

**User Guide**

**IntelliStation Z Pro Type 6866**

**Professional Workstation**



**User Guide**

**IntelliStation Z Pro Type 6866**

**Professional Workstation**



## Note

Before using this information and the product it supports, be sure to read the general information under Appendix D, "Viewing the license agreement" on page 151 and Appendix E, "Product warranties and notices" on page 153.

## Second Edition (July 2000)

**The following paragraph does not apply to the United Kingdom or any country where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This publication could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time.

This publication was developed for products and services offered in the United States of America. IBM may not offer the products, services, or features discussed in this document in other countries, and the information is subject to change without notice. Consult your local IBM representative for information on the products, services, and features available in your area.

Requests for technical information about IBM products should be made to your IBM reseller or IBM marketing representative.

© Copyright International Business Machines Corporation 2000. All rights reserved. Note to U.S. Government Users — Documentation related to restricted rights — Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

---

# Contents

<b>Safety information</b> . . . . .	ix
Laser compliance statement . . . . .	x
Lithium battery notice . . . . .	xii
<b>About this book</b> . . . . .	xiii
Related information . . . . .	xiii
<b>Chapter 1. IBM IntelliStation Z Pro overview</b> . . . . .	1
Features . . . . .	2
Software . . . . .	4
Preinstalled software . . . . .	5
Service Pack 6a (Windows NT Workstation only) . . . . .	6
Additional software . . . . .	6
System specifications . . . . .	8
<b>Chapter 2. Setting up your computer</b> . . . . .	11
Arranging your workspace . . . . .	11
Comfort . . . . .	11
Glare and lighting . . . . .	12
Air circulation . . . . .	13
Electrical outlets and cable lengths . . . . .	13
Connecting computer cables . . . . .	13
Controls and status indicators . . . . .	14
Getting started . . . . .	16
Running the setup program . . . . .	17
Starting your computer for the first time . . . . .	18
Registering your computer . . . . .	18
Using Access IBM . . . . .	19
Additional setup tasks . . . . .	19
Setting up Internet Explorer . . . . .	20
Creating an IBM Enhanced Diagnostics Diskette . . . . .	20
Creating an emergency repair diskette . . . . .	20
Installing other operating systems . . . . .	20
Finishing the installation . . . . .	21
<b>Chapter 3. Operating and caring for your computer</b> . . . . .	23
Starting your computer . . . . .	23
Using video features . . . . .	24
Video device drivers . . . . .	24
Changing monitor settings . . . . .	24
Using audio features . . . . .	25
Line out/headphone . . . . .	25
Audio line in . . . . .	25
Microphone in . . . . .	26

Updating system programs . . . . .	26
Managing your computer . . . . .	27
Wake on LAN . . . . .	27
Alert on LAN . . . . .	27
Remote Program Load or Dynamic Host Configuration Protocol . . . . .	28
Remote Administration . . . . .	28
LANClient Control Manager . . . . .	28
System Migration Assistant . . . . .	28
Desktop Management Interface . . . . .	29
Using security features . . . . .	29
Anti-intrusion features . . . . .	29
Component protection . . . . .	30
Asset ID capability . . . . .	30
IBM security solutions . . . . .	31
Data protection . . . . .	31
Enhanced security . . . . .	32
Locking the keyboard . . . . .	32
Shutting down your computer . . . . .	32
Taking care of your computer . . . . .	32
Basics . . . . .	33
Cleaning your computer . . . . .	33
Moving your computer . . . . .	34
<b>Chapter 4. Using the Configuration/Setup Utility program . . . . .</b>	<b>37</b>
Starting and using the Configuration/Setup Utility program . . . . .	37
Viewing and changing settings . . . . .	38
Exiting from the Configuration/Setup Utility program . . . . .	39
Using System Security . . . . .	40
Using Enhanced Security . . . . .	40
Using Security Profile by Device . . . . .	41
Setting Remote Administration . . . . .	42
Using passwords . . . . .	43
Using Adapter ROM security . . . . .	47
Using Asset ID . . . . .	48
Using the IBM Embedded Security Chip . . . . .	48
Enabling the Pentium III Xeon processor serial number feature . . . . .	48
Other settings in the Configuration/Setup Utility program . . . . .	49
Changing keyboard speed . . . . .	49
Changing and viewing the startup sequence . . . . .	49
Interrupt and DMA resources . . . . .	51
Power-management features . . . . .	51
<b>Chapter 5. Installing options . . . . .</b>	<b>55</b>
Preparing to install options . . . . .	55
Handling static-sensitive devices . . . . .	55
Available internal options . . . . .	56
Tools required . . . . .	56

Removing the cover and front bezel . . . . .	57
Removing the air baffle . . . . .	59
Locating components . . . . .	60
Identifying parts on the system board . . . . .	60
Locating components on the memory card . . . . .	62
Working with memory . . . . .	63
Installing adapters . . . . .	68
Installing internal drives . . . . .	70
Installing a second microprocessor . . . . .	78
Installing a security U-bolt . . . . .	80
Replacing the cover and connecting the cables . . . . .	82
Completing the installation . . . . .	83
Updating the computer configuration . . . . .	83
Configuring Plug and Play adapters . . . . .	84
Starting the Configuration/Setup Utility program . . . . .	84
Configuring startup sequences . . . . .	85
<b>Chapter 6. Troubleshooting . . . . .</b>	<b>87</b>
Power-on self-test (POST) . . . . .	88
Troubleshooting MAP . . . . .	89
POST messages . . . . .	91
POST beep codes . . . . .	95
SCSI error messages . . . . .	96
Software-generated error messages . . . . .	96
Diagnostic error codes and messages . . . . .	96
Troubleshooting charts . . . . .	96
Diskette drive problems . . . . .	98
Hard disk drive problems . . . . .	99
Monitor problems . . . . .	99
General problems . . . . .	102
Intermittent problems . . . . .	103
Keyboard, mouse, or pointing-device problems . . . . .	103
Memory problems . . . . .	104
Option problems . . . . .	105
Parallel port problems . . . . .	106
Serial port problems . . . . .	107
Printer problems . . . . .	107
Software problems . . . . .	108
Universal Serial Bus port problems . . . . .	108
Changing the startup sequence to start from the CD . . . . .	109
IBM Enhanced Diagnostics . . . . .	109
Other diagnostic programs . . . . .	111
Using the ConfigSafe program . . . . .	112
ConfigSafe Save Our System (SOS) feature . . . . .	112
Using the IBM Product Recovery CDs . . . . .	113
Recovering the operating system and support software . . . . .	113
Additional resources . . . . .	115

Installing other operating systems . . . . .	115
Recovering from a POST/BIOS update failure . . . . .	115
Replacing the battery . . . . .	116
<b>Chapter 7. Getting help, service, and information . . . . .</b>	<b>121</b>
Service support . . . . .	121
Before you call for service . . . . .	123
Getting customer support and service . . . . .	123
Using the World Wide Web . . . . .	123
Using electronic support services . . . . .	124
Getting information by fax . . . . .	124
Getting help online . . . . .	125
Getting help by telephone . . . . .	125
Getting help around the world . . . . .	127
Purchasing additional services . . . . .	127
Enhanced PC support line . . . . .	127
900-number operating system and hardware support line . . . . .	128
Network and server support line . . . . .	128
Ordering support line services . . . . .	128
Warranty and repair services . . . . .	129
Ordering publications . . . . .	130
<b>Appendix A. Using the Software Selections CD . . . . .</b>	<b>131</b>
Features of the CD . . . . .	131
Starting the CD . . . . .	132
Using the Software Selections program . . . . .	132
<b>Appendix B. Rack mounting your computer . . . . .</b>	<b>135</b>
Preparing the computer for rack installation . . . . .	136
Preparing the rack enclosure . . . . .	138
Installing the computer in the rack enclosure . . . . .	143
<b>Appendix C. Computer records . . . . .</b>	<b>147</b>
Serial numbers and keys . . . . .	147
Device records . . . . .	148
<b>Appendix D. Viewing the license agreement . . . . .</b>	<b>151</b>
<b>Appendix E. Product warranties and notices . . . . .</b>	<b>153</b>
Warranty Statements . . . . .	153
IBM Statement of Limited Warranty for United States, Puerto Rico, and Canada (Part 1 - General Terms) . . . . .	153
IBM Statement of Warranty Worldwide except Canada, Puerto Rico, Turkey, United States (Part 1 - General Terms) . . . . .	156
Part 2 - Worldwide Country-Unique Terms . . . . .	159
Notices . . . . .	164
Year 2000 readiness and instructions . . . . .	164

Trademarks . . . . .	165
Electronic emission notices . . . . .	165
Other notices . . . . .	167
Power cord notice . . . . .	169
<b>Index . . . . .</b>	<b>171</b>

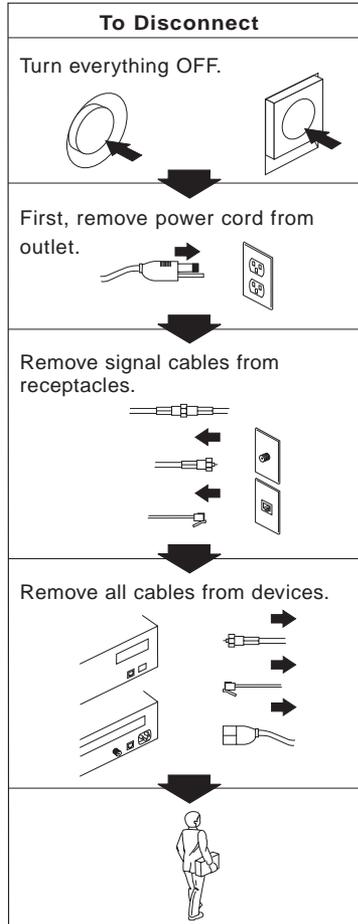
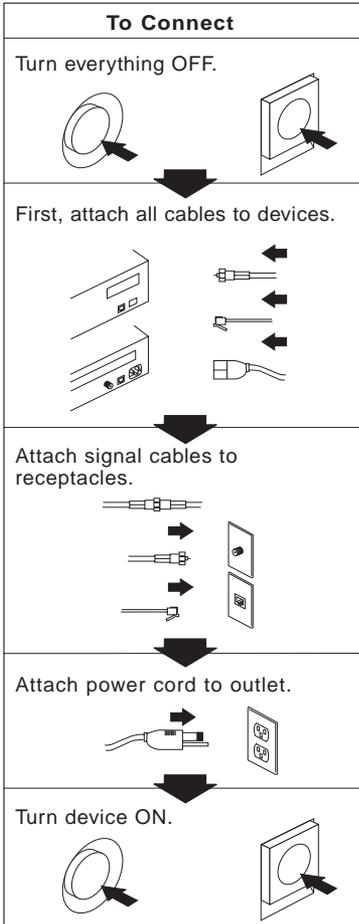


# Safety information



## DANGER:

Electrical current from power, telephone, and communication cables is hazardous. To avoid shock hazard, connect and disconnect cables as shown below when installing, moving or opening the covers of this product or attached devices. The power cord must be used with a properly grounded outlet.



## DANGER

**To avoid a shock hazard, do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

---

## Laser compliance statement

Some IBM Personal Computer models are equipped from the factory with a CD-ROM drive or a DVD-ROM drive. CD-ROM drives and DVD-ROM drives are also sold separately as options. CD-ROM drives and DVD-ROM drives are laser products. These drives are 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, these drives are 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 or a DVD-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.**

Removing the covers of the CD-ROM drive or DVD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive or DVD-ROM drive. **Do not remove the drive covers.**

Some CD-ROM drives and DVD-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.**

Certains modèles d'ordinateurs personnels sont équipés d'origine d'une unité de CD-ROM ou de DVD-ROM. Mais ces unités sont également vendues séparément en tant qu'options. L'unité de CD-ROM/DVD-ROM est

un appareil à laser. Aux États-Unis, l'unité de CD-ROM/DVD-ROM est certifiée conforme aux normes indiquées dans le sous-chapitre J du DHHS 21 CFR relatif aux produits à laser de classe 1. Dans les autres pays, elle est certifiée être un produit à laser de classe 1 conforme aux normes CEI 825 et CENELEC EN 60 825.

Lorsqu'une unité de CD-ROM/DVD-ROM est installée, tenez compte des remarques suivantes:

### **ATTENTION**

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

L'ouverture de l'unité de CD-ROM/DVD-ROM peut entraîner un risque d'exposition au rayon laser. Pour toute intervention, faites appel à du personnel qualifié.

Certaines unités de CD-ROM/DVD-ROM peuvent contenir une diode à laser de classe 3A ou 3B. Tenez compte de la consigne qui suit:

### **DANGER**

**Rayonnement laser lorsque le carter est ouvert. Évitez toute exposition directe des yeux au rayon laser. Évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques.**

---

## Lithium battery notice

### CAUTION:

Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

### *Do not:*

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

### ATTENTION

Danger d'explosion en cas de remplacement incorrect de la batterie.

Remplacer uniquement par une batterie IBM de type 33F8354 ou d'un type équivalent recommandé par le fabricant. La batterie contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

### *Ne pas :*

- Lancer ou plonger dans l'eau
- Chauffer à plus de 100°C (212°F)
- Réparer ou désassembler

Mettre au rebut les batteries usagées conformément aux règlements locaux.

---

## About this book

This book will help you become familiar with your IBM® IntelliStation® Z Pro and its many features. It describes how to set up, configure, operate, maintain, and install options in, your computer. Information about solving problems, getting help, and using software is also included in this book.

---

## Related information

The following documentation contains additional information about your computer. If your computer comes with IBM-preinstalled software, you might be able to view these documents using Access IBM. See page “Using Access IBM” on page 19 for information about how to use Access IBM. The IBM documents listed below can also be found at <http://www.ibm.com> on the World Wide Web.

- *Understanding Your Computer*

This online publication is provided on the *Software Selections CD* that comes with your computer. It includes general information about using personal computers and in-depth information about the specific features of your computer.

- *Hardware Maintenance Manual*

This publication contains information for trained service technicians. It can be found at <http://www.ibm.com/pc/support> on the World Wide Web. Type the machine type/model number (type model) into the **Quick Path** field and click **Go**. Click **Online publications** and then click **Hardware Maintenance Manuals**.

- *Technical Information Manual*

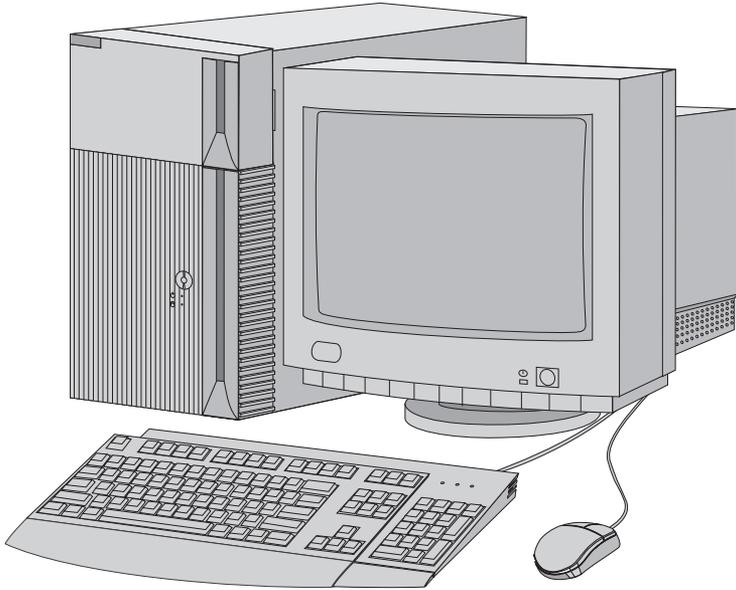
This publication contains information for individuals who want to know more about the technical aspects of their computer. It can be found at <http://www.ibm.com/pc/us> on the World Wide Web. Type the machine type/model number (type model) into the **Quick Path** field and click **Go**. Click **Online publications** and then click **Technical Manuals**.

- README files on the *Device Driver and IBM Enhanced Diagnostics CD*  
Several README files on this CD contain information about the various adapters and devices that might be attached to your computer.
- Adaptec SCSI documentation  
This documentation, included on the *Software Selections CD*, contains information and instructions for installing and configuring small computer systems interface (SCSI) device drivers and devices.



---

## Chapter 1. IBM IntelliStation Z Pro overview



Thank you for selecting an IBM IntelliStation Z Pro professional workstation. Your computer incorporates many of the latest advances in computer technology and is easy to expand and upgrade as your needs change.

This section provides an overview of the computer features, preinstalled software, and system specifications.

---

## Features

### System summary

Your computer might not include all of the features described here. For a listing of features, refer to the System Summary screen in the Configuration/Setup Utility program. See Chapter 4, “Using the Configuration/Setup Utility program” on page 37 for more information.

### Microprocessor

Up to two Intel® Pentium® III Xeon® microprocessors with 512 KB of full speed L2 cache memory and 256 KB of advanced transfer cache memory integrated into the microprocessor

### Memory

- Support for:
  - 2.5 V, 184-pin, Rambus inline memory modules (RIMMs) with checking and error correcting code (ECC) or non-ECC Rambus dynamic random access memory (RDRAM)
  - 64 MB, 128 MB, and 256 MB RIMMs for a maximum of 2 GB
  - RIMM heights up to 34.7 mm (1.375 inches)
- 512 KB flash memory for system programs

### Removable-media drives

- One 3.5-inch, 1.44 MB diskette drive
- One integrated drive electronics (IDE) CD-ROM drive

### Internal hard disk drives

One small computer systems interface (SCSI) hard disk drive

### Graphics subsystem

High-performance accelerated graphics port (AGP) adapter

### Audio subsystem

- Integrated audio controller compatible with Microsoft® Windows® Sound System
- Supports most Sound Blaster applications

### 10/100 Megabits per second integrated Ethernet subsystem

- Support for Wake on LAN®
- Support for Alert on LAN™

## **System management features**

- Remote Program Load (RPL) and Dynamic Host Configuration Protocol (DHCP)
- Wake on LAN
- Wake on Alarm
- Alert on LAN
- Remote Administration (ability to update POST and BIOS over the network)
- Automatic power-on startup
- System Management (SM) BIOS and software
- Ability to store POST hardware test results
- Built-in system management hardware (temperature sensors, fan-speed monitor, chassis-intrusion detector, power supply and microprocessor voltage monitor, and power-switch bypass)
- Advanced Power Management (APM) support
- Advanced Configuration and Power Interface (ACPI) support

## **Input/output features**

- 25-pin, Extended Capabilities Port (ECP)/Extended Parallel Port (EPP) connector
- Two 9-pin, 16550 universal asynchronous receiver/transmitter serial connectors
- Two 4-pin, Universal Serial Bus (USB) port connectors
- Mouse connector
- Keyboard connector
- Monitor connector (on the AGP adapter)
- Three audio connectors (line out/headphone out, line in, and microphone)
- MIDI/joystick connector
- External SCSI connector
- Ethernet connector

## **SCSI channels**

2 SCSI channels for internal and external SCSI devices

## **Expansion capability**

- Up to six available drive bays
  - One 5.25-inch bay available for removable media
  - 3.25-inch bays available for up to six 1.0-inch hard disk drives or up to four 1.6-inch hard disk drives
- Four 32-bit 33 MHz PCI expansion slots
- Two 64-bit 66 MHz PCI expansion slots
- Support for additional internal and external SCSI devices (the number of internal devices that can be installed is limited by the number of available drive bays, power, and cooling requirements)

- Support for additional IDE or EIDE devices

## **Power**

- Automatic switching between ranges, 90–137/180–265 V ac
- Automatic switching, 57–63/47–53 Hz input frequency range
- Built-in overload and surge protection

## **Security features**

- Cover lock and keys (located behind the CD-ROM cover door)
- Support for the addition of a U-bolt and lockable cable
- Power-on and administrator passwords
- Startup sequence control
- Startup without diskette drive, keyboard, or mouse
- Unattended start mode
- Diskette and hard disk I/O control
- Serial and parallel port I/O control
- Alert on LAN
- Security profile by device
- IBM security solutions

## **Operating systems (supported)**

- Microsoft Windows NT® Workstation Version 4.0
- Microsoft Windows® 2000 Professional

## **Operating systems (tested for compatibility)<sup>1</sup>**

- Microsoft Windows 98 Second Edition (SE)
- IBM PC DOS Versions 7.0 and DOS 2000
- MS-DOS® Version 6.22
- Novell NetWare Versions 3.2, 4.2, 5.0 (not supported on all models)
- SCO OpenServer 5.05 (not supported on all models)
- Linux Version 6.0

---

## **Software**

Your computer might come with Microsoft Windows NT Workstation or

---

<sup>1</sup> The operating systems listed here are being tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by IBM as compatible with your computer following the publication of this book. Corrections and additions to the list are available in the IBM online compatibility report, which can be found on the World Wide Web. For World Wide Web pages, see Chapter 7, “Getting help, service, and information” on page 121.

Windows 2000 Professional<sup>2</sup> and a variety of software, including application programs, diagnostic tools, and device drivers. Some of the software is *preinstalled* and some is on the *Software Selections CD* and the *Device Driver and IBM Enhanced Diagnostics CD*. Software, other than Microsoft software, is licensed under the terms of the IBM International License Agreement for Non-Warranted Programs. Appendix D, “Viewing the license agreement” on page 151 of this book contains instructions for viewing the license agreement.

## Preinstalled software

Your preinstalled software includes the following:

- Access IBM, which provides a central menu on your desktop where you can easily access programs and utilities for many of the common tasks that you might want to perform.
- Device drivers for factory-installed features.
- The latest Service Pack that is available at the time of manufacture. For important information on this software, see “Service Pack 6a (Windows NT Workstation only)” on page 6.
- Internet Explorer, a program for browsing the World Wide Web. See “Setting up Internet Explorer” on page 20 for a description.
- ConfigSafe, a utility that can be used to take a “snapshot” of the current operating system configuration. ConfigSafe automatically takes a snapshot of the initial operating system configuration when you start up your computer for the first time. See “Using the ConfigSafe program” on page 112 for information about ConfigSafe.

Additional information about your preinstalled software is in “Getting started” on page 16.

### Important:

1. No backup diskettes for your preinstalled software come with your computer. However, the *Software Selections CD* contains most of your IBM-preinstalled programs.

In addition, your computer comes with two or three IBM *Product Recovery CDs*. These CDs contain the operating system. If your computer has Windows 2000 Professional preinstalled, you have the option to recover or install Windows NT Workstation, using the IBM *Product Recovery CDs*. For more information about recovering or

---

<sup>2</sup> The Microsoft Certificate of Authenticity is your assurance that the Windows software in your computer is legally licensed from Microsoft Corporation.

installing the operating system, see “Using the IBM Product Recovery CDs” on page 113.

2. The device drivers and some programs are also available at <http://www.ibm.com/pc/us/files.html> on the World Wide Web and on the *Device Driver and IBM Enhanced Diagnostics CD*.

## Service Pack 6a (Windows NT Workstation only)

Service Pack 6a is a Windows NT Workstation update that Microsoft makes available to Windows NT Workstation users.

To install device drivers without affecting the Service Pack installation, you must install the device drivers from the I386 directory on drive C. If you install device drivers from any directory or device other than the I386 directory on drive C, you will have to reinstall Service Pack 6a.

To reinstall Service Pack 6a, double-click **Service Pack 6a** on the desktop. Then click **OK**.

Service Pack 6a is available at <http://www.ibm.com/pc/us/news/msinfo.html> from the World Wide Web.

## Additional software

In addition to your IBM-preinstalled programs and device drivers, additional software is provided on the *Software Selections CD*, the *Device Driver and IBM Enhanced Diagnostics CD*, or other CDs. You decide which programs to install based on your needs.

Following is a list of some of the software that is provided on the *Software Selections CD*. Note that the software on the CD is subject to change and might be different from the following list. See Appendix A, “Using the Software Selections CD” on page 131 for further information about the CD.

### **Norton AntiVirus for IBM**

A product that detects and removes viruses from your computer.

### **ConfigSafe**

A configuration tracking and recovery tool. It provides features that you or support personnel can use to restore your Windows NT Workstation configuration if the configuration becomes damaged or unusable. ConfigSafe can also be a valuable troubleshooting tool, especially if problems develop after you install a new application or adapter.

<b>CoSession Remote 32</b>	A communication tool that an IBM technician or in-house administrator can use to diagnose and fix computer problems from a remote location over a LAN.
<b>IBM Universal Manageability Services (UM Services)</b>	Software that you can use to view detailed information about your computer hardware and software, browse Desktop Management Interface (DMI) information, set up alerts, monitor a variety of system resources, and manage your asset security. For more information, go to <a href="http://www.ibm.com/pc/ww/software">http://www.ibm.com/pc/ww/software</a> on the World Wide Web and search for Universal Manageability Services.
<b>IBM Universal Manageability Desktop Extensions (UM Desktop Extensions)</b>	These Life Cycle tools plug into UM Services to provide enhanced network management. For more information, go to <a href="http://www.ibm.com/pc/ww/software">http://www.ibm.com/pc/ww/software</a> on the World Wide Web and search for Universal Manageability Desktop Extensions.
<b>PC-Doctor for Windows</b>	Diagnostic tools that you can use within your Windows operating system. In addition to isolating hardware problems, these tools also provide information about your computer operating environment and some software components. Support documentation is built into the Help system. (See also “IBM Enhanced Diagnostics” on page 109.)
<b>Netscape Communicator</b>	You can use Netscape Communicator to navigate your company intranet or the World Wide Web. Netscape Communicator provides a full suite of Internet functions, including e-mail, threaded discussion groups (newsgroups), and support for the latest features on the World Wide Web.
<b>IBM Internet Connection</b>	You can use IBM Internet Connection to dial into the Internet. You can use this software with the Netscape Navigator browser, which is available on your IBM <i>Software Selections CD</i> .
<b>IBM Update Connector™</b>	Update Connector provides an easy-to-use tool to update software data from an IBM server to your computer over an active Internet connection. Once installed, you only need to start the program to be connected to the Update Connector database. Once connected, Update Connector automatically determines whether available updates are appropriate and, if so, downloads and installs them at your convenience. Update Connector automatically recognizes machine types and models as well as software versions and other criteria when determining which updates to download.

---

## System specifications

### Dimensions

- Height: 440 mm (17.3 in.)
- Width: 216 mm (8.50 in.)
- Depth: 606 mm (23.9 in.)

### Computer Weight

- Minimum configuration as shipped: 25.0 kg (55 lb)
- Maximum configuration: 29.5 kg (65 lb)

### Environment

- Air temperature:
  - Operating: 10° to 35° C (50° to 95° F)
  - Storage: -40° to 60° C (-40° to 140° F)
- Humidity:
  - Operating: 8% to 80%
  - Storage: 8% to 80%
- Maximum altitude: 2134 m (7000 ft)

### Electrical input

- Input voltage:
  - Low range:
    - Minimum: 90 V ac
    - Maximum: 137 V ac
    - Input frequency range: 57 – 63 Hz
  - High range:
    - Minimum: 180 V ac
    - Maximum: 265 V ac
    - Input frequency range: 47 – 53 Hz
- Input kilovolt-amperes (kVA, approximately):
  - Minimum configuration as shipped: 0.52 kVA
  - Maximum configuration: 1.50 kVA

**Note:** Power consumption and heat output vary depending on the number and type of optional features installed and the power-management features in use.

### Heat output

- Approximate heat output in British thermal units (Btu) per hour:
  - Minimum configuration: 340 Btu/hr (100 watts)
  - Maximum configuration: 2385 Btu/hr (700 watts)

### Air flow

Approximately 0.56 cubic meters per minute (50 cubic feet per minute)

## Acoustical noise-emission values

- Average sound-pressure levels:
  - At operator position:
    - Idle: 43 dBA
    - Operating: 45 dBA
  - At bystander position—1 meter (3.3 ft):
    - Idle: 39 dBA
    - Operating: 40 dBA
- Declared (upper limit) sound power levels:
  - Idle: 5.3 bels
  - Operating: 5.5 bels

**Note:** These levels were measured in controlled acoustical environments according to procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in your location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound power levels indicate an upper limit, below which a large number of computers will operate.



---

## Chapter 2. Setting up your computer

This chapter provides the information necessary for setting up your computer and preparing it to run your applications.

### — Before You Begin —

Read “Safety information” on page ix before setting up your computer.

**CAUTION:**

**Weight exceeds 18.1 kg (40 lbs.). Use safe lifting practices when lifting your computer.**

**Attention:** The handle located on the bottom of the computer is intended for sliding the computer across the floor. Do not attempt to lift the computer by this handle.

You will need the following:

- Computer
- Computer power cord
- Keyboard
- Mouse
- Monitor (sold separately with signal cable and power cord)

If you are missing an item, contact your place of purchase.

---

## Arranging your workspace

To get the most from your computer, arrange the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

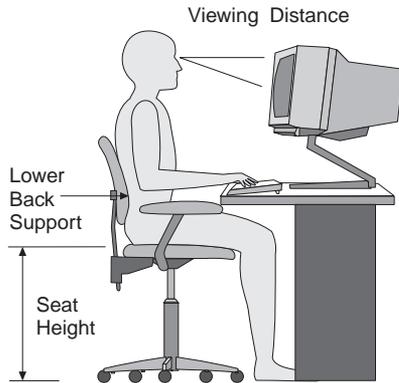
### Comfort

Although no single working position is ideal for everyone, the following guidelines will help you find a position that suits you best.

Choose a good chair to reduce the frequency of fatigue from sitting in the same position for a long time. The backrest and seat should adjust independently and provide good support. The seat should have a curved front to relieve pressure on the thighs. Adjust the seat so that your thighs

are parallel to the floor and your feet are either flat on the floor or on a footrest.

When using the keyboard, keep your forearms parallel to the floor and your wrists in a neutral, comfortable position. Try to keep a light touch on the keyboard and your hands and fingers relaxed. You can change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.



Adjust the monitor so that the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance, usually 51 to 61 cm (20 to 24 in.), and position it so that you can view it without having to twist your body.

## Glare and lighting

Position the monitor to minimize glare and reflections from overhead lights, windows, and other light sources. Place the monitor at right angles to windows and other light sources whenever possible. Reduce overhead lighting, if necessary, by turning off lights or using lower wattage bulbs. If you install the monitor near a window, use curtains or blinds to block the sunlight. You might have to adjust the Brightness and Contrast controls on the monitor as the room lighting changes throughout the day.

Where it is impossible to avoid reflections or to adjust the lighting, place an antiglare filter over the screen. These filters might affect the clarity of the image on the screen; try them only after you have exhausted other methods of reducing glare.

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically using a soft cloth moistened with a nonabrasive liquid glass cleaner.

## Air circulation

Your computer and monitor produce heat. The computer has fans that pull in fresh air and force out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the computer and monitor so that nothing blocks the air vents; usually, 51 mm (2 in.) of air space is sufficient. Also, make sure the vented air is not blowing on someone else.

## Electrical outlets and cable lengths

The location of electrical outlets and the length of power cords and cables that connect to the monitor, printer, and other devices might determine the final placement of your computer.

When arranging your workspace:

- Avoid the use of extension cords. Whenever possible, plug the computer power cord directly into an electrical outlet.
- Keep power cords and cables neatly routed away from walkways and other areas where they might be accidentally dislodged.

For more information about power cords, see “Power cord notice” on page 169.

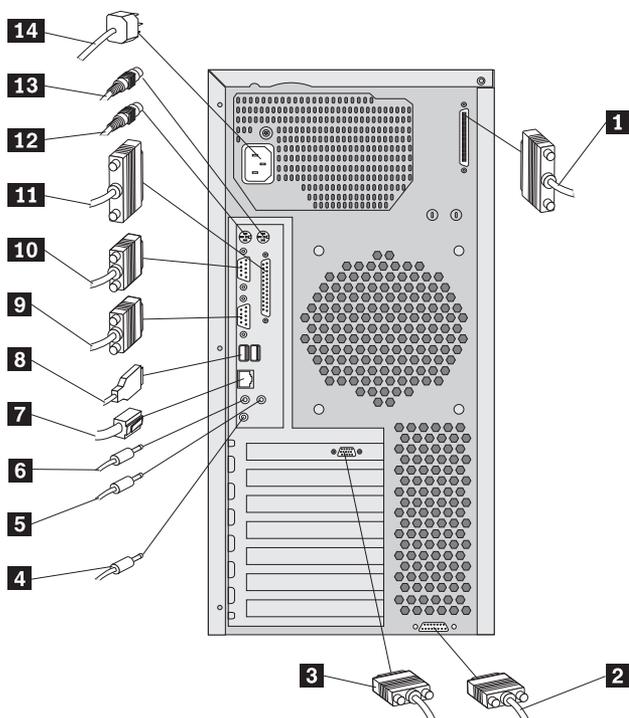
---

## Connecting computer cables

Read the following before connecting cables:

- Connect all device cables before plugging any power cords into an electrical outlet.
- Connect the monitor cable to the monitor if it is not already attached.
- If your computer comes with a ScrollPoint® mouse, the first time you start up your computer your mouse ScrollPoint function might not work. The ScrollPoint mouse function will be enabled after you shut down and restart your computer.
- Connect the power cords to the computer, monitor, and other devices first before plugging them into an electrical outlet.
- In some circumstances, the computer might not turn off immediately when you press the power switch. If this happens, hold the power switch down for 5 to 10 seconds until the computer turns off.

Use the following illustration to help you connect cables to the rear of your computer. Some connectors are color-coded. You might not have devices for all connectors shown here.



- |                                       |                              |
|---------------------------------------|------------------------------|
| <b>1</b> SCSI connector               | <b>8</b> USB connector       |
| <b>2</b> MIDI/joystick connector      | <b>9</b> Serial connector 2  |
| <b>3</b> Monitor connector            | <b>10</b> Serial connector 1 |
| <b>4</b> Line out/headphone connector | <b>11</b> Parallel connector |
| <b>5</b> Microphone in connector      | <b>12</b> Keyboard connector |
| <b>6</b> Audio line in connector      | <b>13</b> Mouse connector    |
| <b>7</b> Ethernet connector           | <b>14</b> Power connector    |

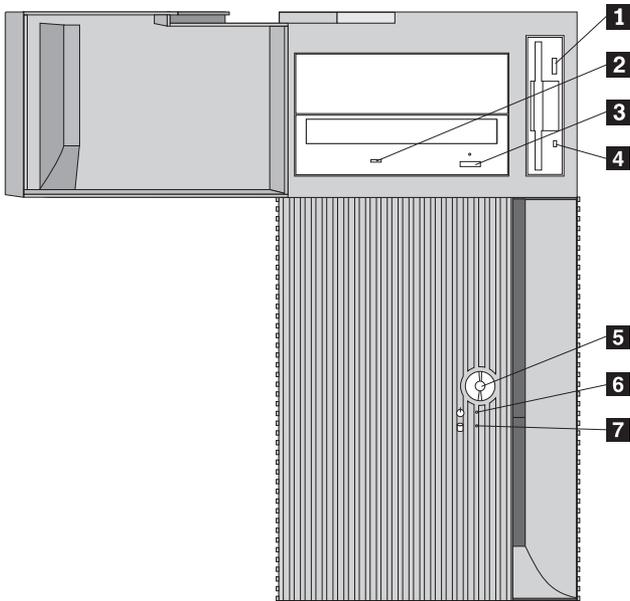
**Note:** Windows NT Workstation does not support the use of the USB port.

---

## Controls and status indicators

The button at the front of your computer enables you to turn on and turn off the computer. The lights are status indicators that tell you when a certain device, such as the hard disk drive, is in use.

The following illustration shows the power control and status indicators for your computer.



- 1** Diskette eject button
- 2** CD-ROM drive light
- 3** CD-ROM eject button
- 4** Diskette drive light

- 5** Power switch
- 6** Power-on light
- 7** Hard disk drive light

The following list describes the controls and status indicators for your computer.

- **Power switch:** Press this switch to turn your computer on or off. Do not turn off your computer if the in-use light for the hard disk drive or diskette drive is on.

**Note:** The power switch normally operates with a single touch. However, in some circumstances the computer might not immediately turn off. If this happens, hold the power switch down for 5 to 10 seconds, and the computer will then turn off.

- **Power-on light:** This status indicator lights when you turn on your computer.
- **Hard disk drive light:** When this light is on, it indicates that the hard disk drive heads are being positioned or that your computer is reading from or writing to the hard disk.

- **Diskette eject button:** Push this button to release a diskette from the drive.
- **Diskette drive light:** When this light is on, it indicates that the diskette drive heads are being positioned or that your computer is reading from or writing to a diskette.
- **CD-ROM eject button:** Push this button to eject a CD from the drive.
- **CD-ROM drive light:** When this light is on, it indicates that your computer is reading from a CD.

---

## Getting started

This section contains the following information to help you get started using your computer:

- What you need before and what happens after you start your computer for the first time
- Starting your computer
- Accessing information and performing tasks from Access IBM on the desktop
- Setting up your hard disk partitions
- Creating an emergency repair disk
- Shutting down your computer

See “Related information” on page xiii for sources of other information about your computer.

For information about IBM-installed software, see “Software” on page 4. Additional programs are on the *Software Selections CD* and, in some cases, on other CDs and diskettes. If you are installing your own operating system, make sure that you install the device drivers after you install your operating system. Device drivers are provided on the *Device Driver and IBM Enhanced Diagnostics CD* and are available on the World Wide Web. Installation instructions are provided with the media or in README files on the diskettes or CDs.

### Important

1. You must complete the setup program before you can access your operating system for the first time.
2. After you have started the setup program, you must complete it before turning off your computer; otherwise, unexpected results might occur.

## Running the setup program

Before you start the setup procedure, you need the following:

- The Microsoft operating system manual that came with your computer in case you need more detailed information than is provided in this chapter
- The Microsoft Certificate of Authenticity (attached to the cover of the Microsoft operating system manual that came with your computer, or to your computer itself) for the Product ID number
- Network information (if applicable) from your network administrator
- The printer model and port that is used by the printer, if a printer is attached directly to your computer

The setup program appears when you start the computer for the first time, or after you have recovered your operating system. The program will prompt you to make choices or type information as required.

### Notes:

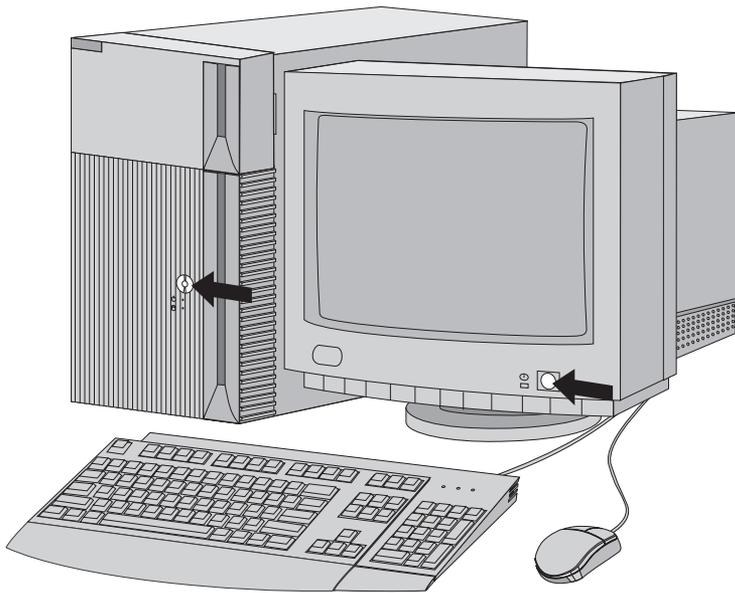
1. If the setup program has already been run once, it will not appear when you start your computer. (If you need more detailed information, see the Microsoft operating system manual that came with your computer.)
2. The setup program that appears when you start the computer is slightly different from the one that is described in your Microsoft operating system manual. Some choices described in your Microsoft operating system manual do not appear because they are preset.
3. During the setup procedure, you must indicate that you accept the Microsoft operating system license agreement, and you might need to type in the Product ID number from your Certificate of Authenticity when prompted. The Certificate of Authenticity is attached to the cover of your Microsoft operating system manual or to the computer itself.

If you are using Windows NT Workstation, you will be prompted to press Ctrl+Alt+Delete to display the logon window, after the setup procedure is completed and the computer is restarted. When prompted, press Ctrl+Alt+Delete to display the logon window. After the logon procedure is completed, the Windows NT Workstation desktop appears.

## Starting your computer for the first time

To start your computer:

1. Turn on all devices connected to the computer.
2. Press and release the power switch on your computer.



**Note:** If you suspect a problem, see Chapter 6, “Troubleshooting” on page 87.

## Registering your computer

Registering takes only a few minutes and helps IBM provide better service to you. The registration program gathers your name, address, voice and fax telephone numbers, e-mail address, machine type, and machine serial number. When your registration information is received, it is placed into a central database that IBM technical support representatives can access for information about your computer when you call for technical assistance, saving you time on the phone. In addition, comments about your computer are reviewed by a team dedicated to customer satisfaction and are taken into consideration in making improvements to IBM computers.

If you choose not to register your computer during the setup procedure, you can use Access IBM at a later time to register your computer. For more information on registering your computer with Access IBM, see “Using Access IBM” on page 19.

## Using Access IBM

Access IBM provides menus on your computer desktop where you can easily access programs and utilities for many of the common tasks that you might want to perform.

The Access IBM menu on the desktop includes the following items:

- Start up
- Customize
- Get help
- View license and warranty

Click on one of the main menu items to access the subtopics.

### Important

You must have Internet Explorer 4.0 or higher installed on your computer to use Access IBM.

### To remove Access IBM from your desktop:

1. From the main menu, click **Customize**
2. From the Customize menu, click **Customize Access IBM**
3. Follow the instructions on the screen

---

## Additional setup tasks

This section includes information about several tasks that you might want to perform as part of setting up your computer. These tasks are optional, and are helpful if performed when setting up your computer for the first time.

- Setting up Internet Explorer
- Creating an IBM Enhanced Diagnostics Diskette
- Creating an emergency repair diskette
- Installing other operating systems

## Setting up Internet Explorer

Internet Explorer is a tool that you can use to navigate your company intranet or the World Wide Web.

**Note:** You *must* be connected to your company intranet or to the World Wide Web (or both) to be able to use Internet Explorer. For information on connecting to the Internet, as well as further information about Internet Explorer, see the Microsoft operating system manual that comes with your computer.

## Creating an IBM Enhanced Diagnostics Diskette

The *IBM Enhanced Diagnostics* Diskette is a self-starting diagnostic diskette used to test hardware components of your computer.

To create this diskette:

1. From the Access IBM main menu, click **Start up**.
2. From the **Start up** menu, click **Create a diagnostic diskette**. A cue card with instructions for creating a diagnostic diskette appears.
3. Follow the instructions on the screen.

You can also download the diagnostic program image from the IBM Web site at <http://www.ibm.com/pc/support> on the World Wide Web. See “IBM Enhanced Diagnostics” on page 109.

## Creating an emergency repair diskette

At your earliest opportunity, create an emergency repair disk for your operating system. It is important that you create this diskette, which can be used for recovery purposes. If you add features to your computer, create a new emergency repair disk to ensure that the diskette reflects your current system configuration. Additional information about creating and using the diskette is in your Microsoft operating system manual.

## Installing other operating systems

If you install (or reinstall) another operating system, you might need additional software or device drivers. Hardware-specific support software is available on the *Device Driver and IBM Enhanced Diagnostics CD*. If you experience problems with device drivers installed from this CD, you can obtain updated device drivers at <http://www.ibm.com/support> on the World Wide Web.

Before installing any operating system, be sure you obtain the latest updates. Contact the operating system manufacturer or, if applicable, check the manufacturer's World Wide Web site to obtain the updates.

To install an operating system, follow the instructions in the documentation provided with the operating system and any updates. Then, follow the instructions in Appendix A, "Using the Software Selections CD" on page 131 to install the support software.

Additional information about operating systems might be available at <http://www.ibm.com/pc/support> on the World Wide Web.

---

## **Finishing the installation**

Locate identification numbers (serial and model/type) and record this information in Appendix C, "Computer records" on page 147.



---

## Chapter 3. Operating and caring for your computer

This chapter provides information to help you in the day-to-day use and care of your computer.

---

### Starting your computer

For instructions to start your computer, see “Starting your computer for the first time” on page 18.

What you see and hear when you start up your computer depends on the features installed and the settings in the Configuration/Setup Utility program.

If Power-on self test (POST) detects a problem, you hear multiple beeps (or no beep) and an error message might appear on the screen. Write down any error code numbers and descriptions. See Chapter 6, “Troubleshooting” on page 87 for more information.

During POST, the following message appears:

Press F12 for Network Boot

Press F1 for Configuration/Setup

If your computer is properly connected and configured to load a startup image from the network, a request is sent and a startup image is loaded into your computer. If the request is unsuccessful or there is no network connection, the operating system and application programs are loaded from the hard disk.

Your computer can “wake up” and be started remotely over a network if it has a properly configured network connection. For more information, see “Wake on LAN” on page 27 and “Changing and viewing the startup sequence” on page 49.

If the system hardware configuration has changed or an error is detected, the Configuration/Setup Utility program menu might be displayed when you press Enter.

---

## Using video features

Your computer has an accelerated graphics port (AGP) graphics adapter that uses a standard video protocol for displaying text and graphic images on a monitor screen. The adapter supports a variety of *video modes*. Video modes are different combinations of resolution, refresh rate, and color defined by a standard video protocol for displaying text or graphics. For more information on video modes, see *Understanding Your Computer* provided on the *Software Selections CD* that comes with your computer and *Technical Information Manual* available on the World Wide Web.

## Video device drivers

To take full advantage of the graphics adapter in your computer, some operating systems and application programs require custom software, known as video device drivers. These device drivers provide support for greater speed, higher resolution, more available colors, and flicker-free images.

Device drivers for the graphics adapter and a README file with instructions for installing the device drivers are provided on the *Device Driver and IBM Enhanced Diagnostics CD* that comes with your computer. If your computer has IBM-preinstalled software, video device drivers have already been installed on the hard disk. However, you can use the device driver installation instructions if you need to reinstall the device drivers or if you need information about obtaining and installing updated device drivers.

See Chapter 7, “Getting help, service, and information” on page 121 for more information.

## Changing monitor settings

To get the best possible image on your screen and to reduce flicker, you might need to reset the resolution and refresh rate of your monitor. You can view and change monitor settings through your operating system using the instructions provided in the README files on the *Device Driver and IBM Enhanced Diagnostics CD* (in the video device driver) or the *IBM Product Recovery CDs* that come with your computer. See your operating system documentation for more information on monitor settings.

### Attention

Before you change any monitor settings, be sure to review the information that comes with your monitor. Using a resolution or refresh rate that is not supported by your monitor might cause the screen to become unreadable and could damage the monitor. The information that comes with your monitor usually includes the resolutions and refresh rates that the monitor supports. If you need additional information, contact the manufacturer of the monitor.

To minimize screen flicker and jitter, set your monitor for the highest noninterlaced refresh rate that the monitor supports. If your monitor complies with the VESA Display Data Channel (DDC) standard, it is probably already set to the highest refresh rate that the monitor and video controller can support. If you are not sure if your monitor is DDC-compliant, see the documentation provided with the monitor.

---

## Using audio features

Your computer has an integrated audio controller that supports Sound Blaster applications and is compatible with the Microsoft Windows Sound System. Your computer also has a single internal speaker and three audio connectors. Using the audio controller, you can record and play back sound and music and enjoy sound with multimedia applications. Optionally, you can connect two stereo speakers to the line-out connector to enjoy better sound with multimedia applications.

The audio connectors in your computer are 3.5 mm (1/8-in.) mini-jacks. A description of the connectors follows. (For the location of the connectors, see “Connecting computer cables” on page 13.)

### Line out/headphone

This jack is used to send audio signals from the computer to external devices, such as powered speakers with built-in amplifiers, headphones, multimedia keyboards, or the audio line-in jack on a stereo system.

**Note:** The internal speaker in your computer is disabled when anything is connected to this connector on your computer.

### Audio line in

This jack is used to accept audio signals from external devices, such as line output from a stereo, television, or musical instrument, into the computer sound system.

## Microphone in

This jack is used to connect a microphone to your computer when you want to record voice or other sounds on the hard disk. This jack can also be used by speech recognition software.

**Note:** If you experience interference or speaker feedback while recording, try reducing the microphone recording volume (gain).

Procedures for recording and playing back sound vary by operating system. See your operating system documentation for information and instructions.

---

## Updating system programs

System programs are the basic layer of software built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the Configuration/Setup Utility program. POST is a set of tests and procedures that is performed each time you turn on your computer. BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can understand. You can use the Configuration/Setup Utility program to view and change the configuration and setup of your computer.

System programs are stored in an electrically erasable programmable read-only module (EEPROM) on the system board. This is sometimes referred to as *flash memory*.

IBM occasionally makes changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see Chapter 7, “Getting help, service, and information” on page 121).

You can update system programs by starting your computer using a flash update diskette or by using the Remote Administration feature, if it is enabled. Instructions for using system programs updates are included in a README file provided with the downloadable files. See “Setting Remote Administration” on page 42 for more information.

---

## Managing your computer

Your computer comes with features that a network administrator or file server can use to remotely manage and control your computer. For more information about system management, see *Understanding Your Computer* (provided on the *IBM Software Selections CD* that comes with your computer).

IBM Universal Manageability Services (UM Services) streamline and automate personal computer systems management and support tasks, such as asset deployment and tracking. These utilities are available for IBM PCs at no additional charge, helping to reduce total cost of ownership of your networked computers so that you can focus vital company resources on essential business activities.

Go to <http://www.ibm.com/pc/us/software/sysmgmt/> on the World Wide Web and select **Products/Downloads** for more information about available system management programs.

### Wake on LAN

A network administrator can use the Wake on LAN feature to turn on your computer from a remote location. When Wake on LAN is used with network-management software, many types of functions, such as data transfers, software updates, and POST or BIOS updates to your computer can be initiated remotely.

**Note:** If the computer power cord is plugged into a surge protector or power strip, make sure that when you turn off power you use the computer power switch and not the surge protector or power strip switch. Otherwise, the Wake on LAN feature will not work.

### Alert on LAN

Your computer supports Alert on LAN technology. Alert on LAN technology provides notification of changes in the computer system even if the computer is turned off. Working with desktop management interface (DMI) and Wake on LAN technologies, Alert on LAN helps to manage and monitor the hardware and software features of your computer.

Alert on LAN generates notifications when the computer cover has been removed, an error is detected during POST, or the computer is disconnected from the network or unplugged from the electrical outlet. Alert on LAN works in conjunction with UM Services.

## **Remote Program Load or Dynamic Host Configuration Protocol**

A network administrator can use Remote Program Load (RPL) or Dynamic Host Configuration Protocol (DHCP) to control your computer. If you use RPL with software such as IBM LANClient Control Manager™, you can use a feature called *Hybrid RPL*, which installs hybrid images (or files) on the hard disk. If your computer is a Hybrid RPL client, each time the computer starts from the network, LANClient Control Manager downloads a small *bootstrap* program to your computer hard disk and avoids the network traffic associated with a standard RPL.

## **Remote Administration**

A network administrator can use the Remote Administration feature to remotely update the POST and BIOS in your computer.

Network-management software, such as LANClient Control Manager, is required in order to take advantage of this feature. See “Setting Remote Administration” on page 42 for configuration information.

## **LANClient Control Manager**

LANClient Control Manager (LCCM) is a graphical, server-based program that aids in system deployment by mass unattended installation of operating systems, complete software images, device drivers, and BIOS updates to remote systems. Used with Wake on LAN, LCCM can remotely start up your system from an off state, which means that installation can be done while the system is not being used. You can download LCCM at no additional charge (Internet access fees excepted).

For more information or to download this software visit <http://www.ibm.com/pc/us/desktop/lccm> on the World Wide Web.

## **System Migration Assistant**

System Migration Assistant (SMA) delivers wizard-like functionality to help administrators remotely transfer configurations, profile settings, device drivers, and files from an IBM or non-IBM PC to supported IBM systems. You can download SMA at no additional charge (Internet access fees excepted).

For more information or to download this software visit <http://www.ibm.com/pc/us/software/sysmgmt/products/sma> on the World Wide Web.

# Desktop Management Interface

Desktop Management Interface (DMI) is a method for gathering information about the hardware and software in your computer. In a network environment, network administrators can use DMI to remotely monitor and control your computer. For more information about DMI, see *Understanding Your Computer* (provided on the *IBM Software Selections CD* that comes with your computer).

---

## Using security features

To deter unauthorized use of your computer, you can use anti-intrusion features and other security features that are provided with your computer.

### Anti-intrusion features

IBM anti-intrusion features help protect against the theft of computer components, such as the microprocessor, system memory modules, or drives.

A cover lock is built into your computer to prevent the cover from being removed. Two identical keys for the cover lock are also supplied. A tag attached to the keys has the key serial number and the address of the key manufacturer.

#### Important

Record the "key code" number along with the manufacturer address and phone number in the space provided in Appendix C, "Computer records" on page 147. Because locksmiths are not authorized to duplicate the cover lock keys, you must order replacement keys from the key manufacturer. When ordering replacement keys, you will need the key code number.

You can set a chassis-intrusion detector inside your computer to alert the system administrator each time the computer cover is removed. This detector is enabled after you set an administrator password in the Configuration/Setup Utility program. After the password is set, and after the computer cover is removed, a POST error message (176) displays on the computer screen the next time the computer is turned on. You must type the correct administrator password to start up the computer. For information on setting passwords, see Chapter 4, "Using the Configuration/Setup Utility program" on page 37.

If your computer uses the Alert on LAN feature, and you are connected to a network that uses Intel LANDesk® Desktop Manager or IBM LANClient Manager, a message is also sent to the network administrator console notifying that the computer cover has been removed. For more information, see “Alert on LAN” on page 27 and contact your network administrator.

## Component protection

Your computer has serialized components that can be registered with a third-party security company. (You can also register the entire system.) By registering computer components, you can improve the chances of identifying the components if they are ever stolen and recovered. For more information about component registration, see the IBM support page at <http://www.ibm.com/pc/us/desktop/assetid> on the World Wide Web.

## Asset ID capability

IBM provides the basis for Asset ID™<sup>3</sup> support in your computer. Asset ID provides the capability to access information about your computer that is stored in an EEPROM module on the system board, using a radio-frequency-enabled portable scanner.

The Asset ID EEPROM contains prerecorded information about the system, including its configuration and the serial numbers of key components. The Asset ID EEPROM also includes a number of blank fields you can record with your choice of information. The Asset ID can be scanned from a short distance. The scanning of the Asset ID does not require the computer cover to be removed or even require that the computer be removed from the box in which it is shipped. This type of wireless tracking enables quicker system deployment and improved asset control. Also, Asset ID information is available through UM Services.

For the latest information on personal computer security features, visit the IBM support page at <http://www.pc.ibm.com/us/desktop/assetid> on the World Wide Web.

For information about enabling Asset ID, see Chapter 4, “Using the Configuration/Setup Utility program” on page 37.

---

<sup>3</sup> Asset ID enables your personal computer to be scanned by various radio frequency-emitting devices supplied by independent companies. Asset ID is intended for use only with radio frequency equipment that meets ANSI/IEEE C95.1 1991 RF Radiation Limits.

## IBM security solutions

IBM security solutions keep electronic business transactions safe. They include the following:

- Integrated security chip that gives you the functionality of a SMART card without the added cost
- Enhanced Security support
- User Verification Manager software that helps manage authentication so that you decide who has access to the components of your system

## Data protection

You can lose data from the hard disk for a variety of reasons. Security violations, viruses, or hard disk drive failure can all contribute to the destruction of data files. To protect against the loss of valuable information, IBM has incorporated many data-saving features within your computer.

### SMART hard disk drive

Your computer comes with a SMART (Self-Monitoring, Analysis, and Reporting Technology) hard disk drive that is enabled to report potential hard disk failures. If an error is detected, a DMI-compliant warning message is sent to the computer screen and, if the computer is part of a network, to an administrator console. When an error is detected, the data on the hard disk can be backed up and the drive replaced.

### SMART Reaction

To help back up important data, IBM provides SMART Reaction™ software on computers with preinstalled software and also on the IBM *Software Selections CD*. SMART Reaction is a client/server software application that helps users and administrators respond effectively to a warning issued by the SMART hard disk drive.

### Virus protection

Your computer has built-in virus protection that can be enabled through the Configuration/Setup Utility program. Also, Norton AntiVirus for IBM is installed on the hard disk of computers that have preinstalled software. Norton AntiVirus for IBM is also on the IBM *Software Selections CD*.

## Enhanced security

Your computer has an enhanced security feature that provides extra protection for your administrator password and your startup sequence settings. With enhanced security, your administrator password and startup sequence are stored in a highly protected, nonvolatile, security EEPROM module that is separate from CMOS memory and the EEPROM module that stores system programs. When your administrator password and security sequence are protected by enhanced security, they remain intact even if the battery in your computer expires or is removed. For more information, see “Using Enhanced Security” on page 40.

## Locking the keyboard

You can disable the keyboard so that others are unable to use it. If a power-on password is set, the keyboard is locked when you turn on the computer. You must type the correct password before the keyboard will unlock. You can enable the power-on password feature with the Configuration/Setup Utility program. See Chapter 4, “Using the Configuration/Setup Utility program” on page 37.

Some operating systems have a keyboard and mouse lock-up feature. Check the documentation that comes with your operating system for more information.

---

## Shutting down your computer

When you are ready to turn off your computer, follow the shutdown procedure for your operating system to prevent the loss of unsaved data or damage to your software programs. See your operating system documentation for instructions.

**Important:**

In some circumstances, the computer might not turn off immediately when you press the power switch. In this case, hold the power switch down for 5 to 10 seconds until the computer turns off.

---

## Taking care of your computer

Use these guidelines for the proper handling and care of your computer.

## Basics

Here are some basic points about keeping your computer functioning properly:

- Keep your computer in a clean, dry environment. Make sure it rests on a flat, sturdy surface.
- Do not place items on top of the monitor or cover any of the vents in the monitor or computer. These vents provide air flow to keep your computer from overheating.
- Keep food and drinks away from all parts of your computer. Food particles and spills might make the keyboard and mouse sticky and unusable.
- Do not get the power switches or other controls wet. Moisture can damage these parts and cause an electrical hazard.
- Always disconnect a power cord by grasping the plug, not the cord.

## Cleaning your computer

It is a good practice to clean your computer periodically to protect the surfaces and ensure trouble-free operation.

### **CAUTION:**

**Be sure to turn off the computer and monitor power switches before cleaning the computer and monitor screen.**

### **Computer and keyboard**

Use only mild cleaning solutions and a damp cloth to clean the painted surfaces of the computer.

### **Monitor screen**

Do not use abrasive cleaners when cleaning the surface of the monitor screen. The screen surface is easily scratched, so avoid touching it with pens, pencil points, and erasers.

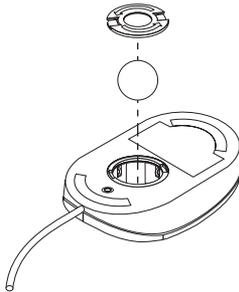
To clean the screen surface, wipe it gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Then use a soft cloth moistened with a nonabrasive liquid glass cleaner.

## Mouse

If the pointer on the screen does not move smoothly with the mouse, you might need to clean the mouse.

To clean your mouse:

1. Turn off the computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down. Unlock the retainer on the bottom of the mouse by moving it in the direction indicated by the arrow on the retainer.



4. Turn the mouse right-side up, and the retainer and ball will drop out.
5. Wash the ball in warm, soapy water and dry it well.
6. Using a damp cloth, wipe the outside of the mouse and the retainer. Be sure to wipe the rollers inside the mouse.
7. Insert the ball and retainer. Lock the retainer by moving it in the opposite direction of the arrow.
8. Reconnect the mouse cable to the computer.

## Moving your computer

Take the following precautions before moving your computer.

1. Back up all files and data from the hard disk.  
Operating systems can vary in the way they perform backup procedures. See your operating system documentation for information about software backup.
2. Remove all media (diskettes, compact discs, tapes, and so on) from the drives.

3. Turn off the computer and all attached devices. Your hard disk drive automatically parks the read/write heads in a nondata area. This process prevents damage to the hard disk.
4. Unplug the power cords from electrical outlets.
5. Note where you have attached your cables to the rear of the computer; then remove them.
6. If you saved the original shipping cartons and packing materials, use them to pack the units. If you are using different cartons, cushion the units to avoid damage.

**CAUTION:**

**Use safe lifting practices when lifting the computer.**



---

## Chapter 4. Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is stored in the electrically erasable programmable read-only memory (EEPROM) of your computer. You can use the Configuration/Setup Utility program to view and change the configuration settings of your computer, regardless of which operating system you are using. However, the settings you select in your operating system might override any similar settings in the Configuration/Setup Utility program.

---

### Starting and using the Configuration/Setup Utility program

The Configuration/Setup Utility program is started automatically when POST detects that newly installed or removed hardware is not reflected in your current configuration. A 162 POST message is displayed. See “Power-on self-test (POST)” on page 88.

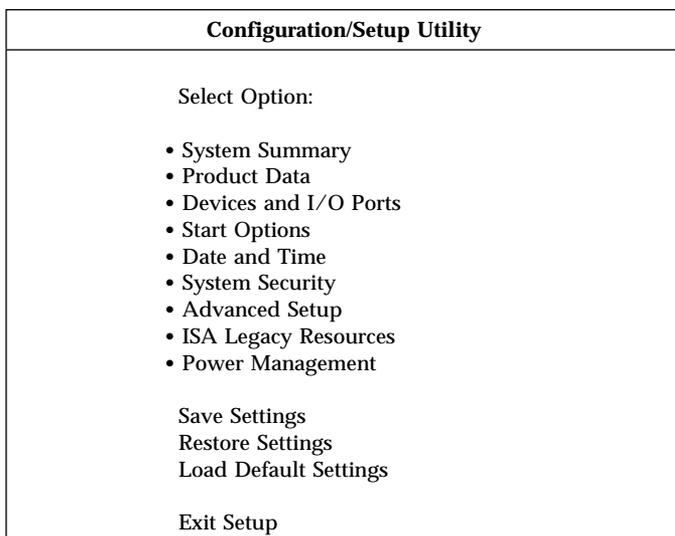
To start the Configuration/Setup Utility program:

1. Turn on your computer. If your computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use lights go off, and restart the computer. (Do not use Ctrl+Alt+Del to restart the computer.)
2. When the Configuration/Setup Utility prompt appears in the lower-left corner of the screen during startup, press F1. (This prompt appears on the screen for only a few seconds. You must press F1 quickly.)
3. If you have *not* set a password, the Configuration/Setup Utility program menu appears on the screen. If you have set a password, the Configuration/Setup Utility program menu will not appear until you type your password and press Enter. See “Using passwords” on page 43 for more information.

**Note:** If new system hardware has been added *and* one or more of the following statements are true, the Configuration/Setup Utility program menu will display before control is passed to the operating system.

- Enhanced POST is in effect.
- Power-on password is enabled.
- Administrator password is enabled.

The menu you see on your computer might look slightly different from the menu shown here, but it will operate the same way.



## Viewing and changing settings

The Configuration/Setup Utility program menu lists items that identify system configuration topics. You might see symbols next to configuration menu items. See the following table for the meaning of the symbols.

Symbol	Explanation
•	An additional menu or screen is available
▶	A change to that item has been made in the system configuration or the Configuration/Setup Utility program has detected an error and attempted to correct it. Also, an additional menu might follow a menu item with a ▶ beside it.
*	A system resource conflict was detected. Resolve this conflict before exiting from the Configuration/Setup Utility program so that your computer will function properly.
[ ]	In the Configuration/Setup Utility program menus, the configuration information you can change is enclosed in brackets like these. You cannot change information that is not surrounded by brackets.

When working with the Configuration/Setup Utility program menu, you must use the keyboard. The following table shows the keys used to accomplish various tasks.

<b>Keys</b>	<b>Function</b>
↑ ↓	Use these arrow keys to move among menu items until the item you want is highlighted.
← →	Use these arrow keys to display and toggle among choices for a menu item.
Enter	Press this key to select a highlighted menu item.
Esc	Press this key to exit from a menu after viewing or making changes to the settings in the menu.
+	Use this key in some menus to increase the numerical value of a setting.
-	Use this key (the minus or hyphen key) in some menus to decrease the numerical value of a setting.
0-9	Use these number keys in some menus to change the numerical value of a setting.
F1	Press this key for help on a selected menu item.
F9	Press this key if you changed and saved the setting of a selected menu item and you want to restore the setting that was active before you made the change.
F10	Press this key to return the setting of a selected menu item to a default value.

**Note:** Active keys are displayed at the bottom of each screen; not all of the above keys are active on every menu.

## **Exiting from the Configuration/Setup Utility program**

When you finish viewing or changing settings, press Esc to return to the Configuration/Setup Utility program menu (you might have to press Esc several times). If you want to save the new settings, select Save Settings before you exit. Otherwise, your changes will not be saved.

---

## Using System Security

Use the System Security menu to customize the security features of your computer. The features included in the System Security menu are Enhanced Security, Security Profile by Device, Remote Administration, and Power On and Administrator Passwords.

### Using Enhanced Security

Enhanced Security can be enabled or disabled only when you update system programs.

If Enhanced Security is enabled and you have not set an administrator password, your computer will operate as though enhanced security is disabled.

If enhanced security is enabled and you have set an administrator password, your computer will operate as follows:

- The contents of the security EEPROM (your administrator password and startup sequence) will be protected from failure of the battery and CMOS memory.
- The security EEPROM will be protected from unauthorized access because it locks after your computer is turned on and the system programs have completed their startup routine. Once it is locked, the security EEPROM cannot be read from or written to by any software application or system software until the computer is turned off and back on again. In a networking environment, this might prevent certain functions from being performed remotely on your computer.

Enhanced Security adds a *hard lock* for an extra measure of protection for the system programs in your computer. Normally, the entire contents of the system programs EEPROM is write protected with a *soft lock*. A soft lock enables the Remote Administration program to function in a network environment. With a hard lock, when your computer is turned on and the system programs startup routine is completed, Remote Administration is locked and cannot be unlocked until the computer is turned off and back on again and the administrator password is entered. Note that, in a networking environment, this prevents the system programs in your computer from being updated remotely. Someone must be present at your computer to turn it on and off and enter the administrator password.

- A chassis-intrusion feature will alert you if the cover of your computer has been opened. This feature will work if your computer is on or off. If the cover has been opened, a prompt for your administrator

password will appear on the screen, and your computer will remain in a suspended state until your administrator password is entered.

- Your configuration settings cannot be changed in the Configuration/Setup Utility program until you enter the administrator password. This means that any changes in computer hardware that the system programs in your computer detect will generate a configuration error until you enter the administrator password.

To enable or disable Enhanced Security:

1. Insert a system programs update (flash) diskette into the diskette drive (drive A) in your computer. System programs updates are available at <http://www.ibm.com/pc/support/> on the World Wide Web.
2. Turn on the computer. If it is on already, you must turn it off and back on again.
3. The update begins, your computer halts, and you are prompted for your administrator password (if you have set an administrator password). The computer remains in a suspended state until you enter the administrator password.
4. When you enter the administrator password, or if no administrator password has been set, the update diskette will continue to run, and you are given the option of enabling or disabling Enhanced Security. Your choice is automatically recorded in the System Security menu of the Configuration/Setup Utility program.

## Using Security Profile by Device

Security Profile by Device enables you to control the level of security for the following:

- IDE controller (for example, hard disk drives): When the feature is set to Disable, all devices connected to the IDE controller are disabled and will not appear in the system configuration.
- Diskette Drive Access: When the feature is set to Disable, the diskette drive cannot be accessed.
- Diskette Write Protect: When the feature is set to Enable, all diskettes are treated as if write-protected.

Setting Security Profile by Device also enables you to control which devices require a password before they start up. There are three classes of these devices:

- Removable media, such as diskette drives and CD-ROM drives
- Hard disk drives
- Network devices

You can set these devices to request a user password, an administrator password, or not to require a password. This way, if you have a power-on or administrator password set for your system, you can configure your computer to prompt you for a password only when certain devices are accessed at startup. For example, if you set Hard Disk Devices to require a User password, each time you attempt to start up from the hard disk, you will be prompted to type the password before the startup proceeds.

Some operating systems require you to type a password before the operating system will load. Security Profile by Device does not change the way the operating system works. If an operating system password is required, you must still type it when prompted, regardless of the Security Profile by Device settings.

To set Security Profile by Device:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. From the Configuration/Setup Utility program menu, select **System Security** and press Enter.
3. Select **Security Profile by Device** and press Enter.
4. Select the desired devices and settings and press Enter.
5. Press Esc twice to return to the Configuration/Setup Utility program menu.
6. Select **Save Settings** from the Configuration/Setup Utility menu; then press Esc and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

## Setting Remote Administration

You can remotely update the system programs, such as POST and BIOS, from a network server by enabling Remote Administration. If you have set an administrator password for your computer, the password does *not* have to be entered in order to remotely update programs. Consult your network administrator for information on setting up your network server to perform POST and BIOS updates.

To set Remote Administration, follow these steps:

1. Start the Configuration/Setup Utility program. See “Starting and using the Configuration/Setup Utility program” on page 37.
2. Select **System Security** and press Enter.
3. Select **Remote Administration** and press Enter.

4. To enable update remote administration, select **Enabled**. To disable, select **Disabled**.
5. Press Esc until you return to the Configuration/Setup Utility program main menu.
6. Select **Save Settings** from the Configuration/Setup Utility program menu; then press Esc and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

## Using passwords

You can use passwords to provide security for your computer and data. There are two kinds of passwords: a power-on password and an administrator password. You do not have to set a password of either type to use your computer. However, if you decide to set one, read the following sections.

### Using a power-on password

The *power-on* password feature deters unauthorized persons from gaining access to your computer. When you set the power-on password, you can choose from three password prompt modes:

**On** In password prompt On mode, you are prompted for the power-on password when you turn on the computer. Until the correct password is entered, the computer operating system will not start, and you will not be able to use the keyboard or mouse to input any other information.

#### Notes:

1. If you have a mouse connected to a serial port, it will be activated when the computer is started, regardless of whether a password is set.
2. If Remote Administration is enabled, you cannot select On. In this case, select Dual. If you try to set this mode to On when Remote Administration is enabled, it will automatically be reset to Dual. For more information, see “Setting Remote Administration” on page 42.

**Off** In password prompt Off mode (sometimes referred to as unattended start mode), you are not prompted to enter your power-on password when you turn on the computer. The operating system will start but you must type the password before you can log on or access applications.

### Important information for mouse users

This information applies only to computers with a mouse connected to the mouse port; a serial mouse is not affected by the password prompt Off mode.

The password prompt Off mode prevents the computer from detecting that a mouse is attached. In this mode, the mouse device driver does not load automatically. Instead, the operating system displays an error message informing you that the mouse connector is disabled.

Once the operating system starts in password prompt Off mode, the computer will remain locked until you type your password. However, the mouse connected to the mouse port remains locked.

### Dual

In the password prompt Dual mode, the startup behavior of the computer depends on whether the computer is started from the computer power switch or by an unattended method, such as remotely over a LAN.

If you start your computer using the power switch, you will be prompted for a password.

If the computer is started by an unattended method, the computer operates the same as it does in password prompt Off mode. See page 43 for more information.

The password does not appear on the screen as you type it. If you type the wrong password, you receive a screen message telling you so. If you type the wrong password three times, you must turn off the computer and start again. When you type the correct password, the computer begins normal operation.

### Setting, changing, and deleting a power-on password

A power-on password can be any combination of up to seven characters (A-Z, a-z, and 0-9).

### Attention

Keep a record of your power-on password in a secure place. If you lose or forget your password, you cannot change or delete it without removing the computer cover and moving a switch on the rocker switch on the system board. See “Erasing a lost or forgotten password (Clearing CMOS)” on page 46 for more information.

To set, change, or delete a power-on password:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. From the Configuration/Setup Utility program menu, select **System Security** and press Enter.
3. Select **Power-On Password** and press Enter.
4. To set or change a power-on password, type your new password and press the Down Arrow (↓). Type your new password again and press the Down Arrow (↓).
5. At **Change Power-On Password**, press Enter.
6. If you want to change the password prompt mode, select **Password Prompt** and then select either **Off**, **On**, or **Dual**. Continue at step 8.
7. To delete a power-on password, select **Delete Power-On Password**. A screen warning you that any existing power-on password will be deleted appears. Press Enter to continue.
8. Press Esc twice to return to the Configuration/Setup Utility program menu.
9. Select **Save Settings** from the Configuration/Setup Utility program menu; then press Enter and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

## Using an administrator password

### Important

If Enhanced Security is enabled, keep a record of your administrator password in a secure place. If you forget or lose the administrator password, you must replace the system board in order to recover.

Setting an administrator password deters unauthorized persons from changing configuration settings. If you are responsible for maintaining the settings of several computers, you might want to set an administrator password.

After you set an administrator password, a password prompt appears each time you try to access the Configuration/Setup Utility program. If you type the wrong password, you receive a message telling you so. If you type the wrong password three times, you must turn the computer off and start again.

If both a power-on and administrator password are set, you can type either password. However, in order to change any settings, you must use your

administrator password. If you enter the power-on password, you will only be able to view limited information.

## Setting, deleting, or changing an administrator password

An administrator password can be any combination of up to seven characters (A-Z, a-z, and 0-9).

To set, change, or delete an administrator password:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. From the Configuration/Setup Utility program menu, select **System Security** and press Enter.
3. Select **Administrator Password** and press Enter.
4. To set or change an administrator password, type your password and press the Down Arrow (↓). Type your password again and press the Down Arrow (↓).
5. At **Change Administrator Password**, press Enter.
6. At **Power-On Password Changeable by User**, select **Yes** or **No**. (If you select **Yes** and an administrator password is set, the power-on password can be changed without having to enter the administrator password. If you select **No** and an administrator password is set, the power-on password cannot be changed unless the administrator password is entered.)
7. At **Require Power-On Password on Warm boot**, select **Yes** or **No**. Continue at step 9.
8. To delete an administrator password, select **Delete Administrator Password** and Press Enter.
9. Press Esc until you return to the Configuration/Setup Utility program menu.
10. Select **Save Settings** from the Configuration/Setup Utility program menu; then press Esc and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

## Erasing a lost or forgotten password (Clearing CMOS)

This section applies to lost or forgotten passwords that are *not* protected by Enhanced Security. For information on lost or forgotten passwords that *are* protected by Enhanced Security, see “Using Enhanced Security” on page 40.

### Important

If possible, record the configuration information of your computer *before* moving switch 3 of the rocker switch.

To erase a lost or forgotten password:

1. Turn off the computer and all attached devices.
2. Unplug the power cord.
3. Remove the cover. See “Removing the cover and front bezel” on page 57.
4. Refer to the system board cover label inside the computer to locate the rocker switch on the system board.

**Note:** You might need to move the front fan aside to allow easier access to the rocker switch. For instructions to move the front fan aside, see “Replacing the battery” on page 116 steps 4 through 7.

5. Set rocker switch 3 to the on position.

**Note:** If you moved the front fan aside, see “Replacing the battery” step 11 on page 119.

6. Replace the cover and plug in the power cord. See “Replacing the cover and connecting the cables” on page 82.
7. Restart the computer, leave it on for about 10 seconds, and then turn off the computer.
8. Repeat steps 2 through 4.
9. Set rocker switch 3 to the off position.

**Note:** If you moved the front fan aside, see “Replacing the battery” step 11 on page 119.

10. Replace the cover and plug in the power cord. See “Replacing the cover and connecting the cables” on page 82.

## Using Adapter ROM security

Adapter ROM security prevents unauthorized users from altering the setup of vital adapters in your computer. You can set Adapter ROM security to on or off.

## Using Asset ID

You can set Asset ID to Enabled or Disabled. Enabling Asset ID enables wireless radio frequency communication. Disabling Asset ID prevents accessing the data stored in the Asset ID EEPROM using an RF scanner; however, the data is still accessible from the desktop using the UM Services software.

## Using the IBM Embedded Security Chip

The Embedded Security Chip is a built-in cryptographic technology that can be used to secure the electronic transmission of information. To use the security features on this chip, you must also install security software that is available at <http://www.ibm.com/pc/us> on the World Wide Web. To enable the IBM Embedded Security Chip, do the following:

1. Start the Configuration/Setup Utility program. See “Starting and using the Configuration/Setup Utility program” on page 37.
2. Select **System Security** and press Enter.
3. Select **IBM Embedded Security Chip** and press Enter.
4. Set **IBM Embedded Security Chip** to Enable and press Enter.
5. Type the password in the bracketed field and press Enter.

You can clear the IBM Embedded Security Chip by selecting **Clear IBM Security Chip** and pressing Enter. This will delete all IBM Embedded Security Chip passwords and encryption values and disable the IBM Embedded Security Chip feature.

---

## Enabling the Pentium III Xeon processor serial number feature

The Pentium III Xeon microprocessor features a processor serial number. The processor serial number is an electronic number unique to each Pentium III Xeon microprocessor. This feature is used primarily to enhance security with Internet transactions. *Your computer is shipped to you with this feature Off (disabled).*

To enable this feature, use the following procedure:

1. Start the Configuration/Setup Utility program. See “Starting and using the Configuration/Setup Utility program” on page 37.
2. Select **Advanced Setup** and press Enter.
3. Select **Processor Control** and press Enter.

4. Change the value for **Processor Serial Number Access** from **Disabled** to **Enabled** and press Enter.
5. Save the settings, exit the program and restart your computer with the computer power switch to activate the new setting.

---

## Other settings in the Configuration/Setup Utility program

The information in this section includes instructions for changing other settings using the Configuration/Setup Utility program, such as the keyboard speed, the startup sequence, remote administration, and power management.

### Changing keyboard speed

You can change the speed at which the keyboard responds when you hold down a key. This setting can be found under Start Options in the Configuration/Setup Utility program. The default *typematic rate* is 30 characters per second (fast rate).

### Changing and viewing the startup sequence

Your computer can be started from several devices including the hard disk drive, diskette drive, CD-ROM drive, or from the network. The startup program looks for these devices in a selected sequence. A different startup sequence can be selected for when your computer is turned on using the power switch than when it is turned on automatically (Wake on LAN). Use the Configuration/Setup Utility to select the primary startup sequence and the automatic power-on startup sequence.

#### Primary startup sequence

These settings control the sequence of devices used to startup your computer when it is turned on using the power switch. The default or preset settings for the primary startup sequence are:

First startup device	[Diskette drive]
Second startup device	[Hard disk 0]
Third startup device	[Network]
Fourth startup device	[Disabled]

## Automatic power on startup sequence

These settings are used to select the sequence of devices used to startup your computer when it is turned on automatically by a timer, a PCI device, or by a wake up request from the LAN. The default settings for the automatic power on startup sequence are shown here.

First startup device	[Network]
Second startup device	[Hard disk 0]
Third startup device	[Disabled]

To view or change the primary or automatic power on startup sequence:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. Select **Start Options** and press Enter.
3. Select **Startup Sequence** from the Start Options menu and press Enter.
4. Use the arrow keys to make your selections and press Esc until you return to the Configuration/Setup Utility program menu.
5. Select **Save Settings** from the Configuration/Setup Utility menu and press Enter. Then press Esc and follow the instruction on the screen to exit from the Configuration/Setup Utility program.

## Error Startup Sequence

You can set your computer to initiate the Error Startup Sequence when POST detects an error by enabling this feature.

To enable the Error Startup Sequence:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. Select **Start Options** and press Enter.
3. Select **Startup Sequence** from the Start Options menu and press Enter.
4. Use the arrow keys to select **Error Startup Sequence** and set it to **Primary, Automatic, or Disabled**.
5. Press Esc until you return to the Configuration/Setup Utility program menu.
6. Select **Save Settings** from the Configuration/Setup Utility menu and press Enter. Then press Esc and follow the instruction on the screen to exit from the Configuration/Setup Utility program.

## Interrupt and DMA resources

This section lists the settings for the default interrupt and direct memory access (DMA) resources for your computer. The interrupt and DMA settings might change if your computer is reconfigured.

Interrupt request	System resource
0	Timer
1	Keyboard
2	Interrupt controller
3	Serial port B*
4	Serial port A*
5	Available
6	Diskette
7	Parallel port*
8	Real Time Clock
9	ACPI*
10	Available
11	Available
12	Mouse
13	Coprocessor
14	Available
15	IDE drives

**Note:** \*IRQs can be modified to alternative settings or disabled.

DMA request	System resource
0	Available
1	Available
2	Diskette
3	Parallel port*
4	System resource
5	Available
6	Available
7	Available

\*DMA can be modified to alternative settings or disabled.

## Power-management features

Your computer comes with built-in energy-saving capabilities. You can view and change energy-saving settings using the power-management menu in the Configuration/Setup Utility program. This section describes the power-management features in your computer and provides instructions for using these features.

### Attention

If a device, such as a monitor, does not have power-management capabilities, it can be damaged when exposed to a reduced power state. Before you make energy-saving selections for your monitor, check the documentation that comes with your monitor to see if it supports Display Power Management Signaling (DPMS).

## ACPI BIOS IRQ

Automatic Configuration and Power Interface (ACPI) BIOS IRQ enables the operating system to control the power-management features of your computer. You can use the ACPI BIOS IRQ setting to configure the interrupts that this feature uses so that you can free resources for other devices. Not all operating systems support ACPI BIOS IRQ. See your operating system documentation to determine if ACPI is supported.

## Setting power-management features

### Important

If your computer has only USB devices connected, you might not be able to wake the system once it has gone to a low-power state.

With power management, the computer and monitor (if the monitor supports DPMS) can be set to go into a reduced power state if they are inactive for a specified length of time.

- **Time to Low Power:** When you enable **Automatic Hardware Power Management**, you can use this option to specify the amount of time that the computer must be inactive before power-management features are activated.
- **System Power:** You can select **ON** if you want the computer to remain on or **OFF** if you want the computer to shut down.
- **Display:** You can use this option to select one of the following reduced-power states:
  - **Standby:** In this mode, the screen is blanked, but the screen image is restored *immediately* when any activity is detected.
  - **Suspend:** In this mode, the monitor uses less power than in Standby mode. The screen is blanked, but the screen image is restored *within a few seconds* after any activity is detected.
  - **Off:** In this mode, the monitor power is turned off. To restore power to the monitor, you must press the monitor power switch.

On some monitors, you might have to press the power switch twice.

If **Off** is selected, you must specify the **Time to Display 'Off.'** You can select 5 minutes to 1 hour.

**Note:** *Time to display off* is the amount of time from when the reduced-power state begins until the display turns off.

- **Disable:** In this mode, the monitor is unaffected by the power management settings.
- **IDE Drives:** You can use this selection to specify whether the IDE drives are enabled or disabled when power-management features are activated.

To set power management features:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. Select **Power Management** and press Enter.
3. Select **APM** and press Enter.
4. Set **APM BIOS Mode** to **Enabled** or **Disabled**.
5. Set **Automatic Hardware Power Management** to **Enabled**.
6. Select values for power management (time to low power, system power, processor speed, display, and time to display off), as desired.
7. Select **Low Power Entry Activity Monitor** and press Enter.
8. Set to **Enabled** or **Disabled** devices you want to be monitored for power management.  
**Note:** If all devices are set to disabled, you must restart the computer to wake the system.
9. Press Esc three times to return to the Configuration/Setup Utility program menu.
10. Select **Save Settings** from the Configuration/Setup Utility program menu; then press Esc and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

## Setting automatic power-on features

You can use the automatic power-on features on the power-management menu to enable and disable features that automatically turn on your computer. You must also select the startup sequence you want to use for the type of power-on event you select.

- **Wake on LAN:** If you have remote network-management software, you can use the IBM-developed Wake on LAN feature. When you set

Wake on LAN to **Enabled**, your computer will turn on when it receives a specific signal from another computer on your local area network (LAN).

- **Wake on Alarm:** With this feature, you can specify a date and time at which the computer will be turned on automatically. This can be either a single event, a daily event, or a weekly event.
- **PCI Wake Up:** If this setting is enabled, your computer turns on in response to wake up requests from PCI devices that support this feature.

To set automatic power-on features, follow these steps:

1. Start the Configuration/Setup Utility program (see “Starting and using the Configuration/Setup Utility program” on page 37).
2. Select **Power Management** and press Enter.
3. Select **Automatic Power On** and press Enter.
4. Select the menu item for the feature you want to set. Use Left Arrow (←) or Right Arrow (→) to select either **Enabled** or **Disabled**. Press Enter.
5. Select Startup Sequence for the feature. Use Left Arrow (←) or Right Arrow (→) to select either **Primary** or **Automatic**. If you select **Automatic**, make sure **Automatic Power On Startup Sequence** in the Startup Sequence menu is set to **Enabled**. Otherwise, the system will use the **Primary** startup sequence.
6. Press Esc until you return to the Configuration/Setup Utility program menu.
7. Select **Save Settings** from the Configuration/Setup Utility program menu and press Enter. Then press Esc and follow the instructions on the screen to exit from the Configuration/Setup Utility program.

---

## Chapter 5. Installing options

You can expand the capabilities of your computer by adding adapters, drives, memory, or a second microprocessor. When adding an option, use these instructions along with the instructions that come with the option.

---

### Preparing to install options

#### Attention

Before you install any option, read the “Safety information” on page ix and “Handling static-sensitive devices.” These precautions and guidelines will help you work safely.

The presence of 5 V standby power might result in damage to your hardware unless you disconnect the power cord from the electrical outlet before opening the computer cover.

#### **CAUTION:**

**Be careful when working near the microprocessor. Under normal use, the microprocessor can become very hot.**

**Note:** It might be easier to perform some procedures with the computer on its side.

### Handling static-sensitive devices

Static electricity, although harmless to you, can seriously damage computer components and options. When you add an option, do *not* open the static-protective package containing the option until you are instructed to do so.

When you handle options and other computer components, take these precautions to avoid static electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters, memory modules, and continuity RIMMs by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you install a new option, touch the static-protective package containing the option to a metal expansion-slot cover or other

unpainted metal surface on the computer for at least two seconds. This reduces static electricity in the package and your body.

- When possible, remove the option and install it directly in the computer without setting the option down. When this is not possible, place the static-protective package that the option came in on a smooth, level surface and place the option on it.
- Do not place the option on the computer cover or other metal surface.

## Available internal options

The following are some available options:

- Peripheral component interconnect (PCI) adapters
- Internal drives
  - CD-Read/Write (CD-RW)
  - Hard disk
  - Diskette drives and other removable media drives (DVD drives and Iomega Zip drives and Jaz drives)
- System memory, called Rambus inline memory modules (RIMMs)
- A second microprocessor

For the latest information about available options, see the following World Wide Web pages:

<http://www.ibm.com/pc/us/options/>  
<http://www.ibm.com/pc/support/>

You can also obtain information by calling the following telephone numbers:

- Within the United States or Canada, call 1-800-IBM-2YOU (1-800-426-2968), your IBM reseller, or IBM marketing representative.
- Outside the United States and Canada, contact your IBM reseller or IBM marketing representative.

## Tools required

To install or remove some options in your computer, you will need a flat-blade screwdriver. Additional tools might be needed for certain options. See the instructions that come with the option.

### Important

Run ConfigSafe (or a similar application) to take a "snapshot" of your operating system configuration before installing an optional device. Using this snapshot, you can view and compare the changes in your operating system configuration after you install an option. Also, if you have problems configuring the option after it is installed, ConfigSafe allows you to restore the operating system configuration to the previous settings.

**Note:** If you have preinstalled software, ConfigSafe took a snapshot of the initial operating system configuration when you started your computer for the first time. You might be able to use this snapshot to restore the operating system configuration to the initial settings.

ConfigSafe is a part of the preinstalled software in your computer. It is also available on the *Software Selections CD*. For more information, see "Using the ConfigSafe program" on page 112 and "Software" on page 4.

## Removing the cover and front bezel

You must remove the computer cover to access the internal components, such as the system board and drive bays. When disconnecting cables, be sure to note where they attach, so you can correctly reattach them later.

### Before you begin

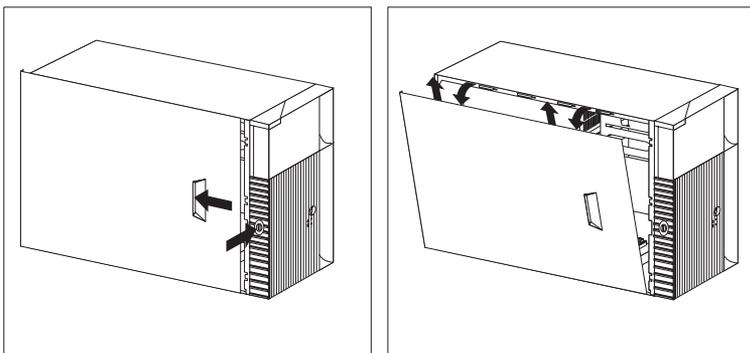
1. Shut down your operating system, remove any media (diskettes, CDs, or tapes) from the drives, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect all cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables connected to the computer.

**Note:** For more information on connectors, see "Connecting computer cables" on page 13.

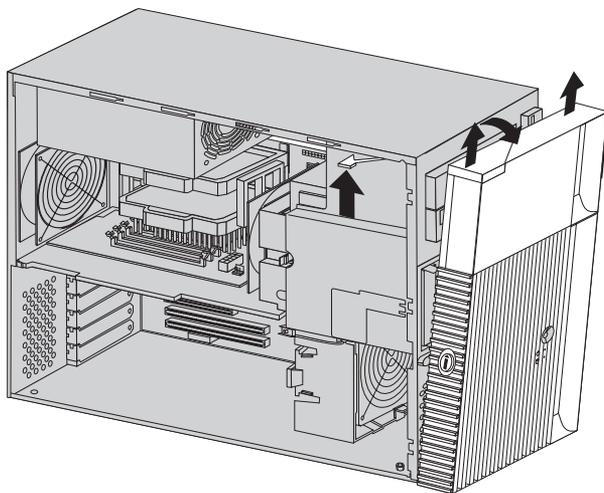
**Attention:** If you have set an administrator password, before removing the computer cover, read the important information in "Using an administrator password" on page 45.

To remove the cover and front bezel:

1. If the key-lock button is locked, unlock it.
2. Press the key-lock button on the left side of the front bezel and slide the side cover toward the rear of the computer.
3. Lift the side cover from the computer.



4. Lift the lever at the top of the chassis and pull the front bezel from the front of the computer.

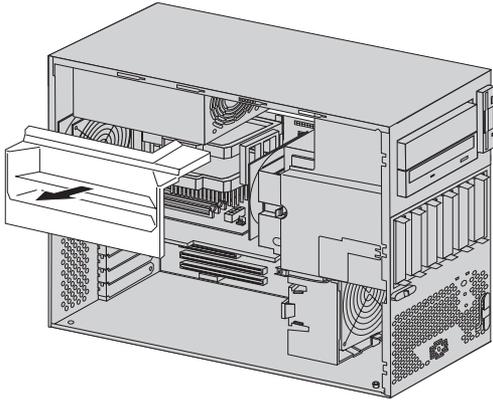


**Attention**

Proper cooling is required for the reliable performance of internal components. Do not operate your computer with the cover removed.

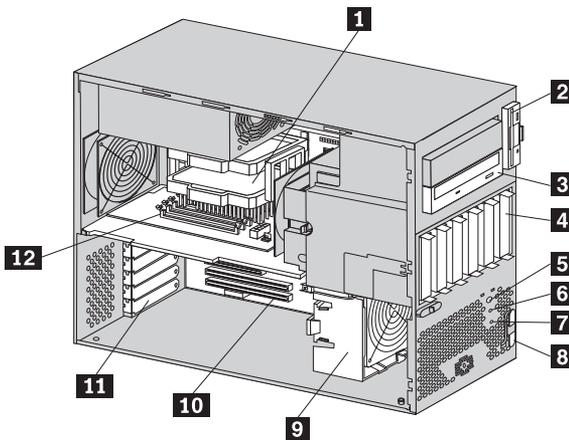
## Removing the air baffle

Your computer might come with a plastic air baffle that directs air flow through the processor. When installing options, you might need to lift it out of the chassis to access some components. Place the baffle back into place before replacing the cover.



## Locating components

Once you have removed the cover and bezel (see “Removing the cover and front bezel” on page 57), you will need to locate and recognize components inside your computer. You might also need to remove the air baffle to access some of the components (see “Removing the air baffle” on page 59). The following illustration will help you locate the various components in your computer.

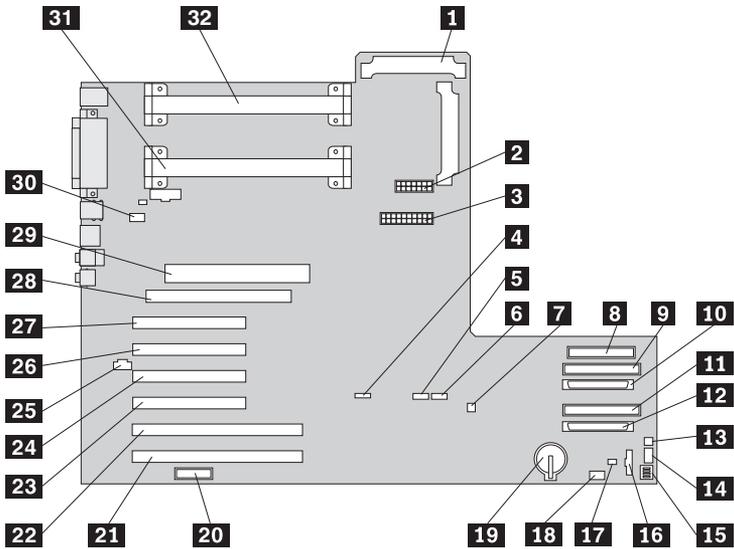


- |          |                       |           |   |
|----------|-----------------------|-----------|---|
| <b>1</b> | Microprocessor        | <b>8</b>  | Radio frequency identification (RFID) antenna |
| <b>2</b> | Diskette drive        | <b>9</b>  | Front fan                                     |
| <b>3</b> | CD-ROM drive          | <b>10</b> | System board                                  |
| <b>4</b> | Hard disk drive       | <b>11</b> | Adapter slot                                  |
| <b>5</b> | Power switch          | <b>12</b> | Memory card                                   |
| <b>6</b> | Power-on light        |           |   |
| <b>7</b> | Hard disk drive light |           |   |

## Identifying parts on the system board

The system board, also called the *planar* or *motherboard*, is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices that are IBM-installed or that you can install later. See the following illustration for the location of parts on the system board.

**Note:** An illustration of the system board with additional information is provided on a label located on the inside of the computer chassis.

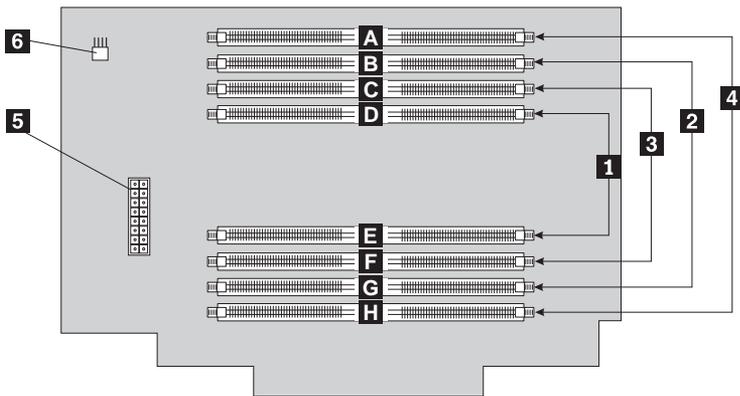


- |           |   |           |                                   |
|-----------|---|-----------|-----------------------------------|
| <b>1</b>  | Second CPU voltage regulator module (VRM) | <b>17</b> | Tamper detection switch connector |
| <b>2</b>  | Power 2                                   | <b>18</b> | Radio Frequency antenna connector |
| <b>3</b>  | Power 1                                   | <b>19</b> | Battery                           |
| <b>4</b>  | Hard disk LED                             | <b>20</b> | MIDI/joystick connector           |
| <b>5</b>  | Wake on LAN connector                     | <b>21</b> | Slot 7 (64-bit PCI adapter)       |
| <b>6</b>  | Alert on LAN connector                    | <b>22</b> | Slot 6 (64-bit PCI adapter)       |
| <b>7</b>  | Wake on Modem connector                   | <b>23</b> | Slot 5 (32-bit PCI adapter)       |
| <b>8</b>  | Diskette drive connector                  | <b>24</b> | Slot 4 (32-bit PCI adapter)       |
| <b>9</b>  | Secondary IDE connector                   | <b>25</b> | CD audio connector                |
| <b>10</b> | SCSI channel B                            | <b>26</b> | Slot 3 (32-bit PCI adapter)       |
| <b>11</b> | Primary IDE connector                     | <b>27</b> | Slot 2 (32-bit PCI adapter)       |
| <b>12</b> | SCSI channel A                            | <b>28</b> | Slot 1 (AGP adapter)              |
| <b>13</b> | Internal speaker connector                | <b>29</b> | Memory card connector             |
| <b>14</b> | Front fan connector                       | <b>30</b> | Rear fan connector                |
| <b>15</b> | Rocker switch                             | <b>31</b> | Microprocessor 1                  |
| <b>16</b> | Front panel connector                     | <b>32</b> | Microprocessor 2                  |

## Locating components on the memory card

Your computer uses a memory card for system memory. The memory card contains RIMM connectors, a power connector, and a hard disk fan connector. Some models come with a memory card that has eight RIMM connectors, and some models come with a memory card that has four RIMM connectors.

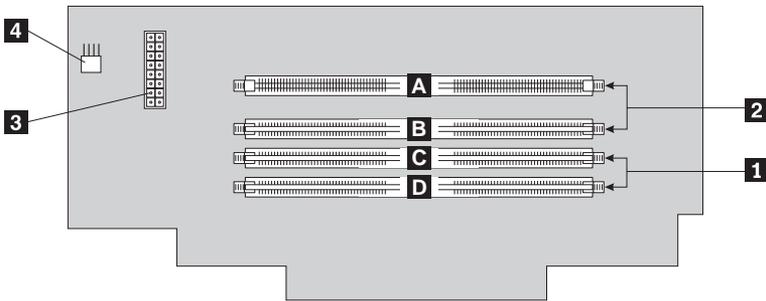
When installing system memory, refer to the following illustration for the location of the RIMM connectors, the power connector, and the hard disk fan connector on the memory card with eight RIMM connectors.



- 1** RIMM pair 1
- 2** RIMM pair 2
- 3** RIMM pair 3
- 4** RIMM pair 4
- 5** Power connector
- 6** Hard disk drive fan connector

- A** RIMM connector 1
- B** RIMM connector 2
- C** RIMM connector 3
- D** RIMM connector 4
- E** RIMM connector 5
- F** RIMM connector 6
- G** RIMM connector 7
- H** RIMM connector 8

When installing system memory, refer to the following illustration for the location of the memory connectors, the power connector, and the hard disk fan connector on the memory card with four RIMM connectors.



- |          |                               |          |                  |
|----------|-------------------------------|----------|------------------|
| <b>1</b> | RIMM pair 1                   | <b>A</b> | RIMM connector 1 |
| <b>2</b> | RIMM pair 2                   | <b>B</b> | RIMM connector 2 |
| <b>3</b> | Power connector               | <b>C</b> | RIMM connector 3 |
| <b>4</b> | Hard disk drive fan connector | <b>D</b> | RIMM connector 4 |

## Working with memory

You can add memory to your computer to increase system performance.

Your computer has up to eight connectors for installing *Rambus inline memory modules (RIMMs)*.

The IBM-installed RIMMs that come with your computer are ECC (error checking and correction) RDRAM (Rambus dynamic random access memory) modules.

When installing or replacing RIMMs, take the following information into consideration:

- The memory card your computer has four or eight RIMM connectors arranged in pairs. RIMMs must be installed in pairs. The RIMMs installed in a RIMM connector pair must be the same speed and size.
- If the memory card in your computer has four RIMM connectors, any connector that does not have a RIMM installed must have a *continuity RIMM (C-RIMM)*, a module that looks like a RIMM but has no memory on it. A C-RIMM is used to continue the connection on a RIMM connector that does not have memory installed in it.

- If the memory card in your computer has eight RIMM connectors, pairs 1 and 3 must have RIMMs or C-RIMMs installed in them. If RIMMs are installed in pair 2, RIMMs or C-RIMMs must be installed in pair 4 for optimal performance. For the arrangement of the RIMM connector pairs on your computer memory card, see the illustration on page 63.
- Install only ECC RIMMs to enable ECC. If you use ECC and non-ECC memory together, it will function as non-ECC memory.
- RIMM connectors do not support dual inline memory modules (DIMMs)
- Use only PC600 or PC800 RIMMs.

**Note:** If you use PC600 and PC800 RIMMs together, all memory will function at the speed of the slowest RIMM.

Use the following table to help you to configure memory if you have a memory card with eight RIMM connectors.

**Memory placement for 8-RIMM Memory Card**

	1	2	3	4	5	6	7	8
<b>2 RIMMs</b>	(1)	(1)	C-RIMM	RIMM	RIMM	C-RIMM	(1)	(1)
<b>4 RIMMs*</b>	(1)	(1)	RIMM	RIMM	RIMM	RIMM	(1)	(1)
<b>6 RIMMs</b>	C-RIMM	RIMM	RIMM	RIMM	RIMM	RIMM	RIMM	C-RIMM
<b>8 RIMMs</b>	RIMM	RIMM	RIMM	RIMM	RIMM	RIMM	RIMM	RIMM

**Note:** Memory must be installed in matched pairs.

\* Non-optimal performance configuration

(1) These connectors may either be left empty or used to store c-rimms.

Use the following table to help you to configure memory if you have a memory card with four RIMM connectors.

**Memory placement for 4-RIMM Memory Card**

	3	4	1	2
<b>2 RIMMs</b>	RIMM	RIMM	C-RIMM	C-RIMM
<b>4 RIMMs</b>	RIMM	RIMM	RIMM	RIMM

**Note:** Memory must be installed in matched pairs.

## Removing a RIMM or C-RIMM

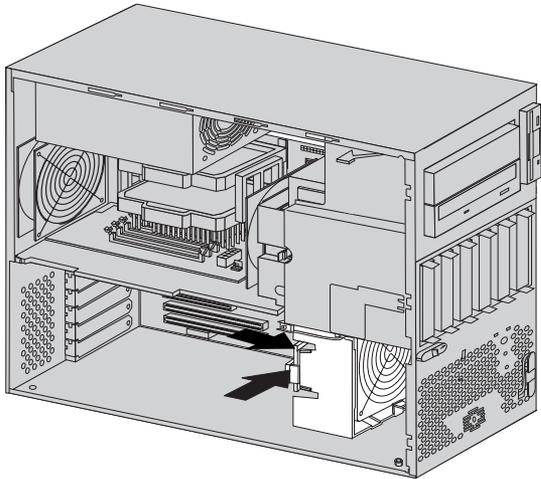
To remove a C-RIMM or RIMM:

### Before you begin

- Turn off the computer and all other connected devices.
- Disconnect all cables attached to the computer and remove the computer cover (see “Removing the cover and front bezel” on page 57).
- If your computer came with an air baffle, you may need to lift it out to access parts of the system board. See “Removing the air baffle” on page 59 for more information.

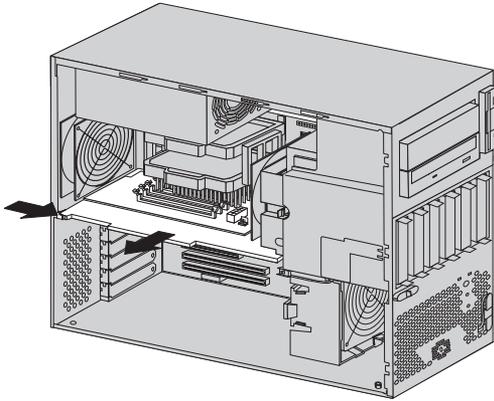
**Attention:** The presence of 5 V standby power might result in damage to your hardware unless you disconnect the power cord from the electrical outlet before opening the computer cover.

1. To locate the RIMM connectors inside your computer, see “Identifying parts on the system board” on page 60 and “Locating components on the memory card” on page 62.
2. Press the tab on the front fan and push the adapter guide latch toward the front of the chassis until it snaps into place.



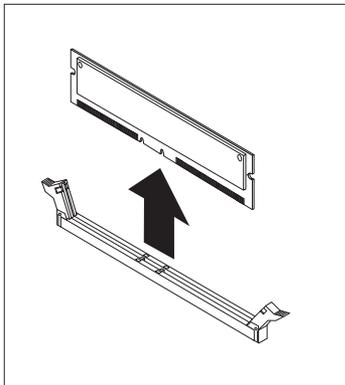
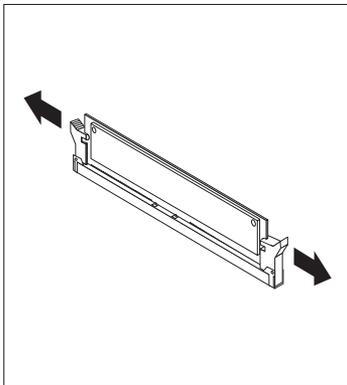
3. Disconnect the power and hard disk drive fan cables on the memory card.

4. Push the tab on the back of the memory card inward and pull the memory card out of the chassis.



5. At both ends of the RIMM connector on the memory card, push outward on the retaining clips until the module is loosened. Lift the RIMM or C-RIMM out of the connector.

**Note:** Be careful not to push too hard on the retaining clips, because the RIMM or C-RIMM might eject too quickly.



6. Store the RIMM or C-RIMM in a static-protective package. Do not discard or lose this part. It might be needed later if you change your memory configuration.

## Installing a RIMM or C-RIMM

### Before you begin

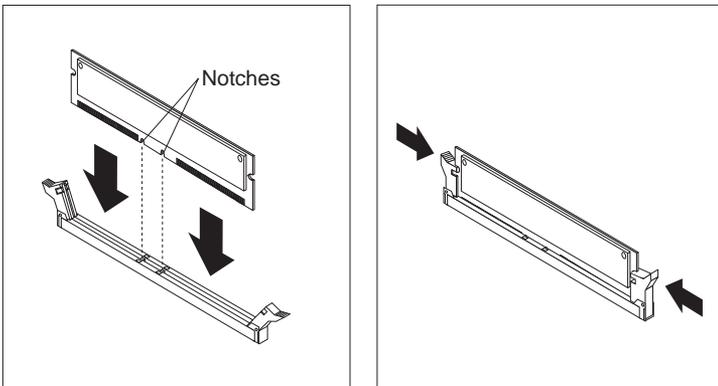
- Read the instructions that come with the new system memory.
- Turn off the computer and all other connected devices.
- Disconnect all cables attached to the computer and remove the computer cover (see “Removing the cover and front bezel” on page 57).

To install a RIMM or C-RIMM:

1. Touch the static-protective package containing the RIMM to any *unpainted* metal surface in the computer, and then remove the RIMM or C-RIMM.
2. Position the RIMM or C-RIMM above the connector so that the two notches on the bottom edge of the module align properly with the empty connector.

**Note:** Pay attention to the orientation of the notches on the connectors and RIMMs. Adjacent connectors might not have the same orientation on the memory card.

3. Firmly push the module straight down into the connector until the retaining clips pop up and fit snugly around both ends of the module.



4. Place the memory card back in the slot on the system board and reattach the power and hard disk drive fan cables to the connectors on the memory card.
5. Release the adapter guide latch on the front fan.
6. Go to the device-record form in Appendix C, “Computer records” on page 147 and record this installation.

### What to do next

- To work with another option, go to the appropriate section.
- To replace the cover, go to “Replacing the cover and connecting the cables” on page 82.

## Installing adapters

You can install a variety of adapters in the expansion slots on the system board. For information to help you locate the system board, see “Locating components” on page 60.

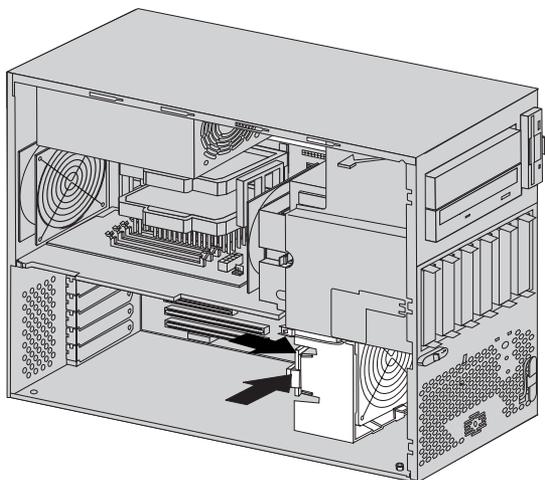
The system board has four 32-bit PCI slots and two 64-bit PCI slots. This section provides information and instructions for installing adapters.

### Before you begin:

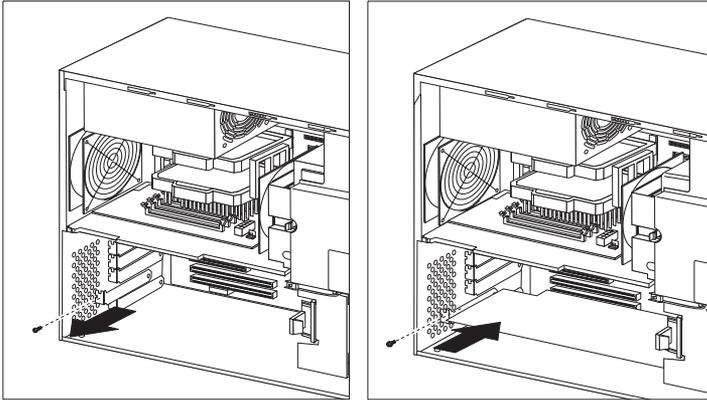
- Read the instructions that come with the new adapter.
- Turn off the computer and all other connected devices.
- Disconnect all cables attached to the computer and remove the computer cover (see “Removing the cover and front bezel” on page 57).

To install an adapter:

1. If you are installing a full-sized adapter in one of the PCI slots on the system board, press the tab on the front fan and push the adapter guide latch back to allow room for the adapter to slide into the adapter guide on the front fan.



2. Remove the screw and the appropriate expansion slot cover.
3. Touch the static-protective package containing the adapter to any *unpainted* metal surface in the computer; then, remove the adapter from the package.
4. Install the adapter and screw it into place.



Adapters supported by your computer use *Plug and Play* technology, which enables the computer to automatically configure the adapter. For more information, see “Updating the computer configuration” on page 83.

#### What to do next

- Go to the device-record form in Appendix C, “Computer records” on page 147 and write the adapter name next to the slot into which you installed it.
- To work with another option, go to the appropriate section.
- To replace the cover, go to “Replacing the cover and connecting the cables” on page 82.

## Installing internal drives

This section provides information and instructions for installing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the drives available for your computer are:

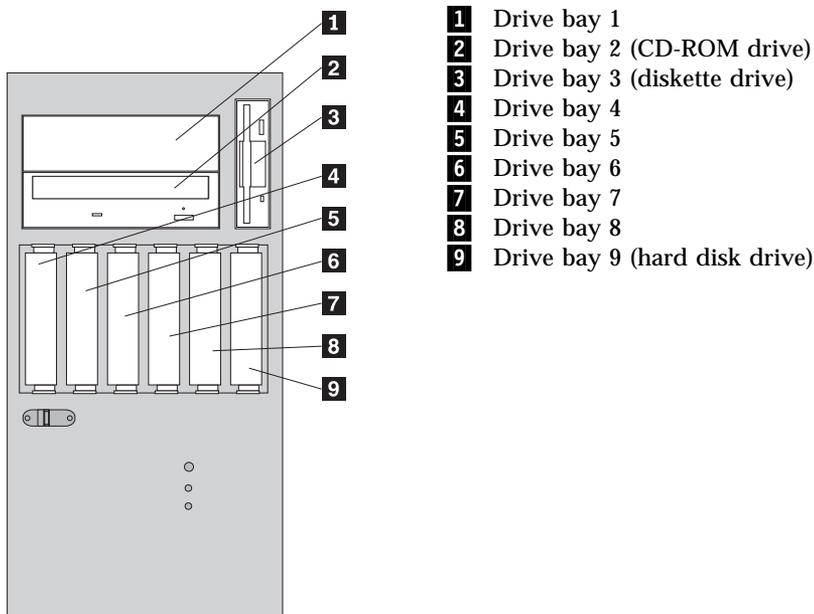
- Hard disk drives
- Removable media drives (CD-ROM drives, Jaz drives, Zip drives, etc.)

Internal drives are installed in *bays*. The bays are referred to as bay 1, bay 2, and so on. When you install an internal drive, it is important to note what type and size of drive you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

Your computer comes with the following IBM-installed drives:

- A CD-ROM drive in bay 2
- A 3.5-inch diskette drive in bay 3
- A 3.5-inch hard disk drive in bay 9

Your computer has a static shield and bay panel installed in bay 1.



## Drive specifications

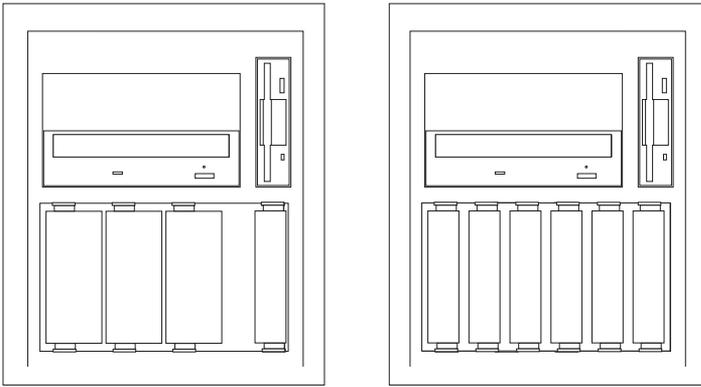
The following table describes some of the drives you can install in each bay and their height requirements.

<b>Bay 1 -</b> Maximum height: 40.6 mm (1.6 in.)	Tape drive DVD Jaz drive Zip drive (bracket required) Hard disk drive (Must be 7200 rpm or less-bracket required)
<b>Bay 2 -</b> Maximum height: 40.6 mm (1.6 in.)	CD-ROM drive (preinstalled)
<b>Bay 3 -</b> Maximum height: 25.4 mm (1.0 in.)	3.5-inch diskette drive (preinstalled)
<b>Bay 4/5 -</b> Maximum height: 40.6 mm (1.6 in.)	3.5-inch hard disk drive
<b>Bay 5/6 -</b> Maximum height: 40.6 mm (1.6 in.)	3.5-inch hard disk drive
<b>Bay 7/8 -</b> Maximum height: 40.6 mm (1.6 in.)	3.5-inch hard disk drive
<b>Bay 8 -</b> Maximum height: 25.4 mm (1.0 in.)	3.5-inch hard disk drive
<b>Bay 9 -</b> Maximum height: 25.4 mm (1.0 in.)	3.5-inch hard disk drive (preinstalled)

### Notes:

1. Install removable-media drives in bay 1.
2. Only one diskette drive is supported.
3. Bays 4, 5, and 6 support either three 25.4 mm (1.0 in.) drives or two 40.6 mm (1.6 in.) drives.
4. Bays 7, 8, and 9 support either three 25.4 mm (1.0 in.) drives or two 40.6 mm (1.6 in.) drives.

See the following illustration for possible drive arrangement.



## SCSI controller

Your computer is equipped with a SCSI controller integrated on the system board for use with Ultra160 SCSI devices.

For computers with preinstalled software, information about the SCSI controller and connecting devices is available by selecting **Get help** → **View documentation** in the Access IBM menu. SCSI documentation is also on the *Software Selections CD* that comes with your computer.

## Power and signal cables for internal drives

Your computer uses cables to connect internal drives to the power supply and system board. The drives that are preinstalled in your computer come with power and signal cables attached. If you replace any drives, it is important to remember which cable is attached to which drive. The following cables are provided:

- Four-wire *power cables* connect most drives to the power supply. At the end of these cables are plastic connectors that attach to different drives; these connectors vary in size. Also, certain power cables attach to the system board.
- Flat *signal cables*, also called *ribbon cables*, connect SCSI, IDE, and diskette drives to the system board.
  - The wider gray signal cable has three connectors. One of these connectors attaches to the CD-ROM drive, one is available for a device installed in bay 1, and one attaches to the secondary IDE connector on the system board.
  - The narrower gray signal cable has two connectors for attaching the diskette drive to the diskette-drive connector on the system board.

- An Ultra160 ribbon cable connects the internal Ultra160 SCSI hard disk drive to the SCSI connector on the system board. This cable has five additional connectors for attaching more internal SCSI devices.
- A round SCSI cable connects external SCSI devices to the SCSI connector on the system board and provides an additional connector for a SCSI device installed in bay 1. If a SCSI device is installed in bay 2 but no external SCSI devices are attached, a SCSI terminator must be attached to the external SCSI connector. For more information on connecting SCSI devices, see the Adaptec SCSI documentation on the *Software Selections CD* that comes with your computer.

**Note:** To locate connectors on the system board, see “Identifying parts on the system board” on page 60.

The following are some important points to remember when connecting IDE internal drives:

- When you install a drive, ensure that the drive connector at the *end* of the signal cable is always connected to a drive; also, ensure that the drive connector at the other end is connected to the system board. This reduces electronic noise from the computer.
- If two IDE devices are used on a single cable, one must be designated as the master device and the other as the slave device; otherwise, the system might not recognize some of the IDE devices. Switch or jumper settings on each IDE device determines the master or slave designation.
- If two IDE devices are on a single cable and only one is a hard disk drive, the hard disk drive must be set as the master device.
- If you have only one IDE device on a cable, it must be set as master.

For help in selecting drives and cables, see page 56.

## Installing a drive in bay 1

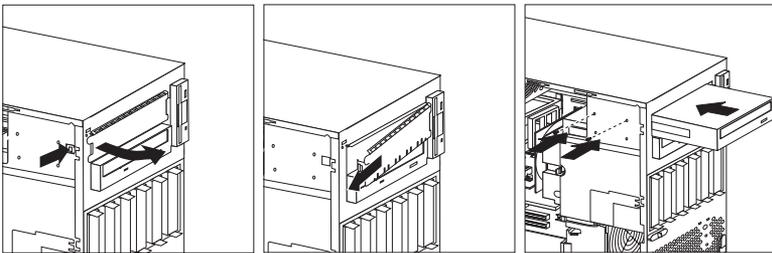
### Before you begin

- For information on installing SCSI drives, see the SCSI information provided on the *Software Selections CD* that comes with your computer.
- Read “Preparing to install options” on page 55.
- Turn off the computer and all other attached devices.
- Disconnect all external cables and power cords, and then remove the computer cover and front bezel(see “Removing the cover and front bezel” on page 57).
- Read the documentation that comes with the drive.

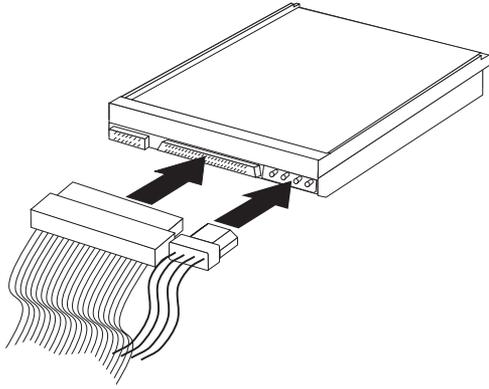
**Note:** To install a 3.5-inch drive into drive bay 1, you need an industry standard bay adapter bracket.

To install a drive in bay 1:

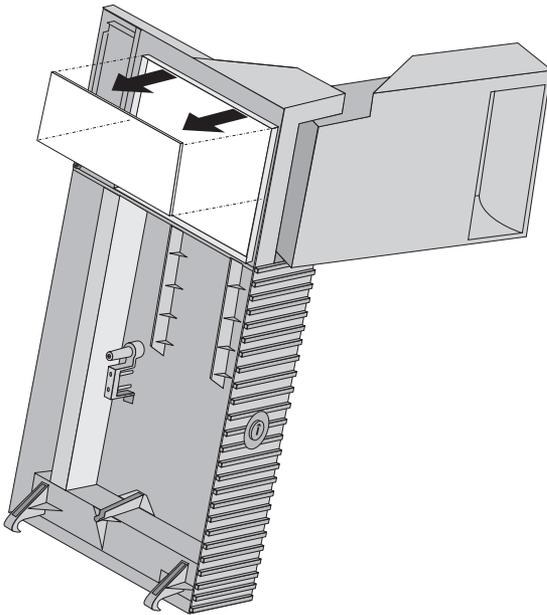
1. Touch the static-protective package containing the new drive to any *unpainted* metal surface and then remove the drive.
2. Remove the EMC shield covering bay 1 and insert the drive into the unoccupied drive bay. Then insert and tighten the screws to hold it in place.



3. Attach all cables to the drive.



4. If the drive is a removable media drive, remove the front bay panel in the cover.



### What to do next:

- Go to the device-record form in Appendix C, “Computer records” on page 147 and record the new installation.
- To work with another option, go to the appropriate section.
- To replace the cover and front bezel, go to “Replacing the cover and connecting the cables” on page 82.

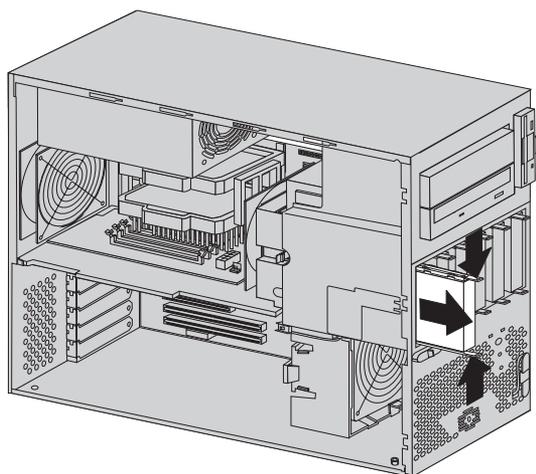
## Installing drives in bays 4, 5, 6, 7, and 8

### Before you begin

- For information on installing SCSI drives, see the SCSI information provided on the *Software Selections CD* that comes with your computer.
- Read “Preparing to install options” on page 55.
- Turn off the computer and all other attached devices.
- Disconnect all external cables and power cords, and then remove the computer cover and front bezel (see “Removing the cover and front bezel” on page 57).
- Read the documentation that comes with the drive.

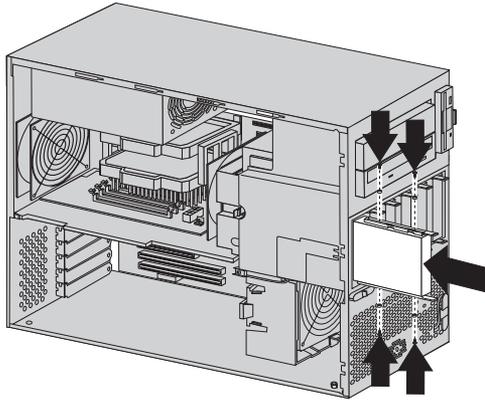
To install a drive in bays 4, 5, 6, 7, and 8:

1. Remove the plastic housing occupying the drive bay into which you want to install the drive.

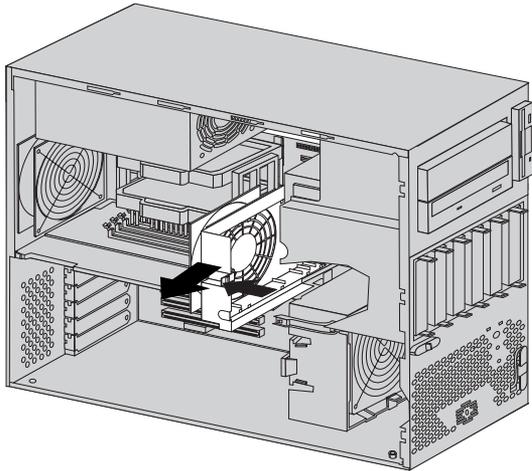


2. Remove the sliding rail mounts from the plastic housing.

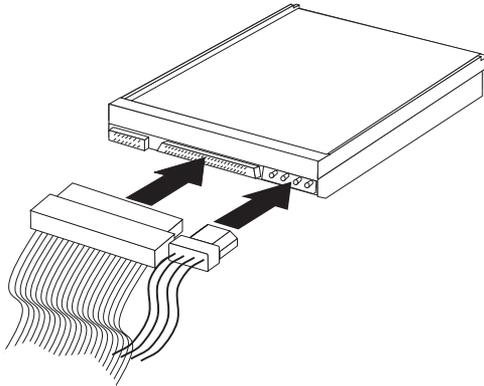
3. Touch the static-protective package containing the new drive to any *unpainted* metal surface and then remove the drive.
4. Mount sliding rails on the drive you wish to install.
5. Slide the drive along the rail guides into the unoccupied drive bay.



6. Unplug the hard disk drive fan power cable from the connector on the memory card.
7. Pull the tab release on the hard disk fan toward the rear of the chassis and slide the hard disk drive fan out of the chassis.



8. Attach all cables to the drive.



9. Replace the hard disk drive fan.

10. Reconnect hard disk drive fan cable.

**What to do next:**

- Go to the device-record form in Appendix C, “Computer records” on page 147 and record the new installation.
- To work with another option, go to the appropriate section.
- To replace the cover, go to “Replacing the cover and connecting the cables” on page 82.

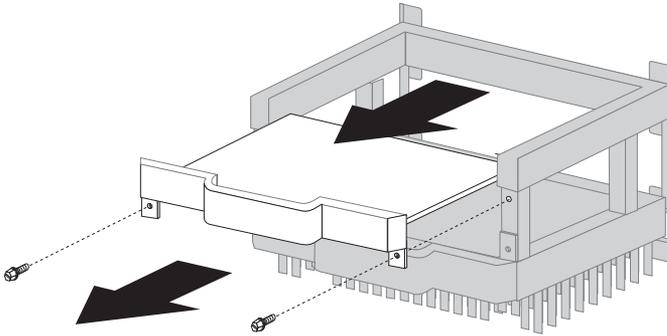
## Installing a second microprocessor

**Important**

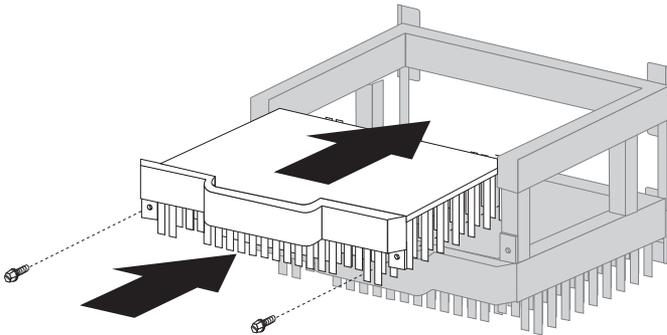
- Be sure to perform a backup of the hard disk before you add a second microprocessor.
- Before installing a second microprocessor, you must run the Multiprocessor Upgrade Option program, provided on the *Software Selections CD*. For information about this utility, see `addepu.txt` on the *Software Selections CD*.
- If you do not perform the installation procedure properly, your computer might be unusable after you install the second microprocessor.

After running the Multiprocessor Upgrade Option program, you can use the following procedure to install a second microprocessor:

1. Read the instructions that come with the new microprocessor.
2. Remove the cover. See “Removing the cover and front bezel” on page 57.
3. If your computer has an air baffle, remove it. See “Removing the air baffle” on page 59.
4. See the system board label inside your computer for the location of the terminator and second microprocessor socket (second CPU).
5. Loosen the two screws holding the terminator card in the secondary microprocessor socket (see “Identifying parts on the system board” on page 60) and remove the terminator card from the second microprocessor socket.



6. Remove the microprocessor from its static-protective package and insert it into the guides. Push the microprocessor into the socket until it is properly seated.



7. Tighten the two screws.

8. To gain access to the second CPU voltage regulator module (VRM) socket on the system board, move aside all power supply cables as necessary. Disconnect cables to the drives only if necessary.
9. Install the VRM supplied with the microprocessor. See “Identifying parts on the system board” on page 60 for the location of the second CPU VRM socket.
10. If your computer has an air baffle, reinstall it.
11. Replace the cover. See “Replacing the cover and connecting the cables” on page 82.

**Notes:**

1. If you add a second microprocessor that runs at a different speed than the primary microprocessor, both will run at the speed of the slower microprocessor.
2. You might need to download and install the current Flash Update program after installing the second microprocessor. See “Updating system programs” on page 26 for more information.

**What to do next:**

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Completing the installation” on page 83.

## Installing a security U-bolt

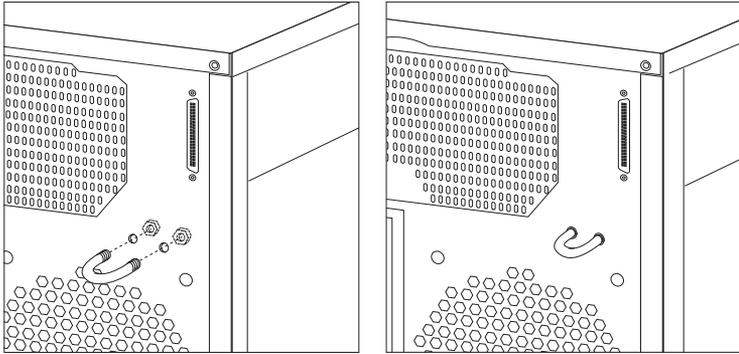
To help prevent hardware theft, you can use the cover lock and add a security U-bolt and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

**Before you begin:**

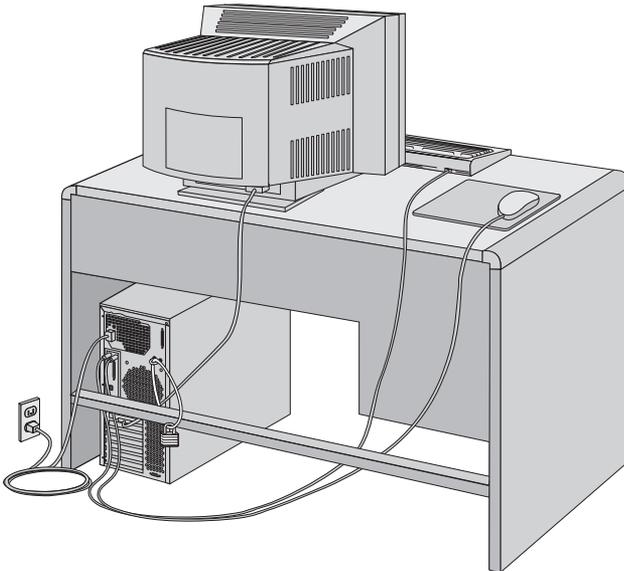
- Obtain the following:
  - A 19-mm (3/4 in.) U-bolt and threaded nuts that fit the U-bolt
  - A security cable
  - A lock, such as a combination lock or padlock
  - An appropriately sized or adjustable wrench
  - A small, flat-blade screwdriver
- Turn off the computer and all other connected devices.
- Disconnect all external cables and power cords and remove the computer cover (see “Removing the cover and front bezel” on page 57).

To install a U-bolt:

1. Use a tool, such as a screwdriver, to remove the two metal knockouts.
2. Insert the U-bolt through the rear panel; then attach and tighten the nuts with an appropriately sized or adjustable wrench.



3. Replace the computer cover. For more information, see “Replacing the cover and connecting the cables” on page 82.
4. Thread the cable through the U-bolt and around an object that is not a part of or permanently secured to the building structure or foundation, and from which it cannot be removed; then fasten the cable ends together with a lock.

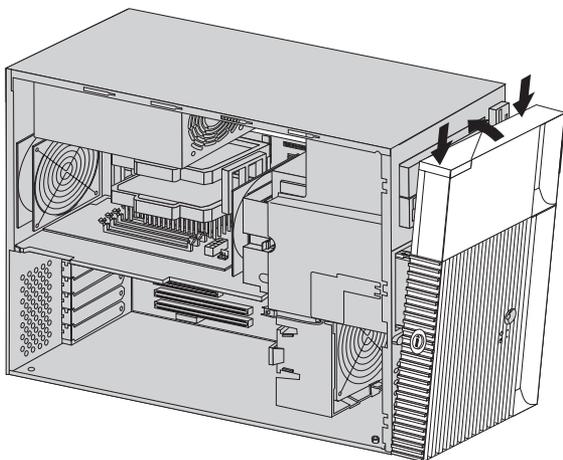


---

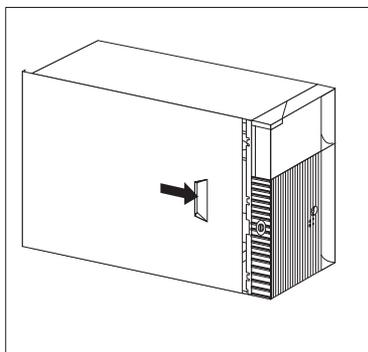
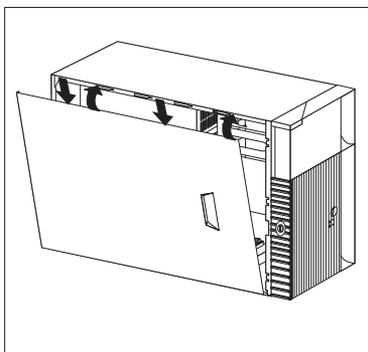
## Replacing the cover and connecting the cables

To replace the cover and connect the cables:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer.
2. Clear any cables that might impede the replacement of the cover.
3. Place the front bezel back onto the front of the chassis and snap it into place.



4. Slide the side cover into place on the chassis and lock the key-lock button as desired.



5. Reconnect the external cables and cords to the computer.
6. Plug the power cords into properly grounded electrical outlets.

7. Update the computer configuration. See “Updating the computer configuration” on page 83.

**Note:** If an error message related to the chassis-intrusion detector appears after you restart your computer, you must type the administrator password. For more information, see “Using passwords” on page 43.

---

## Completing the installation

After working with options, you need to reinstall any removed parts, replace the cover, and reconnect cables, such as power cords and monitor cables. Also, depending on the option installed, you might need to update information in the Configuration/Setup Utility program or install device drivers. For instructions on how to install device drivers, see the instructions that come with your option. Some device drivers are included on the *Device Driver and IBM Enhanced Diagnostics CD* that comes with your computer.

## Updating the computer configuration

### Important

The configuration information in this section applies to installing options. For more information on using the Configuration/Setup Utility program, see the Chapter 4, “Using the Configuration/Setup Utility program” on page 37.

After adding options, you must update the configuration settings. In most cases, system programs perform this configuration automatically. If the settings are not updated automatically, you can use the Configuration/Setup Utility program to reconfigure the appropriate settings. In either case, you must save the settings before exiting from the Configuration/Setup Utility program.

For example, when you start your computer after adding most internal hard disk drives, the settings might be updated. If the settings are not updated, use the Configuration/Setup Utility program to make and save those changes.

**Note:** For more information on error messages from resource conflicts, see Chapter 6, “Troubleshooting” on page 87.

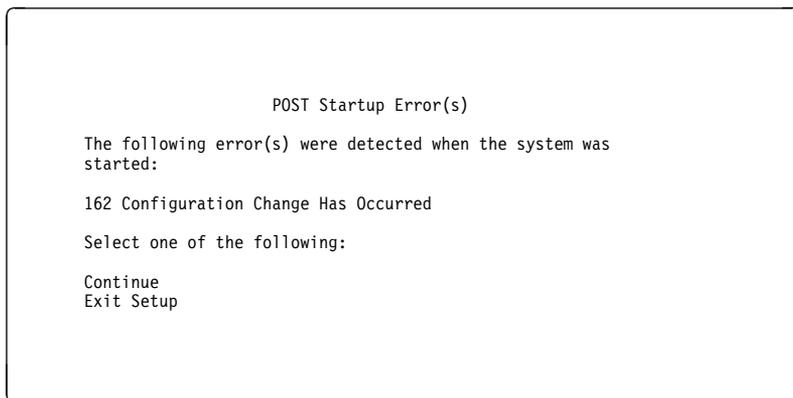
## Configuring Plug and Play adapters

Adapters designed for PCI slots are Plug and Play devices. Plug and Play adapters come with configuration specifications set in the operating system. These specifications provide installation information to the computer during startup. When you install or remove Plug and Play adapters, this information is interpreted by the *basic input/output system (BIOS)*, which supports Plug and Play technology. If the required resources are available, the BIOS software automatically configures the adapter using resources *not* already used by other devices. The system board of your computer supports operating systems that use Plug and Play technology.

**Note:** See Chapter 6, “Troubleshooting” on page 87 for information about error messages resulting from resource conflicts.

## Starting the Configuration/Setup Utility program

When you restart the computer for the first time after working with most options, a message might appear indicating that a configuration change has occurred.



If such a message appears, you are then prompted to start the Configuration/Setup Utility program to manually update the configuration settings or to confirm and save the settings that were automatically updated by the system programs.

**Note:** Depending on the configuration changes that occurred, the error message you see might be different from the one shown here. If the preceding screen appears, select **Continue** until you reach the Configuration/Setup Utility program menu (see Chapter 4, “Using the Configuration/Setup Utility program” on page 37).

If the preceding screen does not appear, use the Configuration/Setup Utility program to configure your computer. For more information, see Chapter 4, “Using the Configuration/Setup Utility program” on page 37.

## **Configuring startup sequences**

When your computer is turned on and after it completes loading the BIOS and performs POST, it looks for an operating system. The order in which it searches devices for the operating system is determined by the primary startup sequence or the automatic startup sequence. After adding new devices to the computer, you might want to change the startup sequence. You can use the Configuration/Setup Utility program to configure startup devices. See “Changing and viewing the startup sequence” on page 49.



---

## Chapter 6. Troubleshooting

This chapter describes diagnostic tools that are available to you. You can use these tools to identify and correct problems that might come up as you use your computer.

**Note**

If your computer does not start when you press the power switch, do the following:

- Make sure your computer and monitor are connected to working electrical outlets.
- Make sure all cables are securely connected to the correct locations.

If this does not correct the problem, have the computer serviced.

Computer problems can be caused by hardware, software, or user error (for example, pressing the wrong key). Using the diagnostic aids discussed in this chapter, you might be able to solve such problems yourself or gather helpful information you can pass on to a service technician.

You can check the hardware by following the procedures in this chapter. You can also use the diagnostic programs provided with your computer (see “IBM Enhanced Diagnostics” on page 109 for a description of these programs).

If the hardware checks out and you have not made a user error, you might have a software problem. If you suspect that you have a software problem, see “Software problems” on page 108 and the operating system documentation that comes with your computer. If you have installed software applications yourself, see the documentation that comes with the software.

The following tools are available to diagnose hardware-related problems:

- Power-on self-test (POST)
- troubleshooting MAP
- troubleshooting charts
- IBM Enhanced Diagnostics program

---

## Power-on self-test (POST)

Each time you turn on your computer, it performs a series of tests that check the operation of the base computer. This series of tests is called the *power-on self-test (POST)*.

POST does the following:

- Checks basic system board operations
- Checks the memory operation
- Compares the current system configuration with that established by the Configuration/Setup Utility program
- Starts the video operation
- Verifies that the diskette drives are working
- Verifies that the hard disk drive and the CD-ROM drive are working

If **Power-On Self-Test** is set to **enhanced**, numbers showing the amount of memory being tested appear in the top-left corner of the screen until the total amount of memory in the system is reached. The options for accessing the Configuration/Setup Utility appears in the lower-left corner of the screen. Quick mode is the default mode of operation.

**Note:** The amount of available memory shown might be somewhat less than expected because of basic input/output system (BIOS) shadowing in random access memory (RAM).

If POST finishes without detecting any problems, the first screen of your operating system or application program appears if you have not set a power-on password. If you have set a power-on password, a password prompt appears. You must type your password before the first screen of your operating system or application program will appear. (For more information about using passwords, see Chapter 4, “Using the Configuration/Setup Utility program” on page 37.)

If **Power-On Status** is enabled and POST detects no problems, you will hear a single beep. If POST detects a problem, you will hear multiple beeps or no beep. In most cases, an error code appears in the top-left corner of the screen, and in some cases a description of the error is displayed beside the code. (Note that the screen will sometimes display multiple error codes and descriptions.) For more information about what caused an error message to appear and what action to take, see “POST messages” on page 91.

POST error messages appear when POST finds problems with or changes to the hardware during startup. POST error messages are 3-, 4-, 5-, 8-, or 12-character alphanumeric messages and include brief explanations (except 1999XXXX errors).

---

## Troubleshooting MAP

Use this procedure as a starting point for problem isolation.

**001**

- Turn off the computer and wait a few seconds.
- Turn on the computer, monitor, and any other attached devices.
- Wait the normal amount of time for the first screen of your application or the operating system to display.

**Is the first screen of your application or operating system displayed?**

Yes No

**002**

Continue at Step 004.

**003**

You might have an I/O device that is failing, or an intermittent problem with your computer.

Go to “IBM Enhanced Diagnostics” on page 109 and run the Enhanced Diagnostics.

---

**004**

You have an unreadable display, an error message, or the computer is sounding a series of beeps.

**Is an error message displayed?**

Yes No

**005**

**Do you hear a series of beeps?**

Yes No

**006**

- Make sure that the monitor is turned on and the brightness and Contrast controls are adjusted correctly.
- Make sure that the monitor signal cable is securely connected to the monitor and to the monitor connector on the graphics adapter. To find the monitor connector on the graphics adapter installed in your computer, see “Connecting computer cables” on page 13.

If the problem persists, have the computer serviced.

007

Go to “POST beep codes” on page 95.

---

008

– See “POST messages” on page 91 and look for the error message; then return here.

**Is the error message in this table?**

Yes No

009

A SCSI error message might be displayed. See the SCSI documentation that comes with your computer.

– or –

An application message might be displayed. See the documentation for your application program.

010

**Did the Configuration/Setup Utility start automatically after the error message displayed?**

Yes No

011

– Follow the action for this error message described in “POST messages” on page 91.

012

**Have you recently added, removed, or changed any hardware?**

Yes No

013

Have the computer serviced.

014

– At the POST Startup Errors screen, select **Continue** if you want to access the Configuration/Setup Utility menu. Select **Exit Setup** if you want to exit from the Configuration/Setup Utility.

If you selected **Continue**, the Configuration/Setup Utility menu appears on the screen. You will see a pointer next to any menu items that are malfunctioning or that have been changed since the last time you turned on your computer. If you did not knowingly make a change to a flagged menu item, there is probably a malfunction in that item. If you made a

change to the hardware recently, continue with the Configuration/Setup Utility. See Chapter 4, “Using the Configuration/Setup Utility program” on page 37. If you have not made changes, have the computer serviced.

## POST messages

Code	Description	Action
101	Interrupt failure	Have the computer serviced.
102	Timer failure	Have the computer serviced.
106	System board failure	Have the computer serviced.
110	System board memory parity error	Have the computer serviced.
111	I/O parity error 2 (I/O channel check latch set)	Go to “IBM Enhanced Diagnostics” on page 109 for instructions on running diagnostics.
114	External ROM checksum error	Have the computer serviced.
121	Hardware error	Have the computer serviced.
151	Real time clock failure	Have the computer serviced.
161	Defective CMOS battery	Replace the battery. See “Replacing the battery” on page 116.
162	CMOS RAM checksum/configuration error	<ol style="list-style-type: none"> <li>1. Go to Chapter 4, “Using the Configuration/Setup Utility program” on page 37 and follow the instructions to fix any configuration errors and save the new configuration.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
163	Clock not updating	Have the computer serviced.
164	CMOS RAM memory size does not match.	Go to “IBM Enhanced Diagnostics” on page 109 for instructions on running diagnostics.

<b>Code</b>	<b>Description</b>	<b>Action</b>
166	Boot block check sum error	<ol style="list-style-type: none"> <li>1. Go to “Recovering from a POST/BIOS update failure” on page 115 and follow the instructions to run the POST/BIOS recovery procedure.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
167	Clock not updating	Update the BIOS. See “Updating system programs” on page 26.
168	Alert on LAN is not working correctly.	<ol style="list-style-type: none"> <li>1. Go to Chapter 4, “Using the Configuration/Setup Utility program” on page 37 to make sure that Alert on LAN is enabled.</li> <li>2. If Alert on LAN is enabled and the problem persists, have the computer serviced.</li> </ol>
175	System board error	Have the computer serviced.
176	The system cover has been removed.	Type the administrator password. If the problem persists, have the computer serviced.
177	An inventory violation occurred, such as a hardware component was removed. This error message is part of the Asset ID feature of the computer.	Type the administrator password. If the problem persists, have the computer serviced.
184	The asset control antenna has not been detected.	Have the computer serviced.
186	A system board or hardware security error occurred.	Have the computer serviced.
187	The administrator password and boot sequences have been cleared.	Go to Chapter 4, “Using the Configuration/Setup Utility program” on page 37 for instructions on setting an administrator password and the startup sequences.
190	The computer chassis-intrusion detector was cleared. (This is an informational message. No action is required.)	

<b>Code</b>	<b>Description</b>	<b>Action</b>
20x	A memory error occurred.	Go to “IBM Enhanced Diagnostics” on page 109 for instructions for running diagnostics.
301 or 303	A keyboard error occurred.	<ol style="list-style-type: none"> <li>1. Make sure the keyboard is properly connected.</li> <li>2. If the keyboard is properly connected, have the computer serviced.</li> </ol>
601	A diskette drive or controller error occurred.	<ol style="list-style-type: none"> <li>1. Go to “IBM Enhanced Diagnostics” on page 109 and if possible follow the instructions to run the Enhanced Diagnostics.</li> <li>2. Have the computer serviced.</li> </ol>
602	The diskette IPL startup (boot) record is not valid.	<ol style="list-style-type: none"> <li>1. The diskette might be defective. Try another diskette.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
604	An unsupported diskette drive is installed.	<ol style="list-style-type: none"> <li>1. Go to “IBM Enhanced Diagnostics” on page 109 and if possible follow the instructions to run the Enhanced Diagnostics.</li> <li>2. Have the computer serviced.</li> </ol>
662	Diskette drive configuration error	<ol style="list-style-type: none"> <li>1. Go to the configuration procedure and verify the diskette drive configuration.</li> <li>2. Run the diagnostics program for the diskette drive. See “IBM Enhanced Diagnostics” on page 109.</li> <li>3. If the problem persists, have the computer serviced.</li> </ol>
762	A math coprocessor configuration error occurred.	Have the computer serviced.
11xx	A serial port error (xx = serial port number) occurred.	Have the computer serviced.

<b>Code</b>	<b>Description</b>	<b>Action</b>
1762	A hard disk configuration error occurred.	<ol style="list-style-type: none"> <li>1. Go to Chapter 4, "Using the Configuration/Setup Utility program" on page 37 and follow the instructions to verify the hard disk drive configuration.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
178x	A hard disk or IDE device failed.	<ol style="list-style-type: none"> <li>1. Go to "IBM Enhanced Diagnostics" on page 109 for instructions on running the diagnostics program on the hard disk and the IDE devices.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
18xx	A PCI adapter has requested an unavailable resource.	Go to Chapter 4, "Using the Configuration/Setup Utility program" on page 37 for instructions on how to reconfigure the PCI devices.
1962	A startup (boot) sequence error occurred.	<ol style="list-style-type: none"> <li>1. Go to Chapter 4, "Using the Configuration/Setup Utility program" on page 37 and follow the instructions to verify that the correct startup sequence is configured.</li> <li>2. If the problem persists, have the computer serviced.</li> </ol>
8603	A pointing device or system board error occurred.	Have the computer serviced.
I9990301	The hard disk drive failed.	Have the computer serviced.

---

## POST beep codes

One beep and the appearance of text on the monitor indicate successful completion of POST. A series of two or three sets of beeps indicates that POST detected an error. The duration of each beep is constant, but the pattern of beeps and pauses between the beeps varies. For example, a 1-2-4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive beeps.

For the following beep codes, the numbers indicate the sequence and number of beeps. For example, a “2-3-2” error symptom (a burst of two beeps, three beeps, then two beeps) indicates a memory-module problem.

If you hear a series of beeps, note the beep code as indicated on the following table and have the computer serviced.

**Note:** Depending on your computer, you might hear beep codes that are not in the following table.

Beep code	Probable cause
1-1-3	CMOS write/read failure
1-1-4	BIOS ROM checksum failure
1-2-1	Programmable interval-timer test failure
1-2-2	DMA initialization failure
1-2-3	DMA page register write/read test failure
1-2-4	RAM refresh verification failure
1-3-1	Memory failure or too many devices on RIMMs
1-3-2	First 64 KB RAM parity test failure or too many devices on RIMMs
2-1-1	Secondary DMA register test in progress or failure
2-1-2	Primary DMA register test in progress or failure
2-1-3	Primary interrupt mask register test failure
2-1-4	Secondary interrupt mask register test failure
2-2-2	Keyboard controller test failure
2-3-2	Screen memory test in progress or failure
2-3-3	Screen retrace tests in progress or failure
3-1-1	Timer tick interrupt test failure
3-1-2	Interval timer channel 2 test failure
3-1-4	Time-of-day clock test failure
3-2-4	Comparing CMOS memory size against actual

Beep code	Probable cause
3-3-1	Memory size mismatch occurred

---

## SCSI error messages

These messages appear if a problem or conflict is detected by the SCSI subsystem. See the SCSI documentation on the *Software Selections CD* that comes with your computer for information about these messages.

---

## Software-generated error messages

These messages appear if a problem or conflict is detected by the application program, the operating system, or both. Error messages for operating-system and other software problems are generally text messages, but they also can be numeric codes. For information about these software error messages, see the information supplied with the operating system and application program.

---

## Diagnostic error codes and messages

These codes and messages appear if a hardware problem is detected by one of the IBM Enhanced Diagnostics programs. Along with error codes, the messages present text information that can be used to identify a failing part. For more information, see “IBM Enhanced Diagnostics” on page 109.

---

## Troubleshooting charts

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

### Important

If you find it necessary to remove the computer cover, first read “Safety information” on page ix and “Removing the cover and front bezel” on page 57 for important safety information and instructions.

If you have just added new software or a new computer option and your computer is not working, do the following before using the troubleshooting charts:

1. Remove the software or device you just added.
2. Run the diagnostic programs to determine if your computer is running correctly. (See “IBM Enhanced Diagnostics” on page 109 for information about diagnostic programs provided with your computer.)
3. Reinstall the new software or new device.

The following directory will help you quickly locate problem categories in the troubleshooting charts.

<b>Problem type</b>	<b>Go to:</b>
Diskette drive	“Diskette drive problems” on page 98
Hard disk drive	“Hard disk drive problems” on page 99
General	“General problems” on page 102
Intermittent	“Intermittent problems” on page 103
Keyboard, mouse, or pointing-device	“Keyboard, mouse, or pointing-device problems” on page 103
Memory	“Memory problems” on page 104
Monitor	“Monitor problems” on page 99
Option	“Option problems” on page 105
Parallel port	“Parallel port problems” on page 106
Printer	“Printer problems” on page 107
Serial ports	“Serial port problems” on page 107
Software	“Software problems” on page 108
Universal Serial Bus port	“Universal Serial Bus port problems” on page 108

## Diskette drive problems

<b>Diskette drive problems</b>	<b>Action</b>
Diskette drive in-use light stays on, or the system bypasses the diskette drive.	<p>If there is a diskette in the drive, verify that:</p> <ol style="list-style-type: none"><li data-bbox="380 285 868 415">1. The diskette drive is enabled. Use the Configuration/Setup Utility to check this. For more information, see Chapter 4, "Using the Configuration/Setup Utility program" on page 37.</li><li data-bbox="380 431 874 513">2. The computer is checking for the diskette drive in the startup sequence. Use the Configuration/Setup Utility to verify this.</li><li data-bbox="380 529 874 610">3. The diskette you are using is good and not damaged. Try inserting another diskette if you have one.</li><li data-bbox="380 626 868 675">4. The diskette is inserted correctly, with its label up and its metal-shutter end first in the drive.</li><li data-bbox="380 691 874 740">5. The diskette contains the necessary files to start the computer (the diskette must be startable).</li><li data-bbox="380 756 889 805">6. The diskette drive cable is properly installed and securely connected.</li><li data-bbox="380 821 889 870">7. There is no problem with your software program (see "Software problems" on page 108).</li></ol> <p>If you cannot correct the problem, have the computer serviced.</p>

## Hard disk drive problems

<b>Hard disk drive problems</b>	<b>Action</b>
Hard disk drive in-use light stays on, or the system bypasses the hard disk drive.	Verify that: <ol style="list-style-type: none"><li data-bbox="412 285 898 415">1. The hard disk drive is enabled. Use the Configuration/Setup Utility to check this. For more information, see Chapter 4, “Using the Configuration/Setup Utility program” on page 37.</li><li data-bbox="412 431 923 506">2. The computer is checking for the hard disk drive in the startup sequence. Use the Configuration/Setup Utility to verify this.</li><li data-bbox="412 522 895 571">3. The hard disk drive cable is properly installed and securely connected.</li><li data-bbox="412 587 925 636">4. There is no problem with your software program (see “Software problems” on page 108).</li></ol> If you cannot correct the problem, have the computer serviced.

## Monitor problems

<b>Monitor problems</b>	<b>Action</b>
General monitor problems	Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information supplied with the monitor for adjustment and testing instructions.  If you cannot find the problem, check the other listings on monitor problems in this table.  If you cannot correct the problem, have the monitor and computer serviced.

Monitor problems	Action
<p>Wavy, unreadable, rolling, distorted, or jittery screen images</p>	<p>If the monitor self-tests show that the monitor is working properly, verify that:</p> <ol style="list-style-type: none"> <li>1. The location of the monitor is appropriate. Magnetic fields around other devices, such as transformers, appliances, fluorescent lights, and other monitors might be causing the problem. To determine if the location is causing the problem:             <ol style="list-style-type: none"> <li>a. Turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.)</li> <li>b. Adjust the placement of the monitor and other devices so that they are at least 300 mm (12 in.) apart. Also, when relocating the monitor, be sure it is at least 75 mm (3 in.) from the diskette drives to prevent diskette drive read/write errors.</li> <li>c. Turn on the monitor.</li> </ol> </li> <li>2. An IBM monitor signal cable is properly connected to the monitor and computer, and that the cable is installed securely. Non-IBM monitor signal cables might cause unpredictable problems.</li> <li>3. You are not trying to run your monitor at a higher refresh rate than the monitor supports. See the documentation supplied with your monitor for supported refresh rates.</li> </ol> <p><b>Note:</b> An enhanced monitor signal cable with additional shielding might be available for your monitor. See your IBM reseller or marketing representative for information.</p> <p>If you cannot correct the problem, have the monitor and computer serviced.</p>

Monitor problems	Action
The screen flickers.	<p>Set the monitor for the highest, noninterlaced refresh rate supported by your monitor and the video controller in your computer. For more information, see the documentation supplied with your monitor and the README files for the graphics adapter that comes with your computer. The README files are on the <i>Software Selections CD</i> supplied with your computer.</p> <p><b>Attention:</b> Using a resolution or refresh rate that is not supported by your monitor might damage it.</p> <p>You can reset the refresh rate through your operating system, using the instructions provided in the README files. See your operating system documentation for further information on monitor settings.</p> <p>If this does not correct the problem, have the monitor and computer serviced.</p>
The monitor works when you turn on the computer, but goes blank when you start some application programs.	<p>Verify that:</p> <ol style="list-style-type: none"> <li>1. The monitor signal cable is securely connected to the monitor and the monitor connector on the graphics adapter. For the location of the monitor connector on the graphics adapter installed in your computer, see “Connecting computer cables” on page 13.</li> <li>2. The necessary device drivers for the application programs are installed.</li> </ol> <p>If you cannot correct the problem, have the monitor and computer serviced.</p>
The monitor works when you turn on the computer, but goes blank after some period of computer inactivity.	<p>The computer is probably set for energy savings using one of the power-management settings. If the power-management features are enabled, disabling or changing power-management settings might solve the problem (see “Power-management features” on page 51).</p> <p>If you cannot correct the problem, have the computer serviced.</p>

Monitor problems	Action
Blank screen	Verify that: <ol style="list-style-type: none"> <li>1. The computer power cord is plugged into the computer and a working electrical outlet.</li> <li>2. The monitor is turned on and the brightness and contrast controls are adjusted correctly.</li> <li>3. The monitor signal cable is securely connected to the monitor and the monitor connector on the graphics adapter. To find the monitor connector on the graphics adapter installed in your computer, see “Connecting computer cables” on page 13.</li> </ol> <p><b>CAUTION:</b>  <b>Before removing the cover, see “Safety information” on page ix.</b></p> <ol style="list-style-type: none"> <li>4. Make sure the graphics adapter is properly installed in the AGP slot. For the location of the AGP slot, see Chapter 5, “Installing options” on page 55. You might need to reseat the adapter.</li> <li>5. All added options have been properly installed and are correctly connected.</li> </ol> <p>If you cannot correct the problem, have the monitor and computer serviced.</p>
Only the cursor appears.	Have the computer serviced.
Wrong characters appear on the screen.	Have the computer serviced.

## General problems

General problems	Action
The computer does not start when you press the power switch.	Verify that: <ol style="list-style-type: none"> <li>1. All cables are securely connected to the proper connectors on the computer. For the location of the connectors, see “Connecting computer cables” on page 13.</li> <li>2. The computer cover is properly installed.</li> </ol> <p>If you cannot correct the problem, have the computer serviced.</p>
Problems such as a broken cover lock or indicator lights not working	Have the computer serviced.

## Intermittent problems

Intermittent problems	Action
A problem occurs only occasionally and is difficult to diagnose.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 256 898 310">1. All cables and cords are securely connected to the rear of the computer and attached devices.</li><li data-bbox="412 326 919 451">2. When the computer is turned on, the fan grill is not blocked (there is air flow around the grill), and the fans are working. If air flow is blocked or the fans are not working, the computer might overheat.</li><li data-bbox="412 467 923 548">3. If SCSI devices are installed, the last external device in each SCSI chain is terminated correctly. (See your SCSI documentation.)</li></ol> <p>If you cannot correct the problem, have the computer serviced.</p>

## Keyboard, mouse, or pointing-device problems

Keyboard, mouse, or pointing-device problems	Action
All or some keys on the keyboard do not work.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 873 889 899">1. The computer and the monitor are turned on.</li><li data-bbox="412 915 910 1019">2. The keyboard cable is securely connected to the keyboard connector on the computer. For the location of the keyboard connector, see “Connecting computer cables” on page 13.</li></ol> <p>If you cannot correct the problem, have the keyboard and computer serviced.</p>
The mouse or pointing device does not work.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 1138 921 1321">1. The mouse or pointing-device cable is securely attached to the proper connector on the computer. Depending on the type of mouse you have, the mouse cable will connect to either the mouse or serial connector. To find the mouse and serial connectors, see “Connecting computer cables” on page 13.</li><li data-bbox="412 1338 891 1386">2. The device drivers for the mouse are installed correctly.</li></ol> <p>If you cannot correct the problem, have the device and computer serviced.</p>

## Memory problems

Memory problems	Action
<p>The amount of memory displayed is less than the amount of memory installed.</p>	<p>The amount of available memory shown might be somewhat less than expected because of basic input/output system (BIOS) shadowing in random access memory (RAM).</p> <p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="380 378 894 456">1. You have installed the correct type of RIMMs for your computer. See “Working with memory” on page 63 for instructions on adding RIMMs.</li><li data-bbox="380 469 873 521">2. The RIMMs are properly installed and securely connected.</li></ol> <p>If the problem persists, run the memory test from the diagnostic program supplied with your computer. (See “IBM Enhanced Diagnostics” on page 109 for further information.) The system might have detected a bad RIMM and automatically reallocated memory to enable your computer to continue to operate.</p> <p>If you cannot correct the problem, have the computer serviced.</p>

# Option problems

Option problems	Action
<p>An IBM option that was just installed does not work.</p>	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 256 859 280">1. The option is designed for your computer.</li><li data-bbox="412 297 870 375">2. You followed the installation instructions supplied with the option and in Chapter 5, "Installing options" on page 55.</li><li data-bbox="412 391 926 492">3. All option files (if required) are installed correctly. Refer to the documentation that comes with the option for information about installing option files.</li><li data-bbox="412 508 859 557">4. You have not loosened any other installed options or cables.</li><li data-bbox="412 573 912 751">5. If the option is an adapter, you have provided enough hardware resources for the adapter to function correctly. See the documentation supplied with the adapter (as well as the documentation for any other installed adapters) to determine the resources required for each adapter.</li><li data-bbox="412 768 926 898">6. You updated the configuration information in the Configuration/Setup Utility, if necessary, and have no conflicts. For more information, see Chapter 4, "Using the Configuration/Setup Utility program" on page 37.)</li></ol> <p>If the problem persists, run the diagnostic programs. (See "IBM Enhanced Diagnostics" on page 109 for information about diagnostic programs provided with your computer.)</p> <p>If you cannot correct the problem, have the option and computer serviced.</p>

Option problems	Action
<p>An IBM option that previously worked does not work now.</p>	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the failing option is a SCSI option, verify that:</p> <ol style="list-style-type: none"> <li>1. The cables for all external SCSI options are connected correctly.</li> <li>2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly.</li> <li>3. All external SCSI options are turned on. External SCSI options must be turned on before the system is turned on.</li> </ol> <p>For more information, see your SCSI documentation.</p> <p>If you cannot correct the problem, have the option and computer serviced.</p>

## Parallel port problems

Parallel port problems	Action
<p>The parallel port cannot be accessed.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> <li>1. Each port is assigned a unique address. See Configuration/Setup Utility program for more information.</li> <li>2. The parallel-port adapter, if you added one, is properly installed and firmly seated. See “Installing adapters” on page 68 for instructions on adding adapters.</li> </ol> <p>If you cannot correct the problem, have the computer serviced.</p>

## Serial port problems

Serial port problems	Action
The serial port cannot be accessed.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 256 898 337">1. Each port is assigned a unique address. See Configuration/Setup Utility program for more information.</li><li data-bbox="412 354 919 456">2. The serial-port adapter, if you added one, is properly installed and firmly seated. See “Installing adapters” on page 68 for instructions on adding adapters.</li></ol> <p>If you cannot correct the problem, have the computer serviced.</p>

## Printer problems

Printer problems	Action
The printer does not work.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="412 725 817 751">1. The printer is turned on and is online.</li><li data-bbox="412 768 919 898">2. The printer signal cable is securely connected to the correct parallel, serial, or USB port on the computer. (See “Connecting computer cables” on page 13 for the location of the parallel, serial, and USB ports.)</li></ol> <p><b>Note:</b> Non-IBM printer signal cables might cause unpredictable problems.</p> <ol style="list-style-type: none"><li data-bbox="412 979 898 1027">3. You have assigned the printer port correctly in your operating system or application program.</li><li data-bbox="412 1044 898 1174">4. You have assigned the printer port correctly in the Configuration/Setup Utility. For more information, see Chapter 4, “Using the Configuration/Setup Utility program” on page 37.</li><li data-bbox="412 1190 919 1239">5. If the problem persists, run the tests described in the documentation that comes with your printer.</li></ol> <p>If you cannot correct the problem, have the printer and computer serviced.</p>

## Software problems

Software problems	Action
Software does not function properly.	<p>To determine if problems are caused by installed software, verify that:</p> <ol style="list-style-type: none"><li data-bbox="380 289 862 391">1. Your computer has the minimum memory requirements needed to use the software. See the information supplied with the software to verify memory requirements.</li></ol> <p><b>Note:</b> If you have just installed an adapter or memory, you might have a memory address conflict.</p> <ol style="list-style-type: none"><li data-bbox="380 496 844 548">2. The software is designed to operate on your computer.</li><li data-bbox="380 561 812 586">3. Other software works on your computer.</li><li data-bbox="380 599 859 651">4. The software you are using works on another computer.</li></ol> <p>If you received any error messages while using the software program, see the information supplied with the software for a description of the messages and solutions to the problem.</p> <p>If you cannot correct the problem, have the computer serviced.</p>

## Universal Serial Bus port problems

Universal Serial Bus port problems	Action
The Universal Serial Bus ports cannot be accessed.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="380 1068 866 1146">1. Each port is assigned a unique address. See Configuration/Setup Utility program for more information.</li><li data-bbox="380 1159 878 1211">2. The USB device is properly installed and firmly seated.</li></ol> <p>If you cannot correct the problem, have the computer serviced.</p>

---

## Changing the startup sequence to start from the CD

If your computer does not start from the CD on the first try, you need to change your startup sequence in the Configuration/Setup Utility program. Follow these steps to change the startup sequence:

1. Turn on your computer. If your computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use lights go off, and restart the computer. (Do not use Ctrl+Alt+Del to restart the computer.)
2. When the Configuration/Setup Utility prompt appears in the lower-left corner of the screen during startup, press F1. (This prompt appears on the screen for only a few seconds. You must press F1 quickly.)
3. Select **Start Options** from the Configuration/Setup Utility program menu.
4. Select **Startup Sequence** from the **Start Options** menu.
5. Note the first startup device shown in the Primary Startup Sequence. You will need this information to restore your original startup sequence after you complete the recovery process.
6. Change your **First Startup Device** in the Primary Startup Sequence to the CD-ROM drive.
7. Press the Esc key until you return to the Configuration/Setup Utility program menu.
8. Before you exit from the program, select **Save Settings** from the Configuration/Setup Utility program menu and press the Enter key.
9. Turn off your computer.

**Note:** Remember to restore your original startup sequence when you have finished using the CD.

---

## IBM Enhanced Diagnostics

IBM provides programs that you can run to diagnose problems you suspect to be hardware related. Several utility programs that provide helpful information about your computer are also included. The user interface for running these diagnostic and utility programs is provided by PC-Doctor for Windows.

The IBM Enhanced Diagnostics program will isolate your computer hardware from software that was preinstalled (or that you have installed) on your hard disk. The programs run independently of the operating system, and *must be run either from CD or diskette*. This method of testing is

generally used when other methods are not accessible or have not been successful in isolating a problem suspected to be hardware related.

The *Device Driver and IBM Enhanced Diagnostics CD* comes with your computer. To run the IBM Enhanced Diagnostics program from the *Device Driver and IBM Enhanced Diagnostics CD*, do the following:

1. Change the start up sequence for your computer. See “Changing the startup sequence to start from the CD” on page 109.
2. Put the *Device Driver and IBM Enhanced Diagnostics CD* in the CD-ROM drive.
3. Shut down the computer.
4. Start up the computer. The IBM Enhanced Diagnostics program will automatically run.
5. Follow the instructions on the screen.

You can also download the latest image of the diagnostics from the IBM Web site.

To download the latest image of the IBM Enhanced Diagnostics from the Web site and create a startable Enhanced Diagnostics diskette:

1. Go to <http://www.ibm.com/pc/us/intellistation> on the World Wide Web.
2. Click **Support**. Select your type/model number and click **Downloadable files** → **Diagnostics**.
3. Download the .EXE file to a hard disk directory (not to a diskette).
4. Go to a DOS prompt and change to the directory where the file was downloaded.
5. Insert a blank high-capacity diskette in diskette drive A.
6. Type the following and press Enter:

filename *a*:

Where *filename* is the name of the file you downloaded from the Web.

The self-extracting downloaded file is copied to the diskette, and a startable *IBM Enhanced Diagnostics* diskette is created.

To start the IBM Enhanced Diagnostics program using the diagnostic diskette, do the following:

1. Turn off your computer and any attached devices.
2. Insert the *IBM Enhanced Diagnostics* diskette into diskette drive A.
3. Turn on all attached devices; then turn on your computer.

4. Follow the instructions on the screen.

---

## Other diagnostic programs

Your computer also contains diagnostic programs designed specifically for the Windows operating environment. Because these diagnostics work with the operating system, they not only test the hardware, but they also analyze certain software components of your computer. They are especially useful in isolating problems related to the operating system and device drivers.

### PC-Doctor for Windows

To use PC-Doctor for Windows:

1. If you have not already done so, install the program onto your hard disk. For information about installing software from the *Software Selections CD*, see Appendix A, “Using the Software Selections CD” on page 131.
2. To run the program after it is installed, select it from the **Programs** choice on the Windows **Start** menu and follow the instructions on the screen. Help is available online.

### CoSession Remote 32

CoSession Remote 32 availability varies by computer model and country. CoSession Remote 32 is a remote-control diagnostic program that can be used by another individual, such as your network administrator, to help diagnose problems with your computer from a remote location. CoSession Remote 32 is provided on the *Software Selections CD* that comes with your computer. To use CoSession Remote 32, it must be installed on your computer, and your computer must have a modem or a LAN connection.

#### Important

Before attempting to use CoSession Remote 32, contact your network administrator for specific instructions on setting up and using the program.

---

## Using the ConfigSafe program

ConfigSafe can be used as a troubleshooting tool, especially if problems develop after you install a new application or option. Before you make any changes to your system configuration, use ConfigSafe to take a snapshot of your current, working operating system configuration. If you have preinstalled software, ConfigSafe automatically takes a snapshot of your initial operating system configuration settings when you first start up your computer. Then you can easily return to that configuration if your computer becomes disabled by changes in the configuration files.

If you are unable to solve a problem yourself and you need assistance from an IBM technical support representative, use ConfigSafe to generate a report about recent changes in your configuration before you call the PC HelpCenter®. The IBM technical support representative will be able to use the information in this report to help you solve the problem.

### ConfigSafe Save Our System (SOS) feature

ConfigSafe has an SOS feature that can be used in a DOS environment if your Windows desktop becomes unusable. To use the SOS feature of ConfigSafe:

1. Access a DOS prompt
2. At the command prompt, type `cd\cfgsafe`. Press Enter.
3. Type `sos`. Press Enter.
4. Select the most recent configuration that is dated before the start of the problem. Press Enter.
5. Restart the computer.

**Note:** If the problem is not solved, you can repeat these steps selecting a different saved configuration, or using the **Undo** button. (The **Undo** button is only available in the Windows version of ConfigSafe.) If the problem cannot be solved with a saved configuration, see “IBM Enhanced Diagnostics” on page 109.

Support documentation is built into the online Help system. To access online Help, run the ConfigSafe program. The online Help files will appear in the pull-down menu on the right side of the screen.

---

## Using the IBM Product Recovery CDs

The IBM *Product Recovery CDs* are provided with your computer so that you can reinstall your operating system, preinstalled applications, and device drivers in case of a hard disk failure or other damage to your files.

To use the IBM *Product Recovery CDs*, place IBM *Product Recovery CD 1* in the CD-ROM drive, then shut down the operating system and turn off the computer. Turn on the computer and the Product Recovery program will begin. If the CD does not start, you may need to change your primary startup sequence. For more information, see “Changing the startup sequence to start from the CD” on page 109.

### Recovering the operating system and support software

If your computer came with Windows 2000 Professional preinstalled, you have the option to recover Windows NT Workstation. If you wish to recover Windows NT Workstation from the Windows 2000 Professional, use your IBM *Product Recovery CD 1* for Windows 2000 Professional, and choose Windows NT Workstation when prompted to choose an operating system.

#### Information for Windows NT Workstation users

The IBM *Product Recovery CDs* for Windows NT Workstation contain a Windows 98 startable CD image that copies files from the CD to the hard disk. The CD initially runs Windows 98 DOS, and then installs Windows NT Workstation 4.0.

**Warning:** The recovery process deletes all information stored on the primary partition (drive C), including any personal files, data, and software stored on the hard disk. If possible, back up your data before starting this process.

### Important information for Windows NT Workstation users

Your computer was shipped from the factory with a FAT16 primary partition. The IBM *Product Recovery CDs* for Windows NT Workstation will work correctly only if your primary partition is FAT16.

If your primary partition is not FAT16, you will see a message about an invalid partition that needs to be repartitioned with the FDISK command.

To run the FDISK command from IBM *Product Recovery CD 1*, place IBM *Product Recovery CD 1* in the CD-ROM drive, press Esc at the Recover Main Menu; then type FDISK at the command prompt. Delete the primary partition, leave the IBM *Product Recovery CD* in the CD-ROM drive, and restart the computer. The IBM *Product Recovery CD* partitions your hard disk correctly.

Use the following steps to recover or reinstall the IBM preinstalled operating system and software:

1. Make backup copies of configuration files and any files you created. Any files not backed up will be lost.
2. Insert your IBM *Product Recovery CD 1* into your CD-ROM drive.
3. Restart your computer. If your computer does not start from the CD, you need to change your startup sequence. (See “Changing the startup sequence to start from the CD” on page 109.)
4. You might be prompted to select the appropriate operating system.
5. The Product Recovery program main menu appears with the following options:

- **Full recovery:** Reformats your hard disk and restores your computer to the original preinstalled software.
- **Partial recovery:** Reformats your hard disk and restores your operating system and all device drivers.

**Note:** If you select **Partial recovery**, not all preinstalled software applications will be recovered. Some applications must be installed from the *Software Selections CD*. For more information on installing software, see Appendix A, “Using the Software Selections CD” on page 131.

- **Repair:** Run the emergency repair utility program.

Select the option you need and follow the instructions on the screen.

6. When the recovery is complete, remove the IBM *Product Recovery CD* and restart your computer.

7. If you changed your startup sequence, make sure you change it back immediately.

## Additional resources

The *IBM Product Recovery CDs* for Windows NT Workstation includes an additional directory called **MSEXTRA**. The *IBM Product Recovery CDs* for Windows 2000 Professional contain additional subdirectories on the root directory called **\support\tools directory\**, and **\valueadd**. These directories include application updates provided by Microsoft for your convenience. Later updates of these files might be available on the Microsoft Web site.

## Installing other operating systems

If you install (or reinstall) another operating system, you might need additional software or device drivers. Hardware-specific support software is available on the *Device Driver and IBM Enhanced Diagnostics CD*. If you experience problems with device drivers installed from this CD, you can obtain updated device drivers at <http://www.ibm.com/support> on the World Wide Web.

Before installing any operating system, be sure you obtain the latest updates. Contact the operating system manufacturer or, if applicable, check the manufacturer's World Wide Web site to obtain the updates.

To install an operating system, follow the instructions in the documentation provided with the operating system and any updates. Then, follow the instructions in Appendix A, "Using the Software Selections CD" on page 131 to install the support software.

Additional information about operating systems might be available at <http://www.ibm.com/pc/support> on the World Wide Web.

---

## Recovering from a POST/BIOS update failure

If power to your computer is interrupted while POST/BIOS is being updated (flash update), your computer might not restart (reboot) correctly. If this happens, use this procedure to recover.

1. Turn off the computer and any attached devices, such as printers, monitors, and external drives.
2. Unplug all power cords from electrical outlets.
3. Remove the cover. See "Removing the cover and front bezel" on page 57.

4. Locate the rocker switch on the system board. See the system board label inside your computer for the location of the rocker switch.  
**Note:** You might need to move the front fan aside to allow easier access to the rocker switch. For instructions to move the front fan aside, see “Replacing the battery” steps 4 through 7 on page 118.
5. Move switch 3 from the off position to the on position.  
**Note:** If you moved the front fan aside, see “Replacing the battery” step 11 on page 119.
6. Install the computer cover. See “Replacing the cover and connecting the cables” on page 82.
7. Connect the power cords for the computer and monitor to electrical outlets.
8. Insert the POST/BIOS update (flash) diskette into drive A. You can download a file to create this diskette from <http://www.ibm.com/pc/support> on the World Wide Web. For more information, see Chapter 7, “Getting help, service, and information” on page 121.
9. Turn on the computer and the monitor.
10. After the update session completes, turn off the computer and monitor.
11. Remove the diskette from drive A.
12. Repeat steps 2 on page 115 through 4, then continue with step 13.
13. Move switch 3 from the on position to the off position.
14. Replace the memory card and the front fan.
15. Install the cover and reconnect any cables that were disconnected.
16. Turn on the computer to restart the operating system.

---

## Replacing the battery

Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as serial- and parallel-port assignments (configuration). A battery keeps this information active when you turn off the computer.

The battery requires no charging or maintenance throughout its life; however, no battery lasts forever. If the battery fails, the date, time, and configuration information are lost, and an error message is displayed when you turn on the computer.

Refer to “Lithium battery notice” on page xii for information about replacing the battery.

**Note:** If Enhanced Security is enabled, the administrator password is not lost when the battery fails. For information on Enhanced Security, see “Using Enhanced Security” on page 40.

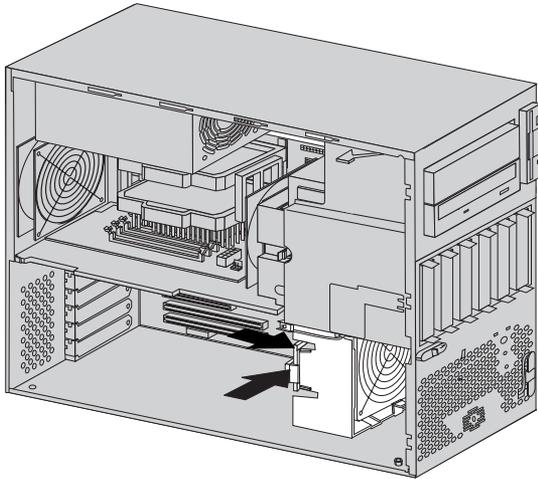
If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

For further information on battery disposal, call IBM at 1-800-IBM-4333 (1-800-426-4333) in the U.S. For information outside of the U.S., contact your IBM reseller or marketing representative.

To change the battery:

1. Turn off the computer and all attached devices.
2. Unplug the power cord.
3. Remove the cover. See “Removing the cover and front bezel” on page 57.

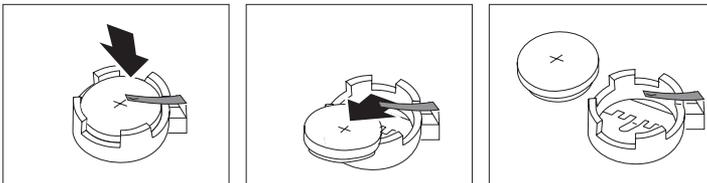
4. Press the latch tab on the front fan and push the adapter guide latch toward the front of the chassis until it snaps into place.



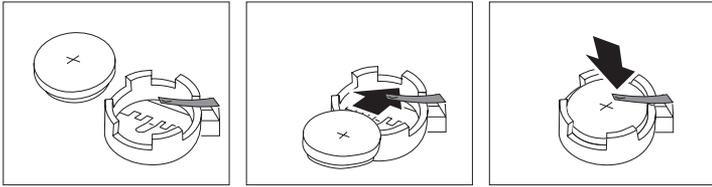
5. Disconnect the hard disk drive power cable and the hard disk drive fan cable on the memory card.
6. Push the tab on the back of the memory card inward and pull the memory card out of the chassis.

**Note:** If any long adapters are installed in PCI slots, they must also be removed. These adapters must also be replaced before replacing the memory card.

7. Press the latch tabs on the front fan to release it from its position in the chassis and move the front fan aside.
8. Locate the battery. Refer to the system board label inside your computer or see “Identifying parts on the system board” on page 60.
9. Remove the old battery.



10. Install the new battery.



11. Replace the memory card, the front fan, or any adapters that were removed to gain access to the battery.
12. Install the cover. See “Completing the installation” on page 83.
13. Plug in the power cord.

**Note:** When the computer is turned on for the first time after battery replacement, an error message might be displayed. This is normal after the battery is replaced.

14. Turn on the computer and all attached devices.
15. See Chapter 4, “Using the Configuration/Setup Utility program” on page 37 to set the date and time and any passwords.
16. Dispose of the old battery as required by local ordinances or regulations.



---

## Chapter 7. Getting help, service, and information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

<a href="http://www.ibm.com">http://www.ibm.com</a>	Main IBM home page
<a href="http://www.ibm.com/pc">http://www.ibm.com/pc</a>	IBM Personal Computing
<a href="http://www.ibm.com/pc/support">http://www.ibm.com/pc/support</a>	IBM Personal Computing Support
<a href="http://www.ibm.com/pc/us/ibmpc">http://www.ibm.com/pc/us/ibmpc</a>	IBM Commercial Desktop PCs (U.S.)
<a href="http://www.ibm.com/pc/us/intellistation">http://www.ibm.com/pc/us/intellistation</a>	IBM IntelliStation Workstations (U.S.)
<a href="http://www.ibm.com/pc/us/accessories">http://www.ibm.com/pc/us/accessories</a>	Options by IBM (U.S.)
<a href="http://www.ibm.com/pc/us/netfinity">http://www.ibm.com/pc/us/netfinity</a>	IBM Netfinity Servers (U.S.)

You can select a country-specific Web site from these pages.

Help is also available from bulletin boards and online services, as well as by fax and telephone. This section provides information about these sources.

Services available and telephone numbers listed are subject to change without notice.

---

### Service support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Personal Computer HelpCenter (1-800-772-2227 in the U.S.) for hardware product assistance covered under the terms of the IBM hardware warranty. See “Getting help by telephone” on page 125 for HelpCenter telephone numbers in other countries.

The following services are available during the warranty period:

- Problem determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- IBM hardware repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering change management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

A compatible monitor, keyboard, and mouse are required for many service activities. Before you have the computer serviced, be sure to have these components attached to your computer, either directly or through a console switch.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts  
**Note:** All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXXX.
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to your IBM hardware warranty for a full explanation of IBM's warranty terms.

---

## Before you call for service

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

If you receive a POST error code when you turn on your computer, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including README files) for the operating system or application program.

---

## Getting customer support and service

Purchasing an IBM PC hardware product entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

## Using the World Wide Web

On the World Wide Web, the IBM Personal Computing Web site has up-to-date information about IBM Personal Computer products and support. The address for the IBM Personal Computing home page is:

<http://www.ibm.com/pc>

You can find support information for your IBM products, including supported options, on the IBM Personal Computing Support page at:

<http://www.ibm.com/pc/support>

If you select Profile from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. You will have the information you need, all in one place. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products. You

also can access online support forums, which are community sites monitored by IBM support staff.

For information about specific Personal Computer products, visit the following pages:

<http://www.ibm.com/pc/us/intellistation>

<http://www.ibm.com/pc/us/ibmpc>

<http://www.ibm.com/pc/us/netfinity>

<http://www.ibm.com/pc/us/thinkpad>

<http://www.ibm.com/pc/us/accessories>

[http://www.direct.ibm.com/content/home/en\\_US/aptiva](http://www.direct.ibm.com/content/home/en_US/aptiva)

You can select a country-specific Web site from these pages.

## Using electronic support services

If you have a modem, you can get help from several popular services. Online information services provide assistance through question-and-answer message areas, live chat rooms, searchable databases, and more.

Technical information is available on a wide range of topics, such as:

- Hardware setup and configuration
- Preinstalled software
- Windows, OS/2, and DOS
- Networking
- Communications
- Multimedia

In addition, the latest device driver updates are available.

Commercial online services, such as America Online (AOL), contain information about IBM products. (For AOL, use the keyword **IBM**.)

## Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada you can receive by fax marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine.

In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

## Getting help online

Online Housecall is a remote communication tool that allows an IBM technical-support representative to access your PC by modem. Many problems can be remotely diagnosed and corrected quickly and easily. In addition to a modem, a remote-access application program is required. This service is not available for servers. There might be a charge for this service, depending on the request.

For more information about configuring your PC for Online Housecall:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

## Getting help by telephone

During the warranty period, you can get help and information by telephone through the IBM PC HelpCenter. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM PC Server or IBM Netfinity Server, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface cards
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.<sup>4</sup>

<b>Country</b>		<b>Telephone number</b>
Austria	Österreich	01-54658 5060
Belgium - Dutch	Belgie	02-714 35 70
Belgium - French	Belgique	02-714 35 15
Canada	Toronto only	416-383-3344
Canada	Canada - all other	1-800-565-3344
Denmark	Danmark	35 25 02 91
Finland	Suomi	09-22 931 840
France	France	01 69 32 40 40
Germany	Deutschland	069-6654 9040
Ireland	Ireland	01-815 9202
Italy	Italia	02-4827 9202
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-504 0501
Norway	Norge	23 05 32 40
Poland	Polska	00800-441 2261
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-751 52 27
Switzerland	Schweiz/Suisse/ Svizzera	0848-80 52 52
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries, contact your IBM reseller or IBM marketing representative.

---

<sup>4</sup> Response time will vary depending on the number and complexity of incoming calls.

## Getting help around the world

If you travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service:

- In the U.S. or Canada, call 1-800-497-7426.
- In Europe, call 44-1475-893638 (Greenock, U.K.).
- In Australia and New Zealand, call 61-2-9354-4171.

In all other countries, contact your IBM reseller or IBM marketing representative.

---

## Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and name might vary by country.

## Enhanced PC support line

Enhanced PC Support is available for desktop and mobile IBM computers that are not connected to a network. Technical support is provided for IBM computers and IBM or non-IBM options, operating systems, and application programs on the Supported Products list.

This service includes technical support for:

- Installing and configuring your out-of-warranty IBM computer
- Installing and configuring non-IBM options in IBM computers
- Using IBM operating systems in IBM and non-IBM computers
- Using application programs and games
- Tuning performance
- Installing device drivers remotely
- Setting up and using multimedia devices
- Identifying system problems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more

information about purchasing Enhanced PC Support, see “Ordering support line services” on page 128.

## **900-number operating system and hardware support line**

In the U.S., if you prefer to obtain technical support on a pay-as-you-go basis, you can use the 900-number support line. The 900-number support line provides support for IBM PC products that are out of the warranty period.

To access this support, call 1-900-555-CLUB (2582). You will be notified of the charge per minute.

## **Network and server support line**

Network and Server Support is available for simple or complex networks made up of IBM servers and workstations using major network operating systems. In addition, many popular non-IBM adapters and network interface cards are supported.

This service includes all of the features of the Enhanced PC Support Line, plus:

- Installing and configuring client workstations and servers
- Identifying system problems and correcting problems on the client or the server
- Using IBM and non-IBM network operating systems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Network and Server Support, see “Ordering support line services.”

## **Ordering support line services**

Enhanced PC Support Line and Network and Server Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

- In the U.S.:
  1. Call 1-800-426-3395.
  2. Select document number 11683 for Network and Server support.
  3. Select document number 11682 for Enhanced PC support.
- In Canada, contact IBM Direct at 1-800-465-7999, or:

1. Call 1-800-465-3299.
  2. Select the HelpWare catalog.
- In all other countries, contact your IBM reseller or IBM marketing representative.

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your HelpCenter.

## Warranty and repair services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service

If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium. The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday through Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.

- On-site service to premium on-site service

If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options, including ThinkPad EasyServ Maintenance Agreements. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4968.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

---

## Ordering publications

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.
- In other countries, contact your IBM reseller or IBM marketing representative.

---

## Appendix A. Using the Software Selections CD

Use the information in this chapter if you want to install or reinstall software from the *IBM Software Selections CD*.

**Important:** You must have Microsoft Internet Explorer 4.0 or later installed to run the *IBM Software Selections CD*.

---

### Features of the CD

The *Software Selections CD* contains diagnostic programs and other support software for your operating system.

**Important**

The *Software Selections CD* does not contain operating systems. Before you can use the CD, the operating system must be installed.

You can use the CD to:

- Install some software products directly from the CD.
- Create an image of the *IBM Software Selections CD* on your hard disk or on a local area network (LAN) disk and install the software products from that image.

The *Software Selections CD* has an easy-to-use, graphical interface and automated installation procedures for most products. It also has a help system that describes the features of the CD.

The products on the *Software Selections CD* are licensed according to the terms and conditions of the IBM International License Agreement for Non-Warranted Programs. (See Appendix D, “Viewing the license agreement” on page 151 for information about viewing the license agreement.)

---

## Starting the CD

To use the *Software Selections CD*, insert the CD into your CD-ROM drive. The Software Selections program starts automatically.

If the auto-run feature is disabled in your computer:

1. Click the Windows **Start** button; then click **Run**.
2. Type *e:\swselect.exe* where *e* is the CD-ROM drive letter.
3. Press Enter. The **Software Selections** menu appears.
4. Select the desired option; then follow the instructions on the screen.

or

To use the *Software Selections CD* with Access IBM to install software:

1. Insert the *Software Selections CD* into your CD-ROM drive.
2. From the Access IBM menu, click **Customize**.
3. From the **Customize** menu, click **Install software**. A **Software Selections for IBM** dialog box appears.
4. Follow the instructions on the screen.

After a program is installed, you can access it through the **Programs** choice on the Windows **Start** menu. For most programs, support documentation is built into the online Help system; for some, online documentation is also provided.

---

## Using the Software Selections program

A Software Selections program is provided on your IBM *Software Selections CD*.

To use the Software Selections program:

1. In the Software Selections menu, click the check box next to each program you want to install.
2. After selecting the software, click **Install**. A window opens showing the software programs that will be installed. Click **OK** to continue with the installation process or click **Cancel** to reset your options.
3. To complete a task, make the applicable selections and follow the instructions on the screen.

After a program is installed, you can access it through the **Programs** choice on the Windows **Start menu**. For most programs, support documentation is built into the online Help system; for some, online documentation is also provided.

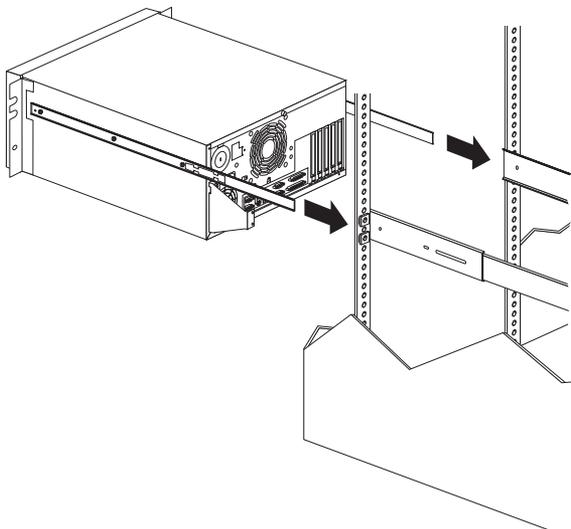


---

## Appendix B. Rack mounting your computer

To configure your computer for rack mounting, you need to install parts on the rack enclosure and the computer. This process has three major steps:

- Preparing the computer for installation in a rack enclosure.
- Preparing the rack enclosure.
- Installing the computer into the rack enclosure.



### Before you begin

- Read “Safety information” on page ix and the safety information in the rack enclosure documentation.
- Turn off the computer.
- See the rack enclosure documentation for additional information on preparing the rack.

---

## Preparing the computer for rack installation

You will need the following:

- Part number 10L7006, Netfinity® Tower-Rack Conversion Kit
- Two 3.5 mm flange nuts which are provided in a plastic bag taped inside the CD-ROM drive cover

### CAUTION:

**Use safe lifting practices when lifting the computer.**

To prepare your computer for installation in a rack enclosure:

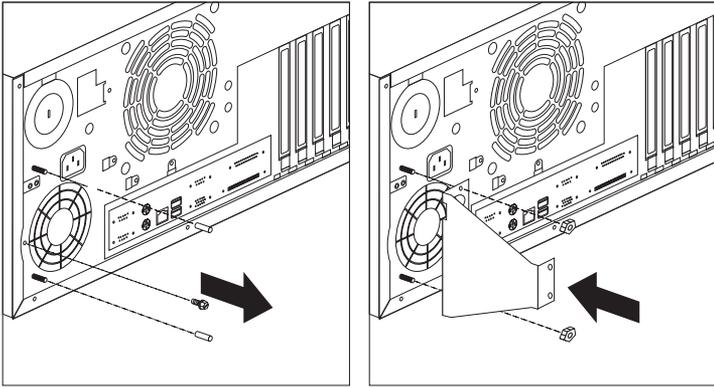
1. Remove the left side cover. See “Removing the cover and front bezel” on page 57.
2. Remove the top and right cover (secured by four slotted screws).
3. Place the computer on its right side to gain access to the inside.
4. Reach in and remove the four feet at the bottom of the computer.
5. Move the computer back to the tower position.
6. Install the new right side cover using three slotted screws.
7. Place the computer on its right side.
8. Install the new left side cover (the left cover has a thumbscrew attached). Tighten the thumbscrew.

#### Attention

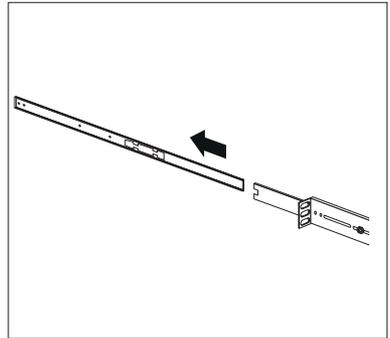
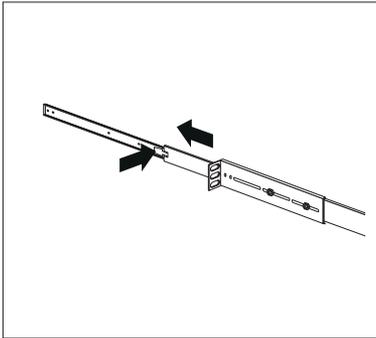
To avoid damage to internal components, use only the short, slotted screws included with the Netfinity Tower-Rack Conversion Kit part number 10L7006.

9. Install L-bracket part number 20L1419 on the left and L-bracket part number 20L1418 on the right, using two short slotted screws per L-bracket.
10. Remove the rubber thread protectors on the two bolt studs near the power supply (as shown in the following illustration).
11. Remove the screw between the two bolt studs (as shown in the following illustration).
12. Install the cable-arm bracket onto the two bolt studs on the rear of the computer. This cable-arm bracket is secured using two 3.5 mm flange nuts which are provided in a plastic bag taped inside the CD-ROM drive cover.

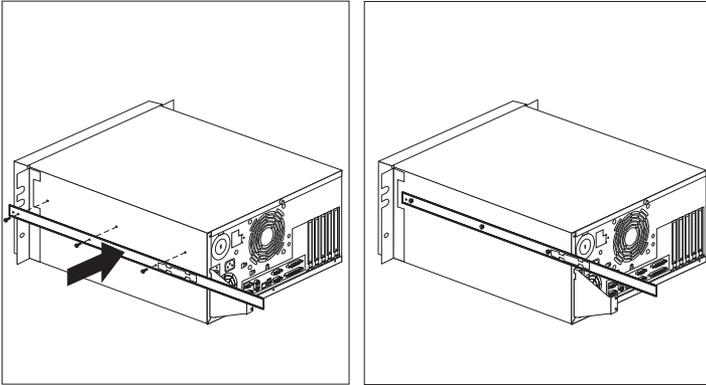
**Note:** This cable-arm bracket will not attach to the computer unless you have first removed the screw near the power supply.



13. Attach the inner slide section of each slide rail to the side of the computer as follows:
- Pull the inner slide until the safety latch locks.
  - Press the safety latch; then, pull the inner slide firmly until it detaches from the outer slide rail.



- c. Align the holes on the inner slide with the holes on sides of the computer; then, attach the slide with three short pan-head screws.



---

## Preparing the rack enclosure

In this section, you will use the following parts:

- Two slide bracket assemblies
- Two slide rails (fitted to system unit)
- One cable-management arm
- Ten long screws
- Ten cage nuts
- Installation template

### Attention

To ensure cabinet stability, plan the installation of computers in the rack enclosure starting from the bottom.

**Note:** This procedure requires two people.

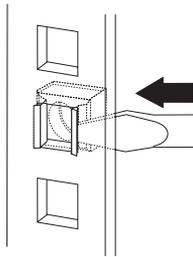
To attach the mounting hardware to the rack enclosure:

1. Mark the positions of the slide brackets on the mounting rails on the rack enclosure:
  - a. Position the template on the front mounting rail on the rack enclosure, aligning the holes. Secure the template in place with tape.

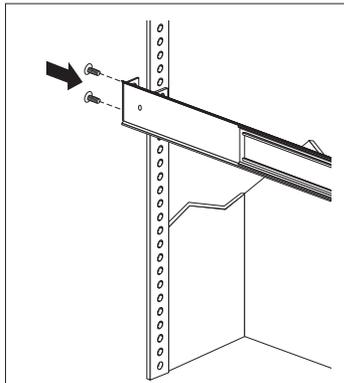
- b. Mark the holes for the slide brackets and cage nuts. If you prefer, mark *all* the cage nut positions on the rack at this time.
- c. Carefully remove the tape from the mounting rails, and attach the template to the rear mounting rails. Mark the locations for the slide brackets and cage nuts.

**Notes:**

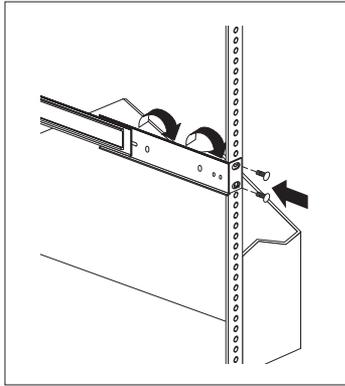
- a. You must align the slide brackets correctly, or the installation cannot be completed.
  - b. The slide rails have four screws each to allow for length adjustment.
2. Install the cage nuts in the marked positions as shown.



3. Attach the slide rail to the left side of the rack enclosure.
- a. Extend the outer slide rail until the slide bracket is flush against the outside of the left front mounting rail. Align the slide rail with the cage nuts on the mounting rail.
  - b. From the front of the rack enclosure, insert two long screws through the slide bracket and mounting rail. Press the slide bracket until it is flush with the outer edge of the mounting rail; then, tighten the screws.

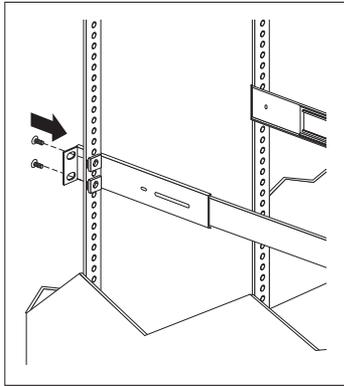


- c. Attach the slide bracket to the left rear side of the rack enclosure.
- 1) Align the holes on the slide bracket with the cage nuts on the rear mounting rail.
  - 2) From the rear of the rack enclosure, insert two long screws through the slide bracket and mounting rail; then, tighten the screws.
  - 3) If it was necessary to adjust the length of the slide rails, tighten the nuts on the slide rail, using pliers, a socket wrench, or an adjustable wrench.

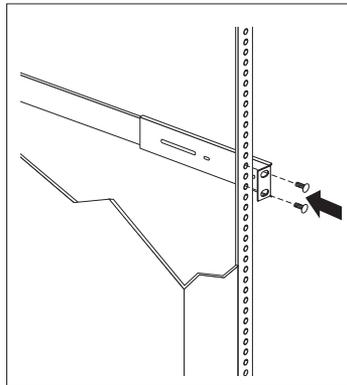


4. Attach the slide rail to the right side of the rack enclosure.
- a. Extend the outer slide rail until the slide bracket is flush against the outside of the right front mounting rail. Align the slide bracket with the cage nuts on the mounting rail.

- b. From the front of the rack enclosure, insert two long screws through the slide bracket and mounting rail. Press the slide rail so that it is flush with the outer edge of the mounting rail and tighten the screws.

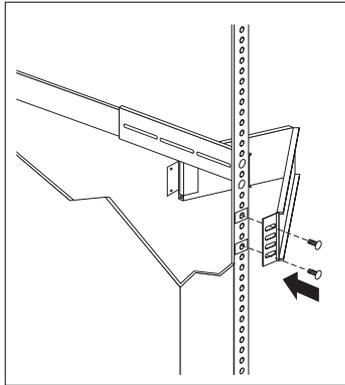


- c. Attach the slide bracket to the right rear of the rack enclosure.
- 1) Align the holes on the bracket with the cage nuts on the rear mounting rail.



- 2) From the rear of the rack enclosure, insert a long screw through holes in the slide bracket and mounting rail; then, tighten the screws.

5. Attach the cable-management arm to the right rear of the rack enclosure.
  - a. Align the holes on the cable-management arm mounting panel with the cage nuts on the rear mounting rail.



- b. From the rear of the rack enclosure, insert a long screw through the holes in the cable-management arm mounting panel and cage nut; then, tighten the screws.

**Notes:**

- 1) You can choose to wait to attach the cable-management arm to the rack until after you have attached the other end of the cable-management arm to the computer.
- 2) To facilitate alignment of the cable-management arm, be sure to insert the screws through the first and fourth holes, as shown.

---

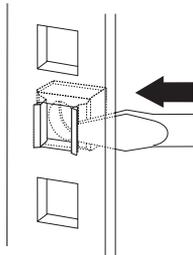
## Installing the computer in the rack enclosure

In this section, you will use the following parts:

- Four long screws
- Two cage nuts
- One cable-management arm
- Cable ties

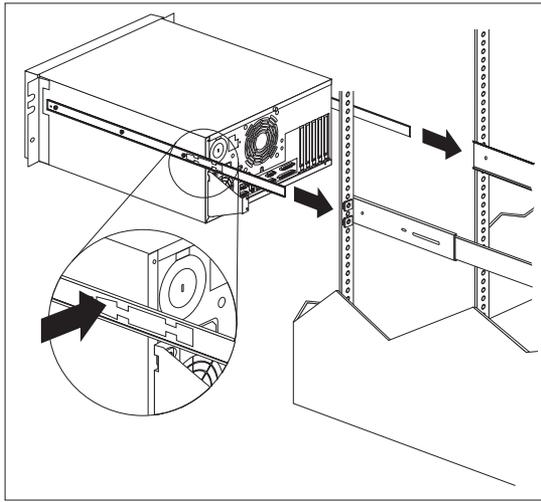
To install the computer into the rack enclosure:

1. If you have not done so already, install a cage nut in each front mounting rail in the marked positions, as shown.

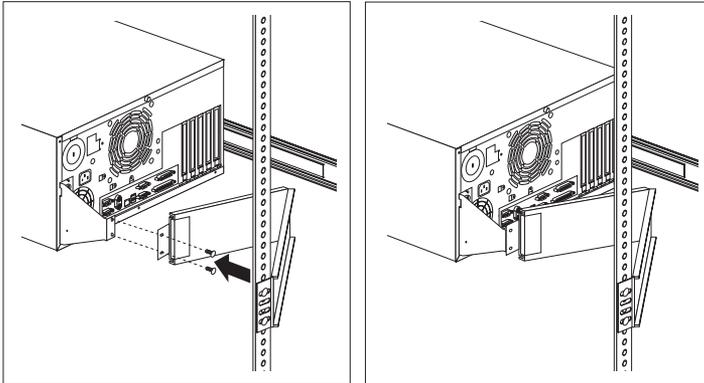


2. Position the computer horizontally, with the 3.5-inch drive bays on the top.
3. Align the inner slides of the computer with the slide rails; then, slide the computer onto the outer slide, until the slide rails click into place.

**Note:** When the computer is fully extended, safety latches on the slide rails lock into place. This prevents the computer from being accidentally pulled out too far and dropped. To release the safety latch, press in.

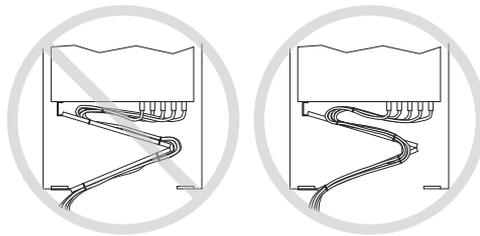
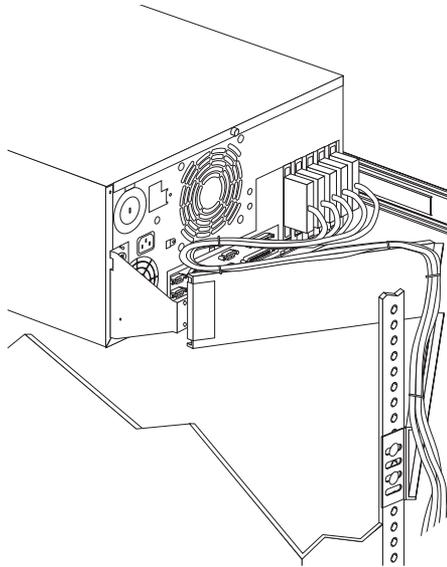


4. Press the safety latches and slide the computer about halfway into the rack enclosure.
5. Attach the cable-management arm to the cable-arm bracket, using two long screws.



6. If you have not done so already, attach the cable-management arm to the rack.
7. Attach the monitor, keyboard, and power cables. See “Connecting computer cables” on page 13.
8. Attach the cables to the cable-management arm using the cable ties provided.

**Note:** Be sure to route the cables above the top edge or below the bottom edge of the cable-management arm to avoid overstressing the cables.



9. Secure the computer in the rack enclosure.
  - a. Slide the computer into the rack enclosure.
  - b. Secure the computer to both sides of the rack enclosure by inserting a long screw through the chassis bracket, mounting rail, and cage nut.



---

## Appendix C. Computer records

This appendix contains forms for recording information about your computer, which can be helpful if you decide to install additional hardware, or if you ever need to have your computer serviced.

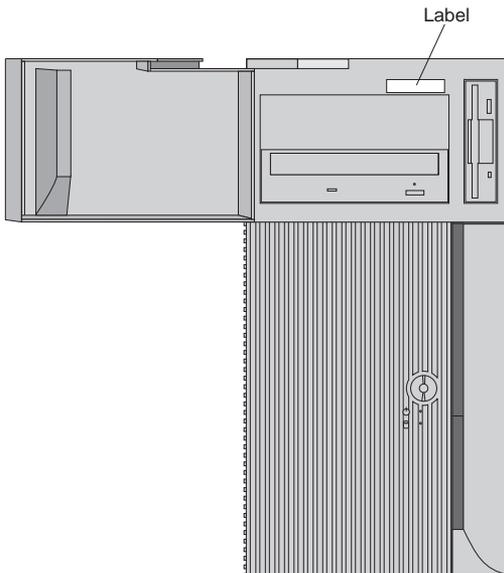
---

### Serial numbers and keys

Record and retain the following information.

Product Name	IntelliStation Z Pro Type 6866
Model/Type (M/T)	_____
Serial Number (S/N)	_____
Key manufacturer address, phone number and key code number	_____

The model and type (M/T) numbers and the serial number (S/N) are located on a label behind the front cover door of your computer.



---

## Device records

Use the following tables to keep a record of the options in or attached to your computer. This information can be helpful when you install additional options, or if you ever need to have your computer serviced.

Location	Option description		
<b>System memory</b>			
<b>8-RIMM memory card</b>			
RIMM pair 1			
(RIMM connector 4)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 5)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
RIMM pair 2			
(RIMM connector 2)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 7)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
RIMM pair 3			
(RIMM connector 3)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 6)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
RIMM pair 4			
(RIMM connector 1)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 8)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
<b>4-RIMM memory card</b>			
RIMM pair 1			
(RIMM connector 3)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 4)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
RIMM pair 2			
(RIMM connector 1)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB
(RIMM connector 2)	<input type="checkbox"/> 64 MB	<input type="checkbox"/> 128 MB	<input type="checkbox"/> 256 MB

Location	Option description
Microprocessor 1	<input type="checkbox"/> Intel _____ MHz
Microprocessor 2	<input type="checkbox"/> Intel _____ MHz
AGP slot	_____
PCI expansion slot 1	_____
PCI expansion slot 2	_____
PCI expansion slot 3	_____
PCI expansion slot 4	_____
PCI expansion slot 5	_____
PCI expansion slot 6	_____
Parallel connector	_____
Serial connector 1	_____
Serial connector 2	_____
USB connector 1	_____
USB connector 2	_____
External SCSI connector	_____
Monitor connector	_____
Audio connectors	_____
Keyboard connector	104-key keyboard <input type="checkbox"/> other _____
Mouse connector	<input type="checkbox"/> ScrollPoint mouse <input type="checkbox"/> Other: _____

Location	Option description
5.25-inch bay 1	_____
5.25-inch bay 2	<input type="checkbox"/> IDE CD-ROM drive <input type="checkbox"/> Other: _____
3.5-inch bay 3	<input type="checkbox"/> 1.44 MB diskette drive <input type="checkbox"/> Other: _____
3.5-inch bay 4	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____
3.5-inch bay 5	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____
3.5-inch bay 6	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____
3.5-inch bay 7	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____
3.5-inch bay 8	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____
3.5-inch bay 9	<input type="checkbox"/> SCSI hard disk drive <input type="checkbox"/> Other: _____

---

## Appendix D. Viewing the license agreement

The IBM International License Agreement for Non-Warranted Programs is viewable through Access IBM in your preinstalled software. Use of your computer signifies acceptance of this agreement. To view the license agreement, do the following:

1. Click the Windows **Start** button.
2. Scroll to and click **Access IBM**.
3. In the Access IBM window, click **View license and warranty**.
4. Click **View the license**.

If your preinstalled software is no longer installed in your computer, you can view the license agreement on the *Software Selections CD* by clicking **Read the license agreement** in the Software Selections program. For more information about *Software Selections CD*, see “Getting started” on page 16.



---

## Appendix E. Product warranties and notices

This appendix includes product warranties, trademarks and notices.

---

### Warranty Statements

The warranty statements consist of two parts: Part 1 and Part 2. Part 1 varies by country. Part 2 is the same for both statements. Be sure to read both the Part 1 that applies to your country and Part 2.

- **United States, Puerto Rico, and Canada (Z125-4753-05 11/97)**  
(Part 1 - General Terms on page 153)
- **Worldwide except Canada, Puerto Rico, Turkey, and United States (Z125-5697-01 11/97)**  
(Part 1 - General Terms on page 156)
- **Worldwide Country-Unique Terms**  
(Part 2 - Country-Unique Terms on page 159)

### IBM Statement of Limited Warranty for United States, Puerto Rico, and Canada (Part 1 - General Terms)

---

*This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 may replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.*

**Machine** - IntelliStation Z Pro Type 6866  
**Warranty Period\*** - Parts: Three (3) Years Labor: Three (3) Years

*\*Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country where service is performed.*

### The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of

Installation. The date on your sales receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if approved by IBM to provide warranty service, will provide repair and exchange service for the Machine, without charge, under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded. The replacement may not be new, but will be in good working order.

### **Extent of Warranty**

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

**THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.**

### **Items Not Covered by Warranty**

IBM does not warrant uninterrupted or error-free operation of a Machine.

Unless specified otherwise, IBM provides non-IBM machines **WITHOUT WARRANTIES OF ANY KIND.**

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

### **Warranty Service**

To obtain warranty service for the Machine, contact your reseller or IBM. In the United States, call IBM at 1-800-772-2227. In Canada, call IBM at 1-800-565-3344. You may be required to present proof of purchase.

IBM or your reseller provides certain types of repair and exchange service, either at your location or at a service center, to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. IBM may repair the failing Machine or exchange it at its discretion.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

Any feature, conversion, or upgrade IBM or your reseller services must be installed on a Machine which is 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided
  - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides,
  - b. secure all programs, data, and funds contained in a Machine,
  - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations, and
  - d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

### **Production Status**

Each IBM Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's appropriate warranty terms apply.

### **Limitation of Liability**

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the greater of U.S. \$100,000 (or equivalent in local currency) or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

**UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

## **IBM Statement of Warranty Worldwide except Canada, Puerto Rico, Turkey, United States (Part 1 - General Terms)**

---

*This Statement of Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 may replace or modify those of Part 1. The warranties provided by IBM in this Statement of Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.*

**IntelliStation Z Pro Type 6866****Warranty Period\* -**

- Bangladesh, China, Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam - Parts: Three (3) Years Labor: One (1) Year \*\*
- Japan - Parts: One (1) Year Labor: One (1) Year
- All other countries not listed - Parts: Three (3) Years Labor: Three (3) Years

\*\* IBM will provide warranty service without charge for:

1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period.

IBM will charge you for any labor it provides in performance of the repair or replacement.

**The IBM Warranty for Machines**

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if approved by IBM to provide warranty service, will provide repair and exchange service for the Machine, without charge, under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded. The replacement may not be new, but will be in good working order.

**Extent of Warranty**

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

**THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.**

## **Items Not Covered by Warranty**

IBM does not warrant uninterrupted or error-free operation of a Machine.

Unless specified otherwise, IBM provides non-IBM machines **WITHOUT WARRANTIES OF ANY KIND.**

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

## **Warranty Service**

To obtain warranty service for the Machine, contact your reseller or IBM. You may be required to present proof of purchase.

IBM or your reseller provides certain types of repair and exchange service, either at your location or at a service center, to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. IBM may repair the failing Machine or exchange it at its discretion.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

Any feature, conversion, or upgrade IBM or your reseller services must be installed on a Machine which is 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided
  - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides,
  - b. secure all programs, data, and funds contained in a Machine,
  - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfil their obligations, and
  - d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

### **Production Status**

Each IBM Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's appropriate warranty terms apply.

### **Limitation of Liability**

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the greater of U.S. \$100,000 (or equivalent in local currency) or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

**UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

## **Part 2 - Worldwide Country-Unique Terms**

---

### **ASIA PACIFIC**

**AUSTRALIA: The IBM Warranty for Machines:** The following paragraph is added to this Section:

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other legislation and are only limited to the extent permitted by the applicable legislation.

**Extent of Warranty:** The following replaces the first and second sentences of this Section:

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, operation in other than the Specified Operating Environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible.

**Limitation of Liability:** The following is added to this Section:

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

**PEOPLE'S REPUBLIC OF CHINA: Governing Law:** The following is added to this Statement:

The laws of the State of New York govern this Statement.

**INDIA: Limitation of Liability:** The following replaces items 1 and 2 of this Section:

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

**NEW ZEALAND: The IBM Warranty for Machines:** The following paragraph is added to this Section:

The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

**Limitation of Liability:** The following is added to this Section:

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

### **EUROPE, MIDDLE EAST, AFRICA (EMEA)**

**The following terms apply to all EMEA countries.**

The terms of this Statement of Warranty apply to Machines purchased from an IBM reseller. If you purchased this Machine from IBM, the terms and conditions of the applicable IBM agreement prevail over this warranty statement.

#### **Warranty Service**

If you purchased an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchased an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

The applicable laws, Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided. However, the laws of Austria govern this Statement if the warranty service is provided in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Federal Republic of Yugoslavia, Georgia, Hungary, Kazakhstan, Kirghizia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, and Ukraine.

**The following terms apply to the country specified:**

**EGYPT: Limitation of Liability:** The following replaces item 2 in this Section:  
2. as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

**FRANCE: Limitation of Liability:** The following replaces the second sentence of the first paragraph of this Section:  
In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

**GERMANY: The IBM Warranty for Machines:** The following replaces the first sentence of the first paragraph of this Section:  
The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:  
The minimum warranty period for Machines is six months.

In case IBM or your reseller are unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

**Extent of Warranty:** The second paragraph does not apply.

**Warranty Service:** The following is added to this Section:  
During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

**Production Status:** The following paragraph replaces this Section:  
Each Machine is newly manufactured. It may incorporate in addition to new parts, re-used parts as well.

**Limitation of Liability:** The following is added to this Section:

The limitations and exclusions specified in the Statement of Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

In item 2, replace “U.S. \$100,000” with “1.000.000 DEM.”

The following sentence is added to the end of the first paragraph of item 2:  
IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

**IRELAND: Extent of Warranty:** The following is added to this Section:  
Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

**Limitation of Liability:** The following replaces items one and two of the first paragraph of this Section:  
1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to the greater of Irish Pounds 75,000 or 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section:  
IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

**ITALY: Limitation of Liability:** The following replaces the second sentence in the first paragraph:  
In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: (item 1 unchanged) 2) as to any other actual damage arising in all situations involving non-performance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

The following replaces the second paragraph of this Section:  
Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: (items 1 and 2 unchanged) 3) indirect damages, even if IBM or your reseller is informed of their possibility.

**SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND:**  
**Limitation of Liability:** The following is added to this Section:  
IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

**TURKIYE: Production Status:** The following replaces this Section:  
IBM fulfils customer orders for IBM Machines as newly manufactured in accordance with IBM's production standards.

**UNITED KINGDOM: Limitation of Liability:** The following replaces items 1 and 2 of the first paragraph of this Section:

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to the greater of Pounds Sterling 150,000 or 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

The following item is added to this paragraph:

3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default will be limited to damages.

## **NORTH AMERICA**

**CANADA: Warranty Service:** The following is added to this Section:

To obtain warranty service from IBM, call **1-800-565-3344**. In Toronto, call **416-383-3344**.

**UNITED STATES OF AMERICA: Warranty Service:** The following is added to this Section:

To obtain warranty service from IBM, call **1-800-772-2227**.

---

## Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.

Any references in this publication to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

## Year 2000 readiness and instructions

This IBM hardware product and IBM software products that might be packaged with it have been designed, when used in accordance with their associated documentation, to process date data correctly within and between the 20th and 21st centuries, provided all other products (for example, software, hardware, and firmware) used with these products properly exchange accurate date data with them.

IBM cannot take responsibility for the date data processing capabilities of non-IBM products, even if those products are preinstalled or otherwise distributed by IBM. You should contact the vendors responsible for those

products directly to determine the capabilities of their products and update them if needed. This IBM hardware product cannot prevent errors that might occur if software, upgrades, or peripheral devices you use or exchange data with do not process data correctly.

The foregoing is a Year 2000 Readiness Disclosure.

## Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

Alert on LAN	LANClient Control Manager
Asset ID	Netfinity
HelpCenter	Netfinity Manager
HelpWare	OS/2
IBM	ScrollPoint
IBM Update Connector	SMART Reaction
IBM Global Network	ThinkPad
IntelliStation	Wake on LAN

Lotus and SmartSuite are trademarks of Lotus Development Corporation in the United States, other countries, or both.

Intel, Pentium, and LANdesk are trademarks or registered trademarks of Intel Corporation in the United States, other countries, or both.

Microsoft, MS-DOS, Windows, and Windows NT Workstation are trademarks or registered trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, and service names may be trademarks or service marks of others.

## Electronic emission notices

### Federal Communications Commission (FCC) Statement

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in

which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### **Industry Canada Class A emission compliance statement**

This Class A digital apparatus complies with Canadian ICES-003.

### **Avis de conformité à la réglementation d'Industrie Canada**

Cet appareil numérique de classe A est conforme à la norme NMB-003 du Canada.

### **Australia and New Zealand Class A statement**

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Other notices

### European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The Limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Taiwan Class A Electronic Emission Statement

警告使用者：  
這是甲類的資訊產品，在  
居住的環境中使用時，可  
能會造成射頻干擾，在這  
種情形下，使用者會被要  
求採取某些適當的對策。

### Statement of Conformity to the Voluntary Control Council for Interference from Information Technology Equipment (VCCI) Class A ITE for Regular Members.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に  
基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を  
引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求  
されることがあります。

## **Power cord notice**

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

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

**IBM power cord**

<b>part number</b>	<b>Used in these countries and regions</b>
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
62X1045	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

# Index

## Numerics

- 1-800 telephone assistance 125
- 900 number support 128

## A

- Access IBM 19
- accessing drive bays 74, 76
- ACPI BIOS IRQ 52
- Adaptec 72, 96
- additional resources 115
- adjusting chair 11
- administrator password 32
- air baffle 59
- air circulation 13
- America Online 124
- antiglare filter 12
- arranging workspace 11
- assistance 121
- audio
  - features 25
  - ports 25
- Automatic Configuration and Power Interface 52
- automatic power-on
  - PCI wake up 54
  - setting 54
  - wake on LAN 53
  - wake up on alarm 54
- available expansion slots 3

## B

- backing up hard disk drive 34
- baffle 59
- basic input/output system
  - See BIOS (basic input/output system)

- battery
  - accessing 60
  - disposing of 116
  - location on system board 60
  - notice xii
  - replacing 116
- bays
  - drive 70
  - drives supported 2
  - installing drives 74, 76
- beeps after POST 88
- BIOS (basic input/output system)
  - recovering from update failure 115

## C

- cable lengths 13
- cables
  - connecting 13, 82
  - disconnecting 57
  - IDE 72
  - routing a signal cable inside the computer 74, 77
  - types for internal drives 72, 73
- care of computer 32
- CD-ROM drive 70, 71
- CDs
  - Device Drivers and IBM Enhanced Diagnostics 24, 115
  - Product Recovery 113
- chair adjustments 11
- changing configuration 83
- chassis-intrusion cover 29
- chassis-intrusion detector 29
- circulation, air 13
- cleaning
  - computer 33
  - monitor 33
  - mouse 34

- CMOS clearing 46
- comfort 11
- completing the installation 83
- component registration 30
- components, locating internal 60
- ConfigSafe 6, 112
- configuration of computer 37
- configuration/setup utility
  - capabilities 37
  - computer startup 18, 23
  - exiting 39
  - starting 37
  - updating 26
- connecting computer cables 13
- continuity RIMM 63
- controls 14
- cord, power 13, 169
- CoSession 7
- CoSession Remote 32 111
- cover
  - lock 29, 57, 58, 82
  - lock keys 29
  - lock, broken 102
  - removing 57, 74, 76
  - replacing 82
- cover, chassis-intrusion 29
- creating a diagnostic diskette 20

## D

- damage, preventing 32, 34
- data protection 31
- DDC (display data channel) 25
  - updating 26
- desktop 24
- Desktop Management Interface (DMI) 29
- device drivers 83
- device drivers, video 24
- device security 41
- DHCP 23, 28
- diagnostic
  - CD-ROM 109

- diagnostic (*continued*)
  - charts 96
  - CoSession Remote 32 111
  - diskette 20, 109
  - error codes and messages 96
  - PC-Doctor 109
  - programs 109
  - tools 87
- direct memory access (DMA)
  - resources 51
- disconnecting cables, external 57
- disk drive, hard 70, 71
- diskette drive 70, 71
- diskette drive connector, location of 60
- diskette drives
  - adding 55
  - eject button 16
  - indicator light 16
  - problems, solving 98, 99
  - supported 2
- display
  - See monitor
- display data channel (DDC) 25
- display power management
  - signaling (DPMS) 51
- DMA (direct memory access)
  - resources 51
- DPMS (display power management signaling) 51
- drive
  - bays 2, 70, 74, 76
  - cables 72
  - installing 74, 76
  - problems, solving 98, 99
  - specifications 71
- drivers, video device 24

## E

- EEPROM 26
- electrical outlets 13

- electronic emission notices 165
- electronic support 124
- emergency repair disk 20
- energy-saving features 51
- enhanced diagnostics 109
- enhanced security 32, 40
- erasing passwords 46
- error
  - resource conflicts 84
  - symptoms 96
- error messages 83
- error startup sequence 50
- expansion slots for adapters 61, 68
- extension cords 13

## F

- fan problems 103
- fatigue 11
- fax, getting information by 124
- features, computer 2
- fee services 127
- fixed disk drives
  - See hard disk drives
- fixed-disk drive 70, 71
- flash memory 2, 26
- flash recovery 115
- flicker, reducing 24

## G

- getting started 16
- glare, reducing 12
- graphics adapters 24, 60

## H

- handling static-sensitive devices 55
- hard disk drive 71
- hard disk drives
  - adding 55
  - backing up 34
  - indicator light 15
  - power management 53

- hard disk drives (*continued*)
  - supported 2
- hardware, identifying parts 60
- height restrictions 68
- help 121
- home page, IBM Personal Computing 121, 123
- Hybrid RPL 28

## I

- IBM enhanced diagnostics 109
- IBM security solutions 31
- IBM Universal Manageability Services 27
- identification numbers 147
- identifying system board parts 60
- indicators, status 14
- input/output features 3
- installing additional software
- IntelliStation overview 1
- intermittent problems 103
- internal drives 70
- international warranty service 127
- Internet Explorer 20
- Internet home page 121, 123

## J

- jumpers, location on system board 60

## K

- keyboard
  - locking 32
  - problems 103
  - speed, changing 49
  - using 12
- keyboard port 13
- keys 29

## L

- LAN wake-up requests 53
- LANClient Control Manager (LCCM) 28
- laser compliance statement xi
- license agreement viewing 151
- lighting 12
- lights, indicator 15, 16
- locating internal components 60
- lock, cover 57, 58, 82
- locking keyboard 32
- locks 29, 102

## M

- memory
  - adding 64
  - available 88
  - counting 18, 23
  - expansion 62
  - flash 2
  - modules 63
  - problems 104
  - RIMMs 2
  - supported 2
  - video 63
- microprocessor 48
  - adding a second 78
  - serial number feature 48
  - standard 2
- monitor
  - care of 12
  - connector 13
  - DDC standard 25
  - disable mode 53
  - flicker 24
  - off mode 52
  - placement of 12
  - power management 51, 52
  - problems, solving 99
  - refresh rate 24
  - resolution 24
  - settings 24

- monitor (*continued*)
  - standby mode 52
  - suspend mode 52
- mouse
  - cleaning 34
  - password prompt off mode 43
  - port 13, 43
  - problems 103
  - serial port 43
  - unattended start mode 43
- moving computer 34

## N

- network and server startup support 125
- network and server support services, fee 128
- network management 27
- networking 53
- noise level 9
- Norton AntiVirus 6
- notices 153

## O

- office space, arranging 11
- Online Housecall 125
- online information services 124
- operating and caring for your computer 23
- operating systems
  - compatible 4
  - installing other 115
  - recovering 113
  - supported 4
- operating systems, other 20
- options 55
  - adapters 68
  - cover 82
  - installed 148
  - internal drive 74, 76
  - internal drives 70

- options (*continued*)
  - internal drives in bay 1 74
  - internal drives in bays 1 and 2 74
  - internal drives in bays 5 through 8 76
  - memory modules (RIMMs) 64, 67
  - problems 105, 106
  - security U-bolt 80
- ordering support line services 128

## P

- parallel port 13
- passwords 43
  - administrator 45
  - computer startup 18, 23, 44
  - erasing 46
  - power-on 43
  - using 43
- PC support services, fee 127
- PC-Doctor 7
- PC-Doctor for Windows 109
- PCI
  - expansion slots 3
  - slot location 13
  - slots 61, 68
  - wake up 54
- Pentium III Xeon 48
- peripheral component interconnect
  - See* PCI
- planning workspace 11
- Plug and Play technology 3
- pointing device problems 103
- ports 13, 57, 82
- POST (power-on self-test)
  - at startup 18, 23
  - description of 88
  - updating 26
- POST/BIOS
  - recovering from update failure 115

- POST/BIOS (*continued*)
  - updates 42
- power
  - cord 13, 169
  - indicator light 15
  - management 51
  - output 4
  - switch 15
- power connectors (internal), location of 60
- power management 51, 52
- power-on password
  - computer startup 18, 23, 44
  - setting 43
  - unattended start mode 43
  - using 43
- power-on self-test
  - See* POST (power-on self-test)
- preparing for installation 57
- printer problems 107
- problem solving 87
- processor
  - See* microprocessor
- protecting data 31
- publications, ordering 130

## R

- rack mounting 135
- records, device and feature 148
- recovering the operating system and support software 113
- refresh rate 24
- registering your computer 18
- remote administration 42
- remote program load (RPL) 28
- remote technical support 125
- removing the cover 57
- replacing the cover and connecting the cables 82
- resolution 24
- resource conflicts 68, 70, 83, 84

- resource conflicts, error messages 84
- ribbon cables 72
- RIMMs (Rambus in-line memory modules) 2
- RPL (Remote program Load)
- RPL description 28

## S

- safety ix
- safety, electrical ix
- screen filter 12
- SCSI 72, 96
- security 41
  - anti-intrusion features 29
  - computer cover 29
  - features 4
  - locks 29
  - passwords 43
- security options 80
- Security profiles by device 41
- security u-bolt, installing 80
- serial number 48, 147
- serial port 13
- serial port problems 107
- server startup support 125
- server support 125
- service summary 121
- services, fee 127
- setting up your computer 11
- setup of computer 37
- shutting down 32
- signal cables for internal drives 72
- small computer systems
  - interface 72
- SMART hard disk drive 31
- SMART Reaction 31
- software
  - additional 6
  - error messages 96
  - errors 108
  - operating system 4

- software (*continued*)
  - preinstalled 5
  - problems 108
- solving problems 87, 123
- specifications, system 8
- starting computer 18, 23
- startup 85
- startup devices, configuring 85
- startup sequence
  - changing 109
  - setting 49
- startup sequence, setting 49
- static-sensitive devices,
  - handling 55
- status indicators 15, 16
- super video graphics array (SVGA) 24
- support line services, ordering 128
- surge protectors 13
- SVGA (super video graphics array) 24
- system
  - programs, updating 26
  - specifications 8
- system board 60
- system management features 27
- System Migration Assistant (SMA) 28

## T

- tape drive 70, 71
- technical support, fee 127
- technical support, remote 125
- technical support, warranty 125
- telephone assistance 125
- telephone cable, disconnecting 57
- trademarks 165
- troubleshooting
  - charts 96
  - information 87

## U

- unattended start mode 43
- Universal Manageability Desktop Extensions 7
- Universal Manageability Services software 7
- Universal Serial Bus (USB) ports 108
- Update Connector 7
- updating computer configuration 83
- USB port 13
- Using the Software Selections CD 131
- utility program, set up 83

## V

- venting of hot air 13
- VGA (video graphics array) 24
- video
  - adapters 24, 60
  - controller 2, 24
  - device drivers 24
  - memory 63
  - modes 24
  - port 13
  - SVGA 24
  - VGA 24
- virus protection 31
- voltage regulator module (VRM), location of 60

## W

- Wake on LAN 53
- Wake on LAN feature 27
- wake up on alarm 54
- warranty
  - statements 153
- warranty extensions and upgrades 129

- warranty service 125
- Windows setup program 17
- work area, arranging 11
- working with adapters 68
- World Wide Web home page 121, 123

## Y

- year 2000 readiness disclosure 164



Part Number: 06P8663

Printed in U.S.A.

July 2000

06P8663

