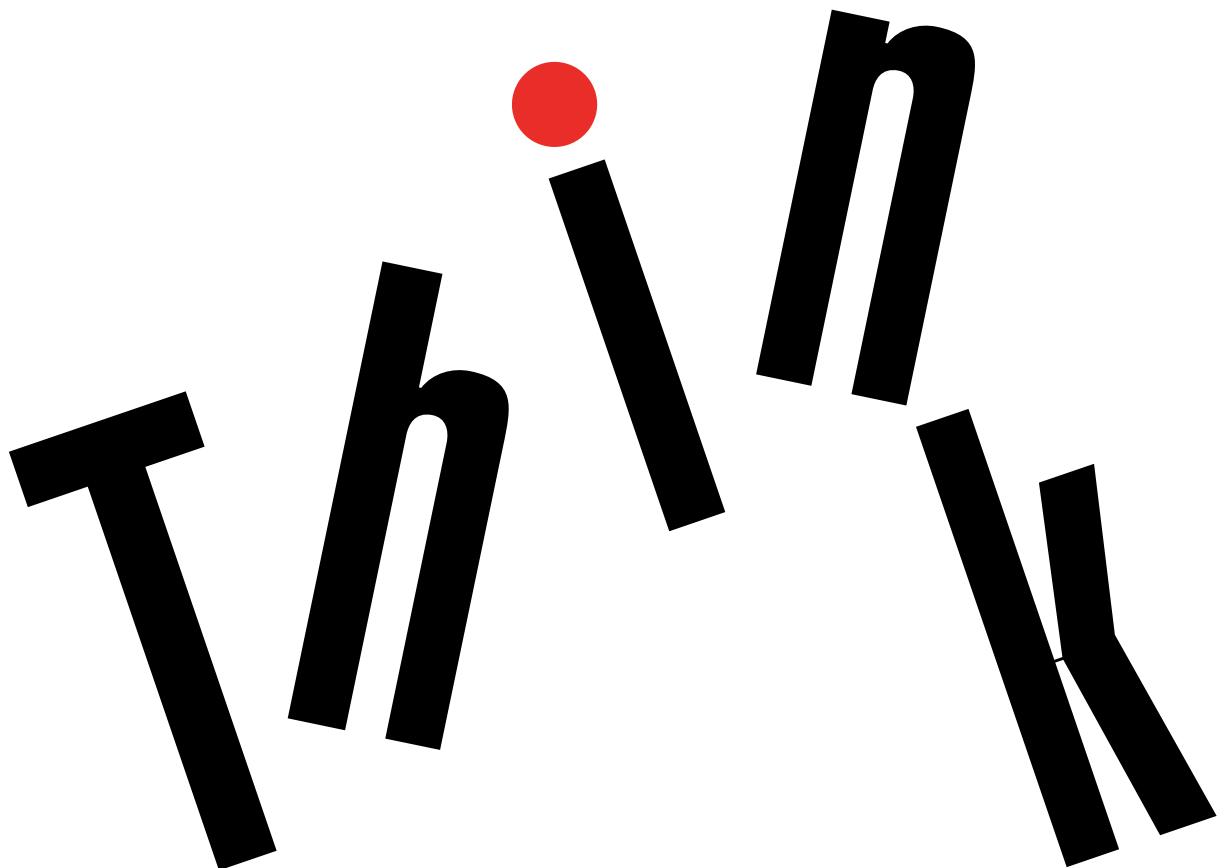


Lenovo

ThinkPad®

ThinkPad 13 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 73.

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About this manual

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

ThinkPad 13

Machine types (MT) 20GL and 20GM

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

Important: This manual is intended only for trained service technicians who are familiar with ThinkPad products. Use this manual along with the advanced diagnostic tests to troubleshoot problems effectively. Before servicing a ThinkPad product, be sure to read all the information under Chapter 1 “Safety information” on page 1 and Chapter 2 “Important service information” on page 19.

Chapter 1. Safety information

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

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

General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
 1. Make sure that you can stand safely without slipping.
 2. Distribute the weight of the object equally between your feet.
 3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
 4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any object that weighs more than 16 kg (35 lb) or that you think is too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, make sure that other service technicians and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your toolcase away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Make sure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, about 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

Attention: Metal objects are good electrical conductors.

- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.
- Fan louvers on the machine help to prevent overheating of internal components. Do not obstruct fan louvers or cover them with labels or stickers.

Electrical safety

Observe the following rules when working on electrical equipment.

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

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the Lenovo USB-C 45W AC Adapter 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 Lenovo USB-C 45W AC Adapter. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine, and to lock the wall box in the off position.
- If you have to work on a machine that has *exposed* electrical circuits, observe the following precautions:
 - Ensure that another person, familiar with the power-off controls, is near you.

Attention: Another person must be there to switch off the power, if necessary.

- Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

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

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

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

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts *with the power on* when they are removed from their normal operating places in a machine:
 - Power supply units
 - Pumps
 - Blowers and fans
 - Motor generators
 - Similar units as listed above

This practice ensures correct grounding of the units.

- If an electrical accident occurs:
 - Use caution; do not become a victim yourself.
 - Switch off power.
 - Send another person to get medical aid.

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 battery 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 Lenovo USB-C 45W AC Adapter disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power off the computer. Disconnect the Lenovo USB-C 45W AC Adapter.
3. Check for cracked or bulging batteries.
4. Remove the cover.
5. Check for any obvious non-ThinkPad alterations. Use good judgment as to the safety of any non-ThinkPad alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

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.



قبل اعادة تشغيل الحاسب بعد الانتهاء من استبدال FRU، تأكد من أنه قد تم اعادة كل من المسامير والسوست وكل الأجزاء الصغيرة الأخرى في أماكنهم ولم يتم فقدم داخل الحاسب. ويمكن التتحقق من ذلك عن طريق هز الحاسب والاستماع لأي صوت مصاخب يصدر منه. قد تؤدي الأجزاء أو الرقائق المعدنية إلى حدوث دائرة قصر.



خطر

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



خطر

تحتوي حزمة البطارية على كمية صغيرة من مادة التيكل. لا تقم بفكها أو القاءها في النار أو الماء ولا تتسبب في احداث دائرة قصر بها. تخلص من حزمة البطارية وفقاً 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 إلى اشتعالها أو انفجارها.



خطر

قد تسبب بطارية الليثيوم في حدوث حريق أو انفجار أو حدوث حروق شديدة. لا تقم بإعادة شحن البطارية أو إزالة موصل الاستقطاب الخاص بها ولا تحاول أيضاً فكها أو تسخينها لأكثر من ١٠٠ درجة مئوية (٢١٢١ فهرنهايت) أو حرقها أو تعريض محتويات الخاتمة الخاصة بها للماء. قم بالخلص من البطارية وفقاً لما هو موضح في القوانين المحلية. استخدم نوع البطارية المحدد والذي يوصى باستخدامه. حيث أنه قد يؤدي استخدام نوع بطارية غير صحيح إلى اشتعالها أو انفجارها.



خطر

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



خطر

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



خطر

على الرغم من أن البطاريات الرئيسية تكون لها جهد منخفض، إلا أنه قد تقوم البطاريات التي حدث قصور بها أو التي تم توصيلها أرضياً بإصدار تيار يكفي لحدوث حروق للأفراد أو تعرض المواد القابلة للاشتعال للحريق.



خطر

ما لم يتم السماح بالتبديل الفوري لأي FRU الجاري استبداله بدون ضرورة إغلاق النظام، قم بتنفيذ ما يلي قبل إزالته، قم بإيقاف تشغيل الحاسوب ونزع كل أسلاك الطاقة من المخارج الكهربائية وقم أيضاً 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-círcito 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 température supérieure à 100°C, ne la faites pas brûler et n'en exposez pas le contenu à l'eau. Mettez la pile au rebut conformément à la réglementation en vigueur. Une pile inappropriée risque de prendre feu ou d'exploser.



DANGER

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



DANGER

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



DANGER

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



DANGER

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



VORSICHT

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 חילוף FRU יש להזקע כל תרגימים, הקפיצים, וחלקים קטנים אחרים הנעיצים במקומם ואינם חופשיים לוו בתקן המחשב. כדי להזקע זאת, יש לשלול את המחשב ולהקשייב גלילי קולות שתקשקק. חלקי או שבבי מוכתב עלולים לגרום لكצרים חשמליים.



סכנה

שלולות חמתנה מסוימות מכילות כמות קטנה של ניקל וקדמיות. אין לפרק שלולות חמתנה, לטווך אותה מודח, להשליך אותה לאש או למים או לבלצ'ר אותה. יש לשליך את השוללה כבורש על ידי התקנות והחוקים המקומיים. יש להשתמש רק בשוללה המופיעה ברישימת החלקים המתאימה. שימוש בשוללה לא מתאימה עלול לגרום להצנחת או התפוצצות של השוללה.



סכנה

מארז השוללה מכיל כמות קטנה של ניקל וקדמיות. אין לפרק את מארז השוללה, להשליך אותו לאש או למים או לknur אותו. יש לשליך את מארז השוללה השוללה כבורש על ידי התקנות והחוקים המקומיים. יש להשתמש רק בשוללה המופיעה ברישימת החלקים המתאימה כבונן חתלה מארז השוללה. שימוש בשוללה לא מתאימה עלול לגרום להצנחת או התפוצצות של השוללה.



סכנה

שלולות תילוגים עלולות לגרום לשရיפה, להתרפצצות או לבזוזות קשות. אין לשעון אותה מחדש, לשליך את החיבור המקוטב שלה, לפרק אותה או להמס אותה לטמפרטורה גבוהה על 100 מעלות צלזיוס. אין לשגרו את השוללה ואין לחשוף אותה לתאנים חמים. יש לשליך את השוללה כדורי בתקנות והחוקים המקומיים. יש להשתמש רק בשוללה המופיעה ברישימת החלקים המתאימים. שימוש בשוללה אחרת עלול לגרום לשכנת שריפה או התפוצצות.



סכנה

אם מסך חכיש חזויל (LCD) נשרב והנוזל מותך החסיס בא בגע עם עיניים או ידיים, שטפו את האוריות הנגועים מיד במים במשך 15 דקות לפחות. פנו לקבלת עזרה רפואי אם תסמינים חמובאים מתחמצע עט חזויל נשיכים לאחר חשיפת.



סכנה

כדי למנוע תח bum, אין להסיר את מכשנת הפלסטיים המגן על חלקי תותחנות של המרටיס

התרמן.



סכנה

אף שתסתולות הראשיות הן מעלות מתח גבוה, סוללה מקווצת או מוארכת עלולה להפוך זום מספק לזרימת כוחית או לחצנת חומרית זליגם.



סכנה

אלא אם מוחרת יחלפה חמיה של חומרה, פעלן כודלן לפני חזרתו:
כבר את המחשב, נתקו את כל כבלי החשמל מהשකעים, וחזיאו את מאורן חסוללות ונטקו את כל חכבים המוחדרים.



危険

FRU の交換後、ThinkPad の電源を入れる前に、ねじ、バネ、その他の小さな部品がすべて正しい位置にあり、また ThinkPad の内部で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。適切なバーツ・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できます。



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、適切なバーツ・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できます。



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 °C (212 °F) 以上への加熱、焼却、電池の中身を水に浸すことなど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。適切なペツ・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・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 절지된 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鎳和鎘。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鎳。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 24
 - “Important notice for replacing a system board” on page 24
 - “How to use error message” on page 25
- “Strategy for replacing FRUs for CTO, special-bid, and standard models” on page 25
 - “Product definition” on page 25
 - “FRU identification” on page 25

Important:

- Advise customers to visit the Lenovo® Support Web site at <http://www.lenovo.com/support> to view the software fixes, download the drivers, and follow the on-screen instructions to install the drivers. For additional assistance, customers might call the Lenovo Customer Support Center. Telephone numbers for the Lenovo Support Center are available at:
<http://www.lenovo.com/support/phone>
- Service training documents for Lenovo authorized service technicians are available at the following Web site. The disassembly and reassembly videos that show the FRU removal and replacement procedures are contained in the documents.
<http://www.lenovoservicetraining.com>

Power management

To reduce power consumption, put the computer into sleep mode if you do not use it.

When the computer enters sleep mode, the following events occur:

- The LCD is powered off.
- The microprocessor stops.

To enter sleep mode, close the lid if you are logged in. To resume from sleep mode, open the computer lid and press any key.

Note: If you are not logged in, closing the lid will shut down the computer.

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

- After a period of inactivity
- When the battery indicator blinks orange, indicating that the battery power is low

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

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

Symptom-to-FRU index

This section contains following information:

- “LCD-related symptoms” on page 20
- “Intermittent problems” on page 20
- “Undetermined problems” on page 21

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 20.

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

LCD-related symptoms

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

Notes:

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

Table 1. LCD-related symptoms

| Symptom or error | FRU or action, in sequence |
|--|--|
| No beep, system-status indicator on, and a blank LCD during POST. | System board |
| <ul style="list-style-type: none">• LCD backlight not working.• LCD too dark.• LCD brightness cannot be adjusted.• LCD contrast cannot be adjusted. | <ol style="list-style-type: none">1. Reseat the LCD connectors.2. LCD assembly3. System board |
| <ul style="list-style-type: none">• LCD screen unreadable.• Characters missing pixels.• Screen abnormal.• Wrong color displayed. | <ol style="list-style-type: none">1. See important note for “LCD-related symptoms.”2. Reseat all LCD connectors.3. LCD assembly4. System board |
| Horizontal or vertical lines displayed on LCD. | 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. External diskette drive or optical drive
 - d. Wireless cards
4. Turn on the computer.
5. Determine whether the problem has been solved.
6. If the problem does not recur, reconnect the removed devices one at a time until you find the failing FRU.
7. If the problem remains, replace the following FRUs one at a time (do not replace a nondefective FRU):
 - a. System board
 - b. LCD assembly

Overview of the Chromebook USB repair shim

You can use a Chromebook USB repair shim (hereafter referred to as the repair shim) as the recovery solution on the Chrome OS operating system.

The repair shim is a bootable device that is required to service the computer. The repair shim is used for the following purposes:

- Diagnose problems and restore the system to the factory-default settings.
- Refresh the system with the latest firmware and software.

The repair shim is not necessary when a Customer Replaceable Unit (CRU) is replaced. If a non-CRU is broken, or there is a strong suspicion that a particular non-CRU is defective, it can be replaced directly. Otherwise, the repair shim must be used to diagnose problems before any non-CRU is replaced.

The following is the list of CRUs for your computer:

- Lenovo USB-C 45W AC Adapter

For CRU definition, see “Locating FRUs and CRUs” on page 36.

Creating the repair shim

As a Lenovo service technician, do the following to create the repair shim:

1. Prepare a USB storage device with at least 8 gigabyte (GB) space. The required USB storage capacity depends on the size of the recovery image.

Attention: Creating the repair shim will delete all data stored on the USB device. To avoid data loss, make a backup copy of all the data that you want to keep.

2. Download latest version of the repair shim image from the Lenovo Support Web site at: <http://www.lenovo.com/support> to create a repair shim. A Lenovo service credential is required.

Note: Ensure that you create the repair shim using the latest version of the repair shim image. Using an earlier version might cause the repair process to fail.

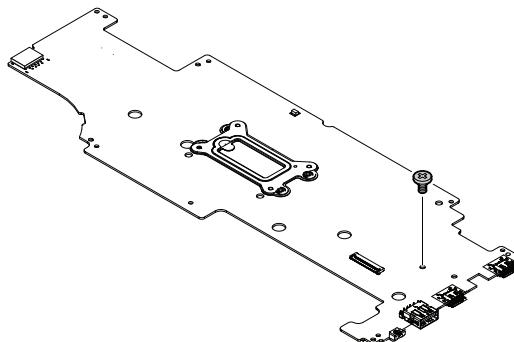
3. Extract the downloaded file that contains the repair shim image.
4. Download the Win32 Disk Imager tool from <http://sourceforge.net/projects/win32diskimager/>.
5. Run the imager tool and follow the on-screen instructions to create the repair shim.
6. After using the repair shim, if you want to recover normal usage of the USB storage device, you will need to format the device. Otherwise, you cannot use the storage space on the device.

Removing and reinstalling the write-protect screw

By default, the on-board Read-Only Memories (ROMs) are set as write-protected. Before refreshing the Chromebook firmware, set the ROMs as unprotected by removing the write-protect screw on the system board. After the refresh, reinstalling the write-protect screw.

To remove the write-protect screw, do the following:

1. Disable the battery. See “Disabling the battery” on page 48.
2. Disconnect the Lenovo USB-C 45W AC Adapter and all cables from the computer, and then remove the keyboard. See “1010 Keyboard” on page 48.
3. Remove the base cover assembly. See “1020 Base cover assembly” on page 54.
4. Remove the wireless LAN card. See “1030 Wireless LAN card” on page 56.
5. Remove the battery. See “1040 Battery” on page 56.
6. Remove the USB support bracket. See “1080 USB support bracket ” on page 59.
7. Remove the thermal fan. See “1090 Thermal fan assembly” on page 60.
8. Remove the system board. See “1110 System board” on page 62.
9. Turn over the system board and then locate the write-protect screw on the system board as shown in the following illustration. To turn off the write-protect function, remove the write-protect screw.



10. After you have removed the write-protect screw, reassemble the computer. Reconnect the Lenovo USB-C 45W AC Adapter and all cables.
11. To turn on the write-protect function, follow the previous steps to locate the hole for the write-protect screw and reinstall the screw. Then reassemble your computer and reconnect the cables.

Using the repair shim

To use the repair shim that you have created, do the following:

1. Turn off the write-protect function. See “Removing and reinstalling the write-protect screw” on page 22.
2. Attach the Lenovo USB-C 45W AC Adapter to the power connector on the computer. Press and hold esc and the refresh key  C, and then press the power button to start the computer and enter recovery mode.

Note: After you turn off the write-protect function, the computer will be in Developer mode. In some cases, the computer might not be in Developer mode after you turn off the write-protect function (step 1). If this happens, press and hold ctrl+d when the recovery screen is displayed, and then press enter. The computer automatically restarts and enters Developer mode after several minutes. When prompted to log on to the computer, turn off the computer. Then repeat step 2 to start the computer and enter recovery mode.

3. When the recovery screen is displayed, connect the repair shim to an available USB connector of the computer. The repair shim will update the firmware and image automatically. When prompted, choose “i” to install the shim to the computer. When the update process finishes, the computer restarts and enters the factory-test-image environment.

Note: The update process is automatic, and takes less than 10 minutes. Information about the update status will be displayed on the computer screen during the process.

4. Remove the repair shim and put it in a safe place. The Runin test starts automatically and you will be prompted for the Vital Product Data (VPD). If the VPD is already present, you may select a model name and press esc to continue. If the write-protect function is still on, this step will not proceed.

Note: If the system board is replaced, you are required to reenter VPD, a 20-character machine type and model (MTM) and serial number (SN) string. The string consists of the 7-digit machine type, 3-digit model number, 8-digit SN, and is preceded by the characters “1S”. You can find the MTM and SN information on the bottom cover. To locate the MTM and SN label, see

“**Applying labels to the base cover**” on page 55.

If the MTM and SN information is already displayed, and match the numbers shown on bottom cover, press esc to leave the values as they are.

5. The Final Assembly Test and Pack (FATP) section starts and then the stress test will run for 10 minutes. This section includes the independent tests for each component. Follow the instructions on the screen to start the tests. For information about the factory test items, see “Factory test items” on page 24.
6. If the factory test items reveal a defective component, turn off the computer, disconnect the Lenovo USB-C 45W AC Adapter, and then replace the defective component. For information about the replacement procedure, see Chapter 8 “Removing or replacing a FRU” on page 47.
7. Turn on the write-protect function. See “Removing and reinstalling the write-protect screw” on page 22.
8. Turn on the computer. The computer enters the factory-test-image environment again. It is recommended that you run Stress Test and FATP Tests to ensure that new components function correctly.

Note: It is not necessary to turn off the write-protect function again if additional components must be replaced.

9. Run the GoogleRequiredTests. If the tests finish successfully, all data stored on the computer will be deleted and the computer will be turned off. If the GoogleRequiredTests fails, refer to the common mistakes that lead to GoogleRequiredTests failure in “Factory test items” on page 24.

Note: If any test is marked as failed, the final process cannot be completed. The final process can be forced to end by pressing f. Do not force the final process to end when a component fails the test. Force the final process to end only when the test has to be bypassed because it cannot be performed.

10. After the repair process finishes, the battery is disabled. The system is in a clean out-of-box state. In order to turn on the computer, attach the Lenovo USB-C 45W AC Adapter to the computer first. If applicable, customers must re-enroll the system for enterprise enrollment.

Factory test items

After the system enters the factory-test-image environment, factory test items will run. The factory test process contains the following three types of tests:

- **FATP Test:** The FATP Test is designed to test the individual component to verify its function, such as the TPM, display, audio, camera, keyboard, and other components. It is recommended that you run all the FATP Test items. Some test items might require an HDMI monitor or an SD card. If the devices are not available, the tests can be bypassed, but with the overall test marked as failed. This will require the finalized step of the GoogleRequiredTests to be forced in order to complete the servicing of the computer (see step 9 in “Using the repair shim” on page 23).
- **Stress Test:** The Stress Test is designed to test how the system functions under stress by running the maximum workload applications. The Stress Test includes the test of memory, microprocessor, and graphics card. The test takes about 10 minutes to finish.
- **GoogleRequiredTests:** GoogleRequiredTests checks the system status and helps reset the system back to the factory-default settings. If any test fails, the system cannot be finalized. The following items are some common mistakes that lead to GoogleRequiredTests failure:
 - **HWID mismatch:** Each Chromebook has a known hardware configuration. Each configuration is assigned an HWID. HWID mismatch can be caused by using unauthorized parts, or missing parts. For information about HWID, see “Hardware identity” on page 46.
If the write-protect function is not turned off before recovering the computer with the repair shim, it will also cause HWID mismatch. For instructions on how to turn off the write-protect function, see “Removing and reinstalling the write-protect screw” on page 22.
 - **Write-protect function is off:** System cannot be finalized until the write-protect function is turned back on.

Strategy for replacing FRUs

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.

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: 20A7CTO1WW).

Special-bid model

This is a unique configuration that has been negotiated between Lenovo and the customer. A unique machine type model (MTM) consists of a 4-character MT, a 4-character model, and a numeric 2-character country code is provided to the customer to place orders (example: 20A7000955). The country code assigned is numeric and does not designate a specific country or region. The custom model factsheet for the MTM indicates which country the special bid MTM is set up for. Special-bid offering is not generally announced.

Standard model

Standard models (fixed configuration) are announced and offered to all customers. The MTM portion of the machine label consists of a 4-character MT, a 4-character model, and an alphabetic 2-character country code. The country code assigned is alphabetic and represents a designated country or region (example: 20A70009UK).

FRU identification

Use Lenovo eSupport to identify major FRUs, FRU part numbers, and FRU descriptions for a product at an MT - serial number level. Examples of major FRUs are 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 introduces following information:

- “What to do first” on page 27
- “Power system checkout” on page 28

Be sure to read the following important notes.

Important:

- **Only certified trained personnel should service the computer. Personnel repairing the Lenovo Chromebook computer must have completed the certification course number RTPW1170 or CTPi217.**
- **Before replacing any Field replaceable Unit (FRU), read the entire page on removing and replacing FRUs.**
- **When you replace FRUs, it is recommended use new nylon-coated screws.**
- **Be extremely careful during such write operations as copying, saving, or formatting.** The sequence of the drives in the computer that you are servicing might have been altered. If you select an incorrect drive, data or programs might be overwritten.
- **Replace a FRU only with another FRU of the correct model.** When you replace a FRU, ensure that the model of the machine and the FRU part number are correct by referring to the Web site: <http://www.lenovo.com/serviceparts-lookup>
- **A FRU should not be replaced because of a single, unreproducible failure.** Single failures can occur for various reasons that have nothing to do with a hardware defect, such as cosmic radiation, electrostatic discharge, or software errors. Consider replacing a FRU only when a problem recurs. If you suspect that a FRU is defective, clear the error log and run the test again. If the error does not recur, do not replace the FRU.
- **Be careful not to replace a nondefective FRU.**

What to do first

When you return a FRU, you must include the following information in the parts exchange form or parts return form that you attach to it:

1. Name and phone number of service technician
2. Date of service
3. Date on which the machine failed
4. Date of purchase
5. Failure symptoms, error codes appearing on the display, and beep symptoms
6. Procedure index and page number in which the failing FRU was detected
7. Failing FRU name and part number
8. Machine type, model number, and serial number
9. Customer's name and address

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

Before checking problems with the computer, determine whether the damage is covered under the warranty by referring to the following list:

The following are not covered under warranty:

- LCD panel cracked from the application of excessive force or from being dropped
- Scratched (cosmetic) parts
- Distortion, deformation, or discoloration of the cosmetic parts
- Plastic parts, latches, pins, or connectors that have been cracked or broken by excessive force
- Damage caused by liquid spilled into the system
- Damage caused by the improper insertion of a PC card or the installation of an incompatible card
- 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 Lenovo USB-C 45W AC 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.

Power system checkout

To verify if a battery and a Lenovo USB-C 45W AC Adapter are functional, do the following:

1. Turn off the computer.
2. Connect the Lenovo USB-C 45W AC Adapter.
3. Turn on the computer. If the computer can be turned on, it means that either the battery or the Lenovo USB-C 45W AC Adapter is functional.
4. Turn off the computer.
5. Disconnect the ac adapter and turn on the computer. If the computer can be turned on, it means the battery is functional.

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

- “Checking the Lenovo USB-C 45W AC Adapter” on page 28
- “Checking the battery and operational charging” on page 28

Checking the Lenovo USB-C 45W AC Adapter

This computer supports only the Lenovo USB-C 45W AC Adapter. When the adapter is connected to the computer, the output voltage at the adapter plug rises from 0 V (when not connected) to 5 V. Then the power delivery communication starts. The Lenovo USB-C 45W AC Adapter outputs 20 V according to the computer output voltage request.

When you use the Lenovo USB-C 45W AC Adapter to charge the computer but no power is charged, see the instructions in this topic to check the Lenovo USB-C 45W AC Adapter.

Note: Noise from the Lenovo USB-C 45W AC Adapter does not always indicate a defect.

To check the Lenovo USB-C 45W AC Adapter when the computer does not charge, do the following:

1. Disconnect the Lenovo USB-C 45W AC Adapter from the computer.
2. Connect a new Lenovo USB-C 45W AC Adapter to the computer. For information about which Lenovo USB-C 45W AC Adapter to order, go to <http://www.lenovo.com/serviceparts-lookup>.
3. If the computer charges, replace the Lenovo USB-C 45W AC Adapter.

Checking the battery and operational charging

Checking the battery

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

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

The battery status indicator is located in the lower-right corner of the screen. To view the percentage of battery power remaining, click the battery status icon.

Checking the operational charging

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

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

Chapter 4. Status indicators

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

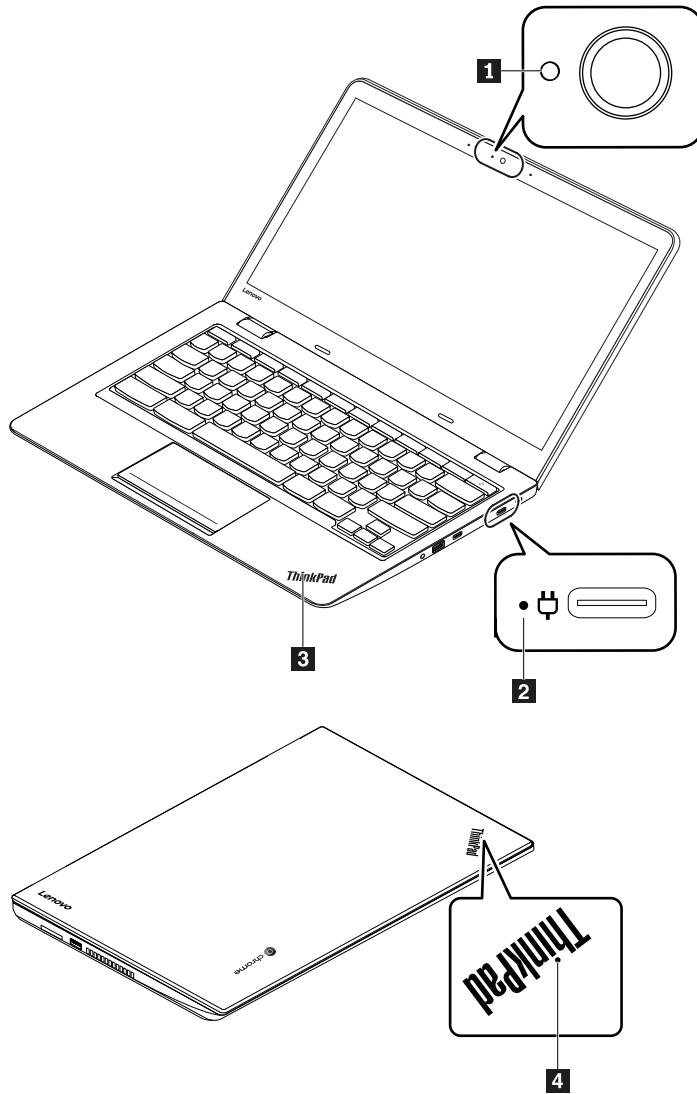


Table 2. Status indicators

| Indicator | Meaning |
|-----------------------------|---|
| 1 Camera-status indicator | When the camera is started, the camera-in-use indicator turns on in green. |
| 2 ac power-status indicator | The ac power-status indicator shows the ac power charging status of the computer. <ul style="list-style-type: none">• Green: Connected to ac power (charging 90%–100%)• Amber: Connected to ac power (charging 1%–89%)• Off: Not connected to ac power (no charging) |
| 3 4 System status indicator | The illuminated dot in the ThinkPad logo works as a system-status indicator. Solid on: The computer is on (in normal use). Blinks slowly: The computer is in sleep mode. |

Table 2. Status indicators (continued)

| Indicator | Meaning |
|------------------|----------------------------------|
| | Off: The computer is off. |

Chapter 5. Function keys

The following table describes the function keys on the computer.

Table 3. Function keys

| Function key | Description |
|--------------|---|
| | Goes to the previous page. |
| | Goes to the next page. |
| | Reloads the current page. |
| | Views the current page in full-screen mode. |
| | Switches between windows. |
| | Decreases the screen brightness. |
| | Increases the screen brightness. |
| | Mutes the volume. |
| | Decreases the volume. |
| | Increases the volume. |
| | Turns on the computer. |
| | Searches applications and the Web. |

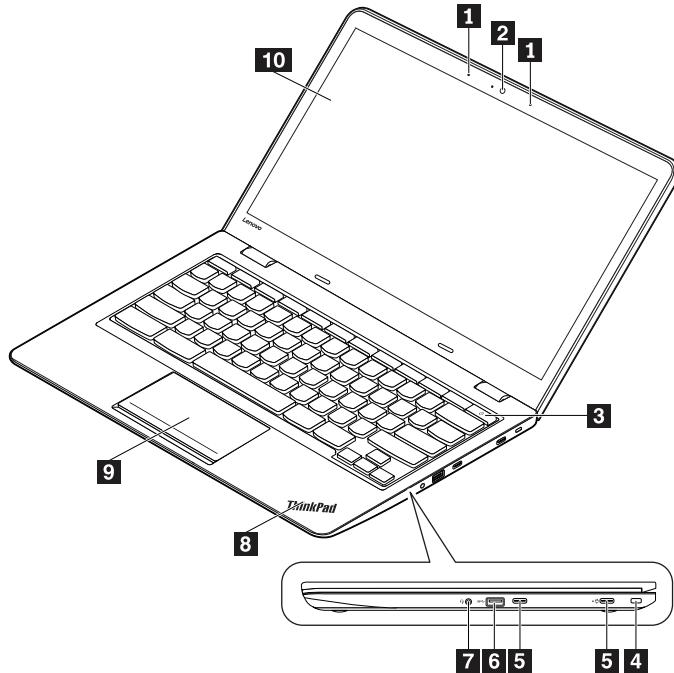
Chapter 6. Locations

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 Microphone

3 Power key

5 USB-C connectors

7 Audio connector

9 Touch pad

2 Camera

4 Security-lock slot

6 Always On USB connector (USB 3.0)

8 System-status indicator¹

10 Screen (multi-touch screen on some models)

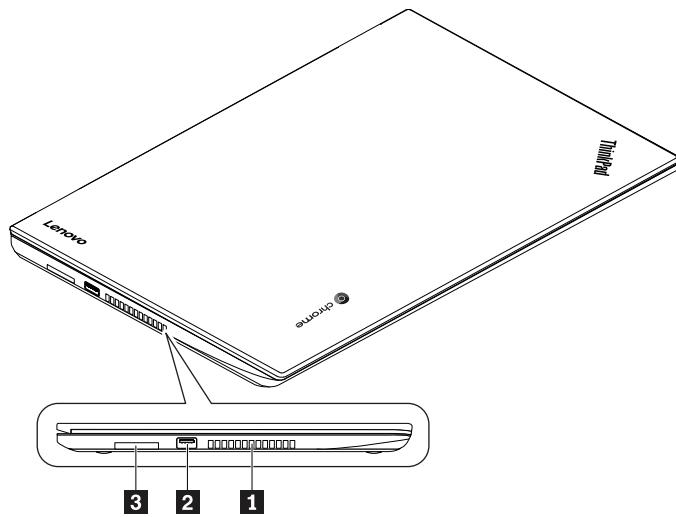
¹: The illuminated dot in the ThinkPad logo works as a system-status indicator.

Solid on: The computer is on (in normal use).

Blinks slowly: The computer is in sleep mode.

Off: The computer is off.

Left-side view

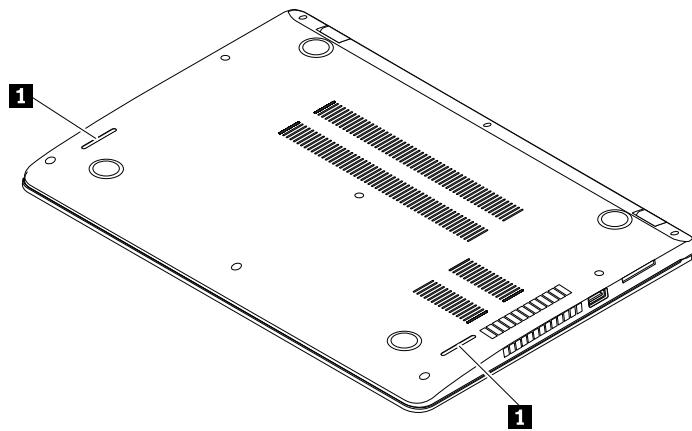


1 Fan louvers

2 Always On USB connectors (USB 3.0)

3 Media-card slot

Bottom view



1 Speakers

Locating FRUs and CRUs

This topic introduces the following service parts:

- “Major FRUs” on page 38
- “LCD FRUs” on page 40

Notes:

- Each FRU is available for all types or models, unless otherwise specified.

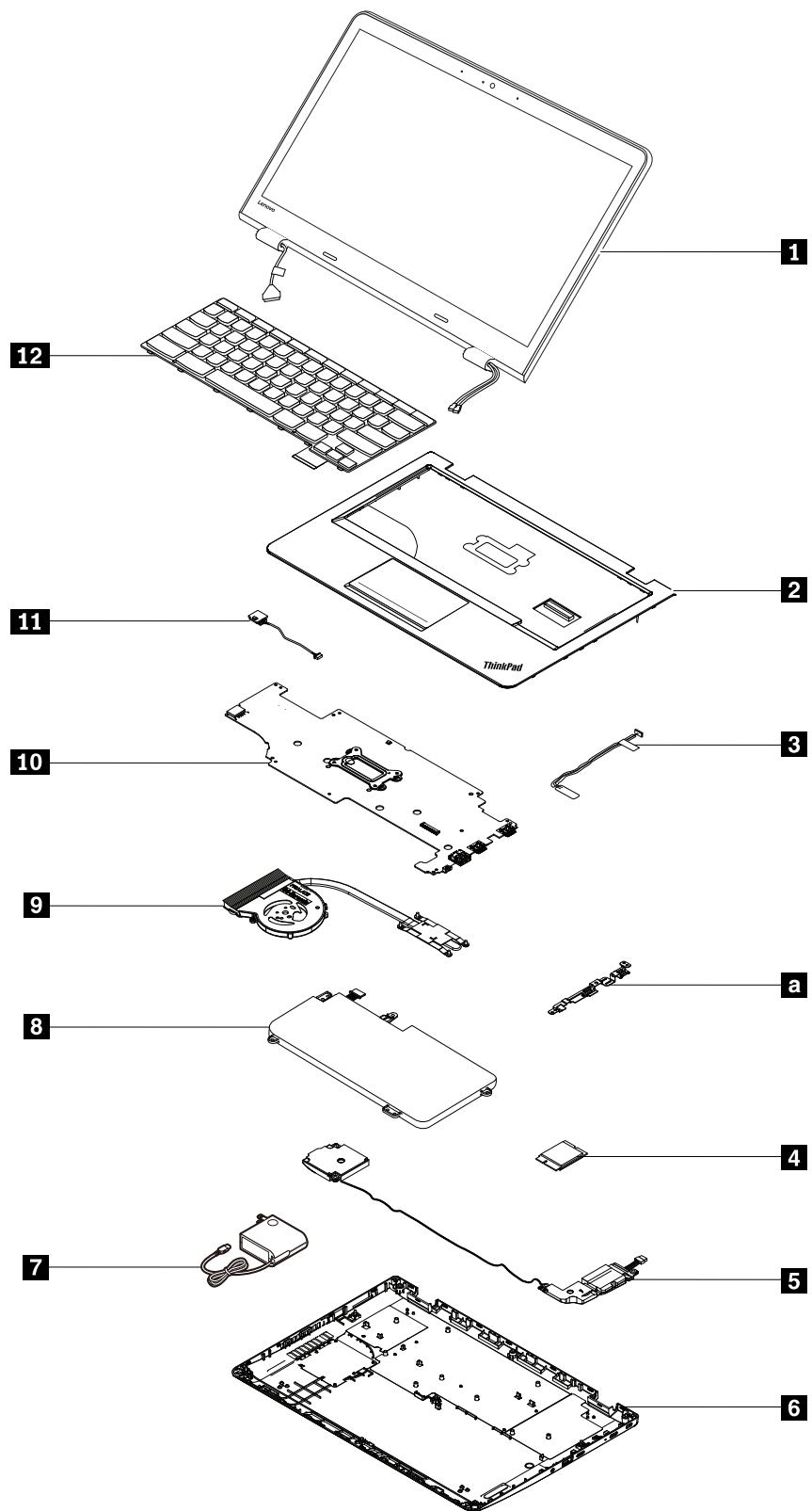
CRU statement for customers:

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

ThinkPad computers contain the following types of CRUs:

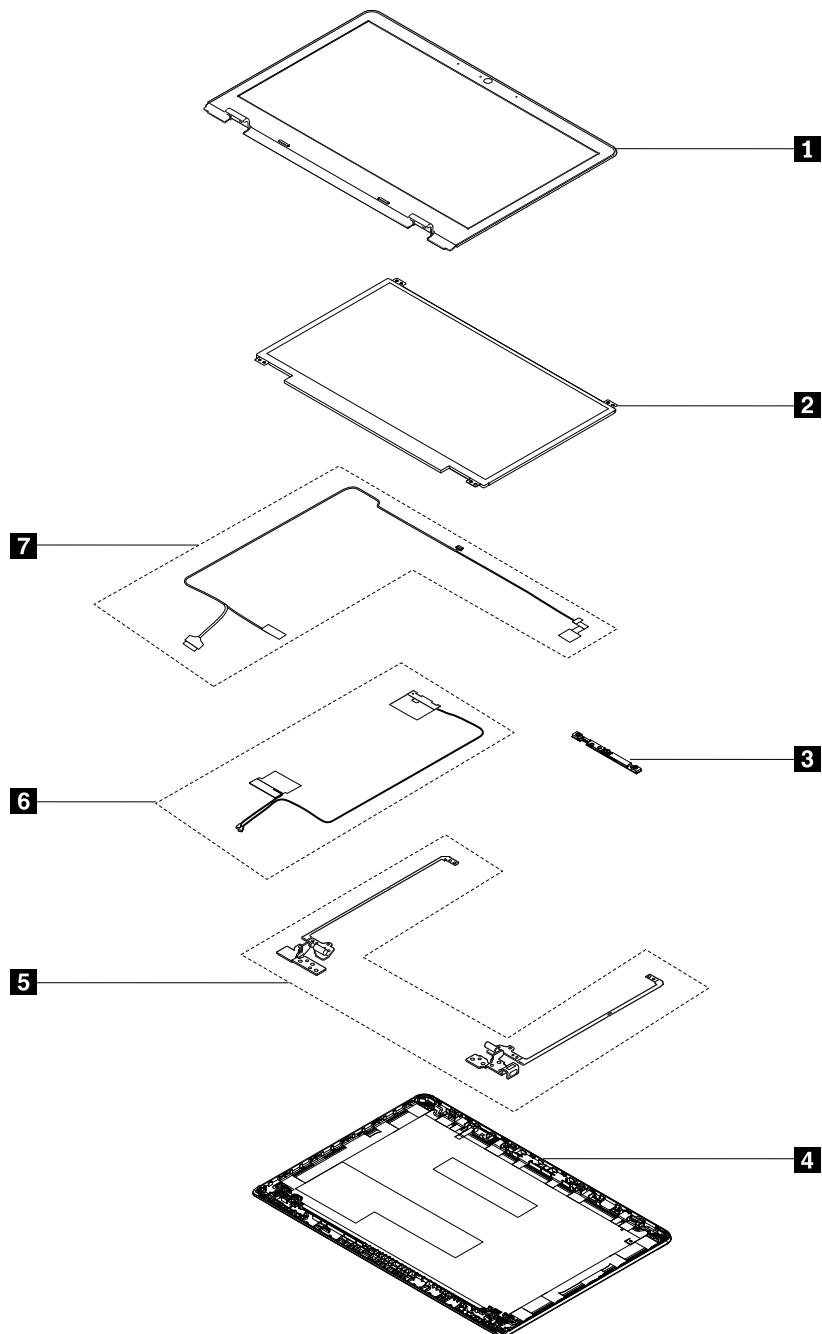
- **Self-service CRUs:** These CRUs unplug or are held by no more than two screws. Examples of these types of CRUs include the Lenovo USB-C 45W AC Adapter. Other self-service CRUs depending on product design might include the wireless card, keyboard, and palm rest with fingerprint reader and touch pad.
- **Optional-service CRUs:** These CRUs are isolated parts within the computer that are concealed by an access panel that is typically secured by more than two screws. Once the access panel is removed, the specific CRU is visible.

Major FRUs



| No. | FRU descriptions | Self-service CRU | Optional-service CRU |
|-----------|--|------------------|----------------------|
| 1 | LCD unit (see “LCD FRUs” on page 40) | No | No |
| 2 | Keyboard bezel assembly | No | No |
| 3 | ThinkPad-logo-LED card | No | No |
| 4 | Wireless LAN card | No | No |
| 5 | Speakers | No | No |
| 6 | Base cover assembly | No | No |
| 7 | Lenovo USB-C 45W AC Adapter | Yes | No |
| 8 | Battery | No | No |
| 9 | Thermal fan assembly | No | No |
| 10 | System board | No | No |
| 11 | Hall sensor with cable | No | No |
| 12 | Keyboard | No | No |
| a | USB support bracket (see “Miscellaneous parts” on page 41) | No | No |

LCD FRUs



| No. | FRU descriptions | Self-service CRU | Optional-service CRU |
|----------|---|------------------|----------------------|
| 1 | LCD bezel assembly | No | No |
| 2 | LCD panel | No | No |
| 3 | Integrated camera and microphone combo card | No | No |
| 4 | LCD rear cover assembly | No | No |
| 5 | Hinge kit | No | No |

| No. | FRU descriptions | Self-service CRU | Optional-service CRU |
|-----|-------------------------------|------------------|----------------------|
| 6 | Wireless LAN antenna assembly | No | No |
| 7 | LCD cable assembly | No | No |

Miscellaneous parts

| FRU descriptions | Self-service CRU | Optional-service CRU |
|--|------------------|----------------------|
| Screw kit | No | No |
| System miscellaneous kit • USB support bracket | No | No |

Connector and cable guide

This topic 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 38 and “LCD FRUs” on page 40.

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

System board connectors and cables

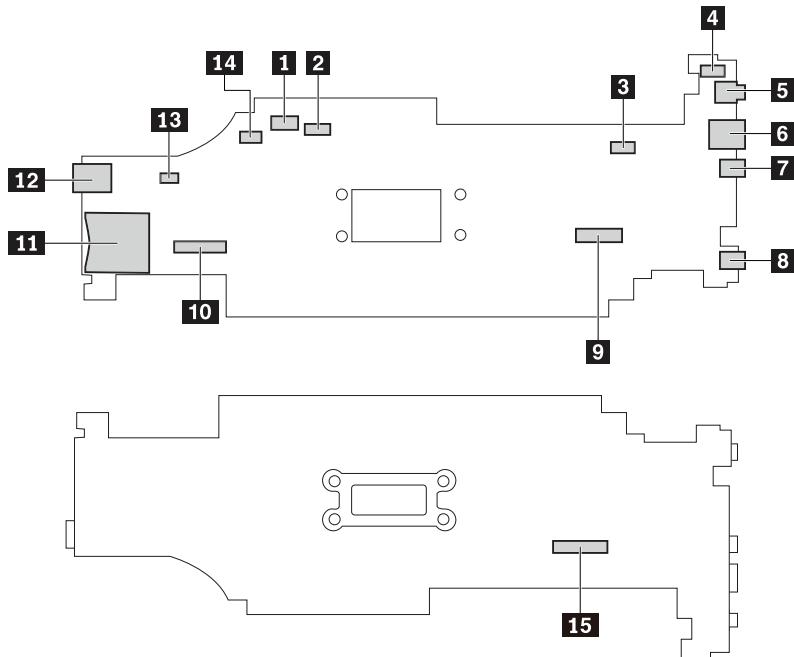


Table 4. System board connector and cable guide

| Item | Connector (location) | Internal cable required | Cable connection |
|------|-------------------------------|-------------------------|---|
| 1 | Battery connector (internal) | Battery cable | The battery comes with a cable. Connect the cable to this connector. |
| 2 | Trackpad connector (internal) | Trackpad cable | The keyboard bezel assembly comes with the trackpad cable. Connect the cable to this connector. |

Table 4. System board connector and cable guide (continued)

| Item | Connector (location) | Internal cable required | Cable connection |
|-----------|--|------------------------------|---|
| 3 | ThinkPad-logo-LED card | ThinkPad-logo-LED card cable | ThinkPad-logo-LED card comes with cable. Connect the cable to this connector. |
| 4 | Speaker assembly connector (internal) | Speaker assembly cable | The speaker assembly comes with a cable. Connect the cable to this connector. |
| 5 | Audio connector (external) | No | Connect headphones or a headset with a 3.5-mm (0.14-inch), 4-pole plug to this connector. |
| 6 | Always On USB 3.0 connector (external) | No | Connect a USB-compatible device to this connector. |
| 7 | USB-C connector (external) | No | Connect a USB-C compatible device to this connector. |
| 8 | USB-C connector (external) | No | Connect a USB-C compatible device to this connector. |
| 9 | Wireless-LAN card slot (internal) | No | Insert the wireless-LAN card into this slot. |
| 10 | LCD connector (internal) | LCD cable | Connect one end to the LCD panel and the other end to this connector. |
| 11 | Media card reader connector (internal) | Media card reader cable | Connect one end to the media card reader and the other end to this connector. |
| 12 | Always On USB 3.0 connector (external) | No | Connect a USB-compatible device to this connector. |
| 13 | Thermal fan connector (internal) | Thermal fan assembly cable | The thermal fan assembly comes with cable. Connect the cable to this connector. |
| 14 | Hall sensor connector (internal) | Hall sensor connector cable | Connect one end to the hall sensor and the other end to this connector. |
| 15 | Keyboard connector (internal) | Keyboard assembly cable | The keyboard assembly comes with a cable. Connect the cable to this connector. |

Camera/microphone board connector and cable



Table 5. Camera/microphone board connector and cable guide

| Item | Connector (location) | Internal cable required | Cable connection |
|----------|--|-------------------------|---|
| 1 | Camera/microphone board connector (internal) | LCD cable | Connect one end to the LCD connector on the system board and the other end to this connector. |

Touch pad connector and cable

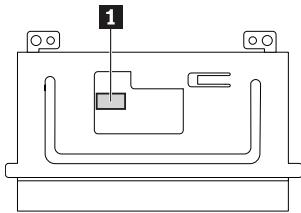


Table 6. Touch pad connector and cable guide

| Item | Connector (location) | Internal cable required | Cable connection |
|----------|--------------------------------|-------------------------|--|
| 1 | Touch pad connector (internal) | Touch pad cable | Connect one end to the touch pad connector on the system board, and the other end to this connector. |

Wireless-LAN card connectors and cables

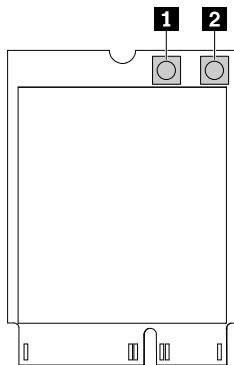


Table 7. Wireless-LAN card connector and cable guide

| Item | Connector (location) | Internal cable required | Cable connection |
|----------|---|--------------------------|--|
| 1 | Wireless-LAN antenna connector (internal) | Wireless-LAN antenna kit | Connect one end of the gray wireless-LAN antenna to the LCD rear cover assembly, and the other end to this connector. |
| 2 | Wireless-LAN antenna connector (internal) | Wireless-LAN antenna kit | Connect one end of the black wireless-LAN antenna to the LCD rear cover assembly, and the other end to this connector. |

Hall sensor board connector and cable

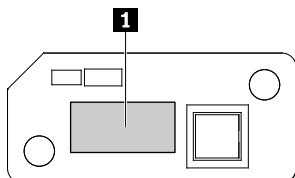


Table 8. Hall sensor board connector and cable guide

| Item | Connector (location) | Internal cable required | Cable connection |
|------|--|-----------------------------|--|
| 1 | Hall sensor board connector (internal) | Hall sensor board connector | Connect one end to the hall sensor board, and the other end to the system board. |

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 7. FRU replacement notices

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

CRU statement for customers:

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

Common service tools

Below is the list of common service tools that you might need while servicing the computer.

- Screwdriver kit (including T5 Torx screwdriver)
- 1/4" drive spinner handle
- 1/4" Sq. to 1/4" hex torx adapter
- TR7-TR-10 tamper resistant torx bits
- Removal tool antenna RF connector
- USB 2.0 CD-RW/DVD-ROM combo drive II
- USB cable
- USB floppy diskette drive for maintenance diskette
- USB floppy diskette drive tool kit
- Test card for integrated Smart Card
- LENOVO ThinkPad Hardware Maintenance Diskette Version 1.76 or later

Note: Download the file from the following Web site:

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

Screw notices

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

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

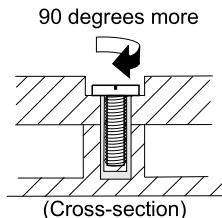
Do the following when you service this machine:

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

Tighten screws as follows:

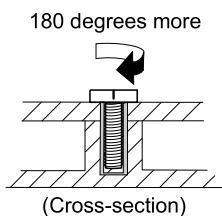
- **Plastic to plastic**

Turn an additional 90 degrees after the screw head touches the surface of the plastic part.



- **Logic card to plastic**

Turn an additional 180 degrees after the screw head touches the surface of the logic card.



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.

Hardware identity

A set of valid hardware identities (HWIDs) are provided by Google. Google logs the exact hardware combination into a Chromebook and creates an HWID. The HWID is used to ensure that all parts are valid during the repair of the Chromebook. The HWID is used for the following purposes:

- Auto-update new patches and software for the lifetime of the computer
- Recover the computer to the factory default settings

If unauthorized parts are installed, you might not get the correct auto-updates for your computer, or you might not recover your computer successfully to the factory default settings. For example, if you install a different model of the wireless LAN card, which is not the required configuration, the HWID will not match.

HWID is checked by using the repair shim. For information about the repair shim, see “Overview of the Chromebook USB repair shim” on page 21.

Prerequisite for replacing a FRU

Use the repair shim before replacing any non-CRUs. The following is the list of CRUs for your Chromebook:

- Lenovo USB-C 45W AC Adapter

For CRU definition, see “Locating FRUs and CRUs” on page 36.

For information about how to use the repair shim, see “Using the repair shim” on page 23.

Chapter 8. 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



DANGER

Before removing any FRU, turn off the computer, unplug the Lenovo USB-C 45W AC Adapter from electrical outlets, disconnect any interconnecting cables, and then disable the battery.

For instructions on how to disable the battery, see “Disabling the battery” on page 48.

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 7 “FRU replacement notices” on page 45.
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.

Attention: After replacing a FRU, do not turn on the computer until you have made sure that all screws, springs, and other small parts are in place and none are loose inside the computer. Verify this by shaking the computer gently and listening for rattling sounds. Metallic parts or metal flakes can cause electrical short circuits.

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

Disabling the battery

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

Note: Follow the instructions on the screen in addition to the instructions in this topic.

1. Turn off your computer and disconnect all cables from the computer. Connect the Lenovo USB-C 45W AC Adapter to the power connector on your computer.
2. Do the following to enter Developer mode:
 - a. Press and hold the esc key, the refresh key  C, and the power key at the same time. When the message Chrome OS is missing or damaged. Please insert a recovery USB stick or SD card. is displayed, press ctrl+d.
- Note:** If you are prompted to turn off the OS verification, press enter.
- b. When the message OS verification is OFF. Press SPACE to re-enable. is displayed, do not press the space key. The computer will restart automatically. This process takes several minutes.
3. When prompted to log on to the computer, press and hold the ctrl + alt + forward key  → at the same time, then the Terminal window is displayed.
4. When prompted to log on to the local host, type chronos in the **localhost login:** field and press enter.
5. Type sudo bash in the **chronos@localhost** field and press enter.
6. Type ectool batterycutoff in the **localhost user** field and press enter.
7. When the message SUCCESS. The battery has arranged a cut-off and the system should be shutdown immediately. is displayed, disconnect the Lenovo USB-C 45W AC Adapter from the computer and the computer turns off immediately. The battery is disabled. Wait several minutes to let the computer cool.

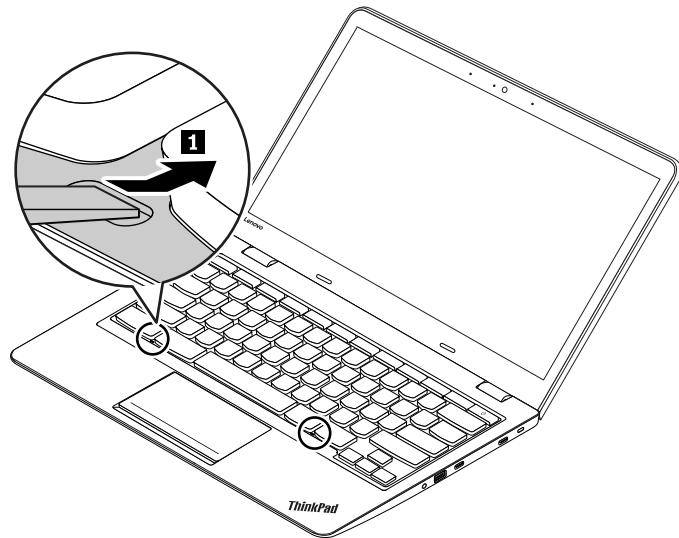
1010 Keyboard

Removal steps of the keyboard

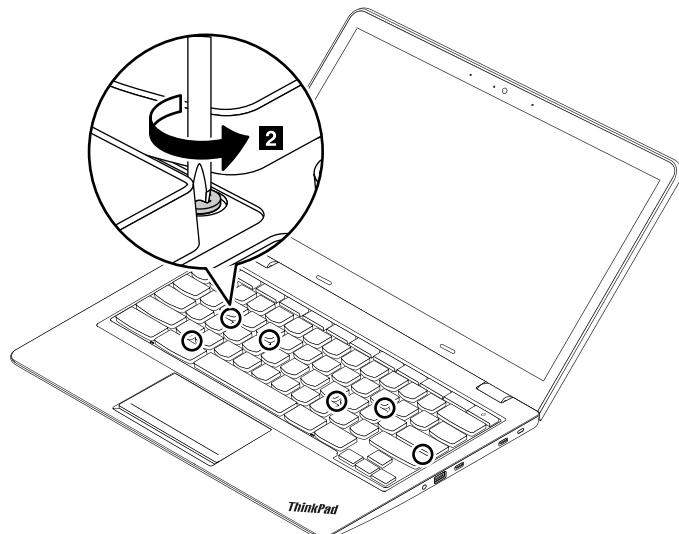
To remove the keyboard, do the following:

Note: You might be instructed to slide the keyboard frame forward or backward in some of the following steps. In this case, ensure that you do not press and hold the keys while sliding the keyboard frame. Otherwise, the keyboard frame cannot be moved.

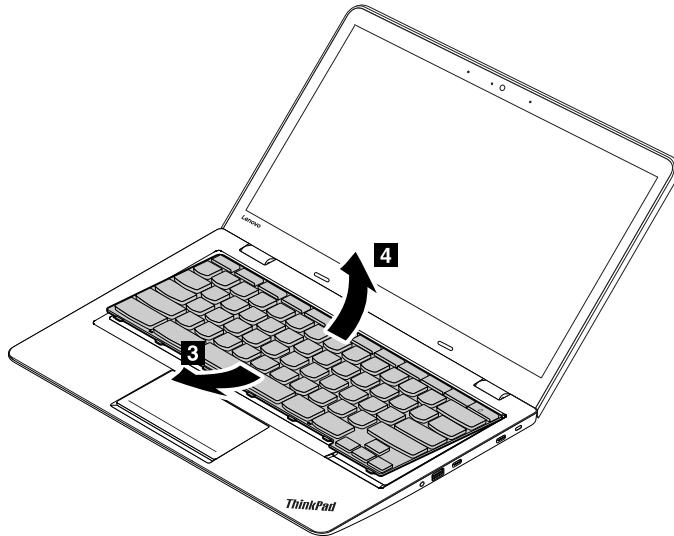
1. To reveal the screw heads beneath the keyboard frame, use the flat end of the multi-tool to slide the keyboard forward by 2.5 mm (0.1 inch).



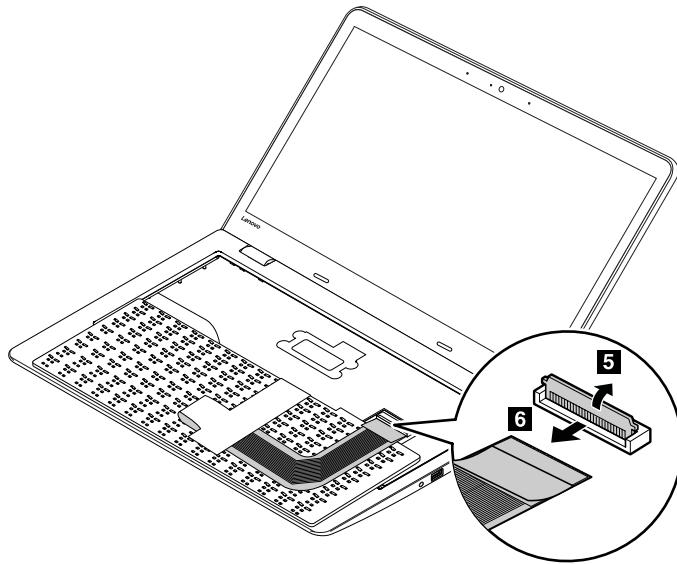
2. Use the cross end of the multi-tool to loosen the screws.



3. Pivot the keyboard slightly upward as shown by arrow **3** until you can see the connectors on the bottom side of the keyboard. Then turn the keyboard over as shown by arrow **4**.

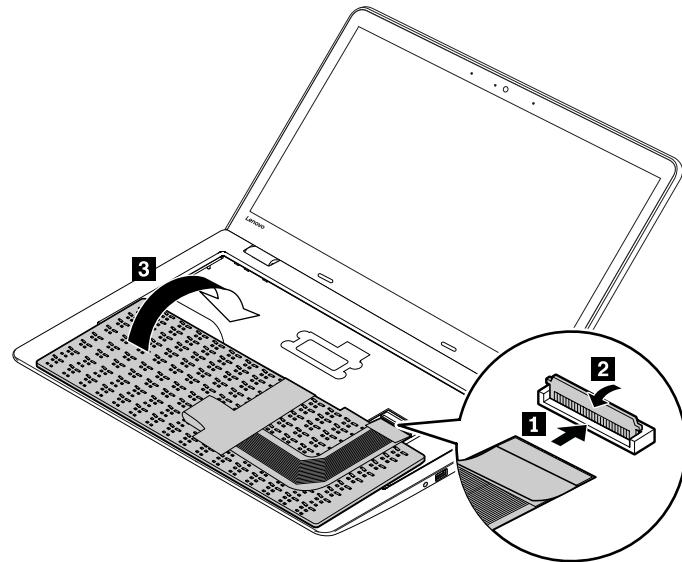


4. Put the keyboard on the palm rest and detach the connectors. Then remove the keyboard.

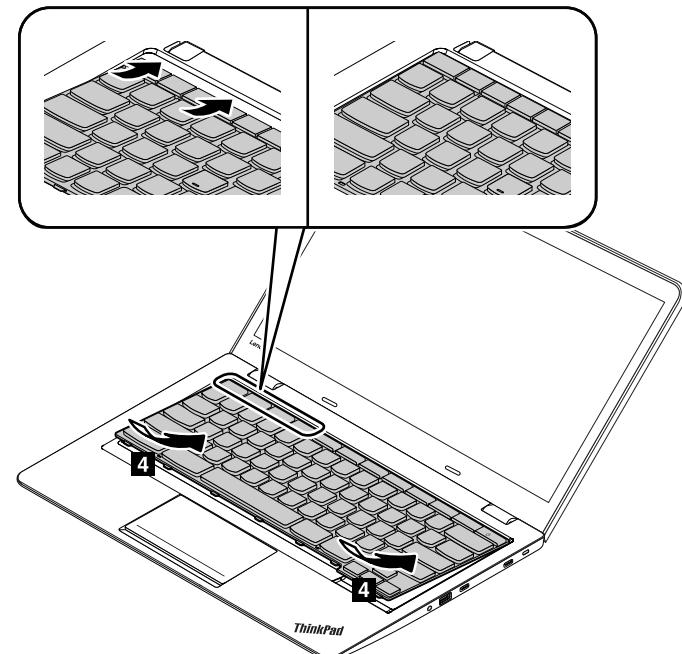


To install the new keyboard, do the following:

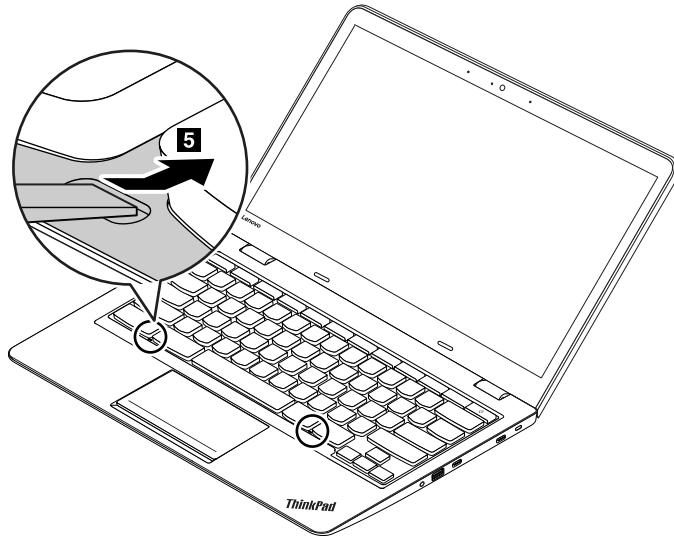
1. Attach the connectors, and then turn the keyboard over.



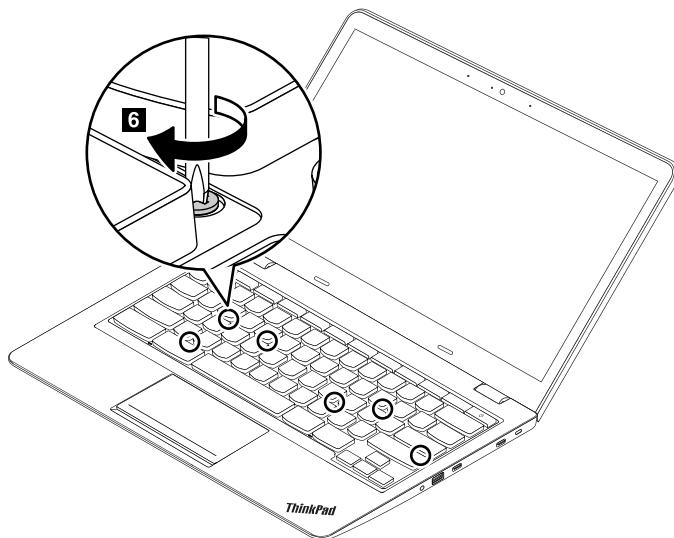
2. Insert the keyboard into the keyboard bezel as shown. Ensure that the front edge of the keyboard (the edge that is close to the display) is under the frame of the keyboard bezel.



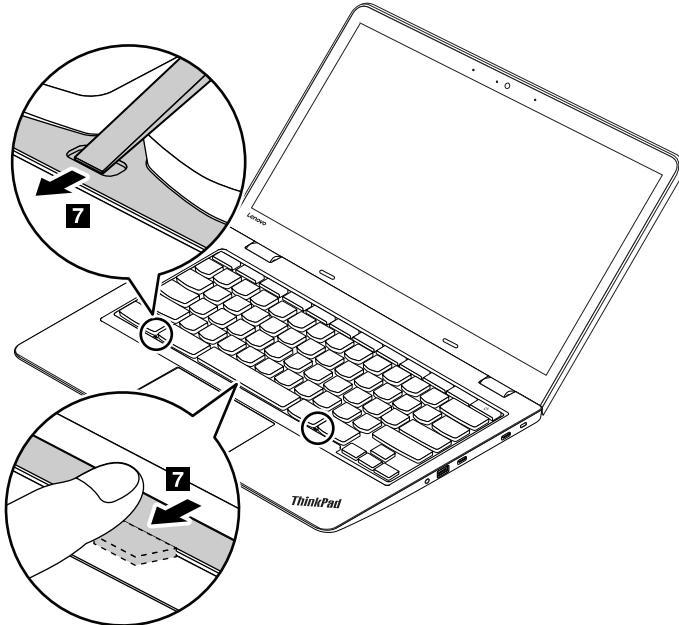
3. Ensure that the screw heads are exposed completely. Otherwise, reveal the screw heads by sliding the keyboard frame forward with the flat end of the keyboard multi-tool.



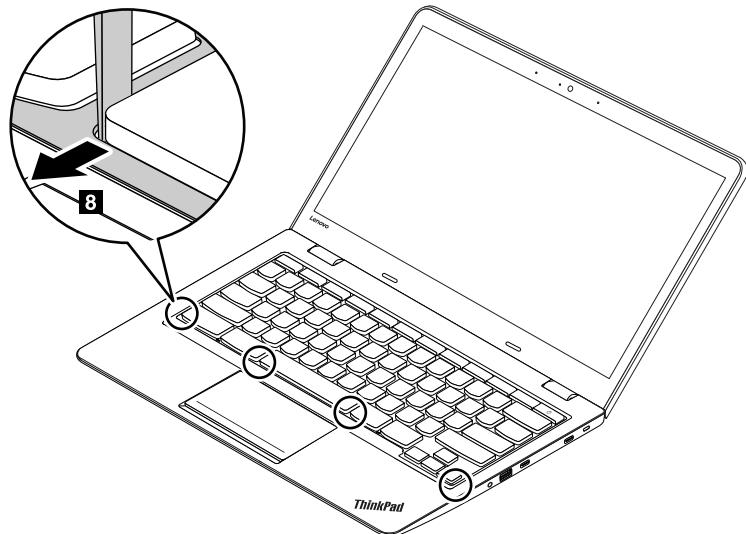
4. Tighten the screws with the cross end of the keyboard multi-tool to secure the keyboard in place.



5. Slide the keyboard frame backward by 2.5 mm (0.1 inch) with the flat end of the keyboard multi-tool to hide the latches of the keyboard frame under the keyboard bezel.



6. Insert the flat end of the keyboard multi-tool into the sides of the keyboard as shown to push the keyboard frame backward. Ensure that there is no gap between the keyboard frame and keyboard bezel.



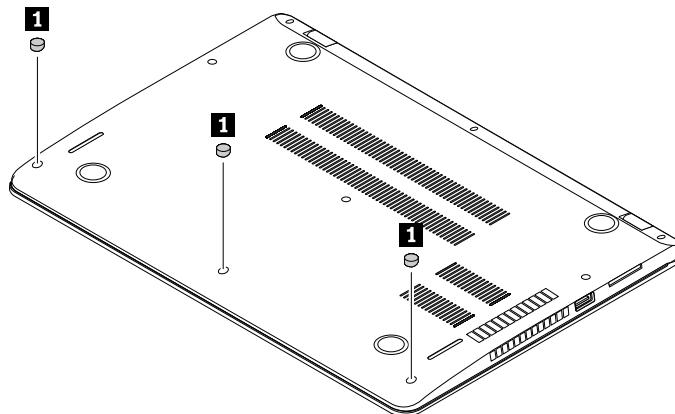
When installing:

Ensure that the connectors are attached firmly.

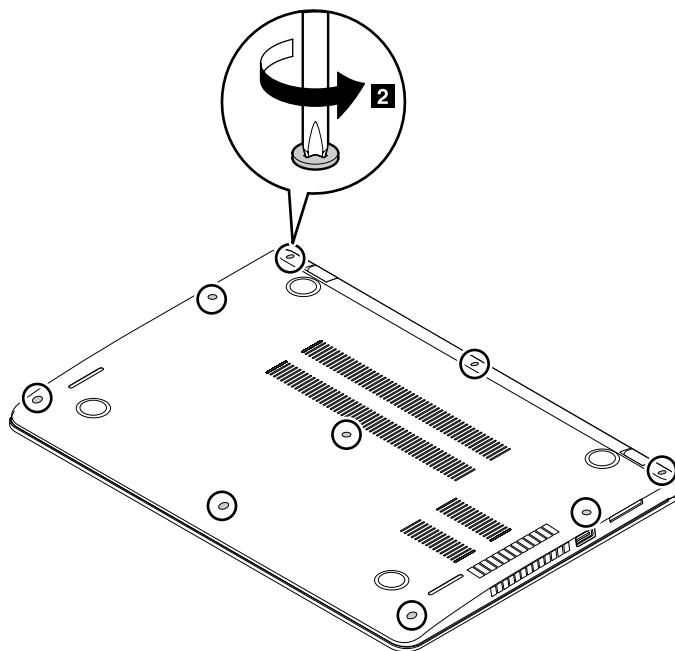
1020 Base cover assembly

Removal steps of the base cover assembly

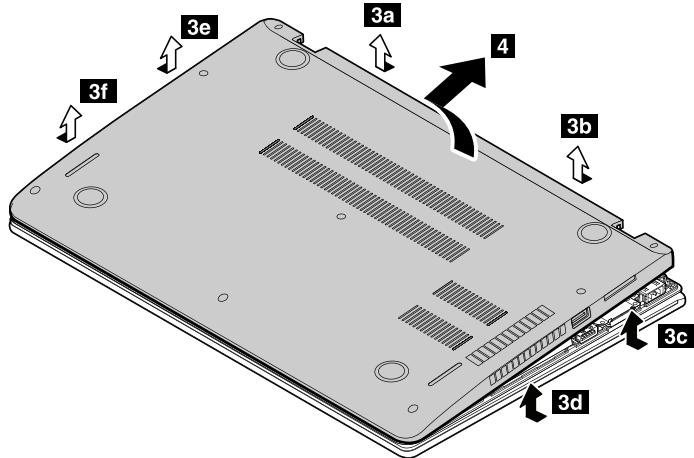
1. Remove the screw caps.



2. Loosen the screws that secure the base cover assembly.

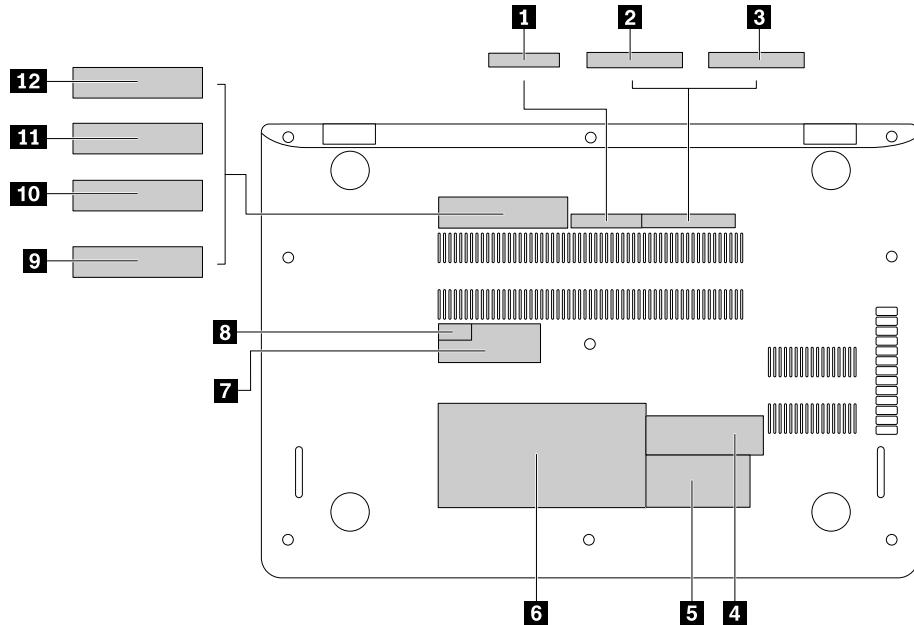


- Pry up the latches in ascending alphabetical order (a to f) as illustrated, and then remove the base cover assembly.



Applying labels to the base cover

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 off from the old base cover, and adhere them to the new one.



When you replace the base cover, apply the serial number label **1**.

The following labels must be peeled off from the old base cover, and then adhere to the new base cover.

- 2** FCC label
- 4** Asset tag
- 6** Asset tag
- 8** ICASA label

- 3** US GEO label
- 5** Asset tag
- 7** Israel homologation label
- 9** EMEA GEO label

10 AP/LA GEO label

11 Taiwan GEO label

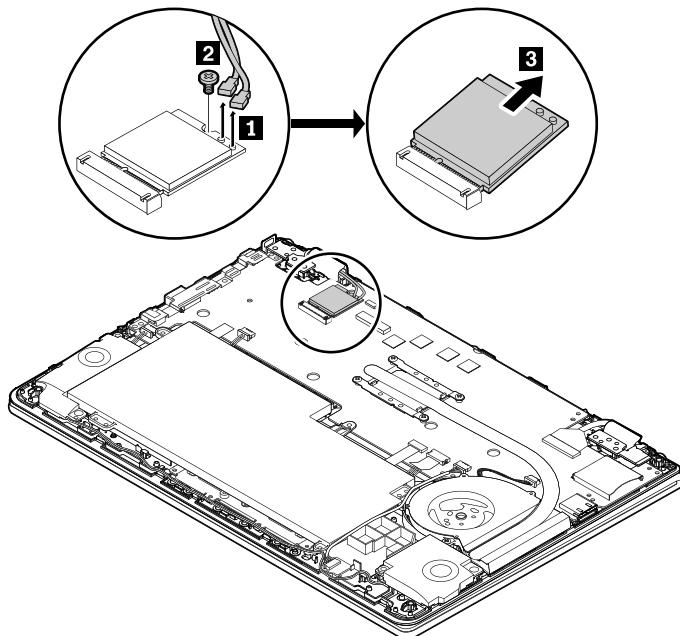
12 ANZ GEO label

1030 Wireless LAN card

For access, remove this FRU:

- “1020 Base cover assembly” on page 54

Removal steps of the wireless LAN card



| Step | Screw (quantity) | Color | Torque |
|----------|---|--------|---------------------------|
| 2 | M2 × L2.5 mm, flat-head, nylon-coated (1) | Silver | 0.181 Nm (1.85 kgf-cm) |

When installing:

- Attach the gray cable to the connector marked “MAIN” on the card, and attach the black cable to the connector marked “AUX”.
- Ensure that the connectors are attached firmly.

1040 Battery

Important notices for replacing a battery

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

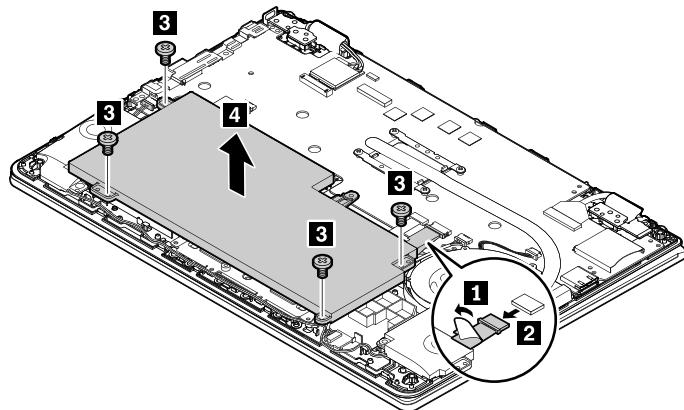
For access, remove this FRU:

- “1020 Base cover assembly” on page 54

Removal steps of the battery



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



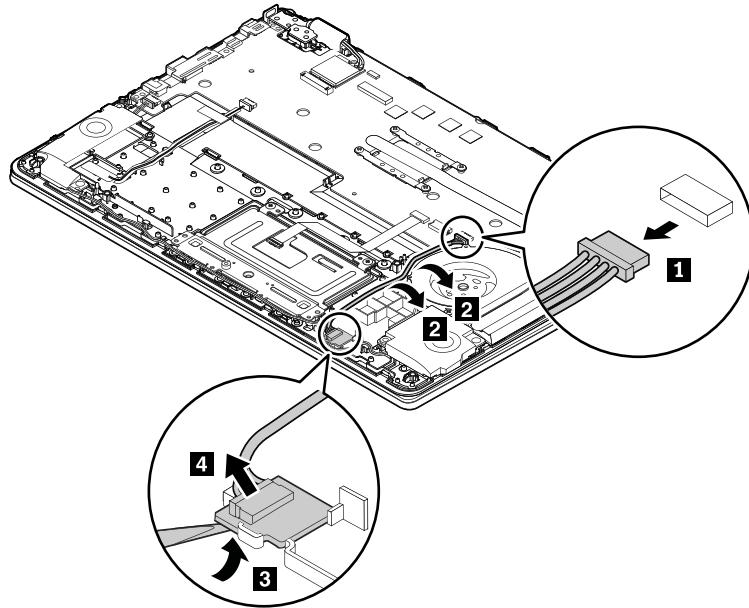
| Step | Screw (quantity) | Color | Torque |
|------|---|-------|---------------------------|
| 3 | M2 × L4 mm, flat-head, nylon-coated (4) | Black | 0.181 Nm (1.85 kgf-cm) |

1050 Hall sensor with cable

For access, remove these FRUs in order:

- “1020 Base cover assembly” on page 54
- “1040 Battery” on page 56

Removal steps of the hall sensor



When installing:

Ensure that the connector is attached firmly.

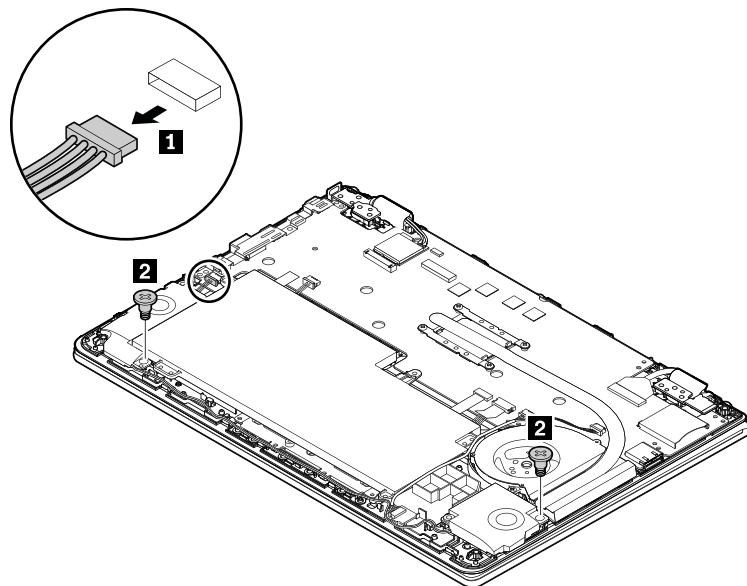
1060 Speaker assembly

For access, remove these FRUs in order:

- “1020 Base cover assembly” on page 54

Removal steps of the speaker assembly

Detach the connector and remove the screws that secure the speaker assembly.

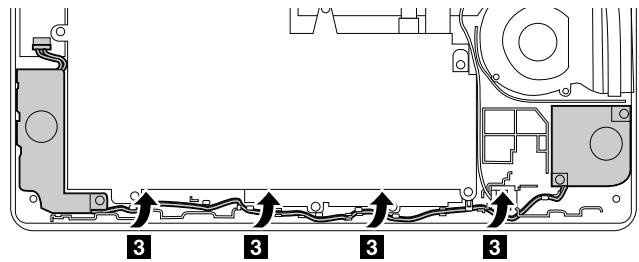


| Step | Screw (quantity) | Color | Torque |
|------|---|-------|---------------------------|
| 2 | M2 × 5.5 mm, big-head, nylon-coated (2) | Black | 0.181 Nm (1.85 kgf-cm) |

Remove the speaker assembly.

When installing:

Ensure that the cables are properly routed.

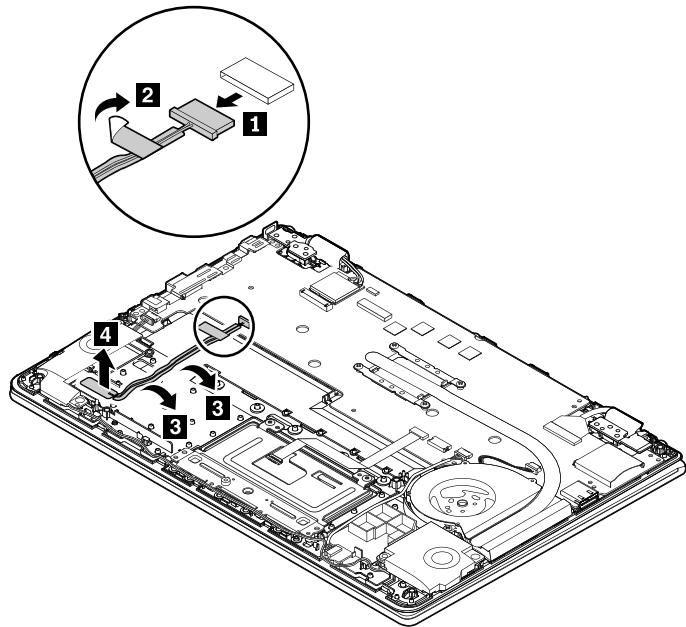


1070 ThinkPad-logo-LED card

For access, remove these FRUs in order:

- “1020 Base cover assembly” on page 54
- “1040 Battery” on page 56

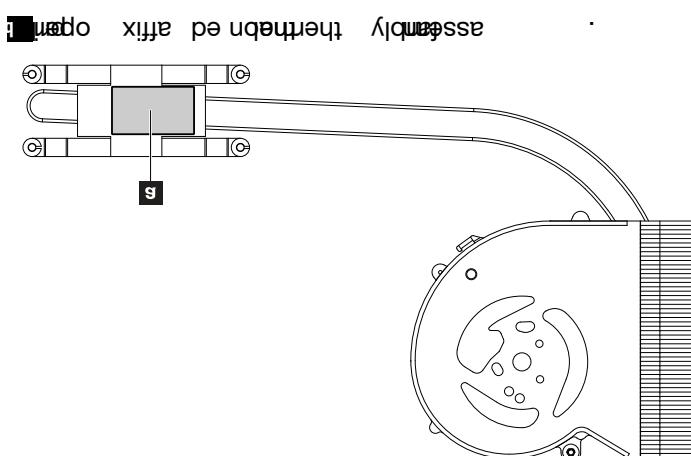
Removal step of the ThinkPad-logo-LED card



1080 USB support bracket

For access, remove these FRUs in order:

- “1020 Base cover assembly” on page 54



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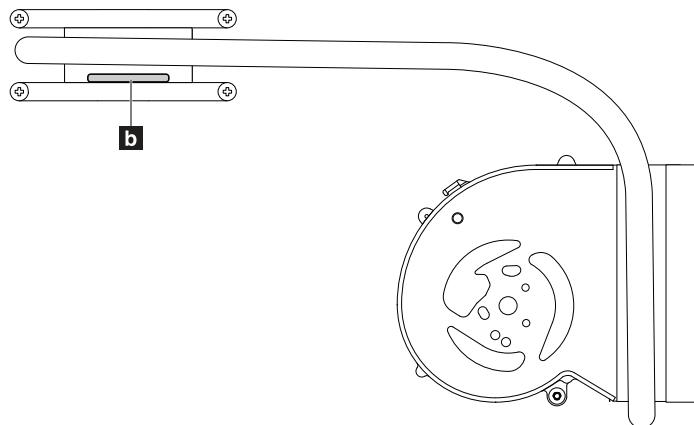
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- Do not touch the thermal grease.
- Do not press, touch, or rotate the fan impeller.
- Do not touch the fan inlet hole.
- Do not twist or pull the cable of the thermal fan assembly.
- Do not apply pressure on the top and bottom covers of the thermal fan assembly.
- Do not press the heat pipe. Hold both sides of the heat pipe if you must 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.

1110 System board

Important notices for handling the system board

When handling the system board, read the following:

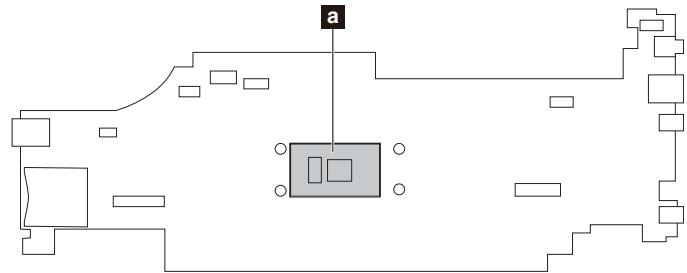
- The system board has an accelerometer, which can be broken when several thousands of G-forces are applied.
- Note:** Dropping a system board from a height of as little as 0.15 m (6 inches) so that it falls flat on a hard bench can subject the accelerometer to as much as 6000 G's of shock.
- Be careful 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:

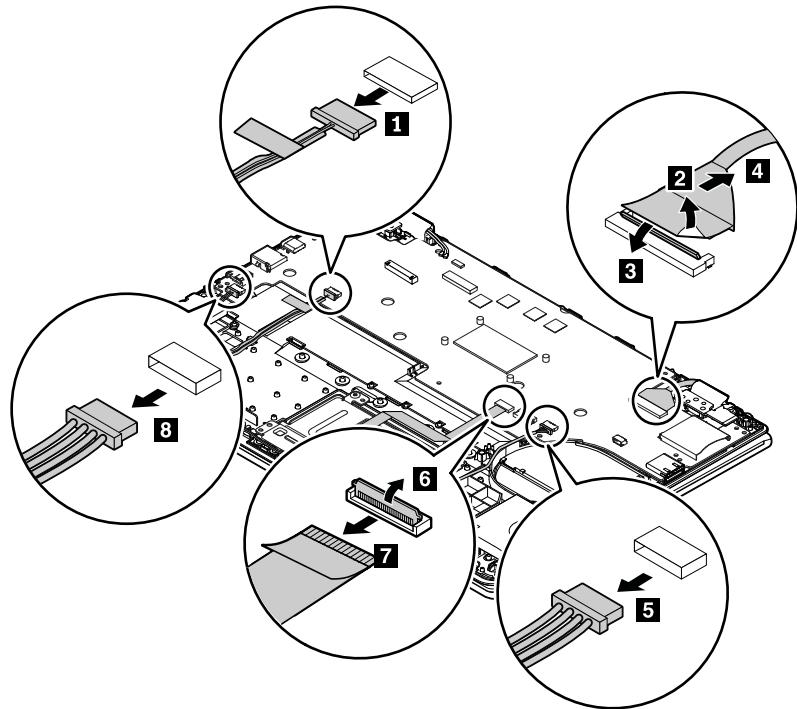
- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1080 USB support bracket ” on page 59
- “1090 Thermal fan assembly” on page 60

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

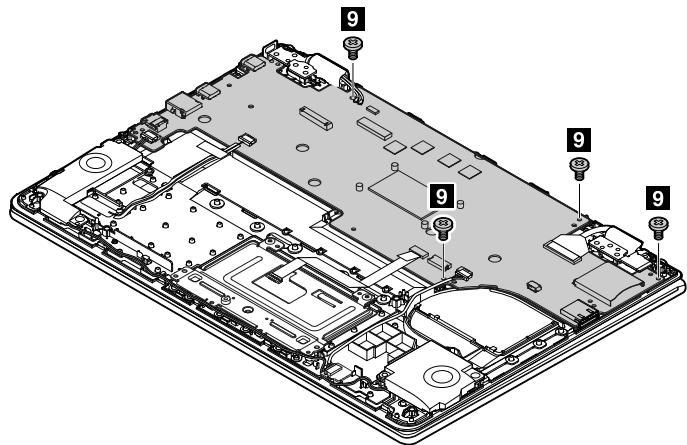
a Microprocessor



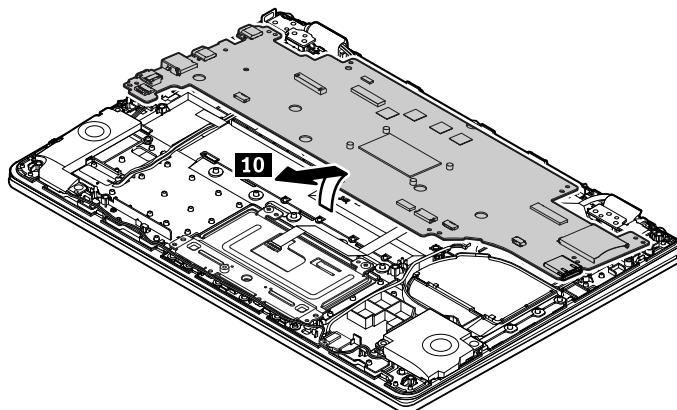
Disconnect the connectors attached to the system board.



Remove the screws that secure the system board.



| Step | Screw (quantity) | Color | Torque |
|------|--|-------|---------------------------|
| 9 | M2.0 × 2.5 mm, flat-head, nylon-coated (4) | Black | 0.181 Nm (1.85 kgf-cm) |



When you install the system board:

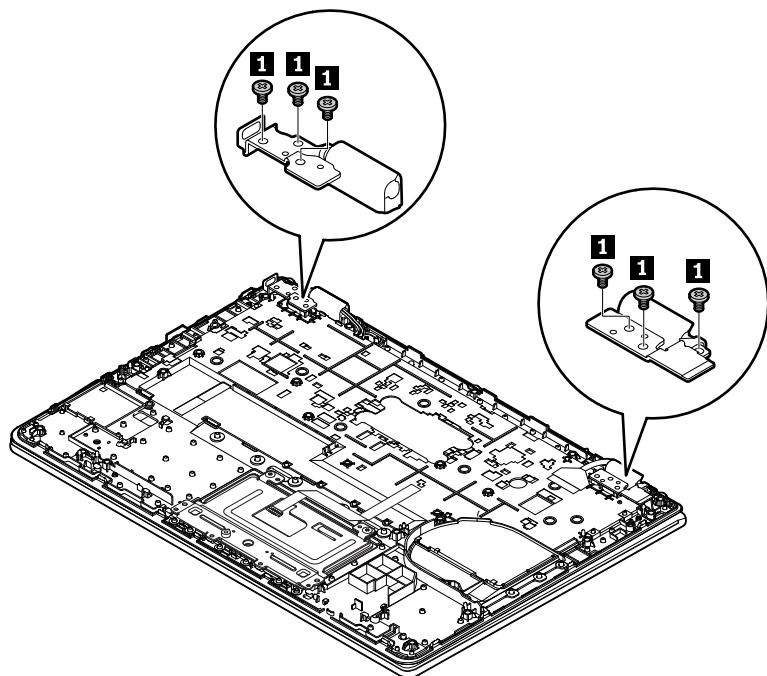
Ensure that all the connectors are attached firmly to the system board.

1120 keyboard bezel assembly and LCD unit

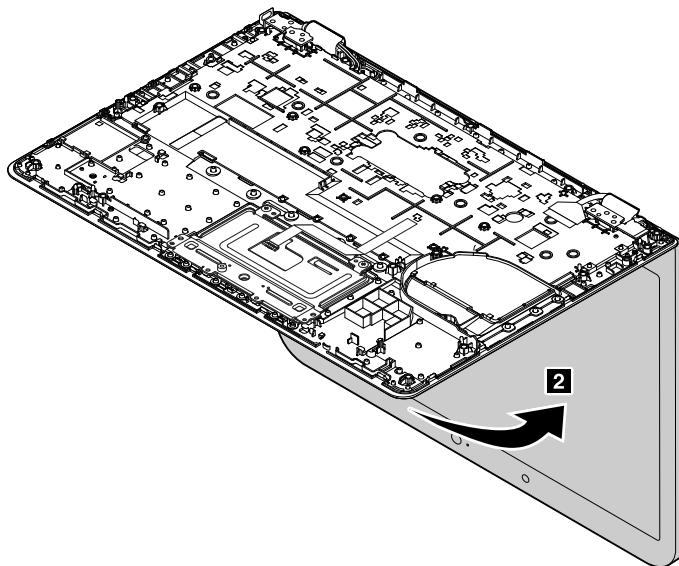
Removal steps of the keyboard bezel assembly and LCD unit

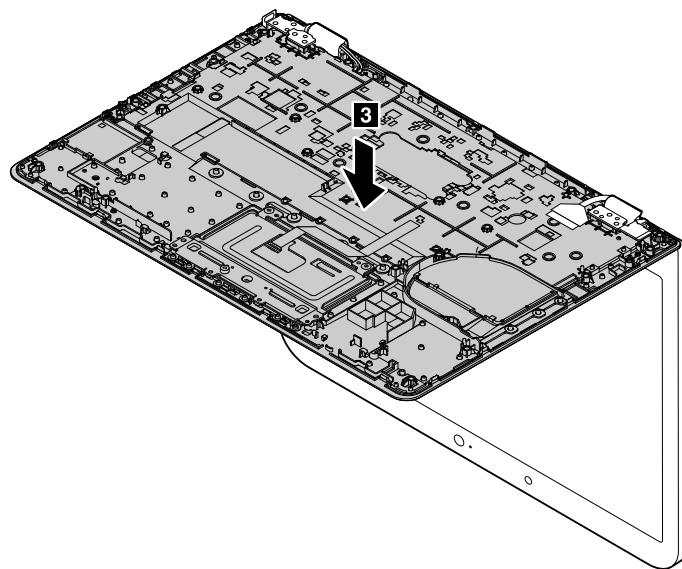
For access, remove these FRUs in order:

- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1050 Hall sensor with cable” on page 57
- “1060 Speaker assembly” on page 58
- “1070 ThinkPad-logo-LED card” on page 59
- “1080 USB support bracket ” on page 59
- “1090 Thermal fan assembly” on page 60
- “1110 System board” on page 62



| Step | Screw (quantity) | Color | Torque |
|------|---|-------|------------------------|
| 1 | M2.5 × L4 mm, flat-head, nylon-coated (6) | Black | 0.249 Nm (3 kgf-cm) |



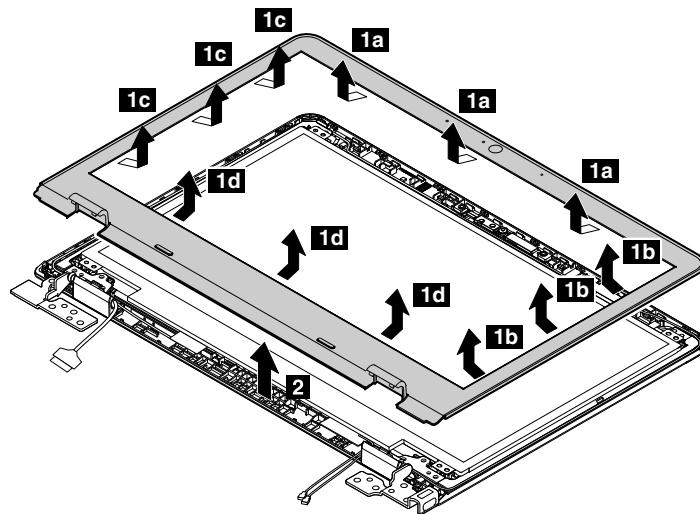


2010 LCD bezel assembly

For access, remove these FRUs in order:

- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1050 Hall sensor with cable” on page 57
- “1060 Speaker assembly” on page 58
- “1070 ThinkPad-logo-LED card” on page 59
- “1080 USB support bracket ” on page 59
- “1090 Thermal fan assembly” on page 60
- “1110 System board” on page 62
- “1120 keyboard bezel assembly and LCD unit” on page 64

Removal steps of the LCD bezel assembly



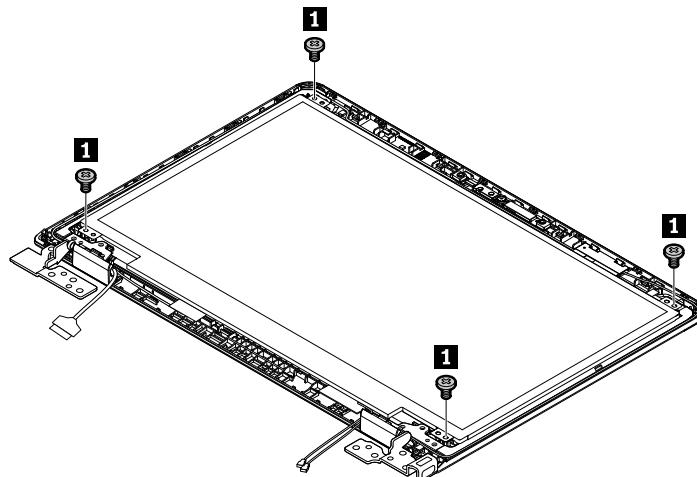
When installing: Ensure that all the latches are attached firmly.

2020 LCD panel

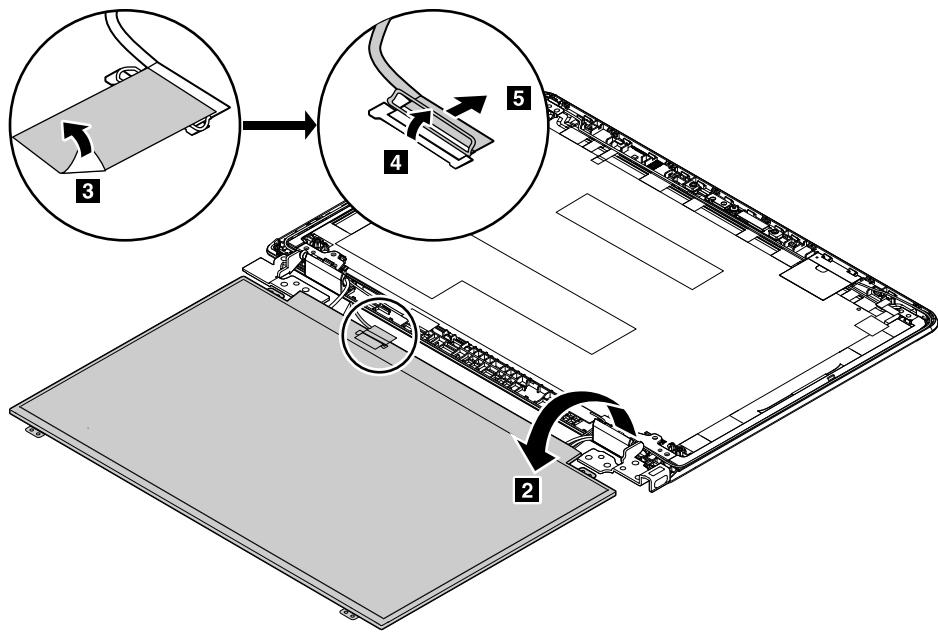
For access, remove these FRUs in order:

- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1050 Hall sensor with cable” on page 57
- “1060 Speaker assembly” on page 58
- “1070 ThinkPad-logo-LED card” on page 59
- “1080 USB support bracket ” on page 59
- “1090 Thermal fan assembly” on page 60
- “1110 System board” on page 62
- “1120 keyboard bezel assembly and LCD unit” on page 64
- “2010 LCD bezel assembly” on page 66

Removal steps of LCD panel



| Step | Screw (quantity) | Color | Torque |
|------|---|-------|---------------------------|
| 1 | M2 x L3 mm, flat-head, nylon-coated (4) | Black | 0.181 Nm (1.85 kgf-cm) |



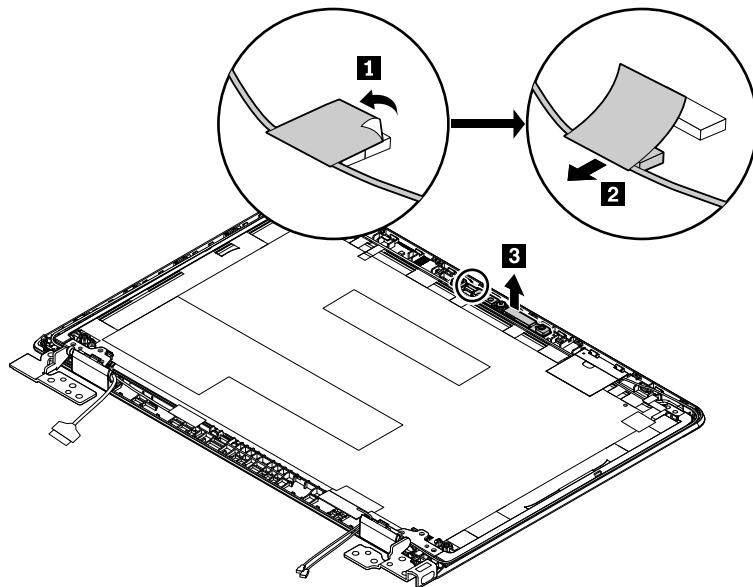
When installing: Ensure that the LCD connector is attached firmly.

2030 Integrated camera and microphone combo card

For access, remove these FRUs in order:

- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1050 Hall sensor with cable” on page 57
- “1060 Speaker assembly” on page 58
- “1070 ThinkPad-logo-LED card” on page 59
- “1080 USB support bracket ” on page 59
- “1090 Thermal fan assembly” on page 60
- “1110 System board” on page 62
- “1120 keyboard bezel assembly and LCD unit” on page 64
- “2010 LCD bezel assembly” on page 66
- “2020 LCD panel” on page 67

Removal steps of the integrated camera and microphone combo card



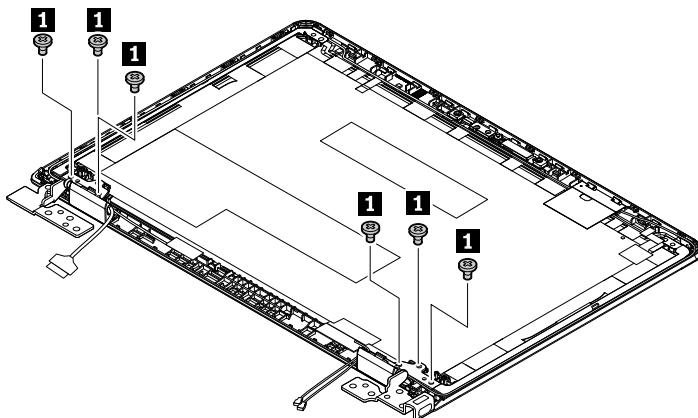
When installing: Ensure that the connector is attached firmly.

2040 Hinge kit

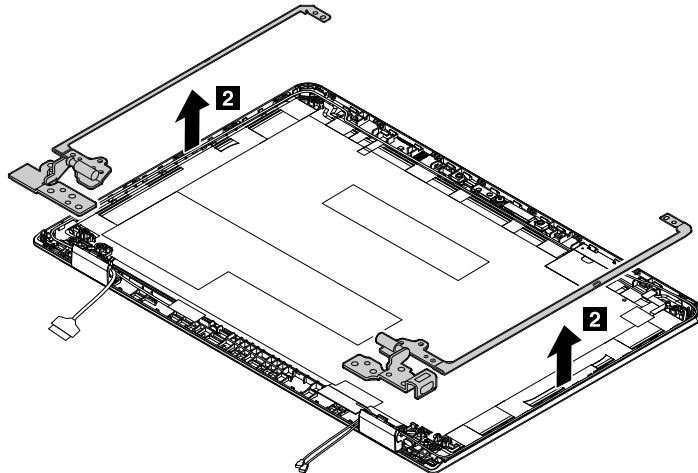
For access, remove these FRUs in order:

- “1010 Keyboard” on page 48
- “1020 Base cover assembly” on page 54
- “1030 Wireless LAN card” on page 56
- “1040 Battery” on page 56
- “1050 Hall sensor with cable” on page 57
- “1060 Speaker assembly” on page 58
- “1070 ThinkPad-logo-LED card” on page 59
- “1080 USB support bracket” on page 59
- “1090 Thermal fan assembly” on page 60
- “1110 System board” on page 62
- “1120 keyboard bezel assembly and LCD unit” on page 64
- “2010 LCD bezel assembly” on page 66
- “2020 LCD panel” on page 67
- “2030 Integrated camera and microphone combo card” on page 68

Removal steps of the hinge kit



| Step | Screw (quantity) | Color | Torque |
|------|---|-------|--------------------------|
| 1 | M2.5 × L3 mm, flat-head, nylon-coated (6) | Black | 0.294 Nm (3.0 kgf-cm) |

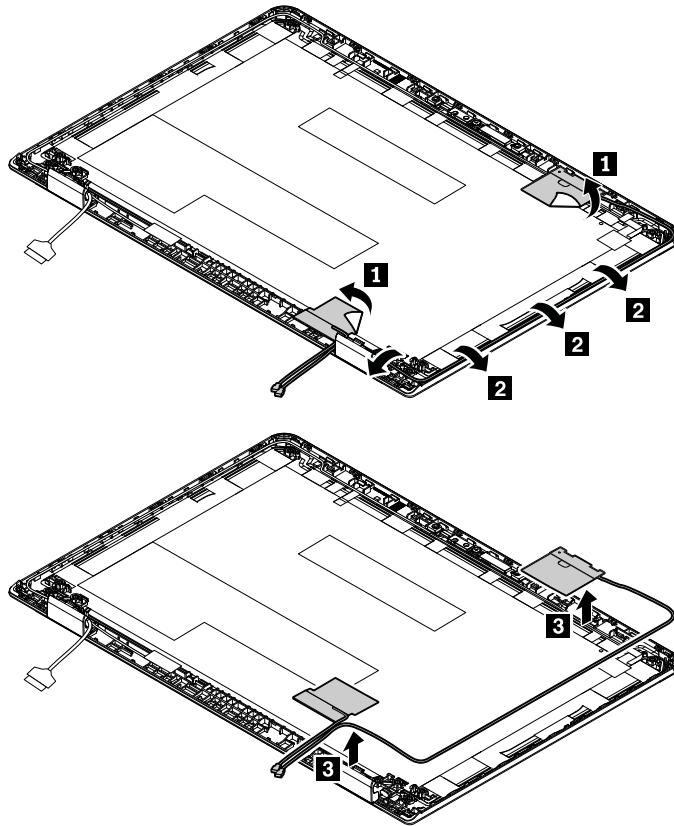


2050 Wireless LAN antenna assembly

For access, remove these FRUs in order:

- “1120 keyboard bezel assembly and LCD unit” on page 64
- “2010 LCD bezel assembly” on page 66
- “2020 LCD panel” on page 67
- “2030 Integrated camera and microphone combo card” on page 68

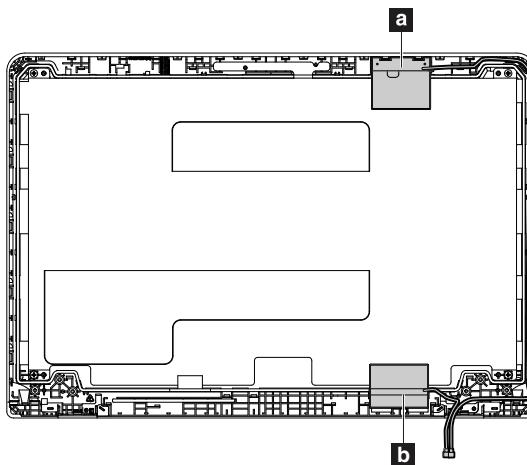
Removal steps of the wireless LAN antenna assembly



Antenna locations

a Wireless LAN main antenna (gray)

b Wireless LAN auxiliary antenna (black)



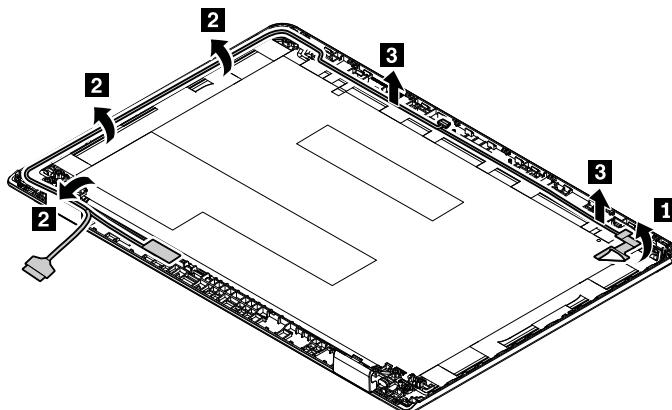
Attention: When you route the cables, ensure that they are not subject to any tension. Tension could cause the cables to be damaged by the cable guides, or a wire to be broken.

2060 LCD cable assembly and LCD rear cover assembly

For access, remove these FRUs in order:

- “1120 keyboard bezel assembly and LCD unit” on page 64
- “2010 LCD bezel assembly” on page 66
- “2020 LCD panel” on page 67
- “2030 Integrated camera and microphone combo card” on page 68
- “2040 Hinge kit” on page 69
- “2050 Wireless LAN antenna assembly” on page 70

Removal step of the LCD cable assembly and LCD rear cover assembly



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Appendix B. Abbreviation table

The following table lists all abbreviations used in this manual.

| Abbreviation | Term |
|--------------|--|
| BGA | Ball Grid Array |
| CD | Compact Disc |
| CRU | Customer Replaceable Unit |
| CTO | Configure To Order |
| DC | Direct current |
| DVD | Digital Video Disc |
| EPO | Emergency power-off |
| ESD | Electrostatic discharge |
| EU | European Union |
| FCC | Federal Communications Commission |
| FRU | Field Replaceable Unit |
| HDMI | High-definition multimedia interface |
| ICs | Integrated circuits |
| ISO | International Standardization Organization |
| LAN | Local area network |
| LCD | Liquid Crystal Display |
| MT | Machine type |
| MTM | Machine type and model |
| PC | Personal Computer |
| POST | Power-on self-test |
| RF | Radio frequency |
| TFTs | Thin-film transistors |
| USB | Universal Serial Bus |



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