



IBM Mobile Systems
ThinkPad Computer
Hardware Maintenance Manual

January 2004

**This manual supports:
ThinkPad X40
(MT 2372)**

Note

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 120.

Second Edition (December 2003)

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About this manual

This manual contains service and reference information for IBM ThinkPad X40 (MT2371) product. Use this manual along with the advanced diagnostic tests to troubleshoot problems.

The manual is divided into sections as follows:

- The common sections provide general information, guidelines, and safety information required in servicing computers.
- The product-specific section includes service, reference, and product-specific parts information.

Important

This manual is intended for trained service personnel who are familiar with ThinkPad products. Use this manual along with the advanced diagnostic tests to troubleshoot problems effectively.

Before servicing an IBM ThinkPad product, be sure to review the safety information under “Safety notices: multilingual translations” on page 4, “Safety information” on page 16, and “Laser compliance statement” on page 22.

Introduction

Important service information

Important

BIOS and device driver fixes are customer-installable. The BIOS and device drivers are posted on the IBM support site <http://www.ibm.com/pc/support>

Advise customers to contact the PC Company HelpCenter at 800-772-2227 if they need assistance in obtaining or installing any diskette fixes.

Customers in Canada should call IBM HelpPC at 800-565-3344 for assistance or download information.

Strategy for replacing FRUs

Before replacing parts

Make sure that all diskette fixes are installed before replacing any FRUs listed in this manual.

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

- **If you are instructed to replace a FRU but the replacement does not correct the problem, reinstall the original FRU before you continue.**
- Some computers have both a processor board and a system board. If you are instructed to replace either the processor board or the system board, and replacing one of them does not correct the problem, reinstall that board, and then replace the other one.
- If an adapter or 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 computer 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.

Strategy for replacing a hard-disk drive

Always try to run a low-level format before replacing a hard-disk drive.

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

How to use error messages

Use the error codes displayed on the screen to diagnose failures. If more than one error code is displayed, begin the diagnosis with the first error code. Whatever causes the first error code may also cause false error codes. If no error code is displayed, see if the error symptom is listed in the Symptom-to-FRU Index for the computer you are servicing.

Diskette compatibility matrix

The compatibility of each of the drives with the diskettes for it is as follows:

Diskette drive	Diskette capacity	Compatibility
3.5-inch	1.0 MB	Read and write
	2.0 MB	Read and write
	4.0 MB	Not compatible

Safety notices: multilingual translations

In this manual, safety notices appear in English with a page number reference to the appropriate multilingual, translated safety notice found in this section.

The following safety notices are provided in English, French, German, Hebrew, Italian, and Spanish.

Safety notice 1



Before the computer is powered-on after FRU replacement, make sure 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 shorts.

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.

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.

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

Prima di accendere l'elaboratore dopo che é stata effettuata la sostituzione di una FRU, accertarsi che tutte le viti, le molle e tutte le altri parti di piccole dimensioni siano nella corretta posizione e non siano sparse all'interno dell'elaboratore. Verificare ciò scuotendo l'elaboratore e prestando attenzione ad eventuali rumori; eventuali parti o pezzetti metallici possono provocare cortocircuiti pericolosi.

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.

Safety notice 2



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.

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.

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 Systematterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.

(continued)

(continuation of safety notice 2)

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

Alcune batterie di riserva contengono una piccola quantità di nichel e cadmio. Non smontarle, ricaricarle, gettarle nel fuoco o nell'acqua né cortocircuitarle. Smaltirle secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). Quando si sostituisce la batteria dell'RTC (real time clock) o la batteria di supporto, utilizzare soltanto i tipi inseriti nell'appropriato Catalogo parti. L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

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.

Safety notice 3



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.

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.

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.

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

(continued)

(continuation of safety notice 3)

La batteria contiene piccole quantità di nichel. Non smontarla, gettarla nel fuoco o nell'acqua né cortocircuitarla. Smaltirla secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). Quando si sostituisce la batteria, utilizzare soltanto i tipi inseriti nell'appropriato Catalogo parti. L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

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.

Safety notice 4



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.

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'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.

Die Systematterie ist eine Lithiumatterie. 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.

(continued)

(continuation of safety notice 4)

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

La batteria di supporto e una batteria al litio e puo incendiarsi, esplodere o procurare gravi ustioni. Evitare di ricaricarla, smontarne il connettore polarizzato, smontarla, riscaldarla ad una temperatura superiore ai 100 gradi centigradi, incendiarla o gettarla in acqua. Smaltirla secondo la normativa in vigore (DPR 915/82, successive disposizioni e disposizioni locali). L'impiego di una batteria non adatta potrebbe determinare l'incendio o l'esplosione della batteria stessa.

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.

Safety notice 5



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.

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.

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.

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

Nel caso che caso l'LCD si dovesse rompere ed il liquido in esso contenuto entrasse in contatto con gli occhi o le mani, lavare immediatamente le parti interessate con acqua corrente per almeno 15 minuti; poi consultare un medico se i sintomi dovessero permanere.

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

Safety notice 6** DANGER**

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

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

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

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

Per evitare scosse elettriche, non rimuovere la copertura in plastica che avvolge la parte inferiore della scheda invertitore.

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

Safety notice 7



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

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.

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.

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

Sebbene le batterie di alimentazione siano a basso voltaggio, una batteria in corto circuito o a massa può fornire corrente sufficiente da bruciare materiali combustibili o provocare ustioni ai tecnici di manutenzione.

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.

Safety notice 8



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

Avant de retirer une unité remplaçable en clientèle, mettez le système hors tension, débranchez tous les cordons d'alimentation des socles de prise de courant, retirez la batterie et déconnectez tous les cordons d'interface.

Die Stromzufuhr muß abgeschaltet, alle Stromkabel aus der Steckdose gezogen, der Akku entfernt und alle Verbindungskabel abgenommen sein, bevor eine FRU entfernt wird.

לפני סילוק FRU כלשהו, יש לכבות את המחשב, לנתק את כל כבלי החשמל משקעי החשמל, להוציא את מארז הסוללה, ואז לנתק כבלי חיבור אחרים אם יש כאלה.

Prima di rimuovere qualsiasi FRU, spegnere il sistema, scollegare dalle prese elettriche tutti i cavi di alimentazione, rimuovere la batteria e poi scollegare i cavi di interconnessione.

Antes de quitar una FRU, apague el sistema, desenchufe todos los cables de las tomas de corriente eléctrica, quite la batería y, a continuación, desconecte cualquier cable de conexión entre dispositivos.

Safety information

The following section presents the safety information that you need to be familiar with before servicing an IBM mobile computer.

General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
 1. Ensure 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 objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your toolbox away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Make sure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

Attention: Metal objects are good electrical conductors.

- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.

- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.
- Fan Louvers on the machine help to prevent overheating of internal components. Do not obstruct fan louvers or cover them with labels or stickers.

Warning

Handling the cord on this product or cords associated with accessories sold with this product will expose you to lead, a chemical known to the state of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

Electrical safety

Observe the following rules when working on electrical equipment.

Important

Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

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

Safety information

- 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; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

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

and similar units. (This practice ensures correct grounding of the units.)

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

Safety inspection guide

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

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

Consider these conditions and the safety hazards they present:

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

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

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
 - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
 - b. The power cord should be the type specified in the parts list.
 - c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.

8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling devices that are sensitive to 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 the black side of 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 is desirable but not required to protect against ESD damage.

- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.

- Use the round ground-prong of the ac plug on ac-operated computers.

Grounding requirements

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

Laser compliance statement

Some IBM Personal Computer models are equipped from the factory with an optical storage device such as a CD-RW drive or a DVD-ROM drive. They are also sold separately as options. The drive is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the drive is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a CD-RW drive, DVD drive or the other laser product is installed, note the following:

 **CAUTION:**

Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

O uso de controles, ajustes ou desempenho de procedimentos diferentes daqueles aqui especificados pode resultar em perigosa exposição à radiação.

凡未在这里指明的任何控制用法、调整、行为，都会导致严重后果。

Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites.

Werden Steuer- und Einstellelemente anders als hier festgesetzt verwendet, kann gefährliche Laserstrahlung auftreten.

Az itt előírt eljárásoktól, beállításoktól és vezérlésektől eltérni a lézersugárzás veszélye miatt kockázatos !

L'utilizzo di controlli, regolazioni o l'esecuzione di procedure diverse da quelle specificate possono provocare l'esposizione a.

Использование элементов настройки и выполнение процедур иных, чем указано здесь, может привести к опасному радиационному облучению.

Použitie kontrôl, úprav alebo iných vykonaní od iných výrobcov, ako je v tomto špecifikované, mohlo by mať za následok nebezpečenstvo vystavenia sa vyžiarovaniu.

El uso de controles o ajustes o la ejecución de procedimientos distintos de los aquí especificados puede provocar la exposición a radiaciones peligrosas.

Opening the CD-RW drive, DVD-ROM drive or the other optical storage device could result in exposure to hazardous laser radiation. There are no serviceable parts inside those drives. **Do not open.**

Some CD-RW drives, DVD-ROM drives, or other optical storage devices contain an embedded Class 3A or Class 3B laser diode. Note the following:

⚠ DANGER

Emits visible and invisible laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Radiação por raio laser ao abrir. Não olhe fixo no feixe de luz, não olhe diretamente por meio de instrumentos óticos e evite exposição direta com o feixe de luz.

开启时会有激光发射时，请勿盯视激光光束，请勿直接查看视觉仪器，并且避免直接接触在激光光束之中。

Rayonnement laser si carter ouvert. Évitez de fixer le faisceau, de le regarder directement avec des instruments optiques, ou de vous exposer au rayon.

Laserstrahlung bei geöffnetem Gerät. Nicht direkt oder über optische Instrumente in den Laserstrahl sehen und den Strahlungsbereich meiden.

Kinyitáskor lézersugár ! Ne nézzen bele se szabad szemmel, se optikai eszközökkel. Kerülje a sugárnyalábbal való érintkezést !.

Aperto l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici e evitare l'esposizione diretta al fascio.

Открывая, берегитесь лазерного излучения.

Не смотрите на луч, не разглядывайте его с помощью оптических инструментов, а также избегайте прямого воздействия лазерного луча.

Keď je laserová jednotka otvorená. Vyhnite sa priamemu pohľadu a nehľadte priamo s optickými nástrojmi do lúča a vyhnite sa priamemu vystaveniu lúčov.

Radiación láser al abrir. No mire fijamente ni examine con instrumental óptico el haz de luz. Evite la exposición directa al haz.

General descriptions

This chapter includes descriptions for any ThinkPad model that has the PC-Doctor® DOS diagnostics program. Some descriptions might not apply to your particular computer.

Read this first

Before you go to the checkout guide, be sure to read this section.

Important notes

- **Only certified trained personnel should service the computer.**
- **Read the entire FRU removal and replacement page before replacing any FRU.**
- **Use new nylon-coated screws when you replace FRUs.**
- **Be extremely careful during such write operations as copying, saving, or formatting.** Drives in the computer that you are servicing sequence might have been altered. If you select an incorrect drive, data or programs might be overwritten.
- **Replace FRUs only for the correct model.** When you replace a FRU, make sure 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 failures can occur for a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, electrostatic discharge, or software errors. Consider replacing a FRU only when a problem recurs. If you suspect that a FRU is defective, clear the error log and run the test again. If the error does not recur, do not replace the FRU.
- **Be careful not to replace a nondefective FRU.**

What to do first

When you 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 servicer
- ___ 2. Date of service
- ___ 3. Date on which the machine failed

Read this first

- ___ 4. Date of purchase
- ___ 5. Failure symptoms, error codes appearing on the display, and beep symptoms
- ___ 6. Procedure index and page number in which the failing FRU was detected
- ___ 7. Failing FRU name and part number
- ___ 8. Machine type, model number, and serial number
- ___ 9. Customer's name and address

Note for warranty:

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

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

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
- Cracked or broken plastic parts, broken latches, broken pins, or broken connectors caused 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
- Damage caused by foreign material in the diskette drive
- Diskette drive damage caused by pressure on the diskette drive cover or by the insertion of a diskette with multiple labels
- Damaged or bent diskette eject button
- Fuses blown by attachment of a nonsupported device
- Forgotten computer password (making the computer unusable)
- Sticky keys caused by spilling a liquid onto the keyboard

The following symptoms might indicate damage caused by nonwarranted activities:

- Missing parts might be a symptom of unauthorized service or modification.
- If the spindle of a hard-disk drive becomes noisy, it may have been subjected to excessive force, or dropped.

Related service information

This section provides information about the following:

- “Service web site”
- “Restoring the preloaded system”
- “Recovering the hard disk to original contents” on page 30
- “Passwords” on page 33
- “Power management” on page 35

Service web site

When the latest maintenance diskette and the system program service diskette become available, a notice will be posted on <http://www.ibm.com/pc/partner/infotips>

Restoring the preloaded system

If the data on a hard-disk drive is damaged or accidentally erased, you can restore the software that was shipped with the computer. This software includes the pre-installed operating system, applications, and device drivers.

To restore the pre-installed software, you can use either the Product Recovery program or a recovery CD.

Ordering the recovery CD

When the hard-disk drive is replaced because of a failure, no Product Recovery program is on the new hard disk. In this case, you must use the Product Recovery CD for the computer. Order the recovery CD and the hard-disk drive at the same time so that you can recover the new hard-disk drive with the pre-installed software when they arrive. For information on which CD to order, see “Recovery CDs” on page 115

The Product Recovery program is in the service partition, a section of the hard-disk drive that is not displayed by Windows Explorer.

Attention: All of the files on the primary hard-disk partition (usually drive C) will be lost in the recovery process. Be sure to back up copies of the files you have saved on your drive C before you begin.

Creating a Recovery Repair diskette

If the operating system cannot boot normally, or if you cannot get access to the Product Recovery program, you can use the Recovery Repair diskette to boot the

computer. Make a Recovery Repair diskette and save it for future use. To make a Recovery Repair diskette, do the following:

1. Shut down and restart the computer.
2. At the prompt, press F11. (The option to press F11 appears for only a few seconds. You must press F11 quickly.) The Product Recovery program main menu opens.

Note: If you are prompted to select the operating system, select one you want to recover. Then the Product Recovery program main menu opens.

3. Select **System Utilities** from the main menu. Press Enter.
4. Select **Create a Recovery Repair diskette**. Press Enter.
5. Follow the on-screen instructions.
6. When the process is completed, label the diskette "Recovery Repair diskette" and save it for future use.

Product Recovery program

Note: The recovery process might take up to 2 hours.

To use the Product Recovery program to restore the pre-installed software, do the following:

1. Save all files and shut down the desktop.
2. Turn off the computer.
3. Turn on the computer. If you are using Windows XP, three messages (F1, F11, and F12) appear on the screen for a few seconds. One of them is "**Press F11 to invoke the IBM Product Recovery program**". While the message is displayed, quickly press F11.

If you are using Windows 2000 or another operating system, the startup screen is displayed first, and then the message "**To start the Product Recovery program, press F11**" at the top of the screen. Here again it appears very briefly; watch for it, and press F11 before it disappears.

Note: If this message is not displayed, you can use a Recovery Repair diskette to get access to the Product Recovery program. (For using a Recovery Repair diskette, see "To use the Recovery Repair diskette:" on page 30.)

4. From the list displayed on the screen, select the operating system you want to recover.
5. Select the recovery options you want, and follow the instructions on the screen.

6. When the Product Recovery program finishes running, the computer will restart with the pre-installed operating system, drivers, and software.

Using the recovery CD

To create the service partition and install the preloaded system from the recovery CD, do the following:

To create the service partition:

1. Erase all partitions on the hard-disk drive, using FDISK or a similar application.
2. Boot with the recovery CD (and the boot diskette if required.)
3. Following message is displayed: **“Your computer originally included a Product Recovery program ... Reinstall the Product Recovery program? (Y/N) []”**.

Note: If the hard-disk drive contains any partitions, you do not receive this message; go to step 1.

4. Press Y key. The service partition is created and loaded with the Product Recovery program files.

Note: If you do not want to create the service partition, press N key, and then go to step 8.

5. At next window, press Enter to continue.
 - The service partition is created. The system automatically reboots during this process.
 - The recovery process copies some files to the service partition, and PKUNZIPs others.
 - Follow the prompts. You may be prompted to change CDs.
 - When the process is complete, the system reboots. Continue to step 6 to install preloaded system.

Install preloaded system from CD:

6. Boot with the recovery CD (and the boot diskette if required.)
7. If the hard-disk drive is blank, the following message is displayed: **“Your computer originally included a Product Recovery program ... Reinstall the Product Recovery program? (Y/N) []”**.
 - To install the service partition, go to step 4.
 - To preload the hard-disk drive without installing the service partition, press N key.
8. If you get a message asking which operating system to install, select the proper operating system and press Enter.
9. A message is displayed: **“Full Recovery:”**. Press Enter to select.

10. On each of the next three windows, press the Y key.
11. Follow the prompts to complete the recovery.

To use the Recovery Repair diskette:

1. Shut down and turn off the computer.
2. Insert the Recovery Repair diskette into the drive, and then turn on the computer.
3. Follow the on-screen instructions.

Recovering the hard disk to original contents

Recovering the hard disk using Access IBM Predesktop Area

Hard disk of ThinkPad computer you are servicing has a hidden, protected area for backups. Contained within this area is a complete backup of the hard disk as it was shipped from the factory and a program called the Access IBM Predesktop Area.

You can use the Access IBM Predesktop Area to restore the contents of the hard disk to an earlier state using any of the backup images stored in the protected area. Access IBM Predesktop Area runs independently of the Windows operating system. Therefore, you can start it by pressing the blue Access IBM button when prompted during startup.

After the Access IBM Predesktop Area opens you can perform a recovery operation, even if you are unable to start Windows.

To recover the hard disk to its original contents, do the following:

Note

The recovery process might take up to 2 hours.

Attention: All of the files on the primary hard-disk partition (usually drive C) will be lost in the recovery process. Be sure to back up copies of the files you have saved on your drive C before you begin.

Note: You might need to use a diskette drive in the recovery process. Use a drive that is compatible with the ThinkPad computer you are servicing.

1. If possible, save all the files and shut down the operating system.
2. Turn off the computer.

3. Turn on the computer. Watch the display carefully. When the following message is displayed, press the blue Access IBM button to open the Access IBM Predesktop Area: "To interrupt normal startup, press the blue Access IBM button."
4. Double-click **Recover to factory contents**.
5. Follow the instructions on the screen.
6. When the recovery process finishes, the computer will restart with the pre-installed operating system, drivers, and software.

Recovering the hard disk using the recovery CD

You can delete the Access IBM Predesktop Area by going into BIOS (F1 at IBM Splash Screen), and then choosing **Security IBM-> Predesktop Area->Disabled**.

This will make the Service Partition area available to FDISK. If you choose **Disabled**, the following warning appears:

Attention! If you select Disabled, the IBM Predesktop Area will be visible and can be reclaimed by the OS. Once the area is overwritten by OS tools, it can't be used with Normal or Secure and you will need to obtain a Recovery CD to retrieve original HDD. Please confirm that you wish to select Disabled.

FDISK will not delete the Access IBM Predesktop Area unless you do this, because it is not visible. You would have to use "bootkil2 /psa" to completely wipe the drive.

Ordering the recovery CD

When the hard-disk drive is replaced because of a failure, no Access IBM Predesktop Area is on the new hard disk. In this case, you must use the recovery CD for the computer. Order the recovery CD and the hard-disk drive at the same time so that you can recover the new hard-disk drive with the pre-installed software when they arrive. For information on which CD to order, see "Recovery CDs" on page 115

To create the service partition and install the factory contents from the recovery CD, do the following:

To create the service partition:

1. Erase all partitions on the hard-disk drive, using FDISK or a similar application.

2. For the proper removal of the Hidden Protected Area(HPA), refer to the white paper at <http://www.pc.ibm.com/qtechinfo/AIBM-T00LS.html>

3. Boot with the recovery CD (and the boot diskette if required.)

4. Following message is displayed: **“Your computer originally included a Product Recovery program ... Reinstall the Product Recovery program? (Y/N) []”**.

Note: If the hard-disk drive contains any partitions, you do not receive this message; go to step 1.

5. Press Y key. The service partition is created and loaded with the Product Recovery program files.

Note: If you do not want to create the service partition, press N key, and then go to step 8.

6. At next window, press Enter to continue.

- The service partition is created. The system automatically reboots during this process.
- The recovery process copies some files to the service partition, and PKUNZIPs others.
- Follow the prompts. You may be prompted to change CDs.
- When the process is complete, the system reboots. Continue to step 6 to install preloaded system.

Install preloaded system from CD:

7. Boot with the recovery CD (and the boot diskette if required.)

8. If the hard-disk drive is blank, the following message is displayed: **“Your computer originally included a Product Recovery program ... Reinstall the Product Recovery program? (Y/N) []”**.

- To install the service partition, go to step 4.
- To preload the hard-disk drive without installing the service partition, press N key.

9. If you get a message asking which operating system to install, select the proper operating system and press Enter.

10. A message is displayed: **“Full Recovery:”**. Press Enter to select.

11. On each of the next three windows, press the Y key.

12. Follow the prompts to complete the recovery.

Passwords

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

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

Exception: If only an SVP is installed, the password prompt does not appear when the operating system is booted.

Power-on password

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

Hard-disk password

There are two hard-disk passwords (HDPs):

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

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

Attention: If the user HDP has been forgotten, check whether a master HDP has been set. If it has, it can be used for access to the hard-disk drive. If no master HDP is available, IBM does not provide any services to reset either the user or the master HDP, or to recover data from the hard-disk drive. The hard-disk drive can be replaced for a scheduled fee.

Supervisor password

A supervisor password (SVP) protects the system information stored in the IBM BIOS Setup Utility. The SVP must be entered in order to get access to the IBM BIOS Setup Utility and make changes to system configuration settings.

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

How to remove the power-on password

To remove a POP that you have forgotten, do the following:

(A) *If no SVP has been set:*

1. Turn off the computer.
2. Remove the battery pack.
For how to remove the battery pack, see “1010 Battery pack” on page 70.
3. Remove the backup battery.
For how to remove the backup battery, see “1070 Backup battery” on page 81.
4. Turn on the computer and wait until the POST ends.
After the POST ends, the password prompt does not appear. The POP has been removed.
5. Reinstall the backup battery and the battery pack.

(B) *If an SVP has been set and is known by the servicer:*

1. Turn on the computer; then, while the “To interrupt normal startup, press the blue Access IBM button” message is displayed at the lower-left of the screen, press the Access IBM button.
2. Enter the SVP. Select **Start setup utility**.
3. Select **Security**, using the cursor keys to move down the menu.
4. Select **Password**.
5. Select **Power-On Password**.
6. At the Enter Current Password field, enter the SVP.
7. When the Enter New Password field opens, leave it blank and press Enter twice.
8. In the Changes have been saved window, press Enter.
9. Press F10; then, in the Setup confirmation window, select **Yes** .

How to remove the hard-disk password

Attention: If **User only** mode is selected and the user HDP has been forgotten and cannot be made available to the servicer, IBM does not provide any services to reset the user HDPs or to recover data from the hard-disk drive. The hard-disk drive can be replaced for a scheduled fee.

To remove a user HDP that has been forgotten, when the SVP and the master HDP are known, do the following:

1. Turn on the computer; then, while the “To interrupt normal startup, press the blue Access IBM button” message is displayed at the lower-left of the screen, press the Access IBM button.
2. For models supporting the Passphrase function, press F1 while HDP icon is appearing on the screen; then enter the master HDP. For the other models, enter the master HDP.

Note: To check whether the ThinkPad computer supports the Passphrase function, enter IBM BIOS Setup Utility and go to **Security -> Password**. If **using Passphrase** item is displayed in the menu, this function is available on the ThinkPad computer.
3. Double-click **Start setup utility**. Enter SVP.
4. Select **Security**, using the cursor keys to move down the menu.
5. Select **Password**.
6. Select **Hard-disk x password**, where x is the letter of the hard-disk drive. A pop-up window opens.
7. Select **Master HDP**.
8. Enter the master HDP; then leave the New Password field blank and press Enter twice.
9. Press F10.
10. Select **Yes** in the Setup Configuration window.
Both user HDP and master HDP will have been removed.

Power management

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

Screen blank mode

Screen blank mode has three variants, as follows:

1. If you press Fn+F3, or the time set on the “LCD off timer” in IBM BIOS Setup Utility expires,
 - The LCD backlight turns off.
 - The hard-disk drive motor stops.
 - The speaker is muted.
2. If you are using the ACPI operating system and you press Fn+F3,
 - The LCD backlight turns off.
 - The hard-disk drive motor stops.
3. If the time set on the “Turn off monitor” timer in the operating system expires,
 - The LCD backlight turns off.

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

Standby mode

When the computer enters standby mode, the following events occur in addition to what occurs in screen blank mode:

- The LCD is powered off.
- The hard-disk drive is powered off.
- The CPU stops.

To enter standby mode, press Fn+F4.

Note: You can change the action of Fn+F4, if you are using the ACPI operating system.

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

- If a “suspend time” has been set on the timer, and the user does not do any operation with the keyboard, the TrackPoint, the hard disk, the parallel connector, or the diskette drive within that time.
- If the battery indicator blinks orange, indicating that the battery power is low. (Alternatively, if **Hibernate when battery becomes low** has been selected in the “Power Management Properties” window, the computer goes into hibernation mode.)

Note for the APM operating system:

Even if you do not set the low-battery alarm, the charge indicator notifies you when the battery is low, and then the computer enters the power-saving mode automatically. This default low-battery behavior is independent of the operating system; so if you have set the low-battery alarm, the computer may not do what you specified. It chooses either your setting or the default setting, whichever is appropriate.

If you are using the ACPI operating system, only the low-battery alarm is available.

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

- Press the Fn key.
- Open the LCD cover.
- Turn on the power switch.

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

- The ring indicator (RI) is signaled by a serial device or a PC Card device (Windows 2000 does not support the ring indicator (RI) resume by PC Card device.)

- The time set on the resume timer elapses.

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

Hibernation mode

In hibernation mode, the following occurs:

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

Note: If the computer enters the hibernation mode while it is docked to the docking station, do not undock it from the docking station before resuming normal operation. If you do undock it and then try to resume normal operation, you will get an error message, and you will have to restart the system.

To cause the computer to enter hibernation mode, do any of the following:

- Press the Fn+F12 keys.
- If you are using the APM operating system and have set the mode to **Power switch mode [Hibernation]**, turn off the power switch.
- If you are using the ACPI operating system and have defined one of the following actions as the event that causes the system to go into hibernation mode, perform that action.
 - Closing the lid.
 - Pressing the power button.
 - Pressing Fn+F4 keys.

Also, the computer goes into hibernation mode automatically in either of the following conditions:

- If a “hibernation time” has been set on the timer, and the user does not do any operation with the keyboard, the TrackPoint, the hard-disk drive, the parallel connector, or the diskette drive within that time.
- If the timer conditions are satisfied in suspend mode.
- If you are using the APM operating system and have set the mode to **Hibernate when battery becomes low**, and the battery charge becomes critically low.

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

Checkout guide

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

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

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

Testing the computer

The ThinkPad computer has a test program called PC-Doctor[®] DOS (hereafter called *PC-Doctor*). You can detect errors by running the diagnostics test included in PC-Doctor. This section is an overview of the procedure. For details that depend on model-unique functions, refer to “Product overview” on page 47.

For some possible configurations of the computer, PC-Doctor might not run correctly. To avoid this problem, you need to initialize the computer setup by use of the IBM BIOS Setup Utility before you run PC-Doctor. On the IBM BIOS Setup Utility screen, press F9, Enter, F10, and then Enter.

Note: When you initialize the computer configuration, some devices are disabled, such as the serial port. If you test one of these devices, you will need to enable it by using PS2.EXE.

PC-Doctor cannot be used to test a device that is in the docking station, even if the computer supports the docking station. To test a USB device, connect it to the USB connector of the computer. To test the Ultrabay device, install it in the Ultrabay Slim slot of the computer.

Creating the PC-Doctor diagnostics diskette

In X40 series, the PC-Doctor disk can be created by using the Access IBM Predesktop Area.

To create the PC-Doctor disk from the Access IBM Predesktop Area, do as follows:

1. Enter the IBM Predesktop application by pressing the Access IBM button during POST.
2. When the Access IBM application finishes loading, double-click the "Create Diagnostic Diskettes" icon.
3. It will take about 15 seconds to authenticate the digital signature, and then the ThinkPad computer will reboot into PC-DOS.
4. A batch file will automatically start up to prompt the user through creating the boot diskettes. The user will be informed how many diskettes will be needed.
 - a. The user will be prompted to insert each diskette in sequence.
 - b. Typically, the user only needs to press the Enter key for the proper floppy drive to format and create the diskette.
 - c. Each diskette will be erased and formatted with the PC-Doctor DOS boot image.
5. Once all the diskettes have been created, the ThinkPad computer will reboot. The user is asked to remove all diskettes from the drive, or to insert the first diskette created if it is desired to run the diagnostics.

To run the test, do as follows:

Note: In the following procedure, you can select an item not only with the arrow keys, but also with the TrackPoint. Instead of pressing Enter, click the left button.

1. Insert the PC-Doctor disk into the diskette drive; then power on the computer.

If the computer cannot be powered on, go to "Power system checkout" on page 41, and check the power sources.

If an error code appears, go to "Symptom-to-FRU index" on page 56.

On the first screen, select the model and press Enter. Follow the instructions on the screen.

2. The main panel of PC-Doctor appears.

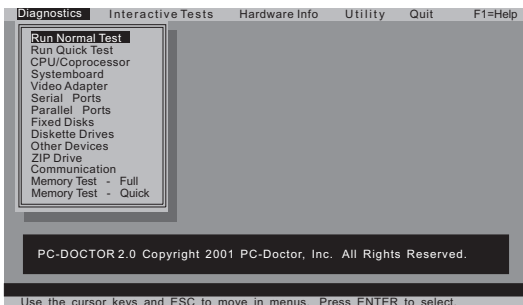
3. Select **Diagnostics** with the arrow keys, and press Enter.

A pull-down menu appears. (Its exact form depends on the model.)

Note: PC-Doctor menu does not mean the formal support device list. Some unsupported device names may appear in the PC-Doctor menu.

The options on the test menu are as follows:

Diagnostics	Interactive Tests
<ul style="list-style-type: none"> • Run Normal Test • Run Quick Test • CPU/Coprocessor • Systemboard • Video Adapter • Serial Ports • Parallel Ports • Fixed Disks • Diskette Drives • Other Devices • Communication • Wireless LAN • Memory Test – Full • Memory Test – Quick 	<ul style="list-style-type: none"> • Keyboard • Video • Internal Speaker • Mouse • Diskette • System Load • CD-ROM/DVD Test • Intel Wireless Radio
<p>Notes:</p> <ul style="list-style-type: none"> • In the Keyboard test in Interactive Tests, the Fn key should be held down for at least 2 seconds; otherwise, it cannot be sensed. • Video Adapter test supports only the LCD display on the ThinkPad computer. Before running PC-Doctor DOS, detach the external Monitor. • To test Digital Signature Chip, the chip must be enabled. • To test Serial Ports or Parallel Ports, the ThinkPad computer must be attached to the X4 UltraBase.. 	



4. Run the applicable function test.
5. Follow the instructions on the screen. If there is a problem, PC-Doctor shows messages describing it.
6. To exit the test, select **Quit — Exit Diag**.
To cancel the test, press Esc.

Note: After executing PC-Doctor, check the system time/date and reset them if needed.

Detecting system information with PC-Doctor

PC-Doctor can detect the following system information:

Hardware Info

- System Configuration
- Memory Contents
- Physical Disk Drives
- Logical Disk Drives
- VGA Information
- IDE Drive Info
- PCI Information
- PNPISA Info
- SMBIOS Info
- VESA LCD Info

Utility

- Run External Tests
- Surface Scan Hard Disk
- Benchmark System
- DOS Shell
- Tech Support Form
- Battery Rundown
- View Test Log
- Print Log
- Save Log
- Full Erase Hard Drive
- Quick Erase Hard Drive

Power system checkout

To verify a symptom, do the following:

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

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

- “Checking the ac adapter” on page 42
- “Checking operational charging” on page 42
- “Checking the battery pack” on page 42
- “Checking the backup battery” on page 43

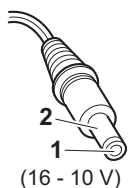
Checking the ac adapter

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

- If the power problem occurs only when the port replicator is used, replace the port replicator.
- If the power-on indicator does not turn on, check the power cord of the ac adapter for correct continuity and installation.
- If the computer does not charge during operation, go to "Checking operational charging."

To check the ac adapter, do the following:

1. Unplug the ac adapter cable from the computer.
2. Measure the output voltage at the plug of the ac adapter cable. See the following figure:



Pin	Voltage (V dc)
1	+15.5 to +17.0
2	Ground

3. If the voltage is not correct, replace the ac adapter.
4. If the voltage is acceptable, do the following:
 - Replace the system board.
 - If the problem persists, go to "Product overview" on page 47.

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

Checking operational charging

To check whether the battery charges properly during operation, use a discharged battery pack or a battery pack that has less than 50% of the total power remaining when installed in the computer.

Perform operational charging. If the battery status indicator or icon does not turn on, remove the battery pack and let it return to room temperature. Reinstall the battery pack. If the charge indicator or icon still does not turn on, replace the battery pack.

If the charge indicator still does not turn on, replace the system board. Then reinstall the battery pack. If it is still not charged, go to the next section.

Checking the battery pack

Battery charging does not start until the Power Meter shows that less than 95% of the total power remains; under this condition the battery pack can charge to 100%

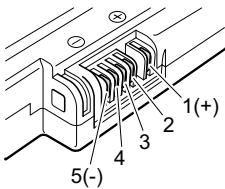
of its capacity. This protects the battery pack from being overcharged or from having a shortened life.

To check the status of your battery, move your cursor to the Power Meter icon in the icon tray of the Windows taskbar and wait for a moment (but do not click), and the percentage of battery power remaining is displayed. To get detailed information about the battery, double-click the Power Meter icon.

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

To check the battery pack, do the following:

1. Power off the computer.
2. Remove the battery pack and measure the voltage between battery terminals 1 (+) and 5 (-). See the following figure:



Terminal	Voltage (V dc)
1	+ 0 to + 12.6
5	Ground (-)

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

Note: Recharging will take at least 3 hours, even if the indicator does not turn on.

If the voltage is still less than +11.0 V dc after recharging, replace the battery.

4. If the voltage is more than +11.0 V dc, measure the resistance between battery terminals 4 and 5. The resistance must be 4 to 30 K Ω .

If the resistance is not correct, replace the battery pack. If the resistance is correct, replace the system board.

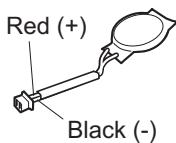
Checking the backup battery

Do the following:

1. Power off the computer, and unplug the ac adapter from it.
2. Turn the computer upside down.
3. Remove the battery pack (see “1010 Battery pack” on page 70).
4. Remove the backup battery (see “Checking the battery pack” on page 42).

Checkout guide

5. Measure the voltage of the backup battery. See the following figure.



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.

ThinkPad X40

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Product overview

This section presents the following product-unique information:

- “Specifications”
- “Status indicators for X40” on page 50
- “FRU tests” on page 52
- “Fn key combinations” on page 53

Specifications

Feature	Description
Processor	<ul style="list-style-type: none"> • Mobile Intel® Pentium® M Processor 1.0 GHz - L2 512 KB cache • Mobile Intel® Pentium® M Processor 1.3 GHz - L2 512 KB cache
Memory (standard)	<ul style="list-style-type: none"> • 256 MB SDRAM on-board (PC2700) card × 1 • 512 MB SDRAM on-board (PC2700) card × 1
Memory (optional)	<ul style="list-style-type: none"> • PC2700 128 MB Memory 200pin JEDEC Standard SO-DIMM • PC2700 256 MB Memory 200pin JEDEC Standard SO-DIMM • PC2700 512 MB Memory 200pin JEDEC Standard SO-DIMM • PC2700 1024 MB Memory 200pin JEDEC Standard SO-DIMM <p>(maximum of 1280 MB for 256M Model & 1536 MB for 512 Model)</p>

(continued)

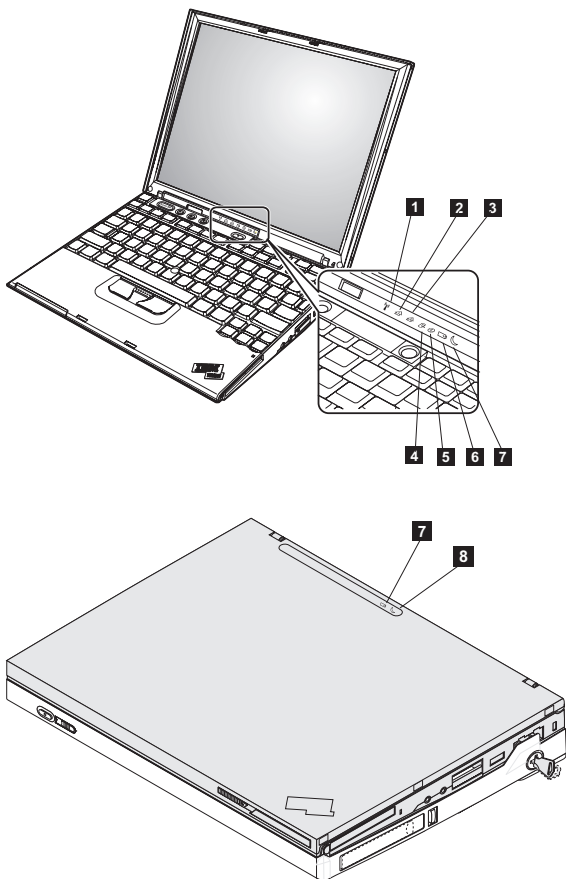
Feature	Description
Bus architecture	<ul style="list-style-type: none"> • HUB link • PCI bus • LPC bus
Video	<ul style="list-style-type: none"> • Graphics chip: Intel 855GME • Total video memory: UMA, 64MBmax
CMOS RAM	<ul style="list-style-type: none"> • 242 bytes
Hard-disk drive	<ul style="list-style-type: none"> • 20.0 GB, 2.5-inch, IDE interface • 40.0 GB, 2.5-inch, IDE interface
Display	<ul style="list-style-type: none"> • 12.1-inch, 16M colors, XGA (1024 × 768 resolution) TFT color LCD
I/O port (system)	<ul style="list-style-type: none"> • External monitor connector • RJ11 connector • RJ45 connector • Stereo headphone jack • Monaural microphone jack • Universal serial bus (USB) connector × 2 • Infrared port • Docking connector • DC-in
I/O port (UltraBase)	<ul style="list-style-type: none"> • External monitor connector • RJ11 • RJ45 • Parallel connector • Serial connector • Keyboard or mouse connector • Universal serial bus (USB) connector × 3 • DC-in
Internal modem	<ul style="list-style-type: none"> • 56.6 Kbps
Audio	<ul style="list-style-type: none"> • Internal monaural speaker • Software control volume
Infrared transfer	<ul style="list-style-type: none"> • IrDA 1.1
Mini PCI card	<ul style="list-style-type: none"> • 802.11a/b/g combo (Wireless) Mini PCI Card • 802.11b single (Wireless) Mini PCI Card • 802.11b/g (Wireless) Mini PCI Card


(continued)

Feature	Description
PC card	<ul style="list-style-type: none"> • One Type-II
SD card	<ul style="list-style-type: none"> • With IO support
Ultrabay device	UltraBay Slim (supported by X4 UltraBase Dock)
Diskette drive (external)	<ul style="list-style-type: none"> • USB diskette drive
Communication daughter card (CDC)	<ul style="list-style-type: none"> • IBM Integrated 56K Modem
AC adapter	<ul style="list-style-type: none"> • 56-watt type
Battery pack (main)	<ul style="list-style-type: none"> • 1 parallel of 4 series of cells (1P4S) Li-Ion battery pack (1.9 AH) (Standard Battery) • 2 parallel of 4 series of cells (2P4S) Li-Ion battery pack (4.2 AH) (Hybrid Battery)
Preinstalled operating system	<ul style="list-style-type: none"> • Windows XP Professional • Windows XP Home edition







Status indicators for X40

The system status indicators show the status of the computer, as follows:



Indicator	Meaning
1 Wireless status 	Green: Wireless is operational and radio on state. This indicator is on when the data is transmitted.

(continued)

Indicator	Meaning
2 Num lock 	Green: The numeric keypad on the keyboard is enabled. To enable or disable the keypad, press and hold the Shift key, and press the NumLk (ScrLk) key.
3 Caps lock 	Green: Caps Lock mode is enabled. To enable or disable Caps Lock mode, press the Caps Lock key.
4 Drive in use 	Green: Data is being read from or written to the hard-disk drive, the diskette drive, or the drive in the Ultrabay device. When this indicator is on, do not put the computer into standby mode or turn off the computer. Note: Do not move the system while the Green drive in use light is on. Sudden physical shock could cause drive errors.
5 Power on 	Green: The computer is on and ready to use. This indicator stays lit whenever the computer is on and is not in standby mode.
6 Battery status 	Green: The battery is in use and has enough power. The ac adapter has charged the battery completely. Blinking green: The battery is being charged, but still has enough power to operate. (At regular intervals, the indicator light turns off briefly.) Orange: The battery is being charged, but the battery power is still low. Blinking orange: The battery needs to be charged. When the indicator starts blinking orange, the computer beeps three times.
7 Standby status 	Green: The computer is in standby mode. Blinking green: The computer is entering standby mode or hibernation mode, or is resuming normal operation.

FRU tests

The following table shows the test for each FRU.

FRU	Applicable test
System board	<ol style="list-style-type: none"> 1. Diagnostics --> CPU/Coprocessor 2. Diagnostics --> Systemboard
Power	Diagnostics --> Other Devices --> IBM AC Adapter, IBM Battery 1 (IBM Battery 2)
LCD unit	<ol style="list-style-type: none"> 1. Diagnostics --> Video Adapter 2. Interactive Tests --> Video
Modem or MDC	<ol style="list-style-type: none"> 1. Make sure the modem is set up correctly. 2. Replace the modem jack and the modem card in turn, and run the following test in Diagnostics --> Communication: <ol style="list-style-type: none"> a. Conexant Smart Modem Interrupt b. Conexant Smart Modem Dialtone
Audio	<ol style="list-style-type: none"> 1. Interactive Tests --> Internal Speaker 2. Diagnostics --> Other Devices --> Analog Devices AC97 CODEC Test
Speaker	Interactive Tests --> Internal Speaker
PC Card slots	<ol style="list-style-type: none"> 1. Diagnostics --> Systemboard --> PCMCIA 2. Insert a PC Card Wrap Plug into every PC Card Slot, and run Diagnostics --> Systemboard --> PCMCIA External Loop
Keyboard	<ol style="list-style-type: none"> 1. Diagnostics --> Systemboard --> Keyboard 2. Interactive Tests --> Keyboard
TrackPoint or pointing device	<p>If the TrackPoint does not work, check the configuration in the ThinkPad Configuration program. If the TrackPoint is disabled, select Enable to enable it.</p> <p>After you use the TrackPoint, the pointer may drift on the screen for a short time. This drift can occur when a slight, steady pressure is applied to the TrackPointing Stick. This symptom is not a hardware problem. If the pointer stops after a short time, no service action is necessary.</p> <p>If enabling the TrackPoint does not correct the problem, continue with the following:</p> <ul style="list-style-type: none"> • Interactive Tests --> Mouse
Hard-disk drive	Diagnostics --> Fixed Disks
Diskette drive	<ol style="list-style-type: none"> 1. Diagnostics --> Diskette Drives 2. Interactive Tests --> Diskette
CD-ROM or DVD drive	<ol style="list-style-type: none"> 1. Diagnostics --> Other Devices --> CD-ROM/DVD 2. Interactive Tests --> CD-ROM/DVD Test

(continued)

FRU	Applicable test
Memory	<ol style="list-style-type: none"> 1. If two DIMMs are installed, remove one of them and run Diagnostics --> Memory Test - Quick. 2. If the problem does not recur, return the DIMM to its place, remove the other one, and run the test again. 3. If the test does not detect the error, run Diagnostics --> Memory Test - Full.
Fan	<ol style="list-style-type: none"> 1. Turn on the computer and check the air turbulence at the louver near the power switch. 2. Run Diagnostics --> Other Devices --> IBM Fan.

Fn key combinations

The following table shows the function of each combination of Fn with a function key.

Key combination	Description
Fn+F1	Reserved.
Fn+F2	Reserved.
Fn+F3	<p>Standby mode</p> <p>Turn off the LCD display, leaving the screen blank. Hard disk drive spindown while CPU still works. To turn the LCD display on again, press any key or the TrackPoint stick.</p>
Fn+F4	<p>Sleep mode</p> <p>This function causes the system to enter a low power sleep state. The unit may remain in the Sleep state for an extended time. For ACPI systems the OS will determine which state the system will enter by user setting on the control panel.</p>
Fn+F5	<p>Wireless radio on/off switching</p> <p>Enable or disable the built-in wireless networking features (the IEEE 802.11 standard). If this combination of keys are pressed, a list of wireless features is displayed in the Wireless Radio Control window. The user can quickly change the power state of each feature in the list.</p>

(continued)

Key combination	Description
Fn+F6	Reserved.
Fn+F7	<p>Switch a display output location</p> <ul style="list-style-type: none"> • External monitor (CRT display) • Computer display and external monitor (LCD + CRT display) • Computer display (LCD) <p>Note: For any operating system other than Windows 2000 or Windows XP, no additional procedure is needed; just press Fn+F7.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. This function does not work when different desktop images are displayed on the computer display and the external monitor (the Extend desktop function). 2. This function does not work while a DVD movie or a video clip is playing. 3. For Windows 2000 or Windows XP, a hotkey application might take over the switching function.
Fn+F8	<p>Display expansion</p> <p>Horizontal/Vertical screen expansion (hardware stretch) function is enabled, so that VGA mode screen will be expanded to whole size of SVGA LCD or XGA LCD.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. In ACPI OS (Windows XP, Windows 2000, and later), this function is not supported. 2. When hardware overlay screen or 3D full screen application is active, this hotkey-function will be disabled.

(continued)

Key combination	Description
Fn+F9	<p>Issue device ejection Opens the IBM ThinkPad EasyEject Utility screen. Buttons for the following choices are displayed:</p> <ul style="list-style-type: none"> • Run EasyEject Actions: User can select, stop, and remove external devices connected to the ThinkPad computer. • Configure EasyEject Actions: User can open the IBM ThinkPad EasyEject Utility main window. • Fn+F9 Settings: User can configure the settings for the Fn+F9 function. <p>Note: This function is supported only in Windows XP and Windows 2000.</p>
Fn+F10	Reserved.
Fn+F11	Reserved.
Fn+F12	<p>Hibernation Turn hibernation mode on. To return to normal operation, press the power button for less than four seconds.</p> <p>Note: To use Fn+F12 for hibernation in Windows XP and Windows 2000, the IBM PM device driver must have been installed on the computer.</p>
Fn+PgUp	<p>ThinkPad light Note: This function is supported only on the ThinkPad computer that have the ThinkLight. The on or off status of the ThinkLight is shown on the screen for a few seconds when the user press Fn+PgUp.</p>
Fn+Home	<p>LCD brightness up The LCD becomes brighter.</p>
Fn+End	<p>LCD brightness down The LCD becomes less bright.</p>
Fn+Spacebar	<p>FullScreen magnifier Enable the FullScreen Magnifier function.</p>

Symptom-to-FRU index

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

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

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

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

If no numeric code is displayed, check the narrative descriptions of symptoms. If the symptom is not described there, go to “Intermittent problems” on page 65.

Note

For an IBM device not supported by diagnostic codes in the ThinkPad notebook computers, see the manual for that device.

Numeric error codes

Symptom or error	FRU or action, in sequence
0175 Bad CRC1, stop POST task—EEPROM CRC1 is not correct (block #6)	System board Replace planar.(System halt)
0176 System Security—The system has been tampered with.	1. Run IBM BIOS Setup Utility, and then save current setting by pressing F10. 2. System board.
0177 Bad SVP data, stop POST task—Checksum of the supervisor password in the EEPROM is not correct.	System board
0182 Bad CRC2. Enter BIOS Setup and load Setup defaults.—Checksum of the CRS2 setting in the EEPROM is not correct.	1. Run IBM BIOS Setup Utility. Press F9, and Enter to load the default setting. Then save current setting by pressing F10. 2. System board.

Symptom or error	FRU or action, in sequence
0185 Bad startup sequence settings. Enter BIOS Setup and load Setup defaults.	1. Run IBM BIOS Setup Utility. Press F9, and Enter to load the default setting. Then save current setting by pressing F10.
0187 EAIA data access error—EEPROM access (read or write) is failed.	System board.
0188 Invalid RFID Serialization Information Area or Bad CRC2—EEPROM checksum is not correct (block #0,1). EEPROM CRC2 is not correct (block #6).	System board. Replace planar. Box serial number needs to be reinstalled.
0189 Invalid RFID configuration information area—EEPROM checksum is not correct (block #4,5).	System board. Replace planar. UUID needs to be reinstalled.
0190 Critical low-battery error	1. Charge the battery pack. 2. Battery pack.
0191 System Security—Invalid Remote Change requested.	1. Run IBM BIOS Setup Utility, and then save current setting by pressing F10. 2. System board.
0192 System Security—IBM Embedded Security hardware tamper detected.	System board.
0199 System Security—IBM Security password retry count exceeded.	1. Run IBM BIOS Setup Utility, and then save current setting by pressing F10. 2. System board.
01C8 More than one modem devices are found. Remove one of them. Press <Esc> to continue.	1. Remove either a Mini-PCI Card. Otherwise, press Esc to ignore the warning message. 2. System board.
01C9 More than one Ethernet devices are found. Remove one of them. Press <Esc> to continue.	1. Remove the Ethernet device that you installed; or press Esc to ignore the warning message. 2. System board.
0200 Failure Fixed Disk—Fixed disk is not working or not configured properly.	1. Reseat the hard-disk drive. 2. Load Setup Defaults in IBM BIOS Setup Utility. 3. Hard-disk drive. 4. System board.

Symptom or error	FRU or action, in sequence
0220 Monitor type does not match CMOS —Monitor type not correctly identified in Setup	Load Setup Defaults in IBM BIOS Setup Utility.
0230 Shadow Ram Failed at offset: nnnn—Shadow RAM failed at offset nnnn of the 64k block at which the error was detected.	System board.
0231 System RAM Failed at offset: nnnn—System RAM failed at offset nnnn of in the 64k block at which the error was detected	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
0232 Extended RAM Failed at offset: nnnn —Extended memory not working or not configured properly at offset nnnn..	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
0250 System battery is dead —The CMOS clock battery indicator shows the battery is dead	Replace the backup battery and run IBM BIOS Setup Utility to reset the time and date.
0251 System CMOS checksum bad —Default configuration used.	Replace the backup battery and run IBM BIOS Setup Utility to reset the time and date.
0252 Password checksum bad—The password is cleared.	Reset the password by running IBM BIOS Setup Utility.
0260 System timer error—The timer test failed	<ol style="list-style-type: none"> 1. Replace the backup battery and run IBM BIOS Setup Utility to reset the time and date. 2. System board.

Symptom or error	FRU or action, in sequence
0270 Real time clock error—Real-Time Clock fails BIOS hardware test	<ol style="list-style-type: none"> 1. Replace the backup battery and run IBM BIOS Setup Utility to reset the time and date. 2. System board.
0271 Date and time error—BIOS found date or time out of range and reset the Real-Time Clock.	Run IBM BIOS Setup Utility to reset the time and date.
0280 Previous boot incomplete—Default configuration used.	<ol style="list-style-type: none"> 1. Load “Setup Default” in IBM BIOS Setup Utility. 2. DIMM. 3. System board.
02B2 Incorrect drive A type—Type of floppy drive A: not correctly identified in Setup.	<ol style="list-style-type: none"> 1. Diskette drive. 2. External FDD cable. 3. I/O card. 4. Run setup
02F4 EISA CMOS not writable—ServerBIOS2 test error: Cannot write to EISA CMOS.	<ol style="list-style-type: none"> 1. Load Setup Defaults in IBM BIOS Setup Utility. 2. Replace the backup battery. 3. System board.
02F5 DMA test failed—ServerBIOS2 test error: Cannot write to extended DMA (Direct Memory Access) registers.	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
02F6 Software NMI failed—ServerBIOS2 test error: Cannot generate software NMI (Non-Maskable Interrupt).	<ol style="list-style-type: none"> 1. DIMM. 2. System board.

Symptom or error	FRU or action, in sequence
02F7 Fail-safe timer NMI failed—ServerBIOS2 test error: Fail-Safe Timer takes too long	<ol style="list-style-type: none"> DIMM. System board.
1801 Unsupported docking station is attached—Attached docking station is not supported by the product	Shut down the computer and remove it from the docking station.
1802 Unauthorized network card is plugged in—Power off and remove the miniPCI network card.	<ol style="list-style-type: none"> Remove Mini PCI network card. System board.
1803 Unauthorized daughter card is plugged in—Power off and remove the daughter card.	<ol style="list-style-type: none"> Remove the daughter card that you installed. System board.
1810 Hard disk partition layout error	<ol style="list-style-type: none"> If the Access IBM Predesktop Area has been previously disabled, then go the the IBM BIOS Setup Utility by pressing F1 to open the IBM BIOS Setup Utility. Select Security->IBM Predesktop Area-> Access IBM Predesktop Area. Set this item to Disabled. Save and exit. If the Access IBM Predesktop Area has not been previously disabled, press Enter to load Access IBM Predesktop Area. Then run RECOVER TO FACTORY CONTENTS in Access IBM Predesktop Area. If item 2 failed, press F3 in welcome screen in RECOVER TO FACTORY CONTENTS. Run FDISK, and then delete all partitions. Run RECOVER TO FACTORY CONTENTS in Access IBM Predesktop Area again. If item 3 failed, select CD-ROM boot in Startup in Access IBM Predesktop Area. Boot from Recovery CD and perform full recovery from it. If item 4 failed, replace the hard-disk drive.

Error messages

Symptom or error	FRU or action, in sequence
Device address conflict.	<ol style="list-style-type: none"> 1. Load “Setup Defaults” in IBM BIOS Setup Utility. 2. Backup battery. 3. System board.
Allocation error for device.	<ol style="list-style-type: none"> 1. Load “Setup Defaults” in IBM BIOS Setup Utility. 2. Backup battery. 3. System board.
Failing bits: nnnn.	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
Invalid system configuration data.	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
I/O device IRQ conflict.	<ol style="list-style-type: none"> 1. Load “Setup Defaults” in IBM BIOS Setup Utility. 2. Backup battery. 3. System board.
Operating system not found.	<ol style="list-style-type: none"> 1. Check that the operating system has no failure and is installed correctly. 2. Enter IBM BIOS Setup Utility and see whether the hard-disk drive and the diskette drive are properly identified. 3. Reseat the hard-disk drive. 4. Reinstall the operating system. 5. Diskette drive. 6. Hard-disk drive. 7. System board.
Hibernation error.	<ol style="list-style-type: none"> 1. Restore the system configuration to what it was before the computer entered hibernation mode. 2. If memory size has been changed, re-create the hibernation file.
Fan error.	Fan.
Thermal sensing error.	System board.
Authentication of system services failed. Press <Esc> to resume.	The IBM Predesktop Area in the HDD is corrupted. Restore it from a recovery CD.
CD ROM drive	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
Entering SETUP	<ol style="list-style-type: none"> 1. DIMM. 2. System board.
Fixed disk n	<ol style="list-style-type: none"> 1. DIMM. 2. System board.

Symptom or error	FRU or action, in sequence
P/S 2 mouse boot summary screen	1. DIMM. 2. System board.
One or more I2O block storage devices were excluded from the setup boot menu	1. DIMM. 2. System board.
Parity Check 1 nnnn	1. DIMM. 2. System board.
Parity Check 2 nnnn	1. DIMM. 2. System board.
Press F1 to resume, F2 to Setup, F3 for previous	1. DIMM. 2. System board.
Press F2 to enter Setup	1. DIMM. 2. System board.
PS/2 Mouse	1. DIMM. 2. System board.
Run the I2O Configuration Utility	1. DIMM. 2. System board.
System BIOS shadowed	1. DIMM. 2. System board.
UMB upper limit segment address: nnnn	1. DIMM. 2. System board.
Video BIOS shadowed	1. DIMM. 2. System board.
Do you want abort resume from hibernation? (Y/N)System memory removed, press F3 to power off system and restore memory chip, press F4 to normal boot	1. DIMM. 2. System board.
Docking station is removed or its ID is different,press F3 to power off system and restore correctdocking station, press F4 to normal boot	No error appears when; undock -> hibernation -> dock -> wakeup. The docking is configured by OS.
WRONG MEMORY: Serial Presence Detected (SPD) indicates 66MHz Memory. This processor requires 100MHz memory. Shut system down.	Shut system down.(Stop this point).

Beep symptoms

Symptom or error	FRU or action, in sequence
One beep and a blank, unreadable, or flashing LCD.	<ol style="list-style-type: none"> 1. Reseat the LCD connector. 2. LCD assembly. 3. External CRT. 4. System board.
One long and two short beeps, and a blank or unreadable LCD.	<ol style="list-style-type: none"> 1. System board. 2. LCD assembly. 3. DIMM.
Two short beeps with error codes.	POST error. See “Numeric error codes” on page 56.
Two short beeps and a blank screen.	<ol style="list-style-type: none"> 1. System board. 2. DIMM.
Three short beeps, pause, three more short beeps, and one short beep.	<ol style="list-style-type: none"> 1. DIMM. 2. System board
One short beep, pause, three short beeps, pause, three more short beeps, and one short beep.	
Only cursor appears.	Reinstall operating system.
Four cycles of four short beeps and a blank screen.	System board (IBM security chip)
Five short beeps and a blank screen.	System board

No-beep symptoms

Symptom or error	FRU or action, in sequence
No beep, power-on indicator on, LCD blank, and no POST.	<ol style="list-style-type: none"> 1. Make sure that every connector is connected tightly and correctly. 2. DIMM. 3. System board.
No beep, power-on indicator on, and LCD blank during POST.	<ol style="list-style-type: none"> 1. Reseat DIMM. 2. System board.
The power-on password prompt appears.	A power-on password or a supervisor password is set. Type the password and press Enter .
The hard-disk password prompt appears.	A hard-disk password is set. Type the password and press Enter .
The DOS full screen looks smaller than it should.	Start the ThinkPad Configuration program and set the Screen expansion function.

LCD-related symptoms

Important

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

- **XGA:** 8 or more bright dots, 8 or more dark dots, or a total of 9 or more bright and dark dots.

Note: A bright dot means a pixel is always on (white or color.) A dark dot means a pixel is always off (black color.)

Symptom or error	FRU or action, in sequence
No beep, power-on indicator on, and a blank LCD during POST.	System board.
<ul style="list-style-type: none"> • LCD backlight not working. • LCD too dark. • LCD brightness cannot be adjusted. • LCD contrast cannot be adjusted. 	<ol style="list-style-type: none"> 1. Reseat the LCD connectors. 2. LCD assembly. 3. System board.
<ul style="list-style-type: none"> • LCD screen unreadable. • Characters missing pixels. • Screen abnormal. • Wrong color displayed. 	<ol style="list-style-type: none"> 1. See important note for “LCD-related symptoms.” 2. Reseat all LCD connectors. 3. LCD assembly. 4. System board.
Horizontal or vertical lines displayed on LCD.	LCD assembly.

Intermittent problems

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

When analyzing an intermittent problem, do the following:

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

Undetermined problems

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

Verify that all attached devices are supported by the computer.

Verify that the power supply being used at the time of the failure is operating correctly. (See “Power system checkout” on page 41.)

1. Power off the computer.
2. Visually check each FRU for damage. Replace any damaged FRU.
3. Remove or disconnect all of the following devices:
 - a. Non-IBM devices
 - b. Devices attached to the port replicator
 - c. Printer, mouse, and other external devices
 - d. Battery pack
 - e. Hard-disk drive
 - f. External diskette drive
 - g. DIMM
 - h. CD-ROM and diskette drive in the Ultrabay
 - i. PC Cards
4. Power on the computer.
5. Determine whether the problem has changed.
6. If the problem does not recur, reconnect the removed devices one at a time until you find the failing FRU.
7. If the problem remains, replace the following FRUs one at a time (do not replace a nondefective FRU):
 - a. System board
 - b. LCD assembly

FRU replacement notices

This section contains notices related to removing and replacing parts. Read this section carefully before replacing any FRU.

Screw notices

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

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

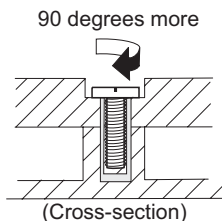
Do the following when you service this machine:

- Keep the screw kit (for the P/N, see “Miscellaneous parts” on page 116) in your tool bag.
- Always use new screws.
- Use a torque screwdriver if you have one.

Tighten screws as follows:

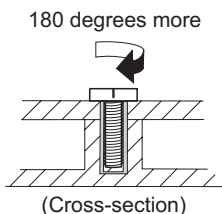
- **Plastic to plastic**

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:



- **Torque driver**

If you have a torque driver, refer to the “Torque” column for each step.

- Make sure you use the correct screw. If you have a torque screwdriver, tighten all screws firmly to the torque shown in the table. **Never use a screw that you removed. Use a new one. Make sure the screws are tightened firmly.**

Retaining serial numbers

This section includes the following descriptions:

- “Restoring the serial number of the system unit”
- “Retaining the UUID” on page 68

Restoring the serial number of the system unit

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

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

Before replacing the system board, save the original serial number by doing the following:

1. Install the ThinkPad Hardware Maintenance Diskette Version 1.69, and restart the computer.
2. From the main menu, select **1. Set System Identification.**
3. Select **2. Read S/N data from EEPROM.**

The serial number for each device is displayed. Write down the serial number of the system unit, designated as follows:

20: System unit serial number

Write down that number.

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

After you have replaced the system board, restore the serial number by doing the following:

1. Install the ThinkPad Hardware Maintenance Diskette Version 1.69 and restart the computer.
2. From the main menu, select **1. Set System Identification.**
3. Select **1. Add S/N data from EEPROM.**

Follow the instructions on the screen.

Retaining the UUID

The Universally Unique Identifier (UUID) is a 128-bit number uniquely assigned to your computer at production and stored in the EEPROM of your system board. The algorithm that generates the number is designed to provide unique IDs until the year A.D. 3400. No two computers in the world have the same number.

When you replace the system board, you must set the UUID on the new system board as follows:

1. Install the ThinkPad Hardware Maintenance Diskette Version 1.69, and restart the computer.
2. From the main menu, select **4. Assign UUID**.

A new UUID is created and written. If a valid UUID already exists, it is not overwritten.

Removing and replacing a FRU

This section presents directions and drawings for use in removing and replacing a FRU. Be sure to observe the following general rules:

1. Do not try to service any computer unless you have been trained and certified. An untrained person runs the risk of damaging parts.
2. Before replacing any FRU, review “FRU replacement notices” on page 66.
3. Begin by removing any FRUs that have to be removed before the failing FRU. Any such FRUs are listed at the top of the page. Remove them in the order in which they are listed.
4. Follow the correct sequence in the steps for removing the FRU, as indicated in the drawings by the numbers in square callouts.
5. When turning a screw to replace a FRU, turn it in the direction indicated by the arrow in the drawing.
6. When removing the FRU, move it in the direction indicated by the arrow in the drawing.
7. To put the new FRU in place, reverse the removal procedure and follow any notes that pertain to replacement. For information about connecting and arranging internal cables, see “Locations” on page 100.
8. When replacing a FRU, use the correct screw as shown in the procedures.

DANGER

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

Attention: After replacing a FRU, do not turn on the computer until you have made sure that all screws, springs, and other small parts are in place and are not loose inside the computer. Verify this by shaking the computer gently and listening for rattling sounds. Metallic parts or metal flakes can cause electrical short circuits.

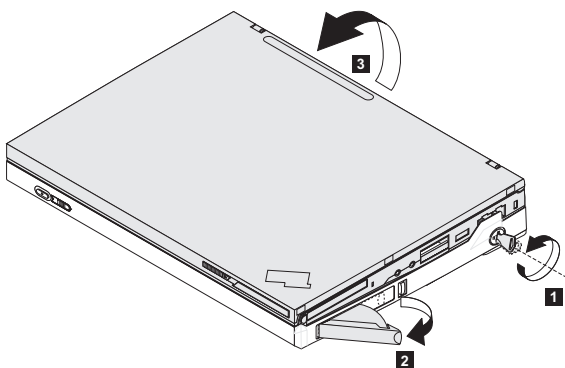
Attention: The system board is sensitive to, and can be damaged by, electrostatic discharge. Before touching it, establish personal grounding by touching a ground point with one hand or by using an electrostatic discharge (ESD) strap (P/N 6405959).

1010 Battery pack

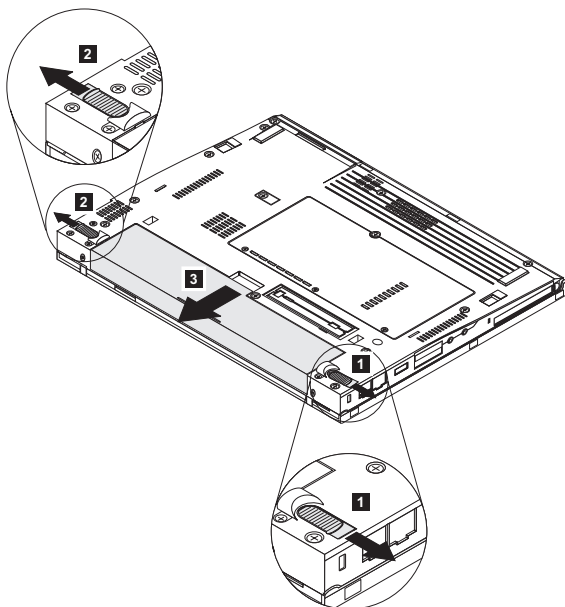


Use only the battery specified in the parts list for your computer. The use of an incorrect battery can result in ignition or explosion of the battery.

Before processing, separate main unit from docking first.



Release the latches to remove the battery pack.



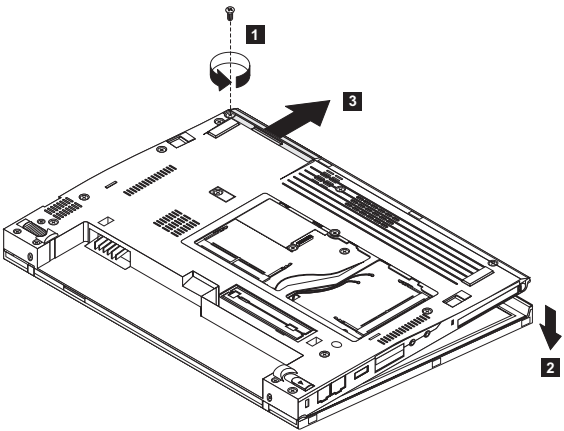
1020 Hard-disk drive

Attention

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

For access, remove following FRU:

- “1010 Battery pack” on page 70



Step	Screw (quantity)	Torque
1	M3 × 4 mm, nylon-coated (1)	0.392 Nm (4 kgfcm)

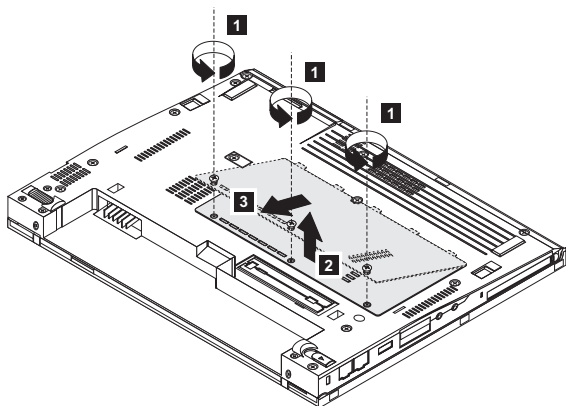
When installing: Make sure that the hard disk is connected firmly.

1030 DIMM cover

For access, remove following FRU:

- “1010 Battery pack” on page 70

Note: Loosen the screws **1**, but do not remove them.



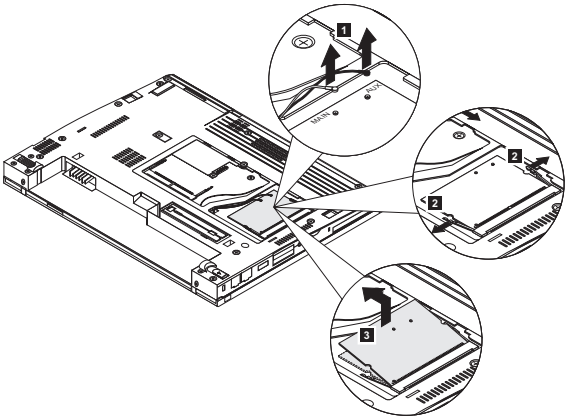
Step	Screw (quantity)	Torque
1	M2 x4 mm (3)	0.157 Nm (1.6 kgfcm)

1040 Antenna, DIMM and Modem Daughter Card II (MDC II)

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1030 DIMM cover” on page 72

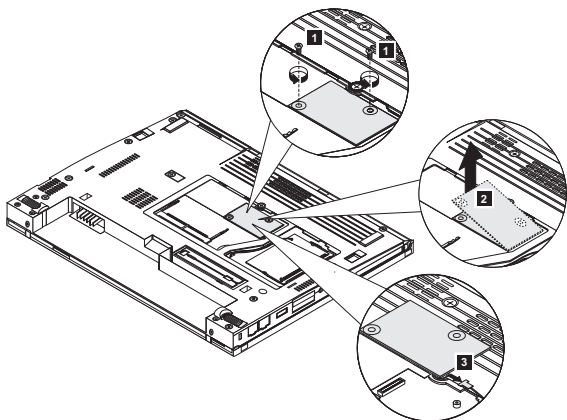
Detach antenna and remove DIMM.



(continue)

Removing and replacing a FRU

Remove MDC II.



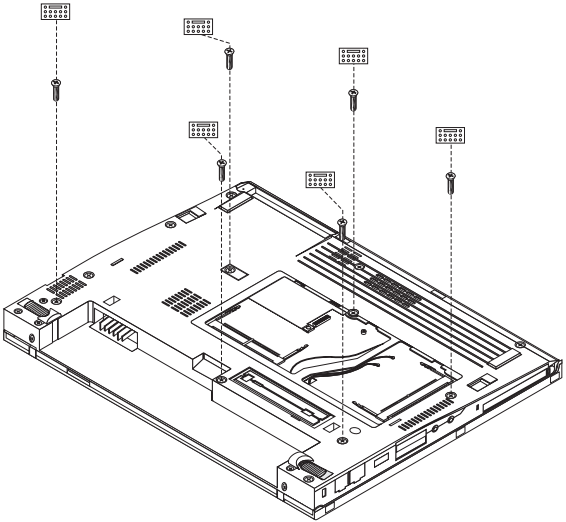
Step	Screw (quantity)	Torque
1	M2 × 3.5 mm, nylon-coated (2)	0.245 Nm (2.5 kgfcm)

1050 Keyboard

For access, remove following FRU:

- “1010 Battery pack” on page 70

Remove 6 screws with keyboard icon to remove keyboard.

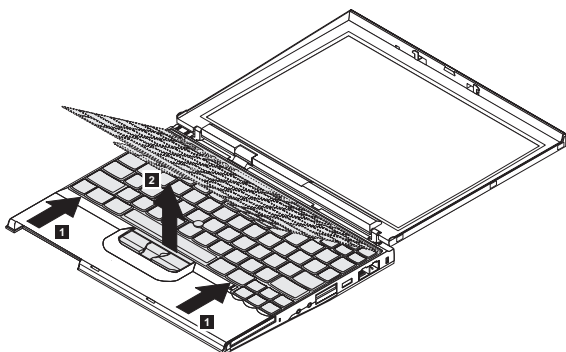


Step	Screw (quantity)	Torque
1	M2 × 6 mm, nylon-coated (6)	0.245 Nm (2.5 kgfcm)

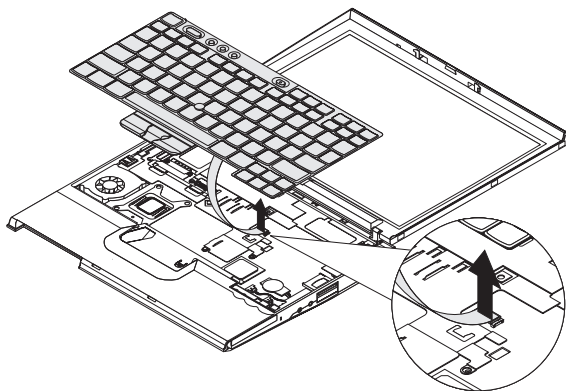
(continued)

Removing and replacing a FRU

Gently push the keyboard forward, as shown in step **1**. Then lift up the keyboard slightly, as shown in step **2**.

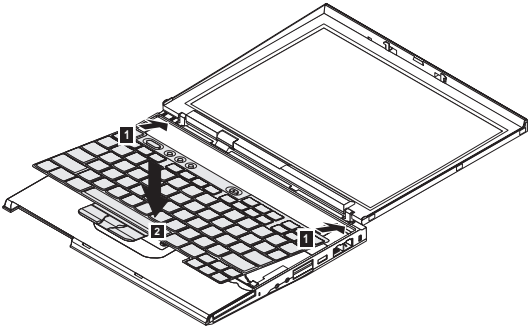


Detach the keyboard connector to remove the keyboard.

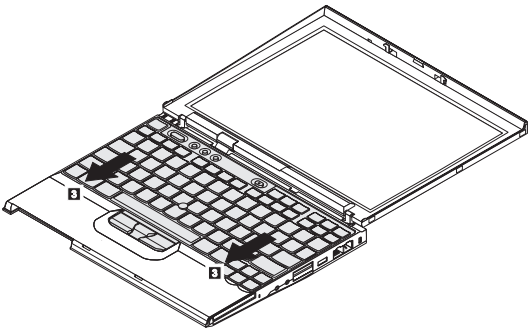


When installing: Please follow the steps below.

1. Attach the connector.
2. Make sure that the keyboard edges, shown in the step **1**, are under the frame. Then press the keys indicated by step **2** to latch the keyboard firmly in place.



3. To make sure that the front side of the keyboard is housed firmly, gently press the keys with your thumbs and try to slide the keyboard toward you.



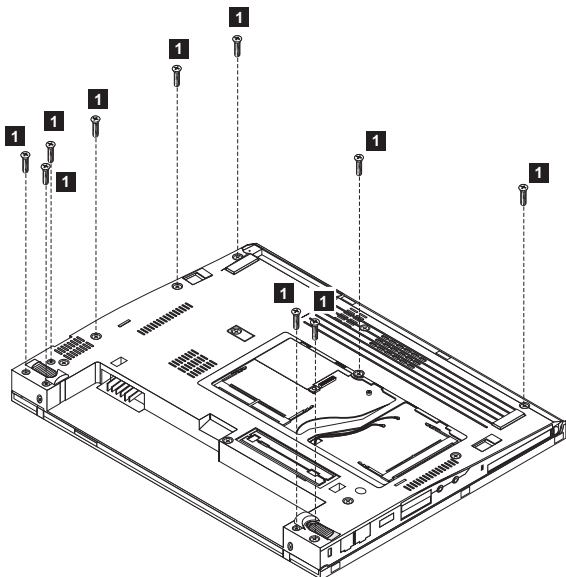
4. Secure the keyboard by tightening the screws from the bottom side of the computer.

1060 Upper case

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1050 Keyboard” on page 75

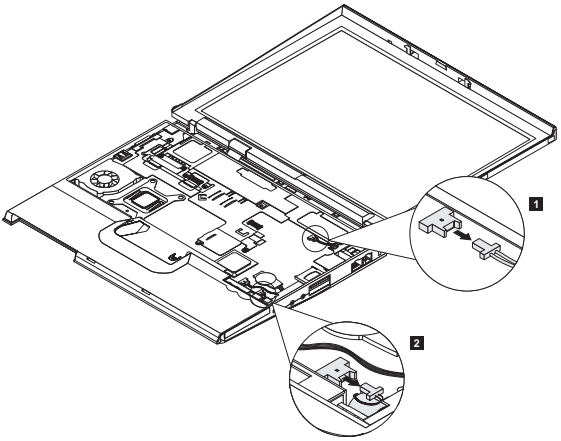
Remove 10 screws as shown below.



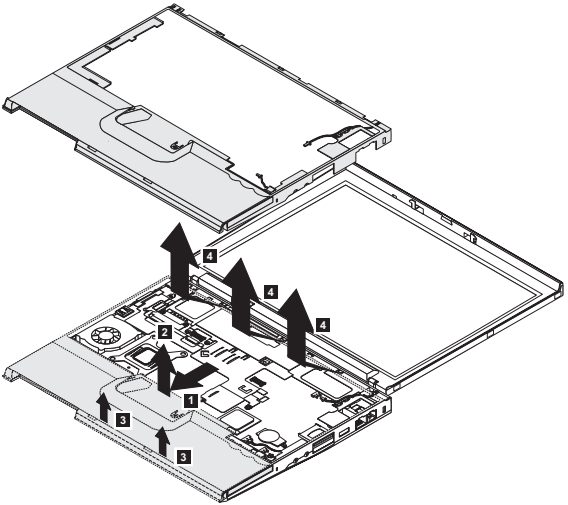
Step	Screw (quantity)	Torque
1	M2 × 6 mm, nylon-coated (10)	0.245 Nm (2.5 kgfcm)

(continued)

Detach cover switch cable(suspend cable), shown as **1** , and microphone cable, shown as **2** .



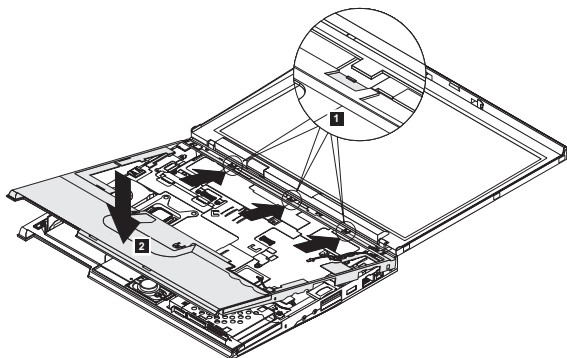
Gently push the upper case backward, as shown in step **1** . And lift it up slightly, as shown in step **2** . Then release the latches, as shown in step **3** and step **4** , carefully to remove the upper case.



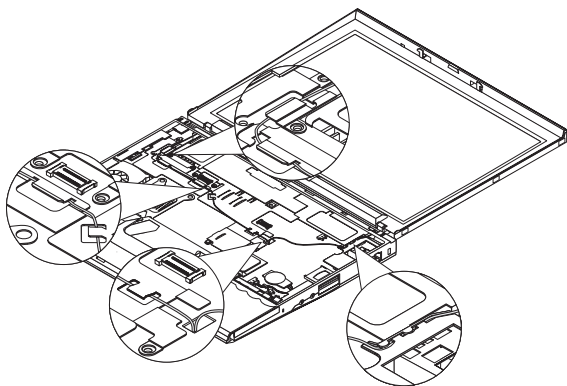
(continued)

Removing and replacing a FRU

When installing: Make sure that the upper case edges, shown in the step **1**, are under the frame.



Note: After installing upper case, please arrange antenna as shown below.



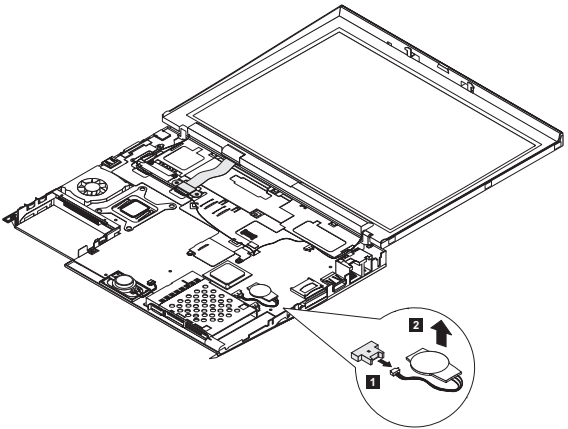
1070 Backup battery

 DANGER

Use only the battery specified in the parts list for your computer. The use of an incorrect battery can result in ignition or explosion of the battery.

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72



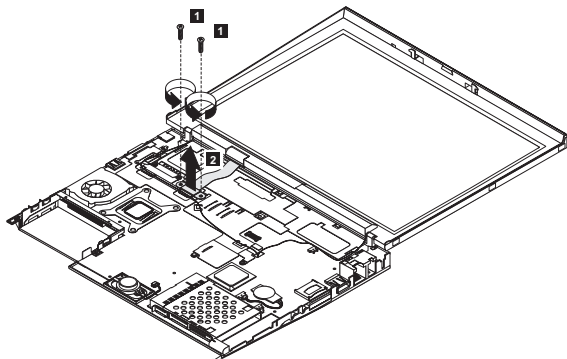
When installing: Make sure that the battery connector is attached firmly.

1080 LCD module

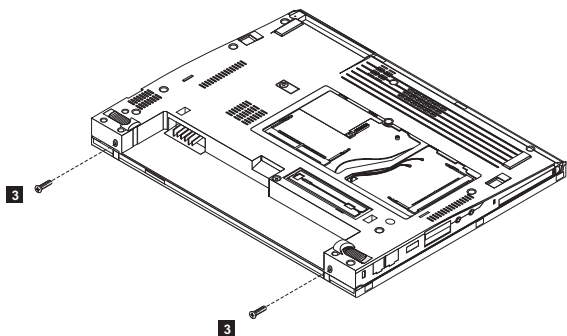
For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78

Before removing LCD module, remove LCD FPC cable first.

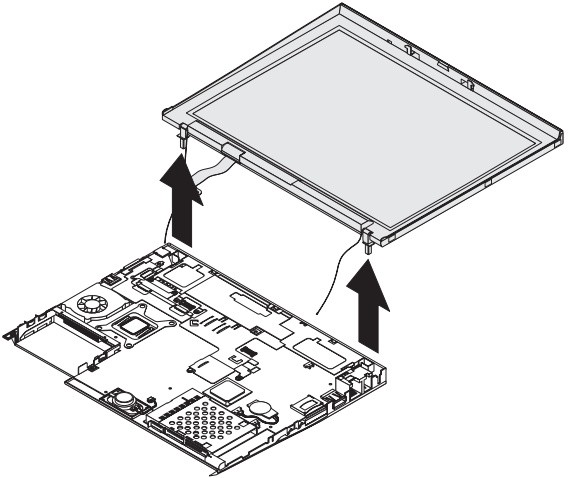


Then remove the two screws at the rear side.



Step	Screw (quantity)	Torque
1	M2 x3.5 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)
3	M2 x6 mm, nylon-coated (2)	0.245 Nm (2.5 kgfcm)

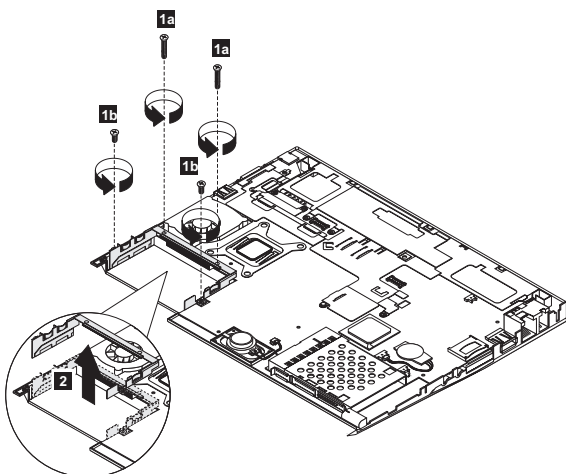
Remove LCD module.



1090 Hard disk housing assembly

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78

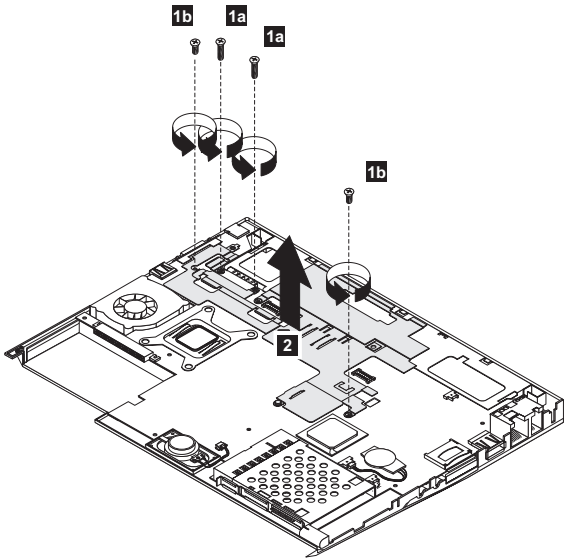


Step	Screw (quantity)	Torque
1a	M2 x8 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)
1b	M2 x3.5 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)

1100 Top shielding

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78



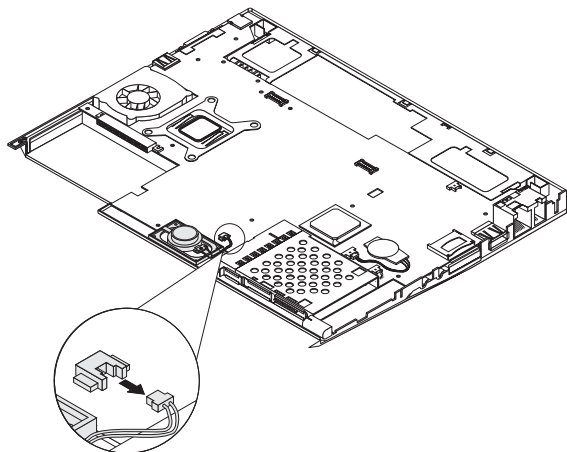
Step	Screw (quantity)	Torque
1a	M2 × 8 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)
1b	M2 ×3.5 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)

1110 Lower case

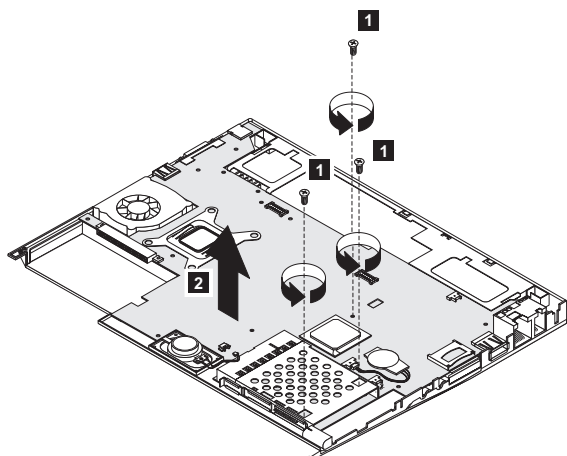
For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1090 Hard disk housing assembly” on page 84
- “1100 Top shielding” on page 85

Before removing lower case, remove speaker cable first.



Remove lower case.

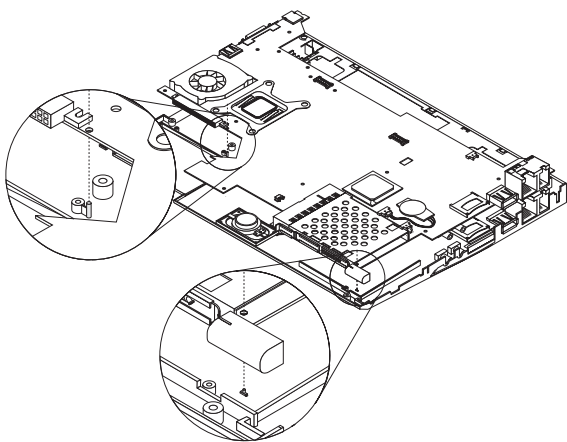


Step	Screw (quantity)	Torque
1	M2 × 3.5 mm, nylon-coated (3)	0.196 Nm (2 kgfcm)

(continued)

Removing and replacing a FRU

When installing: Be careful to align with the 2 location notches.

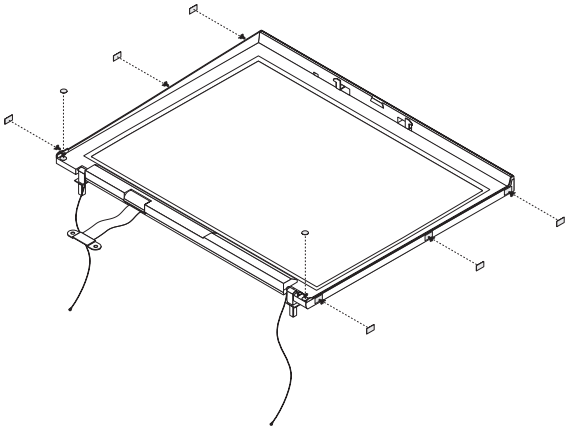


2010 LCD bezel

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1080 LCD module” on page 82

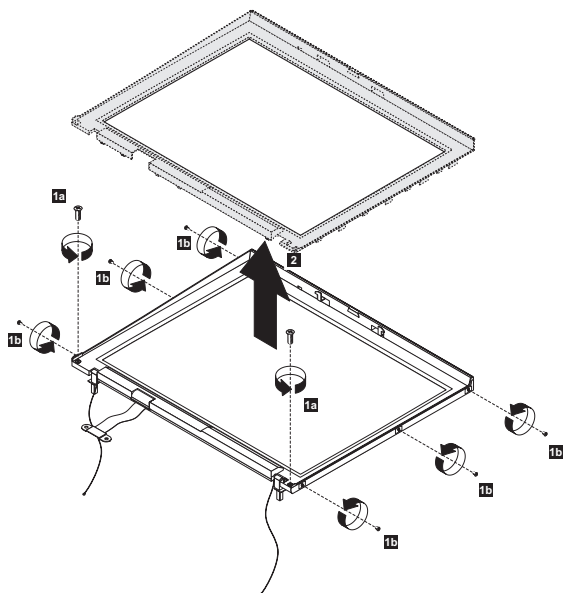
Before removing the LCD bezel, remove the mylars first.



(continued)

Removing and replacing a FRU

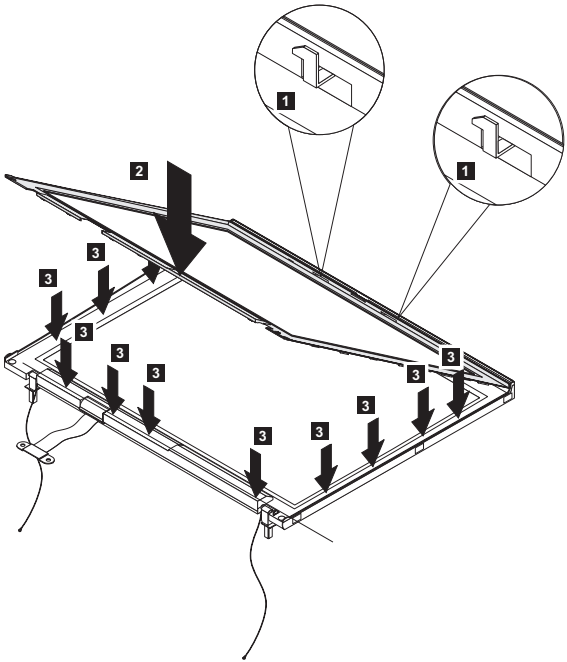
Remove LCD bezel.



Step	Screw (quantity)	Torque
1a	M2.5 × 5 mm, nylon-coated (2)	0.294 Nm (3 kgfcm)
1b	M2 × 2.5 mm, nylon-coated (6)	0.196 Nm (2 kgfcm)

(continued)

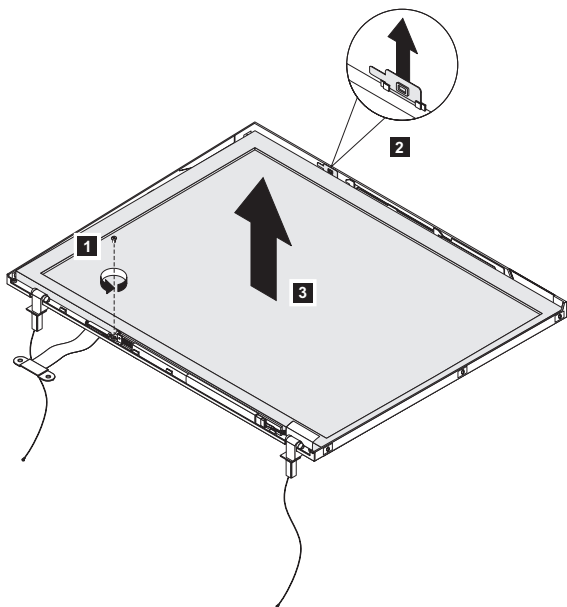
When installing: first place the top edge under the frame, shown as **1**, then push the bezel down and secure with the latches, shown as **3**



2020 LCD

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1080 LCD module” on page 82
- “2010 LCD bezel” on page 89

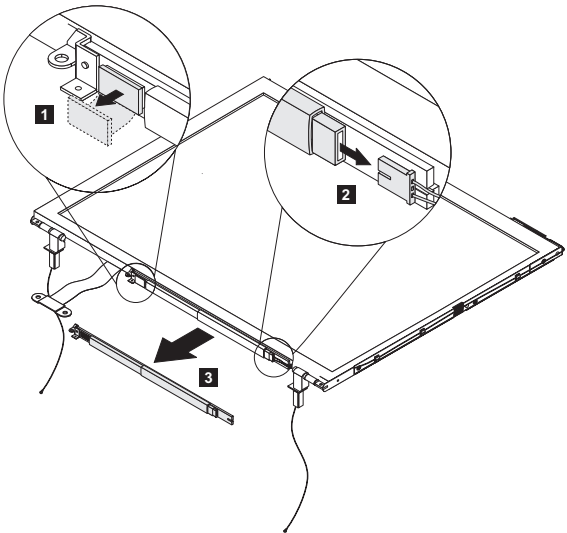


Step	Screw (quantity)	Torque
1	M2 × 2.5 mm, nylon-coated (1)	0.196 Nm (2 kgfcm)

2030 Inverter

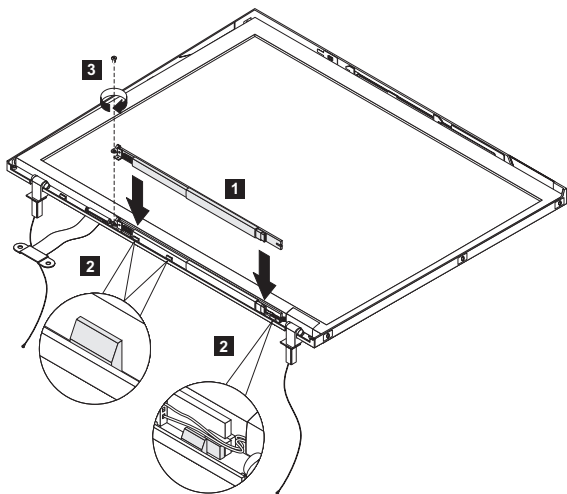
For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1080 LCD module” on page 82
- “2010 LCD bezel” on page 89
- “2020 LCD” on page 92



(continued)

When installing: Attach the inverter back to its original position, as shown in step **1**. And reconnect the LCD cable and inverter cable, as shown in step **2**. Then secure with the one screw, as shown in step **3**.

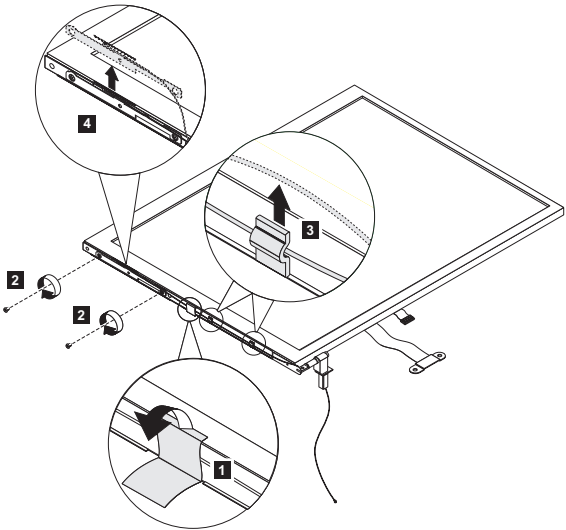


2040 Antenna L and antenna R

For access, remove following FRUs, in order:

- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1080 LCD module” on page 82
- “2010 LCD bezel” on page 89
- “2020 LCD” on page 92
- “2030 Inverter” on page 93

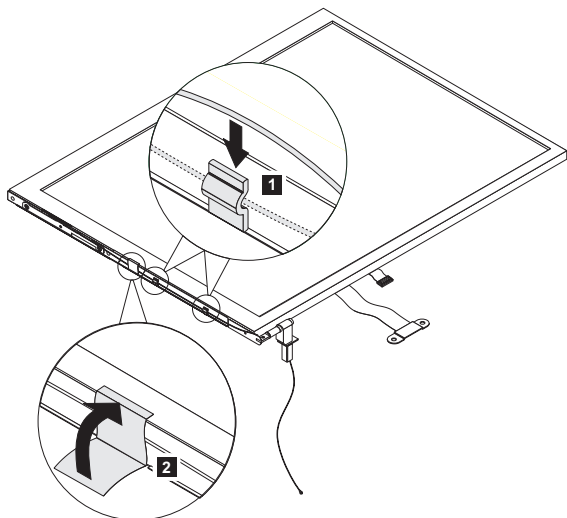
Remove the antenna L.



Step	Screw (quantity)	Torque
2	M2 × 2.5 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)

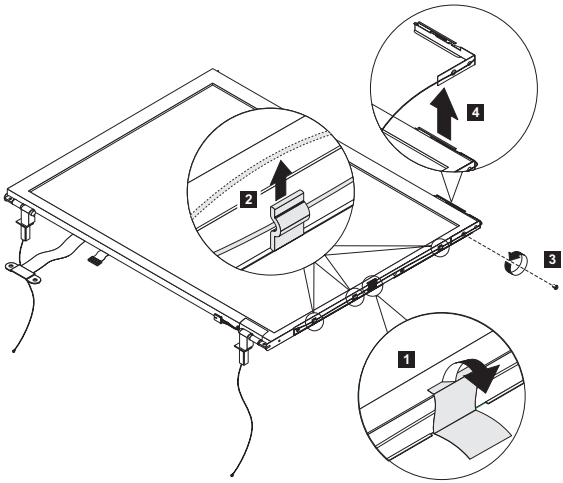
(continued)

When installing: Please put the antenna L in the two clips and put the tape back to its original place, shown as **1** and **2**, before securing it with the two screws.



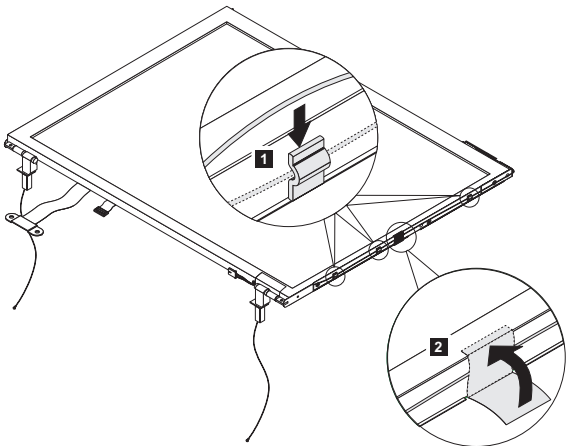
(continued)

Remove the antenna R.



Step	Screw (quantity)	Torque
3	M2 × 2.5 mm, nylon-coated (1)	0.196 Nm (2 kgfcm)

When installing: Please put the antenna R in the three clips and put the tape back to its original place, shown as **1** and **2**, before securing it with the one screw.

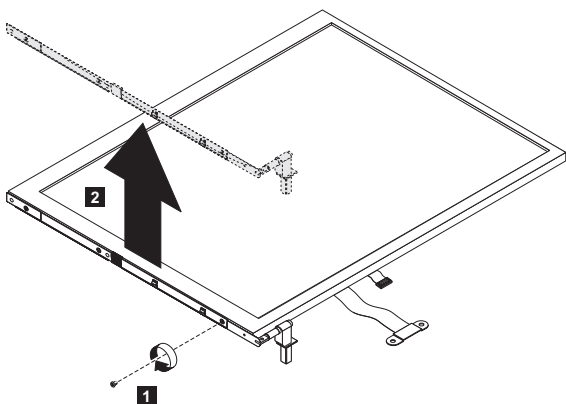


2050 Hinge L and hinge R

For access, remove following FRUs, in order:

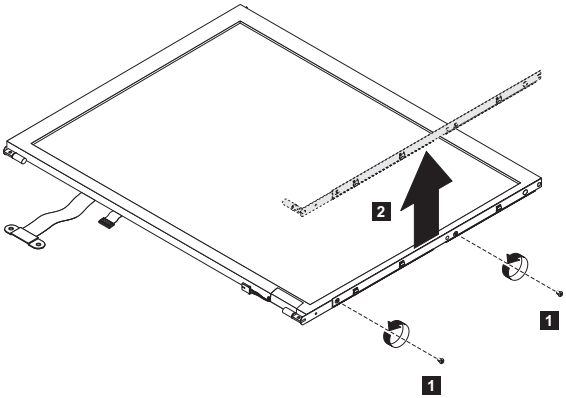
- “1010 Battery pack” on page 70
- “1020 Hard-disk drive” on page 71
- “1030 DIMM cover” on page 72
- “1040 Antenna, DIMM and Modem Daughter Card II (MDC II)” on page 73
- “1070 Backup battery” on page 81
- “1050 Keyboard” on page 75
- “1060 Upper case” on page 78
- “1080 LCD module” on page 82
- “2010 LCD bezel” on page 89
- “2020 LCD” on page 92
- “2030 Inverter” on page 93
- “2040 Antenna L and antenna R” on page 95

Remove hinge L.



Step	Screw (quantity)	Torque
1	M2 × 2.5 mm, nylon-coated (1)	0.196 Nm (2 kgfcm)

Remove hinge R.

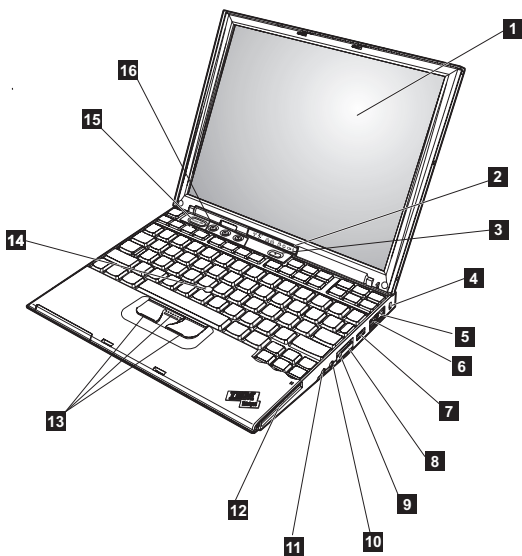


Step	Screw (quantity)	Torque
1	M2 × 2.5 mm, nylon-coated (2)	0.196 Nm (2 kgfcm)

Locations

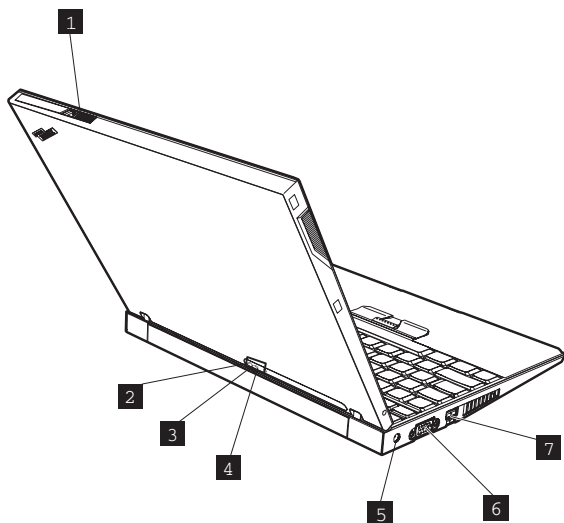
Front view for X40 series

- 1** Computer display
- 2** System status indicators
- 3** Power switch
- 4** Security keyhole
- 5** Modem connector
- 6** Ethernet connector
- 7** USB connector
- 8** Infrared port
- 9** SD card slot
- 10** Stereo headphone jack
- 11** Microphone jack
- 12** PC card slot
- 13** TrackPoint button
- 14** TrackPointing Stick
- 15** Access IBM button
- 16** Volume and mute buttons



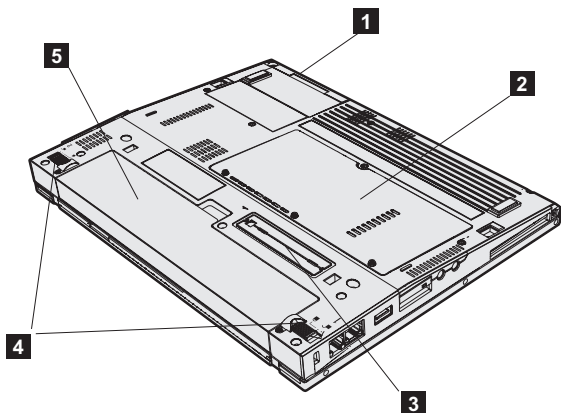
Rear view for X40 series

- 1** LCD latch
- 2** Standby status indicators
- 3** Battery status indicators
- 4** AC Power connector
- 5** External monitor connector
- 6** Powered USB 2.0 connector



Bottom view for X40 series

- 1** Hard disk drive
- 2** Mini-PCI and memory door
- 3** Docking connector
- 4** Battery pack latches
- 5** Battery pack

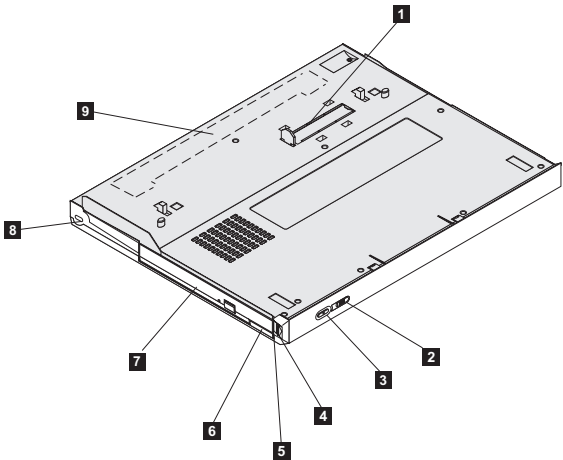


Front View for X4 UltraBase Dock

- 1 Docking connector
- 2 Power lock knob
- 3 Power button
- 4 Ultrabay latch
- 5 Ultrabay status indicator
- 6 Ultrabay eject lever
- 7 Ultra Plus

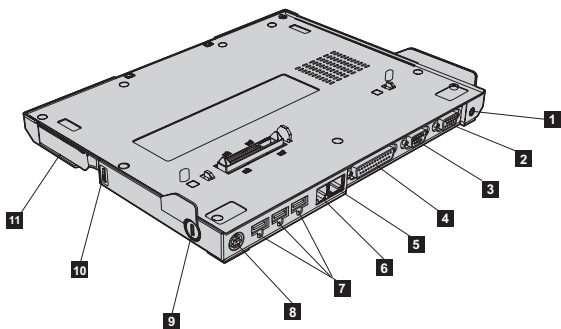
Note: The Ultrabay Slim accepts several storage devices, such as a DVD drive or a CD-RW drive, and also accepts an Ultrabay Slim carrier

- 8 Security keyhole
- 9 Foot



Rear View for X4 UltraBase Dock

- 1** AC-in port
- 2** CRT port
- 3** Serial port
- 4** Parallel port
- 5** RJ45 (ethernet connector)
- 6** RJ11 (modem connector)
- 7** USB connectors
- 8** PS/2 (keyboard or mouse) connector
- 9** Security keyhole
- 10** System eject button
- 11** System eject lever



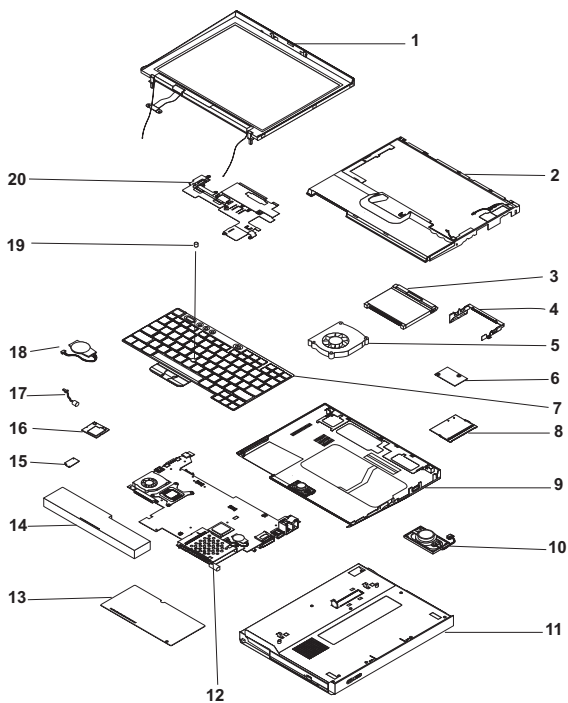
Parts list

X40 series model matrix

The X40 series includes several models. The following tables summarize the characteristics of each model, to help you determine which FRU in the part list meets your need.

Model	CDC	Mini PCI adapter	LCD	Bay device for UltraBase	CPU
X40 (memory, 256 MB; HDD, 20 GB)					
2371-4VM ^{SC} 4VB ^{SC} 4VH ^{SC} 4VJ ^{SC} 4VV ^{SC}	MDC	—	12.1-in. XGA with antenna	—	ULV 1.0 GHz
2371-4WM ^{SC} 4WB ^{SC} 4WH ^{SC} 4WJ ^{SC} 4WV ^{SC}	MDC	802.11b/modem	12.1-in. XGA with antenna		
ULV xxxG: Ultra Low Voltage Mobile Intel® Pentium® III processor - M xxx GHz SC: featuring security chip					

Overall



- Each FRU is available for all types or models, unless specific types or models are specified.
- A CRU (customer-replacable unit) is identified by a single asterisk (*) or two asterisks (**) in the CRU ID column. An N in the CRU ID column means that the part is not a CRU. A single asterisk (*) means that the part is a Tier 1 CRU; two asterisks (**) mean that the part is a Tier 2 CRU.

Tier 1 CRU:

(Example: Mouse, external keyboard, and hard-disk drive with coin screw)

- NO TOOLS ARE REQUIRED.
- A coin or a thumb screw is acceptable.
- Minimal technical expertise is required.
- Minimal problem determination is required—less than 5 minutes.

Tier 2 CRU:

(Example: Adapter card, ThinkPad memory)

- Up to 4 screws or fasteners have to be removed.
 - Some technical experience is required.
 - HelpCenter assistance may be used.
 - Problem determination can be done by the customer, either on site or with HelpCenter assistance.
- FRUs marked with **OP** are available as options.

No.	FRU	P/N	CRU ID
1	LCD unit (see “LCD FRUs” on page 112).		
2	Keyboard bezel (Upper case with cover switch cable, PCMCIA door, and IBM logo) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5313	N
3	Hard-disk drive module (20 GB), HITACHI • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P6083	*
	Hard-disk drive module (40 GB), HITACHI • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P6085	

(continued)

Parts list

No.	FRU	P/N	CRU ID
4	Hard disk drive cover • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5317	*
5	Fan assembly (Fansink assembly with thermal pad) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5808	N
6	CDC Modem card • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7321	**
7	Keyboard* (see "Keyboard" on page 114.)		
8	256—MB DDR SDRAM SO DIMM (PC2700) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	31P9831	*
	512—MB DDR SDRAM SO DIMM (PC2700) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	31P9833	
9	Lower case w/ label M/T2371 • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5315	N

(continued)

No.	FRU	P/N	CRU ID
10	Speaker kit • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P8317	N
11	Slicer assembly • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5331	*
—	Slicer security screw • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5332	*
—	Slicer key • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	TBD	N
12	Planar for ULV 1.0GB / 256MB • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P9379	*
13	Mini-PCI/DIMM door kit (Mini-PCI and DIMM door with screws) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5318	**
14	Battery pack, light battery (4 cell), SANYO • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P0998	*
	Battery pack, light battery (4 cell), PANASONIC • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P1000	*
	Battery pack, large battery (8 cell), SANYO • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P1002	*
	Extended battery, SANYO • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P1007	*

(continued)

Parts list

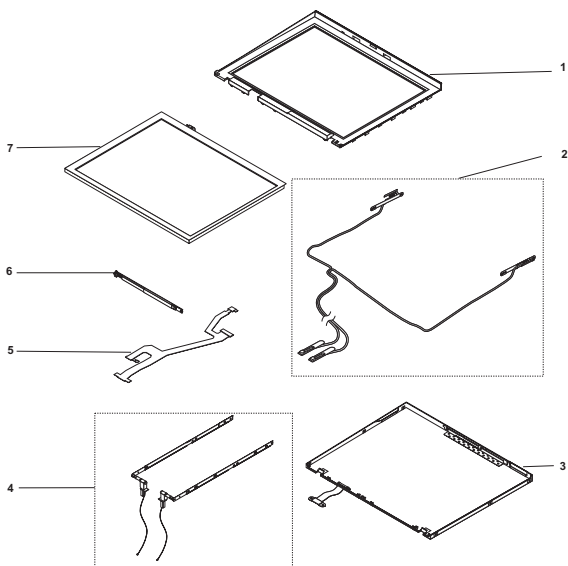
No.	FRU	P/N	CRU ID
15	PC card slot Mesh (PCMCIA slot) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5312	N
16	802.11b wireless card (Calexico) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7267	N
	802.11A\B\G W/W wireless card • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7301	N
	802.11A\B\G Japan wireless card • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7303	N
17	MIC (microphone and rubber) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P8318	N
18	RTC battery • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P1004	**
—	Rubber kit • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5324	N
19	Pointing stick cap set • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P9642	N
—	Cable assembly kit, RJ11 • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P6831	N

(continued)

No.	FRU	P/N	CRU ID
—	AC adapter 2-prong (56 W, 16V), DELTA • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	02K6814	*
	AC adapter 2-prong (56 W, 16V), LITEON • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	02K6815	
	AC adapter 3-prong (56 W, 16V), DELTA • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	02K6813	
	AC adapter 3-prong (56W, 16V), LITEON • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	02K6816	

LCD FRUs

12.1-in. XGA TFT



No.	FRU	P/N	CRU ID
1	LCD bezel assembly 12.1-in.		
	WW (with latch, spring, IBM logo, and antenna cover) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5310	N
2	Antenna cable set • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5328	N
—	LCD icon plate (with front BT x 1, front no BT x 1, rear BT x 1, and rear no BT x 1) • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5330	N
3	LCD rear cover assembly • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5308	N
4	LCD hinge/bracket kit • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	13N5311	N
5	LCD cable assembly • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P6830	N
6	LCD inverter card		
	AMBIT • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7375	N
	SUMIDA • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	91P7377	N
7	LCD 12.1-in. XGA		
	Samsung • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P6685	N
	ID Tech • 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV	92P6687	N

Keyboard

Language	P/N (ASM-NMB)	P/N (ASM-Chicony)	CRU ID
Arabic	93P4608	93P4666	**
Belgian	93P4602	93P4660	
Chinese, Traditional	93P4630	93P4688	
Czech	93P4618	93P4676	
Danish	93P4596	93P4654	
Dutch	91P8329	93P4648	
English, U.K.	91P8325	93P4644	
English, U.S.	91P8319	93P4638	
French, Canadian	91P8321	93P4640	
French, European	91P8327	93P4646	
German	91P8323	93P4642	
Greek	93P4622	93P4680	
Hungarian	93P4620	93P4678	
Hebrew	93P4612	93P4670	
Italian	93P4598	93P4656	
Japanese	93P4628	93P4686	
Korean	93P4632	93P4690	
Norwegian	91P8333	93P4652	
Polish	93P4614	93P4672	
Portuguese	93P4606	93P4664	
Russian	93P4610	93P4668	
Slovakian	93P4626	93P4684	
Slovenian	93P4624	93P4682	
Spanish, European	93P4600	93P4658	
Spanish, Latin American	93P4634	93P4692	
Swedish / Finnish	91P8331	93P4650	
Swiss	93P4604	93P4662	
Thailand	93P4636	93P4694	
Turkish	93P4616	93P4674	

Recovery CDs

For Windows XP Professional

Windows XP professional is preinstalled as the operating system in following models:

- 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV

Language	P/N	CRU ID
Chinese, Traditional	01R9039	*
Chinese, Traditional (Hong Kong S.A.R.)	01R9040	
English, U.S.	01R9037	
Japanese	01R9038	

For Windows XP Home Edition

Windows XP Home edition is preinstalled as the operating system in following models:

- 2371-4VM, 4WM, 4VB, 4WB, 4VH, 4WH, 4VJ, 4WJ, 4VV, 4WV

Language	P/N	CRU ID
Chinese, Traditional	01R	*
Chinese, Traditional (Hong Kong S.A.R.)	01R	
English, U.S.	01R	
Japanese	01R	

Miscellaneous parts

FRU	P/N	CRU ID
Screw pack (300): <ul style="list-style-type: none"> • Screw Wafer M2 x 8 Ni (15000) • Screw MAC Wafer M2 x 2.5 ZN (15000) • Screw MACH Wafer M2 x 6 ZN (15000) • Screw M2.5 x 5 Wafer B-ZN (15000) • Screw Hex Nut W/Washer and Nylok # 4 (15000) • Screw MACH Wafer M2 x 3.5 ZN (15000) • Screw MACH Wafer M3 x 4 ZN (15000) • Screw DIMM Cover Steel Nagano-1 (15000) • Screw MACH Wafer M2.5 x 3 ZN (15000) 	13N5323	N
Miscellaneous kits (300): <ul style="list-style-type: none"> • Knob Battery Lock (300) • Lens IR (300) • Battery Latch Knob (300) • Battery Latch (300) • Battery Lock (300) • SPG Battery Spring SWP_A (300) • Spring CDROM DD (300) 	13N5321	

(continued)

FRU	P/N	CRU ID
System miscellaneous pack (300): <ul style="list-style-type: none">• Assembly I/O Bracket (300)• Assembly Holder Heat Sink (300)	13N5322	N

Common parts list

Tools

Tool	P/N
Triconnector wrap plug	72X8546
PC test card	35G4703
Audio wrap cable	66G5180
USB parallel test cable	05K2580
Screwdriver kit	95F3598
Torque screwdriver	05K4695
5 mm socket wrench	05K4694
Screwdriver	27L8126
1/4" drive spinner handle	1650840
1/4" Sq. to 1/4" hex torx adapter	93F2838
TR7-TR-10 tamper resistant torx bits	00P6967
ThinkPad Hardware Maintenance Diskette Version 1.69 Note: Download the file from the following Web site: http://www.ibm.com/pc/partner/infotips	—

Power cords (system)

IBM power cords for a specific country or region are usually available only in that country or region:

For 2-pin power cords:

Region	P/N	CRU ID
Argentina	36L8870	**
Japan	13H5273	
US and Canada	13H5264	

For 3-pin power cords:

Region	P/N	CRU ID
Australia and New Zealand	76H3514	**
China (P.R.C.)	02K0539	
Denmark	76H3520	
Europe	76H3518	
Israel	76H3532	
Italy	76H3530	
Korea	76H3535	
South Africa and India	76H3522	
Switzerland	76H3528	
U.K.	76H3524	
U.S., Canada, and Thailand	76H3516	

Telephone cable

Region	P/N	CRU ID
Australia	27L0467	**
Austria	27L0449	
BE, BK, BS, BD, BF	27L0451	
DK, DE, PO	27L0447	
FI, NO, NS	27L0446	
France	27L0443	
Germany	27L0441	
Italy	27L0448	
ND, NU	27L0444	
SF, SI, SG, SE	27L0462	
Spain	27L0450	
SW, SU	27L0445	
UK, IR, NZ	27L0442	
US, CAN, TWN, APS, LA, BRZL	27L0465	

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Part Number: 13N6037

(1P) P/N: 13N6037

