



# Hardware Maintenance Manual

**ThinkPad Helix and Enhanced Keyboard Dock for ThinkPad Helix**

**Note:** Before using this manual to service the product it supports, be sure to read the general information under Chapter 10 “Notices” on page 71.

**First Edition (January 2013)**

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## About this manual

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

| Machine  | Machine type (MT)                |
|--|----------------------------------|
| ThinkPad Helix and Enhanced Keyboard Dock for ThinkPad Helix | 3697, 3698, 3700, 3701, and 3702 |

### 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.



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## Chapter 1. Safety information

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

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

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### General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
  1. 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 customers 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 do 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 other parts that you have removed.

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

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

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

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

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

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

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

This practice ensures correct grounding of the units.

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

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## Safety inspection guide

The purpose of this inspection guide is to assist you in identifying potentially unsafe conditions. 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 Cathode ray tube (CRT) face or a bulging capacitor
- Mechanical hazards, such as loose or missing hardware

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

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Turn off the tablet.
3. Disconnect the power supply of the built-in battery by pressing the emergency reset button inside the emergency reset hole using a straightened paper clip.
4. Disconnect the power cord.
5. Check the power cord for the following:
  - a. Make sure that a third-wire ground connector is in good condition. Use a meter to measure the third-wire ground continuity, and make sure that the continuity between the external ground pin and the frame ground is 0.1 ohm or less.
  - b. Use Lenovo authorized power cord only.
  - c. Insulation is not frayed or worn.
6. Remove the LCD module assembly.
7. Check for cracked or bulging built-in batteries.
8. Check for any obvious non-ThinkPad alterations. Use good judgment as to the safety of any non-ThinkPad alterations.
9. 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.
10. Check for worn, frayed, or pinched cables.
11. Check that the built-in battery fasteners (screws or rivets) have not been removed or tampered with.

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## 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.

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## Grounding requirements

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

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## Safety notices (multilingual translations)

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

- English
- Arabic
- Brazilian Portuguese
- French
- German
- Hebrew
- Japanese
- Korean
- Spanish
- Traditional Chinese



### DANGER

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



## **DANGER**

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



## **DANGER**

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



## **DANGER**

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



## **DANGER**

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



## **DANGER**

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



## **DANGER**

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



## DANGER

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



خطر

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



خطر

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



خطر

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



خطر

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



خطر

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



خطر

على الرغم من أن البطاريات الرئيسية يكون لها جهد منخفض، إلا أنه قد تقوم البطاريات التي حدث قصور بها أو التي تم توصيلها أرضيا 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 اغلاق النظام، قم بتنفيذ ما يلي قبل ازالته. قم بإيقاف تشغيل الحاسب ونزع كل أسلاك الطاقة من المخارج الكهربائية وقم أيضا بإزالة حزمة البطارية ثم قم بفصل أي كابلات متصلة.



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



#### PERIGO

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



## DANGER

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



## DANGER

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



## DANGER

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



## DANGER

La pile de sauvegarde contient du lithium. Elle présente des risques d'incendie, d'explosion ou de brûlures graves. Ne la rechargez pas, ne retirez pas son connecteur polarisé et ne la démontez pas. Ne l'exposez pas à une 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 החלפת FRU יש לוודא שכל חברגים, חקפזים, וחלקים קטנים אחרים נמצאים במקומם ואינם חופשיים לזוז בתוך המחשב. כדי לוודא זאת, יש לטלטל את המחשב ולחקש לבילוי קולות שקשוק. חלקי או שבבי מתכת עלולים לגרום לקצרים חשמליים.



סכנה

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



סכנה

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



סכנה

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



סכנה

אם מסך חגביש חנוזלי (LCD) נשבר וחנוזל מתוך חמסך בא במגע עם עיניכם או ידיכם, שטפו את האזורים חגועים מיד במים במשך 15 דקות לפחות. פנו לקבלת עזרה רפואית אם תסמינים חגועים מחמגע עם חנוזל נמשכים לאחר השטיפה.



סכנה

כדי למנוע התחשמלות, אין להסיר את מכסה הפלסטיק חמגן על חלקו התחתון של חכרטיס החמך.



סכנה

אף שהסוללות הראשיות חן בעלות מתח נמוך, סוללה מקוצרת או מוארכת עלולה להפיק זרם מספיק לגרימת כוויות או להצתת חומרים דליקים.



סכנה

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



危険

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



危険

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



危険

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



危険

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



危険

LCD が破損し、LCD 中の液体が目に入ったり、手に触れたりした場合は、液体が触れた部分を少なくとも 15 分間洗い流してください。洗い流した後に、液体によって何らかの症状が現れた場合は、医師の治療を受けてください。



危険

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



危険

메인·배터리의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 달각거리는 소리가 나지 않는지 확인하십시오. 금속 부품 또는 금속 조각은 누전을 일으킬 수 있습니다.



위험

일부 보조 배터리에는 소량의 니켈 및 카드뮴이 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. 올바르게 사용하지 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. 올바르게 사용하지 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. 올바르게 사용하지 않은 배터리를 사용하면 배터리가 발화되거나 폭발할 수 있습니다.



위험

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



위험



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



위험

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



위험

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



PELIGRO

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



PELIGRO

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



PELIGRO

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



PELIGRO

La batería de repuesto es una batería de litio y puede provocar incendios, explosiones o quemaduras graves. No la recargue, ni quite el conector polarizado, ni la desmonte, ni caliente por encima de los 100°C (212°F), ni la incinere ni exponga el contenido de sus celdas al agua. Deséchela tal como dispone la normativa local.



PELIGRO

Si la LCD se rompe y el fluido de su interior entra en contacto con sus ojos o sus manos, lave inmediatamente las áreas afectadas con agua durante 15 minutos como mínimo. Obtenga atención medica si se presenta algún síntoma del fluido despues de lavarse.



#### PELIGRO

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



#### PELIGRO

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



#### PELIGRO

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



#### 危險

完成 FRU 更換之後，在開啟電腦的電源之前，請確定所有螺絲、彈簧及其他小零件都已歸位，沒有遺留在電腦內部。  
若要確認這一點，請搖晃電腦，聽聽看是否有卡嗒的聲響。  
金屬零件或機件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。



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



為避免電擊，請勿拆下轉換卡下面的塑膠護蓋。



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。



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。



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## Chapter 2. Important service information

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

- “Strategy for replacing FRUs” on page 19
  - “Important notice for replacing a system board” on page 19
- “Strategy for replacing FRUs for CTO, CMV, and GAV” on page 20
  - “Product definition” on page 20
  - “FRU identification for CTO, CMV, and GAV products” on page 20

### Important:

- Advise customers to access <http://www.lenovo.com/support> to view the software fixes and driver downloads for the tablet. To install them, advise customers to call the Lenovo® Customer Support Center. Telephone numbers for Lenovo Support Center are available at:  
<http://www.lenovo.com/support/phone>
- System disassembly and reassembly videos that show the FRU removal and replacement procedures for the Lenovo authorized service technicians are available at:  
<http://www.lenovoservicetraining.com/ion/>

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## Strategy for replacing FRUs

### Before replacing parts:

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.**
- 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.

**Attention:** The setup configuration on the tablet you are servicing may have been customized. Running Automatic Configuration may alter the settings. Note the current configuration settings (using the View Configuration option); then, when service has been completed, verify that those settings remain in effect.

## Important notice for replacing a system board

**Attention:** When handling a system board:

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

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## Strategy for replacing FRUs for CTO, CMV, and GAV

### Product definition

#### Dynamic Configure To Order (CTO)

This product type provides the ability for a customer to configure a Lenovo solution from an eSite, and have this configuration sent to fulfillment, where it is built and shipped directly to the customer. The machine label, Product Entitlement Warehouse (PEW), and eSupport will load these products as the 4-digit MT and 3-digit model, where model = "CTO" (Example: 1829-CTO).

#### Custom Model Variant (CMV)

This is a unique configuration that has been negotiated between Lenovo and the customer. A unique 4-digit MT and 3-digit model is provided to the customer to place orders (Example: 1829-W15). A CMV is a special bid offering. Therefore, it is not generally announced.

- The MTM portion of the machine label is the 4-digit MT and 3-digit model, where model = "CTO" (Example: 1829-CTO). The PRODUCT ID portion of the machine label is the 4-digit MT and 3-digit CMV model (Example: 1829-W15).
- The PEW record is the 4-digit MT and 3-digit model, where model = "CTO" (Example: 1829-CTO).
- eSupport will show both the CTO and CMV machine type models (Example: 1829-CTO and 1829-W15 will be found on the eSupport site.)

#### General Announce Variant (GAV)

This is a standard model (fixed configuration). GAVs are announced and offered to all customers. The MTM portion of the machine label is a 4-digit MT and 3-digit model, where model = a "fixed part number", not "CTO" (Example: 1829-F1U). Also, PEW and eSupport will list these products under the same fixed model number.

### FRU identification for CTO, CMV, and GAV products

There are two information resources to identify which FRUs are used to support CTO, CMV, and GAV products. These resources are PEW and eSupport.

#### Using PEW

- **PEW** is the primary source for identifying FRU part numbers and FRU descriptions for the key commodities for CTO, CMV and GAV products at an MT - serial number level. An example of key commodities is system board or Liquid Crystal Display (LCD).
- Remember, all CTO and CMV products are loaded in PEW under the 4-digit MT and 3-digit model, where model = "CTO" (Example: 1829-CTO). GAVs are loaded in PEW under the 4-digit MT and 3-digit model, where model = a "fixed part number", not "CTO" (Example: 1829-F1U).
- PEW can be accessed at the following Web site:  
<http://www.lenovo.com/support/site.wss/document.do?Indocid=LOOK-WARNTY>  
Select Warranty lookup. Input the machine type and the serial number and the list of key commodities will be returned in the PEW record under COMPONENT INFORMATION.

#### Using eSupport

##### For key commodities (examples - hard disk drive, system board, microprocessor, LCD, and memory)

eSupport can be used to view the warranty status of key commodities built in a particular machine serial (this is the same record found in PEW). eSupport can be accessed at <http://www.lenovo.com/support>.

To view the warranty status of the key commodities on a ThinkPad product, do the following:

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

**For the remaining FRUs (the complete list of FRUs at the MT model level)**

eSupport also can be used to view the complete list of FRUs for a machine type and model.

To view the complete list of FRUs, do the following:

1. Go to <http://www.lenovo.com/support>.
2. Click **Parts & Accessories**.
3. Follow the instruction on the screen to identify the product.
4. Click **Product & Parts Detail**.
5. On the PRODUCT AND PARTS DETAIL page, click **Parts Detail** to view the complete list of FRUs.





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## Chapter 3. General checkout

This chapter presents the following information:

- “What to do first” on page 23
- “Power system checkout” on page 26

### Important:

- **Only certified trained personnel should service the tablet.**
- **Before replacing any FRU, read the entire page on removing and replacing FRUs.**
- **When you replace FRUs, use new nylon-coated screws.**
- **Be extremely careful during such write operations as copying, saving, or formatting.**
- **Replace a FRU only with another FRU of the correct model.**

When you replace a FRU, make sure that the model of the machine and the FRU part number are correct by referring to the FRU parts list.

- **A FRU should not be replaced because of a single, unreproducible failure.**

Single failure can occur for a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, electrostatic discharge, or software errors. Consider replacing a FRU only when a problem recurs. If you suspect that a FRU is defective, clear the error log and run the test again. If the error does not recur, do not replace the FRU.

- **Be careful not to replace a non-defective FRU.**

---

## What to do first

When you do 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. Failing FRU name and part number
6. Machine type, model number, and serial number
7. Customer's name and address

**Note:** During the warranty period, the customer may be responsible for repair costs if the tablet damage is caused by misuse, accident, modification, unsuitable physical or operating environment, or improper maintenance by the customer.

The following is a list of some common items that are not covered under warranty and some symptoms that might indicate that the system is subjected to stress beyond normal use. Before checking problems with the ThinkPad product, 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 tablet password (making the tablet unusable)
- Sticky keys caused by spilling a liquid
- Damage caused due to use of an incorrect ac adapter

**The following symptom might indicate damage caused by nonwarranted activities:**

- Missing parts might be a symptom of unauthorized service or modification.

---

## Checkout guide

Use the following diagnostic programs to identify and correct problems with the ThinkPad products. The diagnostic programs are intended to test only ThinkPad products. Using the diagnostic programs to test non-ThinkPad products might lead to false indications of errors and invalid system responses.

When you try to identify and correct a problem, mind the following:

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

### Lenovo Solution Center

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

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

After you install the Lenovo Solution Center program, go to Control Panel and click **System and Security → Lenovo - System Health and Diagnostics** to launch the program.

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

### Quick test programs

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

Lenovo provides the following quick test programs:

- **Lenovo Memory Quick Test:** Use this program to troubleshoot and resolve memory module problems.
- **Lenovo Hard Drive Quick Test:** Use this program to troubleshoot and resolve internal storage problems.

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

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

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

## UEFI diagnostic program

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

To run the UEFI diagnostic program, do the following:

1. Turn on the tablet. If the tablet cannot be turned on, go to “Power system checkout” on page 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 32 for error code descriptions and troubleshooting hints.
2. When the ThinkPad logo is displayed, repeatedly press and release the F10 key. The main screen of the UEFI diagnostic program is displayed.
3. Follow the instructions on the screen to use the diagnostic program.

The options on the main screen are as follows:

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

| Tests  | Tools  |
|--|--|
| <ul style="list-style-type: none"><li>• Quick Memory Test</li><li>• Quick Storage Device Test</li><li>• Exit Application</li></ul> | <ul style="list-style-type: none"><li>• System Information</li></ul> |

## Bootable diagnostic programs

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

To create a bootable diagnostic medium, do the following:

1. Go to <http://www.lenovo.com/diags>.
2. Click **Lenovo Bootable Diagnostics**.
3. Follow the instructions on the Web site to create a bootable diagnostic medium on a USB device or CD.

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

- If you have created the bootable diagnostic medium on a USB device, do the following:
  1. Attach the USB device to the tablet.
  2. Turn on the tablet. If the tablet cannot be turned on, go to “Power system checkout” on page 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 32 for error code descriptions and troubleshooting hints.
  3. When the ThinkPad logo is displayed, repeatedly press and release the F12 key. When the Boot Menu window opens, release the F12 key.
  4. Use the arrow keys to select **USB HDD** and then press Enter. The diagnostic program is launched automatically.
  5. Follow the instructions on the screen to use the diagnostic program.
- If you have created the bootable diagnostic medium on a CD, do the following:
  1. Turn on the tablet. If the tablet cannot be turned on, go to “Power system checkout” on page 26, and check the power sources. If an error code is displayed, go to “Symptom-to-FRU index” on page 32 for error code descriptions and troubleshooting hints.
  2. Insert the CD into the optical drive.

3. Restart the tablet.
4. When the ThinkPad logo is displayed, repeatedly press and release the F12 key. When the Boot Menu window opens, release the F12 key.
5. Use the arrow keys to select **ATAPI CDx** (x: 0, 1, ...) and then press Enter. The diagnostic program is launched automatically.
6. Follow the instructions on the screen to use the diagnostic program.

---

## Power system checkout

To verify if the power system is functional, do the following

1. Disconnect the ac power adapter and the Enhanced Keyboard Dock for ThinkPad Helix (hereafter referred to as the keyboard dock) from the tablet.
2. Press the power button to turn on the tablet. If the tablet can be turned on, it means that the tablet built-in battery is functional.
3. Turn off the tablet and connect the tablet to the keyboard dock. If the status indicator on the keyboard dock (the illuminated dot in the ThinkPad logo) lights up for a moment, it means that the keyboard dock built-in battery is functional.
4. Disconnect the tablet from the keyboard dock. Then connect the ac power adapter to the keyboard dock. If the status indicator on the keyboard dock (the illuminated dot in the ThinkPad logo) lights up for a moment, it means that the ac power adapter is functional.

If you suspect that the power problem is caused by a specific power device, refer to the appropriate checkout item in the following list:

- “Checking the tablet built-in battery” on page 26
- “Checking the keyboard dock built-in battery” on page 26
- “Checking the backup battery” on page 27
- “Checking the ac power adapter” on page 27

## Checking the tablet built-in battery

When the tablet is disconnected from the ac power adapter and the keyboard dock, and the tablet fails when you are using it, check the tablet built-in battery by doing the following:

1. Ensure that the tablet failure is not caused by exhausted battery power.
2. Reset the tablet by inserting a straightened paper clip into the emergency reset hole. Then press the power button. If the tablet cannot be turned on, continue with the next step.
3. Clear Complementary Metal Oxide Semiconductor (CMOS) by inserting a straightened paper clip into the emergency reset hole and pressing the Windows® button at the same time.
4. Press the power button. If the tablet cannot be turned on, continue with the next step.
5. Connect the ac power adapter and press the power button.
  - If the tablet is turned on, disconnect the ac power adapter from the tablet. If the tablet shuts down, it means that the built-in battery fails.
  - If the tablet cannot be turned on, replace the built-in battery with another one. If the tablet can start up with the new battery installed, it means that the original battery fails.

## Checking the keyboard dock built-in battery

To check the keyboard dock built-in battery, do the following:

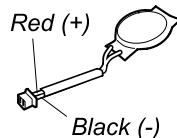
1. Connect the tablet to the keyboard dock and turn on the tablet.

2. Click the battery status icon in the Windows notification area. If the keyboard dock built-in battery is functional, the item **Battery #2** is displayed showing the battery status of the keyboard dock. If you cannot find this item, continue with the next step.
3. Disconnect the tablet from the keyboard dock. Then replace the keyboard dock built-in battery with another one.
4. Connect the tablet to the keyboard dock and check the battery status again. If the item **Battery #2** is displayed correctly, it means that the original battery of the keyboard dock fails.

## Checking the backup battery

To check the backup battery, do the following:

1. Insert a straightened paper clip into the tablet emergency reset hole and press the Windows button on the tablet at the same time to reset the backup battery.
2. Disconnect the tablet from the keyboard dock.
3. Disable the built-in battery. See “Disabling the built-in batteries” on page 48.
4. Remove the backup battery. See “1070 Backup battery” on page 54.
5. Measure the voltage of the backup battery.



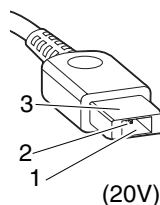
| Wire  | Voltage (V dc) |
|-------|----------------|
| Red   | +2.5 to +3.2   |
| Black | Ground         |

- If the voltage is correct, replace the system board.
- If the voltage is not correct, replace the backup battery.
- If the backup battery discharges quickly after replacement, replace the system board.

## Checking the ac power adapter

If the built-in batteries work properly but they cannot be charged when the ac power adapter is connected, check the ac power adapter by doing the following:

1. Unplug the ac power adapter from the tablet or the keyboard dock.
2. Measure the output voltage at the plug of the ac power adapter cable.



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

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

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

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



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## Chapter 4. Related service information

This chapter presents the following information:

- “Restoring the factory contents by using the product Recovery Disc Set” on page 29
- “Using the Windows recovery program” on page 29
- “Passwords” on page 30
- “Symptom-to-FRU index” on page 32

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### Restoring the factory contents by using the product Recovery Disc Set

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

<http://www.lenovo.com/serviceparts-lookup>

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

**Note:** The recovery process takes several hours. The length of time depends on the method you use. If you use the product Recovery Disc Set, the recovery process takes at least five hours.

1. Connect an external DVD drive to the tablet.
2. Insert the bootable recovery disc into the DVD drive. If the Recovery Disc Set contains more than one recovery disc, insert the *Product Recovery Disc* first.
3. Start the tablet from the external DVD drive.
4. When prompted, select your language and click **Next**.
5. Read the license and accept the terms and conditions. Then follow the instructions on the screen to restore the factory contents.
6. If the Recovery Disc Set contains a *Supplemental Recovery Disc*, insert it when prompted and click **Yes**.

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

7. When all of the data has been copied from the last disc in the set, a message is displayed prompting you to restart the tablet. Follow the instructions on the screen to finish the recovery.

**Note:** The remainder of the recovery process is fully automated and no action is required by you. The tablet will restart into the Windows desktop several times and you might experience periods when no activity is apparent on the screen for several minutes at a time. This is normal.

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

---

### Using the Windows recovery program

Use the built-in recovery programs provided by the Windows 8 operating system to refresh or restore the tablet.

#### Refreshing the tablet

If the tablet does not perform well and the problem might be caused by a recently installed program, do the following to refresh the tablet without losing personal files or changing the settings:

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

1. Swipe in from the right edge to bring up the charms. Tap **Settings → Change PC settings → General**.
2. In the **Refresh your PC without affecting your files** section, tap **Get started**.

### Resetting the tablet to the factory default settings

To reinstall the operating system and all preinstalled programs, reset the tablet to the factory default settings by doing the following:

**Attention:** All the personal files and settings will be deleted after you reset the tablet to the factory default settings. Ensure that the user has made a backup copy of all the data before resetting the tablet to the factory default settings.

1. Swipe in from the right edge to bring up the charms. Tap **Settings → Change PC settings → General**.
2. In the **Remove everything and reinstall Windows** section, tap **Get started**.

### Advanced startup options

Use advanced startup options to change the startup settings of the Windows operating system, start the tablet from an external device, or restore the Windows operating system from a system image.

To use the advanced startup options, do the following:

1. Swipe in from the right edge to bring up the charms. Tap **Settings → Change PC settings → General**.
2. In the **Advanced startup** section, tap **Restart now → Troubleshoot → Advanced options**.
3. Restart the tablet following the instructions on the screen.

For more details about the Windows recovery solutions, refer to the help information system of the Windows 8 operating system.

---

## Passwords

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

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

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

### Power-on password

A power-on password protects the system from being powered on by an unauthorized person. The password must be entered before an operating system can be started.

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

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

1. Turn off the tablet.
2. Remove the tablet built-in battery. See “1030 Tablet built-in battery” on page 50.
3. Remove the backup battery. See “1070 Backup battery” on page 54. Wait for a few seconds.
4. Reinstall the backup battery.



5. Reinstall the tablet built-in battery.
6. Turn on the tablet and wait until the POST ends. After the POST ends, the password prompt does not appear. The power-on password has been removed.

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

1. Insert the tablet into the keyboard dock and turn on the tablet.
2. When the logo screen is displayed, immediately press F1. Type the supervisor password to enter the ThinkPad Setup program.
3. Select **Security**.
4. Select **Password**.
5. Select **Power-On Password**.
6. Type the current supervisor password in the **Enter Current Password** field. then leave the **Enter New Password** field blank, and press Enter twice.
7. In the Changes have been saved window, press Enter.
8. Press F10 to save changes and exit the ThinkPad Setup program.

## Hard disk password

There are two kinds of hard disk passwords:

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

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

**Attention:** If the user hard disk password has been forgotten, check whether a master hard disk password has been set. If it has, it can be used for access to the hard disk drive. If no master hard disk password is available, neither Lenovo nor Lenovo authorized service technicians provide any services to reset either the user or the master hard disk password, or to recover data from the hard disk drive. The only Lenovo and Lenovo authorized servicer solution to put the system back to operational status would be to replace the drive for a scheduled fee.

To remove a user hard disk password that has been forgotten, when the supervisor password and master hard disk password are known, do the following:

1. Insert the tablet into the keyboard dock and turn on the tablet.
2. When the logo screen is displayed, immediately press F1.
3. When the user hard disk password icon is displayed on the screen, press F1. The master hard disk password icon is displayed.
4. Enter the master hard disk password to enter the ThinkPad Setup program.
5. Select **Security**.
6. Select **Password**.
7. Select **Hard-disk x password**, where x is the letter of the hard disk drive. A pop-up window opens.
8. Select **Master hard disk password**.
9. Type the current master hard disk password in the **Enter Current Password** field. Then leave the **Enter New Password** field blank, and press Enter twice.

10. Press F10 to save changes and exit the ThinkPad Setup program. The user hard disk password and the master hard disk password have been removed.

## Supervisor password

The supervisor password protects the system information stored in the ThinkPad Setup program. Without it, no one can change the configuration of the tablet.

If you have set a supervisor password in the ThinkPad Setup program, you are prompt to enter a supervisor password when you start the ThinkPad Setup program.

**Note:** The system administrator can set the same supervisor password on many tablets to make administration easier.

Only a system administrator can set, change, or remove a supervisor password.

To remove the supervisor password, do the following:

1. Print these instructions.
2. Save all open files, and exit all applications.
3. Turn off the tablet.
4. Insert the tablet into the keyboard dock and turn on the tablet.
5. When the logo screen is displayed, immediately press F1. Type the supervisor password to enter the ThinkPad Setup program.
6. Select **Security**.
7. Select **Password**.
8. Select **Supervisor Password**.
9. In the **Enter Current Password** field, type the current supervisor password.
10. Leave the **Enter New Password** and **Confirm New Password** fields blank.
11. Commit your password to memory. A Setup Notice window is displayed.

**Attention:** You might want to take a note of your password and keep it in a safe place. If you forget your supervisor password, Lenovo cannot reset your password. You must take your tablet to a Lenovo reseller or a Lenovo marketing representative to have the system board replaced. Proof of purchase is required, and a fee will be charged for parts and service.

12. Press F10 to save changes and exit the ThinkPad Setup program. The user hard disk password and the master hard disk password have been removed.

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## Symptom-to-FRU index

This section contains following information:

- “Numeric error codes” on page 33
- “Intermittent problems” on page 33
- “Undetermined problems” on page 34

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 tablet. 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 33.

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

## Numeric error codes

Table 2. Numeric error codes

| Symptom or error   | FRU or action, in sequence  |
|--|---|
| <b>0177</b><br>Bad SVP data, stop POST task.                                       | Checksum of the supervisor password in the EEPROM is not correct. The system board should be replaced. Have the tablet serviced.  |
| <b>0183</b><br>Bad CRC of Security Settings in EFI Variable. Enter ThinkPad Setup. | Checksum of the Security settings in the EFI Variable is not correct. Enter ThinkPad Setup to check Security settings, Press F10 and then press Enter to restart the system. If you still have a problem, have the tablet serviced. |
| <b>0187</b><br>EAIA data access error.   | The access to EEPROM is failed. Have the tablet serviced.   |
| <b>0188</b><br>Invalid RFID Serialization Information Area.                        | The EEPROM checksum is not correct (block # 0 and 1). The system board should be replaced, and the box serial number needs to be reinstalled. Have the tablet serviced.   |
| <b>0189</b><br>Invalid RFID configuration information area.                        | The EEPROM checksum is not correct (block # 4 and 5). The system board should be replaced, and the Universally unique identifier (UUID) needs to be reinstalled. Have the tablet serviced.  |
| <b>0190</b><br>Critical low-battery error.   | The tablet turned off, because the battery is low. Connect the ac adapter to the tablet and charge the battery.   |
| <b>0191</b><br>System Security - Invalid remote change requested.                  | The system configuration change has failed. Confirm the operation and try again. To clear the error, enter the ThinkPad Setup.  |
| <b>0199</b><br>System Security - Security password retry count exceeded.           | This message is displayed if you enter a wrong supervisor password more than three times. Confirm the supervisor password and try again. To clear the error, enter the ThinkPad Setup.  |
| <b>2200</b><br>Machine Type and Serial Number are invalid.                         | Machine Type and Serial Number are invalid. Have the tablet serviced.   |
| <b>2201</b><br>Machine UUID is invalid.  | Machine UUID is invalid. Have the tablet serviced.  |

## Intermittent problems

Intermittent system hang problems can be due to various 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.

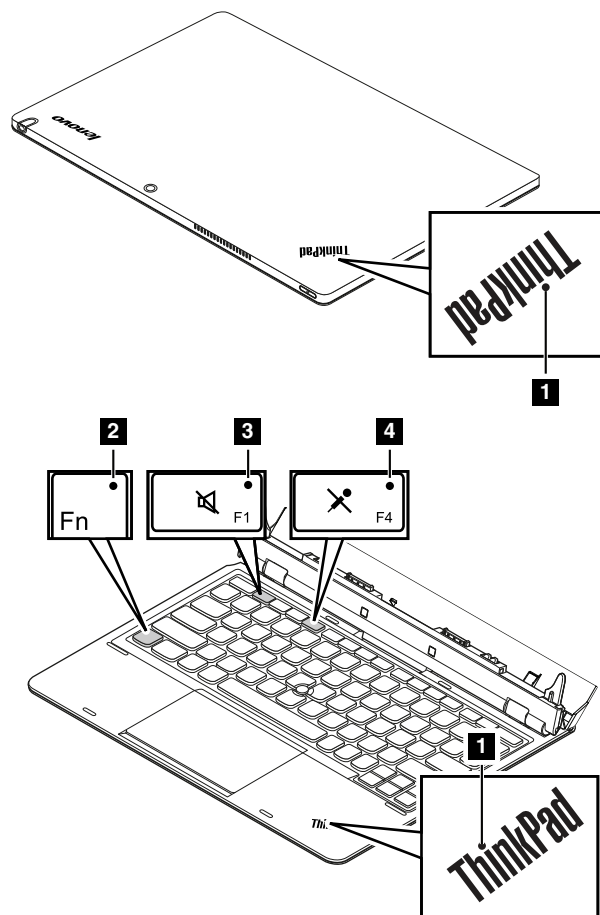
## Undetermined problems

If the diagnostic tests did not identify the 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.

1. Verify that all attached devices are supported by the tablet.
2. Verify that the power supply being used at the time of the failure is operating correctly. See "Power system checkout" on page 26.
3. Turn off the tablet.
4. Visually check each FRU for damage. Replace any damaged FRU.
5. Disconnect all external devices, such as the printer, mouse, and optical drive.
6. Remove the following devices:
  - a. Non-ThinkPad devices
  - b. Battery pack
  - c. Main storage drive
  - d. Memory module
  - e. PC cards
7. Connect the ac power adapter and turn on the tablet.
8. Determine whether the problem has been solved.
9. If the problem does not recur, reconnect the removed devices one at a time until you find the failing FRU.
10. If the problem remains, replace the following FRUs one at a time (do not replace a nondefective FRU):
  - a. System board
  - b. LCD assembly

## Chapter 5. Status indicator

The status indicators show the current status of your computer.



| Indicator                          | Indicator Behavior and Description  |
|------------------------------------|---|
| <b>1</b> System status indicator   | <p>The illuminated dot in the ThinkPad logo on the tablet and the keyboard dock functions as a system status indicator. The following list describes each status of the indicator and the corresponding meaning.</p> <ul style="list-style-type: none"><li>• <b>Blinking for three times:</b> The tablet or the keyboard dock is connected to an ac power source.</li><li>• <b>On:</b> The tablet is on and in use.</li><li>• <b>Off:</b> The tablet is off or in hibernation mode.</li><li>• <b>Slow-blinking:</b> The tablet is in sleep mode.</li><li>• <b>Fast-blinking:</b> The tablet is entering hibernation mode or sleep mode.</li></ul> |
| <b>2</b> Fn Lock indicator         | When the Fn Lock indicator is on, the Fn Lock function is enabled.  |
| <b>3</b> Speaker-mute indicator    | When the speaker-mute indicator is on, the speakers are muted.  |
| <b>4</b> Microphone-mute indicator | When the microphone-mute indicator is on, the microphones are muted.  |



---

## Chapter 6. Function keys

The following table describes the the function of each function key on the keyboard dock.

Table 3. Function keys

| Function key | Description   |
|--------------|---|
| Fn+Esc       | <p>Press Fn+Esc to enable or disable the Fn Lock function and switch between default mode and legacy mode of using the function keys.</p> <ul style="list-style-type: none"><li>• <b>When the Fn Lock function is disabled:</b> The Fn Lock indicator is off (default mode). To initiate the special function of each function key, press the function key directly. To input F1–F12, press the Fn key and the corresponding function key.</li><li>• <b>When the Fn Lock function is enabled:</b> The Fn Lock indicator turns on. To input F1–F12, press the corresponding function key directly. To initiate the special function of each function key, press the Fn key and the corresponding function key.</li></ul> |
| F1           | Speaker mute  |
| F2           | Speaker volume down   |
| F3           | Speaker volume up   |
| F4           | Microphone mute   |
| F5           | Brightness down   |
| F6           | Brightness up   |
| F7           | Switch a display output location  |
| F8           | Enable or disable wireless features   |
| F9           | Open the <b>Settings</b> charm  |
| F10          | Open the <b>Search</b> charm  |
| F11          | View all applications that are currently open   |
| F12          | View all applications   |





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## Chapter 7. Locations

This chapter introduces the locations of hardware components on the tablet and the keyboard dock.

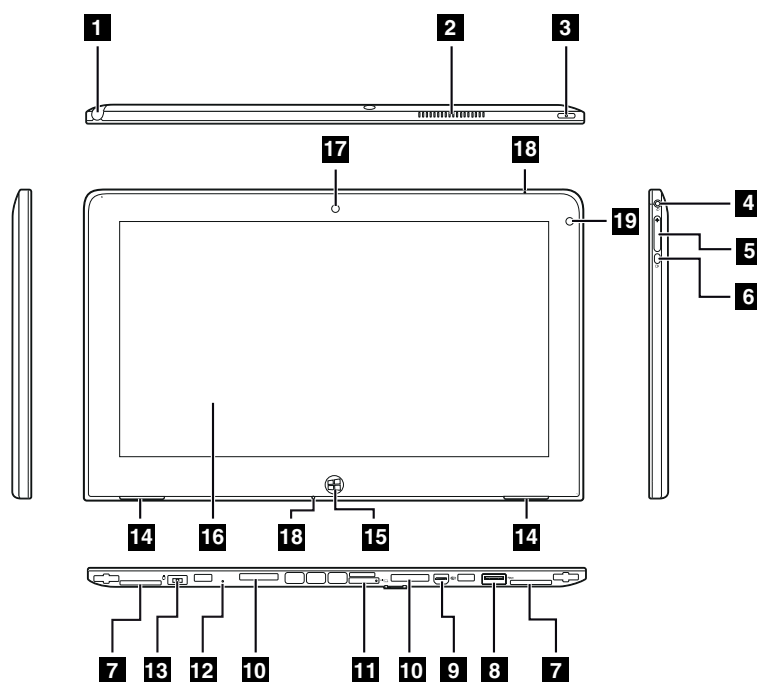
---

### Locating tablet controls, connectors, and indicators

The following illustrations show the locations of controls and hardware components on a ThinkPad Helix and Enhanced Keyboard Dock for ThinkPad Helix.

#### Tablet layout

##### Front and side view



**1** Tablet Digitizer Pen storage

**2** Fan louvers

**3** Power button

**4** Audio connector

**5** Volume control buttons

**6** Screen rotation lock button

**7** Label trays\*

**8** USB 2.0 connector

**9** Mini DisplayPort connector

**10** Keyboard dock connectors

**11** SIM card tray

**12** Emergency reset hole

**13** Power connector

**14** Speakers

**15** Windows button

**16** Multi-touch screen

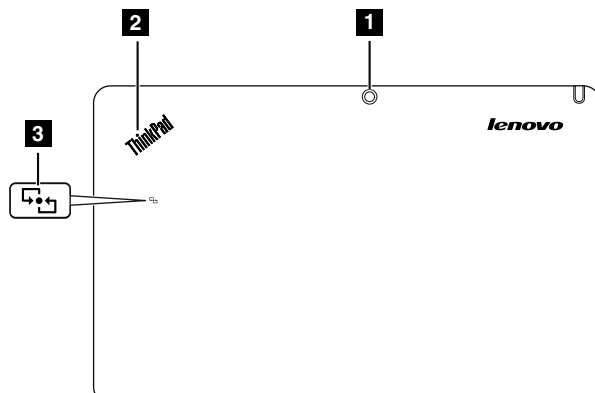
**17** Front-facing camera

**18** Microphones

**19** Ambient light sensor

\* You can find the MTM, serial number, and product ID on one of the label trays.

## Back-side view



**1** Rear-facing camera

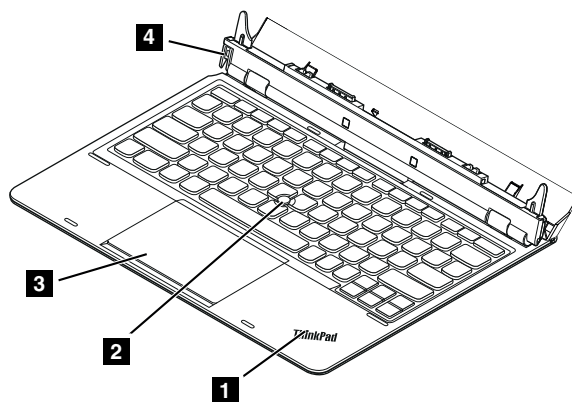
**3** NFC logo (on some models)

**2** Status indicator\*

\* For more information about the status indicator, see Chapter 5 “Status indicator” on page 35.

## Keyboard dock layout

### Front view



**1** Status indicator\*

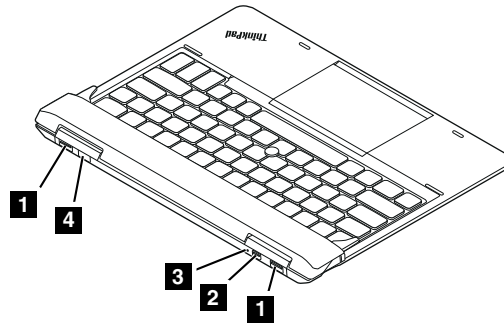
**3** Touch pad

**2** TrackPoint® pointing stick

**4** Eject button

\* For more information about the status indicator, see Chapter 5 “Status indicator” on page 35.

## Rear view



**1** USB 3.0 connectors

**2** Mini DisplayPort connector

**3** Emergency reset hole

**4** Power connector

---

## Locating FRUs and CRUs

This topic introduces the following service parts:

- “Tablet FRUs” on page 42
- “Keyboard dock FRUs” on page 43

### Notes:

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

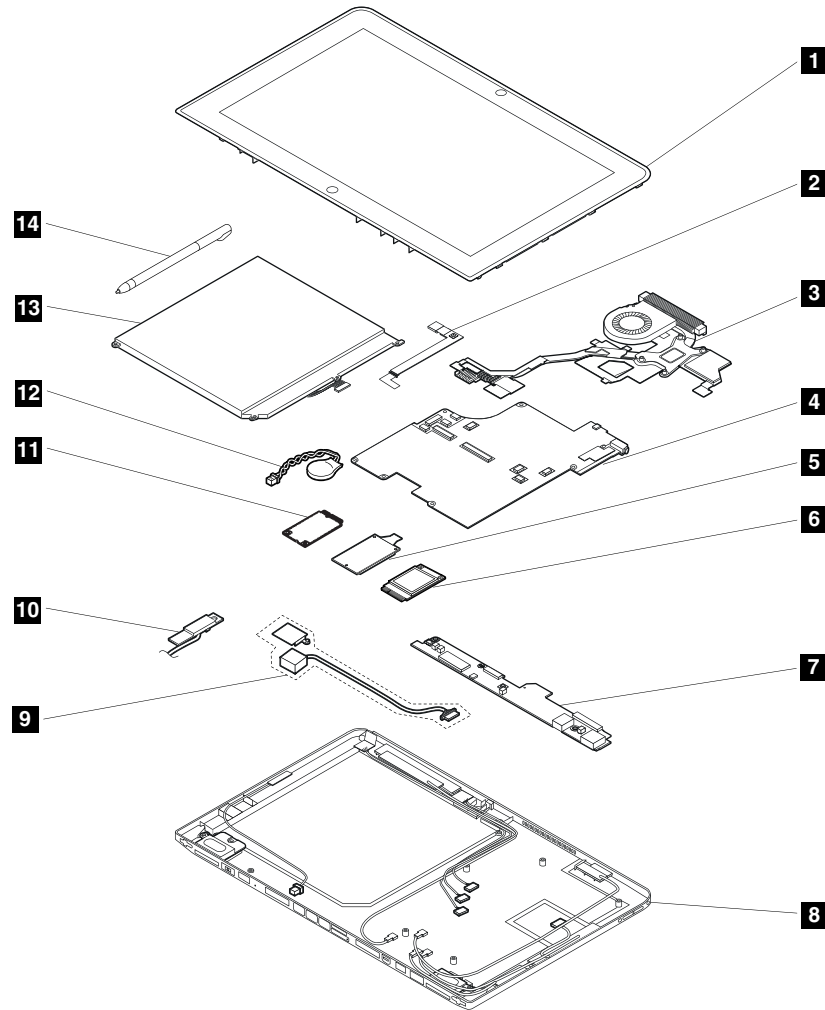
- **CRU statement for customers:**

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 products contain the following types of CRUs:

- **Self-service CRUs:** These CRUs unplug or are held by no more than two screws. Examples of these types of CRUs include the ac power adapter and the Tablet Digitizer Pen.
- **Optional-service CRUs:** These CRUs are isolated parts within the tablet 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.

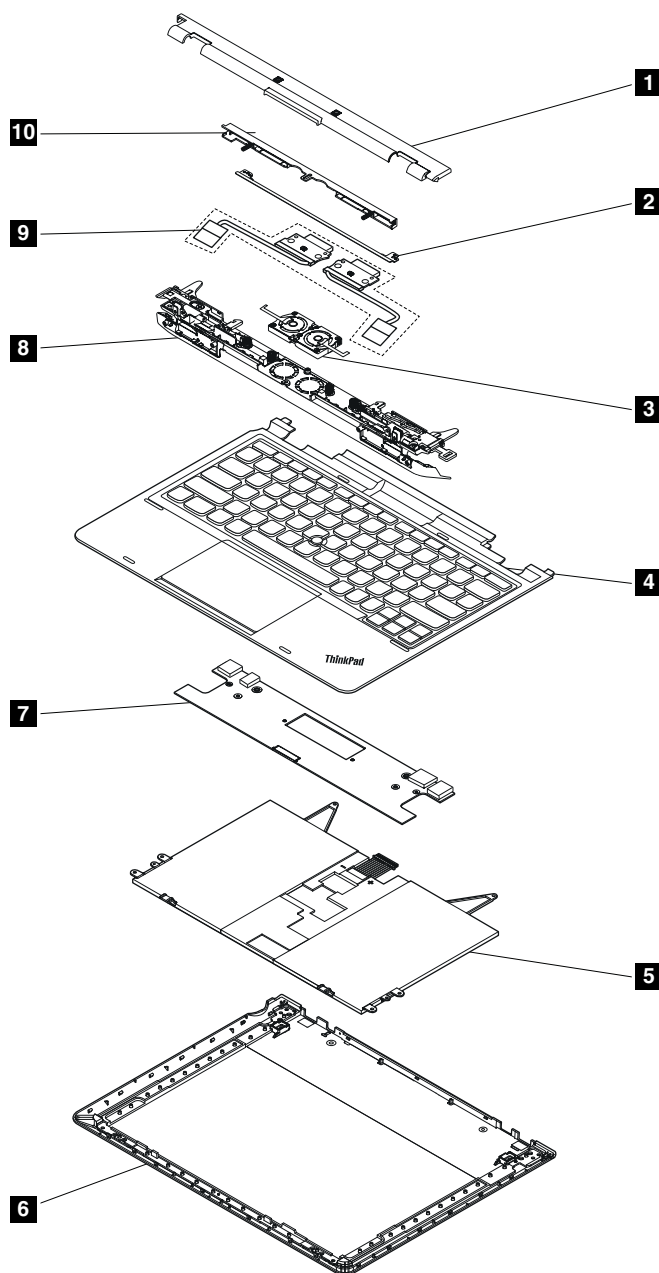
## Tablet FRUs



| No. | Tablet FRU   | Self-service CRU | Optional-service CRU |
|-----|--|------------------|----------------------|
| 1   | LCD assembly   | No               | No                   |
| 2   | Camera assembly with camera cable  | No               | No                   |
| 3   | Tablet thermal fan assembly for tablet   | No               | No                   |
| 4   | System board   | No               | No                   |
| 5   | Wireless WAN card  | No               | No                   |
| 6   | Wireless LAN card  | No               | No                   |
| 7   | Tablet I/O board   | No               | No                   |
| 8   | Tablet base cover assembly (with speakers, label trays, and wireless antennas) | No               | No                   |
| 9   | DC-in cable assembly   | No               | No                   |
| 10  | Bluetooth card   | No               | No                   |
| 11  | mSATA solid-state drive  | No               | No                   |
| 12  | Backup battery   | No               | No                   |

| No. | Tablet FRU              | Self-service CRU | Optional-service CRU |
|-----|-------------------------|------------------|----------------------|
| 13  | Tablet built-in battery | No               | No                   |
| 14  | Tablet Digitizer Pen    | Yes              | No                   |

## Keyboard dock FRUs



| No. | FRU (Overall)                          | Self-service CRU | Optional-service CRU |
|-----|--|------------------|----------------------|
| 1   | Dock and hinge assembly back cover     | No               | No                   |
| 2   | Metal link structure                   | No               | No                   |
| 3   | Thermal fan assembly for keyboard dock | No               | No                   |

| No. | FRU (Overall)              | Self-service CRU | Optional-service CRU |
|-----|----------------------------|------------------|----------------------|
| 4   | Keyboard assembly          | No               | No                   |
| 5   | Built-in battery           | No               | No                   |
| 6   | Base cover                 | No               | No                   |
| 7   | Keyboard dock I/O board    | No               | No                   |
| 8   | Dock and hinge assembly    | No               | No                   |
| 9   | Dock connectors and cables | No               | No                   |
| 10  | Cover of dock connectors   | No               | No                   |

---

## Looking up FRU information

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

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## Chapter 8. FRU replacement notices

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

### CRU statement for customers:

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

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## Screw notices

Loose screws can cause a reliability problem. In the ThinkPad products, 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.

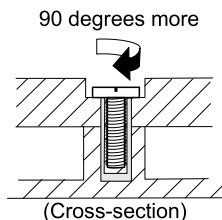
Do the following when you service this machine:

- 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:

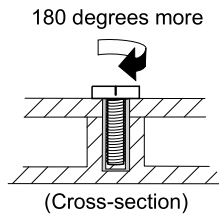
- **Plastic to plastic**

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.

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**Retaining serial numbers, MTM, UUID, and Asset ID**

Instructions for retaining serial numbers, MTM, UUID, or asset ID can be found at the following Web site:  
<http://www.lenovo.com/support>



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## Chapter 9. Removing or replacing a FRU

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

### CRU statement for customers:

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

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### General guidelines

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

1. Do not try to service any ThinkPad product unless you have been trained and certified. An untrained person runs the risk of damaging parts.
2. Before replacing any FRU, review Chapter 8 “FRU replacement notices” on page 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 in 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, remove it in the direction as given by the arrow in the drawing.
7. To put the new FRU in place, reverse the removal procedure and follow any notes that pertain to replacement.
8. When replacing a FRU, use the correct screws as shown in the replacement procedures.



#### **DANGER**

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

**Attention:** After replacing a FRU, do not turn on the tablet until you have made sure that all screws, springs, and other small parts are in place and none are loose inside the system. Verify this by shaking the tablet 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. Before touching it, establish personal grounding by touching a ground point with one hand or by using an electrostatic discharge (ESD) strap.

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## Before servicing ThinkPad Helix and Enhanced Keyboard Dock for ThinkPad Helix

Carefully read this topic before servicing the tablet.

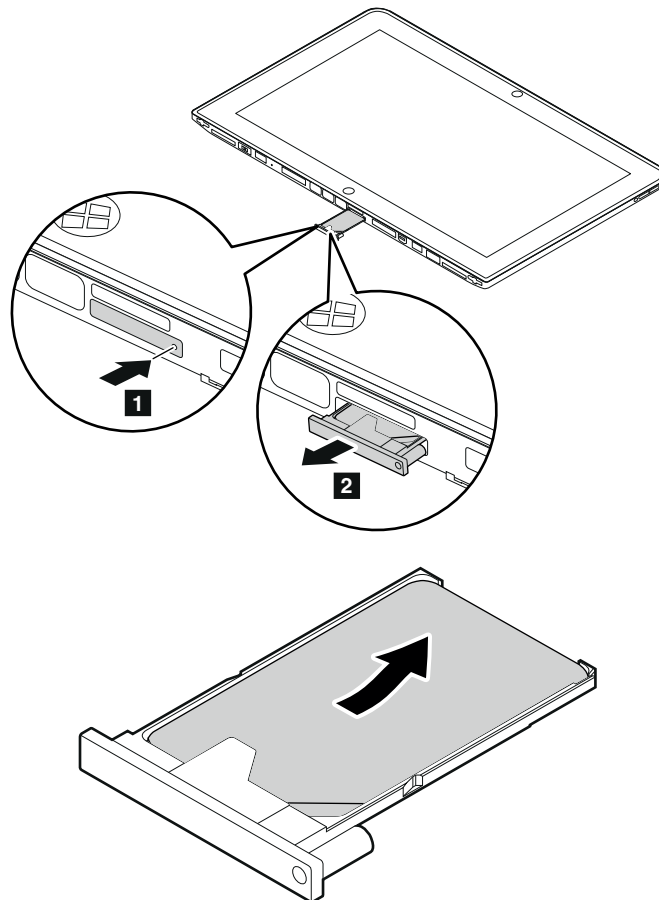
### Disabling the built-in batteries

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

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

### Removing the SIM card

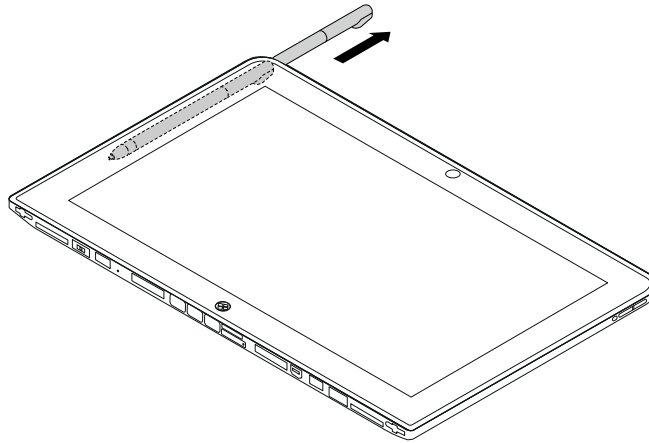
If the tablet you are servicing has a SIM card installed, remove the SIM card before you start the servicing.



After you finish the servicing, ensure that you install the SIM card back to the SIM card tray.

## Removing the Tablet Digitizer Pen

### Removal step of the Tablet Digitizer Pen

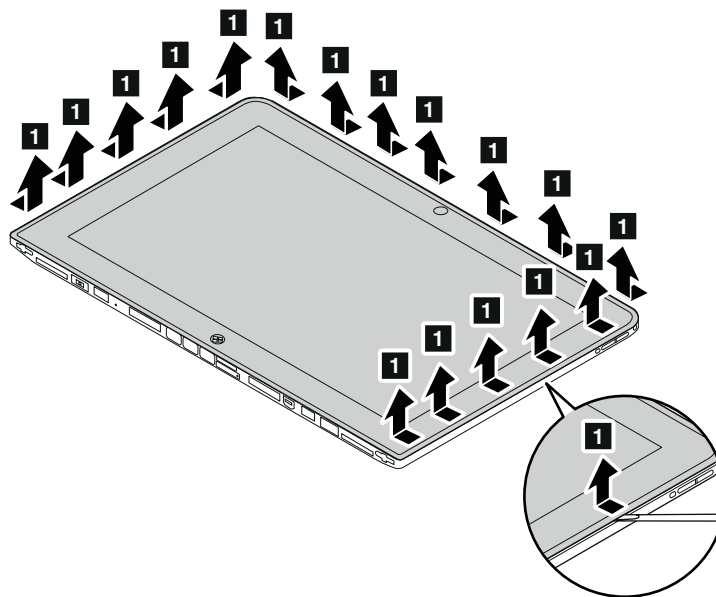


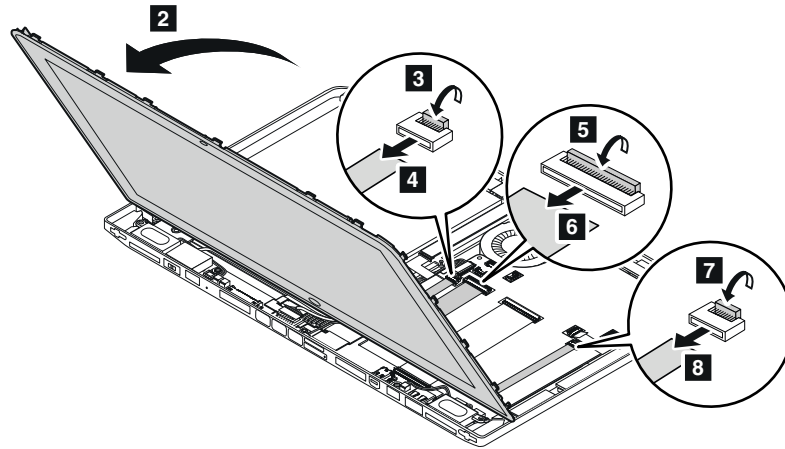
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## 1010 LCD assembly

### Removal steps of the LCD assembly

Use a plastic pry tool to detach the latches of the LCD assembly.



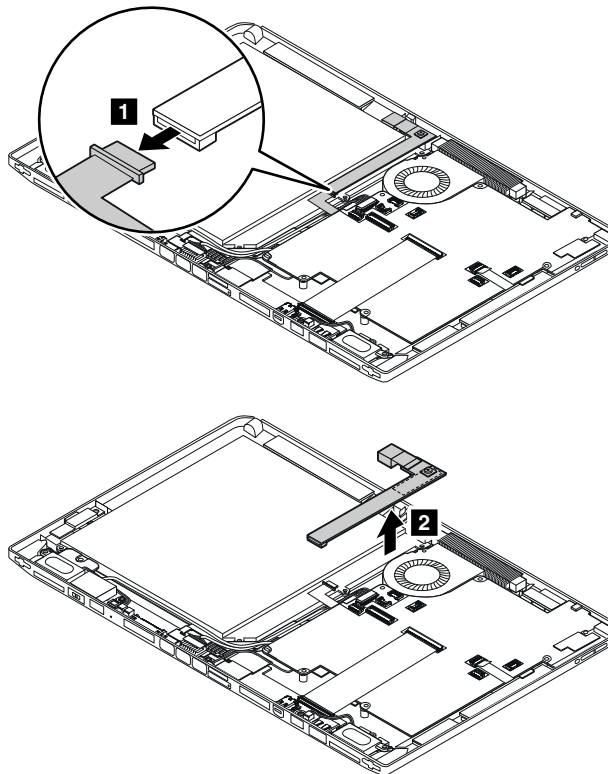


**When installing:** Ensure that the connectors are attached firmly to the system board.

## 1020 Camera assembly

For access, remove the LCD assembly first. See “1010 LCD assembly” on page 49.

### Removal steps of the camera assembly



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

## 1030 Tablet built-in battery

For access, remove these FRUs in order:

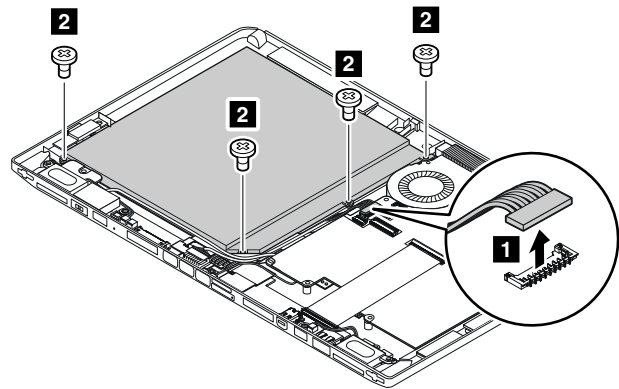
- “1010 LCD assembly” on page 49

- “1020 Camera assembly” on page 50

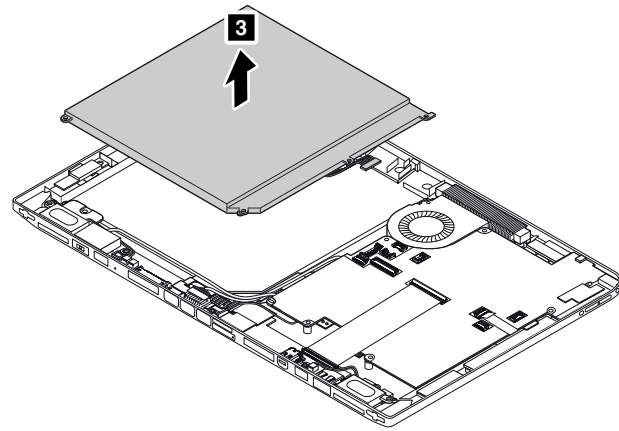


Use only the authorized battery specified for your tablet. Any other battery could ignite or explode.

Removal steps of the tablet built-in battery



| Step | Screw (quantity)                         | Color | Torque                    |
|------|--|-------|---------------------------|
| 2    | M2 × 3.5 mm, flat-head, nylon-coated (4) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



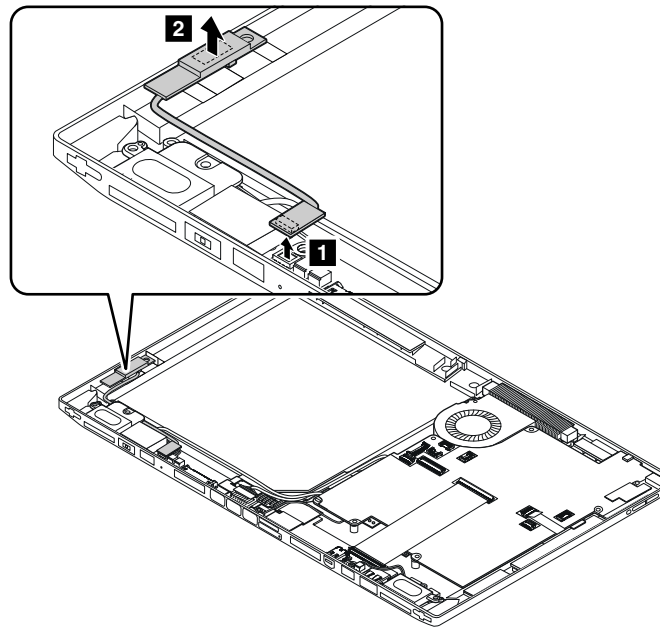
**When installing:** Ensure that the tablet built-in battery connector is attached firmly to the system board.

1040 Bluetooth card and cable

For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50

### Removal steps of the Bluetooth card and cable



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

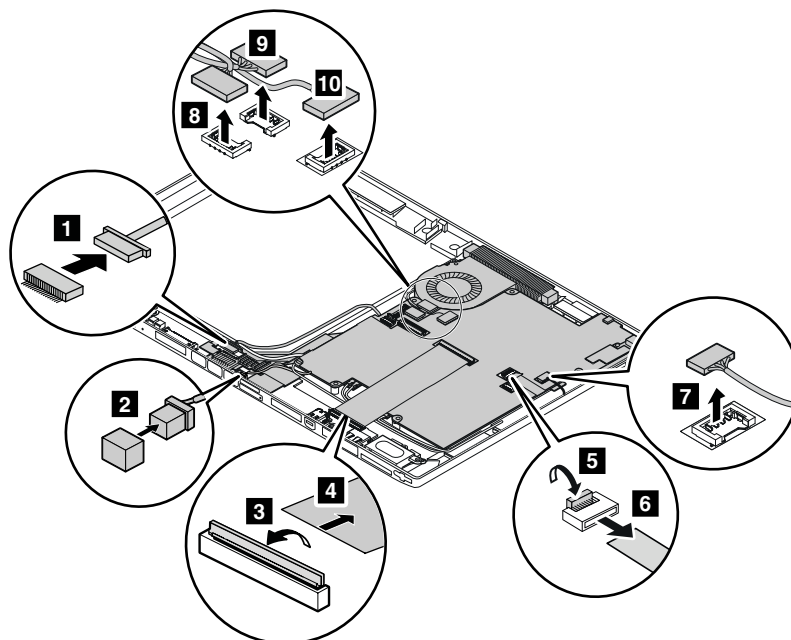
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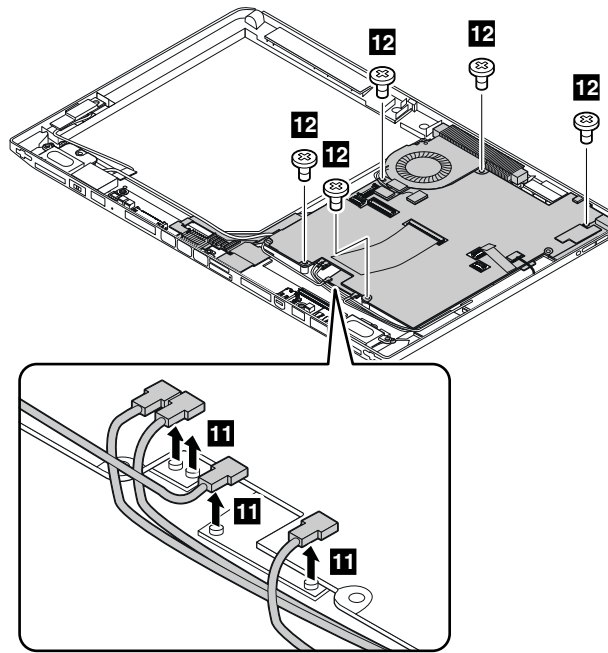
## 1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable

For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50
- “1040 Bluetooth card and cable” on page 51

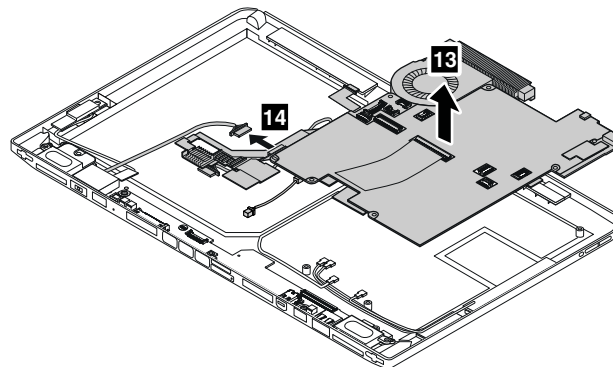
### Removal steps of the system board assembly





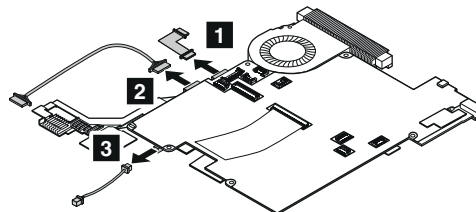
In step **11**, disconnect the connectors by using the removal tool for the antenna RF connector or pick the connectors off in the direction as shown by using your fingers.

| Step      | Screw (quantity)                         | Color  | Torque                    |
|-----------|--|--------|---------------------------|
| <b>12</b> | M2 × 3.5 mm, flat-head, nylon-coated (5) | Silver | 0.181 Nm<br>(1.85 kgf-cm) |



**When installing:** Ensure that the connectors are attached firmly.

**Removal steps of the camera cable, tablet I/O board power cable, and SIM card cable**



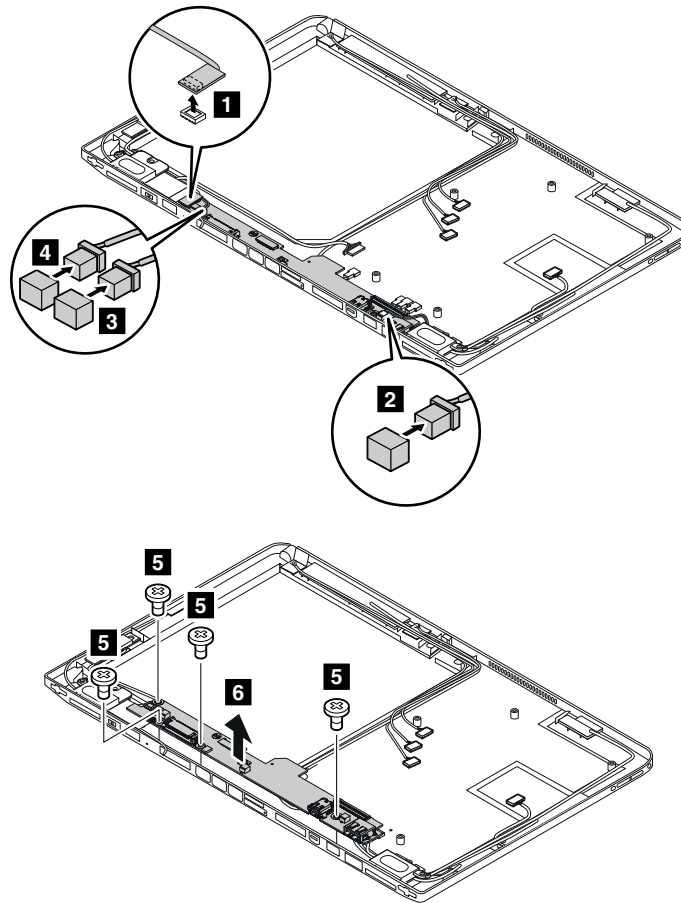
**When installing:** Ensure that the connectors are attached firmly.

## 1060 Tablet I/O board

For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50
- “1040 Bluetooth card and cable” on page 51
- “1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable” on page 52

### Removal steps of the tablet I/O board



| Step | Screw (quantity)                         | Color  | Torque                    |
|------|--|--------|---------------------------|
| 5    | M3 × 2.5 mm, flat-head, nylon-coated (4) | Silver | 0.181 Nm<br>(1.85 kgf-cm) |

**When installing:** Ensure that the connectors are attached firmly.

## 1070 Backup battery

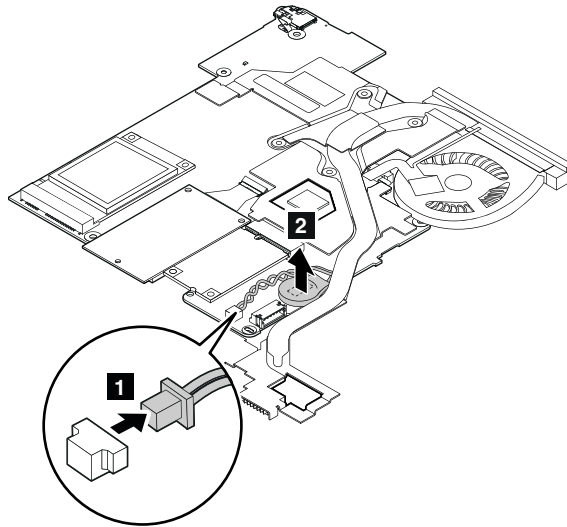
For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50



- “1040 Bluetooth card and cable” on page 51
- “1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable” on page 52

### Removal steps of the backup battery



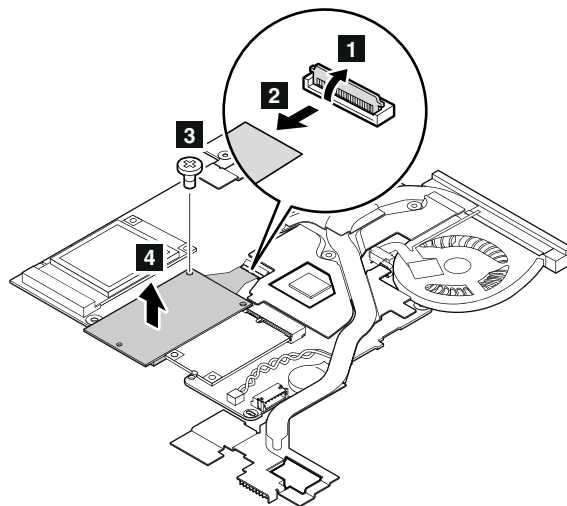
**When installing:** Ensure that the connector is attached firmly.

## 1080 Wireless WAN card, wireless LAN card, and mSATA solid-state drive

For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50
- “1040 Bluetooth card and cable” on page 51
- “1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable” on page 52

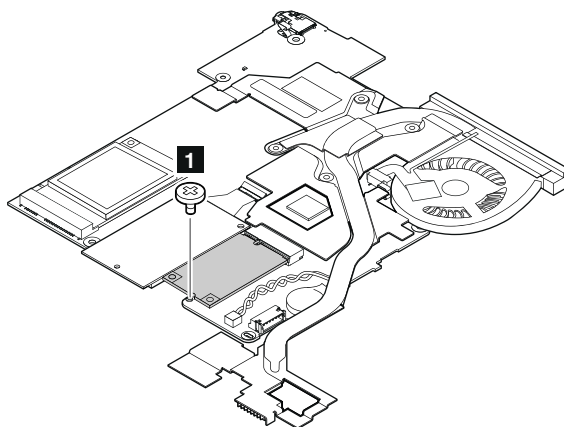
### Removal steps of the wireless WAN card



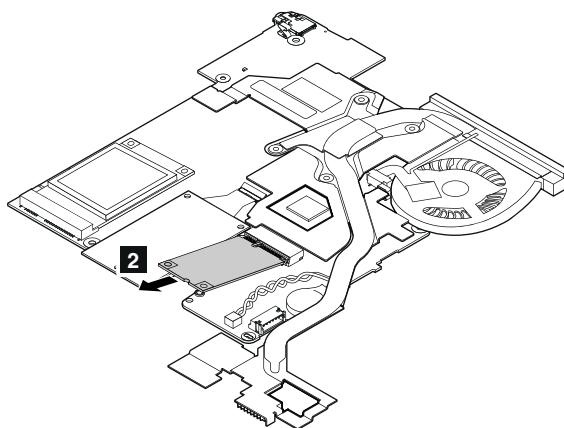
| Step     | Screw (quantity)                         | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>3</b> | M2 × 3.5 mm, flat-head, nylon-coated (1) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

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

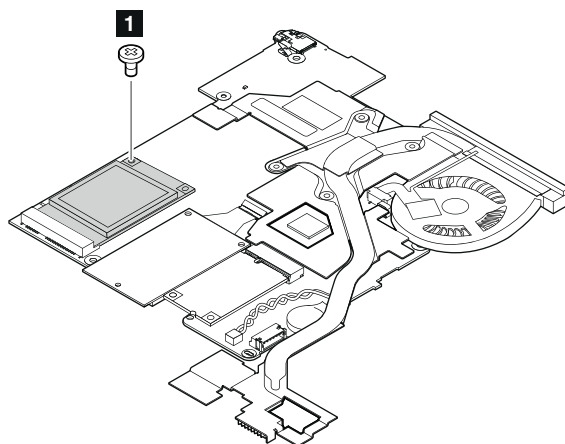
#### Removal steps of the wireless LAN card



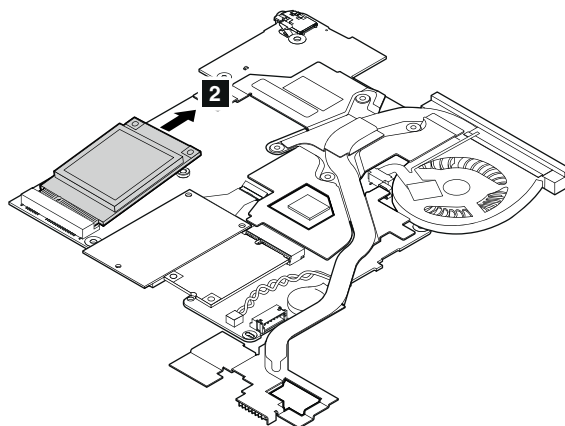
| Step     | Screw (quantity)                         | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3.5 mm, flat-head, nylon-coated (1) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



## Removal steps of the mSATA solid-state drive



| Step     | Screw (quantity)                         | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3.5 mm, flat-head, nylon-coated (1) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

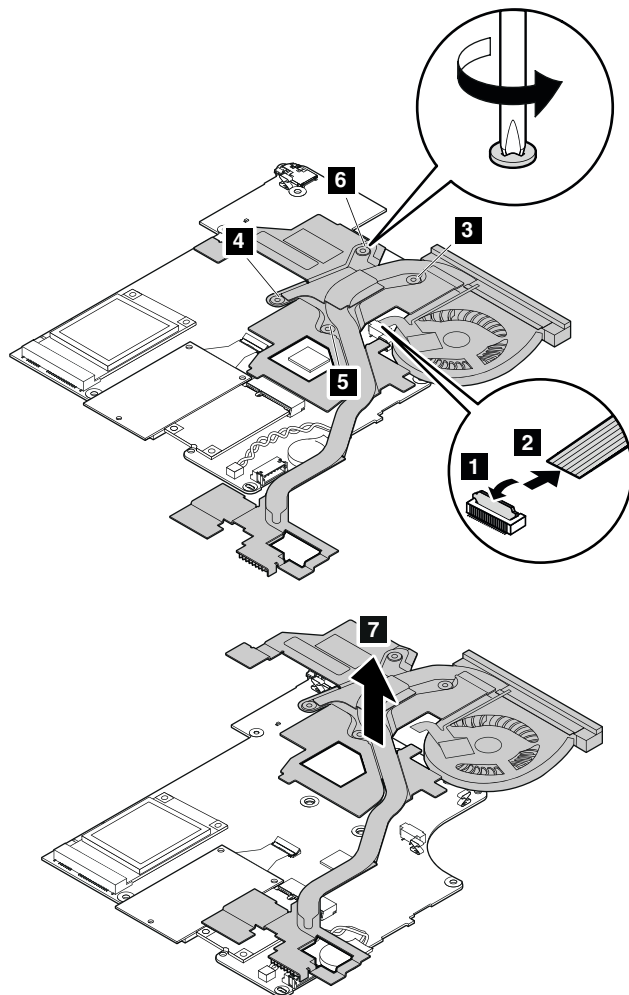


## 1090 Tablet thermal fan assembly

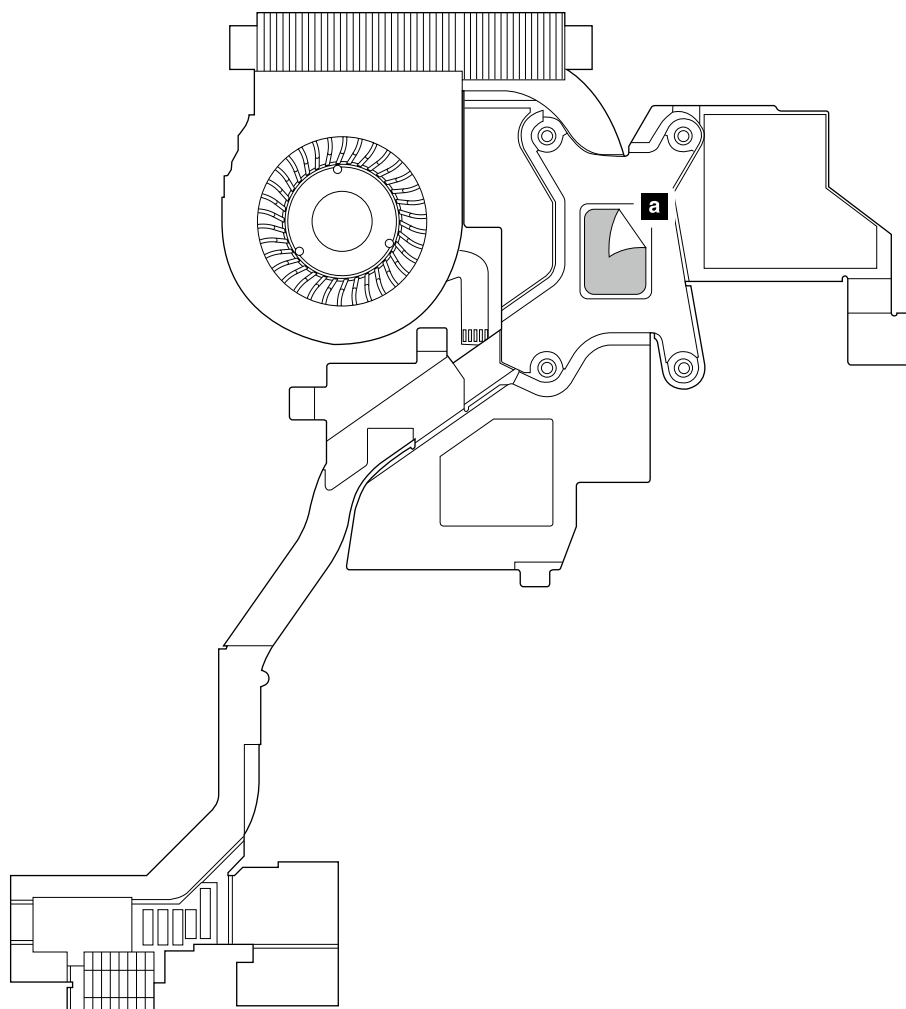
For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50
- “1040 Bluetooth card and cable” on page 51
- “1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable” on page 52

## Removal steps of the thermal fan assembly



**When installing:** Before you install the thermal fan assembly, apply thermal grease, at an amount of 0.2 grams, on the part marked **a** in the following illustration. Either too much or too less application of grease can cause a thermal problem due to imperfect contact with a component.



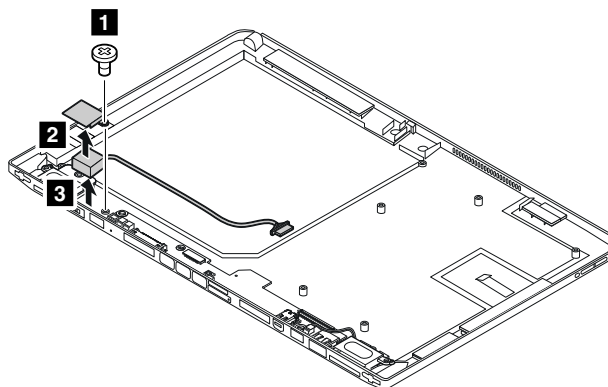
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## 1100 DC-in cable assembly and tablet base cover assembly

For access, remove the following FRUs in order:

- “1010 LCD assembly” on page 49
- “1020 Camera assembly” on page 50
- “1030 Tablet built-in battery” on page 50
- “1040 Bluetooth card and cable” on page 51
- “1050 System board assembly, camera cable, tablet I/O board power cable, and SIM card cable” on page 52
- “1060 Tablet I/O board” on page 54

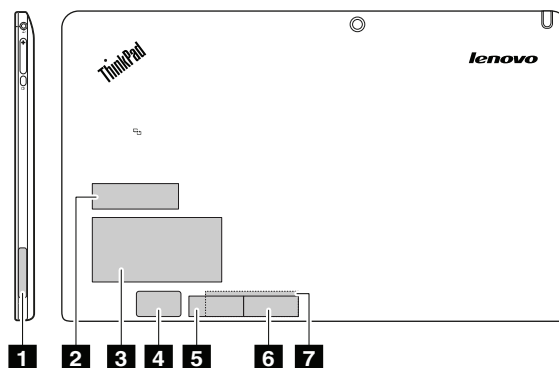
## Removal steps of the DC-in cable assembly and tablet base cover assembly



| Step     | Screw (quantity)                         | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3.5 mm, flat-head, nylon-coated (1) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

## Applying labels to the tablet base cover assembly

On the failing base cover, there might be some labels of several kinds. If the new base cover FRU is shipped with those labels, apply them to the new cover after replacement. For the labels which are not shipped with the new base cover, peel them from the old base cover and adhere them to the new one.



**1** WWAN MAC label

**2** Non-encryption label

**3** Asset tag

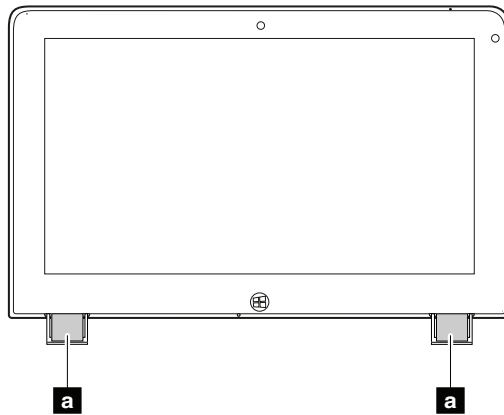
**4** Brazil ANATEL label

**5** Israel label for WLAN and Bluetooth

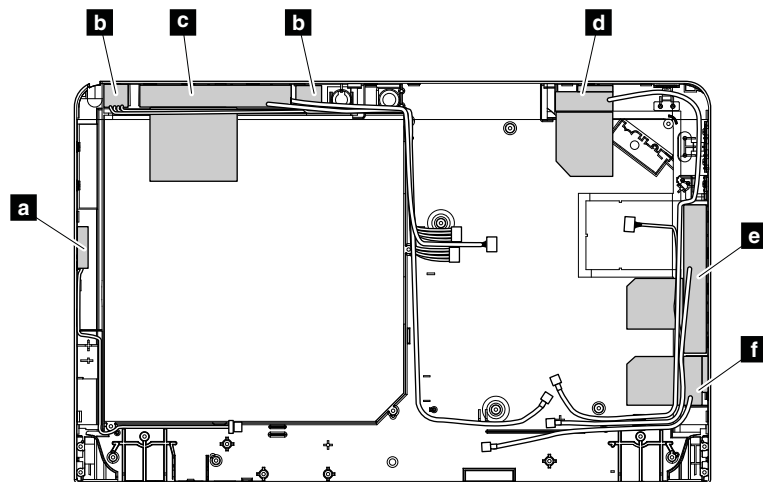
**6** Israel label for WWAN

**7** Indonesia label

Some other labels, including the MTM label, are located on both sides of the two label trays **a**. For those labels, peel them from the old label trays and adhere them to the new ones.



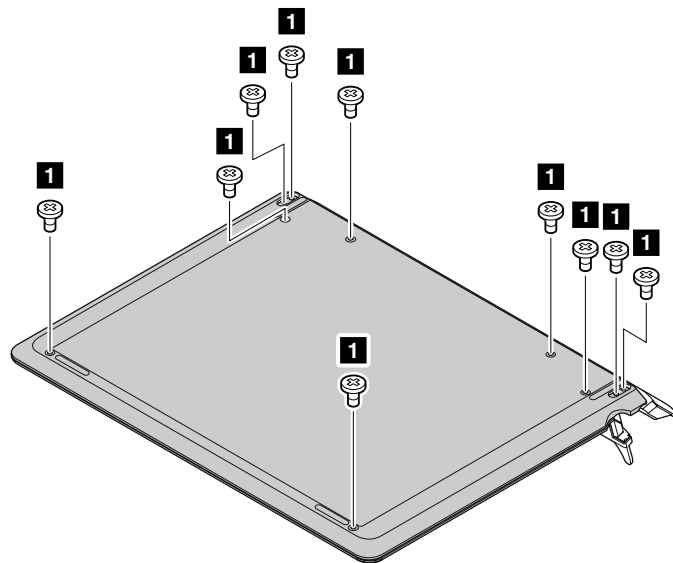
**Antenna location on the tablet base cover assembly**



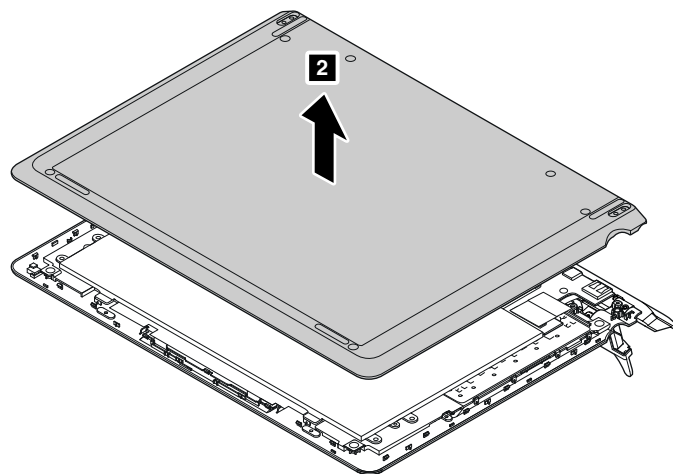
- a** GPS antenna
- b** Proximity sensor assembly
- c** Wireless WAN antenna (main)
- d** Wireless LAN antenna (main)
- e** Wireless WAN antenna (auxiliary)
- f** Wireless LAN antenna (auxiliary)

## 2010 Keyboard dock base cover

### Removal steps of the keyboard dock base cover



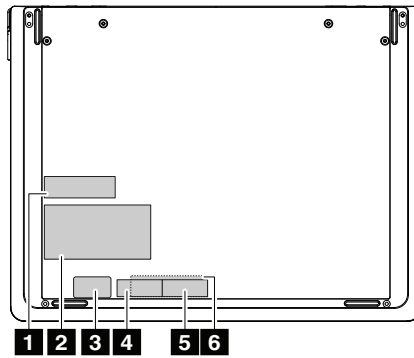
| Step | Screw (quantity)                        | Color | Torque                    |
|------|---|-------|---------------------------|
| 1    | M2 × 4 mm, flat-head, nylon-coated (10) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



### Applying the system label to the keyboard dock base cover

On the failing base cover, there might be some labels of several kinds. If the new base cover FRU is shipped with those labels, apply them to the new cover after replacement. For the labels which are not shipped with the new base cover, peel them from the old base cover and adhere them to the new one.





**1** Non-encryption label

**2** Asset tag

**3** Brazil ANATEL label

**4** Israel label for WLAN and Bluetooth

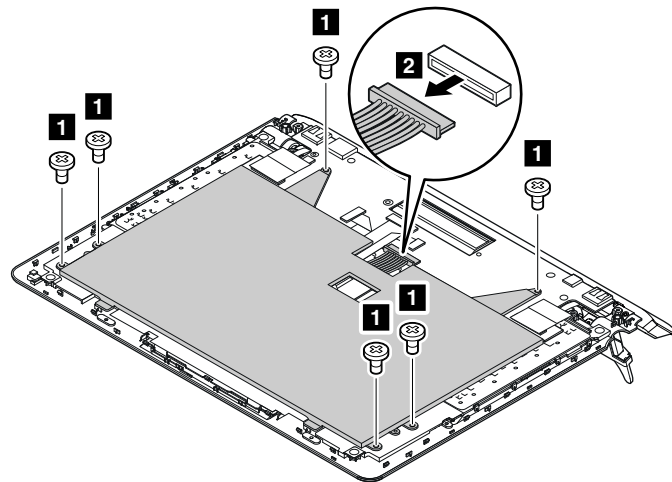
**5** Israel label for WWAN

**6** Indonesia label

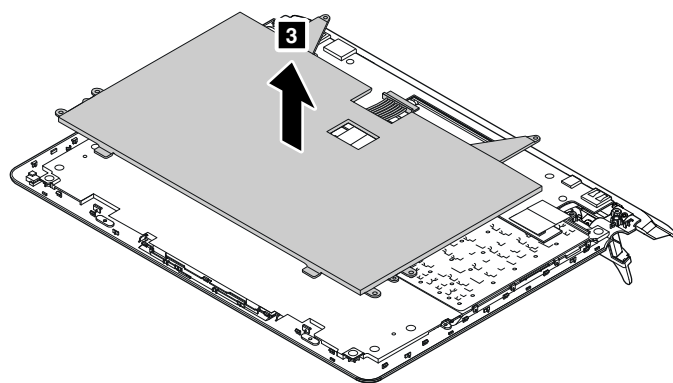
## 2020 Keyboard dock built-in battery

For access, remove the keyboard dock cover first. See “2010 Keyboard dock base cover” on page 62.

### Removal steps of the keyboard dock built-in battery



| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3 mm, flat-head, nylon-coated (6) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



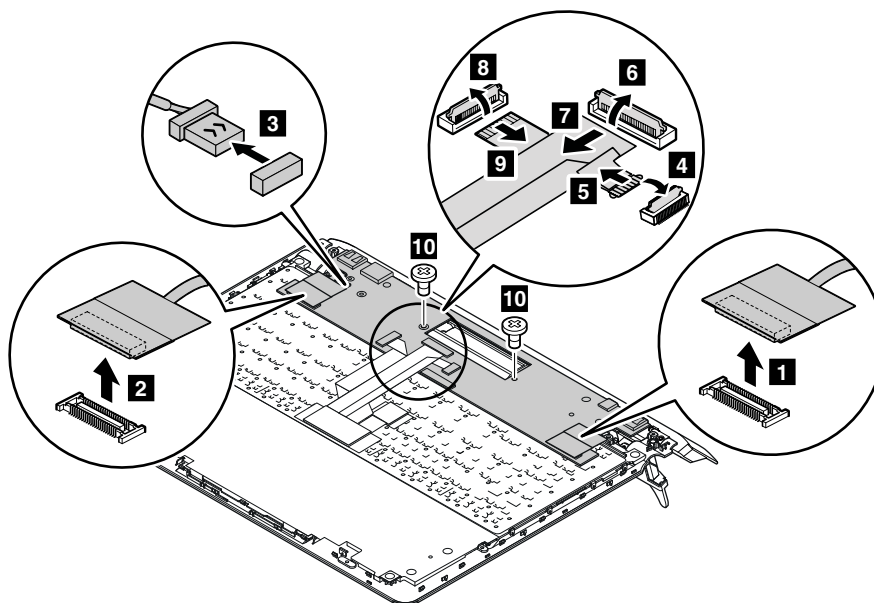
**When installing:** Ensure that the connector is attached firmly.

## 2030 Keyboard dock I/O board

For access, remove the following FRUs in order:

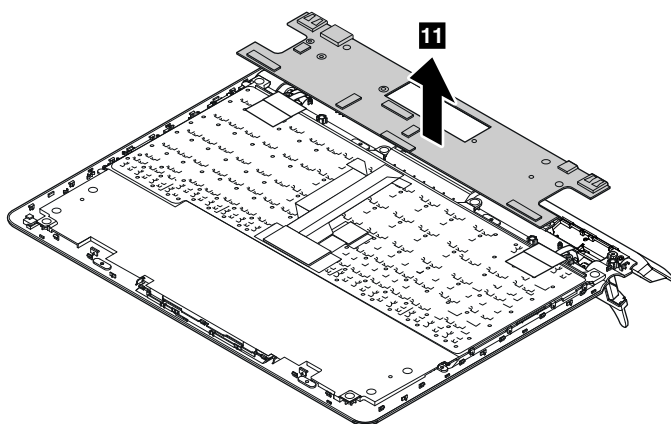
- “2010 Keyboard dock base cover” on page 62
- “2020 Keyboard dock built-in battery” on page 63

### Removal steps of the keyboard dock I/O board



| Step      | Screw (quantity)                       | Color | Torque                    |
|-----------|--|-------|---------------------------|
| <b>10</b> | M2 × 3 mm, flat-head, nylon-coated (2) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

**When installing:** Ensure that the connectors are attached firmly.

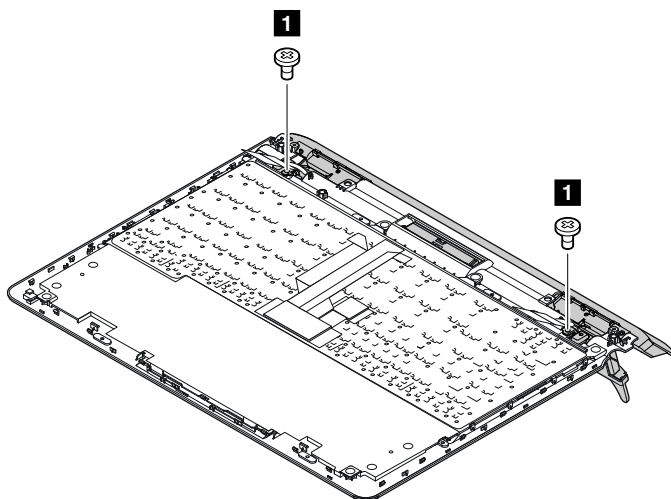


## 2040 Dock and hinge assembly, dock connectors and cables, and thermal fan assembly

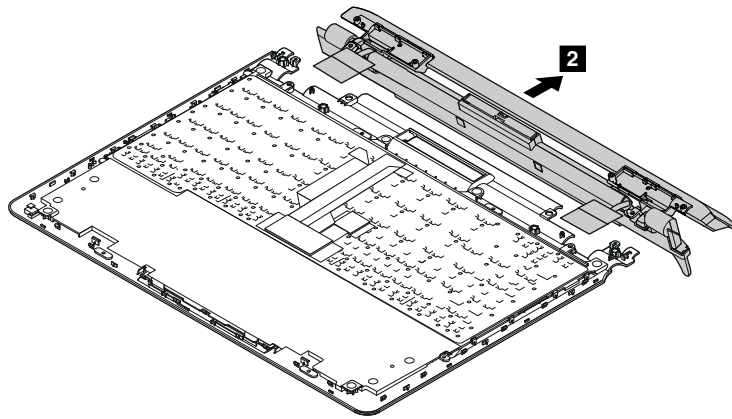
For access, remove the following FRUs in order:

- “2010 Keyboard dock base cover” on page 62
- “2020 Keyboard dock built-in battery” on page 63
- “2030 Keyboard dock I/O board” on page 64

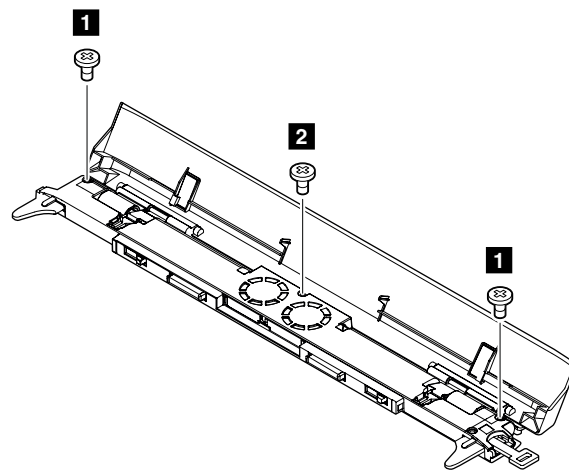
### Removal steps of the dock and hinge assembly



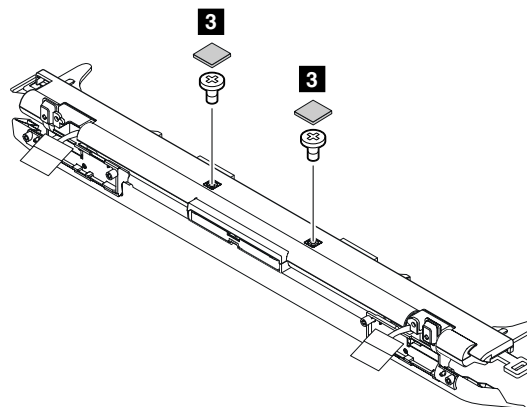
| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3 mm, flat-head, nylon-coated (2) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



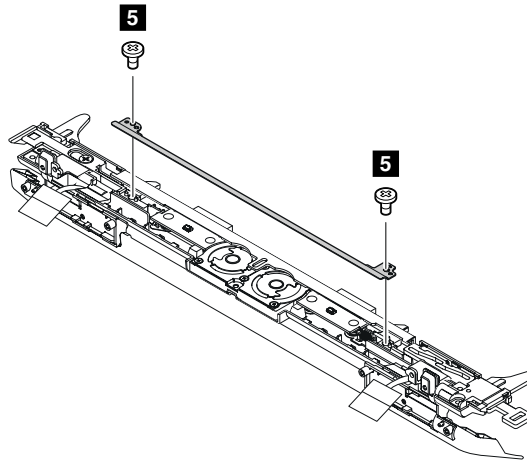
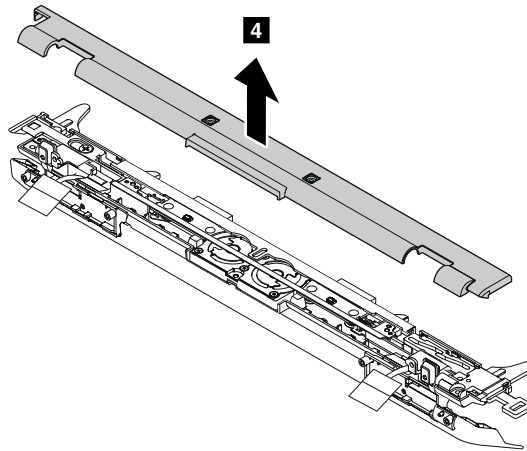
### Removal steps of the dock connectors and cables



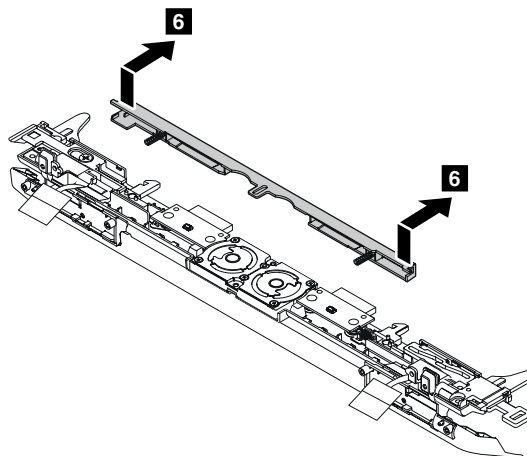
| Step     | Screw (quantity)                         | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2.5 × 6 mm, flat-head, nylon-coated (2) | Black | 0.392 Nm<br>(4 kgf-cm)    |
| <b>2</b> | M2 × 5 mm, flat-head, nylon-coated (1)   | Black | 0.181 Nm<br>(1.85 kgf-cm) |

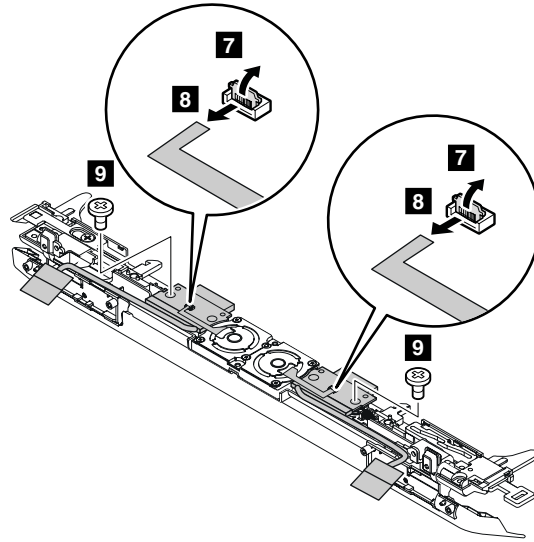


| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>3</b> | M2 × 3 mm, flat-head, nylon-coated (2) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

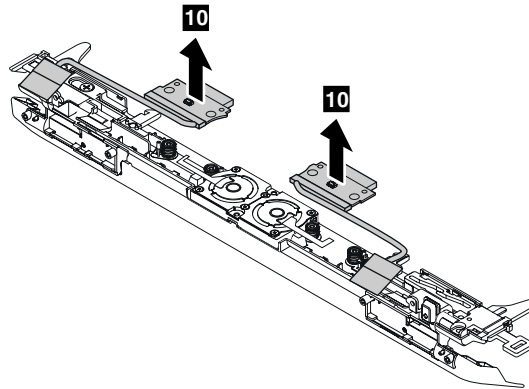


| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>5</b> | M2 × 3 mm, flat-head, nylon-coated (2) | Black | 0.181 Nm<br>(1.85 kgf-cm) |

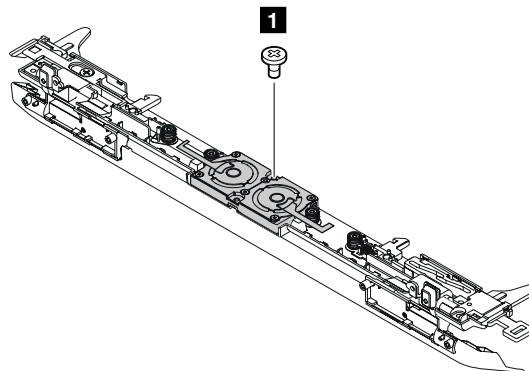




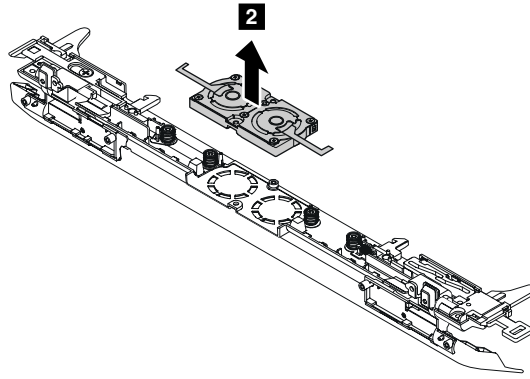
| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>9</b> | M2 × 2 mm, flat-head, nylon-coated (2) | Black | 0.181 Nm<br>(1.85 kgf-cm) |



#### Removal steps of keyboard dock thermal fan assembly



| Step     | Screw (quantity)                       | Color | Torque                    |
|----------|--|-------|---------------------------|
| <b>1</b> | M2 × 3 mm, flat-head, nylon-coated (1) | Black | 0.181 Nm<br>(1.85 kgf-cm) |







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## Appendix A. Abbreviation table

The following table lists all abbreviations used in this manual.

| Abbreviation | Term  |
|--------------|---|
| BGA          | Ball Grid Array                                     |
| CMOS         | Complementary Metal Oxide Semiconductor             |
| CMV          | Custom Model Variant                                |
| CRC          | Cyclic redundancy check                             |
| CRT          | Cathode ray tube                                    |
| CRU          | Customer Replaceable Unit                           |
| CTO          | Configure To Order                                  |
| EAIA         | Enhanced Asset Information Area                     |
| EEPROM       | Electrically Erasable Programmable Read-Only Memory |
| EFI          | Extensible Firmware Interface                       |
| ESD          | Electrostatic discharge                             |
| FRU          | Field Replaceable Unit                              |
| GAV          | General Announce Variant                            |
| IC           | Integrated circuits                                 |
| LCD          | Liquid Crystal Display                              |
| MTM          | Machine type and model                              |
| POST         | Power-on self-test                                  |
| RFID         | Radio-frequency identification                      |
| SVP          | Supervisor password                                 |
| UUID         | Universally unique identifier                       |







Part Number: 0C10337

Printed in China

(1P) P/N: 0C10337

