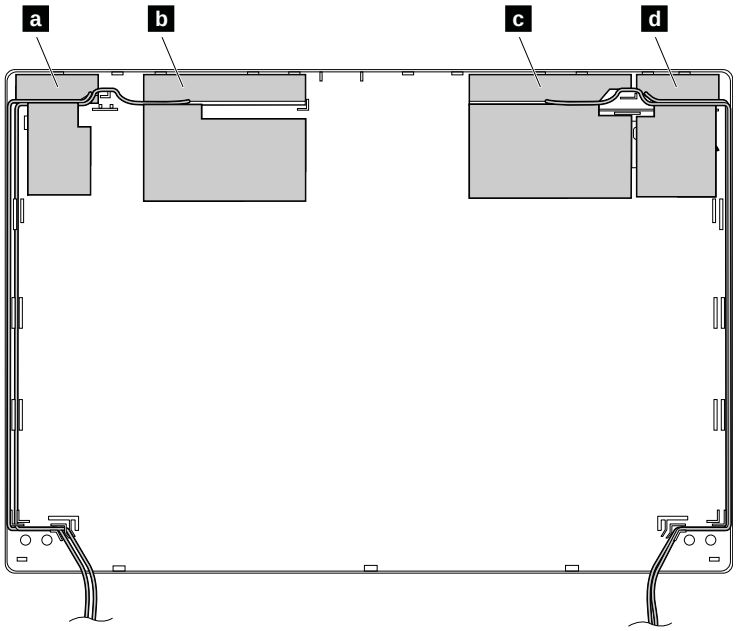




Cable routing:
When you install the antenna assembly and camera cable, route the camera cable in the cable holder and the antenna cable outside the cable holder.



Antenna locations:



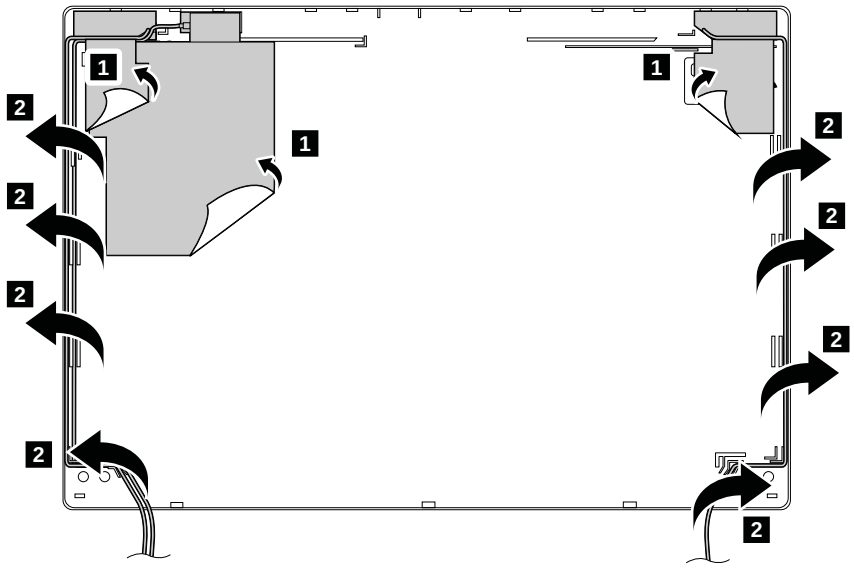
a Wireless-LAN auxiliary antenna (black)

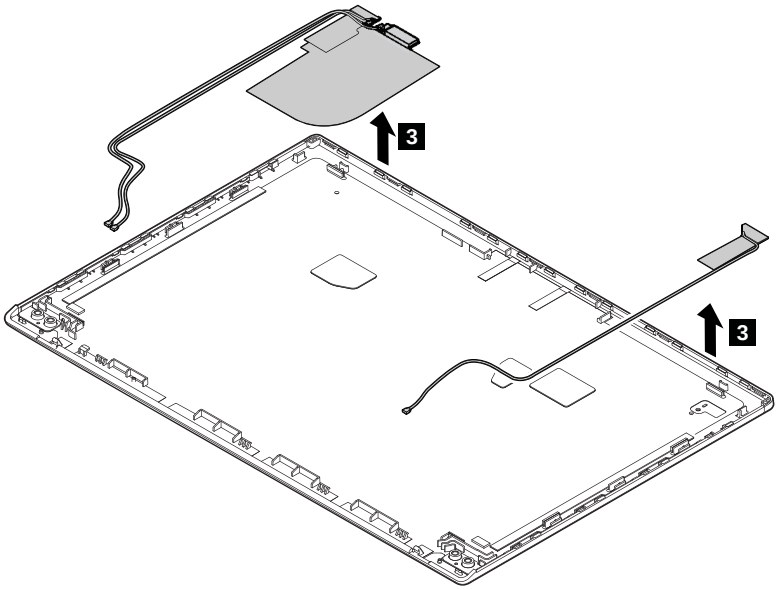
b Wireless-WAN auxiliary antenna (blue, available on some models)

c Wireless-WAN main antenna (orange, available on some models)

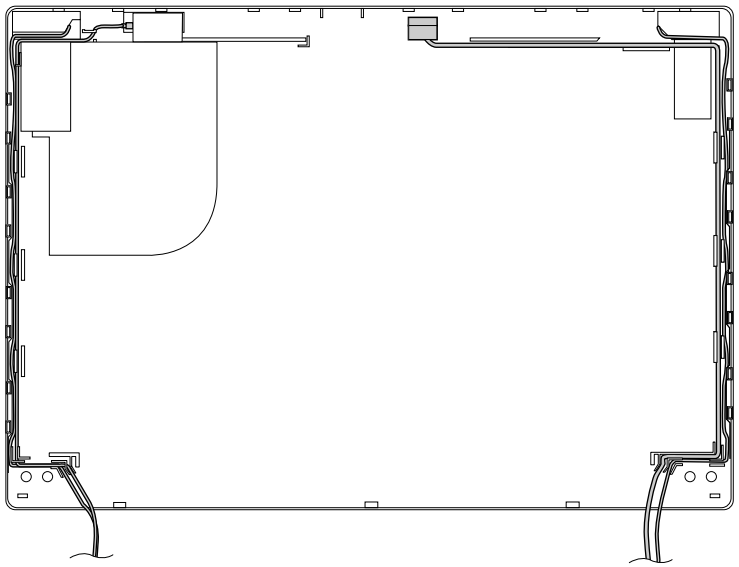
d Wireless-LAN main antenna (gray)

For computer models with the wireless-LAN feature and WiGig feature:

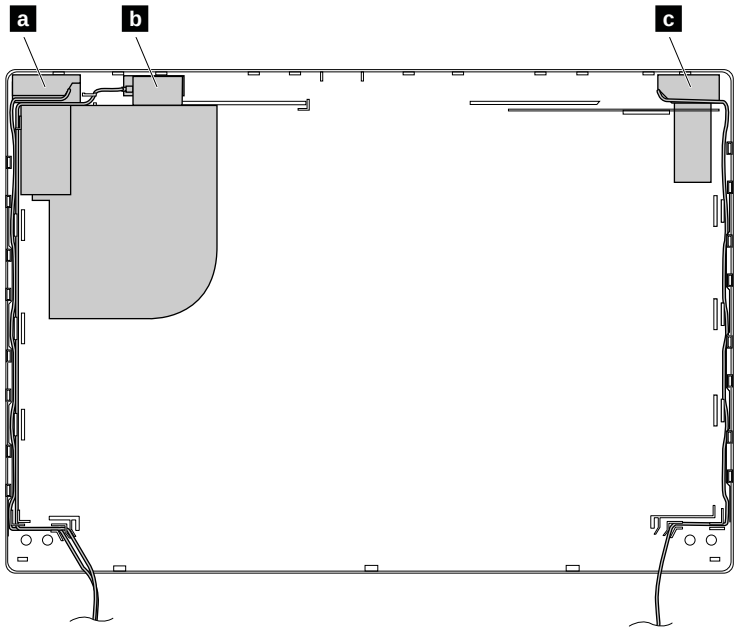




Cable routing:
When you install the antenna assembly and camera cable, route the camera cable in the cable holder and the antenna cable outside the cable holder.



Antenna locations:



a Wireless-LAN auxiliary antenna (black)

b WiGig antenna (white)

c Wireless-LAN main antenna (gray)

Appendix A. Notices

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Appendix B. Abbreviation and acronym table

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

Abbreviation	Term
3G	third generation of mobile telecommunications technology
BGA	Ball Grid Array
BIOS	basic input/output system
CMOS	complementary metal-oxide semiconductor
COA	Certificate of Authentication
CRC	cyclic redundancy check
CRT	cathode ray tube
CRU	customer-replaceable unit
CTO	Configure To Order
EAIA	Enhanced Asset Information Area
ECA	Engineering Change Announcements
EEPROM	Electrically Erasable Programmable Read-Only Memory
EFI	Extensible Firmware Interface
EPO	emergency power-off
ESD	electrostatic discharge
EU	European Union
FCC	Federal Communications Commission
FRU	Field Replaceable Unit
GAV	General Announce Variant
GPU	graphics processing unit
HDD	hard disk drive
HDMI	high-definition multimedia interface
ICs	integrated circuits
ICCID	integrate circuit card identity
ISO	International Standardization Organization
LAN	local area network
LCD	liquid crystal display
MAC	media access control
MT	machine type
MTM	machine type and model
PC	personal computer
PCH	Platform Controller Hub

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Abbreviation	Term
POST	power-on self-test
RAM	random-access memory
RF	radio frequency
RFID	radio-frequency identification
RI	ring indicator
RJ	registered jack
SATA	Serial Advanced Technology Attachment
SIM	subscriber identity module
SVP	supervisor password
TFTs	thin-film transistors
UEFI	Unified Extensible Firmware Interface
USB	Universal Serial Bus
UUID	universally unique identifier
VGA	video graphics array
VRAM	video random-access memory
WAN	wide area network



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