

chapter 4

REMOVAL AND REPLACEMENT PRELIMINARIES

This chapter provides essential information for proper and safe removal and replacement service.

4.1 Tools Required

You will need the following tools to complete the removal and replacement procedures:

- Magnetic Torx T-8 screwdriver (for all screws unless otherwise specified)
- 7-mm hex socket (for bushing guides)
- Small flat-blade screwdriver (optional)
- Scribe
- Tweezers

4.2 Service Considerations

Listed below are some of the considerations that you should keep in mind during disassembly and assembly procedures.

4.2.1 Plastic Parts

Using excessive force during disassembly and reassembly can damage plastic parts. Use care when handling the plastic parts. Apply pressure only at the points designated in the maintenance instructions.

IMPORTANT: As you remove each subassembly from the computer, place it (and all accompanying screws) away from the work area to prevent damage.

4.2.2 Cables and Connectors

Handle cables with extreme care to avoid damage. Apply only the tension required to unseat or seat the cables during removal and insertion. Handle cables by the connector whenever possible. In all cases, avoid bending, twisting, or tearing cables. Route cables in such a way that they cannot be caught or snagged by parts being removed or replaced. Handle flex cables with extreme care; they tear easily.



CAUTION: Place cables in their proper location during the reassembly process. Improper cable placement can damage the computer.

4.3 Preventing Damage to Removable Drives

Removable drives are fragile components that must be handled with care. To prevent damage to the computer, damage to a removable drive, or loss of information, observe these precautions:

- Before removing or inserting a hard drive, shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, then shut it down.
- Before removing a diskette drive or CD-ROM drive, ensure that a diskette or disc is *not* in the drive. Ensure that the CD-ROM tray is closed.
- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.
- Handle drives on surfaces that have at least one inch of shock-proof foam.
- Avoid dropping drives from any height onto any surface.
- Do not use excessive force when inserting a drive into the MultiBay.
- Avoid exposing a hard drive to products that have magnetic fields such as monitors or speakers.
- Avoid exposing a drive to temperature extremes or to liquids.
- If a drive must be mailed, do the following:
 - ❑ Place the hard drive into a bubble pack mailer and then into a box or other suitable form of protective packaging.
 - ❑ Label the package “Fragile: Handle With Care.”

4.4 Preventing Electrostatic Damage

Many electronic components are sensitive to electrostatic discharge (ESD). Circuitry design and structure determine the degree of sensitivity. Networks built into many integrated circuits provide some protection, but in many cases the discharge contains enough power to alter device parameters or melt silicon junctions.

A sudden discharge of static electricity from a finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs anyway. An electronic device exposed to electrostatic discharge may function normally for a while, then degrade in performance or fail early.

4.4.1 Packaging and Transporting Precautions

Use the following grounding precautions when packaging and transporting equipment:

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic-sensitive parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place items on a grounded surface before removing them from their container.
- Always be properly grounded when touching a sensitive component or assembly.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or non-conductive foam.
- Use transporters and conveyers made of antistatic belts and roller bushings. Ensure that mechanized equipment used for moving materials is wired to ground, and that proper materials were selected to avoid static charging. When grounding is not possible, use an ionizer to dissipate electric charges.

4.4.2 Workstation Precautions

Use the following grounding precautions at workstations:

- Cover the workstation with approved static-dissipative material (refer to Table 4-2 later in this chapter).
- Use a wrist strap connected to a properly grounded work surface and use properly grounded tools and equipment.
- Use field service tools, such as cutters, screwdrivers, and vacuums that are conductive.
- When using fixtures that must directly contact dissipative surfaces, use fixtures made of static-safe materials only.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and styrofoam.
- Handle electrostatic-sensitive components, parts, and assemblies by the case or PCM laminate. Handle them only at static-free workstations.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting or removing connectors or test equipment.

4.4.3 Grounding Equipment and Methods

Grounding equipment must include either a wrist strap or a foot strap at a grounded workstation.

- When seated, wear a wrist strap connected to a grounded system. Wrist straps are flexible straps with a minimum of one megohm $\pm 10\%$ resistance in the ground cords. To provide proper ground, a strap must be worn snug against the skin. On grounded mats with banana-plug connectors, connect a wrist strap with alligator clips.
- When standing, use foot straps and a grounded floor mat. Foot straps (heel, toe, or boot straps) can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a minimum of one-megohm resistance between the operator and ground. To be effective, the conductive strips must be worn in contact with the skin.

Other grounding equipment recommended for use in preventing electrostatic damage include:

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids
- Non-conductive foam
- Conductive tabletop workstations with ground cord of one-megohm resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Material-handling packages
- Non-conductive plastic bags, tubes, or boxes
- Metal tote boxes

4.4.4 Electrostatic Voltage Levels and Protective Materials

Table 4-1 shows how humidity affects the electrostatic voltage levels generated by different activities.

| Table 4-1 Typical Electrostatic Voltage Levels | | | |
|---|--------------------------|------------|------------|
| Event | Relative Humidity | | |
| | 10% | 40% | 55% |
| Walking across carpet | 35,000 V | 15,000 V | 7,500 V |
| Walking across vinyl floor | 12,000 V | 5,000 V | 3,000 V |
| Motions of bench worker | 6,000 V | 800 V | 400 V |
| Removing DIPS from plastic tube | 2,000 V | 700 V | 400 V |
| Removing DIPS from vinyl tray | 11,500 V | 4,000 V | 2,000 V |
| Removing DIPS from Styrofoam | 14,500 V | 5,000 V | 3,500 V |
| Removing bubble pack from PCB | 26,500 V | 20,000 V | 7,000 V |
| Packing PCBs in foam-lined box | 21,000 V | 11,000 V | 5,000 V |
| NOTE: 700 volts can degrade a product. | | | |

Table 4-2 lists the shielding protection provided by antistatic bags and floor mats.

| Table 4-2 Static-Shielding Materials | | |
|---|------------|---------------------------------|
| Material | Use | Voltage Protection Level |
| Antistatic plastic | Bags | 1,500 V |
| Carbon-loaded plastic | Floor mats | 7,500 V |
| Metallized laminate | Floor mats | 15,000 V |