Before using this information and the product it supports, be sure to read the general information under "Read This First" on page 19.

Contents

ThinkPad 390X / i Series 1700 Hardware Maintenance Manual

About This Manual

This manual contains service and reference information for the IBM ThinkPad 390X / i Series 1700 products. Use this manual along with the advanced diagnostics tests to troubleshoot problems effectively.

The manual is divided into sections as follows:

- The introduction section provides general information, guidelines, and safety information required to service computers.

- The product-specific section includes service, reference, and product-specific parts information.

Important

This manual is intended for trained servicers 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 (Multi-lingual Translations)" on page 5 and "Safety Information" on page 12.

Introduction

Important Service Information

> **Important**
>
> Diskette fixes are customer installable.
>
> 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 down-load information. The Canadian BBS phone numbers are:
>
> | | |
> |---|---|
> | **Montreal** | 514-938-3022 |
> | **Toronto** | 905-316-4255 |
> | **Vancouver** | 604-664-6464 |
> | **Winnipeg** | 204-934-2735 |

FRU Replacement Strategy

> **Before Replacing Parts**
>
> Ensure that all diskette fixes are installed prior to replacing any FRUs listed in this manual.

Use the following strategy to prevent unnecessary FRU replacement and service expense:

- **If you are instructed to replace a FRU and that 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 the first board that you replaced does not correct the problem, reinstall the original board, then replace the other (processor or system) board.
- If an adapter or device consists of more than one FRU, an error code may be caused by any of the FRUs. 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**
>
> A customized setup configuration (other than default settings) may exist on the computer you are servicing. Running Automatic Configuration may alter those settings. Note the current configuration settings (using the View Configuration option) and verify that the settings are in place when service is complete.

Hard Disk Drive Replacement Strategy:

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 might have been changed. Be extremely careful during write operations such as copying, saving, or formatting. Data or programs can be over-written if you select an incorrect drive.

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. The cause of the first error code can result in false error codes being displayed. 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.

How to Read POST Error Messages

POST error messages are displayed on the screen as three, four, five, or eight digits. The error messages that can be displayed as shorter POST messages are highlighted in this index. Some digits will represent different information for SCSI errors versus non-SCSI errors.

The following example shows which digits display the shorter POST error messages and also defines the SCSI information in an eight-digit error message.

```
              Shorter POST Messages

              |  |  |  |  |
   ┌──┬──┬──┬──┬──┬──┬──┬──┐
   │ 0│ 0│ 0│ 0│ 0│ 0│ 0│ 0│
   └──┴──┴──┴──┴──┴──┴──┴──┘
   |                    |  |  |
Reserved                |  |  |  Size (SCSI)
                        |  |  Slot Number (SCSI)
         Device Code    |  Logical Unit Number (SCSI)
                   ID (SCSI)
```
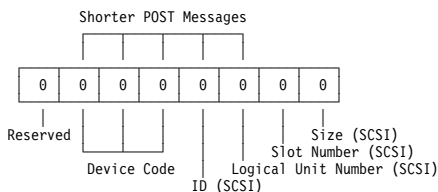
All SCSI devices are set to a different SCSI ID. Duplicate SCSI ID settings can generate a false error message. Use the SCSI ID to determine whether the error message is coming from an internal or an external device.

Drive and Diskette Compatibility Matrix

The following table provides identification information for 3.5-inch drives.

Diskette Drive	Identifying Mark
3.5-Inch - 1.44MB	1.44 on the eject button
3.5-Inch - 2.88MB	2.88 on the eject button

The following table provides compatibility information for 3.5-inch diskettes and 3.5-inch diskette drives.

Diskette Capacity	1.44MB Drive	2.88MB Drive
1.0MB	Read/Write	Read/Write
2.0MB	Read/Write	Read/Write
4.0MB	Not Compatible	Read/Write

The following table provides identification information for 5.25-inch diskette drives.

Diskette Drive	Identifying Mark
5.25-Inch - 360KB (External)	Asterisk on bezel
5.25-Inch - 1.2MB (Internal)	1.2 on the eject button

The following table provides compatibility information for 5.25-inch diskettes and 5.25-inch diskette drives.

Diskette Capacity	360KB Drive	1.2MB Drive
360KB	Read/Write	Read/Write
1.2MB	Not Compatible	Read/Write

Note: A 360KB diskette written to or formatted on a 1.2MB drive can be read reliably only on a 1.2MB drive.

Safety Notices (Multi-lingual Translations)

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

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

Safety Notice 1

Before the computer is powered-on after FRU replacement, make sure all screws, springs, or 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 pi ces 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, muB sichergestellt werden, daB keine Schrauben, Federn oder andere Kleinteile fehlen oder im Gehäuse vergessen wurden. Der Computer muB geschüttelt und auf Klappergeräusche gepr¾ft werden. Metallteile oder -splitter können Kurzschlüsse erzeugen.

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 provocarõan. Las piezas metálicas pueden causar cortocircuitos eléctricos.

Some standby batteries contain a small amount of nickel and cadmium. Do not disassemble it, 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 f¾r Sondermüll beachten. Beim Ersetzen der Bereitschafts- oder Systembatterie nur Batterien des Typs verwenden, der in der Ersatzteilliste aufgeführt ist. Der Einsatz falscher Batterien kann zu Entzündung oder Explosion führen.

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 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 unsachgemäB 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 anschlieBend ein Arzt aufgesucht werden.

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 medica si se presenta algún síntoma del fluido despues de lavarse.

Safety Notice 6

To avoid shock, do not remove the plastic cover that surrounds the lower portion 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.

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

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.

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, then disconnect any interconnecting cables.

Avant de retirer une unitˆ rempla†able 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 muʙ abgeschaltet, alle Stromkabel aus der Steckdose gezogen, der Akku entfernt und alle Verbindungskabel abgenommen sein, bevor eine FRU entfernt wird.

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 contains 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 objects that weigh 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 tool case 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. Ensure 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.

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:
    - 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: There must be a complete circuit to cause electrical shock. 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 intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used 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 bulging capacitor.

- Mechanical hazards, such as loose or missing hardware.

The guide consists of a series of steps presented in a checklist. 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 appropriate type as specified in the parts listings.

    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 Electrostatic Discharge-Sensitive Devices

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 a CD-ROM drive. CD-ROM drives are also sold separately as options. The CD-ROM drive is a laser product. The CD-ROM 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-ROM drive 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 specifice 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-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive. **Do not open.**

Some CD-ROM drives contain an embedded Class 3A or Class 3B laser diode. Note the following.

DANGER:

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. Ker¾lje a sugárnyalábbal való érintkezést !

Aprendo 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.

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 service procedures before replacing any FRUs.
- **Use new nylon-coated screws when you replace FRUs.**
- **Be extremely careful during write operations such as copying, saving, or formatting.** Drives in the computer that you are servicing might have been rearranged or the drive startup 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 FRU part number are correct by refer-ring 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. FRU replacement should be considered only when a recur-ring problem exists. If this is suspected, clear the error log and run the test again. Do not replace any FRUs if log errors do not reappear.

Be careful not to replace a non-defective FRU.

What to Do First

The servicer must include the following in the parts exchange form or parts return form that is attached to the returned FRU:

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

Before checking problems with the computer, determine whether or not the damage applies to the warranty by referring to the following:

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 may indicate that the system was subjected to stresses beyond normal use:

The following is not covered under warranty:

- LCD panel cracked by applying excessive force or from being dropped
- Scratched (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 FDD
- Diskette drive damage caused by the diskette drive cover being pressed or by the insertion of a diskette with multiple labels
- Damaged or bent diskette eject button
- CD-ROM drive damage caused by excessive force, shock, or from being dropped
- Fuses blown by attachment of a nonsupported device
- Forgotten computer password (making the computer unusable)

The following symptoms might indicate damage caused by by nonwarranted activities:

- Missing parts might be a symptom of unauthorized service or modification.
- HDD spindles can become noisy from being subjected to excessive force or from being dropped.

How to Disable the Password

There are three passwords used at a typical customer site: the Setup password, the HDD password, and the Power On password.

- Power On password:
    1. Power off the computer.
    2. Remove the battery pack and AC Adapter.

3. Remove the backup battery (RTC) for 20 minutes or use a screwdriver to touch the backup battery (RTC) for 1 second.

4. Put back the backup battery (RTC).

5. Power on the computer and wait until POST ends.

6. Verify that the password prompt does not appear.

- Supervisor and HDD passwords:

   The Supervisor password and Hard Disk password (Hard Disk1 and Hard Disk2) are security features that are used to protect the system and the hard disk drive data from unauthorized access. No overriding capability is provided, so it cannot be replaced if they are forgotten. If the customer forgets the Supervisor password, the system board must be replaced. If the customer forgets the Hard Disk password, the hard disk drive must be replaced.

Service Web site

When the latest maintenance diskette and system program service diskette are available, they are posted on:

Maintenance diskette:

http://www.pc.ibm.com/partner/infotips

System program service diskette:

http://www.pc.ibm.com/thinkpad

Product Overview

The following shows an overview of the system features of the ThinkPad 390X / i Series 1700 computer.

Feature	Description
Processor	• Intel® Mobile Pentium® III processor 500 MHz, L2 cache • Intel Mobile Pentium III processor 450 MHz, L2 cache • Intel Mobile Pentium II processor 400 MHz, L2 cache • Intel Mobile Celeron™ processor 400 MHz, L2 cache
Bus architecture	PCI Bus
Memory	2 DIMM slots, no memory on the system board 32 MB, 64 MB, 128 MB, or 256 MB DIMM card (max. 512 MB)
Video	• 12.1–inch, 64K colors, 800x600 pixel TFT color LCD • 14.1–inch, 64K colors, 1024x768 pixel TFT color LCD • 15.0–inch, 64K colors, 1024x768 pixel TFT color LCD
Audio	• 16–bit audio • Internal stereo speakers • Internal microphone • Wavetable MIDI
Diskette drive	1.44MB (3–mode), 3.5–inch
Hard disk drive	• 4.8 GB, 2.5–inch, IDE • 6.4 GB, 2.5–inch, IDE • 10.0 GB, 2.5–inch, IDE • 12.0 GB, 2.5–inch, IDE
CD-ROM drive	5.25–inch, 24X speed, E-IDE
DVD-ROM drive (option)	5.25–inch, 4X speed, E-IDE
I/O ports	• External monitor • Headphone/line-out • Line-in • Microphone-in • Mouse/keyboard • Parallel • Serial • USB • RJ45 or RJ11 • TV-out (S-video)
Infrared transfer	IrDA 1.1
Internal modem	56Kbps (depends on the model) PCI

Feature	Description
PC Card (PCMCIA)	One Type III or two Type II CardBus, ZV port support
AC Adapter	56–Watt type

Fn Key Combinations

The following table shows the Fn key and function key combinations and their corresponding functions.

The Fn key works independently of the operating system. The operating system obtains the status through the system management interface to control the system.

Fn +	Result
F2	Fuel-Gauge display on and off
F3	Standby mode
F4	Suspend mode
F7	Switch between the LCD, the external monitor, and both the LCD and external monitor
F8	Expand/shrink screen
F11	Switch power mode
F12	Hibernation mode

Status Indicators

The system status LED indicators show the current computer status. The following shows the location of each indicator symbol and the meaning of each indicator.
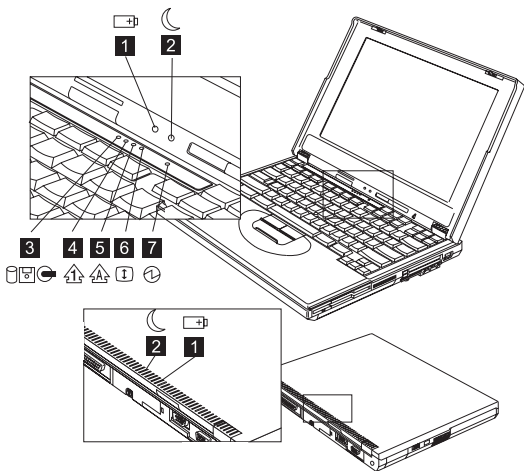
Symbol	Color	Meaning
(1) Battery status ▭➕▯	Green	Enough battery power remains for operation.
	Blinking orange	The battery pack needs to be charged
	Orange	The battery pack is being charged.
(2) Suspend mode ☾	Green	The computer is in suspend mode.
	Blinking green	The computer is entering suspend mode.
(3) Drive in use 🗄🖫⊖	Orange	Data is being read from or written to the hard disk drive, diskette drive, or data is being read from the CD-ROM drive. Do not enter hibernation mode or power off the computer when this indicator is on.
(4) Numeric lock ⬆1	Green	The numeric keypad on the keyboard is enabled. You enable or disable the keypad by pressing and holding the **Shift** key, and pressing the **NumLk** key. For details, see the User's Reference.

Symbol	Color	Meaning
(5) Caps lock ⚠A	Green	Caps Lock mode is enabled. All alphabetic characters *(A-Z)* are entered in capital letters without the **Shift** key being pressed. You enable or disable the Caps Lock mode by pressing the **Caps Lock** key.
(6) Scroll lock ↕	Green	Scroll Lock mode is enabled. The **Arrow** keys can be used as screen-scroll function keys. The cursor cannot be moved with the **Arrow** keys. *Not all application programs support this function.* You enable or disable Scroll Lock mode by pressing the **ScrLk** key.
(7) Power on ⏻	Green	The computer is operational. This indicator is always on when the computer is on and not in suspend mode.

Checkout Guide

Use the following procedure as a guide for computer problems. Besides the checkout tests described in this section, there are other items you can test for using the PC-Doctor DOS diagnostics program. See "PC-Doctor DOS System Diagnostics" on page 48 for details.

Note: The diagnostic tests are intended to test only IBM products. Non-IBM products, prototype cards, or modified options can give false errors and invalid system responses.

1. Obtain the failing symptoms in as much detail as possible.

2. Verify the symptoms by attempting to recreate the failure by running the diagnostic test or by repeating the same operation.

   Note: To run the diagnostics, refer to "Running the Diagnostics" on page 48

3. Use the following table with the verified symptom to determine which page to go to. Search the symptoms column and find the description that best matches your symptom; then go to the page shown in the "Go to" column.

Symptoms (Verified)	Go to
Power failure. (The power-on indicator does not go on or stay on.)	"Power System Checkout" on page 32, then use table in "Power-Related Symptoms" on page 43.
POST does not complete. No beeps or error codes/messages are indicated.	"Symptom-to-FRU Index" on page 38, then use table in "No Beep Symptoms" on page 41.
POST beeps, but no error codes are displayed.	"Symptom-to-FRU Index" on page 38.
POST detected an error and displayed numeric error codes.	"Symptom-to-FRU Index" on page 38, then use table in "Numeric Error Codes" on page 39.
The diagnostic test detected an error and displayed a FRU code.	"Running the Diagnostics" on page 48.
Other symptoms (such as LCD display problems).	"Symptom-to-FRU Index" on page 38.
Symptoms cannot be recreated (intermittent problems).	Use the customer-reported symptoms, and go to "Symptom-to-FRU Index" on page 38.

Audio Checkout

Do as follows:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)

2. Select **Interactive Tests**.

3. Select **Internal Speaker**.

   If no sound is played, replace the speaker or the system board.

4. Select **Stereo Speaker**.

   If no music is played, replace the speaker or the system board.

Diskette Drive Checkout

Do the following to isolate the problem to a controller, drive, or diskette. A scratch, write-enabled, non-defective, high-density (2HD) diskette is required.

CAUTION:
Make sure that the diskette does not have more than one label attached to it. Multiple labels can cause damage to the drive or can cause the drive to fail.

Do the following to select the test device. See "Running the Diagnostics" on page 48 for details.

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)

2. Select **Diagnostics**.

3. Select **Diskette Drives**.

4. Follow the instructions in the message window.

If an error occurs with the internal diskette drive, reseat the connector on the system board.

If the error still remains:

1. Reseat the Combobay.

2. Reseat the Diskette Drive.

3. Replace the Diskette Drive.

4. Replace the Combobay Interposer card.

5. Replace the system board.

CD-ROM Checkout

Do the following to isolate the problem to a controller, drive, or CD-ROM. Make sure that the CD-ROM disc does not have any label attached to it. The label can cause damage to the drive or can cause the drive to fail.

Do the following to select the test device:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)
2. Select **Interactive Tests**.
3. Select **CD-ROM/DVD Test**.
4. Follow the instructions in the message window.

If an error occurs, reseat the connector on the system board.

If the error still remains:

1. Reseat the Combobay.
2. Reseat the CD-ROM.
3. Replace the CD-ROM.
4. Replace the Combobay Interposer card.
5. Replace the system board.

Fan Checkout

To check the Fan, do the following:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)
2. Select **Diagnostics**.
3. Select **Other Devices**.
4. Select **Fan**.
5. Follow the instructions in the message window.

Keyboard and Auxiliary Input Device Checkout

Note: Remove the external keyboard if the internal keyboard is to be tested.

If the internal keyboard does not work or an unexpected character appears, make sure that the flexible cable extending from the keyboard is correctly seated in the connector.

If the keyboard cable connection is correct, run the Keyboard Test.

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)
2. Select **Interactive Tests**.
3. Select **Keyboard**.
4. Follow the instructions in the message window.

If the test detects a keyboard problem, do the following one at a time to correct the problem. Do not replace a non-defective FRU.

1. Replace the keyboard.
2. Replace the system board.

The following auxiliary input devices are supported for this computer:

- Numeric keypad
- Mouse (PS/2 compatible)
- External keyboard (with keyboard/mouse cable)

If any of these devices do not work, reseat the cable connector and repeat the failing operation.

If the problem does not reoccur, replace the device and then the system board.

Memory Checkout

DIMM are available for increasing memory capacity.

Slot 1 (MB)	Slot 2 (MB)	Total Memory (MB)
32	0	32
0	32	32
32	32	64
64	0	64
0	64	64
64	32	96
32	64	96
64	64	128
128	0	128
0	128	128
128	32	160
32	128	160
128	64	192
64	128	192
128	128	256

Memory errors might stop system operation, show error
messages on the screen, or hang the system.

Use the following procedure to isolate memory problems:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor
   DOS System Diagnostics" on page 48 for details.)
2. Select **Memory Test - Full** and/or **Memory Test -
   Quick**.
3. Follow the instructions in the message window.

Note: Make sure that the DIMM is properly installed into
the connector. A loose connection can cause an
error.

System Programs in Flash Memory: System
setup programs are stored in the flash memory.

Flash Memory Update: The flash memory update
is required for the following conditions:

- New versions of system programs
- New features or options

Modem Board Checkout

Do the following to isolate the problem to the system internal modem:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)
2. Select **Diagnostics**.
3. Select **Other Devices**.
4. Run **Modem Loopback Test** and **Modem Dialtone/DTMF Test**.
5. Follow the instructions in the message window.
6. If the test detects a modem problem, replace the modem card.

Power System Checkout

To verify the symptom of the problem power on the computer using each of the following power sources:

1. Remove the battery.

2. Connect the AC Adapter and check that power is supplied.

3. Disconnect the AC Adapter and install the charged battery; then check that power is supplied by the battery.

If you suspect a power problem, refer the the appropriate power supply check listed below:

- "Checking the AC Adapter"
- "Checking the Operational Charging" on page 33
- "Checking the Battery" on page 33

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 ThinkPad Port Replicator with Advanced Etherjet Feature.

- If the power-on indicator does not turn on, check the power cord of the AC Adapter for correct continuity and installation.

- If the operational charge does not work, go to "Checking the Operational Charging" on page 33.

Unplug the AC Adapter cable from the computer and measure the output voltage at the plug of the AC Adapter cable. See the following figure.
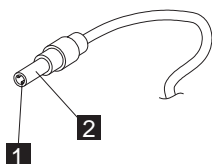
Pin	Voltage (V dc)
1	+15.5 to +17.0
2	Ground

If the voltage is not correct, replace the AC Adapter.

If the voltage is within the range, do the following:

- Replace the DC-DC & BATT board.
- Replace the system board.
- If the problem is not corrected, go to "Undetermined Problems" on page 45

Note: An audible noise from the AC Adapter does not always indicate a defective adapter.

Checking the Operational Charging: To check operational charging, use a discharged battery pack or a Battery that has less than 50% of the total power remaining when installed in the computer.

Perform operational charging. If the battery status indicator does not turn on, remove the Battery and let it return to room temperature. Reinstall the Battery.

If the charge indicator still does not turn on, replace the Battery. If the charge indicator still does not turn on, replace the DC-DC & BATT board, then the system board. Then reinstall the Battery. If the reinstalled Battery is not charged, go to the next section.

Checking the Battery: Battery charging will not start until the Fuel-Gauge shows that less than 95% of the total power remains; with this condition, the Battery can charge to 100% of its capacity. This protects the Battery from being overcharged or having a shortened life.

Do the following:

1. Power off the computer.
2. Remove the Battery and measure the voltage between battery terminals 1(+) and 7(-). See the following figure:
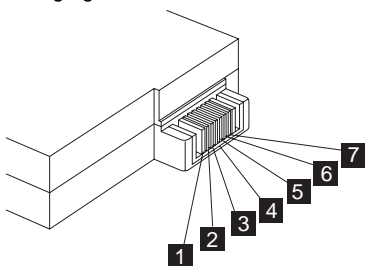
   Note: Signal lines, not used in these steps, are used for communications between the system and the battery.

3. If the voltage is less than 10.8V (Li-Ion) or 9.6V (NiMH), the Battery has been discharged, recharge the Battery. If the voltage is still less than 10.8V (Li-Ion) or 9.6V (NiMH), replace the battery.
4. If the voltage is more than 10.8V (Li-Ion) or 9.6V (NiMH), measure the resistance between battery terminals 1 and 3. The resistance must be 390 ohm (Li-Ion) or 4 to 30K ohm. If the resistance is not correct, replace the Battery. If the resistance is correct, replace the DC-DC & BATT board then the system board.

TrackPoint Checkout

If the external mouse is connected, the TrackPoint does not work. In this case, please detach the external mouse to check the TrackPoint.

If this does not correct the TrackPoint problem, continue with the following.

After you use the TrackPoint, the pointer drifts on the screen for a short time. This self-acting pointer movement can occur when a slight, steady pressure is applied to the TrackPoint pointer. This symptom is not a hardware problem. No service actions are necessary if the pointer movement stops ina short period of time.

If a click button problem or pointing stick problem occurs, do the following:

1. Boot from and start PC-Doctor DOS. (See "PC-Doctor DOS System Diagnostics" on page 48 for details.)
2. Select **Interactive Tests**.
3. Select **Mouse**.
4. Follow the instructions in the message window.

If either the pointing stick or the click button does not work, do the following actions one a time to correct the problem. Do not replace a non-defective FRU.

1. Reseat the keyboard cables.
2. Replace the keyboard.
3. Replace the system board.

Power Management Features

Three power management modes are available in the computer system to reduce power consumption and to prolong battery life.

Standby Mode: In standby mode, the following occurs:

- The LCD backlight turns off.
- The audio amplifier turns off. (Fn+F3)

Events that cause the computer to enter standby mode:

- Standby mode requested by the Fn key (Fn+F3).

The computer exits standby and resumes operation when any key is pressed.

Suspend Mode: In suspend mode, the following occurs:

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

Events that cause the computer to enter suspend mode:

- Suspend mode requested by the Fn key (Fn+F4).
- The Lid is closed (BIOS Setup).
- The specified time has elapsed.
- Battery low occurs and hibernation conditions are insufficient.

   Note: When battery is low, the battery status indicator blinks orange.

- The computer is ejected from the ThinkPad Port Replicator with Advanced Etherjet Feature (BIOS Setup).
- The UltraBay FX (Combobay) switch is pressed.

Notes:

1. In the IBM BIOS Setup Utility, the computer can be set to suspend when lid is closed.
2. In the IBM BIOS Setup Utility, the computer can be set to suspend when docked.

The following events cause the computer to resume operation from suspend mode:

- The Lid is opened.
- The real time clock alarm is signaled.
- The ring indicator (RI) is signaled by the internal modem or a PC Card device.
- The Fn key is pressed.
- Wake on LAN occurs.
- Power switch is pressed.

The computer also exits suspend mode when timer conditions are satisfied for entering hibernation mode.

Hibernation Mode: For Windows NT or OS/2 user:

A Windows NT or OS/2 user cannot create a hibernation file in a Windows NT or OS/2 system that uses the NTFS/HPFS format system. If you want to use hibernation mode, you should reinstall Windows NT with a FAT format system. Also, if boot manager is installed, the computer cannot enter hibernation mode.

Note: Before using hibernation mode, you need a hibernation file.

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.

Notes:

1. In the ThinkPad Configuration program, the computer can be set to suspend when docked.
2. The computer cannot enter hibernation mode when it is attached to the ThinkPad Port Replicator with Advanced Etherjet Feature.

Events that cause the computer to enter hibernation mode:

- Hibernation mode requested by function key (Fn+F12).
- Timer conditions are satisfied in suspend mode when hibernate by timer is enabled.
- A critically low battery condition occurs.
- The power switch is pressed. (BIOS Setup)

The compute exits hibernation mode and resumes operation when the power-on switch is pressed. When power is turned on, the hibernation file in the boot record on the hard disk drive is read and the system status is restored from the hard disk drive.

The following events cause the computer to resume operation from hibernation mode.

- The power switch is pressed.
- The real time clock alarm is signaled.
- Wake on LAN occurs.

How to Create the Hibernation Function: Do as follows:

- Start the ThinkPad Configuration program.
- Click on the **Power Management** icon.
- Click on the **Hibernation Options** tab.
- Click on **Enable Hibernation**.
- Click on **OK**.

Note: If you change the memory size, you need to recreate the hibernation file or partition. For partition-based hibernation, use the hibernation utility to delete the partition first before creating a new one.

Symptom-to-FRU Index

The Symptom-to-FRU Index lists the symptoms and errors and the possible causes. The most likely cause is listed first.

Note: Perform the FRU replacement or actions in the sequence shown in the FRU/Action columns. If a FRU replacement does not solve the problem, put the original part back in the computer. Do not replace a non-defective FRU.

This index can also be used to help you decide the next possible FRUs to be replaced when servicing a computer.

Numeric error codes show the errors detected in POST or system operation (runtime). In the following error codes, X can be any number. If no codes are available, use narrative symptoms.

If the symptom is not listed, go to "Undetermined Problems" on page 45.

Note: For IBM devices not supported by diagnostic codes in this ThinkPad computer, see the manual for that device.

Numeric Error Codes

The following is a list of the message that the BIOS can display. Most of them occur during POST. Some of them display information about a hardware device, e.g., the amount of memory installed. Others may indicate a problem with a device, such as the way it has been configured. Following the list are explanations of the messages and remedies for reported problems.

If the system fails after you make changes in the Setup menus, reset the computer, enter Setup and install Setup defaults or correct the error.

Symptom/Error	FRU/Action in Sequence
0200 Failure Fixed Disk	1. Reseat hard disk drive. 2. Load Setup Defaults in BIOS Setup Utility. 3. Hard disk drive 4. System board
021x Keyboard error	Go to "Keyboard and Auxiliary Input Device Checkout" on page 29.
023x Memory error	1. DIMM 2. BIOS ROM 3. System board
0250 System battery error	Replace backup battery (RTC) and run BIOS Setup Utility to reconfigure the system time, then reboot the system.
0251 System CMOS checksum bad — Default configuration used	1. Backup battery (RTC) 2. Run BIOS Setup Utility to reconfigure the system, then reboot the system.
0260 System timer error	1. Backup battery (RTC) 2. Run BIOS Setup Utility to reconfigure the system, then reboot the system. 3. System board
0270 Real time clock error	1. Backtup battery (RTC) 2. Run BIOS Setup Utility to reconfigure the system, then reboot the system. 3. System board
0271 Check date and time setting	1. Run BIOS Setup Utility and verify date and time. 2. Backup battery (RTC) 3. System board

Symptom/Error	FRU/Action in Sequence
0281 Memory size found by POST differed from CMOS	1. Load Setup Defaults in the BIOS Setup Utility. 2. DIMM 3. System board
02Bx Diskette drive A error	1. Check that the drive is defined with the proper diskette type in BIOS Setup Utility. 2. Go to "Diskette Drive Checkout" on page 27.
02D0 System cache error — Cache disabled	1. CPU card 2. System board

Error Messages

Symptom/Error	FRU/Action in Sequence
Device Address Conflict	1. Load Setup Defaults in BIOS Setup Utility. 2. Backup battery (RTC) 3. System board
Allocation Error for: device	1. Load Setup Defaults in BIOS Setup Utility. 2. Backup battery (RTC) 3. System board
Failing Bits: nnnn	1. DIMM 2. BIOS ROM 3. System board
Invalid System Configuration Data	1. Load Setup Defaults in BIOS Setup Utility. 2. BIOS ROM 3. System board
I/O device IRQ conflict	1. Load Setup Defaults in BIOS Setup Utility. 2. Backup battery (RTC) 3. System board
Operating system not found	1. Enter BIOS Setup Utility and see if the hard disk drive and diskette drive A: are properly identified. 2. Diskette drive 3. Hard disk drive 4. System board
Critical battery low	Save your work; then connect the AC Adapter to the computer to recharge the battery.
ERROR EDO RAM exist, system halt! Non PC100 SDRAM exist, system halt!	1. DIMM 2. System board

No Beep Symptoms

Symptom/Error	FRU/Action in Sequence
No beep, power-on indicator on, LCD blank, no POST	• Ensure every connector is connected tightly and correctly. • DIMM • Reseat CPU card. • CPU card • System board

Symptom/Error	FRU/Action in Sequence
No beep, power-on indicator off, LCD blank during POST	• Battery • AC Adapter • DC-DC & BATT board • System board
No beep, power-on indicator on, LCD blank during POST	• Reseat DIMM. • CPU card • System board
No beep during POST but system runs correctly.	Speaker

LCD-Related Symptoms

Symptom/Error	FRU/Action in Sequence
LCD backlight not working LCD too dark LCD brightness cannot be adjusted LCD contrast cannot be adjusted	1. Reseat the LCD connector. 2. Check the LCD inverter ID 3. LCD FPC 4. LCD inverter 5. LCD 6. System board
LCD screen unreadable Screen abnormal Wrong color displayed	1. Reseat the LCD connector. 2. Check the LCD inverter ID 3. LCD FPC 4. LCD inverter 5. LCD 6. System board
LCD has extra horizontal or vertical lines displayed.	1. Check the LCD inverter ID 2. LCD FPC 3. LCD inverter 4. LCD 5. System board

Keyboard-Related Symptoms

Symptom/Error	FRU/Action in Sequence
Keyboard (one or more keys) doesn't work.	1. Reseat the keyboard cable. 2. Keyboard 3. System board

Indicator-Related Symptoms

Symptom/Error	FRU/Action in Sequence
Indicator incorrectly remains off or on, but system runs correctly.	1. Reseat the LED board. 2. LED board 3. System board

Power-Related Symptoms

Symptom/Error	FRU/Action in Sequence
Power shuts down during operation.	1. Battery 2. AC Adapter 3. DC/DC & Charger board 4. System board
The system will not power on.	1. Battery 2. AC Adapter 3. DC/DC & Charger board 4. System board
The system will not power off.	1. Press and hold the power switch for more than 4 seconds 2. DC/DC & Charger board 3. System board
Battery can't be charged.	• Battery • DC/DC & Charger board • Combobay board • System board

PC Card (PCMCIA)-Related Symptoms

Symptom/Error	FRU/Action in Sequence
System cannot detect the PC Card (PCMCIA)	1. PC Card (PCMCIA) slots assembly 2. System board

Speaker-Related Symptoms

Symptom/Error	FRU/Action in Sequence
Speakers make noise or no sound comes from system.	1. Speaker 2. System board
In DOS or Windows multimedia programs, no sound comes from the computer.	1. Speaker 2. System board

Power Management-Related Symptoms

Symptom/Error	FRU/Action in Sequence
The system will not enter hibernation mode.	1. Check if hibernation file is created. 2. Keyboard (if control is from the keyboard) 3. Hard disk drive 4. System board

Symptom/Error	FRU/Action in Sequence
The system will not wake up from hibernation mode.	1. Keyboard (if control is from the keyboard) 2. Hard disk drive 3. System board
The system will not enter suspend mode after closing the LCD.	1. Lid switch 2. System board
Battery fuel-gauge does not go higher than 90%.	1. Remove Battery and let it cool for 2 hours. 2. Refresh battery (continue using battery in BIOS Setup mode until power off, then charge battery). 3. Battery 4. DC/DC & Charger board 5. System board
System configuration does not match the installed devices.	1. Load Setup Defaults and reboot the system. 2. Reseat the Combobay.
System hangs intermittently.	1. Reseat Hard Disk/Combobay. 2. Fan 3. System board

Peripheral-Device-Related Symptom

Symptom/Error	FRU/Action in Sequence
External display does not work correctly.	System board
USB does not work correctly.	System board
Print problems.	• Run printer self-test. • Printer driver • Printer cable • System board
Serial or parallel port device problems.	• Device driver • Device cable • Device • System board

Note: If you cannot find a symptom or an error in this list and the problem remains, see "Undetermined Problems" on page 45.

Intermittent Problems

Intermittent system hang problems can be caused by a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, electronic discharge, or software errors. FRU replacement should be considered only when a recurring problem exists.

When analyzing an intermittent problem, do the following:

1. Run the advanced 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

You are here because the diagnostic tests did not identify which adapter or device failed, which installed devices are incorrect, whether a short circuit is suspected, or whether the system is inoperative. Follow these procedures to isolate the failing FRU (do not isolate nondefective FRUs).

Verify that the power supply being used at the time of the failure is operating correctly. (See "Power System Checkout" on page 32).

1. Power off the computer.

2. Visually check them for damage. If any problems are found, replace the FRU.

3. Remove or disconnect all of the following devices:

   a. Non-IBM devices

   b. Devices attached to the ThinkPad Port Replicator with Advanced Etherjet Feature

   c. Printer, mouse, and other external devices

   d. Battery

   e. Hard disk drive

   f. DIMM

   g. CD-ROM and Diskette Drive in the Combobay (UltraBay FX)

   h. PC Cards (PCMCIA)

4. Power on the computer.

5. Determine if 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 non-defective FRU.

   a. System board

   b. LCD panel

   c. CPU card

CE Utility Program Diskette

Note: You can download the CE Utility Program Diskette from the IBM website.

Setting the LCD Panel ID

There is an EEPROM in the inverter which stores its supported LCD type ID code. If you replace a LCD with one of a different brand or use a new inverter, the ID information in the inverter EEPROM should be updated.

Follow the steps below to set the LCD Panel ID:

1. Boot from the Utility Program Diskette.

2. Select **LCD Panel ID Utility** from PC DOS 7.0 Startup Menu.

3. Follow the instructions on the screen to read the current or to set a new LCD Panel ID code.

   Note: When you set a new LCD Panel ID and the new LCD is not yet enabled (to function), connect an external CRT to see the program execution process.

   Attention: Make sure the new ID code you choose corresponds to the LCD brand and type. If you write a wrong ID into the inverter, just reboot and re-execute the program and input the correct ID code.

4. Restart the computer — the new LCD should work normally.

Note: If the LCD cannot display after changing the ID code, make sure you write the correct ID code or try reconnecting the LCD FPC cable connectors.

Setting the Thermal Sensor

The system is equipped with sensors to protect against system overheating. By setting the system and processor thermal thresholds, the system can turn on the cooling Fan or shut down automatically when the temperature reaches the defined threshold parameters.

System experiencing frequent auto sensor shutdown may need to reset the thermal sensor threshold and execute the Fan test to ensure the normal operation of the cooling Fan (refer to "Fan Checkout" on page 28).

Follow the steps below to set the thermal threshold:

1. Boot from the Utility Program Diskette.

2. Select **Thermal Sensor Utility** from PC DOS 7.0 Startup menu, then press **F4**.

Writing the RFID Data

The EEPROM on the system board contains the system unit serial number and the system board serial number. When you replace the system board, restore the system unit serial number using the RFID Utility in the ThinkPad CE Utility Diskette. The serial number label is attached to the computer.

This utility allows you to

- add S/N data to the EEPROM (option 1)
- read S/N data from the EEPROM (option 2)
- delete S/N data from the EEPROM (option 3)

Follow the instructions on the screen.

Flash UUID

The EEPROM on the system board contains the Universal Unique ID (UUID) — that is, for Microsoft or Internet use. When you replace the system board using the Flash UUID Utility in the ThinkPad CE Utility Diskette. The UUID utility will automatically assign the UUID via Windows.

Running the Diagnostics

PC-Doctor DOS is used to perform diagnostics on the ThinkPad 390X / i Series 1700.

PC-Doctor DOS System Diagnostics

Note: Some test items require tools as shown below:

- Diskette Drive: Erasable 2HD diskette
- Parallel: Tri-Connector Wrap plug (P/N: 72X8546)
- Serial: Tri-Connector Wrap plug (P/N: 72X8546)
- PCMCIA: PC test card (P/N: 35G4703)
- USB: USB Parallel Test cable (P/N: 05K2580)
- CD-ROM: Any data and audio CDs
- ThinkPad 390X / i Series 1700 PC-Doctor DOS Diskettes 1 and 2 (available from the website)
- ThinkPad 390X / i Series 1700 CE Utility Diskette (available from the website)

To run PC-Doctor DOS:

1. Shutdown the computer.
2. Insert the PC-Doctor DOS diskette into the diskette drive.
3. Turn on the computer.
4. Select the correct model name:
   - Option 1: TP-390X without audio
   - Option 2: TP-390X with audio

   and press **Enter**.
5. Follow the message on the screen.

   The PC-Doctor DOS diagnostics program screen appears.

To use PC-Doctor DOS:

1. Press the **left and right arrow keys** to move around the main menu. Press **Enter** to enable the highlighted option. The main options are:

   - Diagnostics
   - Interactive Tests
   - Hardware Info
   - Utility
   - Quit

2. Press the **up and down arrow keys** to move in a selected menu. Press **Enter** to enable the highlighted option.

Note: You can press **F1** for help.

The Diagnostics and Interactive Tests menus contain test items you perform on the computer. After performing a test, press **F3** to view the test result log for detailed information.

PC-Doctor DOS Diagnostics Error Codes

and Messages: The following table does not include user-initiated aborts, which display the error type 195.

Error Code 0-199

Error Code	Test(s)	Message
0-199	Y2K	Year 2000 issue detected

FRU/Action in Sequence:

- Backup battery (RTC)
- System board

Error Code 1-1 to 1-260

Error Code	Test(s)	Message
1-1	SMBUS	No SMBUS detected (if iFailNoSmbus=1)
1-34	DMA	DMA transfer buffer allocate
1-198	SMBUS	No SMBUS detected (if iFailNoSmbus=0)
1-254	DMA	DMA transfer
1-255	DMA	DMA page register
1-256	DMA	DMA register
1-260	IRQ	IRQ controller

FRU/Action in Sequence:

- System board

Error Code 1-286 to 1-300

Error Code	Test(s)	Message
1-286	Timer	Timer 0
		BIOS timer
1-287	Timer	Timer 1
		RAM refresh
1-288	Timer	Timer 2
1-292	CMOS RAM	Pattern test
1-298	RTC	Time update
1-299	RTC	Periodic interrupt
1-300	RTC	Alarm interrupt

FRU/Action in Sequence:

- Check BIOS setting
- Backup battery (RTC)
- System board

Error Code 5-16 to 15-36

Error Code	Test(s)	Message
5-16	Video	Memory pattern failed
5-24	Video	Video page test failed
5-26	Video	Register failed
5-199	Video	Could not initialize mode 13H for register test
11-2	COM	Timeout sending
11-13	COM	LCR/MCR fail
11-14	COM	Internal loopback
11-15	COM	External loopback
11-40	COM	No interrupt detected
11-197	COM	No FIFO part (can't run FIFO test)
		IR mode enabled (can't run serial test)
		No external loopback adapter (if prompt times out)
11-198	COM	Aborted
11-286	COM	Baudrate register
11-290	COM	DLAB
14-15	LPT	External loopback fail
14-40	LPT	No interrupt
14-196	LPT	Test aborted (too many failures)
14-197	LPT	No loopback (prompt timed out)
14-250	LPT	Data register
15-1	USB	Not detected
15-36	USB	Register failed

FRU/Action in Sequence:

- System board

Error Code 18-1 to 18-27

Error Code	Test(s)	Message
18-1	PCMCIA	No PCMCIA detected
18-5	PCMCIA	Incorrect PCMCIA version
18-9	PCMCIA	Incorrect number of sockets
18-24	PCMCIA	Index register failed
18-27	PCMCIA	Socket configuration read error

FRU/Action in Sequence:

- PCMCIA holder
- System board

Error Code 20-1 to 71-41

Error Code	Test(s)	Message
20-1	PCI	No PCI detected
20-5	PCI	Incorrect PCI BIOS version
20-27	PCI	Problem reading PCI configuration
20-196	PCI	Too many PCI errors
25-14	IDE	Controller data loop
25-32	IDE	Inquiry data change between reads
25-195	IDE	User abort
25-198	IDE	No drive parameters readable
		Testing parameters out of range
25-250	IDE	POST/BIST
25-260	IDE	Read/verify
25-262	IDE	Seek error
71-1	SB	PNPISA sound card detected, but not enabled
		PCI sound card detected, but not enabled
		Sound card not detected
71-11	SB	DSP data loopback failed
71-40	SB	IRQ test failed
71-41	SB	DMA test failed

FRU/Action in Sequence:

- System board

Error Code 75-1

Error Code	Test(s)	Message
75-1	AC CHARGER	AC Charger not supported

FRU/Action in Sequence:

- DC-DC & BATT board
- System board

Error Code 89-250 to 89-294

Error Code	Test(s)	Message
89-250	CPU	Math coprocessor
89-266	CPU	Registers
		MMX
89-278	CPU	Arithmetics
89-282	CPU	Logical ops
89-286	CPU	String ops
89-294	CPU	Exceptions

FRU/Action in Sequence:

- Reload BIOS default setting
- CPU card
- System board

Error Code 170-1 to 175-198

Error Code	Test(s)	Message
170-1	LM80/LM81	Chip not detected (iFailNoLm80=1)
170-27	LM80/LM81	All interrupts masked
170-198	LM80/LM81	Chip not detected (iFailNoLm80=0)
170-250	LM80/LM81	Interrupt condition detected
175-1	LM75/ Max1617/ FAN	Chip not detected (iFailNoLm80=1)
		Fan test not supported
		No fan detected
175-198	LM75/ Max1617	Chip not detected (iFailNoLm80=0)

FRU/Action in Sequence:

- System board

Error Code 175-199

Error Code	Test(s)	Message
175-199	FAN	Fan test failed

FRU/Action in Sequence:

- Fan
- System board

Error Code 175-250 to 185-262

Error Code	Test(s)	Message
175-250	LM75/ Max1617	Interrupt condition detected
185-1	RFID/ ALERTPACK	Asset ID not supported
		SMBUS not detected (if not required)
		AlertPack not supported
		AlertPack not detected (if not required)
185-2	ALERTPACK	Transmission timeout
185-5	ALERTPACK	Invalid revision
185-9	RFID/ ALERTPACK	SMBUS not detected (if required)
		AlertPack not detected (if required)
185-16	ALERTPACK	Pattern test
185-262	RFID/ ALERTPACK	Problem reading EEPROM
		Bad header checksum
		Bad area checksum
		Problem detecting antenna
		No antenna detected

FRU/Action in Sequence:

- System board

Error Code 201-1 to 201-198

Error Code	Test(s)	Message
201-1	DIMM	No SMBus detected (iFailNoSmbus=1)
		No DIMMs detected (iFailNoDimms=1)
201-13	DIMM	EEPROM write protect failed (iFailEpWr=1)
201-25	DIMM	Bad EEPROM checksum
201-198	DIMM	No SMBus detected (iFailNoSmbus=0)

FRU/Action in Sequence:

- DIMM
- System board

Error Code 202-1 to 202-18

Error Code	Test(s)	Message
202-1	CACHE	CPU not in correct mode for test
202-3	CACHE	NMI detected during cache test
202-18	CACHE	Cache failed random pattern test

FRU/Action in Sequence:

- System board

Error Code 206-16 to 206-290

Error Code	Test(s)	Message
206-16	FD	Sector pattern test failed
206-27	FD	Read failure (not able to detect disk size)
206-198	FD	Not able to detect disk size parameters
206-262	FD	Read, write or verify failure
206-290	FD	Seek failed

FRU/Action in Sequence:

- Reseat diskette drive cable
- Diskette drive
- System board

Error Code 215-1 to 215-254

Error Code	Test(s)	Message
215-1	CDROM	No drive or MSCDEX driver detected
215-196	CDROM	Too many errors
215-254	CDROM	Sector read failed

FRU/Action in Sequence:

- Reseat CD-ROM cable
- CD-ROM drive
- System board

Error Code 217-14 to 217-262

Error Code	Test(s)	Message
217-14	HD	Controller data loop
217-32	HD	Inquiry data change between reads
217-195	HD	User abort
217-198	HD	No drive parameters readable
		Testing parameters out of range
217-250	HD	POST/BIST
217-260	HD	Read/verify
217-262	HD	Seek error

FRU/Action in Sequence:

- Reload BIOS default setting
- Hard disk connector
- Hard disk drive

Error Code 301-250 to 301-266

Error Code	Test(s)	Message
301-250	KBD	Interrupt
301-254	KBD	POST
301-258	KBD	Stuck keys
301-266	KBD	Interface

FRU/Action in Sequence:

- Reseat keyboard connector
- Keyboard
- System board

Error Code 304-1 to 304-199

Error Code	Test(s)	Message
304–1	BATTERY	No battery installed
		No battery detected
304–199	BATTERY	General battery failure

FRU/Action in Sequence:

- Battery pack
- DC-DC & BATT board
- System board

Error Code 415-1 to 415-250

Error Code	Test(s)	Message
415-1	MODEM	PnP ISA modem detected but not enabled
		PCI modem detected but not enabled
		Modem not detected
415-250	COM/Modem	Modem ATZ
		No dialtone detected

FRU/Action in Sequence:

- Reseat Modem card
- Modem card
- System board

FRU Removals and Replacements

This section contains information about removals and replacements.

- Do not damage any parts. Only certified and trained personnel should service the computer.

- The arrows in this section show the direction of movement to remove a FRU, or to turn a screw to release the FRU. The arrows are marked in numeric order, in square callout, to show the correct sequence of removal.

- When other FRUs must be removed before the failing FRU is removed, they are listed at the top of the page.

- To replace a FRU, reverse the removal procedure and follow any notes that pertain to replacement.

- When replacing a FRU, use the correct screw size, as shown in the procedures.

Safety Notice 1: Translation on page 5

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

Safety Notice 3: Translation on page 7

The lithium battery can cause a fire, explosion, or 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.

Safety Notice 8: Translation on page 11

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

An electrostatic discharge (ESD) strap (P/N 6405959) must be used to establish personal grounding.

FRU Service Procedures

Review the following procedures before replacing any FRU.

LCD FRU Replacement Notice: The TFT LCD for the notebook computer contains over 2,359,296 thin-film transistors (TFTs). A small number of missing, discolored, or lighted dots (on all the time) 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:

- SVGA (12.1"): 5 or more bright dots, 5 or more dark dots, or a total of 9 or more bright and dark dots
- XGA (15.1"/14.1"): 8 or more bright dots, 8 or more dark dots, or a total of 9 or more bright and dark dots

Replacing the System Board: When you replace the system board, restore the system unit serial number using the RFID Utility and reassign the UUID using the Flash UUID Utility in the ThinkPad 390X / i Series 1700 CE Utility Diskette. See "Writing the RFID Data" on page 47 and "Flash UUID" on page 47 respectively.

Note: Do not power off the computer while restoring the RFID.

Screw Notices: Loose screws can cause a reliability problem. The IBM ThinkPad computer addresses this problem with nylon-coated screws. Tighten screws as follows:

- Plastic to plastic

    Turn an additional **90 degrees** after the screw head touches the surface of the plastic part:
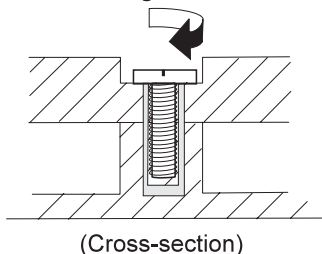
(Cross-section)

- Logic card to plastic

    Turn an additional **180 degrees** after the screw head touches the surface of the plastic part:

180 degrees more
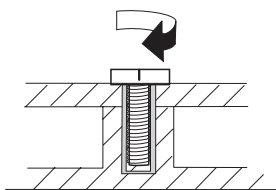
(Cross-section)

- Torque driver

  If you have a torque driver, refer to the "Torque" column with each step.

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

Important Notice

This computer uses special nylon-coated screws with the following characteristics:

- They maintain tight connections.

- They do not easily come loose, even with shock or vibration.

- They need additional force to tighten.

- They should be used only once.

Do the following when you service this machine:

- Have a screw kit (05K5489) available.

- Always use new screws if you are instructed.

- Use a torque screwdriver if you have one.

Battery

To remove the Battery, press the latch to release, then pull out the Battery.
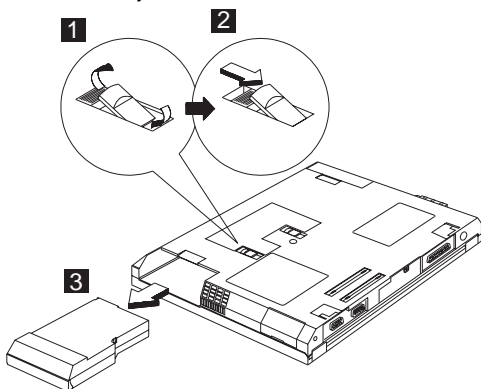
Reverse the steps described above when installing a new battery pack.

Hard Disk Drive

Warning

- 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 on the drive.

- Before removing the drive, have the user make a
  backup copy of all the information on the drive if pos-
  sible.

- Never remove the drive while the system is operating
  or is in suspend mode.

To remove the hard disk drive:

1. Use a coin to unscrew the hard disk drive screw.
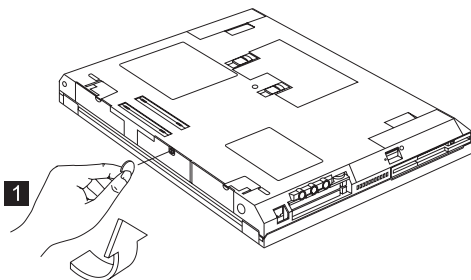
   Note: The screw cannot be removed from the cover.

2. Gently pull out the cover of the hard disk drive
   module.
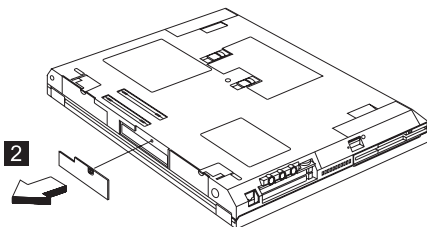
3. Carefully slide out the hard disk drive module to
   remove.
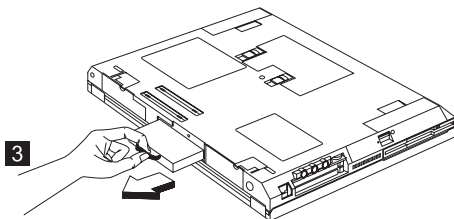
Combo Bay

To remove the Combo Bay, press and hold the lock to release, then slide out the Combo Bay module to remove.
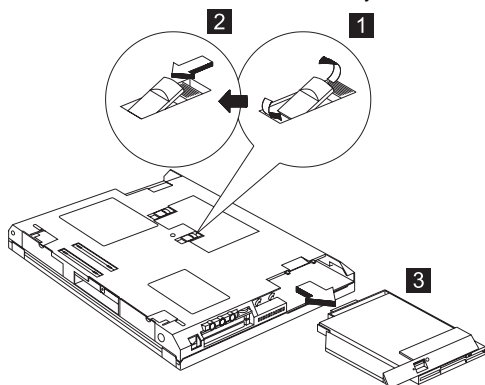
Diskette Drive

To remove the Diskette Drive:

1. Remove the four screws securing the Diskette Drive as shown.

2. Disconnect the Diskette Drive cable from the connector.

   Note: Lift both sides of the connector.

3. Slide out the Diskette Drive to remove.
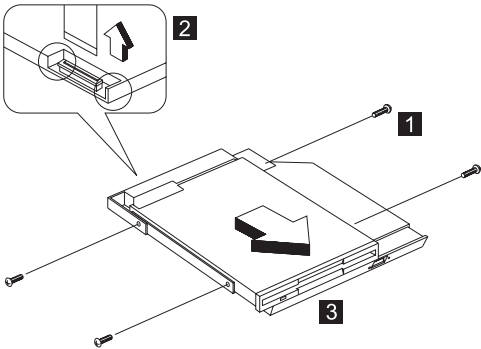
Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 3.5L (3)	Flat head, black	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

CD-ROM

To remove the CD-ROM:

1. Remove the four screws securing the CD-ROM.
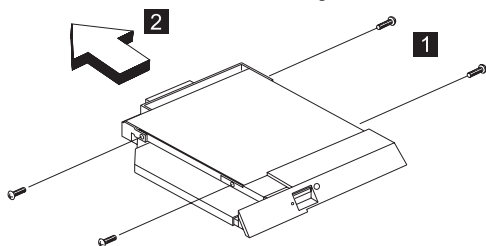
2. Carefully slide out the CD-ROM to remove.

   Note: Watch out for the sharp edges on the CD-ROM.
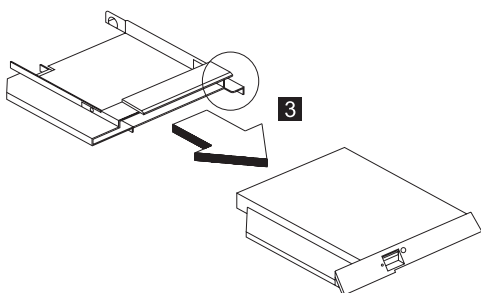
Step	Size (Quantity)	Head & Color	Torque
1	M2.5x 4L (4)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Combo Bay FPC

To remove the Combo Bay FPC:

1. Remove the two screws securing the Combo Bay FPC.
2. Carefully disconnect the Combo Bay FPC from the connector.
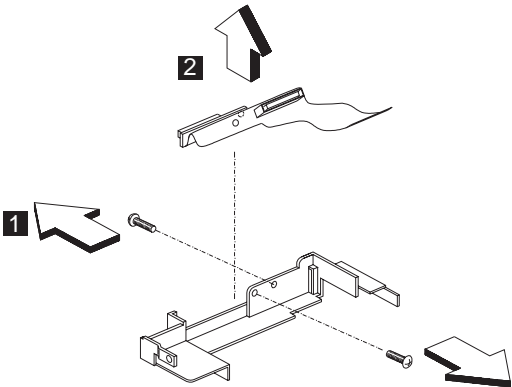
Step	Size (Quan-tity)	Head & Color	Torque
1	M2.5x 3.5L (2)	Flat head, black	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Hard Disk Adapter Combo Bay

To remove the second hard disk drive from the hard disk drive adapter:

1. Remove the two screws of the Combo Bay adapter.
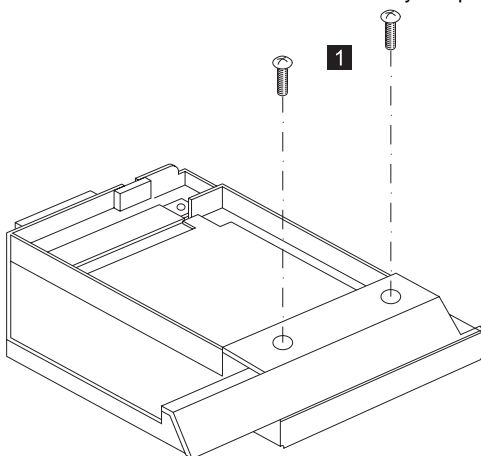
2. Slide the hard disk drive out and up to remove.
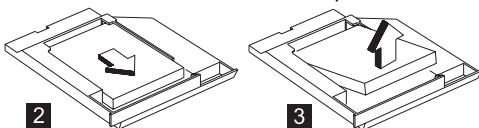
Step	Size (Quantity)	Head & Color	Torque
1	M3 x 5L (2)	Pan head, black	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Modem Card

- "Battery" on page 61

Note: Never remove or attach the card before removing the Battery.

To remove the modem card:

1. Use a flat-bladed screwdriver to remove the screw on the modem door.
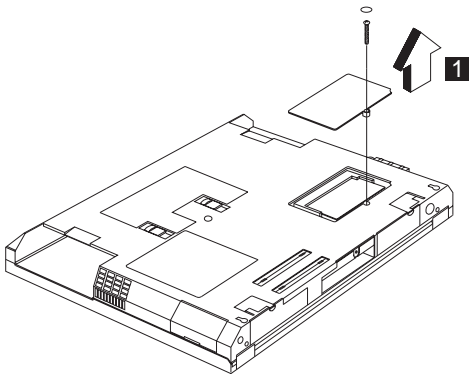
2. Carefully release the latches on both sides of the modem card.

3. Gently pull out the cable from the connector to remove the modem card.
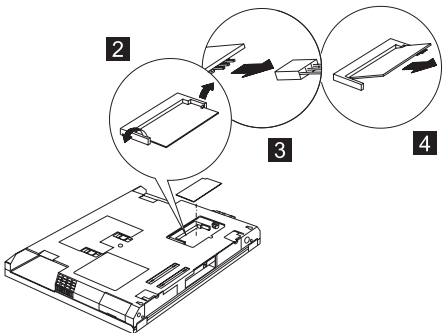
Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 5L (1)	Flat head, black	2.0kgf-cm
Note: The screws do not separate from the modem board cover.			

Backup Battery (RTC)

- "Battery" on page 61
- "Modem Card" on page 68

Safety Notice 4: Translation on page 8

The lithium battery can cause a fire, explosion, or 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 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.

Use your thumb first to pull out the backup battery (RTC).
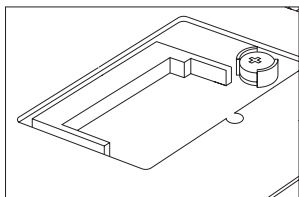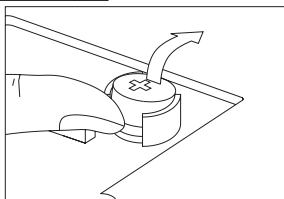
Keyboard

- "Battery" on page 61
- "Hard Disk Drive" on page 62

To remove the keyboard:

1. Use a 1/8" alignment tool to release the latches to lift the middle cover away.
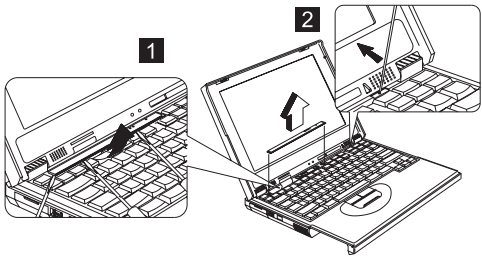
2. Remove the two screws securing the keyboard.
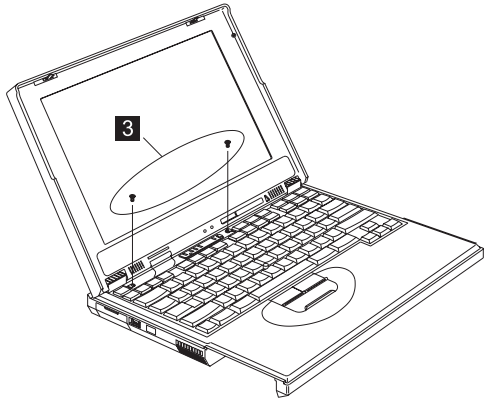
Step	Size (Quan-tity)	Head & Color	Torque
3	M2 x 4L (2)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

3. Carefully lift the keyboard up to expose the keyboard connector.

   Note: Be careful of the keyboard cable as it is fragile.
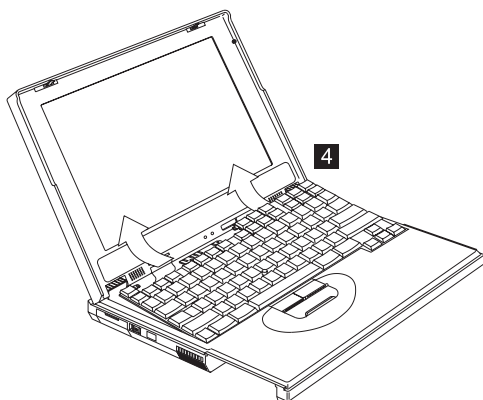
4. Use a flat-bladed screwdriver to release the cable from the connector.

5. Remove the keyboard from the lower case.
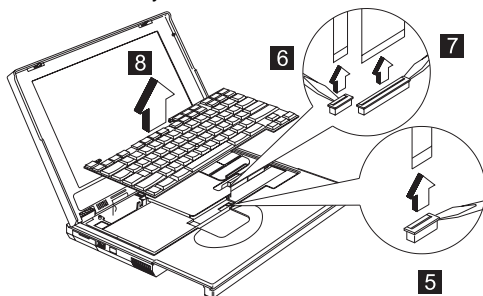
LED Board

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Keyboard" on page 70

To remove the LED board:

1. Remove the screw securing the LED board then disconnect the LED cable from the connector.
2. Lift the LED board.
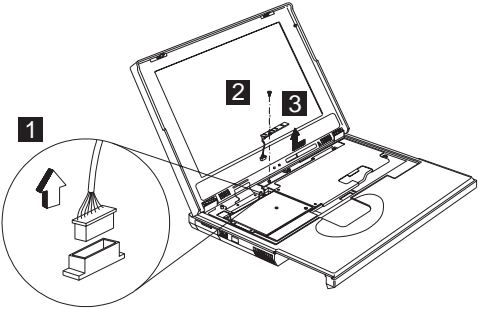
Step	Size (Quantity)	Head & Color	Torque
2	M2 x 4L (1)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Upper Heatsink

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Keyboard" on page 70
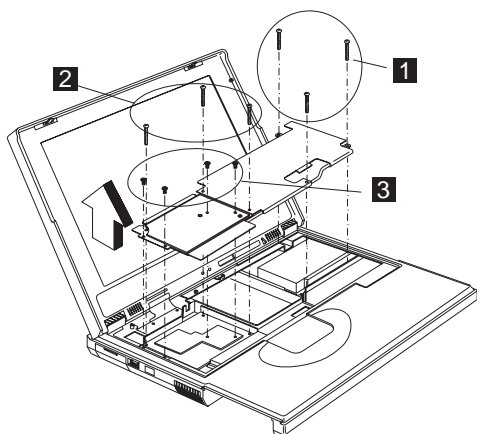
Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 18L (3)	Pan head, black	2.0 kgf-cm
2	M2 x 18L (3)	Pan head, black	2.0 kgf-cm
3	M2 x 4L (4)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

PCMCIA Slots

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Keyboard" on page 70
- "Upper Heatsink" on page 73

To remove the PCMCIA slots:

1. Remove the three screws securing the PCMCIA slot board.
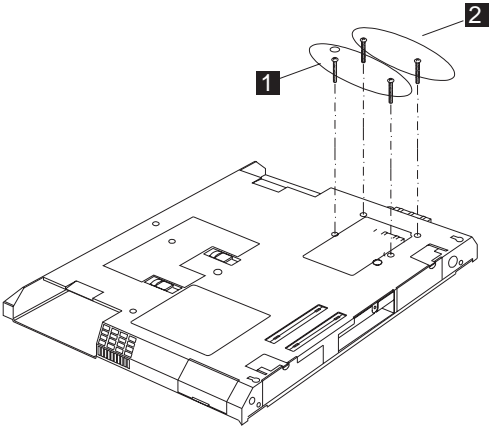
Step	Size (Quantity)	Head & Color	Torque
1	M2 x 18L (2)	Pan head, black	2.0 kgf-cm
2	M2 x 14L (2)	Flat head, silver	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

2. Use a flat-bladed screwdriver to disconnect the PCMCIA card from the connector.
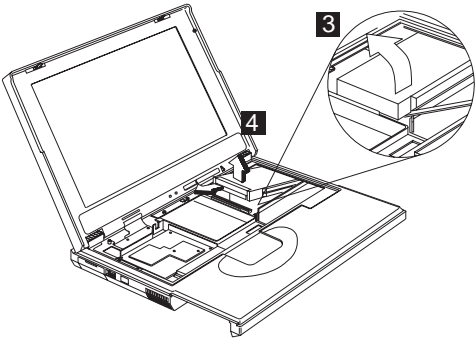
3. Carefully remove the PCMCIA card.
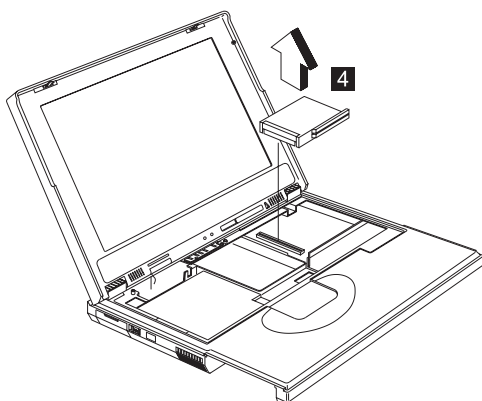
CAUTION:
When reassembling this section of the machine, the upper heatsink must be reassembled first before the PCMCIA slots.

CPU Board

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Keyboard" on page 70

Use the special tool to remove the CPU board.

Note: The CPU tool is for depot use only.
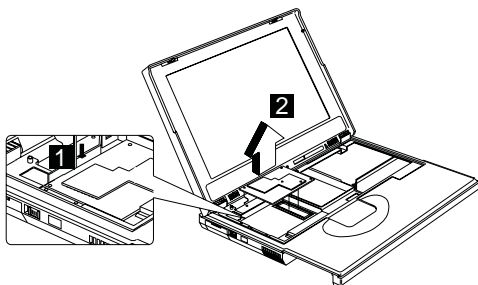
To install the CPU board.

Note: When you replace the CPU board, press only on the places indicated in the figure. Press both sides at the same time. Do not press only one side or any other part of the board.
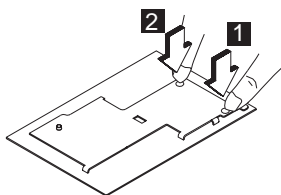
LCD Panel

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Keyboard" on page 70

To remove the LCD Panel:

1. Remove the two screws securing the LCD FPC cable.
2. Remove the LCD FPC cable. Then:
   - Disconnect the LCD FPC cable from the lower case (12.1").
   - Disconnect the LCD FPC cable and LVDS board (15.0" and 14.1").
3. Turn the notebook over; then remove four screws securing the LCD Panel as shown.
4. Pull out the LCD Panel.
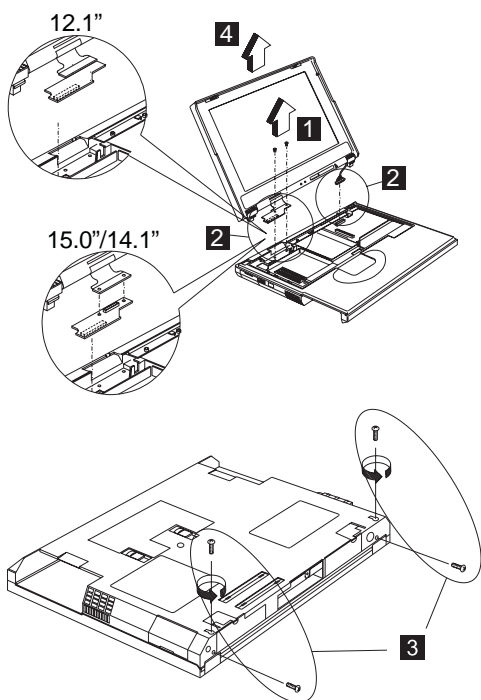
Step	Size (Quantity)	Head & Color	Torque
2	M2.5 x 10L (1)	Pan head, black	12.1"L 1.6 kgf–cm
	M2 x 4L (1)	Flat head, silver	12.1"R 1.6kgf-cm

Step	Size (Quantity)	Head & Color	Torque
2	M2.5 x 18L (1)	Pan head, black	15.1" and 14.1"
	M2 x 10L (1)	Pan head, silver	L:1.6 kgf-cm R:1.6 kgf-cm
3	M2.5 x 6L (4)	Flat head, black	4.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Upper Cover

To remove the upper case:

1. Remove the screws from the upper cover.
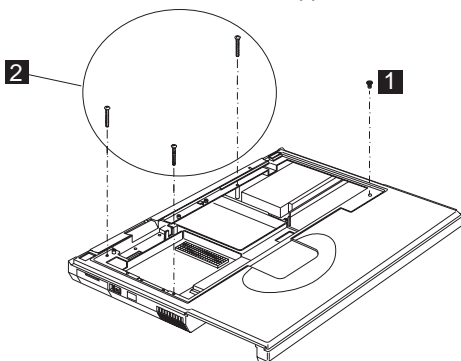
Step	Size (Quantity)	Head & Color	Torque
1	M2 x 4L (1)	Flat head, silver	1.6 kgf-cm
2	M2 x 18L (3)	Pan head, black	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

2. Turn the notebook over. Then remove the 4 screws from the base cover.
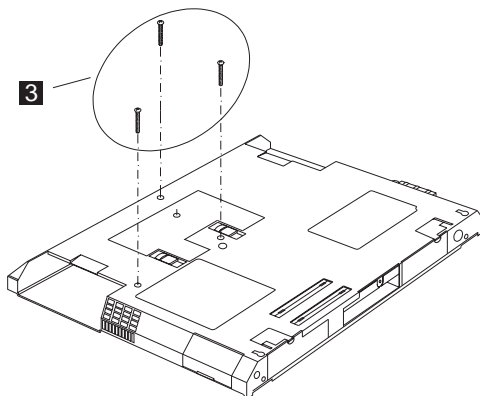
Step	Size (Quantity)	Head & Color	Torque
3	M2.5 x 18L (3)	Pan head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

3. Use a flat-bladed screwdriver to remove the latch.
4. Disconnect the cable from the main unit. Now you can remove the upper cover from the base cover.
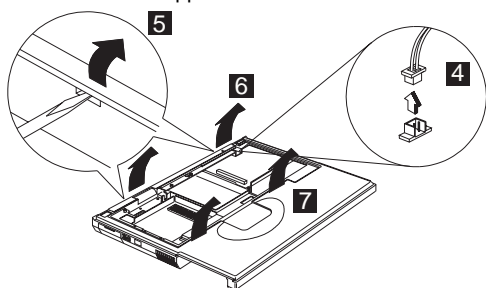
IMM Lower Heatsink

To remove the IMM lower heatsink:

1. Disconnect the fan cable from the connector.

2. Remove the screw securing the IMM lower heatsink. Lift the IMM lower heatsink up to remove.
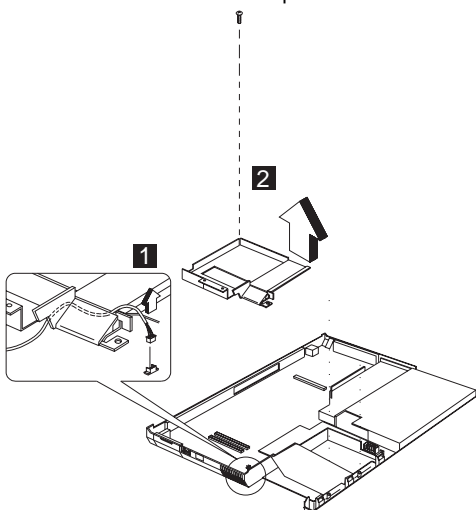
Step	Size (Quantity)	Head & Color	Torque
2	M2 x 10L (1)	Pan head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Fan

Remove the screw securing the fan. Lift the fan up to remove.
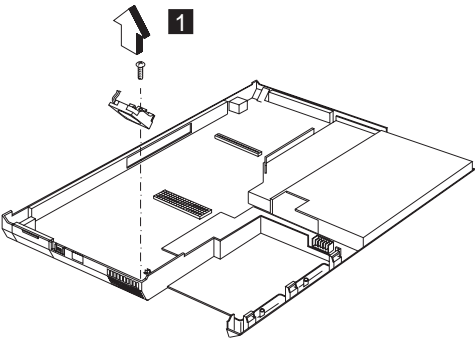
Step	Size (Quantity)	Head & Color	Torque
1	M2 x 4L (1)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Speakers

Note: This section is only for 15.0–inch LCD models.

- "Battery" on page 61
- "Hard Disk Drive" on page 62
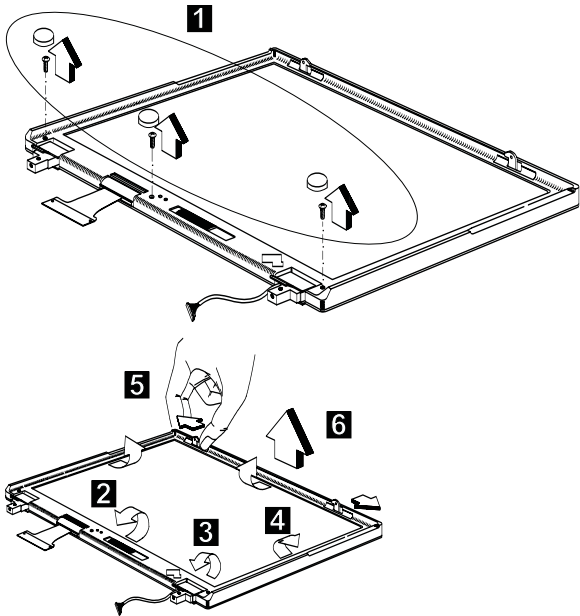- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LED Board" on page 72
- "Upper Heatsink" on page 73
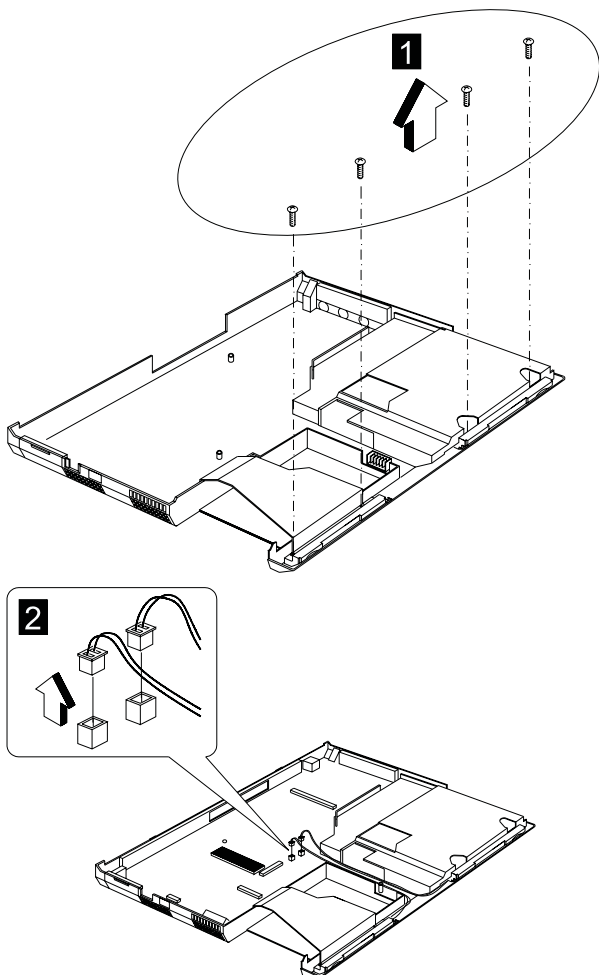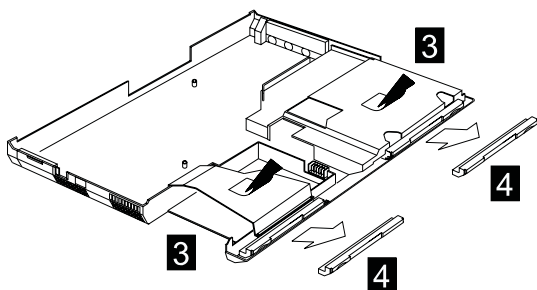
Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 6L (4)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.

Power Latch, IR Board, and DC-DC & BATT Board

To remove these boards and latch:

1. Remove the power latch.

2. Remove the IR board.

3. Remove the screw securing the DC-DC & BATT board (using the 1/8" alignment tool) and disconnect the DC-DC & BATT board from the base cover.
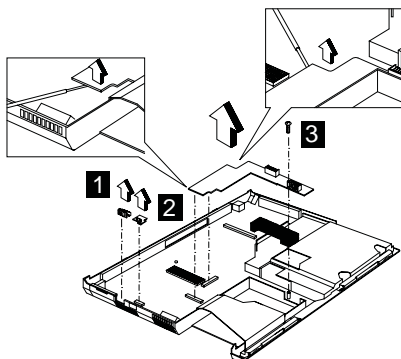
Step	Size (Quantity)	Head & Color	Torque
3	M2.5 x 6L (1)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

System Board

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LED Board" on page 72
- "Upper Heatsink" on page 73
- "CPU Board" on page 76
- "LCD Panel" on page 77
- "Upper Cover" on page 79
- "IMM Lower Heatsink" on page 81
- "Fan" on page 82
- "Speakers" on page 83

   Note: Only for 15.0–inch LCD models.

- "Power Latch, IR Board, and DC-DC & BATT Board" on page 85

Note: See "Replacing the System Board" on page 59 before proceeding.

Remove the two screws from the system board and gently remove the system board from the base cover.
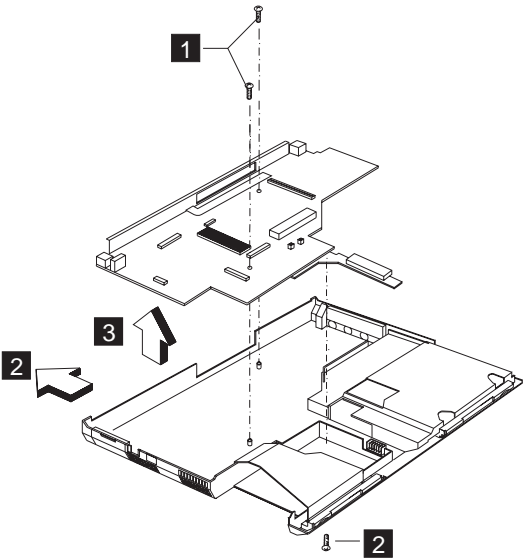
Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 6L (2)	Flat head, black	2.0 kgf-cm
2	M2.5 x 6L (1)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Combo Bay Interposer Board

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LED Board" on page 72
- "Upper Heatsink" on page 73
- "CPU Board" on page 76
- "LCD Panel" on page 77
- "Upper Cover" on page 79
- "IMM Lower Heatsink" on page 81
- "Fan" on page 82
- "Power Latch, IR Board, and DC-DC & BATT Board" on page 85
- "System Board" on page 86

Disconnect the Combo Bay Interposer Board from the system board.
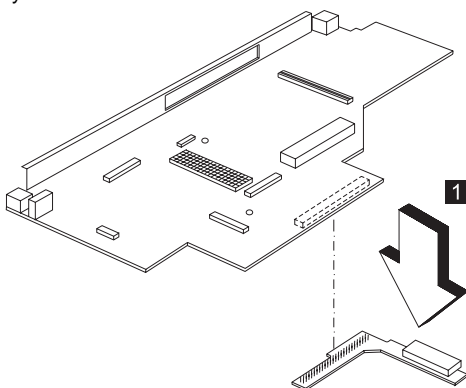
LCD Bezel 15.0"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70

Step	Size (Quantity)	Head & Color	Torque
1	M2.5 x 6L (3)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

LCD Inverter 15.0"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 15.0"" on page 88

Note: See "Setting the LCD Panel ID" on page 46.
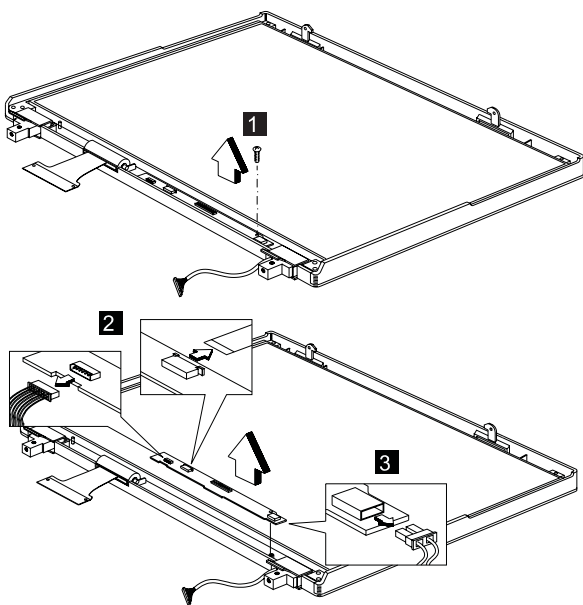
Step	Size (Quantity)	Head & Color	Torque
1	M2 x 4L (1)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Microphone 15.0"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 15.0"" on page 88
- "LCD Inverter 15.0"" on page 89
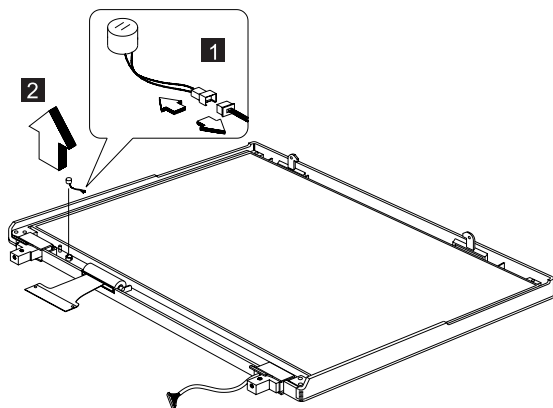
LCD Panel 15.0"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 15.0"" on page 88
- "LCD Inverter 15.0"" on page 89
- "Microphone 15.0"" on page 90
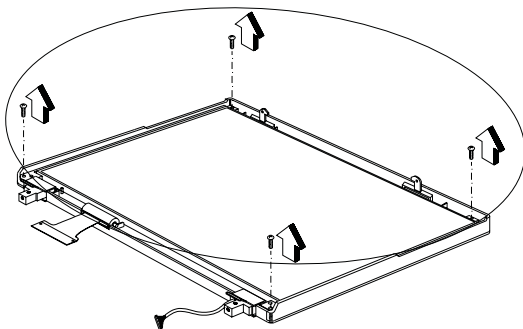
Step	Size (Quantity)	Head & Color	Torque
	M2.5 x 4L (4)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			
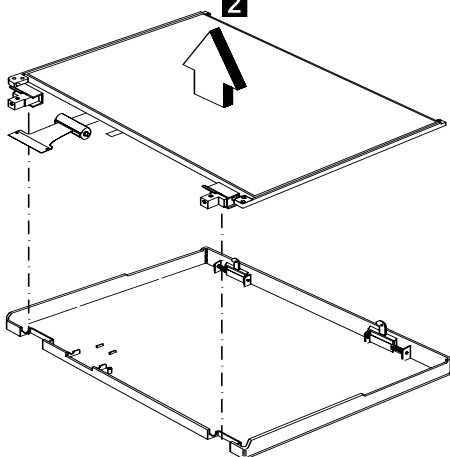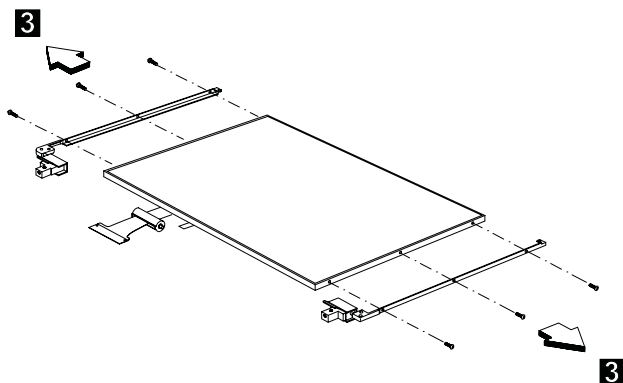
Step	Size (Quan-tity)	Head & Color	Torque
	M2 x 4L (6)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			
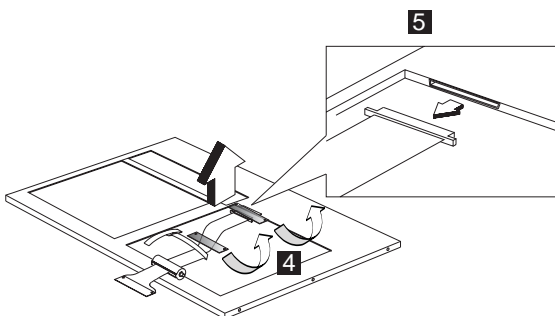
LCD Bezel 14.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
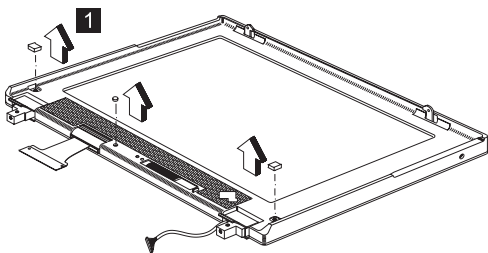
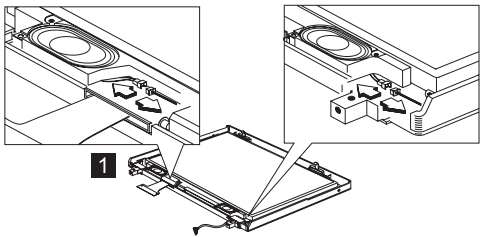Remove the three screws securing the LCD bezel.
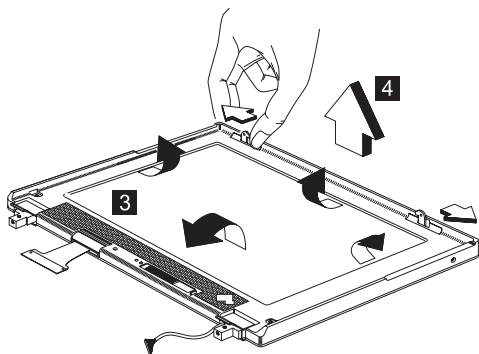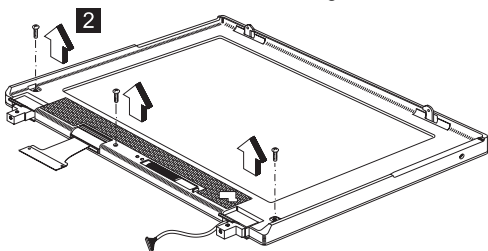
Step	Size (Quantity)	Head & Color	Torque
2	M2.5 x 6L (3)	Pan head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Speaker 14.1"

To remove the speaker:

1. Carefully disconnect the speaker cable from the connector.

2. Remove the five screws securing the speaker.
3. Gently lift the speaker away from the display panel.
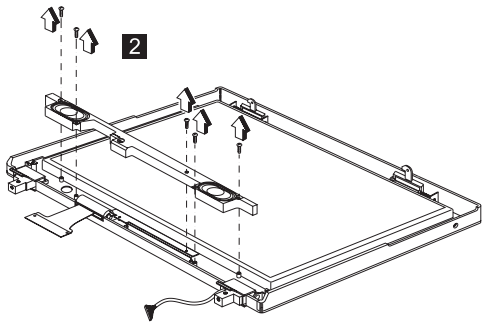
| Step	Size (Quantity)	Head & Color	Torque
2	M2 x 4L (5)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

VR Board 14.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 14.1"" on page 93
- "Speaker 14.1"" on page 94

To remove the VR board:

1. Disconnect the power cable from the VR board.
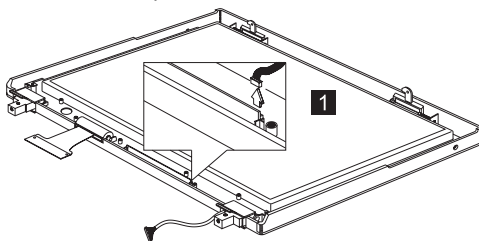
2. Carefully remove the VR board from the display panel.
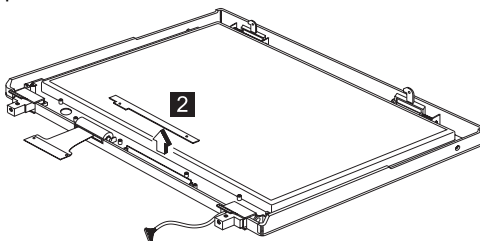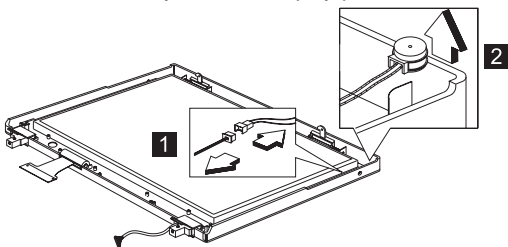
Microphone 14.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 14.1"" on page 93
- "Speaker 14.1"" on page 94
- "VR Board 14.1"" on page 95
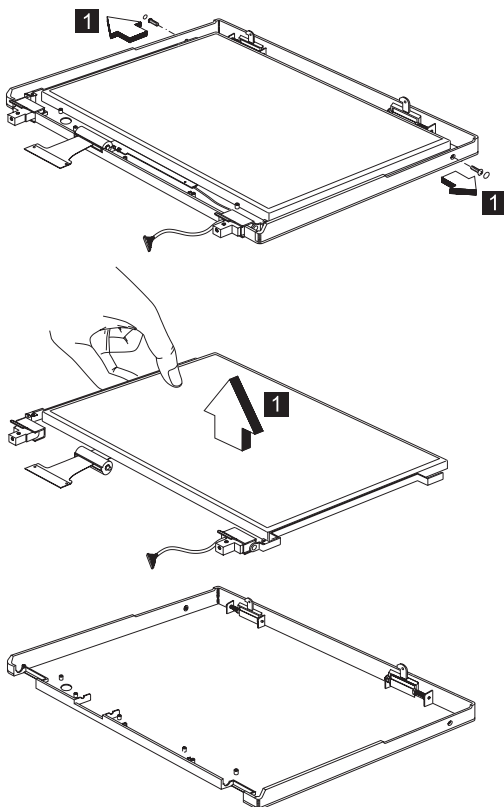
To remove the microphone:

1. Disconnect the power cable from the microphone.
2. Lift the LCD away from the display panel.

LCD Panel 14.1"

Remove the screw covers and screws.

Step	Size (Quantity)	Head & Color	Torque
	M2 x 4L (2)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

LCD Inverter 14.1"

Note:

To remove the LCD inverter:

1. Disconnect the cable from the inverter board.
2. Lift the inverter board away from the display panel.

LCD FPC 14.1"

Disconnect the LCD FPC cable from the LCD.

Note: The LCD FPC cable has a double-sided adhesive tape attached on its back side. Two current black tapes (LCD FPC Stopper Tape) must be applied to this cable.
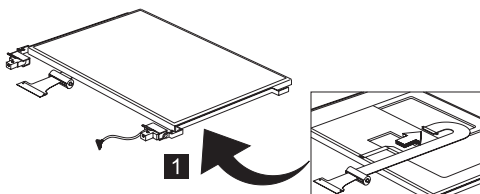
LCD Bezel 12.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
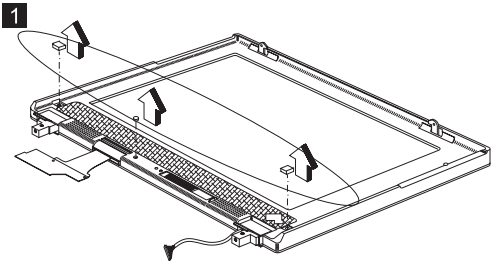
Remove the three screws securing the LCD bezel.
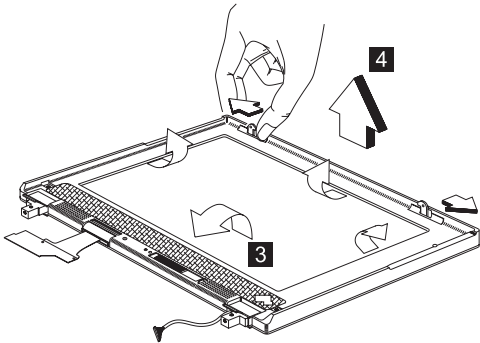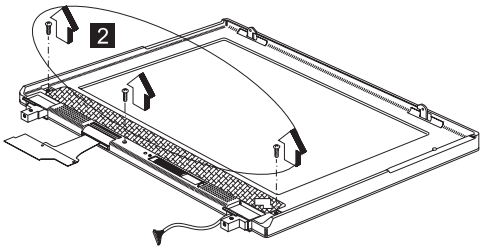
Step	Size (Quantity)	Head & Color	Torque
2	M2.5 x 6L (3)	Flat head, black	2.0 kgf-cm
Note: Make sure you use the correct screw for replacement.			

Speaker 12.1"

To remove the speaker:

1. Carefully disconnect the speaker cable from the connector.
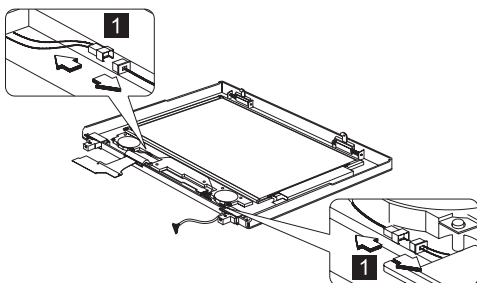
2. Remove the five screws securing the speaker.
3. Gently lift the speaker away from the display panel.

Step	Size (Quantity)	Head & Color	Torque
2	M2 x 4L (5)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

VR Board 12.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 12.1"" on page 100
- "Speaker 12.1"" on page 101

To remove the VR board:

1. Disconnect the power cable from the VR board.
2. Carefully remove the VR board from the display panel.
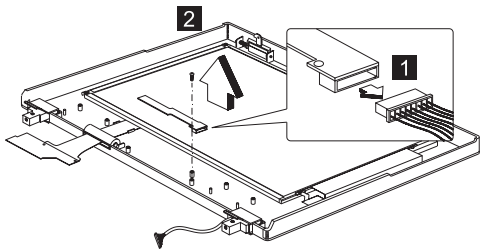
Step	Size (Quantity)	Head & Color	Torque
2	M2 x 4L (1)	Flat head, silver	1.6 kgf-cm
Note: Make sure you use the correct screw for replacement.			

LCD Inverter 12.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 12.1"" on page 100
- "Speaker 12.1"" on page 101
- "VR Board 12.1"" on page 102

Note: See "Setting the LCD Panel ID" on page 46.

To remove the LCD inverter:

1. Disconnect the cable from the inverter board.
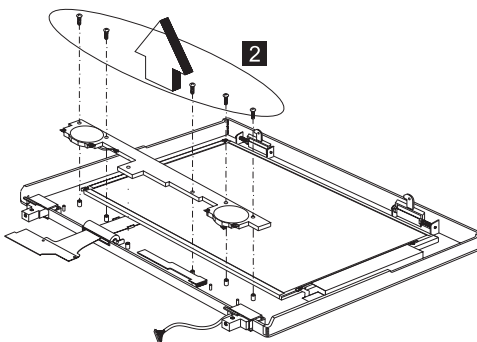2. Lift the inverter board away from the display panel.
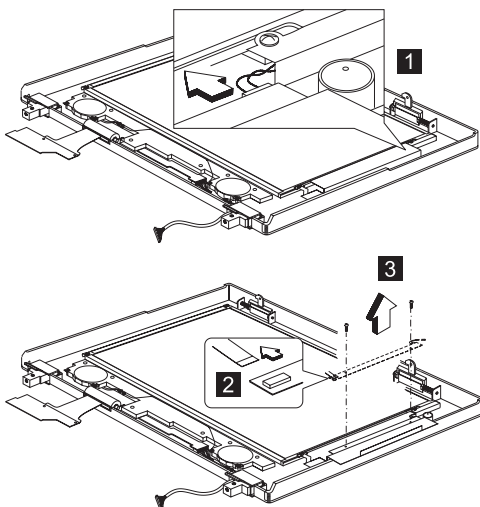
Microphone 12.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 12.1"" on page 100
- "Speaker 12.1"" on page 101
- "VR Board 12.1"" on page 102
- "LCD Inverter 12.1"" on page 103

To remove the microphone:

1. Disconnect the power cable from the microphone.
2. Lift the LCD away from the display panel.
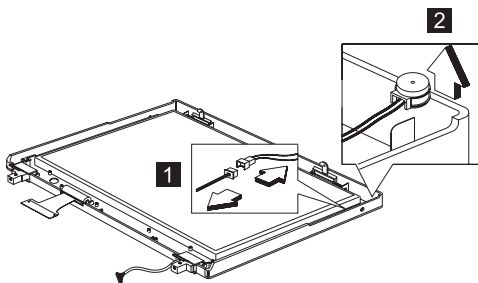
LCD Panel 12.1"

- "Battery" on page 61
- "Hard Disk Drive" on page 62
- "Combo Bay" on page 63
- "Keyboard" on page 70
- "LCD Bezel 12.1"" on page 100
- "Speaker 12.1"" on page 101
- "VR Board 12.1"" on page 102
- "LCD Inverter 12.1"" on page 103
- "Microphone 12.1"" on page 104
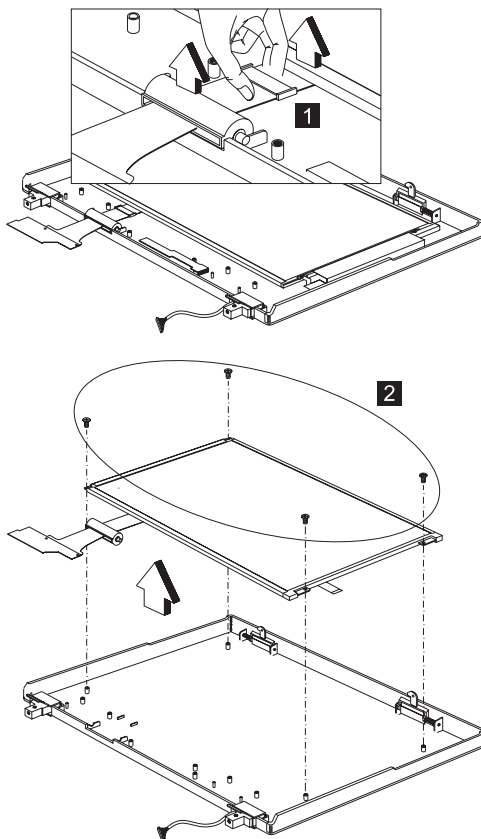
Step	Size (Quantity)	Head & Color	Torque
2	M3 x 5L (4)	Flat head, silver	3.2 kgf-cm
Note: Make sure you use the correct screw for replacement.			

LCD FPC 12.1"

Disconnect the LCD FPC cable from the LCD.
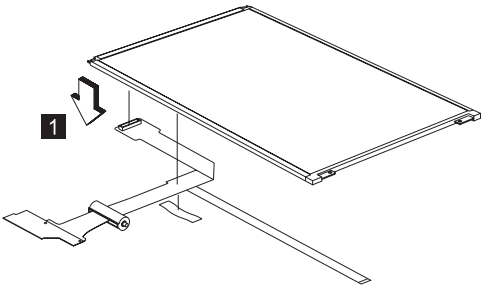
Switch Location
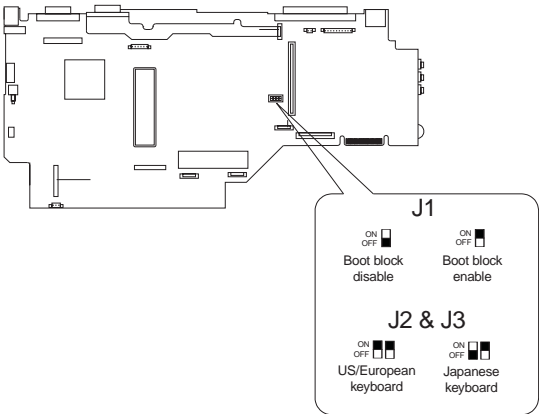
Keyboard Language	US/European	Japanese
J2	ON	OFF
J3	ON	ON

System Unit Parts Listing
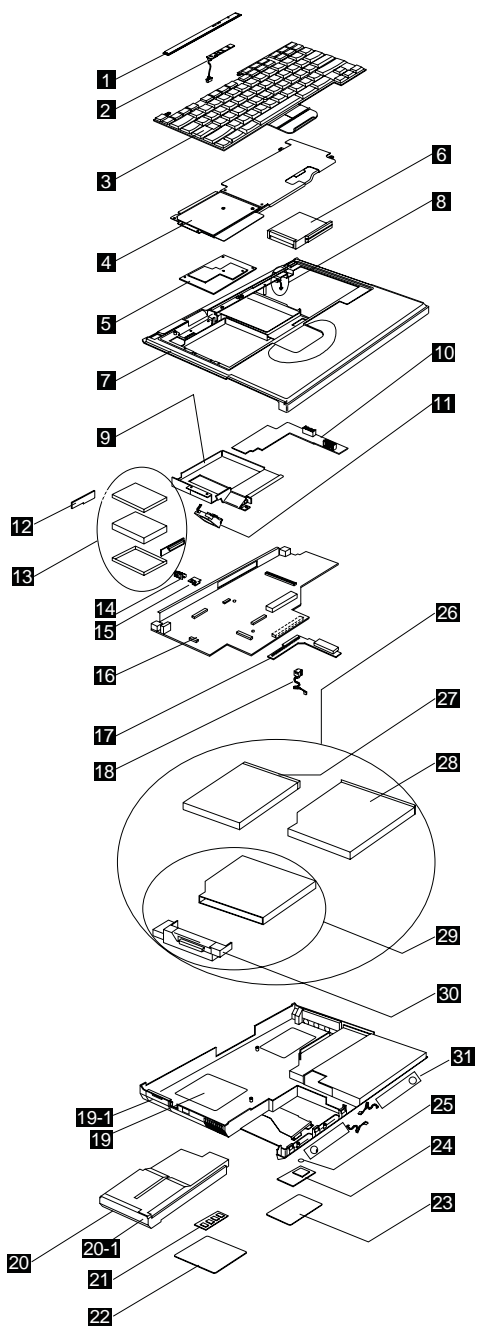
Index	Description	FRU Number
1	Middle Cover	05K5481
2	LED Board W/ Cable	10L1154
3	See Keyboard list	
4	Upper Heatsink For Celeron And Pentium II	10L1930
5	CPU Card (MMC-II, Celeron-400)	10L1439
	CPU Card (MMC-II, Pentium II–400)	10L1440
	CPU Card (MMC-II, Pentium III–450)	10L1354
	CPU Card (MMC-II, Pentium III–500)	10L1355
6	PCMCIA Holder	05K5476
7	Upper Cover 12.1"	05K5478
	Upper Cover 14.1"	05K5946
	Upper Cover 15.0"	08K5832
8	Lid Switch	05K5479
9	MMO Lower Heatsink	08K5837
10	DC-DC & Batt Board for 14.1"/12.1"	08K3406
	DC-DC & Batt Board for 15.0"	10L1435
11	Fan	08K5841
12	HDD Door	08K5834
13	HDD 4.8GB	05K9181
	HDD 6.0GB	05K9262
	HDD 6.4GB	05K8934
	HDD 10.0GB	05K8984
	HDD 12.0GB	05K9263
	HDD Kitting Parts	08K5833
	HDD Adapter Combo Bay	05K5525
14	Base Misc Parts	05K5487
15	IR Board	10L1436
16	System Board (M/B) (W/ AGP)	10L1433
	System Board Support LAN Module (for Japan & Korea only)	08K3100
17	Combo Bay Interposer Card for 15.0"	10L1434
	Combo Bay Interposer Card for 14.1"/12.1"	08K3108
18	PCI Modem Connector	08K5842
19	Base Cover (14.1"/12.1")	08K5838
	Base Cover (15.0")	08K5839
	Base Cover for M/T2624	08K5879
	Base Cover for M/T2627	08K6352
19-1	I/O Door	10L1934
20	Battery (Li-Ion)	02K6520

Index	Description	FRU Number
	Battery (NiMH) (Panasonic)	02K6521
20-1	Battery Slider Cover	05K5942
21	32MB DIMM SDRAM (PC-100)	08K3408
	64MB DIMM SDRAM (PC-100)	08K3409
22	DIMM Door	05K5484
23	RTC	11J8591
24	PCI Modem Card	10L1296
	Ethernet Card	10L1437
25	Modem Door	08K5836
26	Combo CD-ROM + FDD	05K9248
27	Diskette Drive	27L3529
28	CD-ROM (Toshiba)	05K9191
	CD-ROM (LG)	05K9249
	DVD Module	08K9163
29	Combo Bay Bracket	05K6155
30	Combo Bay FPC Kit	05K2819
31	Speaker (15.0")	08K5835
	AC Adapter	
	AC Adapter 3P (Sanken)	02K6555
	AC Adapter 2P (Sanken)	02K6554
	AC Adapter 2P (Delta)	02K6548
	AC Adapter 3P (Delta)	02K6550
	Keyboard	
	KBD US English	02K4705
	KBD Canadian French	02K4706
	KBD German	02K4707
	KBD UK English	02K4708
	KBD French	02K4709
	KBD Dutch	02K4710
	KBD Swedish/Finnish	02K4711
	KBD Norwegian	02K4712
	KBD Danish	02K4713
	KBD Italian	02K4714
	KBD European Spanish	02K4715
	KBD Belgian	02K4716
	KBD Swiss	02K4717
	KBD Portuguese	02K4718
	KBD Greek	02K4719
	KBD Hebrew	02K4720

Index	Description	FRU Number
	KBD Turkish	02K4721
	KBD Arabic	02K4722
	KBD Russian	02K4723
	KBD Slovakian	02K4724
	KBD Slovenian	02K4725
	KBD Hungarian	02K4726
	KBD Czech	02K4727
	KBD Japanese	02K4728
	KBD Traditional Chinese	02K4729
	KBD Korean	02K4730
	KBD LA Spanish	02K4731
	Miscellaneous	
	Misc Name Plate Label Pack	05K5921
	Rubber Kit	05K6176
	FPC Stopper Tape	05K5914
	Mylar Pack	05K5982
	Screw Pack • Screw M2*4 Wafer NI • Screw M2*3E Stainless BT • Screw M2*18 Pan B-ZN • Screw M2*5 28 PAN B-ZN • Screw Mach PAN NYLOK M2.0*10 NI • Screw Flat M3*5L PAN NI • Screw Wafer NYLO M2.5*6L B-ZN • Screw Wafer NYLO M2.5*3.5L B-ZN • Screw Mach PAN NY M2.5*12L B-ZN	05K5489
	Foot L&R	05K5504
	Others	
	Power cord (Japan 2 PIN)	13H5273
	Power cord (Argentina, Australia, Papua New Guinea, New Zealand, Paraguay, Uruguay)	76H3514

Index	Description	FRU Number
	Power cord (Bahamas, Barbados, Bermuda, Bolivia, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras,Jamaica, Korea (South), Mexico, Netherlands, Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), U.S.A., Venezuela)	76H3516
	Power cord (Austria, Belgium, Bulgaria, Czech Republic, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, Indonesia, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Turkey, former Yugoslavia)	76H3518
	Power cord (Denmark)	76H3520
	Power cord (Bangladesh, Pakistan, South Africa, Sri Lanka)	76H3522
	Power cord (Thailand)	76H4866
	Power cord (Abu Dhabi, Albania, Antigua, Bahrain, Brunei, Dubai, Fiji, Hong Kong, India, Ireland, Kenya, Kuwait, Macao, Malaysia, Nigeria, Oman, People's Republic of China, Qatar, Singapore, United Kingdom)	76H3524
	Power cord (Switzerland)	76H3528
	Power cord (Israel)	76H3532
	Power cord (Chile, Italy)	76H3530
	Power cord (Japan)	13H5273

LCD Unit Parts Listing

12.1" LCD Parts Listing
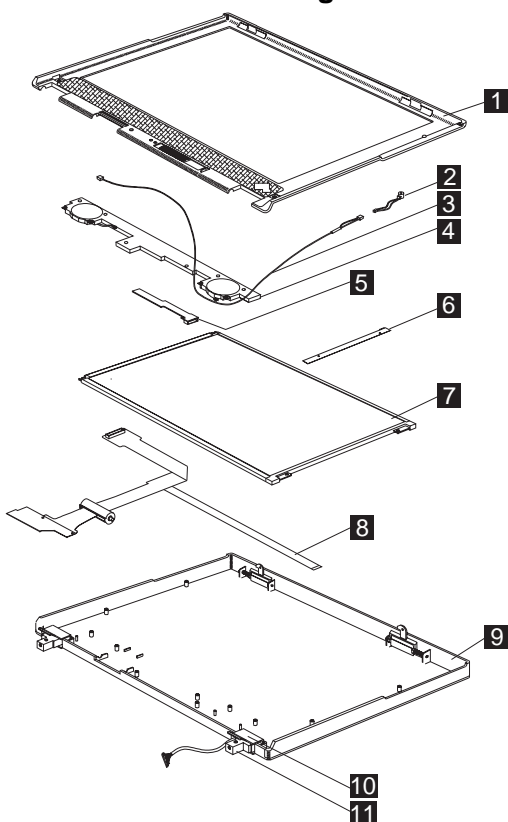
Index	System Unit	FRU Number
1	LCD Bezel (12.1" TFT)	05K5469
2	Microphone W/ Holder	05K5477
3	Cable For Spk/Mic/VR Board	05K2818
4	Speaker (12.1"/13.3")	05K5467
5	VR Board (12.1"/13.3")	30L2576
6	LCD Inverter (12.1" TFT)	10L1645
7	LCD Panel (12.1" TFT)	08K5844
8	LCD FPC (12.1" TFT)	27L0493
9	LCD Rear Cover (12.1" TFT)	08K5845
10	Hinge Cap L,R (12.1"/13.3")	05K5466
11	Hinge L,R (12.1"/13.3")	05K5465
	LCD Misc Parts (LCD latch (L,R), Spring, Brightness/Contrast knob for 12.1", Brightness/Contrast knob for 14.1", LCD bracket for 13.3" only)	05K5488

Index	System Unit	FRU Number
	LG/IBM Logo Kit	05K6044

14.1" LCD Parts Listing
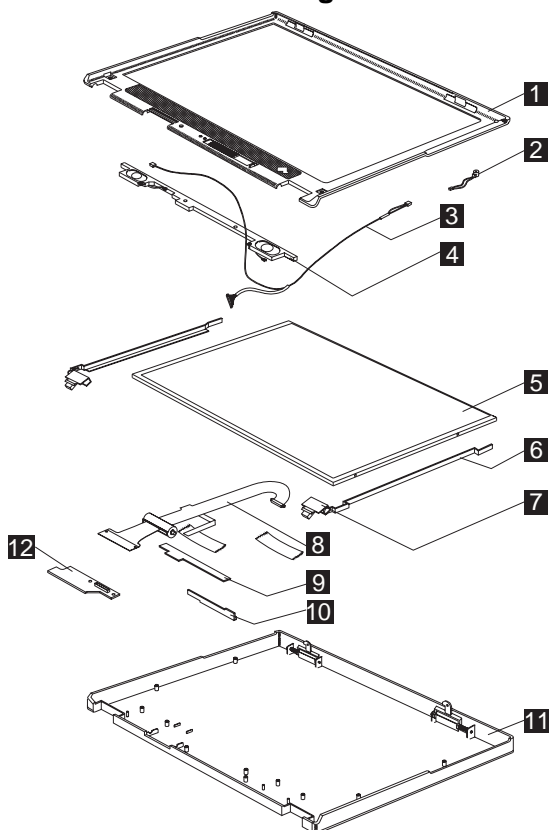
Index	System Unit	FRU Number
1	LCD Bezel (14.1" TFT)	05K5945
2	Microphone W/ Holder	05K5477
3	Cable For Spk/Mic/VR Board	05K2818
4	Speaker (14.1")	02K4869
5	LCD Panel (14.1" TFT)	05K9538
6	Hinge L,R (14.1")	05K5947
7	Hinge Cap L,R (14.1")	05K5948
8	LCD FPC (14.1" TFT)	10L2112
9	LCD Inverter (14.1" TFT)	10L1751
10	VR Board (14.1")	10L1310
11	LCD Rear Cover (14.1" TFT)	05K6208
12	LVDS Board (14.1")	10L1208
13	LCD FPC Stopper Tape	05K5914

Index	System Unit	FRU Number
	LCD Misc Parts (LCD latch (L,R), Spring, Brightness/Contrast knob for 12.1", Brightness/Contrast knob for 14.1", LCD bracket for 13.3" only)	05K5488
	LG/IBM Logo Kit	05K6044

15.0" LCD Parts Listing
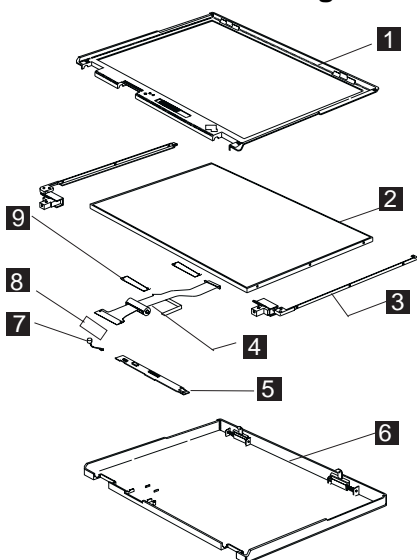

Index	System Unit	FRU Number
1	LCD Bezel (15.0" TFT)	27L0491
2	LCD Panel (15.0" TFT)	08K5828
3	Hinge Bracket (L,R) 15.0"	08K5831
4	LCD FPC (15.0" TFT)	27L0491
5	LCD Inverter (15.0" TFT)	10L1432
6	LCD Rear Cover (15.0" TFT)	08K5829
7	Microphone W/ Holder	05K5477
8	LVDS Board (Thine Chip)	08K3421
	LVDS Board (NS Chip)	08K3422
9	FPC Stopper Tape	05K5914
	LCD Misc Parts (LCD latch (L,R), Spring, Brightness/Contrast knob for 12.1", Brightness/Contrast knob for 14.1", LCD bracket for 13.3" only)	05K5488
	LG/IBM Logo Kit	05K6044

Service Tools

Description	FRU No.	Qty.
Tri-Connector Wrap Plug	72X8546	
PC Test Card	35G4703	
Audio Wrap Cable	66G5180	
Screwdriver Kit	95F3598	
USB Parallel Test Cable	05K2580	
CPU removal tool	08K5880	
5.5mm socket	73G5354	
5.0mm socket	73G1466	
ESD Kit (wrist strap and mat)	73G5518	
ESD Wrist Strap	6405959	
ESD Mat	93F2649	

Note: The CPU tool is for depot use only.

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